Link-Belt Pulse
Calibration Manual

(Level 2)
Access on Cranes with Outrigger Sensors

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CONSTRUCTION EQUIPMENT

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Notes:

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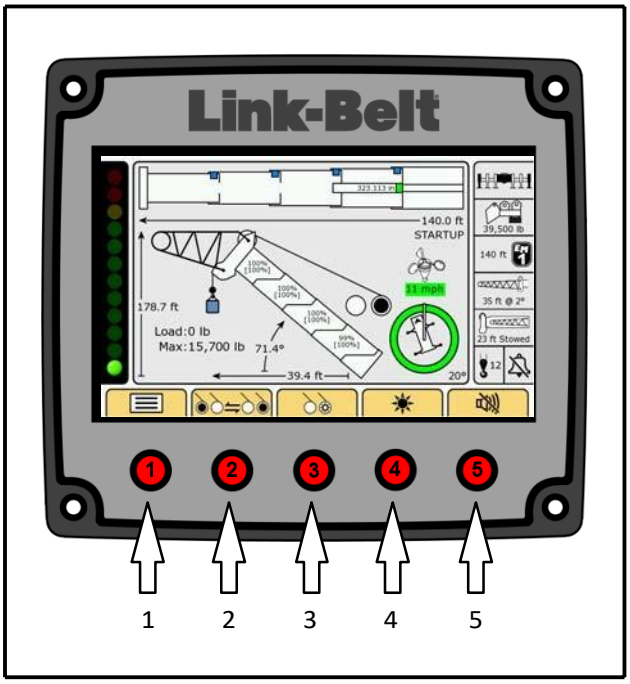
General Information

1. Required Tools
   a. Test weights – [1 approximately 2,000 lb *(907kg)* and 1 approximately 10,000 lb *(4 536kg)*]
   b. Measuring Tape – 200 – 300 ft graduated in tenth's of a foot
   c. Digital level
2. For calibration purposes, boom mode must be selected to allow full extension of all boom sections. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
3. If software is to be updated, record **ALL** Friction Slider Bar Values **BEFORE** programming any of the Electronic Control Modules (ECM's).

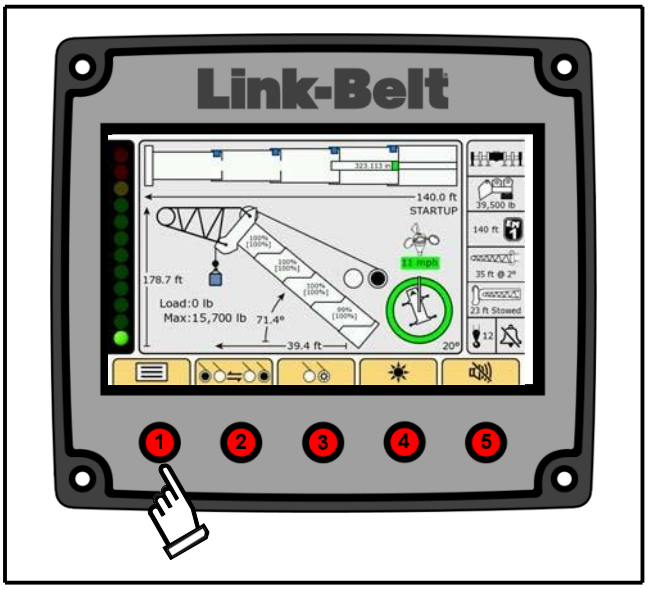
Display Button Identification

1. The Buttons on the actual Pulse Display are not numbered, but for the purpose of this document, Buttons 1 through 5, starting on the left, will be referenced as Button numbers as shown below.

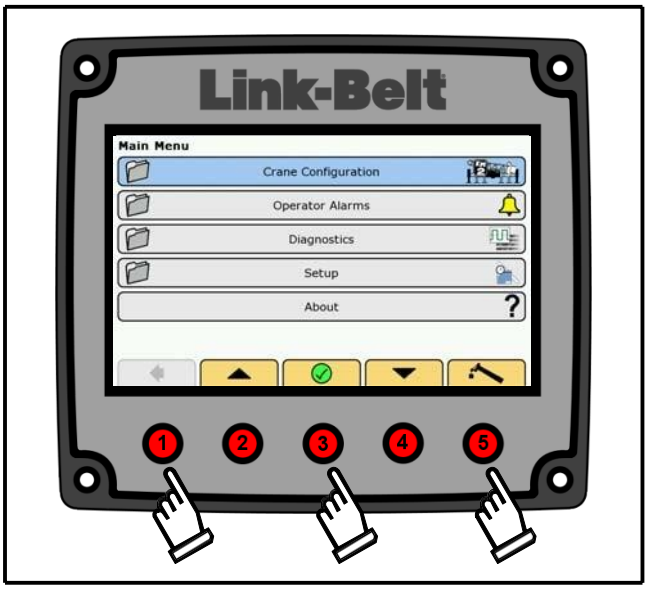


Calibration And Programming Procedures

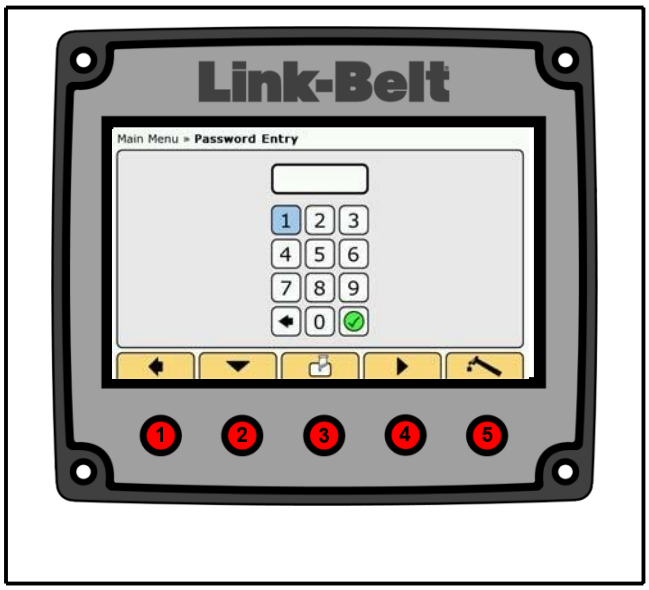
1. Calibration Mode Entry



a. Press Button 1 to enter the Main Menu.



b. Press Buttons 1, 3, and 5 simultaneously, then release, to enter Access Level 2.



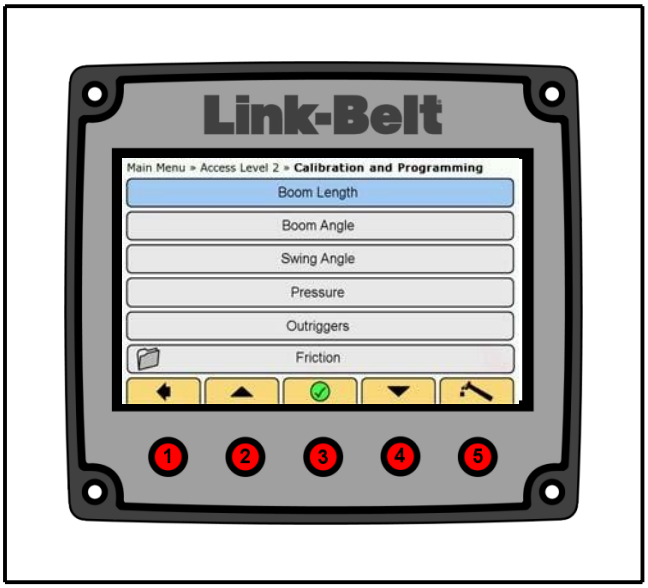
c. Use Buttons 2 and/or 4 to navigate to the first number of the Password and press Button 3 to enter the number. Follow this procedure for each number of the Password. Press Button 3 one more time when checkmark is highlighted.
   1. Level 2 Password is 22222.
   2. When Password is entered correctly, Main Menu, Access Level 2 screen should appear.

Boom Length Calibration

Zero Telescope Cylinder Calibration

1. Fully retract the boom.

2. In Access Level 2, use Buttons 2 and/or 4 to navigate to Calibration and Programming.
3. Press Button 3 to enter Calibration and Programming.



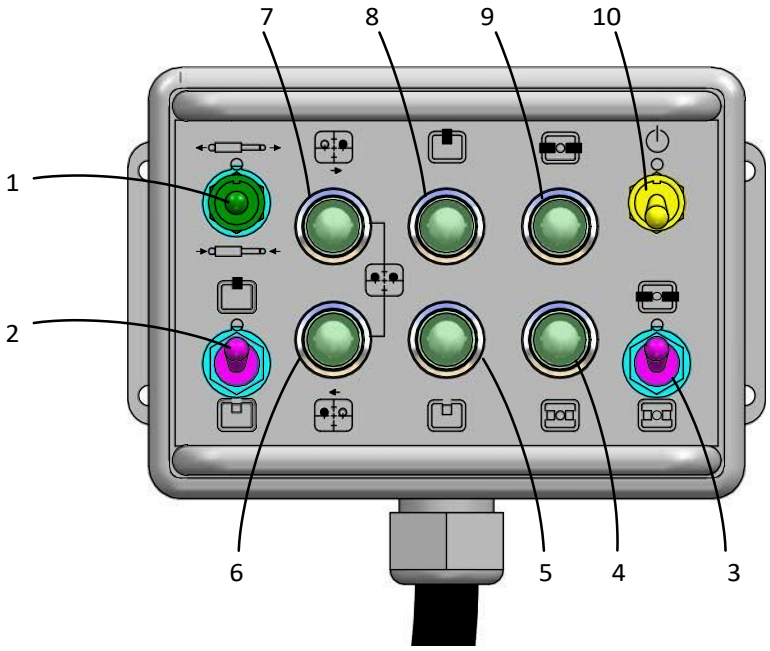
4. Use Buttons 2 and/or 4 to navigate to Boom Length.
5. Press Button 3 to enter Boom Length.

6. Use Buttons 2 and/or 4 to navigate to Calibrate Telescope Cylinder.

CAUTION

Manual mode is intended only for emergency operation.

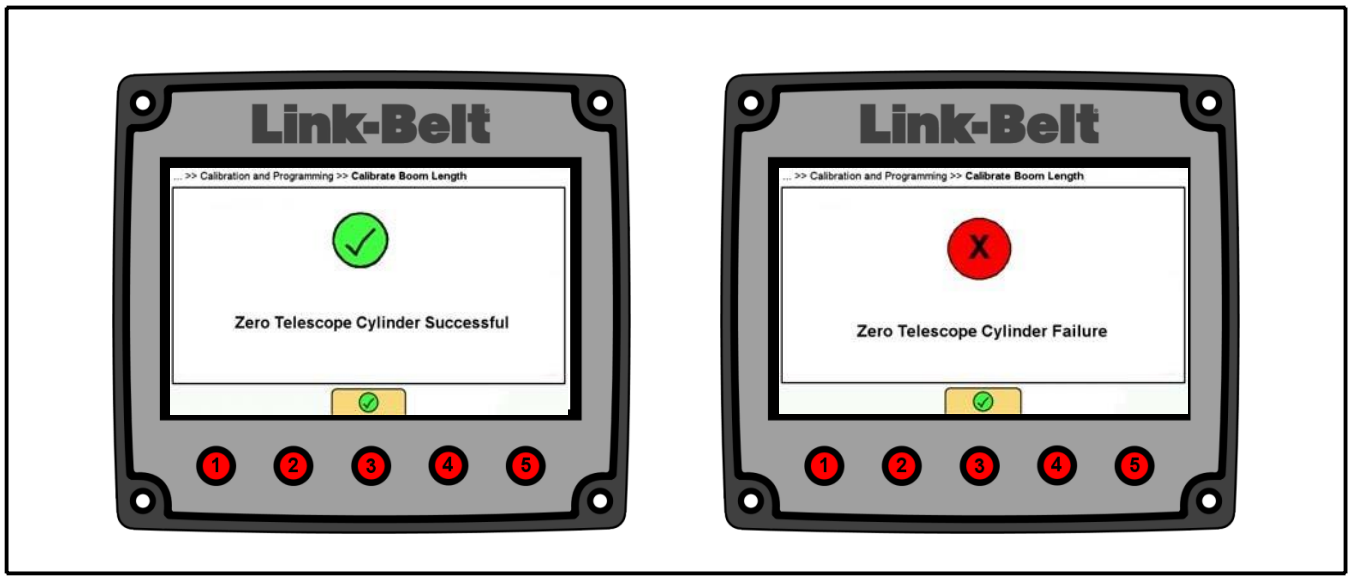
Improper operation of the boom in manual mode can cause major damage to the boom.



1. Extend/Retract Switch
2. Pin/Unpin Switch
3. Latch/Unlatch Switch
4. Not Latched Indicator Light
5. Not Pinned Indicator Light
6. Latch Forward Indicator Light
7. Latch Rearward Indicator Light
8. Pinned Indicator Light
9. Latched Indicator Light
10. Activate Switch

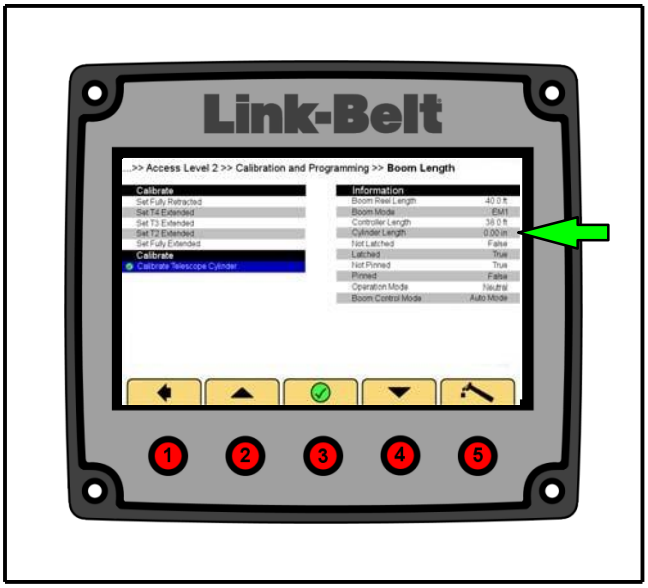
7. Connect the Manual Control Box to the Manual Mode Plug on the crane. Refer to the Crane Operator's Manual for the location of the connection.
8. Push the Activate Switch up and hold. Push the Pin/Unpin Switch up to PIN and the Latch/Unlatch Switch down to UNLATCH.
9. Confirm that the PINNED and NOT LATCHED lights are illuminated. The telescope cylinder may have to be extended or retracted slightly to obtain NOT LATCHED.
10. Fully retract the telescope cylinder until it bottoms out.
11. Press Button 3 to set the telescope cylinder zero point.
12. The Display should show question, “Are you sure?”

13. Press Button 3 to confirm “Yes” or press Button 4 to confirm “No”.



14. Depending on the previous inputs, "Zero Telescope Cylinder Successful" or "Zero Telescope Cylinder Failure" should be shown.

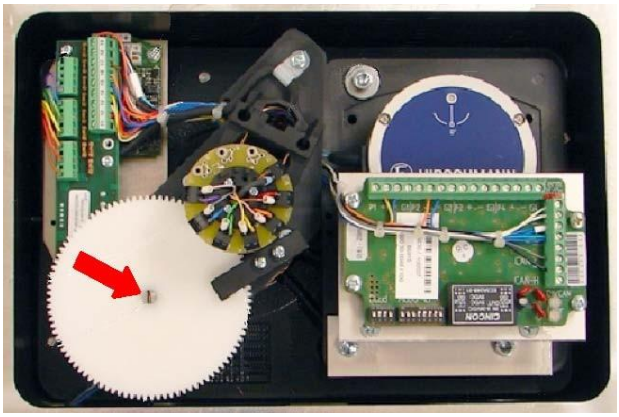
    Note: If a "Zero Telescope Cylinder Failure" is shown when trying to zero the telescope cylinder, confirm that the Manual Control Box is plugged in and the "PINNED and NOT LATCHED" sensors are active.



15. Extend the telescope cylinder slightly and retract it again to verify the telescope cylinder returns to 0.00" ±.009" *(0.00cm ± .023cm)*.
16. With "Zero Telescope Cylinder Successful" disconnect and properly store the Manual Control Box.
17. Press and hold the telescope pedal to return the telescope cylinder to its starting point and let the system Latch and Unpin the section.
18. Zero Telescope Cylinder is complete.

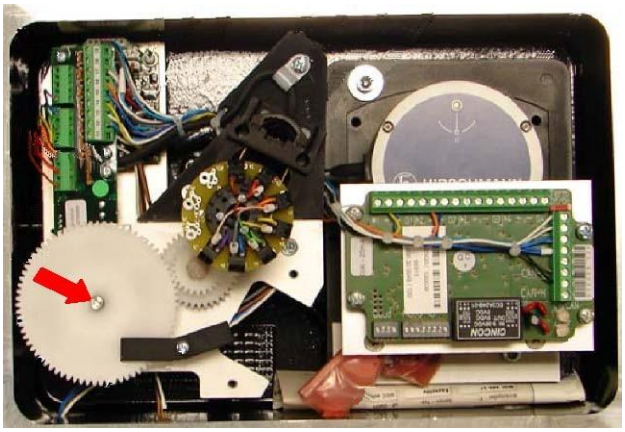
Calibrate Boom Length – PAT Reel Initial Setup

1. Remove cover from PAT reel.
2. Adjust soft stop on length potentiometer.



2-Gear Reeling Drum

a. Soft stop adjustment for 2-gear reel, use small screwdriver and rotate potentiometer counter-clockwise until potentiometer stops.

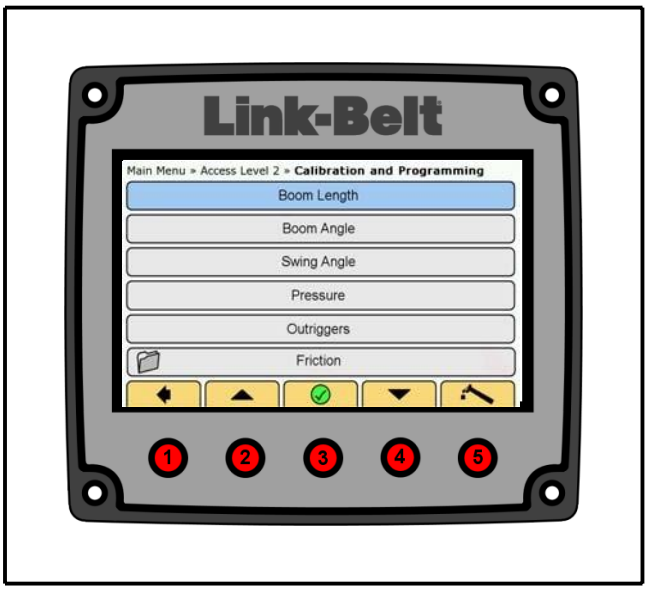


3-Gear Reeling Drum

b. Soft stop adjustment for 3-gear reel, use small screwdriver and rotate potentiometer clock-wise until potentiometer stops.

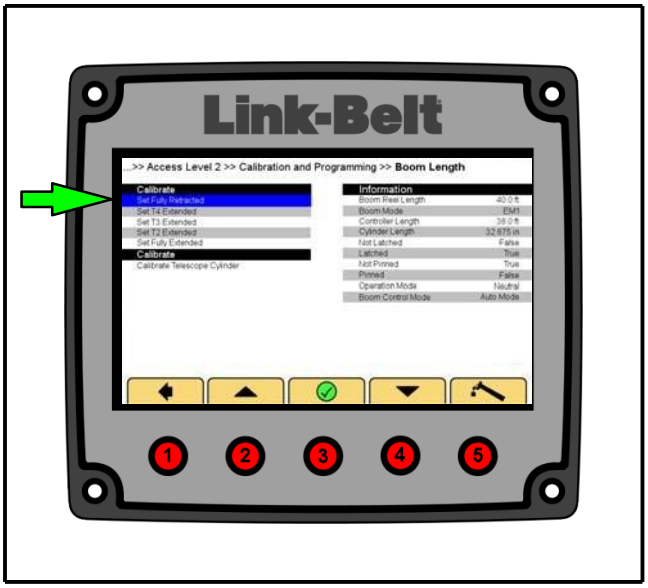
3. Replace cover on PAT reel.
4. Setup complete.

Calibrate Boom Length – Pin And Latching Booms

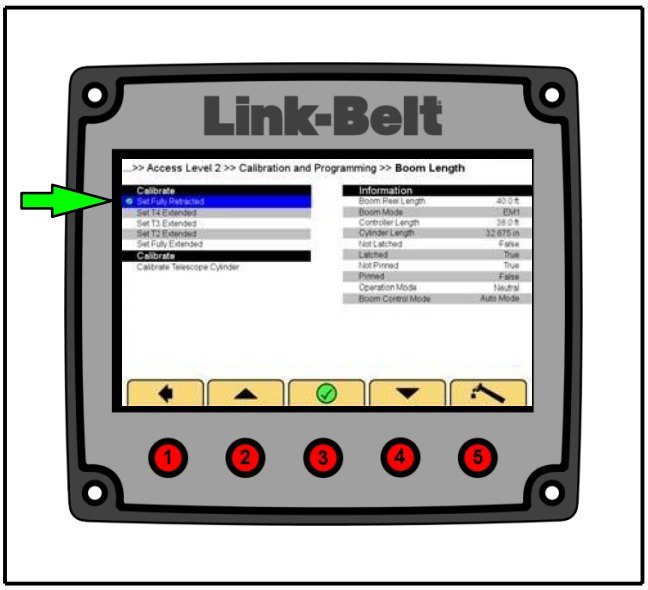


Note: Adjust soft stop on PAT reel first. Refer to "Calibrate Boom Length–PAT Reel Initial Setup".

1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Boom Length.
2. Press Button 3 to enter Boom Length.



3. Use Buttons 2 and/or 4 to navigate to Set Fully Retracted.



4. Fully retract the boom for the first calibration point. With the boom fully retracted and in the "PINNED and LATCHED" condition, press Button 3 which will place a green checkmark by the **Set Fully Retracted** position as in the example above.

   Note: Pressing Button 2 and/or 4 will navigate through the extended sections to be calibrated highlighting them in BOLD type.

5. Extend the boom until the next section is extended and is PINNED and NOT LATCHED and the telescope cylinder is returning to the home position.

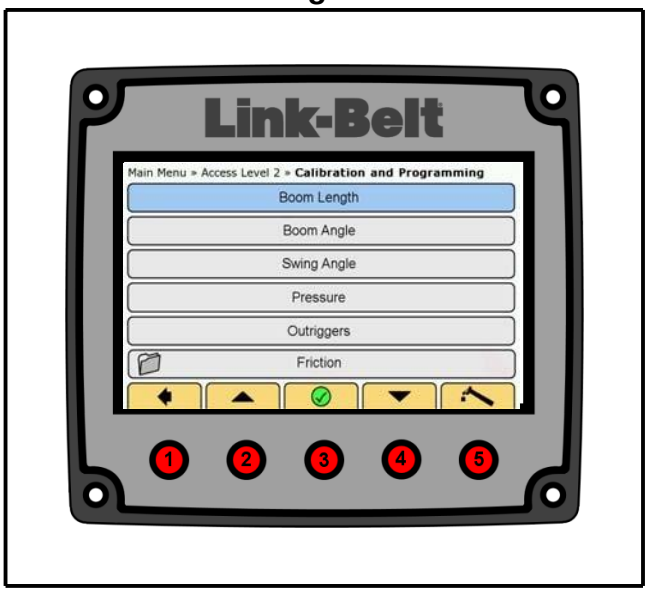
   Note: Section must be PINNED and NOT LATCHED before calibration will be accepted.

6. Press Button 3 to set the next extended section boom length and a green checkmark will appear indicating the calibration point. Repeat this procedure until all sections have been extended.

   Note: The last section will not PIN and UNLATCH.

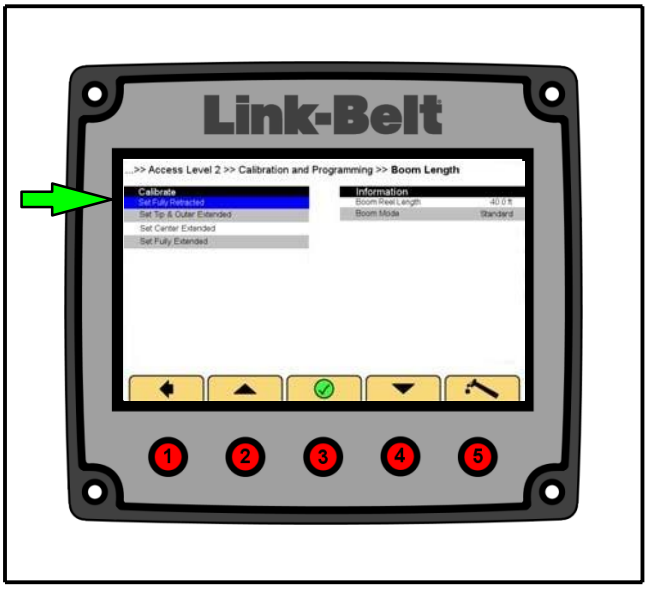
7. When completed all sections will have green checkmarks indicating all sections have been calibrated.
8. Boom Length Calibration is now complete.

Calibrate Boom Length – Full Power Booms

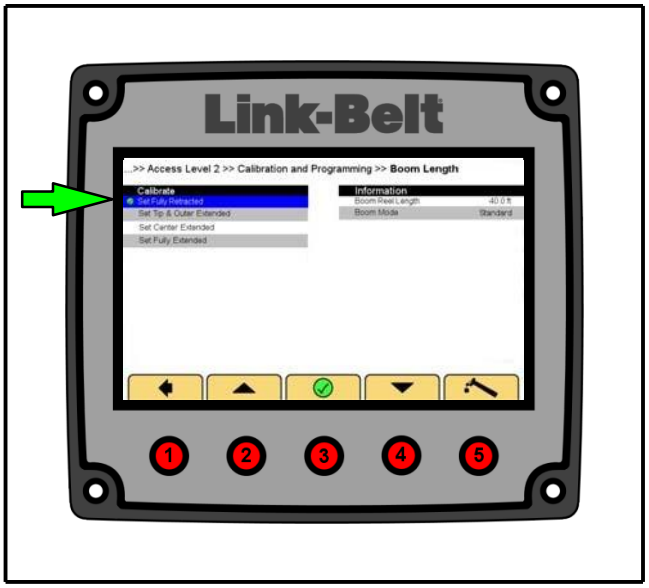


Note: Adjust soft stop on PAT reel first. Refer to "Calibrate Boom Length–PAT Reel Initial Setup".

1. In Access Level 2, Calibration and Programming, Use Buttons 2 and/or 4 to highlight Boom Length.
2. Press Button 3 to enter Boom Length.



3. Use Buttons 2 and/or 4 to highlight Set Fully Retracted.

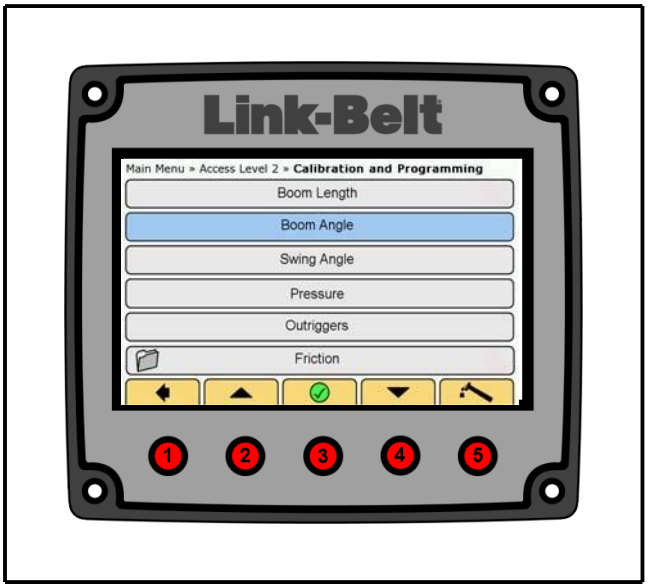


4. Fully retract the boom for the first calibration point - with the boom fully retracted, press Button 3 which will place a green checkmark at the **Set Fully Retracted** position as in the example above.

