H2

Classic GrainGage

H2 Classic GrainGage

User's Guide

First published June 2017

Updated: May 2018

Part Number: 26542-01

Patents

Patent No.: 9,671,273, issued June 6, 2017

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Information is subject to change without notice.

Cautions

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

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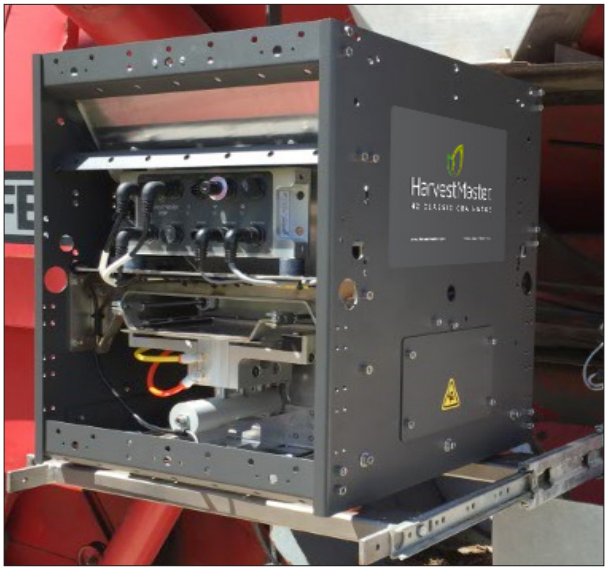
1

INTRODUCTION TO THE H2 CLASSIC GRAINGAGE

Introduction to the H2 Classic GrainGage

The H2 Classic GrainGage™ measures harvested plot weight, moisture, and test weight of grain. The GrainGage comes in a compact, light-weight package, ideal for small plot harvesters and stationary threshers for research data collection.



Designed for field research measurement of grains, beans and oil seeds, the H2 Classic GrainGage™ works in a mobile environment mounted on a plot harvest combine, or it can be operated in connection with a stationary thresher. It provides, on a plot by plot basis, accurate readings of total plot weight, crop moisture and test weight (i.e. pounds per bushel).

The H2 Classic GrainGage™ emerged from a combination of earlier HarvestMaster technology and the proven H2 GrainGage innovations. The design furnishes an accurate, fast, robust plot research instrument.

The heart of the system, the DSP 2 (Digital Signal Processing) electronics module, handles the bulk of logic, communications and control in the H2 Classic GrainGage™, featuring these attributes:

- Precision load cell excitation for the two plot weight cells and the test weight cell
- Signal amplification and kilohertz analog to digital conversion
- Weight signal front end filtering, acquisition, digital signal processing
- Harvester slope and motion compensation, giving results on a moving harvester similar to results achieved making the measurement on a stationary, level platform.

- Control of the system pneumatic values, governing the flow of harvested material through the measurement system sensing material level in the weigh hopper as well as gate position
- Control of the moisture measurement

Other features of the H2 Classic GrainGage™ system include:

- Improved weight accuracy due to higher resolution load cells
- Multiple readings averaged for a more accurate weigh system tare value
- Faster cycle times than the legacy Classic GrainGage™
- User definable sub-cycle measurement count for averaged moisture and test weight
- Removable inserts for low yielding crops

Specifications

Weight: 65.5 lbs (29.7 kg)

Dimensions: 15" w x 18" d x 19" h (38 cm x 46 cm x 48 cm)

Weigh hopper volume: 0.55 bu (19.6 liters)

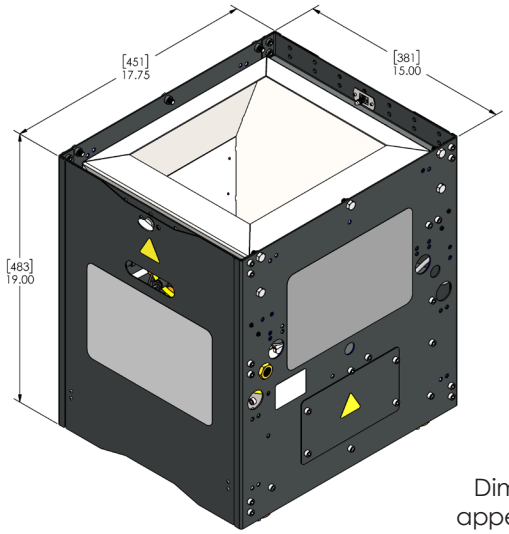
Test chamber volume: 140 in^3 (2.3 liters)

Test chamber volume, small sample insert: 70 in^3 (1.2 liters)

System capacity: approximately 30 lbs (14 kg) in the weigh hopper

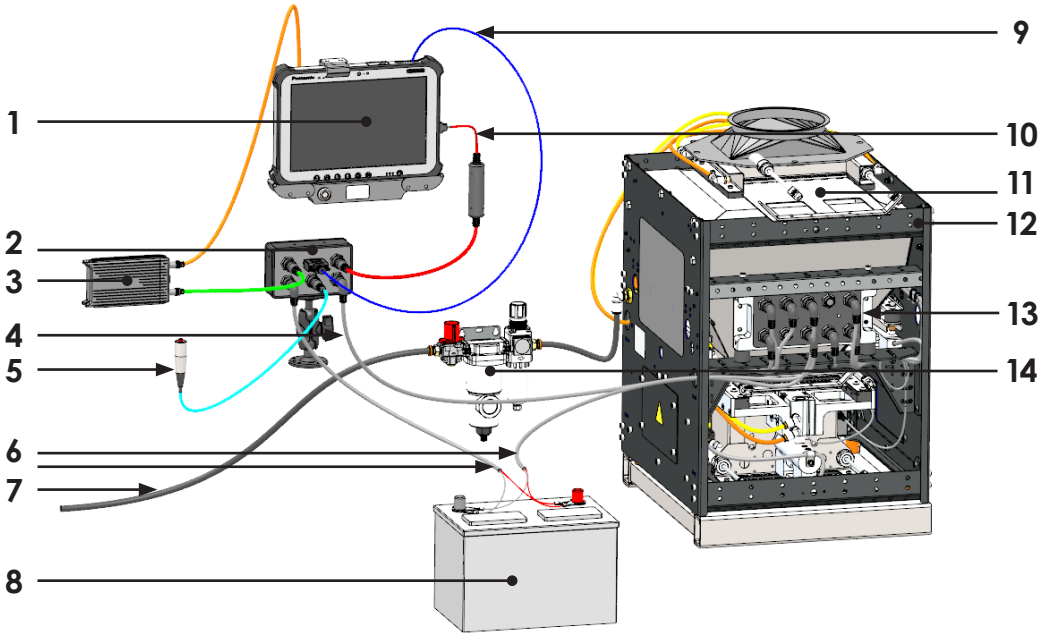
Minimum sample weight: approx. 5 lbs, (2.2 lbs with low yield insert kit)

Storage temperature: -30°C to +60°C



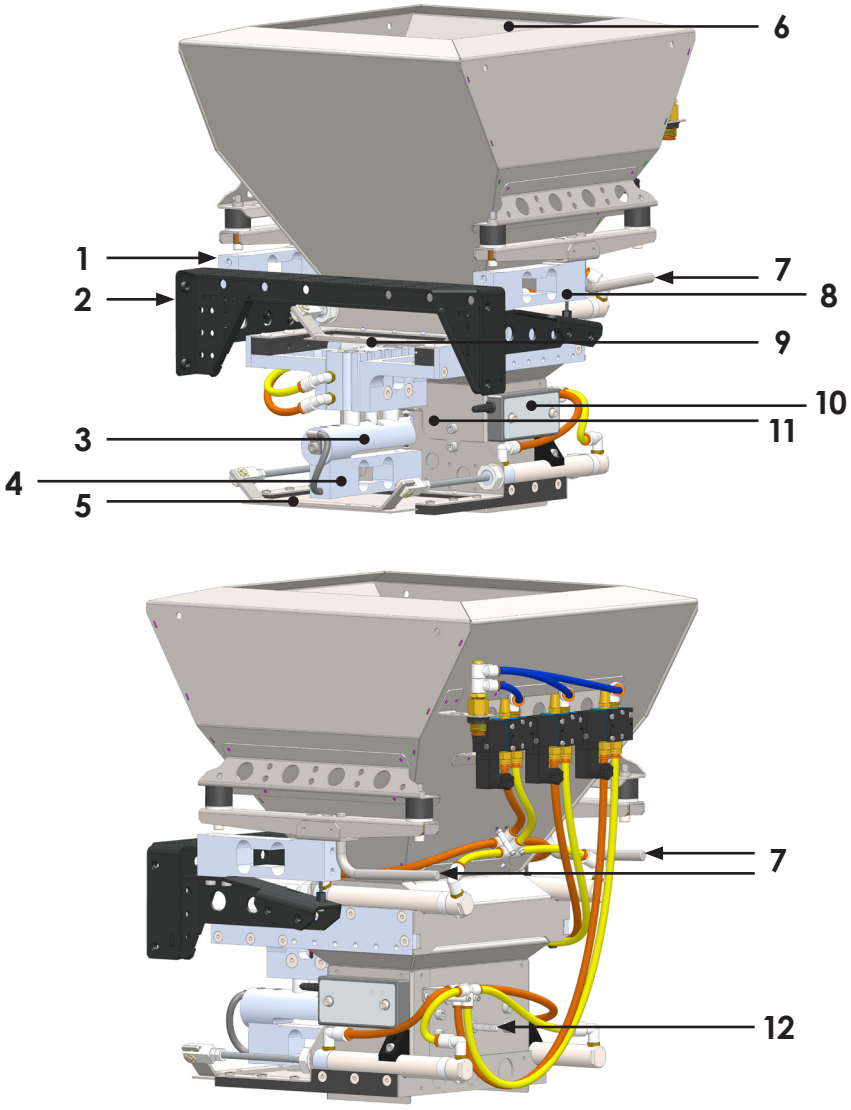
Dimensions shown in drawing appear in inches and millimeters

H2 Classic GrainGage system



1 Tablet computer
2 H2 System Controller
3 Tablet battery charger
4 CAN cable
5 Remote enter
6 12 VDC power cables
7 Pressurized air
8 12 VDC automotive battery
9 Serial cable
10 USB cable (optional accessory)
11 Isolation gate
12 H2 GrainGage chassis
13 DSP 2 module
14 Pneumatic conditioner and shutoff

H2 Classic GrainGage sensors and gates



1 Weigh hopper load cell
2 Weigh frame
3 Separator
4 Test chamber load cell
5 Bottom gate
6 Weigh hopper
7 Calibration weight hook for plot weight
8 Weigh hopper load cell
9 Top gate
10 Grain moisture sensor
11 Test chamber
12 Calibration weight hook for test weight

System components in detail

- **Isolation gate:** The isolation gate is recommended for systems mounted on harvesters to prevent grain from dribbling or flowing into the weigh hopper during a measurement cycle.
- **Plot weigh hopper:** This hopper is the upper portion of the GrainGage in which the grain from a harvested plot is held.
- **Hopper load cells:** These load cells measure the weight of grain in the plot weigh hopper.
- **Top gate:** The gate between the plot weigh hopper and the test chamber is kept closed to keep grain in the weigh hopper, and is opened to allow grain to enter the test chamber.
- **Test chamber:** The test chamber is situated below the plot weigh hopper, and is used to measure the grain moisture and test weight (bulk density / weight per volume) for a subsample.
- **Bottom gate:** The gate at the bottom of the test chamber is kept closed to hold grain in the test chamber and is opened to allow grain to flow out of the GrainGage.
- **Pneumatic gate cylinder:** Pneumatic, relative to this system, means moved or worked by air pressure. The gates in the H2 Classic GrainGage are actuated with pneumatic cylinders, two per gate, in order to reduce the amount of space required for a linear actuation. Check these parts annually as they may periodically need replacement. We recommend having one or two spares on hand.
- **Pneumatic valve:** In the H2 system, there are four pneumatic valves. The DSP 2 module controls these valves, independently opening and closing gates as well as separating and docking the test chamber.
- **Separator:** This pneumatic actuator moves the test chamber upwards into the filling position, or downwards to the weighing position, where it is free from mechanical interference from the filling gate above.
- **Load cell:** Two 20-kilogram aluminum full bridge strain gage load cells are used to make precision weight measurements of the entire weighing/test weight assembly of the H2 Classic GrainGage™. A third load cell (identical, except for cable length) measures the weight of the test chamber contents.

- **Host computer or tablet computer:** A tablet style computer (at least field robust) running MS Windows 7 or higher operating system, loaded with and running the HarvestMaster Mirus™ software for field data collection.
- **H2 System Controller:** A 3 in (7.5 cm) high x 5 in (12.5 cm) wide x 2 in (5 cm) deep electronics enclosure providing communications and signal interface to the H2 Classic GrainGage. The controller provides a serial communications interface, a remote enter button connection, a computer power supply, CAN (Control Area Network) connectivity, and system power on/off.
- **H2 Classic GrainGage DSP 2 module:** DSP stands for Digital Signal Processing. The DSP 2 is the electronics module that does all of signal conditioning, measurement and control of the H2 Classic Graingage. Think of it as the energy, brains and feelers of the entire system. Its functions include providing excitation to the sensors, making measurements through the sensors, and controlling the Graingage™.
- **EM2 Grain Moisture sensor:** The EM2 Grain Moisture sensor measures the dielectric of the sample in the test chamber and converts that value to a percentage grain moisture: Percent Moisture = 100 (M_w / (M_d + M_w)) where M_w is the mass of the water in the grain and M_d is the mass of the grain.

Terminology

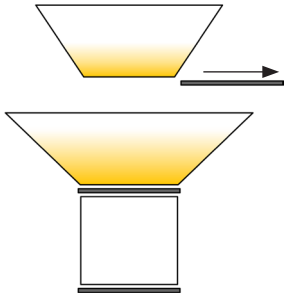
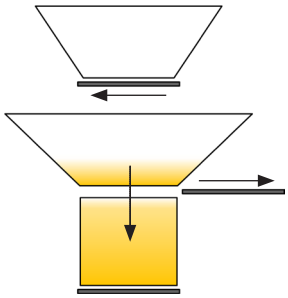
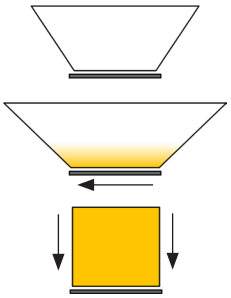
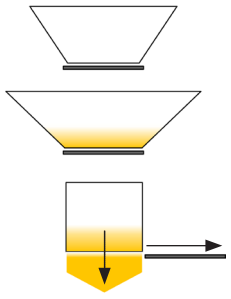
- **Plot weight:** Typically, this is the total weight of grain held in the weigh hopper. However, the H2 Classic GrainGage has a feature allowing it to harvest and weigh plots where the total plot yield is greater than a single weigh hopper full of grain. When the inflowing grain reaches a preset level in the weigh hopper, the isolation gate is automatically closed, and a measurement cycle is triggered, saving the partial-plot measurements for this cycle, and following partial-plot measurements until harvest of the long plot is complete. When the cycle button is pressed, the last measurement cycle completes and the cycle weights are added, the moisture and test weight readings are averaged for the final set of weight, moisture and test weight for the plot.
- **Measurement cycle:** When grain harvested from a plot is more than will fit in the plot weigh hopper, the GrainGage processes each hopper of grain as a partial plot measurement, and the data from the measurement cycles in a plot are totaled (plot weight) or averaged (moisture or test weight) for the entire plot.

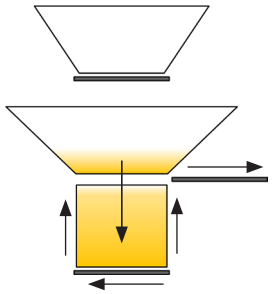
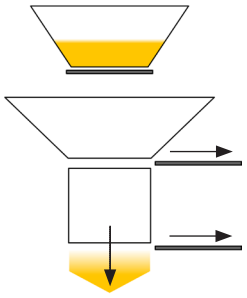
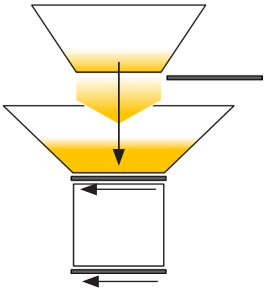
- **Sub-cycle:** A measurement of test weight and moisture performed when the test chamber drops. In the weight measurement setup, the user may specify the number of sub-cycles (within one measurement cycle) on which test weight and moisture readings will be taken. These individual readings are recorded in the backup file, enabling further analysis of plot variability. In normal data collection, these readings are averaged to produce a single set of readings for the plot.
- **Test weight:** Weight per unit volume of a sample of grain in the test chamber. Test weight is measured in lb/bushel, or kg/hectoliter.
- **CAN:** Control Area Network, a robust electronic communication protocol ubiquitous in automotive applications.

How the H2 Classic GrainGage works

The H2 Classic GrainGage processes grain harvested from research plots, measuring the weight of grain collected from the plot, the test weight (pounds per bushel or kg per hectoliter), and moisture.

The following diagrams describe the process. These diagrams show an optional (recommended) isolation gate that prevents grain from flowing into the system while the current weigh hopper contents are being measured.

State	Description and notes	Diagram
1. Incoming grain	• Isolation gate normally open. • Grain falls directly into weigh hopper. • Wait for harvester to clean out, or wait for hopper weight trip point.	
2. Prepare to measure	• Isolation gate closes. • Harvester continues to harvest the next plot. • Top gate opens, filling the test chamber with grain from the hopper.	
3. Measure	• Top gate closes. • Test chamber undocks, separating from the weigh hopper. • GrainGage takes simultaneous measurements for total hopper weight, test weight and moisture.	
4. Evacuate test chamber	• Bottom gate opens, emptying the test chamber. • If last sub-cycle, skip to state 6.	

State	Description and notes	Diagram
5. Measure additional sub-cycle	• Bottom gate closes. • Test chamber re-docks to weigh hopper. • Top gate opens, filling the test chamber with grain from the hopper. • Go to state 3 (except total hopper weight is not repeated for additional sub-cycles).	
6. Evacuate hopper	• Top gate opens (while bottom gate is still open). • All remaining grain empties from the hopper and test chamber.	
7. Prepare for next plot measurement cycle	• Top and bottom gates close. • Test chamber re-docks to weigh hopper. • Isolation gate opens. • Grain flows into the hopper (more grain if strip plot, or grain from next plot). • Go to state 2, if trip was due to hopper weight.	
8. Finalize plot	• Operator triggers "end of plot." • Sub-cycle values of moisture and test weight are averaged, hopper weights are totalized, and final results are recorded for the current plot. • Return to state 1 and repeat for the next plot.	(no diagram)

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RECEIVING AND INSPECTING THE H2 CLASSIC GRAINGAGE

Initial inspection

The H2 Classic GrainGage ships in a corrugated, cardboard shipping crate, and is secured with packing material.

Upon delivery, inspect the shipping crate for any signs of damage. If you identify any damage, contact the shipping company to file a claim. In order to file a claim, the insuring agency must inspect the package before it is opened.

CAUTION: Do not open the shipping crate if you identify damage. Contact the shipping carrier or the insuring agency so that they can inspect the package before it is opened, otherwise your claim may be denied.

If you do not find any issues with the shipping crate, open it and inspect the items you received.

CAUTION: Take care when unpacking product to ensure no damage occurs. Use extra care with the weigh system load cells as dropping a weigh system or an unprotected load cell may result in permanent damage. This type of damage is not covered under our standard warranty.

You must inspect all products and components within seven calendar days to ensure the order is complete and in good physical condition.

Receiving checklist

These tables list the parts that you should expect with the H2 Classic GrainGage. These tables also list parts that are optional accessories and components that may not be included in your shipment.

Standard components and accessories

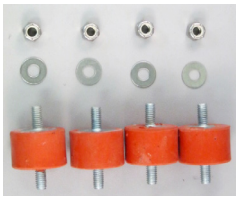
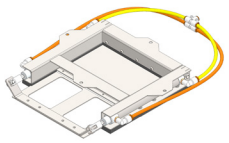
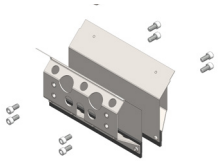
PN	Qty	Description	Notes / Purpose	Photo / Drawing
24404	1	H2 Classic GrainGage (includes 10 hex-cap bolts for use in top-mounting)		
25030	1	H2 System Controller with RAM mount and two button-head, cap screws		
24407	1	H2 Test Chamber Calibration Weight (approx. 3 lbs)	The operator uses the calibration weight to calibrate the weight measurement of the test chamber. The weight is stamped with its precise weight.	
24408	1	H2 Weigh Hopper Calibration Weight (approx. 11 lbs)	The operator uses the calibration weight to calibrate the weight measurement of the plot weigh hopper. The weight is stamped with its precise weight.	
26550	1	H2 Classic Installation Kit	The installation kit parts are listed in a separate table.	see table below

H2 Classic installation kit (PN 26550)

PN	Qty	Description	Notes / Purpose	Photo / Drawing
15332	2	HM8 12 VDC Power Cable, 20 ft	One cable provides power to the H2 System Controller. The other cable provides power to the DSP 2 module for signal conditioning.	
15336	1	HM8 CAN Communications Cable, 20 ft	The CAN communications cable connects the System Controller to DSP 2 module on the GrainGage chassis. The end of the cable with the right angle connector is for connection to the DSP 2 module.	
15374	1	HM8 HMA-400 Remote Enter Button and Cable Assembly	The remote enter button allows the operator to manually trigger a measurement cycle on the GrainGage.	
23237	1	HM 9-pin Serial Cable, 10 ft (3 m)	The serial cable connects the computer to the H2 System Controller.	
26566	1	DSP I/O Actuator Cable	This cable connects to GPIO 1 to control actuator 5 (or acutator 5 and actuator 6 in dual mode). Refer to chapter 4 for details.	
9455	30 ft	PLS Polyurethane Tubing 0.375" OD, 0.250" ID	PN 9455 tubing provides pressurized air to the H2 Classic GrainGage.	
9592	5 ft	PLS Polyurtethane Tubing 0.25" OD, 0.16" ID	PN 9592 tubing connects the auxiliary pneumatic actuator to its pneumatic control valve.	

Optional accessories

You may order these optional accessories, depending on what is needed for your installation.

PN	Qty	Description	Notes / Purpose	Photo / Drawing
26622	1	Rubber mount kit	These mounts are used for mechanical shock isolation from the harvester. The kit includes: 4 Rubber Sandwich Mounts 4 5/16-18 SS Nylock Nuts 4 5/16 Washer 18-8 SS Washers	
20363	1	HM8 USB CAN Converter Cable	This cable is generally used by field technicians. This is not recommend for regular field operations on a plot harvester because the USB connection may be disconnected due to vibration.	
26530	1	HM Isolation Gate Kit	The isolation gate is required for plot harvester installations.	
26545	1	H2 Low-Yield Insert Kit	The low-yield insert kit allows measurements on plot samples as small as 70 cubic inches (1.1 liters).	
26829	1	DSP2 GPIO Breakout Cable	This cable connects to GPIO 1 for connection to the overflow sensor (PN 26771) and the H2 Classic Straight Actuator Cable (PN 26830).	
26771	1	H2 Classic Overflow Sensor	The overflow sensor connects via the DSP2 GPIO Breakout Cable (PN 26829). With conditional action setup, the sensor triggers an isolation gate or similar device to prevent overflow of grain in the GrainGage.	
26830	1	H2 Classic Straight Actuator Cable	This cable is used with the DSP2 GPIO Breakout Cable (PN 26829) to control actuator 5 (or actuator 5 and actuator 6 in dual mode). Refer to chapter 4 for details.	

Tablet computer options

These tablet computers are options for running Mirus and operating the H2 Classic GrainGage.

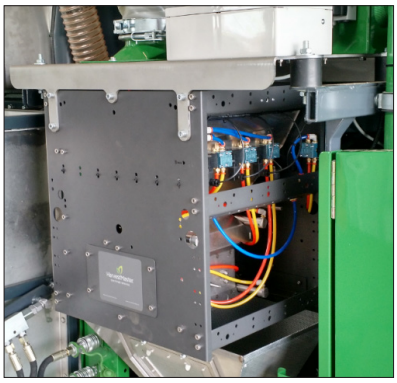
PN	Description	Notes / Purpose	Photo / Drawing
MS2-G-CFG	Mesa 2 with cradle, mounts and 12 VDC charger	7-inch ultra-rugged tablet computer	
24352	Panasonic Toughpad with cradle, mounts and 12 VDC charger	10-inch tablet computer. Panasonic Laptop FZ-G1 Tablet with accessories.	

3

INSTALLATION

Installation types

The H2 Classic GrainGage supports mounting on a harvester or in a stationary/ stand-alone setup for use with a stationary thresher. On a harvester, the GrainGage supports either top mounting or base mounting.

