



HarvestMaster™
BY JUNIPER SYSTEMS



mirus™

H3 Classic GrainGages

USER MANUAL

Mirus for H3 Classic GrainGage User Manual

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Part Number: 33057-00

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Cautions

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



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CHAPTER 1

Mirus Installation

1 Mirus Installation

The Mirus app operates the H3 Classic GrainGage and runs on a Windows tablet. The H3 Classic GrainGage can use a SCiO sensor to detect the SCiO constituent data, or an EM sensor to detect the EM or M2.0 moisture content of the sample.

GrainGage Sensor Connections		
GrainGage	Sensor	Calibration
H3 Classic	EM	EM Moisture and M2.0 Moisture
H3 Classic	SCiO	SCiO constituent data

1.1 System Requirements

- Operating System: Windows® 10 or higher; 32 or 64-bit OS
- Processor Speed: 2.0 GHz Quad Core
- Memory: 8 GB or higher recommended
- Data Storage: 500 MB available disk space
- Display Resolution: 1280 x 800 or higher
- Mirus Version: 4.5.0 or higher

1.2 Download and Install Mirus

1.2.1 Download and Activate Mirus for the H3 Classic GrainGage

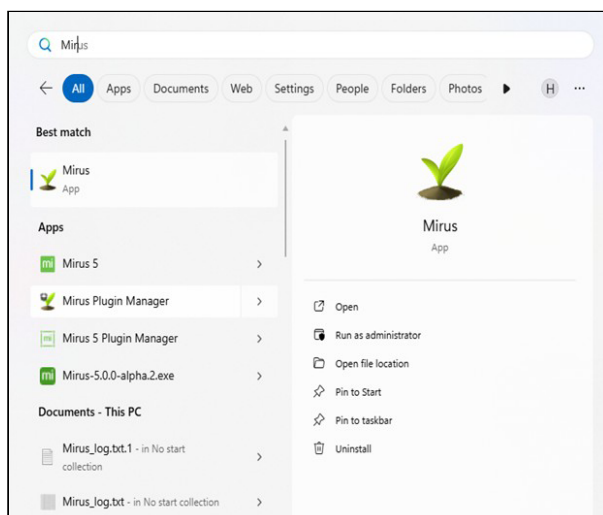
After you have purchased a license for Mirus for the H3 GrainGage,

1. Go to <http://www.harvestmaster.com/support/mirus/downloads>.
2. Tap the down arrow for Mirus Harvest Software.
3. Select and download the most recent Mirus release.
4. Follow the installation instructions.
5. Go to <http://www.harvestmaster.com/activate> and fill out the form.
6. HarvestMaster will send the unlock code via email.
7. Return to the Mirus activation screen and input the unlock code.

1.2.2 Enable the H3 GrainGage Plugin

After you have purchased a license for the H3 Plugin,

1. From the Windows desktop search bar, search for **Mirus Plugin Manager**.



2. From Mirus Plugin Manager, click **H2 GrainGage**, select **disable**.



3. From the Mirus Plugin Manager, click **H3 GrainGage**, select **enable**.



4. Close the Mirus Plugin Manager.

Note: When you attempt to connect to the H3 GrainGage Plugin for the first time, Mirus will prompt you to register the plugin. The H3 Plugin is registered separately from Mirus.

To register the H3 Plugin,

1. Go to <http://www.harvestmaster.com/activate> and fill out the form.
2. HarvestMaster will send the unlock code via email.
3. Return to the H3 Plugin activation screen and input the unlock code.

Check <https://www.harvestmaster.com/support/article/14646> annually for updated software.

1.3 Preparing the GrainGage

1.3.1 Verify GrainGage Readiness

Verify the GrainGage is ready for operation by checking the following:

- The Mirus app is installed and activated.
- The H3 plugin is installed and activated.
- Windows updates are current.
- Automatic sleep, hibernate, and shutdown are disabled on the tablet if it is plugged in.
- The charging cable is connected to the tablet and the tablet is charging.
- Power (12 VDC) is connected to the GrainGage DSP 2 Module and System Controller.
- The CAN cable between the GrainGage and System Controller is connected.
- The USB to CAN or Serial to CAN cable is connected between the CAN bus and tablet.

- The SCiO serial to USB cable is connected to the tablet and GrainGage.
- The remote enter button (typically on the hydrostat lever) is connected properly and functioning.
- The pressurized air is turned on and connected to the GrainGage.

1.3.2 Turn on the GrainGage

To turn on the GrainGage,

1. Start the combine.
2. Activate the GrainGage by pressing the red button on the system controller.
3. Open Mirus.

Note: HarvestMaster recommends verifying the weight and test weight calibrations (in Diagnostics) of the GrainGage each morning by following the steps in [Check Weigh Bucket Calibration](#) and [Check Test Weight Calibration](#). If the weight is off, then recalibrate by following the steps in sections [Weigh Bucket Load Cell Calibration](#) and [Test Weight Load Cell Calibration](#).



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CHAPTER 2

Mirus and GrainGage Setup

2 Mirus and GrainGage Setup

2.1 Start Mirus

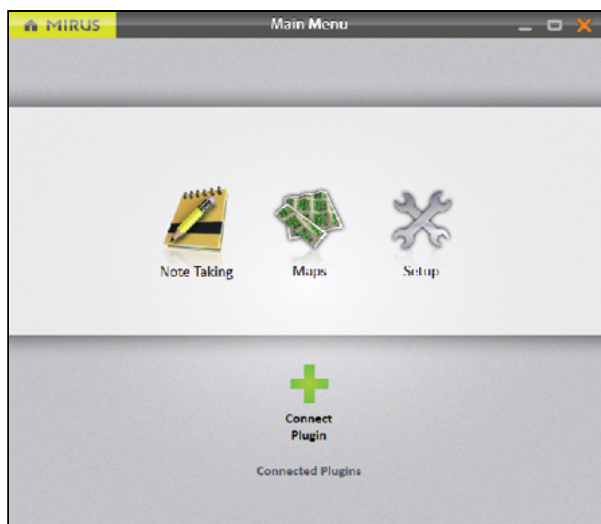
Double tap the Mirus icon  on your Windows desktop.

Mirus opens the Home screen. You can return to the Home screen at any time by selecting the Mirus home icon on the top left corner of the screen.

2.1.1 Connect to the GrainGage Plugin

On the Mirus Home screen,

1. Tap **Connect Plugin**.

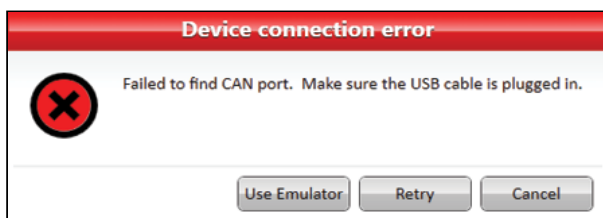


2. Tap **H3 GrainGage**.

Note: You will only be able to select the H3 Plugin after it's been enabled in the Mirus Plugin Manager. See [Enable the H3 GrainGage Plugin](#).

3. Tap the check icon .

If Mirus is unable to detect the GrainGage, the software may display a device connection error.



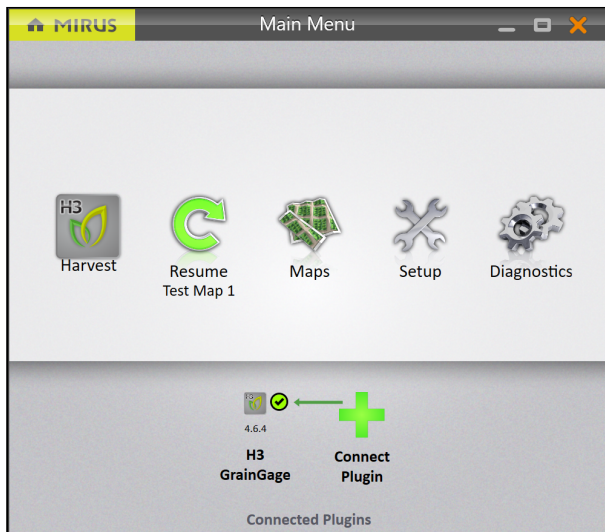
- Check the GrainGage power source to all modules (a green LED illuminated on each module).

Or

- Tap **Use Emulator** to proceed without connecting the GrainGage. Emulator Mode is not recommended for setting up the GrainGage.

If further troubleshooting is needed, see [Can't Connect to GrainGage](#).

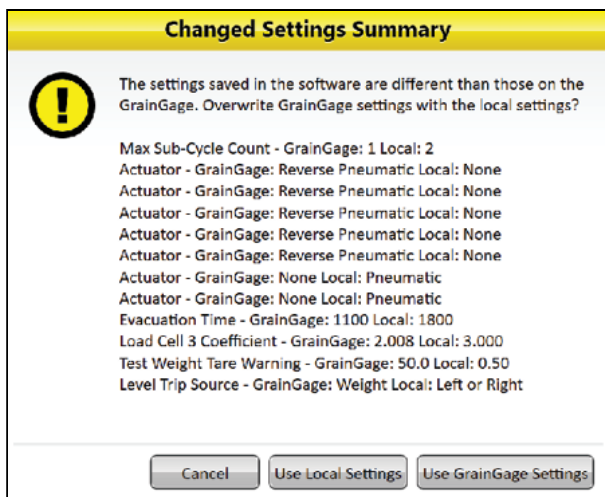
After connecting to the H3 GrainGage plugin, Mirus displays an icon for the GrainGage on the Home screen.



If you upgraded Mirus to a new version or changed settings in emulator mode before connecting to the GrainGage, Mirus will display a Changed Settings Summary warning. You will be prompted to **Use Local Settings** or **Use GrainGage Settings**.

- Local settings use the current settings on the tablet.
- GrainGage settings use the old settings saved to the GrainGage from the previous Mirus version.

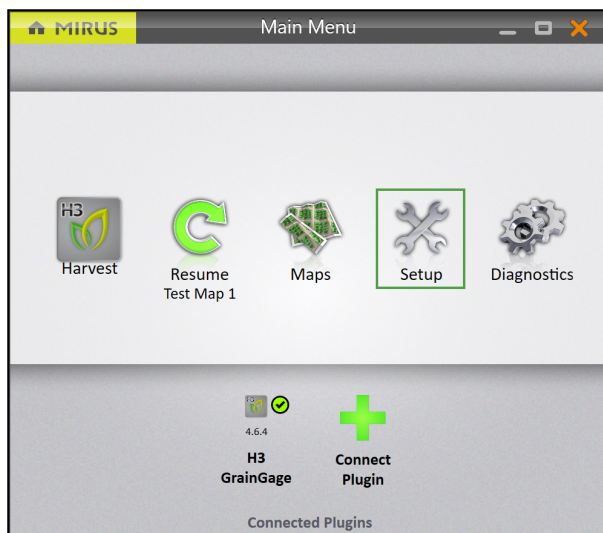
Note: If you want to keep the current GrainGage weight and test weight calibrations, we recommended using the GrainGage Settings.



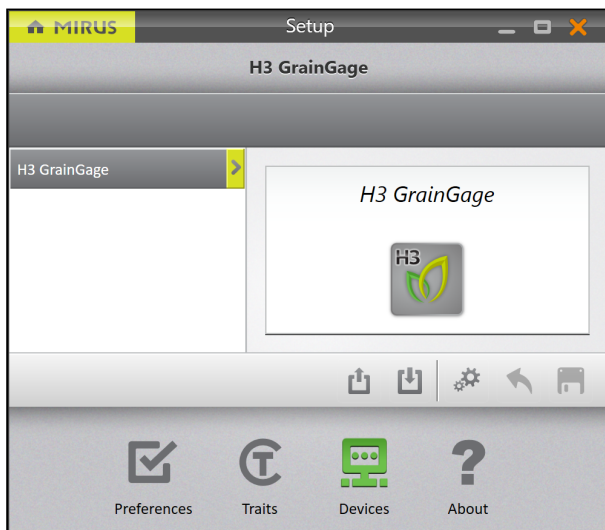
2.2 Set up Mirus Preferences

Open the Home screen,

1. Tap **Setup**.



Mirus opens the Setup screen.



Note the following settings can be saved and restored.

- Actuator settings
- Load cell coefficients (from the [Weigh Bucket Load Cell Calibration](#) and [Test Weight Load Cell Calibration](#))
- Slope and Motion calibration (See [Slope and Motion Calibration.](#))
- Other system settings (See [Configure the GrainGage System Settings.](#))

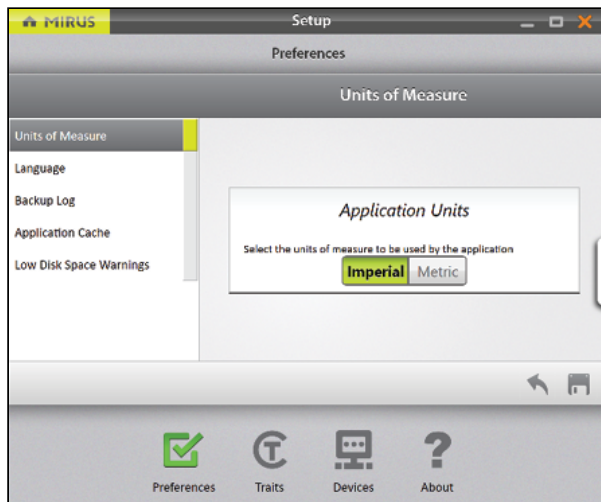
Use the following two buttons available from the Setup screen to save and restore this data.

-  Saves the current settings.
-  Restores settings after the system has been reset.

2.2.1 Set Preferred Units of Measure

On the Setup screen,

1. Tap **Preferences**.
2. Tap **Units of Measure**.
3. Select your preferred units of measure.
4. Tap **Save**.

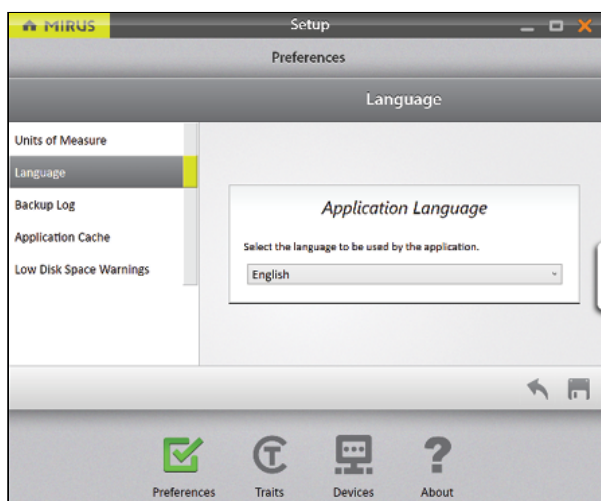


2.2.2 Set Preferred Language

On the **Setup > Preferences** screen,

1. Select **Language**.
2. Choose your preferred language.
3. Tap **Save**.

Note: Some languages may not currently be available in Mirus version 4.4.0.

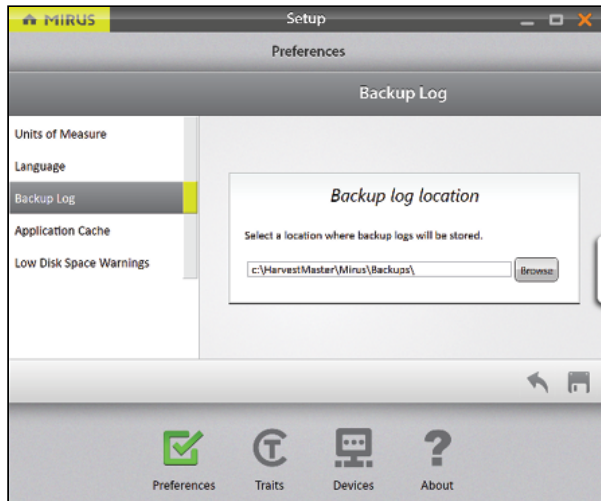


2.2.3 Set Preferred Backup Log Location

On the **Setup > Preferences** screen,

1. Tap **Backup Log**.
2. Enter your preferred file path for the Mirus backup log.
3. Tap **Save**.

Note: Changing the Backup Log location is not recommended. If you do change it, be sure to record the new location.

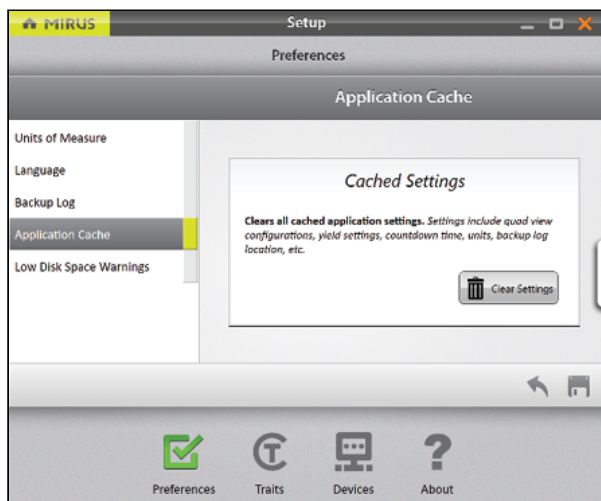


2.2.4 Clear Cached Settings

⚠ CAUTION: This cannot be undone! Clearing the cache will set the application settings back to default and restart Mirus. This should only be done in consultation with a HarvestMaster Field Service Engineer.

On the **Setup > Preferences** screen,

1. Tap **Application Cache**.
2. Tap **Clear Settings**.

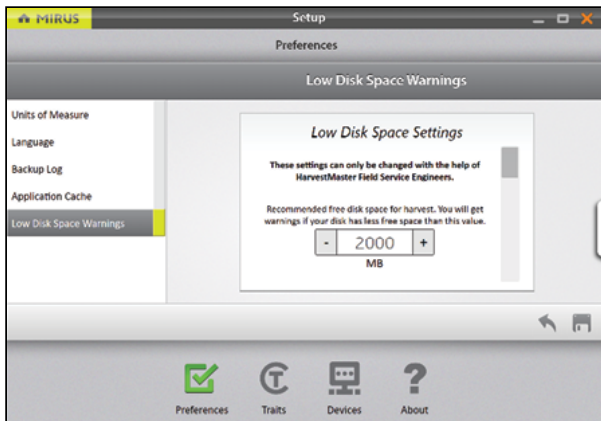


2.2.5 Set Low Disk Space Warnings

On the **Setup > Preferences** screen,

1. Tap **Low Disk Space Warnings**.
2. Set the amount of available disk space left that will trigger a warning.
3. Set the minimum amount of disk space to allow harvest.
4. Tap **Save**.

Generally, Mirus (and additional plugins) may use around 900 MB of disk space. However, the amount of space used in addition to this depends on the size of your map, the amount of data collected, and the quantity of maps created.



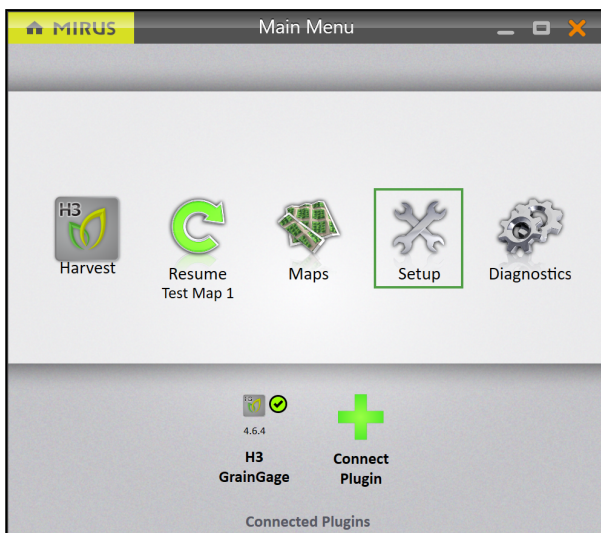
2.3 Setup the GrainGage

2.3.1 Open Setup

On the Home screen,

1. Tap **Setup**.

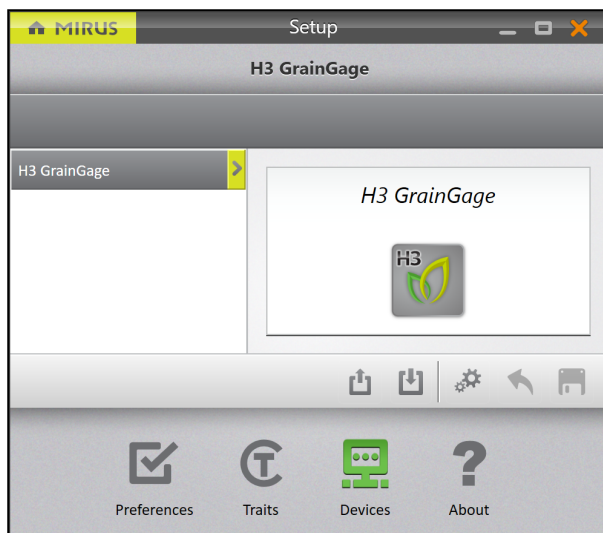
Mirus opens the Setup screen.



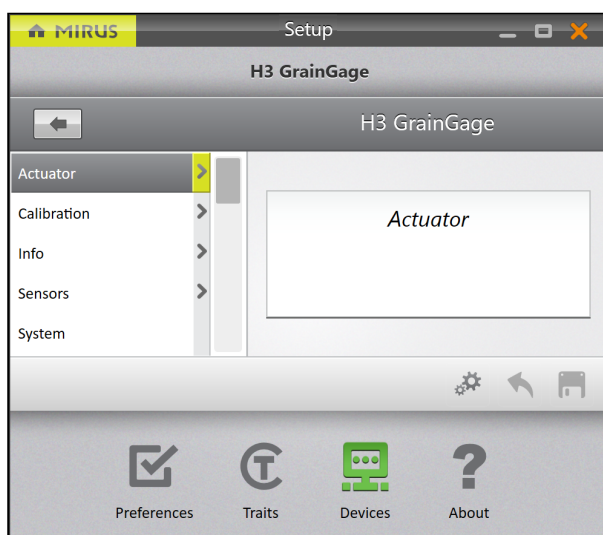
2.3.2 Configure Actuators

The Setup screen defaults to Devices where you will set up your GrainGage.

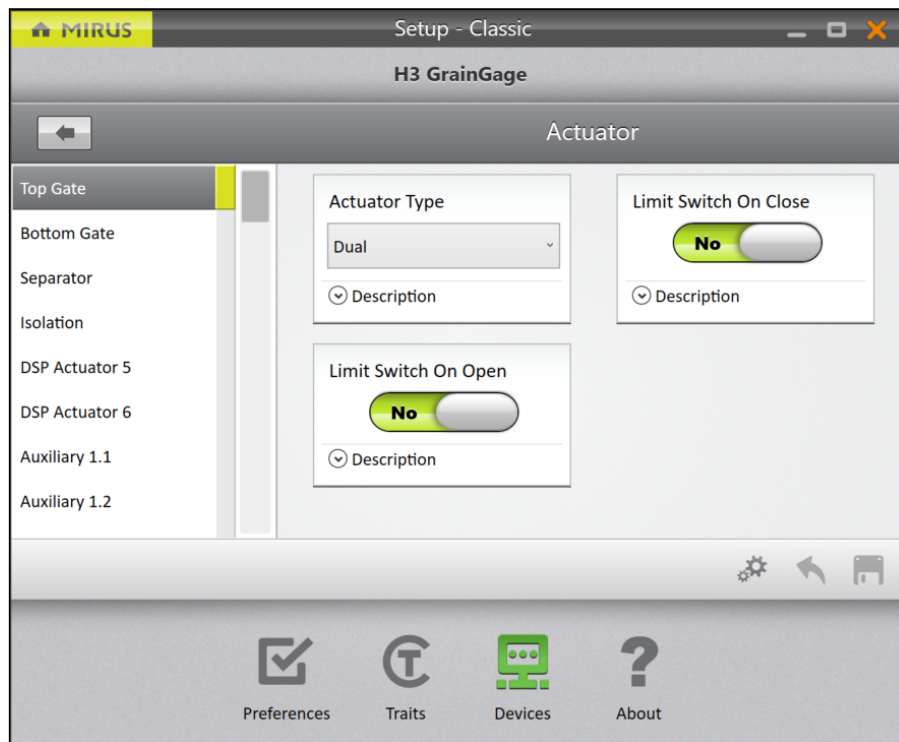
1. Tap **H3 GrainGage**.



2. Tap **Actuator**.



Mirus opens the Actuator Setup screen on which you can configure settings for each actuator in the GrainGage.



The following tables display the default values for each actuator, which may need to be adjusted based on your specific harvest conditions. Please contact a HarvestMaster Field Service Engineer for support.

Top Gate Settings

Setup Parameter	Default Value	Description
Actuator	Dual	The type of actuator. See Auxiliary Actuator Controls—DSP Actuator 5 & 6 table below for actuator type descriptions. Do not change.
Limit Switch on Close	Yes	Enables the limit switch when the gate closes.
Limit Switch on Open	No	Enables the limit switch when the gate opens. This is not supported in the GrainGage Classic.

Bottom Gate Settings

Setup Parameter	Default Value	Description
Actuator	Dual	The type of actuator. See Auxiliary Actuator Controls—DSP Actuator 5 & 6 table below for actuator type descriptions.

Limit Switch on Close	Yes	Enables the limit switch when the gate closes.
-----------------------	-----	--

Limit Switch on Open	No	Enables the limit switch when the gate opens. This is not supported in the GrainGage.
----------------------	----	---

Separator Cylinder Settings

Setup Parameter	Default Value	Description
Actuator	Dual	The type of actuator. See Auxiliary Actuator Controls—DSP Actuator 5 & 6 table below for actuator type descriptions.

Limit Switch on Close	Yes	Enables the limit switch when the gate closes.
-----------------------	-----	--

Limit Switch on Open	No	Enables the limit switch when the gate opens. This is not supported in GrainGage.
----------------------	----	---

Isolation Gate Settings

Setup Parameter	Default Value	Description
Actuator	Dual	The type of actuator. See Auxiliary Actuator Controls—DSP Actuator 5 & 6 table below for actuator type descriptions. This is a custom setting, depending on the type of isolation gate.

Close Transition Time	200 msec	The amount of time it takes the actuator to close the gate.
-----------------------	----------	---

Limit Switch on Close	No	Enables the limit switch when the gate closes.
-----------------------	----	--

Limit Switch on Open	No	Enables the limit switch when the gate opens. This is not supported in the GrainGage.
----------------------	----	---

Open State Time	500 msec	The amount of time the isolation gate remains open before beginning to close.
-----------------	----------	---

Open Transition Time	200 msec	The amount of time it takes the actuator to open the gate.
----------------------	----------	--

Auxiliary Actuator Controls—DSP Actuator 5 & 6

Setup Parameter		Action	Pin 1	Pin 2	Description
Pneumatic		Open	12 V	Ground	Drives solenoid with 12 V continuously while actuated but uses 0 V when not actuated.
		Close	0 V	Ground	
Reverse pneumatic		Open	0 V	Ground	Works in reverse to a pneumatic actuator. For example, if pneumatic opens a door, reverse pneumatic will close the door.
		Close	12 V	Ground	
Dual	Actuator 1	Open	0 V	n/a	Allows the pins to be controlled independently but be tied to a common ground. With a dual actuator, you can control two actuators from one actuator port
		Close	12 V	n/a	
	Actuator 2	Open	n/a	0 V	
Electro-mechanical		Open	12 V for transition time	Ground	Drives the pin with 12 V for the transition time and then uses 0 V when the transition time expires.

Runs forward and backward.

	Close	Ground	12 V for transition time	
--	-------	--------	--------------------------	--

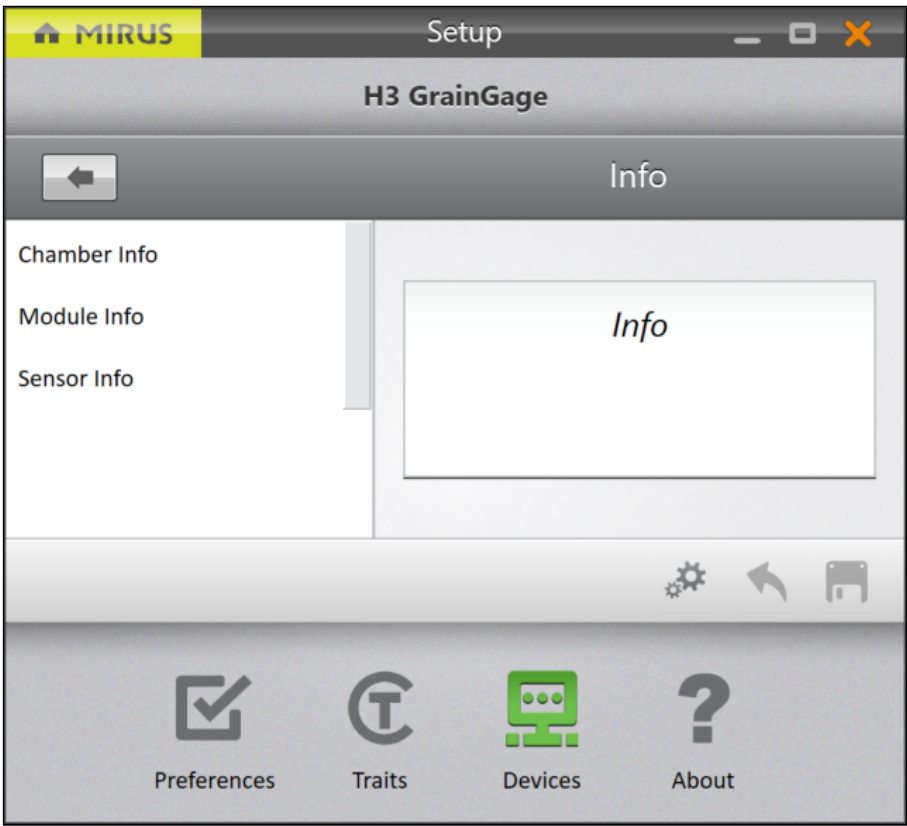
See Chapter 4: [Weight Calibration](#) and Chapter 5: [Chamber Calibration](#) for the details about the **Setup > H3 GrainGage > Calibration options**.

2.3.3 View GrainGage Info

On the **Setup > H3 GrainGage** screen,

1. Tap **Info**.

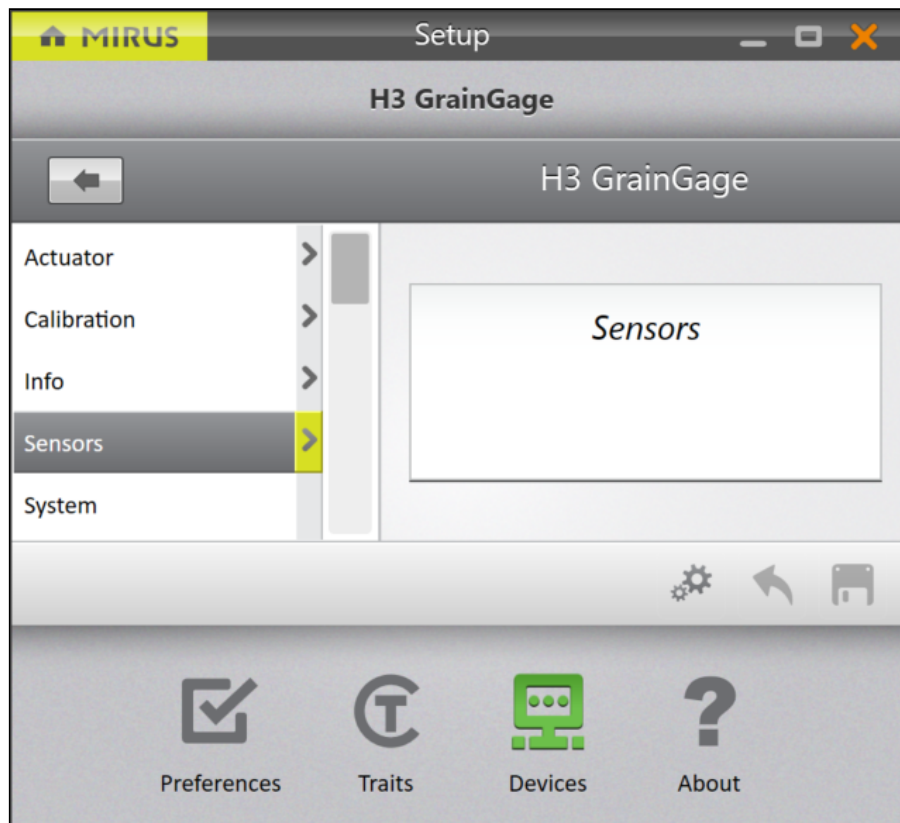
Note: Mirus opens the Info screen on which you can view Chamber, Module, and Sensor information for the GrainGage.



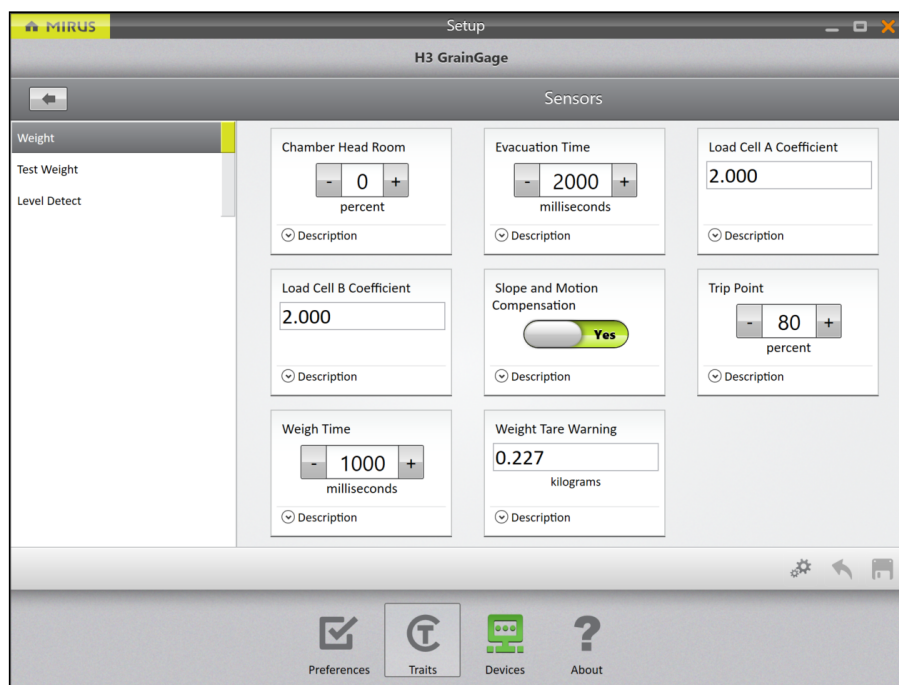
2.3.4 Configure Weight Sensors

On the **Setup > H3 GrainGage** screen,

1. Tap **Sensors > Weight**.



Note: Mirus opens the Weight Sensors Setup screen on which you can configure weigh bucket settings for the GrainGage.



The following table displays the typical preferred setting for each item on this screen.

Weight Sensors Settings		
Setup Parameter	Default Value	Description

Chamber Head Room	25%	The percentage of additional grain required to perform a moisture and test weight measurement or include that sub-cycles as part of the average moisture and test weight measurement. For example, if the chamber head room is set to 25% and the minimum weight threshold is 4 lb, then Mirus requires 5 lb to ensure that the test chamber is full and that the data will be accurate. If the full amount isn't reached (i.e., minimum weight threshold + chamber head room), Mirus doesn't record the moisture or test weight data, because it's not likely to be accurate. Mirus still collects the plot weight. If the amount required by Mirus isn't met on a sub-cycle, then that moisture and test weight measurement won't be included in calculating the average. If you are harvesting low yield grains, the chamber head room can be set as low as 15% without losing any accuracy.
Evacuation Time	2000 msec	The amount of time all the top and bottom gates remain open to allow for the evacuation of all grain from the weigh bucket. This setting overrides the open state time for the top and bottom gates. ⚠ CAUTION: Wetter grain or oil seeds may require longer evacuation times. Low-volume inserts will also require a longer evacuation time. If this setting is inaccurate, it may increase the weighing cycle time unnecessarily or cause the mixing of two plots.
Load Cell Coefficients	2.000	The default values for load cell coefficients are placeholders. These are custom values that are generated during weight calibration. They are used to convert millivolt readings from the load cells into pounds or kilograms. Do not adjust these manually.
Slope and Motion Compensation	Yes	This corrects weight errors resulting from movement and vibration as well as harvesting on a slope.
Trip Point	80%	The percentage of full bucket capacity at which a weight trip cycle will occur.
Weigh Time	1000 msec	The period over which weight readings are averaged. Although a shorter weigh time will shorten cycle

times, it may reduce the accuracy of the measurement.

Weight Tare Warning	0.500 lb (0.227 kg)	This is the threshold above which a tare warning is generated after weigh bucket evacuation.
---------------------	------------------------	--

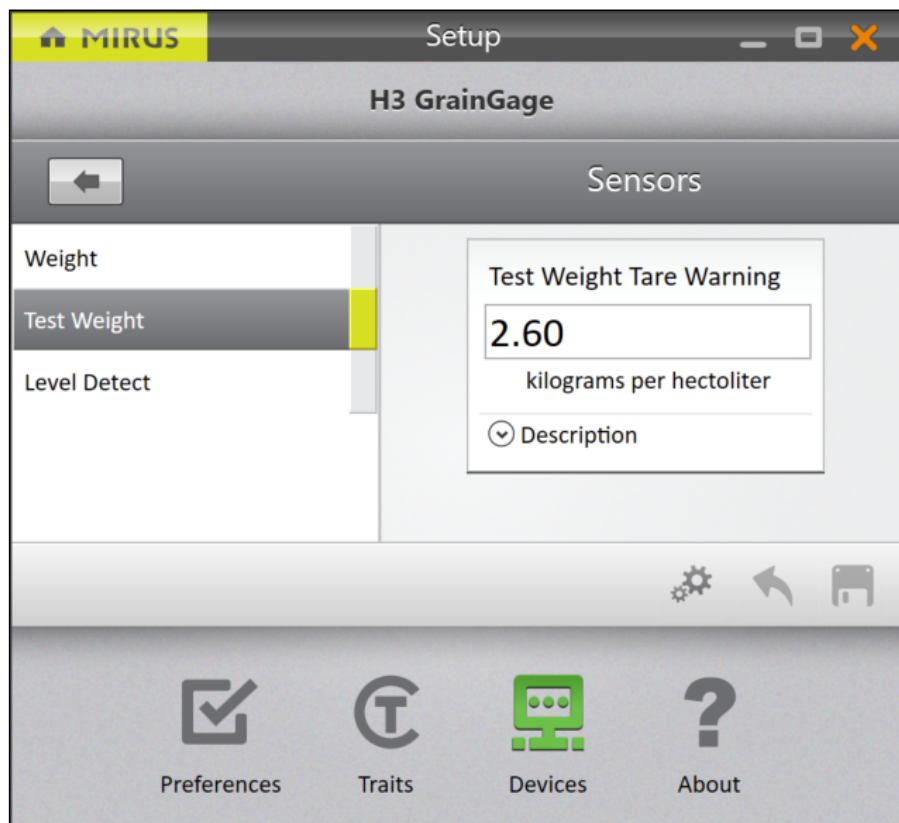
Note: Preconfigured values are default values based on generalized harvest conditions. They may not reflect the optimum settings for the harvest conditions for your particular climate, fields, or grains. Changing default values requires a certain level of experience. Please contact HarvestMaster Field Service Engineers when adjusting these settings. See [Contact a HarvestMaster Field Service Engineer](#).

2.3.5 Configure Test Weight Sensors

On the **Setup > H3 GrainGage > Sensors** screen,

1. Tap **Test Weight**.

Note: Mirus opens the Test Weight Sensor Setup screen on which you can configure test weight settings for the GrainGage.



Test Weight Sensor Settings

Setup Parameter	Default Value	Description
Test Weight Tare Warning	2.02 lb/bu 2.6 kg/hL	A tare warning is generated when a tare check indicates weight in the chamber is above this threshold.

Note: To edit other test weight settings, see [Calibrate Test Weight](#).

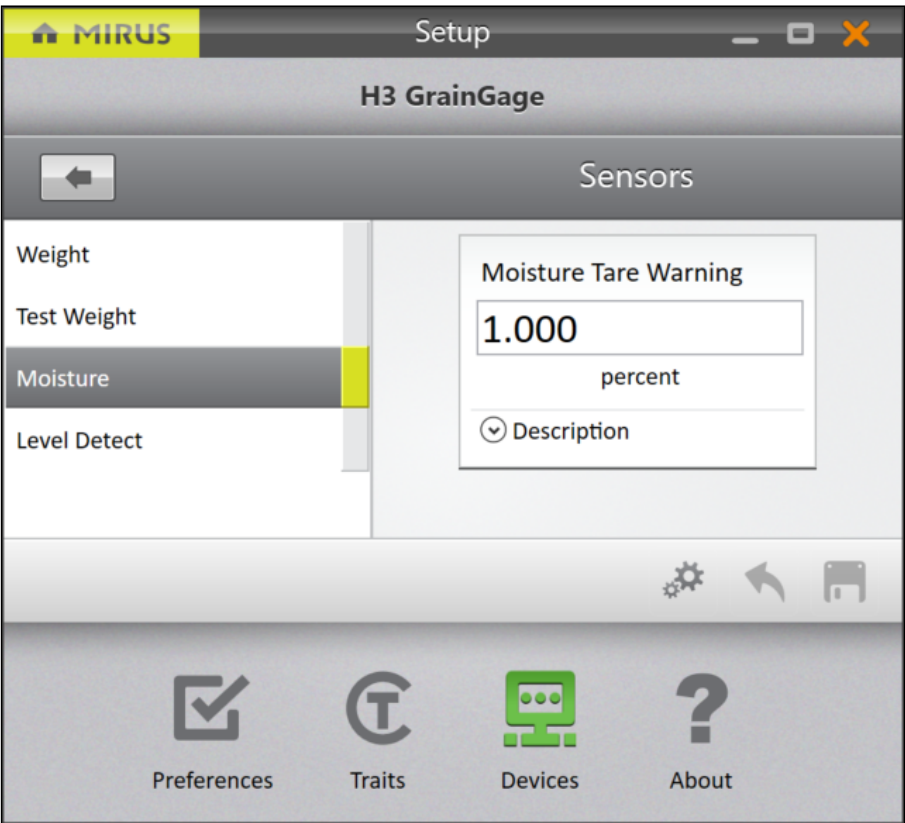
2.3.6 Configure Moisture Sensors

Note: This option is not available when using the SCIO sensor.

On the **Setup > H3 GrainGage > Sensors** screen,

1. Tap **Moisture**.

Note: Mirus opens the Moisture Sensor Setup screen where you can configure the moisture setting for the GrainGage.



Moisture Sensor Settings		
Setup Parameter	Default Value	Description
Moisture Tare Warning	1%	A tare warning is generated when a tare check indicates that the moisture is above this threshold.

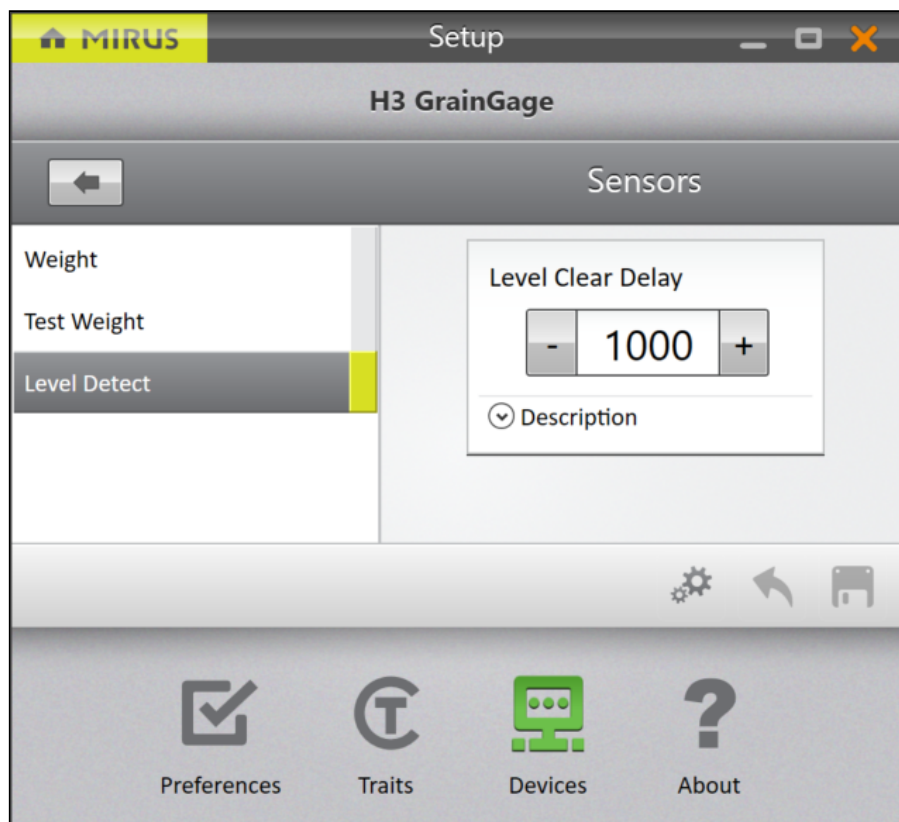
Note: To edit other moisture settings, see [M2.0 Moisture Model Recalibration](#).

2.3.7 Configure Overflow Sensor

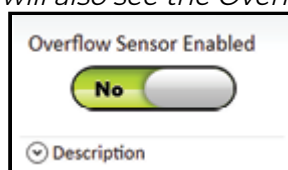
From the **Setup > H3 GrainGage > Sensors** screen.

1. Tap **Level Detect**.

Note: Mirus opens the Level Detect Sensors Setup screen on which you can configure the Level Clear Delay.



Note: Some Classic GrainGages mounted on Wintersteiger Quantum or Classic Plus combines are equipped with an overflow sensor that trips when grain is in close proximity. In that case you will also see the Overflow Sensor Enabled option here.



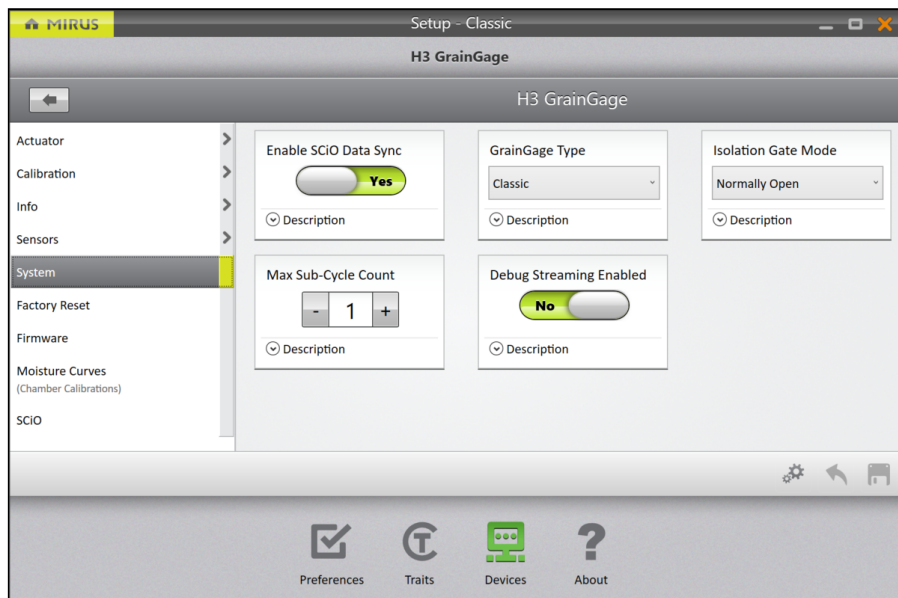
Level Detect Sensor Settings		
Setup Parameter	Default Value	Description
Overflow Sensor	Yes	Enables the sensor for use in overflow detection.

2.3.8 Configure the GrainGage System Settings

On the **Setup > H3 GrainGage** screen,

1. Tap **System**.

Note: Mirus opens the System Setup screen where you can configure settings for the GrainGage.



