Owner's Manual & User Guide

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Before You Begin

Disclaimer

The information and specifications contained in this document are subject to change without notice. Safe-T-Pull Inc. assumes no responsibility or liability for any errors or omissions that may appear in this manual. Safe-T-Pull Inc. reserves the right to update the existing document or to create a new document to correct any errors or omissions. You can receive the latest version of this document by calling your local dealer during their business hours.

Unpacking instructions

Immediately upon receipt, carefully unpack the product and check the packaging to make sure you have received all parts in good condition.

Claims

If the packaging or the material inside the packaging (the product and included accessories) appear damaged from shipping, or show signs of mishandling, upon receipt notify the carrier immediately, not Safe-T-Pull Inc. Failure to do so in a timely manner may invalidate your claim with the carrier. In addition, keep the container and all the packing material for inspection. For other issues such as missing components or parts, damage not related to shipping, or concealed damage, file a claim with Safe-T-Pull Inc. immediately after receiving the merchandise. In any case, take photos of any damage.

Contact Us

Email - sales@safe-t-pull.net
Mail - Safe-T-Pull, P.O. Box 94, Park River, ND 58270
Call - 701-284-6100
Web - www.safe-t-pull.net

Safety Information

Please read the following safety notes carefully before working with the Crop Shuttle. These notes include important safety information about installation, usage, and maintenance. All personnel working on, with, or near a Crop Shuttle must wear safety toed shoes, safety glasses, reflective safety vest, protective gloves, and hard hat.

Rules for safe hydraulic operation

- Park hydraulic machinery where children cannot reach it.
- If the pulling vehicle has hydraulic flow control capabilities (usually measured in GPM), decrease the flow to the minimum amount required to operate the Crop Shuttle

  Block the Crop Shuttle when you must work on the system while raised; DO NOT rely solely on the hydraulic lift.
- Avoid servicing the hydraulic system while the machine engine is running.
- Do not remove cylinders until the Crop Shuttle is resting securely on the ground or safety stands or blocks; shut off engine.
- Before disconnecting hydraulic hoses, relieve all hydraulic pressure.
- Be sure all hose connections are tight and hoses are not damaged.

Three common hydraulic system hazards

1. Burns from very hot, high pressure fluid.
2. Injuries and illness from flailing hydraulic lines.
3. Hydraulic fluid injection into the body.

Ways to prevent hazards from occurring

- When attempting to detect pinhole leaks in hydraulic hoses run a piece of cardboard or wood along the hose.
- NEVER touch hydraulic hoses when they are under pressure.
- NEVER connect a low pressure hose, cylinder, or ANY aftermarket equipment to the Crop Shuttle.
- Ensure all hydraulic components are in proper working condition on the pulling vehicle.
- Periodically check for oil leaks and worn hoses.
- Keep contaminants from hydraulic oil and replace filters regularly.
- Lubricate cylinder rods with protective lubricant to avoid rusting.

Safety Stops

Crop Shuttles are equipped with cylinder chokes for use on the hoist cylinders. These are to be used if maintenance or repair must be done with the Crop Shuttle in the raised position. These cylinder stops are designed to hold the hopper in the raised position if the hydraulic safety systems fail. They are NOT meant to prevent the Crop Shuttle from being lowered under its own hydraulic power. Never perform maintenance or repair on a Crop Shuttle while the tractor is running.

Safety Stops installed on hoist cylinders

Warning Labels

If warning labels become damaged or are unreadable for any reason they must be replaced immediately. Replacement warning labels can be ordered from your authorized Crop Shuttle dealer.

Pinch Point Hazard – Pinch points occur when a part of the machine contacts or rubs against another part or surface. Pinch points can cause laceration and amputation. To prevent serious injury or death, DO NOT step or reach into pinch areas. If service must be done in these areas be sure the tractor is OFF.

Moving Part Hazard – Moving part hazards occur any place where a conveyor, chain, belt, or hydraulics are in motion. To prevent serious injury or death, close and secure guards and shields before operating. Keep hands, feet, hair and clothing away from moving parts. Do NOT stand or climb on machine when operating. If service must be done in these areas be sure the tractor is OFF.

Overhead Conveyor Hazard – Overhead conveyor hazards occur any place where a conveyor, chain, or belt are in motion. To prevent serious injury or death, close and secure guards and shields before operating. Keep hands, feet, hair and clothing away from moving parts. Do NOT stand or climb on or under machine when operating. If service must be done in these areas be sure the tractor is OFF.

Crop Shuttle operations for systems installed with PS-00324 Rev 2

General:

This is a control system to run the conveyor and boom functions of a Crop Shuttle.

Purchased Components:

Opus A3S Display
HFX32 Controller
CAN Pendant
Wire Harnesses

I/O List:

Inputs:

Outputs:

1. Unloading Valve (Digital Output)
2. Hoist Raise (Digital Output)
3. Hoist Lower (Digital Output)
4. Boom Unfold / Boom Unfold 2 (Digital Output)
5. Boom Fold / Boom Fold 2 (Digital Output)
6. Boom Extend (Digital Output)
7. Boom Retract (Digital Output)
8. Front Door Open (Digital Output)
9. Front Door Close (Digital Output)
10. Rear Door Open (Digital Output)
11. Rear Door Close (Digital Output)
12. Hopper Forward (Digital Output)
13. Hopper Reverse (Digital Output)
14. Hopper Speed (Proportional Output)
15. Hopper Closed Center (Digital Output)
16. Extra 1 (Digital Output)

Display

Hard keys:

Next

- When the Next button is pressed, the display changes to the next screen.

Home

- When the Home button is pressed, the display will go to the Home screen.

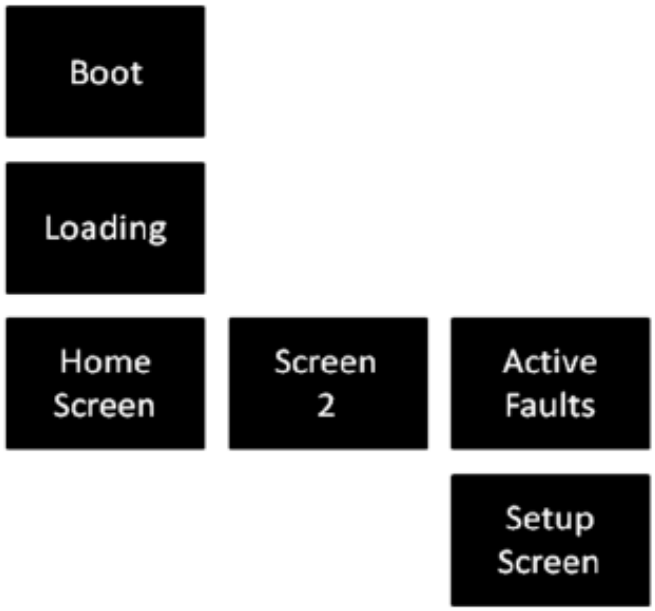
ESC

- When the ESC button is pressed, the display will go back to the previous screen or view.

Encoder

- When the Encoder is pressed, the display will jump between the Home screen and Screen 2
- When the Encoder is turned, it will adjust the selected value.

Display Navigation Layout:



Start up screen:
Company logo

Screen will show when power is applied to the display for approx. 10 sec.

Loading screen:
Company logo, with loading bar

Screen will show right after Start Up Screen for approx. 10 sec.

Home screen:
Home Screen will show right after the loading screen.

The following parameters will be displayed on the Home Screen:

1. Hopper Speed
2. Hopper Direction
3. Hopper Up Time
4. Hopper Down Time

Hopper On Off

- When the Hopper is OFF and the Hopper ON/OFF button is pressed, the Hopper Forward or Reverse, based on the setting on Screen 2, and the Hopper Speed outputs will be turned ON.
- If the Hopper is ON and the Hopper ON/OFF button is pressed, the Hopper Forward or Reverse, based on the setting on Screen 2, and the Hopper Speed outputs will be turned OFF.

Hopper LO MED HI

- The Hopper LO MED HI button will select between LO, MED, and HI setting of the Hopper Speed output. ~~On start up the LO speed setting will be active. When the Hopper Speed output is shut OFF the speed setting will go to LO.~~
- The Encoder will be used to adjust the Hopper LO, MED, and HI Speed setpoints. By pressing the Hopper LO MED HI button the user will be able to select between the three setpoints.
  - Hopper LO Speed: 0-33% (Step by 1%)
  - Hopper MED Speed: 33-66% (Step by 1%)
  - Hopper HI Speed: 66-100% (Step by 1%)
- The Hopper Speed setting will be represented by a bar graph on the home screen. The three speed settings will be saved.

Hopper Up Down

- When the Hopper Up button is pressed, the Hopper Up output will be turned ON, when the button is released, the output will turn OFF. If the Hopper Up Time is set greater than 0 seconds, the Hopper Up output will remain ON for the displayed amount of time. If the button is pressed again the output will turn OFF. If the button is pressed and held for more than half a second, the function will run as momentary and will turn OFF when released.
- When the Hopper Down button is pressed, the Hopper Down output will be turned ON, when the button is released, the output will turn OFF. If the Hopper Down Time is set greater than 0 seconds, the Hopper Down output will remain ON for the displayed amount of time. If the button is pressed again the output will turn OFF. If the button is pressed and held for more than half a second, the function will run as momentary and will turn OFF when released.
- Hopper Up (secs) – Pressing and holding this button links the Encoder to the Hopper Up time. Turning the knob will adjust the time from 0 to 60 seconds.
- Hopper Dn (secs) – Pressing and holding this button links the Encoder to the Hopper Down time. Turning the knob will adjust the time from 0 to 60 seconds.

Rear Door Open Close

- When the Rear Door Open button is pressed, the Rear Door Open output will be turned ON, when the button is released, the output will turn OFF.
- When the Rear Door Close button is pressed, the Rear Door Close output will be turned ON, when the button is released, the output will turn OFF.

Screen 2:
Screen 2 will show after pressing the Next button on the Home Screen.

The following parameters will be displayed on the Screen 2:

Hopper Forward Reverse

- The Hopper Forward Reverse button will select between Forward and Reverse operation of the Hopper. The selected direction will be blue. The direction will be saved and on start up the saved direction will be selected.

Front Door Open Close

- When the Front Door Open button is pressed, the Front Door Open output will be turned ON, when the button is released, the output will turn OFF.
- When the Front Door Close button is pressed, the Front Door Close output will be turned ON, when the button is released, the output will turn OFF.

Boom Out In / Ext Ret

- When the Boom Out button is pressed, the Boom Out output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom In button is pressed, the Boom In output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom Ext button is pressed, the Boom Ext output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom Ret button is pressed, the Boom Ret output will be turned ON, when the button is released, the output will turn OFF.

Backlight Increase Decrease

- When on Screen 2, the Encoder will be used to adjust the Display and CAN Pendant brightness.

Faults

- When the Faults button is pressed, the display will go to the Fault screen.
- If there is an Active Fault, a red icon will show at the top of the Home Screen and Screen 2.

Fault Screen:

The Fault screen will show when the Fault button is pressed from Screen 2.

The Fault screen will display a table indicating the J1939 DM1 message fault codes. The fault codes will be displayed as numerical values unless otherwise specified in the Appendix A: Fault Code Table.

- The ECU (electronic control unit) column indicates which controller the fault is coming from.
- The SPN (suspect parameter number) column indicates what function has a fault.
- The OC (occurrence count) column indicates how many times the fault has occurred.
- The FMI (fault mode indicator) column indicates the reason for the fault.