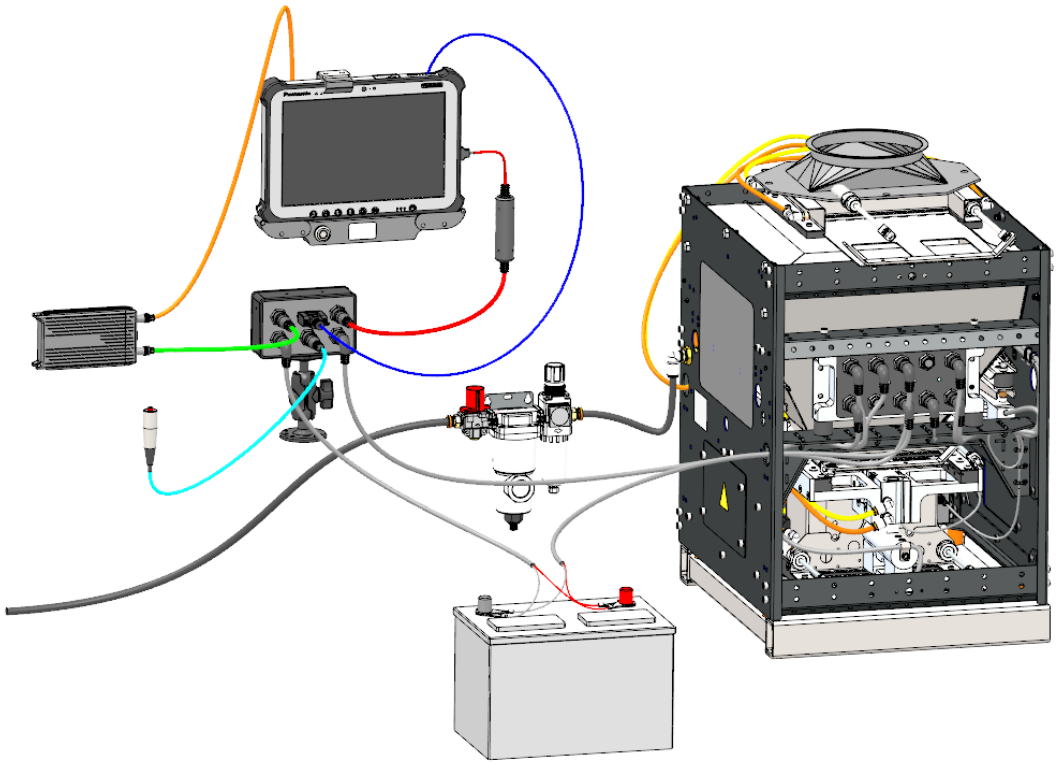


Top Mounting

Base Mounting

Stationary Deployment

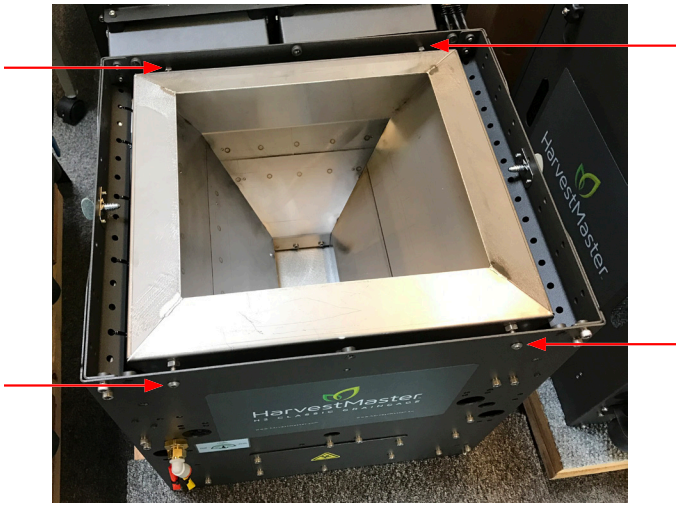
System diagram



Installation on a harvester

Use these guidelines to facilitate installation of the GrainGage on a harvester.

CAUTION: Remove the shipping stops before installing the H2 Classic GrainGage.



Remove shipping stops before installation.

GrainGage mounting and cable routing

Step 1: Park the harvester on a level surface and check the tire pressure to make sure all tires are at normal operating pressure.

Step 2: Identify the location, on the harvester, where the GrainGage will be mounted:

- Give special consideration to allow enough space, about 8 inches (20 cm), for the operator to reach inside to hang the calibration weight.
- Consider mounting the GrainGage to allow removal of the moisture sensor access panel to facilitate service or replacement of the moisture sensor. When looking at the GrainGage from the DSP side, the moisture sensor is located on the right side of the GrainGage.
- In addition, consider routing of cables and hoses to the GrainGage. The weigh hopper works best when cables and airlines run horizontally from the chassis to the weigh hopper.

Step 3: Mount the GrainGage on the harvester, ensuring it is straight and level. Use the parts from the rubber mounting kit (PN 26622) to cushion the GrainGage from the mechanical shocks of the operating plot harvester. If desired, the H2 Classic GrainGage could be mounted on slides or a robust hinging mechanism to give better access for calibration and maintenance. Options for slides are available from *http://www.generaldevices.com*.

Step 4: If the GrainGage is mounted in a location where you cannot see the grain flow and the gates moving, consider mounting a camera to allow observation of the gates and the grain as it flows through the system. Commercially available vehicle backup camera systems can serve this purpose.

Controller, tablet and cabling

The H2 System Controller switches power to the system and indicates the status of operation. It also charges the host computer (12 VDC, maximum 12 A unregulated), provides the connection point for the remote enter switch, and serves as the CAN interface between the GrainGage and the host computer.

Follow these instructions to install the system controller and tablet computer on the harvester.

Step 1: Identify mounting locations in the cab for the H2 System Controller and the tablet computer. Select locations within easy reach and view of the operator, and within a distance of each other allowed by the 10-foot (3 m) serial cable that connects the computer to the controller.

CAUTION: Be sure to provide strain relief for connections so that the weight of the cable is not pulling on the connector as it may result in premature wear or damage to the connectors.

In selecting the mounting locations, consider the paths for routing the power cable to the battery and the CAN cable to the DSP 2 module on the GrainGage.

Step 2: Use the RAM mount in any of four positions (top, bottom, left side, or right side) on the H2 System Controller, depending on desired mounting location.

Step 3: Mount the computer in the desired location.

Step 4: Identify routing for cables and hoses that keeps the cables out of the way of moving parts. Cables can be routed along existing cables or hoses as long as plastic ties are used to hold them in place (at least one tie every two feet).

CAUTION: Route the cables to be free from pinching or kinking during use and maintenance to prevent damage to the cables.

CAUTION: The H2 Classic GrainGage requires a clean 12 volt DC supply in the range of 11.5 volts to 18.0 volts, and the supply of power must be free of transient power spikes.

CAUTION: When using a battery booster to furnish a quick charge on the harvester battery, disconnect the H2 Classic GrainGage power source to prevent damage. DC voltages over 18 volts will damage H2 Classic GrainGage electronics. Many automotive battery boosters exceed 18 volts.

Step 5: Route the power cables (PN 15332). Route one power cable between the H2 System Controller and the battery, and route the other power cable between the DSP 2 Module and the battery. Trim each power cable to length on the pig tail end to suit the installation. The pig tail end of each cable is for connection to the battery. Use a 20 amp fuse on the positive lead to protect the harvest data system.

Step 6: Route the CAN cable from the H2 System Controller to the DSP2 module on the GrainGage.

Pressurized air supply

The H2 Classic GrainGage requires pressurized air in the range of 70 PSI to 80 PSI. The air tank must be at least two gallons and must have a water drain petcock valve on the bottom. A pneumatic conditioner and shutoff (PN 15450) must be used between the air tank and the GrainGage to regulate the pressure and to remove oil aerosols, liquids and fine particles.

Step 1: Identify the mounting location for the air tank. Find a location to allow the operator to drain the tank daily.

Step 2: Identify the path for routing the air hose from the air tank to the pneumatic conditioner and shutoff, and then to the GrainGage.

Step 3: Identify the mounting location for the pneumatic conditioner and shutoff. Select a location that allows the operator to access the shutoff valve.

Step 4: Mount the air tank.

Step 5: Mount the pneumatic conditioner and shutoff in an accessible location.

Step 6: Connect air from the air tank to the pneumatic conditioner and shutoff.

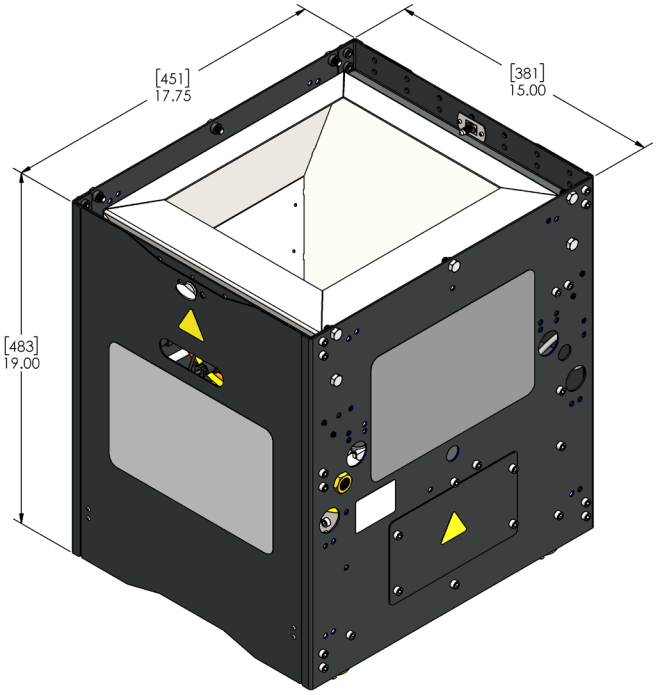
Step 7: Connect air from the pneumatic conditioner and shutoff to the GrainGage with 3⁄8" poly tubing.

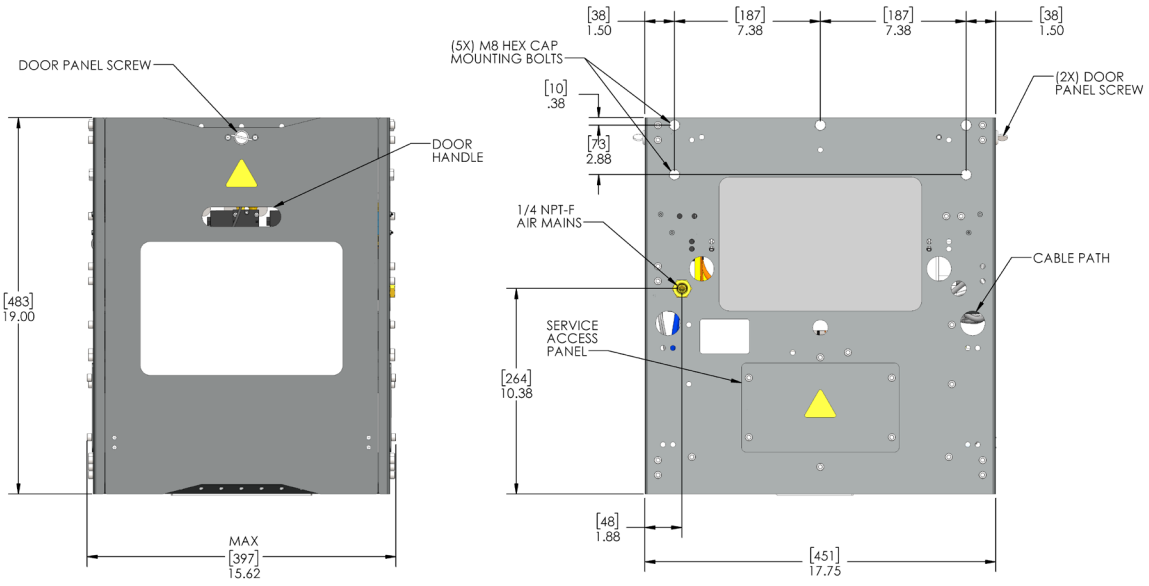
Note: The actuators in the H2 Classic GrainGage are pre-lubricated, and are designed to operate without additional lubrication.

CAUTION: Do not lubricate the actuators and solenoid valves in the GrainGage system as it may lead to premature failure of these components.

H2 Classic GrainGage dimensions

These drawings show dimensions of the H2 Classic GrainGage chassis.





Dimensions shown in drawing appear in inches and millimeters

Post installation inspection and test

After installation, validate proper operation by checking the items in this section.

General inspection

For general inspection, check the following:

- Set the air regulator to 75 PSI. The system supports air pressure in the range of 70 PSI to 80 PSI.
- Verify that the shipping stops have been removed. Refer to the information under the section, Installing on a harvester.

Diagnostics

Connect the tablet computer to the H2 System Controller. Open the Mirus software. If not already selected, the H2 Classic GrainGage from the Plugins list. Open the diagnostics menu.

Weight diagnostics

- Weight after tare normally reads 0.00 +/- 0.01. Lift or push on the weigh hopper and verify that after release, it returns to 0.00 +/- 0.02.
- Load cell 1 normally reads 2.750 mV to 3.500 mV with an empty weigh hopper. Verify that the reading returns to the expected resting value +/- 0.003 mV after lift/push down on weigh hopper.
- Load cell 2 should read similar to load cell 1.
- Q value normally reads 1.000 +/- 0.001 with plot harvester stationary and level, and should remain within +/- 0.005 with the head and separator running.

Tap the unlock icon to see the parameters that follow:

- Accelerometer EOP value should read less than 10 with the plot harvester off.
- Compensated weight EOP value should read less than 10 with the harvester off.
- Compensated test weight EOP should be less than 10 with the harvester off.
- Uncompensated weight EOP should read less than 10 with the plot harvester off.

- Uncompensated test weight EOP should read less than 10 with harvester off.
- Slope and motion compensation should be enabled for best weight measurement performance.

Start the harvester and re-check the following items:

- Accelerometer EOP value should be less than 50 with the harvester on, and thresher running at full throttle.
- Compensated EOP value should be less than 50 with the harvester on, and thresher running.
- Compensated test weight EOP should be less than 50 with the harvester on, and thresher running.

Moisture diagnostics

- Moisture probe temperature typically reads 3 to 5 °C higher than ambient air temperature.
- Supply voltage typically reads in the range of 11 to 16 volts.
- EM voltage typically reads in the range of 1.5 to 2.0 volts and the reading should be stable for an empty test chamber with the top and bottom gates closed.
- EM frequency typically reads in the range of 3.5 to 4.1 mHz for an empty test chamber with the top and bottom gates closed.

Test weight diagnostics

- Test weight normally reads 0.0 +/- 0.2 for an empty test chamber.
- Chamber weight normally reads 0.00 +/- 0.01.
- Load cell voltage normally reads in the range of 1.250 mV to 2.250 mV for an empty chamber while the harvester is stationary.

Actuator diagnostics

For each actuator in the system, tap the on-screen button to open/close or move up/down.

- Top gate open/close
- Bottom gate open/close
- Separator up/down
- Isolation gate open/close

Mechanical inspection

Check the plot weigh hopper for proper alignment. Verify that it is resting on the load cells, and check that it is weighing properly.

Check all cables and electrical connections. Verify that they are secure and have not come loose.

Operational validation

Use a sample with known moisture, test weight, and plot weight to check the measurement accuracy of the system.

Run the known sample of grain through the system, using the "Collect" mode in Mirus on the computer, and then compare results with the data previously measured for the sample. This is the quickest method to check all functions of the system.

While running the sample through the system, check these items:

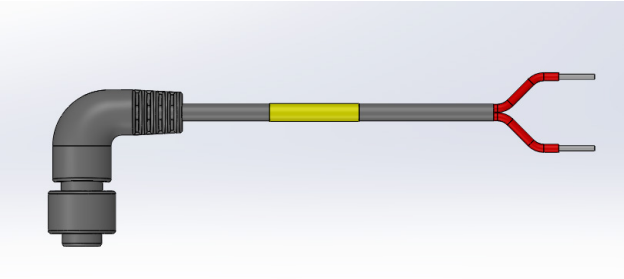
- Grain flow and proper sequence of actuators
- Proper operation of sub-sampler
- Plot weight accuracy
- Moisture accuracy
- Test weight accuracy
- Other special script functions such as air diverters or wiper arms

4

INSTALLATION — AUXILIARY AND OPTIONAL COMPONENTS

DSP I/O actuator cable

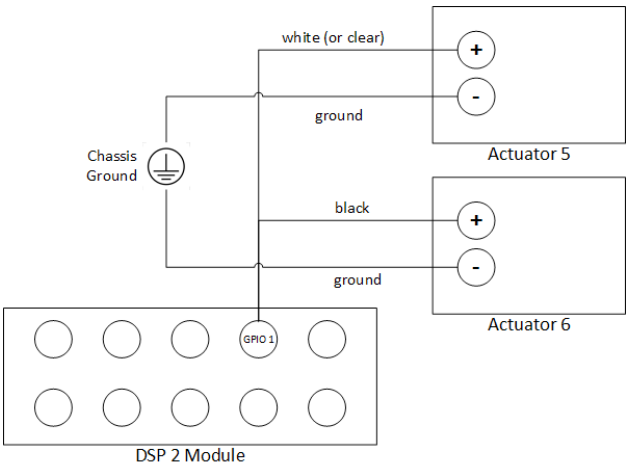
Use the DSP I/O actuator cable (PN 26566) to connect between GPIO 1 on the DSP 2 module and actuator 5 for control of an isolation gate or other auxiliary device. Mirus 4.1 supports dual mode, allowing control of both actuator 5 and actuator 6 when dual mode is selected.



Actuator 5 and 6 wiring (dual mode)

When dual mode is used, wire the white (or clear) wire to the positive terminal on the solenoid for actuator 5, and wire the black wire to the positive terminal on the solenoid for actuator 6. Use additional wiring (not included with the part or kit) to connect the negative terminals to chassis ground. Dual mode only supports pneumatic actuators.

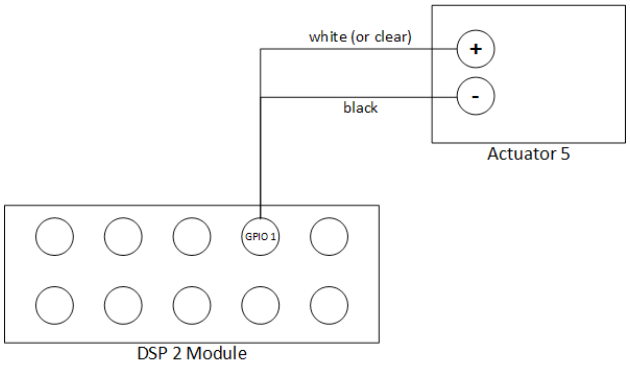
The following diagram shows dual mode wiring with PN 26566.



Actuator 5 wiring (dual mode not used)

When not using dual mode, wire the white (or clear) wire to the positive terminal and the black wire to the negative terminal. This configuration supports multiple types of actuators (e.g. pneumatic, hydraulic, or electric).

The following diagram shows wiring actuator 5 with PN 26566.

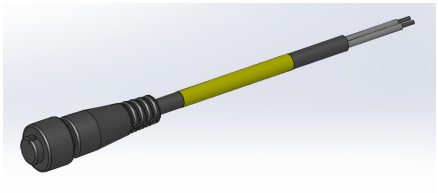


DSP2 GPIO breakout cable, H2 Classic overflow sensor, and H2 Classic straight actuator cable

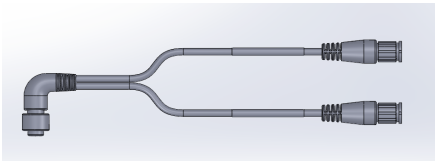
The DSP2 GPIO breakout cable (PN 26829) splits the GPIO 1 port to support connection to the overflow sensor and actuator 5 for control of an isolation gate or other auxiliary device. Mirus 4.1 supports dual mode, allowing control of both actuator 5 and actuator 6 when dual mode is selected.

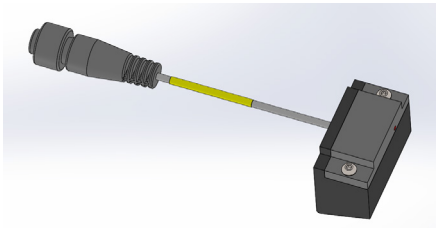
Connect one end of the DSP2 GPIO breakout cable to GPIO 1 on the DSP 2 module, and connect the other two ends of the cable to the H2 Classic overflow sensor (PN 26771) and the H2 Classic straight actuator cable (PN 26830).

26830



26829



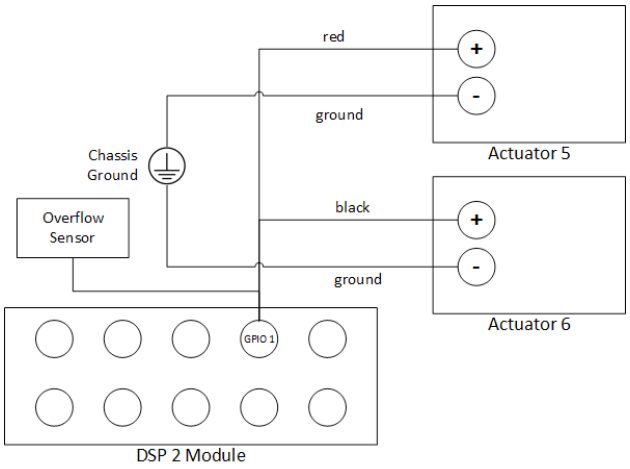


26771

Actuator 5 and 6 wiring (dual mode)

When dual mode is used, wire the red wire to the positive terminal on the solenoid for actuator 5, and wire the black wire to the positive terminal on the solenoid for actuator 6. Use additional wiring (not included with the part or kit) to connect the negative terminals to chassis ground. Dual mode only supports pneumatic actuators.

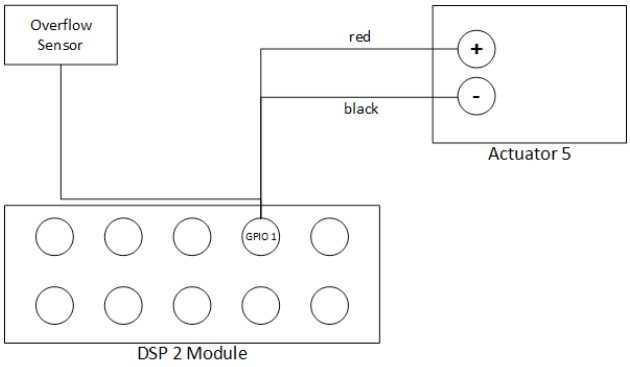
The following diagram shows dual mode wiring with PN 26829, PN 26771, and PN 26830.



Actuator 5 wiring (dual mode not used)

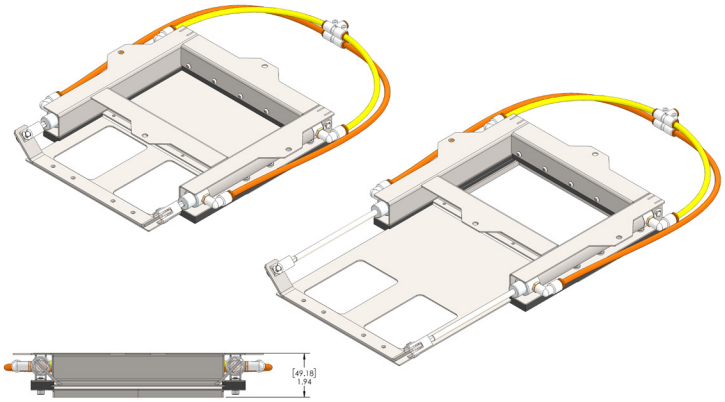
When not using dual mode, wire the red wire to the positive terminal and the black wire to the negative terminal. This configuration supports multiple types of actuators (e.g. pneumatic, hydraulic, or electric).

The following diagram shows wiring actuator 5 with PN 26829, PN 26771, and PN 26830.

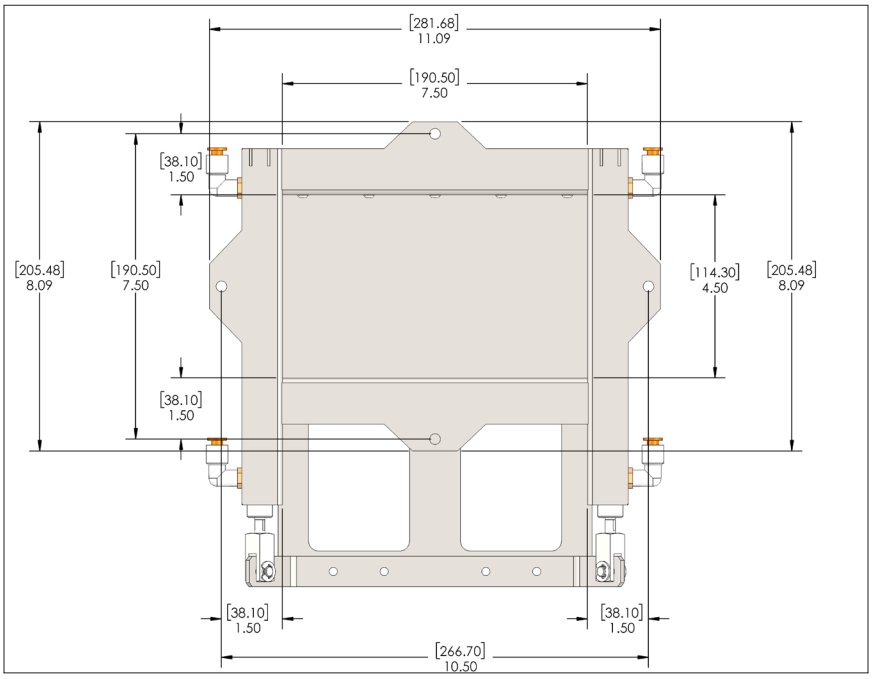


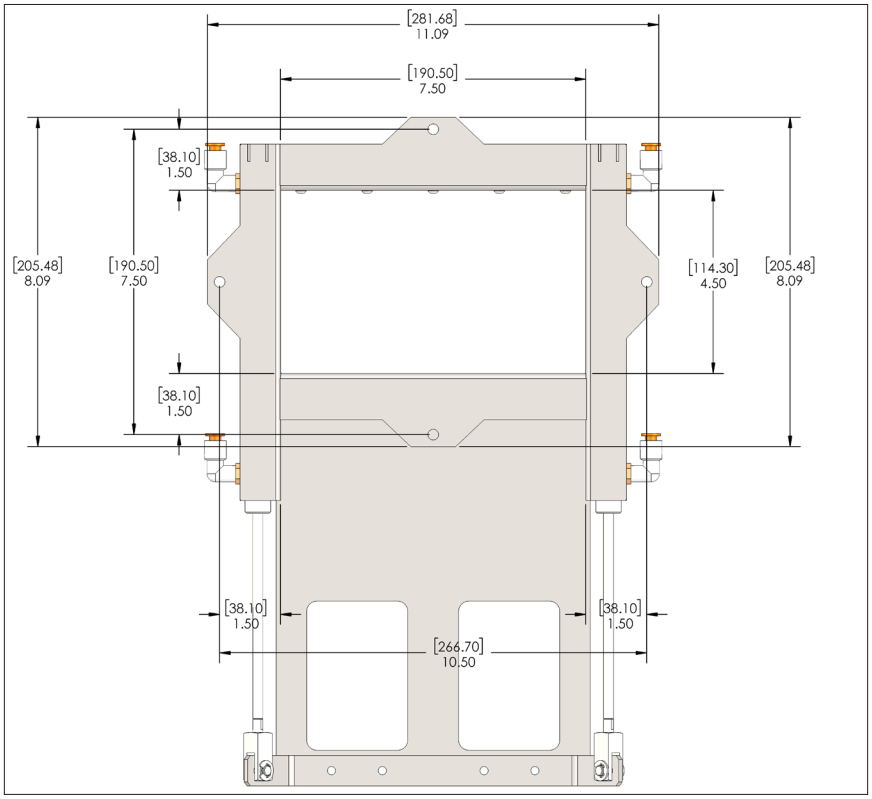
Isolation gate kit

The isolation gate provides the means to halt all grain flow into the H2 Classic GrainGage during a measurement cycle. We recommend the installation of the isolation gate on all plot harvester mounted H2 Classic Graingage systems. There needs to be sufficient holding capacity above the isolation gate to accommodate grain flow for several seconds while the measurement sequence executes.