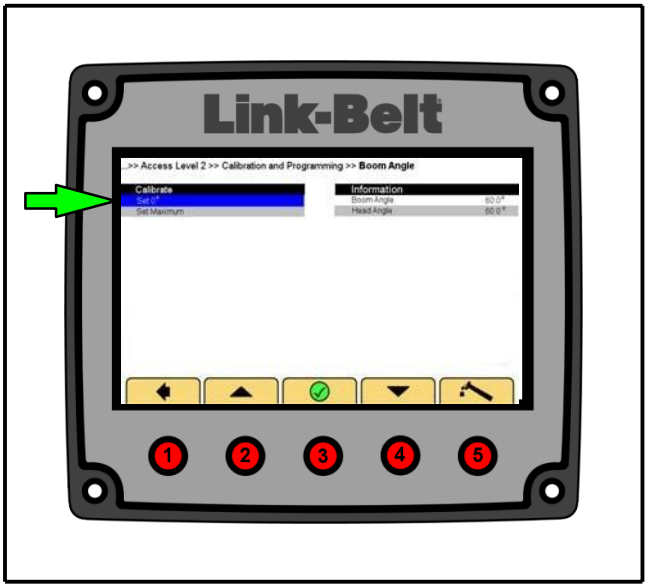
Note: Pressing Button 2 and/or 4 will scroll through the extended sections to be calibrated highlighting them in BOLD type.

5. Using the Boom Telescope Override Switches extend the Tip and Outer boom sections.
6. Press Button 3 to set the extended section boom length and a green checkmark will appear indicating the calibration point. Do not retract Tip and Outer boom sections, proceed to Step 7.
7. Using the Boom Telescope Override Switches extend the Center boom section (if equipped, if not equipped proceed to Step 9).
8. Press Button 3 to set the extended section boom length and a green checkmark will appear indicating the calibration point.
9. Fully extend the boom.
10. When completed all sections will have green checkmarks indicating all sections have been calibrated.
11. Boom Length Calibration is now complete.

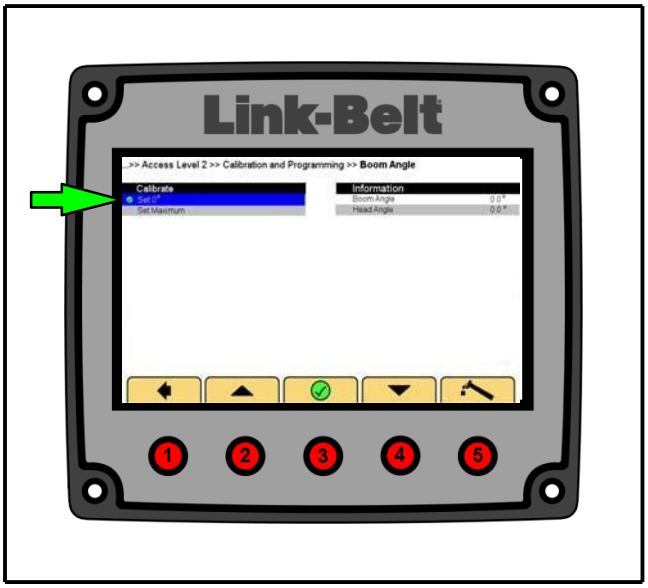
Boom Angle Calibration



1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Boom Angle.
2. Press Button 3 to enter Boom Angle.

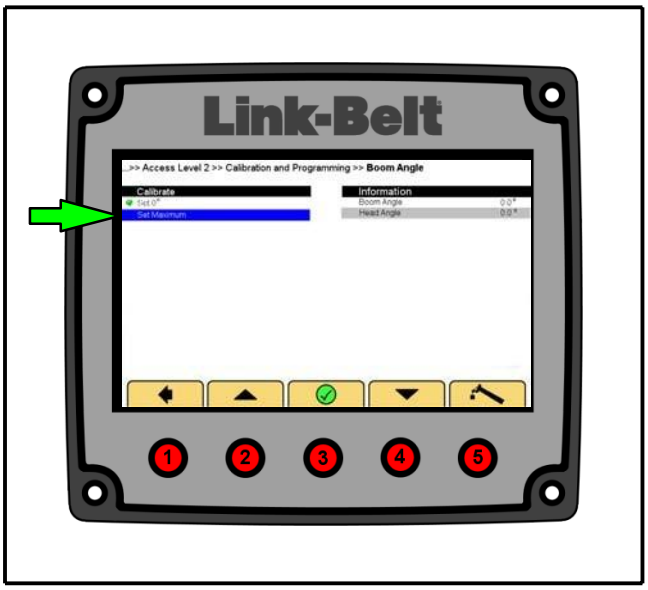


3. Use Buttons 2 and/or 4 to navigate to Set 0°.
4. Ensure the boom is at zero degrees, verifying with a digital level.
5. Press Button 3 to enter Set 0°.

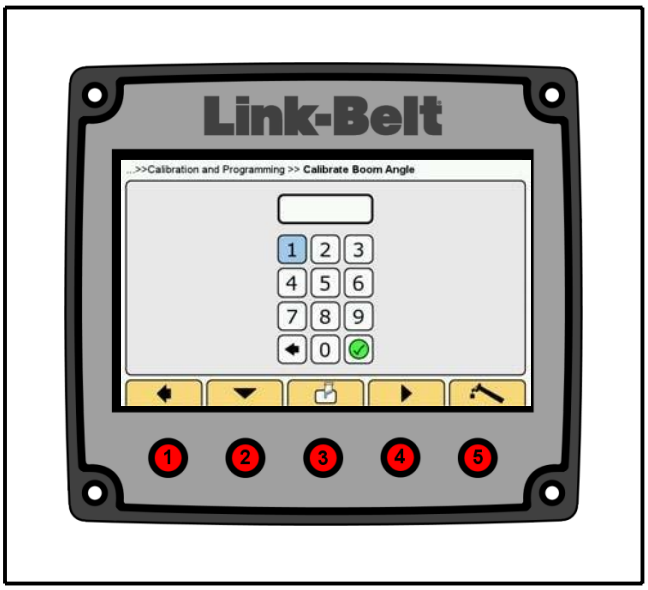


6. A green checkmark will appear indicating position has been calibrated.
7. Raise the boom to 80 degrees, verifying with a digital level. (If 80 degrees cannot be obtained use the next lower whole reading. I.E. = 79 degrees.)

Note: The Software does not contain a decimal point so a whole number must be used.

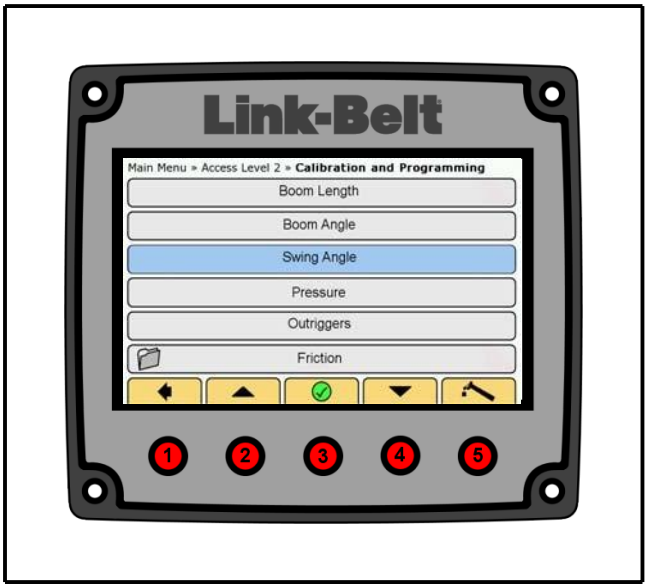


8. Use Buttons 2 and/or 4 to navigate to Set Maximum.
9. Press Button 3 to enter Set Maximum.

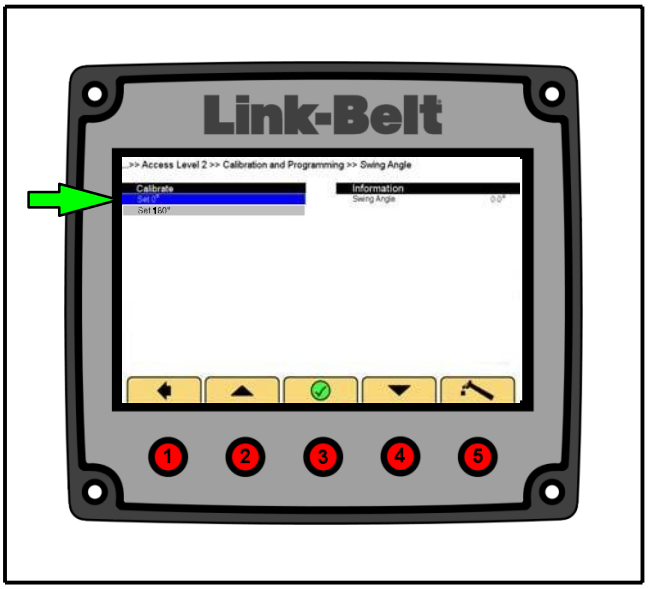


10. Enter actual angle value. I.E. 80 degrees. Use Buttons 2 and/or 4 to navigate to the first number and press Button 3 to enter the number. Repeat for the second number.
11. Use Buttons 2 and/or 4 to navigate to the green checkmark.
12. Press Button 3 to enter the span value.
13. A green checkmark will appear indicating the position has been calibrated.
14. Boom Angle Calibration is now complete.

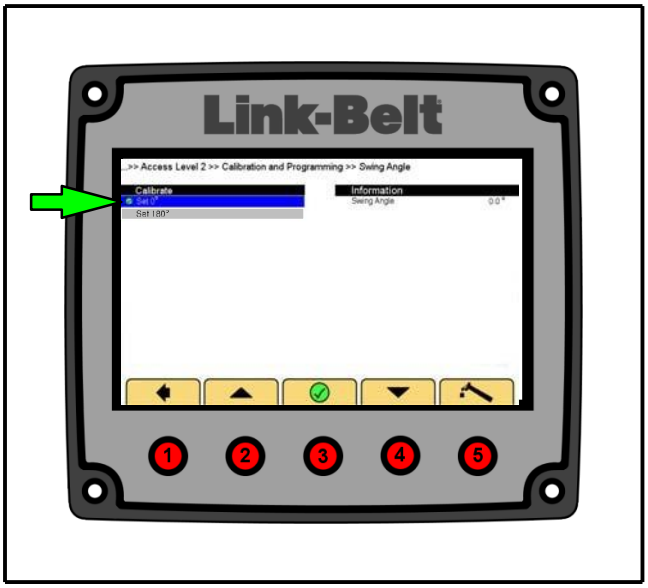
Swing Angle Calibration



1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Swing Angle.
2. Press Button 3 to enter Swing Angle.



3. Swing the upper directly over the front of the carrier and set the travel swing lock.
4. Use Buttons 2 and/or 4 to navigate to Set 0°.
5. Press Button 3 to set the 0° position.



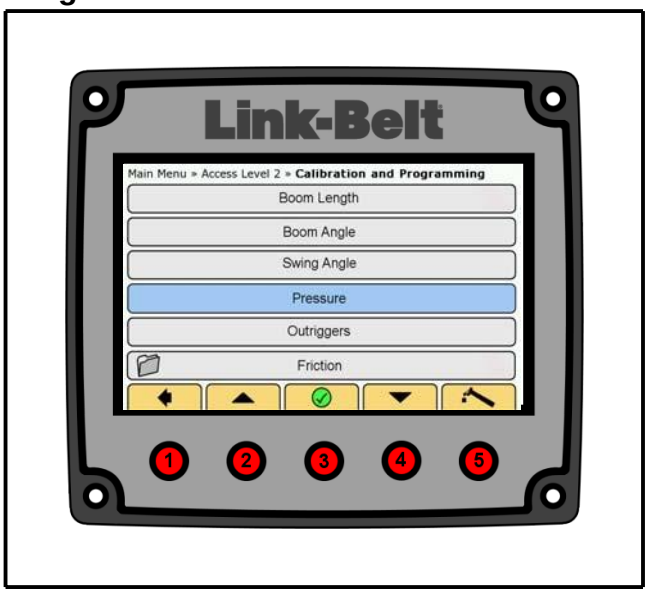
6. A green checkmark will appear indicating the 0° position has been calibrated.
7. Release the travel swing lock.
8. Swing to the right.
9. Ensure degree reading is increasing.

Note: If swing angle decreases, the signal wires on the swing potentiometer will need to be reversed.

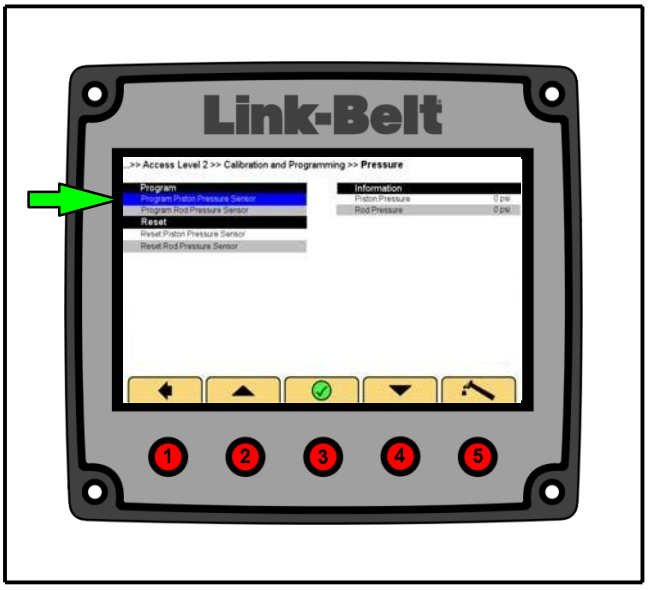
10. Swing the upper directly over the rear of the carrier and set the travel swing lock.
11. Use Buttons 2 and/or 4 to navigate to Set 180°.
12. Press Button 3 to set the 180° position.
13. A green checkmark will appear indicating the 180° position has been calibrated.
14. Swing Angle Calibration is now complete.

Pressure Programming

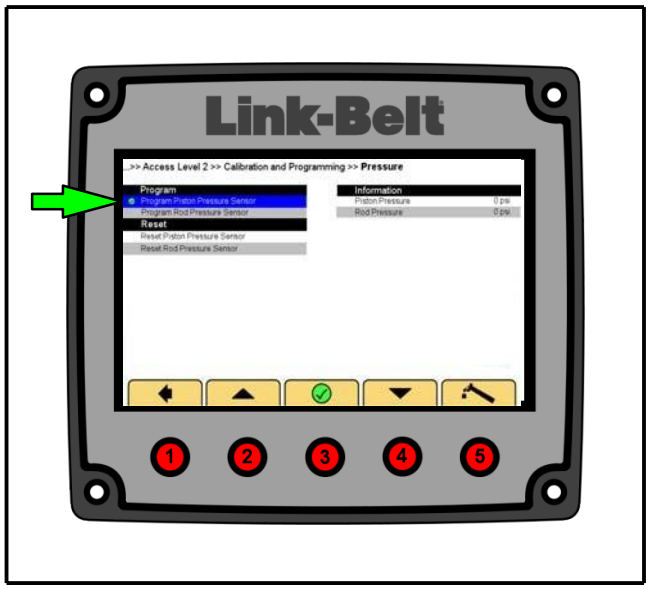
Program Pressure Transducers



1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Pressure.
2. Electrically disconnect both pressure transducers from the system.
3. Press Button 3 to enter Pressure.
4. Electrically connect the Piston pressure transducer.



5. Use Buttons 2 and/or 4 to navigate to Program Piston Pressure Sensor.
6. Press Button 3 to program the piston pressure transducer.



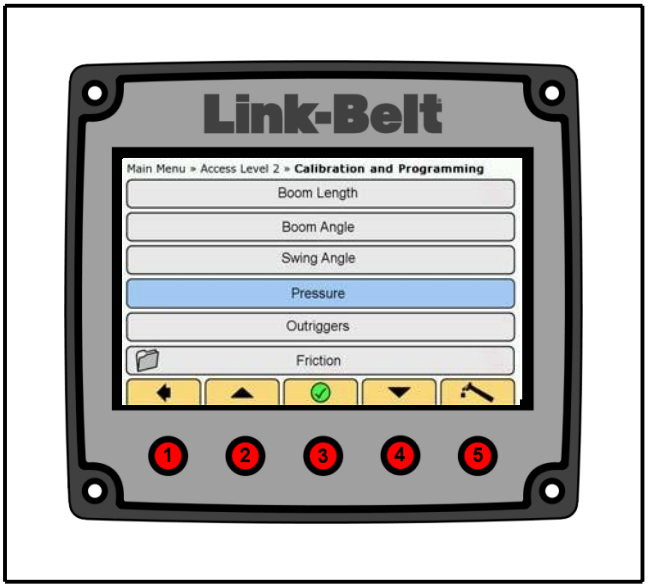
7. A green checkmark will appear indicating piston pressure transducer has been programmed. The piston pressure transducer readout should now reflect hydraulic pressure.

   Note: The piston pressure transducer can remain connected after it has been programmed.

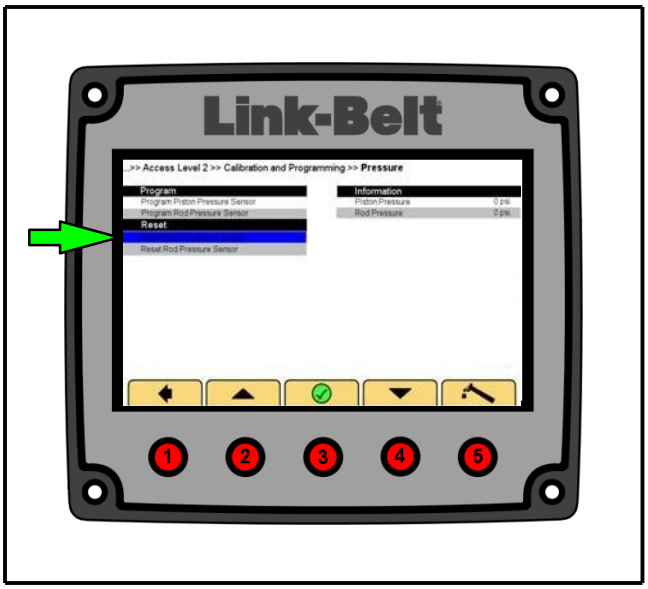
8. Electrically connect the Rod pressure transducer.
9. Use Buttons 2 and/or 4 to navigate to Program Rod Pressure Sensor.
10. Press Button 3 to program the rod pressure transducer.
11. A green checkmark will appear indicating the rod pressure transducer has been programmed. The rod pressure transducer readout should now reflect hydraulic pressure.
12. Pressure Transducers Programming is now complete.

Reset Pressure Transducers

This is used to reset the CAN ID to factory default. If this procedure is used, the CAN ID's must be reprogrammed by repeating the previous procedures, "Program Pressure Transducers".



1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Pressure.
2. Press Button 3 to enter Pressure.



3. Use Buttons 2 and/or 4 to navigate to Reset Piston Pressure Sensor.
4. Press Button 3 to reset the piston pressure transducer to factory default.
5. A green checkmark will appear indicating the piston pressure transducer has been reset.
6. Use Buttons 2 and/or 4 to navigate to Reset Rod Pressure Sensor.
7. Press Button 3 to reset the rod pressure transducer to factory default.
8. A green checkmark will appear indicating the rod pressure transducer has been reset.
9. Pressure Transducers are now reset to factory default.

Outrigger Programming And Calibration

This is used to program and calibrate the outrigger sensors.

1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Outriggers.

2. Press Button 3 to enter Outriggers.
3. Use the following procedures to Program the outrigger sensors.
   a. Disconnect CAN Bus cables from all four outrigger beams.
   b. Connect CAN Bus cable to front left outrigger beam.

      Note: This is the sensor connection on the outrigger cylinder that functions the left outrigger beam on the right side of the crane.

   c. Use Buttons 2 and/or 4 to navigate to "Program Front Left".
   d. Press Button 3 to enter Program Front Left. Verify the green checkmark appears.
   e. Disconnect CAN Bus cable from front left outrigger beam. Connect CAN Bus cable to front right outrigger beam.

      Note: This is the sensor connection on the outrigger cylinder that functions the right outrigger beam on the left side of the crane.

   f. Use Buttons 2 and/or 4 to navigate to "Program Front Right".
   g. Press Button 3 to enter Program Front Right. Verify the green checkmark appears.
   h. Disconnect CAN Bus cable from front right beam. Connect CAN Bus cable to rear left outrigger beam.

      Note: This is the sensor connection on the outrigger cylinder that functions the left outrigger beam on the right side of the crane.

   i. Use Buttons 2 and/or 4 to navigate to "Program Rear Left".
   j. Press Button 3 to enter Program Rear Left. Verify the green checkmark appears.
   k. Disconnect CAN Bus cable from rear left beam. Connect CAN Bus cable to rear right outrigger beam.

      Note: This is the sensor connection on the outrigger cylinder that functions the right outrigger beam on the left side of the crane.

   l. Use Buttons 2 and/or 4 to navigate to "Program Rear Right".
   m. Press Button 3 to enter Program Rear Right. Verify the green checkmark appears.
   n. Connect CAN Bus cables to all outrigger

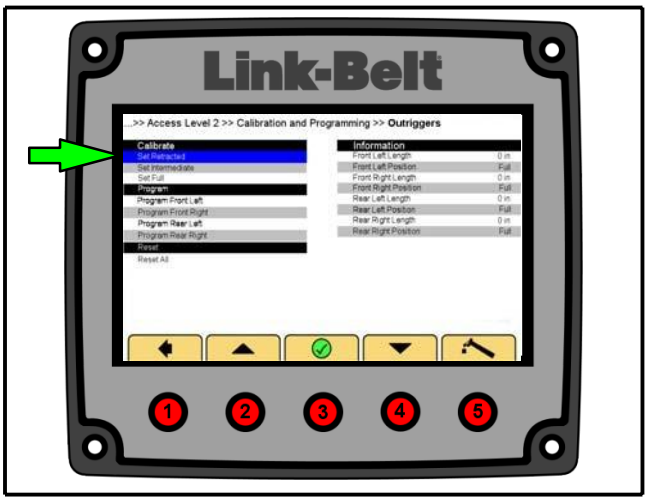
beams.

4. Use the following procedures to reset the outrigger sensors if any outrigger sensor system faults are present.

   Note: One can reset individual or all sensors based on whether or not the sensor(s) is/are connected. If a sensor is connected it will be reset.

   a. Disconnect CAN Bus cables from all four outrigger beams.
   b. Connect CAN Bus cable to front left outrigger beam.
   c. Use Buttons 2 and/or 4 to navigate to “Reset All”.
   d. Press Button 3 to enter Reset All. Verify the green checkmark appears.
   e. Disconnect CAN Bus cable from front left outrigger beam.
   f. Connect CAN Bus cable to front right outrigger beam.
   g. Use Buttons 2 and/or 4 to navigate to “Reset All”.
   h. Press Button 3 to enter Reset All. Verify the green checkmark appears.
   i. Disconnect CAN Bus cable from front right outrigger beam.
   j. Connect CAN Bus cable to rear left outrigger beam.
   k. Use Buttons 2 and/or 4 to navigate to “Reset All”.
   l. Press Button 3 to enter Reset All. Verify the green checkmark appears.
   m. Disconnect CAN Bus cable from rear left outrigger beam.
   n. Connect CAN Bus cable to rear right outrigger beam.
   o. Use Buttons 2 and/or 4 to navigate to “Reset All”.
   p. Press Button 3 to enter Reset All. Verify the green checkmark appears.
   q. Connect appropriate CAN Bus cables to all four outrigger beams.

5. Use the following procedures to Calibrate the outrigger sensors. Recalibrate with any new software download to the system.
   a. Retract all outrigger beams to the fully retracted position.

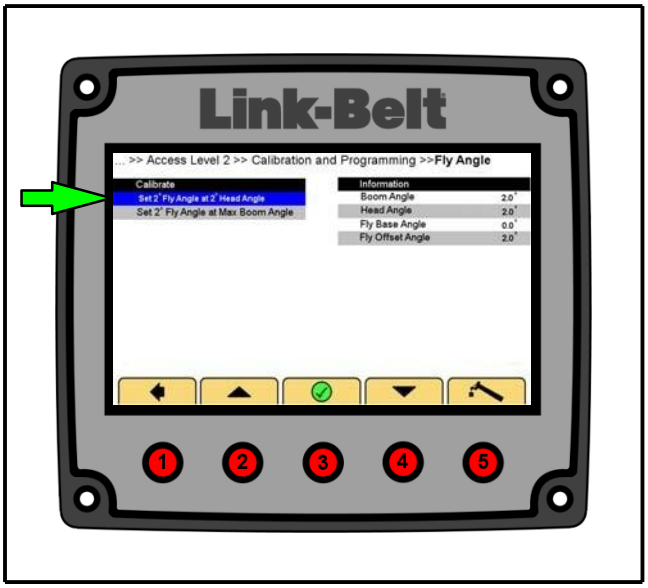


   b. Use Buttons 2 and/or 4 to navigate to “Set Retracted”.
   c. Press Button 3 to enter Set Retracted. Verify the green checkmark appears.
   d. Extend all outrigger beams to intermediate position (using outrigger position pins to set correct position).
   e. Use Buttons 2 and/or 4 to navigate to “Set Intermediate”.
   f. Press Button 3 to enter Set Intermediate. Verify the green checkmark appears.
   g. Extend all outrigger beams to fully extended position.
   h. Use Buttons 2 and/or 4 to navigate to “Set Full”.
   i. Press Button 3 to enter Set Full. Verify the green checkmark appears.
   j. Program and Calibration of Outriggers is now complete.

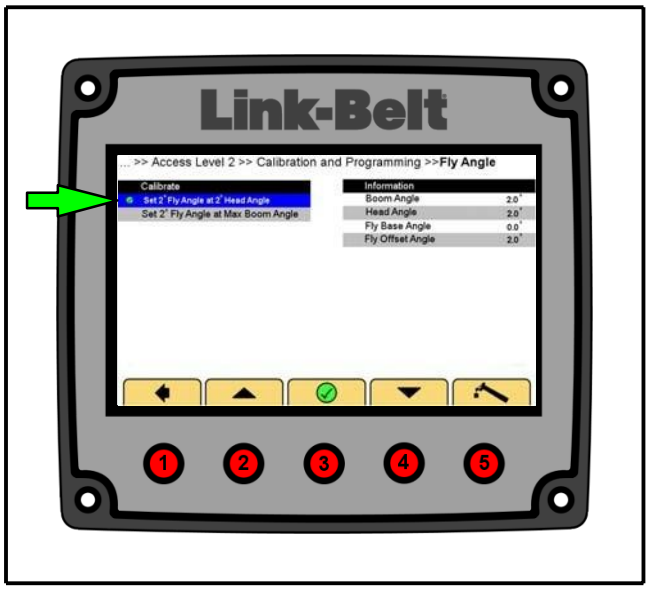
   Note: When setting the Fully Retracted Outrigger position(Set Retracted), the system will set the retracted length value as defined in “General Dimensions” in the Crane Rating Manual. There is a ±1.5” tolerance between the sensors. If a sensor is out of this range an Outrigger Mismatch message will appear on the Display. If in Rigging Mode, this same message will appear on the Display.

Hydraulic Fly Angle Sensor Calibration

1. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Fly Angle.
2. Press Button 3 to enter Fly Angle.