Fault Reset Button

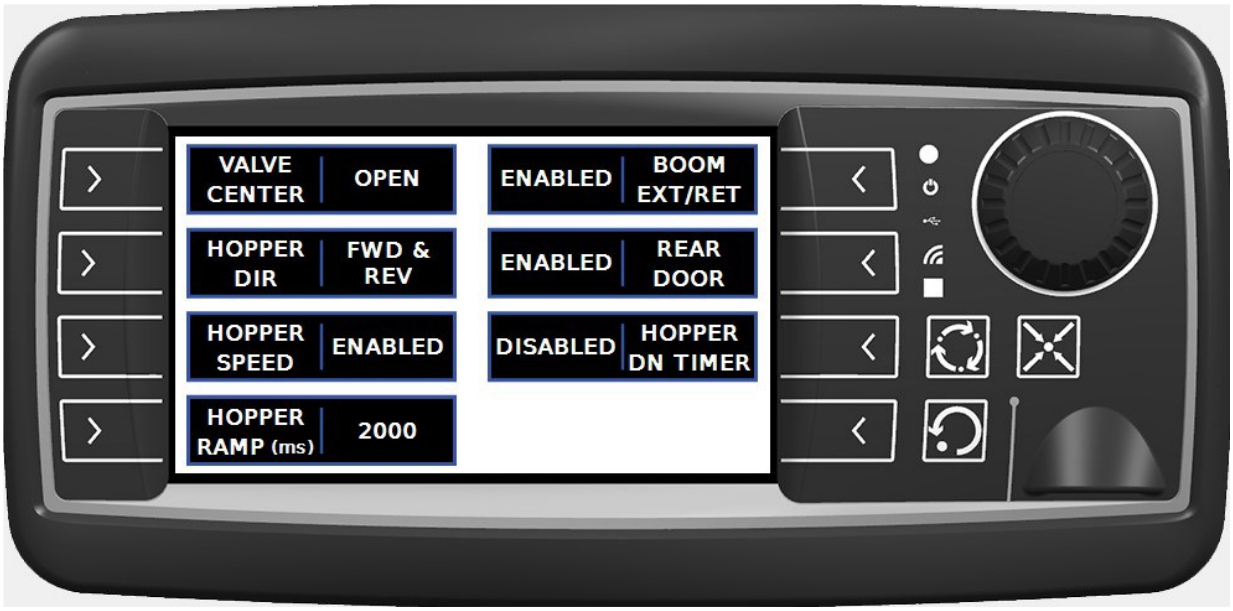
- The Fault Reset button will reset all faults.

Setup Screen Navigation

- Pressing and holding the top two right buttons for 3 seconds will take the user to the Setup screen.

The Display and Controller Software version will be displayed on this page.

Setup Screen:
The Setup screen will show when the Setup buttons are pressed from the Fault Screen.



Valve Center

- Open Center – The Unloading Valve output will be normally OFF and will turn ON with any function. The Hopper Closed Center output will be OFF.
- Closed Center – The Unloading Valve output will be OFF. The Hopper Closed Center Output will be OFF.
- The Open / Closed setting will be saved, the default setting is Closed.

Hopper Direction

- Disabled – The Hopper Fwd button on the Home Screen will control the Hopper Speed valve. The Hopper Forward and Reverse outputs and faults will be disabled. Disabling the Hopper Speed will remove the Hopper ON/OFF button from the Home Screen and the Hopper Direction button from Screen 2. The Hopper Forward and Reverse outputs and faults will be disabled.
- FWD & REV – Enables the Hopper ON/OFF button on the Home Screen and the Hopper Direction button from Screen 2. The Hopper Forward and Reverse outputs and faults will be enabled.
- FWD Only – Enables the Hopper ON/OFF button on the Home Screen and disables the Hopper Direction button from Screen 2. The Hopper Forward output and faults will be enabled.
- The Hopper Direction setting will be saved, the default setting is FWD & REV.

Note: Hopper REV is usually disabled upon delivery. If you receive the unit and REV is an option, disable it if you are not actively using Hopper REV. When you must use Hopper REV watch very carefully and operate it slowly to avoid damage to the floor and drive system.

Hopper Speed

- Disabling Hopper Speed will remove the Hopper Lo/Med/Hi button and the Hopper Speed bar graph from the Home Screen. The Hopper Speed output and faults will be disabled.
- The Hopper Speed setting will be saved, the default setting is Enabled.

Hopper Ramp (ms)

- If Hopper Speed is Enabled, the Hopper Ramp Up Time will be available.
- Press the Hopper Ramp button and turn the Encoder to adjust the time in milliseconds it takes the Hopper Speed output to ramp from the Minimum current to the Maximum current.
- The Hopper Ramp setting will be saved, the default setting is 2000.

Boom Extend / Retract

- Disabling Boom Extend / Retract will remove the Boom Extend and Boom Retract buttons from Screen 2. The Boom Extend and Retract outputs and faults will be disabled.
- The Boom Extend / Retract setting will be saved, the default setting is Enabled.

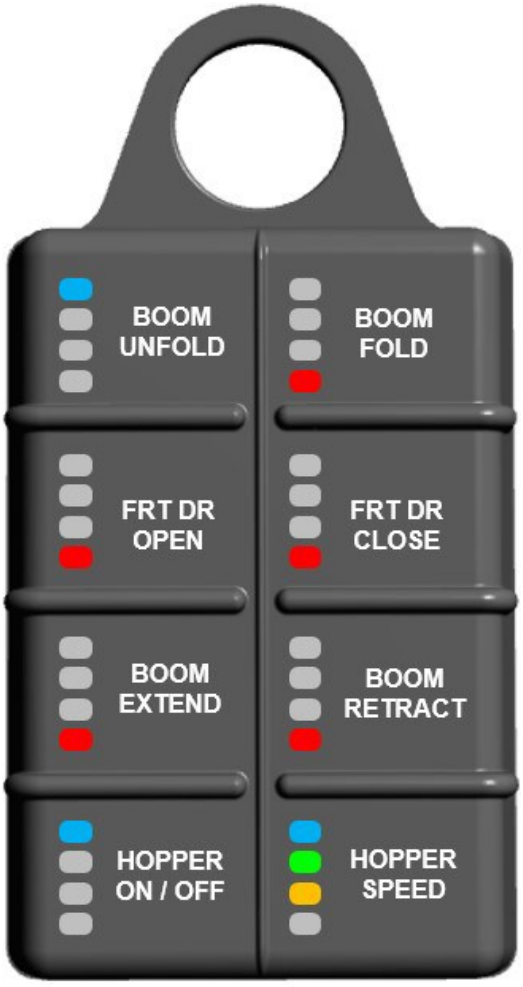
Rear Door

- Disabling Rear Door will remove the Rear Door Open and Rear Door Close button2 from the Home Screen. The Rear Door Open and Close outputs and faults will be disabled.
- The Rear Door setting will be saved, the default setting is Enabled.

Hopper Down Timer

- Disabling Hopper Down Timer will remove the latching Hopper Down output timer option from the Home Screen.
- The Hopper Down Timer setting will be saved, the default setting is Disabled.

CAN Pendant:



The following functions are on the CAN Pendant:

Boom Unfold

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Fold

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Front Door Open

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Front Door Close

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Extend

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Retract

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Hopper On/Off

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed and the function is OFF, the output will be turned ON. When the button is pressed and the function is ON, the output will be turned OFF.
- If the Hopper was turned ON from the CAN Pendant, and the CAN Pendant is disconnected, the output will be turned OFF.

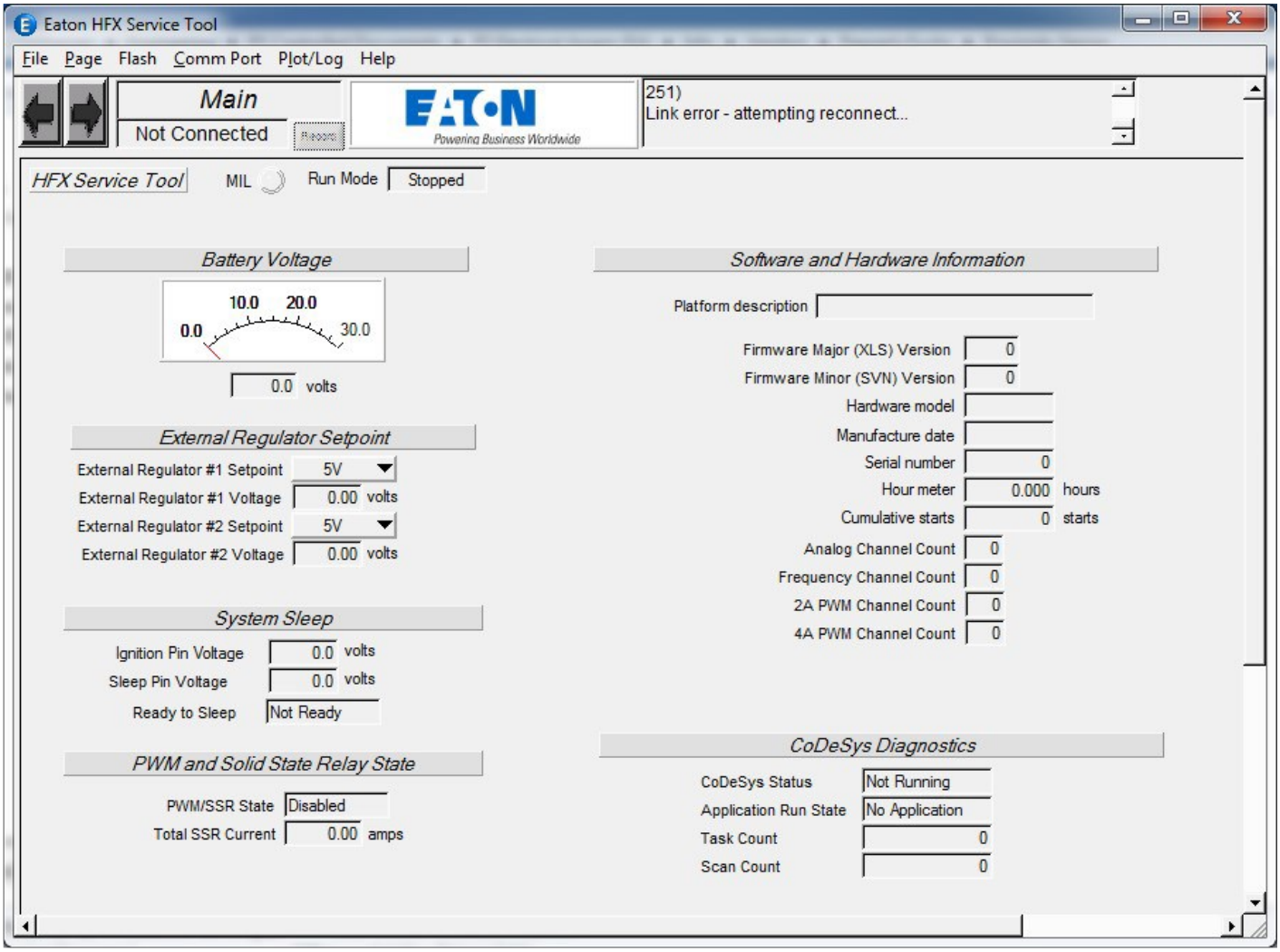
Hopper Speed

- Yellow LED = Hopper Low Speed, Yellow and Green LED = Hopper Medium Speed, Yellow, Green, and Blue LED = Hopper Hi Speed
- When the button is pressed the next speed set point will be selected.

HFX Service Tool:
The HFX Service Tool is required to make program updates to the controller and also includes a diagnostic tool.

Part Number: 102EC99101A

Diagnostic Tool:



Appendix A: Fault Code Table

ECU	SPN-FMI	Description
0x22	50000-22	Hopper Raise: Open circuit
0x22	50000-23	Hopper Raise: Short to ground
0x22	50000-24	Hopper Raise: Short to battery
0x22	50001-22	Boom Extend: Open circuit
0x22	50001-23	Boom Extend: Short to ground
0x22	50001-24	Boom Extend: Short to battery
0x22	50002-22	Front Door Open: Open circuit
0x22	50002-23	Front Door Open: Short to ground
0x22	50002-24	Front Door Open: Short to battery
0x22	50003-22	Rear Door Open: Open circuit
0x22	50003-23	Rear Door Open: Short to ground
0x22	50003-24	Rear Door Open: Short to battery
0x22	50004-22	Hopper Speed: Open circuit
0x22	50004-23	Hopper Speed: Short to ground
0x22	50004-24	Hopper Speed: Short to battery
0x22	50005-22	Hopper Forward: Open circuit
0x22	50005-23	Hopper Forward: Short to ground
0x22	50005-24	Hopper Forward: Short to battery
0x22	50006-22	Rear Door Close: Open circuit
0x22	50006-23	Rear Door Close: Short to ground
0x22	50006-24	Rear Door Close: Short to battery
0x22	50007-22	Front Door Close: Open circuit
0x22	50007-23	Front Door Close: Short to ground
0x22	50007-24	Front Door Close: Short to battery
0x22	50008-22	Boom Retract: Open circuit
0x22	50008-23	Boom Retract: Short to ground
0x22	50008-24	Boom Retract: Short to battery
0x22	50009-22	Hopper Lower: Open circuit
0x22	50009-23	Hopper Lower: Short to ground
0x22	50009-24	Hopper Lower: Short to battery
0x22	50010-22	Unloading Valve: Open circuit
0x22	50010-23	Unloading Valve: Short to ground
0x22	50010-24	Unloading Valve: Short to battery
0x22	50011-22	Hopper Reverse: Open circuit
0x22	50011-23	Hopper Reverse: Short to ground
0x22	50011-24	Hopper Reverse: Short to battery
0x22	50012-22	Hopper Closed Center: Open circuit
0x22	50012-23	Hopper Closed Center: Short to ground
0x22	50012-24	Hopper Closed Center: Short to battery
0x22	50013-22	Boom Unfold: Open circuit
0x22	50013-23	Boom Unfold: Short to ground
0x22	50013-24	Boom Unfold: Short to battery
0x22	50014-22	Extra 1: Open circuit
0x22	50014-23	Extra 1: Short to ground
0x22	50014-24	Extra 1: Short to battery
0x22	50015-22	Boom Fold: Open circuit
0x22	50015-23	Boom Fold: Short to ground
0x22	50015-24	Boom Fold: Short to battery

Short to ground - typically a blown fuse. Qty 2 in the circuit, key power & constant power.
Open circuit - typically the cord is unplugged at the deutsch connector.
Short to Battery - typically a cut or pinch in the cord.

