HarvestMaster™

BY JUNIPER SYSTEMS

mirus™

Straw Weight Plugin

USER'S GUIDE

Mirus Straw Weight System User's Guide

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Trademarks

Disclaimer

Information is subject to change without notice.

Cautions

CAUTION: This symbol indicates that failure to follow directions could result in damage to equipment or loss of information.

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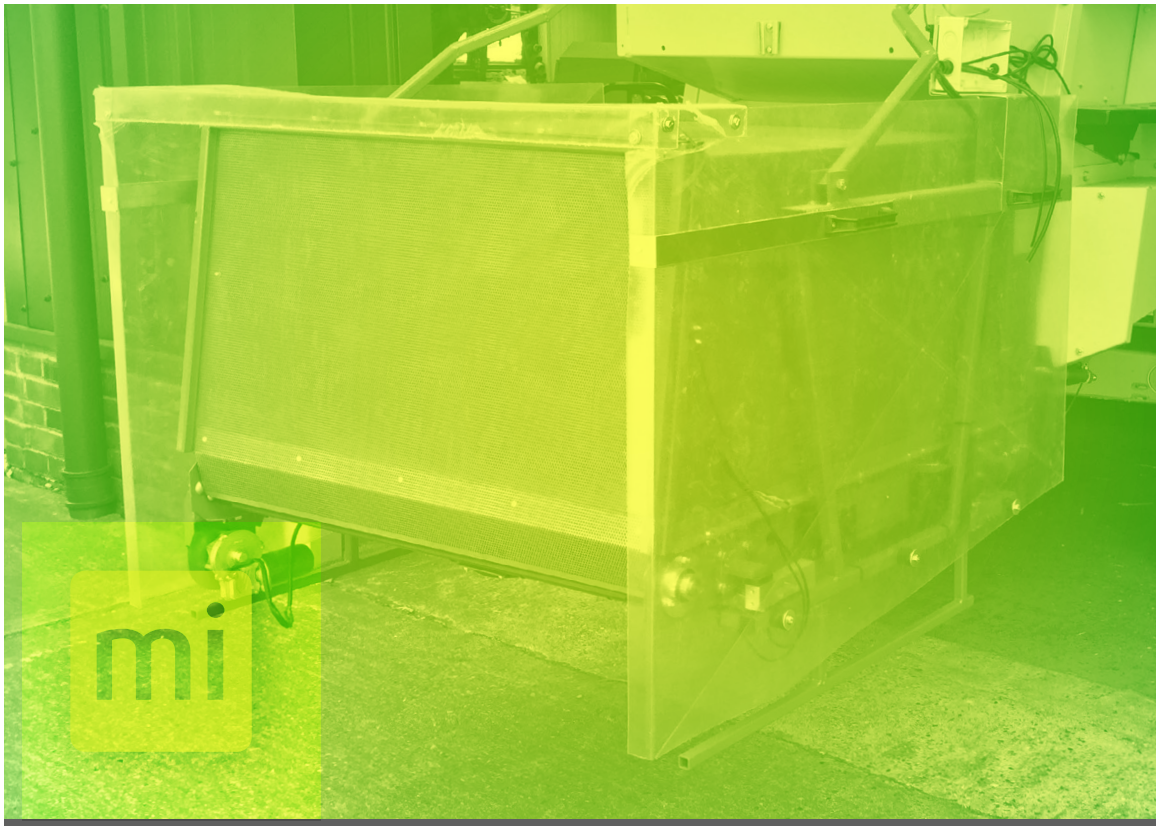
Straw Weight Plugin



Chapter One

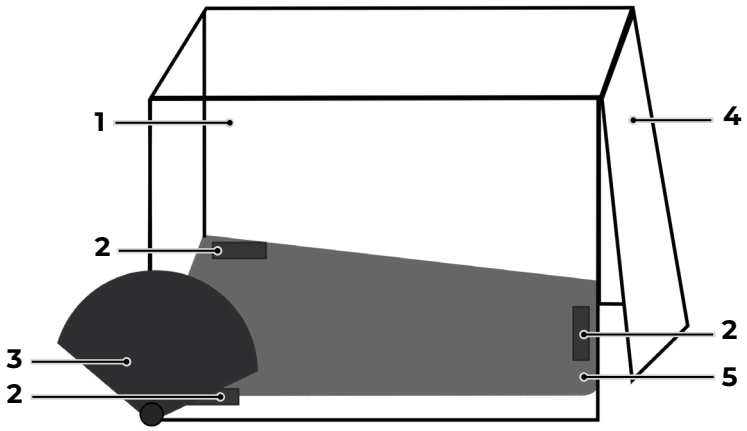
Introduction

Introduction to the Straw Weight System

The Straw Weight System allows seed researchers to automatically collect and weigh straw from wheat, barley, and other cereals during harvest. It is designed to be used with the HarvestMaster Mirus data collection software, and it works in combination with the HarvestMaster H2 and HM800 GrainGages.

System Diagram

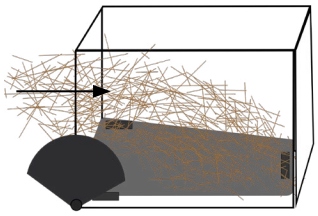
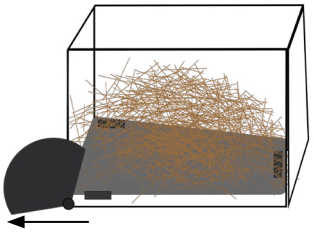
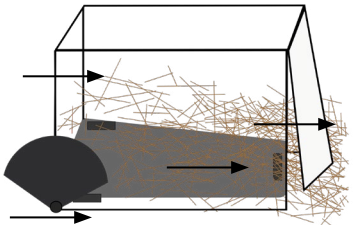
A straw weigh basket conects to be back of the combine, and collects straw during harvest. The figure below shows the basic features of the straw weigh basket.



1	Straw weigh basket frame	4	Straw release gate
2	Load cell	5	Conveyor belt
3	Air diversion panel (pivot showing)		

How the Straw Weight System Works

The Straw Weight System collects straw while the GrainGage collects and cycles grain from the test plot. After the GrainGage finishes measuring and recording grain data, the Straw Weight System weighs the straw and then unloads it. The following table details each stage in the process:

GrainGage	Straw Weight System	Diagram
• During harvest, the grain is routed to the GrainGage. • Once the entire plot is harvested, the combine operator clicks the *Cycle* button in Mirus. • The GrainGage collects weight, test weight, and moisture data.	• The straw is blown out the back of the combine into the weigh basket.	
• The GrainGage cycle finishes. • The combine operator keeps the combine in place while the Straw Weight System weighs the straw.	• The air diversion panel diverts the air blowing from the combine away from the weigh basket. • The basket weighs the straw. • Mirus records and displays straw weight in real time.	
	• The air diversion panel releases, allowing the combine to blow into the basket again. • The straw release gate opens. • The combine blower and the conveyor belt push the straw out of the basket.	
• In Mirus, the *Cycle* button turns from yellow to green. • The combine operator proceeds to harvest the next plot.	• The weigh basket begins to collect straw from the next plot.	

