Goal:

This troubleshooting guide has the objective of helping the OEM customers carry out basic repairs on Rayco-Wylie i3500 systems. Other problems, causes or solutions can be considered.
It covers many of the difficulties encountered in the field, and assumes some system familiarity on the part of the user of this document. If this guide indicates that a part may need to be replaced, please converse with a technical representative to confirm the diagnosis and ensure that the right part is ordered. For any replaced part, check the switch and jumper settings. Make any changes necessary to make the new part identical to the one you are replacing. Some of the diagrams presented in this document may not be identical to your installed device.

Contents

1.0 How do I override the lockout

Press and hold the second button from the right at the lower edge of the console screen. This will provide 8 seconds of override. If the reason for the lock out condition is still present after 8 seconds, then the condition will reassert itself, and you will need to release the button and press and hold it again.

1.10 If holding the button did not override the lockout, open the relay box, (the black box located behind the seat or near the floor of the cab), remove the two wires in the terminal block going into 'com1' and 'no1'. Warning, the crane will be operating without any lockout function until the wires are reconnected. Always test the interlock function after reconnecting the wires, (engaging the atb and checking boom function is a quick method of verifying functionality).
Twist the wires together. This will eliminate the Rayco Wylie system from the crane's interlock controls. If the problem persists, the failure is in the crane itself and not associated with the LMI. If the problem is gone, then the relay or relay box may need to be replaced.

2.0 Load reads too high or too low.

Water in the transducer boxes can cause high weight readings, and if it does not damage the circuit, the readings may return to normal when the box is dried. Do not pressure wash any system component.

These solutions rely on the calculated radius matching the actual radius within a few inches. If these do not match, the system will be using the wrong data to calculate the load. If you suspect the displayed radius is incorrect, measure the actual and compare to the calculated on the console before continuing. Keep in mind that the radius calculation relies on an accurate boom length and angle reading. If there is an issue with either the length or angle, address that first.

2.10 If the system reads too light or too heavy by a few hundred pounds, make sure that the system is configured for the physical condition of the crane, (main boom, jib, jib angle, # parts of line) also check for jib deduct if jib is stowed, no deduct if erect or not stowed on the side of the boom, (the deduct is in use if a capitol 'D' is present at the tip of the boom on the display, and can be changed with button 7, 'Duty', the 'deduct erect/stowed' option).

2.20 Check load 1+2 readings. With the boom resting on the physical stop, go to diagnostics, scroll down to load 1 and load 2. The numbers in the 'ain' column should be about 200 to 400, the number in the dr+ column should be close to 5.0 Note: The dr+ is the 5-volt power on the board and the ain is the digital reading of the pressure.

2.21 If the ain and dr+ are zero, go to step 4.10

2.22 If the ain is zero and dr+ is normal, check the wiring of the transducer to the terminal block. Remove, reinstall, retighten all the wires. If ain still not reading, the transducer may be bad. Replace and do the transducer calibration

2.23 If the ain reads high or low, (but not zero), for either load 1 or 2, scroll downward in diagnostics until you get to the page with TX0 and TX1. Both of these should read 0.0 to 3.0. If one or both reads higher than 3.0 or less than 0.0, use the transducer calibration procedure to resolve the issue.