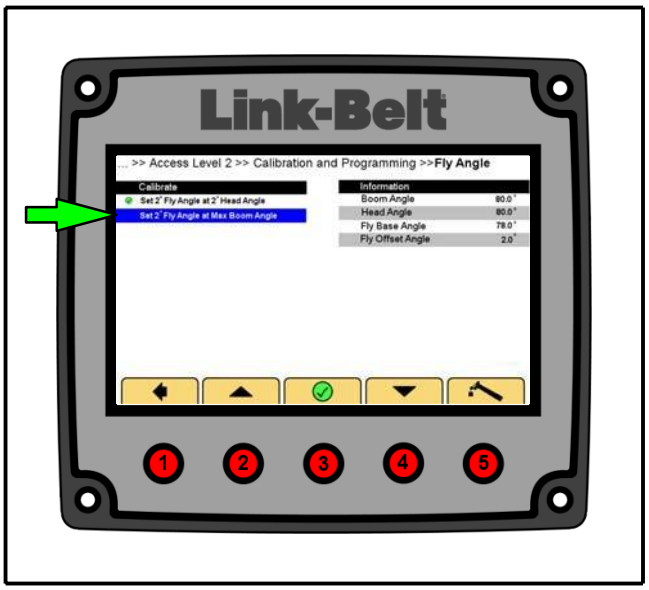


3. Use Buttons 2 and/or 4 to navigate to Set 2° Fly Angle at 2° Head Angle.
4. Confirm that the Head Angle is at 2°.
5. Press Button 3 to enter Set 2°Fly Angle at 2° Head Angle.

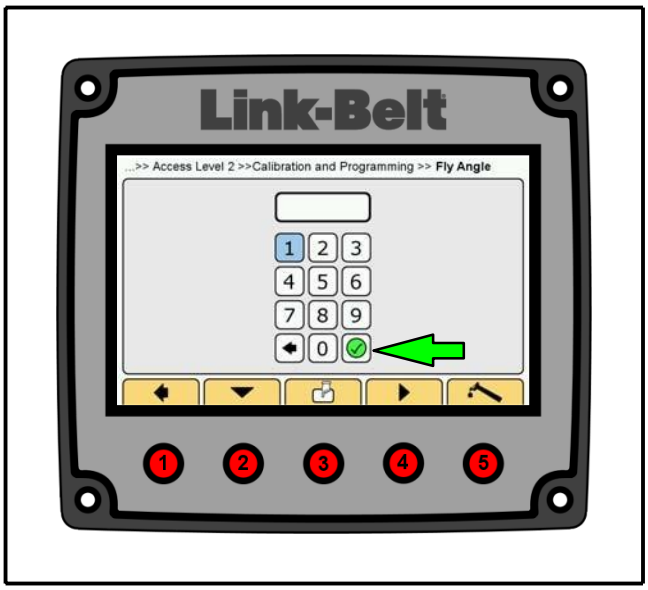


6. A green checkmark will appear indicating the 2° Angle has been calibrated.
7. Raise the boom to 80°. (If 80° cannot be obtained, use the next lower whole reading. I.E. = 79°.)

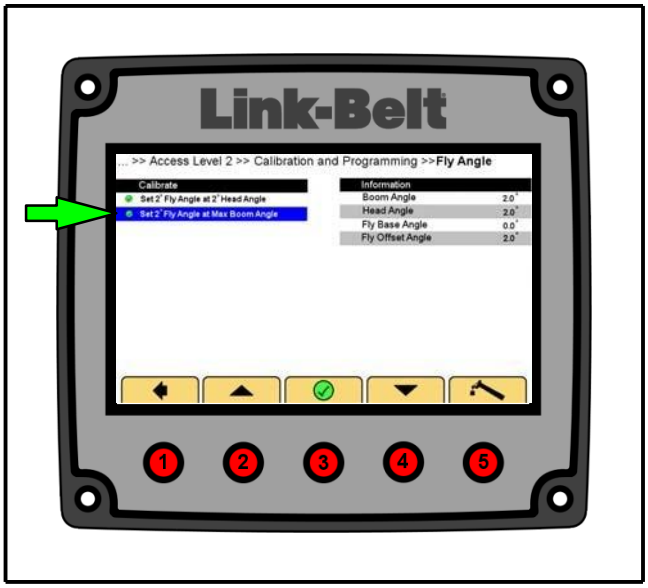
Note: The Software does not contain a decimal point so a whole number must be used.



8. Use Buttons 2 and/or 4 to navigate to Set 2° Fly Angle at Max Boom Angle.
9. Press Button 3 to enter Set 2°Fly Angle at Max Boom Angle.



10. Confirm and then enter the actual boom angle value. (I.E. 80°.) Use Buttons 2 and/or 4 to navigate to the first number and press Button 3 to enter the number. Repeat for the second number of the boom angle.
11. Use Buttons 2 and/or 4 to navigate to the green checkmark.
12. Press Button 3 to enter the span value.



13. A green checkmark will appear indicating the position has been calibrated.
14. Hydraulic Fly Angle Calibration is now complete.

Main Winch Friction Calibration

See Appendix A for Dynamic and Friction Calibration procedures for cranes requiring these procedures.

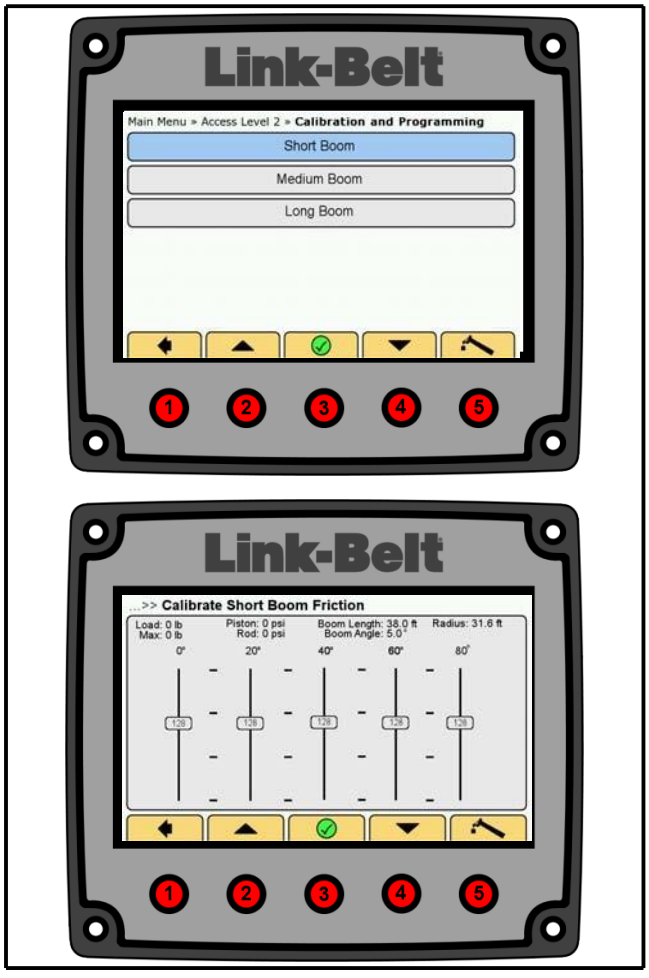
1. Ensure the computer system is fully operational, in working mode, and with a fully functional ATB system. Setup crane on fully extended outriggers, and select boom mode to allow full extension of all boom sections. Configure the crane to lift from the main winch and preferably with full counterweight. Crane engine should be operating around 1000 RPM for smooth operation. **CRANE MUST BE CONFIGURED WITH THE CORRECT ATTACHMENTS AND PROPERLY SETUP.** Calibration is to be done at 0, 20, 40, 60, and 80 degree boom angles. These procedures will be done for fully retracted boom and repeated for half extended and fully extended boom lengths. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**

Note: Some angles may not be attainable. If between two angles – I.E. 12 degrees actual boom angle, adjust sliders for 0 degrees and 20 degrees equally.

2. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Friction.
3. Press Button 3 to enter Friction.

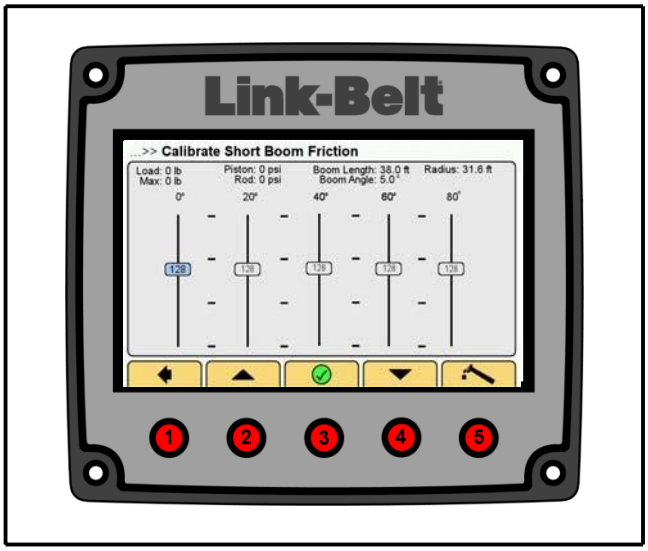
Note: Depending upon the crane model, the front winch may be the Main Winch or may be the Auxiliary Winch. To determine the winch(es), if the crane has a removable rear winch, the rear winch is considered to be the Auxiliary Winch, or if the crane has only one winch, then it is considered to be the Main Winch.

4. Use Buttons 2 and/or 4 to navigate to Main Winch.
5. Press Button 3 to enter Main Winch.

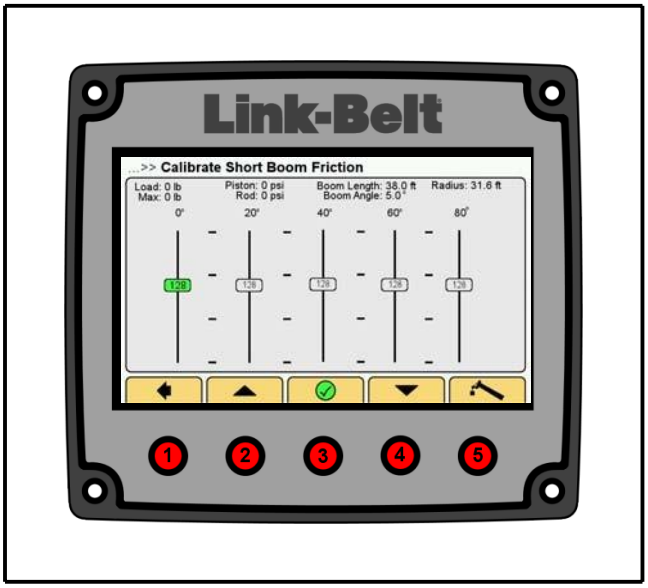


6. Use Buttons 2 and/or 4 to navigate to Short Boom.
7. Press Button 3 to enter Short Boom.

8. Calibrate Short Boom Friction screen should appear.
9. Fully retract the boom and position to 0 degree boom angle.



10. Use Buttons 2 and/or 4 to move the highlighted position (blue) to the 0 degree adjustment slider.



11. Press Button 3 to activate the slider, which will turn the slider green.
12. Lift the test weight of approximately 2,000 lb *(907kg)*.
13. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

Note: Static load adjustment will not show correction until Step 14 is completed.

14. Press Button 3 to select the chosen setting.
15. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
16. Boom up to 20 degrees. Use Buttons 2 and/or 4 to move the highlighted position to the 20 degree adjustment slider.
17. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

Note: Static load adjustment will not show correction until Step 18 is completed.

18. Press Button 3 to select the chosen setting.
19. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
20. Boom up to 40 degrees. Use Buttons 2 and/or 4 to move the highlighted position to the 40 degree adjustment slider.
21. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

Note: Static load adjustment will not show correction until Step 22 is completed.

22. Press Button 3 to select the chosen setting.
23. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
24. Boom up to 60 degrees. Use Buttons 2 and/or 4 to move the highlighted position to the 60 degree adjustment slider.

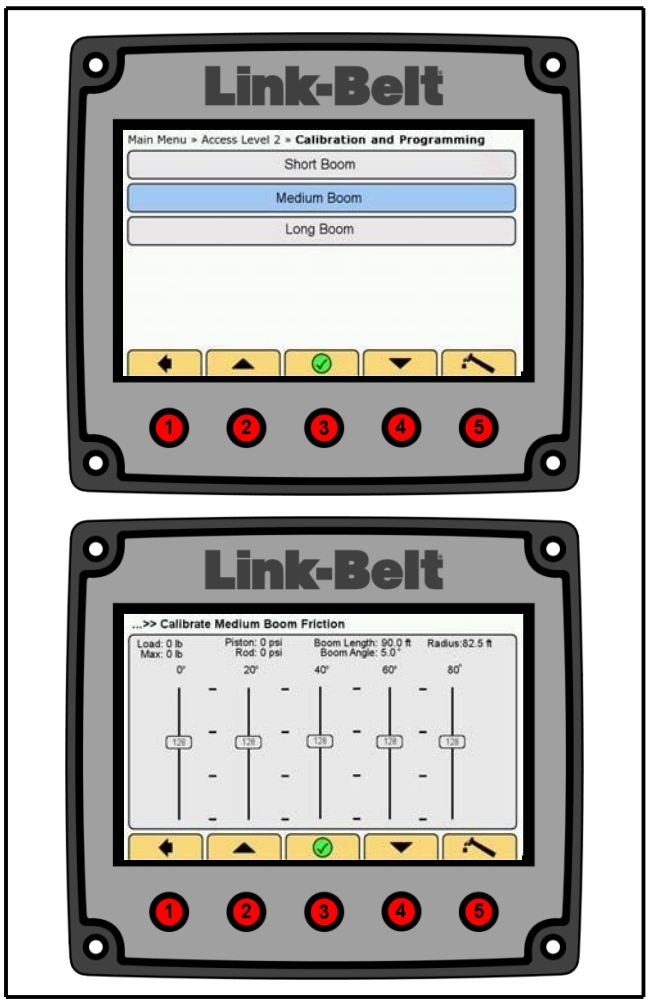
25. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

    Note: Static load adjustment will not show correction until Step 26 is completed.

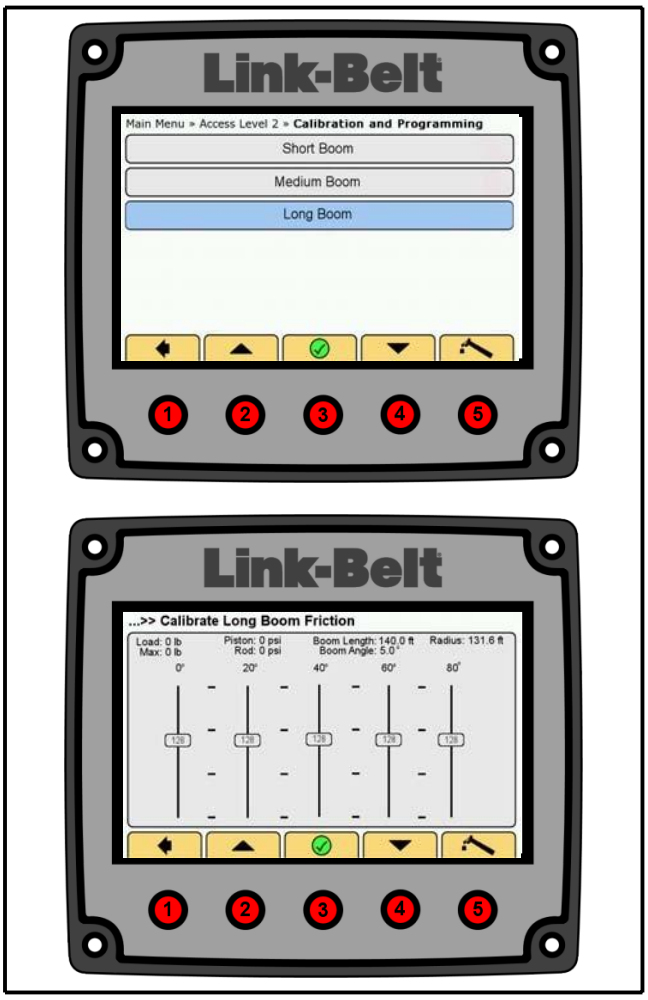
26. Press Button 3 to select the chosen setting.
27. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
28. Boom up to 80 degrees. Use Buttons 2 and/or 4 to move the highlighted position to the 80 degree adjustment slider.
29. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

    Note: Static load adjustment will not show correction until Step 30 is completed.

30. Press Button 3 to select the chosen setting.
31. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
32. Repeat the complete procedures above for Medium Boom (half extended boom length) and Long Boom (fully extended boom length) lengths.



33. Medium Boom (half extended boom length) screens.



34. Long Boom (fully extended boom length) screens.

35. Repeat the complete "Main Winch Friction Calibration" procedures given previously while lifting the test weight of approximately 10,000 lb *(4 536kg)* in place of the test weight of approximately 2,000 lb *(907kg)*, where applicable within the load rating charts. **CRANE MAY BE LIMITED ON CAPACITY. REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**

Auxiliary Winch Friction Calibration

See Appendix A for Dynamic and Friction Calibration procedures for cranes requiring these procedures.

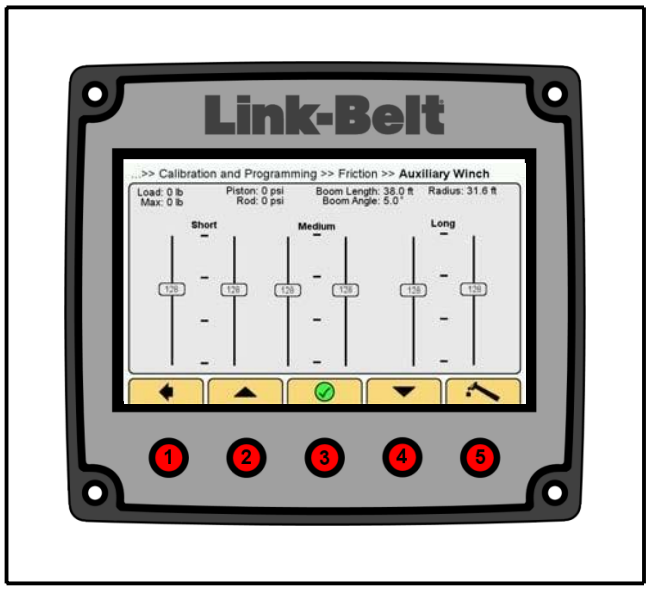
1. Ensure the computer system is fully operational, in working mode, and with a fully functional ATB system. Setup crane on fully extended outriggers, and select boom mode to allow full extension of all boom sections. Configure the crane to lift from the auxiliary winch and preferably with full counterweight. Crane engine should be operating around 1000 RPM for smooth operation. **CRANE MUST BE CONFIGURED WITH THE CORRECT ATTACHMENTS AND PROPERLY SETUP.** Calibration is to be done at 20 and 60+ degree boom angles. These proced- ures will be done for fully retracted boom and re- peated for half extended and fully extended boom lengths. **REFER TO THE CRANE RATING MANU- AL FOR SAFE OPERATION.**

Note: Some angles may not be attainable. If between two angles – I.E. 12 degrees actual boom angle, adjust sliders for 0 degrees and 20 degrees equally.

2. Ensure the Main Winch Friction Calibration has been completed before proceeding with this calibration for the Auxiliary Winch Friction Calibration.
3. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Friction.
4. Press Button 3 to enter Friction.

Note: Depending upon the crane model, the front winch may be the Main Winch or may be the Auxiliary Winch. To determine the winch(es), if the crane has a removable rear winch, the rear winch is considered to be the Auxiliary Winch, or if the crane has only one winch, then it is considered to be the Main Winch.

5. Use Buttons 2 and/or 4 to navigate to Auxiliary Winch.
6. Press Button 3 to enter Auxiliary Winch.



7. Fully retract the boom and position it to a 65 degree boom angle. Lift the test weight of approximately 10,000 lb *(4 536kg)*.
8. Use Buttons 2 and/or 4 to move the highlighted position (blue) to the right side (Bias) Short adjustment slider. (Refer to Bias And Slope Sliders Explanation.)
9. Press Button 3 to activate the slider, which will turn the slider green.

10. With the test weight hanging in a “static” state, use Buttons 2 and/or 4 to adjust the static load to actual load on the hook. Move the slider in 5 point increments to determine what effect it has and select the best position.

    Note: Static load adjustment will not show correction until Step 11 is completed.

11. Press Button 3 to select the chosen setting.
12. At each friction modifier angle, lift the load and wait approximately 30 seconds for the accurate load number. (If an adjustment is made to the friction modifier slider bar, engage the boom hoist hydraulic slightly and wait approximately 30 seconds for the accurate load number.)
13. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
14. Boom down to a 20 degree boom angle. Use Buttons 2 and/or 4 to move the highlighted position to the left side (Slope) Short adjustment slider. (Refer to Bias And Slope Sliders Explanation.)
15. With the test weight hanging in a “static” state, use Buttons 2 and/or 4 to adjust the static load to actual load on the hook. Move the slider in 5 point increments to determine what effect it has and select the best position.

    Note: Static load adjustment will not show correction until Step 16 is completed.

16. Press Button 3 to select the chosen setting.
17. At each friction modifier angle, lift the load and wait approximately 30 seconds for the accurate load number. (If an adjustment is made to the friction modifier slider bar, engage the boom hoist hydraulic slightly and wait approximately 30 seconds for the accurate load number.)
18. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
19. Repeat Steps 7 through 18 until actual load is equal at 20 and 65 degree boom angles.

    Note: These Steps may need to be repeated several times to get actual load correct at both the 20 and 65 degree boom angles.

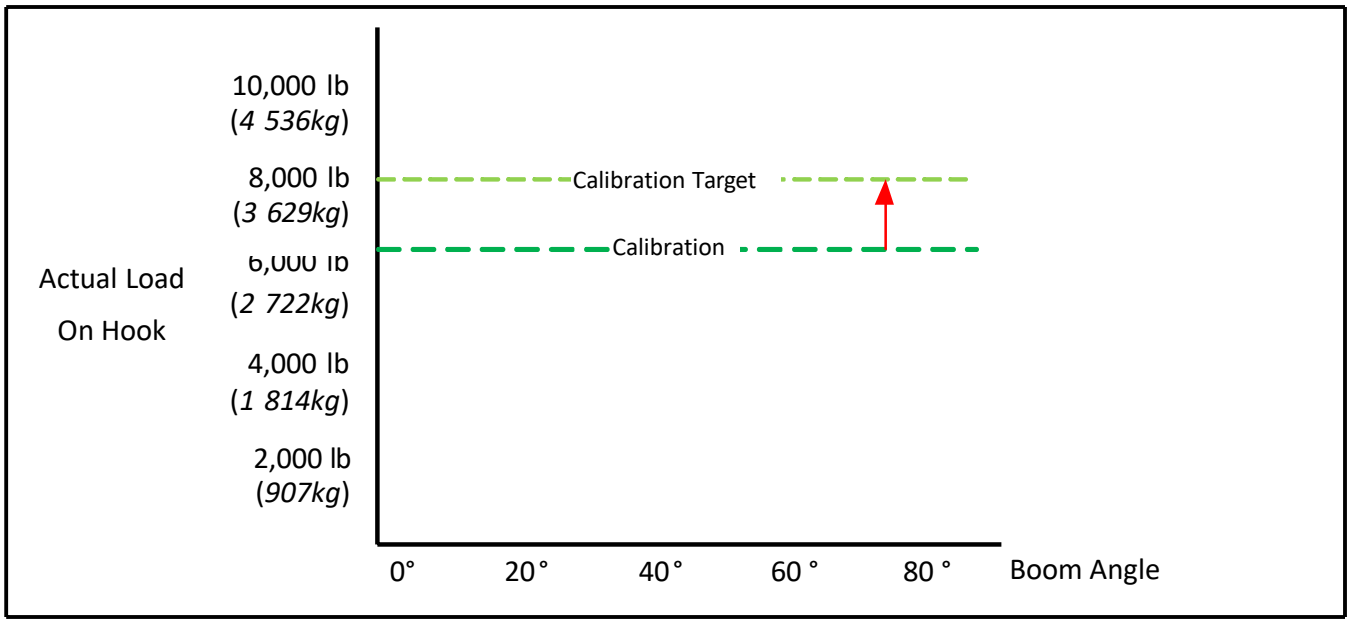
20. Position boom to a 40 degree boom angle.
21. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
22. Repeat Steps 7 through 21 for Medium Boom (High Angle at 70 degree boom angle) and Long Boom (High Angle at 75 degree boom angle).

    Note: The 20 degree boom angle may not be attainable with “Long Boom”. Boom down as low as the crane configuration will allow within the limits of the Crane Rating Manual.

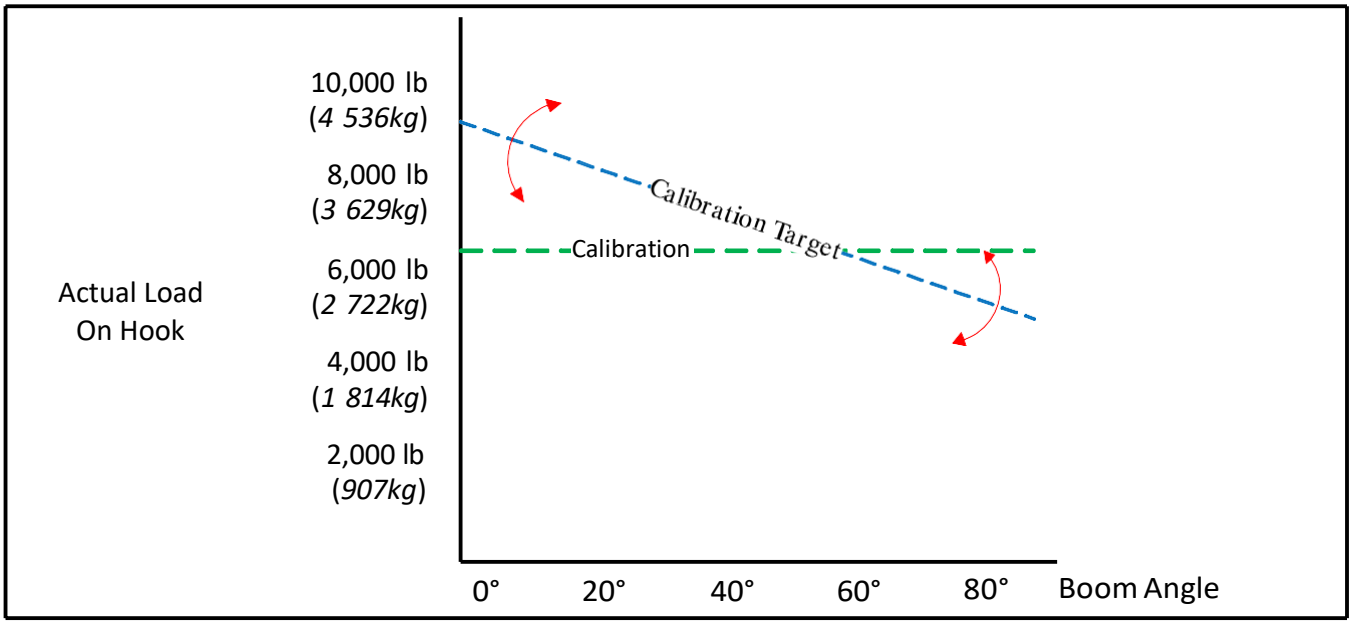
Bias And Slope Sliders Explanation

Always start at a high boom angle and adjust the Bias to achieve actual load on hook. The Bias slider will move the entire Calibration Target UP or DOWN as shown below.

I.E. – Actual load on hook is 8,000 lb *(3 629kg)* and the Calibration Target is at 6,500 lb *(2 948kg)*, increase the slider value until the Calibration Target of 8,000 lb *(3 629kg)* is achieved.



Boom down to 20 degree boom angle and adjust the Slope to achieve the actual load on hook. When the Slope is adjusted, the Calibration Target is tilted. At low boom angles, the pressure applied to the transducers is greater than the pressure applied at a high boom angles. The system uses a multiplier when generating the Calibration Target so there is more effect at low boom angle when using the Slope adjustment than at high boom angles as shown below.