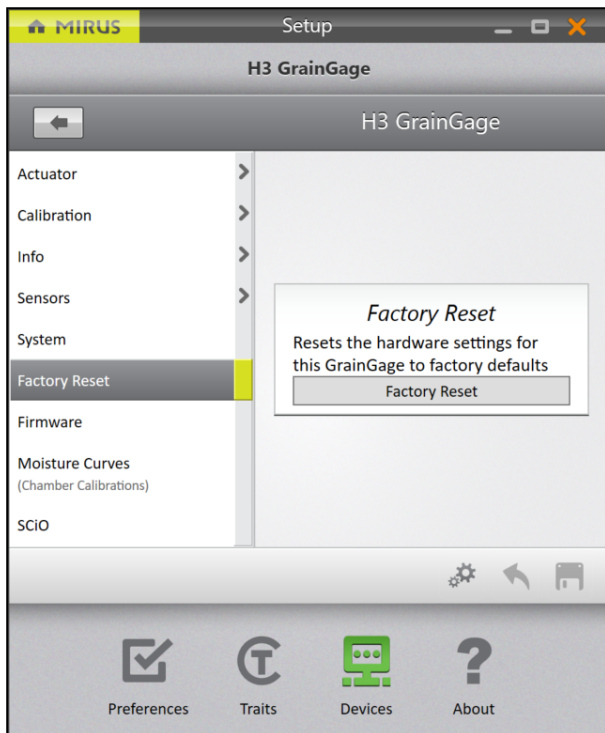
The following table displays the typical preferred setting for each item on this screen.

System Settings		
Item	Default Value	Description
Debug Streaming Enabled	Yes	This enables or disables debug streaming messages for the DSP module. HarvestMaster recommends leaving this enabled.
GrainGage Type	Classic	Designates which GrainGage type is connected to Mirus.
Isolation Gate Mode	Normally Open	Controls the initial state of the isolation gate.
Max Sub-Cycle Count	1	The maximum number of sub-cycles that will be run during a cycle if the minimum weight threshold continues to be satisfied.
Enable SCiO Data Sync	Yes	H3 SCiO scan data will be backed up to the cloud upon connecting to the internet.

2.3.9 Reset the GrainGage to Factory Settings

This option can be found on the **Setup > H3 GrainGage > Factory Reset** screen. Some of the settings can be saved and restored following a reset. See [Set up Mirus Preferences](#) for the details.

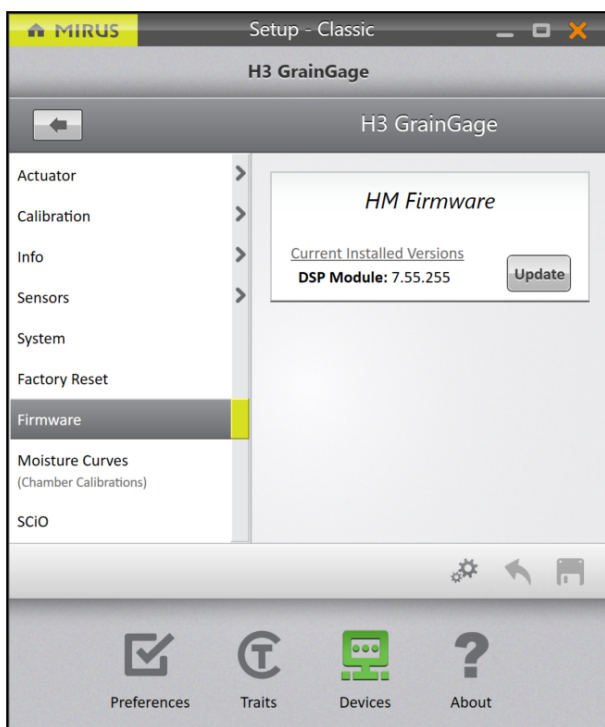
⚠ CAUTION: This cannot be undone! Resetting the GrainGage to factory defaults will clear all your settings, including actuator timers and weight calibrations. This should only be done in consultation with a HarvestMaster Field Service Engineer.



2.3.10 Update the GrainGage Firmware

This option can be found on the **Setup > H3 GrainGage > Firmware** screen.

As an operator, you are not likely to need this screen. When you install or update Mirus, the program will check for the latest firmware and update it automatically. The purpose of this screen is to help HarvestMaster Field Service Engineers during troubleshooting procedures.

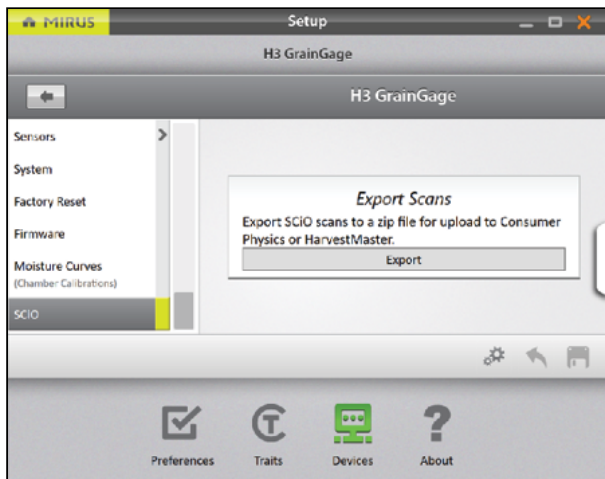


The moisture curve option is covered in detail in [Moisture Curve and Chamber Calibration Wizard](#).

2.3.11 Export SCiO Files

This option can be found on the **Setup > H3 GrainGage > SCiO** screen.

You can zip the raw scan files that could be used for post-processing here if needed.

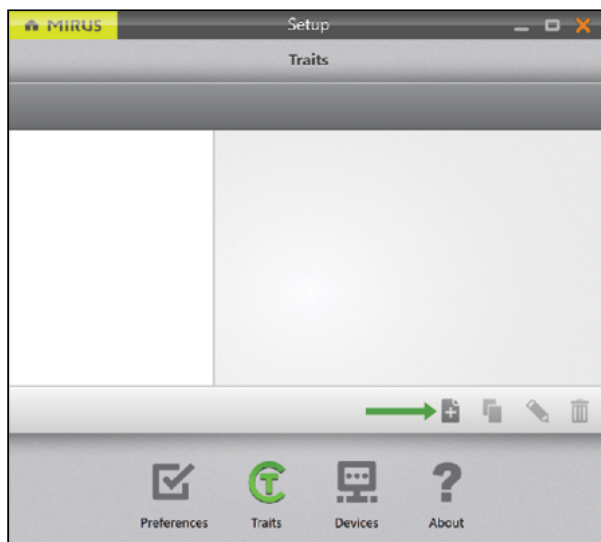


2.3.12 Create and Record Traits

This option can be found on the Setup screen.

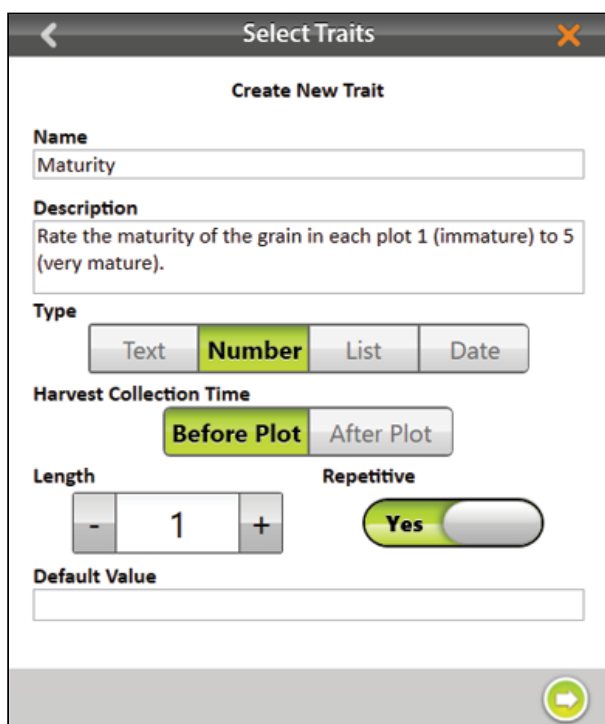
To create a new trait,

1. Tap the new icon .



2. Enter a **Name** and **Description** for the new trait.
3. Select the **Type** of trait.
4. Select when you want Mirus to prompt the operator to record the trait: **Before Plot** or **After Plot**.
5. Specify the **Length**, or number of characters allowed in the record field.
6. Indicate whether or not this trait is **Repetitive**.

7. Enter the **Default Value** (if needed).
8. Tap the next arrow  to save the trait.



Select Traits ✕

Create New Trait

Name
Maturity

Description
Rate the maturity of the grain in each plot 1 (immature) to 5 (very mature).

Type
Text **Number** List Date

Harvest Collection Time
Before Plot After Plot

Length
- 1 +

Repetitive
Yes

Default Value



The following table describes the settings for each item on this screen.

New Trait Settings	
Item	Description
Name	This is the name of the trait.
Description	This describes the type of data to be recorded within the trait.
Type	- Text: A text trait allows the user to record text relative to the individual plot. You can set a character limit (Length) and/or a Default Value for quick selection. - Number: A number trait allows the user to record a number (e.g., a score) relative to an individual plot. You can set a character limit (Length) and/or a Default Value for quick selection. - List: A list trait allows the user to select a value from a list of options. The list is created by entering the values in the Default Value field. To add multiple values, tap the plus icon  on the right side of the window. This feature functions best when selecting from no more than five different trait values. - Date: A date trait records dates. The Default Value is the current date, but a user may select a different date.

Harvest Collection Time	Specifies whether trait data will be collected before or after the plot is harvested.
-------------------------	---

Length	This setting helps Mirus know when to move on to the next trait. After the allotted number of characters is entered, Mirus moves on automatically so that the operator doesn't need to press enter.
--------	---

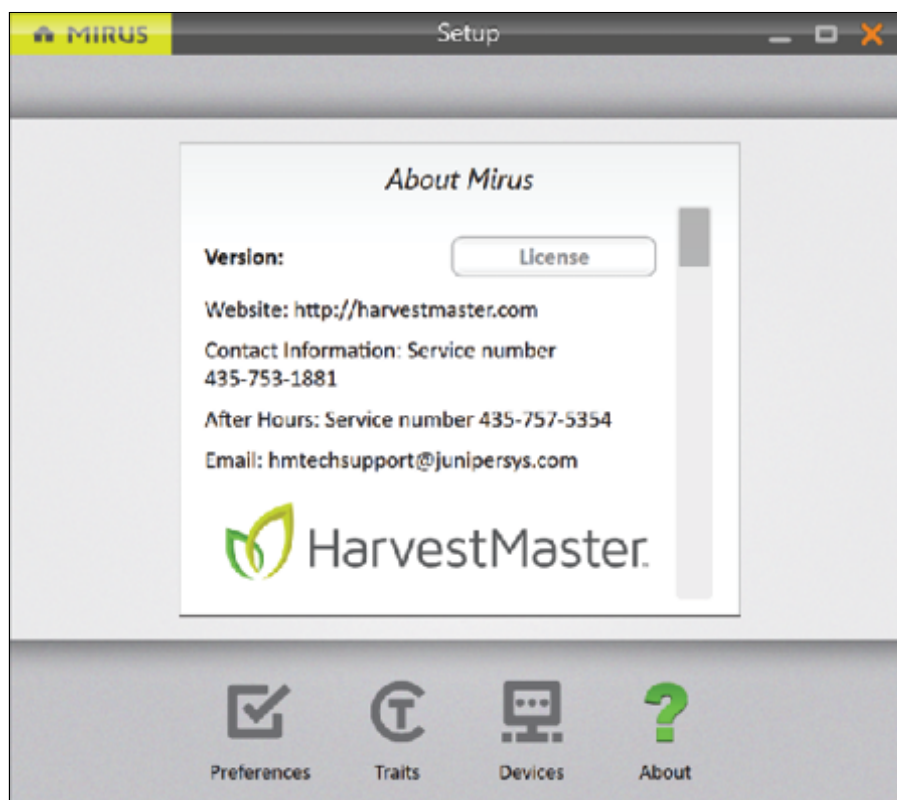
Repetitive	Selecting Yes indicates data for that trait will be collected multiple times on different days. For example, if you wanted to rate your grain for disease three times a year, you would have a repetitive disease trait.
------------	--

Default Value	This is the most common or most expected value for this trait. Mirus will automatically populate the record field with this value to save the operator time. The operator needs only to press or tap Enter. If the value is different from the default value, the operator can enter the new value and press Enter. If the maximum number of characters within the length of the trait is met, Mirus will advance automatically.
---------------	--

2.3.13 View Information About Mirus

This option can be viewed on the **Setup** > **About** screen.

This screen shows information about Mirus, including the version number, license information, website, and contact information.



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CHAPTER 3

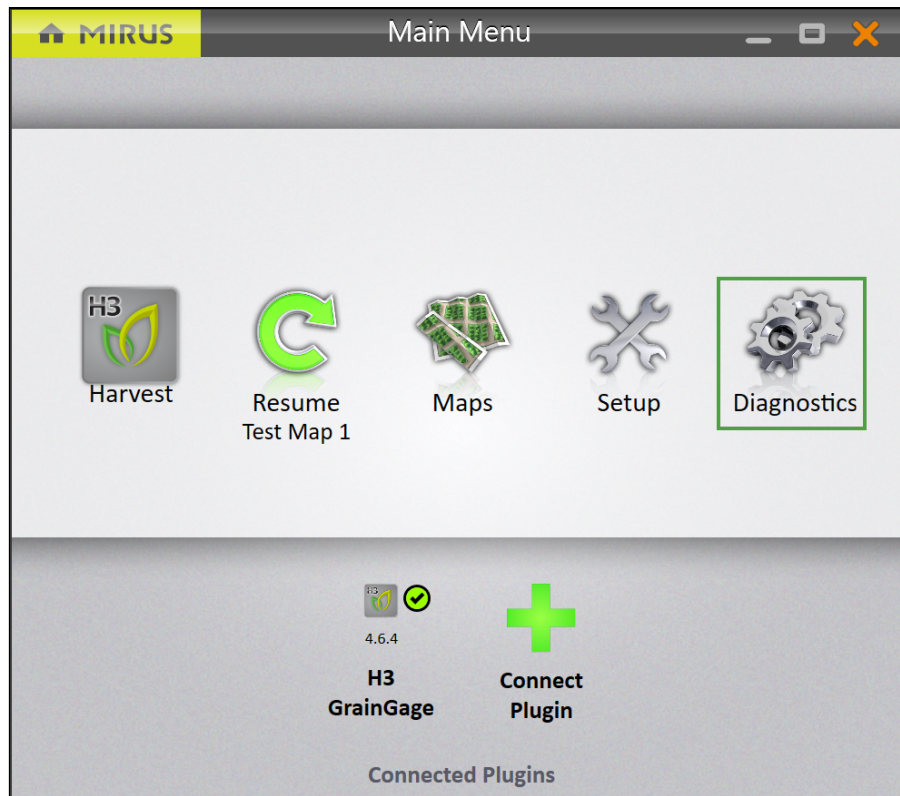
GrainGage Diagnostics & Alerts

3 GrainGage Diagnostics and Alerts

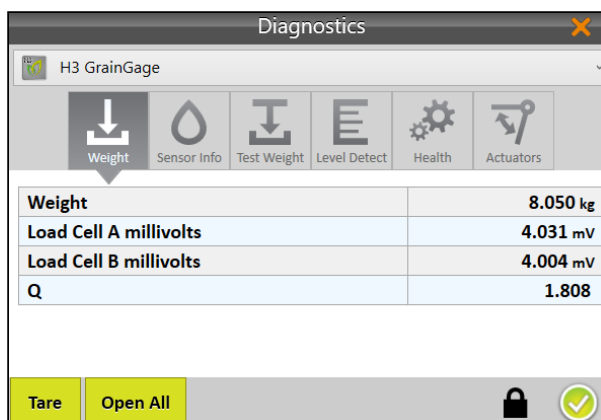
3.1 Diagnostics Dialog Box

On the Home screen,

1. Tap **Diagnostics**.



Mirus opens the Diagnostics box.



The buttons at the bottom of the Diagnostics box are the same for all tabs.

- **Tare** Allows the operator to tare all load cells and the EM moisture sensor in the GrainGage.
- **Open All** Allows the operator to open and close all gates in the GrainGage and allows the grain to flow straight through.

-  Provides additional information for each screen (primarily for HarvestMaster Field Service Engineers).

Each tab provides additional functionality, as detailed below.

*Note: Tapping **Tare** in a Diagnostics tab tares the load cells and EM Moisture sensor. Mirus does not allow taring of individual sensors.*

The icon panel across the top of the Diagnostics dialog box allows you to access each diagnostic category. All Diagnostics screens show the **Tare** and **Open All** (or **Close All**) buttons, as explained in the following table.

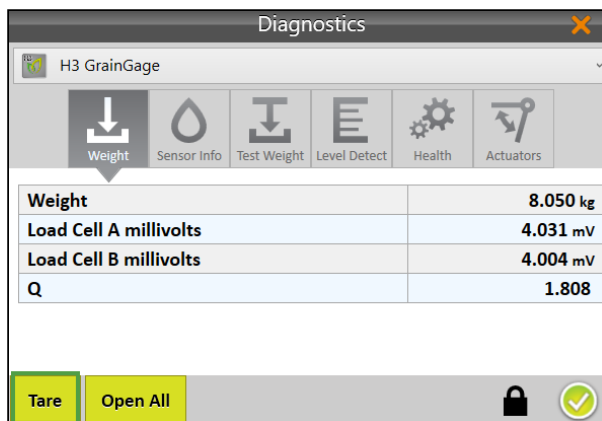
Diagnostics Tare and Open and Close All Gates	
Button	Description
Tare	Use the Tare button to zero all load cells and the moisture sensor. The tare process is as follows: ▪ Check the GrainGage and make sure it is free of grain or debris. ▪ Tap Tare. ▪ The gates open and clear the GrainGage. ▪ The gates close. ▪ Sensor readings average over 4 seconds. ▪ Mirus then uses that average to establish the zero weight readings for the empty weigh bucket and test chamber. ▪ Mirus also resets the EM moisture and level sensor readings to zero.
Open All	Use the Open All button to open all of the gates. With all of the gates open, the grain flows straight through the GrainGage unimpeded, and no data is collected or recorded. In this mode, the button changes to Close All. Some machines can divert the air directly to the grain tank before it reaches the GrainGage. It is best to completely bypass the GrainGage rather than opening all the gates, when this is an option.
Close All	Use the Close All button to put the GrainGage into Harvest Mode and return to measuring the grain and recording data.

3.1.1 Tare the GrainGage

To tare the GrainGage,

1. Turn on the combine with the throttle turned up, and then turn on the thresher.
2. In the Diagnostics box, tap **Tare**.
3. After the tare is complete, tap the check icon  to exit Diagnostics.

Note: HarvestMaster recommends that you tare the GrainGage with the combine turned on and the thresher running. Taring should be the last thing you do before you start to harvest. For improved data quality, do not tare within a field trial.

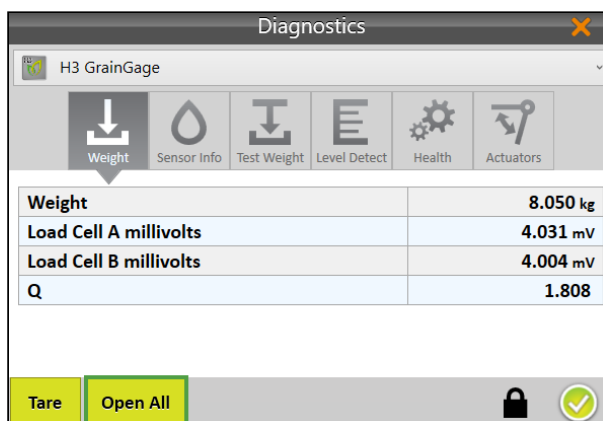


3.1.2 Open/Close All

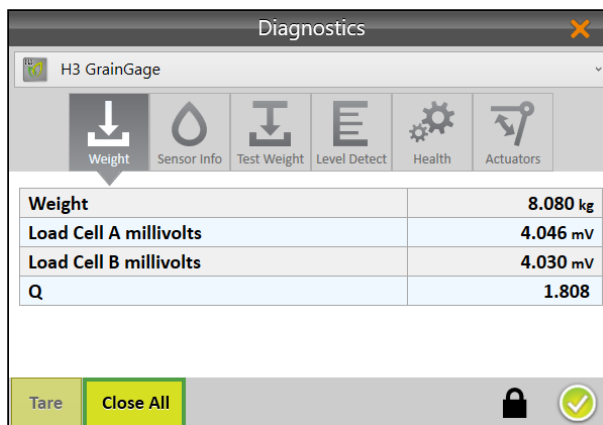
In the Diagnostics box,

1. In the Diagnostics box, tap **Open All**.

Note: No data is collected when all of the gates of the GrainGage are open.



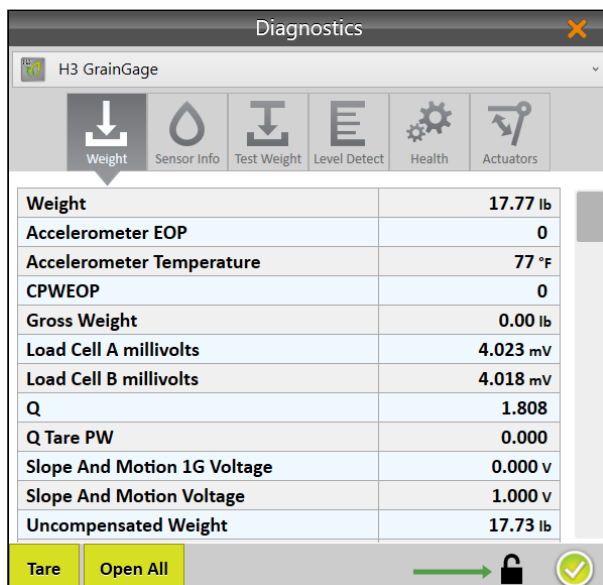
2. Harvest border plots.
All gates are in the open position.
3. Tap **Close All** to begin collecting data again.
4. Tap the check icon  to exit Diagnostics.
All gates are in the correct position for Harvest mode.



3.1.3 Weight Diagnostics

To check the weight diagnostics,

1. Make sure the combine is off.
2. Open the Diagnostics screen and ensure the Weight tab is selected.
3. Open the lock icon.
4. Watch the values on the Weight tab while you have someone lift or push on the plot bucket and then release it.



5. Check the following values.

Weight Diagnostics		
Field	Value	Description
Weight	0.00 +/- 0.02	Shows the weight of the contents in the weigh bucket. Weight after Tare normally reads 0.00 +/- 0.02.

		To change the units of measure, see Set Preferred Units of Measure .
Load Cell A & B millivolts	+/- 0.003 mV	These readings are for the two load cells that measure plot weight. The millivolt readings vary linearly with weight added. The empty weigh bucket causes the load cells to read between 3.100 and 3.800 mV.
Q	1.00 +/- 0.001	This multiplier corrects the weight measurement based on the slope and motion of the weighing platform. When Slope and Motion Compensation is disabled, Q is 1.000. When Slope and Motion Compensation is enabled, Q should be 1.000 +/- .05 (depending on the slope the combine is on or intensity of vibrations/movement). If the Q value is off, see Slope and Motion Calibration.
Accelerometer EOP	< 10	The Accelerometer EOP should be less than 10 with the combine off.
Compensated EOP (CPWEOP)	< 10	The Compensated EOP should be less than 10 with the combine off.
Uncompensated EOP (UPWEOP)	< 10	The Uncompensated EOP should be less than 10 with the combine off.
Slope and Motion Voltage	.900 to 1.00 V	

6. Start the combine. Re-check the following values.

Weight Diagnostics		
Field	Value	Description
Q	1.000 +/- 0.001	The Q value reads 1.000 +/- 0.001 with the combine on and the head and separator running.
Accelerometer EOP	< 50	The Accelerometer EOP is less than 50 with the combine on and thresher running at full throttle.
Compensated EOP (CPWEOP)	< 50	The Compensated EOP is less than 50 with the combine on the thresher running.

3.1.4 GrainGage Sensor Info Diagnostics

To check the moisture diagnostics for the H3 GrainGage,

1. Make sure the combine is off.
2. Open the Diagnostics screen and tap **Sensor Info**.

The information displayed will be specific to the sensor you are using.

EM Sensor

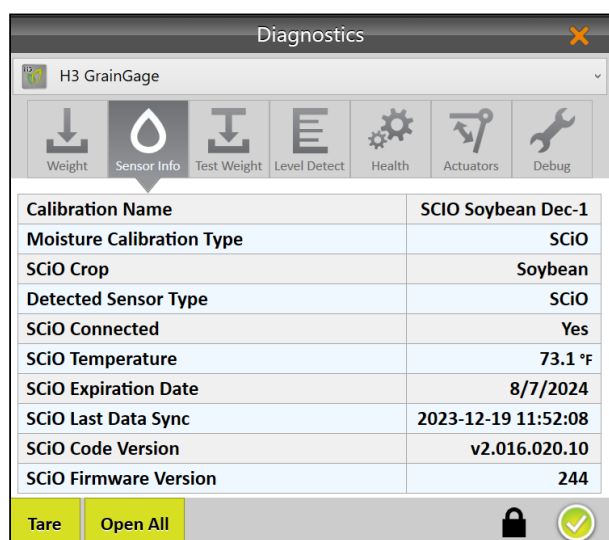
Diagnostics	
H3 GrainGage	
Weight	Sensor Info
Test Weight	Level Detect
Health	Actuators
Moisture	0.00 %
Calibration Name	m2 wheat
Moisture Calibration Type	M2
Moisture Voltage	0.000 v
Absolute Moisture Voltage	3.610 v
Detected Sensor Type	EM
EM Frequency	1.8891 Mhz
EM Voltage	2080 mV
Grain Model	Wheat
Moisture Probe Temperature	22.7 °C
Supply Voltage	12.965 v
Tare	Open All

EM Sensor Info Diagnostics		
Field	Value	Description
Moisture		This is the moisture measurement for grain in the test weight chamber.
Calibration Name		This is the name of the grain moisture curve that is applied. It is typical to have a moisture curve for each type of grain being harvested (for example, corn, wheat, soybeans, and so on).
Moisture Calibration Type		This displays the type of the active moisture calibration—EM or M2.0. If the M2.0 calibration is active the grain type is displayed.
Moisture Voltage		This is a relative voltage reading that is calculated based on the EM sensor reading and empty chamber voltage. This voltage is part of moisture

curve calculations. It can be used to tune or generate a new EM moisture curve.

Absolute Moisture Voltage		This is the raw moisture sensor reading without any offset applied from a moisture curve. This is primarily used for maintenance and troubleshooting.
EM Frequency	3.5 to 4.1 MHz	This is a basic measure used for calculating grain moisture. This value is typically between 3.5 and 4.1 MHz for an empty chamber.
EM Voltage	1.5 to 2.0 V	This is a basic measure used for calculating grain moisture. This value is typically between 1.5 and 2.0 V for an empty chamber.
Moisture Probe Temperature	3 to 5° C higher than ambient air temperature	This temperature is measured in Celsius by the moisture probe. Since the sensed signal from moist grain changes with temperature, the temperature measurement is used to apply a correction in calculating grain moisture.
Supply Voltage	11 to 16 V	The amount of supply voltage the moisture sensor is receiving.

SCiO sensor



SCiO Sensor Info Diagnostics

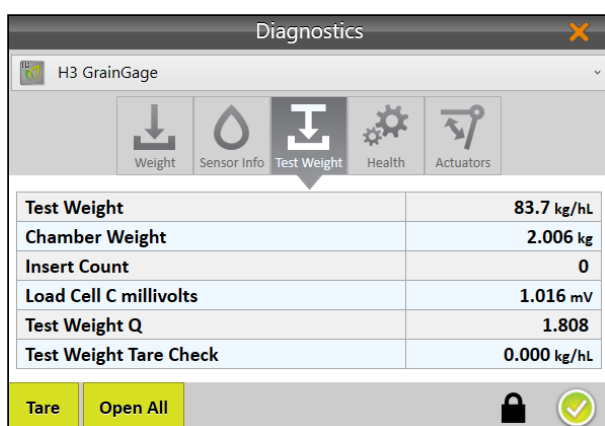
Field	Description
-------	-------------

Calibration Name	The name of the Mirus calibration file in use.
Moisture Calibration Type	The type of the active moisture calibration file.
SCiO Crop	The selected crop of the current calibration file (moisture curve) which was chosen during that file's creation.
Detected Sensor Type	The connected sensor. An H3 can have either a SCiO Sensor or an EM Sensor connected.
SCiO Connected	This shows if the communication with the SCiO sensor is successful.
SCiO Temperature	The sensor temperature.
SCiO Expiration Date	This is the date the SCiO Code Version expires. After this date a new version must be installed or no SCiO data can be collected.
SCiO Last Data Sync	This is the date and time that data from the SCiO Sensor was last synced with Mirus and uploaded to the SCiO cloud (if enabled).
SCiO Code Version	The SCiO sensor calibration program associated with the specific SCiO sensor currently in use.
SCiO Firmware Version	The version of SCiO sensor firmware currently in use.

3.1.5 Test Weight Diagnostics

To check the test weight diagnostics,

1. Make sure the combine is off.
2. Open the Diagnostics screen and tap **Test Weight**.



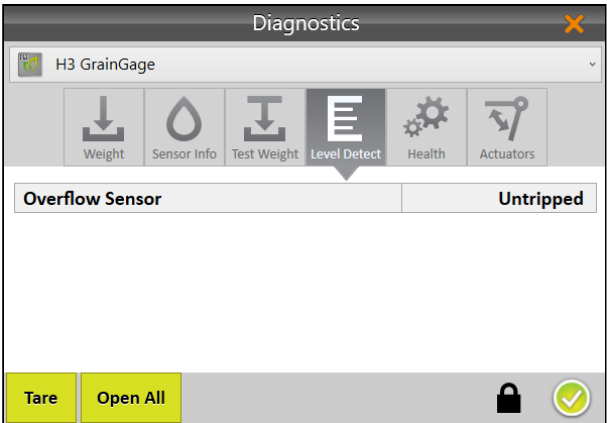
- Open the lock icon to view the following values.

Test Weight Diagnostics		
Field	Value	Description
Test Weight		Real-time test weight of grain in the test chamber.
Chamber Weight	0.00 +/- 0.01 lb (.004 kg)	Real-time weight of grain in the chamber. This value does not include the weight of the chamber.
Insert Count		The number of inserts that have been set.
Load Cell C millivolts	1.400 to 1.900 mV	The live operating voltage of the test weight load cell.
Test Weight Q		This multiplier corrects the test weight measurement based on the slope and motion of the weighing platform.
Test Weight Tare Check		Test weight value at the time the system last performed a tare check.
Compensated test weight EOP (CTWEOP)	< 10	The compensated test weight should be less than 10 with the combine off.
Uncompensated test weight EOP (UTWEOP)	< 10	The uncompensated test weight should be less than 10 with the combine off.

- Start the combine and run the thresher.
- Ensure Compensated Test Weight EOP (CTWEOP) is less than 50.

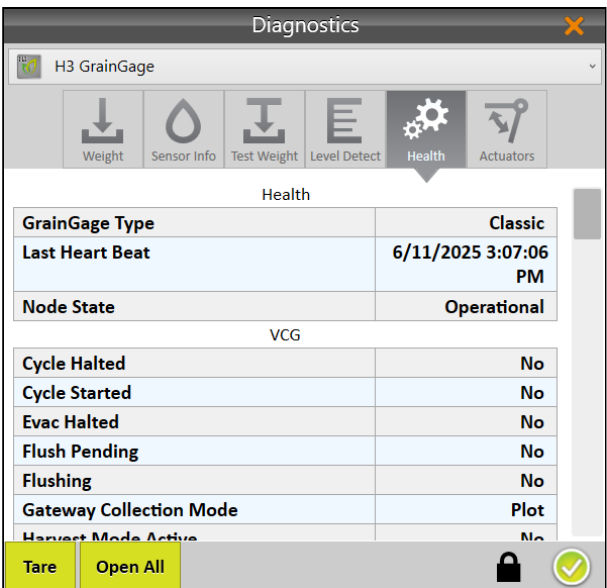
3.1.6 Level Detect Diagnostics

On the Level Detect Diagnostics screen, Mirus displays the status of the Overflow Sensor. It should be untripped when the weigh bucket is empty. When the overflow sensor is disabled, the Diagnostics box will show the overflow sensor as untripped, and the status will not change.



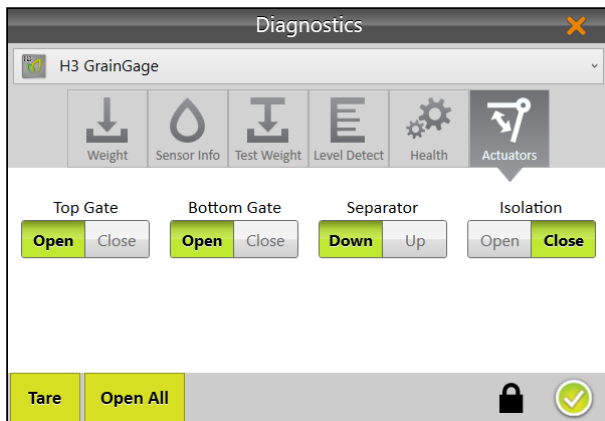
3.1.7 Health Diagnostics

The Health Diagnostics screen is used by HarvestMaster Field Service Engineers.



3.1.8 Actuators Diagnostics

Use the Actuators Diagnostics screen to manually test the actuators controlling all gates connected to the GrainGage.



To check the actuators,

1. Under Top Gate, tap **Open** and then **Close**.
2. Under Bottom Gate, tap **Open** and then **Close**.
3. Under Separator, tap **Up** and then **Down**.
4. Under Isolation, tap **Open** and then **Close**.

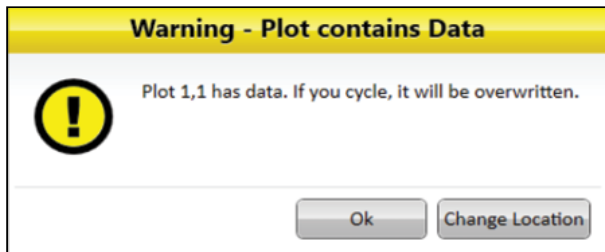
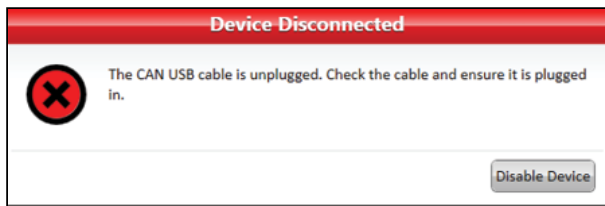
For more information about actuators, see [Configure Actuators](#).

3.2 Alerts

Mirus uses three categories of user messages, distinguishable by the icon and color used with the message.

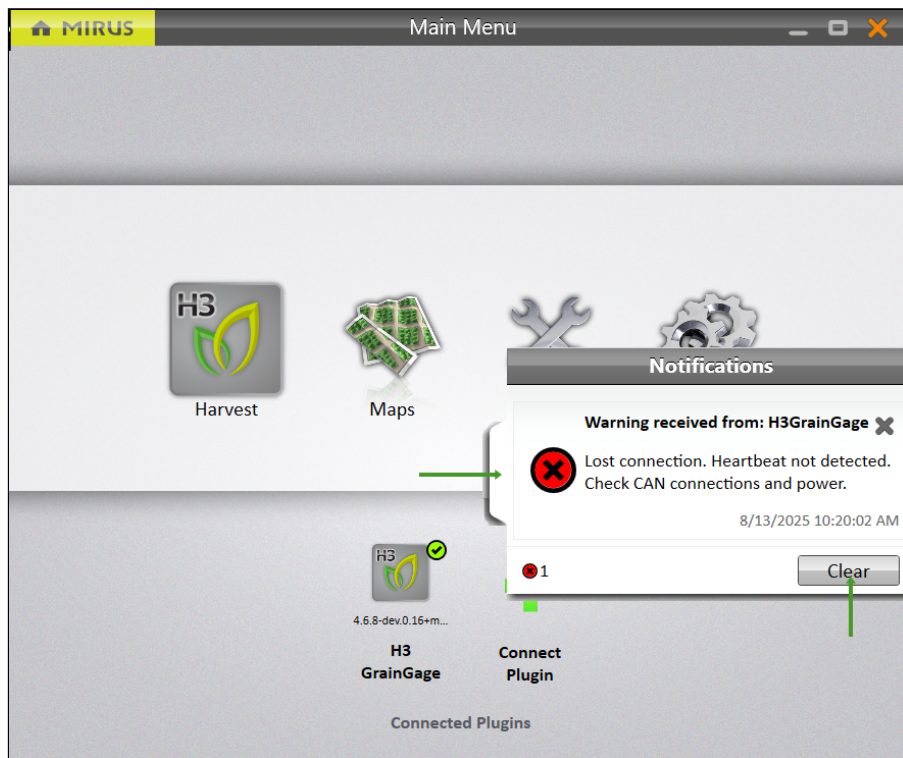
Mirus Alerts		
Icon	Category	Description
	Error	An error message describes a problem that prevents the user or GrainGage from completing a task. The problem could cause erroneous measurements, data corruption, data loss, or some other system malfunction.
	Warning	A warning message provides cautionary information.
	Confirmation	A confirmation message provides status information about the changing nature of an activity. These messages provide information to explain that the GrainGage is operating as expected.

Messages requiring action appear in a dialog box. Tap the button to acknowledge the message or choose an option. The images below display examples of these messages.



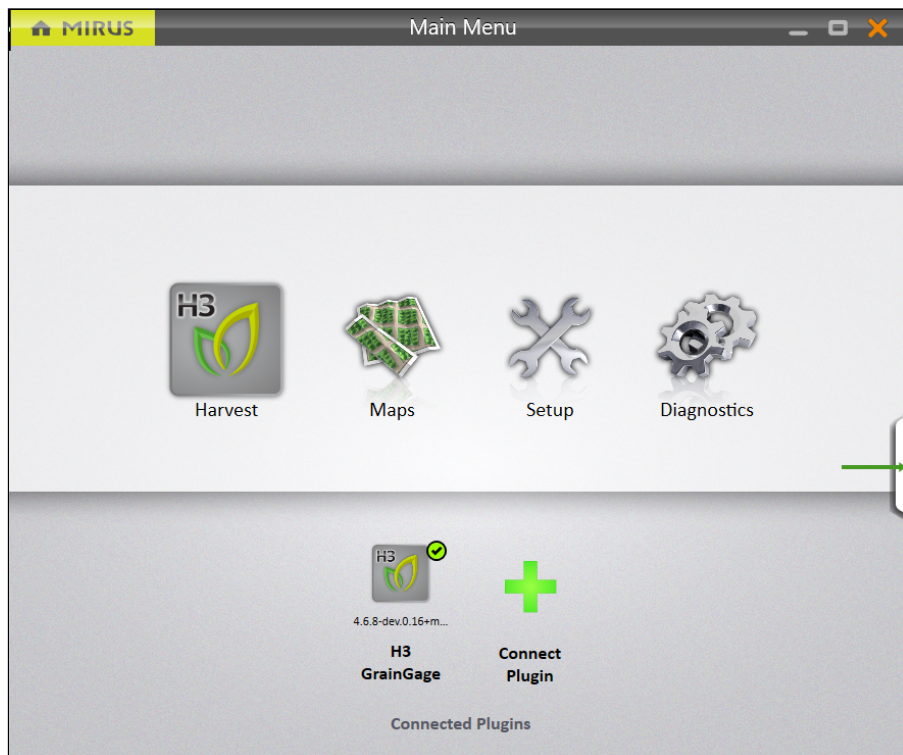
Other messages appear as notifications that pop out from the right side of the window.

- Tap the white tab to hide the message.
- Tap the X or **Clear** to clear it.
- Do nothing and Mirus will automatically hide the message.



Messages that have been hidden can be viewed again by clicking on the notifications tab on the right edge of the window.

This tab is only visible if there are messages, and it disappears when there are no messages or when all messages have been cleared. Messages that have been cleared cannot be restored.



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CHAPTER 4

Weight Calibration

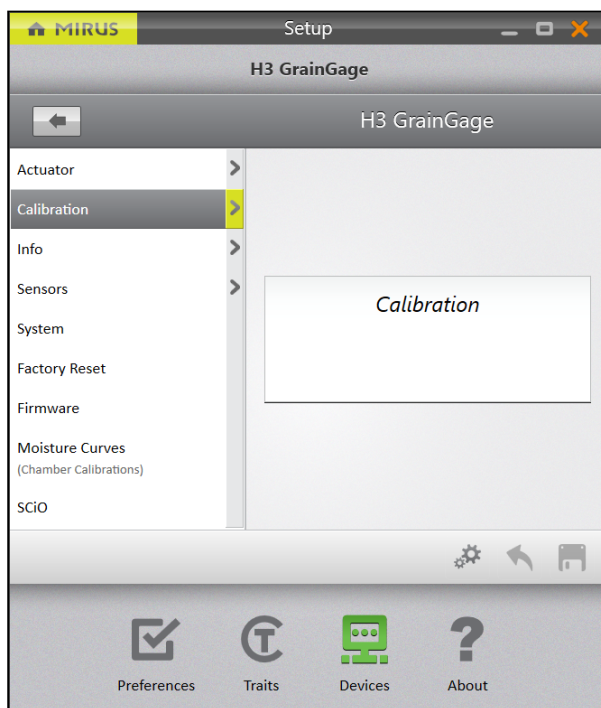
4 Weight Calibration

4.1 Slope and Motion Calibration

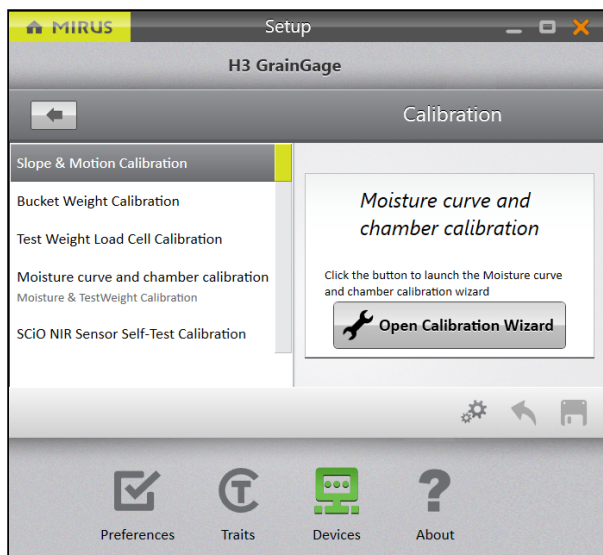
Slope and motion calibration establishes the 1G voltage for the accelerometer inside the GrainGage. This calibration is critical for good weight measurements on the moving combine. It should not need to be calibrated more than once a year.

To calibrate the slope and motion,

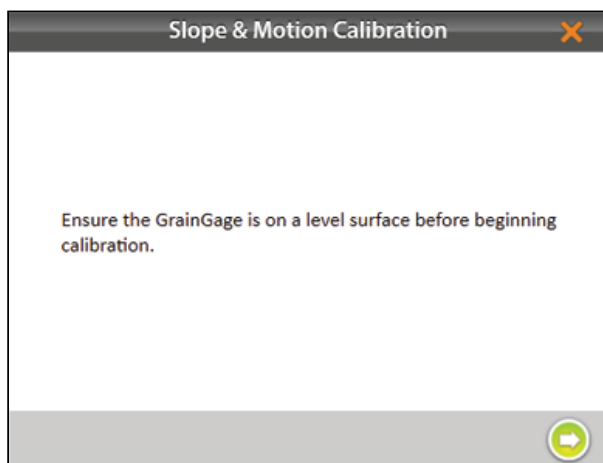
1. Park the combine on a level surface.
2. Shut off the engine and keep the GrainGage powered on.
3. Go to **Home > Setup > H3 GrainGage**.
4. Tap **Calibration**.



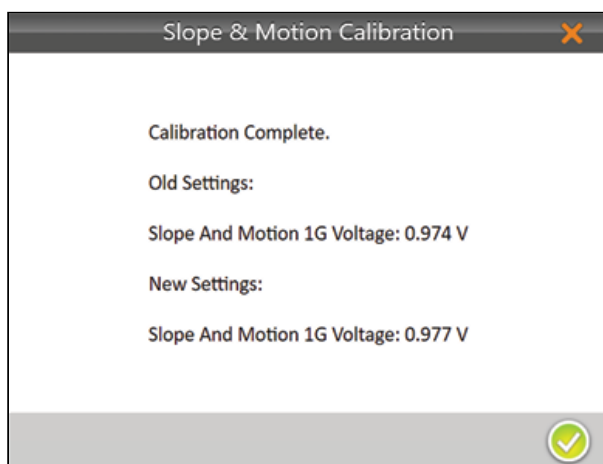
5. Tap **Slope & Motion Calibration**.
6. Tap **Open Calibration Wizard**.



7. Tap the next arrow ➡ to initiate the calibration.

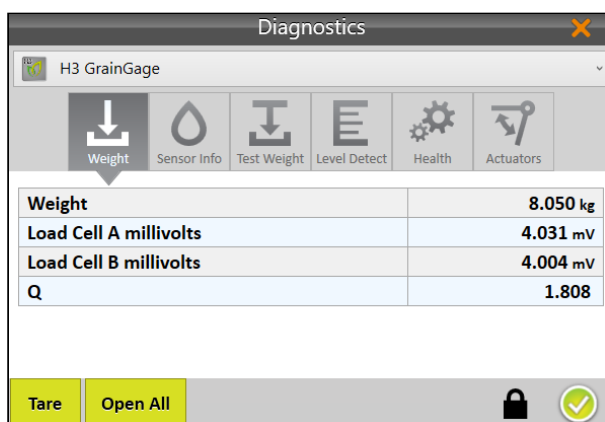


8. Tap the check icon ✓ to apply the new slope and motion settings.
Note: A typical 1G voltage should be in the range of .950 and 1.0 volts.



9. Tap the gear icon ⚙ below the calibration wizard to open Diagnostics.

10. Verify that slope and motion compensation is working and has been enabled by checking the Q value. It should be 1.000 +/- .05 with the machine running. The Q value will change depending on the machine vibration.
11. Tap the check icon  to close Diagnostics.



4.2 Weigh Bucket Load Cell Calibration

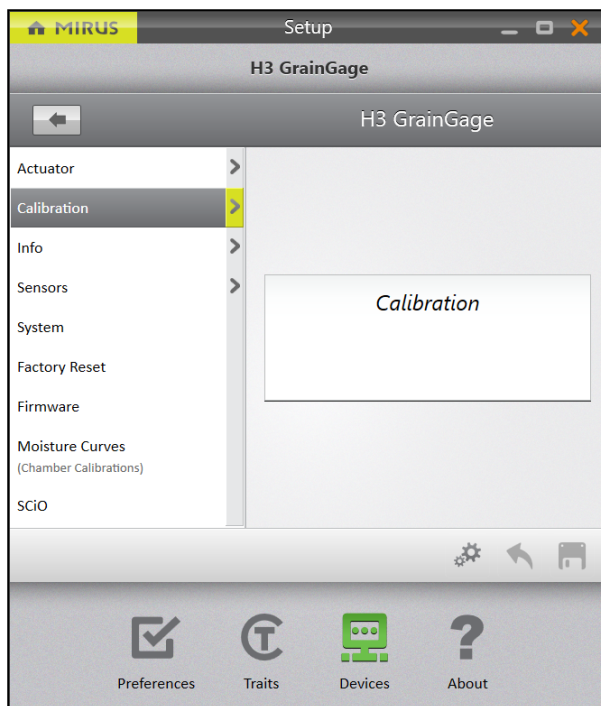
Weigh bucket calibration ensures the accuracy of the GrainGage's weight calculations. This calibration should be done on initial setup and should not need to be calibrated again unless repairs are needed on the GrainGage weigh system.

4.2.1 Calibrate Weigh Bucket

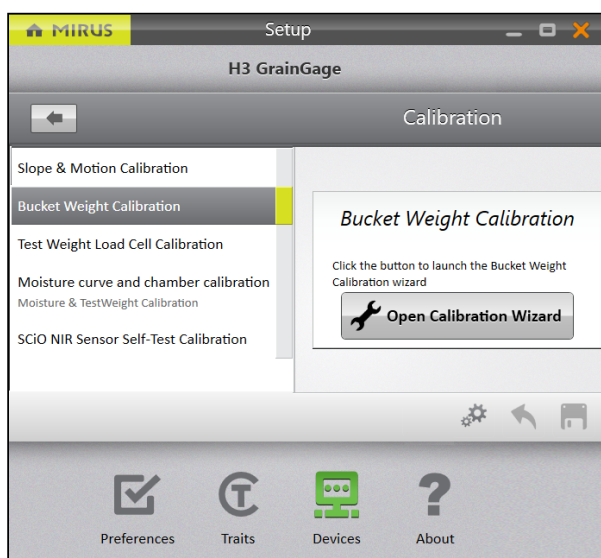
Use the weight calibration wizard and the larger weight (11 lb/5 kg) included with the GrainGage to calibrate the weigh bucket load cells.