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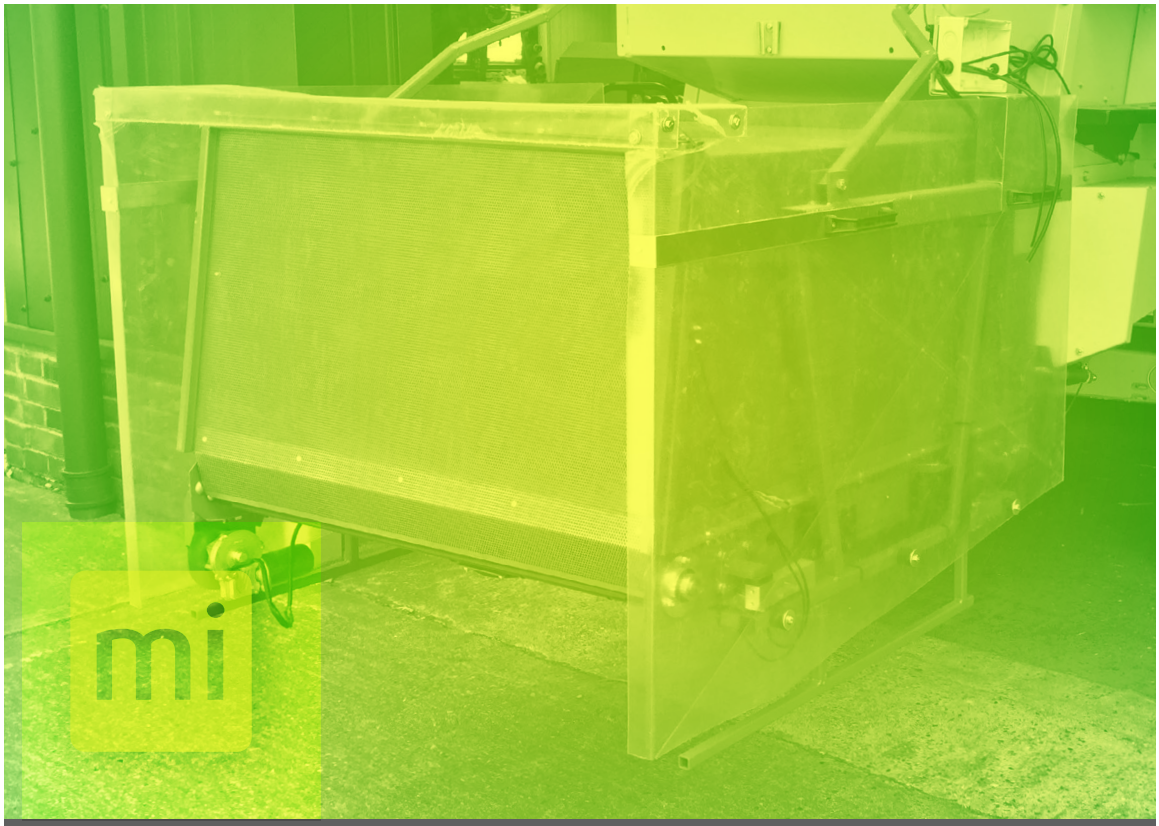
Straw Weight Plugin



Chapter Two

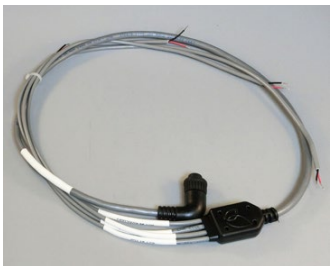
Installation

Hardware Installation

The Straw Weight System uses a rugged tablet computer running Mirus data collection software. A system controller ties together the tablet, the Straw Weight System, and the GrainGage. The Straw Weight System has its own dedicated DSP2 module, which allows Mirus (and the operator) to control and automate the system.

System Parts

The Straw Weight System ships with the following parts, which are used to connect it to the HarvestMaster Mirus/GrainGage system that is already installed on the combine:

PN	Qty	Description	Image
28465	1	Straw Weight DSP2 Module	
26252	1	Actuator Cable	
15332	1	Power Cable	
15336	1	CAN Long Cable	

PN	Qty	Description	Image
15335	1	CAN Patch Cable Short	
15337	1	CAN Breakout Strip	
24563	3	20kg Plot Load Cell	

Connection and Wiring

Recommendations from HarvestMaster:

- The Straw Weight DSP2 Module and the CAN Breakout Strip should be mounted on flat vertical surfaces.
- The system can support 3 or 4 load cells for the basket. The recommendation is 3 load cells in a triangular pattern.
- The Actuator Cable is labeled: Act 1, Act 2, Act 3, Act 4. Connect the cable as follows:

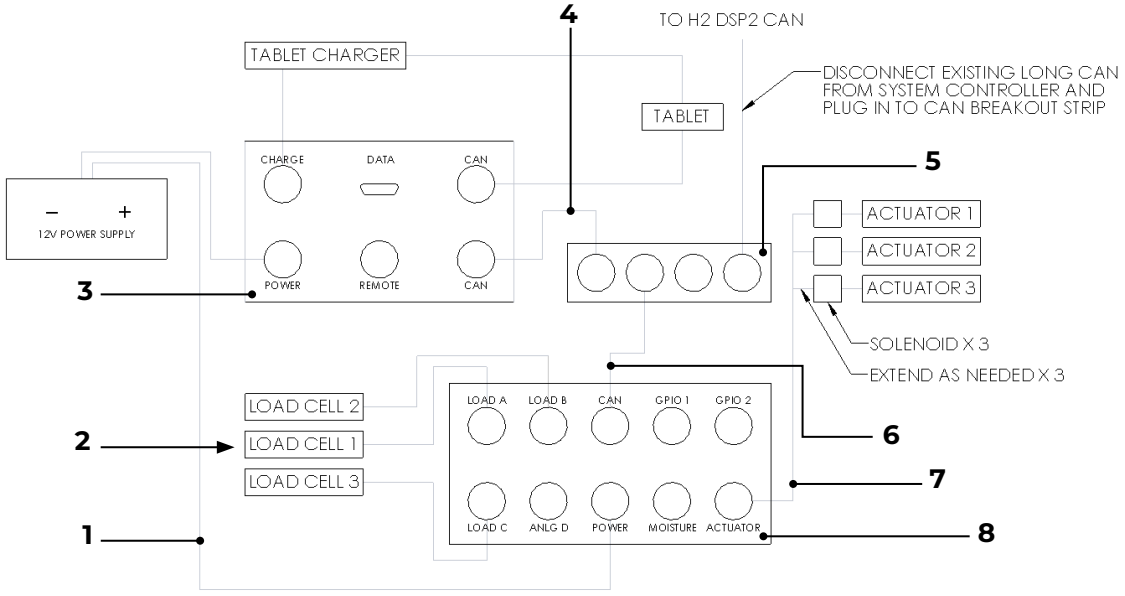
Actuator	Connects To
Act 1	Air diversion panel
Act 2	Conveyor belt
Act 3	Straw release gate on the back of the basket

Wiring Diagrams

The wiring configurations vary depending on whether the Straw Weight System connects to an H2 GrainGage or an HM800 GrainGage.

