FIELD REFERENCE GUIDE

HIGH CAPACITY GRAIN GAGE

HarvestMaster™

Field Research Software™

High Capacity GrainGage™

Reference Guide

P/N 15305-04

Contents

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CHAPTER 1

GETTING STARTED WITH FRS SOFTWARE

Downloading and Installing FRS

Downloading and Installing Harvest Modules

FRS Software for Allegro MX

Removing and Installing Latest Version of FRS and Related Firmware

Replacing the original script files:

Updating Datalink for FRS

Getting Started with FRS Software

Introduction

Designed by seed researchers, Field Research Software™ (FRS) helps seed researchers and agriculture scientists perform data collection tasks on research plots.

The High Capacity GrainGage™ is employed on combines to record weight, moisture, and test weight on grains. It aids research scientists by automating data collection. This Field Reference Guide helps you through the setup, calibration, and harvest with the Twin or Single High Capacity GrainGage.

This guide also outlines the operation of the Field Research Software Harvest module. The FRS Harvest module is a component of the FRS Note Taking™ application. This Field Reference Guide assumes the user is familiar with the operation of FRS Note Taking. For more information, see the FRS Note Taking Field Reference Guide.

FRS software is designed so you can either tap on the touch screen with a stylus or use the keyboard. Function keys, arrow keys, the Enter key, and the Tab key are designed to help you move the cursor through the software and make selections.

Figure 1-1: Left: Single HCGG—Right: Twin HCGG

Downloading and Installing FRS

1. Go to http://www.harvestmaster.com/HarvestMaster/support/Downloads/FRS-Suite.
2. Download FRS Note Taking, making sure you select the correct version of the software for your handheld OS (ex. CX vs. MX).
3. Make an Activesync (XP) or Mobile Device Center (Vista/Win 7) connection between your handheld and PC.
4. Run FRS Note Taking setup on PC.
5. Choose installation location on PC.
6. Choose "Yes" to allow program to install in default location on handheld.
7. Give it a minute or two to download onto your handheld.

8. Run FRS on handheld.
9. Enter name and previously obtained serial number and registration key.

Downloading and Installing Harvest Modules

1. Go to http://www.harvestmaster.com/HarvestMaster/support/Downloads/FRS-Suite.
2. Download CAB file associated with your harvest module and correct handheld OS (example: 400 vs. 800 and CX vs. MX).
3. Make an Activesync (XP) or Mobile Device Center (Vista/ Win 7) connection between your handheld and PC.
4. Click Explore (XP) / File Management (Vista/ Win 7).
5. Click and drag the CAB file from the PC to the handheld to a location that you can find later with File Explorer.
6. Allow file to convert to handheld format.
7. Run file on handheld.
8. Install to ***Device***.

FRS Software for Allegro MX

Important notes

The process of updating FRS will erase all data associated with the current installation of FRS on the handheld. Please review the items in this section to understand which data is at risk and be sure to make backup copies so that you can restore files that are critical to your FRS setup. Please review the RELEASE NOTES associated with the latest software version located on the HarvestMaster website. These notes will recommend optimal settings and instructions to maximize the efficiency of your Harvest Data System.

This update will:

- Remove all existing versions of FRS stored on your handheld.
- Remove the FRS database on the handheld. This includes field maps, customized trait list, trait templates, and other associated data. This data needs to be exported and saved so that they can be imported back into FRS after the new software is installed.
- Erase special harvest script files (GHM, Kincaid air diverter, Wintersteiger subsampler, etc.). These instructions will guide you through how to either download the latest script file or save your original script files and import them into the newest version of FRS.

- Erase the harvest calibrations and handheld settings, including load cell coefficients, chamber volumes, actuator settings, level detect sensor settings, timers, and moisture curves. In order to avoid having to recalibrate after the update, be sure to record the current harvest calibrations and handheld settings so that they can be entered in FRS after the update.

Requirements

- Original FRS Note Taking serial number and registration codes found on the back of CD case or laminated card sent at the time of purchase.
- Allegro MX Field PC
- Microsoft ActiveSync (for Windows XP) or Windows Mobile Device Center (for Windows Vista)
- Either a Power Dock (recommended) or a USB-to-mini-USB cable ActiveSync/Mobile Device Center connection to PC

Saving your original script file

1. Go to *Start > Programs > File Explorer.*
2. Go to ***My Device > Program Files > FRS***.
3. Go into your Harvest Module's folder.

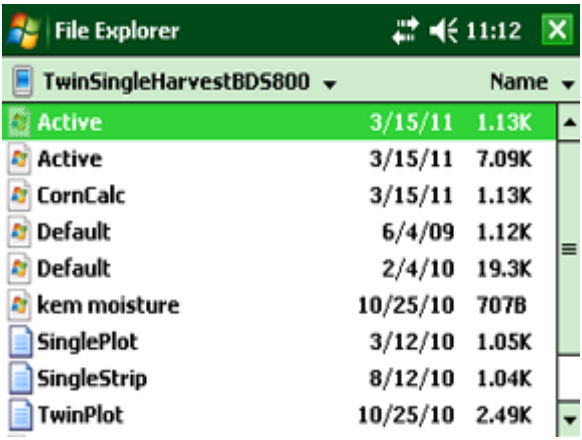


Figure 1-2: HCGG script screen

4. Hold Ctrl on the handheld keyboard and tap once on the appropriate text files to high-light them.
5. Click ***Menu > Edit > Copy.***
6. Go back to ***My Device*** and go to ***Storage***.
7. Tap on ***Menu > Edit > Paste***.

Removing and Installing Latest Version of FRS and Related Firmware

Removing FRS and Firmware on Handheld

1. Tap on ***Start > Settings > System Tab***.
2. Scroll down and select ***Remove Programs***.

Figure 1-3: Remove Programs icon

3. Choose to remove your Harvest Module.

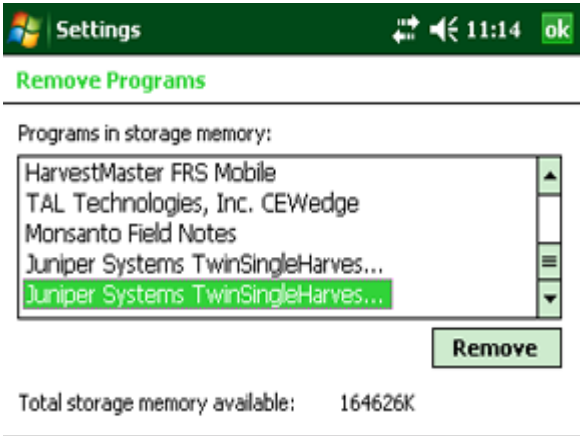


Figure 1-4: Remove Programs screen

4. Confirm your intention to remove the program.
5. Choose to remove FRS.

6. Confirm your intention to remove the program.
7. Choose to remove all application data.
8. Tap on ***Start > File Explorer > Program Files***.
9. Scroll down and highlight FRS.

Figure 1-5: Highlight FRS

10. Click ***Menu***, and delete FRS folder.
11. Choose ***Yes*** to whatever questions it asks about removing files.

Now you can download new software onto the handheld. Follow the instructions for downloading new software at the beginning of this chapter .

Replacing the original script files:

If there are no updated script files specified in the release notes,you can now copy/paste the original script files from the storage folder into the new harvest module folder. .

1. On the handheld, go to Start > Programs > File Explorer
2. Go to My Device > Storage
3. Hold Ctrl on the handheld's keyboard and click all the text files there.
4. Click Menu > Edit > Cut
5. Go to My Device > Program Files > FRS
6. Go into your Harvest Module's folder
7. Click Menu > Edit > Paste and answer yes when prompted.

If there are updated script files, download them from the website and paste them into your harvest module folder as previously instructed from steps five to seven.

HM-400 Users:

- If you are using an HM-400 system without a BDS test weight cup, you are ready to connect the handheld to the device. After a connection has been made to the Harvest Data System (HDS), the firmware or IOS on the HM-400 will automatically update. If your GrainGage has a BDS test weight cup, you must also update the firmware on the Hybrid module. See instructions below.

- You can key in your calibration settings that were previously copied down and verify the calibration and operation. If you never changed the transition timers on the actuators, we recommend leaving them at default to speed up operation.

Hybrid Module Firmware update:

1. Must also load HM-800 harvest module software for your appropriate handheld and harvest data system with BDS.
2. Connect Allegro via CAN-serial cable to a breakout box.
3. Unplug CAN cable from hybrid module and plug directly into breakout box.
4. Plug a short CAN cable from breakout box to the now open CAN port on the hybrid module.
5. Turn power on to the system and follow the steps outlined below to update the firmware on only the Hybrid module.

HM-800 Users:

- For HM-800 Systems, the firmware must be manually updated using a utility on the handheld. Follow the steps below to complete the HM-800 update.
- Using both the battery with a full charge and the external power cord is ideal before updating the firmware. Also make sure the auto suspend is disabled on the handheld. (***Start>Settings>System>Power>Advanced***)If you do not

have an external power cord, you can use the Console charge cord. Failure to power the Allegro during the full firmware update process could lock the Console module.

Updating HM-800 Firmware

1. Connect handheld to HDS.
2. Select ***Start > File Explorer > My Device > Program Files > FRS > Firmware***.
3. Run ***HM-800 Updater***.

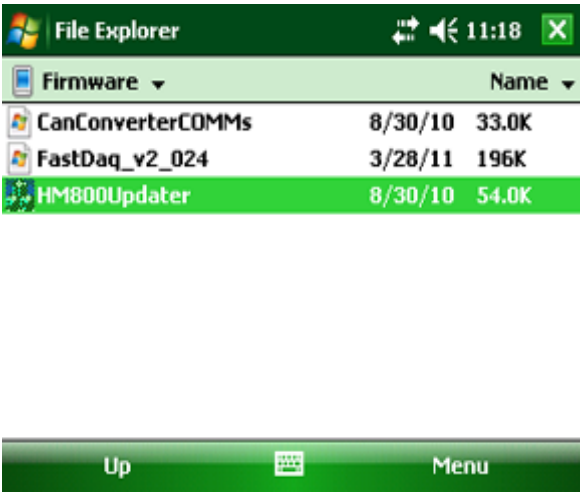


Figure 1-6: Select HM-800 Updater

4. Choose the file that contains the updated information.

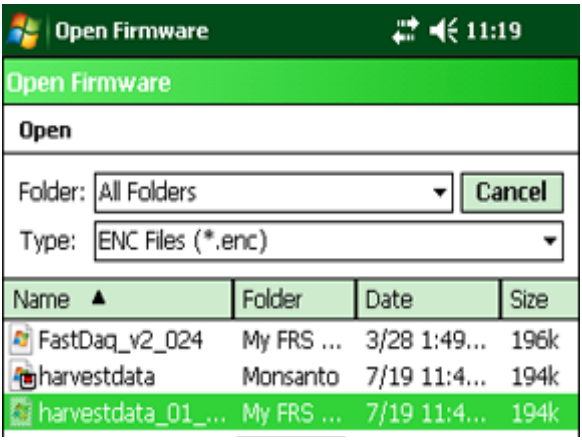


Figure 1-7: Select .enc file

5. Select the module you wish to update.

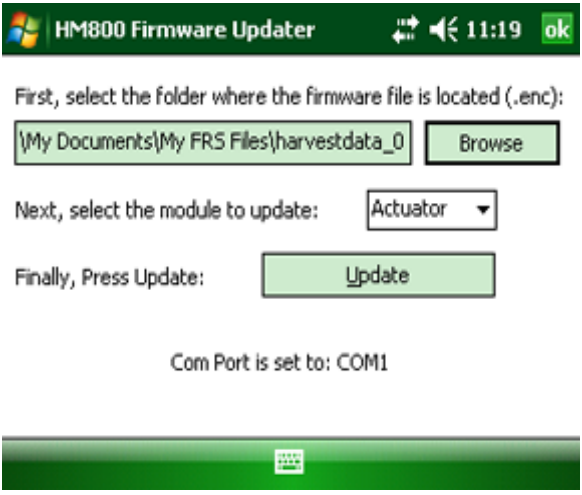


Figure 1-8: Select module to update

6. Click on Update and it will show the current firmware

version installed and give you the option of continuing.

7. If the versions do not match and the current firmware version is older than the new firmware version, select ***Yes.***

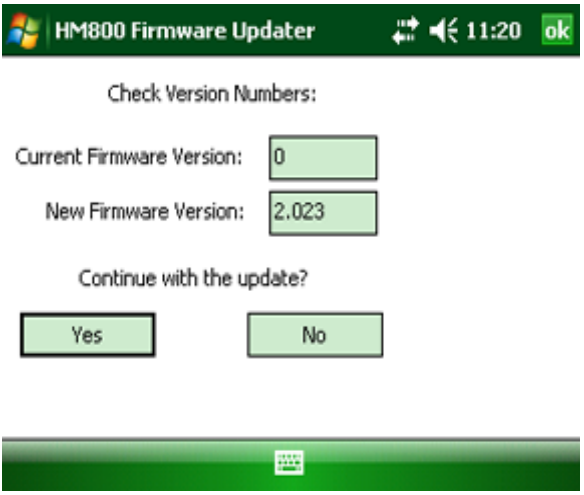


Figure 1-9: Select* Yes *to continue

8. Continue the firmware update for all HM-800 modules.

When the firmware update is complete, open FRS and type in your calibration settings that were previously recorded. If you never changed the transition timers on the actuators, we recommend leaving them at default to speed up operation. Verify the calibration and operation of the system. You will also need to import any data that you exported earlier such as maps, customized trait list, trait templates, existing data,

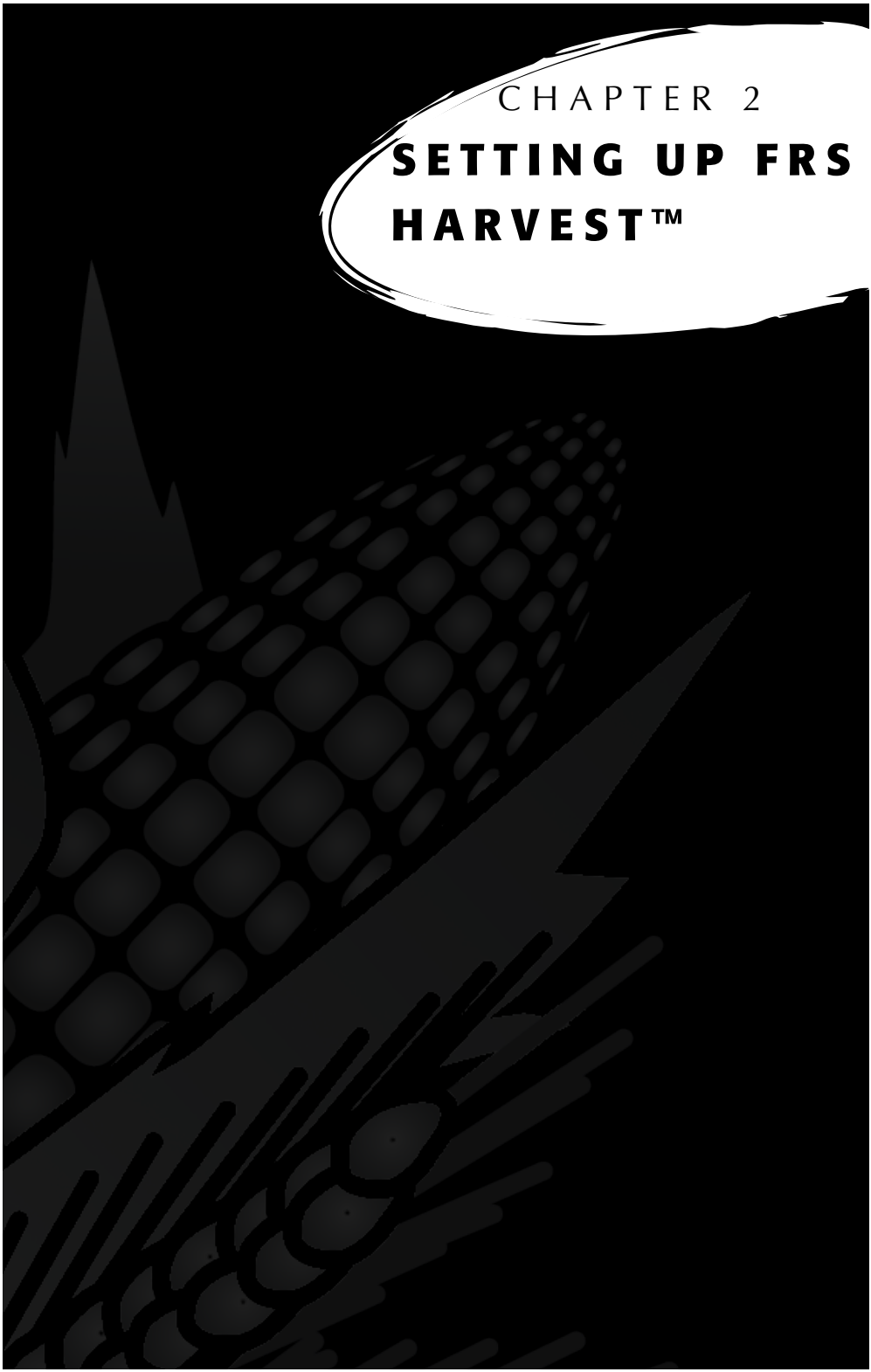
etc. Refer to chapter 7 of the FRS Field Reference Guide: Note Taking manual for further instructions on importing and exporting files.

Updating Datalink for FRS

1. First, you will need to uninstall the original version of Datalink for FRS from your PC.
2. After uninstalling the original Datalink for FRS, visit http://www.harvestmaster.com/updates and download the latest version of Datalink for FRS.
3. Run and install this latest version and your Datalink for FRS will be updated and compatible with the latest FRS version.

CHAPTER 2

SETTING UP FRS HARVEST™



Setting Up FRS *Harvest*™

Follow these steps to enable your Twin or Single High Capacity GrainGage to work with FRS ***Harvest.***

1. Make sure the cables between the control device and the handheld are set up properly so the software and hardware can communicate. For details about cable placement, see ***Appendix C: Cable Wiring for the HM-800.***

2. From the Main FRS Screen, select ***Setup*** (F3).

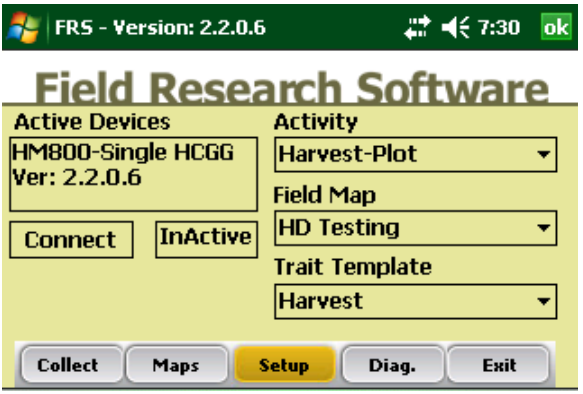


Figure 2-1: Choose* Setup *on the Main FRS Screen

3. The Setup menu appears. Tap on the plus sign [+] next to ***System*** or use the right arrow to expand the System option.

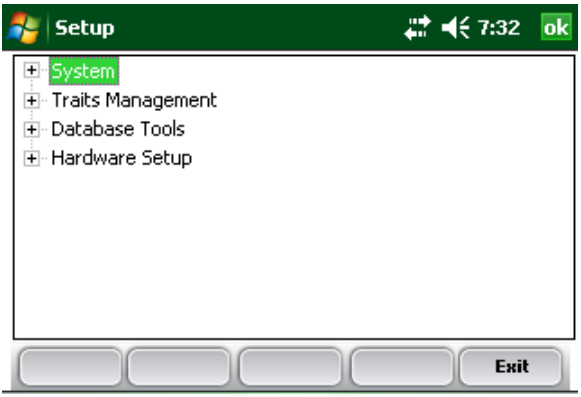


Figure 2-2: Setup menu

4. Select ***Manage Devices*** either by double-tapping it or by using the up or down arrow keys and pressing the Enter key.

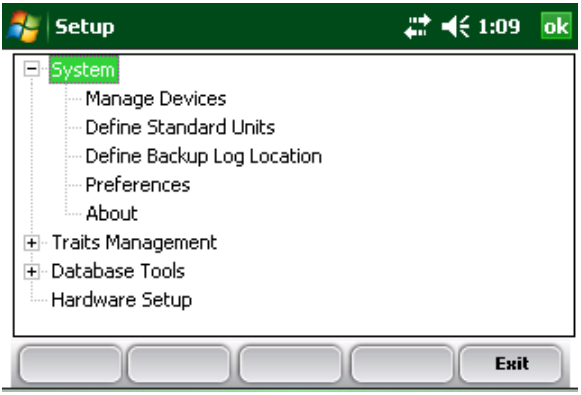


Figure 2-3: Setup menu with Manage Devices selected

5. In the Devices screen shown below, enable the Twin or Single High Capacity GrainGage by tapping on the

appropriate check box. You can also highlight the desired module using the navigation arrows and press the spacebar to check the box.

6. ***Note:*** Only one device can be enabled at a time.

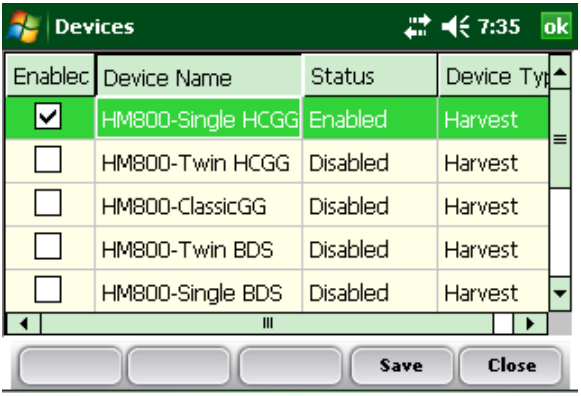


Figure 2-4: Devices screen showing the HM-800 Single HCGG as enabled

7. Press **Save** (F4). The software begins to load and checks to see if hardware devices are connected. Wait until the software has finished loading before proceeding to the next chapter.

CHAPTER 3

CALIBRATING AND PREPARING FOR HARVEST

Weight Calibration

EM Sensor (Moisture/Test WT)

Timers

Actuators

Setup File

Calibrating and Preparing the High Capacity GrainGage for Harvest

This chapter explains how to calibrate and set up your High Capacity GrainGage to work with FRS Harvest. The sections below describe the first- and second-level menu options in the Setup menu under HCGG Setup.

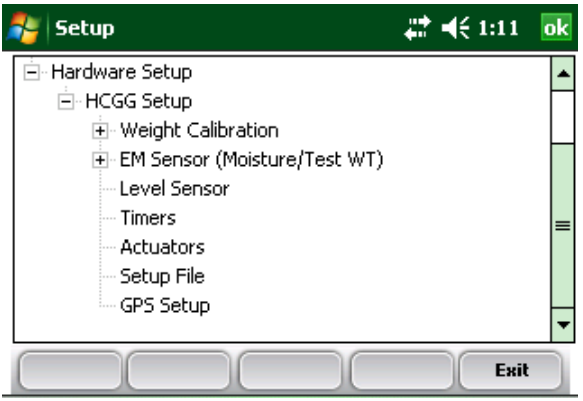


Figure 3-1: This chapter explains the options under HCGG Setup in the Setup menu

Weight Calibration

Before you can collect data using your High Capacity GrainGage, you need to first calibrate the weight of the load cells, edit the weight calibration for your data, enter the weight calibration for the Slope and Motion Sensor, and set the Retare Warning. The following sections explain how to

perform each task, each of which is listed as an option in the Setup menu under ***Weight Calibration.***

Load Cells—Calibration Wizard

Follow these steps to calibrate the weight for the load cells.