Crop Shuttle operations for systems installed with PS-01442 Rev 3

General:

This is a control system to run the conveyor and boom functions of a Crop Shuttle.

Purchased Components:

Opus A3S Display
HFX48 Controller
CAN Pendant
Wire Harnesses

I/O List:

Inputs:

1. Roller 1 PSI (CANopen)
2. Roller 2 PSI (CANopen)
3. Roller 3 PSI (CANopen)
4. Roller 4 PSI (CANopen)

Outputs:

1. Unloading Valve (Digital Output)
2. Hoist Raise (Digital Output)
3. Hoist Lower (Digital Output)
4. Boom Unfold / Boom Unfold 2 (Digital Output)
5. Boom Fold / Boom Fold 2 (Digital Output)
6. Boom Extend (Digital Output)
7. Boom Retract (Digital Output)
8. Front Door Open (Digital Output)
9. Front Door Close (Digital Output)
10. Rear Door Open (Digital Output)
11. Rear Door Close (Digital Output)
12. Hopper Forward (Digital Output)
13. Hopper Reverse (Digital Output)
14. Hopper Speed (Proportional Output)
15. Hopper Closed Center (Digital Output)
16. Clean REV 1 (Digital Output)
17. Clean REV 2 (Digital Output)
18. Clean REV 3 (Digital Output)
19. Clean REV 4 (Digital Output)
20. Clean Speed 1 (Proportional Output)
21. Clean Speed 2 (Proportional Output)
22. Clean Speed 3 (Proportional Output)
23. Clean Rollers Raise (Digital Output)
24. Clean Rollers Lower (Digital Output)

Display

Hard keys:

Next

- When the Next button is pressed, the display changes to the next screen.

Home

- When the Home button is pressed, the display will go to the Home screen.

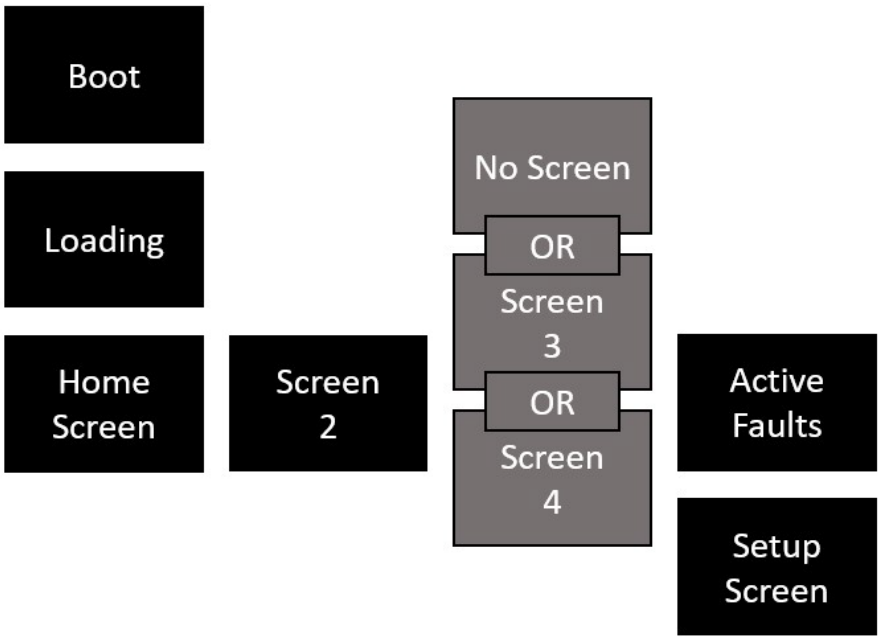
ESC

- When the ESC button is pressed, the display will go back to the previous screen or view.

Encoder

- When the Encoder is pressed, the display will jump between screens
- When the Encoder is turned, it will adjust the selected value.

Display Navigation Layout:



Start up screen:
Company logo

Screen will show when power is applied to the display for approx. 10 sec.

Loading screen:
Company logo, with loading bar

Screen will show right after Start Up Screen for approx. 10 sec.

Home screen:
Home Screen will show right after the loading screen.

The following parameters will be displayed on the Home Screen:

1. Hopper Speed
2. Hopper Direction
3. Hopper Up Time
4. Hopper Down Time

Hopper On Off

- When the Hopper is OFF and the Hopper ON/OFF button is pressed, the Hopper Forward or Reverse, based on the setting on Screen 2, and the Hopper Speed outputs will be turned ON.
- If the Hopper is ON and the Hopper ON/OFF button is pressed, the Hopper Forward or Reverse, based on the setting on Screen 2, and the Hopper Speed outputs will be turned OFF.

Hopper LO MED HI

- The Hopper LO MED HI button will select between LO, MED, and HI setting of the Hopper Speed output. ~~On start up the LO speed setting will be active. When the Hopper Speed output is shut OFF the speed setting will go to LO.~~
- The Encoder will be used to adjust the Hopper LO, MED, and HI Speed setpoints. By pressing the Hopper LO MED HI button the user will be able to select between the three setpoints.
  - Hopper LO Speed: 0-33% (Step by 1%)
  - Hopper MED Speed: 33-66% (Step by 1%)
  - Hopper HI Speed: 66-100% (Step by 1%)
- The Hopper Speed setting will be represented by a bar graph on the home screen. The three speed settings will be saved.

Hopper Up Down

- When the Hopper Up button is pressed, the Hopper Up output will be turned ON, when the button is released, the output will turn OFF. If the Hopper Up Time is set greater than 0 seconds, the Hopper Up output will remain ON for the displayed amount of time. If the button is pressed again the output will turn OFF. If the button is pressed and held for more than half a second, the function will run as momentary and will turn OFF when released.
- When the Hopper Down button is pressed, the Hopper Down output will be turned ON, when the button is released, the output will turn OFF. If the Hopper Down Time is set greater than 0 seconds, the Hopper Down output will remain ON for the displayed amount of time. If the button is pressed again the output will turn OFF. If the button is pressed and held for more than half a second, the function will run as momentary and will turn OFF when released.
- Hopper Up (secs) – Pressing and holding this button links the Encoder to the Hopper Up time. Turning the knob will adjust the time from 0 to 60 seconds.
- Hopper Dn (secs) – Pressing and holding this button links the Encoder to the Hopper Down time. Turning the knob will adjust the time from 0 to 60 seconds.

Rear Door Open Close

- When the Rear Door Open button is pressed, the Rear Door Open output will be turned ON, when the button is released, the output will turn OFF.
- When the Rear Door Close button is pressed, the Rear Door Close output will be turned ON, when the button is released, the output will turn OFF.

Screen 2:
Screen 2 will show after pressing the Next button on the Home Screen.

The following parameters will be displayed on the Screen 2:

Hopper Forward Reverse

- The Hopper Forward Reverse button will select between Forward and Reverse operation of the Hopper. The selected direction will be blue. The direction will be saved and on start up the saved direction will be selected.

Front Door Open Close

- When the Front Door Open button is pressed, the Front Door Open output will be turned ON, when the button is released, the output will turn OFF.
- When the Front Door Close button is pressed, the Front Door Close output will be turned ON, when the button is released, the output will turn OFF.

Boom Out In / Ext Ret

- When the Boom Out button is pressed, the Boom Out output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom In button is pressed, the Boom In output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom Ext button is pressed, the Boom Ext output will be turned ON, when the button is released, the output will turn OFF.
- When the Boom Ret button is pressed, the Boom Ret output will be turned ON, when the button is released, the output will turn OFF.

Backlight Increase Decrease

- When on Screen 2, the Encoder will be used to adjust the Display and CAN Pendant brightness.

Screen 3:
Screen 3 will show after pressing the Next button on Screen 2 if Cleaning Table 1 is Enabled.

The following parameters will be displayed on Screen 3:

1. Clod REV 1 (Clean REV 1 Output) Red LED = OFF, Blue LED = ON
2. Clod REV 2 (Clean REV 2 Output) Red LED = OFF, Blue LED = ON
3. Spiral Speed (Clean Speed 1 AND Clean Speed 2 Outputs) Setting
4. Clod Speed (Clean Speed 3 Output) Setting

- The Encoder will be used to adjust the Spiral and Clod Speed settings. By pressing the Spiral Speed or Clod Speed button the user will be able to select between the two settings.
  - ◊ Spiral Speed: 0-100% (Step by 1%)
  - ◊ Clod Speed: 0-100% (Step by 1%)
- The Spiral and Clod Speed settings will be represented by a bar graph and number. The two speed settings will be saved.

Clod Rev 1 2

- When the Clod REV 1 button is pressed, the Clean REV 1 output will be turned ON, when the button is pressed again, output will be turned OFF.
- When the Clod REV 2 button is pressed, the Clean REV 2 output will be turned ON, when the button is pressed again, output will be turned OFF.
- The ON/OFF settings will be saved.

Roller Up Down

- When the Rollers Up button is pressed, the Rollers Up output will be turned ON, when the button is released, the output will turn OFF.
- When the Rollers Down button is pressed, the Rollers Down output will be turned ON, when the button is released, the output will turn OFF.

Screen 4:
Screen 4 will show after pressing the Next button on Screen 2 if Cleaning Table 2 is Enabled.

The following parameters will be displayed on Screen 4:

1. REV 1 (Clean REV 1 Output) Red LED = OFF, Blue LED = ON
2. REV 2 (Clean REV 2 Output) Red LED = OFF, Blue LED = ON
3. REV 3 (Clean REV 1 Output) Red LED = OFF, Blue LED = ON
4. REV 4 (Clean REV 2 Output) Red LED = OFF, Blue LED = ON
5. Roller 1 PSI – Bar graph and PSI number
6. Roller 2 PSI – Bar graph and PSI number
7. Roller 3 PSI – Bar graph and PSI number
8. Roller 4 PSI – Bar graph and PSI number
9. REV Time Setting
10. Rock PSI Setting
11. Bog Time Setting
12. Bog PSI Setting

- The Encoder will be used to adjust the REV time, Rock PSI, Bog Time, and Bog PSI settings. By pressing the REV time, Rock PSI, Bog Time, or Bog PSI button the user will be able to select between the four settings.
  - ◊ REV Time: 0-5000 milliseconds (Step by 100ms)
  - ◊ Rock PSI: 0-2550 PSI (Step by 10PSI)
  - ◊ Bog Time: 0-5000 milliseconds (Step by 100ms)
  - ◊ Bog PSI: 0-2550 PSI (Step by 10PSI)
- The REV time, Rock PSI, Bog Time, and Bog PSI settings will be represented by number. The four settings will be saved.

Clod Rev 1 2 3 4

- When the REV 1 button is pressed, the Clean REV 1 output will be turned ON, when the button is released, the output will turn OFF.
- When the REV 2 button is pressed, the Clean REV 2 output will be turned ON, when the button is released, the output will turn OFF.
- When the REV 3 button is pressed, the Clean REV 3 output will be turned ON, when the button is released, the output will turn OFF.
- When the REV 4 button is pressed, the Clean REV 4 output will be turned ON, when the button is released, the output will turn OFF.

REV Time

- The amount of time an individual Roller will reverse for if an auto reverse is triggered.