Wiring Into an H2 GrainGage System

The following diagram provides detailed wiring instructions for connecting a Straw Weight System to an existing H2 GrainGage system. This diagram assumes certain hardware components will be available with the existing H2 GrainGage configuration (Tablet, H2 System Controller, H2 DSP2 Module, and various cables).



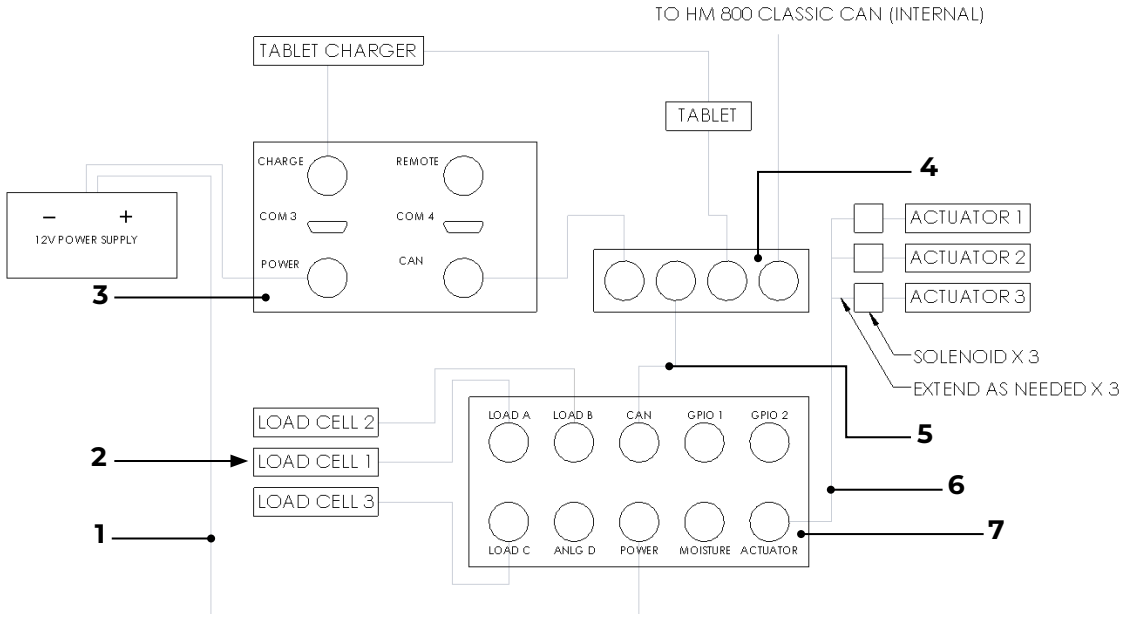
1	Power Cable	5	CAN Breakout Strip
2	Load Cells	6	CAN Long Cable
3	H2 System Controller	7	Actuator Cable
4	CAN Patch Cable Short	8	Straw Weight DSP2 Module

Wiring Into an HM800 GrainGage System

Existing HM800 GrainGage systems already have a CAN Breakout Strip. For this reason, the Straw Weight System in this configuration does not need the following parts: CAN Breakout Strip (PN 15337) and CAN Patch Cable Short (PN 15335). And the HM800 GrainGage system will need the following adjustment:

1. Remove the Terminator that is plugged into the CAN Breakout Strip found in the cab of the combine.
2. In its place, plug in the CAN Long Cable (PN 15336).

All other wiring of the Straw Weight System into the HM800 GrainGage system should follow the diagram below. This diagram assumes certain hardware components will be available with the existing HM800 GrainGage configuration (Tablet, HM800 System Console, CAN Breakout Strip, and various cables).



1	Power Cable	5	CAN Long Cable
2	Load Cells	6	Actuator Cable
3	HM800 System Console	7	Straw Weight DSP2 Module
4	HM800 CAN Breakout Strip (found in the cab)		

Mirus Installation

Mirus provides the user interface and software control for the Straw Weight System. It is designed to run on a rugged tablet on the Microsoft Windows 10 operating system.

The Straw Weight System requires Mirus 4.2.3 or later. To install or update Mirus:

1. On your rugged tablet computer, go to *http://www.harvestmaster.com/HarvestMaster/support/Downloads/Mirus-Harvest-Software*.
2. Download the latest version of Mirus.
3. Run the Mirus software installation and follow the prompts on the screen.
4. Activate Mirus online at *www.harvestmaster.com/activate*.

HarvestMaster updates Mirus annually. Check the HarvestMaster website for updates at least once every 12 months. You can also call your HarvestMaster representative.

Straw Weight Plugin Installation

Mirus requires the Straw Weight Plugin to control the Straw Weight System. Mirus must be installed before installing the plugin.

1. Download the Straw Weight Plugin from *http://www.harvestmaster.com/HarvestMaster/support/Downloads/Mirus-Plugins-Scripts*. The plugin files use the .mbp file extension.
2. Run the .mbp file for the plugin.
3. Activate the plugin online at *www.harvestmaster.com/activate* or by calling your HarvestMaster representative.

Firmware Update

The firmware in the GrainGage's H2 DSP2 module will likely need updating. Mirus will prompt you to update the first time you open it with the entire system (hardware and software) installed. Or you can also update the firmware while changing the Node ID for the Straw Weight DSP2 module *(Appendix A: Node ID and Firmware on page 27)* .