3.0 Error codes

Error message	Execution process	Error cause
Angle sensor defect. #	The angle sensor value in volts is not valid (if < 1 volt or > 4 volts).	1- Accelerometer or converter 12 bits are defective.
Length out of range #	A 0xFFFF code is sent by angle/length card to indicate that length sensor is not present.	1- Length sensor is not installed, 2- A wire is cut between length sensor and circuit board.
Load chart error	When starting system, there is a reading verification of chip charter (Flash).	1- Load chart chip is not installed, 2- Verify the kind of memory (must be a flash memory 29F040B), 3- There is a problem with flash memory (U12).
No load chart	The actual crane configuration is unauthorized. The programmed load chart does not support it.	1- Verify if charter is right and if it represents well the crane to calibrate. 2- Does load chart depend on rotation? 3- Does load chart depend on DIN entrees?
Not calibrated	There is no calibration for selected duty.	1- Unloaded hoist calibration (empty) and unloaded deflection must be done.
Comm. angle/length #	I3500 system does not receive data from angle sensor. If 'time out' delay is reached, then a communication error is displayed.	1- The angle/length circuit board is defective, 2- Can bus network cable is broken.
Dr+ angle/length #	5 volts reference voltage is not valid (if < 4.5 volts or > 5.5 volts).	1- Angle/length circuit board is defective.
Can Bus general error	Can Bus controller verification.	1- There is a problem with CANbus controller, either SJA1000 or MCP2515 (U29)
C memory error	When starting the system, there is a verification (Writing / Reading) of bank C chip. This is an EEPROM (28HC256). It is used as a backup for the system's operation parameters. Ex. winch, number of strands, # duty.	1- There is a problem with EEPROM memory (U45)
Limit memory error	When starting system, there is a verification (Writing/Reading) of the backup chip of the limit programmed (limiter scope).	1- There is a problem with flash memory (U52)
A memory	When starting system, there is a verification (Reading) of bank A chip. This is an EEPROM (28HC256). It is used as a backup for calibration data.	1- There is a problem with memory EEPROM (U44)
RAM memory error	When starting system, there is a verification (Writing/ Reading) of RAM chip. This is a temporary memory.	1- There is a problem with RAM memory (U3). With Logger option, the cause is RAM memory (U5). - if system is behaving strangely, - if system initializes often during operation mode, - if system never starts.

4.0 The console displays errors for load, and or, angle, length, radius.

Go to diagnostics, check dr+ for angle and length, load1 and load2. This should be 5.0. If it reads zero for all four locations, then the 12vdc is probably not getting to the boxes on the boom side of the slipring, go to step 4.10.

If the dr+ is good for angle and length but bad for load 1+2, go to step 4.22.

If the dr+ is good for load 1+2 but bad for angle/ length, go to 4.30.

If dr+ is good for load 1+2 and the load shows error, go to 2.20.

If dr+ is good for angle and length and an error is indicated for either of them, then the system may need an angle or length calibration. Go to 10.0 or 11.0

If after eliminating the cause of the error, the system is not indicating accurately, then the module which was experiencing the error may need to be recalibrated.

If the transducer box or length/ angle box needs to be replaced, the appropriate calibration must be done after the new part is installed.

4.10 Open the relay box, (the black box located behind the seat or near the floor of the cab), measure the voltage between the white and blue wires on the canbus connector going to the slipring, (the connector on the right lower edge of the box goes into a 4/5 pin connector hooking it to the internal circuit board, the voltage can be read as it comes off of the board.) This should be 12vdc.

4.11 If the 12vdc is missing, check the internal fuses, the relay box may need to be replaced if the fuses are good.

4.20 In the transducer box, measure the incoming 12vdc on the white and blue wire from the canbus connector (the left most connector coming into the bottom of the box).

4.21 If there is no 12vdc in the transducer box, check the wiring above and below the slipring for problems, (corrosion, bad connections, broken wires, …).

4.22 If 12vdc is present at the transducer box on the white and blue wire from the canbus connector (the left most connector coming into the bottom of the box). replace the internal fuse, (check the inside of the box cover for fuse and spare locations). Check diagnostics for load 1+2, dr+ should be close to 5.0

4.23 If the new fuse blows, or the load 1+2 dr+ continues to read incorrectly, then the box may need to be replaced.

4.30 For a length/angle/radius error, measure the incoming 12vdc on the white and blue wire from the canbus connector (The newer cable reel has the board located inside the assembly, the older reel has an external box mounted on a bracket.)

4.31 If 12vdc is missing, check to see if the 12vdc is leaving the transducer box thru the connector on the right side of the board. If there is no 12vdc at this point, then the transducer box may need to be replaced. If the 12vdc is present at the canbus cable leaving the right side of the transducer box, but not present at the cable reel, the cable may be damaged and in need of being replaced.

4.32 If 12 vdc is present, replace the on board fuse with the spare as identified on the sticker on the inside of the cover, or as marked on the board. Check diagnostics for 5.0 on dr+ for angle and length.