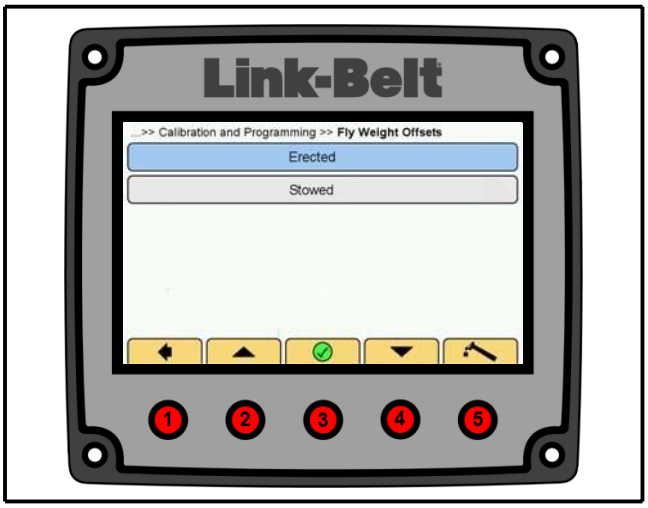


When adjusting the Slope, return to the high boom angle and check the weight. Adjust the Bias again, if necessary, then return to the low boom angle and check the weight. As the Bias is adjusted, the pivot point will move accordingly. This procedure may need to be repeated several times to achieve the actual load on hook at both high and low boom angles.

Fly Weight Calibration (Fly Erected)

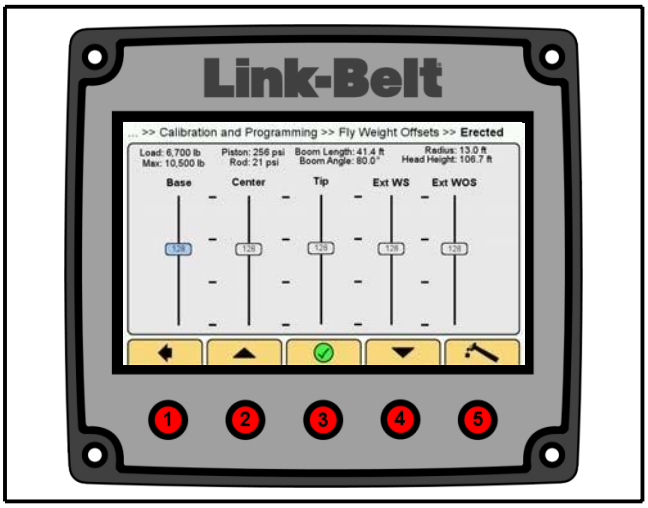
1. Ensure the computer system is fully operational, in working mode, and with a fully functional anti-two block system. Setup crane on fully extended outriggers and select boom mode to allow full extension of all boom sections. Configure the crane preferably with full counterweight. **CRANE MUST BE CONFIGURED WITH THE CORRECT ATTACHMENTS AND PROPERLY SETUP. REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
2. Prior to adjusting the weight of any fly section, all other friction calibration steps must first be completed.
3. Fly weights should be adjusted only if the load cannot be corrected through the Main and Auxiliary friction calibration sliders.
4. After all friction calibration, if the erected fly section is still not meeting the requirements for load on hook, then the sliders below can be used to adjust the weight of the erected fly section.
   a. If the number is increased, the weight of the fly is increased, which will decrease the load on hook.
   b. If the number is decreased, the weight of the fly is decreased, which will increase the load on hook.
   c. To return to the default fly weight, set the value at 128.

5. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Fly Weight Offsets.
6. Press Button 3 to enter Fly Weight Offsets.



7. Use Buttons 2 and/or 4 to move the highlighted position (blue) to Erected.
8. Press Button 3 to enter Erected.

9. Press Button 3 to accept the Warning.



10. Sliders
    a. Base - Slider used to adjust the weight of the Fly Base Section.
    b. Center - Slider used to adjust the weight of the Fly Center Section.
    c. Tip - Slider used to adjust the weight of the Fly Tip Section.
    d. Ext WS - Slider used to adjust the weight of the Fly Extension with sheaves.
    e. Ext WOS - Slider used to adjust the weight of the Fly Extension without sheaves.
11. Use Buttons 2 and/or 4 to move the highlighted position (blue) to the appropriate adjustment slider.
12. Press Button 3 to activate the slider, which will turn the slider green.
13. With the test weight hanging in a “static” state, use Buttons 2 and/or 4 to adjust the static load to actual load on hook.

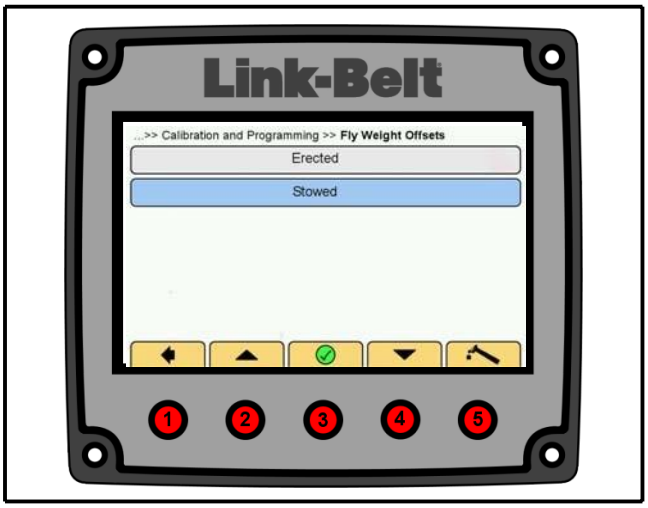
    Note: Static load adjustment will not show correction until Step 14 is completed.

14. Press Button 3 to select the chosen setting.
15. If an adjustment is made to the slider bar, engage the boom hoist hydraulics again slightly and wait 30 seconds for the accurate load reading to show.
16. The load reading must be equal to actual load to +10% over actual load. **The load reading must not be below actual load.**
17. Perform test picks at short, medium, and long boom lengths, each at 3 different boom angles (high, medium, and low angles) to verify actual load accuracy.

Fly Weight Calibration (Fly Stowed)

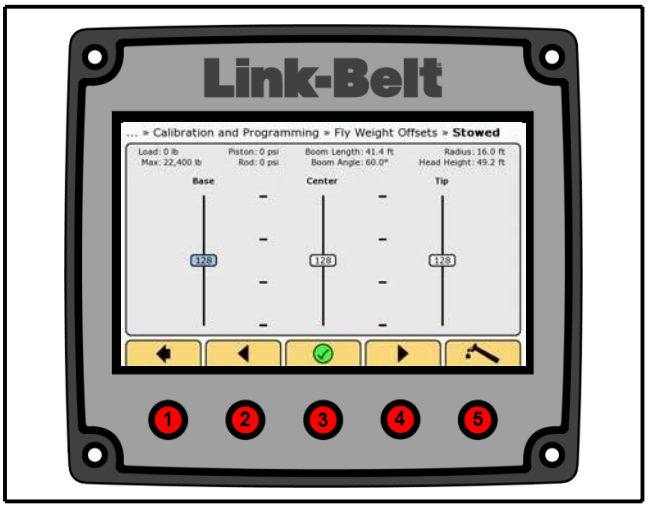
1. Ensure the computer system is fully operational, in working mode, and with a fully functional anti-two block system. Setup crane on fully extended outriggers and select boom mode to allow full extension of all boom sections. Configure the crane preferably with full counterweight. **CRANE MUST BE CONFIGURED WITH THE CORRECT ATTACHMENTS AND PROPERLY SETUP. REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
2. Prior to adjusting the weight of any fly section, all other friction calibration steps must first be completed.
3. Fly weights should be adjusted only if the load cannot be corrected through the Main and Auxiliary friction calibration sliders.
4. After all friction calibration, if the stowed fly section is still not meeting the requirements for load on hook, then the sliders below can be used to adjust the weight of the stowed fly section.
   a. If the number is increased, the weight of the fly is increased, which will decrease the load on hook.
   b. If the number is decreased, the weight of the fly is decreased, which will increase the load on hook.
   c. To return to the default fly weight, set the value at 128.

5. In Access Level 2, Calibration and Programming use Buttons 2 and/or 4 to navigate to Fly Weight Offsets.
6. Press Button 3 to enter Fly Weight Offsets.



7. Use Buttons 2 and/or 4 to move the highlighted position (blue) to Stowed.
8. Press Button 3 to enter Stowed.

9. Press Button 3 to accept the Warning.



10. Sliders
    a. Base - Slider used to adjust the weight of the Fly Base Section.
    b. Center - Slider used to adjust the weight of the Fly Center Section.
    c. Tip - Slider used to adjust the weight of the Fly Tip Section.

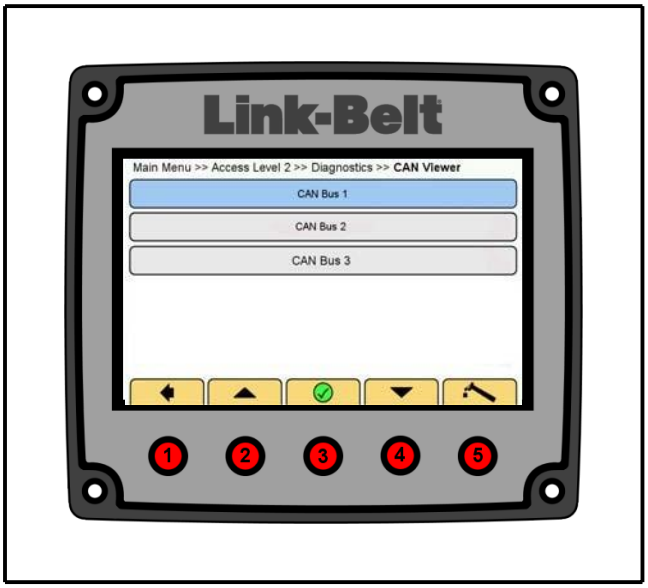
11. Use Buttons 2 and/or 4 to move the highlighted position (blue) to the appropriate adjustment slider.
12. Press Button 3 to activate the slider, which will turn the slider green.
13. With the test weight hanging in a "static" state, use Buttons 2 and/or 4 to adjust the static load to actual load on hook.

    Note: Static load adjustment will not show correction until Step 14 is completed.

14. Press Button 3 to select the chosen setting.
15. If an adjustment is made to the slider bar, engage the boom hoist hydraulics again slightly and wait 30 seconds for the accurate load reading to show.
16. The load reading must be equal to actual load to +10% over actual load. **The load reading must not be below actual load.**
17. Perform test picks at short, medium, and long boom lengths, each at 3 different boom angles (high, medium, and low angles) to verify actual load accuracy.

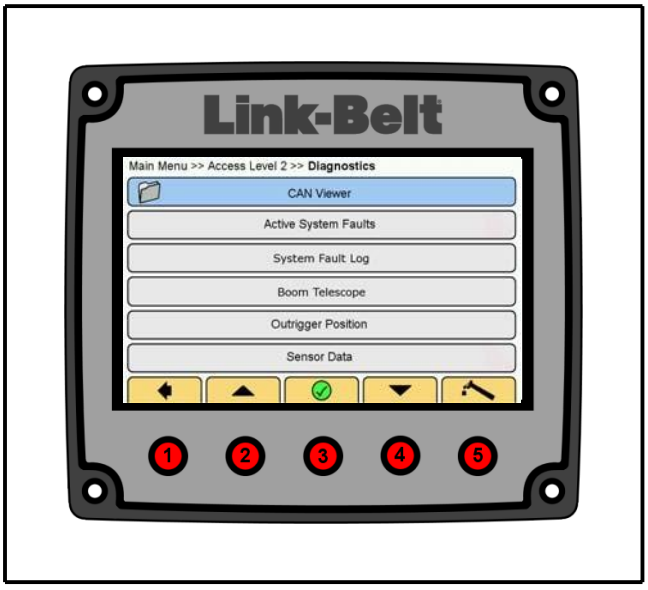
Diagnostics

1. In Access Level 2, use Buttons 2 and/or 4 to navigate to Diagnostics.
2. Press Button 3 to enter Diagnostics.

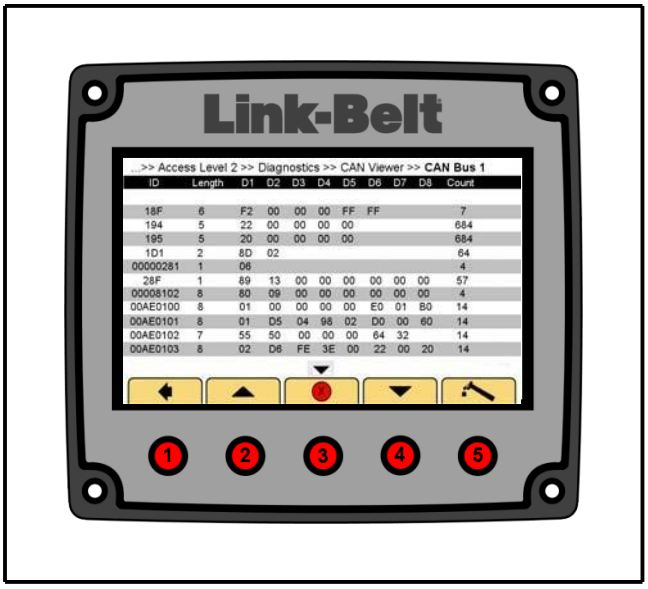


3. The CAN Viewer allows the operator to view the CAN traffic on either CAN Bus 1, 2, or 3.

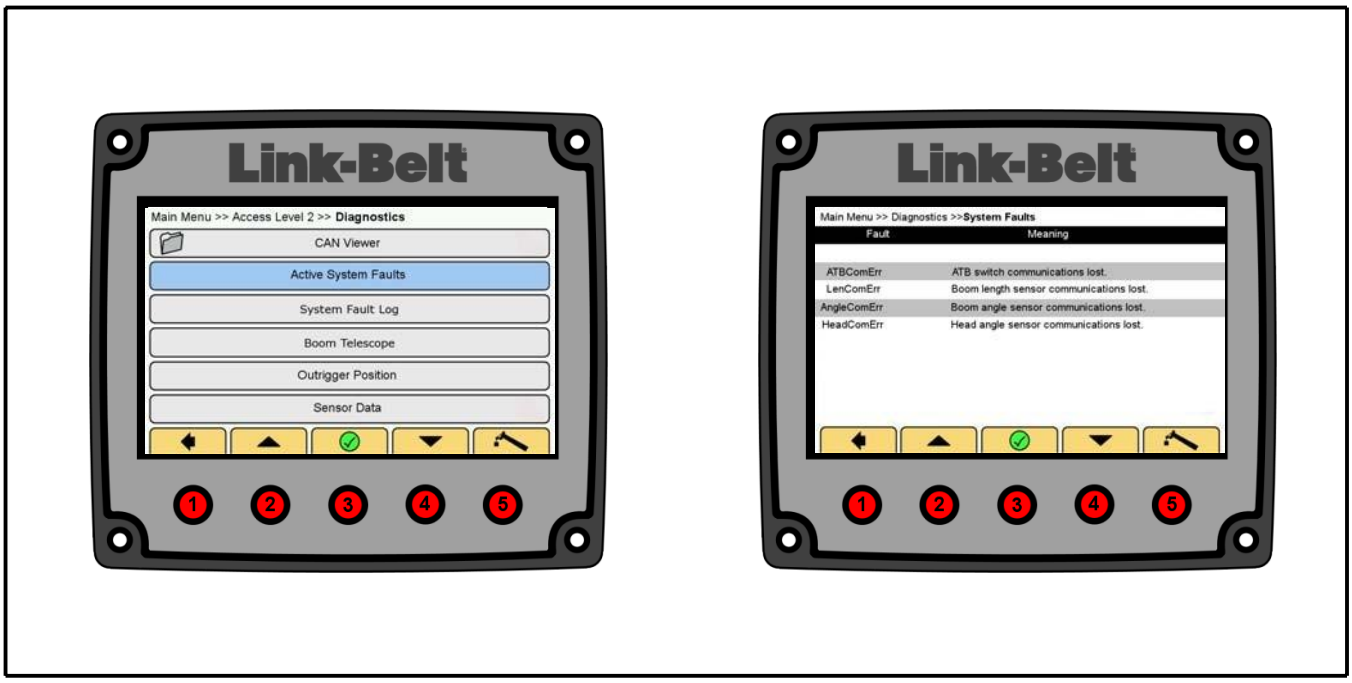
CAN Viewer



1. In Access Level 2, Diagnostics, use Buttons 2 and/or 4 to navigate to CAN Viewer.
2. Press Button 3 to enter CAN Viewer.



4. CAN Bus 1 is used to view Rated Capacity Limiter (RCL) CAN messages.
5. CAN Bus 2 is used to view Latching Telescope Controller (LTC) CAN messages.
6. CAN Bus 3 is used to view Outrigger CAN messages.
7. Press Button 2 to scroll UP one page.
8. Press Button 3 to restart the count.
9. Press Button 4 to scroll DOWN one page.

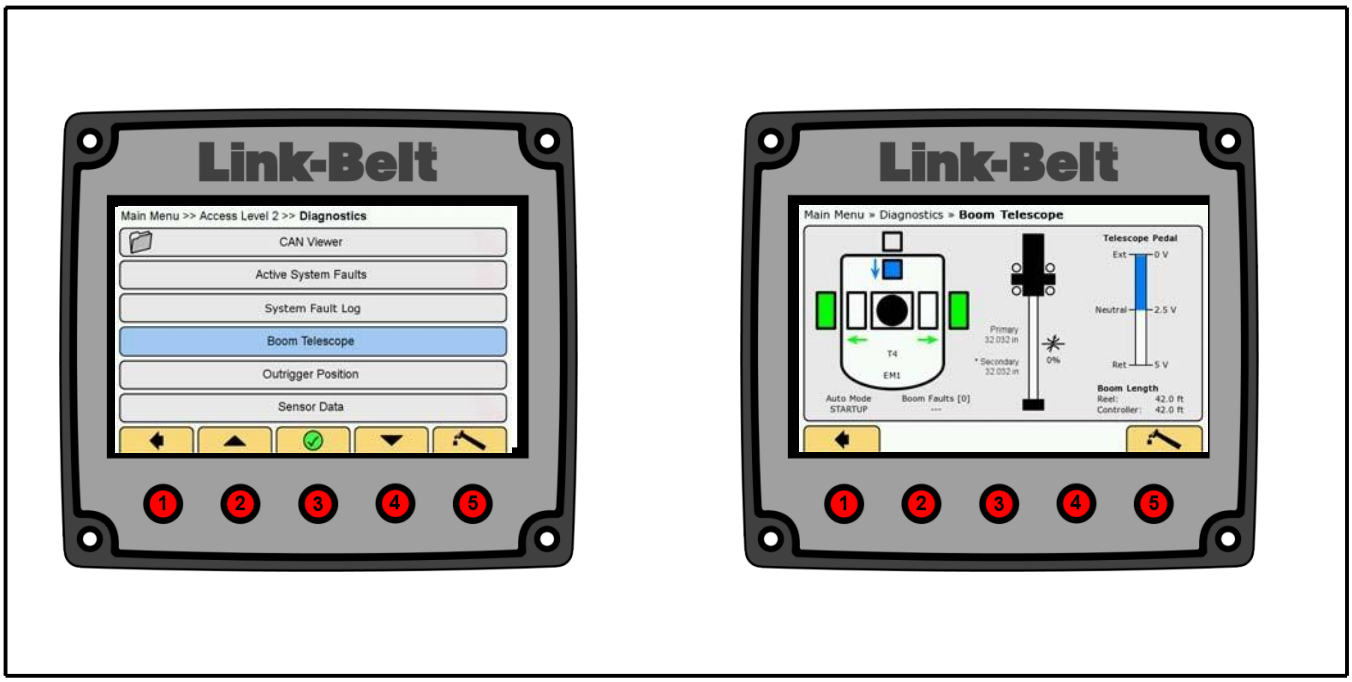


Active System Faults

1. In Access Level 2, Diagnostics, use Buttons 2 and/or 4 to navigate to Active System Faults.
2. Press Button 3 to enter Active System Faults.
   a. All active system faults for both RCL and LTC systems are shown.
      1. Fault – abbreviated message.
      2. Meaning – description of the fault.
      3. Use Buttons 2 and/or 4 to navigate to a fault message. Press Button 3 and a detailed page should appear with information on how to correct/clear the fault.

System Fault Log

3. In Access Level 2, Diagnostics, use Buttons 2 and/or 4 to navigate to System Fault Log.
4. Press Button 3 to enter System Fault Log.
   a. Previous Faults – lists the last 15 faults.

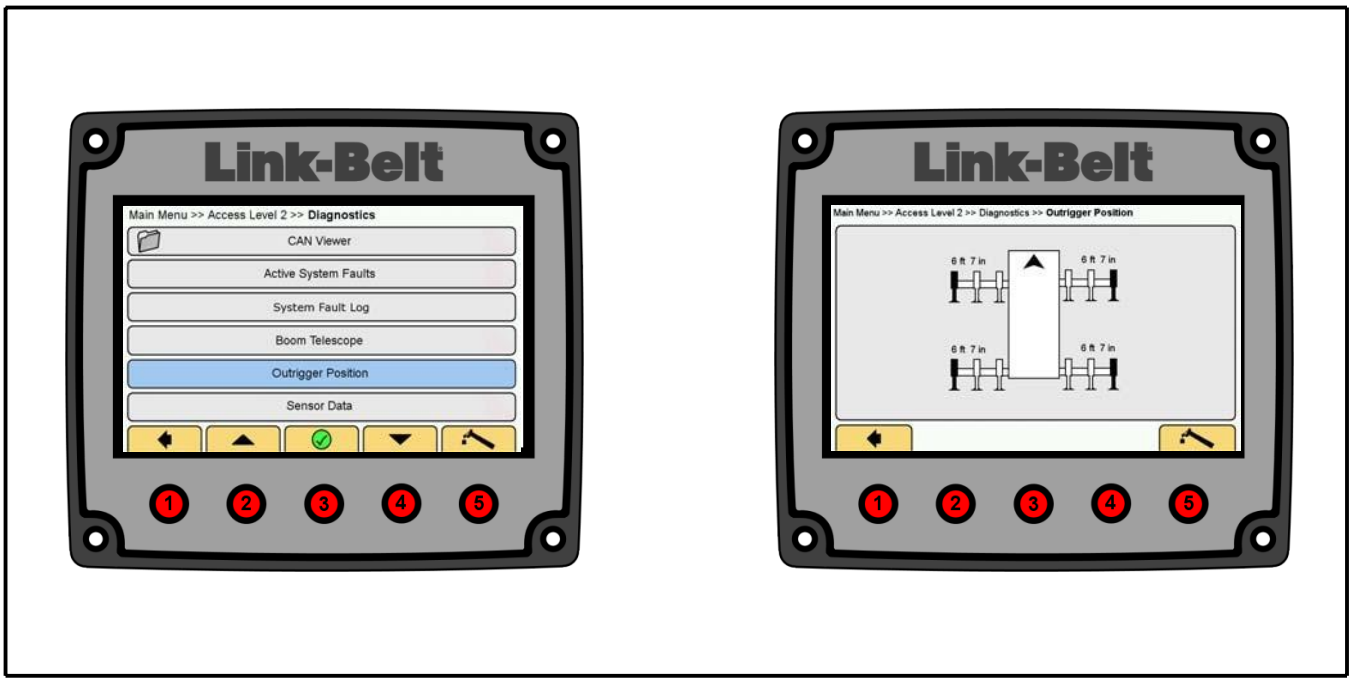


Boom Telescope Diagnostics

1. In Access Level 2, Diagnostics, use Buttons 2 and/ or 4 to navigate to Boom Telescope.
2. Press Button 3 to enter Boom Telescope.
   a. Pinned
   b. Unpinned
   c. Latched
   d. Unlatched
   e. Boom Extension Mode
   f. Auto or Manual Mode
   g. LTC Message Area
   h. Number of Active Boom Faults
   i. Active Boom Fault
   j. Primary Telescope Cylinder Length –

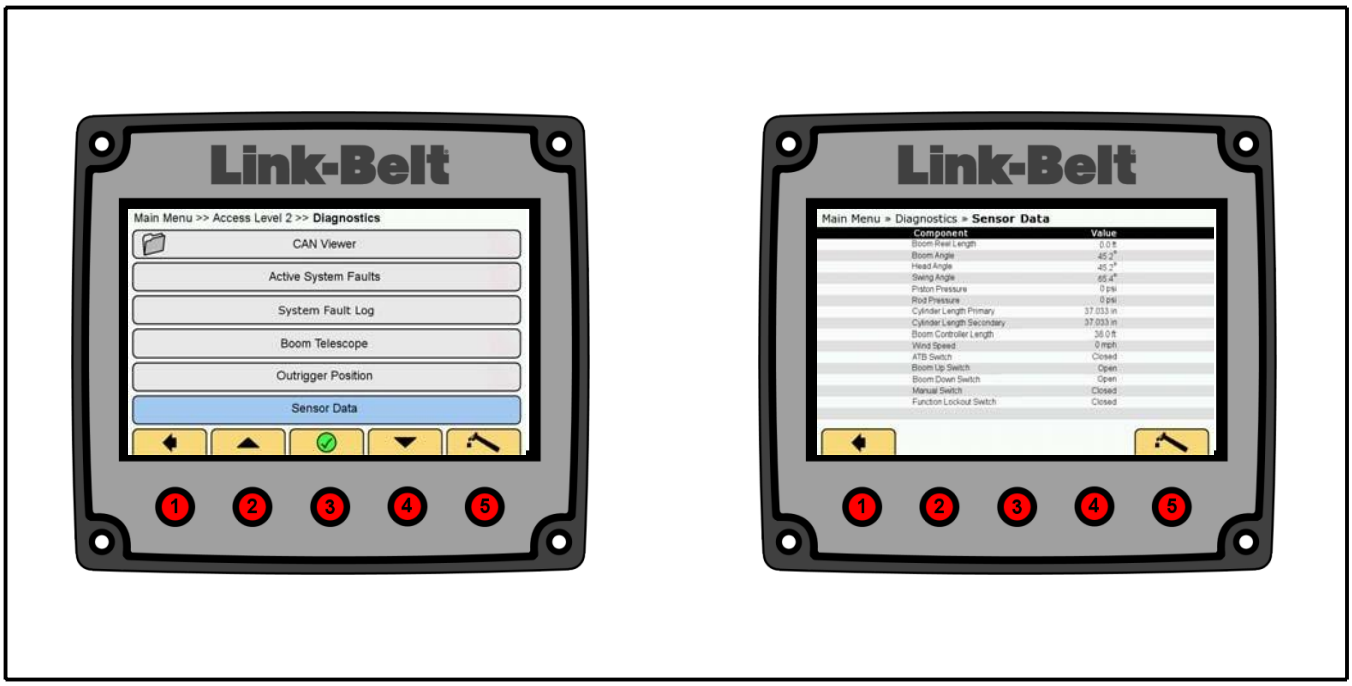
      * - indicates LTC controller is currently using encoder
   k. Secondary Telescope Cylinder Length –

      * - indicates LTC controller is currently using encoder
   l. % of Hydraulic Flow
   m. Latch Present Left Front/Right Front/Left Rear/ Right Rear
   n. Pedal Voltage
   o. Boom Length Given by Reel
   p. Boom Length Calculated by Boom Controller



Outrigger Position Diagnostics

1. In Access Level 2, Diagnostics, use Buttons 2 and/or 4 to navigate to Outrigger Position.
2. Press Button 3 to enter Outrigger Position.
   a. This screen will show actual length and position readings of each outrigger beam.