Rock PSI

- The amount of PSI above the calculated average PSI of an individual Roller that will trigger an auto reverse.

BOG Time

- The amount of time an individual Roller is above the Bog PSI setting that will trigger an auto reverse.

BOG PSI

- The amount of PSI used for determining a BOG condition.

Faults

- When the Faults button is pressed, the display will go to the Fault screen.
- If there is an Active Fault, a red icon will show at the top of the Home Screen and Screen 2.

Fault Screen:

The Fault screen will show when the Fault button is pressed from Screen 2.

The Fault screen will display a table indicating the J1939 DM1 message fault codes. The fault codes will be displayed as numerical values unless otherwise specified in the Appendix A: Fault Code Table.

- The ECU (electronic control unit) column indicates which controller the fault is coming from.
- The SPN (suspect parameter number) column indicates what function has a fault.
- The OC (occurrence count) column indicates how many times the fault has occurred.
- The FMI (fault mode indicator) column indicates the reason for the fault.

Fault Reset Button

- The Fault Reset button will reset all faults.

Setup Screen Navigation

- Pressing and holding the top two right buttons for 3 seconds will take the user to the Setup screen.

The Display and Controller Software version will be displayed on this page.

Setup Screen:

The Setup screen will show when the Setup buttons are pressed from the Fault Screen.

Valve Center

- Open Center – The Unloading Valve output will be normally OFF and will turn ON with any function. The Hopper Closed Center output will be OFF.
- Closed Center – The Unloading Valve output will be OFF. The Hopper Closed Center Output will be OFF.
- The Open / Closed setting will be saved, the default setting is Closed.

Hopper Direction

- Disabled – The Hopper Fwd button on the Home Screen will control the Hopper Speed valve. The Hopper Forward and Reverse outputs and faults will be disabled. Disabling the Hopper Speed will remove the Hopper ON/OFF button from the Home Screen and the Hopper Direction button from Screen 2. The Hopper Forward and Reverse outputs and faults will be disabled.
- FWD & REV – Enables the Hopper ON/OFF button on the Home Screen and the Hopper Direction button from Screen 2. The Hopper Forward and Reverse outputs and faults will be enabled.
- FWD Only – Enables the Hopper ON/OFF button on the Home Screen and disables the Hopper Direction button from Screen 2. The Hopper Forward output and faults will be enabled.
- The Hopper Direction setting will be saved, the default setting is FWD & REV.

Note: Hopper REV is usually disabled upon delivery. If you receive the unit and REV is an option, disable it if you are not actively using Hopper REV. When you must use Hopper REV watch very carefully and operate it slowly to avoid damage to the floor and drive system.

Hopper Speed

- Disabling Hopper Speed will remove the Hopper Lo/Med/Hi button and the Hopper Speed bar graph from the Home Screen. The Hopper Speed output and faults will be disabled.
- The Hopper Speed setting will be saved, the default setting is Enabled.

Hopper Ramp (ms)

- If Hopper Speed is Enabled, the Hopper Ramp Up Time will be available.
- Press the Hopper Ramp button and turn the Encoder to adjust the time in milliseconds it takes the Hopper Speed output to ramp from the Minimum current to the Maximum current.
- The Hopper Ramp setting will be saved, the default setting is 2000.

Boom Extend / Retract

- Disabling Boom Extend / Retract will remove the Boom Extend and Boom Retract buttons from Screen 2. The Boom Extend and Retract outputs and faults will be disabled.
- The Boom Extend / Retract setting will be saved, the default setting is Enabled.

Rear Door

- Disabling Rear Door will remove the Rear Door Open and Rear Door Close button2 from the Home Screen. The Rear Door Open and Close outputs and faults will be disabled.
- The Rear Door setting will be saved, the default setting is Enabled.

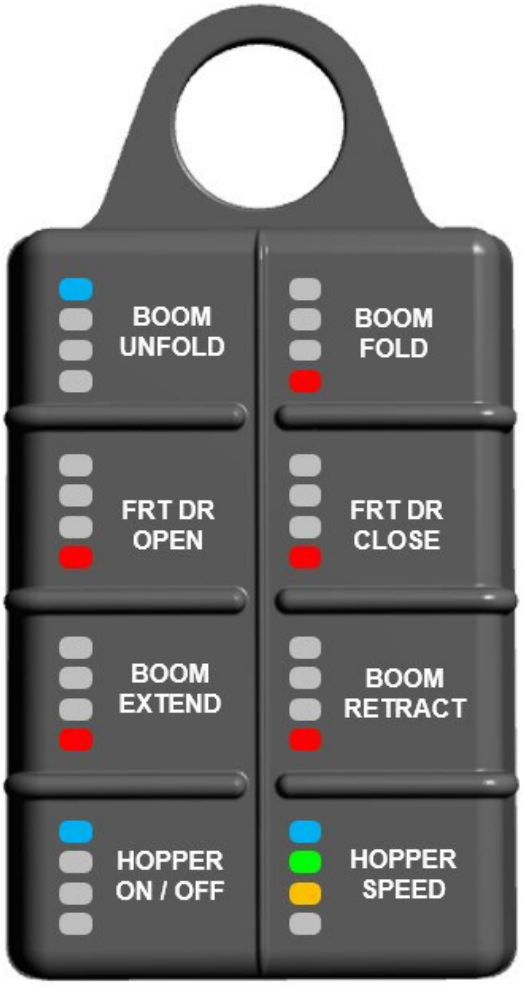
Hopper Down Timer

- Disabling Hopper Down Timer will remove the latching Hopper Down output timer option from the Home Screen.
- The Hopper Down Timer setting will be saved, the default setting is Disabled.

Cleaning Table

- Disabling Cleaning Table will remove Screens 3 and 4 and will disable all Cleaning Table outputs, inputs, and faults.
- Cleaning Table 1 – Screen 3 will be Enabled as well as Clean REV 1, Clean REV 2, Rollers Raise, Rollers Lower, Clean Speed 1, Clean Speed 2, and Clean Speed 3.
- Cleaning Table 2 – Screen 4 will be Enabled as well as Clean REV 1, Clean REV 2, Clean Rev 3, Clean REV 4, Roller 1 PSI, Roller 2 PSI, Roller 3 PSI, and Roller 4 PSI.
- The Cleaning Table setting will be saved, the default setting is Disabled.

CAN Pendant:



The following functions are on the CAN Pendant:

Boom Unfold

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Fold

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Front Door Open

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Front Door Close

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Extend

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Boom Retract

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed the output will be turned ON, when the button is released, the output will turn OFF.

Hopper On/Off

- Red LED = Function OFF, Blue LED = Function ON
- When the button is pressed and the function is OFF, the output will be turned ON. When the button is pressed and the function is ON, the output will be turned OFF.
- If the Hopper was turned ON from the CAN Pendant, and the CAN Pendant is disconnected, the output will be turned OFF.

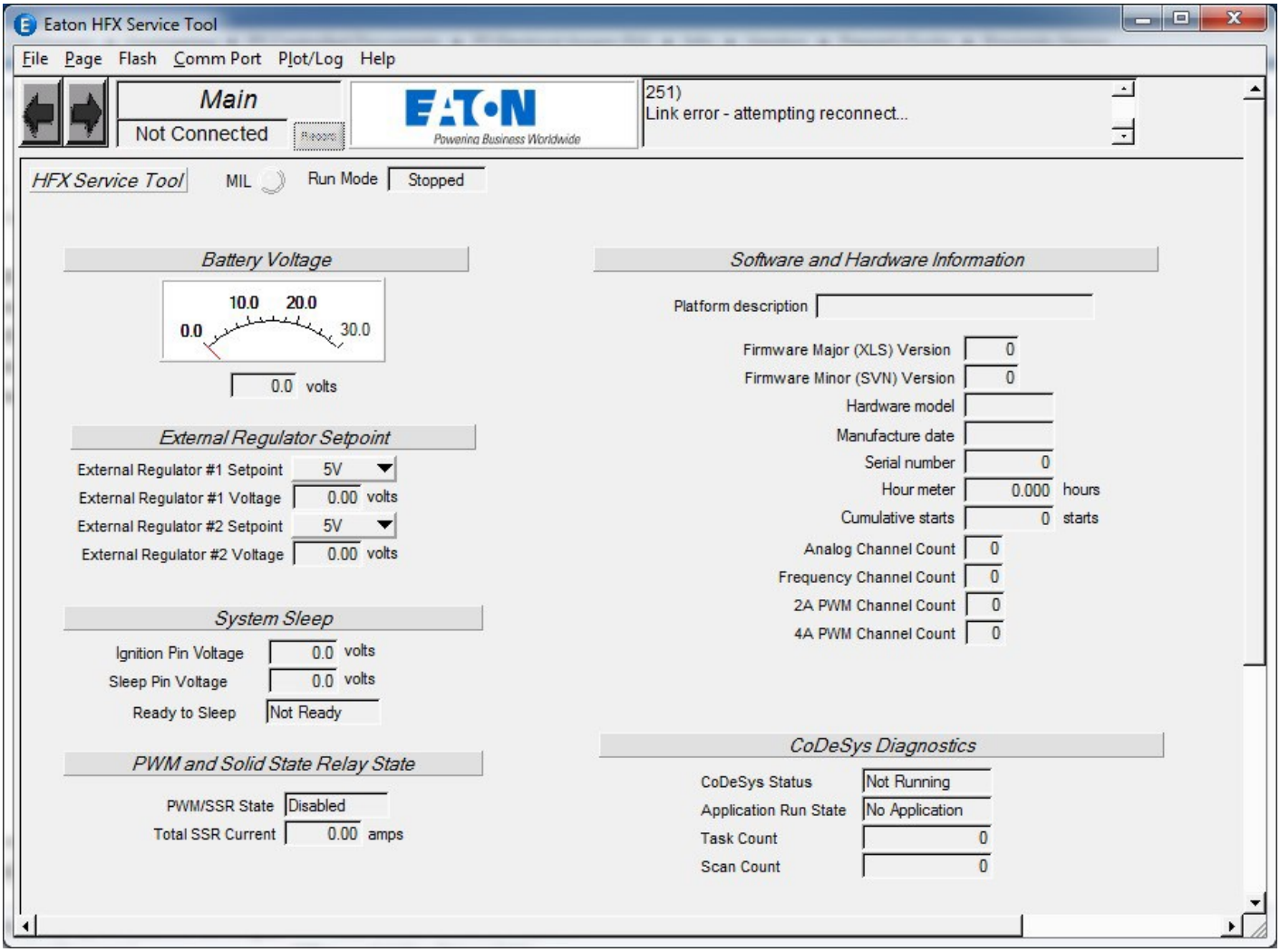
Hopper Speed

- Yellow LED = Hopper Low Speed, Yellow and Green LED = Hopper Medium Speed, Yellow, Green, and Blue LED = Hopper Hi Speed
- When the button is pressed the next speed set point will be selected.

HFX Service Tool:
The HFX Service Tool is required to make program updates to the controller and also includes a diagnostic tool.

Part Number: 102EC99101A

Diagnostic Tool:



Appendix A: Fault Code Table

ECU	SPN-FMI	Description
0x22 ECU1	50000-31	Hopper Raise: Condition Exists
0x22 ECU1	50001-31	Boom Extend: Condition Exists
0x22 ECU1	50002-31	Front Door Open: Condition Exists
0x22 ECU1	50003-31	Rear Door Open: Condition Exists
0x22 ECU1	50004-31	Hopper Speed: Condition Exists
0x22 ECU1	50005-31	Hopper Forward: Condition Exists
0x22 ECU1	50006-31	Rear Door Close: Condition Exists
0x22 ECU1	50007-31	Front Door Close: Condition Exists
0x22 ECU1	50008-31	Boom Retract: Condition Exists
0x22 ECU1	50009-31	Hopper Lower: Condition Exists
0x22 ECU1	50010-31	Unloading Valve: Condition Exists
0x22 ECU1	50011-31	Hopper Reverse: Condition Exists
0x22 ECU1	50012-31	Hopper Closed Center: Condition Exists
0x22 ECU1	50013-31	Boom Unfold: Condition Exists
0x22 ECU1	50014-31	Extra 1: Condition Exists
0x22 ECU1	50015-31	Boom Fold: Condition Exists
0x22 ECU1	50016-31	Clean REV 1: Condition Exists
0x22 ECU1	50017-31	Clean REV 2: Condition Exists
0x22 ECU1	50018-31	Rollers Raise: Condition Exists
0x22 ECU1	50019-31	Clean Speed 1: Condition Exists
0x22 ECU1	50020-31	Clean Speed 2: Condition Exists
0x22 ECU1	50021-31	Clean Speed 3: Condition Exists
0x22 ECU1	50022-31	Clean REV 3: Condition Exists
0x22 ECU1	50023-31	Clean REV 4: Condition Exists
0x22 ECU1	50024-31	Rollers Lower: Condition Exists
0x22 ECU1	50025-31	Roller 1 PSI: Condition Exists
0x22 ECU1	50026-31	Roller 2 PSI: Condition Exists
0x22 ECU1	50027-31	Roller 3 PSI: Condition Exists
0x22 ECU1	50028-31	Roller 4 PSI: Condition Exists

Short to ground - typically a blown fuse. Qty 2 in the circuit, key power & constant power.
Open circuit - typically the cord is unplugged at the deutsch connector.
Short to Battery - typically a cut or pinch in the cord.