4.33 If the new fuse blows, or angle and length dr+ continues to read incorrectly, then the board may need to be replaced.

5.0 Relay Box Controller

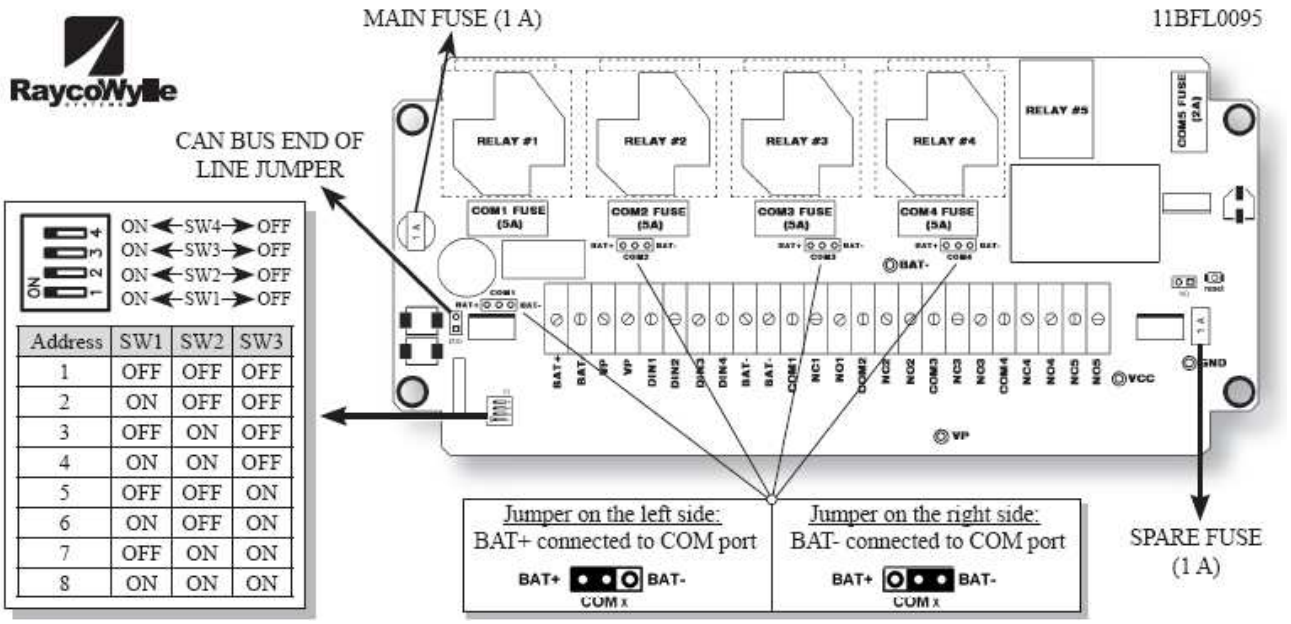
5.10 Check the fuses in the relay controller with an ohmmeter. You can use the spare one if it blown. (See drawing for location)

5.20 Check the voltage supply between BAT + and BAT –. It must be between 10.2 to 28.8 volts.

5.30 Check the power supply cable integrity and the connection from the dash to the relay box controller.

5.40 Check the fuse F7 with an ohmmeter inside the display box.

5.50 Check the voltage with a voltmeter between Vcc and GND. It must be 5 volts ±0.5 volts.



"33M0080" Relay box Controller

6.0 Transducers and CANbus Load Interface

6.10 Check the Pressure transducers cable integrity and connections.

6.20 Check the CANbus load cables integrity (jacket and connectors).

6.30 Check the fuses in the load interface with an ohmmeter. You can use the spare one if it blown. (See drawing for location).