Isolation gate drawings



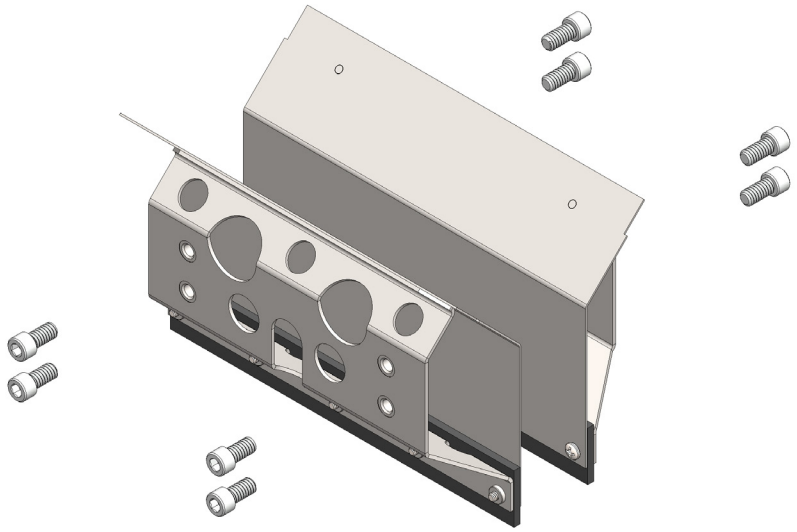


Dimensions shown in drawing appear in inches and millimeters

Low-yield insert kit

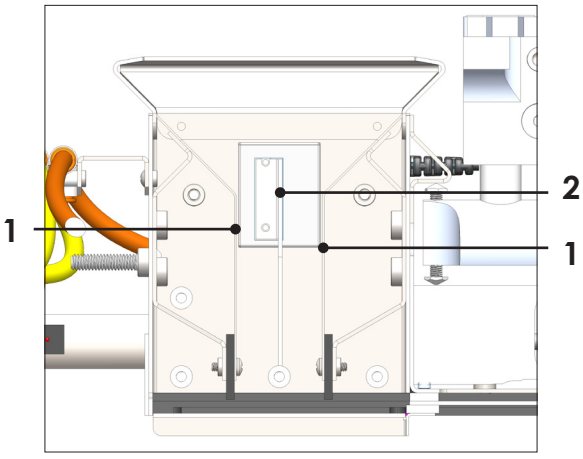
The low-yield insert kit allows the H2 GrainGage to measure test weight and moisture for low volume plot samples. If the yield from the plot is not large enough to fill the test chamber (140 cubic inches or 2.3 liters), install the low-yield insert kit to process the plot samples. The low-yield insert kit allows measurements on plot samples as small as 70 cubic inches (1.1 liters).

The kit includes two insert pieces and eight hex-drive, socket-cap screws. The drawing shows the test chamber with the insert kit.



Install the inserts in the test chamber, on either side of the moisture blade, and secure each of the insert pieces with the hex-drive, socket-cap screws.

The cutaway view (below) shows the inserts installed in the test chamber on either side of the moisture blade.



1 Inserts - both sides of the test chamber
2 Moisture blade

Installing the low-yield insert kit

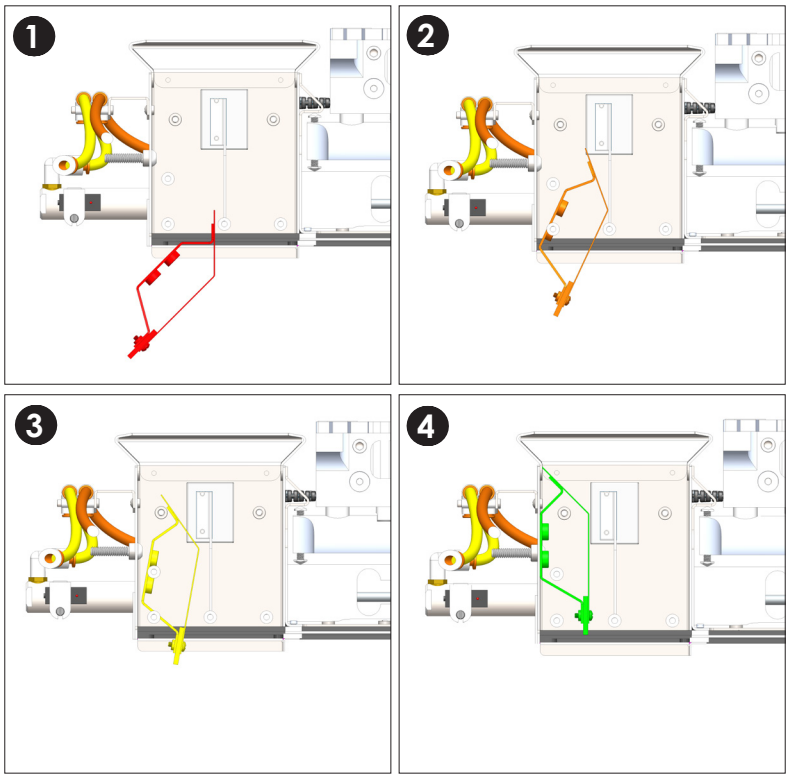
Tools needed: 3⁄16" Allen wrench, 5⁄32" Allen wrench, 7⁄16" box wrench

Four holes on each side of the test chamber provide a means to attach the low-yield inserts. These holes are plugged by two flat metal plates, one on each side, or by eight 14-20 button-head screws, four on each side.

Step 1: Remove the insert hole plugs from the test chamber, either the plates or the button-head screws. Save these parts to plug the holes when the inserts are removed.

Step 2: With the bottom gate open, slide one insert up and into the test chamber. Angle and rotate the insert as you slide it into place against the wall of the test chamber.

These cutaway drawings show how to angle the insert as you slide it into place.



Step 3: Secure the insert with four hex-drive, socket-cap screws (¼-20 x 0.5", PN 26546).

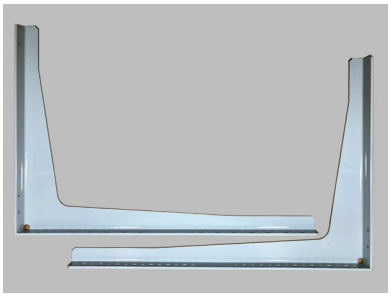
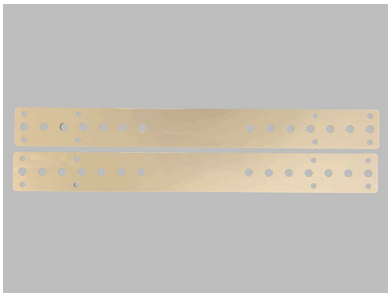
Step 4: Repeat the process for the second insert on the other side of the chamber.

Step 5: Re-calibrate the moisture sensor and test weight, and be sure to retare.

H2 GrainGage retrofit kit

The H2 GrainGage retrofit kit (PN 26889) helps to mount an H2 Classic GrainGage in place of a High Capacity GrainGage or HM800 Classic GrainGage.

Parts in the kit

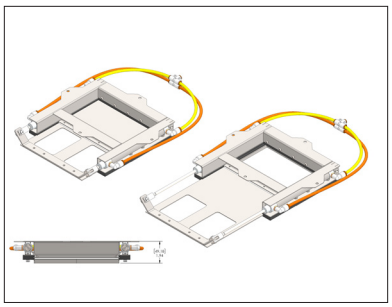
PN	Qty	Description	Image
26890	1	H2 retrofit mounting arm, left	
26891	1	H2 retrofit mounting arm, right	
26892	2	H2 back mounting brace	
26893	2	H2 bottom mounting support	
26946	1	H2C isolation gate funnel	

PN	Qty	Description	Image
26622	1	H2 Classic rubber isolation kit	
	4 6 6	H2C retrofit mount spacer 3/8"-16 serrated flange hex bolts 3/8"-16 flanged hex nuts	
	16 16	1/4"-20 flat head socket cap screws 1/4"-20 Nylock nuts	
	2 4	1/4"-20 rubber mounts 1/4"-20 hex bolts	
	8 8	#6-32 button head socket cap screws #6-32 Nylock nuts	

PN	Qty	Description	Image
	4	1/4"-20 hex cap bolts	
	8	1/4"-inch flat washers	
	4	1/4"-20 Nylock nuts	

The assembled mounting is shown below. Several mounting holes along the back of the frame to adjust for height and location relative to a cyclone and the HM800 mounting.

Flow of air from the cyclone must stop while measuring weight in the GrainGage. If the harvester is not already equipped with an isolation gate, an isolation gate (PN 26530) may be purchased separately.

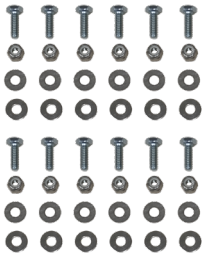


A picture of a complete installation is shown below.

H2 GrainGage retrofit kit for Wintersteiger Classic or Delta combines

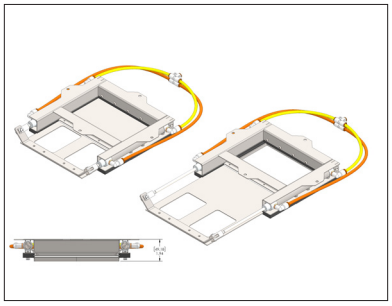
The H2 GrainGage retrofit kit for Wintersteiger Classic or Delta combines (PN 26931) helps to mount an H2 Classic in place of an HM800 GrainGage.

Parts in the kit

PN	Qty	Description	Image
26907	2	H2C mount WS support bar	
26946	1	H2C isolation gate funnel	
26622	1	H2 classic rubber isolation kit	
	12 12 24	1/4"-20 hex cap bolts 1/4"-20 Nylock nuts 1/4"-inch flat washers	

PN	Qty	Description	Image
	8 8	#6-32 button head socket cap screws #6-32 Nylock nuts	

Flow of air from the cyclone must stop while measuring weight in the GrainGage. If the harvester is not already equipped with an isolation gate, an isolation gate (PN 26530) may be purchased separately.

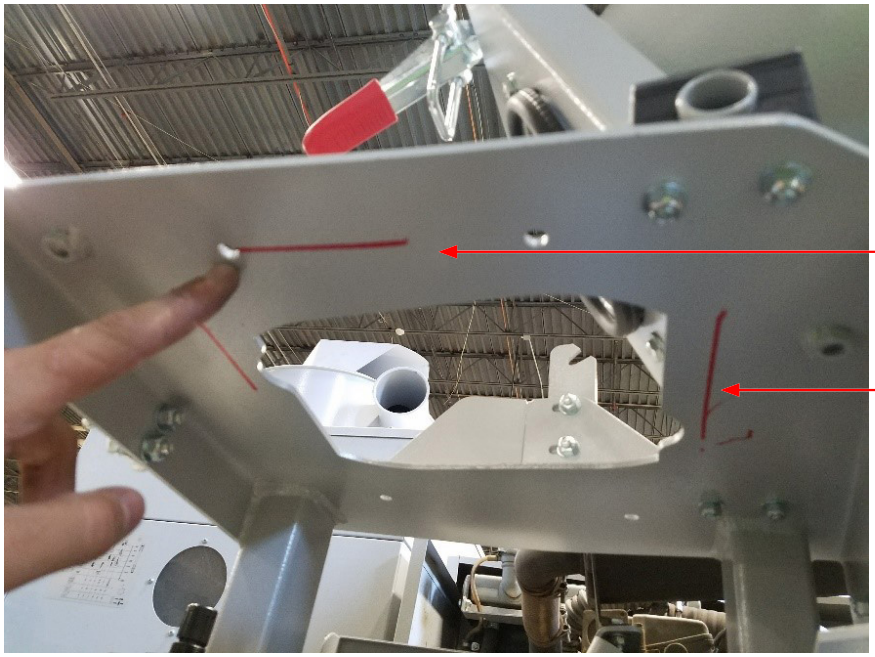


Installation

These instructions describe how to use the retrofit kit to replace an HM800 GrainGage with an H2 Classic GrainGage on a Wintersteiger Classic or Delta combine.

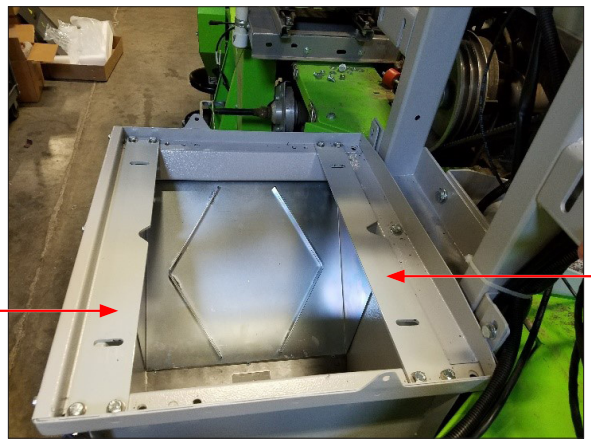
The following picture shows the HM800 on a Wintersteiger Classic combine.

Before removing the HM800, mark the location of the Wintersteiger grain hopper relative to the frame below the cyclone. You will need these markings later in the installation process to weld it to the frame. With the H2 Classic, the hopper is welded to the frame below the cyclone, and this is different from the HM800 installation where the hopper is bolted to the top of the HM800 GrainGage.



Remove the HM800 GrainGage, and verify that the sump is solid and can support the combined weight of the H2 Classic GrainGage (90 lbs) and the weight of a full bucket of grain.

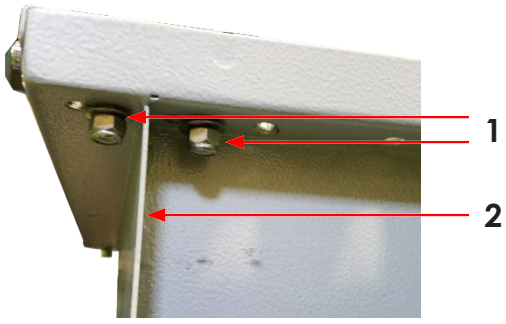
Place the support bars on top of the sump.



Place support bars

The outside support bar should be 3/16 inch from the edge of the sump. Align the support bar with an existing mounting hole, and drill additional holes as needed. The bolts and nuts to secure the outside mounting bar should straddle the sump wall.

Place outside support bar 3/16" from edge



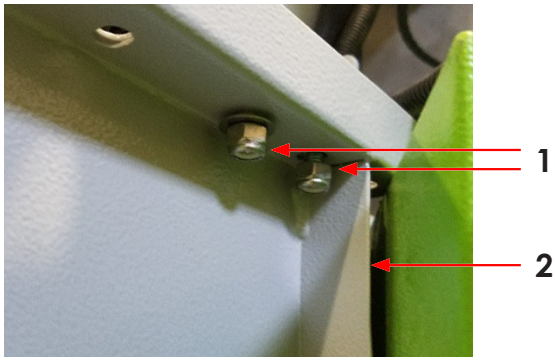
Secure outside support bar with a bolt on each side of the sump wall

1 Bolts, nuts, washers securing the outside support bar

2 Sump wall

The inside support bar should be 1-3/8 inches from the edge of the sump. Align one of the support bar holes with the sump hole. The bolts and nuts to secure the inside mounting bar should be located inside the sump wall.

Place inside support bar 1-3/8" from edge

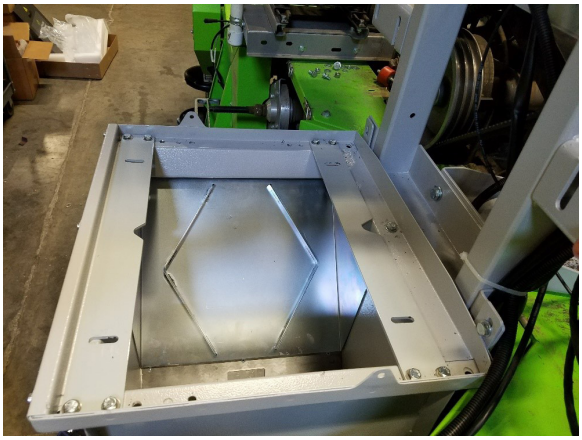


Secure inside support bar with bolts inside the sump wall

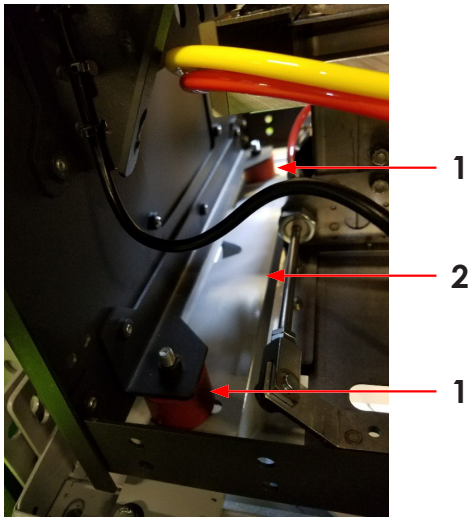
1 Bolts, nuts, washers securing the outside support bar

2 Sump wall

The following picture shows the location of the support bars after installation.



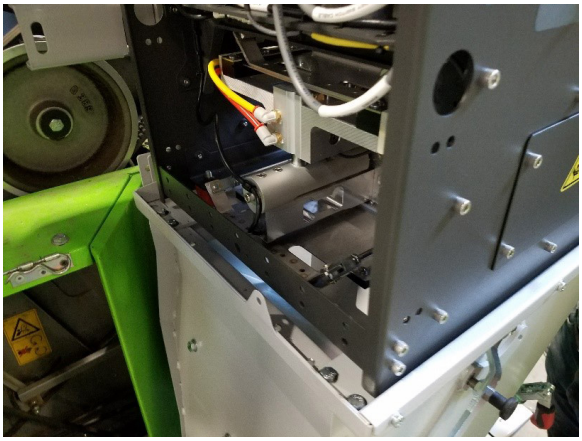
Secure the rubber isolation mounts to the bottom of the H2 Classic GrainGage and attach the GrainGage to the support bars. Position the GrainGage as far towards the combine as the slotted holes in the support bars allow.



Secure rubber mounts to GrainGage and attach to support bars

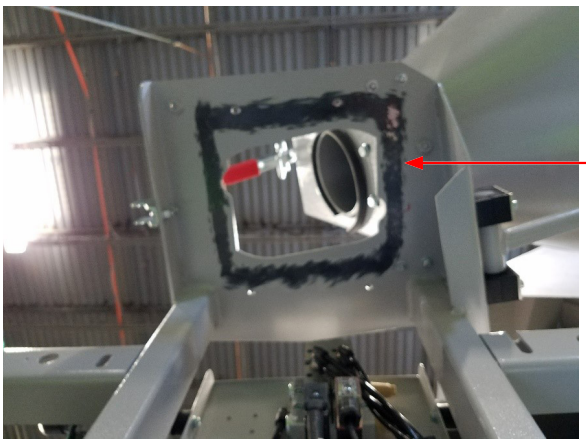
1 Rubber mount
2 Support bar

The DSP module and test weight load cell/cylinder mechanism should face toward the front of the combine.



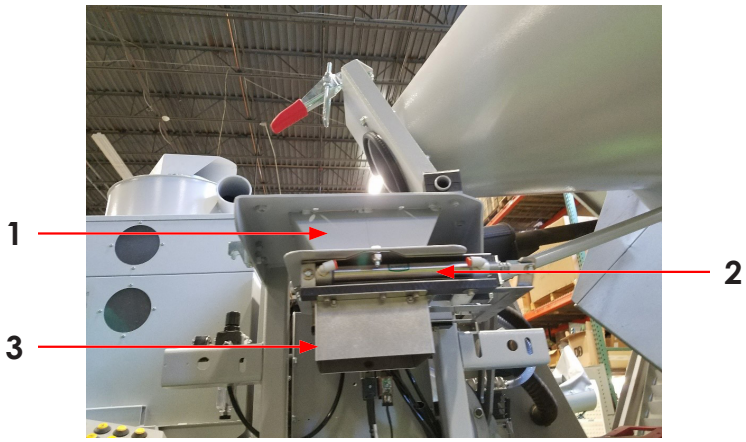
Use the marks on the frame (refer to previous instructions) to position the Wintersteiger grain hopper so that it can be welded to the frame.

Before welding the Wintersteiger grain hopper to the frame, grind off the paint to expose the metal.



After welding, we recommend repainting the hopper and frame with Rustolium Silver Paint.

Attach the Isolation Gate and Isolation Gate Funnel supplied to the bottom of the Wintersteiger Grain Hopper. Check that the Isolation Gate Funnel directs grain into the H2 weigh bucket. Bolt patterns on the isolation gate and Isolation Gate Funnel match to holes on the Wintersteiger grain hopper.



The following photo shows the completed installation.

5


HarvestMaster
H2 CLASSIC GRAINGAGE
www.harvestmaster.com
www.harvestmaster.eu

OPERATION

Introduction to Mirus

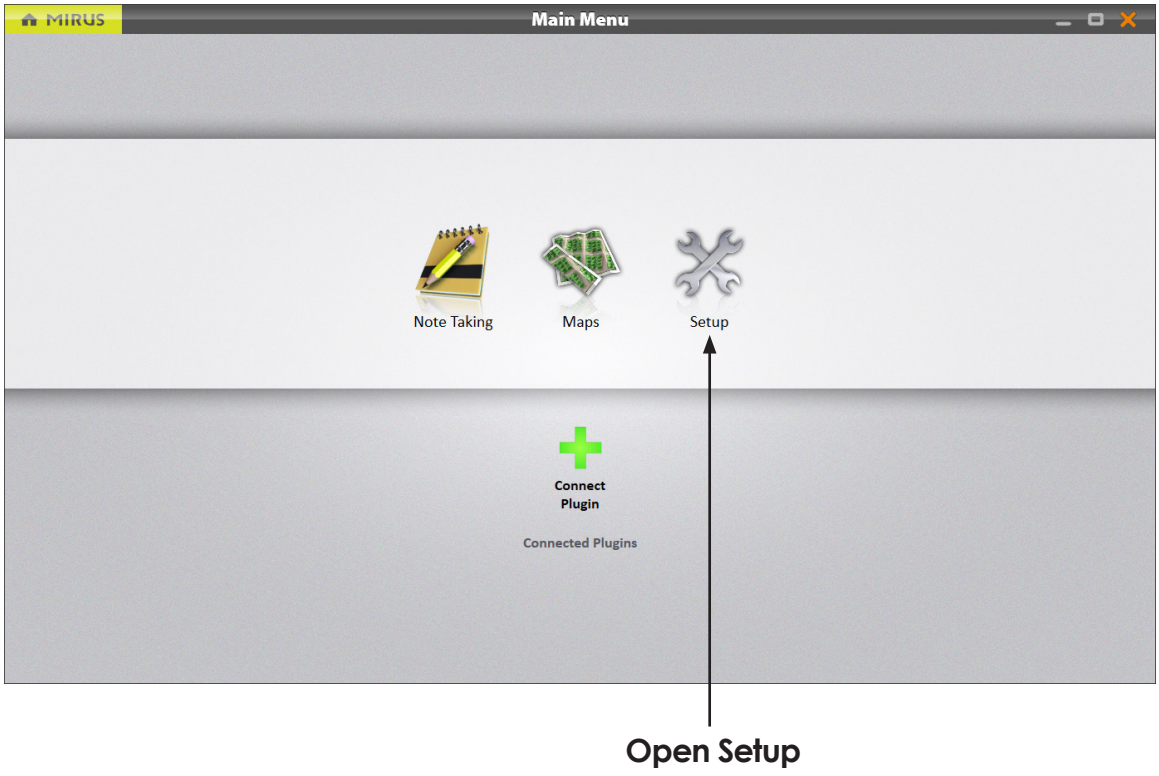
The Mirus software runs on the tablet computer to operate the GrainGage. This section walks you through basic operation and navigation of Mirus. Use this section to become familiar with Mirus. Additional information is available in other sections that follow and on our website at: *http://www.harvestmaster.com/HarvestMaster/support/Knowledge-Base/Mirus-Harvest-Software*.