Setup

Recommended Hydraulic Port Selection

Port 1: Typically the priority valve on your tractor. We recommend using port 1 for your "Hopper Pressure" and "Hopper Return" hoses. You will need to change your SCV settings to maximum flow and constant. If you want less back pressure and more flow you can plumb your "Hopper Return" to the case drain.

Note: During operation you will leave this SCV on constantly and control the Hopper ON/OFF as well as the Hopper Speed with the Crop Shuttle Display.

Port 2: We recommend using port 2 for your "Control Pressure" and "Control Return" hoses. You will need to change your SCV settings to maximum flow and constant.

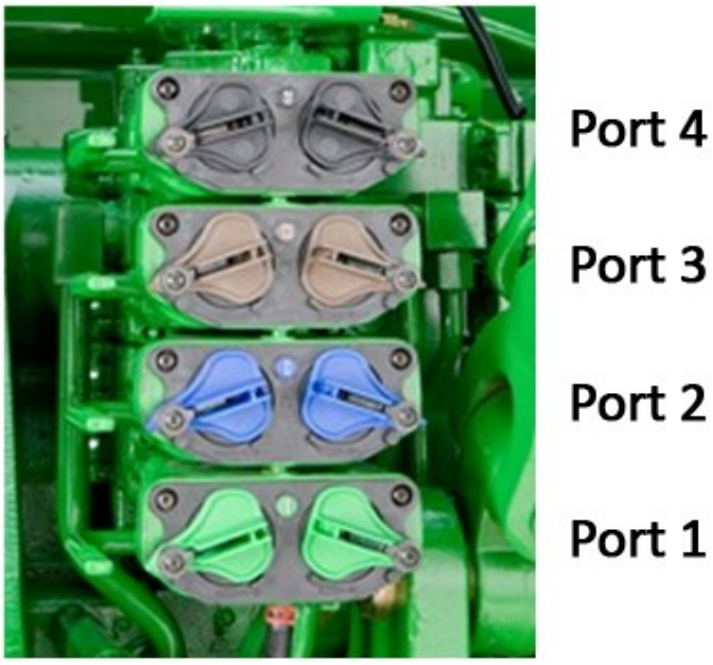
Note: During operation you will leave this SCV on constantly and control the Front Door, Hopper Raise, Rear Door and Boom Fold functions with the Crop Shuttle Display.

Port 3: We recommend using port 3 for your "Boom Pressure" and "Boom Return" hoses.

Note: During operation you will need to change your SCV flow setting to the speed you want your unloading belt to operate at. Also set your timing on the SCV to constant flow. When shutting off the flow to stop the boom belt, it is proper practice to kick that particular port into float to avoid damage to the drive motor.

Ports 4-6: We recommend using ports 4 through 6 for all other functions of the Crop Shuttle that you might have installed.

Note: Other options might include: hydraulic jack, silage spinner, lime spreader and potato seed loader..



Setup

Assembly

Depending on how your Crop Shuttle was shipped, it may require to be assembled before use.

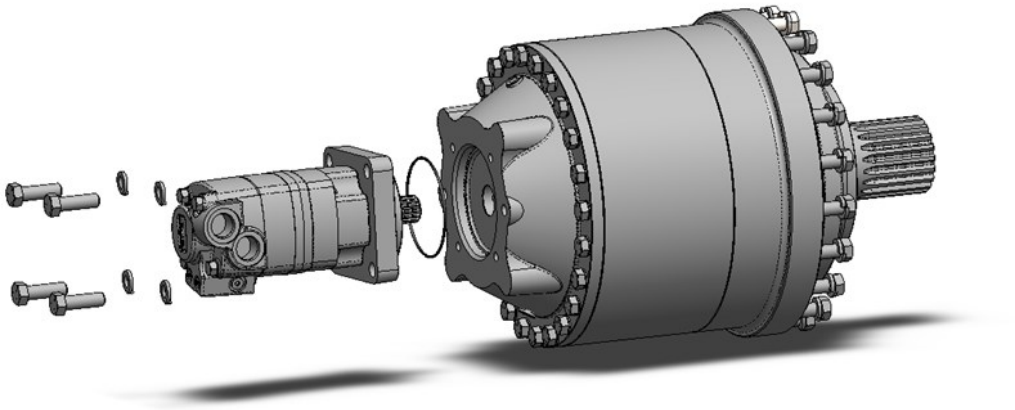
Recommended Tools:

- Lifting Device (forklift, skid steer, etc.)
- Chain or Lifting Strap
- Full set of sockets and wrenches
- Screw driver set
- Pry bar/line up punch

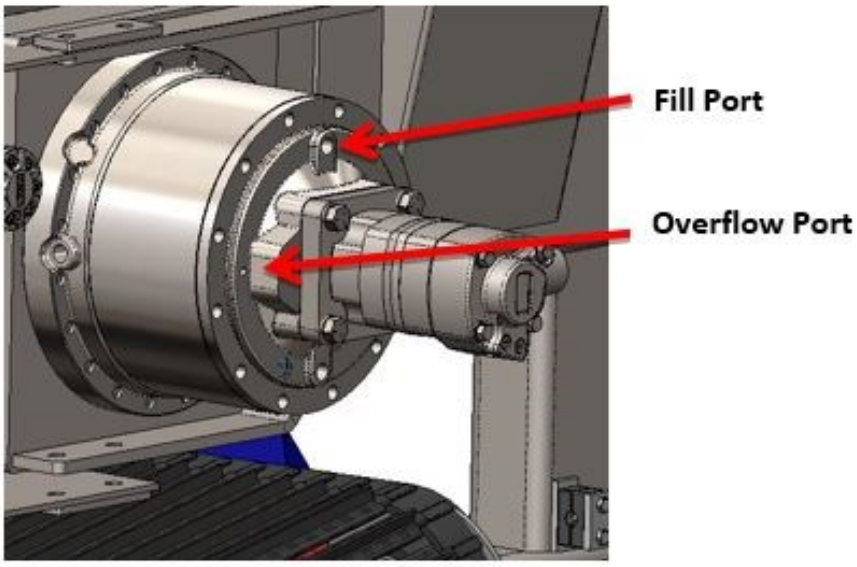
Step 1: Locate and connect display controller to Crop Shuttle main wire harness. Fasten all wires and cable in a way that they will never be crushed, bent, or frayed. Mount the Display screen in a secure position where you are comfortable operating while driving. Install computer power cable and 3 pin connection.

> **Note:** If you have a fault appear you will need to check your tractor's fuse panel for the "keyed power" AND "constant power". Both need to has power in order to operate without fault. For more information on the Eaton Display unit, please refer to the operations section of this user manual.

Step 2: Install the orbital motor to the gearbox. Be sure the splines are clean and free of any debris. When installing the motor to the gearbox be sure the o-ring is not punctured or pinched. Tighten the bolts until snug with a 3/4” wrench.



Step 3: Check and fill gearbox oil after installing orbital motor with 80w-90 gear lube. Fill until oil until it begins coming out of the overflow port. Note: if you will be running in colder temperatures you can drain all oil and use a synthetic gear lube will a lower weight such as 75w-90 synthetic.

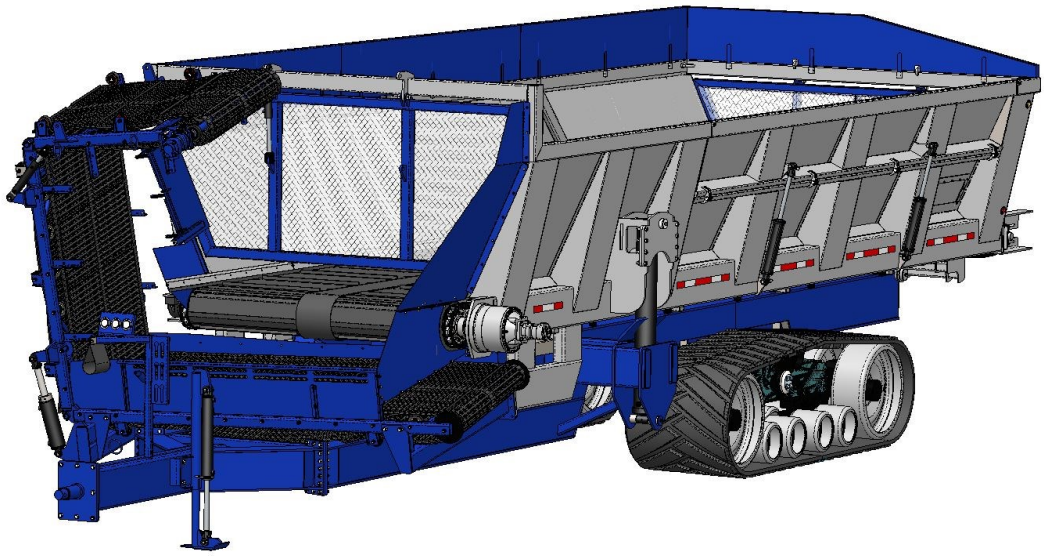


Step 4: Connect all necessary hydraulic lines to tractor remote valves. It is recommended to have the hopper drive connected to the tractor's priority valve (usually valve #1).

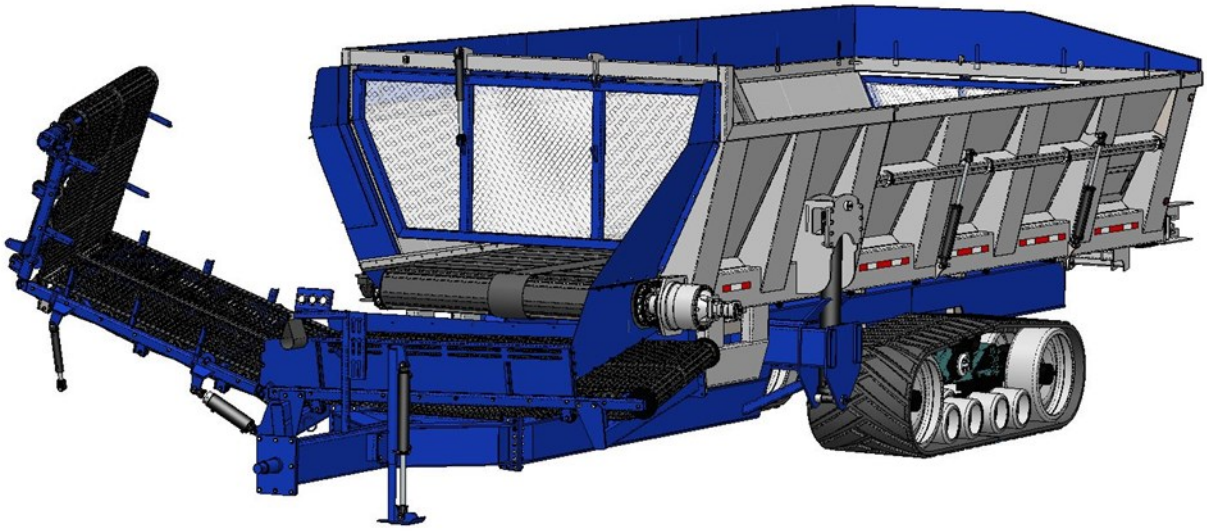
For more information refer to page 38 of this document.

Step 5: Unfold boom. Depending on options, boom cylinders may be disconnected from their mounts for transport.