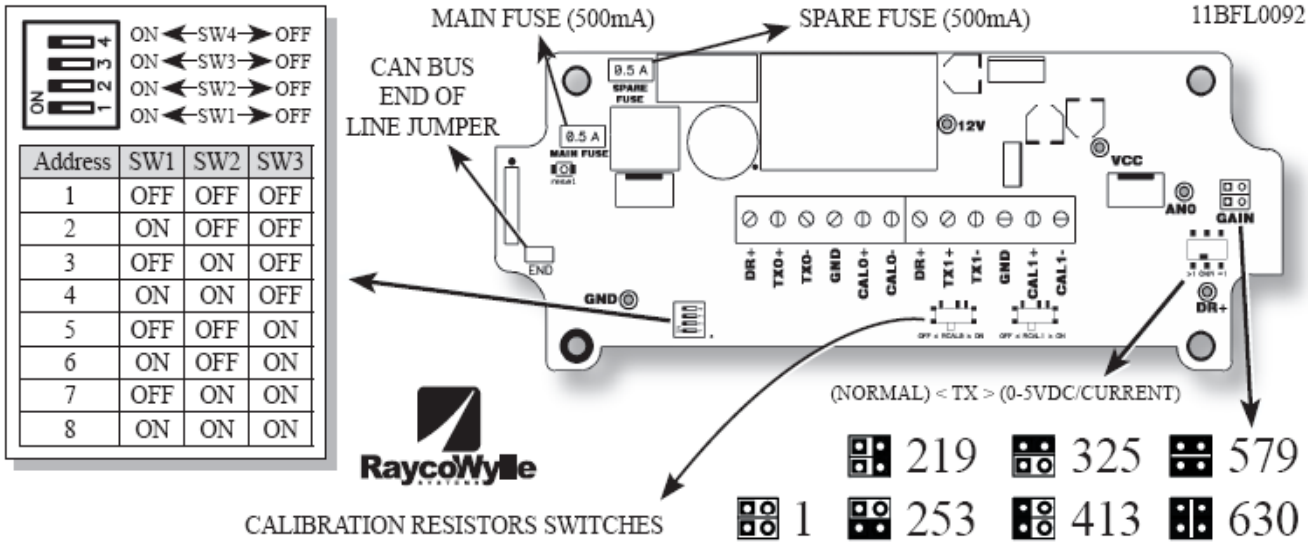
6.40 Check the voltage with a voltmeter between DR+ and GND. It must be 5 volts ±0.5 volts.

6.50 Check the voltage with a voltmeter between 12V and GND. It must be 12 volts ±0.5 volts.

6.60 Check the voltage with a voltmeter between Vcc and GND. It must be 5 volts ±0.5 volts.

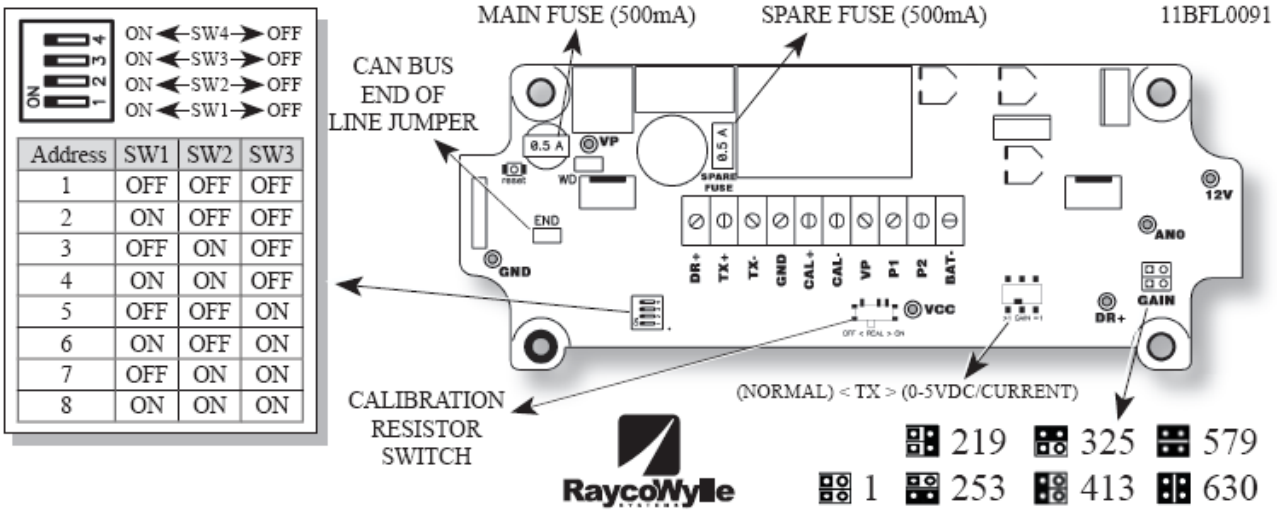
6.70 Disconnect the pressure transducer suspected and bleed it. Use an ohmmeter to verify all wires combinations. Follow the diagram to check the resistor.