1. Select the units you wish to use by going to ***Setup > System > Define Standard Units***. Select English or metric units. Press ***Save*** (F4).
2. Arrow down to the Hardware Setup option and expand it by tapping the ⊞ or using the right arrow on the keyboard.
3. Expand ***HCGG Setup.***
4. Expand ***Weight Calibration.***
5. Turn off the Slope and Motion sensor.
6. Place the calibration plate in the top of the bucket.
7. Select ***Load Cells,*** as shown in Figure 3-2. Follow the instructions on the screen.

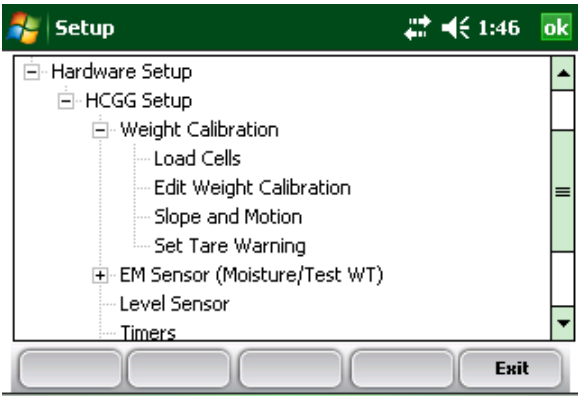


Figure 3-2: Setup menu with Load Cells selected

8. Enter the known value of your calibration weight in pounds or kilograms to the nearest hundredth. ***Example: 11.56 lb.*** Only the last four digits (three with a decimal point) will show.

Figure 3-3: Enter the weight calibration value

9. Select **Next** (F4) to move to the next screen.

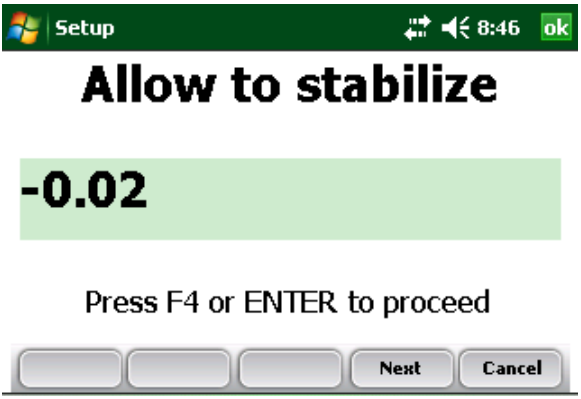


Figure 3-4: Load Cell Calibration screen

10. Allow the reading to stabilize, then select **Next** (F4). A new screen appears telling you to place a weight on one side of the bucket.

11. Place the known weight on one side of the bottom weigh bucket as far to the right side as possible (see Figure 3-5).

Figure 3-5: Place the weight on the right side of the weigh bucket

The Load Cell Calibration screen shows the weight reading (see Figure 3-6). The weight displayed may not equal the value of your weight. This is okay.

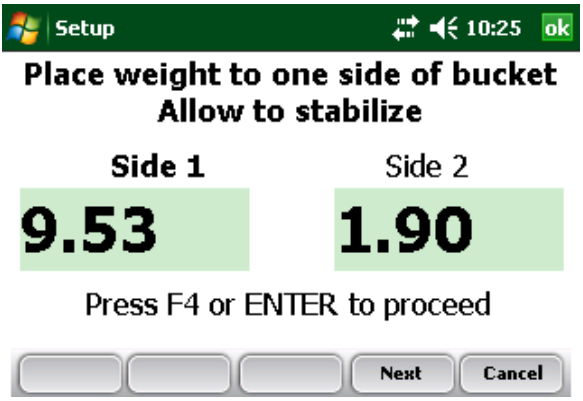


Figure 3-6: Load Cell Calibration screen after a weight is added

12. Select **Next** (F4) to move to the next screen.

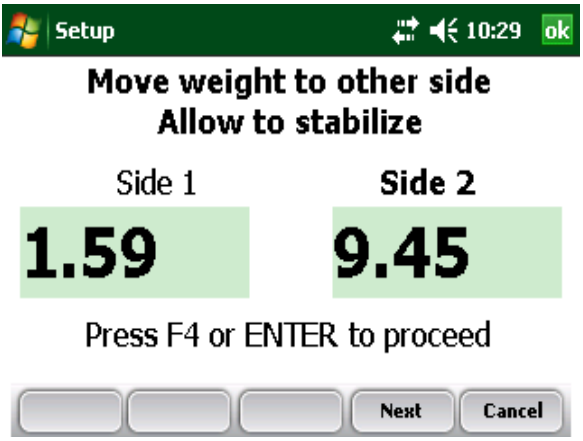


Figure 3-7: Load Cell Calibration with weight moved

13. Move the weight to the other side of the weigh bucket for calibration.

14. Select **Next** (F4) or press **Enter** to get a new weight reading. If the calibration was successful, new load cell calibration coefficients will be displayed under ***Current calibration coefficients*** along with the previous calibration coefficients.

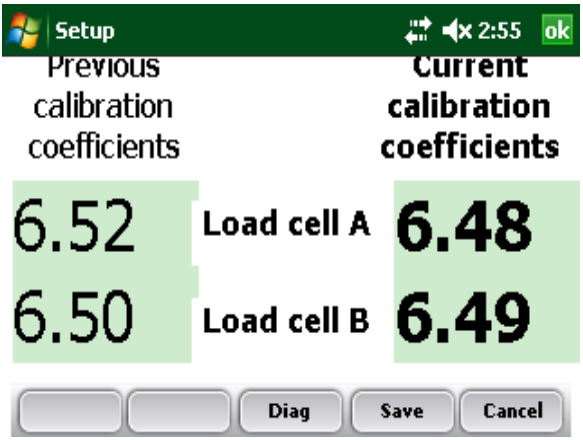


Figure 3-8: New and current calibration coefficients are displayed

Note: You can check your load cell calibration from this screen by selecting **Diag.** (F3). The Diagnostics screen appears. Select **Close** (F5) to close the Diagnostics screen and return to the last step in the calibration menu.

15. Select **Save** (F4) to accept the calibration changes and return to the Setup menu.

Edit Weight Calibration

You can manually adjust load cell calibration coefficients by selecting ***Setup > Weight Calibration >Edit Weight Calibration***.

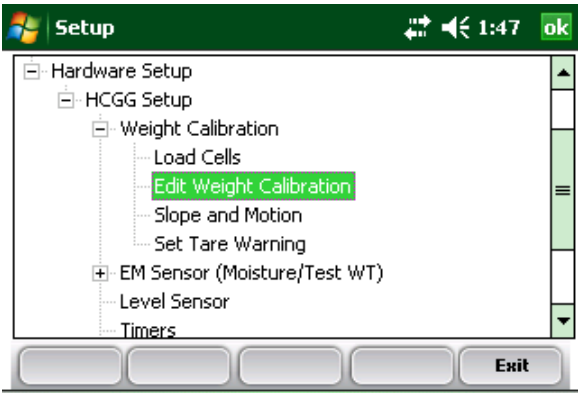


Figure 3-9: Select Edit Weight Calibration on the Setup menu

The Edit Weight Calibration screen appears, shown in Figure 3-11. If you know the load cell coefficients for each load cell, you can enter them here. If you do not know the coefficients, calibrate the load cell using the calibration wizard described earlier in this chapter.

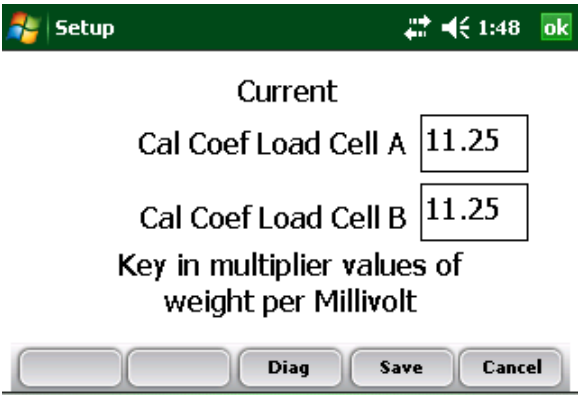


Figure 3-10: Edit Weight Calibration screen

Slope and Motion sensor

The Slope and Motion Sensor refers to patented technology used to eliminate errors created by combine vibrations and slope. The sensor lets you collect weight readings while the combine is in motion. To set the sensor, follow these steps:

Note: The Slope and Motion sensor should only be enabled when connected to the combine console. The system will malfunction if device is enabled when not connected to the console.

1. From the Setup menu, select ***Hardware Setup*** > ***HCGG Setup*** > ***Weight Calibration,*** then arrow down or select ***Slope and Motion.***

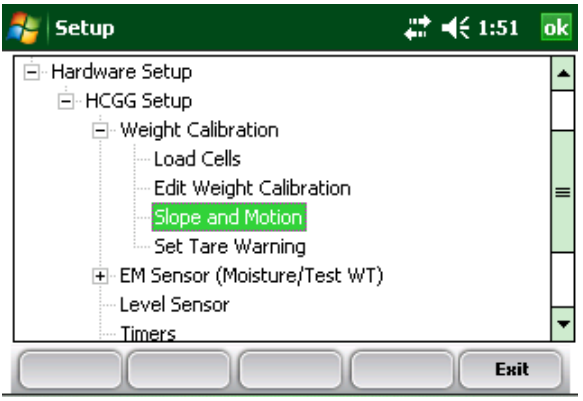


Figure 3-11: Setup menu with Slope and Motion selected

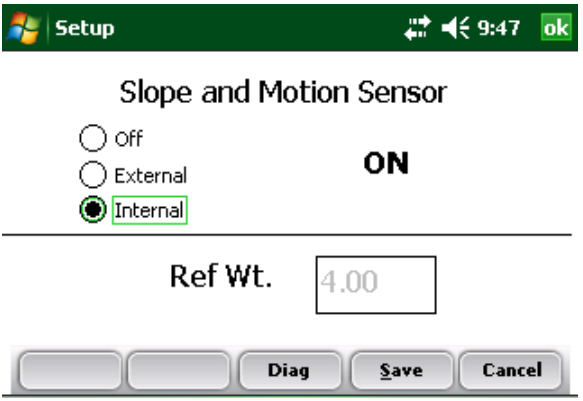


Figure 3-12: Select internal for HM-800 system

2. Park the combine on a level surface.
3. Select ***Internal*** to enable the Slope and Motion Sensor. Wait 10 seconds until the ON/OFF label in the center of the screen changes to **ON.**

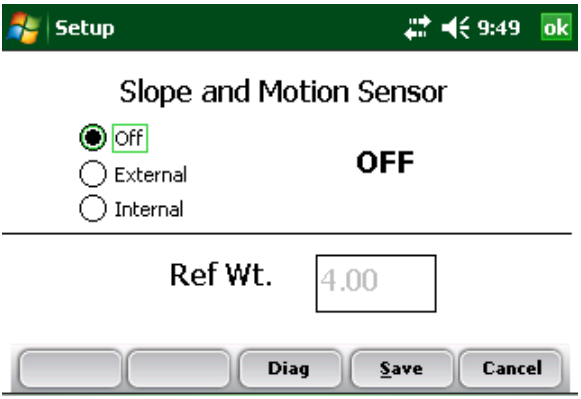


Figure 3-13: Slope & Motion Setup screen with the Slope and Motion Sensor turned off

4. To disable the Slope and Motion Sensor, press the ***OFF*** button.

Set Retare Warning

During harvest, the HCGG software checks that the bucket has returned to its tare or zero weight after the weigh bucket has been emptied. If the weight or moisture value does not return to the tare value (indicating that perhaps grain or trash has lodged in the plot bucket), an error message appears, indicating the system did not tare. If you see this error message, stop and check the bucket because the system does not stop cycling when this message appears.

To adjust the retare threshold (the point at which the error message appears) so that it checks the system more or less frequently, follow these steps:

1. From the Setup menu, select ***Hardware Setup*** > ***Weight Calibration*** > ***Set Retare Warning.***

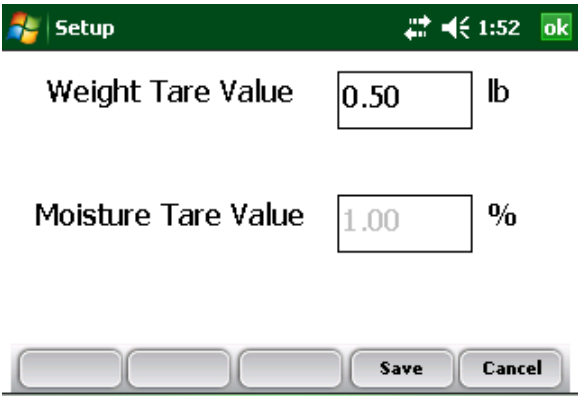


Figure 3-14: Set Retare Warning Values screen

2. Set the weight retare to the desired value.

Note: The default retare setting for the HCGG is 0.5 lb. The moisture default is 1% and is not adjustable.

EM Sensor (Moisture/Test WT)

The HCGG system uses the EM Grain Moisture sensor for both moisture and test weight measurement. Two options are available under ***EM Sensor (Moisture/Test WT): Moisture Curve*** and ***Test Weight Coefficients.*** Each option is described below.

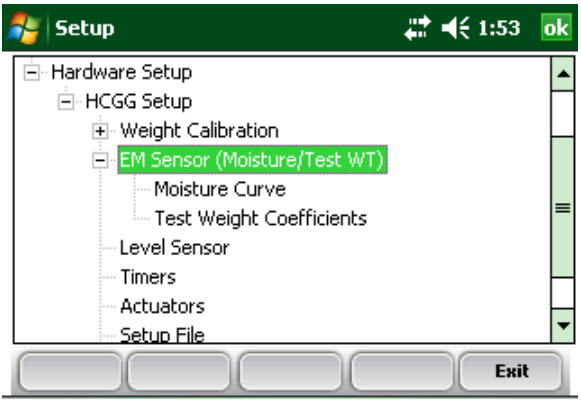


Figure 3-15: Setup screen with EM Sensor option selected

Moisture Curve

Editing a moisture curve

To edit a moisture curve, follow these steps.

1. Select **Setup** (F3), then choose ***Hardware Setup*** > ***HCGG Setup*** > ***EM Sensor*** > ***Moisture curve.***

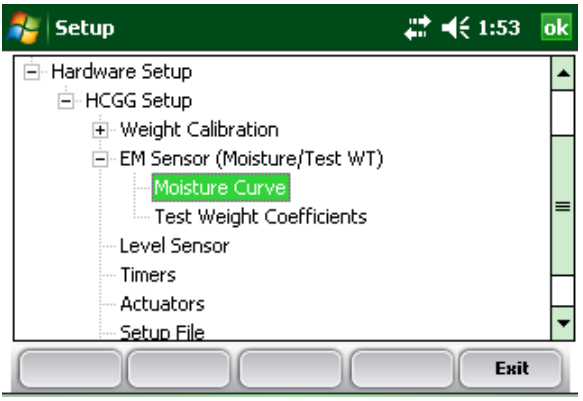


Figure 3-16: Setup screen with Moisture Curve screen selected

The Moisture Curve screen appears, listing any existing moisture curves and giving you the option to edit, delete, or copy moisture curves. Each of these actions is described in more detail below.

Note: When calibrating a curve or checking a curve the sample should NOT be stored in an airtight container. Condensation causes surface moisture, which will affect readings.

Note: The check mark next to one of the curves indicates the curve most recently used.

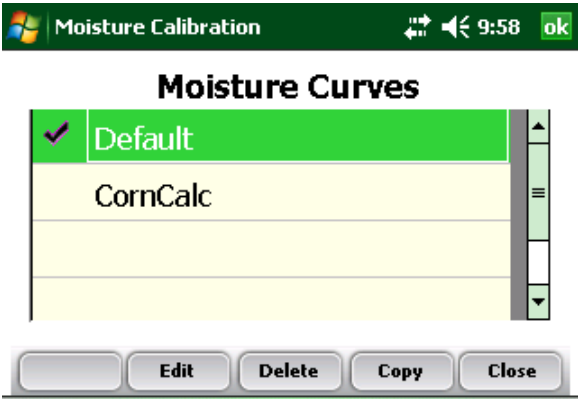


Figure 3-17: Moisture Calibration main screen

The Moisture Calibration screen lists all moisture curves that have been created. One of the curves is a ***Default*** grain moisture sensor curve that comes with FRS. It can be copied but not modified. The default curve consists of a set of known data points, which the system uses when making the moisture measurement on a sample of grain. When plotted in a spreadsheet, the default curve appears like the graph in Figure 3-18.

Default Moisture Curve	
Moist %	**MV**
0.00%	0.00
10.00%	1.22
13.00%	1.61
16.00%	1.93
19.00%	2.19
22.00%	2.41
25.00%	2.60
28.00%	2.77
31.00%	2.93
34.00%	3.07
37.00%	3.19
40.00%	3.30

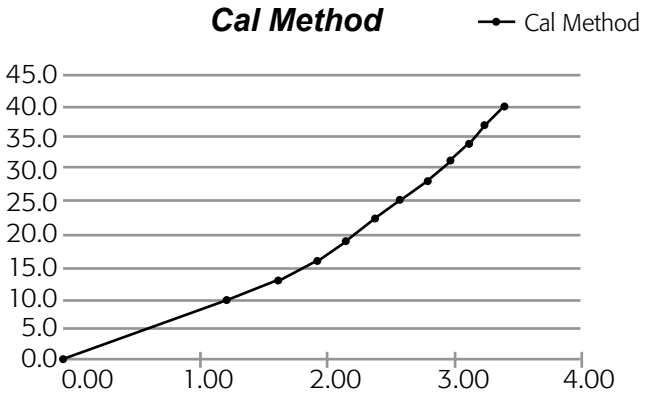


Figure 3-18: Default moisture curve as it appears in a spreadsheet (top) and as it appears in a graph (bottom)

1. Get a moisture reading on a grain sample. Ensure that the bench analyzer is properly calibrated or your readings will be off. Run the sample through the analyzer three to five times and average the readings.
2. To check moisture, choose **Diag.** (F4) on the main FRS screen then select ***Moisture.*** Record the Rel Vlts and the Moisture (%) from each sample that has been cycled through the grain gage. Compare the Moisture (%) reading with a known percent moisture from a standard.

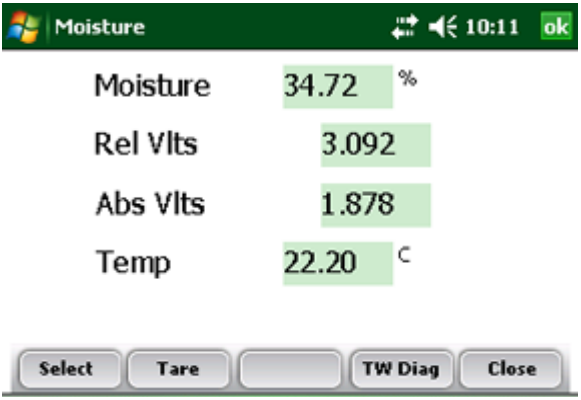


Figure 3-19: Diagnostics Moisture screen

3. Adjust the moisture curve by adjusting individual points in the curve. The following sections explain how to make adjustments to individual points, how to delete a curve, and how to copy a curve.

Note: We recommend creating a different moisture curve for each different grain type. A pre-calibrated moisture curve to aid in adjusting your moisture calibration

can be found on the HarvestMaster web site. This spreadsheet helps you adjust the points on the moisture curve to match your system.

4. To access the spreadsheet, go to ***www.harvestmaster.com*** and choose ***Support*** > ***Knowledge Base***. From there, select ***Moisture Sensor.*** Choose the link called HM-800 EM Sensor Moisture Curve Calculator (with suggested curves) to view the spreadsheet.

Moisture Calibration/Adjustment

Before re-calibrating the moisture curve, it is important to note that a simple check of the EM sensor readings is all that may be required. Simply dump a few known samples through the system and verify the readings. If the readings are within specifications, no further calibration is needed. However, if the readings significantly differ from a bench top moisture analyzer, the following calibration may be necessary.

Note: Before proceeding, ensure that the bench analyzer is properly calibrated.

Two known samples at ambient temperatures will help start the calibration process. Test these samples on a bench top moisture analyzer and record the readings. A sample with a moisture range of 12-15% and a sample from 23-26% will perform the best with the EM sensor.

NOTE: Do not use “re-wet” or “water-added” samples for the calibration process. The physical characteristics

of “re-wet” corn are significantly different than freshly harvested or naturally drying field corn and can adversely affect readings from the EM sensor. Storage of grain samples should be in unsealed containers to prevent the collection of surface moistures. The grain samples should be kept out of direct sunlight as it only takes a few minutes for the grain to start “sweating,” which can also affect readings. It is also important to note that when you are dumping samples through the system, you cycle the grain through the system as it would during normal harvest conditions. For example, if there are holding hoppers present, use the holding hoppers to dump the grain into the system.

5. Navigate to the moisture diagnostics menu and record the temperature reading from an empty bucket.

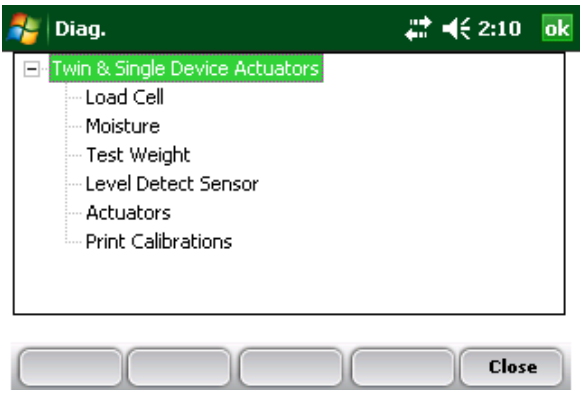


Figure 3-20: Diagnostics Menu screen

6. Dump the first sample into the system and record the REL volts. Repeat this at least three times.

7. Retrieve the first sample from the system for later use.
8. Dump the second grain sample into the system and record the REL volts for the second sample. Repeat this at least three times.
9. Retrieve second sample for later use.
10. Now that you have your readings from the HarvestMaster system, follow the instructions for the HarvestMaster moisture calibration spreadsheet located on our website at http://www.harvestmaster.com/HarvestMaster/support/Knowledge-Base.
11. Enter the moisture readings from your bench top moisture analyzer into the yellow column for moisture.
12. Enter the REL volts for both samples into the yellow column for volts.
13. Enter the temperature reading from the empty bucket into the yellow box for calibration temp.

Your new curve should now automatically generate. See **EM Grain Sensor Moisture Curve Calculator** following this section.

14. Once the new curve has been generated, create a new moisture curve in FRS and enter the values from the spreadsheet (***Setup>HCGG Setup>MoistureCurve***).