Step 1: Verify that the system is ready for operation by checking these things:

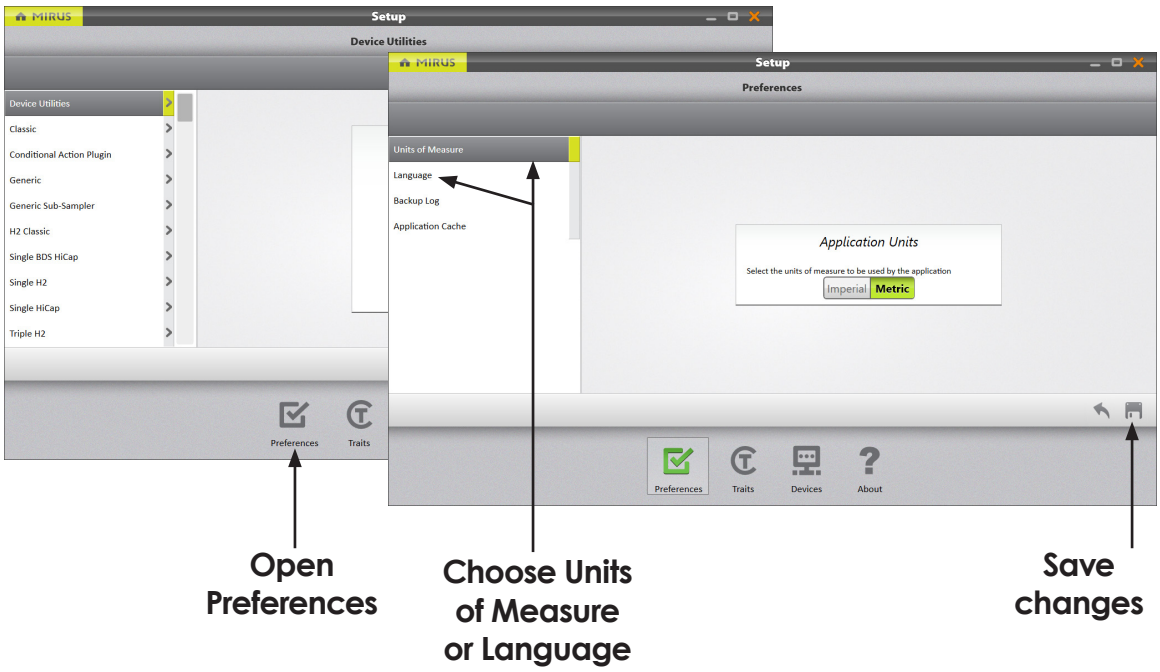
- Mirus software installed on mobile computer
- Windows updates installed on mobile computer
- Power plan on mobile computer disables automatic sleep, hibernate, and shutdown
- Power (12 VDC) connected to H2 System Controller
- Power (12 VDC) connected to DSP 2 Module
- Power/charging cable connected to mobile computer
- RS-232 cable (or USB CAN converter cable) connected between H2 System Controller and mobile computer
- Remote enter button connected to H2 System Controller
- CAN cable connected from H2 System Controller to DSP 2 module
- Pressurized air connected to the H2 Classic GrainGage

Step 2: Press the power button on the System Controller to power up the GrainGage. An LED on the console indicates that power is on, and blinking red and yellow lights on the DSP 2 module indicates that there is power to the module.

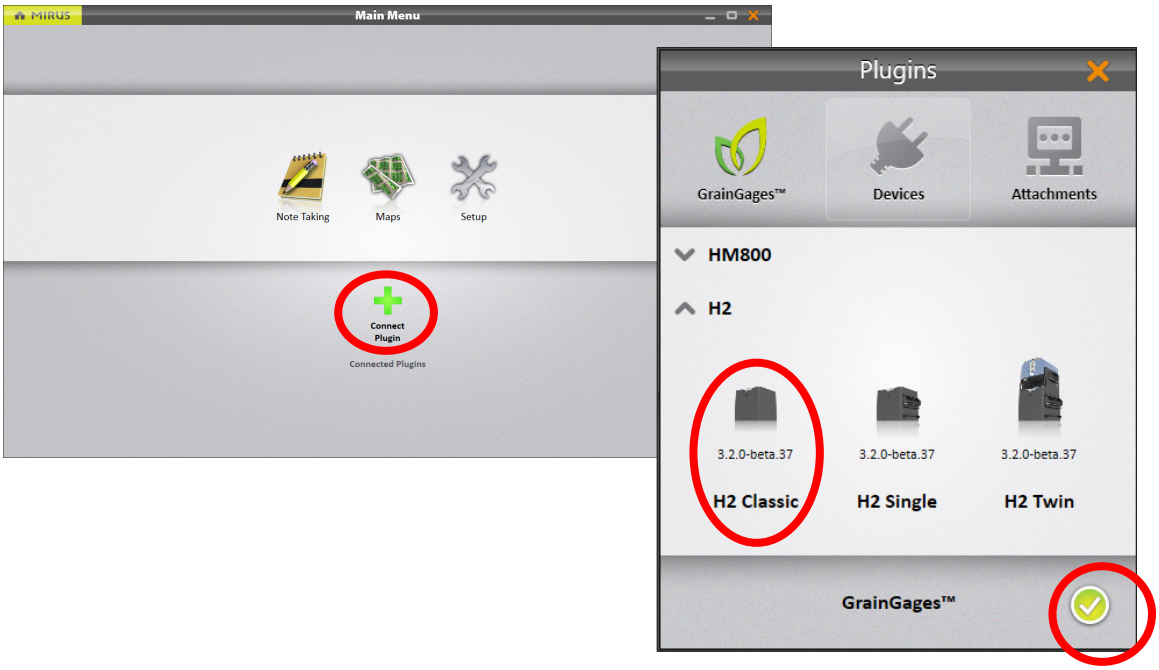
Step 3: Launch the Mirus software on the computer. The software displays the main menu.



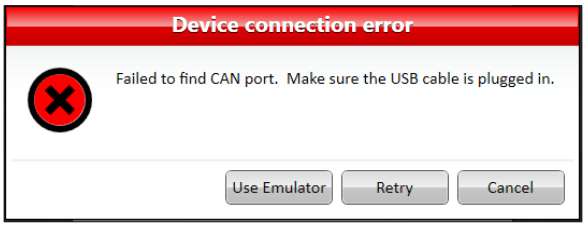
Step 4: Configure the language and units of measure by selecting **Setup > Preferences**, and then choosing the options for **language** and **units of measure**. Use the **save** button to keep changes to the configuration.



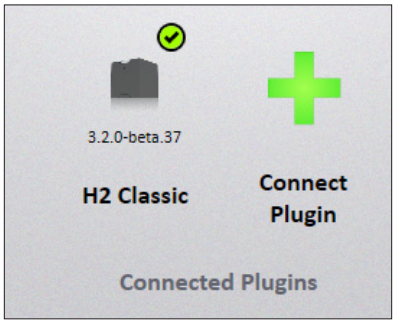
Step 5: Click the Mirus home button in the upper left corner to return to the Main Menu, and select **Connect Plugin**, and then choose **H2 Classic** and complete the selection by using the **check mark** button in the bottom right corner of the screen.



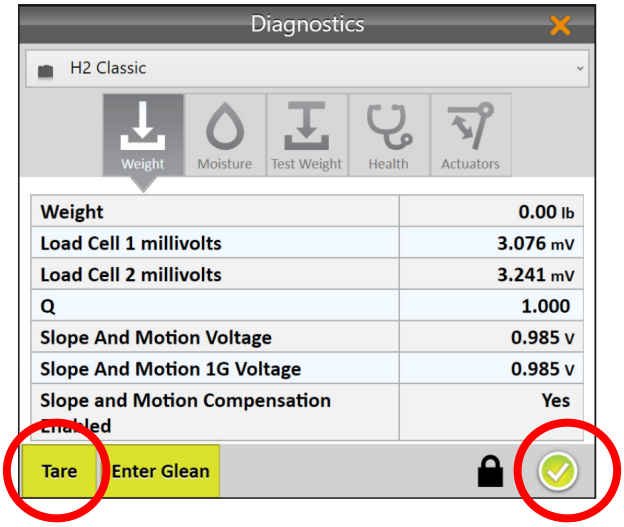
If Mirus is unable to detect the GrainGage, you may notice the software stall for a few seconds, and the software displays a device connection error. Check to make sure the GrainGage has power, and check that all of the cables are plugged in. You may alternatively select the Use Emulator option to proceed without connecting the GrainGage.



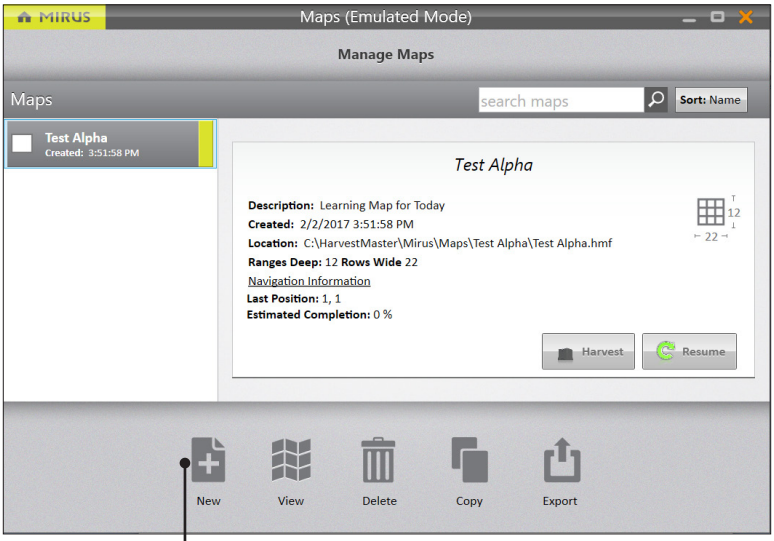
After adding the H2 Classic plugin, you should now see an icon for the H2 Classic on the Main Menu screen.



Step 6: Open the **Diagnostics** screen, and use the **Tare** button to zero the weight and moisture readings. Leave the Diagnostic screen by using the **check mark** in the bottom right corner or the X in the top right corner.

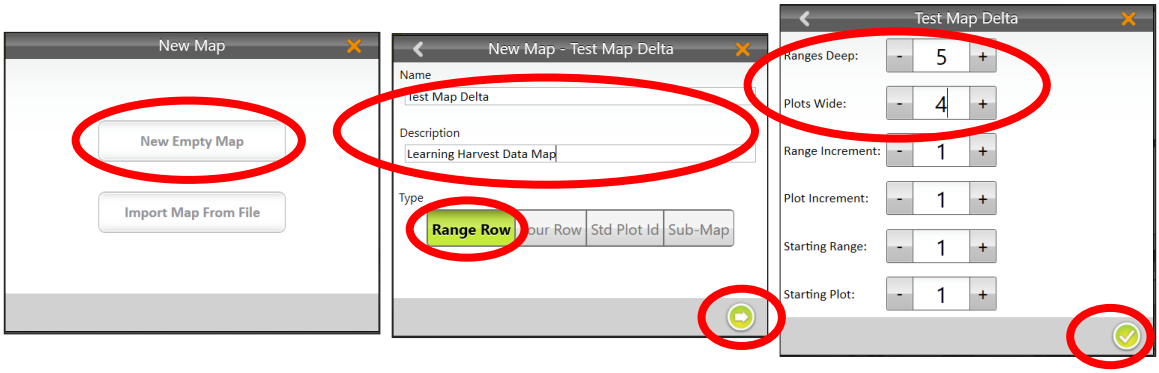


Step 7: Create a field map file to store the data by opening the **Maps** screen, and use the **New** button to create a new map.

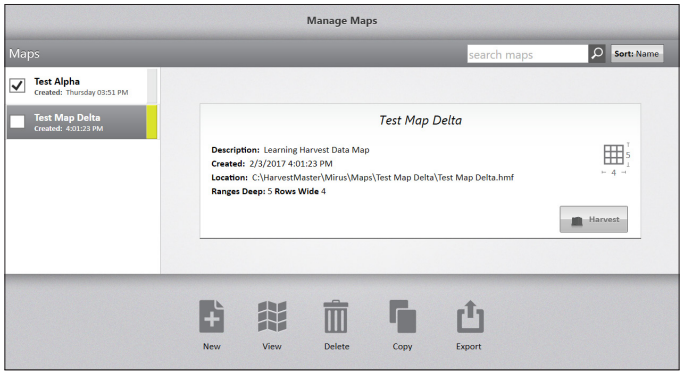


Create new map

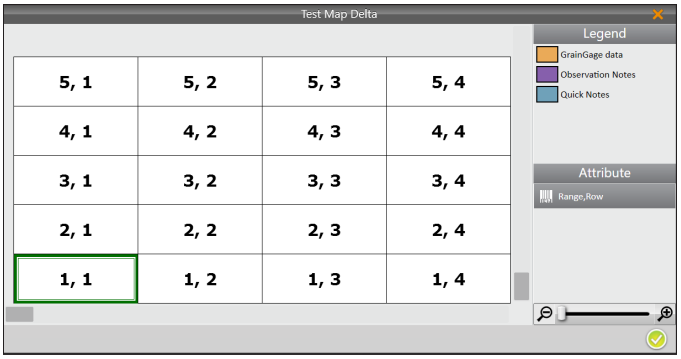
Choose the option to create a **New Empty Map**. Give the map a name and a description. Make sure the type is set to **Range Row**, and proceed to the next screen by clicking the **arrow** button in the bottom right corner. Set the **Range Deep** to 5 and the the **Plots Wide** to 4. Complete the new map creation by clicking the **check mark** button in the bottom right corner.



The Maps screen now lists the new map on the left side of the screen.



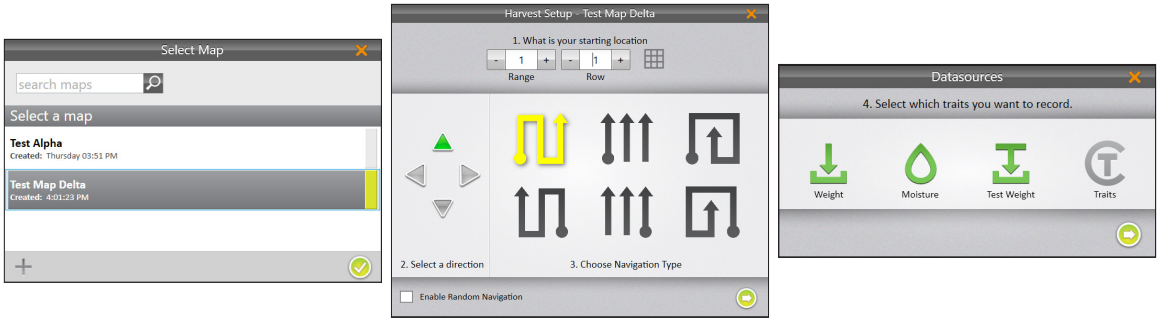
View the new map by selecting the map from the list, and then using the **View** button. Close this screen by clicking on the **X** in the top right corner or the **check mark** in the bottom right corner.



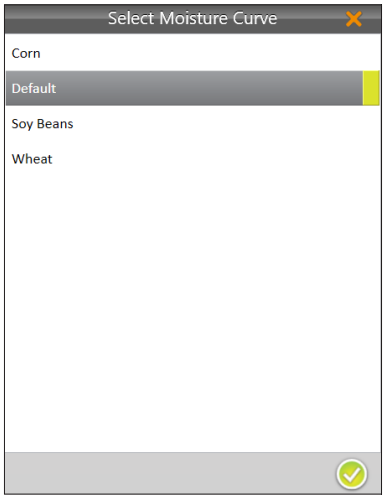
Return to the Main Menu by using the **Mirus home** button in the top left corner.

Step 8: Enter harvest mode by choosing the **Harvest** icon on the Main Menu.

A prompt will ask you to select a map. Choose the map created in the previous step, and then use the **check mark** in the bottom right corner.

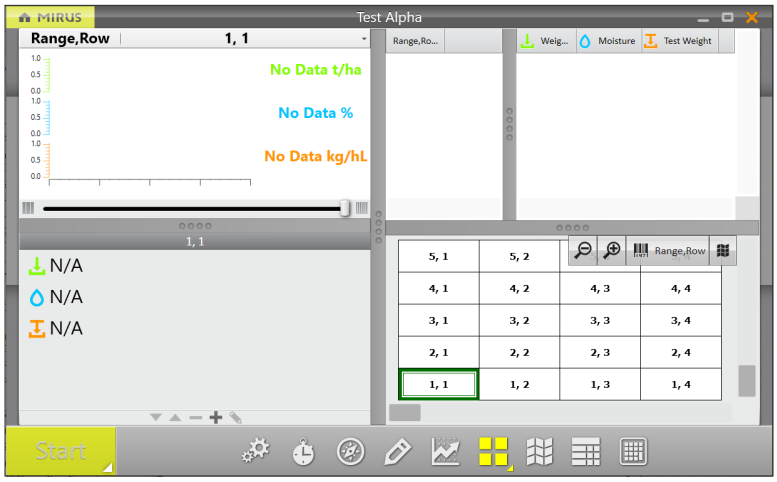


Now, select the **starting location** (Range 1, Row 1), **harvest direction** (up), **navigation type** (serpentine), and use the **arrow** in the bottom right corner to advance to the next screen. By default, the H2 Classic enables the recording of weight, test weight, and moisture. Verify that those options are enabled and use the **arrow** in the bottom right corner to continue.

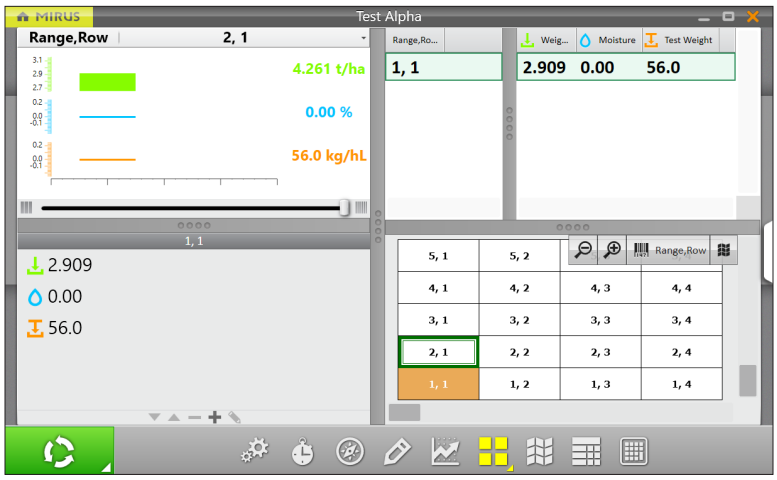


Mirus prompts you to select the moisture curve. Choose **Default** and then complete the harvest setup by using the **check mark** icon in the bottom right corner of this screen.

Step 9: Collect data by using the **Start** button in the bottom left corner of the screen. The button changes to a cycle icon. Tap the **cycle** button to start a measurement cycle.

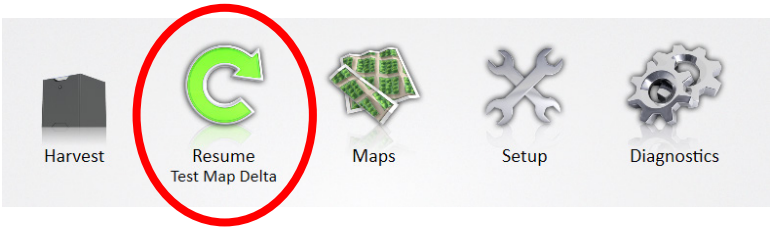


Allow the previous measurement cycle to complete, and then tap the **cycle** button again to collect another set of measurements.

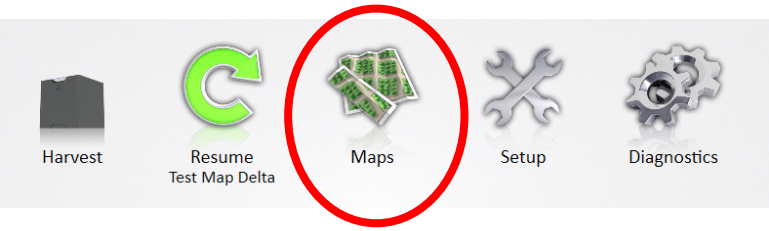


Tap the **Mirus home** button in the top left corner to exit harvest mode.

For reference, note that the **Resume** option is available in the Main Menu. This would allow you to resume harvest mode to continue collecting data from additional plots.



Step 10: Export the data that you collected by tapping the **Maps** icon in the Main Menu.

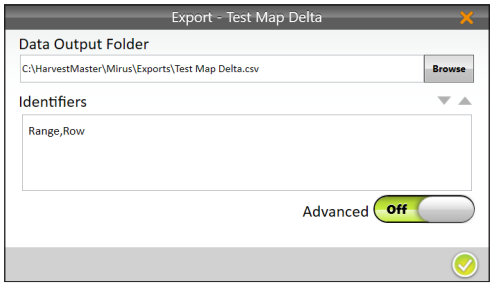


Select the map from the list on the left side of the screen.

For reference, note that with the map selected, Mirus provides options to enter harvest mode or to resume.

To export the data from the map, tap the **Export** button, located in the panel of buttons along the bottom of the screen.

Mirus prompts you to select the folder location to save the data in .CSV format.



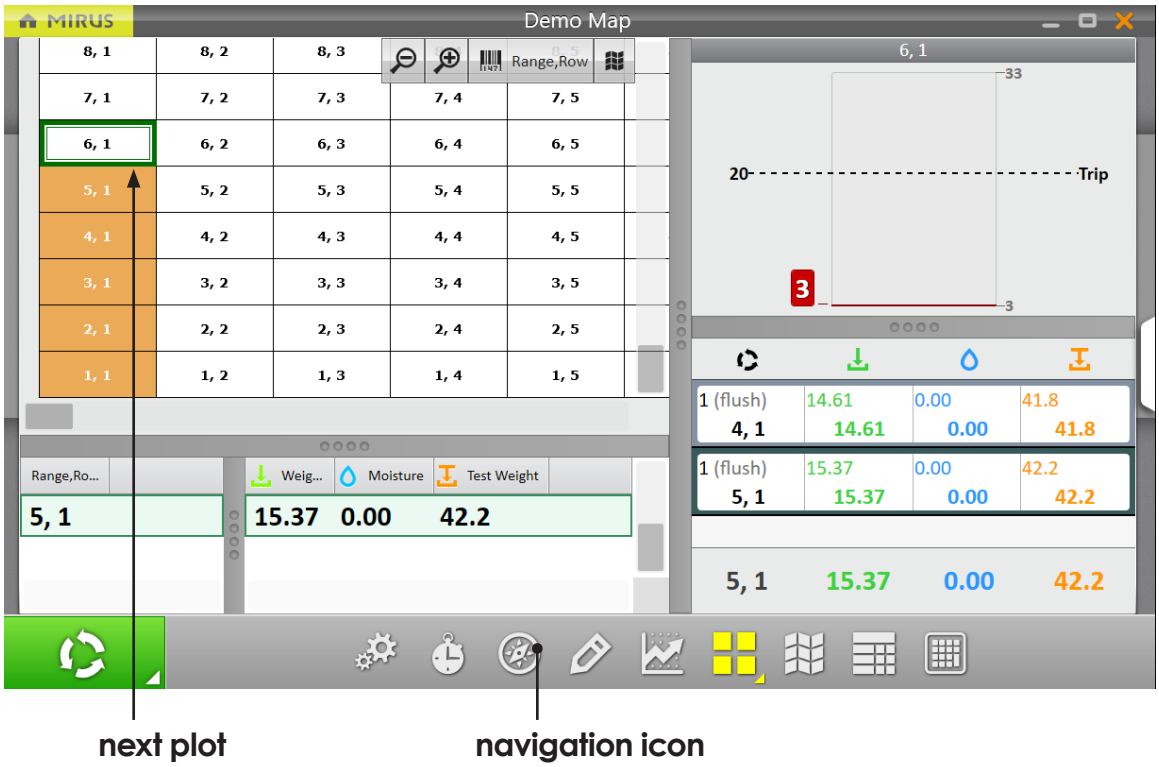
These steps have provided a short introduction to using and navigating the Mirus software. Please refer to the next section for more detailed information about the screens and functions that you can access in the Mirus software.

Harvest mode tasks

These sections cover information about performing some typical tasks in harvest mode.

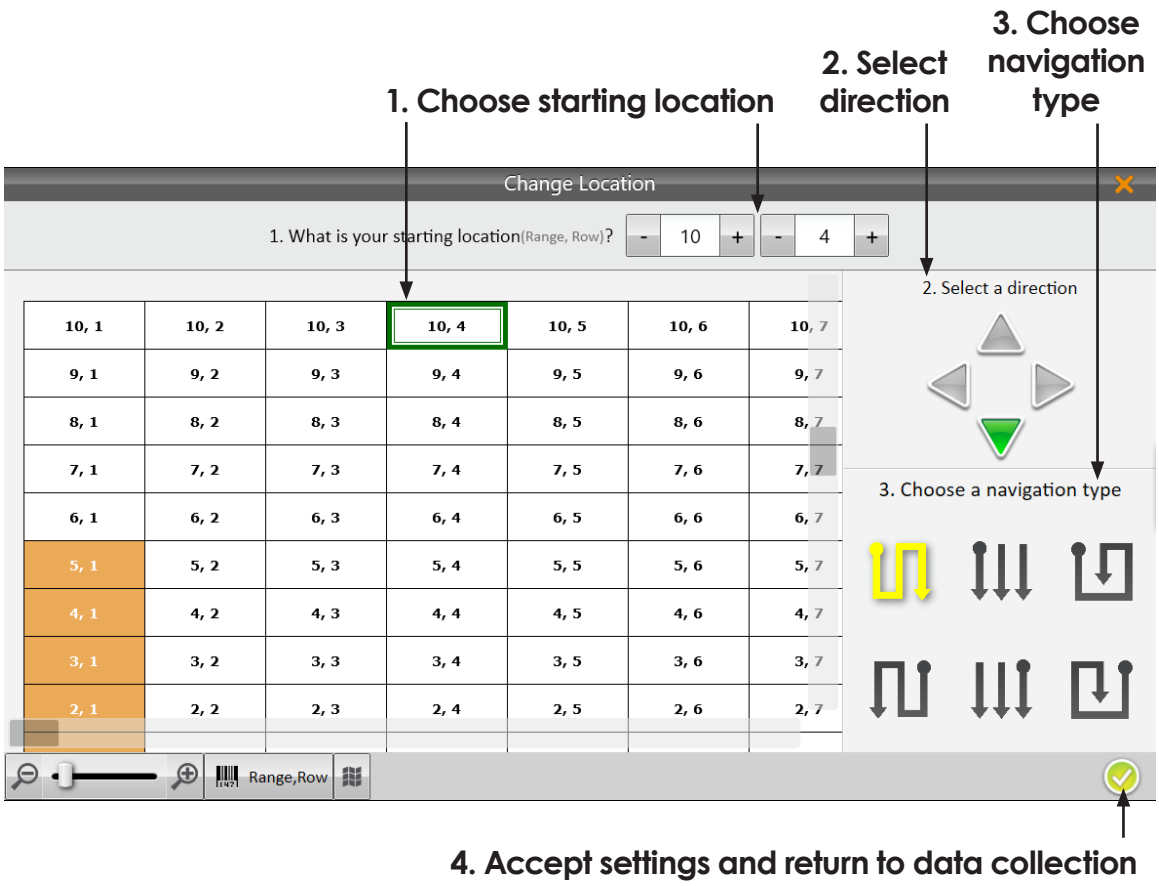
Relocate to a different plot

In harvest mode, the Mirus quad-view displays a map of plots similar to this screen shot.