To calibrate the weigh bucket,

1. Park the combine on a level surface.
2. Shut off the engine and keep the GrainGage powered on.
3. Check that the weigh bucket is empty.
4. From **Home > Setup > H3 GrainGage**, tap **Calibration**.
5. Tap **Calibration**.



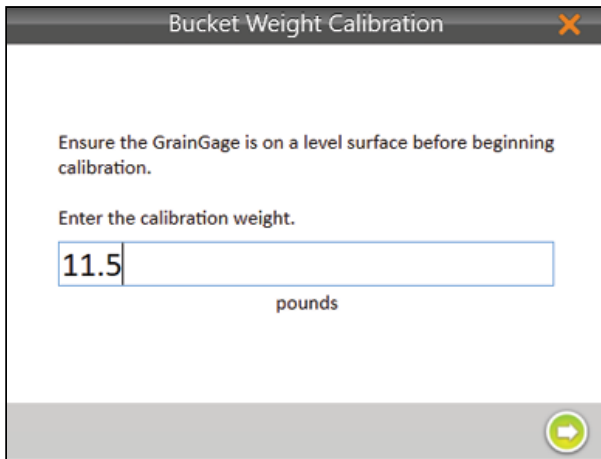
6. Tap **Bucket Weight Calibration**.
7. Tap **Open Calibration Wizard**.



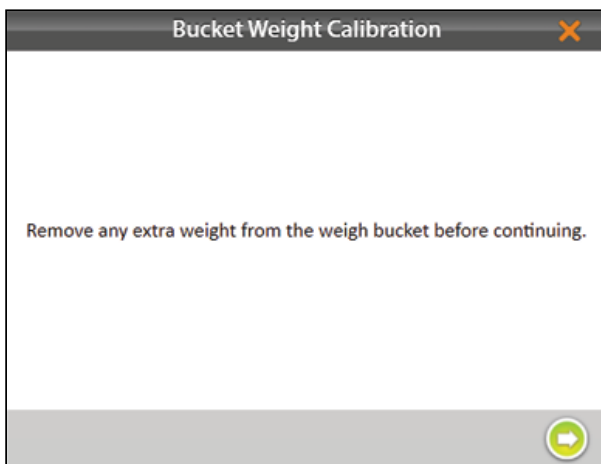
Follow the on-screen instructions as shown below.

8. Find the value stamped on the side of the weight.
9. Enter that value in the field.

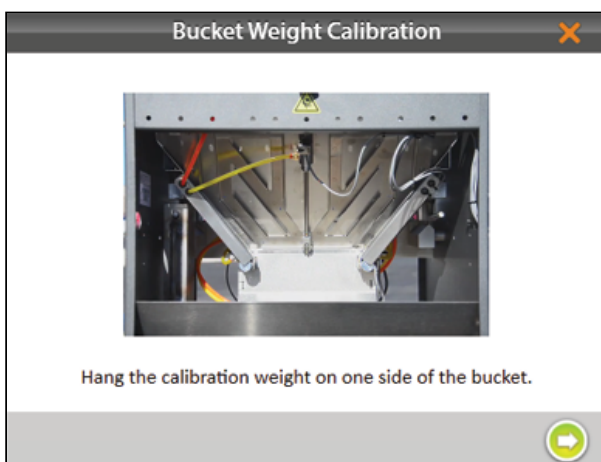
10. Tap the next arrow  to initiate the calibration.



11. Check for and remove any extra weight from the weigh bucket.

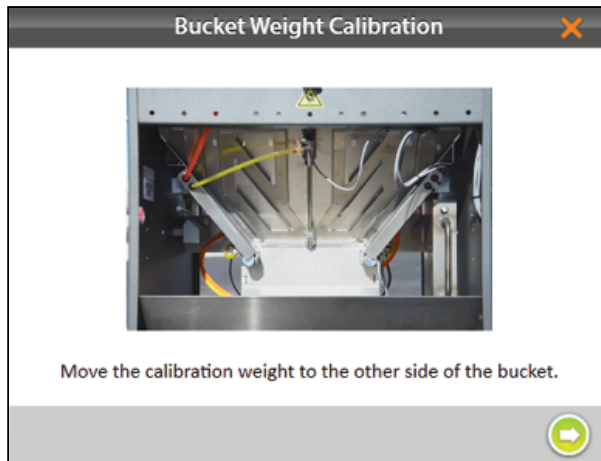


12. When prompted, hang the weight as directed.
13. Tap the next arrow .



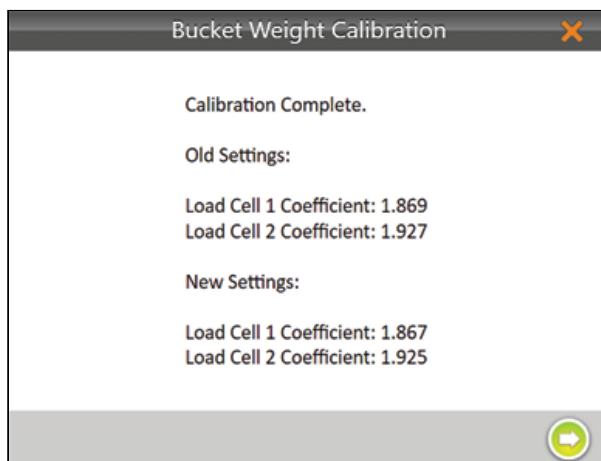
14. When prompted, move and hang the weight on the other side as directed.

15. Tap the next arrow .

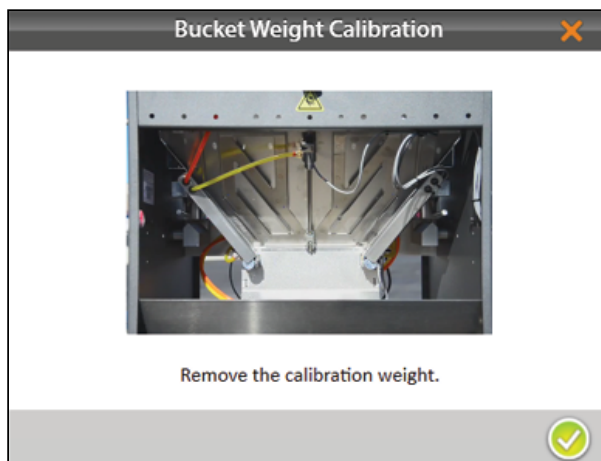


Mirus displays the old and new load cell coefficients.
Note: Typical calibration coefficients should be 1.9 +/- .2.

16. Tap the next arrow .



17. Remove the calibration weight.



18. Tap the the check icon  to finish. The system will tare and the wizard will close.

4.2.2 Check Weigh Bucket Calibration

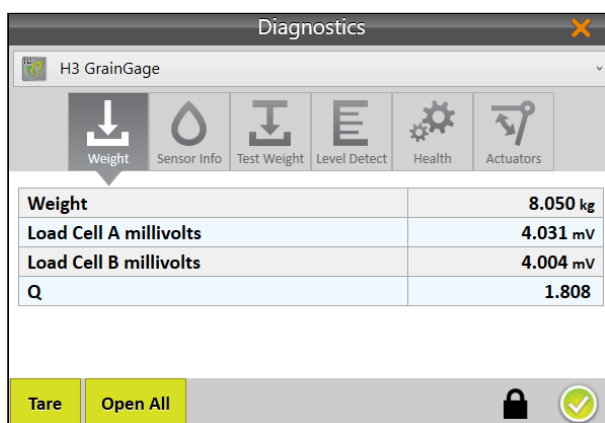
Weigh bucket calibration is stable. It rarely changes or loses accuracy. However, because the consequences of poor calibration can be devastating to your research data, HarvestMaster highly recommends checking the weigh bucket calibration every year before the harvest season begins, as well as every day before harvest. This can be done on the Weight Diagnostics screen.

To check the weigh bucket calibration,

1. After calibrating the weigh bucket, tap the gear icon  below the calibration wizard to open **Diagnostics > Weight**.
2. Hang the calibration weight from each of the weight hangers.
3. The Diagnostics screen should report weight readings that are very close to the value stamped on the calibration weight. If it's not within .05 lb (23 g) when the combine and thresher are on and .02 lb (9 g) when the combine is off, HarvestMaster recommends a new weight calibration.

Note: If the weight readings continue to be off, you may have a bad load cell or something interfering with the bucket weight.

4. Tap the check icon  to close the Diagnostics box.



4.3 Test Weight Load Cell Calibration

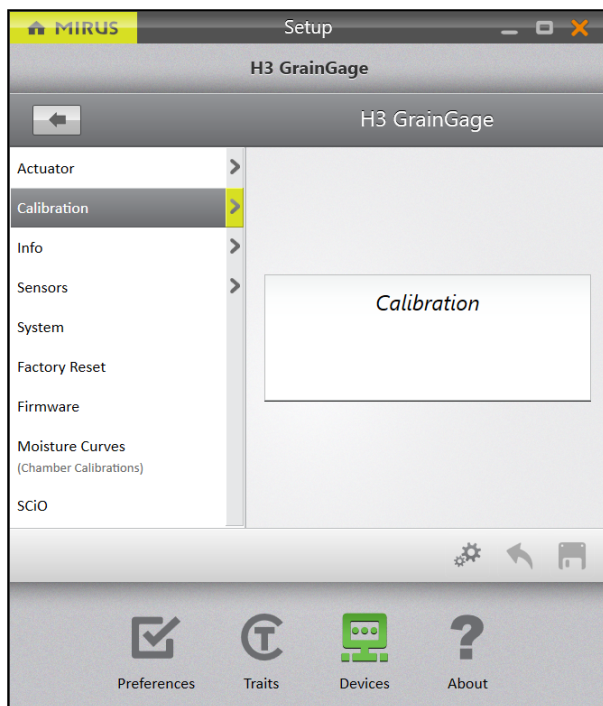
Test weight load cell calibration ensures the accuracy of the GrainGage's weight calculations. This calibration should be done on initial setup and should not need to be calibrated again unless repairs are needed on the GrainGage weigh system.

4.3.1 Calibrate Test Weight

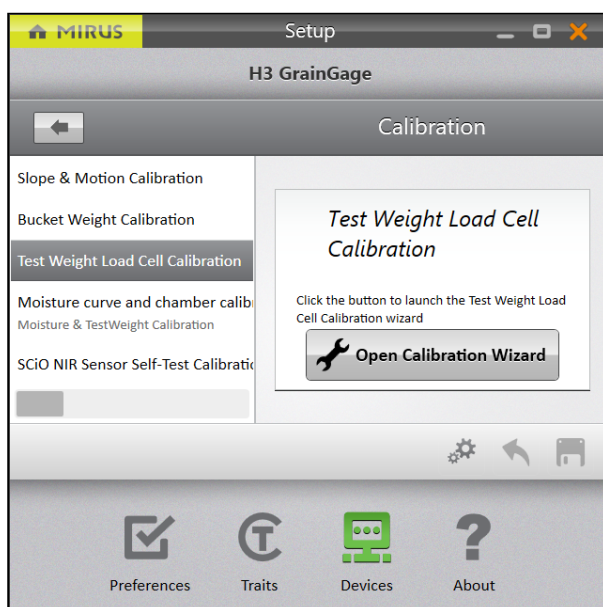
Use the test weight load cell calibration wizard and the smaller calibration weight (3 lb/1.4 kg) included with the GrainGage to calibrate the test weight chamber load cell.

To calibrate test weight,

1. Park the combine on a level surface.
2. Shut off the engine. Keep the GrainGage powered on.
3. Check that the test chamber is empty.
4. From **Home > Setup > H3 GrainGage**, tap **Calibration**.



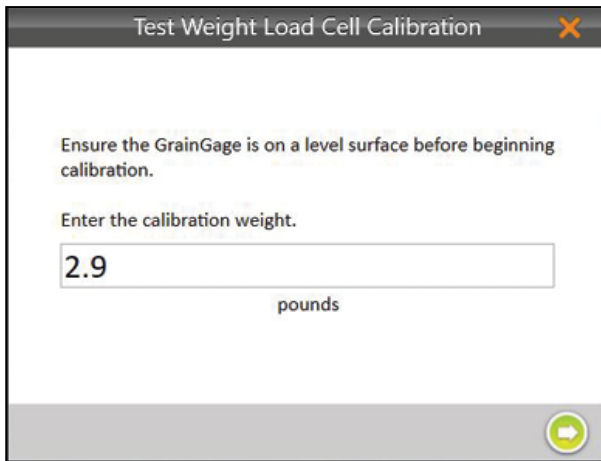
5. Tap **Test Weight Load Cell Calibration**.
6. Tap **Open Calibration Wizard**.



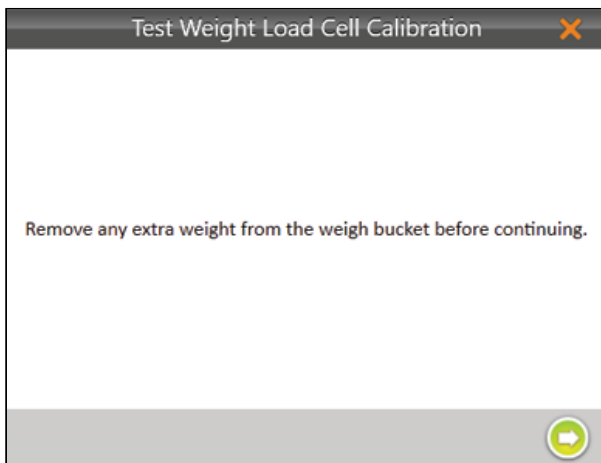
Follow the on-screen video instructions as shown below.

7. Find the value stamped on the side of the weight.
8. Enter that value in the field.

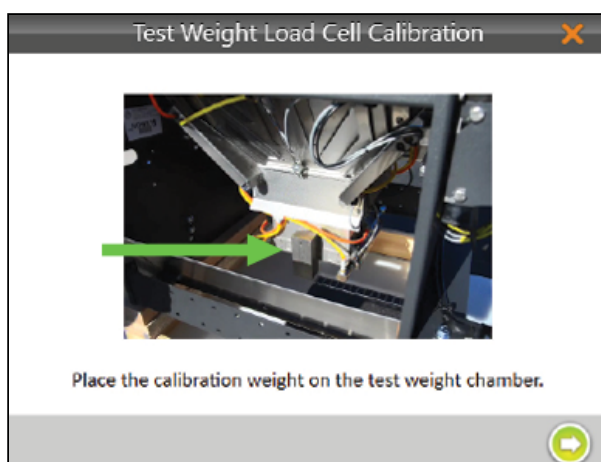
9. Tap the next arrow  to initiate the calibration.



10. Check for and remove any extra weight from the weigh bucket.

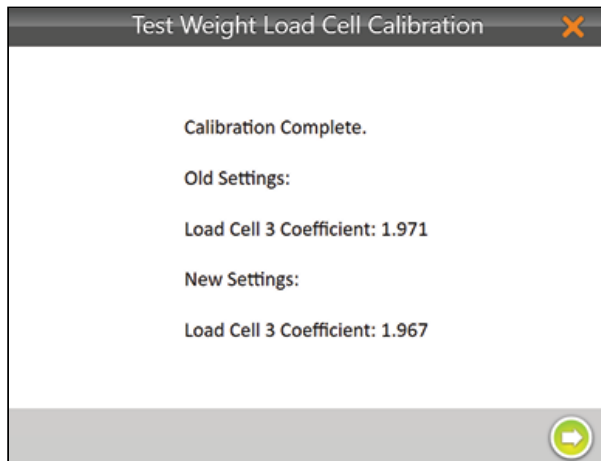


11. When prompted, place the weight as shown.
12. Tap the next arrow .

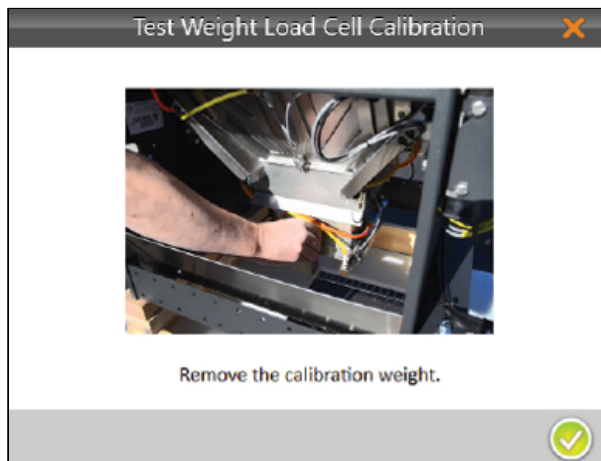


Mirus displays the old and new load cell coefficients.

Note: Typical load cell coefficients should be 1.9 +/- .2.



13. Remove the calibration weight.
14. Tap the check icon  to finish.

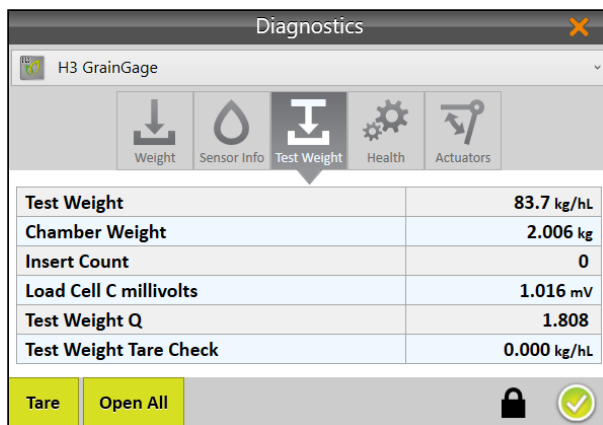


The system will tare and the wizard will close.

4.3.2 Check Test Weight Calibration

The test weight calibration is stable and rarely changes or loses accuracy. However, because the consequences of poor calibration can be devastating to your research data, HarvestMaster highly recommends checking the test weight calibration every year before the harvest season begins, as well as every day before harvest. This can be done from the Test Weight Diagnostics box.

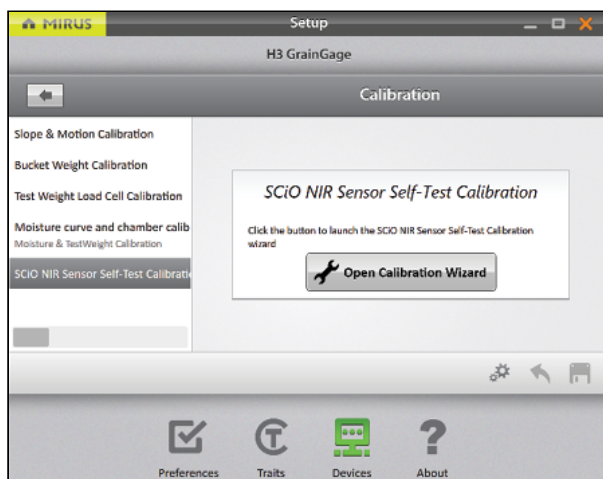
1. After calibrating the test chamber, tap the gear icon  below the calibration wizard to open **Diagnostics > Test Weight**.
2. Hang the (smaller) calibration test weight from the weight hanger on the test chamber.
3. The Diagnostics box should report a reading that is very close to the value stamped on the calibration weight. If it's not within .05 lb (23 g) when the combine and thresher are on and .02 lb (9 g) when the combine is off, HarvestMaster recommends a new weight calibration.
4. Tap the check icon  to close Diagnostics.



4.4 SCiO NIR Sensor Self Test

To run the SCiO NIR Sensor Self Test,

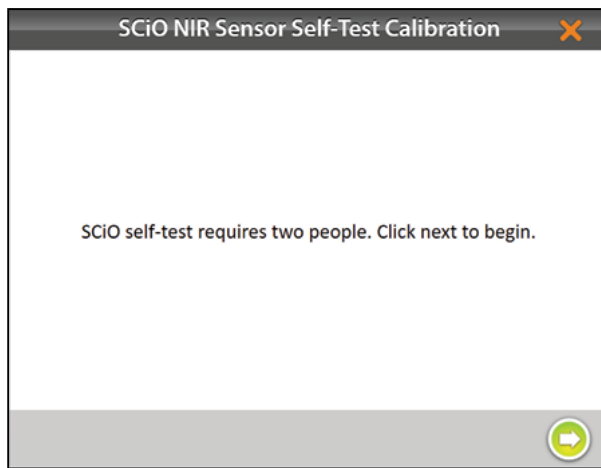
1. From **Setup > H3 GrainGage > Calibration**, tap **SCiO NIR Sensor Self-Test Calibration**.
2. Tap **Open Calibration Wizard**.



Follow the on-screen video instructions as shown below.

3. Ensure that there are two people performing the calibration.

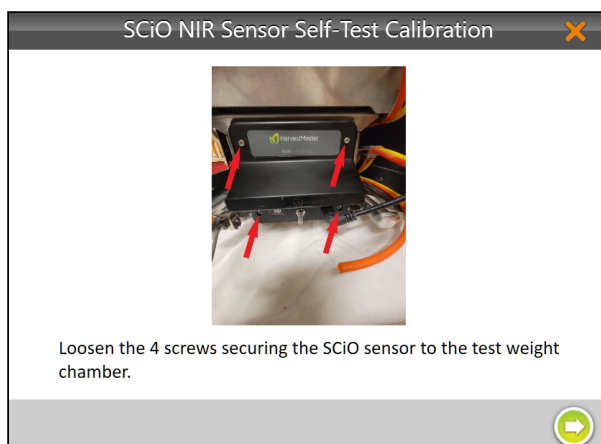
4. Tap the next arrow .



5. Shut off pressure to the GrainGage. Remove the air lines.
6. Tap the next arrow .

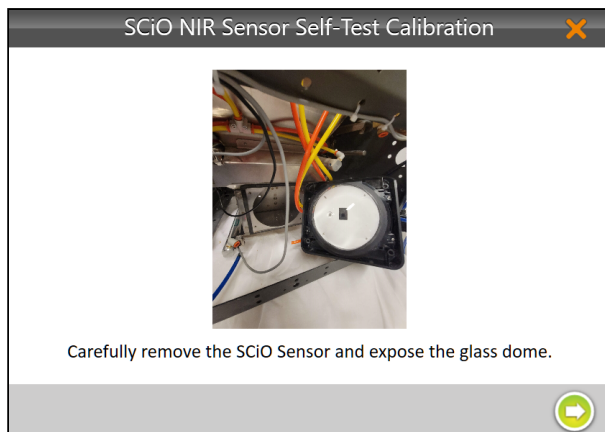


7. Loosen the four screws securing the SCiO sensor to the test weight chamber.
8. Tap the next arrow .

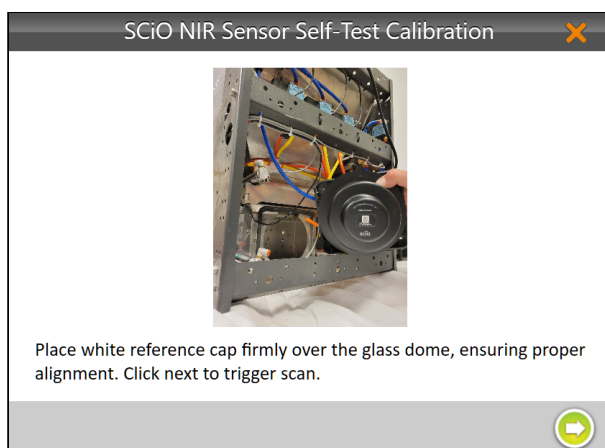


9. Carefully remove the SCiO sensor and expose the glass dome.

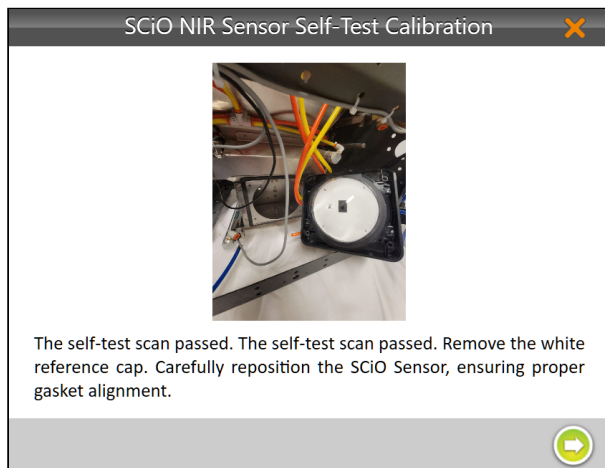
10. Tap the next arrow .



11. Place the white reference cap firmly over the glass dome.
⚠ CAUTION: The white reference cap matches a specific sensor. Take care to keep it correctly paired.
12. Tap the next arrow  to trigger the scan.



13. After the scan, remove the white reference cap.
14. Carefully re-position the SCiO sensor to ensure the proper gasket alignment.



- 15. Tighten the four screws.
- 16. Tap the next arrow .



- 17. Reconnect the air lines.
- 18. Tap the check icon  to finish.



Take the actions noted in the table below based on the result you receive from the SCiO Self Test.

SCiO Sensor Self Test	
Result	Action
The Self Test passed.	Exit Self Test
The Self Test failed.	Power cycle the SCiO sensor. Repeat steps 1–18 two more times. Power cycling between each repeat.
External light is interfering with the test.	Move the GrainGage to a shaded environment. Repeat steps 1–18.

Device temperature is low/high.

Bring the SCiO sensor temperature to 40–120°F (5–50°C). Repeat steps 1–18.

mirus™



CHAPTER 5

Chamber Calibration

5 Chamber Calibration

Creating a calibration file (moisture curve) is an essential part of the harvesting process. The calibration file you use must be created specifically for your harvest conditions. Because the accuracy of your data depends on this calibration file, be extremely careful and precise as you create it. Mirus makes the calibration file creation process easy, but please note the following details about your sensor.

5.1 SCiO Sensor Considerations

The chamber calibration will create a SCiO Calibration File (moisture curve) that stores the type of crop being harvested, the calibrated chamber volume, the number of inserts, the offsets to the default SCiO data predictions, and other pertinent data. While Mirus allows you to offset SCiO data using the Recalibrate feature within the calibration file, HarvestMaster advises against offsetting. We recommend creating a calibration file specifically for your harvest conditions as described in [Create a SCiO Calibration File](#).

5.2 EM2/3 Sensor Considerations

5.2.1 M2.0 Moisture

The chamber calibration will create an M2.0 Calibration File (moisture curve) that stores the type of crop being harvested, the calibrated chamber volume, the number of inserts, the offsets to the default M2.0 moisture prediction, and other pertinent data. When creating an M2.0 Calibration File, Mirus will automatically generate an EM Moisture Curve within the same file. Although you will only see the M2.0 predictions during harvest, both moisture methods (M2.0 & EM) are calculated and available for export.

5.2.2 EM Moisture

The chamber calibration will create an EM Calibration File (moisture curve) that stores the calibrated chamber volume, the number of inserts, a relationship between the output of the EM Sensor and a moisture prediction (a curve), and other pertinent data. If the desired crop is available via M2.0, HarvestMaster recommends creating an M2.0 Calibration File and not an EM Calibration File.

5.3 Chamber Calibration Best Practices

Calibrate the slope and motion, bucket weight, and test weight load cell before the chamber calibration adjusts the test weight chamber volume.

Maintain the air pressure at 75 lb (34 kg) during the chamber calibration. If necessary, run the combine to maintain the air pressure.

Before harvesting, generate a chamber calibration (moisture curve).

Chamber calibrations:

- Align the test weight with a benchtop lab sensor.
- Align constituents (including moisture) if desired.
- Correlate the number of inserts and crops used.
- Set a temperature baseline.

If you add or remove low-volume inserts, you must recalibrate or create a new calibration file (moisture curve) specific to your current setup.

With the release of Mirus 4.5.0 there are multiple ways to perform a chamber calibration:

- SCiO calibration
 - The SCiO data is only available when Mirus has connected to the H3 GrainGage and you are using a SCiO NIR sensor.
 - For more information about the SCiO calibration, see [Create a SCiO Calibration File](#).
- M2.0 moisture calibration
 - The M2.0 moisture model is a preset model that is used with EM2 and EM3 sensors.
 - For more information about the M2.0 moisture calibration, see [Create an M2.0 Calibration File](#).
- EM moisture curve
 - For more information about the EM moisture curve, see [Create an EM Calibration File](#).

Grains Scanned by each Sensor

Sensor	Grain
SCiO	Wheat—Moisture, Protein Corn—Moisture Soybean—Moisture, Protein, Oil Barley—Moisture, Protein
M2.0 Measures Moisture only	Wheat Corn Soybean Oats Barley Canola/Rapeseed Rice
EM Measures Moisture only	All Grains

For more information about the industry moisture standard, see [Appendix A: Standard Moisture and Test Weight](#).

M2.0 calibrations are performed with systems that have an EM2 or EM3 sensor.

5.4 Prepare Samples

Preparing your samples is a critical first step towards creating and maintaining an effective moisture curve.

Imitate harvest conditions. When calibrating, imitate harvest conditions as closely as possible.

- Use grain at the ambient outdoor temperature for calibrating. If the grain samples are cool (from air conditioning or cold storage), acclimate them by spreading them out on a clean surface overnight. If you are calibrating outside, keep the samples in the shade. Do not leave them in the sun to warm up.
- Cycle the grain through the hopper or cyclone to reduce differences from grain.

Create precision. HarvestMaster recommends cycling samples multiple times and averaging the readings for both the benchtop lab sensor and the GrainGage.

- Use room temperature grain.
- Create the known values by averaging the sample readings from the reference device. Cycle each sample 3–5 times.
- Create and use a moisture curve for each insert configuration you will use during harvest.
- Test in the reference device and in the GrainGage within an hour.
- Use the sensor at harvest temperature. Bring the sensor to harvest temperature by running the combine for at least 30 minutes before doing the chamber calibration.

To create a moisture curve that is representative of the moisture range, encountered during harvest, use samples of at least 6 pounds.

⚠ CAUTION: Do not re-wet grain samples. If you need to adjust the moisture content, take a natural sample and dry it down.

Annually check and tune moisture curves. Checking and tuning moisture curves each season will give you the best data quality.

5.4.1 Additional Preparation for Samples used with EM Sensors

Plan ahead for calibration. Creating an accurate moisture curve requires using grain samples with a range of moisture percentages. Collecting enough samples to calibrate properly requires advanced planning. HarvestMaster recommends planting grain varieties that will be available for harvest before test plots are ready or harvesting border plots early and drying them to varying moistures.

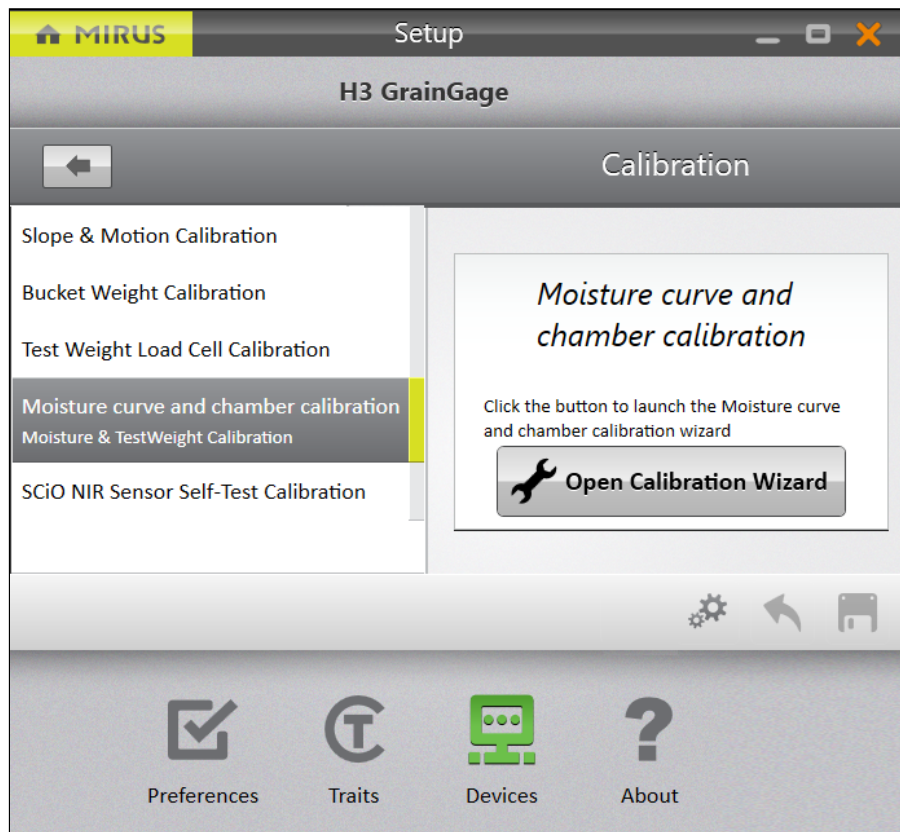
Collect and prepare samples.

- Use no less than three samples to generate a curve. The more samples the better.
- Use samples that vary in moisture by at least 3% (from lowest to highest moisture content).

5.5 Moisture Curve and Chamber Calibration Wizard

To open the moisture curve and chamber calibration wizard,

1. Go to **Home > Setup > H3 GrainGage > Calibration.**
2. Tap **Moisture curve and chamber calibration > Open Calibration Wizard.**



This will take you to the moisture calibration screen. For the next steps, see [Create a SCiO Calibration File](#), [Create an M2.0 Calibration File](#), or [Create an EM Calibration File](#).

5.5.1 Create a SCiO Calibration File

Note: This is only available with the H3 GrainGage and a SCiO sensor installed.

The purpose of the following calibration is to select a crop and calibrate the test chamber volume (test weight). The default SCiO moisture/protein/oil (where applicable) value in Mirus is compiled from thousands of samples around the world. While it is possible for you to offset that data and make it more relevant, HarvestMaster does not recommend doing so. (If you would like to offset the SCiO moisture/protein/oil (where applicable see [SCiO Offset Recalibration](#).)

To begin the calibration you will need one sample that is at least 6 lb (2.7 kg) at the industry moisture standard.

In the Calibration Wizard,

1. Enter a Name for the calibration file.
2. Enter the Chamber inserts count.

The insert count is the number of inserts present in the chamber. It is used to select the default volume for the test chamber, which is important to the accuracy of the system.

For more information about insert counts and installing the inserts, see the relevant GrainGage Hardware Manual.

Moisture curve and chamber calibration ✕

Enter a name for this moisture curve and chamber calibration. It's recommended to have Year, Crop, Number of inserts and Moisture calibration type in your name.
Ex. 2021Corn1M2, 2021Wheat0

Chamber Inserts

SCiO Crop

3. Select the SCiO Crop.

Moisture curve and chamber calibration ✕

Enter a name for this moisture curve and chamber calibration. It's recommended to have Year, Crop, Number of inserts and Moisture calibration type in your name.
Ex. 2021Corn1M2, 2021Wheat0

Chamber Inserts

SCiO Crop

Soybean

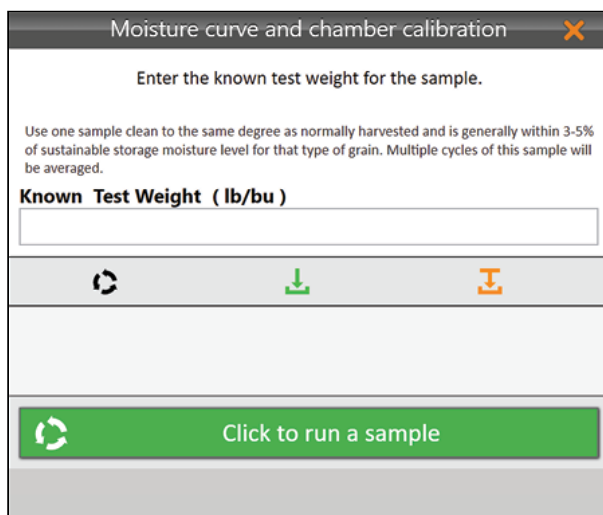
Corn

Barley

Wheat

4. Tap the next arrow .
5. Pour the grain sample into the GrainGage hopper to simulate harvest.

6. Enter the Known Test Weight.



Moisture curve and chamber calibration

Enter the known test weight for the sample.

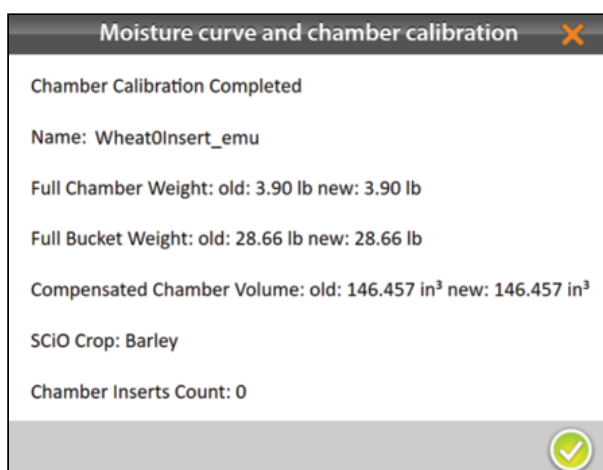
Use one sample clean to the same degree as normally harvested and is generally within 3-5% of sustainable storage moisture level for that type of grain. Multiple cycles of this sample will be averaged.

Known Test Weight (lb/bu)

 Click to run a sample

7. Tap **Click to run a sample**.
8. Using the same sample, repeat steps 5–7 at least two more times.
The GrainGage cycles the grain, and Mirus displays details of the calibration.
9. Tap the check icon  to display the calibration file.



Moisture curve and chamber calibration

Chamber Calibration Completed

Name: Wheat0Insert_emu

Full Chamber Weight: old: 3.90 lb new: 3.90 lb

Full Bucket Weight: old: 28.66 lb new: 28.66 lb

Compensated Chamber Volume: old: 146.457 in³ new: 146.457 in³

SCiO Crop: Barley

Chamber Inserts Count: 0



10. Tap the green check icon  to save the calibration file.

To offset the SCiO data, see [SCiO Offset Recalibration](#) (not recommended).

The screenshot shows a software interface for chamber calibration. It includes several input fields: 'Compensated Chamber Volume' (146.457 cubic inches), 'Full Chamber Weight' (3.90 pounds), 'Full Bucket Weight' (28.66 pounds), 'Chamber Inserts' (0), 'SCIO Crop' (Corn), and 'Moisture Offset' (0). Below these fields is a table with columns: Sample, %, REF %, lb, lb/bu, REF lb/bu, lb Chamber Weight, and in³ Compensated Chair. The table contains three rows of data. At the bottom, there are buttons for 'Tare' and 'Recalibrate', and a green checkmark icon.

Sample	%	REF %	lb	lb/bu	REF lb/bu	lb Chamber Weight	in³ Compensated Chair
1					56.0	0.00	146.457
2					56.0	0.00	146.457
3					56.0	0.00	146.457

5.5.2 Create an M2.0 Calibration File

Calibrating the chamber to create a calibration file consists of two parts:

1. Calibrating with moisture and test weight with the first sample.
2. Calibrating with the remaining moisture samples.

To begin the calibration you will need one sample that is at least 6 lb (2.7 kg) at the industry moisture standard.

For more information about the industry moisture standard, see [Appendix A: Standard Moisture and Test Weight](#).

Continue the calibration with a dry grain sample and a wet grain sample (more samples can be used as well). Each sample should be cycled at least three times.

The Calibration Steps in the table below describe each step needed to create a moisture curve.

Calibration Steps

	Cycle with Test Weight	Moisture	Test Weight
1.	Sample A	Industry Standard	Variable
2.	Cycle Sample A two more times.		Continue to use the same test weight value.
	Cycle without Test Weight	Moisture	Test Weight
3.	Sample B	Dry Grain	Test weight output should reflect the test weight from the benchtop sensor.

4. Cycle Sample B two more times.

5.	Sample C	Wet Grain	Test weight output should reflect the test weight from the benchtop sensor.
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6. Cycle Sample C two more times.

Note: This table reflects the minimum number of cycles needed to create a calibration file. To improve your calibration file, cycle several more moisture samples.

M2.0 Chamber Calibration

In the Calibration Wizard,

The insert count is the number of inserts present in the chamber. It is used to select default volume for the test chamber, which is important to the accuracy of the system.

For more information about insert counts and installing the inserts, see the relevant GrainGage Hardware Manual.

1. Enter a Name for the calibration file.
2. Enter the Chamber Inserts count.
3. Under the Moisture Model Type, select M2.0.
4. Choose the grain you are harvesting.

Note: If you are harvesting a grain that is not listed here, see [Create an EM Calibration File](#).

5. Tap the next arrow .

6. Calibrate the chamber using moisture and test weight (steps 7–10) and with moisture samples (with no test weight) (steps 10–17).

The following steps explain how to begin a chamber calibration by using moisture and test weight.

7. Pour the grain sample into the GrainGage hopper to simulate harvest.
8. Enter the Known Moisture and Test Weight.

9. Tap **Click to run a sample**.

10. Using the same sample, repeat steps 7–9 at least two more times.

The following steps explain how to continue a chamber calibration by adding moisture samples (with no test weight).

11. Pour a grain sample into the GrainGage hopper to simulate harvest.

12. Enter the Known Moisture.
13. Tap **Click to run a sample**.

Moisture curve and chamber calibration

Enter the known Moisture for the sample.

Cycle as many samples as desired. Samples should be at least 3% from the 1st sample.

Known Moisture (%) [Last Value](#)

	Volt	
1.1 1.000	10.0	20
1	20	
2.1 1.000	10.1	20
2	20	

Click to run a sample

Click to complete calibration

14. Using the same sample, pour it into the GrainGage hopper again.
*Note: Tap **Last Value** to automatically populate the Known Moisture with the same value as the previous sample.*
15. Repeat steps 11–14 until all grain samples have been cycled through the GrainGage.
Note: HarvestMaster recommends using at least three samples and cycling them three times each.

16. Tap the next arrow  to complete the calibration.

Moisture curve and chamber calibration

Enter the known Moisture for the sample.

Cycle as many samples as desired. Samples should be at least 3% from the 1st sample.

Known Moisture (%)

Last Value

		Volt	
1	1.1 0.823	10.7	15.5
	0.82	15.5	
2	2.1 0.828	11.5	15.5
	0.83	15.5	
3	3.1 0.830	11.2	15.5
	0.83	15.5	
4	4.1 0.874	11.3	18
	0.87	18	
5	5.1 0.850	11.7	18
	0.85	18	
6	6.1 0.834	11.5	18
	0.83	18	

Click to run a sample

Click  to complete calibration



If the moisture content of your samples do not cover a range of at least 3%, Mirus displays an Insufficient Moisture Range warning.

- Tap **Ignore** to continue with the current samples.
- Tap **Return** to add more samples with a variety of moisture percentages.

Insufficient Moisture Range

The range of moisture samples provided is less than recommended. For best results, use samples with at least 3% spread in moisture.

Ignore

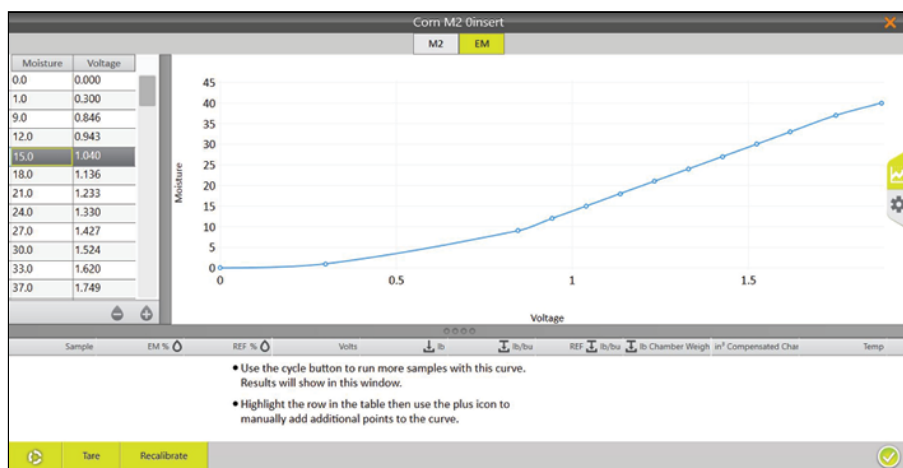
Return

17. Tap the check icon .

Mirus displays the moisture calibration information.

The screenshot shows the 'Corn M2.0insert' calibration window. It has two tabs: 'M2' (selected) and 'EM'. The 'M2' tab contains several input fields: 'Compensated Chamber Volume' (150.301 cubic inches), 'Full Chamber Weight' (3.99 pounds), 'Full Bucket Weight' (28.61 pounds), 'H2 Moisture 2.0 Grain Model' (set to 'Corn'), and 'H2 Moisture 2.0 Adjustment Offset' (4.782). Each field has a 'Description' link below it. To the right is a 'Chamber Inserts' section with a value of 0. At the bottom, there is a table with columns for Sample, % Moisture, REF % Moisture, and various weight and volume units. Below the table are instructions: 'Use the cycle button to run more samples with this curve. Results will show in this window.' and 'Highlight the row in the table then use the plus icon to manually add additional points to the curve.' At the very bottom are buttons for 'Tare' and 'Recalibrate', and a green checkmark icon on the right.

When this calibration file is selected for harvest, Mirus will use the M2.0 calibration throughout harvest, but it will save the EM calibration for reference. You can select the EM tab to view this saved calibration.



18. Tap the check icon  to save the new M2.0 calibration file.

5.5.3 Create an EM Calibration File

Chamber Calibration Overview

Calibrating the chamber to create a moisture curve consists of two parts:

1. Calibrating with moisture and test weight with the first sample.
2. Calibrating with the remaining moisture samples.

Both of these parts are necessary to create an accurate moisture curve.

To begin the calibration you will need one sample that is at least 6 lb (2.7 kg) at the industry moisture standard (e.g., the industry moisture standard for corn is 15.5%).

For more information about the industry moisture standard, see [Appendix A: Standard Moisture and Test Weight](#).

Continue the calibration with a dry grain sample and a wet grain sample (more samples can be used as well). Each sample should be cycled at least three times.

The Calibration Steps in the table below describe each step needed to create a moisture curve.

Calibration Steps

Cycle with Test Weight		Moisture	Test Weight
1.	Sample A	Industry Standard	Variable
2.	Cycle Sample A two more times.		Continue to use the same test weight value.
Cycle without Test Weight		Moisture	Test Weight
3.	Sample B	Dry Grain	Test weight output should reflect the test weight from the benchtop sensor.
4.	Cycle Sample B two more times.		
5.	Sample C	Wet Grain	Test weight output should reflect the test weight from the benchtop sensor.
6.	Cycle Sample C two more times.		

Note: This table reflects the minimum number of cycles needed to create a moisture curve. To improve your moisture curve, cycle several more moisture samples.

EM Chamber Calibration

In the Calibration Wizard,

1. Enter a name for the moisture curve.

2. Enter the Chamber Inserts count.
The insert count is the number of inserts present in the chamber. It is used to select default volume for the test chamber, which is important to the accuracy of the system. For more information on insert counts and installing inserts, see the relevant GrainGage Hardware Manual.

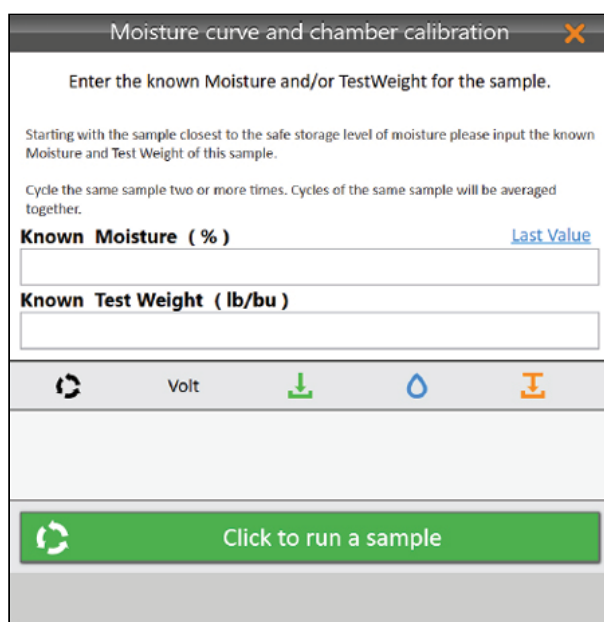
3. Under Moisture Model Type, select **EM2**.