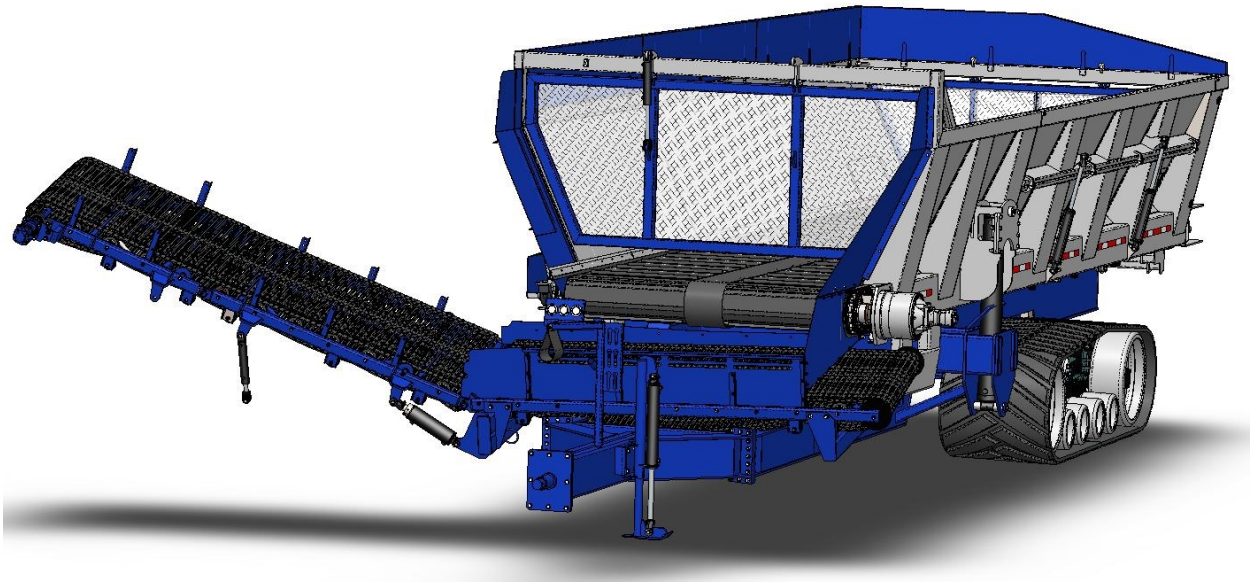
Remove all straps holding belt or cylinders in place



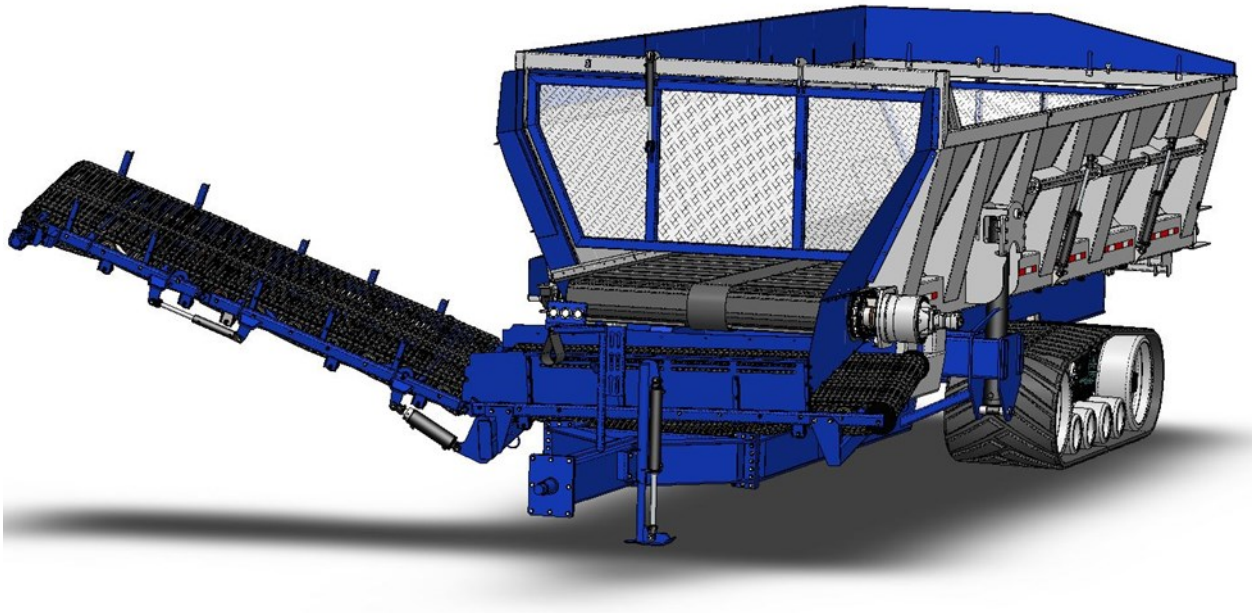
Using hydraulic controls lower, the connected cylinders (Boom Fold/Unfold function) so the boom is at an approximate 15 degree angle as shown. Keep all personnel away for safety.

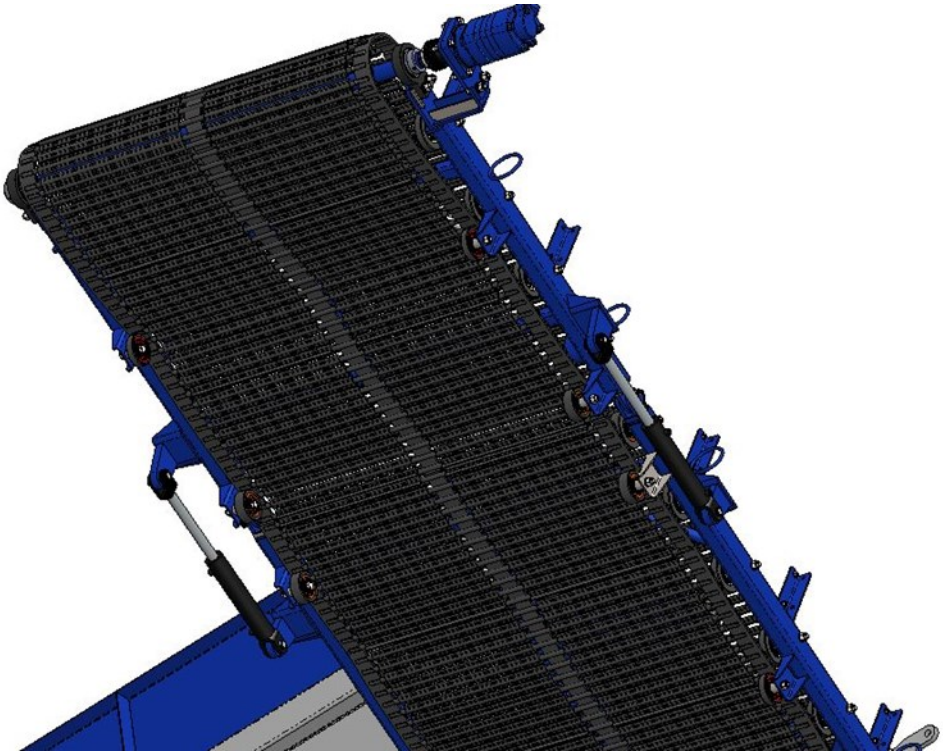


Using lift straps and a forklift, begin unfolding the disconnected boom section and stop when disconnected hydraulic cylinders are able to be attached.

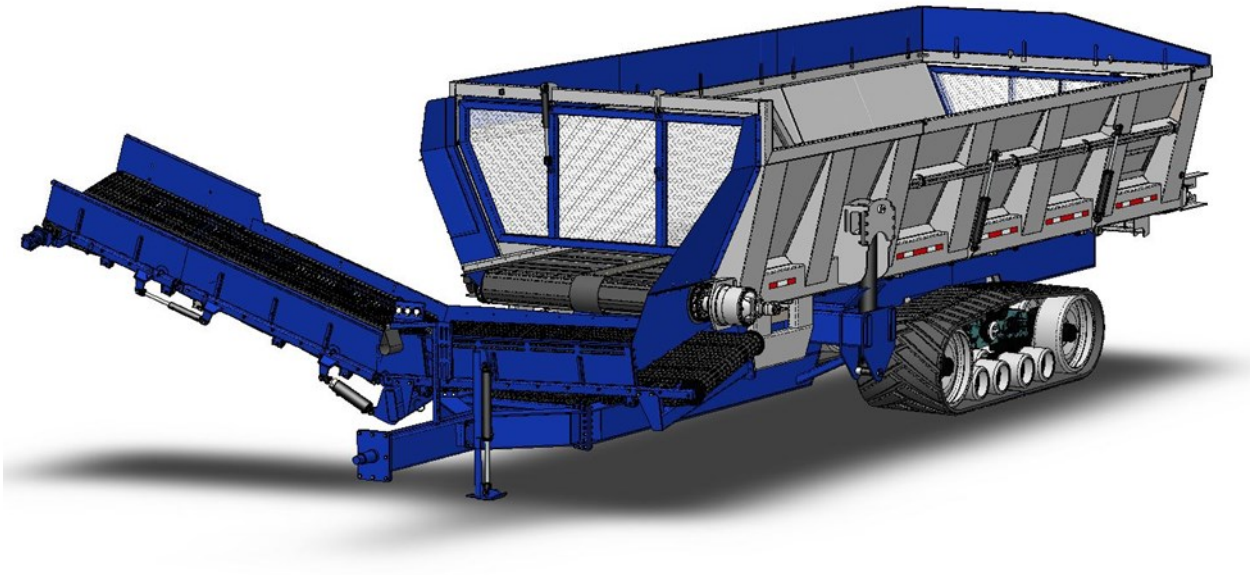


Attach hydraulic cylinders with provided pins. Once the boom is under the weight of the cylinders, you can remove the forklift and lifting straps.

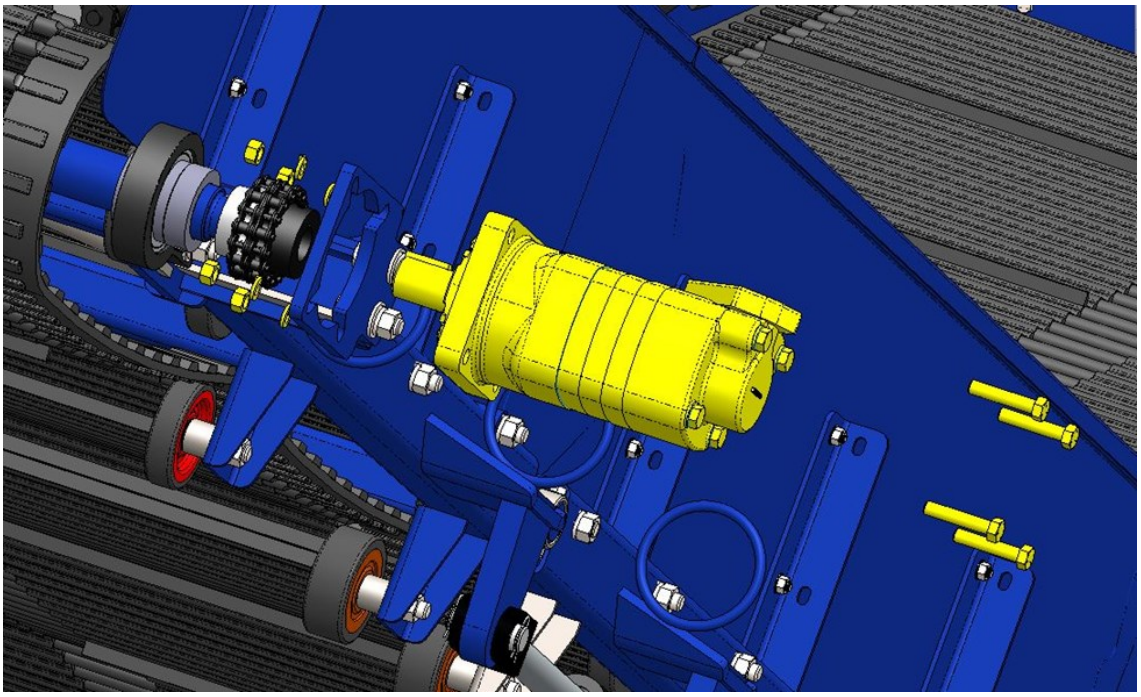




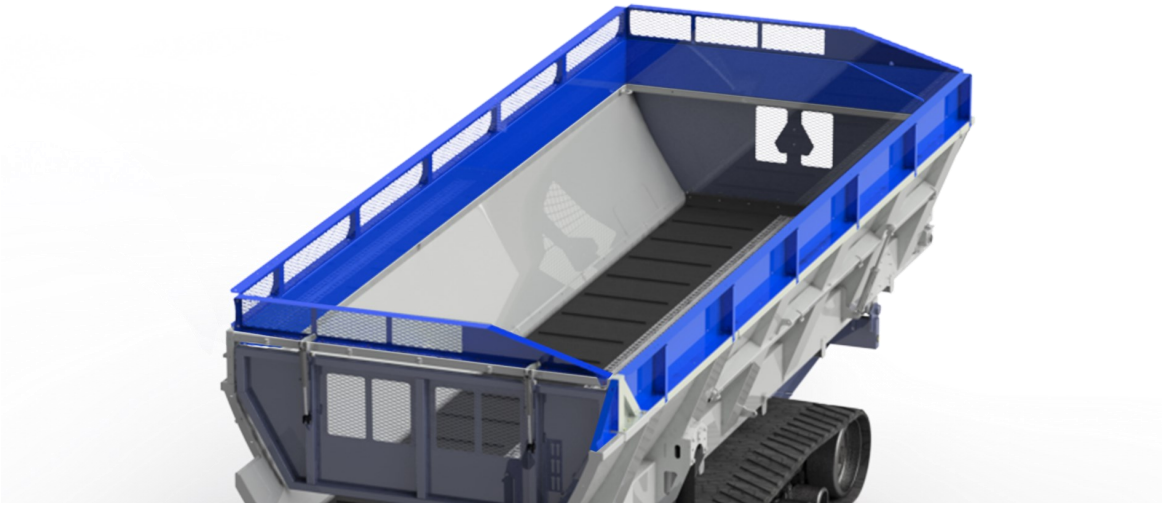
Install any boom tins that have been removed for shipping with supplied hardware. Depending on options, boom tins may be removed to “back fold” the boom for transport.