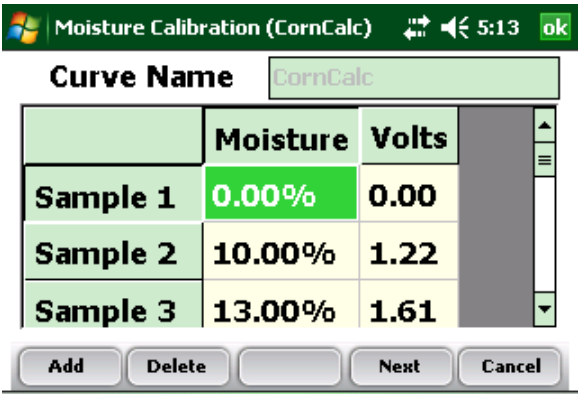


Figure 3-21: Moisture curve view

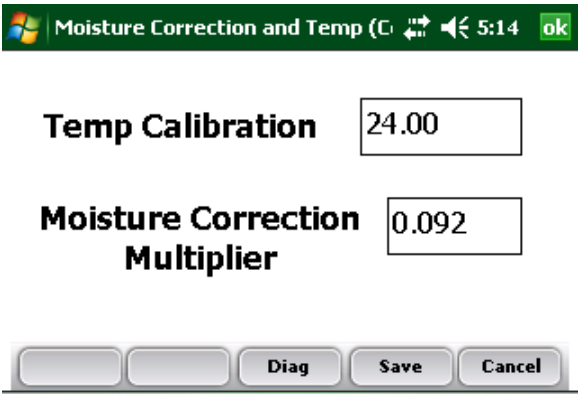


Figure 3-22: Temp compensation screen.

15. Save the new curve. Dump the samples back through the system to verify the readings. We also suggest dumping three to five samples of different moistures to verify readings throughout a moisture range that you may

encounter during harvest. You have now successfully calibrated your EM sensor!

EM Grain Sensor Moisture Curve Calculator

Instructions:

1. Activate the tare process in the grain moisture diagnostics screen with an empty chamber.
2. Cycle a known moisture DRY grain sample (e.g. 12% to 15% for corn) through the moisture sensor chamber. Write down the known moisture value, Temp, AND the "Rel Vlts" value. DO NOT use empty chamber readings for these values.
3. Cycle a wet grain sample (e.g. 23% to 26% for corn) through the moisture sensor chamber. Write down the known moisture value and the "Rel Vlts" value for the wet sample.
4. Enter the readings for the dry grain sample opposite the label "Dry Sample"in this spread sheet, Enter the readings for the wet grain sample opposite the label "Wet Sample."
5. After entering these values, the table of ordered pairs will be adjusted to match the two given points.
6. In the setup menu of the harvest data software, enter the values of the table below for the grain moisture sensor calibration curve.

Note: Unhiding lines 22 to 25 on the spreadsheet shows the equations that calculate the logarithmic fit characteristic of the EM Grain Sensor output with respect to grain moisture.

	% Moisture	"Rel Vlts"	
Dry Sample:	13.0	1.267	Dry Sample readings
Wet Sample:	25.0	2.550	Wet Sample readings
Generated Curve:			Cal Temp: 21.5
	10.0	0.752	
	13.0	1.267	
	16.0	1.674	
	19.0	2.012	
	22.0	2.299	
	25.0	2.550	
	28.0	2.772	
	31.0	2.972	
	34.0	3.153	
	37.0	3.319	
	40.0	3.472	

Table 3-1: Sample EM sensor moisture curve data points

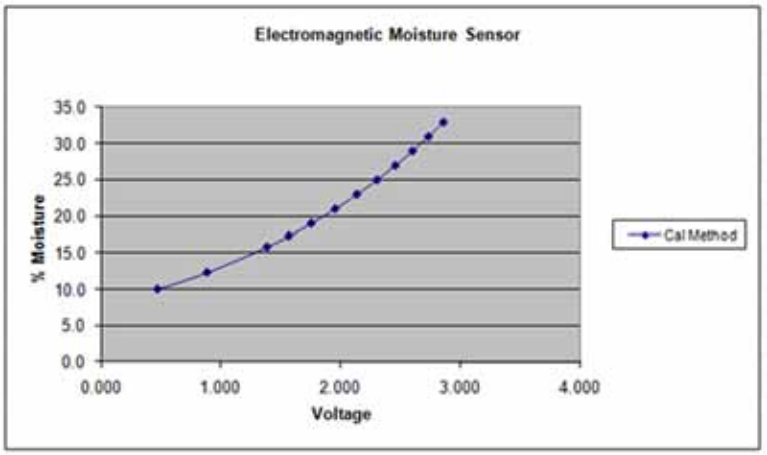


Figure 3-23: EM Sensor moisture curve

Fine Tuning Moisture Curves

If any adjustment is needed to the curve, you can easily adjust the moistures up or down in the curve. First, verify the moistures high or low that the EM sensor is reading and adjust the moistures in the opposite direction in the table of the curve. The example below will clarify this procedure. (Actual moistures and voltage you experience may differ from below.)

In the example below, the EM sensor was reading 1% high, therefore you can adjust the moisture percentages in your curve down by 1%.

Sample 1 = 13.5 % EM reading=14.5%

Sample 2 = 25% EM reading= 26%

Adjusted Moisture	Moisture	Volts
0	0	0
9	10	1.22
12	13	1.61
15	16	1.93
18	19	2.19
21	22	2.41
24	25	2.61
26	27	2.77
28	29	2.93
31	32	3.07
34	35	3.19
37	38	3.3

Table 3-2: Moisture Curve Points

Deleting a Curve

The ***Delete*** option in the Moisture Curve menu allows you to remove unwanted moisture curves. To delete an unwanted moisture curve, follow these steps:

1. Select the curve you want to delete and press **Delete** (F3).

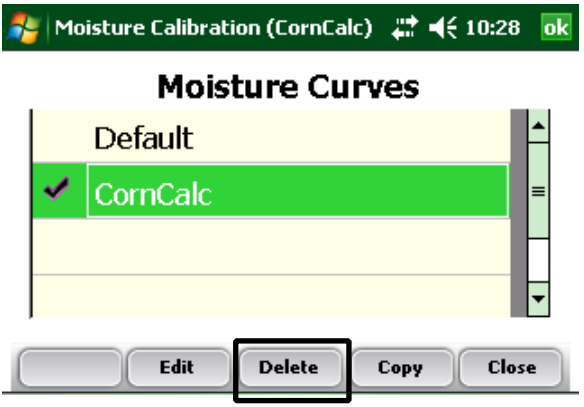


Figure 3-24: Delete a moisture curve by selecting it and selecting* Delete *(F3)

2. Confirm the delete by selecting ***Yes*** or ***No***.

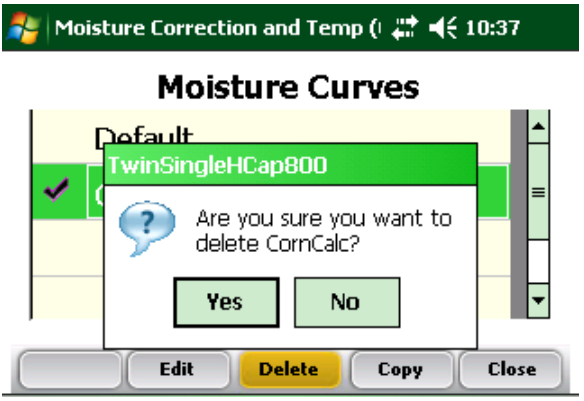


Figure 3-25: Warning screen requires you to choose Yes or No

Copying a Curve

The Default Moisture cannot be modified. To make changes to this curve, you must first make a copy of it. Follow these steps to copy a curve:

1. Select the moisture curve you want to copy or rename and then press **Copy** (F4).
2. Type in the new name of the moisture curve, make any desired changes, then press **Next** (F4).
3. Press **Save** (F4) to save the file and exit the screen.

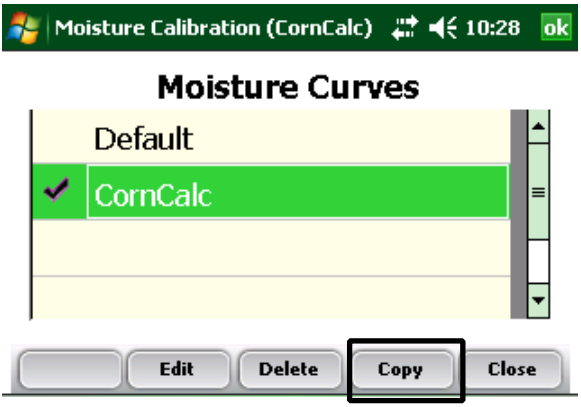


Figure 3-26: Copy a moisture curve by selecting it and selecting* Copy *(F4)

Test Weight Coefficients (test weight calibration check)

Note: If your systems is equipped with a Bulk Density Sensor, refer to Chapter 4 for setup and calibration.

After you have adjusted the moisture curve but before you do any weight measurements, prepare to gather the needed test weights by following these steps:

Note: It is critically important that the moisture is properly calibrated before starting. If not, all calibrations will need to be repeated.

1. From the Main FRS screen, Select **Setup** (F3), then ***Hardware Setup*** > ***HCGG Setup*** > ***EM Sensor*** > ***Test Weight Coefficients.*** The Test Weight Coefficient screen appears.

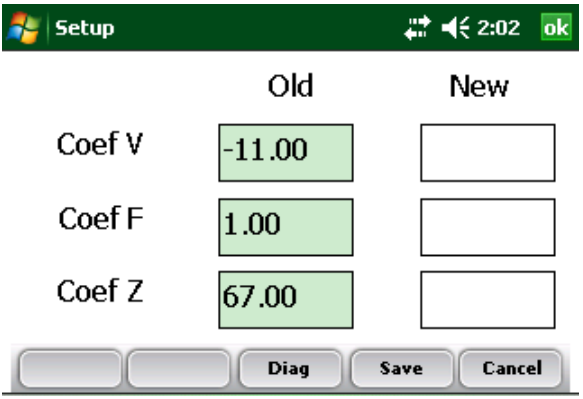


Figure 3-27: Test Weight Coefficient screen

Test Weight is determined by changes in the voltage and frequency of the EM Grain Sensor rather than by volume methods. Coefficient V (CoefV) and Coefficient F (CoefF)

values have been optimized. **DO NOT ADJUST THEM.**

To adjust test weight measured by the EM Grain Sensor, adjust Coefficient Z, as explained below.

1. Coefficient Z is an offset adjustment used to adjust the measured test weight positively or negatively to match the actual test weight. In the event that the measured test weight is higher than the actual test weight, decrease the Coefficient Z. The example below aids in this adjustment.
2. Before adjusting the Test Weight Coefficient Z, get to know the following terms.
    - **Actual test weight** is the true test weight of the grain as measured by a USDA or other standard method
    - **Measured test weight** is the test weight measured by the EM Grain Sensor and the GrainGage
3. To adjust your test weight reading, determine the actual test weight of the grain sample by using a USDA quart cup or some other standardized method. Enter the diagnostics screen by selecting **Diag** (F3) to see the measured test weight and then pour the grain sample into the weigh bucket
4. Use the formula below to figure out how much to adjust Coefficient Z to create the New Coefficient Z value.

Actual Test Weight – Measured test weight = Coefficient Z adjustment value

For example, if the system produces a measured test weight of 54.52 lb./bu. (pounds per bushel) but the actual test weight was 53.52 lb./bu, then you would need to decrease the Coefficient Z value by 1.

Figure 3-28: Example shows Test Weight

53.52 lb./bu. – 54.52 lb./bu. = –1.00 lb./bu.

In Figure 3-29, the Coefficient Z value is 67.00, so changing the Coefficient Z value by –1.00 changes the new Coefficient Z to 66.00.

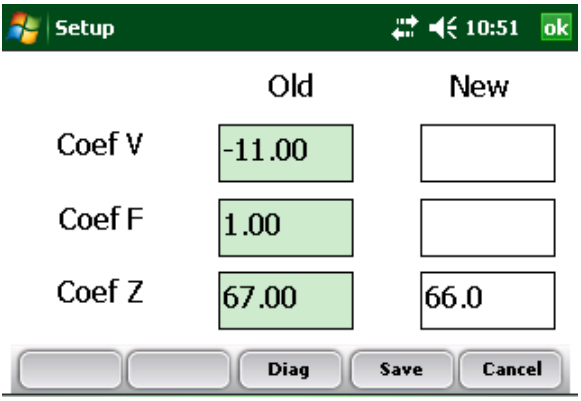


Figure 3-29: The new Coefficient Z value in this screen differs from the old value by –1.00

Level Sensor

The level sensor is used to automatically cycle the system when harvesting strip tests or plots longer than can be completely weighed in one cycle of the system.

To view or change the settings of the level detect sensor, follow these steps:

1. Choose **Setup** (F3) on the main FRS screen, then select ***Hardware Setup*** > ***HCGG Setup*** > ***Level Sensor.***

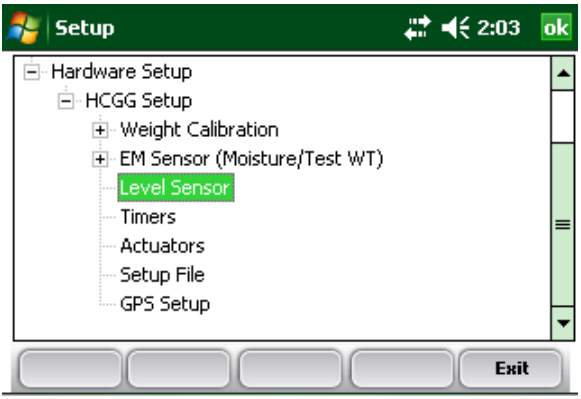


Figure 3-30: Choose Level Sensor from the Setup menu

2. The Level Detect Sensor Settings screen appears (see Figure 3-31).

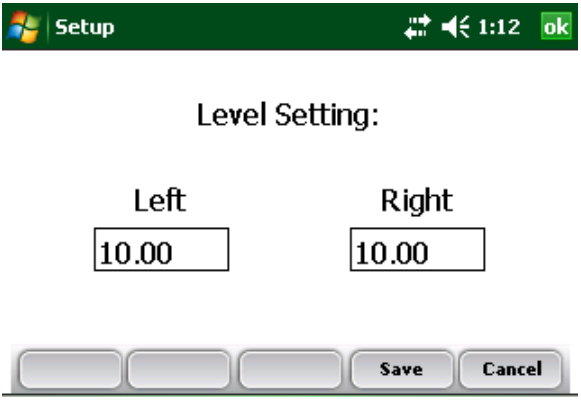


Figure 3-31: Level Detect Sensor Settings main screen

3. For most grains, set the level sensor to 3.0. The level's setting indicates the trigger point of the level

sensor while harvesting in strip mode. A higher value corresponds to a less sensitive operation, which allows more grain to fill the bucket before beginning a measurement sequence.

4. Select **Save** to save the settings or **Cancel** to exit.

Timers

The Timer screen is used to adjust various timers used with the system. Each of these timers can be adjusted using the Timer Setup screen, which is available by choosing **Setup** (F3) from the main FRS screen then selecting ***Hardware System*** > ***HCGG Setup*** > ***Timers.*** The legends are defined as follow:

- **Hopper Open.** The amount of time the hopper door remains open before beginning the close process. ***Note:*** 1.00=1 second.
- **Plot Open.** The amount of time the plot door stays open before starting the close process.
- **Weigh time.** The amount of time data is collected and averaged to determine the actual weight reading
- **CountDown timer.** The amount of time from when the enter key is pressed until the system starts to cycle. Usually equal to the time it takes for the combine to clean out or the time it takes for the last grain kernels to travel from the head of the combine to the hoppers. ***Note:*** 1.00=1 second.

Figure 3-32: Timer Setup screen

Note: Timer settings shown may not be accurate for your version of FRS. Please refer to ***www.harvestmaster.com>support>documentation>FRS 2 Note Taking guide> Release Notes*** for the proper settings.

Actuators

The Actuator Setup screen is used to select the appropriate type of actuator and transition times for your system. To access the screen, choose **Setup** (F3) on the main FRS screen then select ***Hardware Setup*** > ***HCGG Setup*** > ***Actuators.***

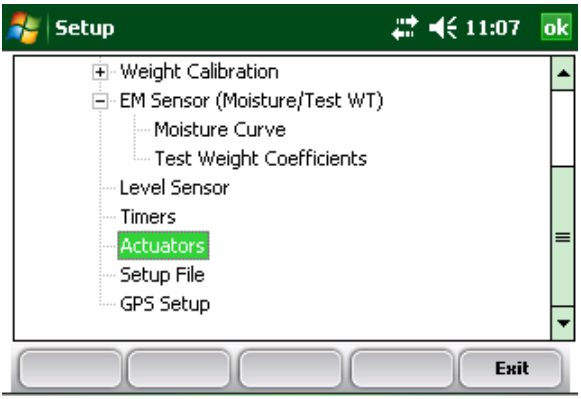


Figure 3-33: Select* Actuators *from the Setup menu to access the Actuator Setup screen

Once you see the Actuator Setup screen, select the appropriate actuator type from the drop-down menu for each actuator.

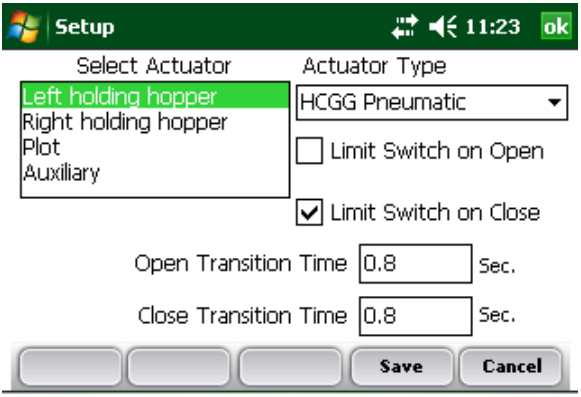


Figure 3-34: Actuator Setup screen

If limit switches are being used, check the boxes accordingly. If limit switches are not being used, enter the time in seconds

needed for the stroke of the actuator to fully extend or retract. In the example above, the limit switch is enabled for the Left Holding Hopper on the closing transition only. On the opening transition, a time of 0.8 seconds controls the actuator. See our website for correct timer settings.

Setup File

The ***Setup File*** option on the Setup menu is a way to establish specific settings for a specific machine. This is helpful if you want to use your handheld with more than one combine. The steps below explain how to establish setup files for two combines.

1. Set up and calibrate one combine.
2. On the FRS main menu, select **Setup** (F3). Expand the **Hardware Setup** option to reveal **HCGG Setup**. Expand that list to reveal **Setup File**. Select that. A list of existing setup files appears.

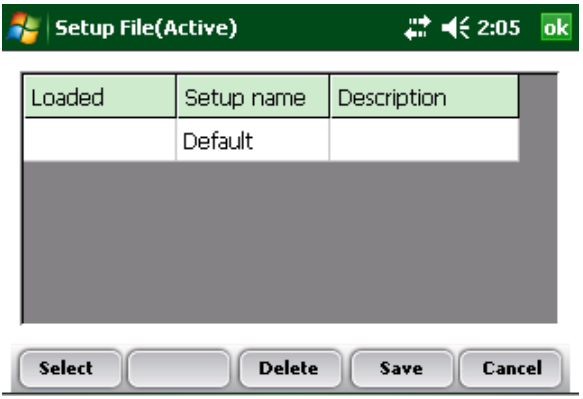


Figure 3-35: Setup files that appear by default

By default, the settings you created when you set up and calibrated the handheld were saved to the Default setup file.

3. To create a setup file for a second combine, select **Save** (F4).

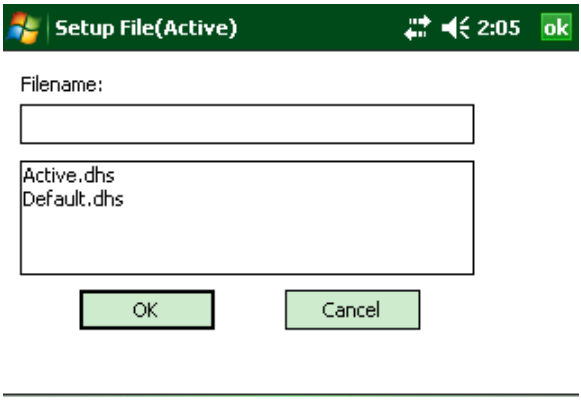


Figure 3-36: Naming a new setup file

4. Create a name for the second setup file.

5. Repeat steps one and two. The new setup file appears.

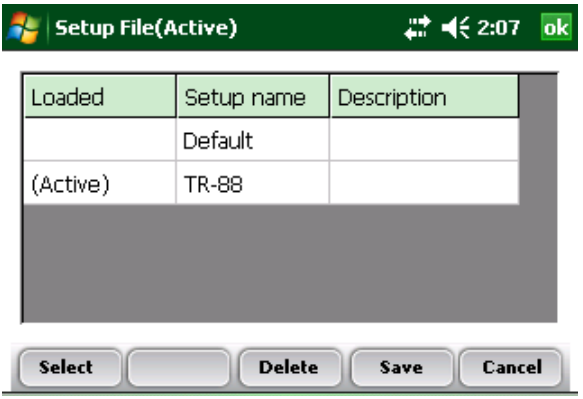


Figure 3-37: The new setup file appears

6. As you can see in the first column, this second setup file is now the active file, which means that any setting and calibrations changes you make are automatically saved to that file. To make another setup file active, select it then select **Select.**

To create setup files for additional machines, repeat the process.

CHAPTER 4

BULK DENSITY SENSOR

Bulk Density Sensor

Bulk Density Sensor

Bulk Density Sensor

The Bulk Density Sensor (BDS) is an innovative design to measure grain test weight in the HarvestMaster High Capacity CrainGage. The BDS measures test weight using the traditional volumetric method. The BDS is compatible with all HM-800 Twin and Single High Capacity GrainGages.

Figure 4-1: BDS cup inside bucket and outside of bucket

The central parts of the BDS include a precision load cell, cylindrical volume cup with dumping door, and a leveling arm. These items are mounted inside the weight bucket of the High Capacity GrainGage.

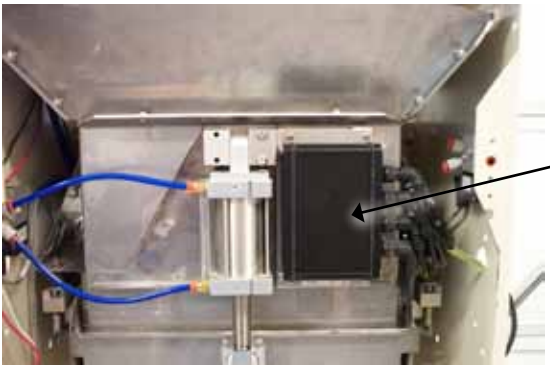


Figure 4-2: Picture of BDS Hybrid Module on bucket.

Electronic control and measurement for the BDS is performed by the HM-800 Hybrid Module. This module controls the cycling of the door that empties the BDS cup and the sequence of leveling arm used to clear excess grain off the BDS cup. The BDS Hybrid Module also provides an analog input for the precision load cell.

A unique feature of the BDS Hybrid Module is its internal motion compensation. This feature internally compensates the final BDS test weight data to account for vibrations and movement that typically occur when measurements are made on the combine. These vibrations can cause errors in the resulting test weight data. With the internal compensation, BDS test weight data accuracy and repeatability is superior over other standard methods of test weight measurement.

Inputs to the BDS Hybrid Module are as follows:

- LC (Load Cell Input)
- PWR (+12v Power)
- CAN (communications from BDS Hybrid Module to the HarvestMaster system)
- ACT (actuator input for the BDS Cup Door and Level Arm)

The BDS Hybrid Module also includes LED diagnostics for troubleshooting and communications. LED function is outlined below.

- PWR—solid Green LED when 12v power is applied
- RX—Flashing Red LED indicating data is being received by the BDS Hybrid Module. When no data is being sent to the hybrid, this LED remains unlit.
- TX—Flashing Red LED indicating data is being transmitted from the BDS Hybrid Module. When no data is being sent from the module, this LED remains unlit.
- IND—Flashing yellow light every second indicates the BDS Hybrid Module is functioning correctly

Refer to Figure 4-3 for location of connectors and LEDs.

Figure 4-3: Side view of BDS Hybrid Module showing connectors and labels.