In this example, the software is ready for harvest (or note taking) on range 6, row 1. But supposed you want to continue harvest or note taking from the top of the field (range 10) on row 4 and proceed downward.

Click on the navigation icon to open the Change Location dialog.



Step 1: In the navigation dialog, select the location on the map where you wish to resume data collection by clicking that position on the map or by entering the range and row at the top of the window. In this example, we select range 10, row 4.

Step 2: Choose the direction by clicking on one of the arrows in the upper right portion of the window.

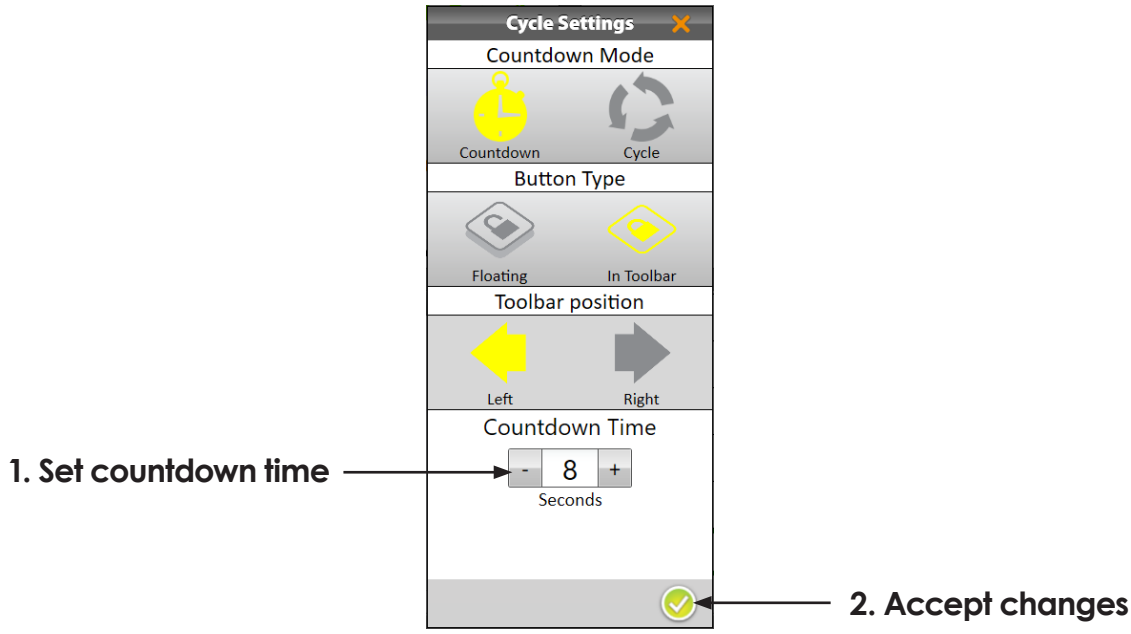
Step 3: Choose a navigation pattern by clicking on one of the options in the lower right portion of the window.

Step 4: Click the check mark in the bottom left corner of the window to use the new location and navigation settings and continue data collection.

Change the countdown timer

In harvest mode (data collection mode), the cycle button in the bottom left corner of the window triggers the GrainGage measurement cycle. Mirus provides options to meet your specific needs.

Select the timer icon at the bottom of the screen to open the Cycle Settings dialog.

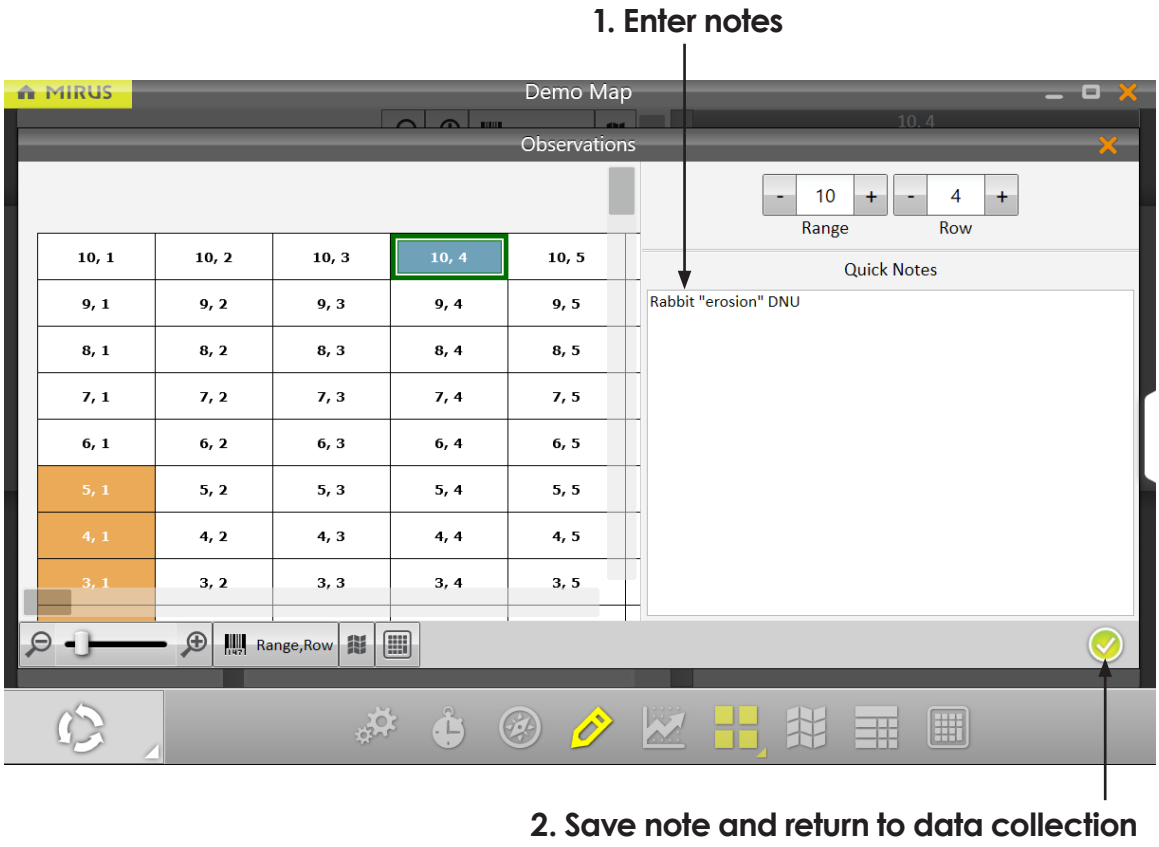


Change the countdown time to your desired setting, and then use the check mark in the bottom right corner to accept the changes.

The other options on the Cycle Settings screen allow you to customize the placement of the cycle control.

Annotate plot data

In harvest mode (data collection mode), use the pencil icon to open the Quick Notes window on the right side of the screen.



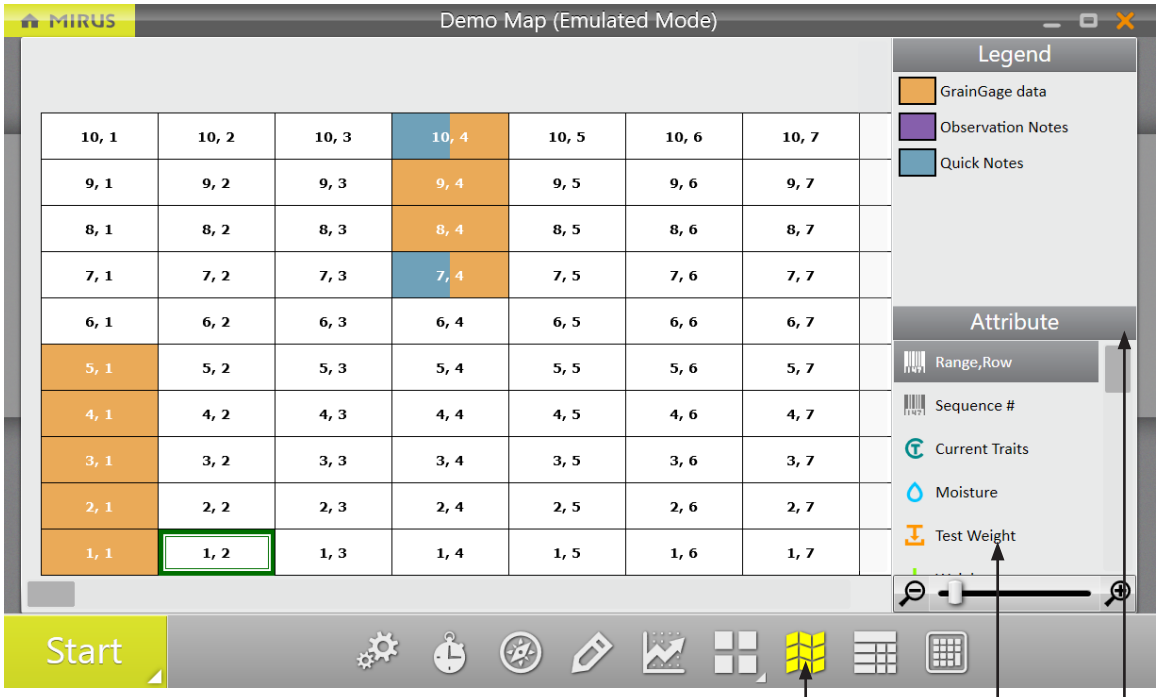
The Quick Notes screen shows plot position at the top, and provides a text box into which you can enter information about the plot. Mirus stores quick notes in addition to traits that you may have setup for taking simultaneous with harvest data measurements.

Spatial display (heat map)

Mirus allows you to configure, display and export a spatial view of the data collected.

Configure the spatial display

In harvest mode, choose the spatial display icon to display data in a heat map format.



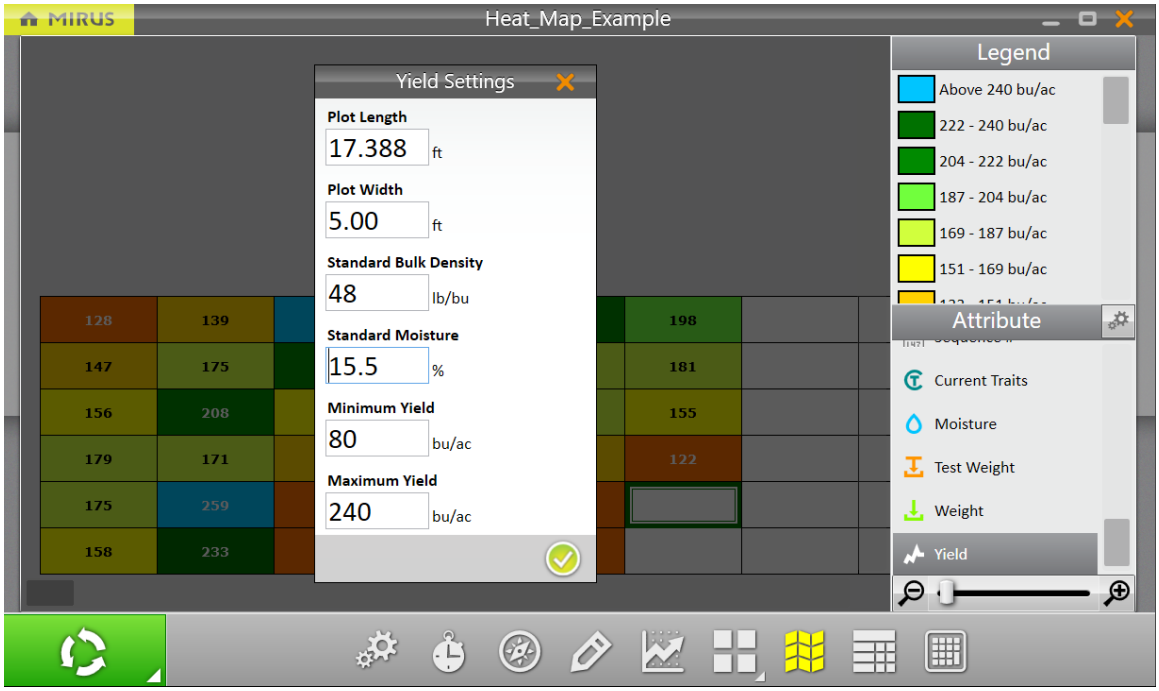
1. Select spatial display

2. Select an attribute

(Gear icon appears here.)

3. Use gear icon to adjust colors by setting maximum and minimum

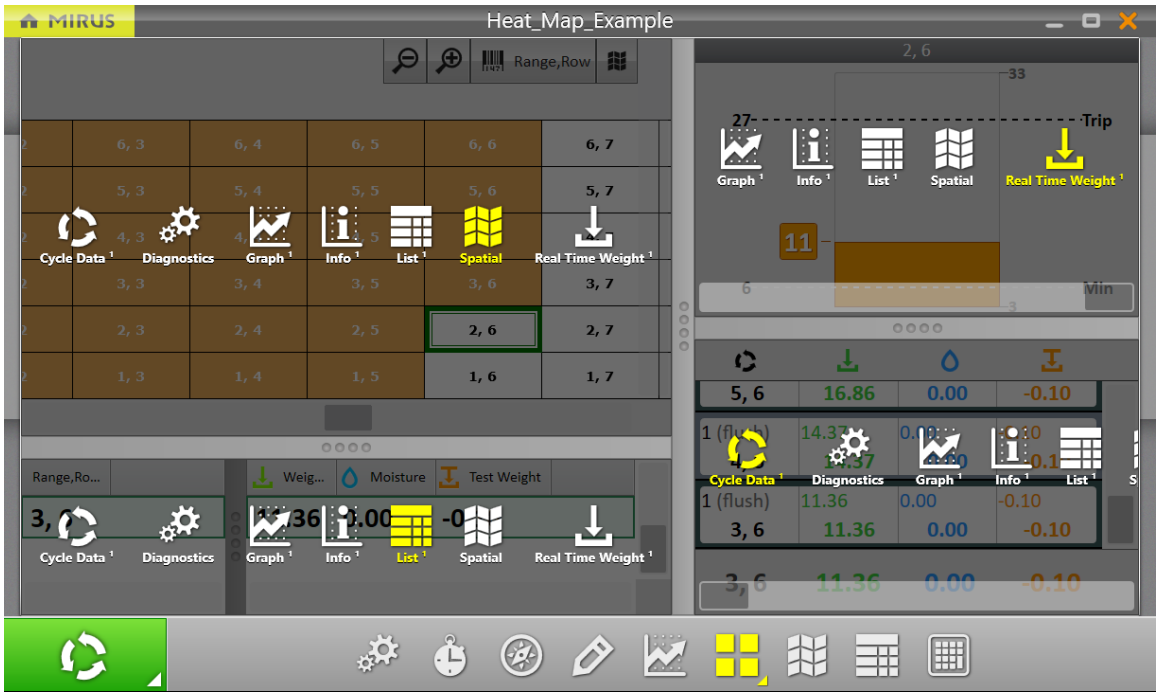
When you select a numeric attribute, such as test weight, the gear icon appears on the right side of the screen. Use the gear icon to access a dialog that allows you to set the maximum and minimum values for the attribute and thereby control the resolution of the colors used for that attribute on the heat map. The following screen shot shows an example of what you will see.



After you have made changes, if any, use the check mark to finish.

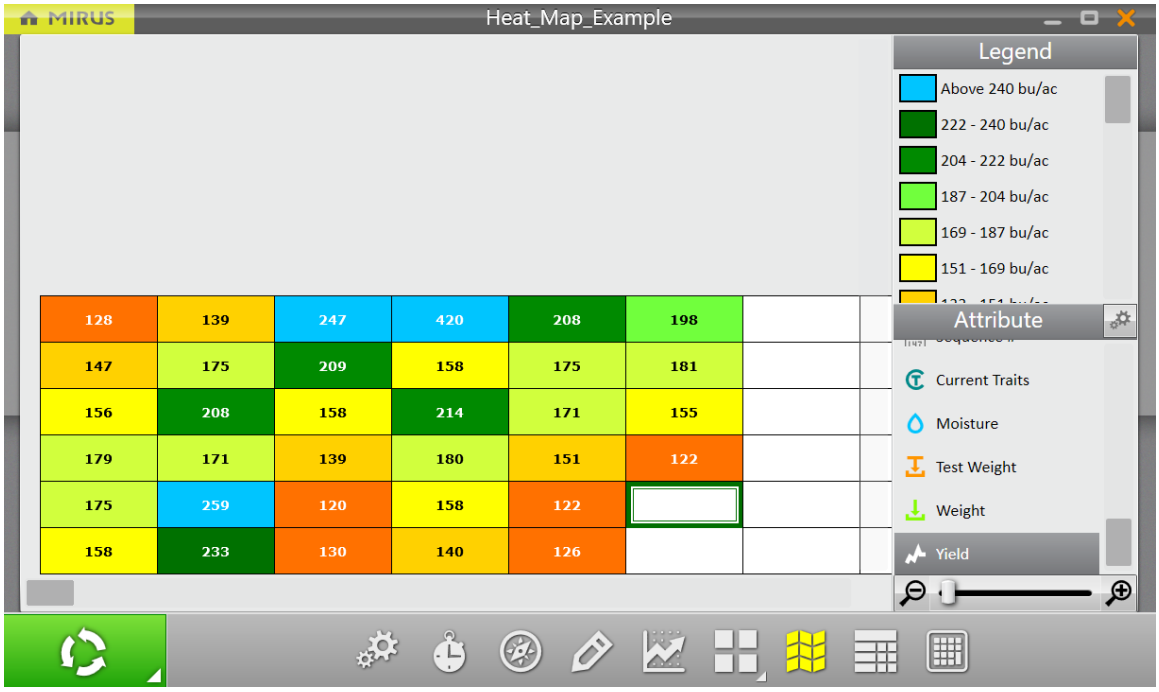
Show spatial display in quad view

After configuring the spatial view, you can add it to the quad view. In harvest mode, use the quad view icon to configure the quad view.



For each quadrant, select the information that you wish to display, and then click the quad view icon again to exit the quad view configuration.

After harvesting plots, enter spatial view, and Mirus shows a screen similar to the following.

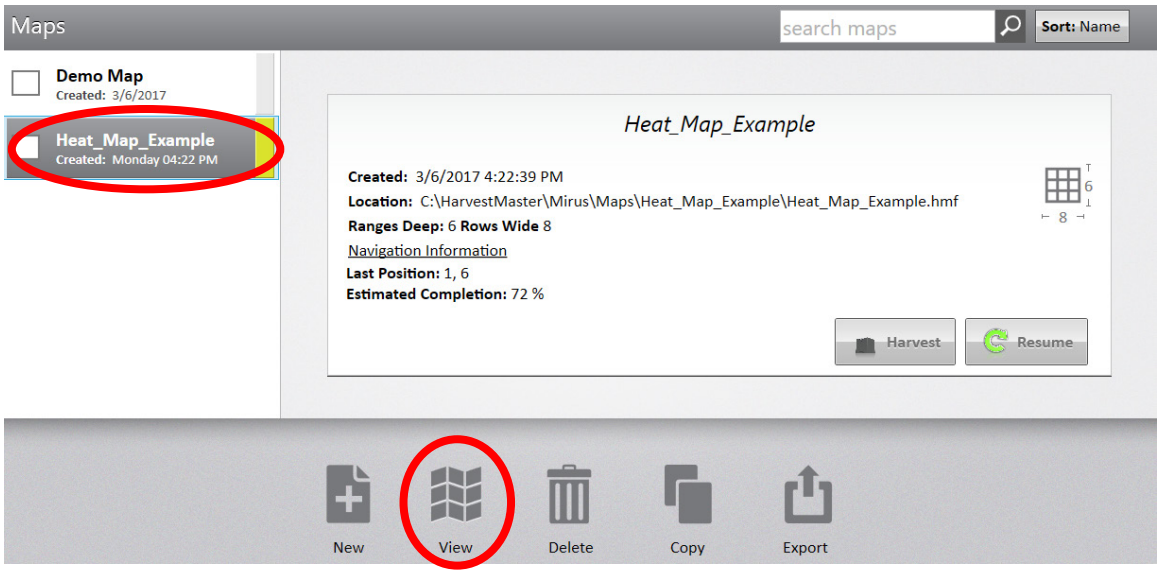


Export spatial view data

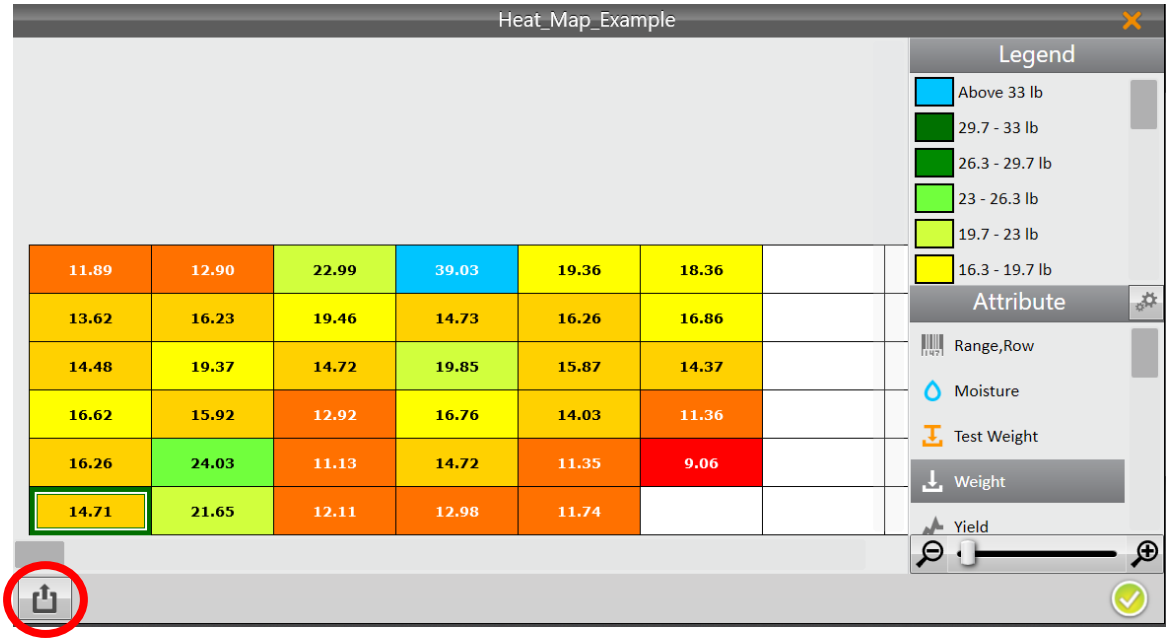
Mirus provides an easy method for exporting the spatial view data to a spreadsheet.

From the Main Menu in Mirus, select Maps.

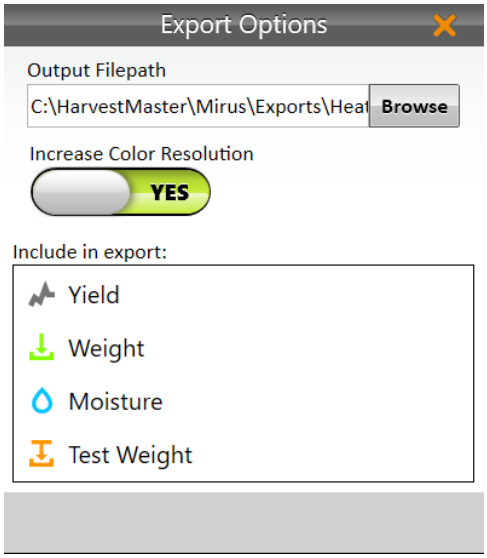
Next, select the desired map from the list on the left side of the window, and then use the spatial view icon to display the data in a heat map format.