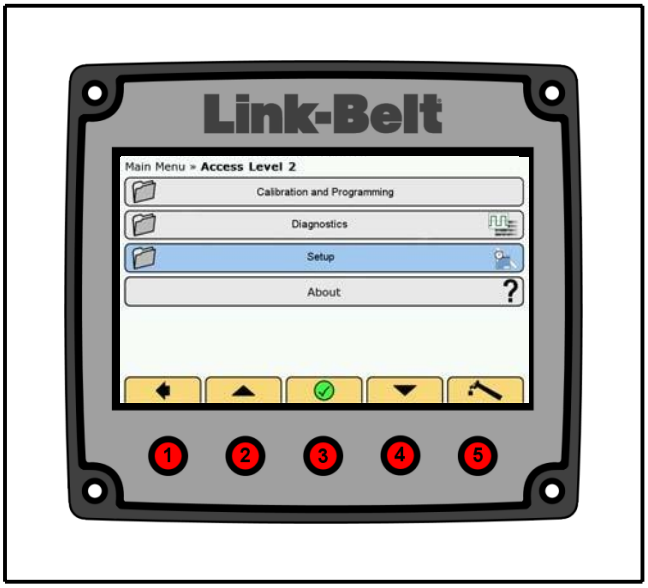


Sensor Data

Active Sensor Values – Shows a summary of all sensors in the system.

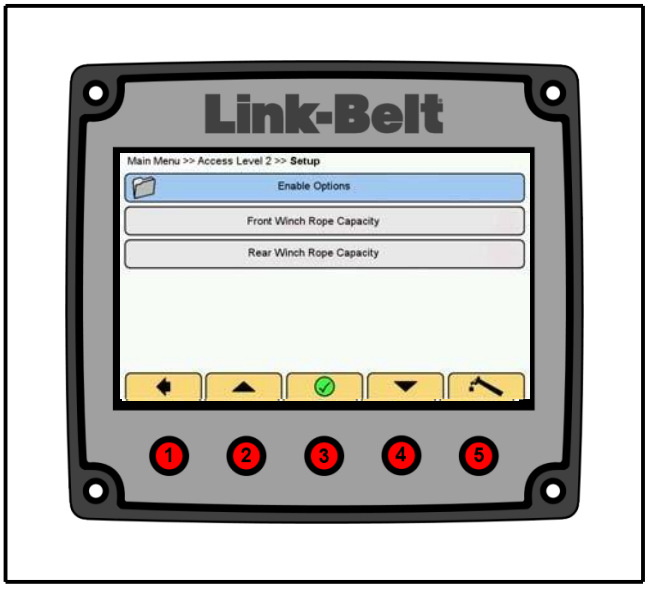
1. In Access Level 2, Diagnostics, use Buttons 2 and/ or 4 to navigate to Sensor Data.
2. Press Button 3 to enter Sensor Data.
   a. Boom Reel Length
   b. Boom Angle
   c. Head Angle
   d. Swing Angle
   e. Piston Pressure
   f. Rod Pressure
   g. Cylinder Length Primary
   h. Cylinder Length Secondary
   i. Boom Controller Length
   j. Wind Speed
   k. ATB Switch
   l. Boom Up Switch
   m. Boom Down Switch
   n. Manual Switch
   o. Function Lockout Switch

Setup



1. In Access Level 2, use Buttons 2 and/or 4 to navigate to Setup.
2. Press Button 3 to enter Setup.

Enable Options

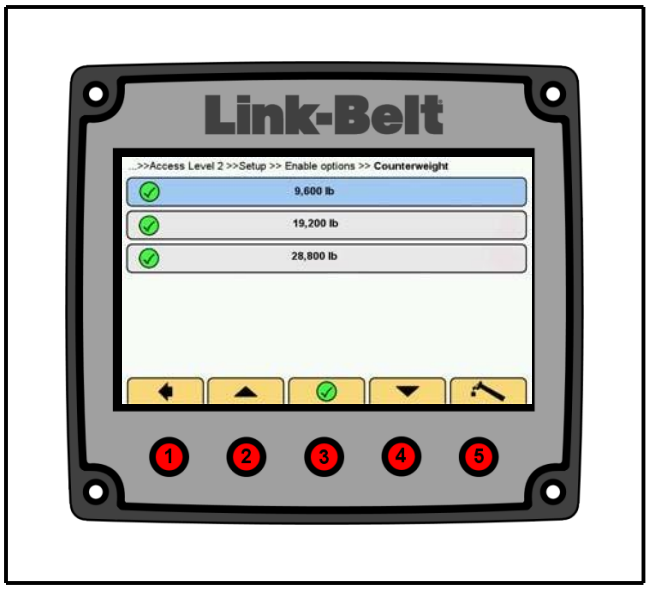


1. In Access Level 2, Setup, use Buttons 2 and/or 4 to navigate to Enable Options.
2. Press Button 3 to enter Enable Options.

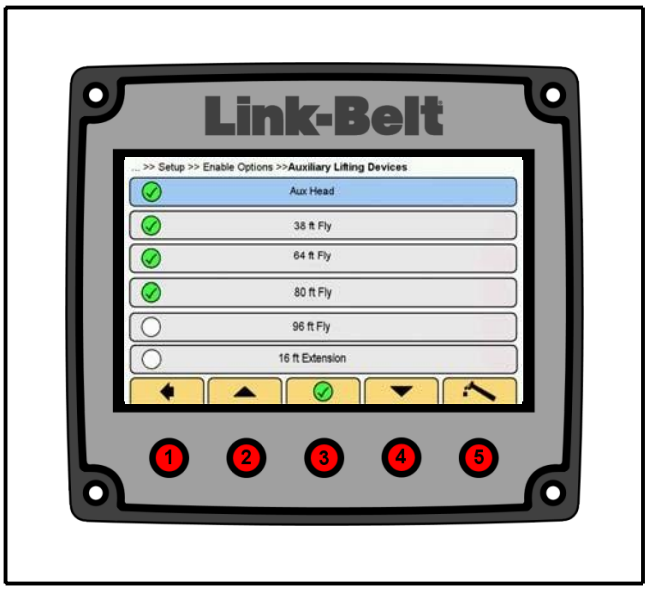
Counterweight

Crane dependant option – enables/disables counterweight selections.

1. In Access Level 2, Setup, Enable Options, use Buttons 2 and/or 4 to navigate to Counterweight.
2. Press Button 3 to enter Counterweight.



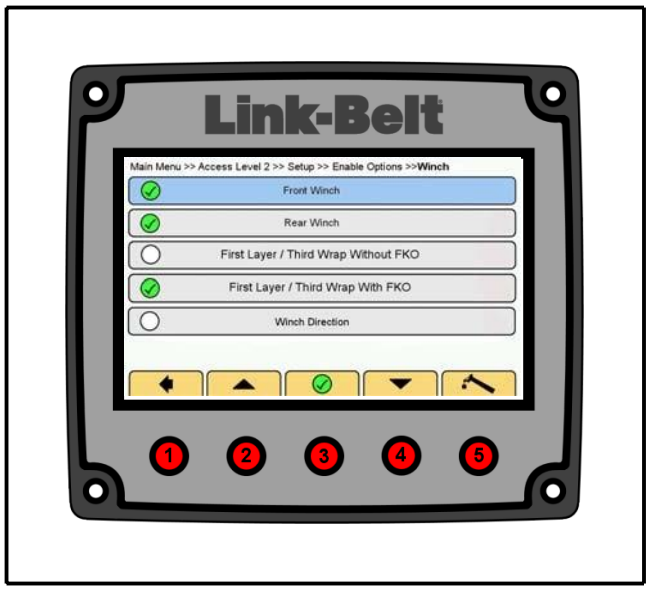
3. Use Buttons 2 and/or 4 to navigate to desired counterweight selection.
4. Press Button 3 to enable desired selection. (Pressing Button 3 again will disable the selection.)
5. Repeat procedures for all applicable counterweight selections.



Auxiliary Lifting Devices

This enables/disables Auxiliary Head and Fly Selections.

1. In Access Level 2, Setup, Enable Options, use Buttons 2 and/or 4 to navigate to Auxiliary Lifting Devices.
   a. Auxiliary (Aux) Head
   b. Fly – Crane dependant option
2. Press Button 3 to enter Auxiliary Lifting Devices.
3. Use Buttons 2 and/or 4 to navigate to the desired device selection.
4. Press Button 3 to enable the desired selection. (Pressing Button 3 again will disable the selection.)
5. Repeat procedures for all applicable selections.



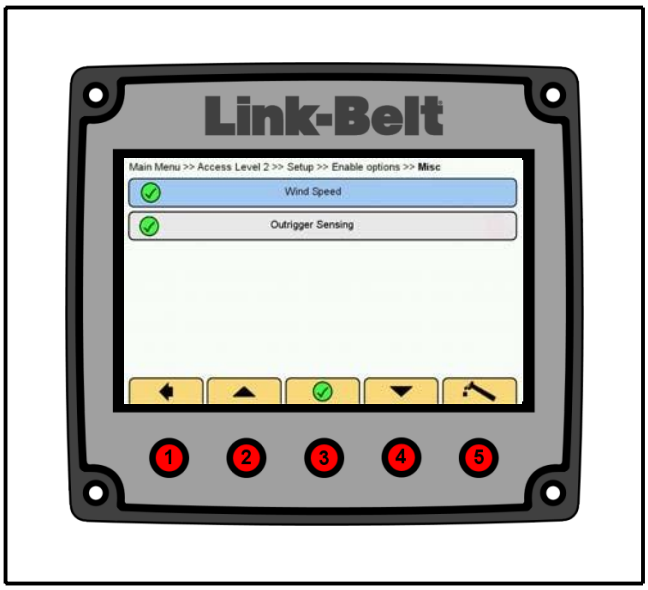
Winch

This enables/disables Winch and First Layer/Third Wrap Selections.

1. In Access Level 2, Setup, Enable Options, use Buttons 2 and/or 4 to navigate to Winch.
2. Press Button 3 to enter Winch.
3. Use Buttons 2 or 4 to navigate to desired device selection.
   a. Front Winch
   b. Rear Winch
   c. First Layer/Third Wrap Without Function Kickout (FKO)
   d. First Layer/Third Wrap With Function Kickout (FKO)
   e. Winch Direction
4. Press Button 3 to enable desired selection. (Pressing Button 3 again will disable the selection.)
5. Repeat procedures for all applicable selections.

Misc

1. In Access Level 2, Setup, Enable Options, use Buttons 2 and/or 4 to navigate to Misc.



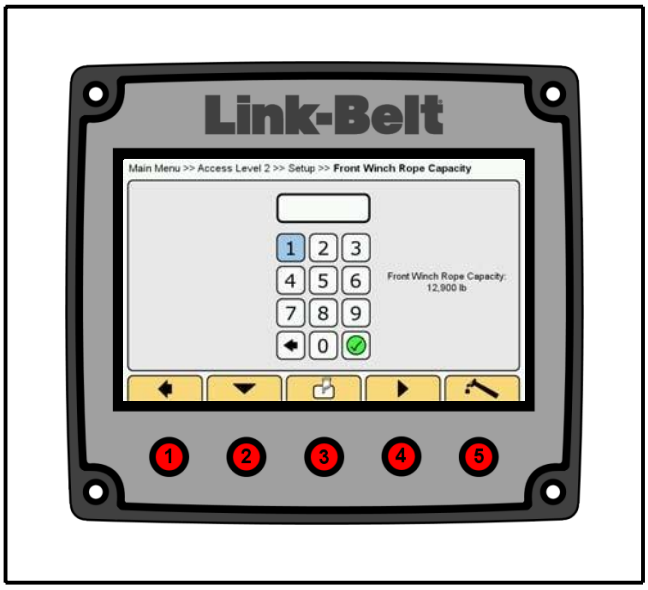
2. Press Button 3 to enter Misc.
3. Use Buttons 2 and/or 4 to navigate to desired device selection.
   a. Wind Speed – enables/disables wind speed indication
   b. Outrigger Sensing – enables/disables outrigger sensing
4. Press Button 3 to enable desired selection.
5. Repeat procedures for all applicable selections.

Front Winch Rope Capacity

1. In Access Level 2, Setup, use Buttons 2 and/or 4 to navigate to Front Winch Rope Capacity.
2. Press Button 3 to enter Front Winch Rope Capacity.

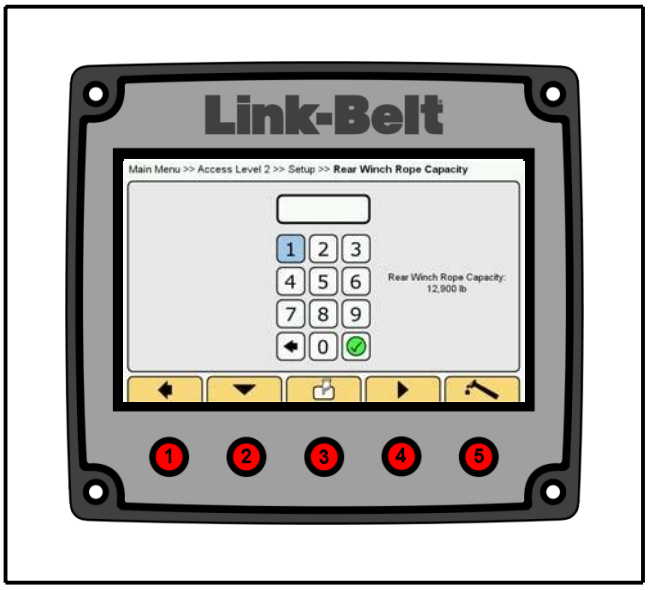
Rear Winch Rope Capacity

1. In Access Level 2, Setup, use Buttons 2 and/or 4 to navigate to Rear Winch Rope Capacity.
2. Press Button 3 to enter Rear Winch Rope Capacity.



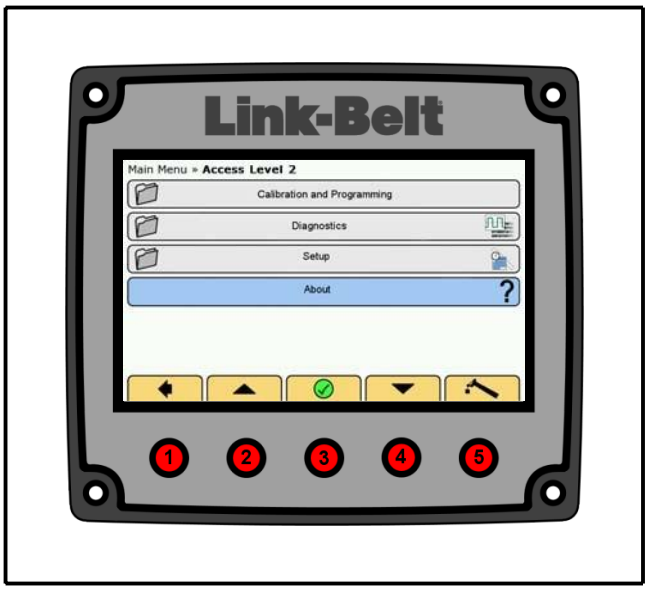
3. Use Buttons 2 and/or 4 to navigate to the first number in the front winch rope capacity. Press Button 3 to enter the number. Repeat for each number in the front winch rope capacity.

Note: Rope Capacity Value Entry – enter value as a whole number (I.E. – 12,900 = 12900).



3. Use Buttons 2 and/or 4 to navigate to the first number in the rear winch rope capacity. Press Button 3 to enter the number. Repeat for each number in the rear winch rope capacity.

Note: Rope Capacity Value Entry – enter value as a whole number (I.E. – 12,900 = 12900).



About

1. In Access Level 2, use Buttons 2 and/or 4 to navigate to About.
2. Press Button 3 to enter About.
   a. Display Version
   b. RCL Version
   c. LTC Version
   d. Crane Serial
   e. Load Chart
   f. Display Crane Type
   g. Display Menu Type

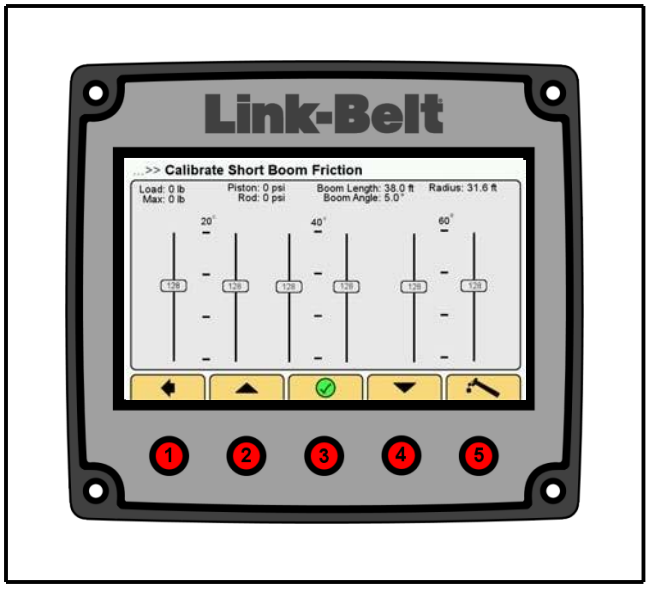
Appendix A

Friction And Dynamic Calibration

1. Ensure the computer system is fully operational, in working mode, and with a fully functional ATB system. Setup crane on fully extended outriggers, and select boom mode to allow full extension of all boom sections. Configure the crane with enough counterweight to lift the test weight of approximately 2,000 lb *(907kg)*, at a minimum of 20 degree boom angle. Crane engine should be operating around 1000 RPM for smooth operation. **CRANE MUST BE CONFIGURED WITH THE CORRECT ATTACHMENTS AND PROPERLY SETUP. REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**

2. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Calibrate Static Friction.
3. Press Button 3 to enter Calibrate Static Friction.

4. Use Buttons 2 and/or 4 to navigate to Calibrate Short Boom Static Friction.
5. Press Button 3 to enter Calibrate Short Boom Static Friction.



6. Use Buttons 2 and/or 4 to navigate to the 0 degree adjustment sliders.
7. Press Button 3 to activate the sliders, which will turn the sliders green.
8. Move the boom to a 20 degree boom angle.
9. Lift the test weight of approximately 2,000 lb *(907kg)*.
10. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower

piston pressures and the number on the right for

higher piston pressures. Adjust sliders until the correct weight is displayed.

Note: Static load adjustment will not show correction until Step 11 is completed.

11. Press Button 3 to select the chosen setting.
12. Repeat Steps 6 through 11 and adjust the load for 40 and 60 degree boom angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
13. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must both be adjusted to smooth out the curve.
14. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
15. Press Button 1 to return to Calibrate Static Friction.
16. Use Buttons 2 and/or 4 to navigate to Calibrate Medium Boom Static Friction.
17. Press Button 3 to enter Calibrate Medium Boom Static Friction.
18. Use Buttons 2 and/or 4 to navigate to the 0 degree adjustment sliders.
19. Press Button 3 to activate the sliders, which will turn the sliders green.
20. Extend boom to one-half the length of the fully extended boom.
21. Move the boom to a 20 degree boom angle.
22. Lift the test weight of approximately 2,000 lb *(907kg).*
23. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

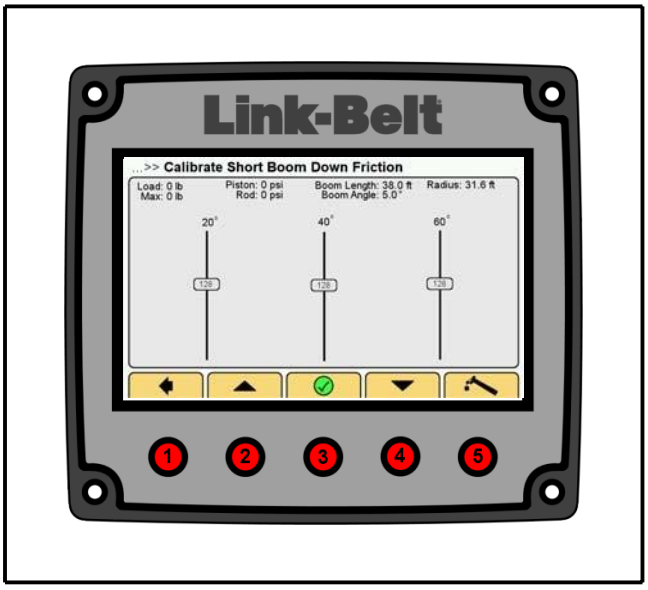
Note: Static load adjustment will not show correction until Step 24 is completed.

24. Press Button 3 to select the chosen setting.
25. Repeat Steps 18 through 23 and adjust the load for 40 and 60 degree boom angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
26. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must both be adjusted to smooth out the curve.
27. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**
28. Press Button 1 to return to Calibrate Static Friction.
29. Use Buttons 2 and/or 4 to navigate to Calibrate Long Boom Static Friction.
30. Press Button 3 to enter Calibrate Long Boom Static Friction.
31. Use Buttons 2 and/or 4 to navigate to the 0 degree adjustment sliders.
32. Press Button 3 to activate the sliders, which will turn the sliders green.
33. Extend the boom to its fully extended length.
34. Move the boom to a 20 degree boom angle.
35. Lift the test weight of approximately 2,000 lb *(907kg).*
36. Wait at least 30 seconds for the accurate load weight. (If an adjustment is made to the friction modifier sliders, slightly engage the boom hoist hydraulics again and wait at least 30 seconds for the accurate load weight.) Use the number on the left for lower piston pressures and the number on the right for higher piston pressures. Adjust sliders until the correct weight is displayed.

Note: Static load adjustment will not show correction until Step 37 is completed.

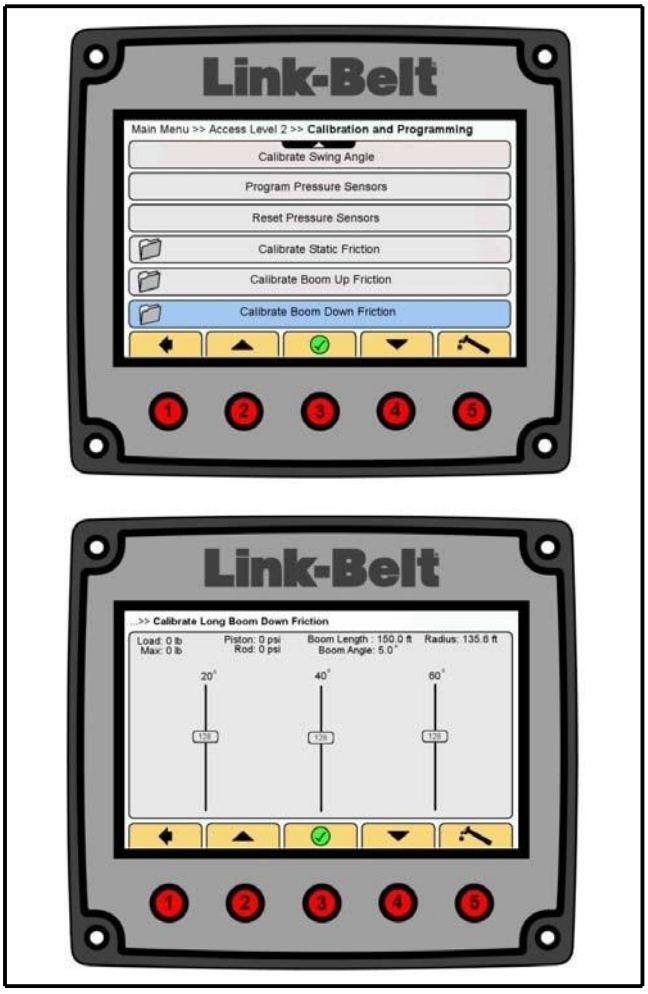
37. Press Button 3 to select the chosen setting.
38. Repeat Steps 31 through 36 and adjust the load for 40 and 60 degree boom angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
39. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must both be adjusted to smooth out the curve.
40. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.**

41. In Access Level 2, Calibration and Programming, use Buttons 2 and/or 4 to navigate to Calibrate Boom Down Friction.
42. Press Button 3 to enter Calibrate Boom Down Friction.

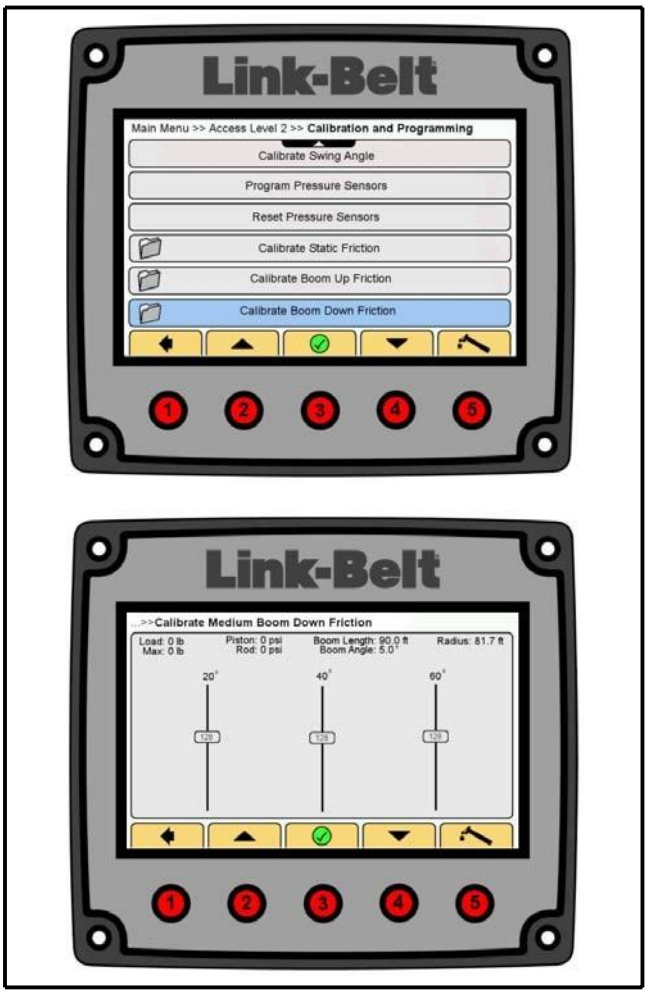


43. Use Buttons 2 and/or 4 to navigate to Calibrate Short Boom Down Friction.
44. Press Button 3 to enter Calibrate Short Boom Down Friction.
45. Fully retract the boom.
46. Lift the test weight of approximately 2,000 lb *(907kg).*
47. Move the load thru each specified friction modifier angle.
48. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
49. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
50. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.
51. Press Button 1 to return to Calibrate Boom Up Friction.
52. Use Buttons 2 and/or 4 to navigate to Calibrate Short Boom Up Friction.
53. Press Button 3 to enter Calibrate Short Boom Up Friction.
54. Ensure the boom is fully retracted.
55. Lift the test weight of approximately 2,000 lb *(907kg).*
56. Move the load thru each specified friction modifier angle.
57. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
58. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
59. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.
60. Press Button 1 to return to Calibrate Boom Down Friction.
61. Use Buttons 2 and/or 4 to navigate to Calibrate Medium Boom Down Friction.
62. Press Button 3 to enter Calibrate Medium Boom Down Friction.
63. Extend the boom to one-half the fully extended length.
64. Lift the test weight of approximately 2,000 lb *(907kg).*
65. Move the load thru each specified friction modifier angle.
66. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
67. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
68. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.

69. Press Button 1 to return to Calibrate Boom Up Friction.
70. Use Buttons 2 and/or 4 to navigate to Calibrate Medium Boom Up Friction.
71. Press Button 3 to enter Calibrate medium Boom Up Friction.
72. Ensure the boom is extended to one-half the fully extended length.
73. Lift the test weight of approximately 2,000 lb *(907kg).*
74. Move the load thru each specified friction modifier angle.
75. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
76. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
77. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.
78. Press Button 1 to return to Calibrate Boom Down Friction.
79. Use Buttons 2 and/or 4 to navigate to Calibrate Long Boom Down Friction.
80. Press Button 3 to enter Calibrate Long Boom Down Friction.
81. Fully extend the boom.
82. Lift the test weight of approximately 2,000 lb *(907kg).*
83. Move the load thru each specified friction modifier angle.
84. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
85. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
86. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.
87. Press Button 1 to return to Calibrate Boom Up Friction.
88. Use Buttons 2 and/or 4 to navigate to Calibrate Long Boom Up Friction.
89. Press Button 3 to enter Calibrate Long Boom Up Friction.
90. Ensure the boom is fully extended.
91. Lift the test weight of approximately 2,000 lb *(907kg).*
92. Move the load thru each specified friction modifier angle.
93. Adjust the load for 20, 40, and 60 degree angles. **REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
94. If a boom angle is unattainable and the load is between two friction modifier angles, the sliders for the higher and lower angle must be both adjusted to smooth out the curve.
95. The load reading must be equal to actual load to +10% over actual load. **It must not be below actual load.** The boom hoist valve should be fully engaged (wide open) in order to get an accurate load reading.
96. Fully retract the boom.