Wire Diagram - *HM-800*

In applications where the BDS is used with HM-800 Systems, the BDS Hybrid Module communicates from the CAN communications connector to the CAN Breakout box located inside the High Capacity GrainGage. The short CAN Terminator normally installed on the CAN Breakout box should be moved to the **CAN Diagnostics** port found on the HM-800 Analog module. Refer to the HM-800 Wire Diagram for further information.

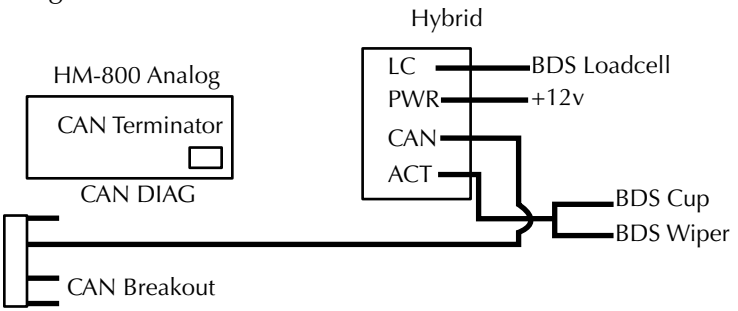


Figure 4-5: HM-800 Wire Diagram

Figure 4-6: Analog module showing CAN Terminator

FRS with BDS

To start using the BDS system, the BDS High Capacity GrainGage software should first be installed onto the handheld. The BDS module can then be enabled. Refer to the section on installing FRS software found in Chapter 2 of this User's Guide.

Enable Twin/Single Bulk Density Sensor

To enable the Bulk Density Sensor (BDS), select **Setup** (F3) from the main FRS Screen. Expand the System tree and go to **Manage Devices**.

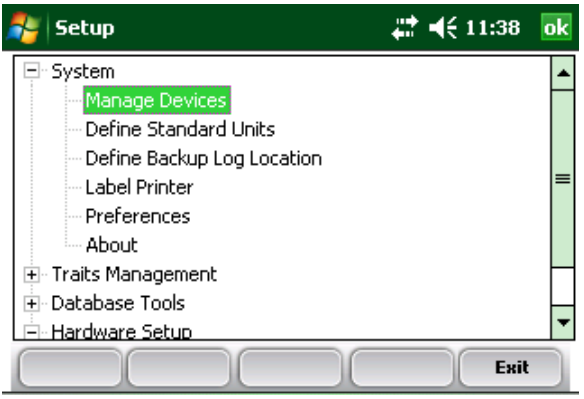


Figure 4-7: Manage Device Setup screen

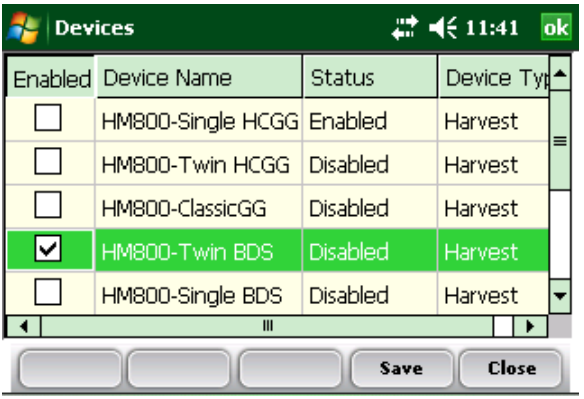


Figure 4-8: Enable BDS screen

The BDS module can be enabled by highlighting the selection and tapping on the screen to select or by pressing the space bar. Press **Save** (F4) to save and exit.

BDS Calibration and Setup

To calibrate the BDS, select **Setup** (F3) from the main FRS screen.

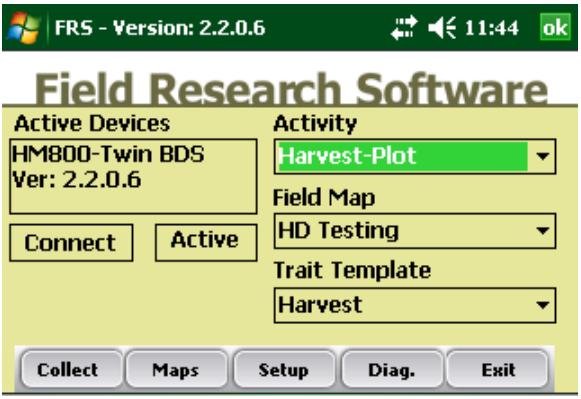


Figure 4-9: Main FRS screen

From the Setup menu, arrow down to HCGG Setup. Expand this menu tree and arrow down to the Test Weight menu item. Press **Enter**.

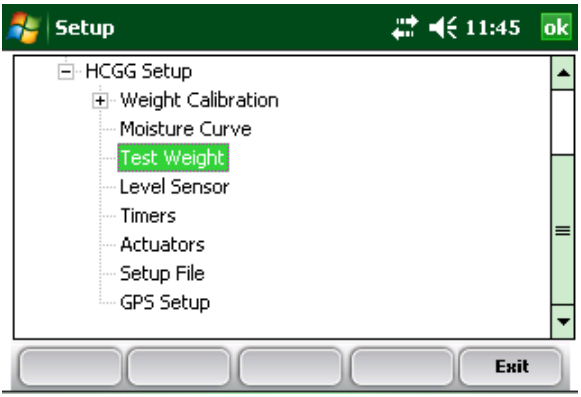


Figure 4-10: BDS Setup Screen

Description of BDS Setup screen

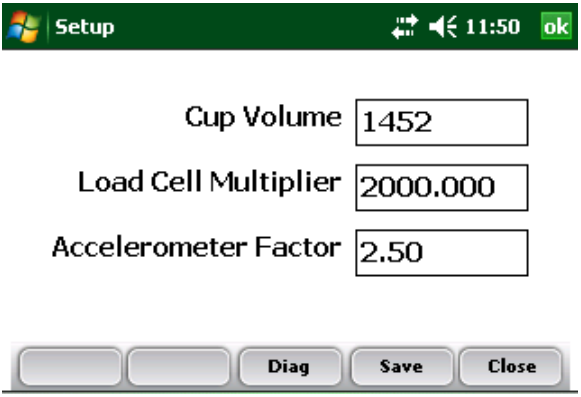


Figure 4-11: Test Weight Setup Screen

Cup Volume

The Cup Volume is used to adjust the actual volume of the BDS cup to account for difference in grain compaction and grain types. We recommend checking the Test Weight accuracy and adjusting cup volume for each type of crop harvested. Typical value is between 1450 and 1550 counts. Units for the cup volume do not change between English and Metric units.

Load Cell Multiplier

The load cell multiplier is used to adjust the calibration of the BDS based on variation in the load cells. For greatest accuracy the load cell multiplier for each BDS system should be calculated.

Typical value for the Load Cell Multiplier is 2000. Depending on the response of your BDS load cell, this value may change.

Accelerometer Factor

The Accelerometer Factor (AF) setting for the BDS is generally set to a value between 2.00 and 2.70. Its purpose is to "amplify" the correction factor for vertical motion sensed by the Bulk Density Sensor (BDS) signal conditioning unit during a measurement. To disable the slope and motion compensation for BDS readings, set the Accelerometer Factor to 0.00. Refer to "Setting the Accelerometer Factor (AF)" section below.

BDS Calibration and Verification

Weight Calibration

The first step to calibrating the BDS system is to set the load cell multiplier and verify accuracy against a known standard weight. A precision weight for calibrating the BDS is included with each BDS system.

Figure 4-12: BDS Calibration weight.

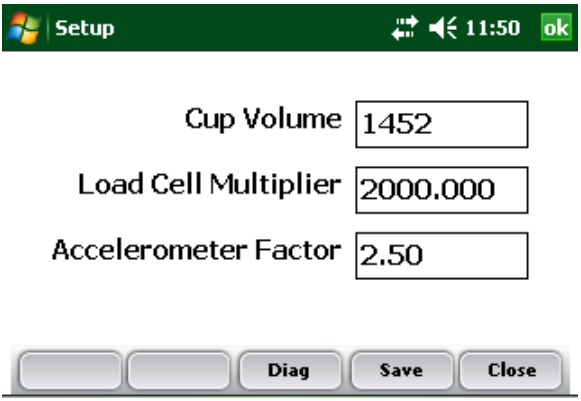


Figure 4-13: Test Weight Setup Screen

To adjust the Load Cell Multiplier, enter Diagnostics by selecting F3. Tare the LC and Accelerometer by pressing F1 then F2 in the Diagnostics screen.

Note: It is important that the combine be turned off and as level as possible before setting the Tare on the Accelerometer.

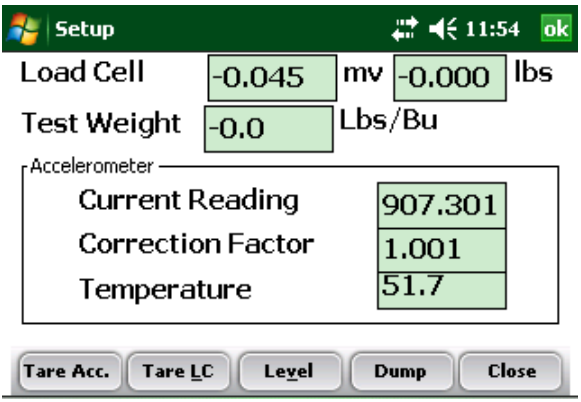


Figure 4-14: Diag TW screen

Place the BDS Calibration weight inside the BDS cup and observe the weight reading in the diagnostics screen.

Figure 4-15: Placing BDS Weight in BDS cup

If the weight reading observed in diagnostics does not match the actual value of the calibration weight, use the following formula to adjust the Load Cell Multiplier.

New Load Cell Multiplier=
Actual Weight/BDS Measured Weight * Load Cell Multiplier

As an example, assume your test weight value is 2.789 lb., your measured weight in the BDS cup is 2.856 lb., and your load cell multiplier is 2000. You would divide 2.789 by 2.856, and multiply the result by 2000. This would give you a new load cell multiplier value of 1953.081.

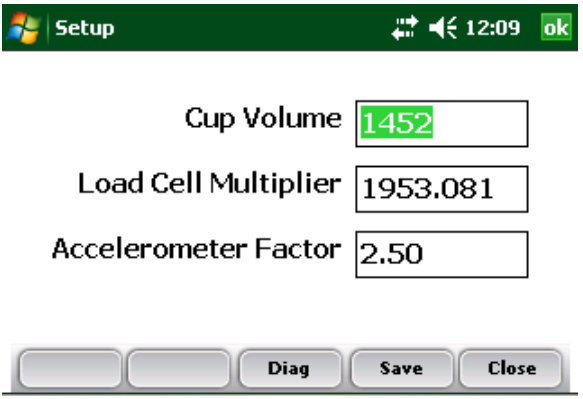


Figure 4-16: Test Weight Setup Screen

Key the new Load Cell Multiplier into the text box. Press **Save** (F4). Check load cell calibration in Diagnostics and repeat tare and calibration if necessary.

Test Weight Calibration

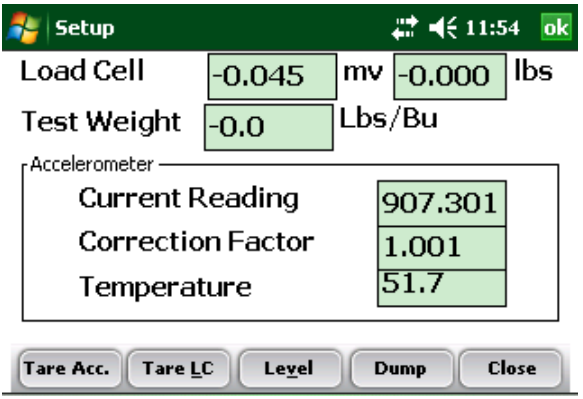


Figure 4-17: Diag TW with empty cup

Note: To get the best results, always dump the grain through either the upper hoppers or an auxiliary gate before measuring. By controlling the way the sample fills the cup, error in calibration is reduced.

Pour a known test weight sample into the BDS while in the Test Weight Diagnostics screen. Press **Level** (F3) to level the grain to the top of the cup. Observe the Test Weight reading in the diagnostics.

Note: Check that the grain sample in the High Capacity Weigh Bucket is not touching the bottom or sides of the BDS cup. We recommend that you open the Weigh Bucket when pouring and verifying a grain sample.

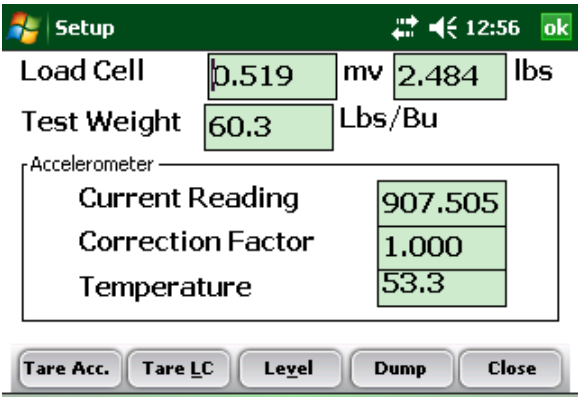


Figure 4-18: Diag TW with grain

If the test weight reading of the BDS does not match the known test weight of the grain sample, adjust cup volume using the formula below.

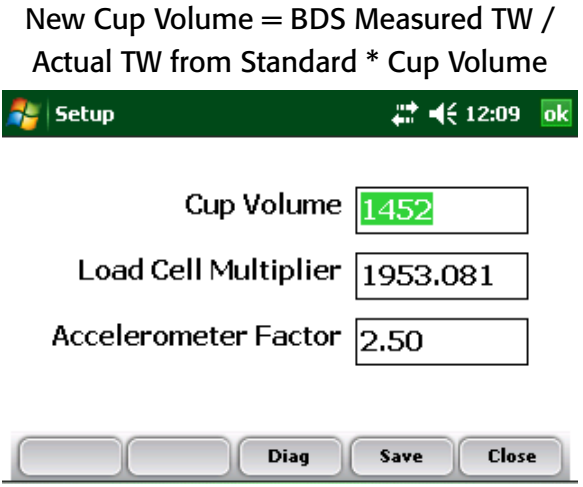


Figure 4-19: Diag Setup Screen

Key in the new cup volume into the setup menu then verify BDS test weight measurement again by dumping the grain sample into the BDS cup.

Setting the Accelerometer Factor (AF)

With the BDS installed and operational, use the following method to find the setting best suited for the harvester on which the system is installed. Have a fairly level area (e.g. empty parking area or a field) where the harvester can move forward and stop to simulate harvesting plots.

1. Set the BDS calibration weight in the top of the BDS sample cup.
2. Make observations in the test weight diagnostics screen to see which AF settings give the best results with harvester vibration and harvester motion. The harvester

motion should include the up/down jolting of the machine that occurs with up/down positioning of the head.

3. With the BDS calibration weight on the cup and the machine still, Test Weight Diagnostics will display a constant weight typically around 2.50 lb. (61.016/bu.) or the value of the BDS calibration weight. Determining the best AF value is an exercise in successive approximation, observing the diagnostics weight value for minimum variance while subjecting the machine to separator vibration as well as harvester forward/back motion and head up/down motion.

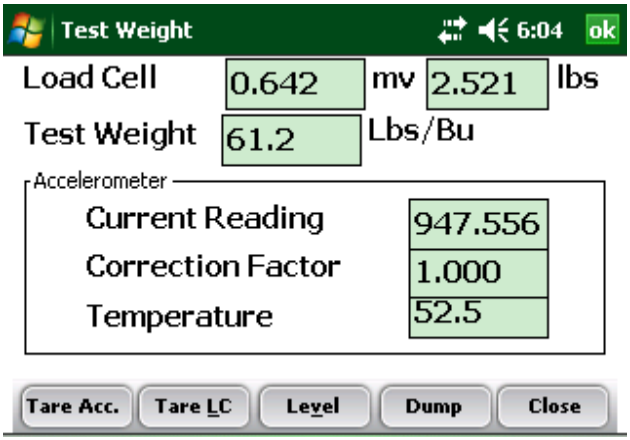


Figure 4-20: Test Weight Diagnostics screen

4. Begin with AF = 2.55 (default value). Note the diagnostic weight value range with each of the harvester motions (separator and head running, forward/reverse harvester motion, and head up/down motion).

5. Perform subsequent repeats of step four with AF equal to values of 1.5, 2.0, 2.5, and perhaps even 3.0. There should be a range of AF values in which the variable of the diagnostic test weight reading is minimized. Typically the Test Weight reading should not vary more than ±0.5 lb./bu. while moving the combine head.

These calibration factors (Load Cell Multiplier and Accelerometer Factor) should be very stable for a given installation, and they should not change from year to year.

BDS Diagnostics

The Diagnostics Test Weight menu allows you to view readings associated with the Bulk Density Sensor (BDS), which is used to measure test weight volumetrically. This following information appears on the screen.

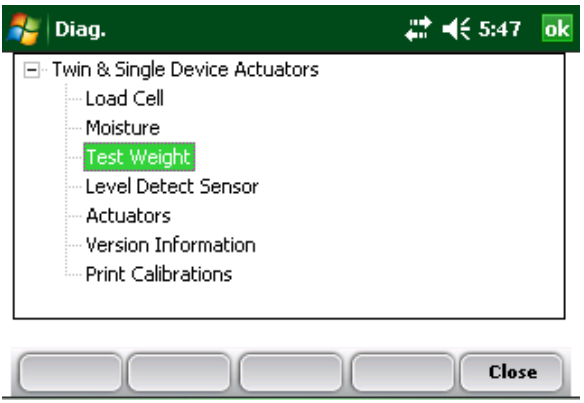


Figure 4-21: Diag Setup Screen

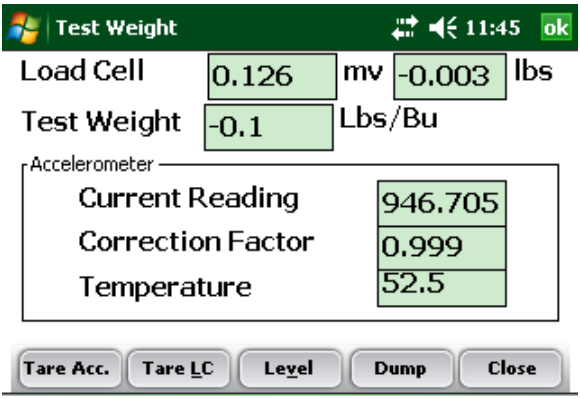


Figure 4-22: BDS Diag Screen

Load Cell

The millivolt reading for the load cell used with the BDS sensor is displayed along with the corresponding weight reading in lb. or Kg. By placing a known weight in the BDS cup, the weight accuracy can be verified.

Test Weight

Shows the converted test weight in lb./bu. or Kg/hL as measured by the BDS cup.

Accelerometer

Current Reading

Shows the current voltage reading from the internal accelerometer used to compensate BDS data readings to eliminate vibration errors.

Correction Factor

The amount of correction or compensation applied by the BDS to the test weight reading. A correction factor of 1.000 indicates no compensation.

Temperature

Temperature of the BDS circuitry used for troubleshooting and monitoring of the BDS compensation.

Function Keys

- **Tare Acc. (**F1**).** Sets the tare or reference value for the accelerometer. This should only be selected when the combine is turned off and level.
- **Tare LC** (F2). Sets the tare or zero point for the BDS load Cell.
- **Level** (F3)**.** Extends the BDS cup level arm to provide uniformity in the amount of grain in the cup.
    - To test BDS test weight accuracy, dump a grain sample into the holding hoppers then open hoppers to fill BDS cup. Press **Level (**F3) to level the grain in the cup. Record the value displayed in the Test Weight reading and compare this reading from the BDS to a known sample test weight. To adjust, refer to BDS Setup section of manual.
- **Dump** (F4). Opens the BDS cup to empty the contents of the BDS cup.
- **Close** (F5). Exits the Test Weight Diagnostics screen.

BDS Harvest Sequence

To begin harvesting with the BDS, first ensure the Twin or Single High Capacity GrainGage with BDS has been enabled.

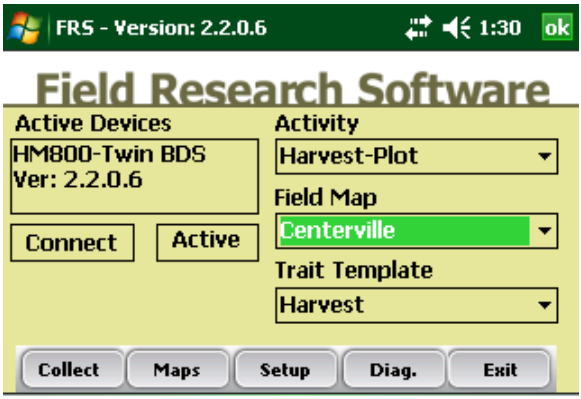


Figure 4-23: Main BDS FRS screen

A system with the BDS enabled operates in a similar manner to a regular High Capacity GrainGage except test weight is measured volumetrically with the BDS.

Once a BDS device has been enabled, follow the same harvest sequence by pressing **Collect** (F1) from the main FRS screen. Follow the initialization sequence found in Harvest Data Collection chapter of this manual.

The High Capacity GrainGage with BDS cycles in the same manner as a non-BDS High Capacity GrainGage except when measuring test weight. Grain is dumped into the weigh bucket and the BDS is filled. Plot weight and moisture are recorded and the Plot door is opened. As soon as the Plot door opens, the BDS level arm extends to level the grain in

the BDS cup. The test weight is then measured in the BDS cup and stored. The cup door opens, emptying the grain, and the plot door closes. The Plot bucket is now ready to accept grain from the next hopper.

Note: For best accuracy, we recommend installing the wind guard when harvesting with the BDS. Contact HarvestMaster if you do not have a wind guard.

Solenoid adjustment

If the leveling arm or cup door are cycling sluggishly or slamming excessively hard, adjustments can be made to each actuator's solenoid. Each solenoid has adjustment screws that if adjusted in (clockwise) will decrease the air supplied to actuator, and if adjusted out (counterclockwise) will supply more air to the actuator. Each solenoid has two screws, one for extending the actuator cylinder and one for retracting actuator cylinder. See image below for location of each solenoid.

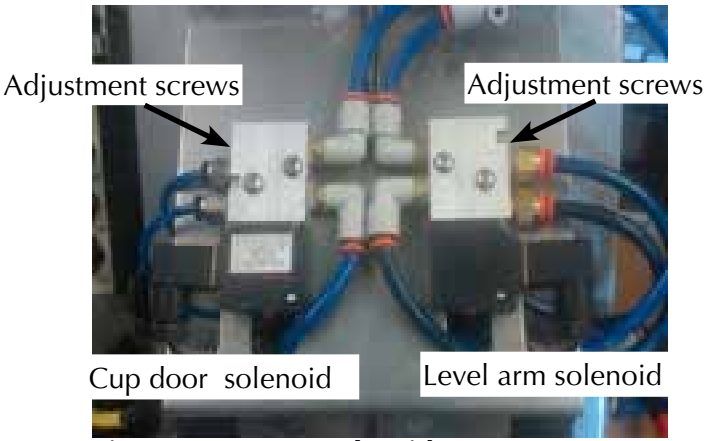


Figure 4-24: BDS Solenoids

CHAPTER 5

DIAGNOSTICS MENU

Load Cell

Moisture

Test Weight

Level Detect Sensor

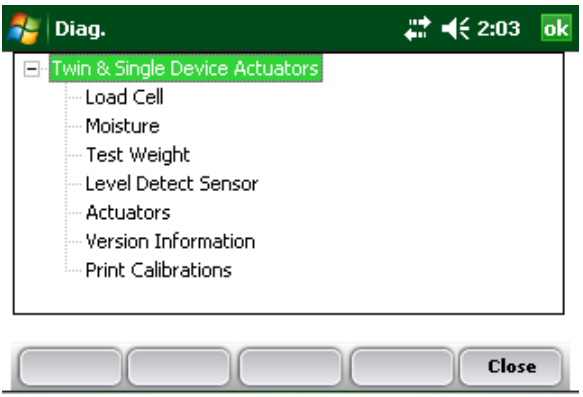
Actuators

Version Information

Print Calibrations

Diagnostics Menu

The Diagnostics menu is designed to help you troubleshoot and test your hardware. To access this option, select **Diag.** (F4) from the main FRS screen. Six submenu options appear on the Diagnostics Menu page, shown in the following image. Each option is described below.