Note: If you are harvesting wheat, corn, barley, oats, canola/rapeseed, soybean, or rice see, [Create an M2.0 Calibration File](#).

4. Tap the next arrow .
5. Calibrate the chamber using moisture and test weight (steps 6–9) and then with moisture samples (with no test weight) (steps 19–24).

The following steps explain how to begin a chamber calibration by using moisture and test weight.

6. Pour the grain sample into the GrainGage hopper to simulate harvest.
7. Enter the Known Moisture and Test Weight.
8. Tap **Click to run a sample**.



9. Using the same sample, repeat steps 6–8 at least 2 more times.

The following steps explain how to continue a chamber calibration by adding moisture samples (with no test weight).

10. Pour a grain sample into the GrainGage hopper to simulate harvest.
11. Enter the Known Moisture.

12. Tap **Click to run a sample**.

Moisture curve and chamber calibration

Enter the known Moisture for the sample.

Cycle as many samples as desired. Samples should be at least 3% from the 1st sample.

Known Moisture (%) [Last Value](#)

		Volt	
1	1.1 1.000	10.0	20
2	2.1 1.000	10.1	20

Click to run a sample

Click to complete calibration

13. Using the same sample, repeat steps 1-3 at least two more times.

*Note: Tap **Last Value** to automatically populate the Known Moisture with the same value as the previous sample.*

14. Repeat steps 10-13 until all grain samples have been cycled through the GrainGage.

Note: HarvestMaster recommends using at least three samples and cycling them three times each.

15. Tap the next arrow  to complete the calibration.

If the moisture content of your samples does not cover a range of at least 3%, Mirus displays an Insufficient Moisture Range warning.

- Tap **Ignore** to continue with the current samples.
- Tap **Return** to add more samples with a variety of moisture percentages.

Insufficient Moisture Range

The range of moisture samples provided is less than recommended. For best results, use samples with at least 3% spread in moisture.

Ignore Return

16. Tap the check icon .

Moisture curve and chamber calibration

Chamber Calibration Completed

Name: EM Curve

Full Chamber Weight: old: 1.562 kg new: 1.588 kg

Full Bucket Weight: old: 11.52 kg new: 11.18 kg

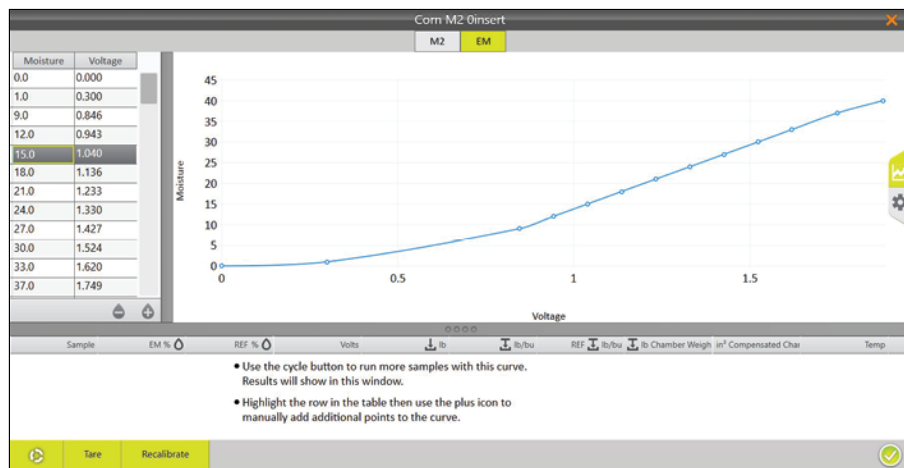
Compensated Chamber Volume: old: 2603.333 cm³ new: 2586.667 cm³

Moisture Curve Points: 2

Chamber Inserts Count: 0



Mirus displays the moisture curve and voltages graphically.



17. Tap the check icon  to save the new EM moisture curve.

If desired, first tap the gear icon  on the right for more information about this moisture curve.

Note: Only adjust these settings if a HarvestMaster Field Service Engineer tells you to.

Corn M2 0insert

M2 EM

Compensated Chamber Volume
150.301
cubic inches


Calibration Temp:
19.2
degrees celsius


Full Chamber Weight
3.99
pounds


Temperature Coefficient
0.092


Full Bucket Weight
28.61
pounds


Chamber Inserts
0


Sample EM % REF % Volts lb lb/bu REF lb/bu lb Chamber Weigh in³ Compensated Char Temp

- Use the cycle button to run more samples with this curve. Results will show in this window.
- Highlight the row in the table then use the plus icon to manually add additional points to the curve.



Tare

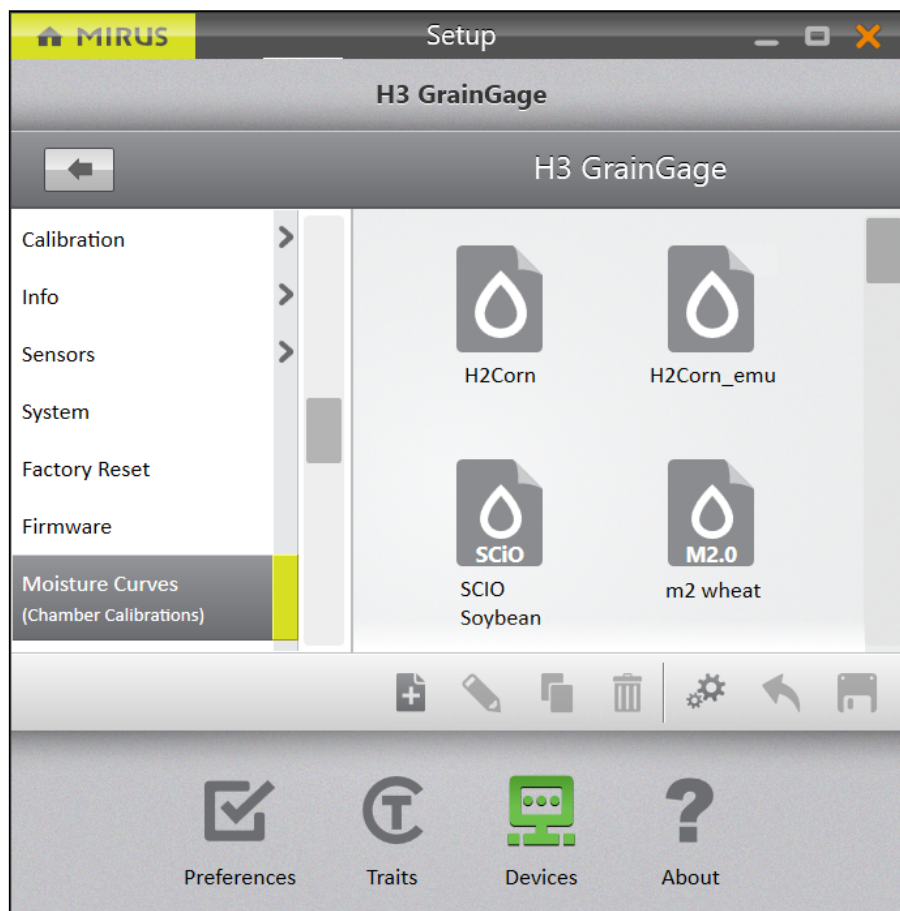
Recalibrate



5.6 Test a Calibration File (Moisture Curve)

HarvestMaster recommends testing the new calibration file against different samples to confirm the data.

1. Test the grain samples with a reference device by cycling sub-samples from the larger sample 3–5 times and averaging the data. The averages are the known values.
2. Within the hour, take the samples out to the GrainGage. If you are calibrating outside, make sure the samples stay in the shade.
3. Open Mirus.
4. Go to **Setup > H3 GrainGage > Moisture Curves**.
5. Select the moisture curve you want to test.
6. Tap the edit icon .



7. Pour the grain sample into the hopper (to simulate harvest). Release the isolation gate so that the grain drops into the GrainGage uniformly.
 8. Tap the Cycle button .
- Mirus takes its measurements and displays the readings from the sample.

SCiO Sample Data Screen

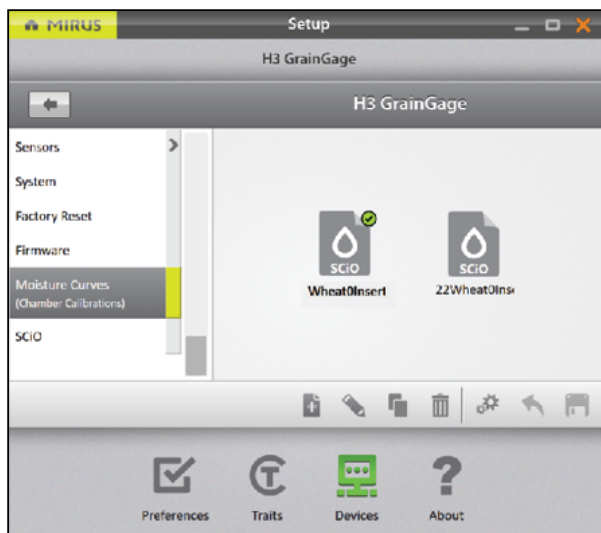
M2.0 Sample Data Screen

9. Cycle the sample through the GrainGage (repeat steps 7 and 8) two more times. This allows you to average the data readings for the sample.
10. If the calibration file needs to be tuned to match the sample, tap **Recalibrate**.

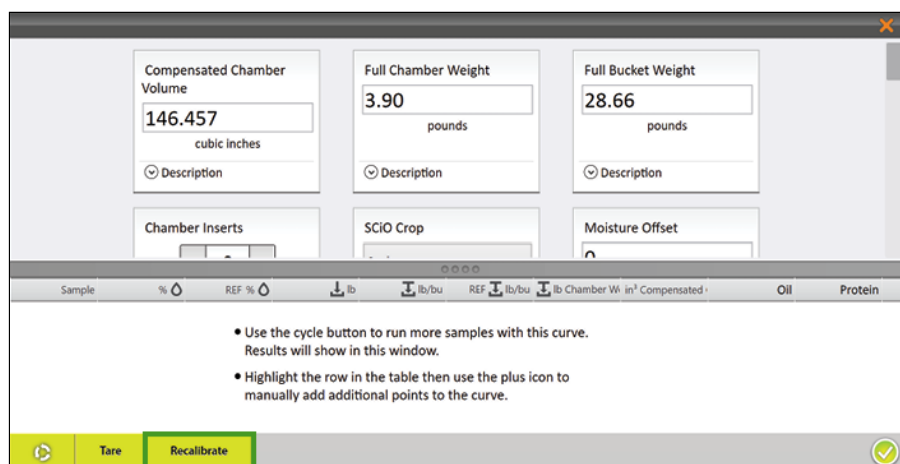
5.7 Test Weight Recalibration

The test weight recalibration is similar for SClO, M2.0, and EM.

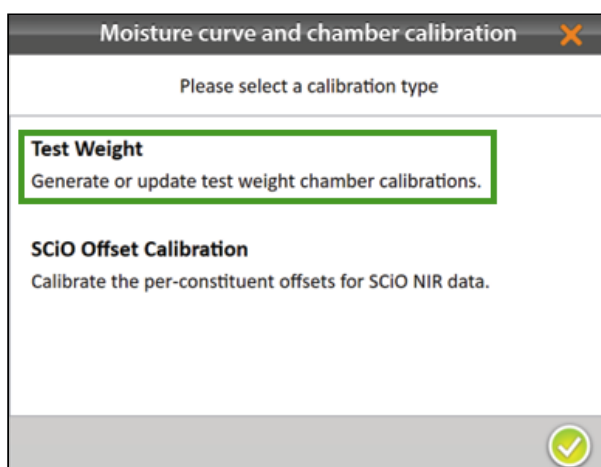
1. Open Mirus.
2. Go to **Setup > H3 GrainGage > Moisture Curves**.
3. Select the calibration you want to modify.
4. Tap the edit icon .



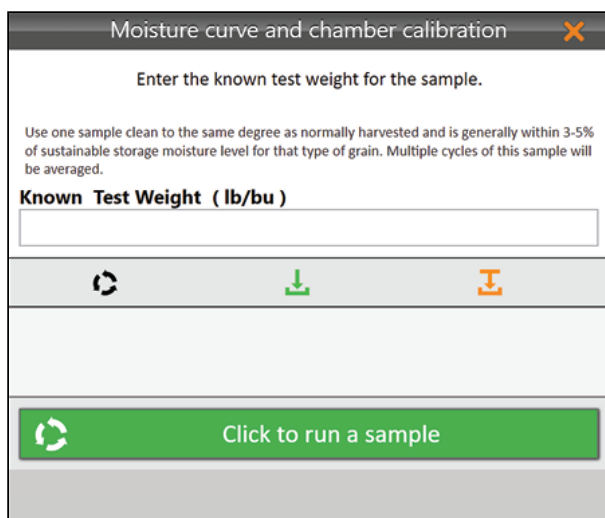
5. Tap **Recalibrate**.



6. Select **Test Weight** and tap

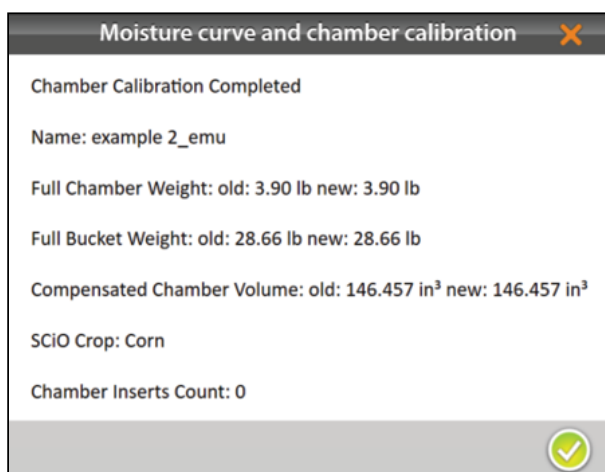


7. Pour the grain sample into the hopper (to simulate harvest). Ensure the isolation gate is open so the grain drops into the GrainGage.



The screenshot shows a software interface titled "Moisture curve and chamber calibration" with a close button (X) in the top right corner. The main text area contains the instruction: "Enter the known test weight for the sample." Below this, a smaller line of text reads: "Use one sample clean to the same degree as normally harvested and is generally within 3-5% of sustainable storage moisture level for that type of grain. Multiple cycles of this sample will be averaged." A label "Known Test Weight (lb/bu)" is positioned above a text input field. Below the input field is a row of three icons: a circular arrow, a green downward arrow, and an orange double-headed vertical arrow. At the bottom of the screen is a large green button with a circular arrow icon and the text "Click to run a sample".

8. Enter the Known Test Weight.
9. Tap **Click to run a sample**.
10. After you have run one sample 3–5 times, tap the next arrow . Mirus displays the modified calibration information.
11. Tap the check icon .



The screenshot shows the same software interface, but now displaying calibration results. The title "Moisture curve and chamber calibration" and the close button (X) remain at the top. The main text area displays the following information: "Chamber Calibration Completed", "Name: example_2_emu", "Full Chamber Weight: old: 3.90 lb new: 3.90 lb", "Full Bucket Weight: old: 28.66 lb new: 28.66 lb", "Compensated Chamber Volume: old: 146.457 in³ new: 146.457 in³", "SCiO Crop: Corn", and "Chamber Inserts Count: 0". At the bottom right corner, there is a green circular icon with a white checkmark.

12. Tap the check icon  to save.

Compensated Chamber Volume: 146.457 cubic inches

Full Chamber Weight: 3.90 pounds

Full Bucket Weight: 28.66 pounds

Chamber Inserts: 0

SCiO Crop: Corn

Moisture Offset: 2.6

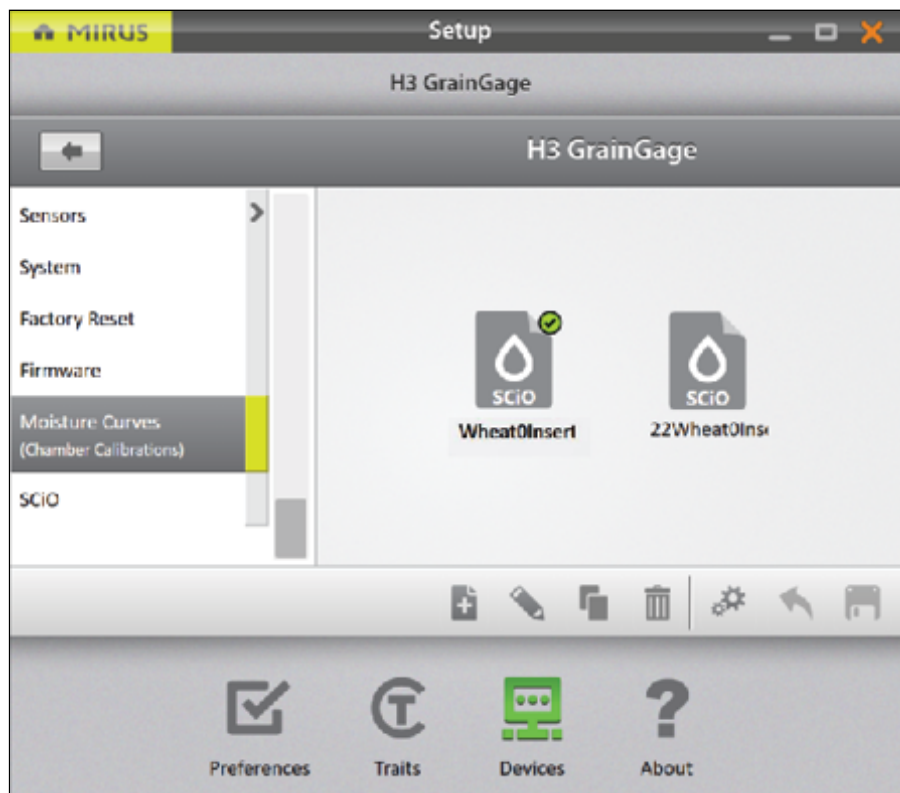
Sample	%	REF %	lb	lb/bu	REF lb/bu	lb Chamber Weight	in ³ Compensated Char
1		10.0				0.00	146.457
2		15.0				0.00	146.457
3		13.0				0.00	146.457

Buttons: Tare, Recalibrate

5.8 SCiO Offset Recalibration

Note: This is not recommended. If you offset the SCiO data, HarvestMaster recommends using 100 samples (20 samples minimum).

1. Open Mirus.
2. Go to **Setup** > **H3 GrainGage** > **Moisture Curves**.
3. Select the SCiO calibration you want to test.
4. Tap the edit icon .



5. Tap **Recalibrate**.

Compensated Chamber Volume: 146.457 cubic inches

Full Chamber Weight: 3.90 pounds

Full Bucket Weight: 28.66 pounds

Chamber Inserts: [Dropdown]

SCiO Crop: [Dropdown]

Moisture Offset: [Dropdown]

Sample	%	REF %	lb	lb/bu	REF lb/bu	lb Chamber Wi in ³ Compensated	Oil	Protein
• Use the cycle button to run more samples with this curve. Results will show in this window. • Highlight the row in the table then use the plus icon to manually add additional points to the curve.								

Buttons: Cycle, Tare, Recalibrate, Confirm

6. Select **SCiO Offset Calibration**.

Moisture curve and chamber calibration

Please select a calibration type

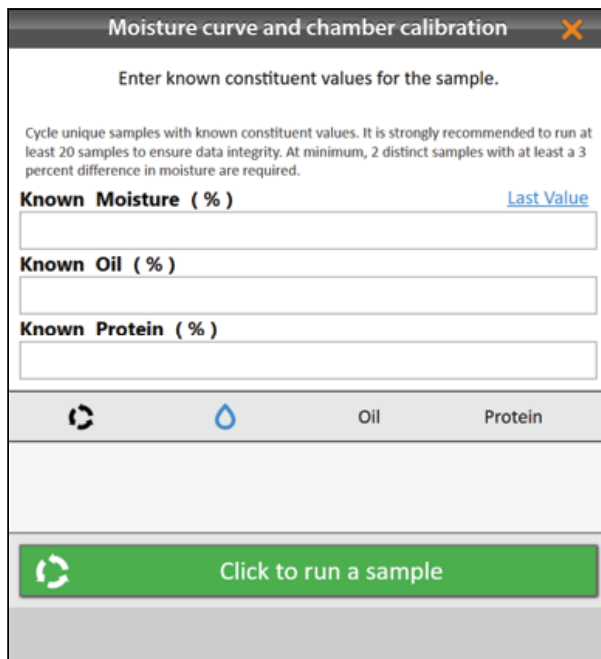
Test Weight
Generate or update test weight chamber calibrations.

SCiO Offset Calibration
Calibrate the per-constituent offsets for SCiO NIR data.

Confirm

7. Pour the grain sample into the hopper (to simulate harvest). Ensure the isolation gate is open so the grain drops into the GrainGage.
8. Enter the Known Moisture.
9. Enter the Known Oil, if applicable.
10. Enter the Known Protein, if applicable.
11. Tap **Click to run a sample**.

12. After you have run all the samples 3–5 times each, tap the next arrow .



Moisture curve and chamber calibration 

Enter known constituent values for the sample.

Cycle unique samples with known constituent values. It is strongly recommended to run at least 20 samples to ensure data integrity. At minimum, 2 distinct samples with at least a 3 percent difference in moisture are required.

Known Moisture (%) [Last Value](#)

Known Oil (%)

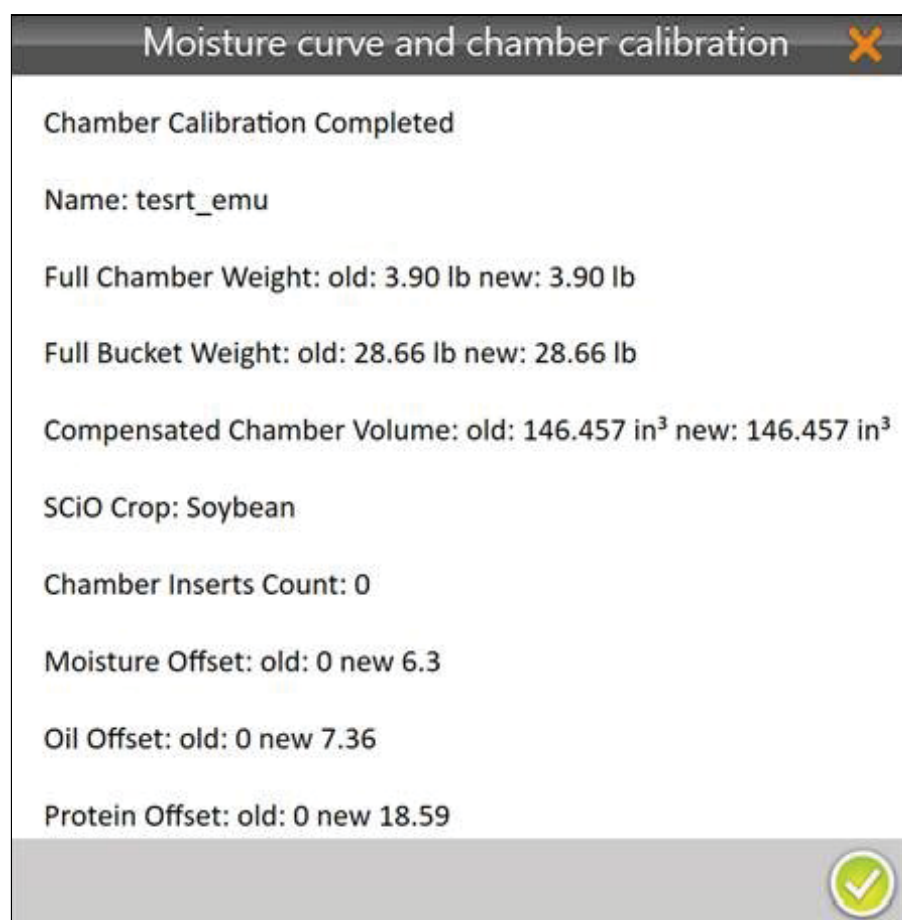
Known Protein (%)

  Oil Protein

 **Click to run a sample**

Note: Mirus will display the recalibrated values.

13. Tap the check icon .



Moisture curve and chamber calibration 

Chamber Calibration Completed

Name: tesrt_emu

Full Chamber Weight: old: 3.90 lb new: 3.90 lb

Full Bucket Weight: old: 28.66 lb new: 28.66 lb

Compensated Chamber Volume: old: 146.457 in³ new: 146.457 in³

SCiO Crop: Soybean

Chamber Inserts Count: 0

Moisture Offset: old: 0 new 6.3

Oil Offset: old: 0 new 7.36

Protein Offset: old: 0 new 18.59



14. On the final screen, tap  to save the calibration file.

Compensated Chamber Volume: 146.457 cubic inches

Full Chamber Weight: 3.90 pounds

Full Bucket Weight: 28.66 pounds

Chamber Inserts: 0

SCIO Crop: Corn

Moisture Offset: 2.6

Sample	%	REF %	lb	lb/bu	REF lb/bu	lb Chamber Weight	in ³ Compensated Char
1		10.0				0.00	146.457
2		15.0				0.00	146.457
3		13.0				0.00	146.457

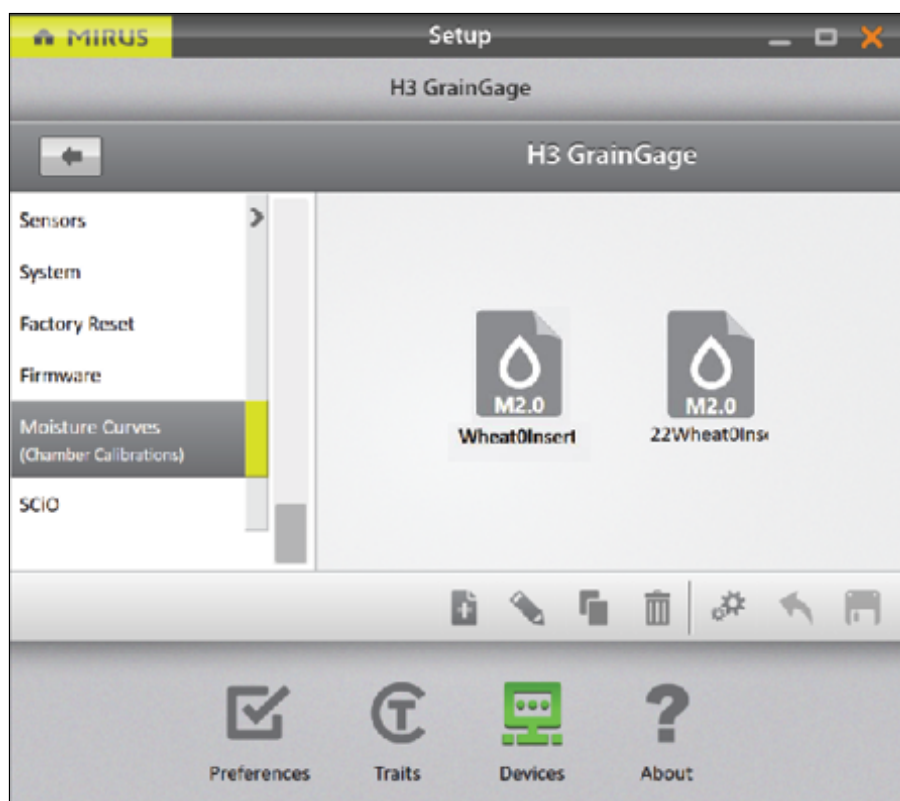
Buttons: Tare, Recalibrate

5.8.1 M2.0 Moisture Model Recalibration

⚠ CAUTION: [Test Weight Recalibration](#) must be completed before following the steps in this section.

To adjust an M2.0 moisture calibration,

1. Open Mirus.
2. Go to **Setup > H3 GrainGage > Moisture Curves**.



3. Select the moisture curve you want to adjust.
4. Tap the edit icon .
5. Tap **Recalibrate**.

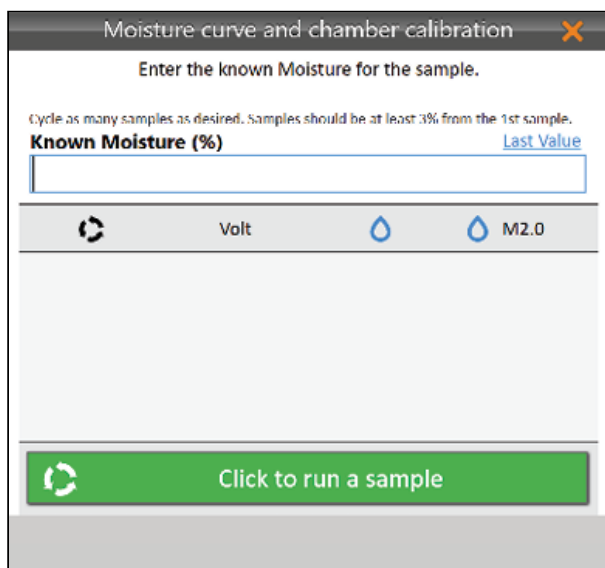
Note: Adjusting the M2.0 calibration factors in the samples originally used in the calibration.

6. Select **H2 Moisture 2.0 Model Adjust** and tap the next arrow ➡.

Note: HarvestMaster recommends using different moisture samples (spread 2-3% apart) to adjust and existing moisture curve.

7. Pour the grain sample into the hopper (to simulate harvest). Ensure the isolation gate is open so the grain drops into the GrainGage.
8. Enter the Known Moisture percentage.

9. Tap **Click to run a sample**.



Moisture curve and chamber calibration

Enter the known Moisture for the sample.

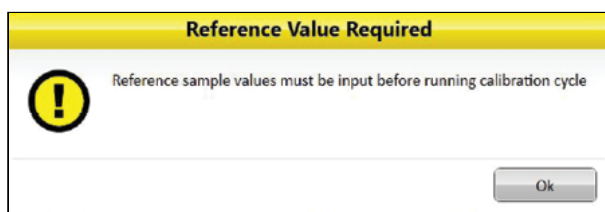
Cycle as many samples as desired. Samples should be at least 3% from the 1st sample.

Known Moisture (%) [Last Value](#)

Volt M2.0

Click to run a sample

If you do not enter a moisture value you will see the Reference Value Required warning.



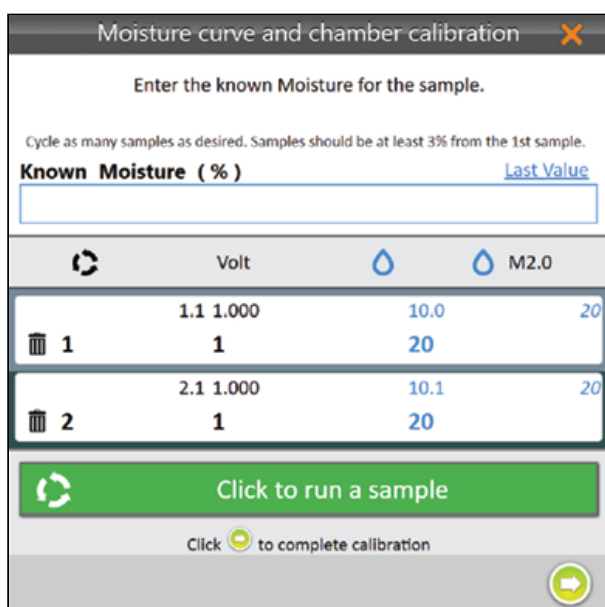
Reference Value Required

Reference sample values must be input before running calibration cycle

Ok

10. Repeat steps 7–9 with all moisture samples.
HarvestMaster recommends using multiple samples when possible.

Note: The Last Value button can be used to fill the Known Moisture field with the previous percentage when the same sample is run multiple times.



Moisture curve and chamber calibration

Enter the known Moisture for the sample.

Cycle as many samples as desired. Samples should be at least 3% from the 1st sample.

Known Moisture (%) [Last Value](#)

	Volt	M2.0
1	1.1 1.000	10.0 20
2	2.1 1.000	10.1 20

Click to run a sample

Click  to complete calibration

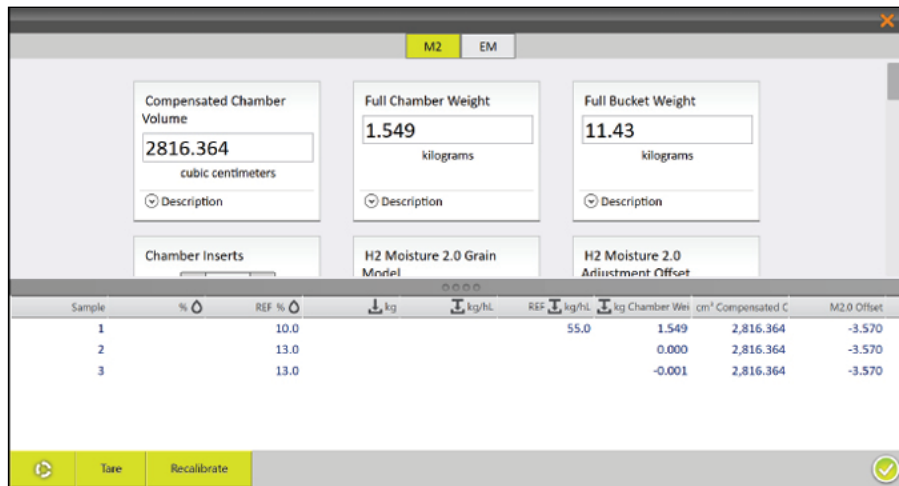
11. Tap the next arrow  to complete the recalibration.

Mirus displays the changes in the chamber calibration settings.

12. Tap the check icon .

Mirus displays the moisture curve and voltages.

13. Tap the check icon  to save the new M2.0 calibration file.



Sample	% H ₂ O	REF % H ₂ O	kg	kg/hL	REF kg/hL	kg Chamber Wei	cm ³ Compensated C	M2.0 Offset
1		10.0			55.0	1.549	2,816.364	-3.570
2		13.0				0.000	2,816.364	-3.570
3		13.0				-0.001	2,816.364	-3.570

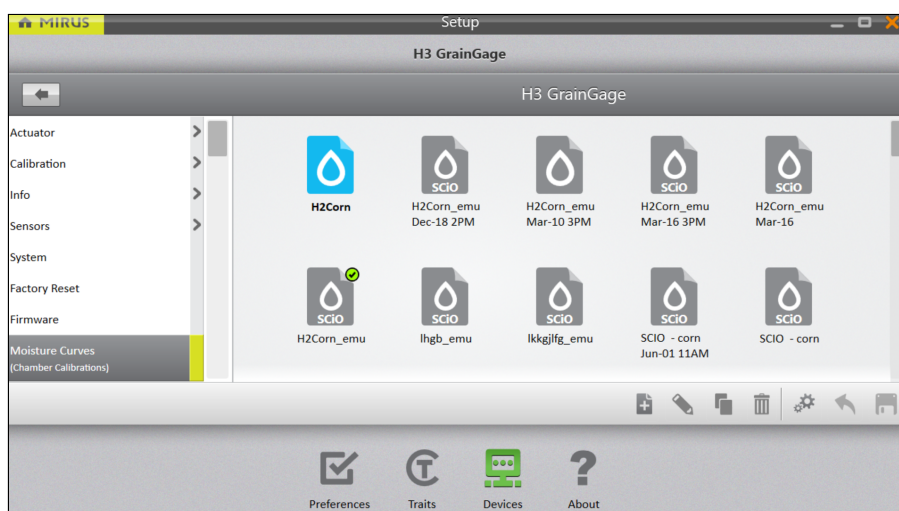
5.9 EM Moisture Recalibrate

When recalibrating an EM Moisture curve, the slope of the curve is not changed. The entire curve shifts to match the new sample. Fine-tuning a curve is often done later in the season as additional moisture samples are available.

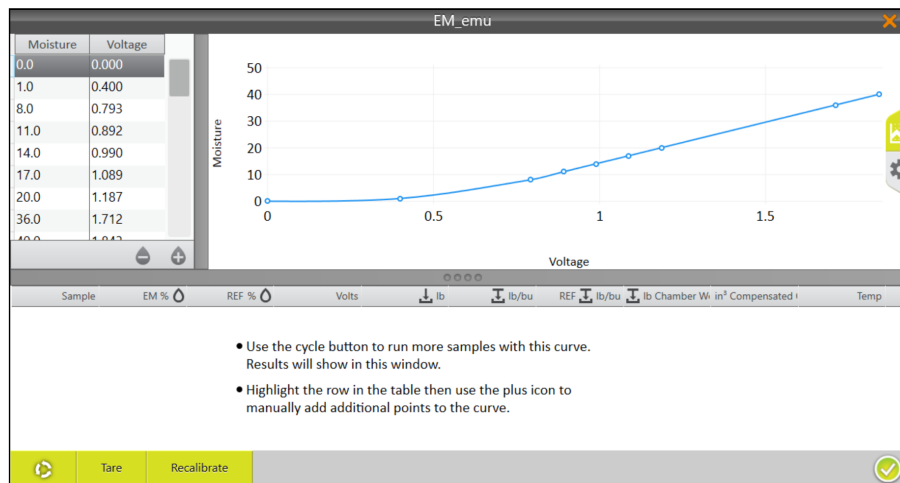
⚠ CAUTION: [Test Weight Recalibration](#) must be completed before following the steps in this section.

To adjust an M2.0 moisture calibration,

1. Open Mirus.
2. Go to **Setup > H3 GrainGage > Moisture Curves**.

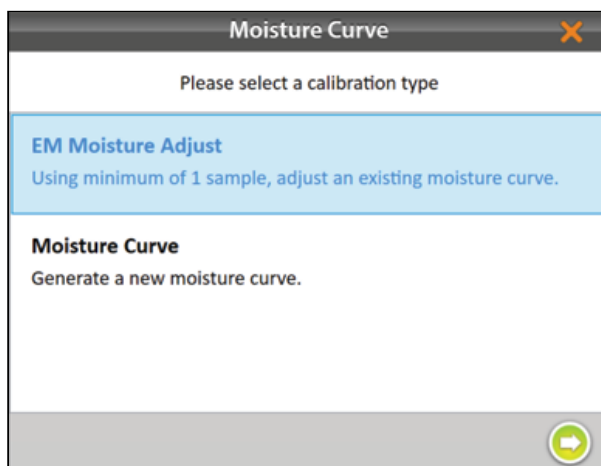


3. Select the EM moisture curve you want to adjust.
4. Tap the edit icon .
5. Tap **Recalibrate**.



6. Select Moisture Adjust and tap the next arrow .

Note: Multiple samples can be used to adjust an existing moisture curve. If test weight needs to be adjusted, see the next section.



7. Pour the grain sample into the hopper (to simulate harvest). Ensure the isolation gate is open, so the grain drops into the GrainGage.
8. Enter the Known Moisture percentage.

9. Tap **Click to run a sample**.

10. Repeat steps 7–9 with the same sample at least two more times.
Note: The Last Value button can be used to fill the Known Moisture field with the previous percentage when the same sample is run multiple times.
11. Tap the next arrow  to complete the recalibration.
 Mirus displays the adjusted moisture curve with its moisture percentages and voltages.

 to complete calibration' and a next arrow button."/>

			Volt	
1	1.1	1.000	10.0	20
2	2.1	1.000	10.1	20

5.10 Manual Calibration of an EM Moisture Curve Using Excel

HarvestMaster provides a spreadsheet for creating a two-point calibration online. It can be downloaded here: www.harvestmaster.com/data/files/mirus/EM2 Sample Curves 2018.xlsx. Follow the instructions in the spreadsheet for creating the curve.

5.11 Calibrate High Moisture Corn on an EM Moisture Curve

When calibrating with high moisture corn samples, some moisture curves do not follow a linear voltage relationship. HarvestMaster recommends manually adjusting the upper half of moisture curves with grain samples above 26%.

To do this type of adjustment, start by using samples below 26% moisture to create a base curve as described in [Chamber Calibration](#).

Once you have a base curve, use 3–5 samples (multiple samples required) that are 26% and above to manually adjust the top half of the curve:

1. With the moisture curve open, cycle samples above 26% through the GrainGage 3–5 times each. Average the moisture readings for each sample.
2. Calculate the moisture percentage offsets.

The offset is the difference between the benchtop sensor's moisture measurement and the GrainGage's moisture measurement.

For example, Sample One has the following moisture measurements:

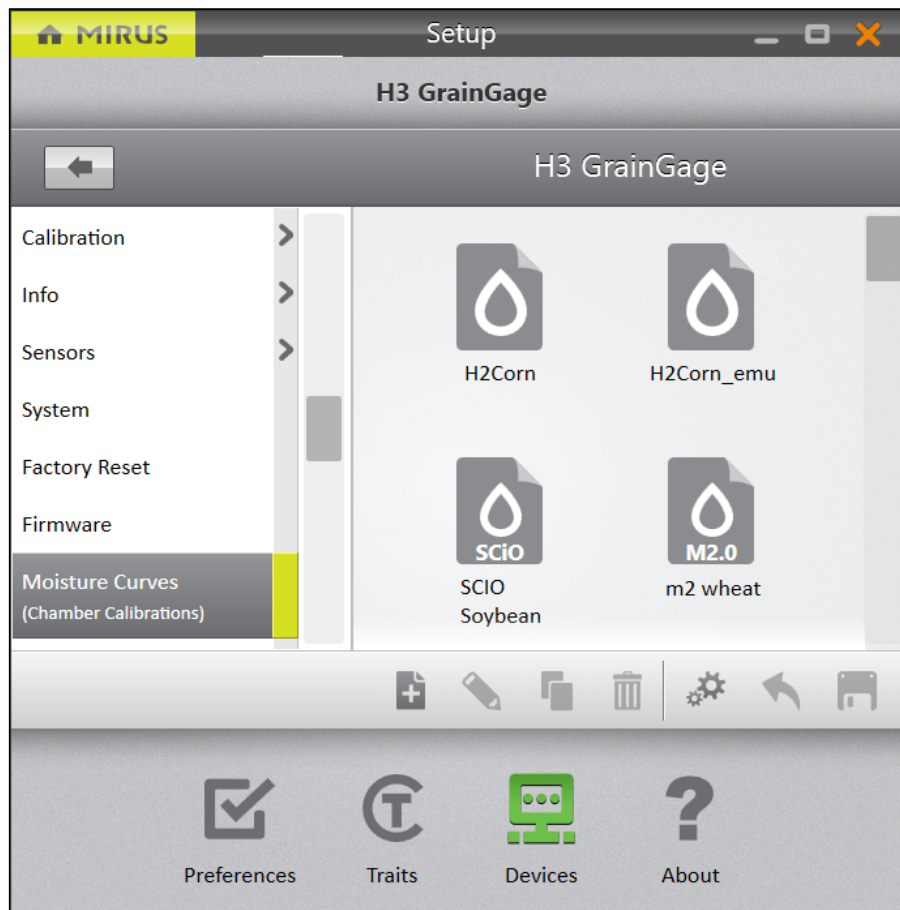
- Benchtop sensor: 33%
- GrainGage: 31.8%

The offset would be $33\% - 31.8\% = +1.2\%$

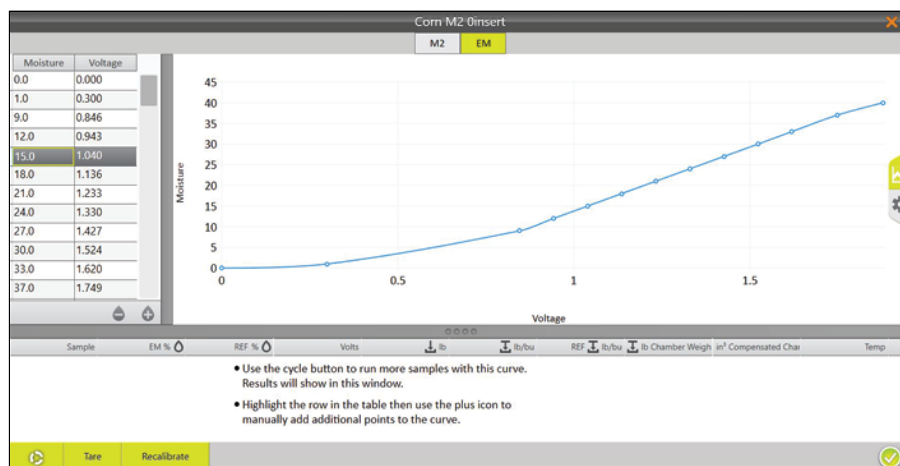
3. If the average readings of the higher moisture samples do not match the moisture curve, average all the sample offsets.

For example, if your benchtop sensor says Sample One is +1.2%, Sample Two is +0.8%, and Sample Three is +1.0%, the average offset is +1.0%.

4. Open Mirus.
5. Go to **Setup > H3 GrainGage > Moisture Curves**.
6. Select the moisture curve you want to test.
7. Tap the edit icon .



8. Add the average offset to each moisture point with the exception of the 0 and 1 moisture points (never adjust 0 or 1). Subtract for a negative average offset. Do not adjust voltages.



Add or subtract the offsets here.

Moisture	Voltage
0.0	0.000
1.0	0.300
9.0	0.846
12.0	0.943
15.0	1.040
18.0	1.136
21.0	1.233
24.0	1.330
27.0	1.427
30.0	1.524
33.0	1.620
37.0	1.749

As needed add or remove points in the curve here. 

In the example above, readings from the benchtop sensor indicate that the grain samples above 26% have, on average, 1% higher moisture than the percentages in the base moisture curve. Therefore, in the curve:

- 26% would become 27%
- 29% would become 30%
- 40% would become 41%

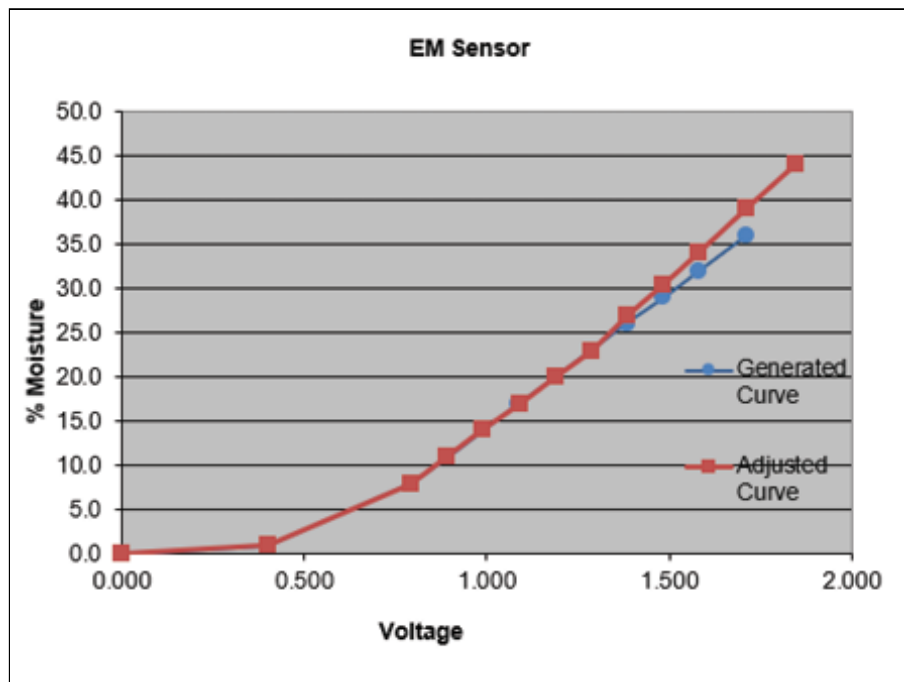
The lower and upper ends of the newly adjusted moisture curve should graphically depict a smooth point-to-point transition (as illustrated below). If it isn't smooth, HarvestMaster recommends generating a new curve.

9. Once the curve is adjusted, recheck samples, starting with the lower half of the moisture curve.
10. After adjusting the lower half of the curve, cycle samples above 26% and repeat the adjustment procedure (steps 1–8 above). Only adjust the points above 26% and leave the points on the lower half alone.

In some cases, the higher the moisture, the steeper the slope of the curve. This is indicated by a steady increase in the difference between the moisture curve and the moisture percentages in the grain samples as the moisture values increase.