COLOR WIRE	RESISTANCE VALUE
RED AND BLUE	380 ohm ± 2 ohm
RED AND YELLOW	277 ohm ± 2 ohm
RED AND GREEN	277 ohm
BLUE AND GREEN	277 ohm
BLUE AND YELLOW	277 ohm
GREEN AND YELLOW	350 ohm
BLACK AND WHITE	*Don't verify black and white wire*



Address	SW1	SW2	SW3
1	OFF	OFF	OFF
2	ON	OFF	OFF
3	OFF	ON	OFF
4	ON	ON	OFF
5	OFF	OFF	ON
6	ON	OFF	ON
7	OFF	ON	ON
8	ON	ON	ON

“33M0078” Double CANbus load interface



Address	SW1	SW2	SW3
1	OFF	OFF	OFF
2	ON	OFF	OFF
3	OFF	ON	OFF
4	ON	ON	OFF
5	OFF	OFF	ON
6	ON	OFF	ON
7	OFF	ON	ON
8	ON	ON	ON

“33M0077” Single CANbus load interface

7.0 Transducer Calibration

Before calibrating the transducers, check to see what they have for an output. The following are the normal readings for various conditions, if your system falls outside of these parameters then it most likely needs to be calibrated.

Ensure that the transducer physical connections are tight. Go to the main screen. Lower the boom until it hits the physical stop, release the control. Go to diagnostics and check TX0 and TX1 (should be 0.0 to 3.0). If possible, engage the boom control to continue lowering the boom, TX0 should rise to over 240, (this may not be possible on some systems). Lift the boom for 3-5 seconds. Check TX0, (should be about 30), TX1, (should be 0.0 to 3.0). As you lower the boom, TX1 will increase.

Note: bore=load1=TX0, rod=load2=TX1.

It is always a good idea to loosen the transducer fittings to ensure that there is no pressure in the lines during calibration, take all necessary precautions before engaging in this activity

7.10 With the cal switch in the console turned on, (located in the lower left corner inside the console), the boom resting on the physical stop, the engine turned off, remove the cover from the transducer box. Go to the transducer you wish to calibrate and write down the 4-digit number inscribed on the side of the transducer body, (should be aprox 280.0 to 299.9). If the system uses two bore transducers, you will need to record both values, add them together, and divide by two for the correct value. If no number fitting the above description can be located on the transducer, use a wrench to loosen the fitting, and rotate the transducer until the cal number can be viewed.

1.20 With the electronic power turned on, enter calibration mode by pressing the 'mode' button, scrolling down to 'calibration' and pressing the checkmark button, the password is 1234, the numbers are on the buttons. Select the transducer to be calibrated using option 4, the scroll buttons and the check mark button.

7.30 Zero the transducer by selecting option 5, and hitting the check mark. The check mark will need to be used twice more to complete the task. Do not press any buttons when the console indicates that the change is being made, until after the message window goes away.

7.40 Select option 6 to span the transducer. Go to the transducer box and move the calibration button on the circuit board of the transducer you wish to calibrate.

Note: Two models for the transducer box are currently in use, 33M077 and 33M0078. If two boxes are mounted near the slip ring, then they should both be 33M0077. If there is only one box, it will be a 33M0078. The 77 has only one cal switch while the 78 has two. In the 78, the right most switch is for the rod while the one closer to the middle of the board is for the bore.

A four digit number should now be present on the console, (should be aprox 280.0 to 299.9). The sensor value should also indicate a 4-digit number. If it does not, there may be a problem with the transducer, go to 7.41. Press the check mark, the number mentioned above should now read 300.0 and be highlighted. Using the scroll buttons, change this value until it matches the number you got from the side of the transducer you wish to calibrate. Hit the check mark to accept and save this number.