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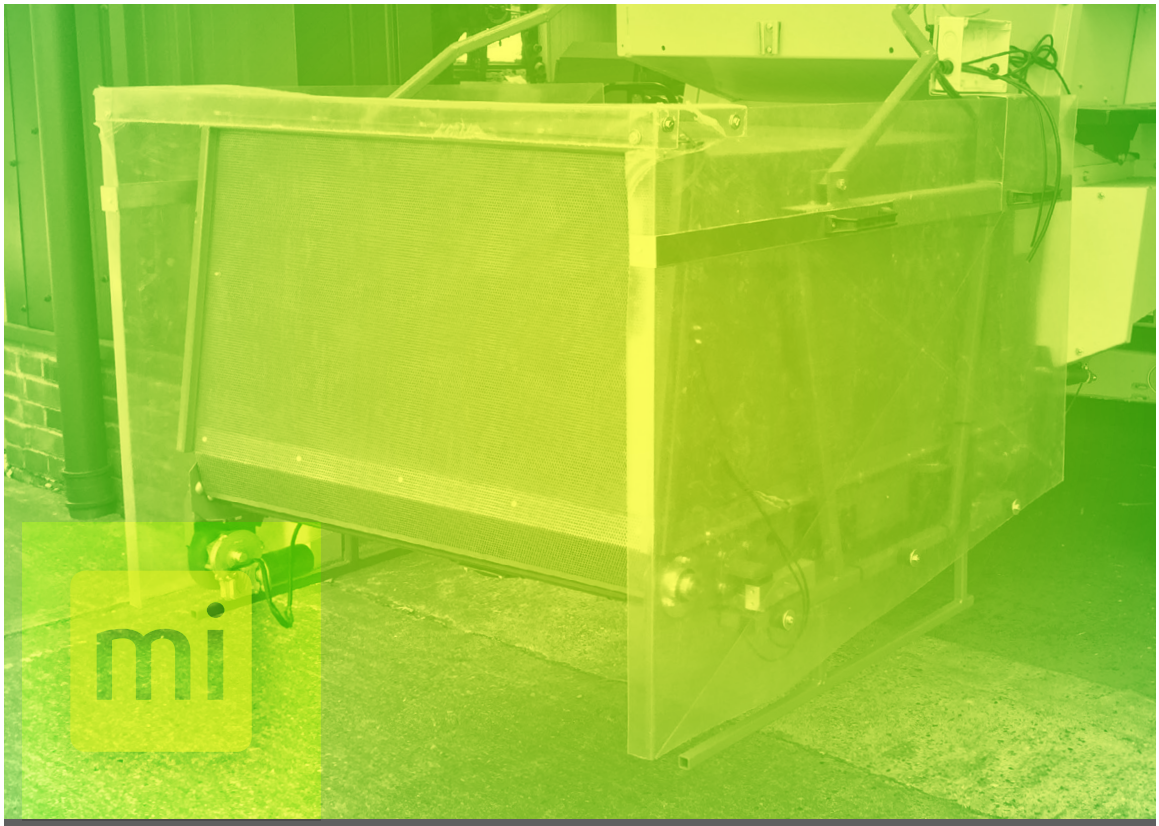
Straw Weight Plugin



Chapter Three

Calibration and Setup

Calibration

The Straw Weight System needs the following calibrations:

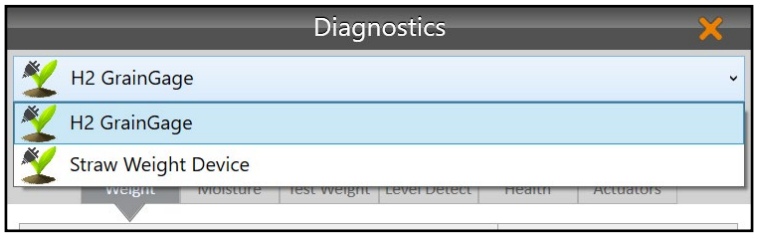
- Calibrate slope and motion (one time)
- Calibrate weight (each harvest and as needed)

Slope and Motion Calibration

Slope and motion only needs to be calibrated the first time the Straw Weight DSP2 module is connected. The purpose of this calibration is to allow weight to tare to zero. Slope and motion is not used in the measurement and cannot be enabled.

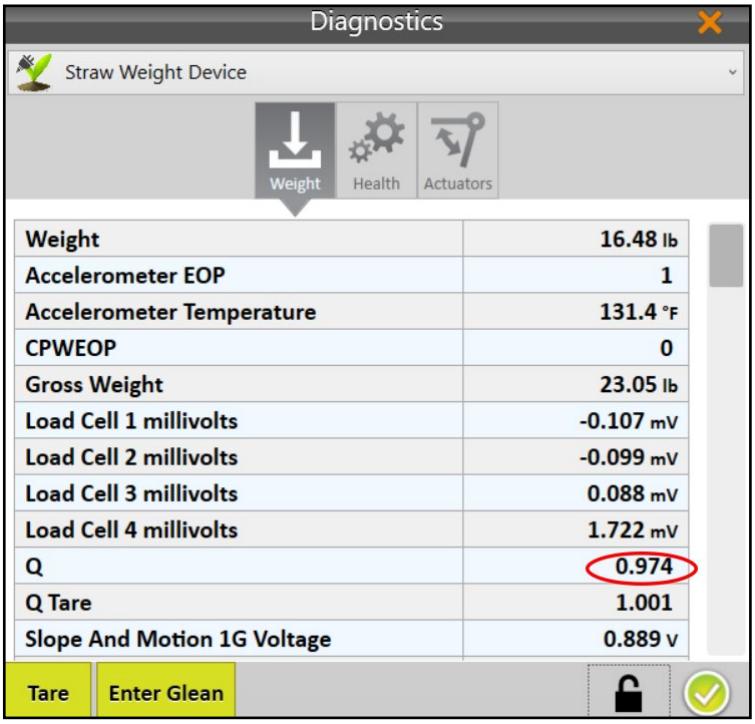
Check whether slope and motion has been calibrated in Mirus:

1. Go to *Diagnostics*.
2. Select *Straw Weight Device* from the dropdown menu.



3. On the *Weight* tab, click the padlock icon .

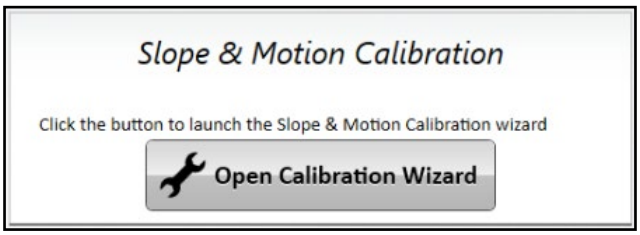
This will reveal more diagnostic data, including the Q value.



4. Check the Q value, which should read 1.000 +/- 0.01. If the Q value is not within range (as seen in the image above), then slope and motion need to be calibrated.

If slope and motion do need to be calibrated, park the combine and the Straw Weight System on a level surface and turn off the engine. Keep the harvest data system powered on, and start the slope and motion calibration wizard:

1. Go to *Home > Straw Weight Plugin*.
2. Go to *Setup > Straw Weight Device > Calibration > Slope and Motion Calibration*.
3. Click on *Open Calibration Wizard*.



Mirus will complete the calibration automatically.

Weigh Basket Calibration

Calibrate the straw weigh basket once per harvest season and check it daily using a known weight.

The Straw Weight System calibrates weight using coefficients that compensate for discrepancies in measured weight. These coefficients need to be updated periodically, which is what you are doing when you calibrate weight.