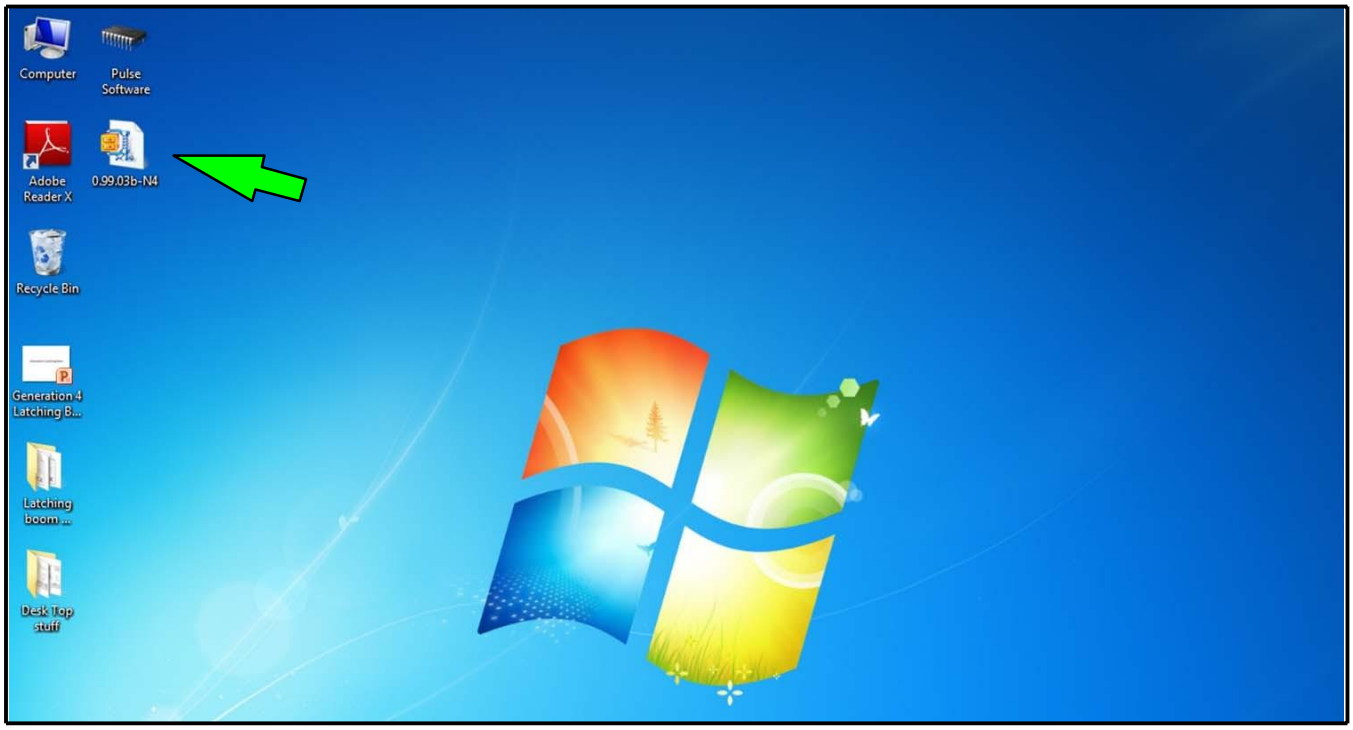
97. Medium Boom (half extended boom length) screens.



98. Long Boom (fully extended boom length) screens.
99. Repeat the complete procedures above lifting the test weight of approximately 10,000 lb *(4 536kg)*, in place of the weight of approximately 2,000 lb *(907kg)*, where applicable within the load rating charts. **CRANE MAY BE LIMITED ON CAPACITY. REFER TO THE CRANE RATING MANUAL FOR SAFE OPERATION.**
100. Perform Auxiliary Winch Friction Calibration.

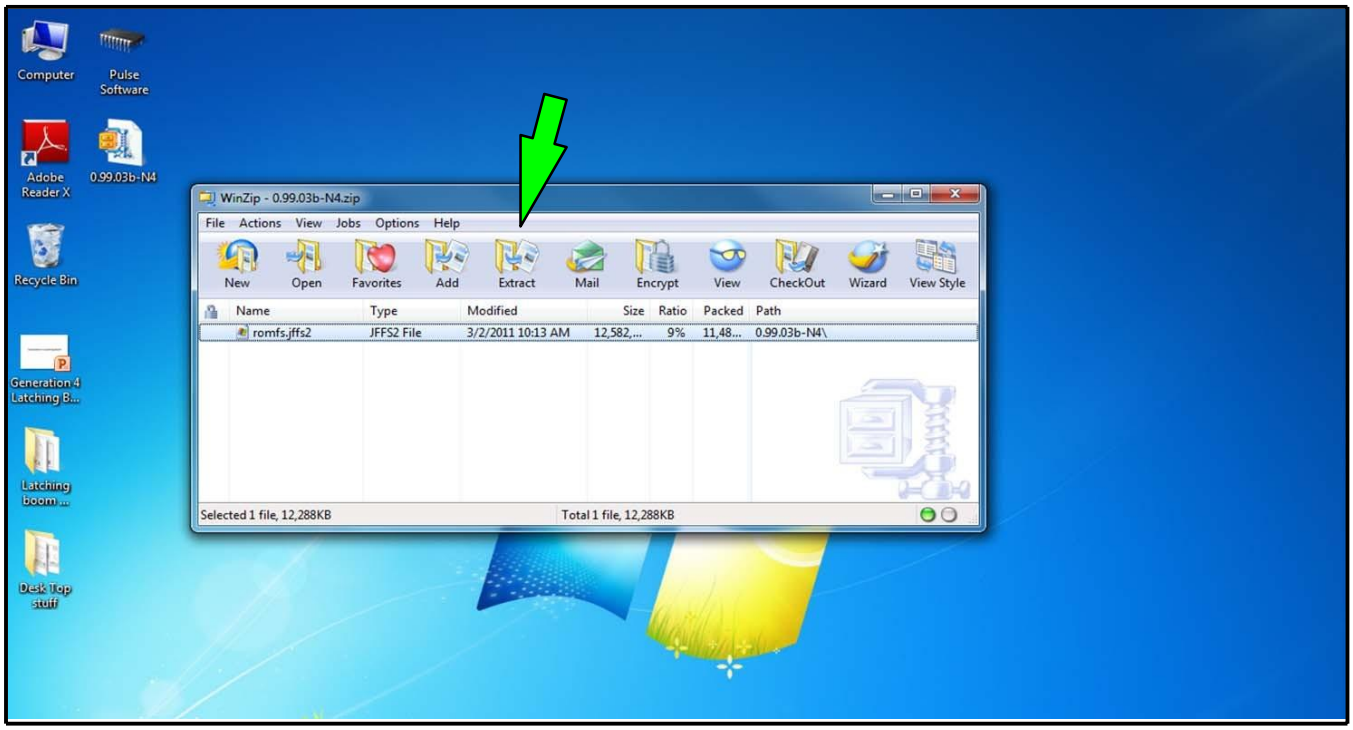
Appendix B

HED Programming Instructions

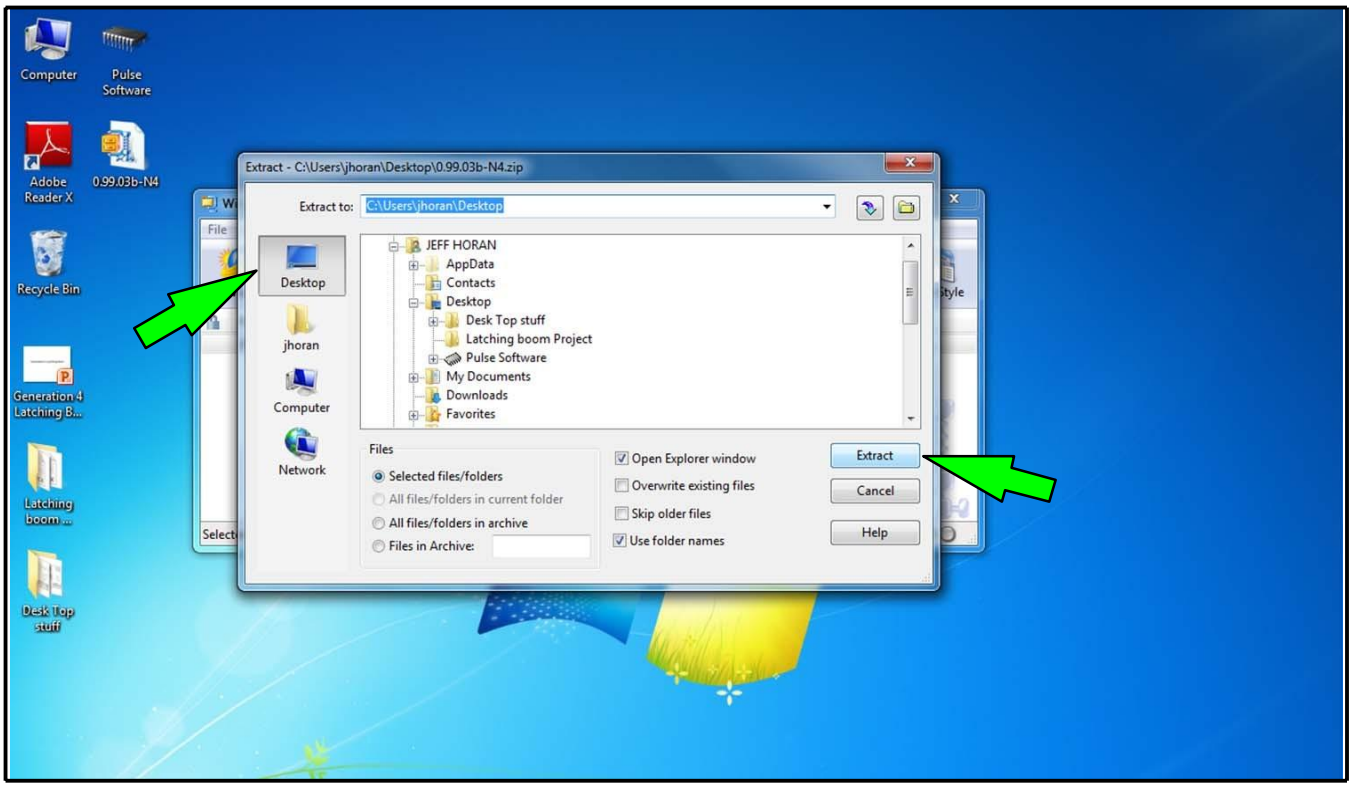


When arriving at the crane, the laptop display to be used should look similar to the above.

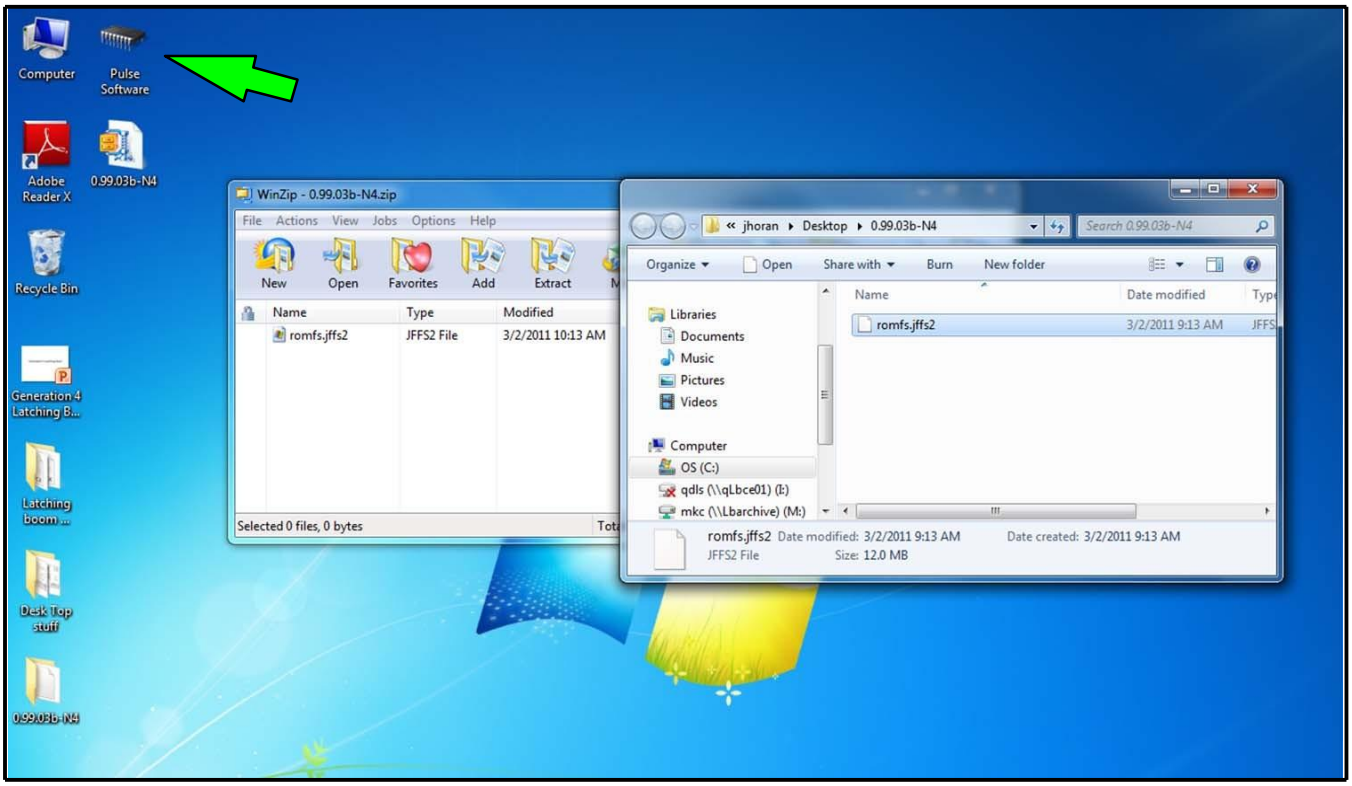
1. Use the left mouse button and double click on the HED file to be programmed to the crane RCL computer.



2. WinZip should open and look similar to the above. (If it does not, click on the “open in classic view” button.) Click the “Extract” icon.

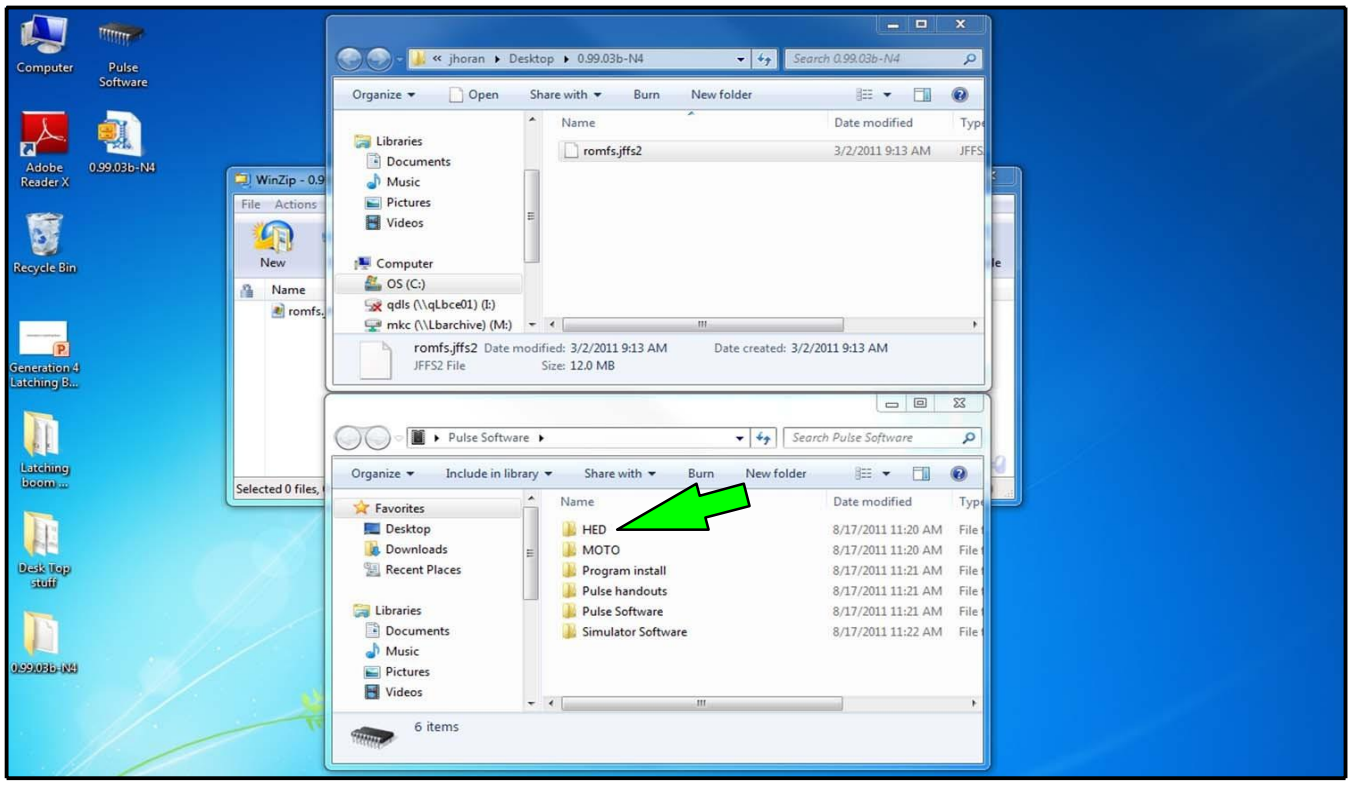


3. Click the “Desktop” icon.
4. Click the “Extract” button.



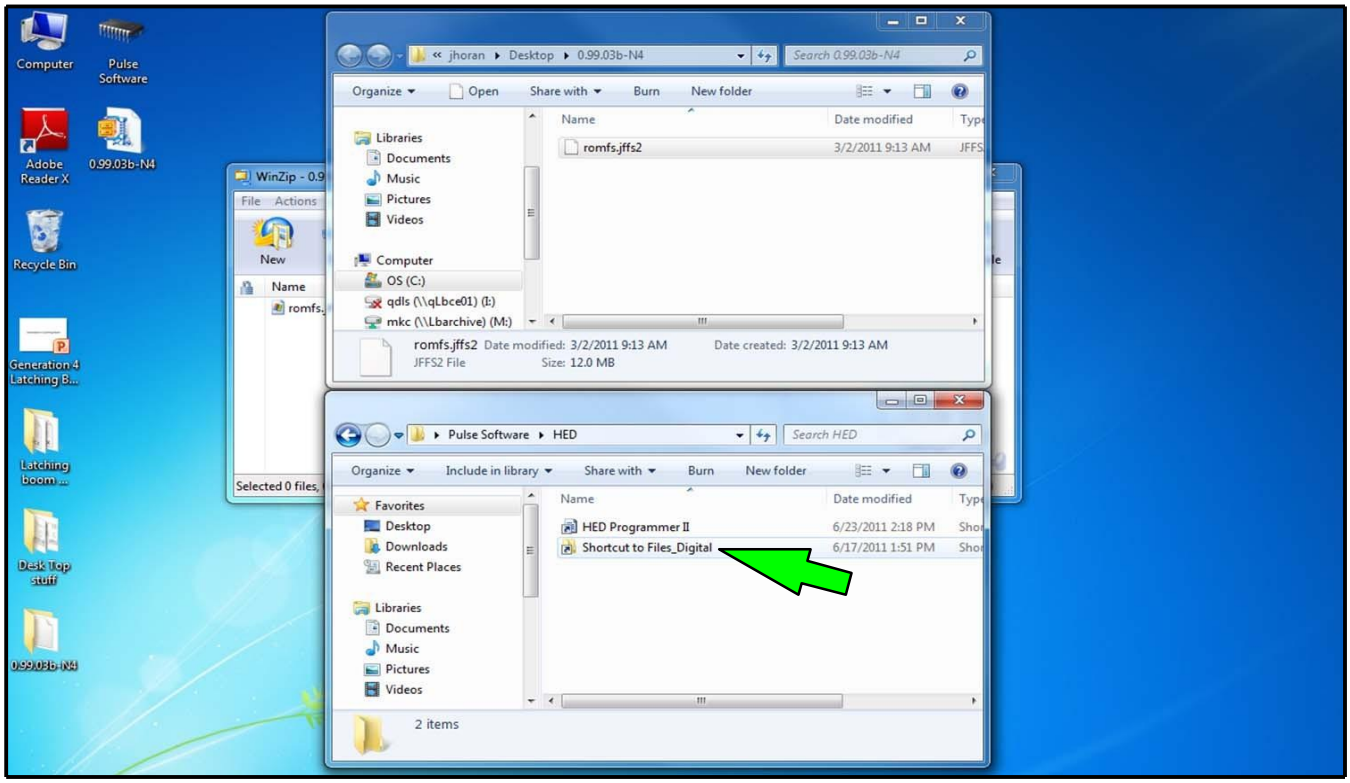
A window should open and the screen should look similar to the above.

5. Use the left mouse button and double click on the “Pulse Software” icon.

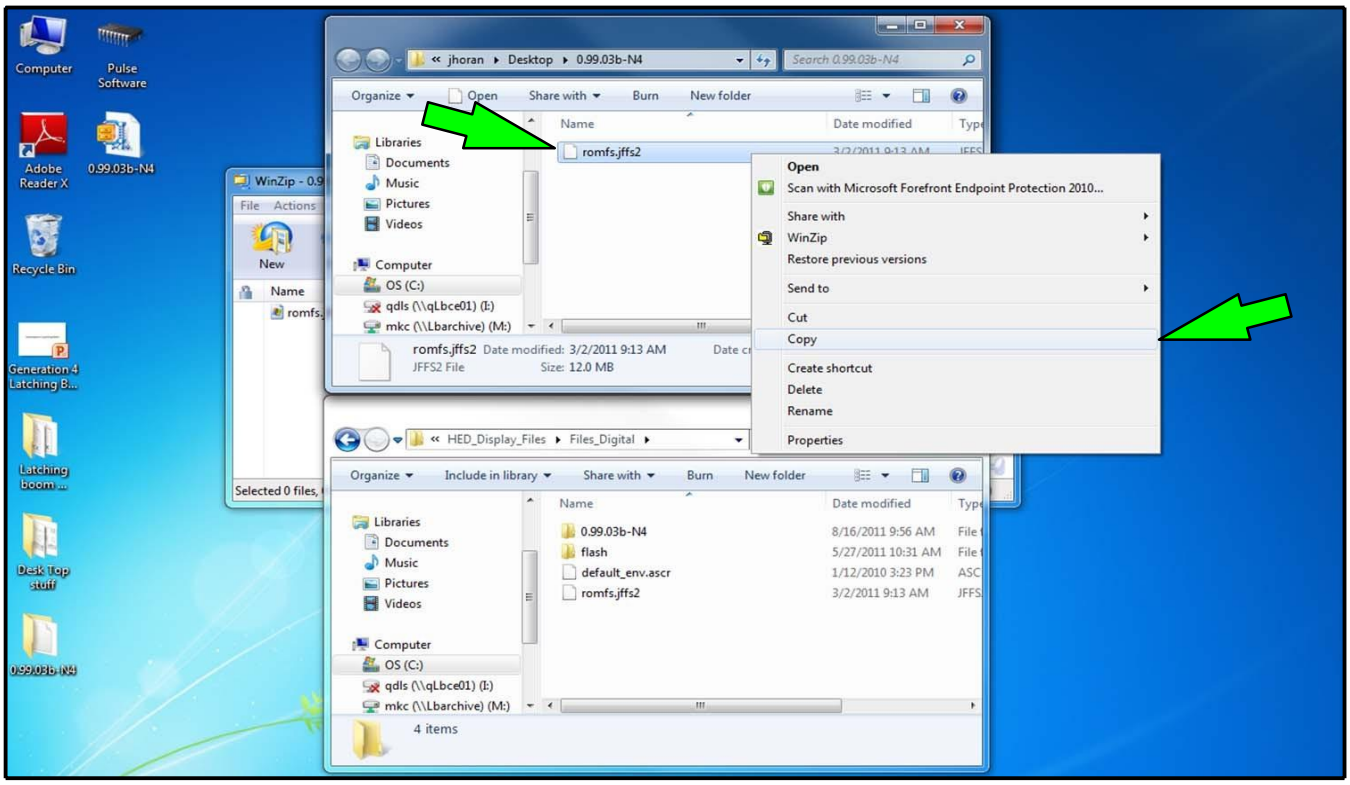


A second window should open and the screen should look similar to the above.

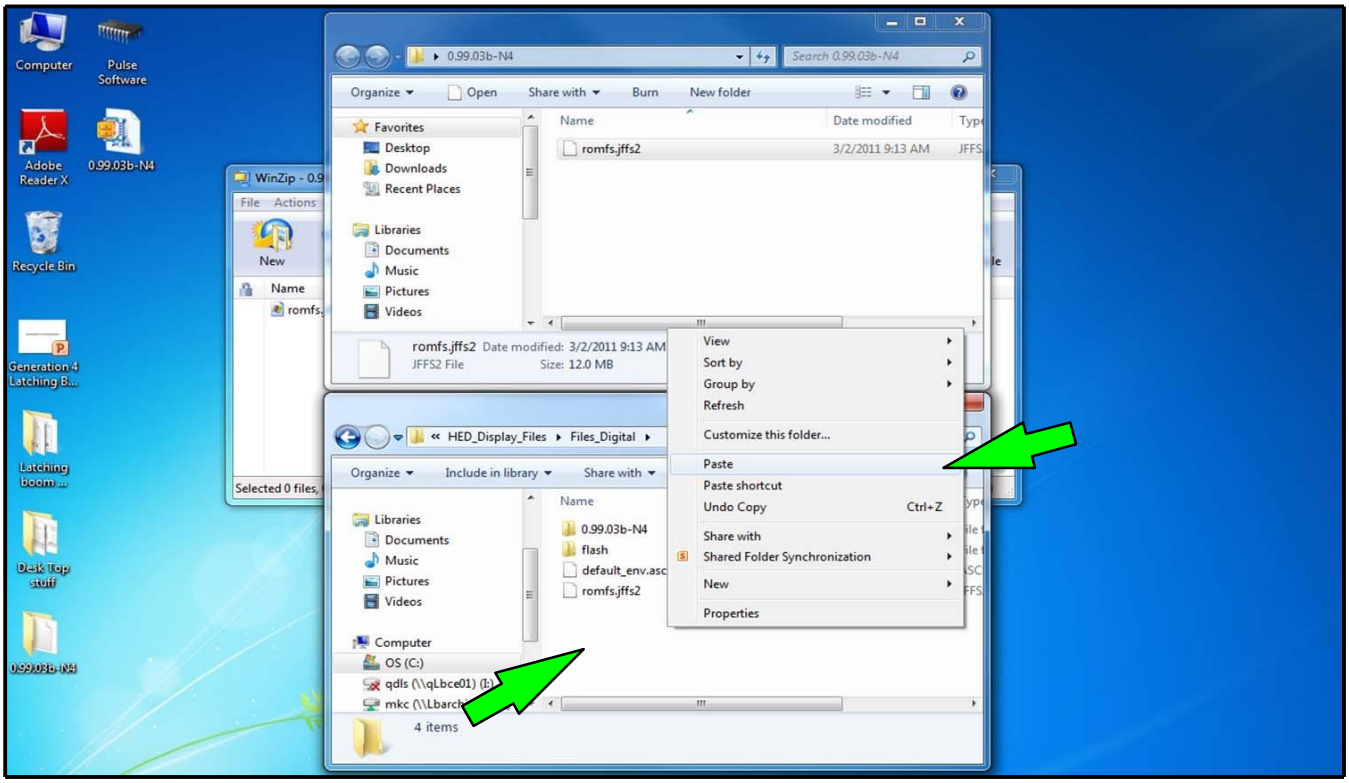
6. Use the left mouse button and double click the “HED” folder.