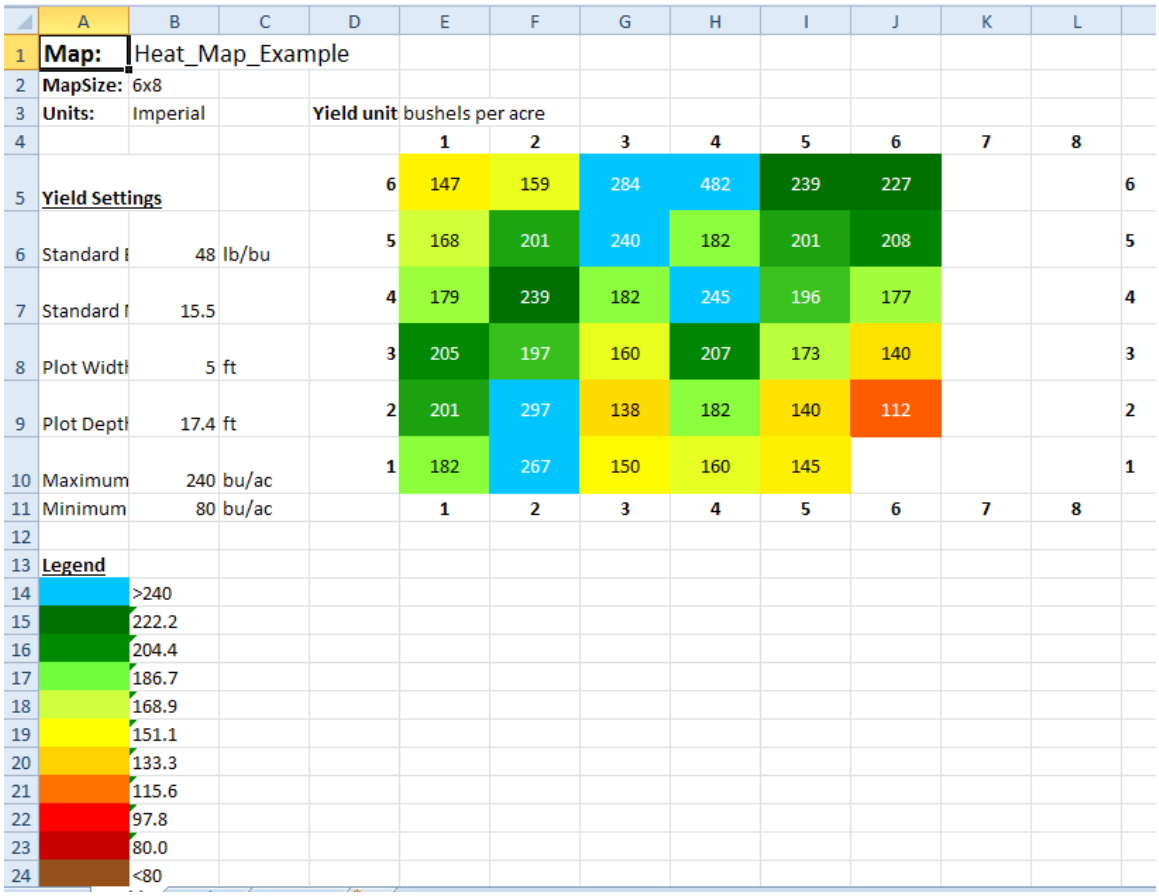
This screen is similar to the spatial view that is available in harvest mode. But this screen shows an export button in the bottom left corner. Use the export button to open the export dialog that allows you to choose the file name, folder and the attributes to include in the exported file.



After selecting at least one attribute, a green check mark appears in the bottom right corner of the Export Options dialog. Click the check mark to save the exported data.



If Microsoft Excel is installed, the spreadsheet opens automatically, showing the exported data. The following screen shot shows the 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 I	48	lb/bu	**5**	168	201	240	182	201	208			**5**
7	Standard I	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											

Plugins and Mirus Plugin Manager

Mirus uses software extensions called plugins to handle a variety of different tasks. Mirus uses plugins to operate harvest data systems such as the H2 Classic GrainGage as well as handling other data collection and machine control.

Mirus shows connected plugins on the Main Menu in the lower portion of the screen.

If no plugins appear in the the lower portion of the Main Menu, use the Connect Plugin button, also located in the lower portion of the Main Menu, to connect the H2 Classic GrainGage.

The Plugins screen shows available plugins in two categories, GrainGages and Attachments. The selected category appears in color, and the main body of the Plugins screen shows the plugins. The GrainGages category lists harvest data systems, and the Attachments category lists plugins that support the major plugin.

You can remove connected plugins by clicking on them on the Main Menu screen.

Additional plugins are available for download from HarvestMaster.com. Some of the available plugins for use with the H2 Classic GrainGage are:

- GNSS (Global Navigation Satellite System) enables position tracking while harvesting field plots.
- Zebra label printer supports using a Zebra label printer with the system for tasks such as printing bar code labels for sample bags.
- NIR Spectrometer plugin uses either the Zeiss Corona Extreme or the Polytec PSS-X-212 to record NIR spectra on the grain sample leaving the H2 Classic GrainGage.

Contact HarvestMaster sales to obtain a quotation for plugins to meet custom research operations requirements.

Other plugins for use outside of harvest time are:

- Planter plugin controls precision space planters, including such applications as variable rate seeding.
- Cone planter plugin.
- Solid fertilizer variable rate applicator control / Multi-boom spray prescription control.

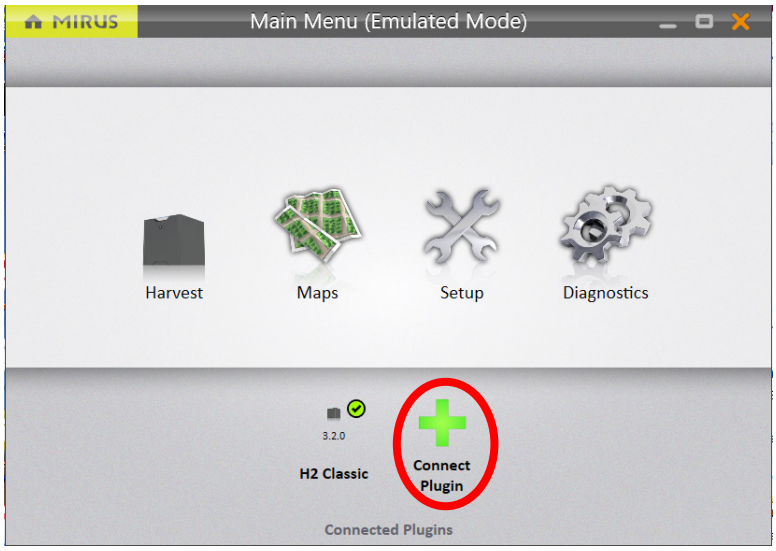
Conditional action plugin

The H2 Classic GrainGage device plugin for Mirus includes a conditional action software machine, used for functionality such as triggering an NIR spectrometer to acquire reflectance spectra from the grain passing from weight measurement in the H2 system. Other uses for the conditional action software machine include:

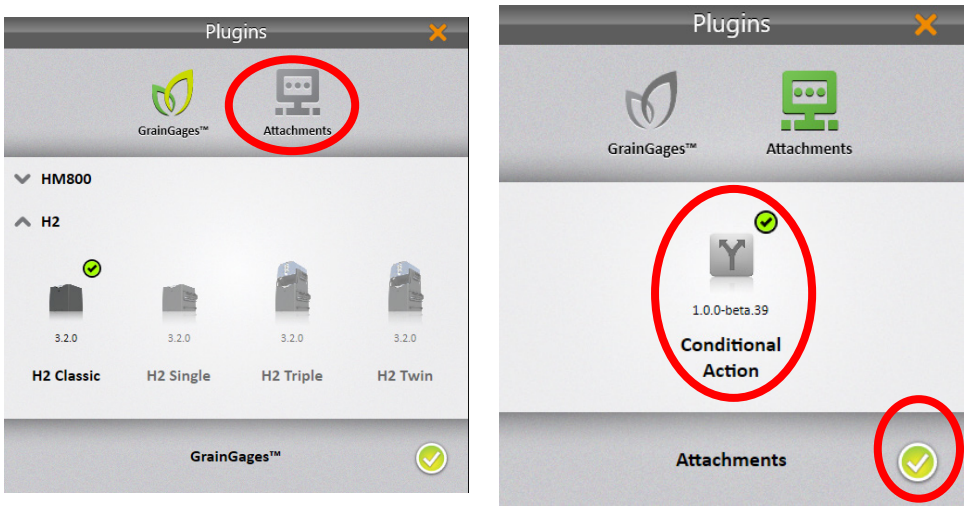
- activating a sub-sampling system on the grain stream after GrainGage measurements finish,
- gating off air entering the cyclone after grain delivery is complete, and before GrainGage sampling begins,
- taking a sub-sample of grain for certain pre-marked plot (based on plot ID pre-loaded in to the Mirus field map, or
- triggering an actuator based on multiple system criteria.

The H2 Classic GrainGage plugin needs to be connected before adding the Conditional Action plugin.

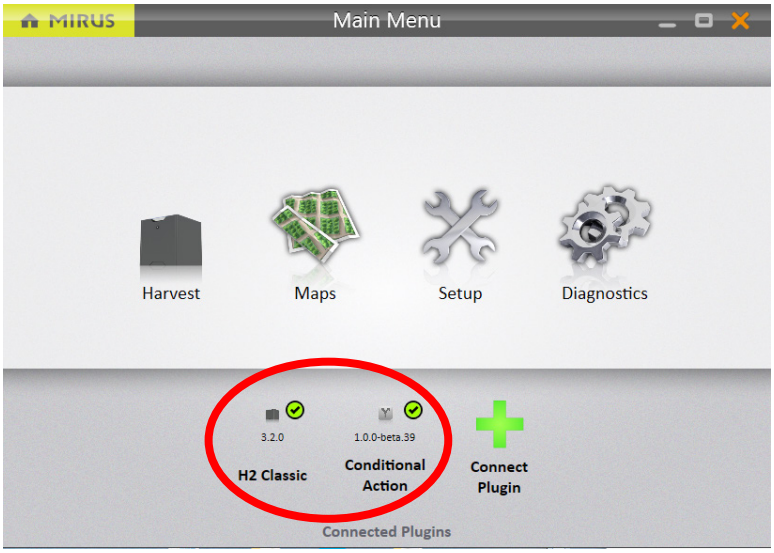
Add the Conditional Action plugin by using the Connect Plugin option on the Main Menu in Mirus.



When Mirus shows the Plugins dialog, choose Attachments, and then choose Conditional Action. A green check mark appears next to the Conditional Action plugin icon when it has been selected. Use the green check mark in the lower, right corner to confirm your selection.

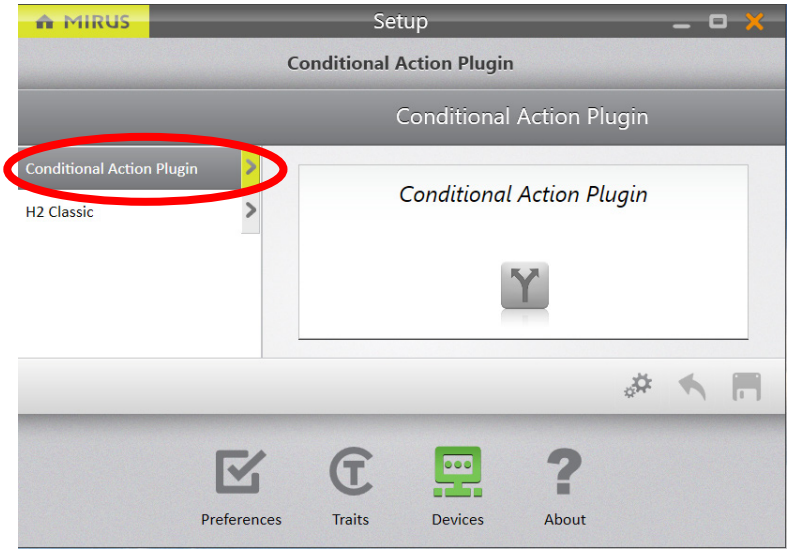


The Conditional Action plugin is now connected, and appears in the lower portion of the screen on the Mirus Main Menu screen.

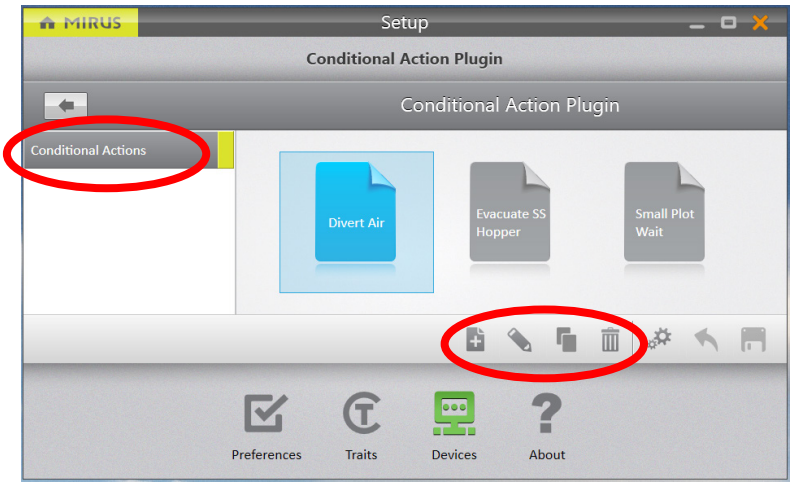


To configured conditional actions, click on the setup icon . The Setup screen appears, showing the Conditional Action Plugin in the list on the left side of the screen.

Choose the Conditional Action Plugin from the list on the left.

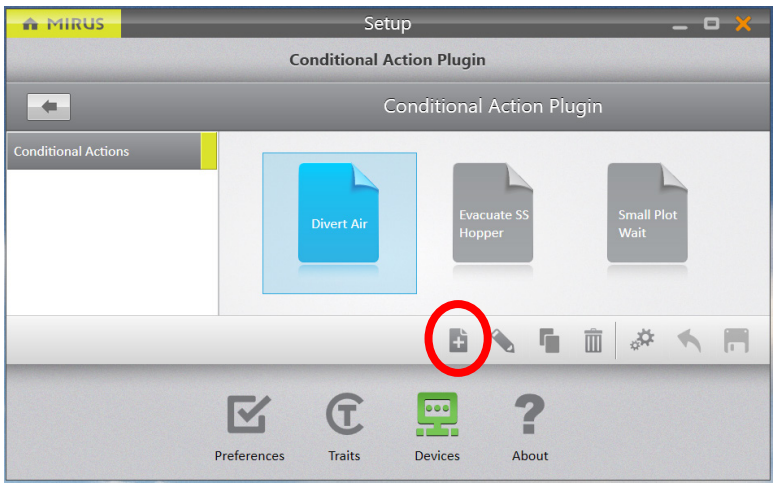


Choose Conditional Actions in the list on the left to get options for creating and editing conditional actions.



Icon	Description
	Add a new conditional action definition
	Edit the highlighted conditional action
	Copy the highlighted conditional action
	Discard the highlighted conditional action

Click the icon to create a new conditional action. Mirus shows the Create a Conditional Action dialog.



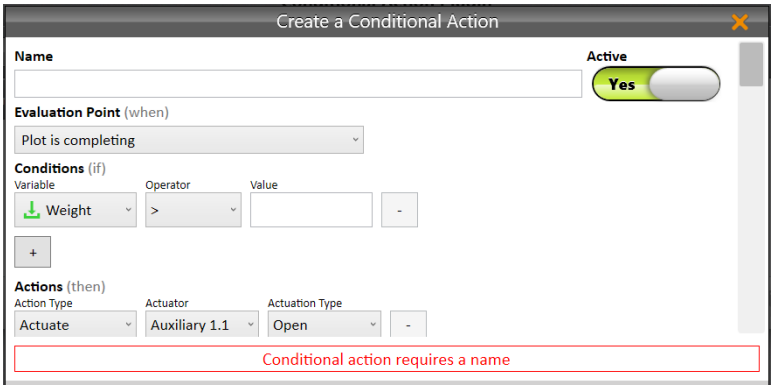
Enter a name for the conditional action.

Define when the conditional action is activated by clicking on the drop down menu for Evaluation Point and choosing an option.

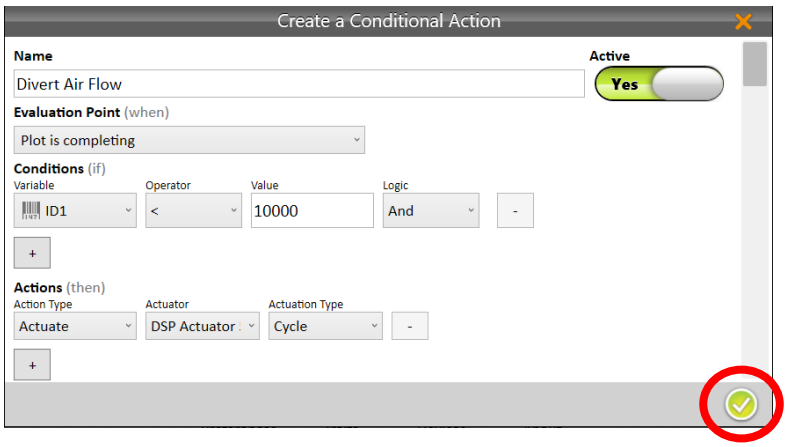
Define the condition by choosing options for the Variable, Operator and Value. You can add more conditions by using the plus icon.

If you need to remove a condition, use the minus icon next to the condition.

Define the action by choosing options for the Action Type, Actuator, and Actuation Type. As with conditions, you can add more actions by using the plus icon, and you can remove an action by using the minus icon next to the action.



When you have finished defining the conditional action, click the green check mark in the lower right corner to finish and save it.



Mirus Plugin Manager

Mirus Plugin Manager installs with Mirus and controls the plugins available in Mirus.

Open Mirus Plugin Manager through the Windows Start Menu at **Start** > **All Apps** > **Mirus** > **Mirus Plugin Manager**.

After starting Mirus Plugin Manager, the body of the window shows all of the available plugins and reports the status for each plugin. A green check mark indicates that the plugin is enabled, making it available for use in Mirus.

Green check mark indicates that the plugin is enabled and can be selected in Mirus.

The Mirus Plugin Manager allows you to repair, uninstall, enable, disable, or get information about each plugin by clicking on the plugin and choosing an option from the menu that appears.

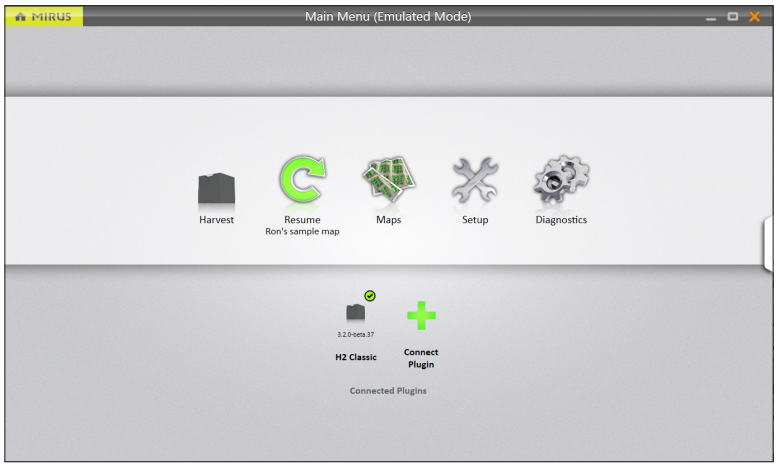
We recommend using Mirus Plugin Manager to disable plugins that you don't plan to use.

Mirus reference

This section provides reference information, describing the screens and functions of Mirus.

Main Menu screen

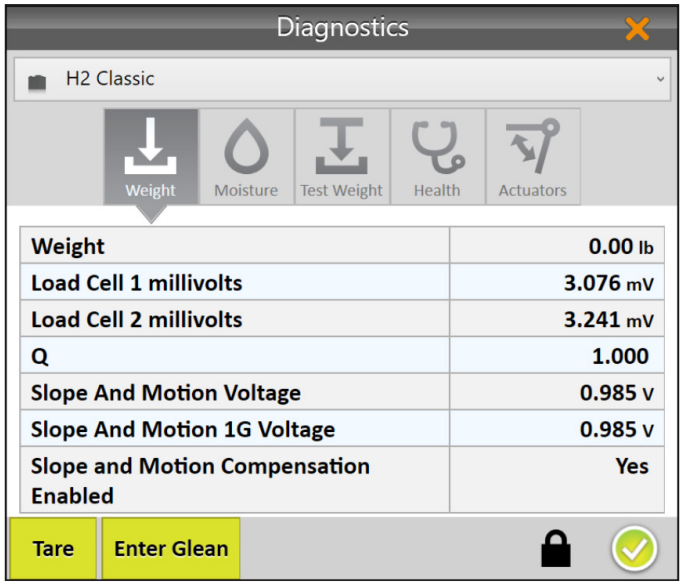
The Main Menu shows two banks of icons. Use the icons in the main panel to access primary functions in the software (Harvest, Resume, Maps, Setup and Diagnostics). The icons in the lower panel allow for the connection of plugins and shows plugins that have already been activated. The Mirus home button is in the top left corner of the screen and can be used from other screens in the software to return to the Main Menu.



Specific applications are added and accessed by using the icon in the lower panel on this screen. These are for functions such as harvest, planting, applicator, field notes, and special data acquisition.

Diagnostics screen

In Diagnostics, Mirus shows live readings from the GrainGage and provides direct access for manually opening and closing the actuators. Diagnostics shows an icon panel across the top of the screen to access each area of diagnostics.

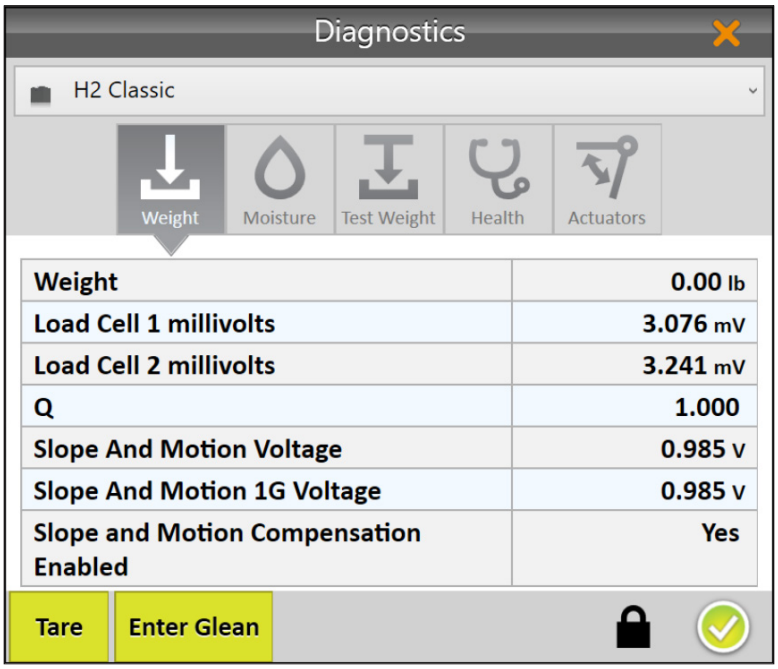


All diagnostics screens show the Tare and Enter Glean (or Exit Glean) buttons.

Item	Description
Tare button	Use the Tare button to zero the plot weight hopper weight, test chamber weight, and the moisture sensor. This process opens the gates to empty the system, closes the gates, averages load cell voltages over 10 seconds, and uses that average to establish the zero weight readings for the empty hopper and empty test chamber.
Enter Glean button	Use the Enter Glean button to put the system in glean mode. This mode opens all gates in the system so that grain flows straight through, unimpeded by any gates. In this mode, the label on the button changes to "Exit Glean." Use this mode when you need to glean off border plots.
Exit Glean button	Use the Exit Glean button to put the system into harvest mode to make measurements on the grain.

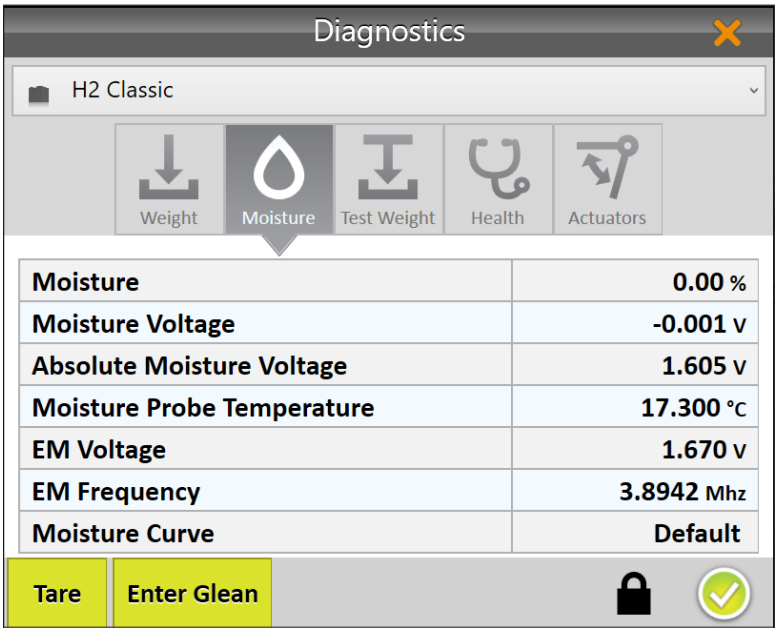
Weight diagnostics

On the Weight diagnostics screen, live measures are shown for the sensors measuring weight in the plot weigh hopper.



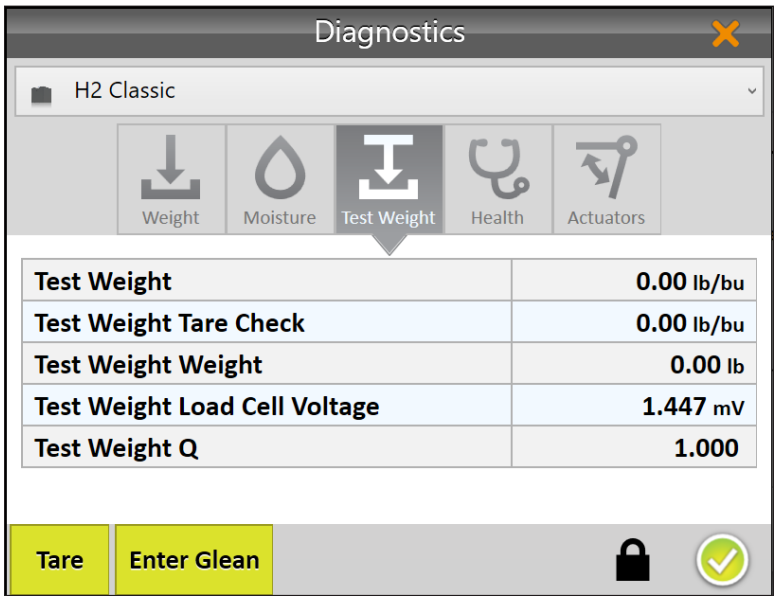
Item	Description
Weight	This number shows the weight of the contents in the plot weight hopper. Depending on how units of measure is configured (found at Main Menu > Settings > Preferences > Units of Measure), weight will be shown in pounds or kilograms.
Load Cell 1 millivolts	These readings are for the two load cells that measure plot weight. The millivolt readings vary linearly with weight added. The empty weigh hopper causes the load cells to read about 3.100 +/- 0.200 mV.
Load Cell 2 millivolts	
Q	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 + or - .01 (depending on the slope the machine is on or intensity of vibrations/movement.
Slope and Motion Voltage	This is used to calculate Q.
Slope and Motion 1G Voltage	This is used to calculate Q.
Slope and Motion Compensation Enabled	This reports whether Slope and Motion Compensation is enabled. We recommend enabling this feature. To use Slope and Motion Compensation, two steps are required. Enable Slope and Motion Compensation in Setup > H2 Classic > Sensors > Weight, and then calibrate Slope and Motion Compensation in Setup > H2 Classic > Calibration > Bucket Slope and Motion Calibration.