In order to check and calibrate weight, you will need the following tools:

- The *Loadcell_Coefficient_Calculation.xls* spreadsheet, bundled with this manual.

  This spreadsheet uses the following equation to calculate calibration coefficients:

  actual weight ÷ measured weight × current coefficient = new coefficient

  Once the new coefficient for a particular load cell is calculated, the operator enters this number back into Mirus, and the system calibrates according to the new coefficient. This process is repeated for each load cell.

  The instructions below explain how to calculate coefficients using the spreadsheet. The values are the same whether using the spreadsheet or the above equation.

- A calibration weight like the one shown in the image below:

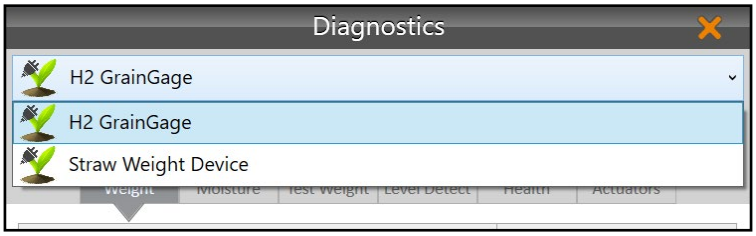
The calibration weight should be at least 10 lb/4.5 kg and should have an exact known weight. If you have an H2 Classic GrainGage, a calibration weight like this came with your GrainGage.

Check Weight Calibration

To check weight, do the following:

1. Park the combine and Straw Weight System on a level surface.
2. In Mirus, load the Straw Weight Plugin.

3. Go to *Diagnostics*. 
4. Select *Straw Weight Device* from the dropdown menu.

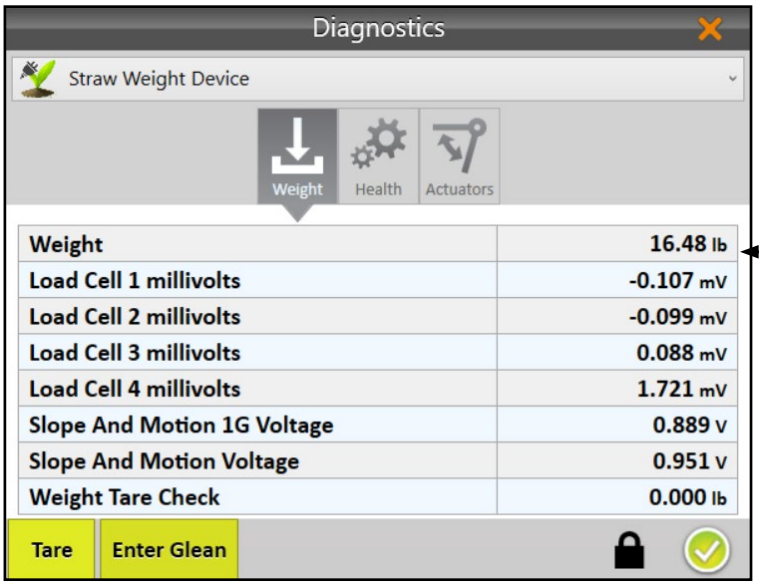


5. Select the *Weight* tab. 
6. With the weigh basket empty, click on *Tare*. 

7. Place the calibration weight in the basket.

   The weight value in the Diagnostics box should equal the calibration weight. If the two are equal, then the straw weigh basket is calibrated. If they are different, then the basket needs to be calibrated.

For example, in the screenshot below, the Weight value is 16.48 lb. The actual known weight is 11.21 lb. This weigh basket would need to be calibrated.



Calibrate Weight

To calibrate weight, do the following:

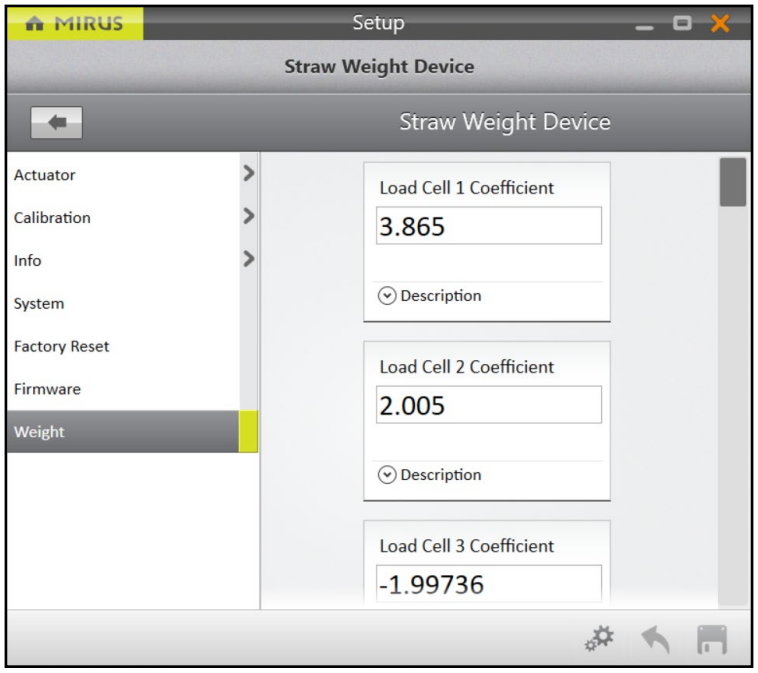
1. Park the combine and Straw Weight System on a level surface.
2. Open the Loadcell_Coefficient_Calculation.xls spreadsheet.
3. Input the known calibration weight under ***actual weight*** in the spreadsheet.

Enter the known calibration weight.

	actual weight	measured	current coeff	New
LC1	11.44	21.77	3.865	2.031034
LC2	11.44	11.43	2.005	2.006754
LC3	11.44	11.44	-1.99736	-1.99736
LC4	11.44	12.1	0.524	0.495418

4. In Mirus, load the Straw Weight Plugin.

5. Go to *Setup* > *Straw Weight Device* > *Weight*. Mirus will display the following screen:



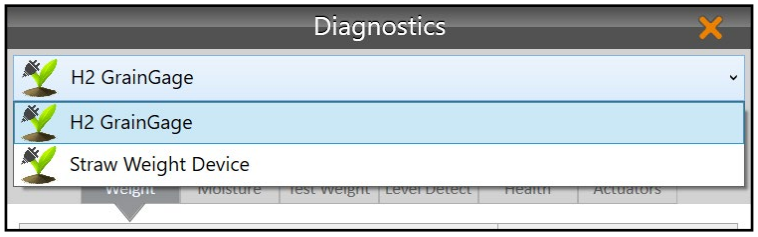
6. Enter the Load Cell Coefficients from this screen into the ***current coeff*** column in the spreadsheet.

	actual weight	measured	current coeff	New
LC1	11.44	21.77	3.865	2.031034
LC2	11.44	11.43	2.005	2.006754
LC3	11.44	11.44	-1.99736	-1.99736
LC4	11.44	12.1	0.524	0.495418

Enter the current coefficients.