This scenario is not uncommon in high moisture corn. It requires adding extra percentage points as the moisture value increases. For example, adding the following percentages to the default curve will help match the steeper slope in higher moisture grain samples:

- Add 1% to moisture values 26% to 27%
- Add 1.5% to moisture values 28% to 30%
- Add 2% to moisture values above 30%



The following tables illustrate this type of adjustment.

Original Curve		Adjusted Curve	
Moisture	Voltage	Moisture	Voltage
0.0	0.000	0.0	0.000
1.0	0.400	1.0	0.400
8.0	0.793	8.0	0.793
11.0	0.892	11.0	0.892
14.0	0.990	14.0	0.990
17.0	1.089	17.0	1.089
20.0	1.187	20.0	1.187
23.0	1.286	23.0	1.286
26.0	1.385	27.0	1.385

29.0	1.483		30.5	1.483
32.0	1.582		34.0	1.582
36.0	1.713		39.0	1.713
40.0	1.845		44.0	1.845

mirus™



CHAPTER 6

Field Maps

6 Field Maps

A map of your field is crucial for collecting your research data. You can create a map in Mirus or import an existing map. You can export the data associated with your map as a CSV file or as a color-coded visual map in a spreadsheet. You can view, copy, or delete your map as needed. When creating a map, choose the one that best fits your field and research needs from the following map varieties:

- Range Row field map—a two-digit coordinate of range and plot number identifies the research plots in your field (See [Create a Range Row Field Map](#))
- Standard Plot ID field map—a unique ID number identifies each plot (See [Create a Standard Plot ID Map](#))
- Sub-map—smaller division of an existing field map (See [Create a Sub-Map.](#))

6.1 Create a Range Row Field Map

A range row field map describes your research field using a combination of numbered ranges and plots to create a coordinate system. The first number in the coordinate pair indicates the range. The second number indicates the plot. The coordinate pair is separated by a comma: Range, Plot.

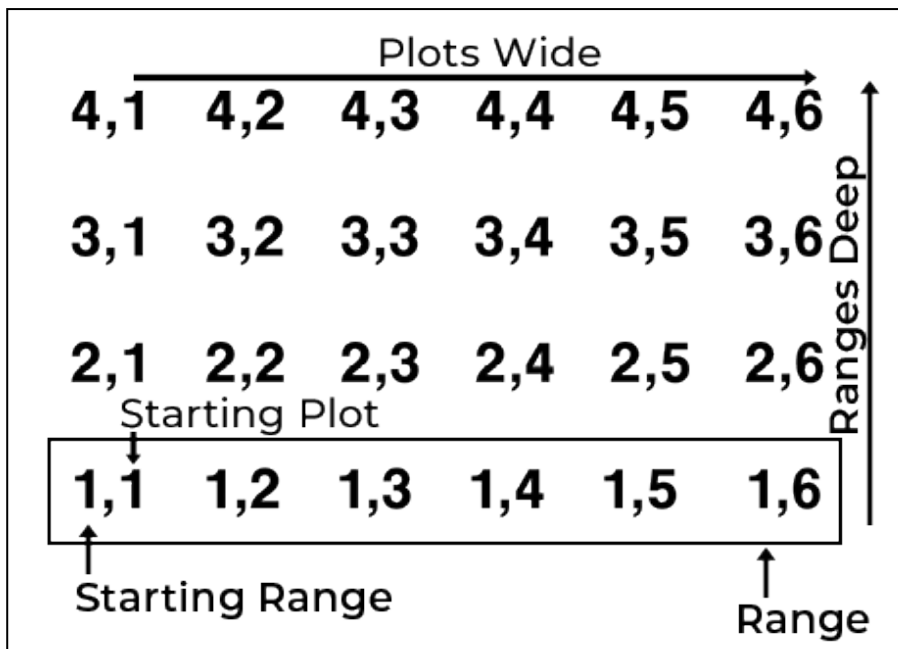
Numbering starts with the bottom left corner of the field. Range numbering counts from bottom to top. Plot numbering counts from left to right and is repeated through the ranges.

When creating a new map, you will define your field by entering numbers for the following attributes.

Field Map Attributes		
Option	Description	Typical Value
Ranges Deep	The number of ranges within a given field.	
Starting Range	The number of the first range.	1
Range Increment	The numeric interval between ranges.	1
Plots Wide	The number of plots across a given field.	
Starting Plot	The number of the bottom left plot.	1
Plot Increment	The numeric interval between plots. <i>Note: Row crops often use the plot increment number to count the number of plants planted across the plot. So the coordinate pair identifying the plot is the number of the left-most row of plants in the plot. If plots contained 2 corn plants, the increment would be set to 2. The first plot would be identified by coordinates 1,1. The second plot's coordinates would be 1,3.</i>	1

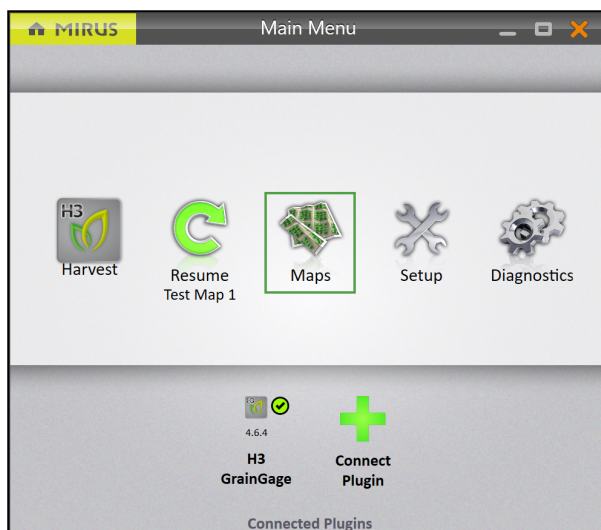
The field map illustrated below was created using the following settings,

- Ranges deep: 4
- Range increment: 1
- Starting Range: 1
- Plots wide: 6
- Plot increment: 1
- Starting plot: 1

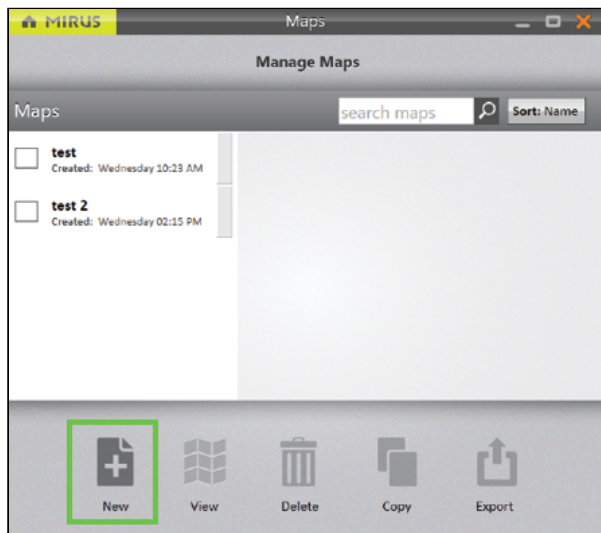


To create a Range Row map,

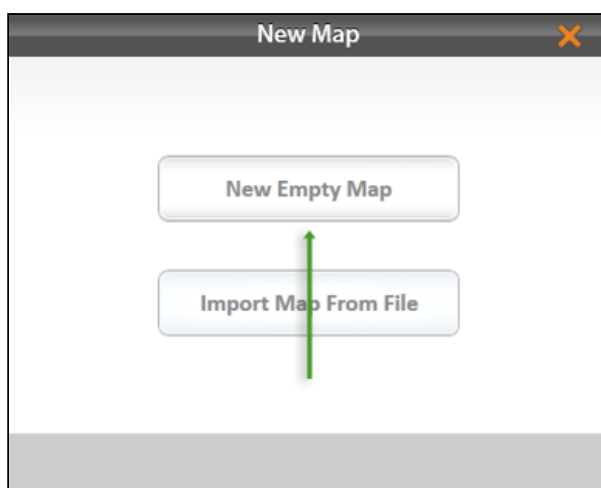
1. Tap **Maps** .



2. Tap **New**.



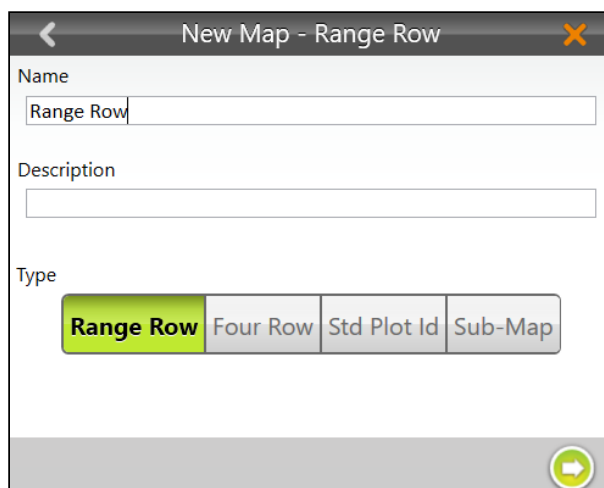
3. Select **New Empty Map**.



4. Name and describe the map.
*Note: The Name box will only accept basic letters and numbers. Do not use emojis or the following special characters: > < : " \ ? | / **

5. Tap **Range Row**.

Note: The Four Row option only applies to Twin plot systems.

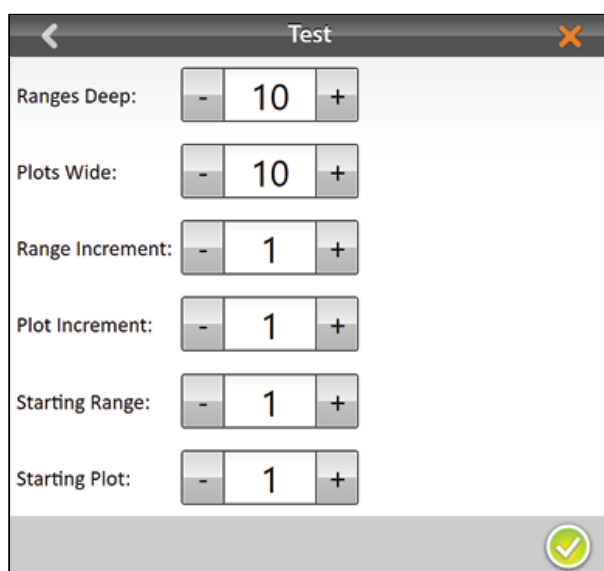


6. Tap the next arrow .

7. Set the following:

- Ranges deep
- Plots wide
- Range increment
- Plot increment
- Starting range
- Starting plot

8. Tap the check icon to save the map.

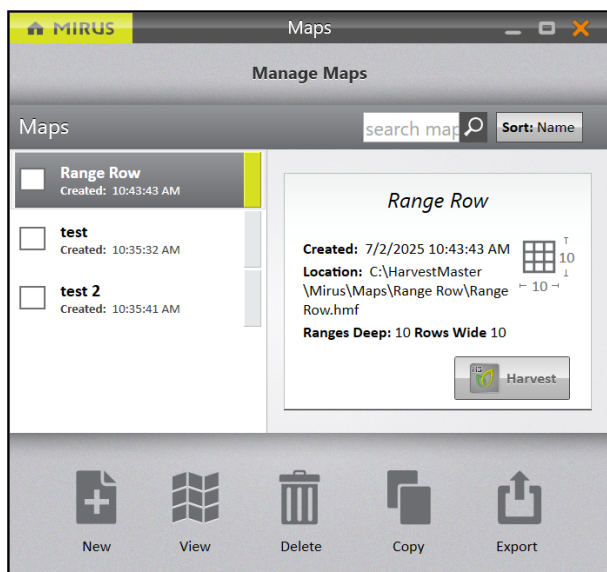


Mirus displays a description of the map on the Manage Maps screen. From this screen, Mirus allows you to do the following with your maps:

- Create new
- View
- Delete

- Copy
- Export

You also have the option to begin or resume harvest.



6.2 Create a Standard Plot ID Map

A Standard Plot ID map gives a unique ID number to each plot. Numbering begins with the bottom left corner of a field and counts up. Plots in a horizontal line on the map are called a range. The standard plot ID map is very customizable. You can adjust the counting increments (e.g. 1, 10, 100), the direction the number sequence will be applied from the lower left corner of the field, the pattern in which the numbers flow through the field. You can also add replications, repeated groupings of plots. A replication could be less than a range or encompass multiple ranges.

When creating a new map, you will define your field by entering numbers for the following attributes.

Field Map Attributes		
Option	Description	Typical Value
Ranges Deep	The number of ranges within a given field. <i>Note: Mirus allows up to 999 ranges, but your field ID number could contain five digits, depending on your other settings.</i>	
Rows Wide	The number of plots across a given field. Plots grouped together from bottom to top form a row. So, it is also the number of rows within the field. <i>Note: Each row is equal to one plot. If you have multiple row crop plants in each plot, the Mirus row is the plot, not the plants.</i>	

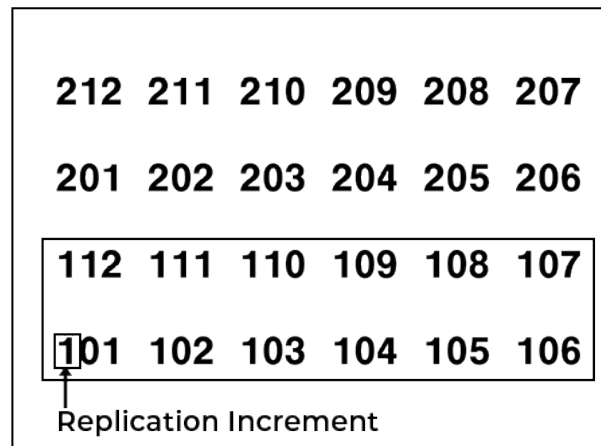
Starting Plot ID	The number of the bottom left plot.	
Plots per Replication	The number of grouped plots to be repeated.	
Replication Increment	The numeric interval between the first plots in each replication (e.g., 100 or 1000).	
Plot Increment	The numeric interval between plots.	1
Pattern	The path in which the numbers flow through the field. Choose serpentine or sequential.	
Direction	The way that the numbers are counted through the field. Choose to count the plot numbers from left to right (horizontal) or bottom to top (vertical).	

In order to collect the correct data, the map pattern and direction should follow the pattern used to plant the field. It doesn't matter if your pattern for harvesting matches.

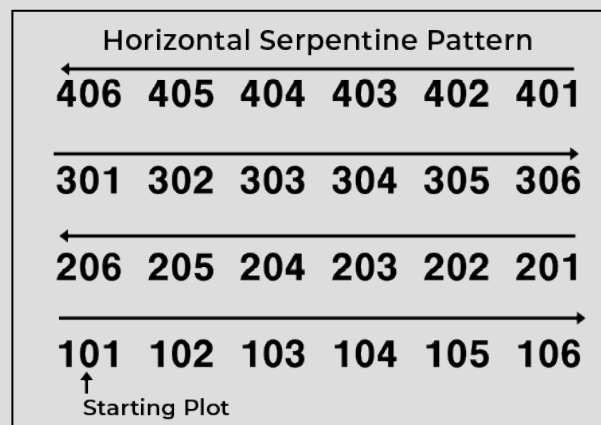
Illustrations of Standard Plot ID Field Map Options

Options	Illustration
▪ Ranges deep: 4 ▪ Rows wide: 6 ▪ Starting plot ID: 101[*] ▪ Plots per Replication: 10[*] ▪ Replication increment: 100[*] ▪ Plot Increment: 1[*] ▪ Pattern: Sequential[*] ▪ Direction: Horizontal	Diagram illustrating a horizontal field map layout. The field is a 4x6 grid of plots. The top row is labeled "Rows Wide" with an arrow pointing right. The plots are numbered sequentially from 401 to 106. The bottom row is labeled "Row" with an arrow pointing up. The plot 102 is highlighted with a box, and an arrow points to it labeled "Plot Increment".
	Diagram illustrating a vertical field map layout. The field is a 4x6 grid of plots. The right side is labeled "Ranges Deep" with an arrow pointing up. The plots are numbered sequentially from 401 to 106. The bottom row is labeled "Starting Plot ID" with an arrow pointing up. The plot 106 is highlighted with a box, and an arrow points to it labeled "Range".

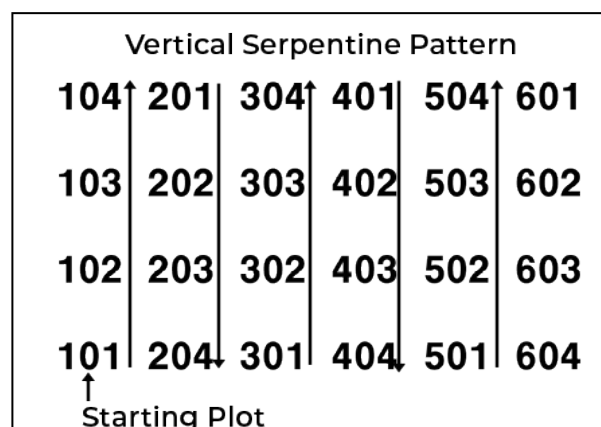
- Ranges deep: 4
- Rows wide: 6
- Starting plot ID: 101^{*}
- Plots per Replication: 12
- Replication increment: 100^{*}
- Plot Increment: 1^{*}
- Pattern: Sequential
- Direction: Horizontal



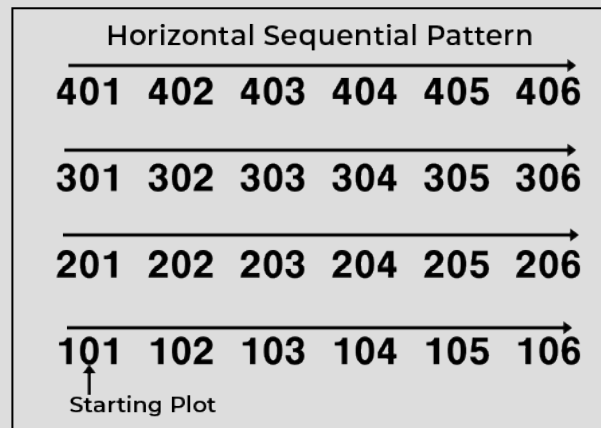
- Ranges deep: 4
- Rows wide: 6
- Starting plot ID: 101^{*}
- Plots per Replication: 10^{*}
- Replication increment: 100^{*}
- Plot Increment: 1^{*}
- Pattern: Serpentine
- Direction: Horizontal



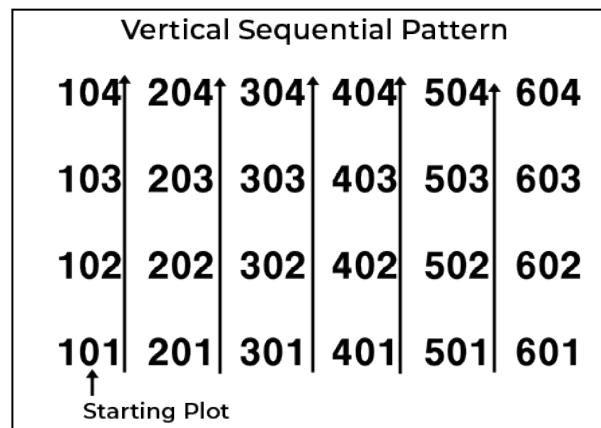
- Ranges deep: 4
- Rows wide: 6
- Starting plot ID: 101^{*}
- Plots per Replication: 10^{*}
- Replication increment: 100^{*}
- Plot Increment: 1^{*}
- Pattern: Serpentine
- Direction: Vertical



- Ranges deep: 4
- Rows wide: 6
- Starting plot ID: 101^{*}
- Plots per Replication: 10^{*}
- Replication increment: 100^{*}
- Plot Increment: 1^{*}
- Pattern: Serpentine
- Direction: Horizontal



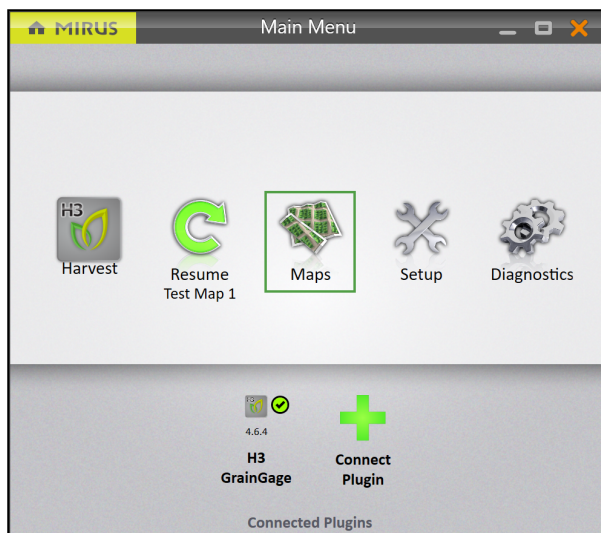
- Ranges deep: 4
- Rows wide: 6
- Starting plot ID: 101^{*}
- Plots per Replication: 10^{*}
- Replication increment: 100^{*}
- Plot Increment: 1^{*}
- Pattern: Sequential^{*}
- Direction: Vertical^{*}



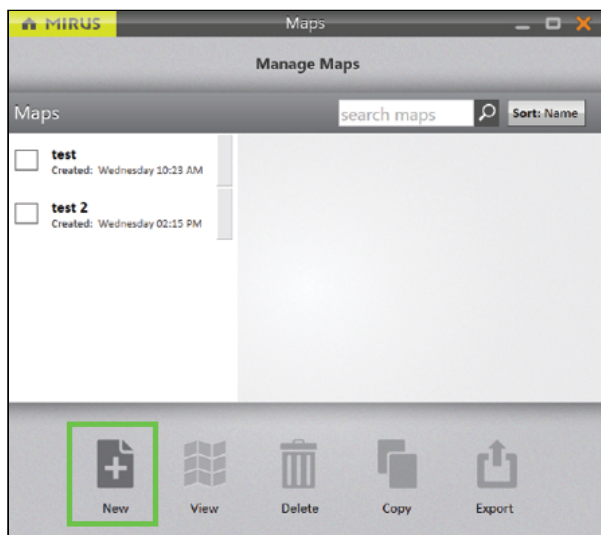
*default value

To create a Standard Plot ID map,

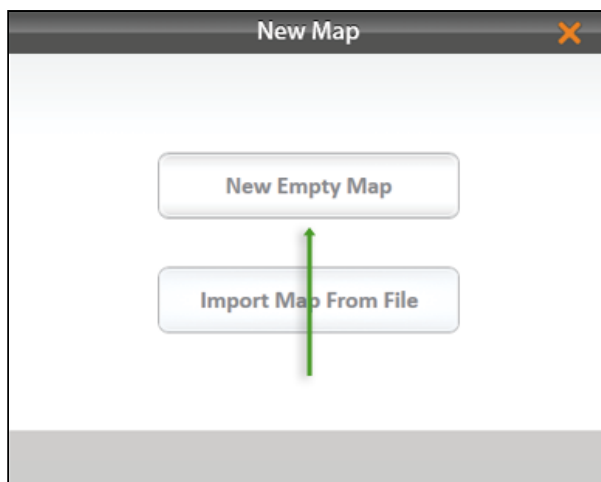
1. Tap **Maps** .



2. Tap **New**.



3. Select **New Empty Map**.

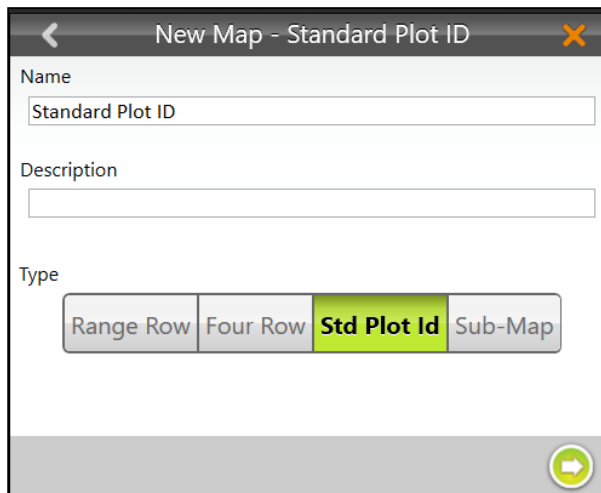


4. Name and describe the map.

5. Tap **Standard Plot ID**.

6. Tap the next arrow .

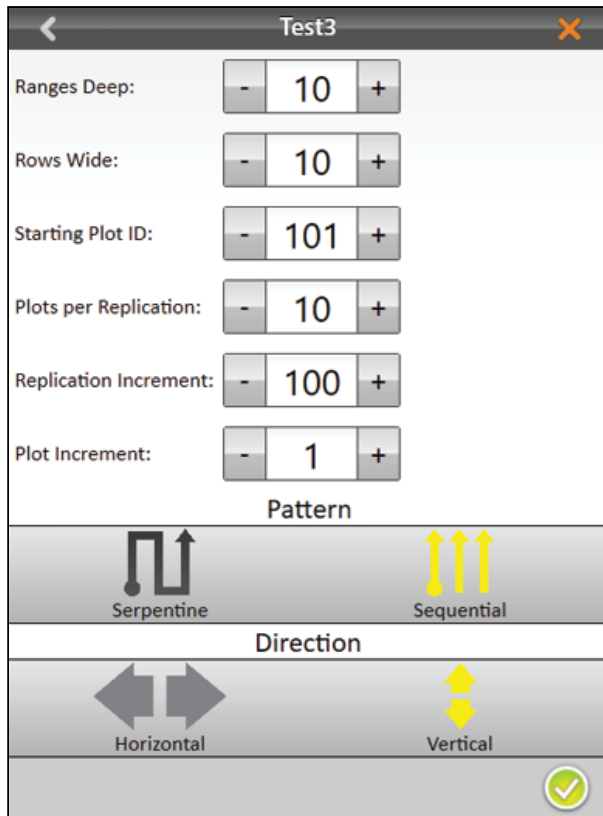
*Note: The Name box will only accept basic letters and numbers. Do not use emojis or the following special characters: > < : " \ ? | / **



7. Set the following:

- Ranges deep
- Rows wide
- Starting plot ID
- Plots per replication
- Replication increment
- Plot increment
- Pattern
- Direction

8. Tap the check icon  to save the map.

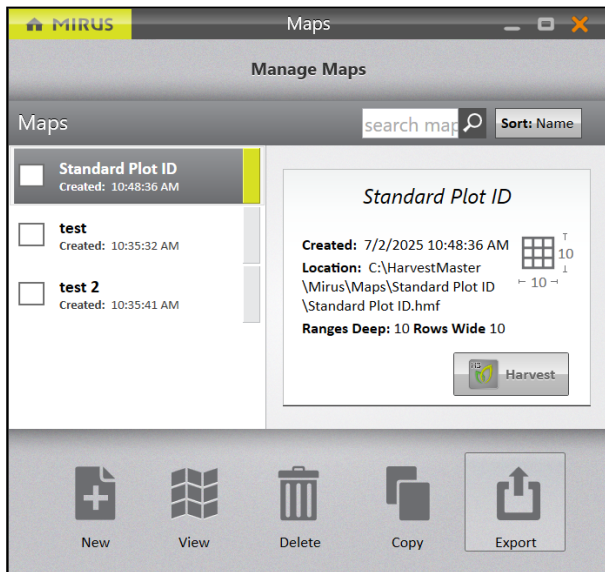


Mirus displays a description of the map on the Manage Maps screen.

From this screen, Mirus allows you to do the following with your maps:

- Create new
- View
- Delete
- Copy
- Export

You also have the option to begin or resume harvest.



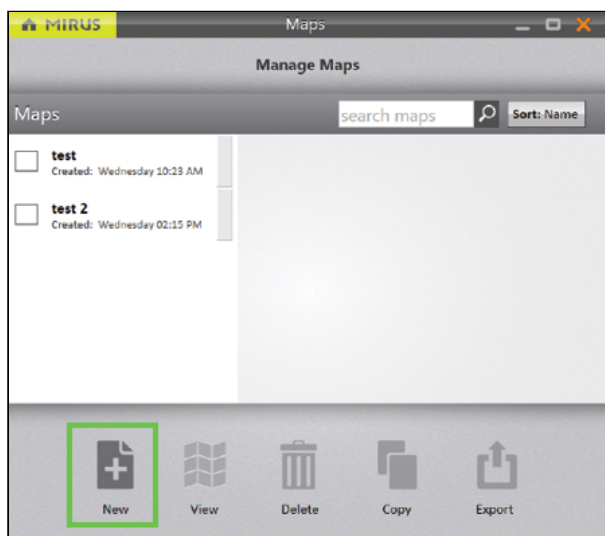
*Note: In Map View, Mirus initially displays Standard Plot ID maps as Range Row maps. To display the plot IDs, select **Plot ID** under Attribute.*

Test3						
109	209	309	409	509	609	709
108	208	308	408	508	608	708
107	207	307	407	507	607	707
106	206	306	406	506	606	706
105	205	305	405	505	605	705
104	204	304	404	504	604	704
103	203	303	403	503	603	703
102	202	302	402	502	602	702
101	201	301	401	501	601	701

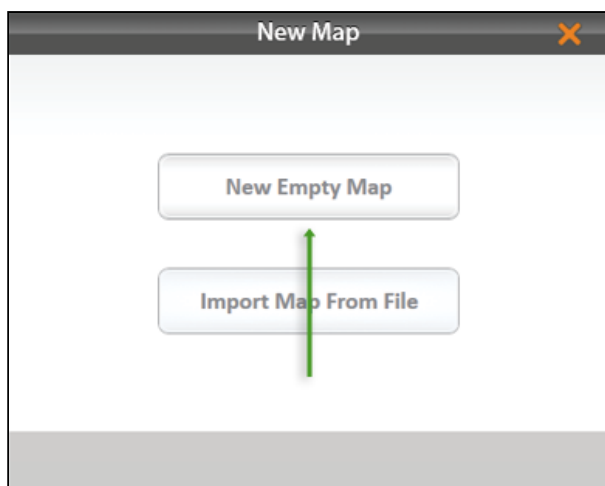
6.3 Create a Sub-Map

Mirus allows the creation of sub-maps—smaller divisions of the larger field maps. To create a sub-map,

1. Open the Manage Maps screen, and tap **New**.

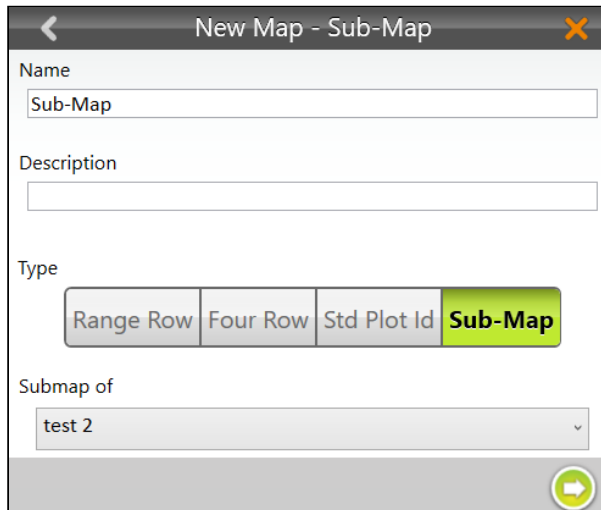


2. Select **New Empty Map**.

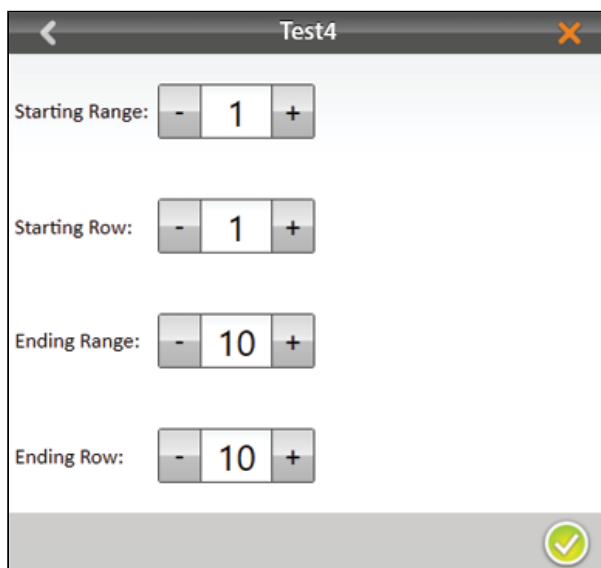


3. Name and describe the map.
 4. Tap **Sub-Map**.
 5. Select which map this will be a sub-map of.
 6. Tap the next arrow .
- Note: The Name box will only accept basic letters and numbers. Do not use emojis or the*

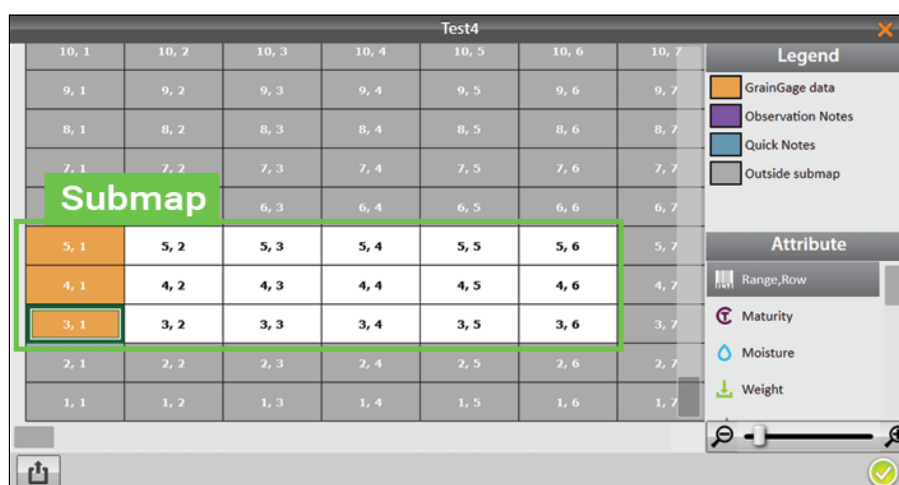
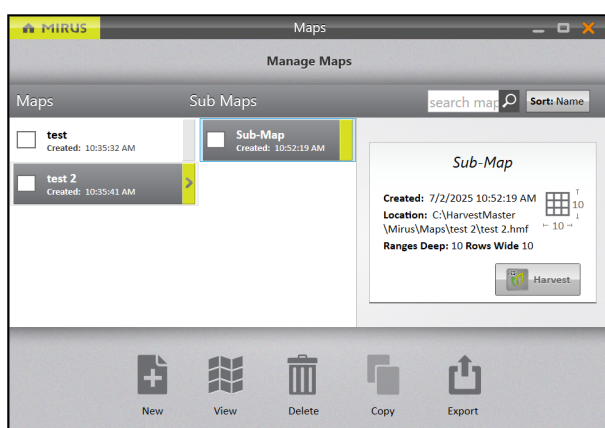
following special characters: > < : " \ ? / *



7. The plot and range increments are the same as the larger field map. Set the following:
 - Starting range
 - Starting row
 - Ending range
 - Ending row
8. Tap the check icon  to save the map.



- On the Manage Maps screen, Mirus displays the sub-map under the main field map it is a part of.



6.4 Import a Map

In Mirus you can easily import maps created in Microsoft Excel or research programs such as PRISM® and AGROBASE®. This can be done in Range Row and Two Dimensional (2D) formats. The imported field map may include information such as Range, Row, Replication, Pass, Pedigree, or other plot identifiers. You can view these identifiers when you open the map in Harvest Mode. (For more information, refer to [Graph View](#) and [List View](#).)

This section explains how to import Range Row, 2D maps, and multiple maps.

6.4.1 Import a Range Row Map

Range row maps need to be in CSV format in order to be imported. Following is an importable range row map file. Notice,

- The Header row must include columns for range and row. Additional columns are optional.
- If you will be harvesting border plots, do not forget to include them in your map.
- The main benefit of importing maps is that you can include more data and identifiers (in addition to range and row) for each plot. In the example below notice the columns PLTID

and study.

	A	B	C	D	E
1	PLTID	Range	Row	Study	
2	Border		1	1	Border
3	1001	1	2	45	
4	1002	1	3	67	
5	1003	1	4	45	
6	1004	1	5	34	
7	Border	1	6	Border	
8	Border	2	1	Border	
9	2001	2	2	67	
10	2002	2	3	56	
11	2003	2	4	87	
12	2004	2	5	12	
13	Border	2	6	Border	
14	Border	3	1	Border	
15	3001	3	2	76	
16	3002	3	3	98	
17	3003	3	4	96	
18	3004	3	5	23	
19	Border	3	6	Border	
20					

Note: The CSV data for the range row map is a list. The data for the ranges and rows must be entirely numeric; however, the columns can have any name. During the import process, Mirus allows you to select which of the columns of numbers to use as the Range and Rows.

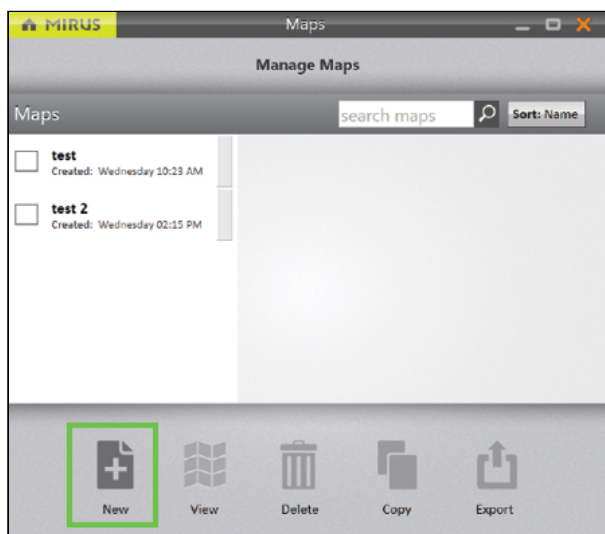
*Note: Only basic letters and numbers are accepted in the spreadsheet. Do not use emojis or the following special characters: > < : " \ ? | / **

To import a Range Row map,

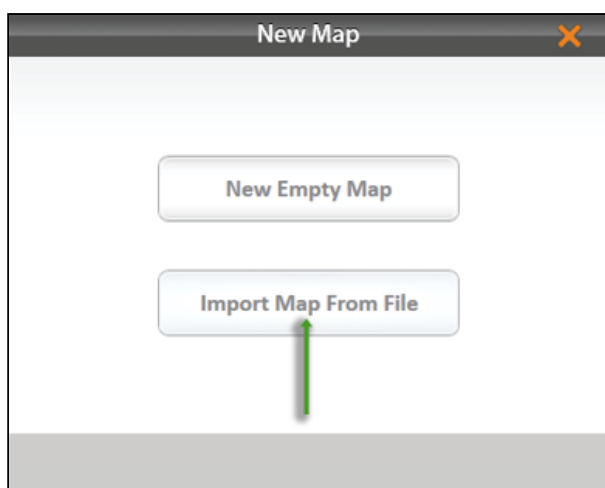
1. Tap **Maps** .



2. Tap **New**.

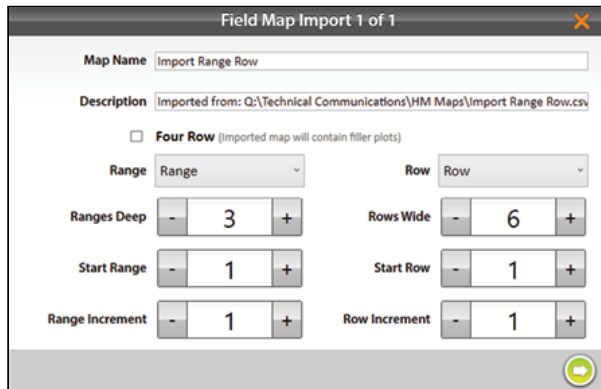


3. Select **Import Map from File**.



4. Navigate to and select the desired file.
5. Check the values displayed by Mirus and make sure they reflect the map you are importing. If necessary, change the columns designated as Range and Row by clicking on their respective drop-down menus.

Tap the drop-down menus to display other options for the range and row columns.



Field Map Import 1 of 1

Map Name: Import Range Row

Description: Imported from: Q:\Technical Communications\HM Maps\Import Range Row.csv

☐ Four Row (Imported map will contain filler plots)

Range: Range Row: Row

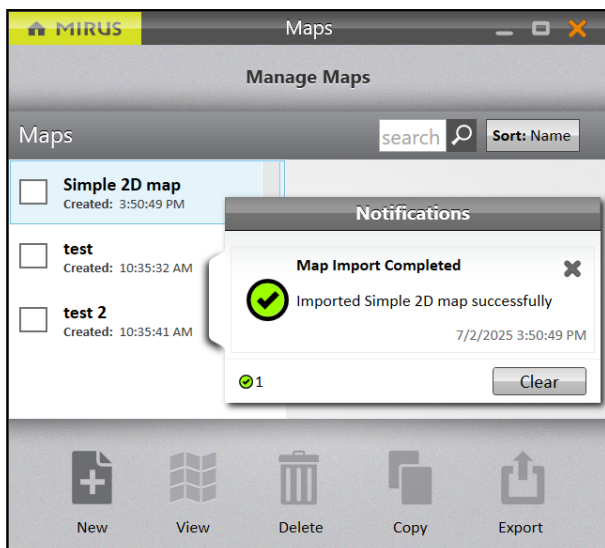
Ranges Deep: 3 Rows Wide: 6

Start Range: 1 Start Row: 1

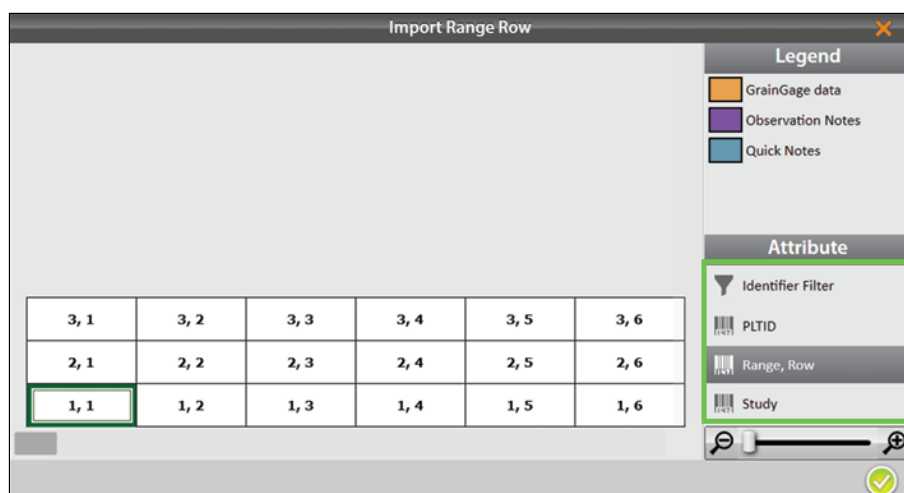
Range Increment: 1 Row Increment: 1

6. Tap the next arrow .

On the Manage Maps screen, Mirus displays a notification that the map has been imported successfully.



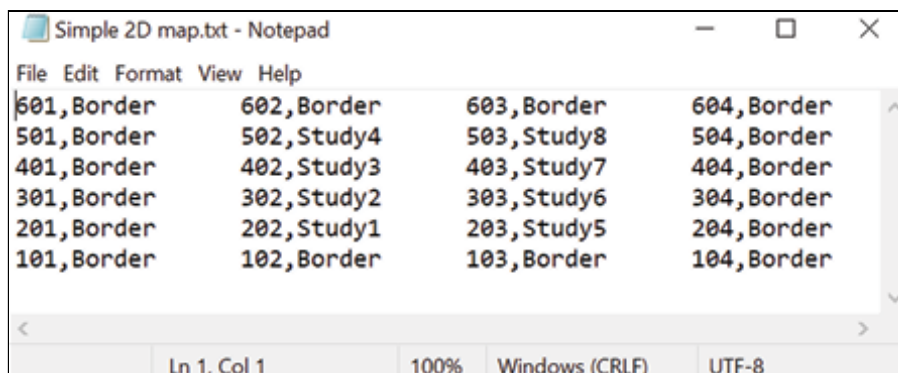
Mirus imports the additional attributes. You can select the attributes to view in the Attribute pane.



6.4.2 Import a Two-Dimensional (2D) Map

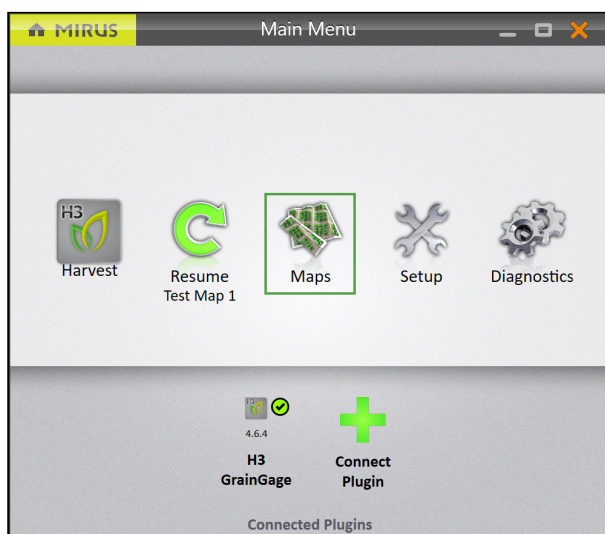
Two-dimensional (2D) maps have the same layout as the field. Plot IDs in a 2D map allow any plot name in any order to be used on the map. This type of map must be created with a spreadsheet or text editor and saved as a tab-delimited file or TXT file. Do not use any headings or spaces when creating a 2D map. Plot IDs may not contain any symbols.

Two-dimensional maps need to be in TXT format in order to be imported. The following is an importable 2D map file:

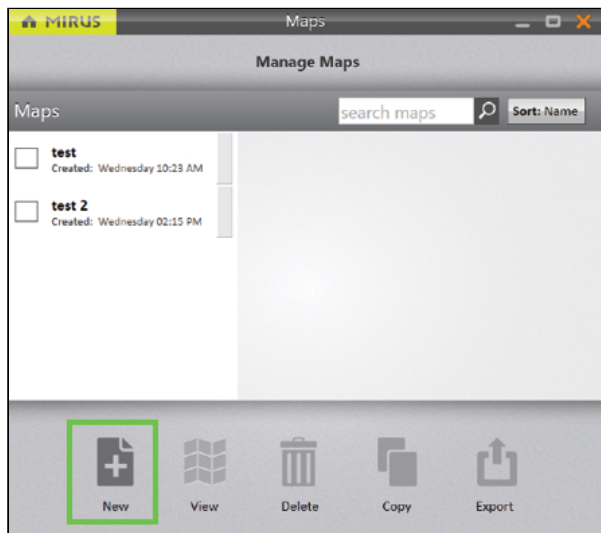


The following instructions walk you through importing a 2D map. On the Mirus Home screen,

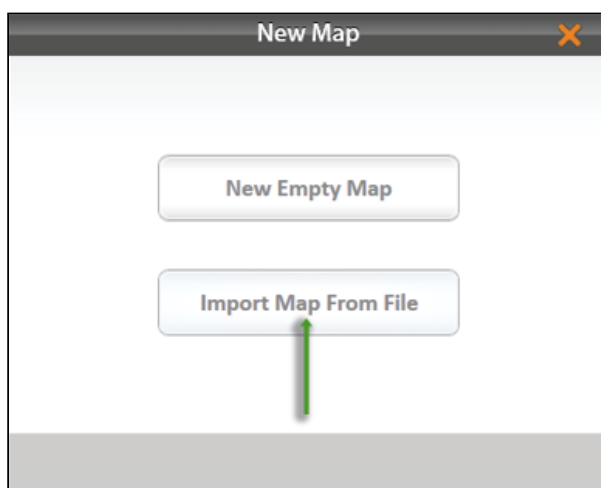
1. Tap **Maps** .



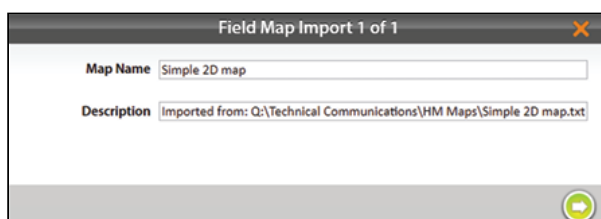
2. Tap **New**.