F*igure 5-1: Diagnostics Menu screen*

Load Cell

Checking the calibration

You can check the calibration of the load cell using the options on the Diagnostics Menu screen. Before you do that, however, first check the accuracy of your calibrations by ensuring that—

- The combine is on level ground and out of the wind
- The weigh bucket is empty
- The calibration weight is close to the weight of a typical plot you plan to harvest

Follow these steps to check your load cell calibration:

1. From the Diagnostics Menu, select ***Load Cell.*** The Diagnostics Load Cell screen appears, shown here

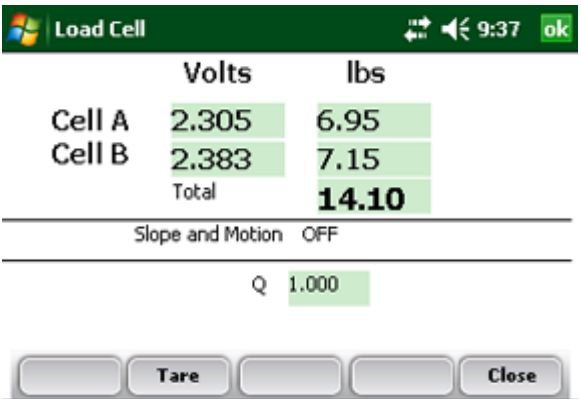


Figure 5-2: Diagnostics Load Cell screen

2. Make sure the weight values for Cell A, Cell B, and the total weight all equal close to zero. If not, tare the system by selecting **Tare** (F2).

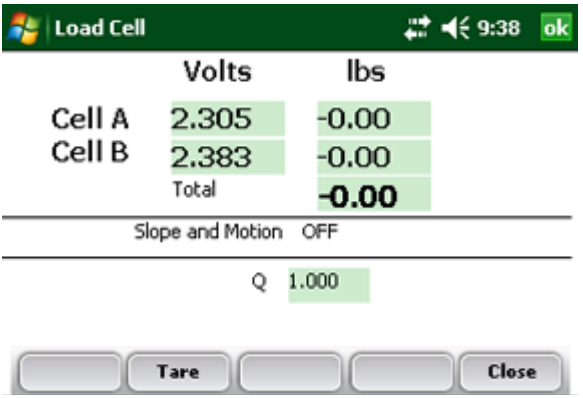


Figure 5-3: Weight values for Cell A, Cell B, and Total change after a tare

3. Place your known weight into the bucket.

4. The weight shown in the Total line should match your known weight. If the weight is incorrect, recalibrate the load cells by returning to the main FRS page and selecting ***Setup*** > ***Hardware Setup*** > ***HCGG Setup*** > ***Weight Calibration.***

In addition to showing information related to the load cells, the Diagnostics Load Cell screen shows the values associated with the Slope and Motion Sensor. Information for this screen is described below.

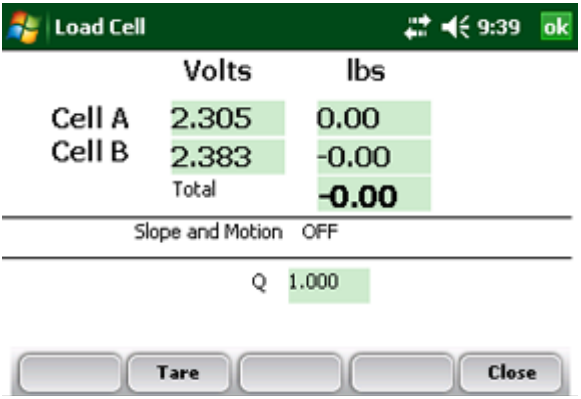


Figure 5-4: Elements of the Diagnostics Load Cell screen

Volts (Voltage)

The Volts reading displays the raw voltage reading from load cells A and B.

Lb. or kg (weight)

The Weight reading displays the calibrated weights of the load cells.

Total

This value reflects the total weight on both load cells plus any adjustment if the Slope and Motion sensor was turned on.

Ref, Q, and Total

These values are used for calculations. Note that the Q value should typically read 1.000 (+/- .01). If it does not, we recommend that you disable then re-enable the Slope and Motion sensor from the Setup menu.

SM (Slope and Motion) status

The SM status shows whether the Slope and Motion Sensor is turned ***On*** or ***Off.***

Tare (F2)

Tares the load cells if the Total weight is not zero.

Moisture

The Moisture option allows you to view readings associated with the EM Grain Moisture sensor, which is also used to measure test weight.

To view the Diagnostics Moisture screen, select ***Moisture*** from the Diagnostics menu. The following information is displayed.

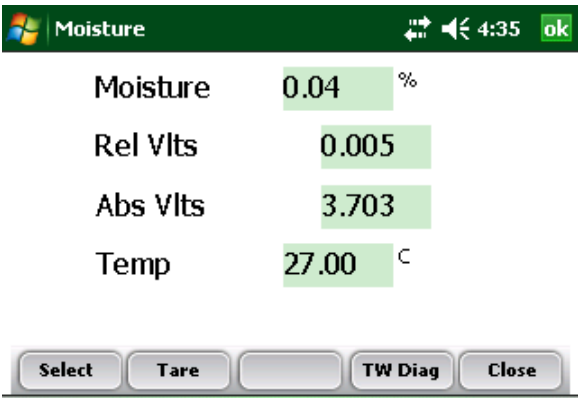


Figure 5-5: Diagnostics Moisture screen

Moisture
The percentage of moisture read by the moisture sensor.

Rel Vlts (Relative Volts)
The tared-out voltage reading of the moisture sensor. This voltage reading is used in the moisture curves.

Abs Vlts (Absolute Volts)
The raw voltage reading from the moisture sensor. Primarily used for troubleshooting purposes only.

Temp (Temperature)
The temperature is read from the moisture sensor in degrees Celsius.

Tare (F2)
To tare the moisture reading, select **Tare** (F2).

Select (F1)
Selecting this soft key opens the moisture curve menu screen, allowing you to select a moisture curve to be used for checking calibration. Select the curve and then tap **Select** (F1) again to return to the previous screen.

TW Diag. (F4)
Takes you to the Diagnostics Test Weight screen. See the next section for more details.

EM Sensor Test Weight

Note: If a Bulk Density Sensor is installed refer to Chapter 4 for Diagnostics.

The Diagnostics Test Weight menu allows you to view readings associated with the EM Grain Moisture sensor, which is used to measure test weight and moisture. The following information appears on the screen.

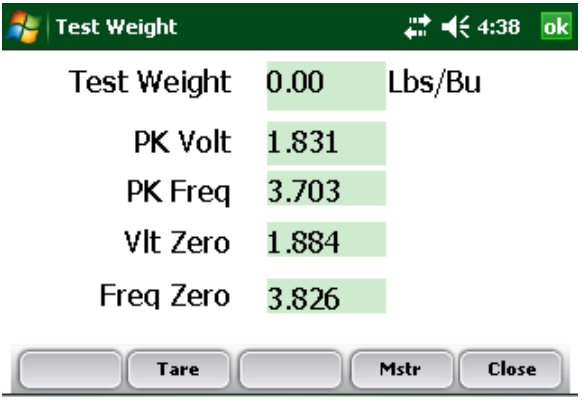


Figure 5-6: Diagnostics Test Weight screen

Test Weight

Appears in either pounds per bushel or kilograms per hectoliter, depending on which units you selected in the Setup menu. This example shows pounds per bushel. For details about selecting units, see the ***Field Reference Guide (Note Taking)***.

PK Volt

Current voltage reading from the EM Grain Sensor

PK Freq
Current Frequency readings from the EM Grain Sensor

Vlt Zero
Tare Voltage Value

Freq Zero
Tare Frequency Value

Tare (F2)
Performs a tare of the test weight system.

Mstr (F4)
Takes you to the Moisture diagnostic screen. Since the EM sensor measures both moisture and test weight, navigation is provided from one to the other.

LED Codes on the EM Grain Moisture Sensor

Green, yellow, and red LED's (light emitting diode) are designed into the sensor for service and diagnostics purposes. These LED's can be viewed by looking at the right side of the white plastic housing of the sensor. The function of the LED's are described as follows.

Green: On solid when +12 VDC is applied to the sensor

Yellow: Blinks whenever a message is transmitted from the sensor such as when the application software is in the moisture diagnostics menu.

Red: Indicates sensor error conditions. With no error codes, the red alternates one second on, then one second off.

Any error codes are represented by pairs of 'rapid blinking', the number of blinks corresponding to the first and second digit of an error code from the list below:

11. Watchdog reset has occurred

12. Timed Task Buffer overflow detected

13. Low memory alert (M < 50 bytes)

21. Input buffer overrun

22. Checksum error detected

23. Unrecognized command received by sensor

24. RS-485 busy encountered

25. Sensor response message aborted

32. Frequency measurement zero error (no oscillation counts)

33. Frequency measurement range error (over 3 Mhz)

41. Blade voltage range error

42. Temperature sensor zero error (reading at or below –15 C (5 F)

43. Temperature sensor range error (reading above +60 C)

44. System supply voltage below +10.0 Volts

45. System voltage above +18.0 Volts

55. Invalid error code reported

When the sensor is operating normally, no error codes should show. There should just be a steady one second on, one second off blink of the red. Otherwise, general interpretation would be:

11, 12, 13, 55:	Software system problems. Report to customer service and design engineering with description of circumstances.
21, 22, 23, 24, 25:	Faulty sensor wires, or faulty System Console. These could be caused by some fault within the EM Moisture Sensor, but it is not likely.
32, 33, 41:	Likely cause would be a bad connection from the sensor to the ground plane around the blade, or from the sensor board to the blade.
42, 43:	Assuming the temperature is in a normal ambient range from -10 C to +40 C, these codes would indicate a failed temperature sensor, or board solder connection.
44,45:	These are more likely caused by a problem in the power supplied to the EMGS.

Level Detect Sensor

The Diagnostics Level Detect Sensor screen shows readings from the level detect sensor, which is used to detect the level of grain in a bucket. To access this screen, select **Diag** (F4) from the main FRS screen, then select **Level Detect Sensor.** The following information is displayed.

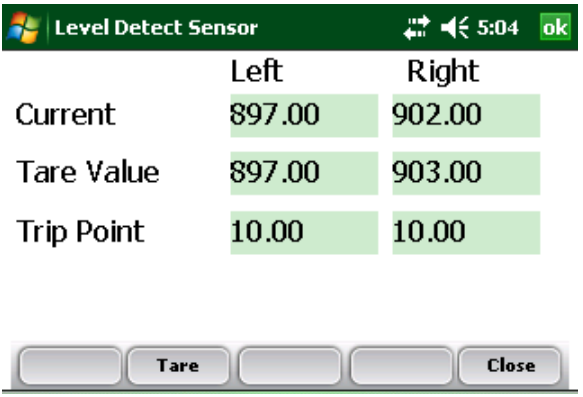


Figure 5-7: Level Detect Sensor screen

Current

The current readings from the level detect sensor.

Tare Value

The zero reference frequency

Trip Point

The minimum reading that the level detect must reach before cycling the system.

Tare (F2)

Re-tares the level detect reference frequency.

Actuators

This Actuator Controls screen allows you to open, close, or cycle any or all of the actuators. To access this screen, select **Diag**. (F4) from the main FRS screen, then select **Actuator.** The Actuator Controls screen appears.

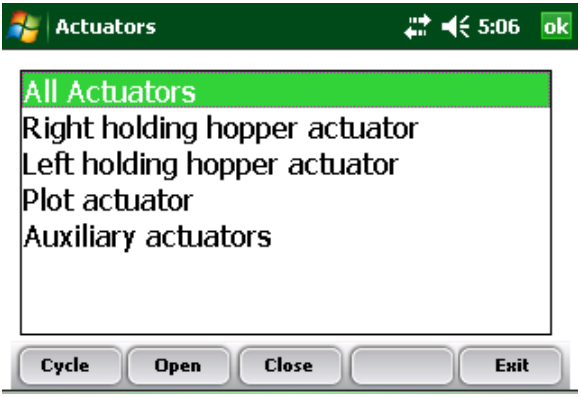


Figure 5-8: Actuator Controls screen

Select the actuator you want to control, and then choose from one of the menu options: **Cycle** (F1), **Open** (F2), or **Close** (F3).

Version Information screen

The purpose of the version information screen is to enable you to see at a glance if you have the latest version of HM-800 firmware in your modules. If you need to update your firmware, or just want to check on the current version, follow these steps:

1. Visit our website at www.harvestmaster.com.
2. Select **Support**.
3. Select **Downloads** under the HarvestMaster menu.
4. Select **High Capacity Grain Gage.**
5. Choose the version of software for your Allegro (CX or MX) from the appropriate menu.

Follow the installation instructions as outlined with the update file.

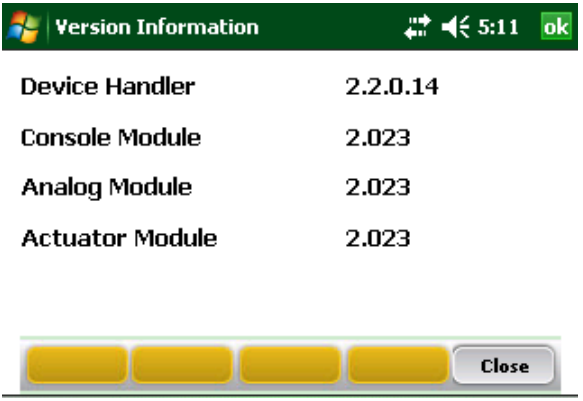


Figure 5-9: Version Information screen

Print Calibrations

The Print Calibrations menu allows you to print your calibration settings. To print, select the **All Settings** option and select **Print** (F1).

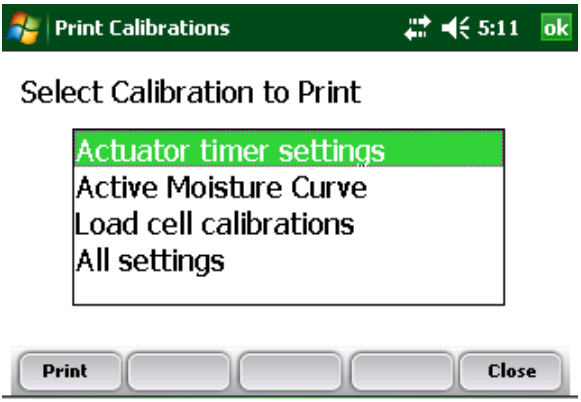


Figure 5-10: Print Calibrations screen

CHAPTER 6

HARVEST DATA COLLECTION

Harvesting and collecting data

Viewing your harvest data using the List Screen

Harvest Data Collection

After you have calibrated the High Capacity GrainGage, created harvest traits, and created a new harvest trait template, you are now ready to collect data. This chapter explains how to prepare for, collect, and view harvest data using FRS. For addition information, refer to the ***FRS Field Reference Guide (Note Taking).***

Preparing to collect harvest data

Follow these steps to prepare FRS to collect harvest data:

1. On the FRS Main Screen, make sure the Active Devices box shows Twin HCGG or Single HCGG, depending on which device you enabled in the Setup menu under ***System*** > ***Manage Devices.***

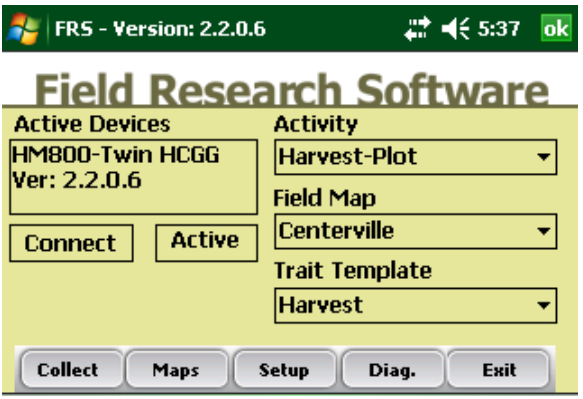


Figure 6-1: The HM-800 Twin HCGG appears in the Active Devices box

2. Select the appropriate activity from the Activity drop-down menu on the FRS Main Screen. For example, if you plan to use FRS for harvesting, select the ***Harvest-Plot*** or ***Harvest-Strip*** Activity. For standard plot lengths, set the activity to Harvest-Plot.3. On this same screen, select the correct field map name from the pull down menu.

Note: If you need a new field map for harvest, create one before proceeding to the next step. Refer to the FRS Note Taking Field Reference Guide (Note Taking) manual for instructions on creating a new field map.

3. Select the trait template you want to use from the Trait Template drop-down box. Options include the harvest traits you created such as Weight, Moisture or Test Weight.

4. Select **Collect** (F1) to enter data collection mode. The Moisture Calibration screen appears.

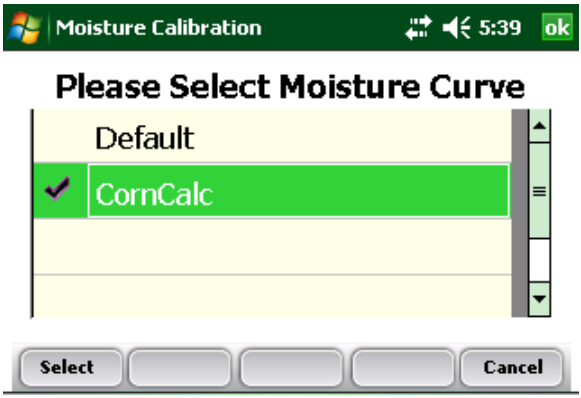


Figure 6-2: Moisture Calibration screen

5. Select a moisture curve from the list, then tap **Select** (F1). Wait while harvest set ups are loaded.

6. The Collect Data Spatial screen appears, shown below.

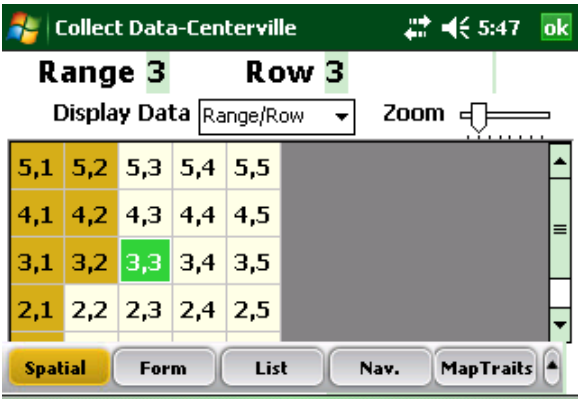


Figure 6-3: Row 3, Range 3 is selected in the Collect Data Spatial screen

7. Choose the starting plot location by selecting the cell. In Figure 6-1, the selected cell is Row 3, Range 3. After you select the starting plot cell, the screen shows the combine's current location in the field and which plots have already been harvested, as shown by shading.

Note: The current weight and moisture values appear at the bottom of the Collect screen. If these values are higher than desired, perform a tare by pressing F6 (blue key and F1).

Note: For a twin plot combine, the selected cell always represents the left side for the combine, as shown in Figure 6-4. For single plot combines, it represents the starting plot.

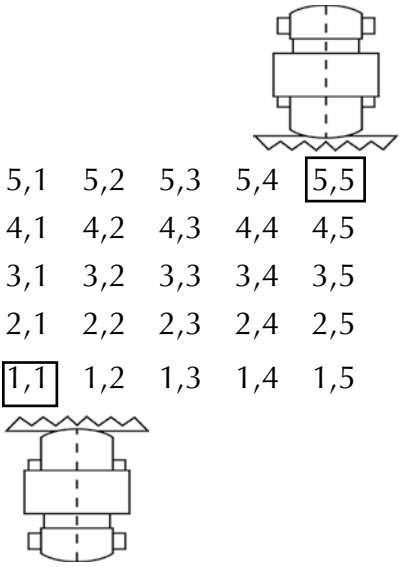


Figure 6-4: Make sure the left side of your twin plot combine is lined up with the first plot you have scheduled to harvest. For Single Plot combines, the starting range and row correspond to the plot being harvested.

8. Establish your navigation type by selecting **Nav.** (F4). The ***Select Navigation*** screen appears.

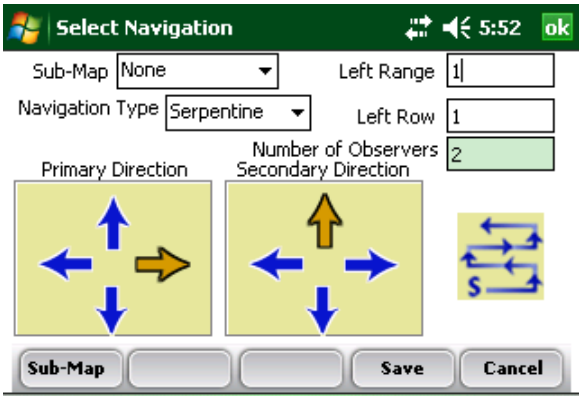


Figure 6-5: Select Navigation screen for a single plot combine

Navigation Type

The navigation type is the harvest route through a field. Select a navigation type from the pull down menu. Examples of Navigation patterns for harvest are shown below.

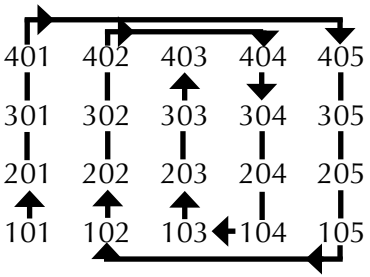


Figure 6-6: Circular navigation type

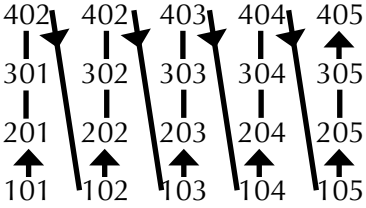


Figure 6-7: Sequential navigation type

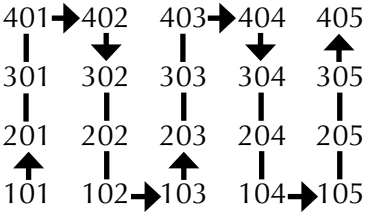


Figure 6-8: Serpentine navigation type

Left Range, Left Row (starting location)

The Left Range and Left Row options on the screen show the starting plot you selected in the previous screen. If you are using a twin plot combine, the selected cell always represents the left side of the combine.

Number of Observers

The number of observers is set automatically based on the equipment used. For twin plot combines, the number is set to 2; for all single plot combines, the number is set to 1.

Select **Save** (F4) to save your settings.

Harvesting and collecting data

Just as there are two basic methods for harvesting, there are two harvest methods with FRS: Plot Harvest and Strip Harvest. The steps for performing each method using FRS are described below.

Plot Harvest Sequence (also called Harvest-Plot on the FRS Main screen)

1. To begin harvesting, press the **Form** (F2) button from any of the Data Collection screens. The Form screen appears, which allows you to cycle the system and record your harvest data.