7.41 Remove and reinstall the black and white wires from the problem transducer where they connect to the terminal in the transducer box. If this does not solve the issue, try connecting the other transducer's black and white wires into the failing channel.

Example: When calibrating load-1, the sensor value stayed at 350 when the cal switch was engaged. If two transducers are used for load one, disconnect one of the from the cal circuit by removing its black and white wires from the terminal block. Check the reading on the 'span transducer' page, senor value should be a 4-digit number, if not, disconnect and try the other sensor. If one sensor indicates a 4-digit value and the other does not, replace the bad transducer and do transducer cal. If both transducers fail to yield a 4-digit value in 'span transducer' when the cal switch in the transducer box is in the on position, then the transducer box should be replaced. Do a transducer cal after installing the new box. In the above example, if load-1 has only a single transducer, use the black and white wires from the load-2 sensor to test the box if the wires are long enough.

7.50 On the console, go to diagnostics, scroll down to TX0, TX1. The transducer you are calibrating should read 280 to 299.9. In the transducer box, move the cal switch back to it's original position. The TX reading should now be 0.0 to 3.0. If the reading does not go to 0.0 to 3.0, repeat the process again, if it continues to fail, the transducer box and/or the transducer may need to be replaced.

7.60 Insure that the transducer physical connections are tight. Go to the main screen. Lift the boom for 3-5 seconds. Check the load reading. Go to diagnostics and check TX0, (should be about 30), TX1, (should be 0.0 to 3.0). If the calibration procedure worked ok, but the load or TX values are still far from what they should be, the transducer and/or the transducer box may need to be replaced.

Remember to return the calibration switch in the console to the normal operating condition before closing the console. If you loosened the hydraulic fitting for the transducer to ensure there was no pressure in the line, do not forget to tighten it before lifting the boom.

8.0 System indicates ATB is active

Make sure the A2B switch mechanical components work properly. Disconnect the 2 pin connecter that connects the cable reel to the ATB switch at the tip of the boom. Using an ohmmeter, the switch can be examined, (should read open when ATB is active and short when not active). If no meter is available, insert a jumper, (a paperclip will work) to short out the two wires on the cable heading back to the cable reel. If the ATB signal goes away, then the source of the problem is in the ATB switch itself or the receptacle for the connecter.

8.10 Open the cable reel enclosure and the related CANbus interface box if present, check the A2B brush contacts and wiring.

8.20 Disconnect the wires to BAT – and A2B on the circuit board or in the CANbus interface box if present, (see 33M0075 and 22BCB1189). Use a jumper to close the loop between A2B and BAT -. The A2B alarm should disappear if the CANbus interface is working properly. If the alarm is still present, then the board may need to be replaced and the new one will need an angle and length calibration.

8.30 Using an ohmmeter, check for continuity from BAT- and A2B on the circuit board to the 2 pin connecter for the ATB receptacle.

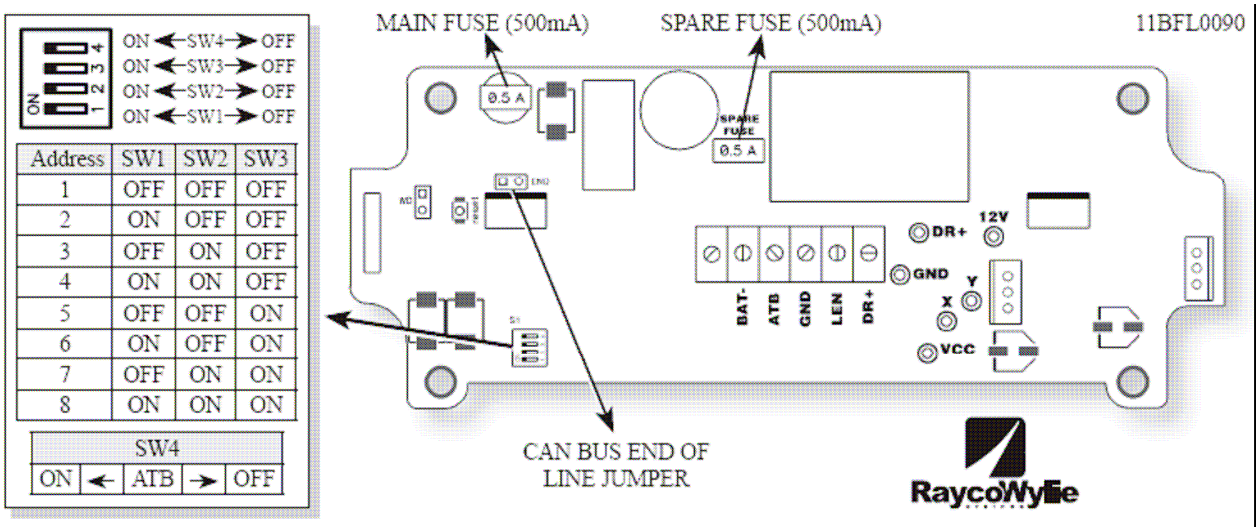
9.0 Length and angle physical layout and troubleshooting data.