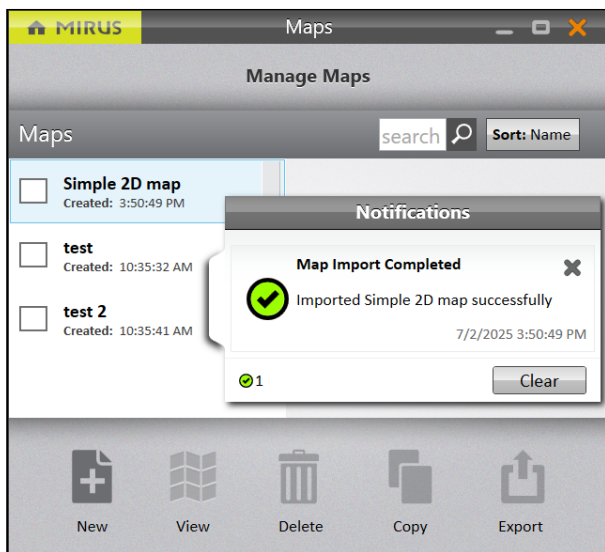
3. Select **Import Map from File**.
4. Navigate to and select the desired file.



5. If desired, change the default description displayed by Mirus.
6. Tap the next arrow .



On the Manage Maps screen, Mirus displays a notification that the map has been imported successfully.



Mirus imports the additional attributes, but defaults to the Range,Row view. Select a different attribute to change the view.

Simple 2D map				Legend
601	602	603	604	
501	502	503	504	- GrainGage data - Observation Notes - Quick Notes
401	402	403	404	
301	302	303	304	
201	202	203	204	
101	102	103	104	Attribute - Id 1 - Id 2 - Identifier Filter - Range,Row

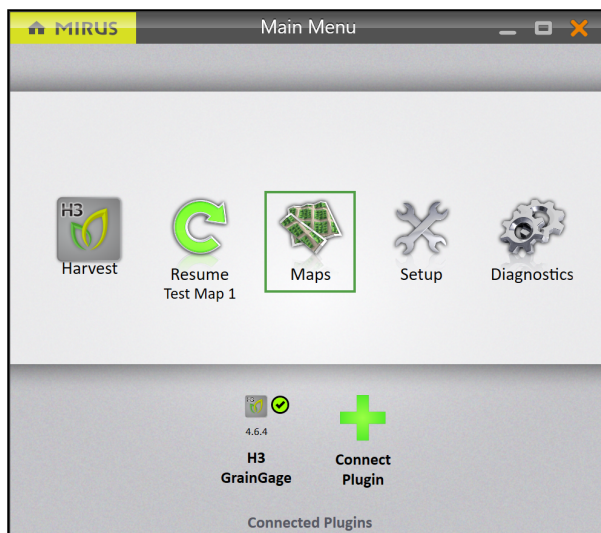
Simple 2D map				Legend
Border	Border	Border	Border	
Border	Study4	Study8	Border	- GrainGage data - Observation Notes - Quick Notes
Border	Study3	Study7	Border	
Border	Study2	Study6	Border	
Border	Study1	Study5	Border	
Border	Border	Border	Border	Attribute - Id 1 - Id 2 - Identifier Filter - Range,Row

6.4.3 Import Multiple Maps

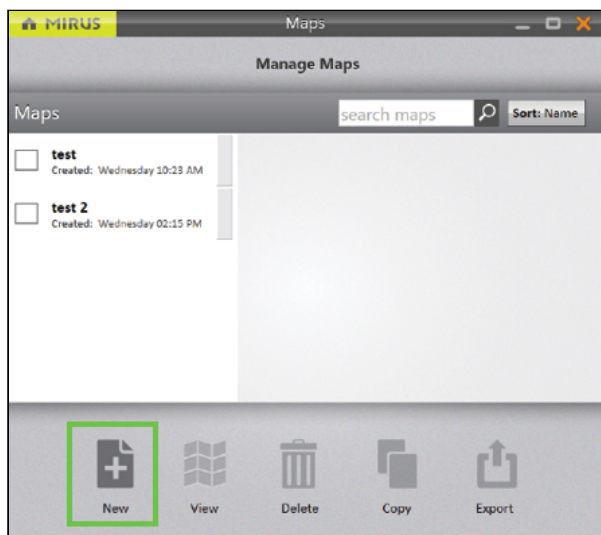
It is possible to import multiple maps at the same time.

On the Mirus Home screen,

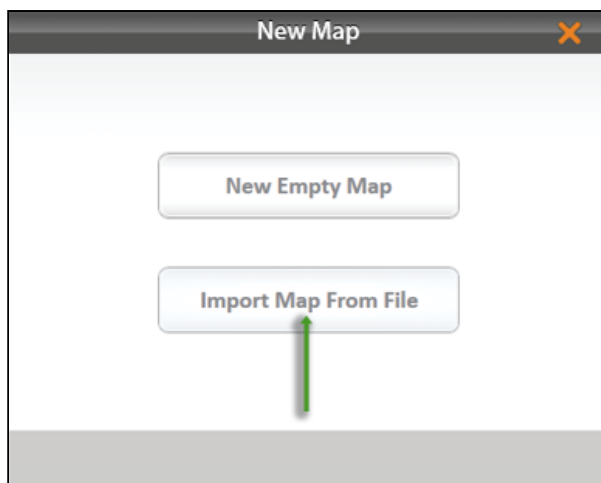
1. Tap **Maps** .



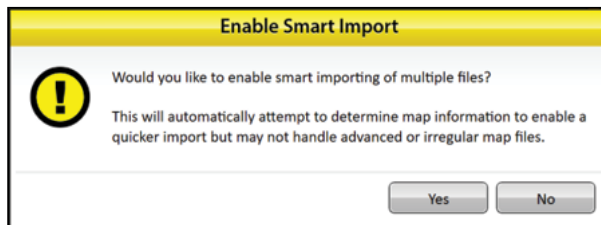
2. Tap **New**.



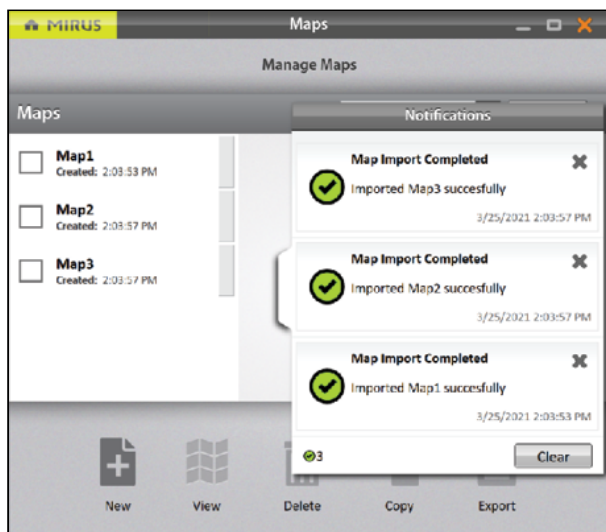
3. Select **Import Map from File**.



4. Navigate to the desired files.
5. Select the desired files and tap **Open**.
Note: You can select multiple files by holding the Ctrl key and marking each file you want to import.
6. Tap **Yes** to enable Smart Import.
Smart Import will import each file automatically without any additional input. If the map name already exists, the import will stop to allow the user to change the name.



On the Manage Maps screen, Mirus displays a notification that the maps have been imported successfully.

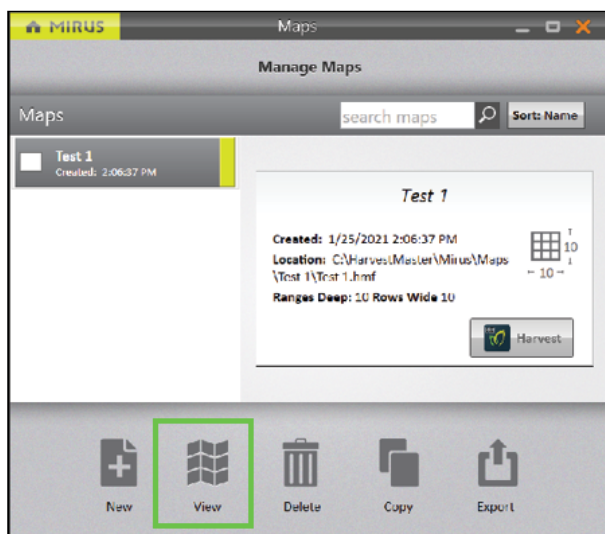


6.5 View a Map

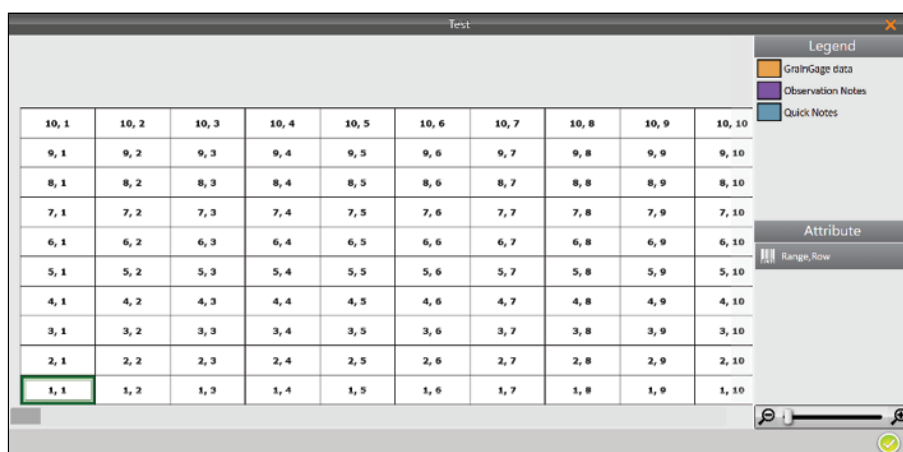
Open the Manage Maps screen,

1. Select the map you want to view.

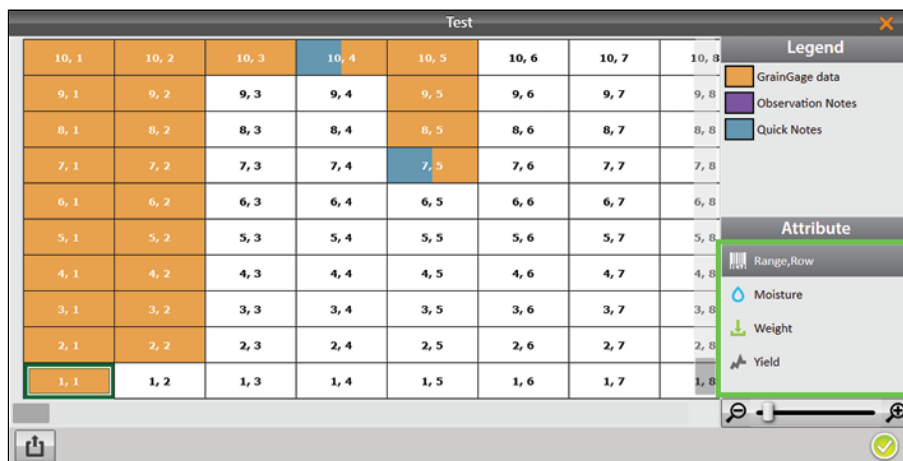
2. Tap **View**.



Mirus opens the Map View screen. The image below displays a map that has not yet been harvested:



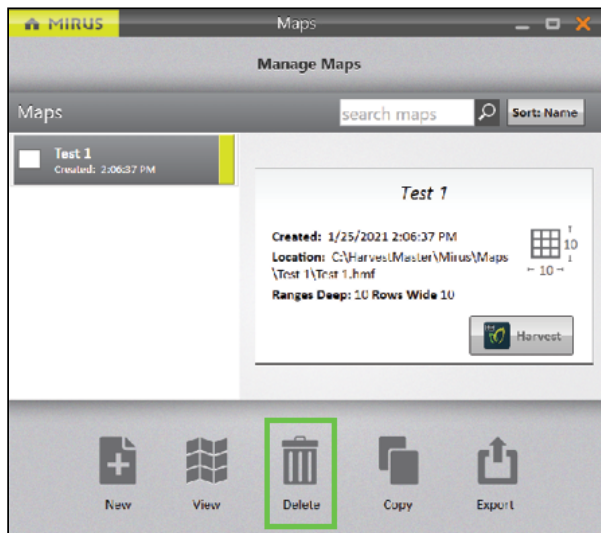
Depending on the attributes in the map and what data has been collected, Map View can be configured to display different attributes of the grain as shown in the image below:



6.6 Delete a Map

On the Manage Maps screen,

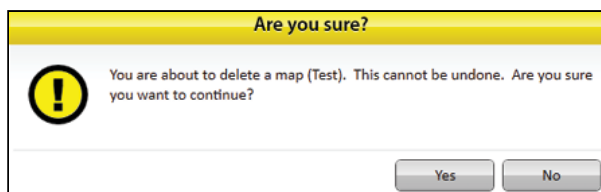
1. Select the map you want to delete.
2. Tap **Delete**.



Mirus asks if you are sure.

⚠ CAUTION: This cannot be undone! You cannot recover a deleted map.

3. If you choose to proceed, tap **Yes**.



Mirus deletes the map, and it is no longer available in the list on the Manage Maps screen.

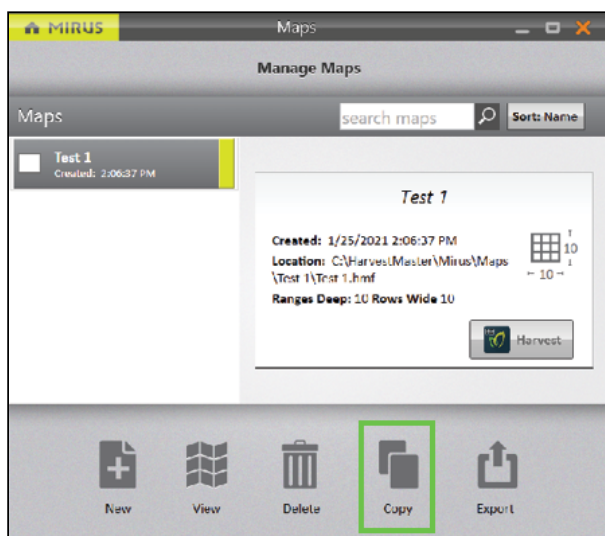
6.7 Copy a Map

Maps can be reused from year to year. To do so, simply copy the map in Mirus.

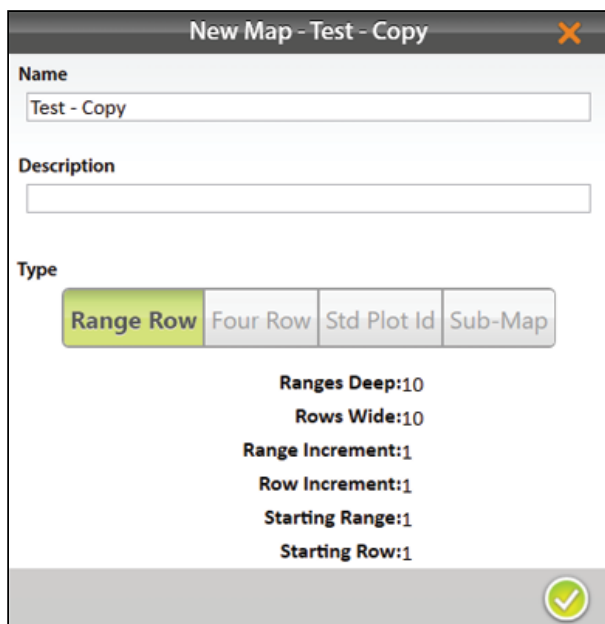
On the Manage Maps screen,

1. Select the map you want to copy.
2. Tap **Copy**.

Note: This option will only copy the layout of the map. The data within the map will not be copied.



3. Enter the name and description of the map.
4. Tap the check icon  to save the new copy.



Mirus adds it to the list of maps on the Manage Maps screen.

6.8 Export Map Data

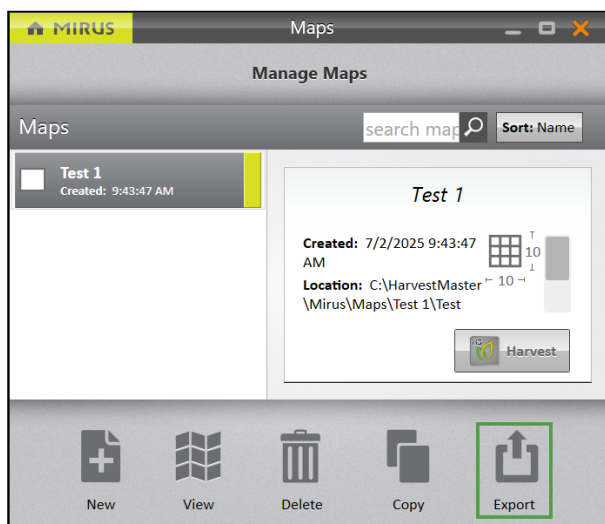
The Manage Maps screen allows you to export maps as data and as heat maps. The export data option creates a detailed spreadsheet of your data. The heat map option creates a color-coded visual map (in a spreadsheet) of the parameters you set for each color.

On the Manage Maps screen,

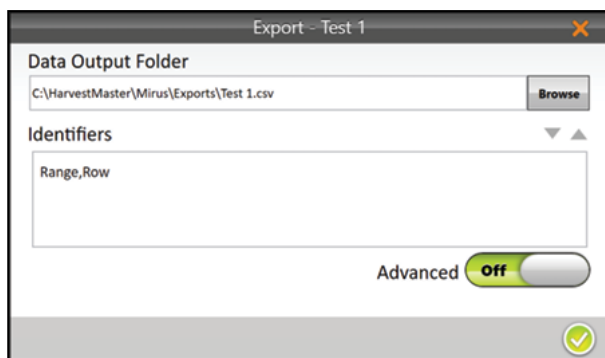
1. Select the map from which you want to export data.

Note: To export multiple maps, hold down the Shift key and select the desired maps.

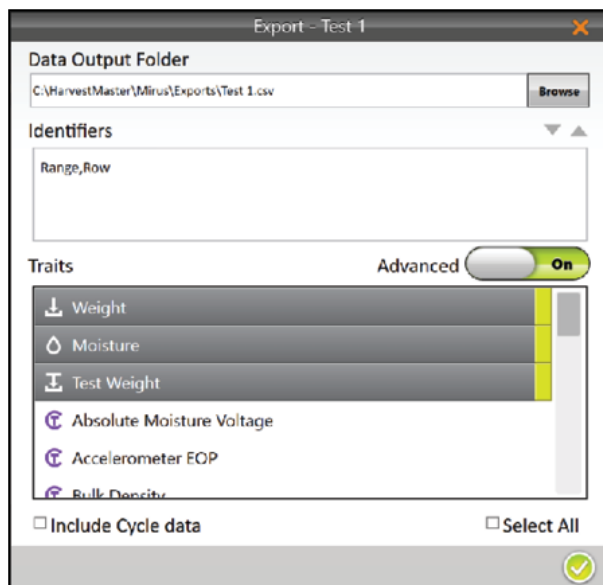
2. Tap **Export**.



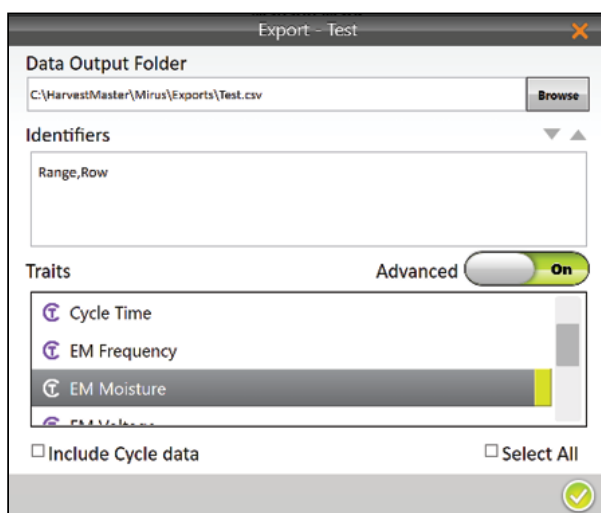
3. Enter the file path for the exported data.



- When Advanced is switched to **Off**, Mirus automatically exports the data for weight, test weight, and moisture.
 - When Advanced is switched to **On**, Mirus displays a list of available traits to export with the data.
4. (optional) Select the individual traits you would like to export.
 - Check Select All to export all the listed traits.
 - Check Include Cycle Data to include sub-cycle and weight trip data.

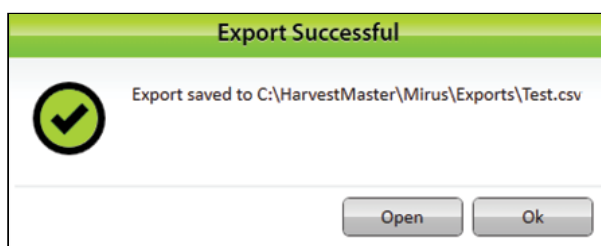


5. Tap the check icon  to finish exporting the data.



Mirus notifies of the successful export.

- Tap **OK** to finish the export.
- Tap **Open** to finish the export, and open the CSV file.



Mirus exports the data into CSV (comma delimited) form. This allows you to import the data into other programs for analysis.

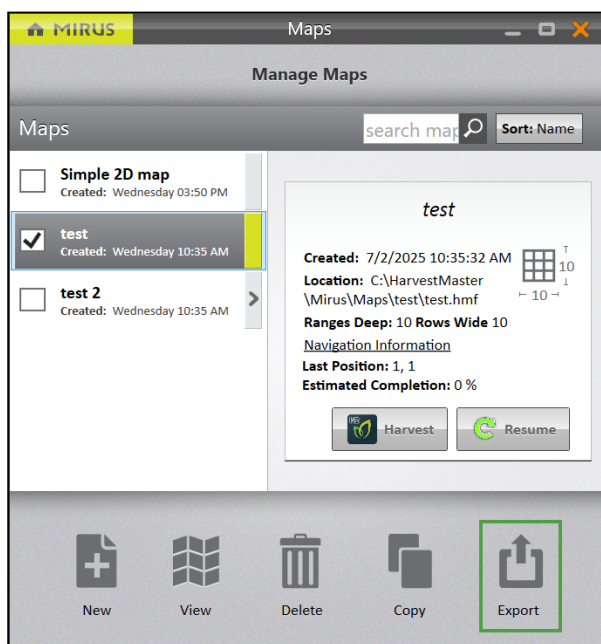
	A	B	C	D	E	F	G	H	I	J	K
1	Date/Time	Range	Rows	Weight	Moisture	Absolute Moisture	CSPP (25)	Road Cell 1	Yield	Quick Test	Harvest/Sequence
2	10/25/2019 10:00:00	1	1	10.000	10.0	1	11	0.000			1
3	10/25/2019 10:00:00	2	1	10.000	10.0	1	11	0.000			2
4	10/25/2019 10:00:00	3	1	10.000	10.0	1	11	0.000			3
5	10/25/2019 10:00:00	4	1	10.000	10.0	1	11	0.000			4
6	10/25/2019 10:00:00	5	1	10.000	10.0	1	11	0.000			5
7	10/25/2019 10:00:00	6	1	10.000	10.0	1	11	0.000			6
8	10/25/2019 10:00:00	7	1	10.000	10.0	1	11	0.000			7
9	10/25/2019 10:00:00	8	1	10.000	10.0	1	11	0.000			8
10	10/25/2019 10:00:00	9	1	10.000	10.0	1	11	0.000			9
11	10/25/2019 10:00:00	10	1	10.000	10.0	1	11	0.000			10
12	10/25/2019 10:00:00	2	2	10.000	10.0	1	11	0.000			11
13	10/25/2019 10:00:00	3	2	10.000	10.0	1	11	0.000			12
14	10/25/2019 10:00:00	4	2	10.000	10.0	1	11	0.000			13
15	10/25/2019 10:00:00	5	2	10.000	10.0	1	11	0.000			14
16	10/25/2019 10:00:00	6	2	10.000	10.0	1	11	0.000			15
17	10/25/2019 10:00:00	7	2	10.000	10.0	1	11	0.000			16
18	10/25/2019 10:00:00	8	2	10.000	10.0	1	11	0.000			17
19	10/25/2019 10:00:00	9	2	10.000	10.0	1	11	0.000			18
20	10/25/2019 10:00:00	10	2	10.000	10.0	1	11	0.000			19

6.9 Export a Heat Map

Exporting a heat map creates a color-coded visual map in a spreadsheet for each desired attribute. The colors in the heat map are determined by the Legend. It can be altered by changing the minimum and maximum for each attribute. For instructions, see the following sections: [Configure Weight in Spatial Display](#), [Configure Moisture in Spatial Display](#), [Configure Test Weight in Spatial Display](#), and [Configure Plot Size and Yield in Spatial Display](#).

To export a heat map,

1. Select the map you want to export from the Manage Maps screen.
2. Tap **Export**.

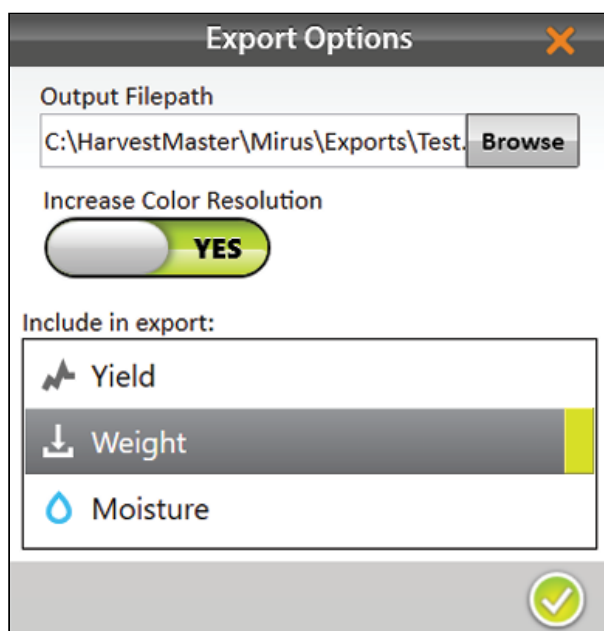


3. Enter the file path for the exported map.
4. Select whether you want to increase color resolution.

5. Select the attributes you want included in the export.

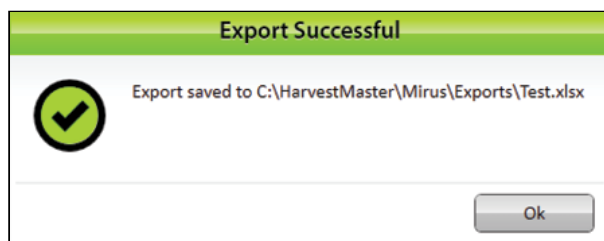
Note: If you select multiple attributes, each attribute will be displayed in a separate tab within Excel.

6. Tap the check icon  to finish exporting the map.



Mirus notifies of the successful export.

7. Tap **OK** to finish the export.



If Microsoft Excel is installed, a spreadsheet opens automatically, showing the exported heat map.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Map:	Heat_Map_Example										
2	MapSize:	6x8										
3	Units:	Imperial	Yield unit bushels per acre									
4					1	2	3	4	5	6	7	8
5	Yield Settings			6	147	159	284	482	239	227		6
6	Standard f	48 lb/bu		5	168	201	240	182	201	208		5
7	Standard f	15.5		4	179	239	182	245	196	177		4
8	Plot Width	5 ft		3	205	197	160	207	173	140		3
9	Plot Depth	17.4 ft		2	201	297	138	182	140	112		2
10	Maximum	240 bu/ac		1	182	267	150	160	145			1
11	Minimum	80 bu/ac			1	2	3	4	5	6	7	8
12												
13	Legend											
14		>240										
15		222.2										
16		204.4										
17		186.7										
18		168.9										
19		151.1										
20		133.3										
21		115.6										
22		97.8										
23		80.0										
24		<80										

mirus™



CHAPTER 7

Harvest Mode

7 Harvest Mode

You must create or import a map before you can harvest.

From the Mirus Home screen,

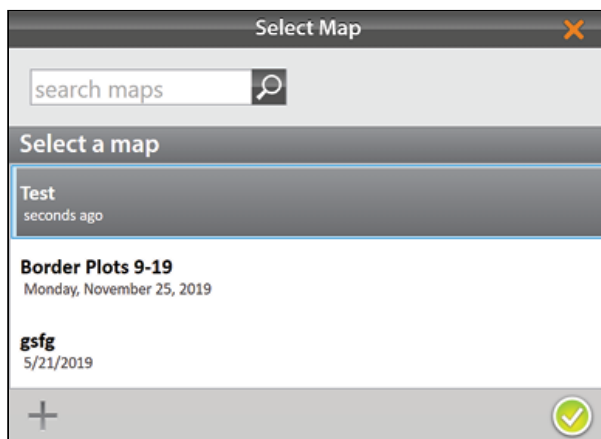
1. Tap **Harvest** .

Note: If the Harvest icon is not visible, see [Connect to the GrainGage Plugin](#) for instructions on loading the H3 GrainGage plugin.

Note: Harvest can also be entered from  (Maps) or  (Resume).

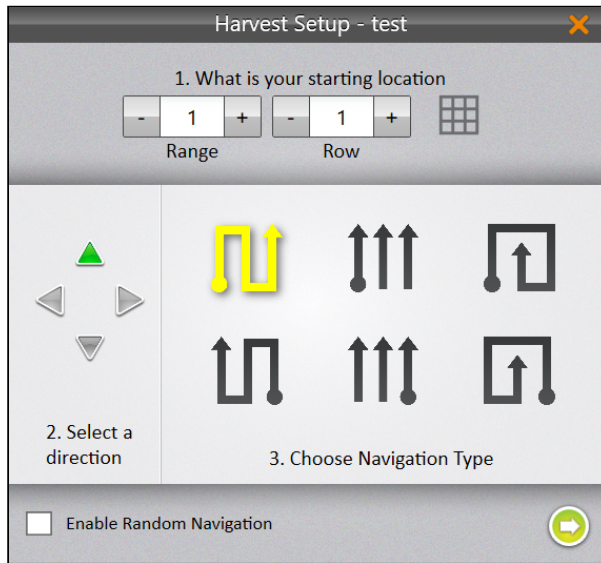


2. Select a map or tap the plus icon  to create a new map.
3. Tap the check icon .

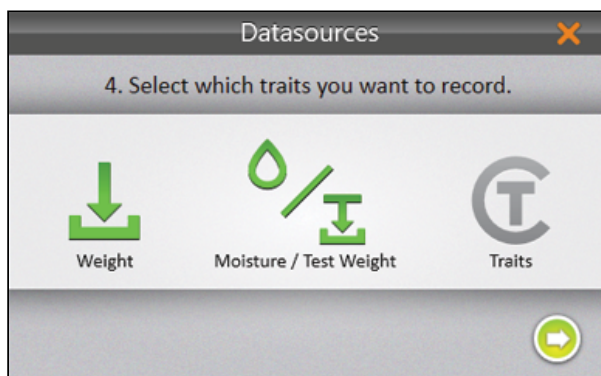


4. Enter the starting location.
Note: Use the matrix  to choose the starting location.
 5. Select the direction of harvest.
 6. Choose a navigation type.
 7. Tap the next arrow .
- Note: If you check **Enable Random Navigation**, you will be able to change your location on the main Harvest screen just by tapping on the desired plot. This is mostly used for*

note taking.



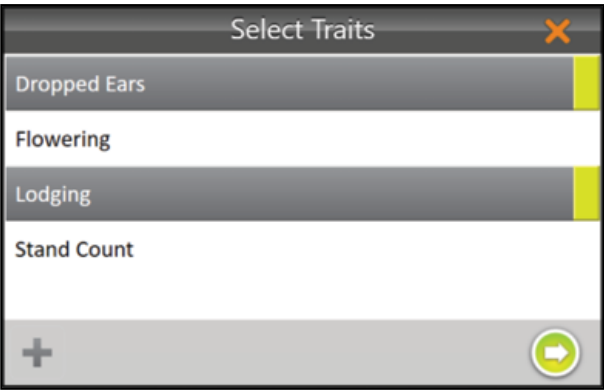
8. Select which attributes you plan to record.
Note: Both moisture and test weight must be enabled even if only one trait is desired. The undesired trait can be modified post-process.



If **Traits** are enabled, the Select Traits dialog box will appear. You will be prompted to choose a previously configured trait or create a new one. For more information about configuring Traits from the Setup screen, see [Create and Record Traits](#).

9. Select one or all of the traits to include.

10. Tap the next arrow .

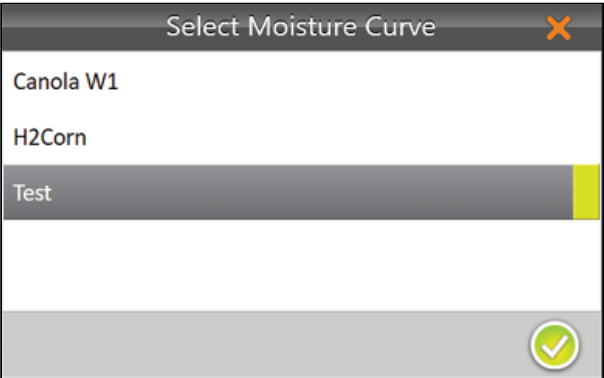


If you selected **Moisture/Test Weight**, Mirus prompts you to select a moisture curve.

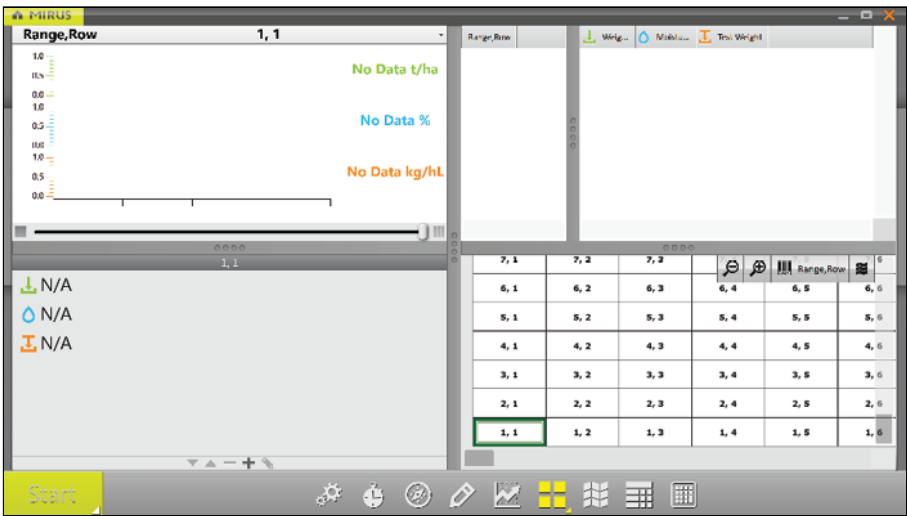
11. Select a **Moisture Curve**.

12. Tap the check icon .

Note: You will only be able to see the SCiO calibration file if you are connected to an H3 GrainGage with a SCiO sensor installed.

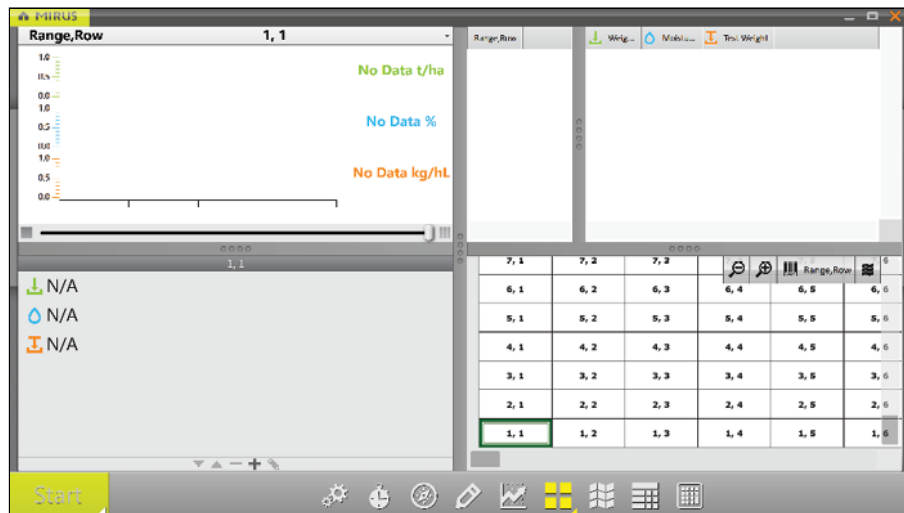


Mirus opens the Harvest screen and is ready to be configured or to collect data. If you have connected with a SCiO sensor, the SCiO data will display here too.



7.1 Configure Harvest Screen Options

The Harvest screen provides several options for configuring how data is collected and presented during harvest. The default view of the Harvest screen shows four evenly-spaced sections that display the data for graph, list, info, and spatial views. (Descriptions and additional options are described below.)



Harvest Screen Options		
Icon	Option	Description
	Start Cycle Countdown Go	The button changes as you proceed through your field. Tap Start when you are ready to begin harvesting the field. If you are using the countdown timer, the set time will count backward, indicating the delay before the GrainGage cycles the grain. (See Configure Cycle Settings.) If you are not using a count down, tap Cycle  to begin measurements when all of the grain has been delivered to the weigh bucket. Go indicates it's time to move to the next plot. More details can be found in Collect Harvest Data.
	Diagnostics	Opens the Diagnostics dialog box for monitoring during harvest.
	Cycle Settings	Allows the operator to change the Mode, Button Type, Position, and Countdown time for the Start/Cycle/Countdown/Go button.
	Navigation	Opens the Change Location dialog box and allows the operator to make changes to location, direction, and navigation type.

	Observations	Opens a dialog box in which the operator can record notes for each plot during harvest. This is also where you can add information about any traits you configured.
	Graph View	Displays accumulating data as a graph.
	Quad View	The default view. Divides the display into four smaller windows. The operator can adjust the size of each window and customize them each to display data in Cycle Data, Diagnostics, Graph, Info, List, Spatial, or Real Time Weight view. This screen should be used during your harvest.
	Map View	Opens the Spatial Display, also referred to as a heat map. This display can be configured to show attribute data plot by plot.
	List View	Displays accumulating data as a list.
	Ten Key	Numeric keypad for fast entry of trait and note data.

7.1.1 Configure Cycle Settings

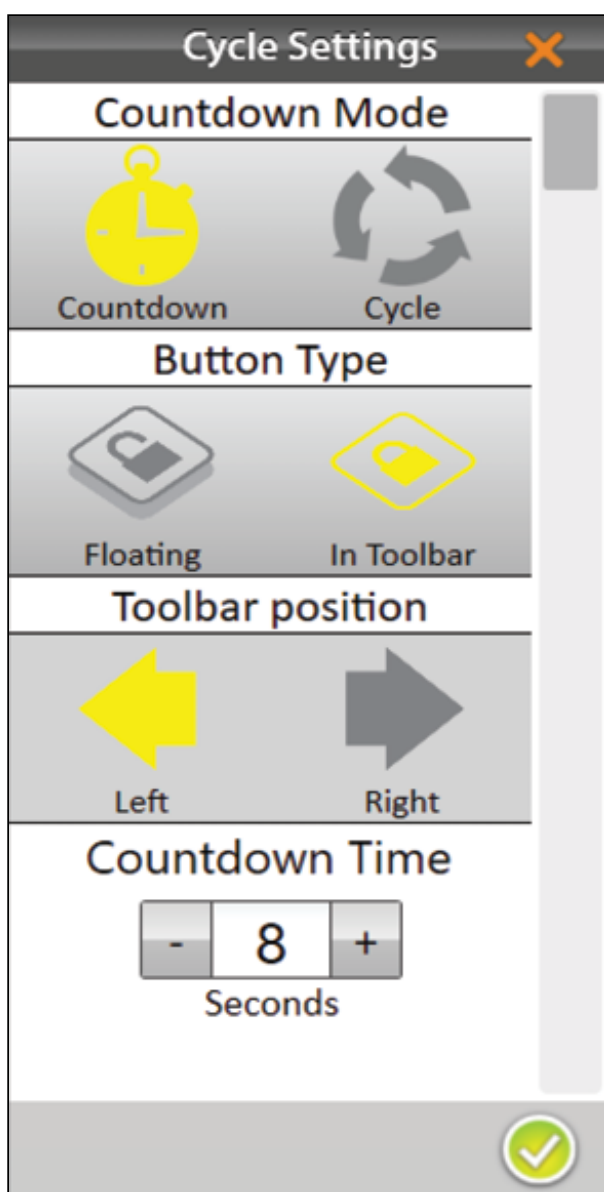
The cycle settings determine the settings of the **Start/Cycle/Countdown/Go** button. These settings can change the Countdown Mode, Button Type, and Toolbar Position.

The countdown timer sets a wait time at the start of each cycle to ensure that all of the grain from the current plot reaches the GrainGage before cycling.

To configure the Countdown Mode,

1. Tap the cycle settings icon  in the toolbar.
2. Select your desired countdown mode. Choose
 - **Countdown** to include a countdown of the time required for the sample to exit the combine and fill the weigh bucket. Adjust the countdown time at the bottom of the options to match the time that it takes with your equipment.

- **Cycle** to manually indicate (tap start button, press enter, press trigger) that the sample has filled the weigh bucket.

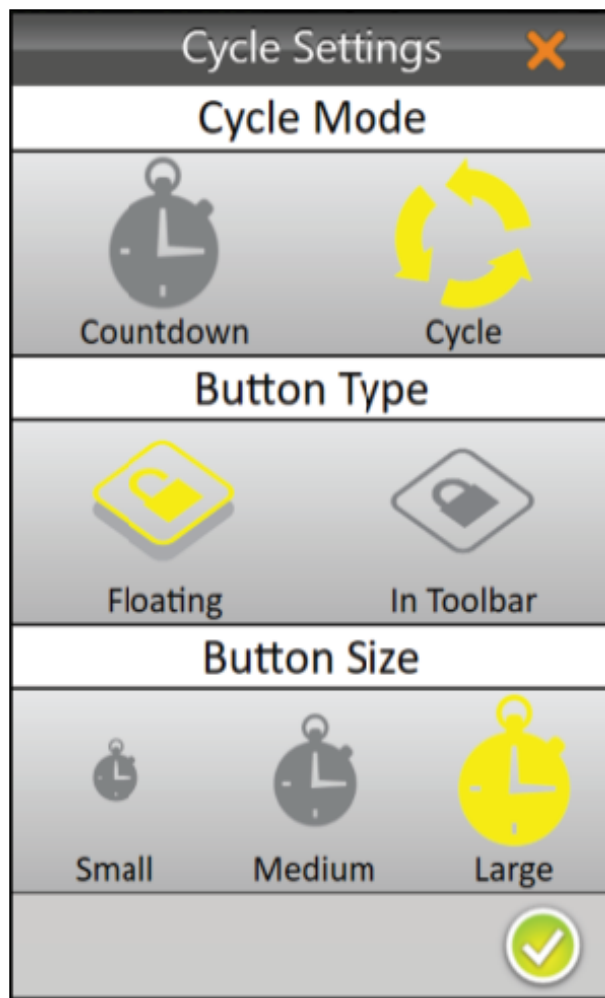


3. Tap the check icon .

To change the Button Type,

1. Tap the cycle settings icon  in the toolbar.
2. Select your preferred button type. Choose
 - **Floating** to put the Start/Cycle/Countdown/Go button in a separate dialog box that can be moved to any location on the screen. If you select **Floating**, Mirus prompts you to choose the small, medium, or large size for the floating button.

- **In Toolbar** to leave the Start/Cycle/Countdown/Go button in the bottom corner of the Mirus window.

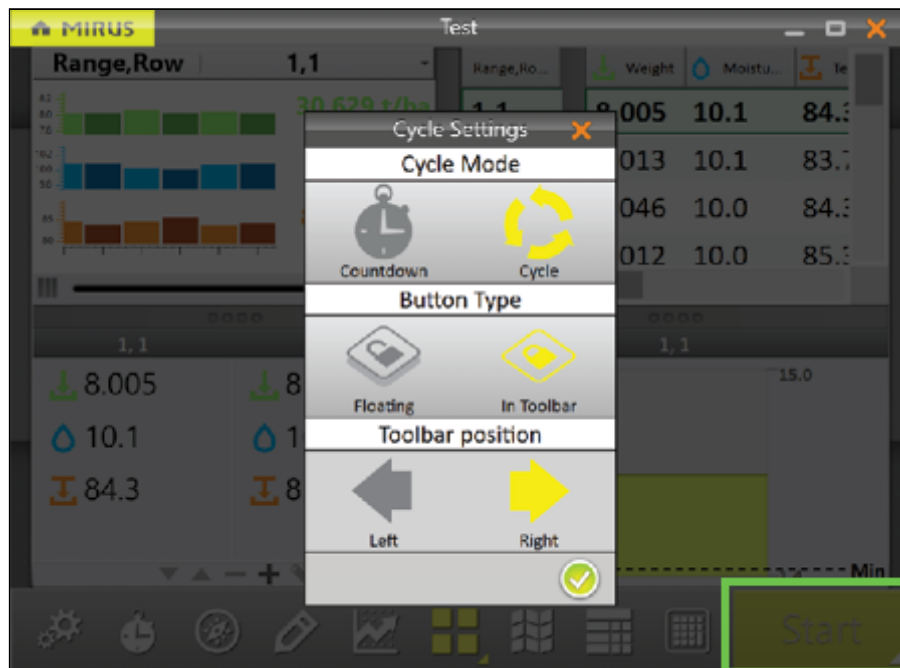


3. Tap the check icon .

To change the Toolbar position of the button,

1. Tap the cycle settings icon  in the toolbar.
2. Select **In Toolbar**.
3. Select **Left** or **Right**.

The default position is left. If you select right, Mirus moves the **Start/Cycle/Countdown/Go** button to the other side of the screen.

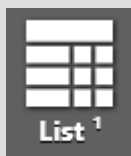


4. Tap the check icon .

7.1.2 Quad View

Mirus provides the option of viewing four screens at once when **Quad View**  is selected. (Quad view is the default view.) Each screen can be configured to display the data differently. The options are described in the following table.

Quad View	
Option	Description
 Cycle Data ¹	Displays the plot, weight, moisture, test weight, and trait data for each cycle.
 Diagnostics	Displays the Diagnostics dialog box for monitoring during harvest. (Also available in the Harvest Mode toolbar.)
 Graph ¹	Shows the plot progression of weight, moisture, and test weight in a graph. (Also available in the Harvest Mode toolbar.)
 Info ¹	Displays the weight, moisture, and test weight of the most recent plot.



Displays accumulating data as a list. (Also available in the Harvest Mode toolbar.)



Displays attribute data with colors plot by plot. It is also referred to as a heat map. The colors are listed below:

- **Gold**—The plot has harvest data.
- **Purple**—The plot has trait note data.
- **Blue**—The plot has a quick note.

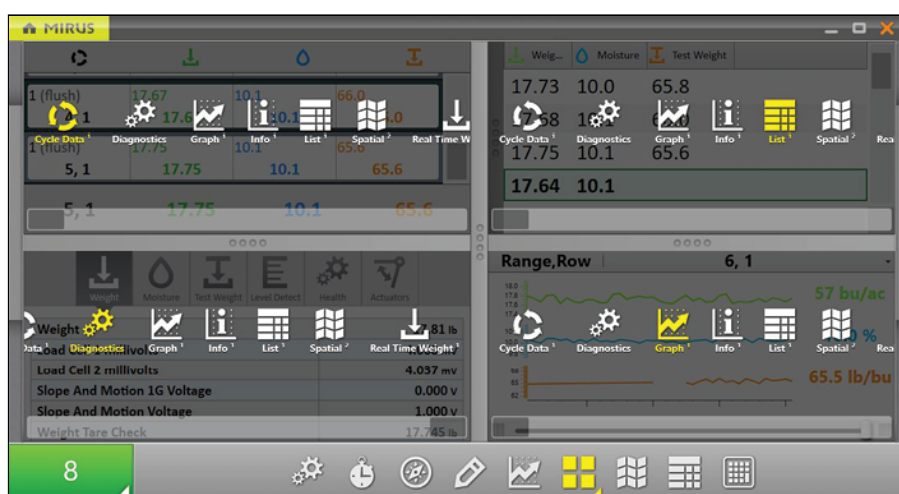
(Also available in the Harvest Mode toolbar.)