Step 6: You may need to install the orbit motor for boom drive, it may have be removed for transport. (All parts for installation of motor are highlighted in yellow). Be sure to use nickel based anti-seize on the shaft and couplers. Be sure to have the key stock installed and to tighten all set screws.



Step 7: There are many variations and configuration of tip tops. Depending on size constraints you may need to install the tip tops with the hardware provided. Below are a some configurations.



Maintenance

First-Run Maintenance

After assembling your Crop Shuttle for the first time, “First-Run Maintenance” should be done to ensure your Crop Shuttle is operating correctly. This will prevent you from making costly mistakes and ensure longevity of your Crop Shuttle.

- Check gearbox oil (P.53)
- Check all grease points (P.50)
- Check track alignment (P.49)
- Check boom belt is properly aligned (P.53)
- Check boom belt is properly tensioned (P.52)
- Check hopper chain properly aligned (P.54)
- Check hopper chain properly tensioned (P.54)
- Check all hydraulic connections are secure
- Check hydraulic fluid level in the tractor
- Check hydraulic connections are in the correct sequence. (Pressure vs. Return)
- Check for any hydraulic leaks. Correct immediately as this will introduce contaminates into the tractors hydraulic system. Check the tractors hydraulic fluid level if any leaks have been corrected.

Pre-Shift Maintenance

Before every shift or every 10 hours of use, “Pre-Shift Maintenance” must be done to ensure the Crop Shuttle is operating correctly. This will prevent costly repairs and ensure longevity of the Crop Shuttle.

- Grease ALL grease points (P.50)
- Perform a visual check of all hydraulic lines
- Oil and check condition of the hopper chains (P.51)
- Check boom belt alignment and condition (P.53)
- Check hopper chain properly tensioned (P.54)
- Inspect wear on all moving parts
- Check for fray, kinks, or tears in all electrical cables
- Check hydraulic fluid level in the tractor
- Check track alignment (P.49)
- Inspect and clean track system (P.49)
- Check for oil leaks on tracks (P.49)
- Once all the above maintenance has been performed, run the hopper chain and the boom belt and listen for any unusual noises. This may be an indicator of a failing bearing, roller, or chain that would otherwise not be seen by visual inspection.

Periodic Maintenance

The following items must be checked at the indicated time intervals. This will prevent costly repairs and ensure the longevity of your Crop Shuttle.

	Every Shift or 10 Hours	Weekly or 50 Hours	Monthly or 100 Hours	Annually or 500 Hours	5 Years or 2000 Hours
Grease all grease points	X				
Perform a visual check of all hydraulic lines	X				
Inspect wear of all moving parts	X				
Check alignment and condition of boom belt	X				
Oil and check condition of hopper chains	X				
Check for frays, kinks, tears, or cuts in electrical cables	X				
Check hydraulic fluid level in tractor	X				
Check track alignment	X				
Inspect and clean track system	X				
Inspect track condition	X				
Inspect for oil leaks on tracks	X				
Grease undercarriage and track system pivot points		X			
Check oil level of gear box		X			
Check condition of boom rollers and guide wheels			X		
Check track tension			X		
Re-torque track wheels			X		
Repack track carrier roller bearings				X	
Change gear box oil				X	
Replace all boom rollers (if necessary)				X	
Replace track hub and pivot oil and set wheel bearing rolling torque					X

For complete list of track maintenance items, visit the “Track Owners Manual” supplied by Camso

End of Season Maintenance

At the end of each harvest OR anytime the Crop Shuttle will not be in use for an extended period of time, “End of season maintenance” must be done. If not done properly and timely, moving parts may corrode and seize. This will prevent costly repairs and ensure the longevity of your Crop Shuttle.

- Pressure wash all dirt, mud and other debris.
- Grease ALL grease points (P.50)
- Oil hopper chains (P.51)
- Coat any unpainted shaft or other machined surfaces with anti-seize

At the end of every harvest is also a good time to look over the entire Crop Shuttle and replace any worn or damaged parts. To order replacement parts, contact your authorized Crop Shuttle dealer.

- Perform a visual check of all hydraulic lines. Correct any leaks as soon as possible as this will introduce contaminates into the tractor’s hydraulic system.
- Check condition of the hopper chains. All links should move freely but without excess “slop” in the pins.
- Check boom belt alignment and condition (P.53)
- Inspect wear on all moving parts
- Check for frays, kinks, tears, or cuts in all electrical cables
- Check track alignment (P.49)
- Inspect and clean track system (P49.)
- Inspect track condition (P.49)
- Check for oil leaks on tracks (P.49)
- Pressure wash off any excess dirt, mud or debris
- Perform any periodic maintenance according to the periodic maintenance chart (P.47)

Technical Information

Tracks

Following and performing the recommended maintenance procedures and transport limitation will dramatically prolong the life of the track system and avoid costly repairs.

For complete information on the track system, see the "Tracks" section of this binder.

The following list is a quick guideline to give you a basic understanding of the Camso Trailed Track System(TTS).

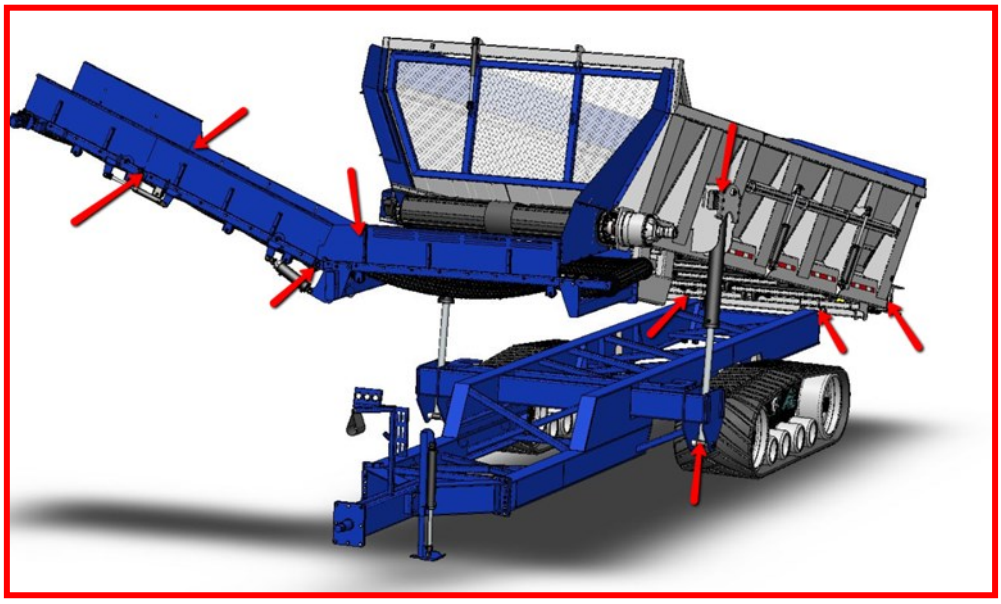
- Most personal injuries occurring during equipment operation, maintenance, or repair are caused by failure to observe basic safety rules and precautions. In most cases, an injury can be avoided by recognizing hazardous situations before an injury occurs.
- A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.
- Improper operation and maintenance of this product can be hazardous and may result in injury or death.
- Do not perform any lubrication, maintenance or repair on this product, until you have read and understood the Operators Manual.
- Safety precautions and warnings are provided in the manual. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.
- Any application differing from the ones prescribed in this manual is to be considered improper and potentially dangerous.
- Correct track tension is required for best performance and track life.
- Camso TTS can work in extreme conditions: for operator and machine safety, be sure to know your surroundings
- Camso TTS is free to pivot around the main axle following ground conformation. During transition over uneven ground terrain, check for interferences and move slowly to avoid over oscillating the undercarriage.
- Cross large ground irregularities with suitable speed reduction and/or proper incidence angle. In particular, when high, sharp bumps are crossed move forward slowly to avoid shocks on the machine.
- Camso TTS does not damage standard road-bed constructions. Operators must know and respect road traffic laws.
- Rubber tracks have not been designed for extended use on the road. Camso is not responsible for track and system damage resulting from extended road use. Long road periods and/or roading at higher than recommended maximum speeds may cause premature wear or failure of the tracks or wheels. To reduce damage during roading decrease overall machine weight and decrease machine speed. See "Transport Limitations" section for further information.
- Long runs on side slopes increase the wear on the side of guide lugs and idlers
- Keep materials out of the undercarriage. Inspect undercarriage daily and remove any material as necessary. In some conditions inspect more frequently.

- If a machine becomes stuck, clear away as much material from the undercarriage as possible prior to pulling the machine out.
- Avoid short turning radius turns and operations especially when loaded. Spot turning creates debris ingestion and can also induce high torque loading in the system.
- Configure drawbar and hitch correctly during field operations.
- Use caution when operating track systems in loose, flowing material. Loose material can become trapped between track and idlers, resulting in track damage.
- Keep material out of the undercarriage. This may require scraping material out of tight places and in some conditions require frequent inspection and cleaning.

Grease points

The following is a list of where all grease points are located on the Crop Shuttle. The number of grease points on your Crop Shuttle may vary depending on model and options. All grease points should be greased every 10 hours or before every shift.

- 2 grease points on the rear hinge of the Crop Shuttle where the hopper meets the frame.
- 2 grease points on each hopper hoist cylinder (4 total).
- 2 grease points on each moving boom section. Total number will depend on the model of boom.
- 1 grease point on each tail shaft bearing (2 total).
- 1 grease point on head shaft bearing.
- If your Crop Shuttle is equipped with distribution rollers, 1 grease point on each bearing (4 total).
- 2 slide rails on the boom tensioner.
- 1 grease point on boom head shaft bearing.
- Check “Tracks” section of this binder for complete list of track grease points.



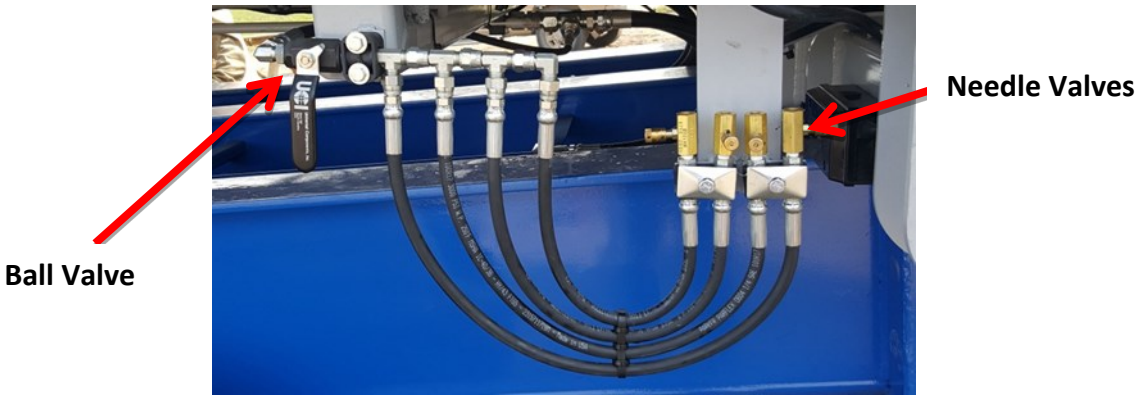
Oiling Hopper Chains

There are 2 ways to oil the hopper chains in the Crop Shuttle. Proper safety procedures must be strictly followed to prevent serious injury or death. The Hopper chains should be oiled every 10 hours or before every shift.