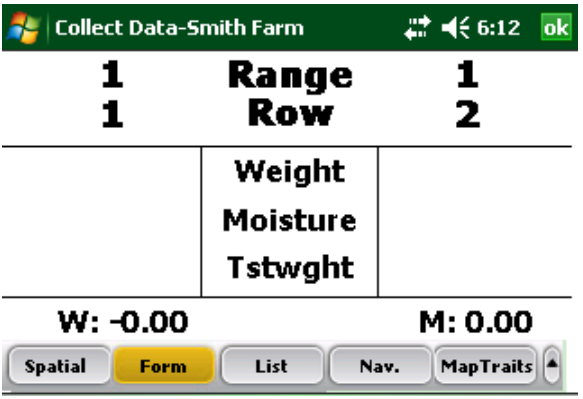


Figure 6-9: Form screen before data has been collected

Note: Pressing F6 retares the system. To select F6 on an Allegro Field PC, press the blue button, then F1.

2. Harvest the first plot; as soon as all the grain has left the combine header, press the Enter key on the handheld to begin the countdown timer. The timer corresponds to the amount of time it takes for the combine to thresh the grain and for all of the grain to reach the hoppers.
3. At the end of the plot, stop the combine and wait until the timer reaches zero.

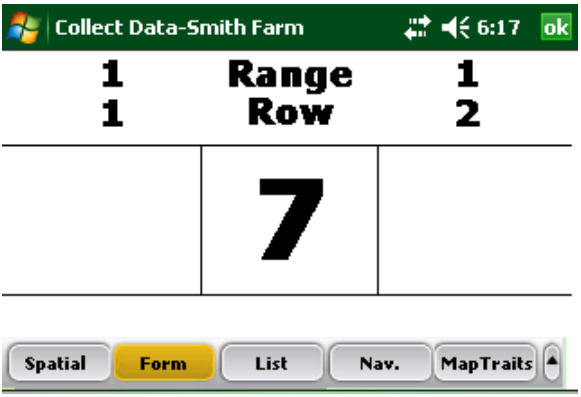


Figure 6-10: Countdown timer as it appears with the High Capacity GrainGage

As soon as the countdown timer reaches zero, the High Capacity GrainGage starts its sequence. The auxiliary actuator door (isolation gate) closes to prevent any mixing of plots and the left hopper door opens, emptying its contents into the weigh bucket where weight, moisture, and test weight are recorded.

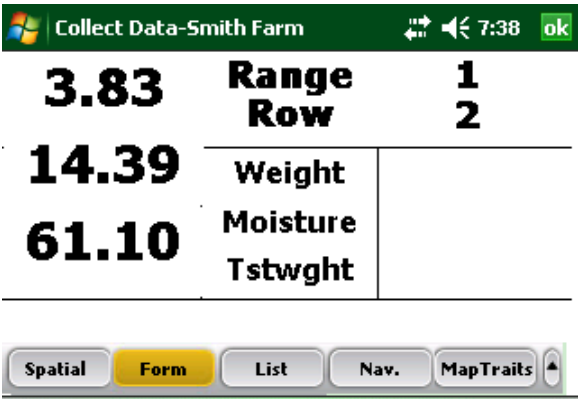


Figure 6-11: Form screen showing data for left side of the combine

Note: You can start harvesting the next plot as soon as the countdown timer reaches Zero. The Aux actuator or Isolation gate prevents grain in the combine from mixing with grain being processed by the High Capacity GrainGage.

Note: If necessary, you can adjust the countdown timer in the Setup Timer menu. To access that menu, return to the Setup menu, then choose ***Hardware Setup*** > ***HCGG Setup*** > ***EM Sensor*** > ***Timers.*** We recommend setting the Countdown Timer to reflect the time it takes so that there is less than .5 lb. (.23 kg) of grain carryover from plot to plot.

The High Capacity GrainGage then follows this sequence: After the system has measured the grain from the left hopper

and emptied it from the weigh bucket, the right hopper door opens, emptying its grain into the plot bucket.

The right hopper door closes and the Aux actuator opens, allowing grain to flow into the hopper again. Data from both hoppers is stored to the FRS database and sent to the printer for data backup.

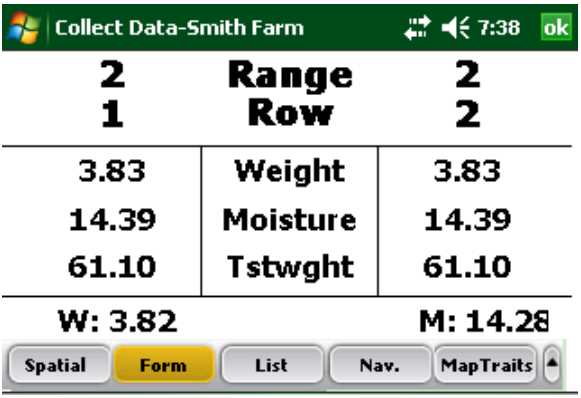


Figure 6-12: Form screen showing data for both sides of the combine

Typically the user can press Enter again after the data from the left hopper has been shown on the screen.

Next, the current plot identifiers are advanced to the next in sequence after the data is stored. The process continues for each new plot.

Single Plot Harvest

When harvesting with a single plot combine, the harvest sequence is the same as for a twin plot. The Form Screen changes for single plot mode.

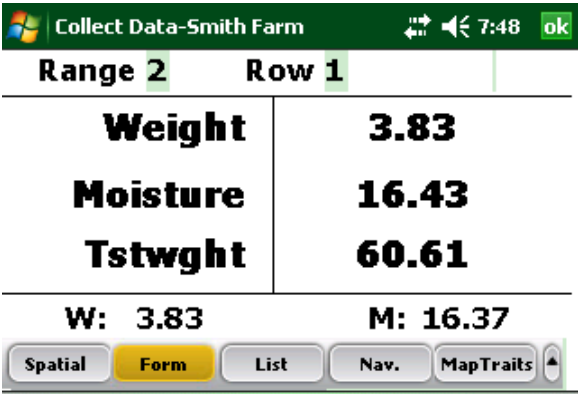


Figure 6-13: Form screen showing data for a single plot combine

Strip Harvest Sequence

Strip test harvest involves harvesting plots that are longer than the standard 20 ft. plot. On strip plots, the amount of grain to be harvested exceeds the 60 lb. capacity of the weigh bucket. To prevent the weigh bucket from overfilling, grain level sensors installed into the holding hoppers trigger the system to cycle when the grain reaches a certain level on the level detect sensors. To set this level go to **Setup** (F3) > ***Hardware Setup*** > ***HCGG Setup*** > ***Level Sensors.***

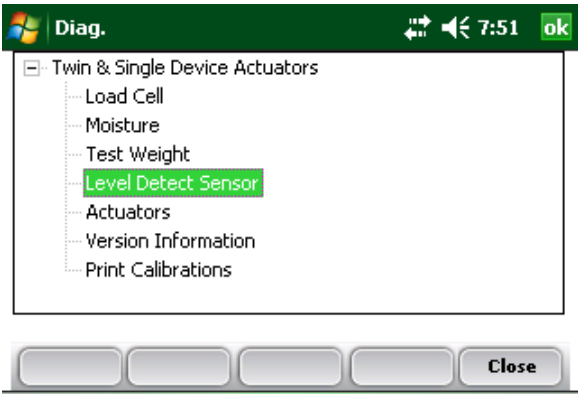


Figure 6-14: Select* Level Sensor *from the Setup menu to access the Level Detect screen

The level indicates the amount of grain required to trigger the strip harvest sequence. The higher the level detect setting the more grain required to trigger strip harvest.

In the case of a Single Plot combine, the Left level sensor value corresponds to the level sensor installed into the weigh bucket.

To begin the sequence of strip harvest, select the Harvest-Strip from the Activity drop down menu located on the main FRS screen.

Figure 6-15: Harvest-strip in drop down menu

After selecting the strip harvest activity, select **Collect** (F1). Follow the same sequence as Harvest-Plot to select a moisture curve, starting range and row and the Navigation pattern.

As soon as the these settings have been saved and selected, press **Form** (F2).

The sequence for harvesting in strip mode is as follows:

1. The user drives the combine through the strip plot. Grain is shelled in the combine and routed into the holding hoppers.
2. When the grain becomes full enough in either hopper to trip the threshold of the level detect, the left bucket cycles in the same sequence as Harvest Plot.
3. During this part of Strip harvest the Countdown Timer is not enabled and the Aux gate still operates as normal.
4. The left hopper is cycled first followed by the right hopper.

5. The weight, moisture and test weight for the left side is displayed on the screen of the computer.

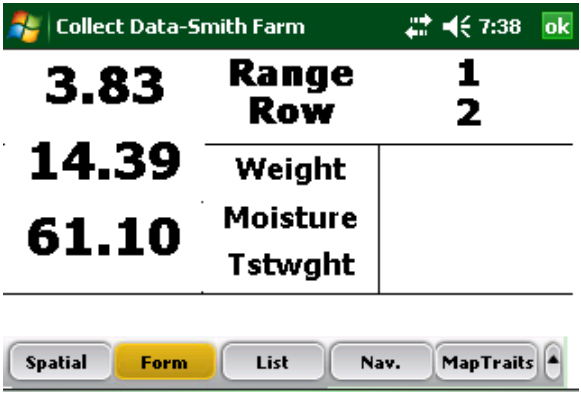


Figure 6-16: Screen showing data while cycling

6. After the weigh bucket has emptied the left side, the right hopper opens allowing grain to dump into the weigh bucket so it can be processed. Data from the right side is displayed on the screen of the computer.

7. The sequence continues to repeat as long as the level detects are triggered by grain filling up the hoppers.

8. Each time data from a hopper is recorded, Plot weight is added to the existing Plot weight data, while the Moisture and Test weight are averaged with the previous cycles. The number of times or cycles that the system has gone through is displayed on the screen.

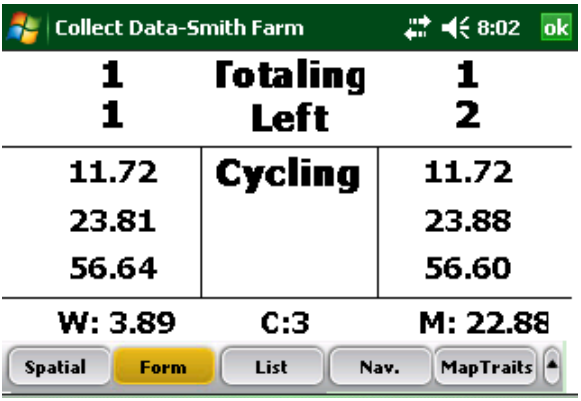


Figure 6-17: Screen showing data and number of cycles

9. When the entire strip has been harvested, the user presses the Enter key.

10. One last bucket sequence is initiated. No moisture or test weight is recorded on this step. Plot weight is recorded and added to the total.

11. A complete summary of the Plot with total weight, Moisture average and Test Weight average are stored and printed on the printer

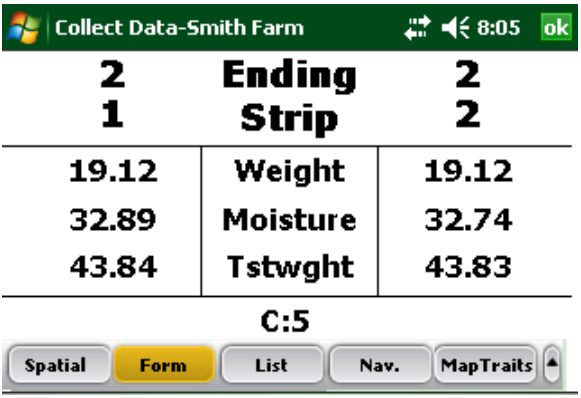


Figure 6-18: Summary of strip harvest

12. After the last hopper closes, the Plot locator or ID is advanced for both sides of the combine.

In some cases the amount of grain in a strip is too low to cycle the level detect. In this case the user can press the Enter key without the level detect being pressed, the system cycles just like in normal plot mode.

Viewing your harvest data using the List Screen

By selecting **List** (F3), you can view your harvest data.

Note: You CANNOT collect harvest data while you are in this screen. To harvest, you must be in the Form screen. See the section above called ***Plot Harvest Sequence*** for details.

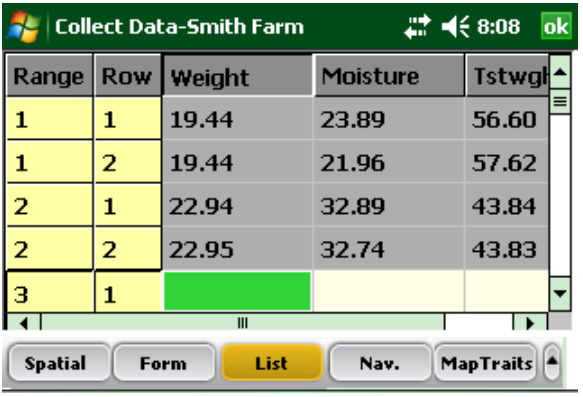


Figure 6-19: List screen showing moisture, test weight, and weight values for each plot

CHAPTER 7

EXPORTING DATA

Extracting collected data

Backup Log for Harvest Modules

DataLink for FRS

Exporting Data

Data can be exported from FRS in either of two ways. The first is to use the built-in Import/Export Utility. The second is to use Datalink for FRS. Both ways are described in this chapter.

Extracting collected data

The first step in exporting data is to extract collected data from the FRS database to the Export folder on the handheld. To extract data, follow these steps:

1. Select ***Setup*** on the main FRS screen to enter the Setup screen.

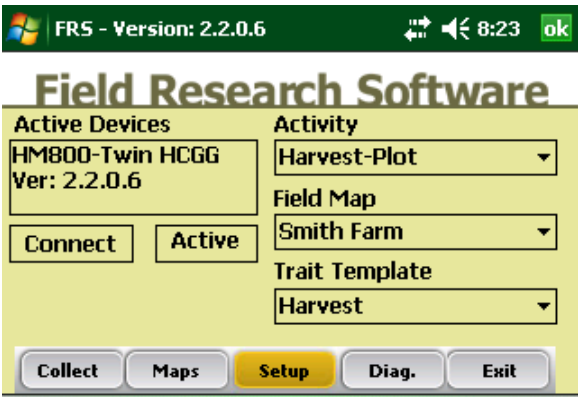


Figure 7-1: Select* Setup *from the main FRS screen

2. Choose ***Database Tools*** > ***Export data*** to CSV from the Setup menu.

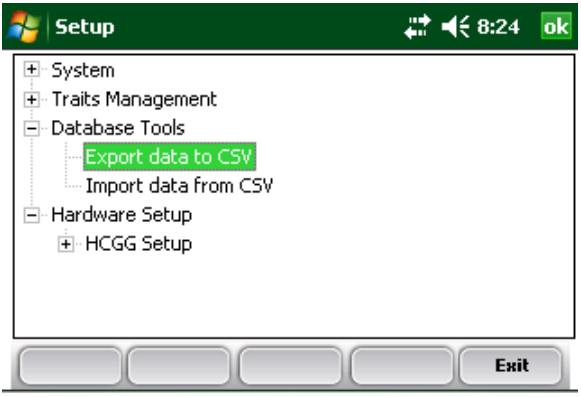


Figure 7-2: Choose* Export data to CSV *from the Setup menu

3. The Import/Export Utility screen appears. Select ***Export from FRS Database.***

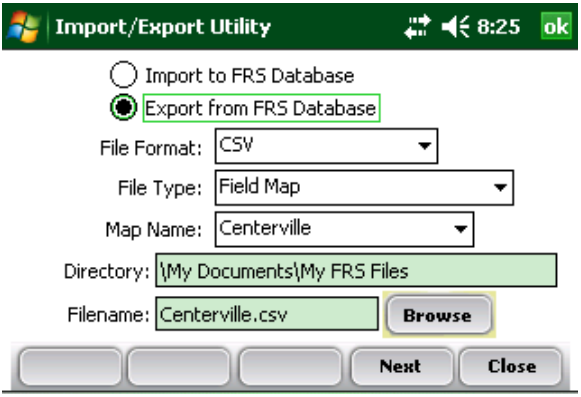


Figure 7-3: Import/Export Utility screen

4. Fill in the information on the Import/Export Utility screen. For more information about the elements on the

screen, see the ***FRS Note Taking Field Reference Guide.*** To find the map file you want to export, choose ***Browse.***

5. Select **Next** (F4).

If you extracted a field map, the Export Map Data screen appears, showing the target path where the file will be saved. Select the option to ***Include previously exported data*** if you plan to export all data associated with this map. If you only want to export new data associated with the map in the future, leave the option unselected.

After data has been exported to the handheld, it can be copied to the desktop using ActiveSync or Windows Mobile Device Center.

Refer to the ***FRS Note Taking Field Reference Guide*** for more details on exporting data.

Backup Log for Harvest Modules

FRS software creates a backup log of data that has been collected from the harvester. This log file contains the date, time, range, row, plot weight, moisture, and test weight for each plot harvested. It also contains values used for moisture and test weight calibration, and Slope and Motion compensation, or Q value. The backup log file is found on the Allegro, see Figure 7-4.

Path: C_Drive\FRS\HarvestBackup

Each backup log references the same name as the field map used for harvest. For example, if the name of the field being harvested is Smith Farm, the name of the backup log would be Smith Farm_HCGG.csv.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2	Date	Time	Range(D1)	Row(D2)	D3	Weight	Moisture	Test Weight	ZeroF	ZeroV	CurrentF	CurrentV	SlopeMotionQ	Temp
3	1/10/2007	15:55:26	1	28		24.90	19.0	67.0	3.4874	0.736	2.2260	0.168	0.995713	30.9
4	1/10/2007	15:55:33	1	29		27.80	18.6	57.1	3.4874	0.736	2.2462	0.179	1.016837	30.9
5	1/10/2007	15:55:44	2	28		34.80	20.2	56.5	3.4874	0.736	2.1879	0.130	0.994499	30.9
6	1/10/2007	15:55:50	2	29		31.80	21.8	66.3	3.4874	0.736	2.0863	0.080	1.004304	30.6
7	1/10/2007	15:56:03	3	28		28.00	21.4	58.4	3.4874	0.736	2.1087	0.095	0.998153	30.6
8	1/10/2007	15:56:10	3	29		35.10	23.6	56.1	3.4874	0.736	1.9662	0.060	1.008031	30.6
9	1/10/2007	15:56:22	4	28		25.90	20.1	66.6	3.4874	0.736	2.1067	0.130	0.995713	30.5
10	1/10/2007	15:56:29	4	29		36.10	21.0	56.4	3.4874	0.736	2.1492	0.102	1.000804	30.5
11														

Figure 7-4: Example of backup log file.

DataLink for FRS

Figure 7-5: DataLink main menu

DataLink for FRS is a utility program for your PC that facilitates the management of the FRS database.

The FRS database can easily become quite large and difficult to manage in a timely fashion on a handheld computer. ***DataLink for FRS*** moves the entire database to a PC to facilitate the management of the FRS database. By using the computing power of a desktop PC, actions that might take an hour or more on a handheld computer are finished in minutes.

Cautionary Note: Because the entire database is being copied from FRS on a hand-held computer to a PC and back to FRS, extreme care must be taken to copy the database back to the handheld computer before any other collections are made. When the database is copied from one location to another, it will overwrite the database at the destination. It is important that the master database be kept on the handheld and NOT on the PC.

DataLink Functions

Seven functions are available from the opening screen for ***DataLink for FRS***.

The seven functions are:

- Copy database from handheld to desktop PC
- Import file to database from desktop PC
- Export files from database to desktop PC
- Backup database to folder on desktop PC
- Restore database from backup folder
- DataLink Utilities
- Save database from PC to handheld

Figure 7-6: DataLink main menu

Installing DataLink

To install ***DataLink for FRS*** on your PC, follow these steps:

1. Go to http://www.harvestmaster.com/HarvestMaster/support/Downloads/FRS-Suite/Datalink-for-FRS.
2. Choose the version that matches the operating system on your PC
3. Follow the on-line instructions to download and install the program on your PC.

Launching DataLink

DataLink will detect when a handheld device is connected via ActiveSync (XP) / Windows Mobile Device Center (Vista/7) to your PC. You can set your Allegro in the Power Dock and establish a connection either before or after launching the program.

Copying the Database

When a handheld is detected the following prompt will appear:

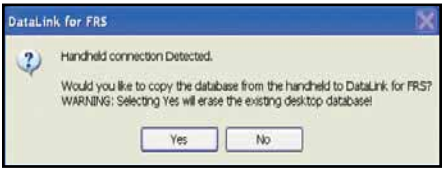


Figure 7-7: Handheld connection detected prompt

You can copy the FRS database to your PC as the software is booting or from the main menu after the software has launched

Note: FRS cannot be running when the database is copied to or from the handheld.

When the database is copied from one location to another, it will overwrite the database at the destination. This can result in loss of data if due diligence is not observed. Warnings such as the one below require you to confirm each copy request.

Figure 7-8: Warning screen

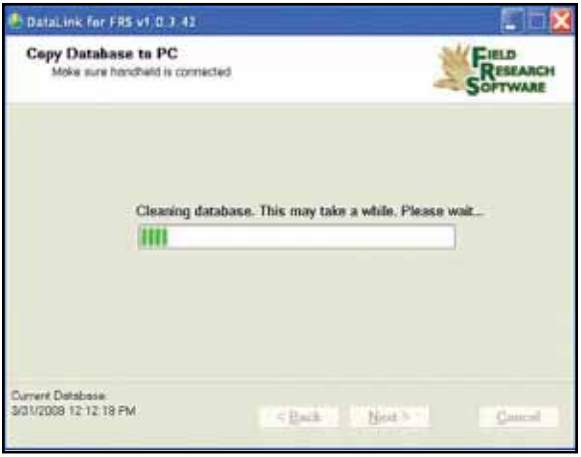


Figure 7-9: Clean Database screen

Notice that time was spent cleaning up the database. The time this requires is proportional to the size and length of time the database has been used.

Importing a File to the Database

Figure 7-10: Importing file to database

Select the ***Import*** option and hit ***Next.***

Several types of files can be imported to the database.

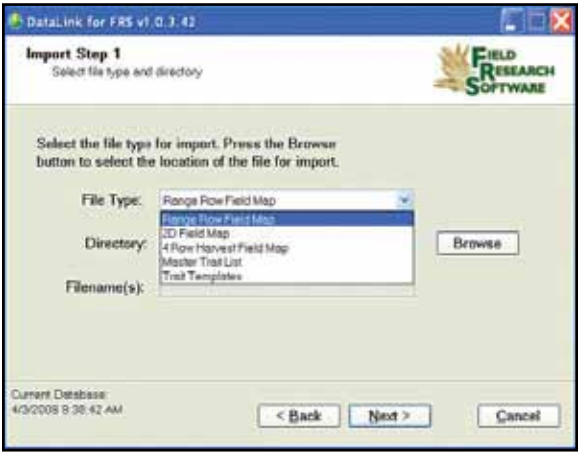


Figure 7-11: Select file type

- Range Row maps are the most common field maps in FRS.
- 2D and 4 Row maps are specialty maps for specific applications.
- The Master Trait List is a list of all traits that can be observed.
- A trait template is for organizing a smaller list of traits that are of interest for daily or seasonal observations.

These files can be created or edited on a PC and then imported to the FRS database while it is in the DataLink program on the PC.

As is common in many Windows applications, the browse feature lets you select the file to import.