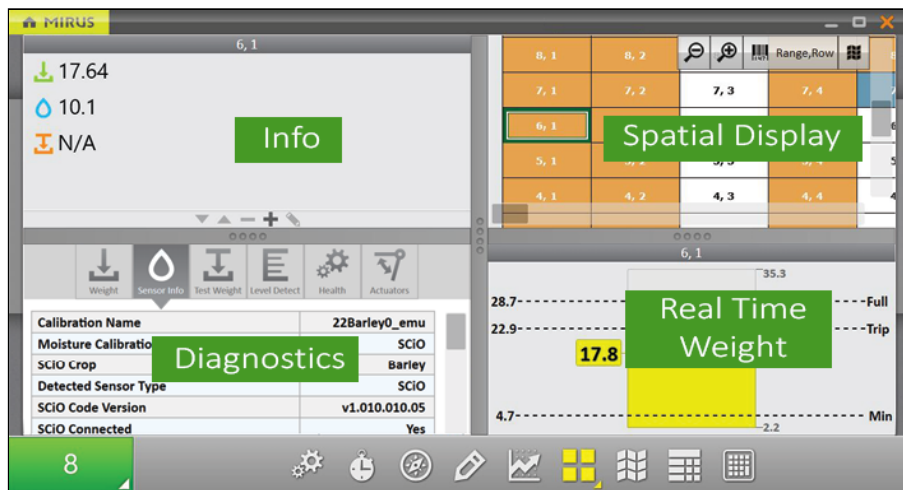
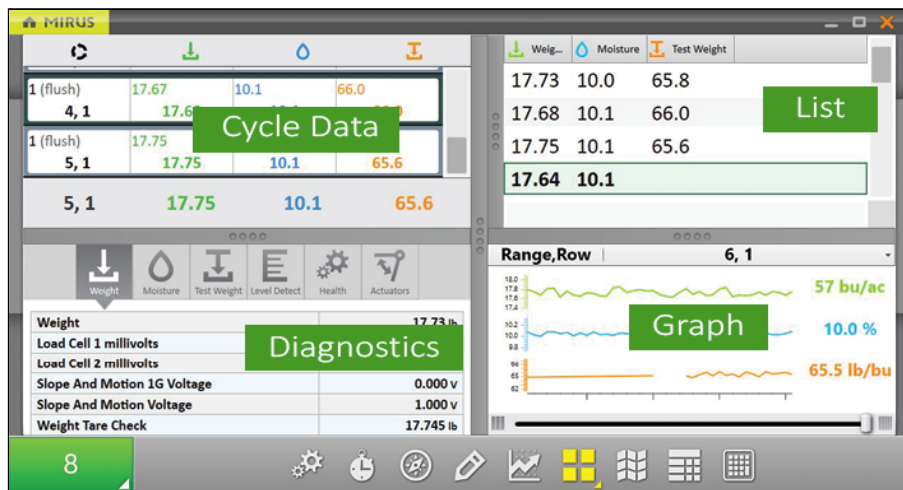
Displays the real time weight of the weigh bucket. (Also available in the Harvest Mode toolbar.)

To configure the Quad View screens:

1. Enter Quad View by tapping the Quad View icon .
If desired, enlarge and shrink specific screens by dragging the borders of the Quad View screens.
2. Tap the Quad View icon a second time. Mirus displays options for each of the four screens. The option displayed in each section is colored yellow. Tap another option to change.



3. Tap the Quad View icon again. Mirus exits the configuration screens. The following pictures show examples of what each of the options looks like in the Quad View.



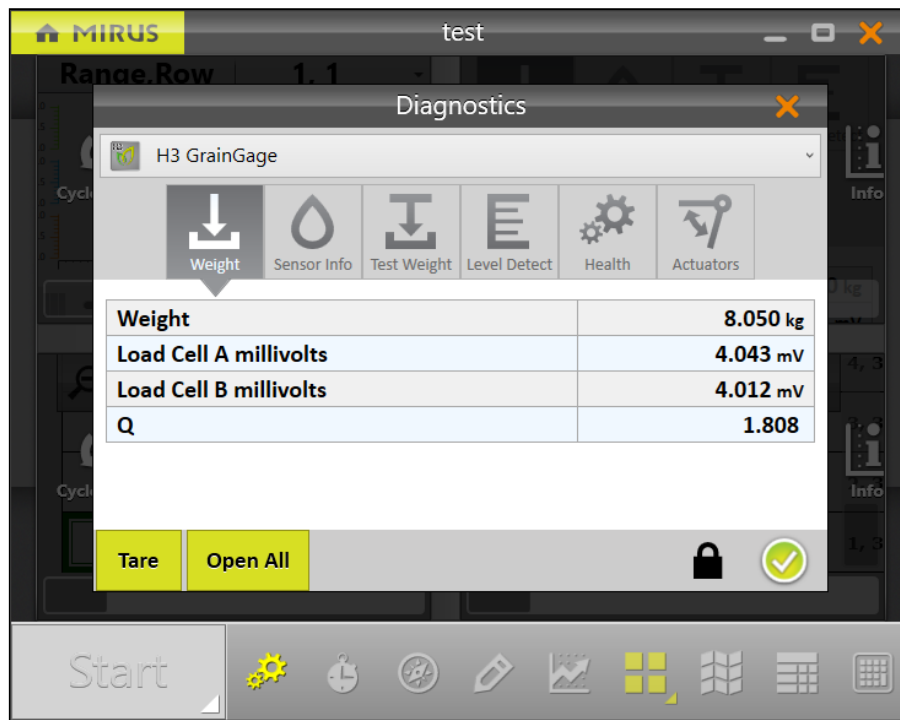
7.1.3 Diagnostics Screen

To access the Diagnostics screen in Harvest Mode,

1. Tap the gear icon  on the toolbar.
2. Select the tab for the diagnostic function you want to see.

Note: If you open the Actuator tab, you can see the status of the gates and actuators while they cycle during the harvest.

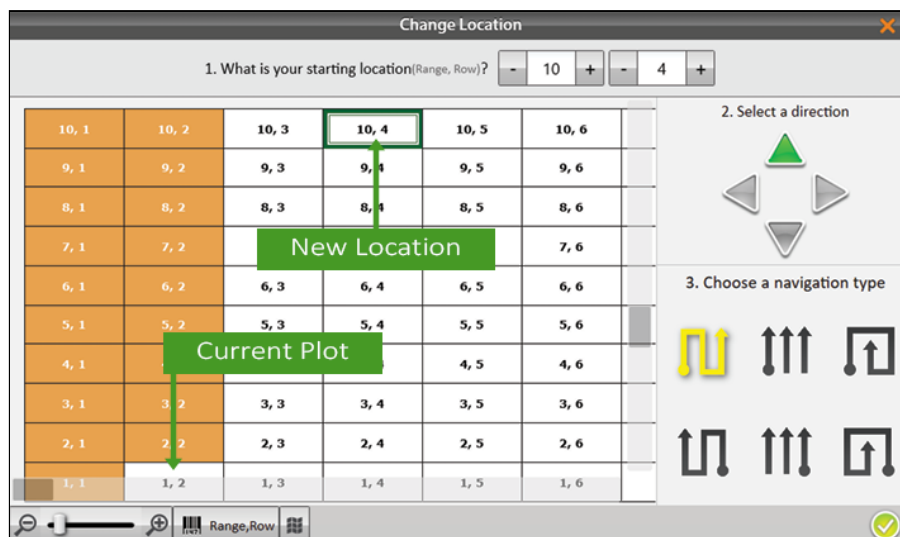
Note: The Diagnostics screen will not open while the GrainGage is cycling.



7.1.4 Navigation Screen

To change your location, direction, or navigation type,

1. Tap the navigation icon  to open the Change Location dialog box.
 2. Select the location on the map where you wish to resume data collection in one of two ways:
 - Tap on the plot in the map.
- Or
- Enter the range and row in the fields at the top of the dialog box.

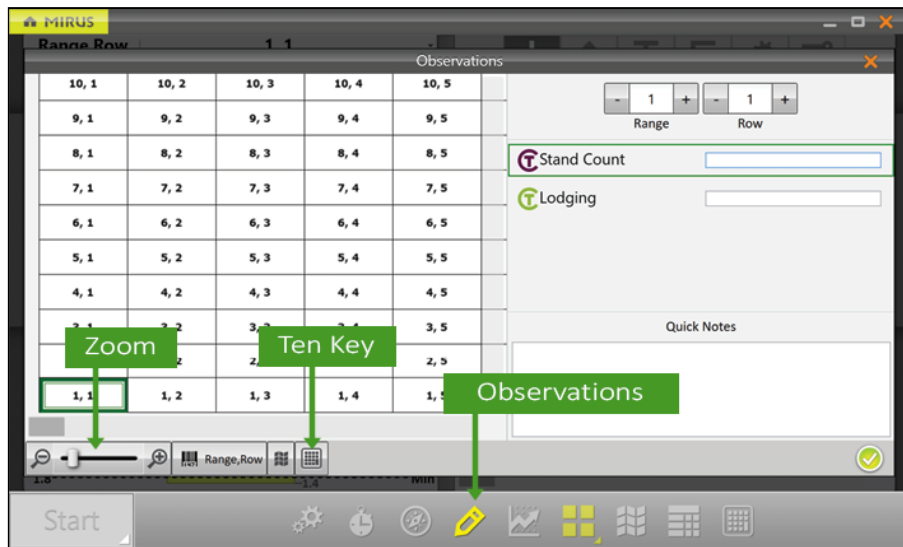


3. Select an arrow to change direction.
4. Select a navigation pattern by clicking on one of the options in the lower right portion of the window.
5. Tap the check icon .

7.1.5 Observations Screen

On the Harvest screen,

1. Tap the pencil icon  to open the Observations window.



The Observations screen shows the plot position and provides character fields for notes on each trait and a Quick Notes text box to record any other observations for each plot. Mirus stores the quick notes and trait notes alongside harvest data.

1. Tap the Ten Key icon  for a floating dialog box that can also enter trait notes and quick notes.

(Also available in the Harvest Mode toolbar.)



7.1.6 Graph View

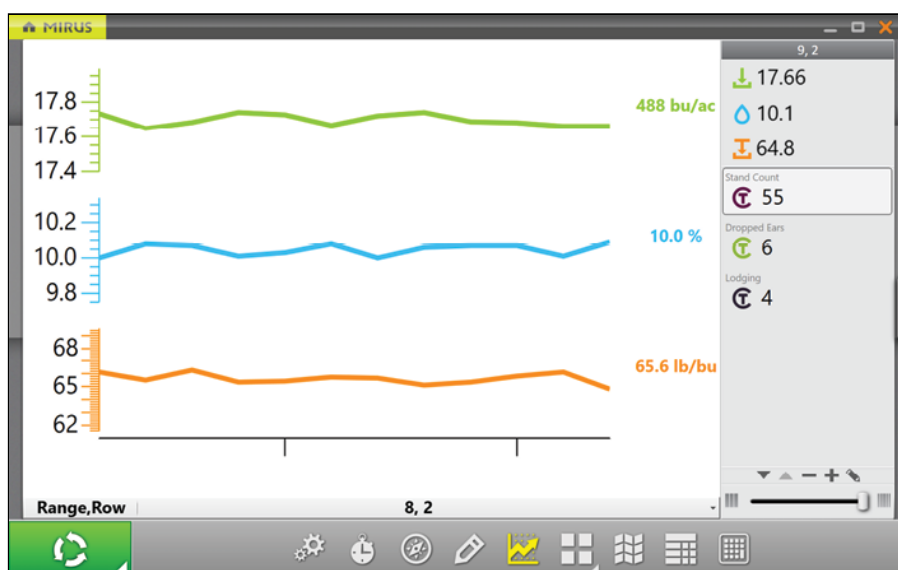
To view the harvest data in graph form, tap the graph icon  in the toolbar.

The column to the right of the graph shows the data for the current plot.

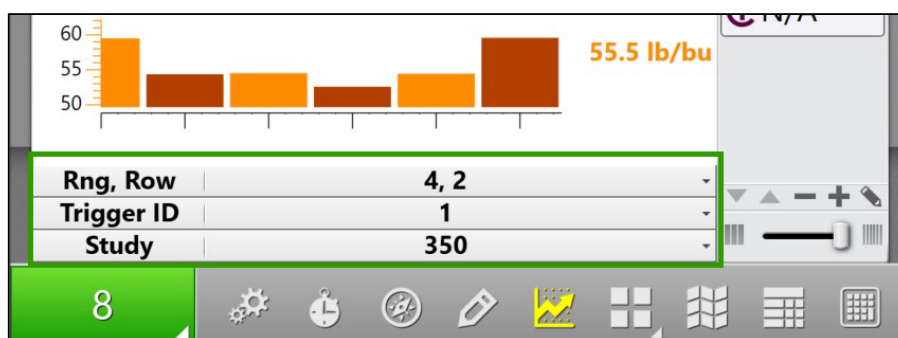
In the graph, each bar (or point in the line graph) represents a plot. Each graph represents the map for three different traits: green for weight, blue for moisture, and orange for test weight. The values shown at the end of the graphs show the averages. The green average shows the yield based on the weight measurements and plot size. To set the yield parameters, see [Configure Plot Size and Yield in Spatial Display](#).



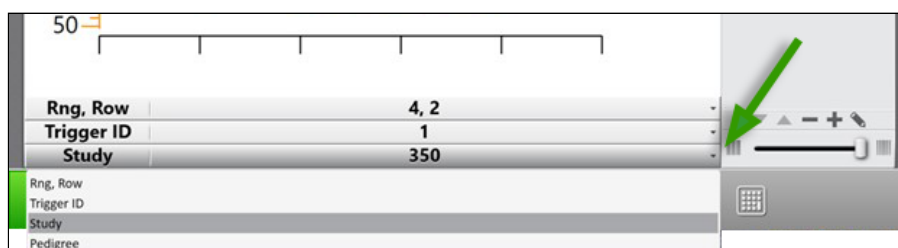
Click the graph icon  again to switch between a bar graph (shown above) and a line graph (shown below).



If you are using an imported map with multiple plot identifiers, Mirus displays up to three of these identifiers below the graph. By default, the first identifier is range/row followed by any additional identifiers in the order they were imported.



To view a different identifier, click the drop-down arrow next to the identifier you want to change and select an identifier from the list.



7.1.7 List View

In List View, you can see the data in the form of a spreadsheet.

Range, Row	Weight	Moistu...	Test Weight	Dropped Ears	Lodgi...
1, 1	8.022	10.1	84.7		
2, 1	8.020	10.1	83.9		
3, 1	8.036	10.0	84.0		
4, 1	8.092	10.1	84.3		
5, 1	8.039	10.0	85.1		
6, 1	8.080	10.1	84.4		
7, 1	8.047	10.1	84.0		
8, 1	8.076	10.1	84.7		

If you are using an imported map with multiple plot identifiers, Mirus displays the range/row first followed by any additional identifiers in the order they were imported.

Rng, Row	Trigger ID	Study	Weight	Moistu...	Test Weight	Lodgi...
1, 1		350	6.34	10.2	59.2	0
2, 1		350	5.72	11.8	54.1	0
3, 1	1	350	5.64	11.9	54.2	0
4, 1	1	350	5.63	12.1	52.3	0
5, 1	1	350	5.72	11.8	54.1	0
5, 2		350	6.35	10.2	59.3	0

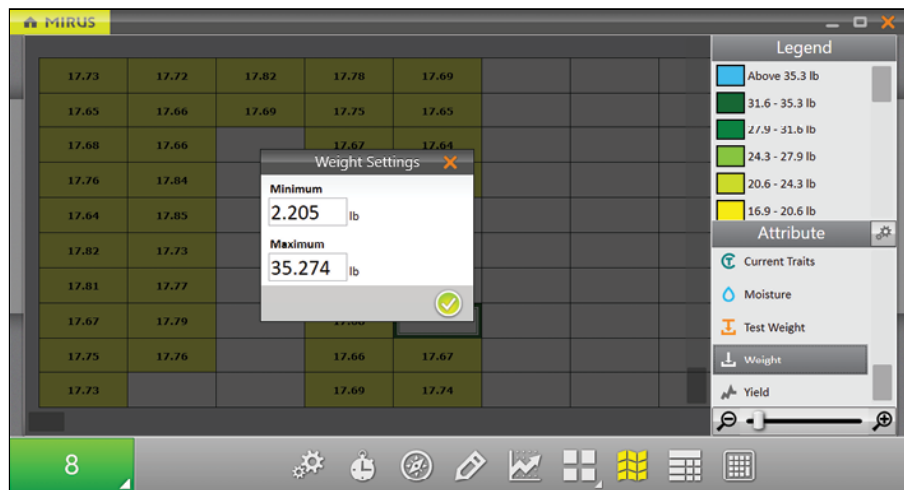
Additional plot identifiers from the imported map

7.1.8 Configure Weight in Spatial Display

To set the minimum and maximum weight,

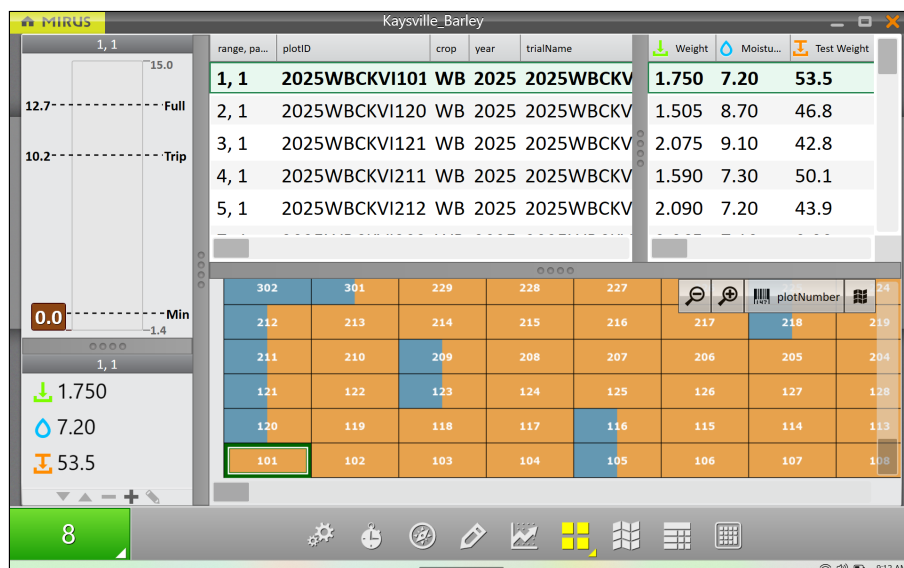
1. Tap the Spatial Display icon  to display data in a heat map format.
2. Select the **Weight** attribute.
3. Tap the gear icon  in the Attribute bar.
4. Set the **Minimum** and **Maximum** Weight.
5. Tap the check icon .

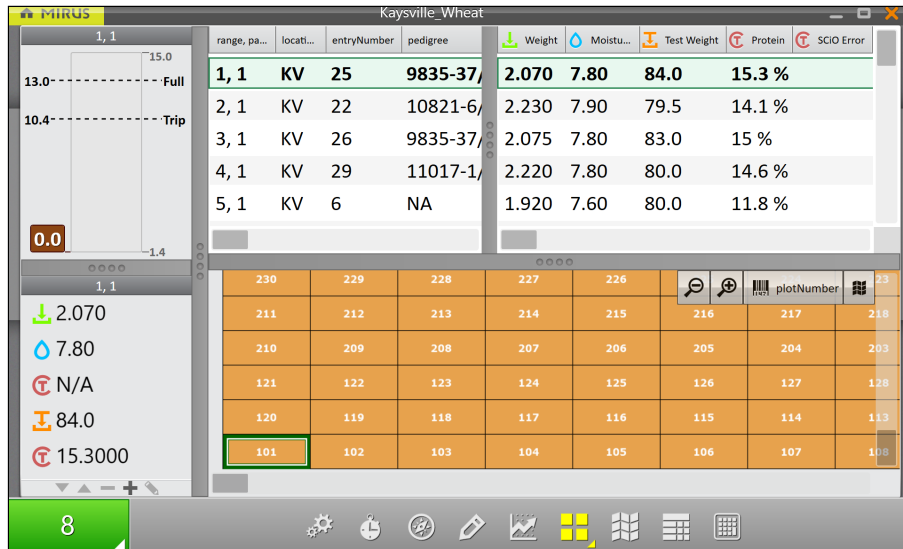
Adjusting the minimum and maximum values helps to create a more detailed legend and define the scope of the graphs and maps. The narrower the minimum and maximum range, the more detailed the information displayed becomes.



This setting adjusts the maximum weight on the Real Time Weight display, which allows you to track how full the GrainGage is getting with each plot. This is important to monitor so the GrainGage doesn't overflow. (The minimum weight shown on the Real Time Weight display is adjusted with the Chamber Head Room under **Setup > H3 GrainGage Sensors > Weight.**)

EM Sensor



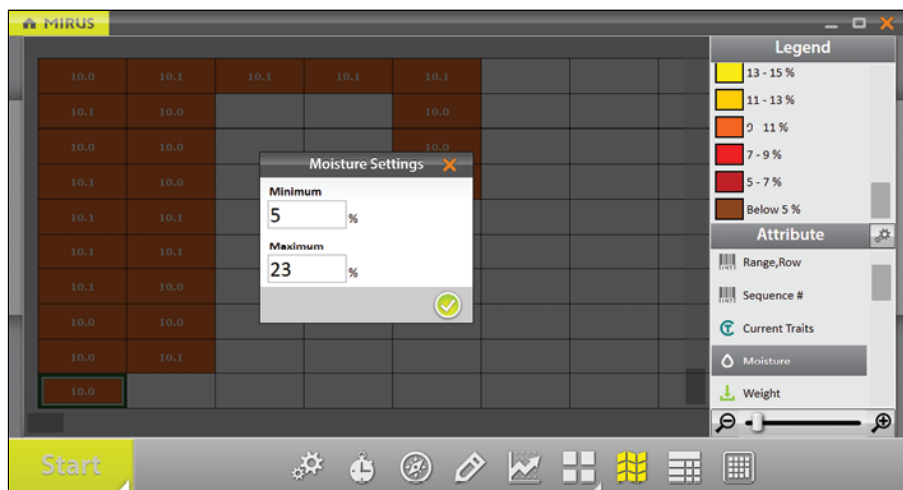


7.1.9 Configure Moisture in Spatial Display

To set the minimum and maximum moisture,

1. Tap the Spatial Display icon  to display data in a heat map format.
2. Select the **Moisture** attribute.
3. Tap the gear icon  in the Attribute bar.
4. Set the **Minimum** and **Maximum** moisture.
5. Tap the check icon .

Adjusting the minimum and maximum values helps to create a more detailed legend and define the scope of the graphs and maps. The narrower the minimum and maximum range, the more detailed the information displayed becomes.



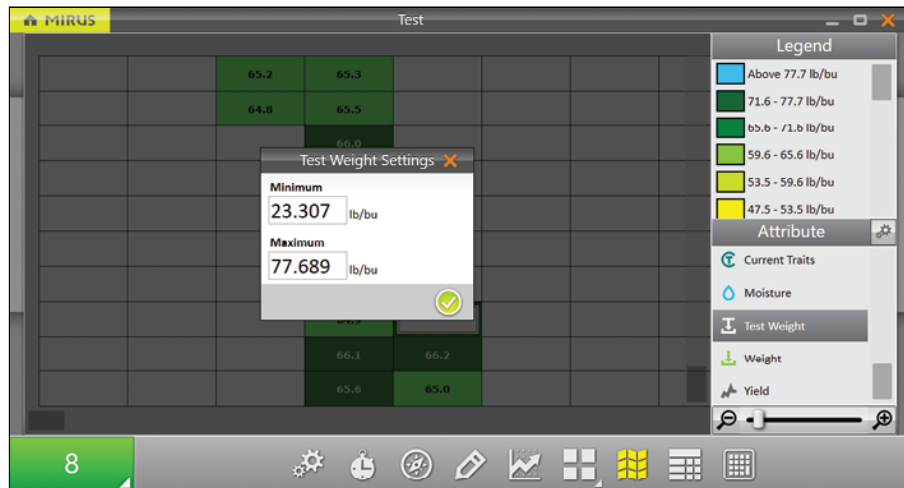
7.1.10 Configure Test Weight in Spatial Display

To set the minimum and maximum test weight,

1. Tap the Spatial Display icon  to display data in a heat map format.
2. Select the **Test Weight** attribute.

3. Tap the gear icon  in the Attribute bar.
4. Set the **Minimum** and **Maximum** Test Weight Settings.
5. Tap the check icon .

Adjusting the minimum and maximum values helps to create a more detailed legend and define the scope of the graphs and maps. The narrower the minimum and maximum range, the more detailed the information displayed becomes.

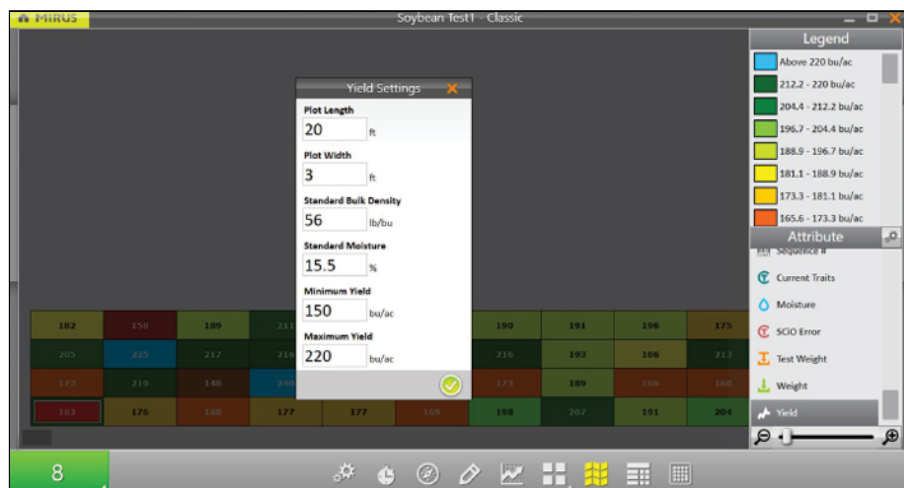


7.1.11 Configure Plot Size and Yield in Spatial Display

To set the minimum and maximum plot size and yield,

1. Tap the Spatial Display icon  to display data in a heat map format.
2. Select the **Yield** attribute.
3. Tap the gear icon  in the Attribute bar.
4. Set the **Plot Length** and **Width**.
5. Set the **Minimum** and **Maximum** Yield.
6. Tap the check icon .

The values set here help calculate the yield per acre (bu/ac, kg/ha) using the weight measurements divided by the plot area. For each minimum and maximum changed, the Legend will change to match the correct values.



Adjusting the minimum and maximum values helps to create a more detailed legend and define the scope of the graphs and maps. The narrower the minimum and maximum range, the more detailed the information displayed becomes.

For examples of standard bulk density and standard moisture values, see [Appendix A: Standard Moisture and Test Weight](#).

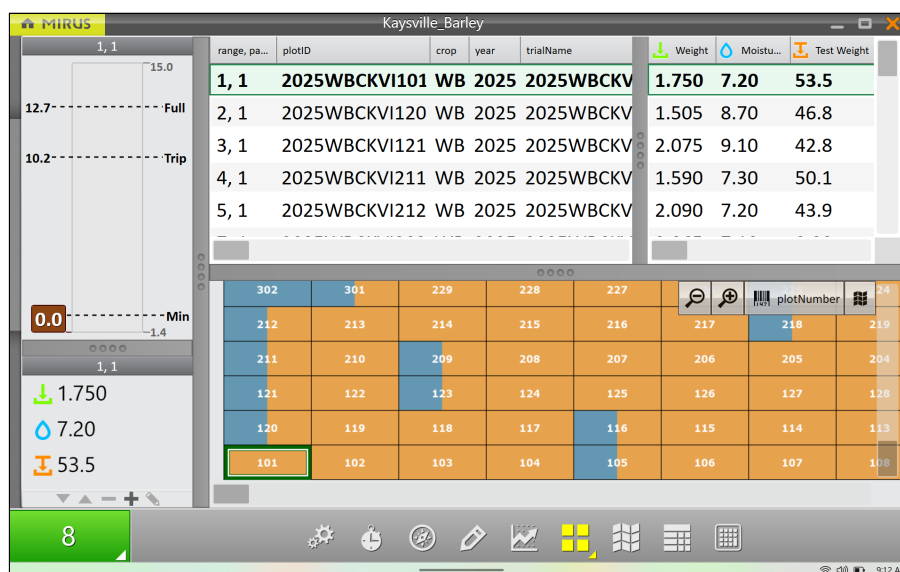
7.2 Collect Harvest Data

7.2.1 Harvest with Cycle Button

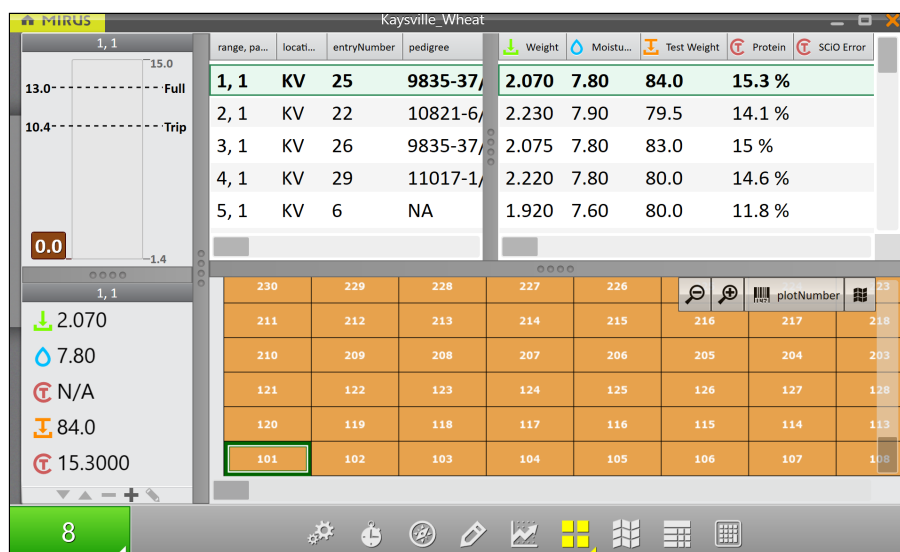
Note: It is best to use the countdown timer. See [Harvest with Countdown Timer](#). Using the countdown timer typically gives a more consistent clean-out time from plot to plot which can improve the quality of your data.

1. Open the Mirus Harvest screen.
2. Select a map, configure the harvest setup, choose traits, and a moisture curve. See [Harvest Mode](#) for specifics.
3. Start the thresher and throttle up.
4. Tare the GrainGage if necessary.
5. Tap  in Mirus.

EM Sensor

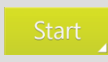


SCiO Sensor



- Harvest the first plot.
- Press **Remote Enter** or **Cycle**  when all the grain is in the GrainGage.
- When prompted with a green Go button , start into the next plot.
- Repeat for each plot.

The following table explains each stage of the **Start/Cycle/Go** button during harvest.

Cycle Mode			
Button Stage	Operator Action	Harvest Stage	
1		Enter press when ready to harvest.	Harvest begins.
2		Enter press after all the grain has been delivered to the weigh bucket.	The isolation gate closes. If the trip point is met, the GrainGage will automatically cycle. The GrainGage can cycle several times through the plot until the weight trip no longer occurs. <i>Note: The amount of grain in the weigh bucket can be seen on the Real Time Weight display. Make sure the weight peaks and stabilizes before you press Cycle.</i>
3		Wait for the cycle to end.	The red cycle indicator appears to show the ongoing cycle.
4		Proceed to the next plot.	The isolation gate is closed. The GrainGage is running the flush cycle and is ready to harvest the next plot.
5		N/A	The isolation gate is opened. The GrainGage is ready for the next plot.

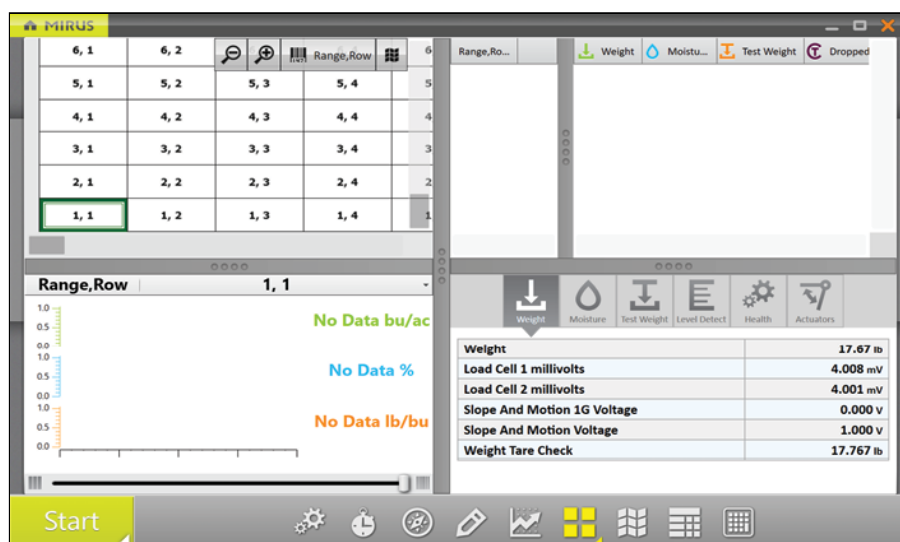
- 6 Return to #2 at the end of the next plot. Mirus is ready to begin the cycle for the next plot.

7.2.2 Harvest with Countdown Timer

Note: It is best to use the countdown timer. Using the countdown timer typically gives a more consistent clean-out time from plot to plot which can improve the quality of your data.

To harvest with the countdown timer,

1. Open the Mirus Harvest screen.
2. Select a map, configure the harvest setup, choose traits, and choose a moisture curve. See [Harvest Mode](#) for specifics.
3. Start the thresher and throttle up.
4. Tare the GrainGage if necessary.
5. Tap the  in Mirus.



6. Harvest the first plot.
7. When the head is stopped in the alley and clear, start the countdown timer by pressing remote enter or tapping the countdown timer button .

Note: It is critical the countdown timer is set long enough for all the grain to be delivered to the GrainGage before reaching zero.
8. When prompted with a green Go button , start into the next plot.
9. Repeat for each plot.

The following table explains each stage of the **Start/Countdown/Go** button during harvest.

Countdown Mode			
	Button Stage	Operator Action	Harvest Stage
1		Enter press.	Harvest begins.

2  Enter press at the end of the plot after all the grain has cleared the head.

The GrainGage is waiting for the trip point to be met or an Enter press at the end of the plot. If the trip point is met, the GrainGage will automatically cycle. The GrainGage can cycle several times through the plot until the weight trip occurs.

Note: The amount of grain in the weight bucket can be seen on the Real Time Weight screen.

An Enter press begins the countdown.

3		Wait until the countdown ends.	The countdown indicates the amount of time set to complete the grain delivery to the GrainGage before the cycle starts. <i>Note: If the weight trip is triggered during the countdown, the timer will continue as the GrainGage cycles. If the timer has reached zero before the weigh cycle finishes, the flush cycle will begin after the weigh cycle is complete.</i>
4		N/A	The yellow indicator briefly appears to show the isolation gate is closing and the GrainGage is starting to cycle.
5		Proceed to the next plot.	The isolation gate is closed. The GrainGage is running the flush cycle and it is ready to harvest the next plot.
6		N/A	The isolation gate is opened. The GrainGage is ready for the next plot.
7		Return to #2 at the end of the next plot.	Mirus is ready to begin the cycle for the next plot.

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CHAPTER 8

Appendix A: Standard Moisture and Test Weight

8 Appendix A: Standard Moisture and Test Weight

Test weight should always be calculated with a sample that is as close to the industry moisture standard as possible. The table below shows some examples of the industry moisture standard.

Standard Moisture and Test Weight		
Grain	Moisture	Test Weight
Wheat	13.5%	60 lb/bu (77 kg/hL)
Canola	8.5%	47 lb/bu (60 kg/hL)
Soybean	13%	55 lb/bu (71 kg/hL)
Barley	14.5%	48 lb/bu (62 kg/hL)
Corn	15.5%	56 lb/bu (72 kg/hL)
Rye	14%	56 lb/bu (72 kg/hL)
Sorghum	13%	56 lb/bu (72 kg/hL)
Oats	13.5%	32 lb/bu (41 kg/hL)
Sunflower	10%	25 lb/bu (32 kg/hL)

8.1 References for Standard Moisture and Test Weight

Devkota P., & Mulvaney M. J. (2020, May). Adjusting crop yield to a standard moisture content. IFAS Extension, University of Florida. <https://edis.ifas.ufl.edu/publication/AG442>.

Isleib, J. (2012, August 6). Test weight in small grains. Michigan State University Extension.
https://www.canr.msu.edu/news/test_weight_in_small_grains.

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CHAPTER 9

Appendix B: Troubleshooting Mirus

9 Appendix B: Troubleshooting Mirus

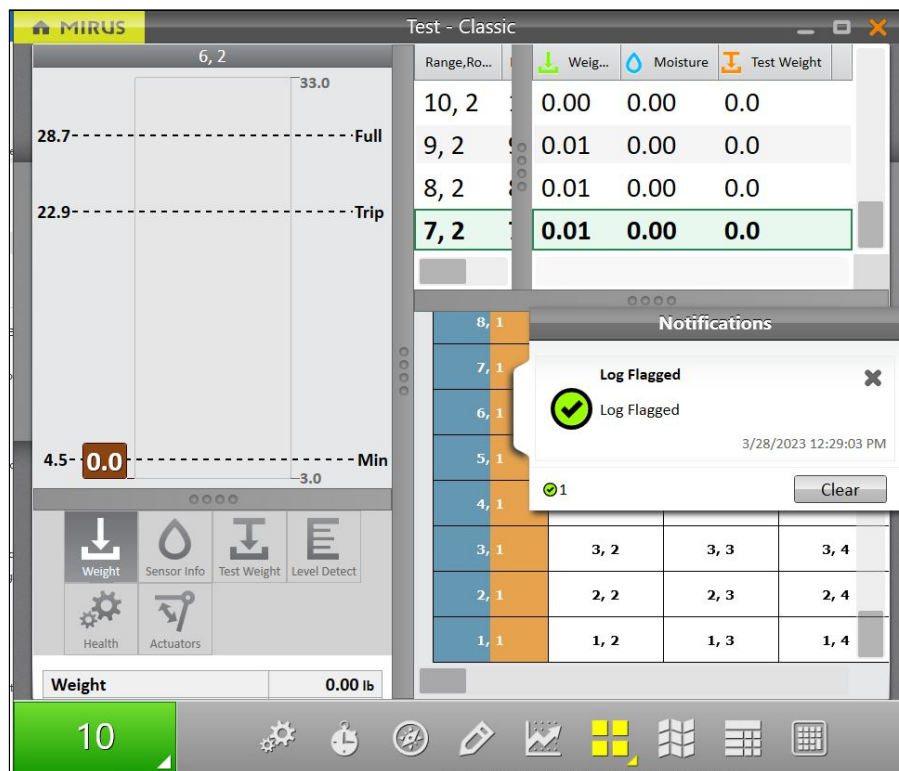
9.1 Error Logs

Error logs are used by HarvestMaster Engineers to pinpoint the problem occurring in Mirus.

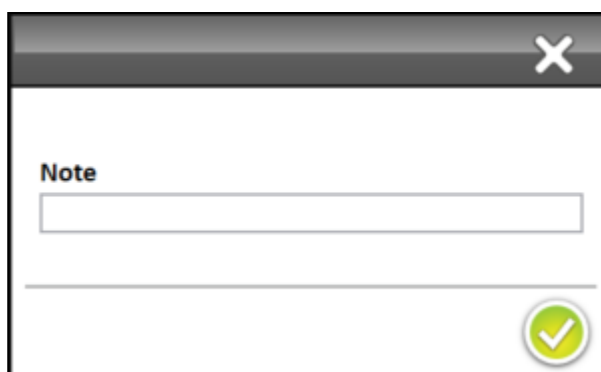
9.1.1 Flag Errors

When experiencing an error, in Mirus version 4.3.0 and later, you can flag the error for the HarvestMaster Engineers. When an error has been flagged, the engineers can find it easily within the error logs.

- Use F5 to flag the error in the error log.



- Use F6 to flag and leave a message in the error log.



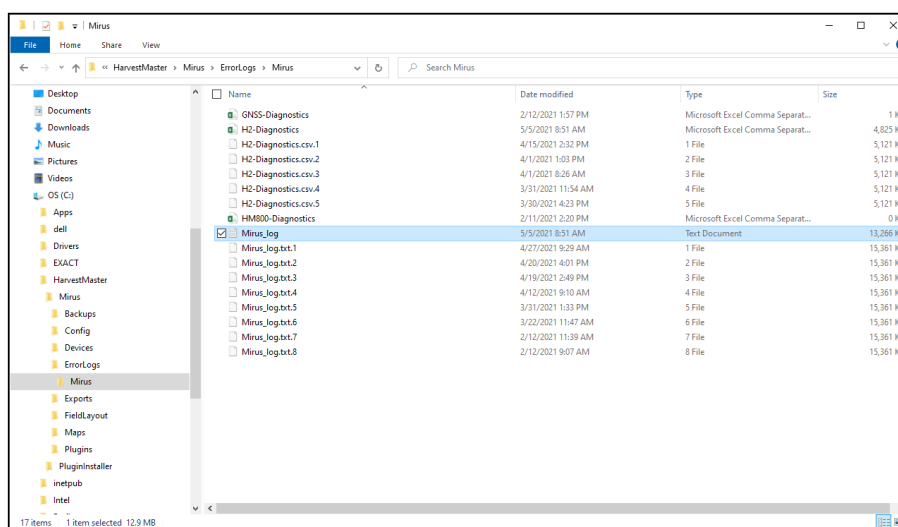
9.1.2 Find and Send Error and Backup Logs

After an error has occurred, copy the error and backup log files as soon as possible to send to the HarvestMaster Field Service Engineers.

If you do not copy the error log files right after the error occurs, it will be harder to find the point of error or the error might get overwritten with newer error files.

To find and send the error and backup logs to the HarvestMaster Field Service Engineers,

1. Open File Explorer on your device.
2. Go to C:\HarvestMaster\Mirus\Errorlogs\Mirus and C:\HarvestMaster\Mirus\Backups.
3. Send the Mirus_log text document and the relevant map file to the HarvestMaster Field Service Engineers (hmtechsupport@junipersys.com).



9.2 SCiO Sensor Errors

SCiO Sensor Errors		
Error Message	Possible Reasons for Error	Possible Resolutions
Outlier	Sample exceeds the calibration spec (unique variety/out of supported parameter range/out of supported sample temperature range/etc.)	1. Run a known sample and check if the model results are reasonable. If they are, then the problem is sample-related, not device-related. 2. If the error persists, run a self test when available. (See SCiO NIR Sensor Self Test.) If the self-test fails, contact HarvestMaster. (See Contact a HarvestMaster Field Service Engineer.)

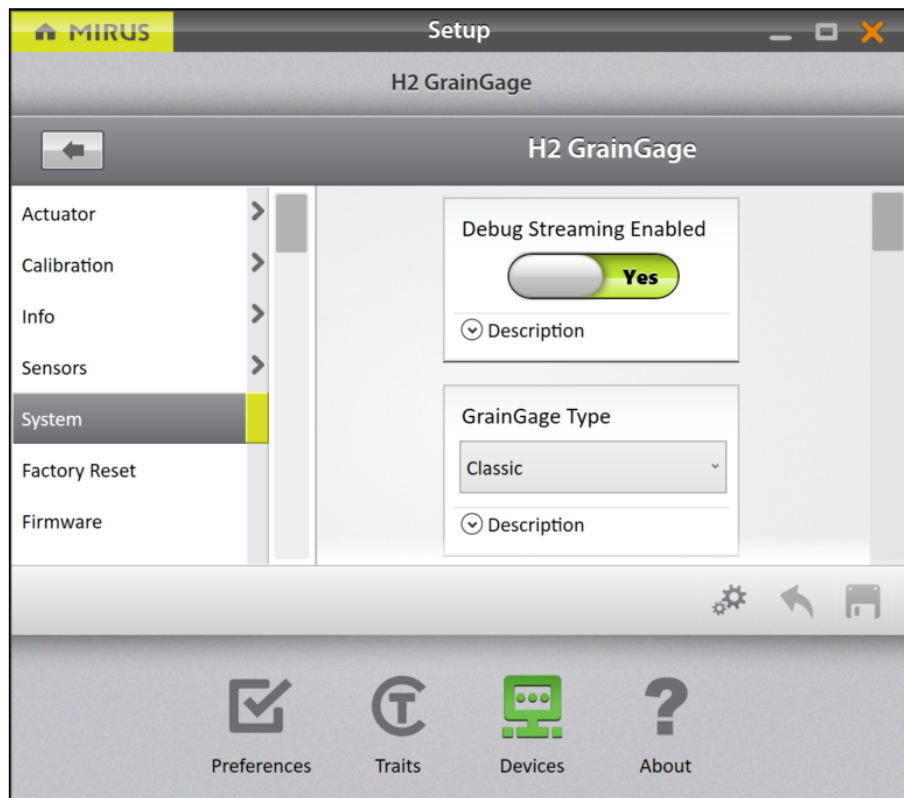
Sample Reflectance is Too Weak	Test chamber was empty (no grains) during the scanning	Make sure there is no timing issue: 1. Restart the system. 2. Try to run the sample again. 3. If the error persists, try to run a known sample that was predicted in the past. 4. If the error persists, run a self test when available. (See SCiO NIR Sensor Self Test.)
	Malfunctioning light source	Run a self test when available. (See SCiO NIR Sensor Self Test .)
Temperature is Out of Supported Range	Sensor temperature exceeds the allowed range of -10°C to 60°C	Wait until the sensor temperature warms (if it was too cold) or cools (if it was too hot) and run the sample again.
Invalid Scan	Electronic problem resulting in a spectrum that is not valid	1. Restart the system. 2. Try to run the sample again. 3. If error persists, run a self test when available. (See SCiO NIR Sensor Self Test.)

9.3 Enable or Disable Debug Streaming

This option enables debug streaming messages from the DSP module. This option is on by default and HarvestMaster recommends leaving it on for troubleshooting purposes.

To find the debug streaming option,

1. Enter the Mirus Home screen.
2. Select **Setup > H3 GrainGage > System**.



9.4 Common Errors

9.4.1 Inaccurate Plot Weight

If weight values are inaccurate, open Diagnostics and follow the steps listed below.

1. Ensure the weigh bucket of the GrainGage is in the tracks.
2. Clean inside the bucket, around the bucket, and around the load cells of the GrainGage with compressed air.
3. Ensure there is nothing putting positive or negative tension on the weigh bucket/load cells (air hoses, cables, overload protection pin, etc.).
4. Apply negative and positive pressure to the bucket while watching the weight values in Diagnostics. Remove the pressure to ensure the weight returns to zero. Do this several times to ensure repeatability.
5. Put the HarvestMaster calibration weight in the bucket with the top gate closed and check it against the calibration weight in Diagnostics.
6. Check to ensure the Load Cell 1 millivolts and Load Cell 2 millivolts move when weight is applied and are stable when static.
7. If a problem is identified with one load cell from step 6, try swapping Load Cell 1 with Load Cell 2 at the DSP module to see if the problem follows the load cell or the port on the module.
8. If the problem persists, contact the HarvestMaster Field Service Engineers. For contact information, see [Contact a HarvestMaster Field Service Engineer](#).

9.4.2 Inaccurate Test Weight

1. Clean inside and around the test cup. Clean around the load cell and overload protection pins with compressed air.
2. Check the overload protection pins by applying around 5 lb (2.3 kg) of downward and upward pressure to the cup while watching the readings change in Mirus.

3. Check to ensure air pressure remains above 75 PSI (5 bar) when cycling GrainGage.
4. Check the airflow through the air valves to ensure enough flow to quickly close the gates and raise/lower the separator.
5. Remove the air pressure and lift the separator up by hand to ensure it is not binding.
6. If the problem persists, contact the HarvestMaster Field Service Engineers. For contact information, see [Contact a HarvestMaster Field Service Engineer](#).