Moisture diagnostics



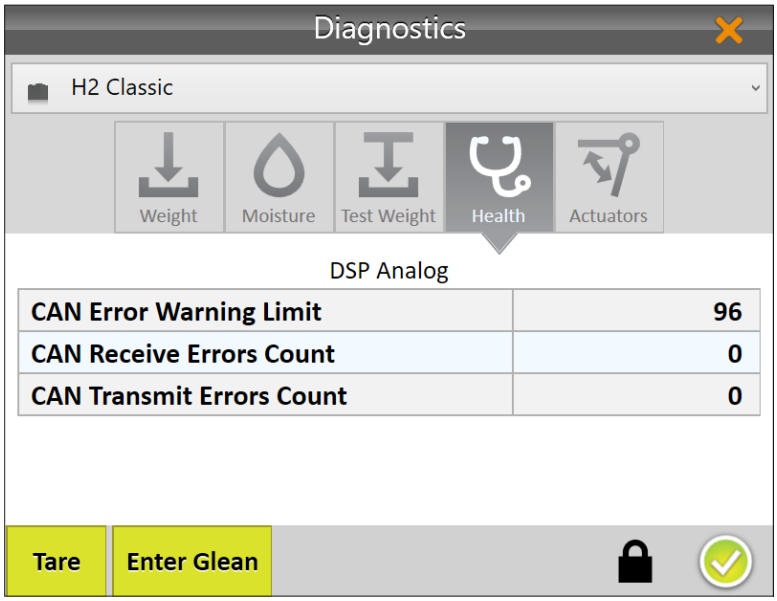
Item	Description
Moisture	This is the moisture measurement for grain in the test chamber.
Moisture Voltage	This value is a pseudo reading, calculated in firmware from EM voltage and EM frequency. This number is set to 0.000 V after a tare operation.
Absolute Moisture Voltage	This is the empty chamber reading for moisture voltage. It is set after doing a tare operation.
Moisture Probe Temperature	This is the temperature measured by the moisture probe. Since the sensed signal from moist grain decreases with temperature, the temperature measurement is used to apply a correction in calculating grain moisture.
EM Voltage	This, along with EM Frequency, are the basic measures for calculating grain moisture. This value is typically about 1.600 V for an empty chamber.
EM Frequency	This, along with EM Voltage, are the basic measures for calculating grain moisture. This value is typically about 3.8 MHz for an empty chamber.
Moisture Curve	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 (e.g. corn, wheat, soy beans, etc.).

Test weight diagnostics



Item	Description
Test Weight	This is the bulk density (weight per volume) of the contents of the chamber. When empty, it should read 0.00 +/- 0.2 lb/bu.
Test Weight Tare Check	This should always read 0.00 for an empty test chamber.
Test Weight Weight	This is the weight of the material in the test chamber.
Test Weight Load Cell Voltage	This is the voltage measured by the load cell, and is converted to weight.
Test Weight Q	This is the value to compensate for slope and motion. This value is the same as the one from the plot weigh hopper.

Health diagnostics



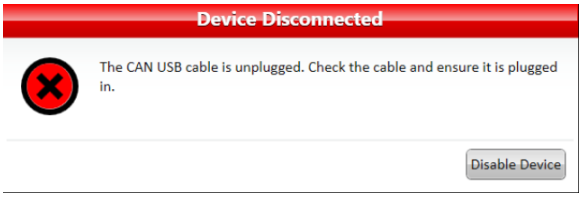
Item	Description
CAN Error Warning Limit	The number of errors that can occur before the software treats the CAN connection as unreliable and warns the user.
CAN Receive Errors Count	This is a count of the number of CAN receive or transmit errors. In normal operation, this number is typically zero. If this counter increases, check the CAN cable. An increasing count of CAN errors may indicate a bad connection, and may indicate a need to replace the CAN cable.
CAN Transmit Errors Count	

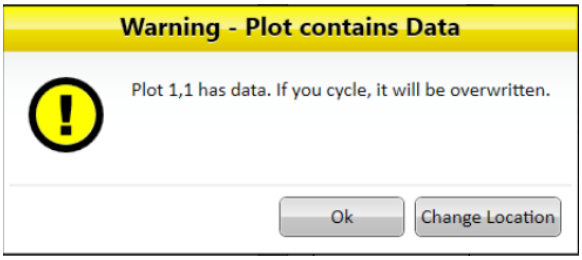
Conventions for Mirus user messages

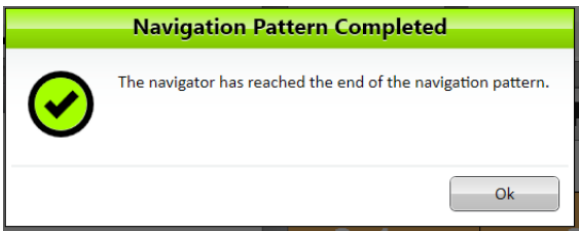
Mirus uses three categories of user messages, distinguishable by the icon and color used with the message.

Icon	Category	Description
	error	Error messages display with graphical elements colored red, and the message describes a problem that prevents the user or system from completing a task. The problem could cause erroneous measurements, data corruption, data loss, or some other system malfunction. The error message provides information describing what happened and why, what the result could be, and what the user can do to prevent the problem in the future.
	warning	Warning messages display with graphical elements colored yellow, and the messages provide cautionary information. The message may present options for the user.
	confirmation	Confirmation messages display with graphical elements colored green, and the messages provide status information about the changing nature of an activity. These messages provide information to explain that the system is operating as expected.

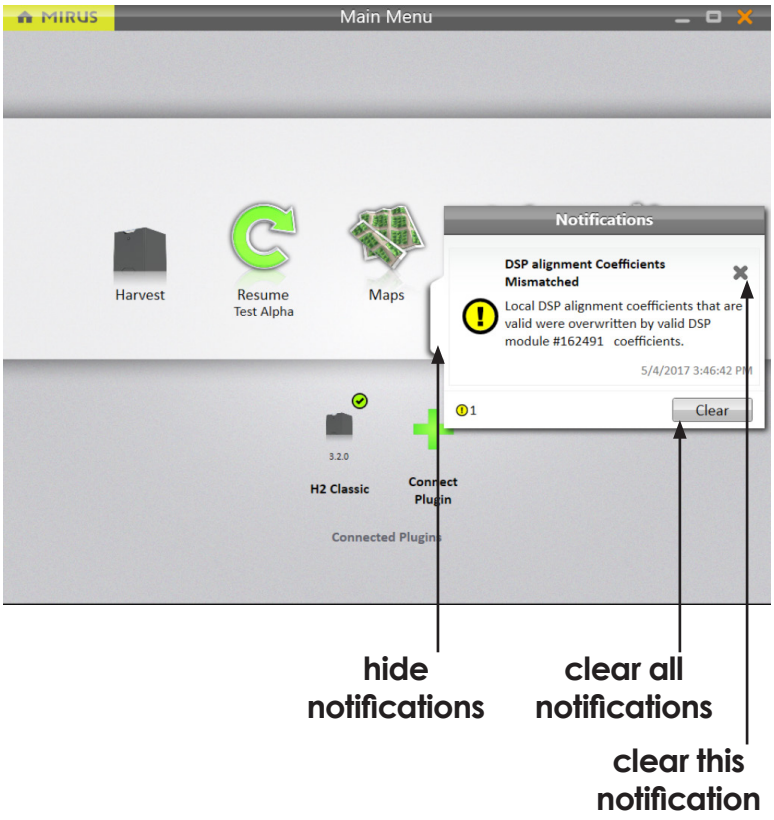
Messages requiring action appear in a dialog box, and stop the software until you take action such as clicking a button to acknowledge the message or to choose an option. The images below show examples of these messages.



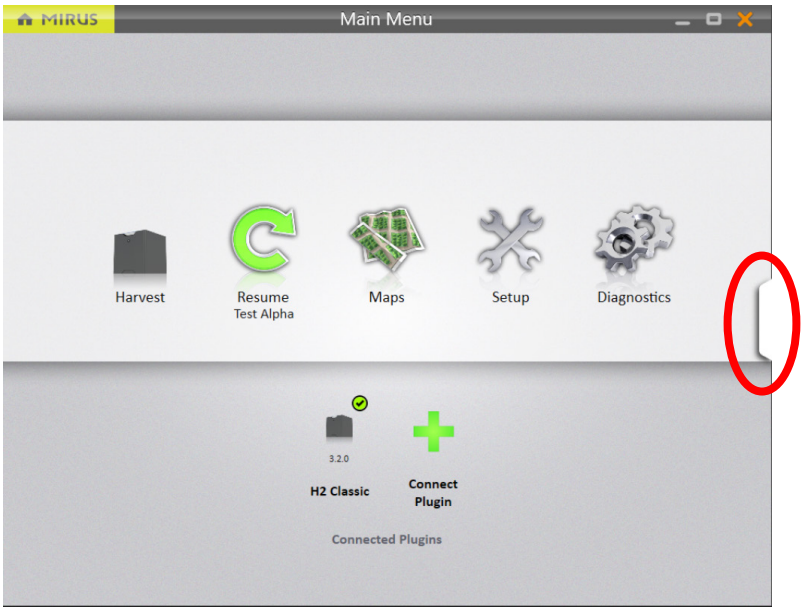




Messages displayed for notification purposes appear as notifications that pop out from the right side of the window. When notification messages appear, you can hide the message, clear the message, or take no action and allow the message to automatically hide.



While Mirus is running, notification messages that have been hidden can be viewed again by clicking on the notifications tab on the right edge of the window. The notifications tab is only visible if there are notification messages, and it disappears when there are no messages or when all messages have been cleared.

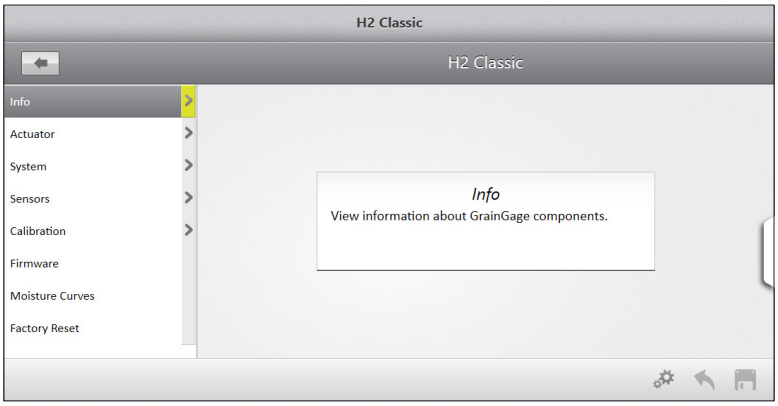


6

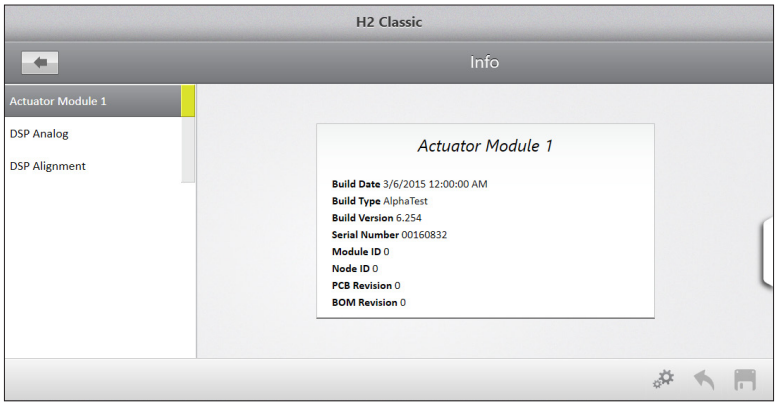
SETTINGS AND CALIBRATION

H2 Classic GrainGage setup and calibration

Open Mirus to settings and calibration functions by selecting **Setup > H2 Classic**, and Mirus displays a list of H2 Classic setup options on the left side of the screen. If you did not see an option for H2 Classic, refer to the Operation chapter for instruction on installing the H2 Classic plugin.

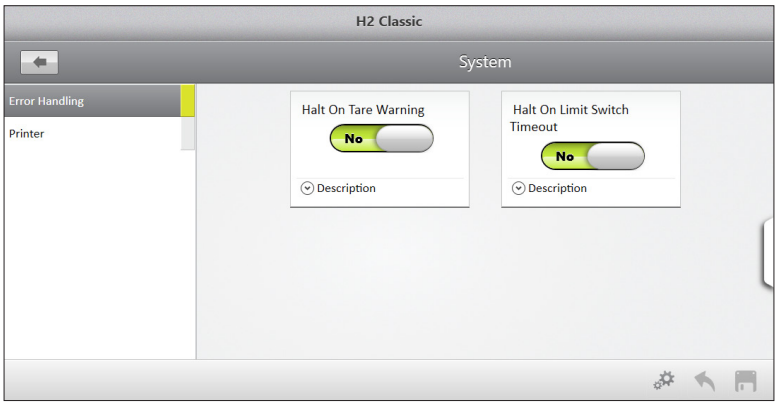


Select **Info**, and Mirus displays diagnostic and operational information for modules and features in the H2 Classic GrainGage. Explore each of the options in the list on the left side of the screen to become familiar with the information available about the system.



Use the **Back** icon (top left corner) to return to H2 Classic setup screen, and then select **System**. Mirus displays the System screen, presenting options for Error Handling and Printer. Select **Error Handling** to configure how the system

responds to certain events. Use the switch on each setting to configure the desired action. To learn more information about each setting, click the arrow icon to expand the description of the setting. You can click the arrow icon again to hide the description.



Use the **Back** icon (top left corner) to return to H2 Classic setup screen, and then select **Sensors > Weight**.

The table below shows the settings that control measurements for the hopper weight readings.

Setup parameter	**Typical value**	**Description**
Minimum Weight Threshold	4.5 lbs (2 kg)	The minimum weight of grain required to fill the test chamber, allowing the moisture and test weight readings to be included in the average for the plot.
Max Sub-cycle Count	1 or 2	The maximum number of sub-cycles of test moisture and test weight measurements to be taken per hopper-full of grain. The more taken, the longer the time required per hopper-full of grain. A sub-cycle normally requires 5 to 6 seconds. Total hopper weight is acquired from the hopper load cells simultaneously with the first sub-cycle measurements taken.
Evacuation Time	2000 msec	The amount of time the GrainGage gates remain open to allow for evacuation of all grain from the hopper and test chamber. Caution: Wetter grain or oil seeds may require longer evacuation times. Low-volume inserts will also require a longer evacuation time.
Settle Time	600 msec	Time interval between top gate closed and the beginning of the Weigh Time (weight measurement).
Load Cell Count	2	The number of load cells used for the weigh hopper.
Weigh Time	1000 msec	The period over which weight readings are averaged. A shorter weigh time may reduce the accuracy of the measurement.
Slope and Motion Compensation	Yes	Change this setting by using the slider. This corrects weight errors resulting from harvesting on a slope, movement, and vibration.

Setup parameter	Typical value	Description
Load Cell 1 Coefficient	2.500 lb/mV	This value is generated from the weight calibration. It is used to convert millivolt readings from the load cell into pounds or kilograms.
Load Cell 2 Coefficient	2.500 lb/mV	This value is generated from the weight calibration. It is used to convert millivolt readings from the load cell into pounds or kilograms.
Weight Tare Warning	0.5 lb	This is the threshold above which a tare warning is generated after hopper and test chamber evacuation.
Diagnostic Weight Streaming Rate	3 Hz	The rate at which the weight data is streamed while in the diagnostic display.
Collect Weight Streaming Rate	3 Hz	The rate at which the weight data is streamed while in harvest.

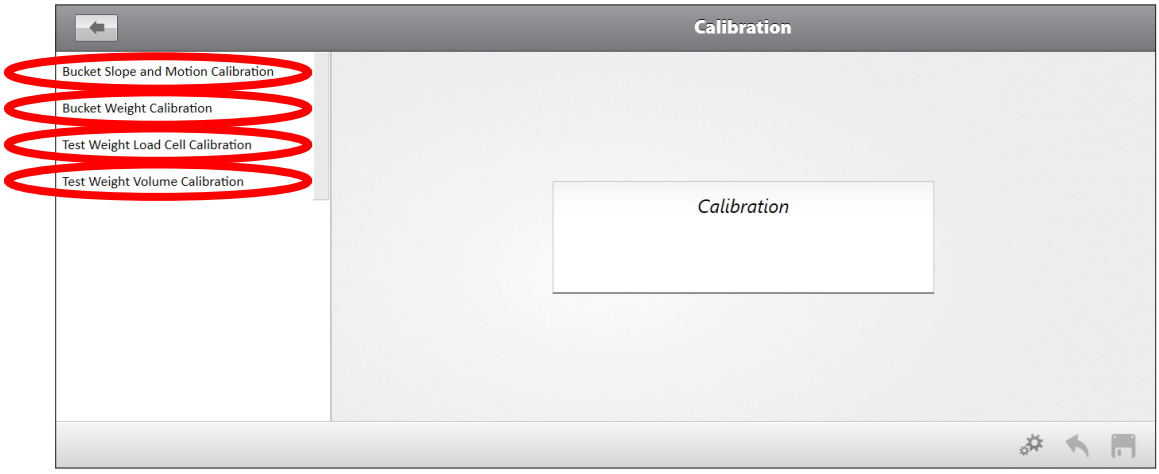
Select the **Moisture** screen to view the option for measuring moisture. The setting is shown in the table below.

Setup parameter	Typical value	Description
Moisture Tare Warning	1%	This is the threshold above which a tare warning is generated when reading in an empty chamber.

Select the **Test Weight** screen to view the options for measuring test weight. The settings are shown in the table below.

Setup parameter	Typical value	Description
Test Weight Chamber Sample Volume	148.8 cubic inches	This is the volume of the test chamber used in the test weight calculation. The value is generated by using the test weight calibration wizard.
Weight Conversion Multiplier	1500	This is the coefficient used to calculate weight from the test chamber load cell. This value is generated by using the test weight calibration wizard.
Test Weight Tare Warning	1,00 lb per bushel (1.287 kg per hectoliter)	This is the threshold above which a tare warning generated when measuring an empty chamber.
Trip Weight Threshold	20.0 lbs (9.0 kg)	This is the threshold weight of grain in the hopper at which a measurement cycle is triggered.
Level Clear Delay	not applicable	not applicable

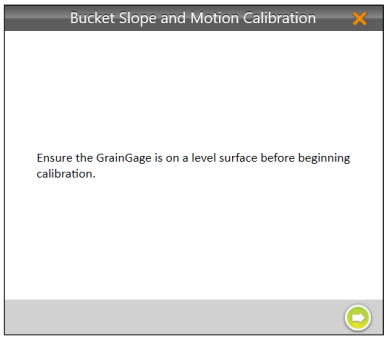
Use the **Back** icon (top left corner) to return to H2 Classic setup screen, and then select **Calibration**.

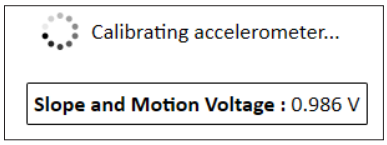


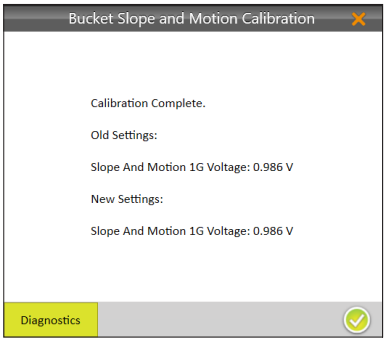
Make sure the GrainGage is correctly calibrated by working through each menu in calibration. The following sections guide you through each calibration wizard.

Slope and Motion calibration

Use the slope and motion calibration wizard to calibrate the accelerometer and establish the 1G voltage. This is critical for good weight and test weight measurements on the moving harvester.





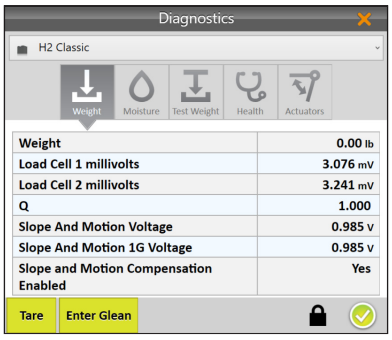


Park the harvester on a level surface and shutoff the engine. Keep the harvest data system powered on, and start the slope and motion calibration wizard.

During calibration, Mirus displays a message that indicates that it is calibrating the accelerometer, and it also displays the Slope and Motion Voltage, a tare reading that is averaged over a few seconds.

When calibration is complete, Mirus displays a message, showing the previous setting and the new setting. Select the check mark in the bottom right corner of the dialog box to apply the newly calibrated slope and motion settings. Allow a few seconds for the system to complete this process.

Refer to the Weight Diagnostics screen to verify that slope and motion compensation is enabled and to see the value of Q. The value of Q normally reads 1.000 +/- 0.002.



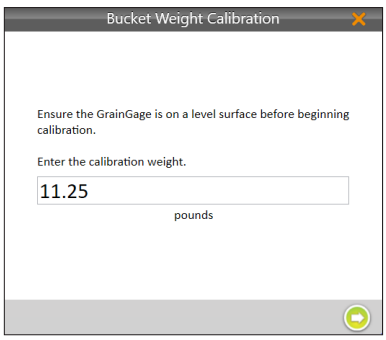
Weight calibration

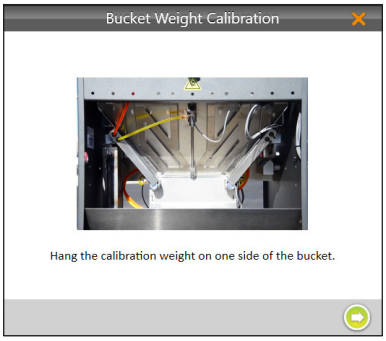
Use the weight calibration wizard and a calibration weight to calibrate the plot weigh hopper load cells.

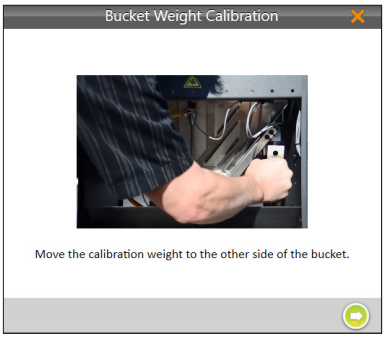
Before starting the calibration, check the plot weigh hopper to verify that it is empty and that nothing is weighing on it.

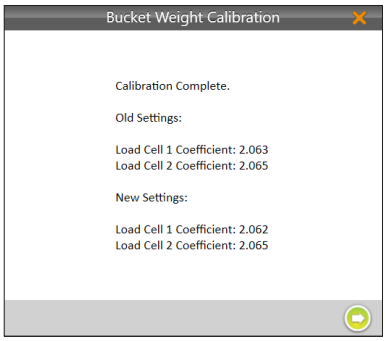
For convenience, the gear icon in the bottom left corner of the screen opens the Diagnostics screen. Use this to check the weigh hopper readings before calibration and again after calibration.

Start the weight calibration wizard, and follow the on-screen instructions.









Using the larger of the two calibration weights delivered with the GrainGage, find the value stamped on the side of the weight, and enter that value in the prompt and click the green arrow. The software displays a message, "Calibrating the Empty Bucket." Mirus captures the zero weight signal from the load cells. Follow the on-screen instructions.

Hang the calibration weight as directed, and click the arrow in the bottom right corner of the dialog box to start the measurement sequence. When the system has finished, Mirus prompts you to move the calibration weight to the other side of the hopper.

Mirus displays two sets of loaded readings, along with a set of empty readings. The calibration wizard uses these to calculate the load cell coefficients. Mirus displays the old settings and the new settings.

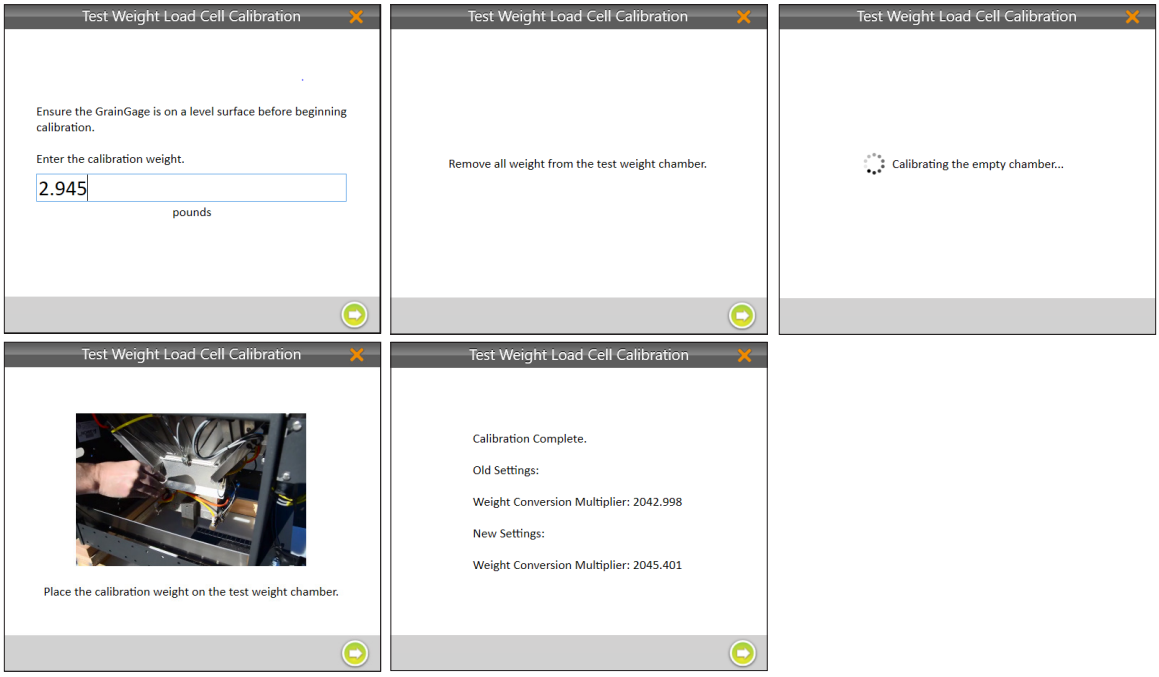
Remove the calibration weight.