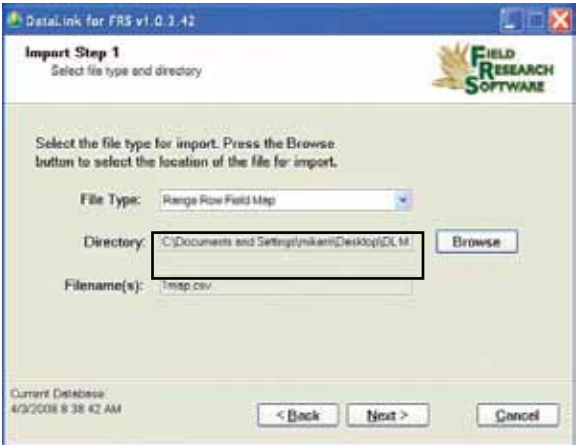


Figure 7-12: Select file

When a field map is selected, the ***Next*** button allows you to choose map settings. FRS organizes all maps by range row and then handles any other map identifiers simply as additional identifiers. Therefore range row must be defined as to its location in the spreadsheet that is being imported.

DataLink reads the column headings from the map to be imported, and populates them in the drop down menu. Select the appropriate column heading from the map that corresponds to the Range and Row from the choices in the drop down menu.

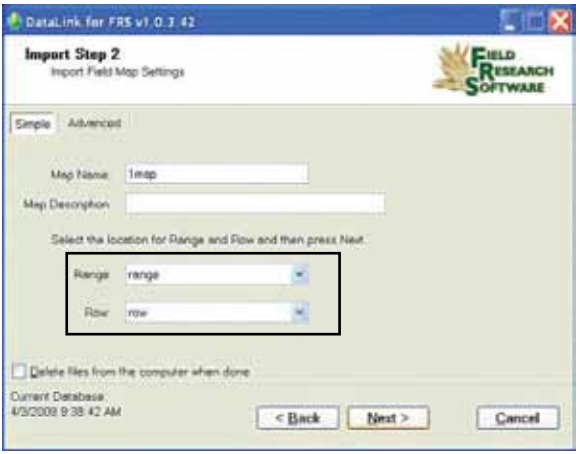


Figure 7-13: Range and Row headings

The following discussion involves specialty maps that may or may not apply to your situation. If you do not need to use 2D maps or 4 Row Harvest maps, skip this section.

The 2D Map feature refers to maps that are created two-dimensionally to represent the same layout as the field.

ID's in 2D maps allows any plot name in any order to be used on a map. Plot names can be repeated on the same map as many times as needed. This type map must be created with a spreadsheet or text editor and saved as a tab delimited file or .txt file. Do not use any headings or spaces when creating a 2D map.

101	Trial	Border	102
201	202	North	South
101	102	103	104
201	202	203	204
Beans	Rice	Wheat	Corn
Sally	George	Sue	Charles

Figure 7-14: Example of 2D map layout

DataLink will assign range row to each plot and associate the plot IDs as additional plot identifiers.

The 4 Row Harvest Field Map is a unique layout where every other plot or set of 2 rows is border throughout the field. 4 Row Harvest Field Maps allow a map that only contains the research rows to be imported into FRS. Upon import, the border rows are created by FRS and carry the same row number as the previous research row with the addition of an "X."

Example is the first row or plot is Range 1 Row 1, then next row or plot is designated Range 1 Row 1X. This sequence is repeated throughout the field.

The field is harvested the same as any other field map with data being stored for research plots and buffer plots. Upon Export, the buffered rows are not exported, only the research rows are included in the export file.

Importing Master Trait Lists and Templates

Master trait lists and trait templates are files that can be imported. When you import either, the existing list or templates will be deleted. A warning appears so the user can confirm the action.

Figure 7-15: Warning on importing traits

Exporting a File from the Database

Figure 7-16: Export files from database

Select the Export option and hit Next.

Figure 7-17: File types and files

This screen allows the selection of what file type and which files to export. The ***include previously exported data*** checkbox allows data collected and exported in separate activities or days to all be exported together on one spreadsheet at the conclusion of a map.

For example, at the end of the season, a spreadsheet could contain several observations accomplished with different templates and traits and the harvested data together on one map.

Imagine that in the spring, an emergence observation could occur and the data down-loaded for safe keeping. Mid summer might be a good time to take notes on any disease evidence and that data could be downloaded. In the fall a lodging study might be appropriate and downloaded after completion. Then the crop is harvested and the plot weight, moisture and test weight are recorded. When this last data is exported the "Include previously exported data" checkbox could be checked. The spreadsheet would now contain all the collected data from the season in one place.

After making the desired selection and pressing next, the choice is where to put the exported files. The browse button facilitates the choice.

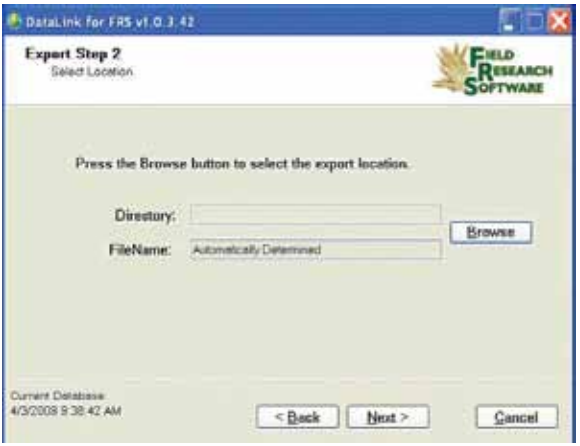


Figure 7-18: Exported file location

Step 3 allows the user to choose the map IDs and in what order, they will appear in the exported file.

Notice the checkbox near the bottom of the screen. If a map was imported as a 4 Row Harvest Field Map and buffer rows were added, checking this box will remove those added rows when the file is exported.

Figure 7-19: Choose which row to export

Backup and Restore database to and from a Folder

The next feature allows the database from FRS to be relocated on the PC and stored as a backup copy. It will be stored outside of the DataLink program. The Restore feature brings the database from the storage location back into the DataLink program. This works well for "cloning" a database onto several handhelds or just archiving a database to a safe location.

Figure 7-20: Backup database

DataLink Utilities

Select DataLink Utilities and press ***Next.***

Figure 7-21: Datalink Utilities

Three utility choices are available: Delete Maps, Clean Current Database, and Copy backup log files from handheld.

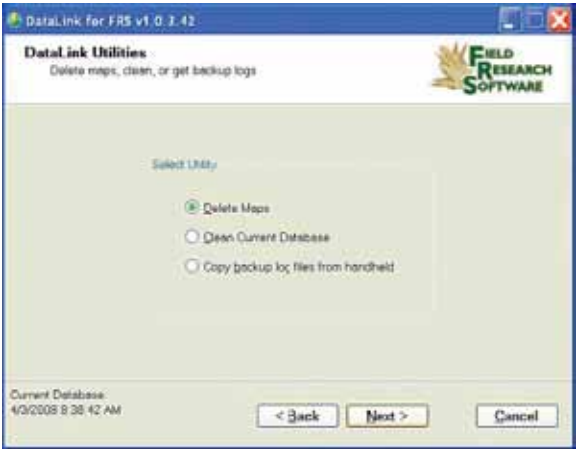


Figure 7-22: Utility choices

- Delete Maps

1. The FRS database is a complex collection of related tables where even a simple delete command often requires considerable computing power. Being able to perform map deletions on a PC instead of on a handheld device is a substantial time saver.

- Clean Current Database

2. Cleans all files that were previously marked for deletion. Due to the complexity of the database, delete commands made from the handheld computer are carried out by marking the file as deleted and no longer displaying it. When this utility is selected, the marked files are deleted and any associated tables are adjusted accordingly.

- Copy backup log files from handheld

3. When data is collected in FRS it is stored in the map where the collection took place. To insure that no data is lost, a backup log is created as the data for each trait is collected. This backup log contains the time of each observation, the date and other behind the scene information. It is therefore not a concise record of only the collected data, but it is another copy of the data in case the map and its associated data are lost.

Save Database from PC to Handheld

The final menu option is to save the database back to the handheld. Select this option and choose ***Next.***

Figure 7-23: Save database

The following warning appears. Read each warning carefully and confirm that the pending action is the desired action.

Figure 7-24: Warning

It is recommended that whenever the database is copied from the handheld computer, that it should always be copied back to the handheld computer before any work is done with the handheld to avoid losing data.

CHAPTER 8

GENERAL CARE AND MAINTENANCE

High Capacity GrainGage Regular Maintenance

Return for Repair Procedure

General Care and Maintenance

Daily System Check

1. Make sure that there are no loose cables hoses or equipment and all wires free of moving parts? Do all of the moving parts such as doors and actuators move freely without anything interfering?
2. If the combine has been transported, check to make sure the plot bucket has not shifted out of the rails or slots on either side of the bucket.
3. Connect the handheld computer to the controller and start Field Research Software. It should load the Setups for the installed hardware and boot to the main FRS screen.
4. From the main screen select ***Diag*** (F4) or ***Connect***. Select ***Load Cells*** from the diagnostics menu. Record or observe the voltages values for Cell A and Cell B and the Total weight with the bucket empty. Place a known weight, we recommend at least 10 lb. in the plot bucket, the voltages for A and B should increase to a certain point and stabilize. The Total weight reading should correspond to the amount of the know weight placed in the bucket. Remove the weight, the voltage should return to the original voltage level and the weight should return to zero.

5. Select ***Moisture*** from the diagnostics menu. Check to see the Temp reading is in the range of current outside ambient temperature. The temperature sensor will typically be higher than current outside temperature by about 5° C. Check the Absolute voltage reading is 3.500 +/– 0.2. Check that when you dump grain into the plot bucket or grab the EM sensor blade by hand the Relative voltage increases and the Absolute voltage decreases.
6. Select ***Test Weight*** from the diagnostics menu. Check that the PK Volts is 2.00 +/– 0.5 and the PK Freq is 3.500 +/– 0.2. Verify that when you dump grain into the plot bucket or grab the EM sensor the PK Volts and PK Freq both decrease.
7. Cycle each gate from the System Console in manual mode with the handheld connected and booted into the FRS software, to make certain that all gates open and stay open while the open light is on. Close them and make sure that the gate actually closes. Also it is needed to verify that all auxiliary actuators being used such as air diverters are sending the correct signal to the proper place and for the proper amount of time.
8. Make certain all diverters and special scripts are operating correctly.
9. If an oil bath compressor is used make sure that an oil separator is installed and working. Make sure that if the combine will be used in high humidity area that a water separator is installed in the air system.

10. We recommend that the next step be done with the combine running as if you were actually going to harvest. Enter the Collect mode and ***Select*** (F1) the Default moisture curve. Select ***Form*** (F2) then ***Save*** (F4) the current Navigation screen. Return to the ***Form*** (F2) screen and cycle the system in the same manner you would during harvest letting the countdown timer and the buckets cycle. The watch the data displayed on the screen to verify that the values are zero. Grain samples can be poured into the bucket to produce harvest conditions. Verify that all gates and actuators are operating as they should. Cycle the system several times to make certain everything is operating as intended.

High Capacity GrainGage Regular Maintenance

HarvestMaster products are built to be robust and will withstand most weather conditions. All of our products are environmentally sealed and built for outdoor use. However, there are some steps you can take that will increase the operational life of the system. The following tips will help you to have fewer problems and will ensure the maximum life out of your system.

Recommended Pre-Harvest Maintenance

We recommend starting your pre-harvest checklist at least two weeks before you plan to be in the field. In addition, we also recommend that when you are checking calibrations

that you run several samples of grain with known weights and moistures through the system to assure accurate moisture and weight calibrations.

All Systems

- Clean the combine battery terminals to assure a good power and good connection.
- Inspect all cables for mice damage.
- Make sure all cables are secure (locked into place) and are not touching or interfering with the weigh bucket assembly.
- If equipped with a pneumatic air system, check the filters and lubricator for contamination. Replace as necessary. Close the petcock valve on the air tank and charge the system up to 120 PSI. Check for air leaks. Operating pressure should be regulated to 60-80 PSI.
- Check the limit switches for proper function (adjust if needed).
- Check the actuator operation for each door assembly for normal operation. Slow moving actuators are usually an indication of a plugged metal porous vent on exhaust port of solenoid. Replace or clean as needed.
- Ensure the weigh bucket or pan moves freely. Also ensure the bucket is resting in aluminum tracks and not binding.

- Check the actuators and slides for proper function and adjustment. If needed, lubricate the slides with DRY graphite to minimize gum or chaff buildup. ***CAUTION:*** Do not use wet lubricants on the gate assemblies.
- Run "DIAGNOSTIC" menu checks on the load cells, moisture sensor, and level detect sensor as outlined in the Diagnostics section of this reference guide.
- Check weight and moisture calibrations.

Recommended Maintenance during Harvest (each morning)

- If your GrainGage is equipped with pneumatics, drain the water from the air tank using the petcock relief valve.
- Drain water from the lubricator/water separator bowl by pulling down on the drain plug.
- Blow chaff and broken kernels out of and from around the weight bucket or pan.
- Check the load cell calibration using a known weight.
- Check the compressor air filters.

Recommended Post-Harvest Maintenance

- Print setups and moisture curves. Save and file this information in an area where it can be found in future years if needed.
- With about 120 PSI forced air, blow all chaff and broken kernels out of and from around the weigh bucket or pan.

Blow upward (from the bottom of the GrainGage) on each overload protection pin to ensure all the debris is out of the channels and away from the protection pins.

- Avoid using water to clean in and around the weigh systems. If you use a sprayer washer to clean the combine, be sure to keep the water away from all sensors and cabling.
- Disconnect the air hose from the GrainGage and let the air run (free-flow) for at least 5 minutes.
- Drain the air tank.
- Drain the pneumatic filter bowls and blow them dry with forced air.
- If the system has pneumatic actuators (e.g. GrainGages), retract all the cylinder rams into the housing.
- If mice have been a problem in the past, place mouse poison or traps in areas where mice might appear. Moth balls tend to help as well.
- If your Harvest Data System console is mounted outside of the cab (e.g. exposed to the elements), we recommend removing or covering the control box. It is best to store your system in a warm and dry environment.
- If the combine is not protected from the weather, cover any exposed cable ends (connectors) with plastic bags and secure tightly with twist-ties or rubber bands.

Installation and Maintenance Tips

We suggest the following tips when installing and/or maintaining the Harvest Data System:

When using pneumatics:

Note: We recommend that oil not be used in the pneumatic system of the Grain Gage. Please refer to older manuals at HarvestMater.com if your system is currently using oil.

- Install a three- to five-gallon reservoir air-tank. This tank must have a petcock type drain valve or an electronically controlled drain valve to allow any water that accumulates inside the tank to be drained.
- Install the Bosch Combo filter/regulator as close to the High Capacity System as possible
- If areas of high humidity or when using a lubricated compressor it is recommended to install a Keaser Model KOR-20.
- Replace the Keaser filter every 100,000 plots or when the indicator is mostly RED. Us the "USOR-20" replacement filter element (sourced by Juniper systems).

CAUTION: Certain compressor oils, chemicals, household cleaners, solvents, paints, and fumes may damage the plastic bowl. Be sure that you use cleaning chemicals that are safe for polycarbonate material.

Operating Specifications

The following operation specifications show the maximum pressure and temperature ratings for the filter bowl:

Bowl Type	*PSIG*	*Temperature*
Transparent Plastic	150 (10.3 bar)	125° F (52° C)
Metal	200 (14 bar)	175° F (79° C)

Air Regulator

The regulator should be adjusted between 50 and 85 PSI (100 PSI if using BDS). Colder temperatures may require higher pressures.

To adjust the pressure, complete the following steps:

1. Unlock the regulator by pulling down on the adjusting valve.
2. Turn the regulator clockwise to increase the pressure and counter clockwise to decrease the pressure.

Replacing the Keaser Filter USOR-20

1. Release the air pressure from the air lines by either opening the relief valve on the GrainGage or opening the drain valve on the air tank.
2. Turn the filter bowl housing ¼ turn counter-clock-wise and gently pull down on the bowl while gradually tipping the bowl back and forth until it is removed.
3. Remove the RED filter by turning it counter clock-wise (as if removing a right handed screw).
4. Install new filter and tighten finger tight.
5. Reinstall filter bowls housing in reverse order as removed.

Cylinder Removal and Installation

The cylinders on the High Capacity Grain Gage (HCGG) can become worn from constant use and eventually wear out. As the cylinder wears out it leaks air or responds slowly to the open and close command of the System Console. When this starts happening, it is time to remove your old cylinders and install new ones.

Tools Needed

Tools needed for cylinder removal:

- Small Flathead Screwdriver
- 5/32″ Allen wrench
- 1/2″ Socket wrench
- Adjustable wrench
- Vise-grip
- Thick cotton cloth

Figure 9-2 shows the cylinder and identifies the components you need to remove or replace throughout this process.

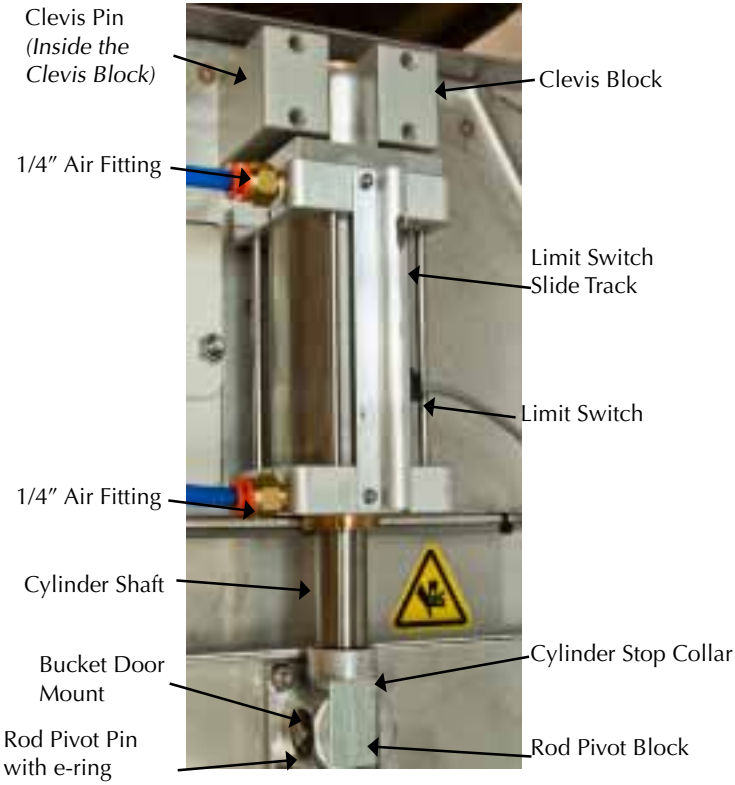


Figure 9-2: Elements of the HCGG actuator assembly

Removing the Cylinder

To remove the cylinder from the HCGG, complete the following steps:

1. Locate the air source shut off valve on the back of the HCGG.

2. Release the air pressure by rotating the air valve handle outward.
3. Using a permanent marker, mark which air hose is attached to the top 1/4″ air fitting and which air hose is attached to the bottom 1/4″ air fitting. This ensures that the air hoses are connected properly when the new cylinder is installed.
4. Remove the air hoses from the cylinder by pushing on the plastic ring around the 1/4″ air fitting (commonly red or orange) while pulling the air hose out of the fitting.

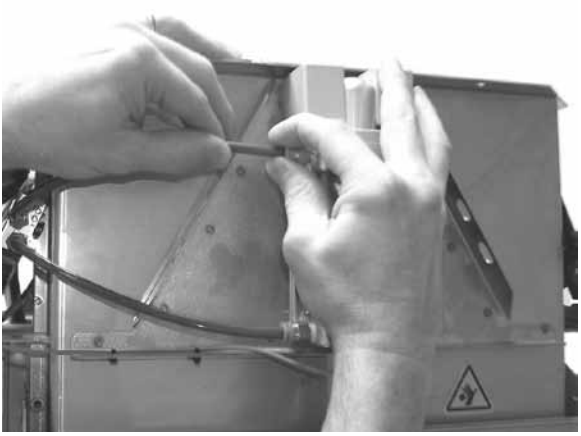


Figure 9-3: Removing the air hose

5. Using a small flat head screwdriver, loosen the limit switch screw enough so that it slides up and down freely. Do not remove the limit switch screw.

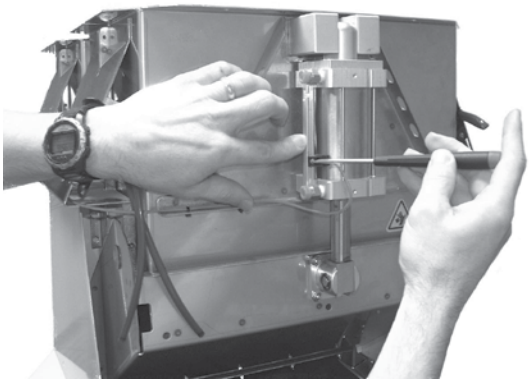


Figure 9-4: Loosening the limit switch

6. Slide the limit switch toward the top of the cylinder and pull the limit switch out of the small notch opening in the top of the limit switch mounting slide.

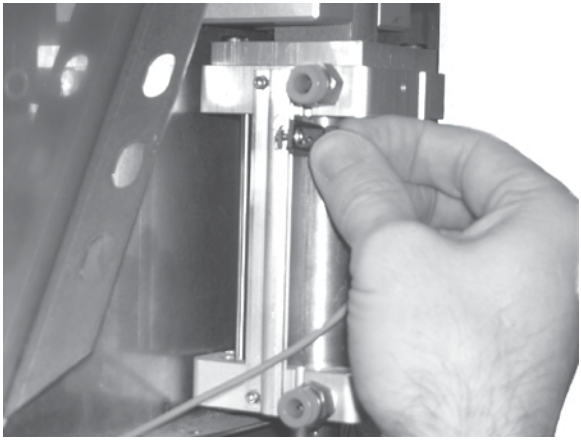


Figure 9-5: Removing the limit switch

7. Using a small flat head screwdriver, pry one locking e-ring from the end of the Rod Pivot Pin. The Rod Pivot Pin is used to secure the cylinder to the bucket door.

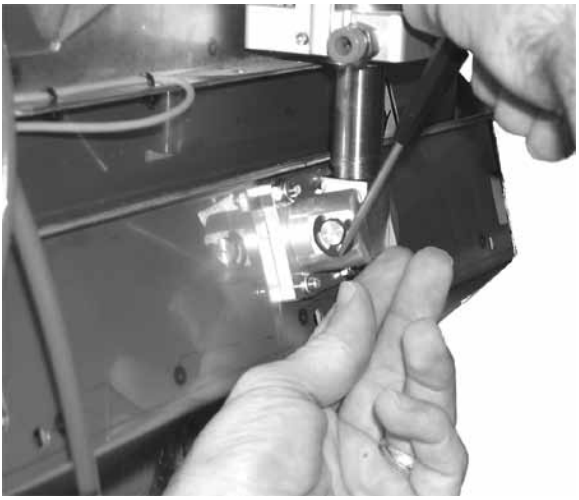


Figure 9-6: Removing the e-ring from the pin

8. Slide the Rod Pivot Pin out of the Rod Pivot Block.

Figure 9-7: Remove the rod pivot pin

9. Using a 5/32″ Allen wrench, unscrew and remove the four 1/4″ button-head screws located inside the bucket. These screws hold the left and right Clevis Blocks to the bucket.