7. In Mirus, go to *Diagnostics*. 

8. Select *Straw Weight Device* from the dropdown menu.

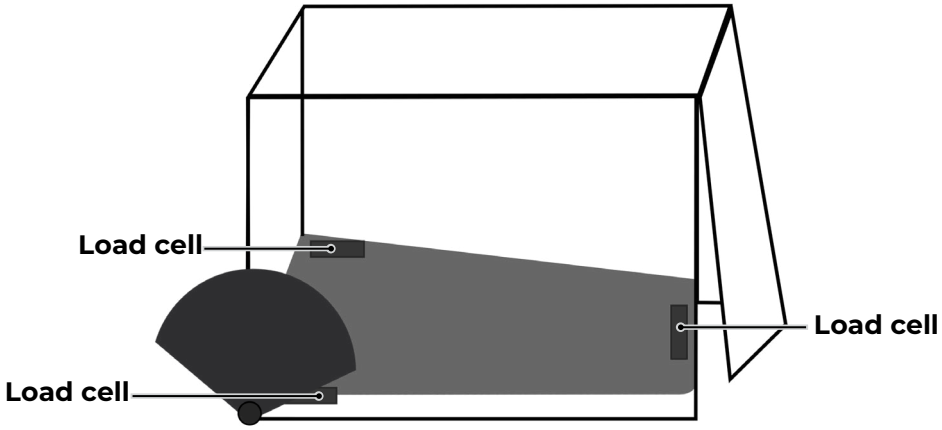


9. Select the *Weight* tab. 

10. Click on *Tare*. 

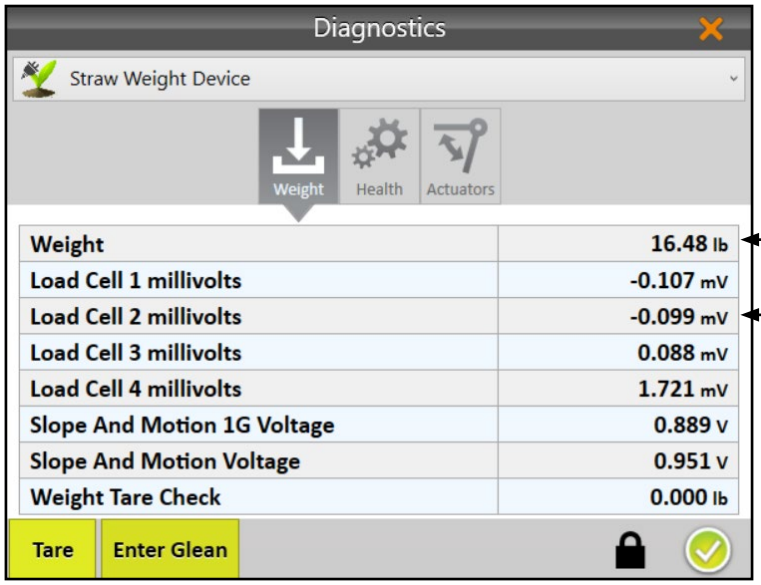
Following the Tare, the weight in Diagnostics should read at 0.00.

11. Place the calibration weight in the weigh basket, immediately next to (or on top of) one of the load cells. Below is a diagram of where the load cells are located in the basket.



When you place the weight by one of the load cells, two types of values will change in the Mirus *Diagnostics* box: the Weight value and the voltage for each of the load cells.

The voltage for one load cell will change more than the others when you place the weight. This is important because this is how you know which load cell the system recognizes as having received the weight. For example, if the voltage on Load Cell 2 changes more than the other two load cells, you can be confident that the system recognizes the load cell holding the weight as Load Cell 2.



12. Input the Weight value into the ***measured*** column on the spreadsheet, according to which load cell the weight is associated with.

	actual weight	measured	current coeff	New
LC1	11.44	21.77	3.865	2.031034
LC2	11.44	16.48	2.005	2.890849
LC3	11.44	11.44	-1.99736	-1.99736
LC4	11.44	12.1	0.524	0.495418

Enter the Weight value for each corresponding load cell.

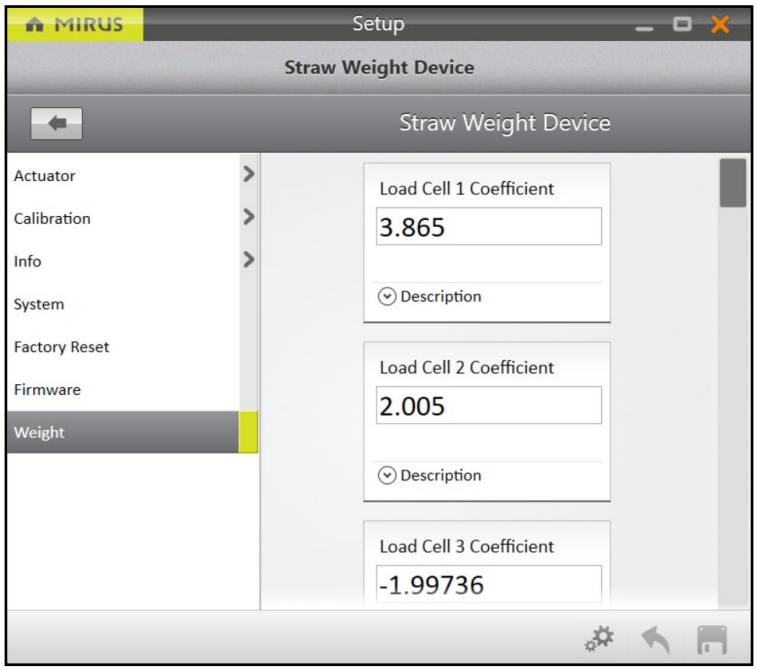
This will change the coefficient values in the ***New*** column.

	actual weight	measured	current coeff	New
LC1	11.44	21.77	3.865	2.031034
LC2	11.44	16.48	2.005	2.890849
LC3	11.44	11.44	-1.99736	-1.99736
LC4	11.44	12.1	0.524	0.495418

The spreadsheet calculates new coefficient values.

13. Repeat steps 11 and 12 until you have new coefficient values for each of the three load cells.

14. In Mirus, go to *Setup* > *Straw Weight Device* > *Weight*.



15. Enter the new load cell coefficients from the ***New*** column in the spreadsheet.

16. Click *Save*.

17. Test the calibration by placing the calibration weight immediately next to (or on top of) each load cell and in the middle of the straw basket. Each time you place the calibration weight, the Weight value in Mirus Diagnostics should be equal to the calibration weight.