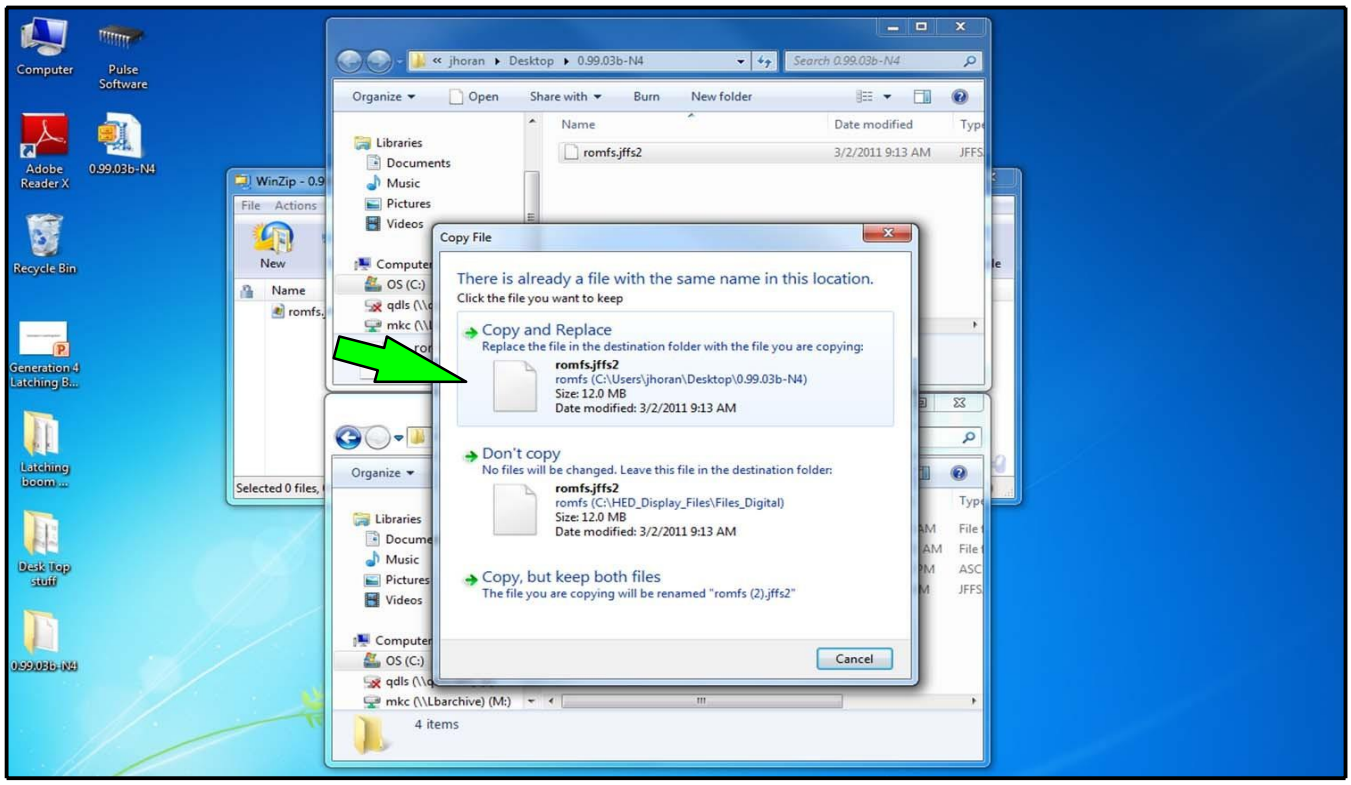
7. Use the left mouse button and double click the “Shortcut to Files_Digital” folder.



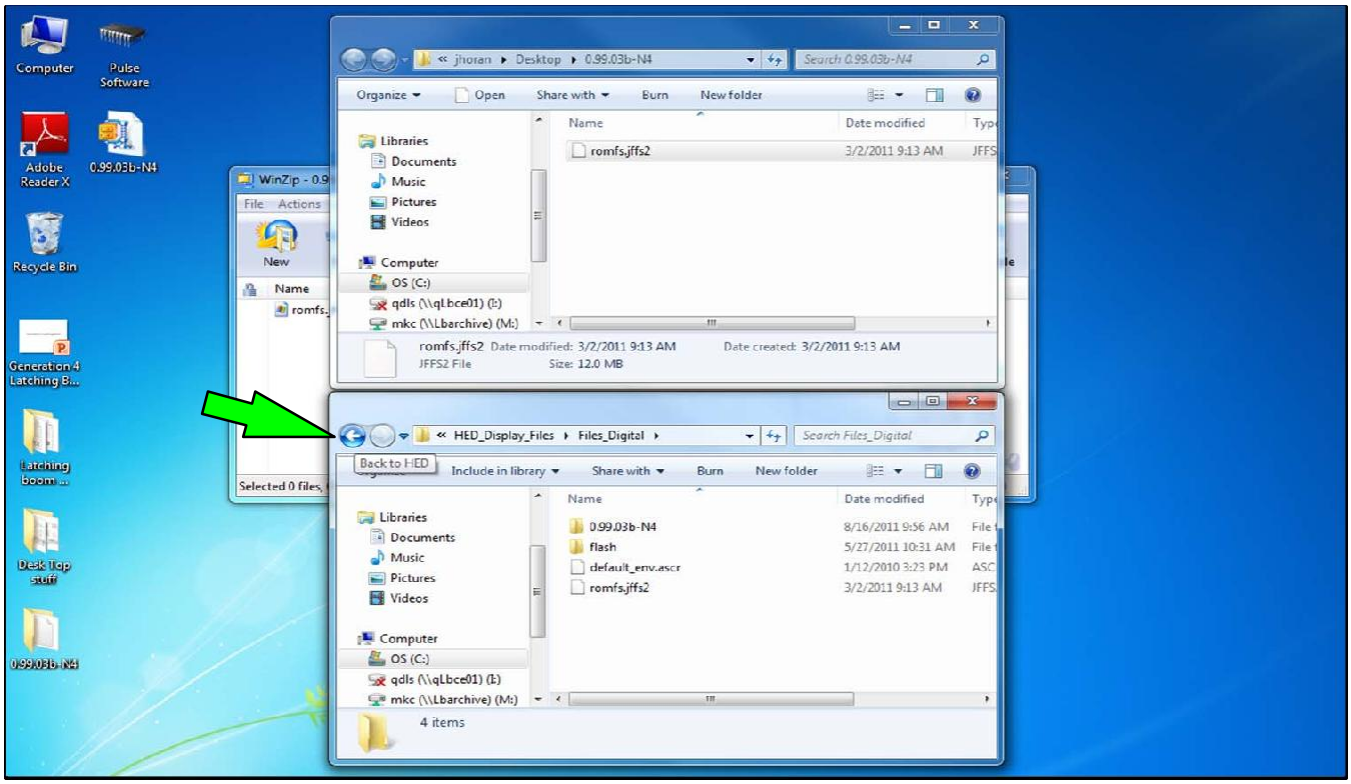
8. Use the right mouse button and click on the “romfs.jffs2” file.
9. Use the left mouse button and click on the “Copy” option.



10. Use the right mouse button and click in the “Files_Digital” window.
11. Use the left mouse button and click the “Paste” option.

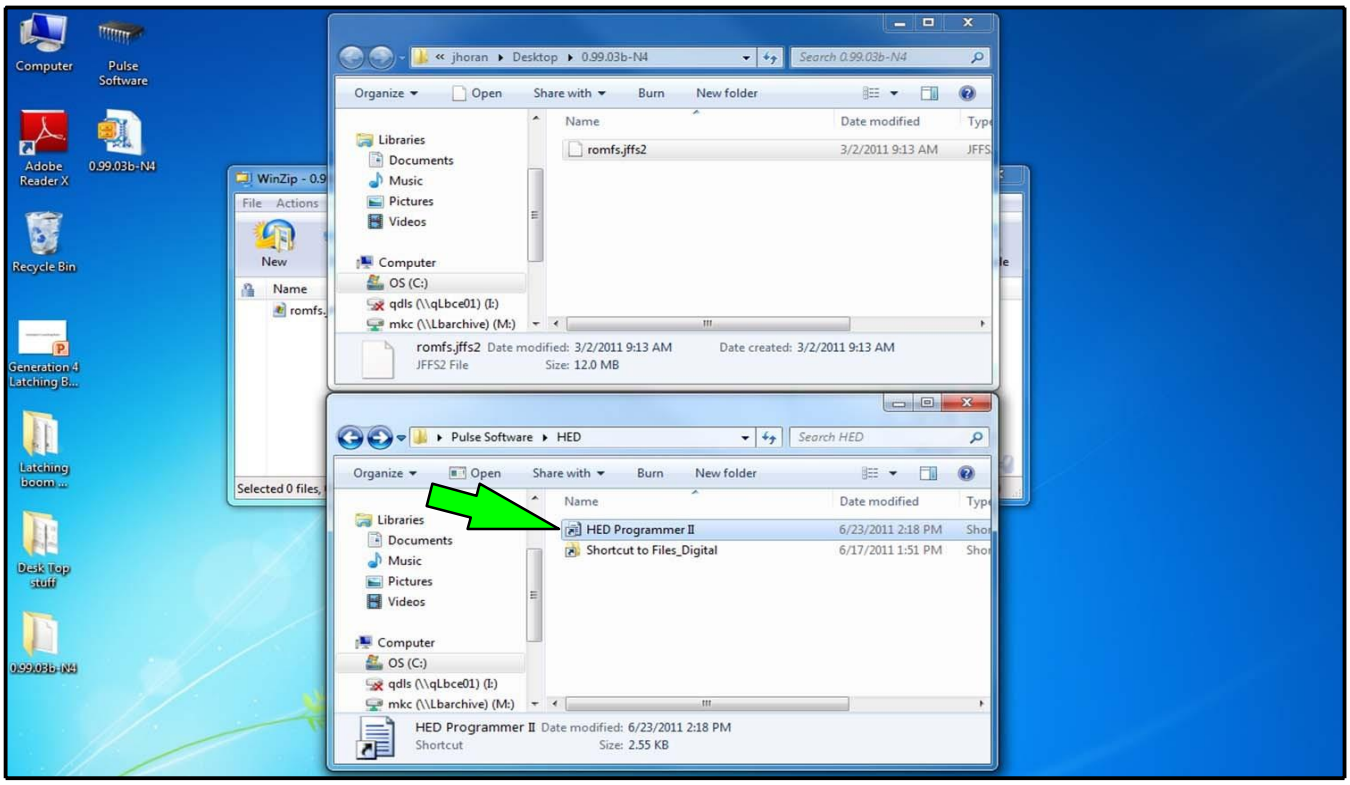


12. Left click on the "Copy and Replace" option.

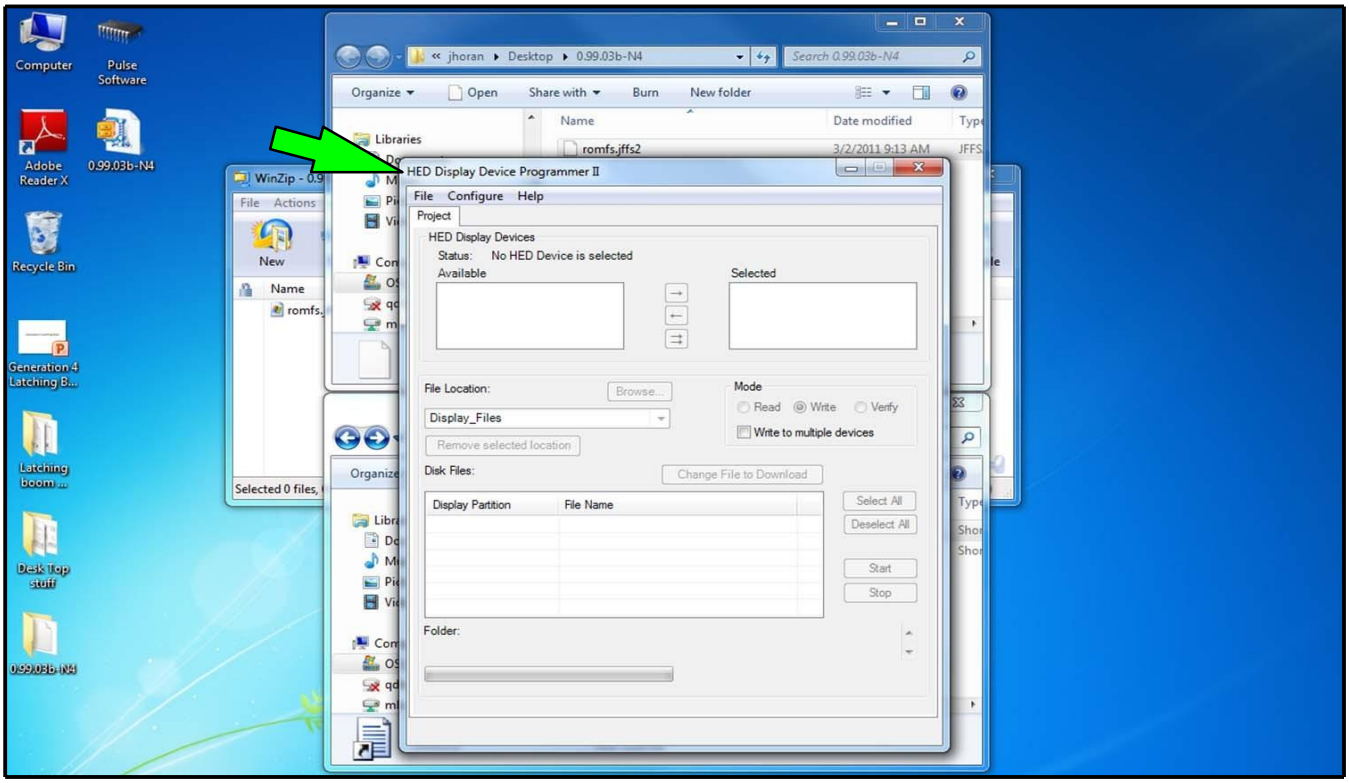


File preparation is complete.

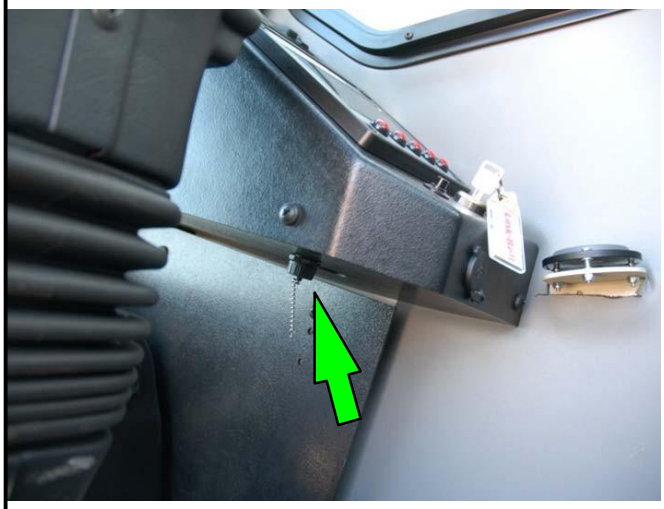
13. Use the left mouse button and click on the "Back" arrow button.



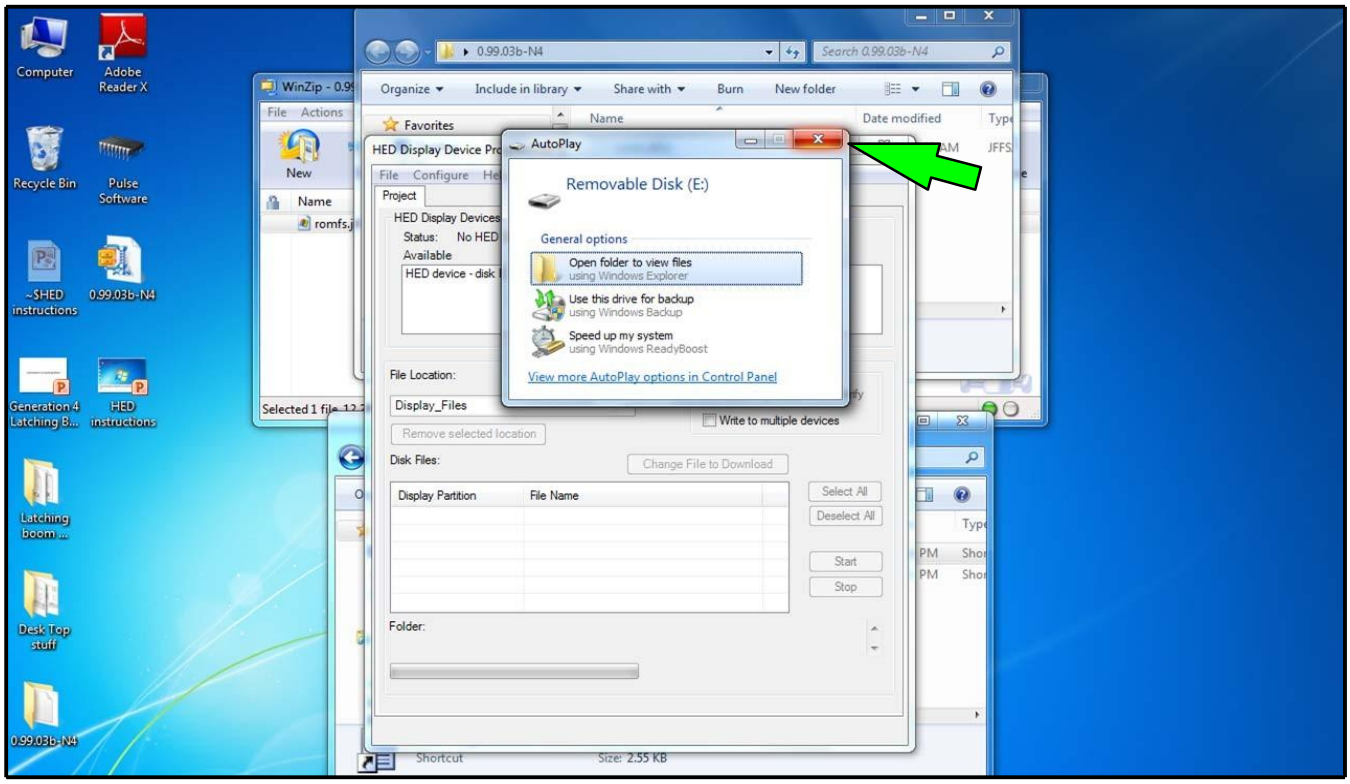
14. Left click on the “HED Programmer II” file.



The “HED Display Device Programmer II” window should open as shown above.

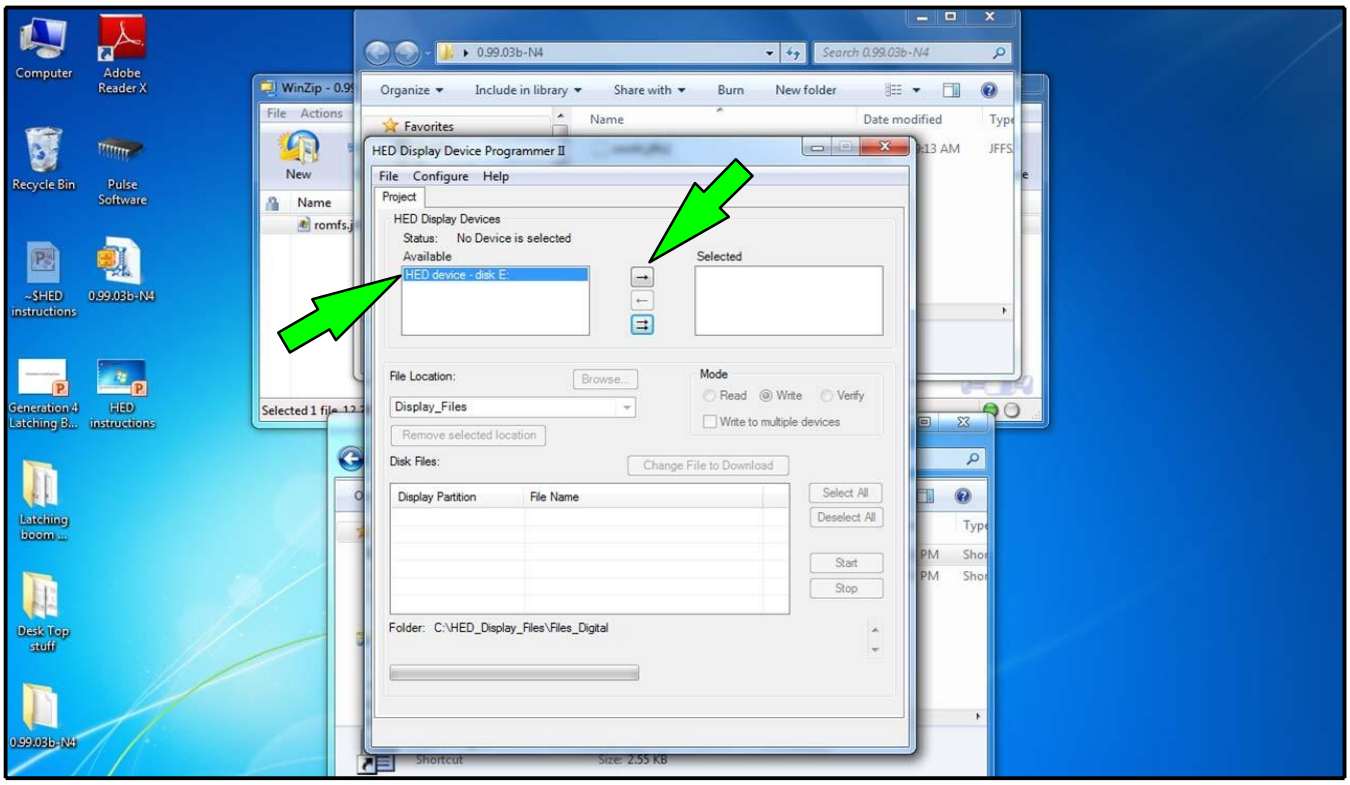


15. Turn the crane ignition switch off.
16. Connect the laptop to the USB Programming Connector.
17. Turn the crane ignition switch on.

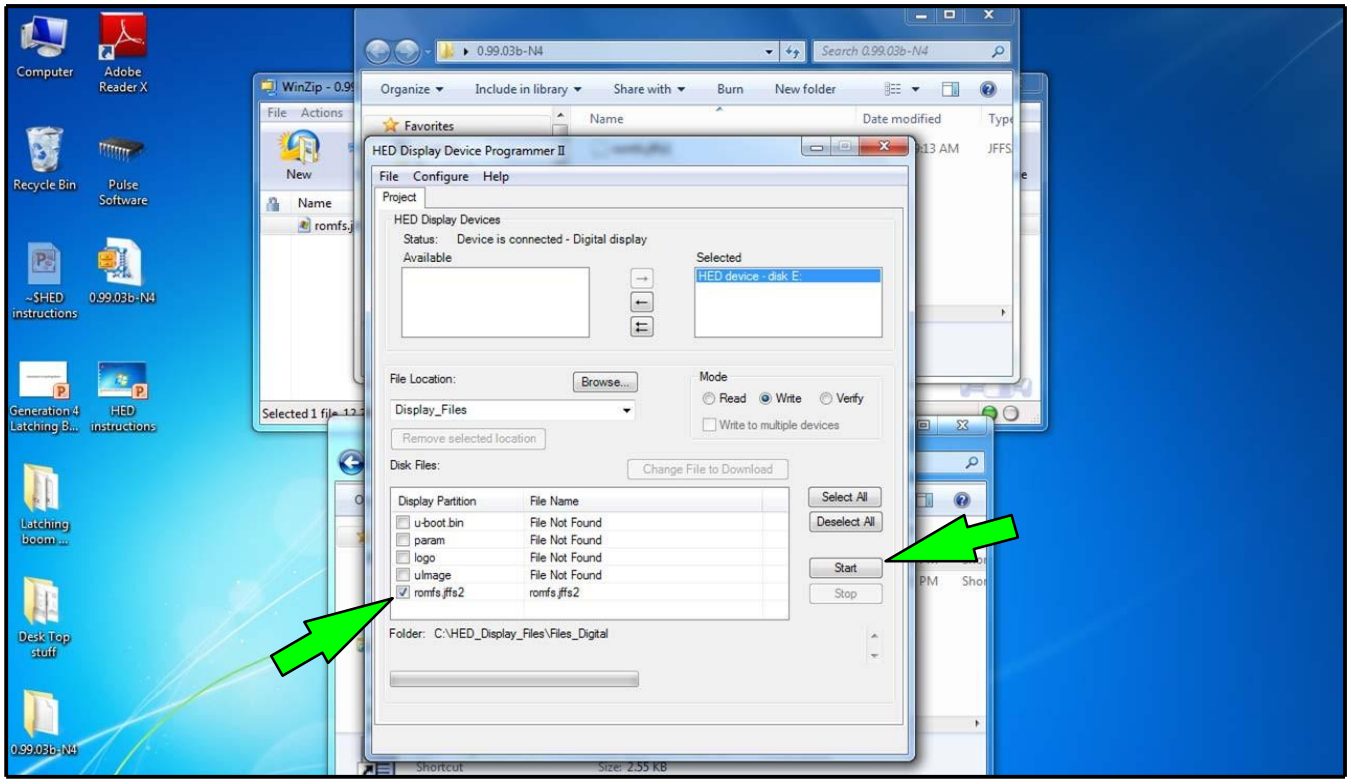


An “AutoPlay” window should open automatically as shown above.

18. Close the “AutoPlay” window by left clicking the “X” button.

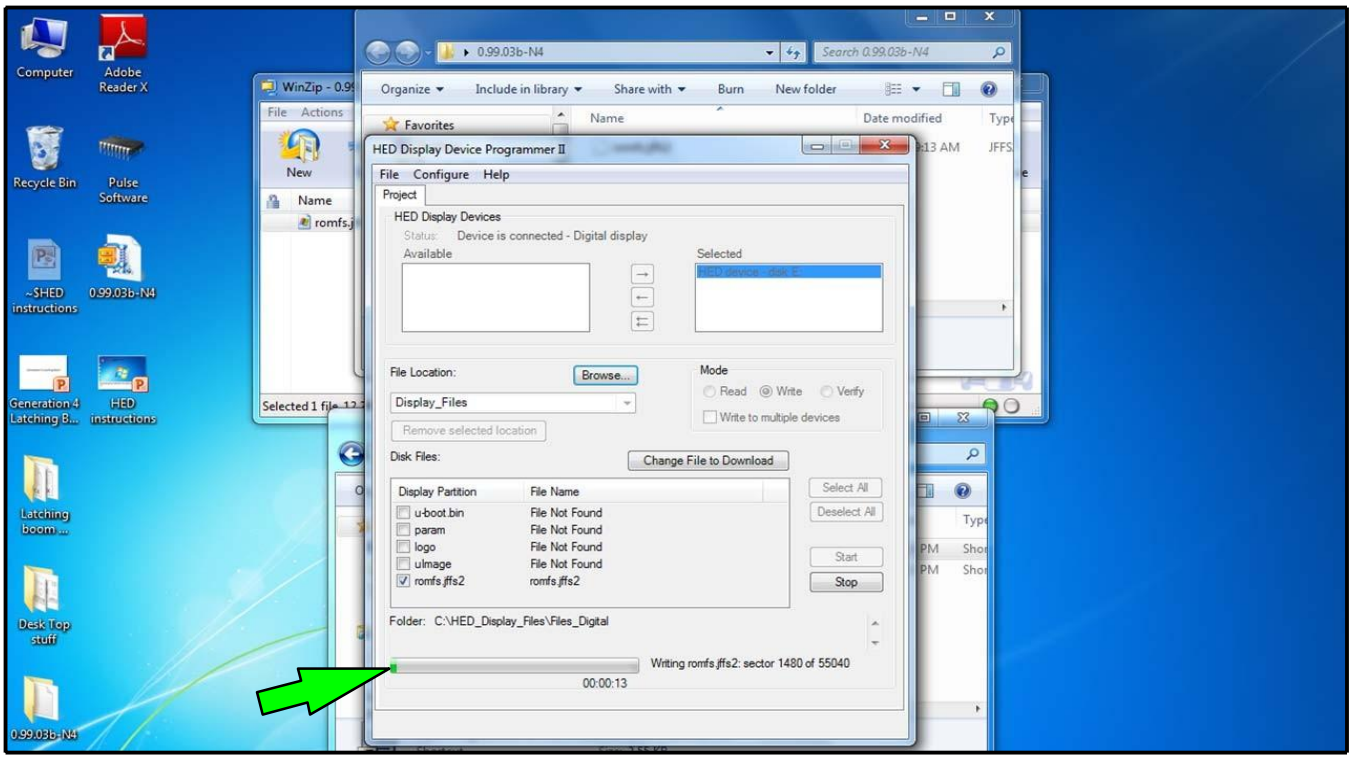


19. Use the left mouse button to click on “HED device –disk E:”
20. Use the left mouse button to click the single right arrow button.