9.4.3 Inaccurate Moisture or Constituent Data

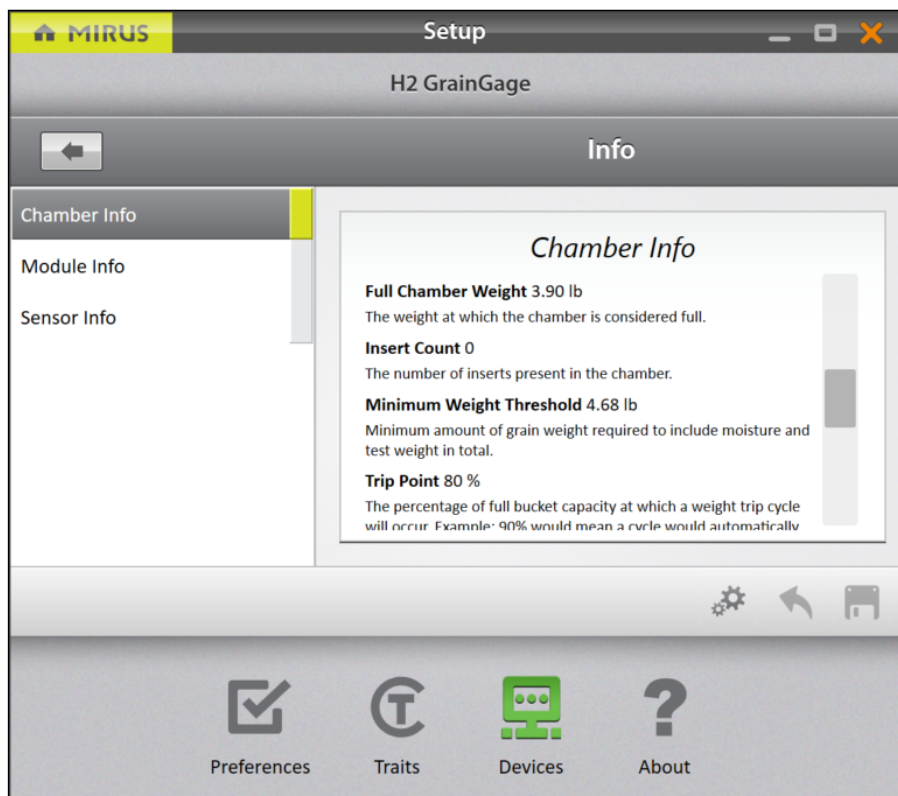
1. Check to ensure you are meeting the minimum weight threshold (see section below).
2. Inspect and clean the moisture blade or SCiO sensor glass dome.
3. Touch the blade while watching the change in moisture readings within Diagnostics.
4. Check moisture temperature to ensure it is within 5–10 degrees of the ambient air temperature.
5. Check the supply voltage to ensure it is between 12 and 14 volts.
6. Check to ensure the moisture blade and sensor mounting screws are secure.
7. If the problem persists, contact the HarvestMaster Field Service Engineers. For contact information, see [Contact a HarvestMaster Field Service Engineer](#).

9.4.4 Not Meeting Minimum Weight Threshold

The minimum weight threshold is the minimum amount of grain required for accurate moisture and test weight data. By default, if the minimum weight threshold is not met, moisture and test weight data will be recorded as zero and/or not included in the plot average when taking sub-samples.

To ensure the plots are yielding enough grain to measure accurate data,

1. Go to **Setup > Info > Chamber Info**.



- If the minimum weight threshold value is outside 2–6 lb., recalibrate the test weight for the chamber calibration.
- If you are not harvesting enough grain to meet the minimum weight threshold, install low yield inserts and recalibrate the chamber. For more information about low yield inserts, see the applicable GrainGage Hardware User Manual.
- If installing low yield inserts doesn't work, you can either lower the chamber head room or override the minimum weight threshold. If you do this the test weight measurements should be verified. For more information, see [Contact a HarvestMaster Field Service Engineer](#).

9.4.5 Can't Connect to GrainGage

1. Ensure the System Controller is turned on and you have power to all the modules.
2. Check there is a solid green power light, flashing yellow status light, and no flashing red light on each of the modules.
3. Ensure all the cables are properly connected.
 - A USB or serial cable between the tablet dock and the System Controller.
 - A CAN cable between the System Controller and the GrainGage.
 - A SCiO serial to USB cable (PN: 31517) between the SCiO Sensor junction on the GrainGage and the tablet/dock.
4. Unplug the USB or serial cable from the dock and plug it directly into the tablet to check if the dock is dysfunctional.
5. Ensure the GrainGage plugin is enabled. For instructions on how to enable the plugin, see [Connect to the GrainGage Plugin](#).
6. Shutdown and reboot the tablet. Turn off the System Controller and leave it off for 30 seconds. Then turn it back on and attempt to connect.
7. Unplug the CAN and power cables on the modules, leave them for 30 seconds, then plug them back in and attempt to connect.
8. If the problem persists, contact the HarvestMaster Field Service Engineers. For contact information, see [Contact a HarvestMaster Field Service Engineer](#).

9.4.6 SCiO NIR Sensor Not Connecting or Unable to Perform Scan

1. Use the Windows Services app to check that the correct SCiO services are running on tablet.
2. Check the connections between the SCiO NIR sensor, the moisture port on the DSP module, and the USB on tablet computer.
3. If the SCiO USB cable is plugged into the tablet dock, move it to a USB port directly on the tablet.
4. Using Device Manager in Windows, uninstall the *USB Serial Port* under Ports (COM & LPT). Reboot the tablet to reinstall drivers.
5. Follow the instructions for the [SCiO NIR Sensor Self Test](#).

9.4.7 Tare Warnings

⚠ CAUTION: Do not re-tare the system without knowing what is causing the tare warning.

A tare warning can be prompted for the reasons explained in the table below.

Tare Warnings	
If	Then

Debris is in the bucket or test chamber.	Check the bucket and test chamber to ensure that there is nothing remaining (grain, debris, trash, etc.).
Positive or negative tension is on the weigh bucket or load cells.	Move any air hoses, cables, or overload protection pins putting tension on the weigh bucket or load cells.
Leftover grain is in the weigh system.	The evacuation time is not long enough for the grain to fully empty out of the GrainGage. 1. Go to Setup > Sensors > Weight > Evacuation Time. 2. Lengthen the evacuation time by 500 milliseconds. 3. Harvest another plot and check again.
Tare warning values have been adjusted.	Restore the values to the default setting. See the Weight Sensors Settings .

If the problem persists, contact the HarvestMaster Field Service Engineers at the number in [Contact a HarvestMaster Field Service Engineer](#).

9.5 Contact HarvestMaster

9.5.1 Instructional Content

Visit the [HarvestMaster YouTube](#) channel and the [HarvestMaster Support](#) page for instructional videos and help articles on Mirus and the GrainGage.

This instructional content includes (but is not limited to):

- [M2.0 Calibration](#)
- [Recalibrate Traditional Moisture Curve to the New M2.0 Model in Mirus 4.3.0](#)
- [Mirus Overview](#)
- [Weight Tare Warnings](#)
- [Errors on Power Up with Mirus](#)
- [Mirus Locks Up](#)
- [GrainGage Will Not Connect](#)

9.5.2 Contact a HarvestMaster Field Service Engineer

Phone Number: 435-753-1881

Email: hmtechsupport@junipersys.com

Address: 1132 W 1700 N, Logan, UT 84321

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CHAPTER 10

Appendix C: Use the Conditional Action Plugin

10 Appendix C: Use the Conditional Action Plugin

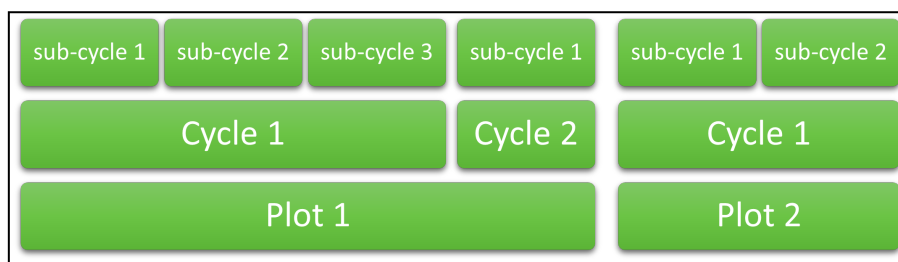
The Conditional Action plugin allows users to perform custom actions at various points of the harvest process. Conditional actions are preferred to manual script modifications for the following reasons:

- Conditional actions are more apparent to a user and can be explicitly enabled and disabled without manual script modifications.
- Conditional actions are less prone to error because they can be edited with a user interface (UI) and are validated upon entering harvest.
- Conditional actions easily transfer to another computer or tablet.
- Conditional actions can be explicitly named so their functions are more obvious.
- Some behavior is only possible with a conditional action (e.g. performing actions prior to the GrainGage evacuation).

Note: You can use a conditional action to modify or intercept inter-cycle behavior of the GrainGage. In other words, you cannot perform synchronous actions after a cycle starts and before a cycle completes. If you need to execute actions within a GrainGage cycle, please contact one of the HarvestMaster Field Service Engineers.

10.1 Cycling Hierarchy

To understand conditional actions, it is helpful to understand the cycling hierarchy for a GrainGage. The graphic below demonstrates a possible plot cycling scenario.



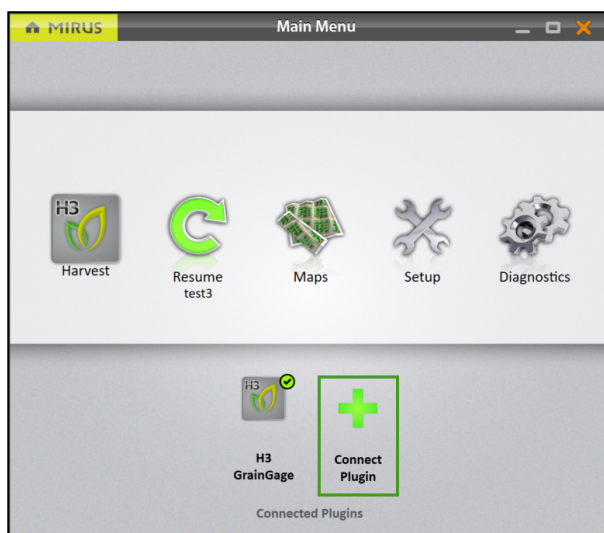
Strip Mode allows for multiple cycles per plot. Plot Mode has one cycle per plot. In the example graphic above, Plot 1 could only occur if Strip Mode is enabled, because it has two cycles in one plot. Plot 2 could occur in both Plot and Strip Modes as it only has one cycle per plot, even though there are two sub-cycles.

Note: Sub-cycling can still occur in Plot Mode.

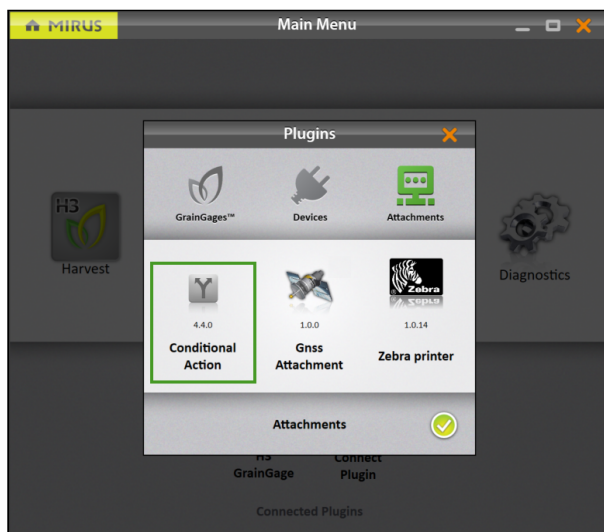
10.2 Create a Conditional Action

To create a conditional action,

1. Connect the Conditional Action plugin.
 - Tap **Connect Plugin**.

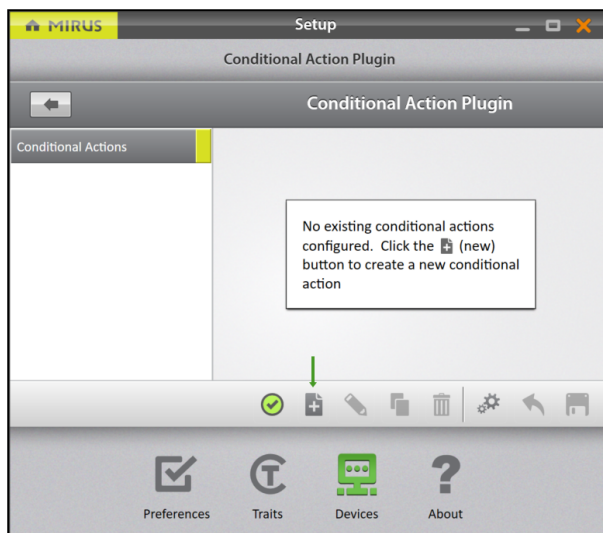


- Under the Attachments tab, select **Conditional Action**.



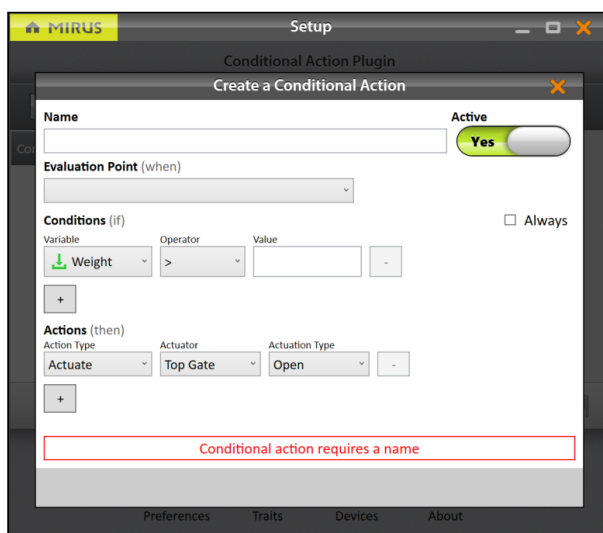
When the plugin has been selected a green check will appear in the corner.

- Tap the green check ✓ in the bottom right corner to save.
2. Go to **Setup > Conditional Action Plugin > Conditional Actions**.
 3. Tap the new icon +.



4. Name the conditional action.

- This is also the filename that will be used when the conditional action is saved to C:\HarvestMaster\Mirus\Config\ConditionalAction\Conditions



5. Set Active to Yes or No.

- If set to Yes, the defined conditional action will be evaluated during harvest.
- If set to No, the conditional action will be skipped during harvest.

6. Select an Evaluation Point (when) from the drop-down.

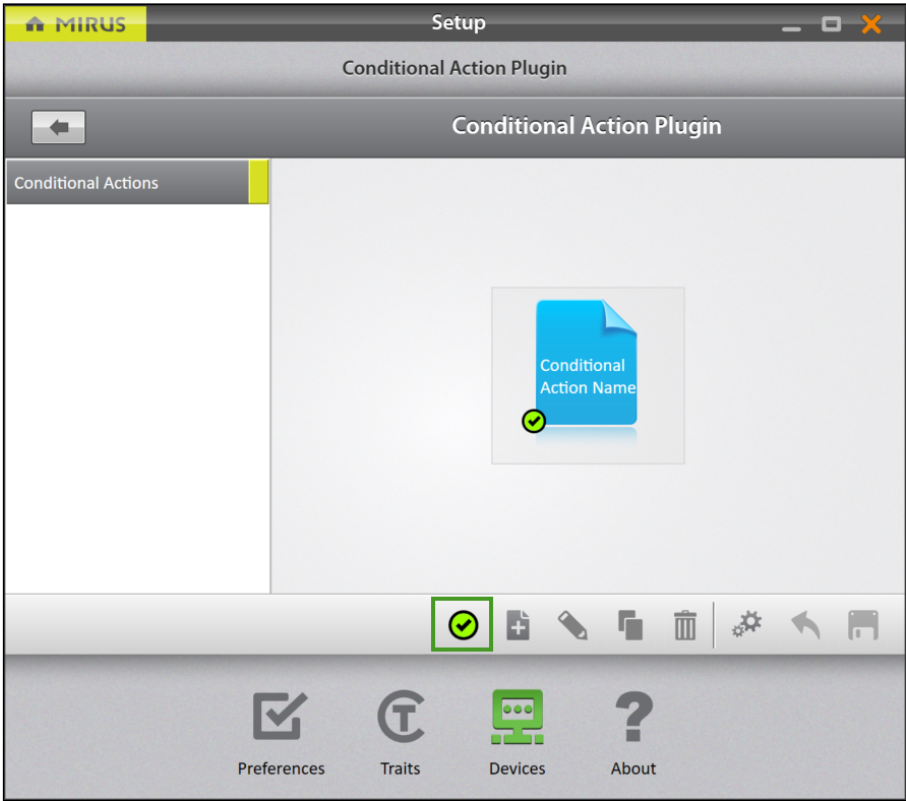
- This option allows the user to define the point at which the active conditional actions will be evaluated.
- The sequence of these evaluation points are explained in [Evaluation Points](#).

7. If you want the actions to always be performed at the specified evaluation point, check Always.

8. Select the Conditions (if).

- Conditions (if) are optional conditions that control if the defined actions will be executed.
- More explanation of conditions and variables is provided in [Conditions](#).

9. Add Actions (then).
 - The drop-downs include a list of actions to be performed in sequence if the conditions are met at the designated evaluation point.
 - More details about actions are provided in [Actions](#).
10. Tap the green check to save the conditional action.
 To turn the conditional action on or off, select the green check.



10.3 Evaluation Points

The designated evaluation point of a conditional action determines when, in the sequence of a cycle, a conditional action will be evaluated and executed. Evaluation points happen in sequence, which means subsequent evaluation points will not be executed until the previous evaluation point has completed.

The following table explains when an evaluation point occurs.

Evaluation Point (when)	
Option	Description
On ENTER Press	Evaluation occurs when the remote enter or cycle button is clicked. If a countdown timer is enabled, it occurs as soon as the countdown timer starts.
Plot is starting	Evaluation occurs when the GrainGage is about to begin cycling a plot for the first time.

- In Strip Mode, it occurs when the first cycle is tripped (weight or level trip).
- In Plot Mode, it occurs after the countdown timer expires. If there is no countdown timer, it occurs as soon as the cycle is requested (enter).

Evaluation occurs before the isolation gate closes, except in the case where the plot was started by an overflow or weight trip. In these cases, it occurs immediately after the isolation gate closes.

Cycle is starting	Evaluation occurs at the start of every cycle after a plot is started. ▪ In Strip Mode, multiple cycle starts can occur before a plot is completed. ▪ In Plot Mode, there is only one cycle start per plot.
Before sub-cycle evac	Evaluation occurs before the test weight chamber is evacuated. If sub-cycling is enabled, this can happen multiple times per cycle. At this point, the sub-cycle weight, moisture, and test weight data has been received. <i>Note: If sub-cycling is enabled, use the evaluation point would be the one to use to prevent any grain from evacuating from the GrainGage. As the subsequent before cycle evac event occurs after all the previous sub-cycle evacs.</i> <i>Note: If only one sub-cycle is configured (default), this is functionally equivalent to the Before Cycle Evac evaluation point.</i> <i>Note: This is not applicable to devices that cannot sub-cycle like the HM800.</i>
Before Cycle Evac	Evaluation occurs during a cycle before grain is evacuated from the GrainGage. <i>Note: At this point, the cycle measurement data has been received and the weight, moisture, and/or test weight condition variables can be used to compare against cycle data values.</i>
Before Plot Evac	Evaluation occurs before the final evacuation of grain from the GrainGage. <i>Note: At this point, weight moisture, and test weight data is available for the plot, and conditional actions can be performed on plot totals and averages.</i> <i>Note: In Strip Mode, evaluation occurs after cycle of tripped cycles are completed and before the flush cycle completes.</i>
Cycle completed	Evaluation occurs at the end of each cycle after the bottom gate and evacuation gates close. ▪ In Strip Mode, evaluation may occur multiple times within a plot if a cycle is tripped.

Plot completed Evaluation occurs at the end of the plot after the tare check occurs and the isolation gate opens.

10.4 Conditions

Users can also define conditions that determine if an action should or should not be performed. For example, a user may only want to collect a sub-sample if the weight for the plot is above a specified value (e.g. 5 lbs). Conditions can be defined for a few variables.

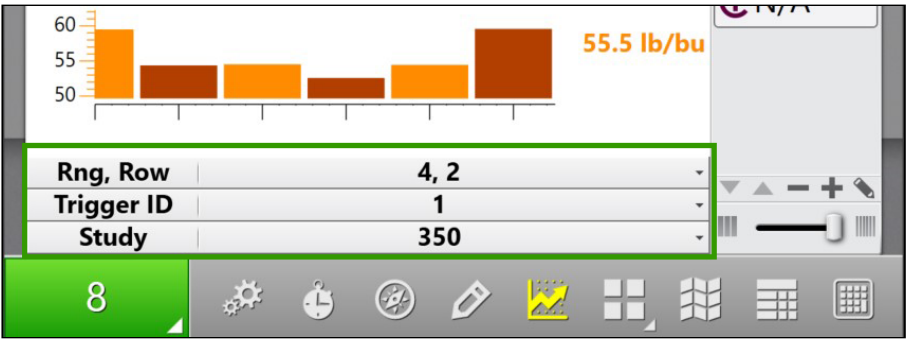
Conditions (if)	
Variable	Moisture
Weight, Moisture, Test Weight	Weight, Moisture, and Test Weight are used to compare a context sensitive weight, moisture, and/or test weight measurement value to a specified value. These variables can only be used with the “Before [Type] Evac” and “[Type] Completed” evaluation points. This is because these are the points at which the data is available from the GrainGage. The Weight, Moisture, and Test Weight variables are context sensitive, based on the evaluation point: ▪ If you are using a sub-cycle evaluation point, it will compare against chamber measurements. ▪ If you are using a cycle evaluation point, it will compare cycle totals/averages of weight, moisture, and/or test weight. ▪ If you are using a plot evaluation point, it will compare against the plot totals/averages of weight, moisture, and/or test weight.

ID1/ID2/ID3 ID1/ID2/ID3 is used to conditionally execute actions based off the plot identifiers in an imported map.

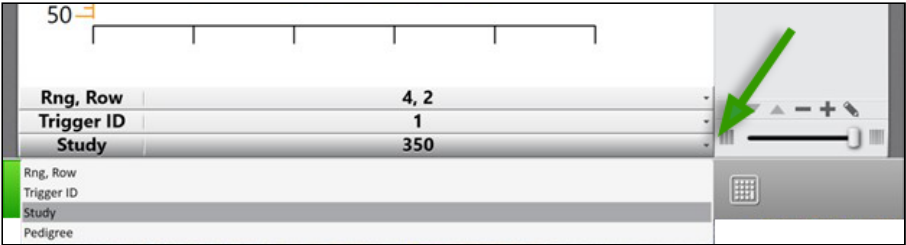
If a sub-sample should only be taken for specific plots, a map could be imported that has a “1” for a plot that requires a sub-sample. A condition of if “ID1” = “1” could be assigned, so the actions to control the sub-sampler only occur on designated plots.

ID1/ID2/ID3 are the plot identifiers shown when you view the map in [Graph View](#). ID1 is always range/row. ID2 is the second identifier, and ID3 is the third identifier. By default, the identifiers appear in the order they

were imported.



To change the identifier associated with an ID condition, view the map in [Graph View](#), click the drop-down arrow next to the identifier you want to change, and select the desired identifier from the list.



Is Flush Cycle	The Flush Cycle is used to execute actions conditionally if the current cycle is a flush cycle. The value must be True or False.
----------------	---

Cycle Count	Cycle Count is used to execute conditions based on the current cycle number.
-------------	--

10.5 Actions

The actions in a conditional action are the functions to be performed at an evaluation point, should the conditions be met. For example, an action would be helpful in the following scenario: an air diverter needs to be actuated at the start of a flush cycle to ensure all the grain from the cyclone has fallen into the GrainGage before closing the isolation gate.

Actions (then)	
Action Type	Description
Actuate	Allows the user to actuate a specified actuator open or close.

Delay	Allows the user to delay the cycling sequence for a specified amount of time (in milliseconds).
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CHAPTER 11

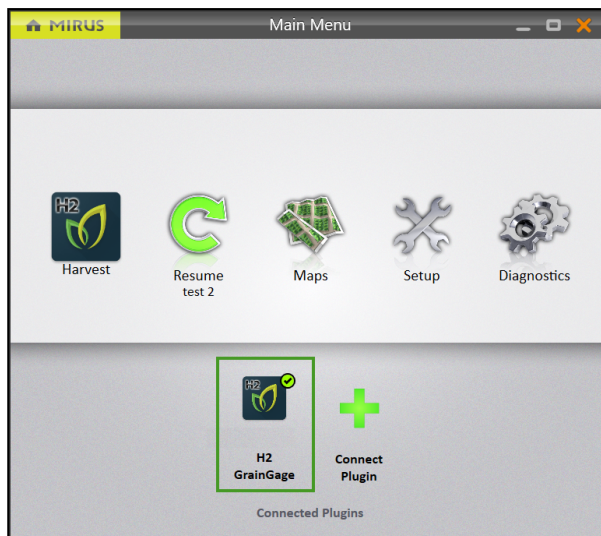
Appendix D: Take Notes with Mirus

11 Appendix D: Take Notes in Mirus

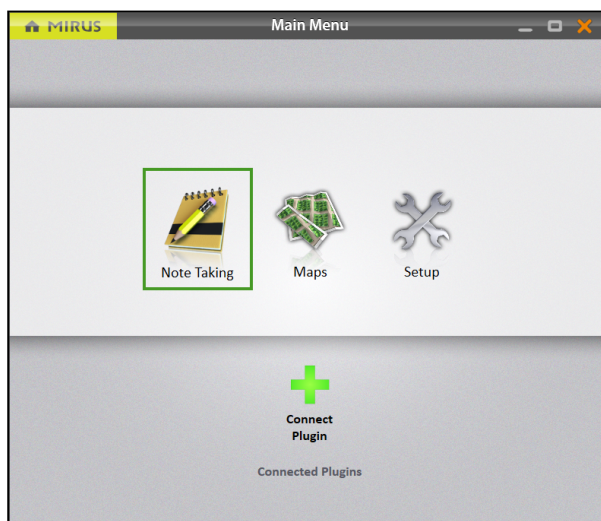
Mirus Note Taking provides a simplified process of taking notes in the field using many of the same tools supplied for harvest. Mirus Note Taking uses intuitive data collection forms, color-coded heat maps, and customized pick lists to help streamline your data collection process. It can help identify sections within your plots by range and row, or by a specific sub-section of your trial using sub-maps (see [Create a Sub-Map](#)). The navigation feature tracks your location as you walk and collect data within the field. By adding the GNSS plugin you can have the option to locate and navigate to plot information using GNSS coordinates.

11.1 Enter Note Taking

1. Disable the GrainGage (if connected) by clicking on the plugin with the green check.



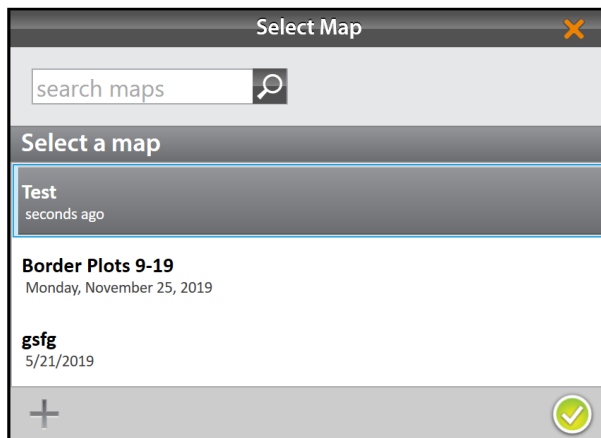
2. Tap **Note Taking**.



3. Select a map or tap the plus icon  to create or import a new map.
4. Tap the check icon .

For more information about creating or importing a map, see [Create a Range Row Field](#)

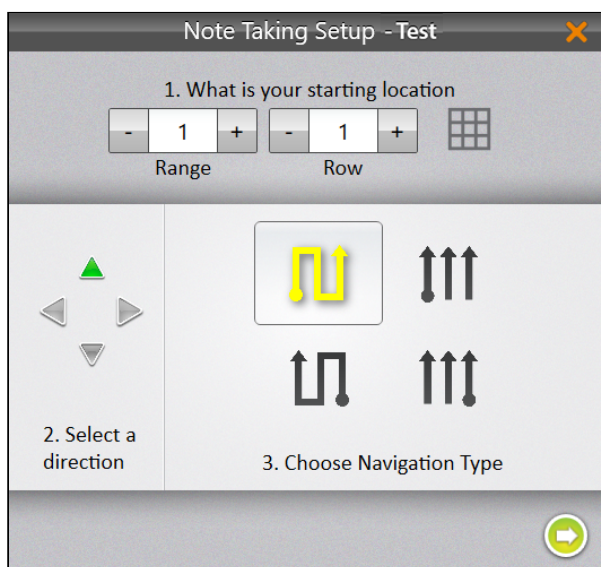
[Map](#), [Create a Standard Plot ID Map](#) or [Import a Map](#).



5. Enter the starting location.

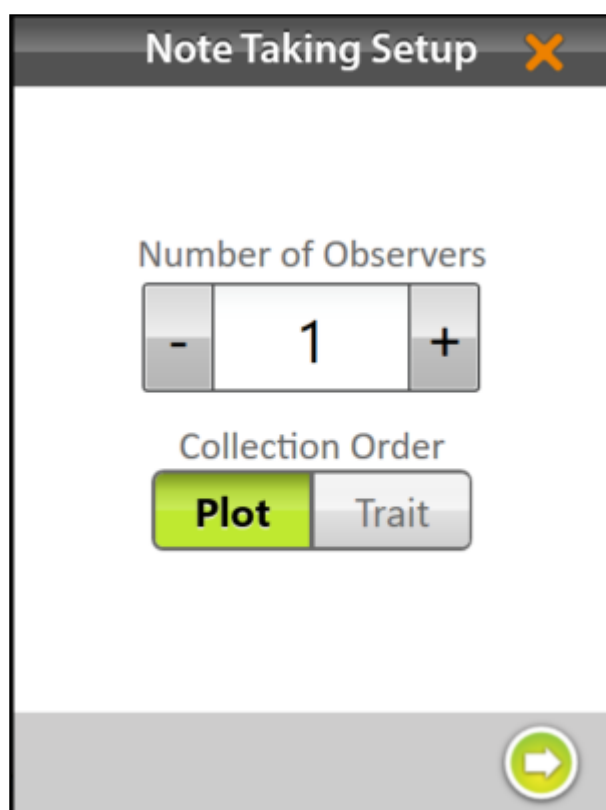
Note: Click on the matrix  to bring up another screen to allow you to choose the starting location.

6. Select the direction of harvest.
7. Choose a navigation type.
8. Tap the next arrow .



9. Enter the number of observers and the collection order.
 - **Number of Observers:** Multiple observers can use the same handheld device. The person holding the handheld will add the notes from the additional observers.
 - **Plot Order:** Mirus will prompt you to enter all the selected traits for each plot before moving to the next observer.

- **Trait Order:** Mirus will prompt you to enter one trait at a time per plot through all the observers before routing to the next row or range.

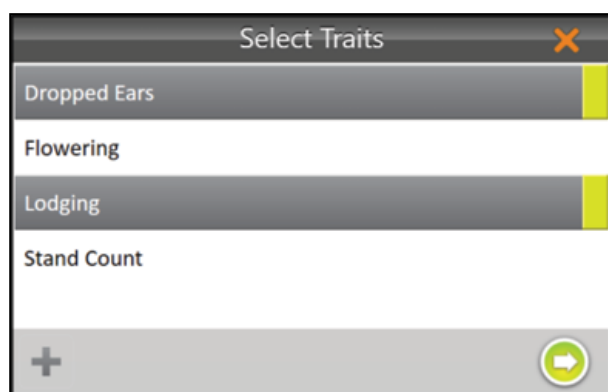


The 'Note Taking Setup' screen features a title bar with an orange close button. Below the title, the 'Number of Observers' is set to 1, with minus and plus buttons for adjustment. The 'Collection Order' is set to 'Plot', with a 'Trait' button next to it. A green arrow button is located at the bottom right.

10. Select one or all of the traits to include.

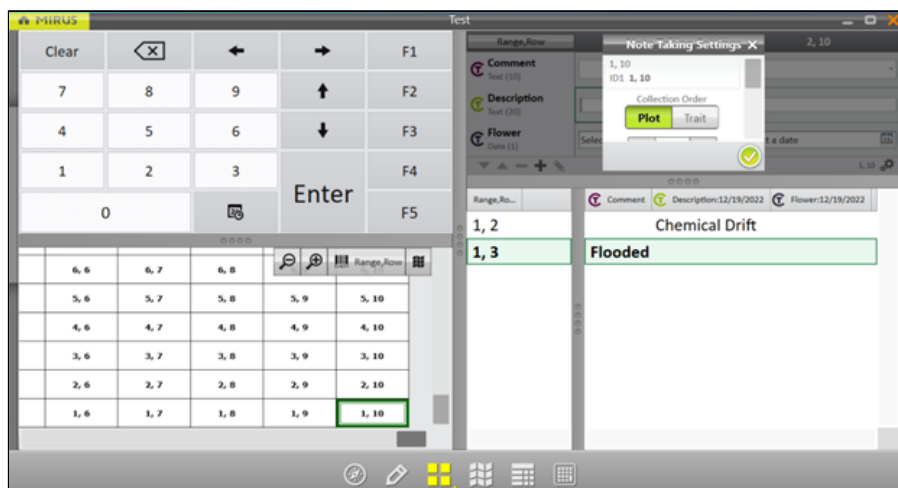
11. Tap the green check .

Note: For more information about configuring Traits from the Setup screen, see [Create and Record Traits](#).



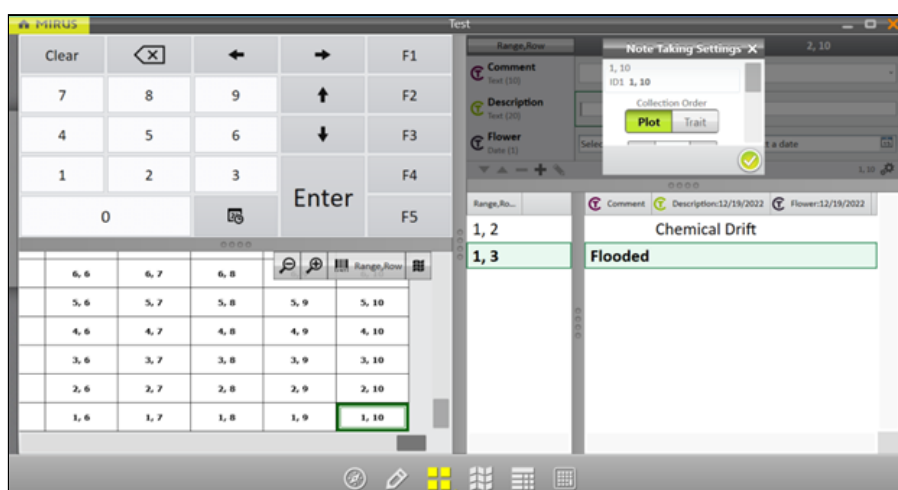
The 'Select Traits' screen has a title bar with an orange close button. It displays a list of traits: 'Dropped Ears', 'Flowering', 'Lodging', and 'Stand Count'. Each trait has a yellow checkmark on its right side. At the bottom left is a plus sign, and at the bottom right is a green arrow button.

Mirus opens the Note Taking screen and is ready to be configured or collect data.



11.2 Configure the Note Taking Screen

The Note Taking Quad View is similar to the Harvest Mode Quad View ([Configure Harvest Screen Options](#)). It can provide several options for configuring how data is collected and presented during collection.



Note Taking Screen Options		
Icon	Option	Description
	Navigation	Opens the Change Location dialog box and allows the operator to make changes to location, direction, and navigation type.
	Observations/Notes	Opens a dialog box where the operator can record notes for each plot during harvest. This is also where you can add information about any traits you configured.
	Quad View	Divides the display into four smaller windows. The operator can adjust the size of each window and customize them each to display data in List, Spatial, Observations/Notes, or Ten Key view. This screen should be used during collection.



Map View

Opens the Spatial Display, also referred to as a heat map. This display can be configured to show attribute data plot by plot.



List View

Displays the accumulating data as a list.



Ten Key

Numeric keypad for fast entry of trait and note data.

11.2.1 Navigation Screen

The Navigation screen can be used to change your location, direction, or navigation type. For more information about this screen, see [Navigation Screen](#).

11.2.2 Notes Screen

The Notes screen shows plot position and provides character fields for notes on each trait.

When this screen is selected as one of the Quad Views, data entry uses the navigation function defined by the user to move from plot to plot. This screen works well for ratings or counts collected on every plot.

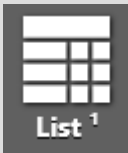
When this screen is selected from the toolbar, it allows data entry on a random plot selection, such as heading or maturity data collection. Just select the plot from the spatial view then enter data using the keyboard. A quick note can also be entered from this screen.

In addition, on this screen you can manually open the Note Taking Settings by tapping the gear icon  in the lower right corner.

For more information about this screen, see [Observations Screen](#).

11.2.3 Quad View

Mirus provides the option of viewing four screens at once when Quad View is selected. Each screen can be configured to display the data differently. The screen options are as follows:

Quad View	
Option	Description
 List ¹	Displays accumulating data as a list.
 Spatial ²	Displays attribute data with colors plot by plot. It is also referred to as a heat map. This is the only screen that can be shown in multiple quadrants.
 Notes ¹	Opens a dialog box where the operator can record notes for each plot during harvest.



Numeric keypad for fast entry of trait and note data.

The quad data collection screen is optimized for the portrait screen orientation.

For more information about this screen, see [Quad View](#).

11.2.4 Map View

The Map View shows the Spatial Display, also referred to as a heat map. This display can be configured to show attribute data plot by plot. You can use the Attribute list to select the data you want displayed.

For more information about configuring this screen, see [Configure Weight in Spatial Display](#), [Configure Moisture in Spatial Display](#), [Configure Test Weight in Spatial Display](#), or [Configure Plot Size and Yield in Spatial Display](#).

11.2.5 List View

In List View, you can see the data in the form of a spreadsheet.

11.2.6 Ten Key

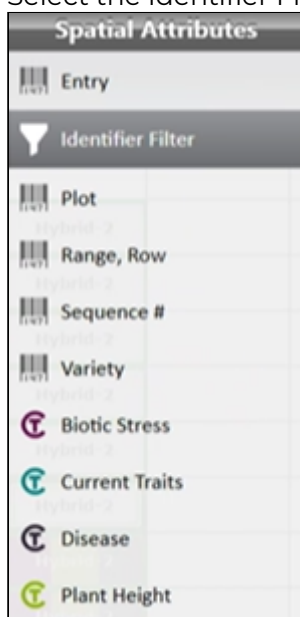
The Ten Key provides a way to enter quick notes. It can be accessed from the Quad View or the toolbar.

For more information about this screen, see [Observations Screen](#).

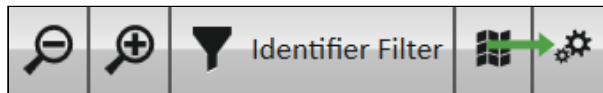
11.3 Identifier Search (Imported Maps Only)

With imported maps, you can search identifiers to find certain plots in the field that are part of a test block you want to collect data on. This feature can only be used on maps that are imported with identifiers.

1. Select the Identifier Filter from the attribute list.



2. Select the settings gears.

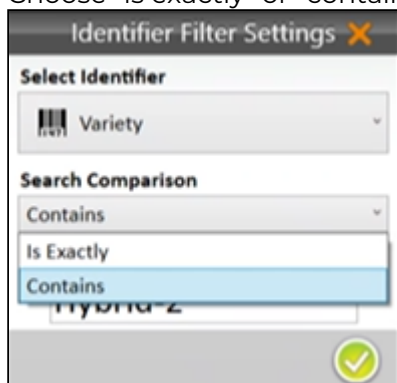


3. Select the identifier you would like to filter/search.

Note: The options available from the drop-down menu will vary based on your map.



4. Choose "is exactly" or "contains."



5. Enter your search criteria.

Note: The search criteria must be based on information included in your map.

6. Tap the .

With the identifier filter applied, the spatial view will show only the plots that contain that match.

Hybrid-2

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CHAPTER 12

Appendix E: Mirus Backup Log

12 Appendix E: Mirus Backup Log

Mirus creates a backup log when you open a map for Harvest or Note Taking. Use the backup log to help troubleshoot problems and improve data quality. For example, you can review the cycle data in the backup log and improve data quality by manually removing outlying data points that have been negatively affected by trash, chaff, or debris.

The backup log file is a CSV file stored in C:\HarvestMaster\Mirus\Backups.

The table below describes all possible fields that *may* be included in the backup log. The fields in your log are determined by your GrainGage system and plugins. Fields specific to the GNSS Plugin are described in the [Mirus GNSS Plugin User Manual](#).

Backup Log	
Field Name	Description
Settings	A comprehensive list of all the configuration settings, load cell calibration coefficients, and moisture curve used when harvesting this map.
Date/Time	The date and time that the data was collected (MM/DD/YYYY HH:mm).
Range	Identifier for the range number.
Row	Identifier for row number.
Cycle	Number identifying each cycle in the plot. A "T" in this field indicates that the row contains the total plot weight and a plot average of other constituent data, such as test weight, moisture content, and bulk density.
Weight	The weight of each cycle.
Moisture	The EM, M2.0, or NIR moisture reading for each cycle.
Test weight	The test weight of each cycle.
Absolute moisture voltage	The raw voltage from the moisture sensor with the tare having no affect. With an empty chamber, the voltage typically ranges from .6–1.1 V.
AcceLEOP	This value indicates how well the slope and motion sensor is working. The value ranges from 0–250: ▪ Good: 0–49 ▪ Borderline: 50–99 ▪ Bad: 100 or greater
Bulk density	Uncompensated test weight reading.
Chamber weight	The weight of the grain in the test cup chamber.

CPWEOP	This value indicates the stability of the slope and motion sensor for plot weight measurements. The value ranges from 0–250: ▪ Good: 0–49 ▪ Borderline: 50–99 ▪ Bad: 100 or greater
CTWEOP	This value indicates the stability of the slope and motion sensor during test weight measurements. The value ranges from 0–250: ▪ Good: 0–49 ▪ Borderline: 50–99 ▪ Bad: 100 or greater
Cycle time	Time (in milliseconds) that it took the GrainGage to complete the cycle.
EM frequency	Oscillation frequency from the EM moisture sensor. Used to calculate moisture. With an empty chamber, the frequency typically ranges from 3.4–4.1 mHz.
EM moisture	The EM moisture reading if the GrainGage is using the M2.0 moisture model. This field will be empty if the GrainGage is using another moisture model.
EM voltage	The oscillation voltage (mV) from the EM moisture sensor used in calculating moisture. With an empty chamber, the voltage ranges between 1.4–2.0 V.
Is flush	True—The GrainGage is in the last cycle of the plot (flush cycle). False—The GrainGage is cycling due to a weight or level sensor trip point.
Is overflow cycle	True—An installed overflow sensor triggered the GrainGage to start a cycle. False—The cycle was not triggered by an overflow sensor.
Load cell A millivolts	The voltage reading from the plot load cell plugged into load cell port A.
Load cell B millivolts	The voltage reading from the plot load cell plugged into load cell port B.
Load cell C millivolts	The voltage reading from the test cup load cell plugged into load cell port C.
Min weight unsatisfied	True—The minimum weight threshold was not met for the cycle. False—The minimum weight threshold was met for the cycle.
Moisture probe temperature	Temperature measured by the EM moisture sensor. Used in calculating the grain moisture.

Moisture tare check	Moisture tare check performed between each plot. The value is typically close to zero.
Moisture voltage	Absolute moisture voltage from the moisture sensor after the tare is applied. This voltage should be close to zero with an empty chamber.
SCiO constituent data, such as protein, oil, and nitrogen	The backup log includes columns for the constituent data of the harvested crop, such as protein, oil, and nitrogen. The specific columns included in the backup log depend on the crop type.
Q	Plot weight multiplier value that corrects the weight measurement based on the slope and motion of the weight platform. When slope and motion compensation is disabled, Q is 1.000. When slope and motion compensation is enabled, Q should be $1.000 \pm .05$, depending on the slope of the GrainGage or intensity of the vibrations/movement.
Remaining weight	Total weight measured during the completed weigh cycle. Calculated by subtracting the weight of the test cup sub-cycles from the total weight measured.
SCiO crop name	Name of the crop being harvested, such as corn, wheat, or barley.
SCiO error	Error message in this field indicates that the SCiO NIR sensor cannot confirm the quality of the scan.
SCiO GrainGage DSP	The serial number of the GrainGage DSP.
SCiO moisture	The NIR moisture reading for the plot.
SCiO plot ID	SCiO identifier for each plot.
SCiO scan ID	SCiO identifier for each NIR scan.
SCiO temperature	The temperature measured by the SCiO NIR sensor.
Supply voltage	Voltage supplied to the GrainGage. Typically between 11.5–13 V when the machine is running.
Test weight Q	Test weight multiplier value that corrects the weight measurement based on the slope and motion of the weighing platform. When slope and motion compensation is disabled, Q is 1.000. When slope and motion is enabled, Q is $1.000 \pm .05$, depending on the slope of the GrainGage or intensity of the vibrations/movement.
Test weight tare check	Value for test weight tare check between each plot. The value is typically close to zero.
Uncompensated weight	Plot weight with no slope and motion compensation applied.

UPWEOP

Uncompensated Plot Weight EOP. This value indicates how well the slope and motion compensation is working for plot weight. The value ranges from 0–250:

- Good: 0–49
- Borderline: 50–99
- Bad: 100 or greater

UTWEOP	Uncompensated Test Weight EOP. This value (ranging from 0–250) quantifies the level of slope and motion detected in the uncompensated test weight load cell signals. Higher values indicate greater levels of instability. Turn on Slope and Motion Compensation to correct weight errors resulting from movement, vibration, and slope.
Weight tare check	Result of plot weight tare check between each plot. Typically the value is close to zero.
ID2	Additional identifier information specific to your field or application.
Trait name	Name of the custom trait being tracked with the map. Each custom trait has its own row in the backup log.
Trait data	Data observed for the custom trait. Each custom trait has its own row in the backup log.

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CHAPTER 13

Appendix F: Limited Warranty

13 Appendix F: Limited Warranty

13.1 Software

Software products that are designed by Juniper Systems for use with a hardware product and that are properly installed on that hardware product are warranted to the end user not to fail to execute their programming instructions due to defects in material or workmanship for a period of one year from the date of delivery.

If Juniper Systems receives notice of such defects during the one year warranty period, Juniper Systems shall, at its option, repair or replace the defective software media. Warranty is limited to repair or replacement of software media.

The warranties provided herein do not apply in the case of improper or inadequate maintenance or in the case of repair by any person not previously authorized in writing by Juniper Systems to do such maintenance or make such repairs.

These warranties likewise do not apply where the products have been operated outside the environmental specification of the product, where software products other than those specified by Juniper Systems have been used, or where attempts at software interface have been made by any person not previously authorized by Juniper Systems to perform such interfacing operations.

13.2 Disclaimer of Warranties

The warranties set forth herein are in lieu of all other warranties of Juniper Systems, whether written, oral or implied. Juniper Systems makes no warranties regarding its products (hardware or software), including without limitation warranties as to merchantability, fitness for a particular purpose, any warranty arising from course of performance, course of dealing, or usage of trade whether any of the foregoing warranties are either expressed or implied. Juniper Systems specifically makes no warranties as to the suitability of its products for any particular application. Juniper Systems shall in no event be liable for special, incidental, or consequential damages in connection with or arising out of the furnishing, performance or use of any product covered by this agreement whether such claim is based upon warranty (express or implied), contract, strict liability, negligence or otherwise.

13.3 Updates or Modifications

Juniper Systems shall be under no obligation to update or modify its products except as herein noted to correct program errors. Furthermore, the customer agrees that all representations and warranties contained herein shall be immediately null and void in the event of any modification, alteration or change in or to any product affected by or on behalf of the customer except for a change made by Juniper Systems.

13.4 Removal of Serial Number

Removal of the Juniper Systems serial number label from an instrument will void any warranty on the said instrument. Juniper Systems will not repair or update an instrument and return it to an individual if the instrument is without the said serial number label.

13.5 Extended Warranties

Juniper Systems offers a variety of warranty options to extend coverage beyond the standard warranty. You can contact Juniper Systems Customer Service Department for details at (435) 753-1881 (6 am–5 pm MT, Mon–Fri).