Note: If the calibration doesn't appear to have worked, repeat the process. It can sometimes take two rounds of calibrating to get the weight exact. If you do repeat the process, remember to enter the ***new coefficients*** *into the spreadsheet and into Mirus as the* ***current coefficients*** *for the second round.*

Setup and Timing

The Straw Weight System automates the processes of collecting, weighing, and unloading straw via the use of three actuators. This section details the necessary settings and timing adjustments for these actuators.

Actuators

1. In Mirus, load the Straw Weight Plugin.

2. Go to *Setup > Straw Weight Device > Actuator.*

This opens the Actuator Setup screen, including a list of actuators in the Straw Weight System. The individual actuators control the following actions in the system:

- **Actuator 1**: Activates the air diversion panel to stop air from blowing into the weigh basket while the straw is being weighed.
- **Actuator 2**: Activates the conveyor belt that pushes the straw out of the weigh basket after it has been weighed.
- **Actuator 3**: Activates the straw release gate (back door to the basket), holding it open while the conveyor belt pushes the straw out the basket.

The system is capable of supporting up to six actuators, which is why the Actuator Setup screen lists more than three. However, the Straw Weight default configuration only uses three.

Actuators 1–3 in the Straw Weight System should be set to Dual mode. If they are not, do the following:

1. In the Actuator Setup screen, select *DSP Actuator 1*.
2. Click on the first dropdown menu in the setup screen.

3. Select *Dual*.
4. Click *Save*.
5. Repeat for Actuators 2 and 3.

Note: The unused actuators (4–6) should be set to None.

Actuator Times

Each actuator has several timers, most of which do not need to be changed for the Straw Weight System. The following table explains which timers need to be adjusted for each actuator:

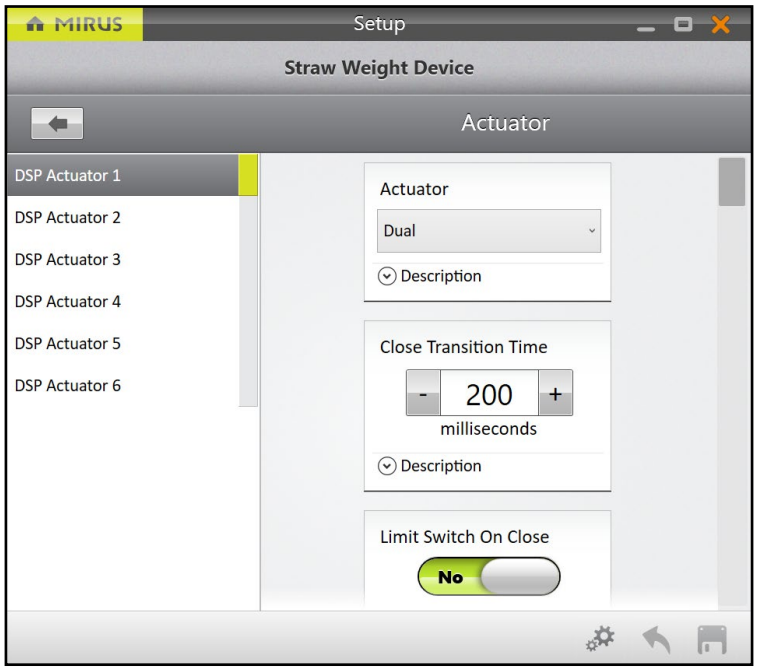
Actuator	Open Transition Time	Close Transition Time
Actuator 1 (Air Diversion Panel)	Time it takes for the actuator to move the diversion panel into place to prevent the air from blowing into the weigh basket.	Time it takes for the actuator to move the diversion panel back open so that the combine blows into the weigh basket again.
Actuator 2 (Conveyor Belt)	N/A	Time it takes for the conveyor belt to completely empty the weigh basket. This time may change depending on the type and amount of straw.
Actuator 3 (Straw Release Gate)	Time it takes for the actuator to open the back release gate for the weigh basket.	Time it takes for the actuator to close the back release gate for the weigh basket.

Open and Close Transition Times for Actuators 1 and 3 can be calibrated by timing the actuators and how long it takes each of them to complete their task.

Close Transition Time for Actuator 2 should be calibrated by harvesting a test plot with a representative volume of straw, then timing how long it takes the conveyor belt to push the straw out of the basket.

These timers are accessed under their respective actuators on the Actuator Setup screen.

1. In Mirus, go to *Setup > Straw Weight Device > Actuator.*
2. Select *DSP Actuator 1.*
3. Scroll down to *Close Transition Time* and/or *Open Transition Time*.



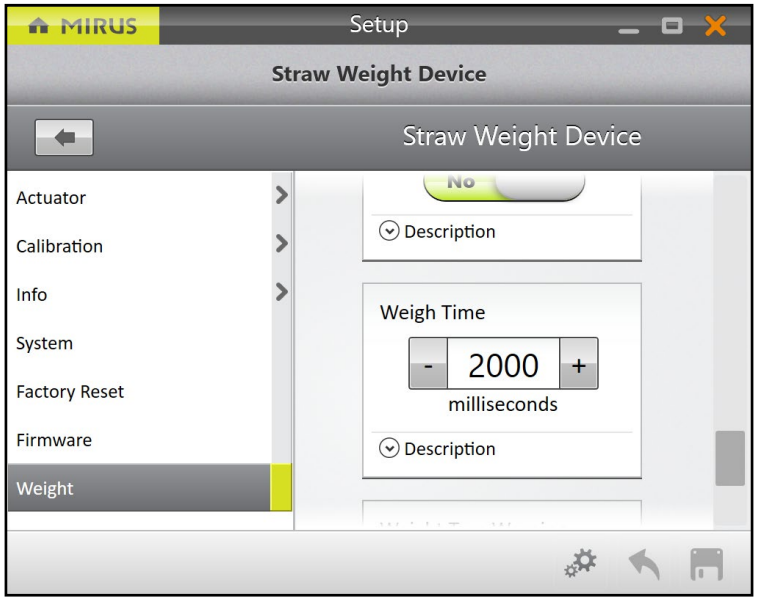
4. Set the time according to calibration guidelines above.
5. Click *Save.*

Weigh Time

Weigh Time determines how long Mirus averages the load cell readings while the basket is weighing the straw. More time means more load cell readings to average, which usually means higher accuracy. The default setting for this timer is 2000 milliseconds (two seconds). HarvestMaster does not recommend setting this time to less than the default.