9.10 Check the voltage with a voltmeter between DR+ and GND. It must be 5 volts ±0.5 volts.

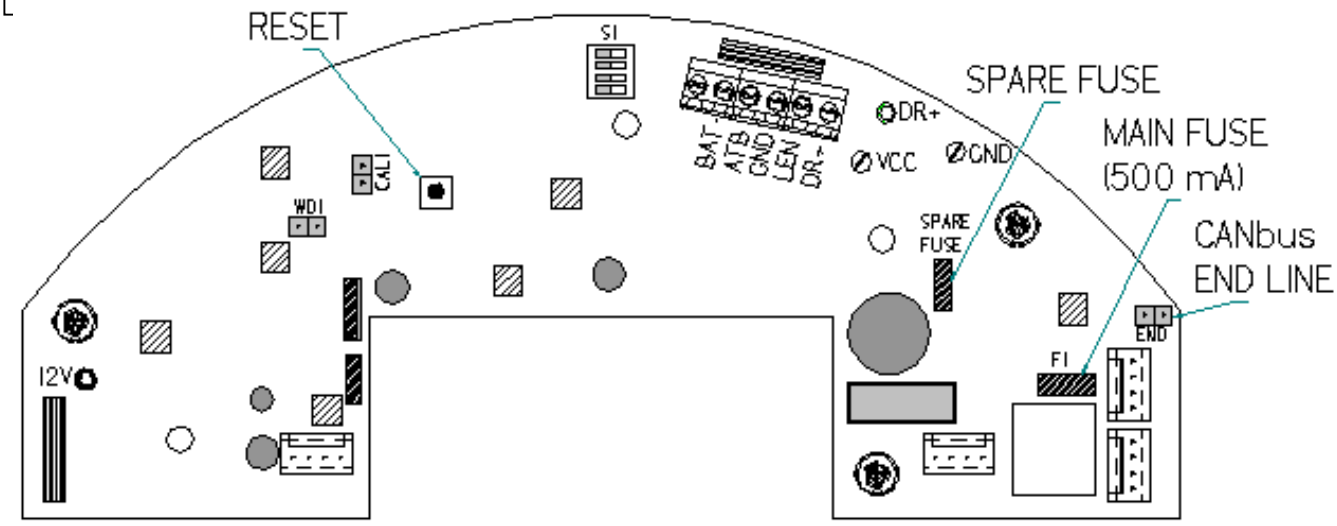
9.20 Check the voltage with a voltmeter between 12V and GND. It must be 12 volts ±0.5 volts.

9.30 Check the voltage with a voltmeter between Vcc and GND. It must be 5 volts ±0.5 volts.

9.40 Check the fuses on the angle, length and A2B CANbus interface with an ohmmeter. You can use the spare one if it blown. (See drawing for locate)



“33M0075” Angle, length and A2B CANbus interface



"22BCB1192" Angle, length and A2B CANbus interface
(Localized inside of medium cable reel)

10.0 Angle Calibration

10.10 With the cal switch in the console turned on, (located in the lower left corner inside the console), and the boom resting on the physical stop, lift the boom until your digital angle gauge indicates zero degrees. enter calibration mode by pressing the 'mode' button, scrolling down to 'calibration' and pressing the checkmark button, the password is 1234, the numbers are on the buttons.