If requested, click the arrow again to perform a store of the tare value with the new calibration.

To check the calibration, open the Weight Diagnostics screen, and watch the readings as you hang the calibration weight from each of the calibration weight hangers. Mirus should report readings that are exactly the same as the value stamped on the calibration weight.

Test Weight calibration

Use the test weight calibration wizard and a calibration weight to calibrate the test chamber load cell, and follow the on-screen instructions.



Using the smaller of the two calibration weights delivered with the GrainGage, find the value stamped on the side of the weight, and enter that value in the prompt and click the green arrow.

When prompted, hang the test chamber calibration weight from the calibration hook, and then click the arrow in the bottom right corner of the dialog box to proceed.

When the calibration is complete, Mirus displays the old setting and the new setting.

Test weight volume calibration

Use the chamber calibration wizard to calibrate the test weight measured by the GrainGage to the test weight measured using the bench top method. Due to differences between the grain flow dynamics of the two instruments, there can be a difference between the two methods for measuring test weight. This calibration assigns a pseudo-volume for the test chamber to collect data that is comparable to data measured by the bench top method.

You may note that test weight data, especially when measured on a harvester, tend to vary more than in a laboratory because the grain samples on a harvester tend to contain more trash and may be higher in moisture than grain samples in a lab. You may observe variability as high as 0.5 lb/bu (0.6 kg/hl) between harvester grain samples and laboratory grain samples.

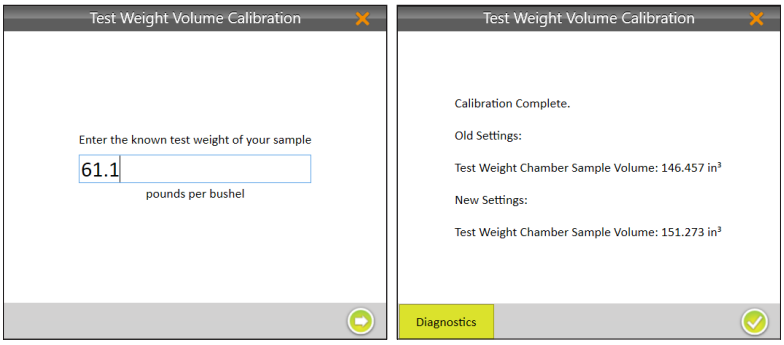
Step 1: Collect and prepare a grain sample. Use a representative grain sample for this calibration. If you are harvesting wheat, use wheat for the calibration. If you are harvesting corn, use corn for the calibration, and so forth.

Use a sample size of at least 10 lbs for the standard volume test chamber, or use a sample size of at least 5 lbs when using the low-volume inserts in the test chamber.

Use a sample that is clean to the same degree as normally harvested grain coming through the plot harvester and that is no more than three to five percent wetter than the sustainable storage moisture level for the grain being harvested. Run the same grain sample on the bench top measurement device before running it through the GrainGage.

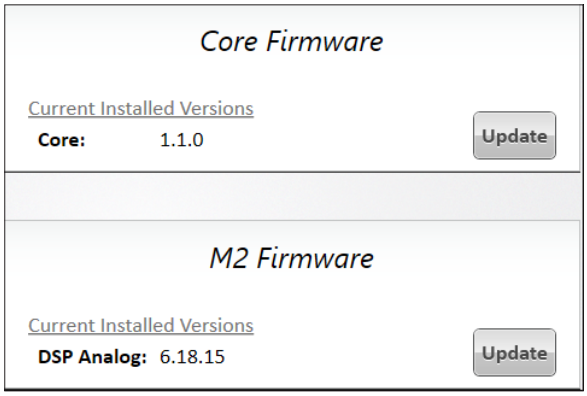
Step 2: Use your bench top instrument to make the reference measurement of test weight, using at least three samples. Write this number down so that you can enter it in Mirus during the calibration process.

Step 3: In Mirus, start the chamber calibration wizard, and follow the on-screen instructions. The instructions should prompt you to enter the known value for the test weight and pour the sample into the GrainGage. During the process, the grain sample will cycle through the GrainGage, and the GrainGage will take measurements. When complete, Mirus will show the newly calculated values.



Firmware

Under the Setup menu for the H2 Classic, Mirus provides the option to check the version of the current firmware in the system. Since Mirus automatically checks the firmware versions, it is rarely necessary to use the firmware update options on this screen.



Moisture Curves

Before harvesting, you need to generate a grain moisture calibration curve. The H2 Classic GrainGage uses the moisture calibration curve to convert the raw capacitance readings from the EM2 grain moisture sensor to percent grain moisture. The EM2 sensor voltage due to grain moisture, called Moisture Voltage, varies linearly with percent moisture content in the grain.

Mirus includes a default moisture, a factory calibration for corn only. Call customer service for additional factory calibrated moisture curves.

Preparing samples

Before each harvest, check your moisture calibration, and if necessary tune your moisture calibration.

To check and tune your moisture calibration, use at least two grain samples. Use samples about equal to your average plot weight.

Follow these steps to prepare your samples:

Step 1: Collect a wet grain sample. The wet sample should be 80% to 90% of the maximum moisture you plan to harvest.

Step 2: Collect a dry grain sample. The dry grain sample should be 110% to 120% of the driest grain sample you plan to harvest.

Step 3: Using the most accurate moisture standard available, take at least three different moisture readings on each sample.

Step 4: Average the readings for each sample to calculate the "known moisture" for each sample.

CAUTION: Do not add water to grain samples to add moisture as rewet grain responds differently than naturally wet grain and produces an inaccurate moisture curve. Freshly harvested samples are the best choice for creating a good moisture curve. If it is not possible to use fresh grain samples, harvest wet samples and dry them to the moistures you want. When preparing calibration samples, always allow them to cool/warm to ambient temperature before taking a moisture measurement.

CAUTION: Allow grain samples to cool or warm to ambient temperature before taking a measurement as inaccurate data may result.

Use the prepared samples within one hour. If you cannot use them within one hour, recheck the moisture by using the steps above.

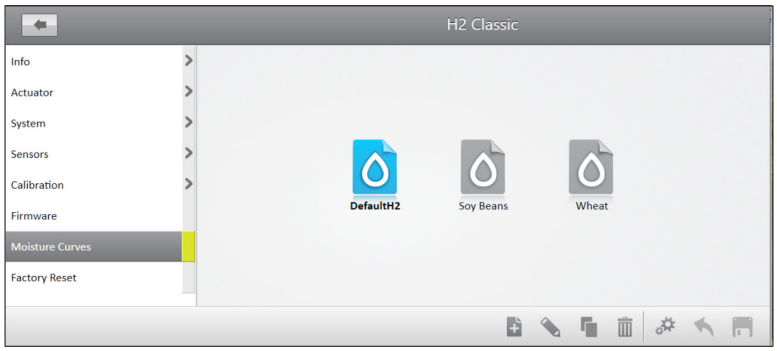
CAUTION: Keep samples in the shade (away from direct sunlight). Change in temperature will cause the sample moisture to drift. Heat, especially from direct sunlight, will cause grain to sweat, resulting in more error in your calibration.

To calibrate, put in a sample of known moisture close to the dry end, and generate the corresponding Moisture Voltage reading, then do the same thing at the wet end of the curve. The following screen shots step through an example.

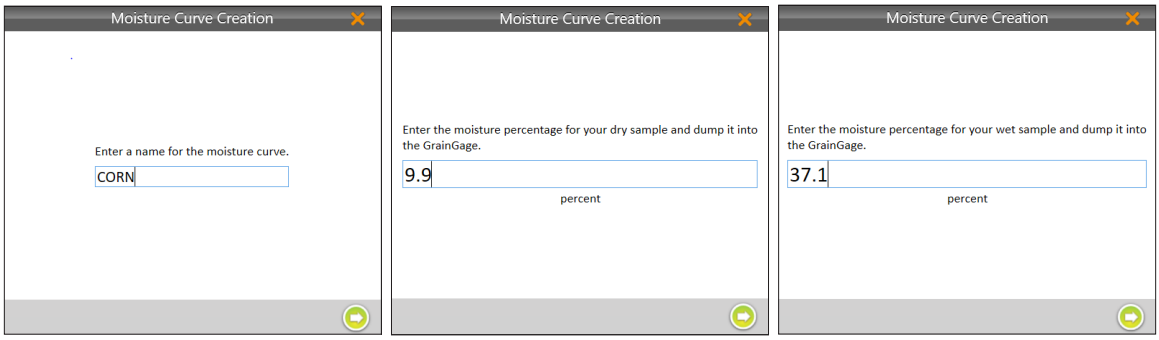
Creating a new moisture curve

To calibrate a new moisture curve, we recommend using the Moisture Calibration wizard. You are prompted to place the dry (110% to 120% of the dry end) sample into the cyclone. When this sample is processed, the system generates the corresponding Moisture Voltage reading. You are asked to repeat the process with the wet (about 80% to 90%) sample. These screen shots step through an example.

Select Moisture Curves to bring up a list of existing grain moisture curves in the system.

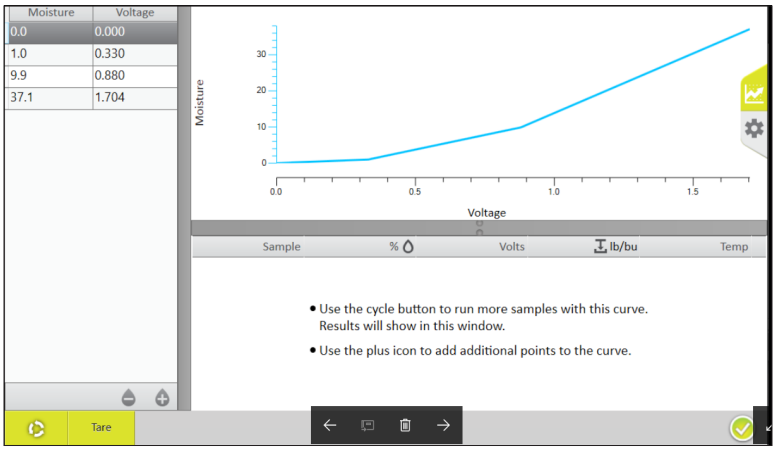


Generate a new moisture curve by using the plus icon from the icon panel at the bottom of the screen and follow the on-screen instructions.



Enter a name for the moisture curve. Enter the percentage for the dry sample. Enter the percentage for the wet sample.

Mirus displays a screen with a chart to show the moisture curve.



Note that the lower part of the curve, below the 9.9% still has one more bend in it. This prevents a false tare warning message, and since we expect no grain moistures below the lowest user entered point, it is of no consequence in operations. However, if you expect to be harvesting plots with moistures lower than your lowest point, enter another user-entered point to extrapolate the upper part of the straight line to correspond to the lowest grain moisture that you will measure.

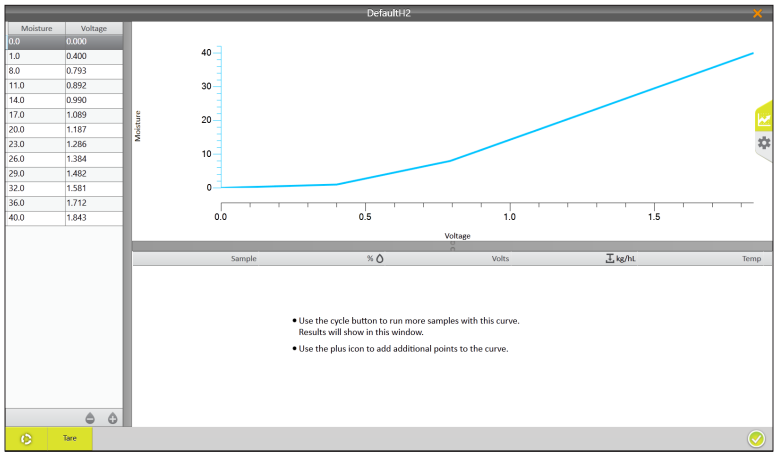
To add other known points on the curve, follow the instructions on the screen. Use the cycle button to run more samples with this curve, and use the plus icon to add additional points to the curve. The plus icon inserts a line of zeros in the table. Enter in the percent moisture and Moisture Voltage readings from the new points you generated.

Tuning an existing moisture curve

Follow these steps below to check or tune an existing moisture curve:

Step 1: Select the moisture curve you want to tune.

Step 2: Click on the pencil to edit the curve.



Step 3: Place one sample in the cyclone.

Step 4: Press the cycle button (bottom left corner).

Step 5: Repeat steps 3 and 4 for all prepared samples.

Step 6: Average the offset for each sample. For example, if sample one was 1.2% high and sample two was 0.8% high, the average offset is +1.0%.

Step 7: Add (or subtract for a negative offset) the offset to each moisture point with exception to the 0 = 0 moisture point. In the example above, 1% would become 2%, 8% would become 9% and so forth, until the wettest point 40% would become 41%.

Step 8: Save the changes by tapping the green check in the bottom right corner.

If desired, the moisture and voltage can be tweaked according to the moisture and voltage recorded in the cycle diagnostic window. Use the plus icon to add moisture points, and use the minus icon to delete moisture points. The moisture curve line chart can be slightly parabolic, but should always follow a smooth change in slope as indicated in the chart above.

Factory Reset

Under the Setup menu for the H2 Classic, Mirus provides the option to reset the system to factory defaults.

CAUTION: The factory reset option is not typically used, and when used, you will need to completely recalibrate the system.

7

CARE AND MAINTENANCE

General care

Achieving the best system performance with the H2 Classic GrainGage year after year comes through periodic cleaning and maintenance of the system, both during the harvest season and at the end of the season. Fully trained and experienced field technicians and engineers are available to come on-site and perform a full system calibration and checkout before the new harvest season begins.

Here is a check list of these system service items:

- Make a few simple maintenance checks at startup each day during the harvest season.
- Perform system cleaning and protective measures at the end of the season.
- Within a month or so of the new harvest season, perform, or have a HarvestMaster Field Engineer/Technician perform, a thorough system inspection, worn parts replacement as necessary, calibration and measurement performance check.

For optimum system service and longevity, we recommended subscribing to HarvestMaster's Premium Support Plan: *http://www.harvestmaster.com/HarvestMaster/support/Premium-Support-Plan*.

Daily system check

Inspect cables and air supply tubing

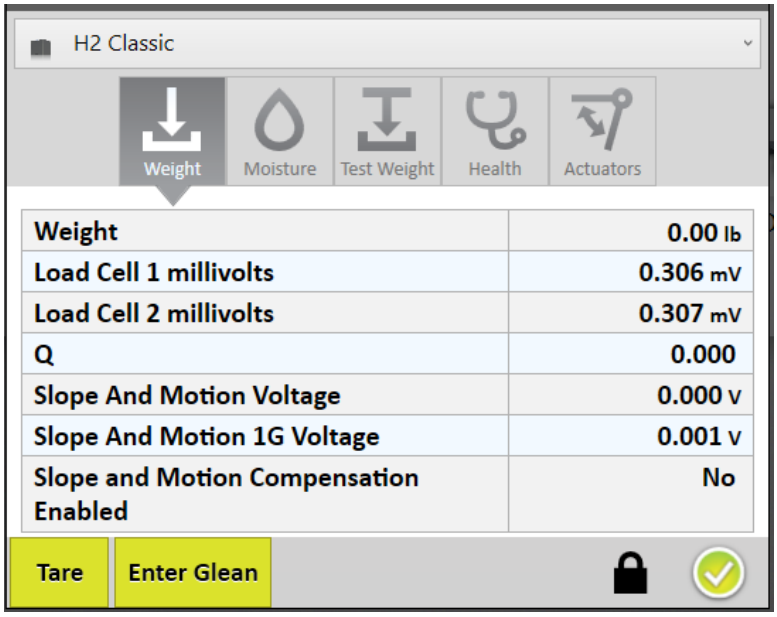
Remove the rear chassis door, exposing the pneumatic air valves and DSP 2 module. Inspect to make sure that all cables and air tubing in the H2 Classic GrainGage chassis are tied up and free of interference of the slide gates and test chamber as these devices operate. Where air supply tubing and instrumentation wiring connect between the chassis and the test chamber, ensure that these runs are free from rubbing on anything when the access door is in place.

Check weigh hopper anchor pins

Ensure that the 4 weigh hopper anchor pins are resting down through the load cell support frame (two resting points above each load cell). A sudden bump in the road during combine transport on a truck can sometimes jump the hopper up out of these supports, and you have to reset the weigh hopper into its proper operating position. Otherwise, weight errors result.

Verify weight calibration

With the tablet computer for the system plugged in, press the power button on the H2 System Control Module and start the Mirus software. Select Diagnostics, and note that, with an empty weigh hopper, the weight dialogue window displays readings similar to the following screen shot.



When calibrated and operating properly, Weight reads 0.00 +/- 0.02 lb. On first use, and occasionally after that, use the Tare button to re-zero the weight measurement while the hopper is empty. If the weight frequently reads more than +/- 0.02 lb, check for mechanical interference with the weight hopper or harvest trash hanging up in the system.

On occasion, while observing the weight diagnostics screen, you should put the harvester in motion, including engaging the separator and the head, thus inducing even more vibration. The accuracy of plot weight should remain at 0.00 +/- 0.02 lb (10g) with Slope & Motion Compensation enabled (found in Settings > Sensors > Weight).

Verify calibration by using the calibration weight that accompanies the system. The side of the calibration weight is stamped with its value. Remove the access panel of the H2 Classic GrainGage on the Air Supply side and observe a

horizontal bar just below the load cell on either side of the weigh hopper. While in the Diagnostics > Weight dialogue of Mirus, place the calibration weight on either load cell bar. You should observe a weight reading on the screen within +/- 0.02 lb (0.01 kg) of the value stamped on the weight.

- If the reading is within 0.02 (10 g) of the actual weight, the system is operating within its specified range, otherwise you may need to calibrate the weigh hopper.
- The system generally provides more repeatable readings by performing this test with the harvester running. The vibrations from the harvester tend to help free the system of hysteresis.
- If the reading is within about 0.05 lb (25g) of the actual weight, press the weigh hopper upwards or downwards. If the reading tends to stay slightly too high or too low, it may indicate something is hanging up the weigh hopper. Check for cables and air lines that may need to be re-tied. The weigh hopper works best when cables and airlines run horizontally from the chassis to the weigh hopper.
- If any excess dust, chaff, or trash is accumulated on the weigh hopper or test chamber, use a pressurized air hose to blow it off.

Return for repair

For technical questions or repair needs on the H2 Classic GrainGage, contact a HarvestMaster technical service representative:

USA

Web:	www.HarvestMaster.com
Email:	support@HarvestMaster.com
Phone:	+1 (435) 753-1881, after hours phone: (435) 757-5354

Europe

Web:	www.HarvestMaster.eu
Email:	support@HarvestMaster.eu
Phone:	+43 724 221 9333

In many situations, HarvestMaster technical service representatives can resolve problems by troubleshooting the issue over the phone. The technician may also be able to assist by logging onto your system through TeamViewer™. When replacement of a harvest data system component is required, it is generally most efficient for the user to replace the part with guidance from a HarvestMaster technician.

HarvestMaster service plans

The warranty covering the H2 Classic GrainGage protects against manufacturer's defects. Refer to appendix A for details on the standard warranty. In addition to the warranty, HarvestMaster offers service plans to help reduce down-time during the busy harvest season:

- Premium Maintenance and Support Plan
- Maintenance Option Replacement Parts
- On-site Service Visits

We provide details about these service options on our website at: *http://www.harvestmaster.com/HarvestMaster/support/Premium-Support-Plan*

A


HarvestMaster
H2 CLASSIC GRAINGAGE
www.harvestmaster.com
www.harvestmaster.eu

WARRANTY

Limited Warranty

Hardware

All products manufactured by Juniper Systems, Inc. (Juniper Systems) when properly installed, calibrated, and operated in accordance with instruction manuals accompanying the hardware and used for the purpose for which the hardware was designed shall be free from defects in materials and workmanship for a period of one (1) year from the date of shipment.

In the event a defect in materials or workmanship is discovered and reported to Juniper Systems within the one year period, Juniper Systems will, at its option, repair the defect or replace the defective product. Juniper Systems' obligation hereunder will be limited to such repair or replacement.

The customer shall have the responsibility to ship the defective equipment to Juniper Systems with all cost of shipment prepaid. After repair or replacement Juniper Systems will, at their own expense, ship the replacement or repaired item back to the customer using the same type of carrier.

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.

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.

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.

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.

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).

B

ELECTRONIC CONNECTIONS AND WIRING DIAGRAMS

Wiring for DSP module ports

Load A, B and C ports

The H2 Classic GrainGage supports Load A, Load B, and Load C ports. The Load D port is not used in this system.

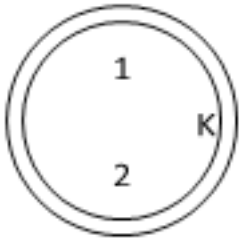
Pin	Wire Color	Signal	Notes
1	green	5 V excitation	5.000 V +/- 0.005 mV
2	no connection	no connection	
3	red	load signal out -	millivolt level output from load cell
4	white	load signal out +	approximately 15 mV full scale
5	black	load cell ground	
6	shield	cable shield connection	

CAN port

The Control Area Network (CAN) port is 250 Kbit/second ISOBUS compatible.

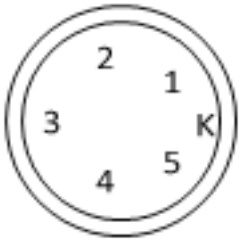
Pin	Wire Color	Signal	Notes
1	red	CAN power	provides power to the module
2	yellow	CAN +	CAN differential signal (high)
3	black	CAN ground	ground for CAN power
4	green	CAN -	CAN differential signal (low)
5	no connection	no connection	
6		RS-232 debug TX	product diagnostics, special cable
7		RS-232 debug RX	product diagnostics, special cable
8		RS-232 ground	product diagnostics, special cable

Power port



Pin	Wire Color	Signal	Notes
1	black	power ground	connect to harvester battery (chassis ground)
2	red	+12 VDC automotive power	9 to 18 V operating range connect, fused, to harvester battery, +12 V terminal

Moisture port



Pin	Wire Color	Signal	Notes
1	red	+12 VDC sensor power	9 to 15 V operating range
2	black	sensor power ground	
3	green	RS-485 +	
4	white	RS-485 -	
5	shield	sensor wiring shield	

GPIO 1 port

Pin	Wire Color	Signal	Notes
1		12 VDC unregulated power	
2		power ground	
3		digital in 1	
4		digital in 2	
5		digital in 7	
6		digital in 8	
7		H-Bridge 3 out FWD	
8		H-Bridge 3 out FWD	

GPIO 2 port

Pin	Wire Color	Signal	Notes
1		12 VDC unregulated power	
2		power ground	
3		digital in 3	
4		digital in 4	
5		digital in 5	
6		digital in 6	

Actuator port

Pin	Wire Color	Signal	Notes
1		ground	
2		ground	
3		ground	
4		ground	
5		H bridge 1 FWD	
6		H bridge 1 RVRS	
7		H bridge 2 RVRS	
8		H bridge 2 FWD	

C

SENSOR AND MODULE ERROR CODES

Moisture sensor LED error codes

The EM2 Moisture Sensor contains an orange LED and a red LED. The red LED displays error codes by groupings of short pulses, beginning after a long (one second) "on" pulse. For instance, an error code of 21 would be displayed as two short red light pulses, pause, then one short red light pulse followed by a pause. If more than one error code is present, the next error code begins showing right after the first, until all error codes have been displayed. This is followed again by a long (one second) red "on". Then the sequence restarts.

Error Code	Description
11	Stack overflow — sentinel byte overwritten
12	Watchdog reset has occurred
13	Timed task buffer overflow
21	Input buffer overrun (>25 character packet received)
22	Checksum error detected
23	Unrecognized command
24	RS485 busy (for 5ms) encountered
25	Transmit message aborted due to the 50 ms RS485 busy
31	Frequency interrupt overrun (missed frequency count)
32	Frequency measurement zero error (no oscillation counts)
33	Frequency measurement range error (>4.2 MHz)
44	System supply voltage below +10.5 Volts
45	System voltage above +16.0 Volts
55	Invalid error code

DSP Module bootloader error codes

Code	Description
Red & Yellow single blink per 1.5 sec.	Waiting for update
Red & Yellow double blink per 1.5 sec.	Flash memory empty
Red & Yellow triple blink per 1.5 sec.	Flash memory corrupted
Red & Yellow quadruple blink per 1.5 sec.	Firmware incompatible

DSP Module runtime error codes

Code	Description
1	Hardware error
2	OS software error
4	Hardware stack overflow
5	Software stack overflow
7	BSS overflow
8	OS RAM overflow
9	TCB overflow
10	FIFO overflow
11	CAN overflow