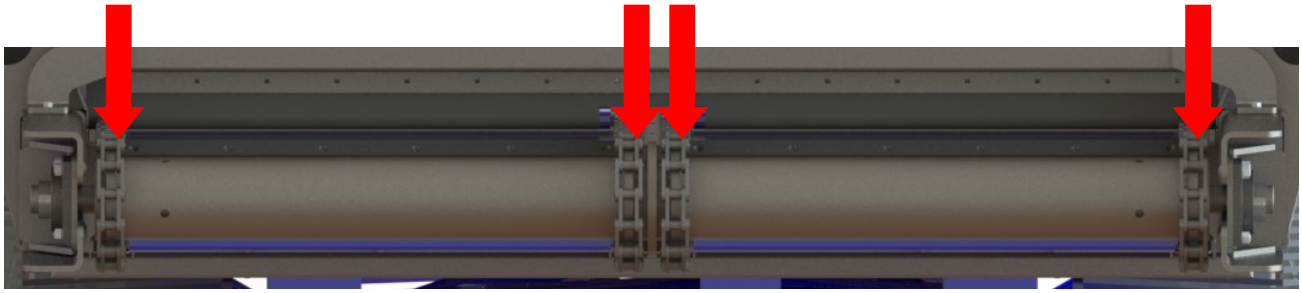
Automatic Hopper Chain Oiling System

To use the Automatic Hopper Chain Oiling System:

1. Check the hydraulic fluid level in your tractor. The Automatic Hopper Chain Oiling System uses hydraulic fluid from the tractor to oil the chains.
2. Be sure the hopper is completely empty.
3. Turn on the Hopper Drive Motor. This will pressurize the Chain Oiling System.
4. Open the ball valve
5. Open the first needle valve only. Oil will start flowing to the first hopper chain. Adjust the needle valve until there is a steady, continuous drip. Continue to run the hopper drive motor until the chain has made three complete revolutions or sufficient oil has coated the inner pin of the chain link. This may take several minutes depending on model and options. As the chain is being oiled, check the hydraulic fluid level in the tractor.
6. Close the first needle valve and repeat steps 5 and 6 for the 2nd, 3rd, and 4th hopper chains. Be sure to only oil one chain at a time. This will ensure an even and consistent flow of oil.
7. Close the ball valve.
8. Turn off the Hopper Drive Motor.
9. Check the hydraulic fluid level in the tractor.



Manual Hopper Chain Oiling



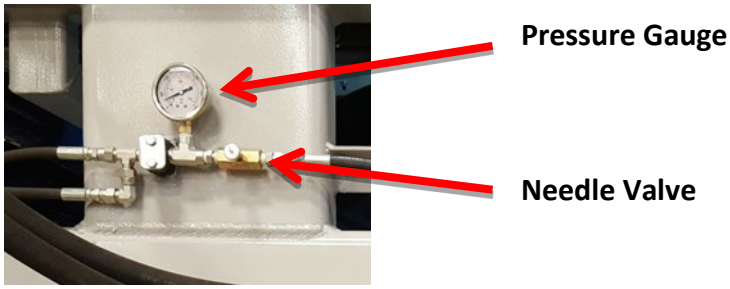
To manually oil the hopper chains:

1. Be sure the hopper is completely empty
2. Turn on the hopper drive motor
3. Slowly pour oil over each chain as it comes around the hopper tail roller.

Exercise extreme caution when doing this! You will be very near a pinch point.

4. Continue to oil until the chain has made three complete revolutions or sufficient oil has coated the inner pin of the chain link. This may take several minutes depending on model and options.

Boom belt tension



Boom belt tension should be checked every 10 hours or before every shift. Not all boom options will have belt tensioning systems. To set the proper tension of the boom belt:

1. Extend boom fully
2. Press and hold “Front Door Up” on the hydraulic control screen while a second person opens the boom tension needle valve
3. Close the needle valve once the pressure reaches 500 psi. This is a good starting point for boom tension but may need a slight increase to 700-900 psi if harvest conditions are wet and muddy. If more pressure is required, clean all dirt, mud and other debris and inspect all moving boom parts. Excess belt tension will decrease the life of the boom belt.

To relieve tension of boom belt:

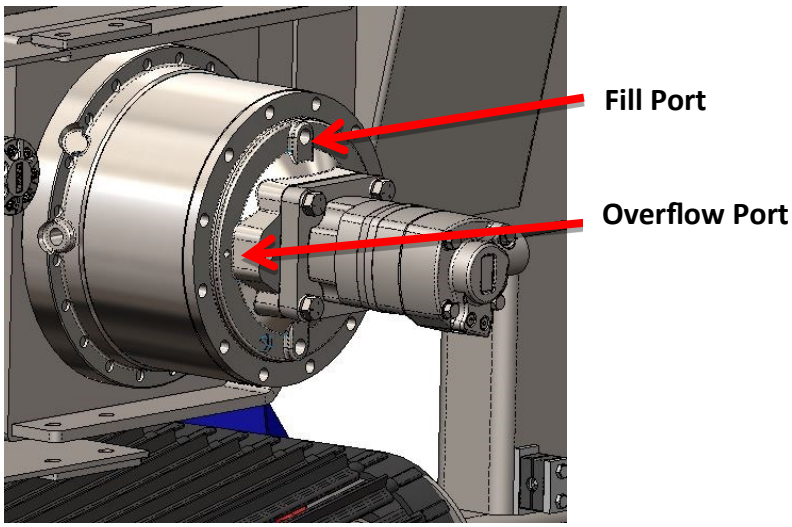
1. Extend boom fully
2. Press and hold “Front Door Down” on the hydraulic control screen while a second person opens the boom tension needle valve
3. Close the needle valve once it reaches or nears 0 psi.

Boom belt alignment

Boom belt alignment should be checked every 10 hours or before every shift. To check for proper alignment of the boom belt:

1. Extend boom fully
2. Raise the hopper into its unloading position
3. Run the boom belt and check for excessive rubbing on either side of the belt
4. If the belt is not running true, the sprockets on the drive shaft may need to be adjusted

Hopper drive gear box fill



The hopper drive gear box must never be run without a proper level of oil. Below it the instructions to fill the gear box to the proper level:

1. Remove the overflow plug
2. Remove the fill plug
3. Slowly fill the gear box with 80w-90 gear lube until the gear lube starts running out of the overflow port.

Note: if you will be running in colder temperatures you can drain all oil and use a synthetic gear lube will a lower weight such as 75w-90 synthetic.

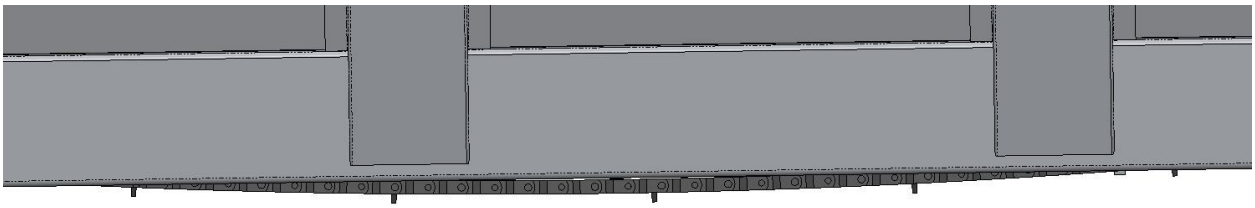
4. Replace the overflow plug
5. Replace the fill plug

The gear box oil level must be checked any time the orbit motor is removed from the gear box. The orbit motor may be shipped disconnected from the factory depending on shipping methods. During normal use the gearbox oil must be checked weekly or every 50 hours, whichever comes first. Gearbox oil should be changed out every year or after 500 hours of operation, whichever comes first.

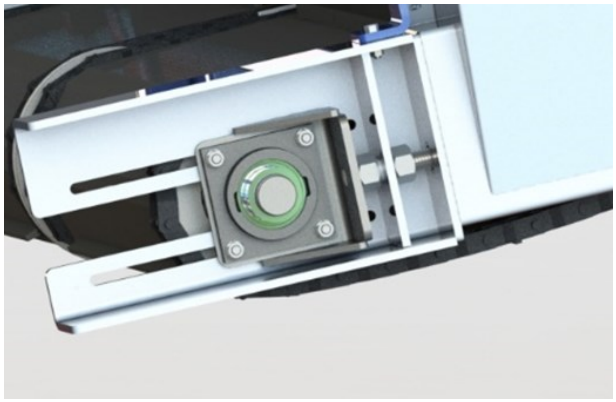
Hopper chain tension

The hopper chains must always maintain proper tension. If the chain is too loose it may "wrap" around the head shaft. If the chain is too tight it will wear the bearings, gearbox, and chain prematurely. Hopper chain tension should be checked every 10 hours or before every shift.

A properly tensioned chain will sag slightly between the return cross bars. If there is excessive noise or "clicking" from the hopper chain, it may need to be tightened.



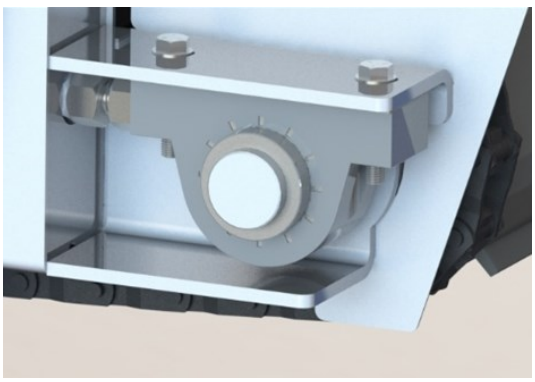
To tighten the hopper chain, adjust the jack bolts on the tail shaft. Proper care must be taken to ensure both sides are tightened evenly. A misaligned tail shaft can lead to serious damage of your Crop Shuttle.



Hopper chain alignment

The hopper chains must always run "true". If the hopper chains run closer to one side of the hopper than the other, excessive wear and damage will occur. The chains should always be centered on each drive sprocket and never come in contact with the side walls of the hopper. If the chains need to be adjusted, tighten or loosen the jack bolt on the head shaft bearing.

If maintenance or repair is ever performed on the hopper chains, all 4 chains must be the exact same length (same number of links).



In-Field Operation Instructions

The following is a basic explanation of how to unload the Crop Shuttle into a truck:

1. As you are approaching the truck, pressurize the Hopper Drive hydraulic circuit and the Accessory Valve Bank hydraulic circuits.
2. Raise the Hopper up to its unloading height.
3. ***Warning: Maintain a travel speed of 5 mph or less when the Hopper is raised!***
4. Pressurize the Boom Belt hydraulic circuit. This will start the boom chain.
5. Line the cart up with the truck to get the desired load distribution in the truck box.
6. Once in position, open the front door then start the hopper chain using the hand-held hydraulic remote.
7. Drive the tractor forward using a low gear to ensure a level load on the truck.
8. Once the truck is nearly full, stop the hopper chain. Use the remaining amount of product on the boom belt to "top-off" the truck if needed.
9. Slowly pull away from the truck.
10. ***Caution: Before pulling away, check the immediate area for bystanders!***
11. Once safely away from the truck, fold the boom, lower the hopper and shut the front door.
12. Turn off the Hopper Drive hydraulic circuit and the Accessory Valve Bank hydraulic circuit.
13. Shift back into a higher gear and return to the harvester for another load.

Tips for efficient use of your Crop Shuttle:

1. If loading multiple trucks simultaneously, make sure the trucks are perfectly in a line. This will prevent the need to "line up" a second time.
2. Set the automatic raise time on the hydraulic control unit to get the perfect unloading height every time.
3. If possible, stage the trucks on both sides of the field. The Crop Shuttle can then unload into whichever one is nearest.