10.11 Use **"⮝"** or "⮟" to choose the "select sensor" line and press **"✓"**.

10.12 Highlight the angle sensor and press the **"✓"**, wait for the system's confirmation.

10.13 Choose the " Zero sensor" line and press **"✓"**.
This value must be above 100 bits. If smaller, turn the sensor in the cable reel or associated can bus interface box to increase the value.

10.14 Press **"✓"** twice to confirm the zero and wait for the system confirmation.

10.15 Return to the main screen and elevate the boom to about 60 degrees.
Compare the system to your digital device. The system should be within 1 degree.

Remember to return the calibration switch in the console to the normal operating condition before closing the console.

11.0 Length calibration

11.10 With the cal switch in the console turned on, (located in the lower left corner inside the console), and the boom fully retracted, enter calibration mode by pressing the 'mode' button, scrolling down to 'calibration' and pressing the checkmark button, the password is 1234, the numbers are on the buttons.

11.12 Use **"▲"** or "▼" to choose the "select sensor" line and press **"✓"**.

11.13 Highlight the length sensor and press the **"✓"**, wait for the system's confirmation.

11.14 When the change is approved, scroll using **"▲"** or **"▼"** to choose the "- zero sensor" line and press **"✓"**. The sensor's value must be approximately 100 bits (0,50 volts; adjust the potentiometer inside the cable reel if necessary).

11.15 Press **"✓"** to edit the zero value (when the boom is completely retracted, the value must be set to zero)

11.16 Press **"✓"** again to confirm the value.

11.17 Press **#5 "ESC"** to return to the main calibration menu.

11.20 Use **"▲"** or **"▼"** to choose the "-span sensor" line and press **"✓"**.

11.21 Extend the boom completely. The sensor value should be 150 bits above the zero value. Please refer to the crane main boom chart. Enter the difference between the fully extended main boom length and the fully retracted main boom length. For example: A fully extended boom of 81 feet minus a fully retracted boom of 34 feet = 47 feet. You enter 47.0 at span extension.

11.22 Press **"✓"** to edit the span value.

11.23 Use **"▲"** or **"▼"** to edit the span value.

11.24 Press **"✓"** to confirm the value.

11.25 Press **#5 "ESC"** to return to the main calibration menu.

11.30 Fully extend the boom and verify that the calculated length matches the value on the load chart, then retract the boom and ensure that the retracted value also matches the load chart.

Remember to return the calibration switch in the console to the normal operating condition before closing the console.

12.0 The console has no power when the crane is turned on.

12.10 Unplug the console and remove the back cover. Check the fuse on the right side of the circuit board. Make sure the wires are firmly attached to the terminal block, (you can use an ohm meter to check the connectivity between the plug and the terminal block, a small gauge wire may also be needed). If no problems are found, continue to next step.

12.11 Attach the cable to the console and check for 12vdc on the terminal block between BAT+ and BAT-

If the 12vdc is present and the console fails to operate, it may need to be replaced. If this is the case, you will need to provide the crane model #, serial #, and the number on the console that begins with 'FC', (such as FC09-0145).

12.20 Open the relay box, (the black box located behind the seat or near the floor of the cab in most cases), measure the voltage between the white and blue wires on the canbus connector going to the console, (the connector on the left lower edge of the box goes into a 4/5 pin connector hooking it to the internal circuit board, the voltage can be read as it comes off of the board.) This should be 12vdc.

12.30 If there is no 12vdc on the canbus cable to the console, go to 5.00 and examine the relay box and incoming power suply

13.0 Proximity switch information

13.10 Check if the proximity switch works properly with a steel component close to the front sensor. The red light must be turned on.

13.20 The distance between the target and the proximity switch must be adjusted to 3/16" maximum.

13.30 Check the cable integrity between the proximity switch and the relay box controller (33M0081).

13.40 Check the connections inside the relay box controller (33M0081). The wiring is as follows;. Brown-VP, Black-DIN1, Blue-BAT-