To increase the Weigh Time:

1. In Mirus, go to *Setup* > *Straw Weight Device* > *Weight*.
2. Scroll down to *Weigh Time*.



3. Change the Weigh Time.
4. Click *Save*.

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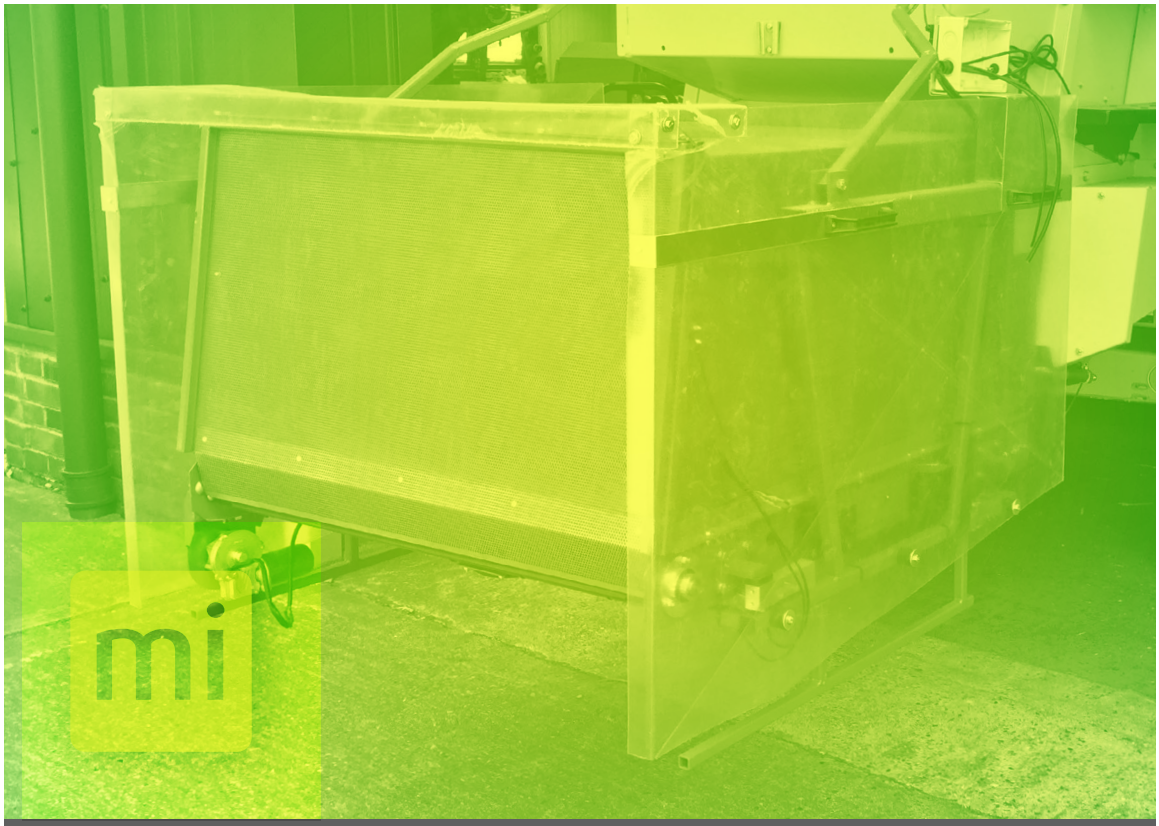
Straw Weight Plugin



Appendix A

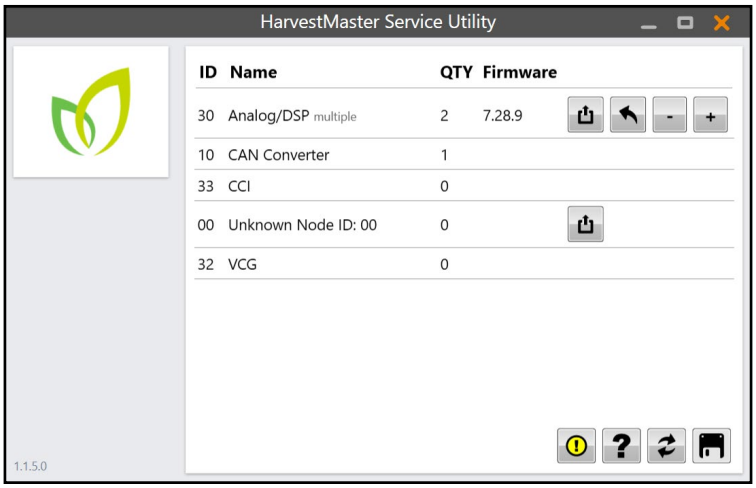
Appendix A: Node ID and Firmware

Change the Node ID

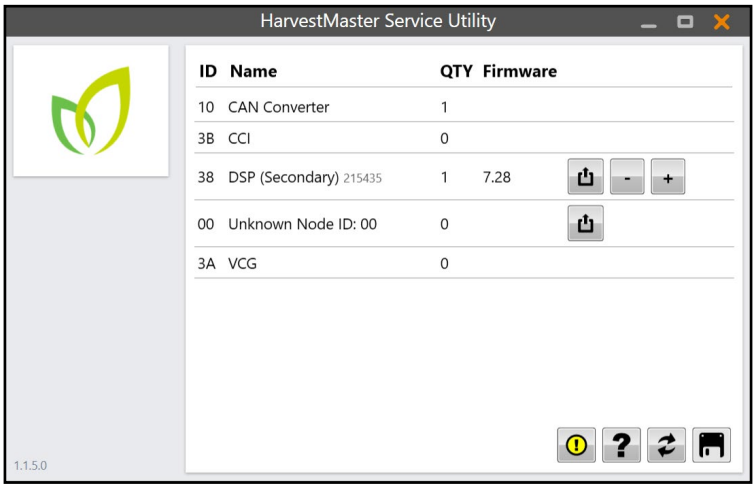
The GrainGage and the Straw Weight System each have their own DSP modules. In order for the software to understand which DSP module it is communicating with, the Node IDs have to be different. For this reason, it is necessary to change the Node ID for the new (Straw Weight) DSP module. The instructions are as follows:

1. On your laptop or rugged tablet, navigate to the HarvestMaster Service Utility: Go to *(C:) > HarvestMaster > Mirus > Devices > HM800 > Tools > HM.Service*.

   As displayed below, there are two DSP modules with the Node ID of 30.



2. Unplug the CAN cable connecting to the GrainGage DSP module.
3. Refresh the HarvestMaster Service Utility. It should only show one DSP module. This is the one connected to the Straw Weight System.
4. Change the Node ID for the remaining DSP (Straw Weight) module to 38.



5. Click save.

Update Firmware

After updating the Node ID,

1. Check to see if the firmware for the Straw Weight DSP module (ID 38) needs to be updated by clicking the update icon. 
2. If prompted to update, go to *(C:) > HarvestMaster > Mirus > Devices > HM800 > Firmware* and select the folder with the highest version number.
3. Click on the filename beginning with *DSP*.
4. After the update, refresh the Service Utility. 
5. Reconnect the CAN cable on the GrainGage DSP module and refresh the Service Utility. 
6. If necessary, update the firmware on the GrainGage DSP module (Node ID 30).