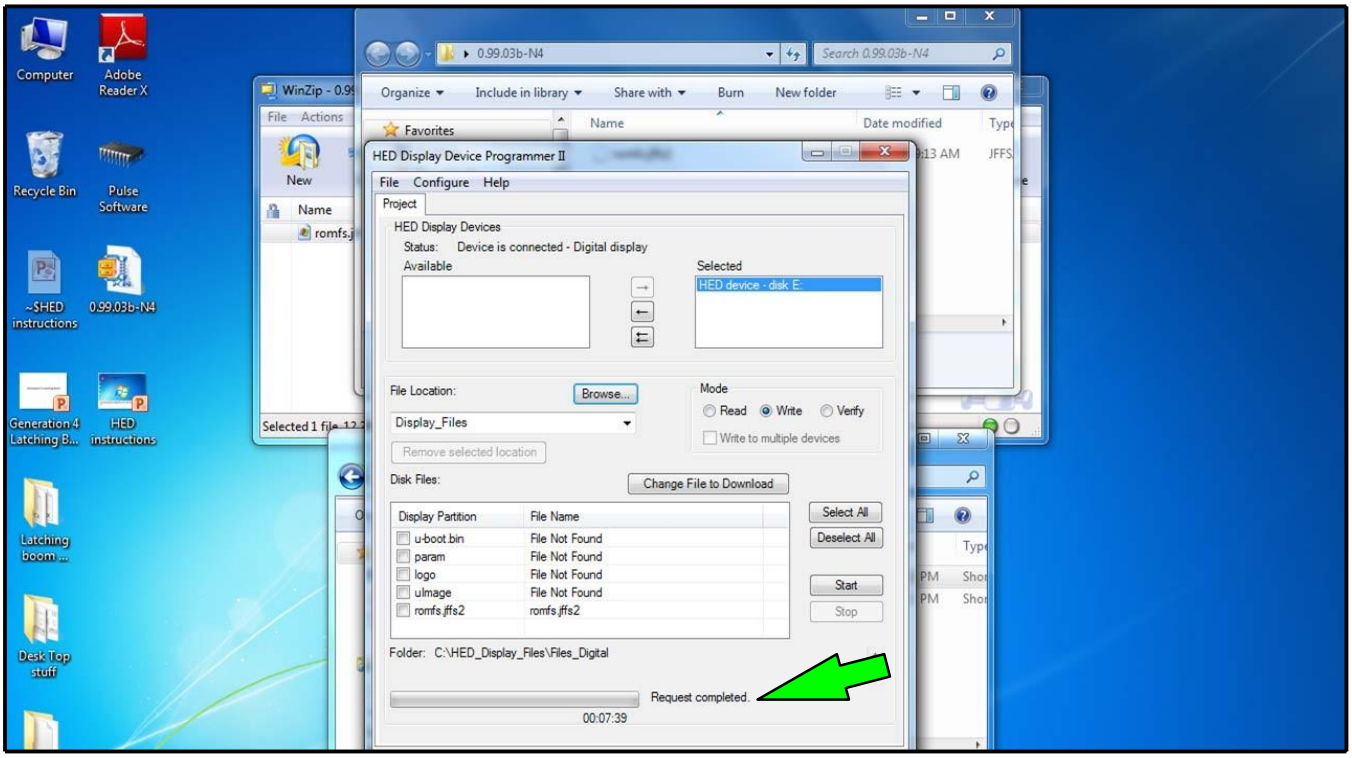


21. Use the left mouse button to click on the box next to “romfs.jffs2”. This will place a check mark in the box. If programming a new display that has not been programmed before, also place a check in the box next to “logo”. **Note: Select only the “romfs.jffs2” file and/or the “logo” file. Do not select any other file(s).**

22. Use the left mouse button to click on the “Start” button.



After clicking the “Start” button, programming should begin. Do not allow the computer to “go to sleep”. The status bar should begin to move.



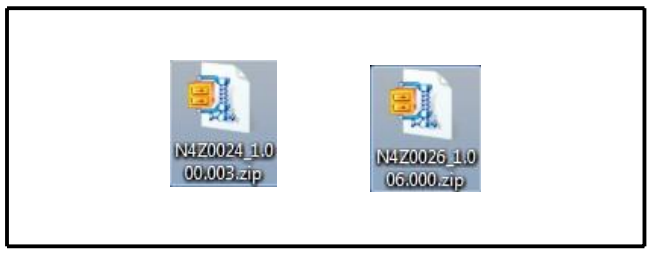
Once “Request completed.” appears at the bottom of the screen, the programming process is complete.

23. Turn the crane ignition switch off, remove the RCL Display fuse, close the “HED Display Device Programmer II” program, and disconnect the USB cable.
24. Once above is completed, install the RCL Display fuse and turn the crane ignition switch back on to ensure the RCL Display powers back up.

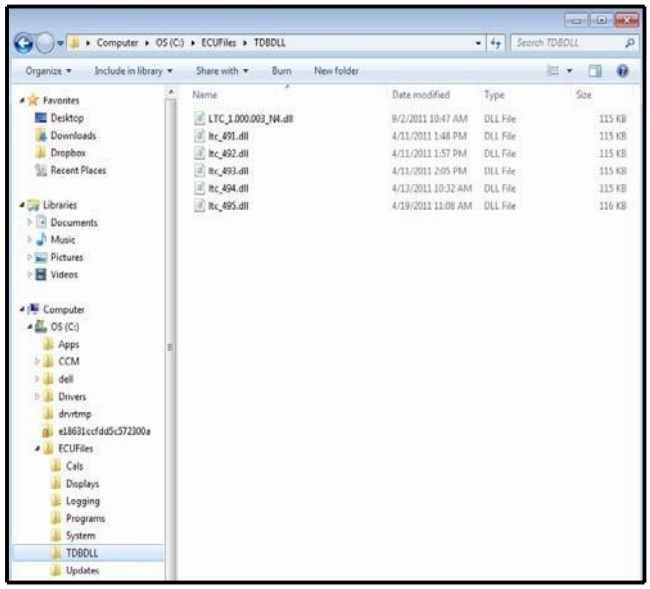
Appendix C

ECM Programming Instructions

1. Before updating any software, always record ALL friction slider values. These values can be entered after updating software to minimize the time required for calibration.



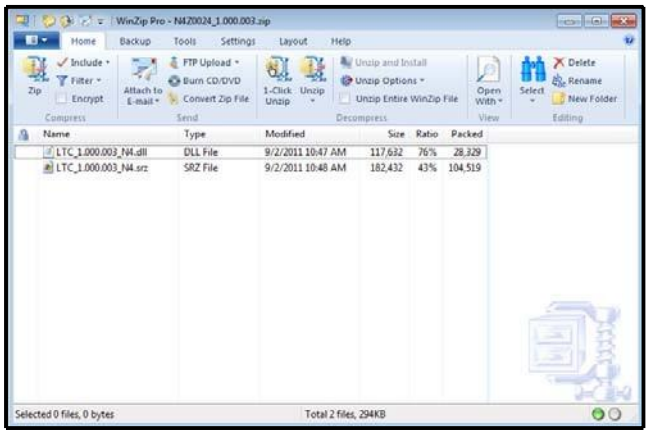
2. Download the appropriate compressed (zipped) file(s) for the Rated Capacity Limiter (RCL) computer or Latching Telescope Control (LTC) (boom controller) system to a location on the computer where the files can be easily found. See Examples above.



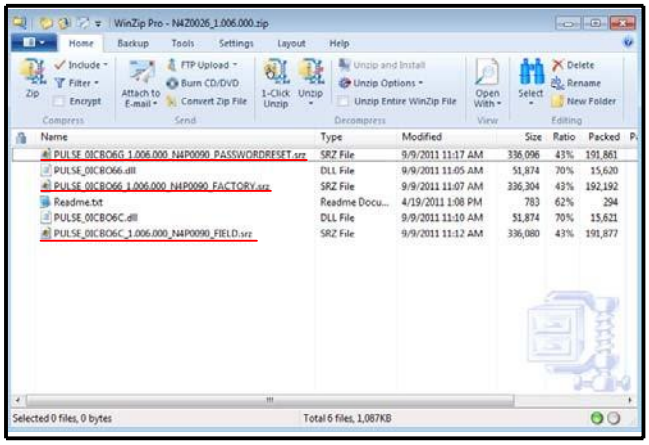
3. Unzip all the files on the computer where the files can be easily found.
4. Zipped files are structured as follows:

   LTC File – this file will contain two files.

   The ".dll" file needs to be placed in folder C:\ECUFiles\TDBDLL as this file is used with the LTC Variables screen. Leave any previous files in the folder.



The ".srz" file will be the file to program the LTC Electronic Control Module (ECM).

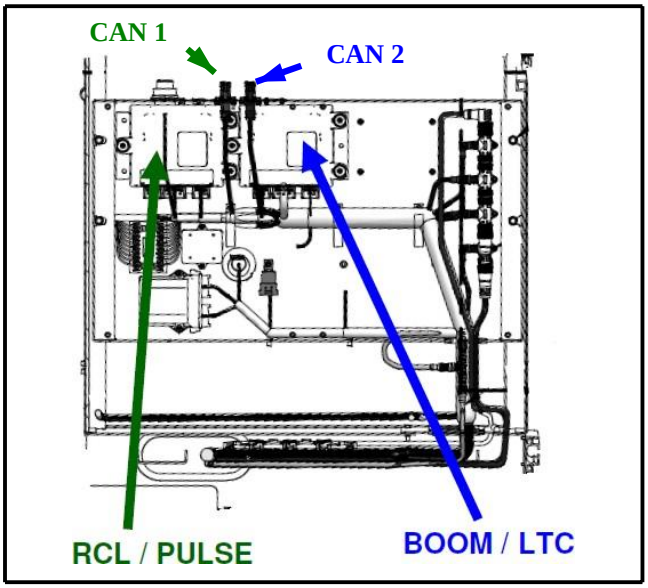


RCL Files – will contain three ".srz" files that are used to program the RCL ECM. They are as follows:

PASSWORDRESET – use this file to reset the default factory passwords.

FACTORY – use this file when directed to do so by the version description. This file will erase ALL calibration data. Full calibration will be required.

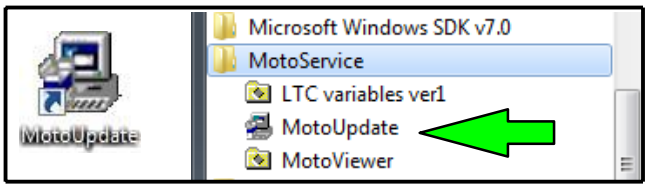
FIELD – use this file to update software. No calibration required.



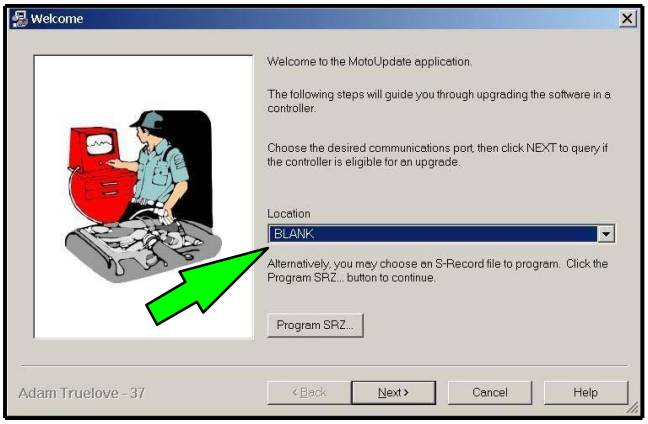
5. Connect Kvaser CAN Interface to J1939 CAN programming connector (RCL – CAN1 or LTC – CAN 2) on crane.

6. Connect USB Kvaser CAN Interface to USB port on the computer.

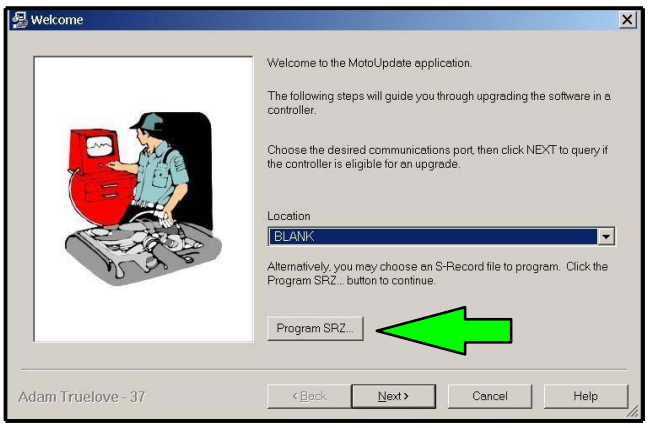
7. Insert the Moto Service License dongle into an unused USB port on the computer.



8. Turn crane ignition switch to the "ON" position. (The crane engine does not have to be started.)
9. Start the "MotoUpdate" software (Desktop Icon or through the Start – All Programs Menu).
10. Select the correct programming location (Blank, RCL, or LTC).
    a. BLANK – used for programming a new ECM.
    b. LTC – used for programming the LTC ECM (Boom Controller).
    c. RCL – used for programming the RCL ECM (RCL Computer).



11. The following are examples of the procedures for each of the programming locations.
12. Select the programming location for "BLANK".

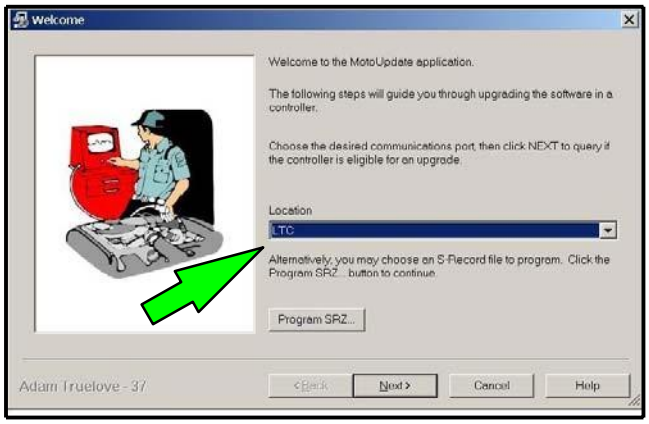


13. Click the “Program SRZ” button.

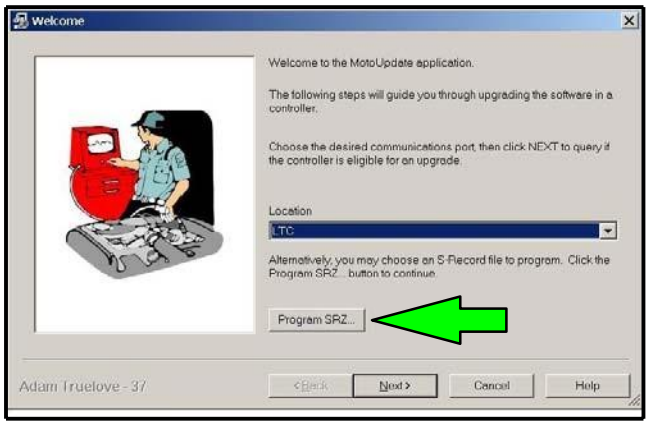
14. Using the “BLANK” programming location will set the “CityID” of the ECM. **Confirm all connections are connected into the correct programming port when using the “BLANK” command**.
    a. RCL = CityID 09
    b. LTC = CityID 10
15. Select file to be loaded. Either a RCL or LTC file and the “CityID” will be set according to the file selected.

16. Program will search for the ECM, connect to the ECM, and begin loading the selected file.

17. When programming is complete, “Programming Successful” message should appear.

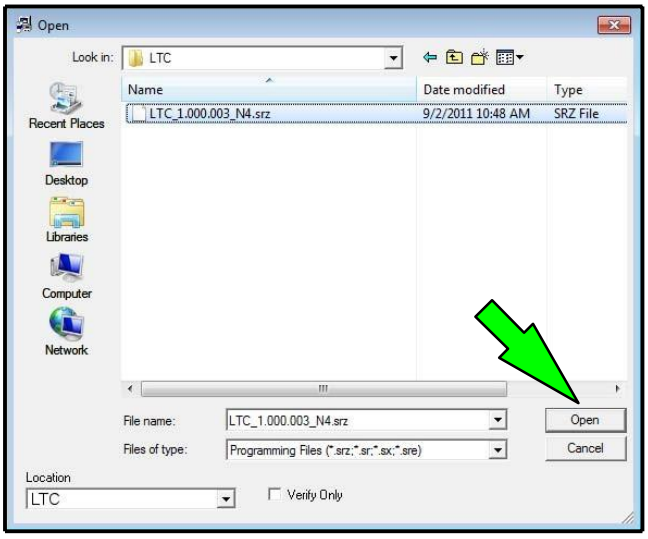


18. Select the programming location for “LTC”.

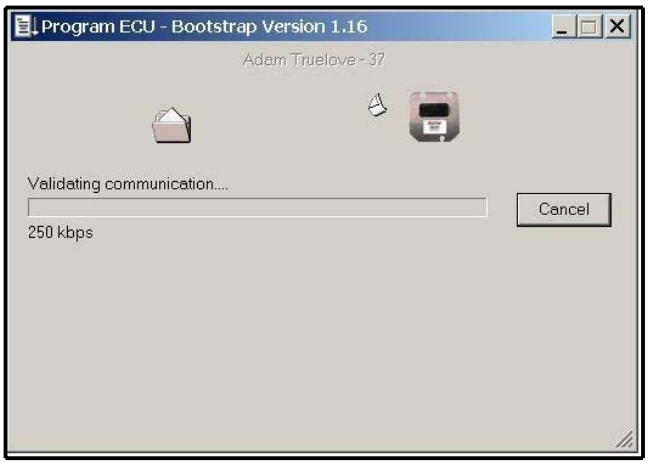


19. Click the “Program SRZ” button.

20. Select file to be programmed.

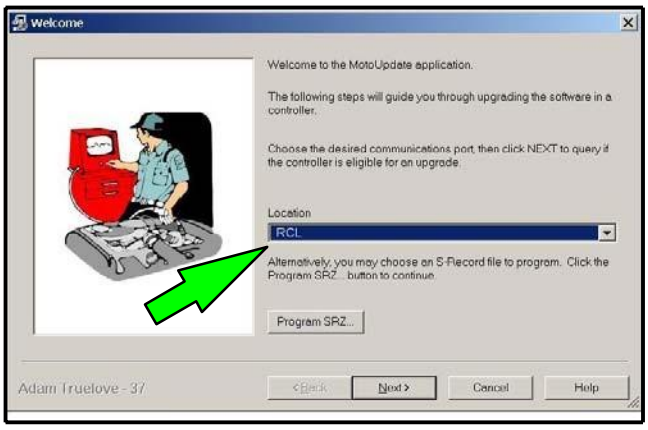


21. Click “Open”.

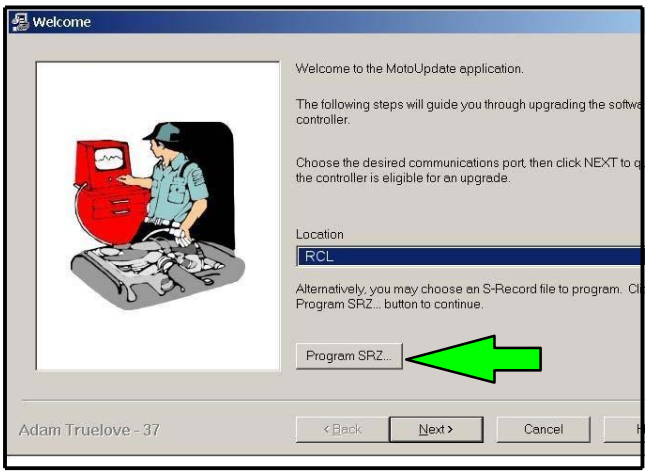


22. Program will search for the ECM, connect to the ECM, and begin loading the selected file.

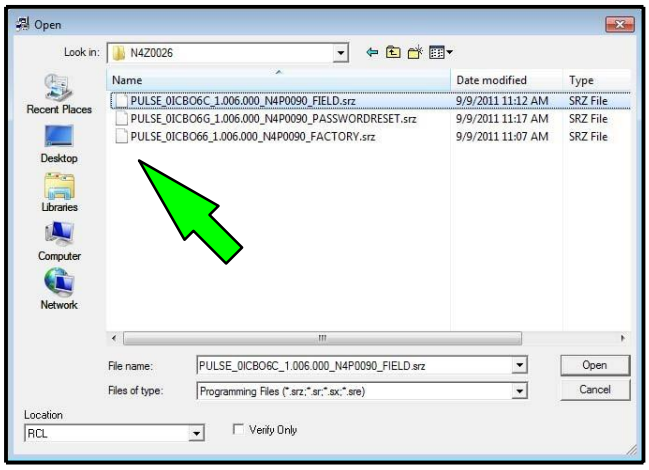
23. When programming is complete, “Programming Successful” message should appear.



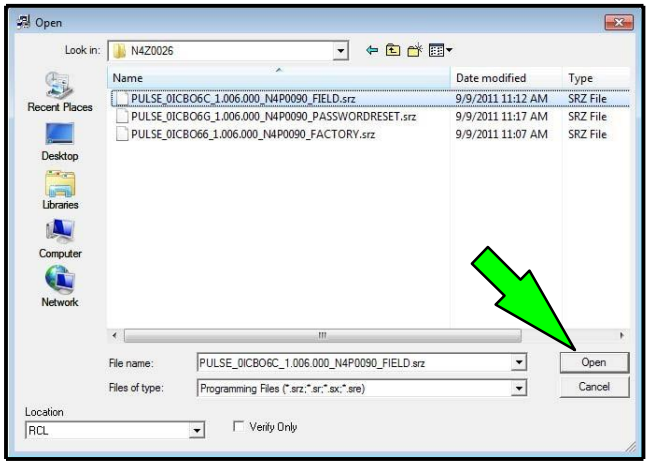
24. Select the programming location for "RCL".



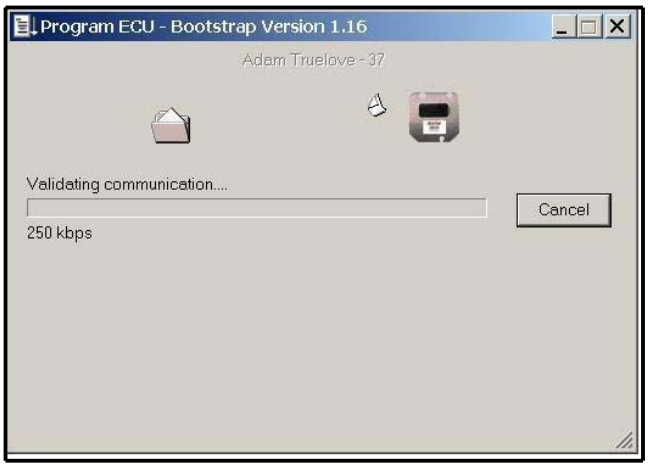
25. Click the "Program SRZ" button.



26. Select the file to be programmed.
    a. FIELD – use this file to update software. No calibration required.
    b. PASSWORDRESET – use this file to reset the default factory passwords.
    c. FACTORY – use this file when directed to do so by the version description. This file will erase ALL calibration data. Full calibration will be required.



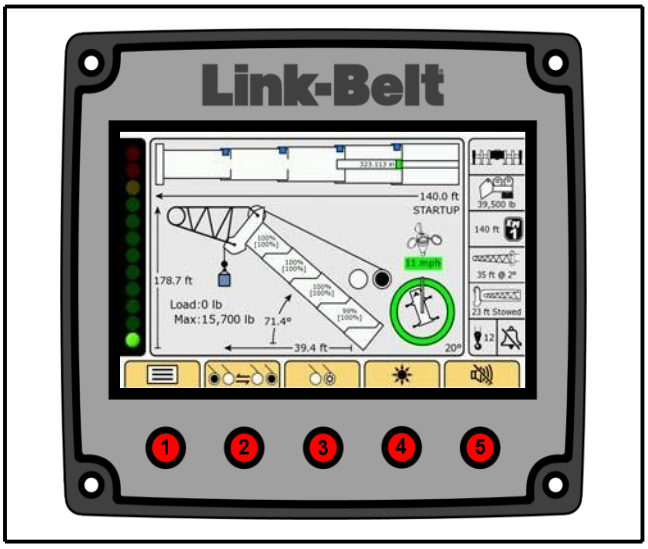
27. Click "Open".



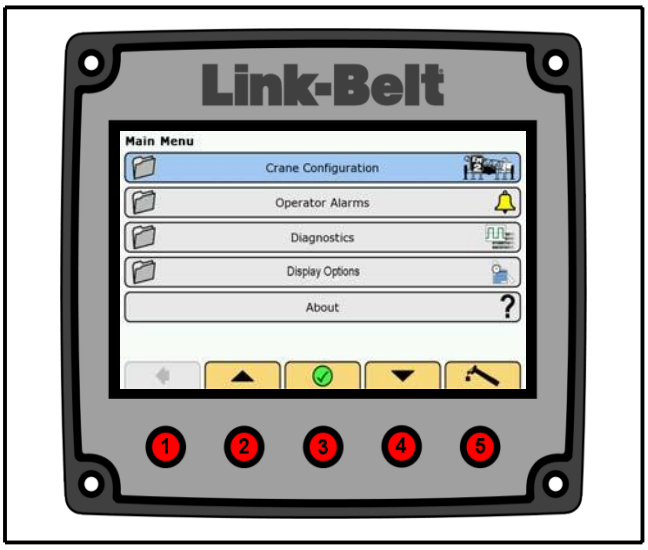
28. Program will search for the ECM, connect to the ECM, and begin loading the selected file.

29. When programming is complete “Programming Successful” message should appear.
30. Turn crane ignition switch to the “OFF” position.
31. Disconnect Kvaser CAN Interface from crane and laptop.
32. Turn crane ignition switch to the “ON” position. (Crane engine does not have to be started.)
33. Let the system boot up.

Note: If doing a “Factory” load of the software, warning banners/fault messages may be encountered until the system is calibrated.



34. Press button 1 to enter the Main Menu.



35. Scroll down to “About”.

36. Press button 3 to enter “About”.

37. Verify the program version of the installed software (RCL or LTC). This is located on the file that was installed.

IE: PULSE_0ICBO6C_***1.006.000***_N4P0090_FIELD.srz

38. Depending on the version of the software (“FACTORY” or “FIELD”) installed, perform necessary procedures to complete the installation.
    a. FIELD version – no calibration required
    b. FACTORY version – full calibration required. Refer to procedures given previously in this Pulse Calibration Manual.
39. Turn crane ignition switch to the “OFF” position.