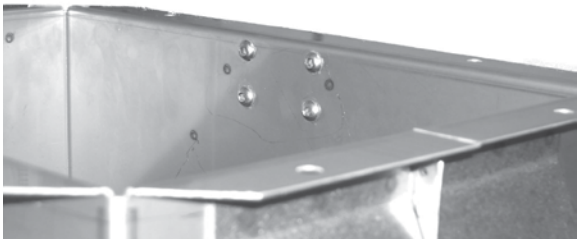


Figure 9-8: Button-head screws (far side)

10. Pull one Clevis Block off the top side of the cylinder, and then slide the cylinder off the Clevis Block Pin.

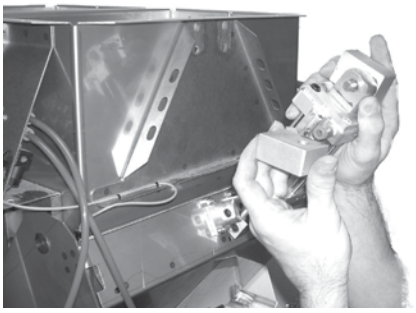


Figure 9-9: Slide the cylinder off the clevis rod

11. Use a 1/2″ socket to unscrew and remove the two 1/4″ air fittings from the cylinder.

CAUTION: Do not damage or score the cylinder in any way. Doing so will damage the seals inside the cylinder.

12. Pull the Cylinder Shaft out of the cylinder enough to wrap some thick cotton cloth around it and clamp it with a pair of vise-grips. The cloth helps protect the Cylinder Shaft from the jaws of the vise-grip.

13. Use the adjustable wrench to hold the Rod Pivot Block.

Turn the block counter clockwise while using the vise-grips and cloth to hold to the Cylinder Shaft.

14. Remove the stop collar from the cylinder shaft.

Now that the defective cylinder is removed from your HCGG bucket, you are ready to install the new one.

Installing the Cylinder

To install the new cylinder, complete the following steps:

1. Using your fingers, remove the locking nut from the end of the new cylinder shaft and discard it.
2. Slide the stop collar onto the cylinder shaft.
3. Pull the Cylinder Shaft out of the cylinder enough to wrap some thick cotton cloth around it and clamp it with a pair of vise-grips. The cloth helps protect the Cylinder Shaft from the jaws of the vise-grip.
4. Use the adjustable wrench to hold the Rod Pivot Block. Turn the block clockwise to attach it to the cylinder while using the vise-grips to hold to the Cylinder Shaft.

Note: As an additional air-tight precaution, we recommend putting Teflon tape on the threads that the air fittings screw on to, ensuring an air-tight seal.

5. Using a 1/2″ socket, tighten the two 1/4″ air fittings onto the new cylinder.
6. Slide the top of the new cylinder on to Clevis Block Pin and place the two Clevis blocks onto the pin, clamping the cylinder in the middle.

7. Place the Clevis Blocks to their mounting locations at the top of the bucket and start the four 1/4″ button-head screws into place using a 5/32″ Allen wrench.

Note: Do not tighten the 1/4″ button-head screws all the way; the cylinder needs to be aligned and adjusted first.

8. Extend the cylinder and insert the Rod Pivot Block into the bucket door mounts.

9. Slide the Rod Pivot Pin through the bucket door mounts and Rod Pivot Block pin hole. This connects the cylinder shaft to the bucket door.

10. Attach the e-ring to its proper location by pushing it until it snaps into place. An attached e-ring on each end of the pin secures the Rod Pivot Pin place.

Note: The cylinder position is not adjustable on newer systems, so the following may not apply to your situation.

11. Adjust the Clevis Blocks so there is a 1/4″ clearance between the top of the Clevis blocks and the bottom of the bucket lip. You can place a 1/4″ Allen wrench between the mounting block and bucket lip to set the clearance.

Figure 9-10: Adjust the space between the clevis block and the bucket lip

12. Using a 5/32″ Allen wrench, securely tighten the 1/4″ button-head screws into place.
13. Reconnect each air hose to its correct location (top to top, bottom to bottom) on the cylinder by pushing the air hose into the fitting then pulling on it to ensure it is securely attached.
14. Slide the limit switch back through the small opening in the top of the slide rod but do not tighten it.
15. Turn on the air source to the HCGG.
16. Turn on the power supply to the HCGG.

The new cylinder is installed, but the limit switch still needs to be adjusted. Refer to the Limit Switch Adjustment section of this chapter to complete the installation process.

Limit Switch Adjustment

On the High Capacity GrainGage (HCGG), each cylinder has a small black limit switch to detect the position of the bucket door. If the limit switch is not set correctly for each bucket door, it can result in the doors not opening or closing completely. Each limit switch is located on the cylinder for each bucket door.

Tools Needed

Tools needed for adjusting a limit switch:

- Flat-head screwdriver
- Permanent marker

Adjusting the Limit Switch

To adjust a limit switch, complete the follow steps:

1. Check that the air source and power to the HCGG are turned on.
2. Check that the bucket door is completely closed.
3. Locate the first limit switch needing adjustment.

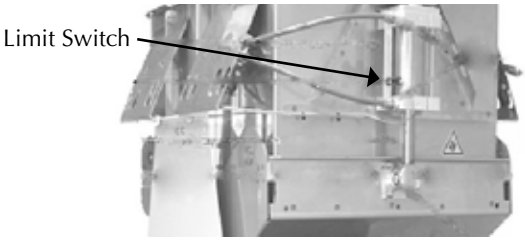


Figure 9-11: Location of limit switch

4. If not already loosened (for those who have just installed a new cylinder) use a flat head screwdriver to loosen the small screw holding the limit switch in place.
5. Slide the loosened magnetic limit switch up or down on the channel until the LED located on the limit switch lights up.
6. Use a flat head screwdriver to tighten limit switch screw.
7. Mark the top edge of the limit switch, on the side of the actuator, with a permanent marker.

Figure 9-12: Use a marker to mark the top edge of the limit switch

Follow the previous steps for each bucket door limit switch.

Testing the Limit Switch Adjustment

After the limit switch has been adjusted, we recommend testing the adjustment. To do this, complete the following steps:

1. Set the Auto/Manual switch on the System Console to Manual.

2. Set switch to Open, making sure the specified door opens all the way, in the correct direction at the actuation of the manual switch.
3. Set switch to Close, making sure the specified door closes all the way, in the correct direction at the actuation of the manual switch.
4. Check the System Console for the light to stop blinking for the bucket door you just closed.

Note: If the light on the System Console continues to blink, the limit switch needs to be readjusted. If the System Console light stops blinking and stays on, the limit switch is correctly set.

5. Complete the previous steps for each limit switch on your HCGG.

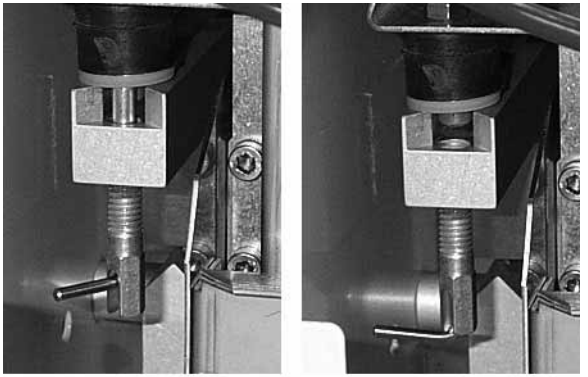
The limit switches on your HCGG are now adjusted and tested.

Weigh Bucket Removal

There are rare situations that require the removal of the weigh bucket. If you find yourself in a situation that requires the removal of the weigh bucket, complete the following steps to correctly remove the weigh bucket.

1. Unscrew and remove the two front braces of the bottom half of the HCGG allowing you access to the inside of the HCGG.

2. Push down the arms on the retractable locks and turn them forward so the locks are held in the "unlocked" position.



Locked Unlocked

Figure 9-13: Unlocking retractable locks

3. Remove the two air hoses by pushing in the plastic collars and at the same time, pulling on the hoses in the opposite direction.

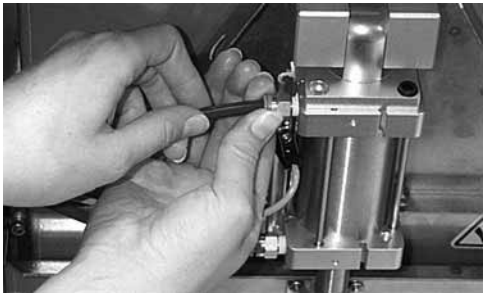


Figure 9-14: Removing the air hose

4. Remove the limit switch by loosening the mounting screw and sliding the limit switch up and out of the mounting bracket.

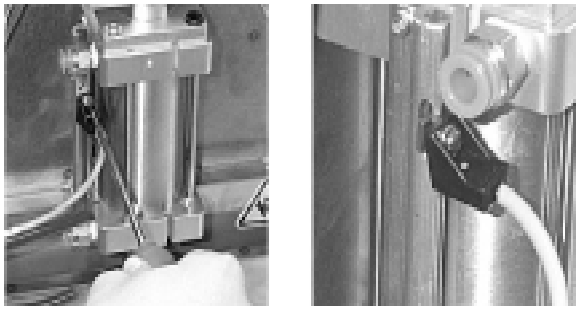


Figure 9-15: Removing the limit switch

5. Disconnect the "Moisture Sensor" connector from the Analog module.

Figure 9-16: Removing the weigh bucket

Replacing the Load Cell

The load cell can be replaced once the weigh bucket has been removed. To replace the load cell complete the following steps:

1. Locate the load cell on the inside of the HCGG.

2. Remove the defective load cell's cable from the Analog module.

Figure 9-17: Load cell

3. Remove the two screws that attach to the bottom of the load cell using a 3/16″ Allen wrench.

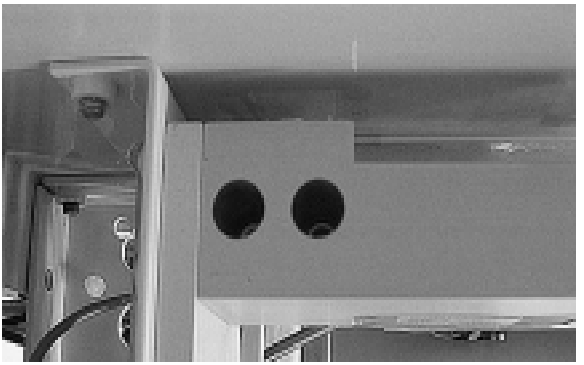


Figure 9-18: Bottom two screws of load cell

4. Use a 3/16″ Allen wrench to carefully remove the two screws on the top of the support that lead into the load cell.

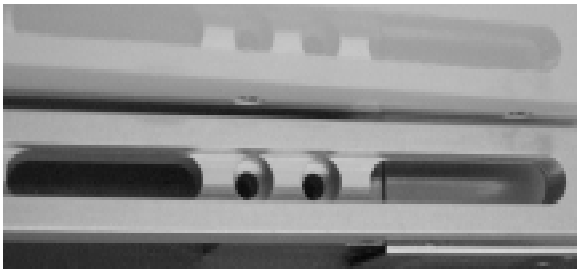


Figure 9-19: Two top screws of load cell

5. Remove broken load cell and replace with new load cell.
6. Reattach screws. We recommend using 242 Loc-Tite to keep screws snug.

Reinstalling the Weigh Bucket

Reinstall the weigh bucket with the following steps:

1. Replace the bucket by carefully pushing it into the bottom half of the HCGG and watching the hoses and limit switch so they are not caught as you push it in.
2. Connect the Moisture Sensor connector to the Analog module.
3. Adjust the limit switch by sliding the loosened mount screw into the Mounting bracket and sliding it down.
4. Use a flat head screwdriver and tighten the screw. See *Adjusting the Limit Switch* earlier in this section.
5. Attach the two air hoses by pushing on the hoses into the 1/4″ Air Fittings until they cannot go in any farther.
6. Push down the arms on the retractable locks and turn

them so the locks slide back up into the "locked" position.

7. Return the two front braces of the bottom half of the HCGG, and screw them back into place. Use LocTite 222 on the threads of the screws.

Your weigh bucket is now reinstalled into your HCGG.

If you have any maintenance questions, please contact a Juniper Systems Technical Service Representative at (435) 753-1881 or e-mail them at techsupport@junipersys.com.

Return for Repair Procedure

In the event that your Harvest Data System needs repairs, contact a Juniper Systems Technical Service Representative for a Returned Materials Authorization (RMA) number. Please have the following information ready when you call:

- Serial Number
- Model Number
- Name and Company/University/Agency
- Phone and Fax Numbers
- Clear description of problem
- Purchase Order Number and Billing Address

Under the Premium Support Agreement, HarvestMaster will ship you a replacement loaner Next Day Federal Express or UPS Red. To avoid any problems in the return procedure, complete the following steps:

1. Once you receive the loaner unit, fill out the shipping and RMA forms that were included with your loaner equipment. Include a description of the failure. The more information you can supply concerning the malfunction and the circumstances under which it occurred, the quicker our technicians can complete the repair.
2. Package your equipment in the same box (if the existing box is still good). Package the unit properly to avoid shipping damage.
3. Write the RMA# on the package you ship. Ship it Federal Express, Next Day Air Mail, or UPS Red.

Your equipment will be repaired and returned to you. After receiving your repaired equipment, you will be authorized a period in which to return the loaner unit before you will be billed for it. There is an annual service and support fee that allows you to have this service. Please call for detailed information and pricing.

APPENDIX

Appendix A: Warranty

Appendix B: Mounting Diagrams

Appendix C: Cable Wiring Diagrams for the HM-800

Appendix D: Getting the HCGG Ready

Appendix E FRS Update for CX

Appendix F: FRS Update for Laptop

Appendix A
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 materials or workmanship for a period of one year from 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 HarvestMaster 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

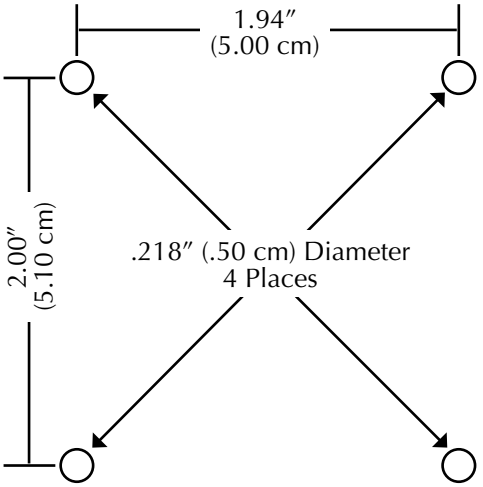
Removal of the Juniper Systems serial number label from an instrument will void any warranty on the said instrument. Juniper Systems will not repair or update an instrument and return it to an individual if the instrument is without the said serial number label.

Extended Warranties

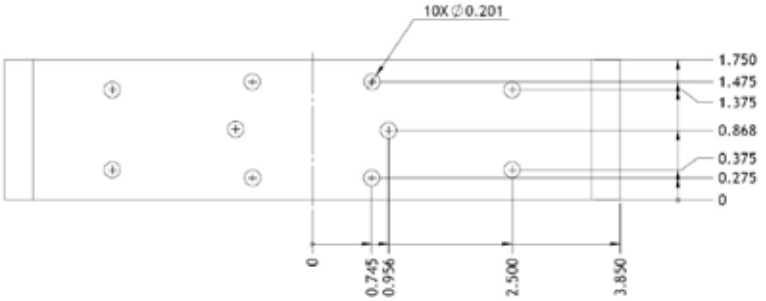
Juniper Systems offers a variety of warranty options to extend coverage beyond the standard warranty. You can contact Juniper Systems Customer Service Department for details at (435) 753-1881 (6 am - 5 pm MT, Mon-Fri).

Appendix B
Mounting Diagrams

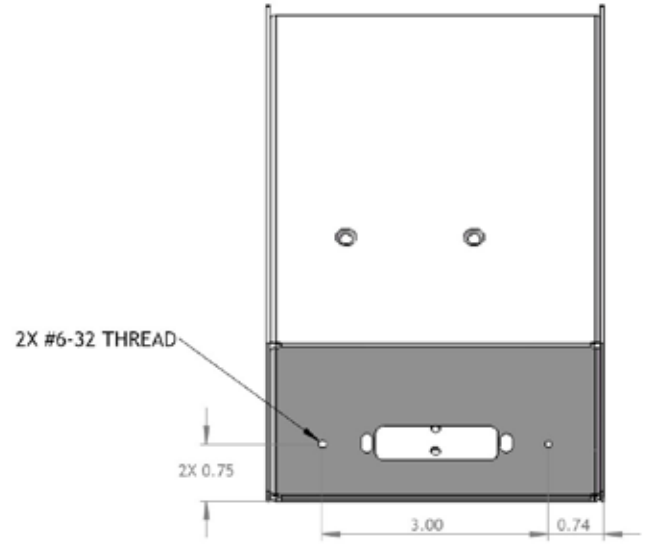
This diagram shows placement for mounting the Field Computer cradle.

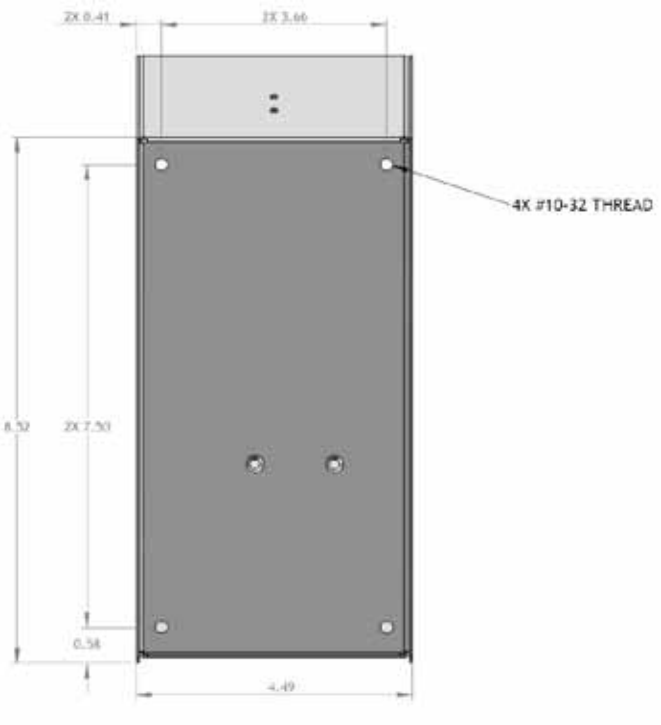


Below is pictured the system console mounting diagram.



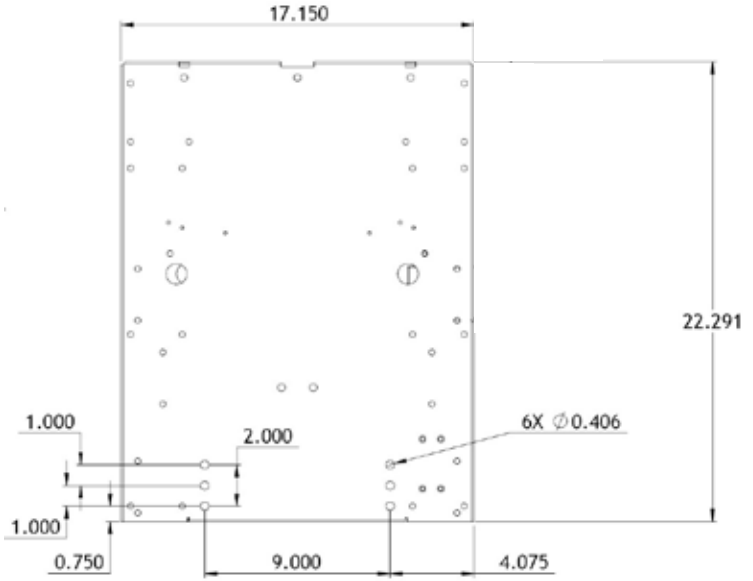
The next two diagrams are for mounting the printer.


2X #6-32 THREAD
2X 0.75
3.00
0.74

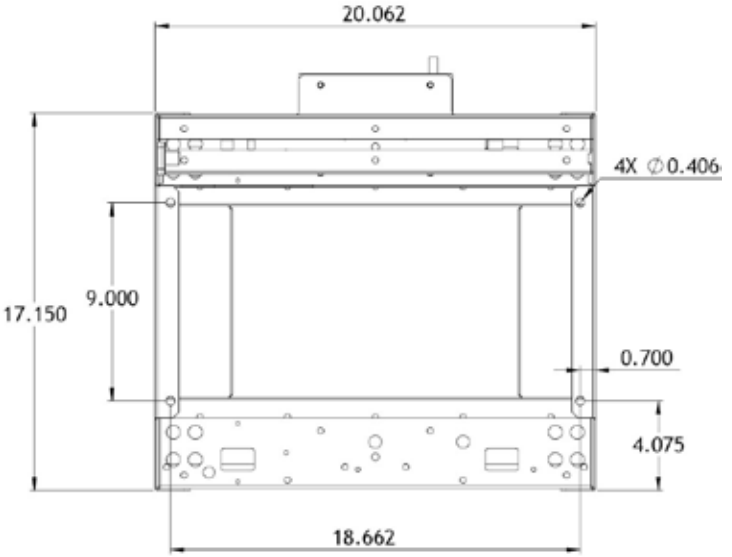

2X 0.41
2X 3.66
4X #10-32 THREAD
8.32
2X 7.50
0.58
4.49

The following diagrams are for mounting the HCGG.

Side View



Bottom View



Appendix C

Cable Wiring Diagrams for the HM-800

Cable Connections for HM-800

Within the HM-800 there are several components. Figure C-1 shows the components wired on the stand.

Figure C-1: Front view of HM-800 components

Figure C-2 shows the cable connections from the HM-800

System Console and modules to other components.

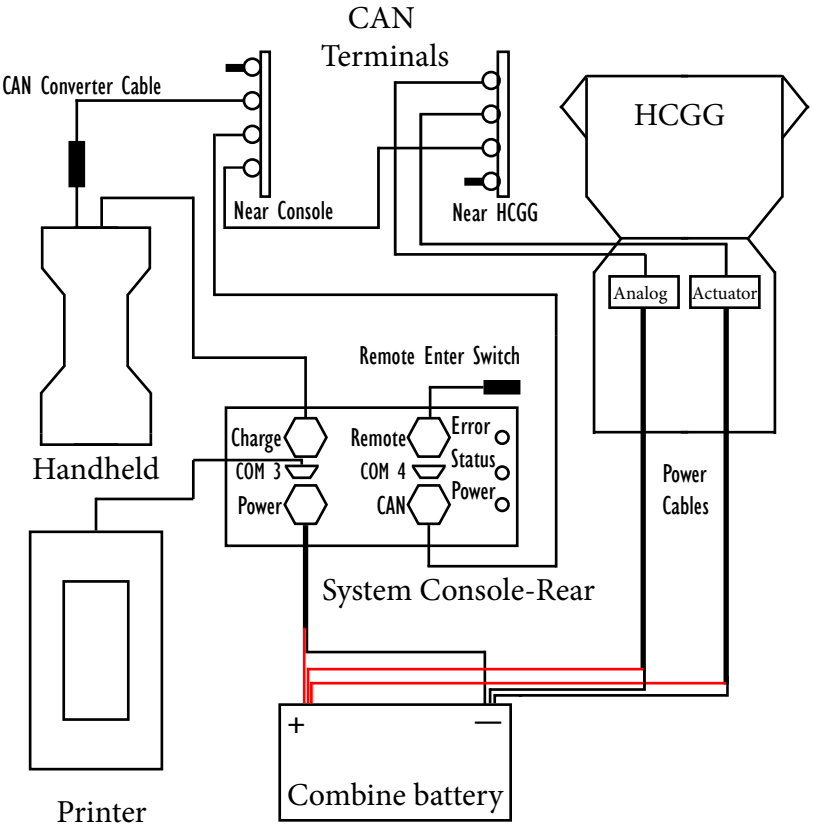


Figure C-2a: Cable connections for the HM-800

ACTUATOR

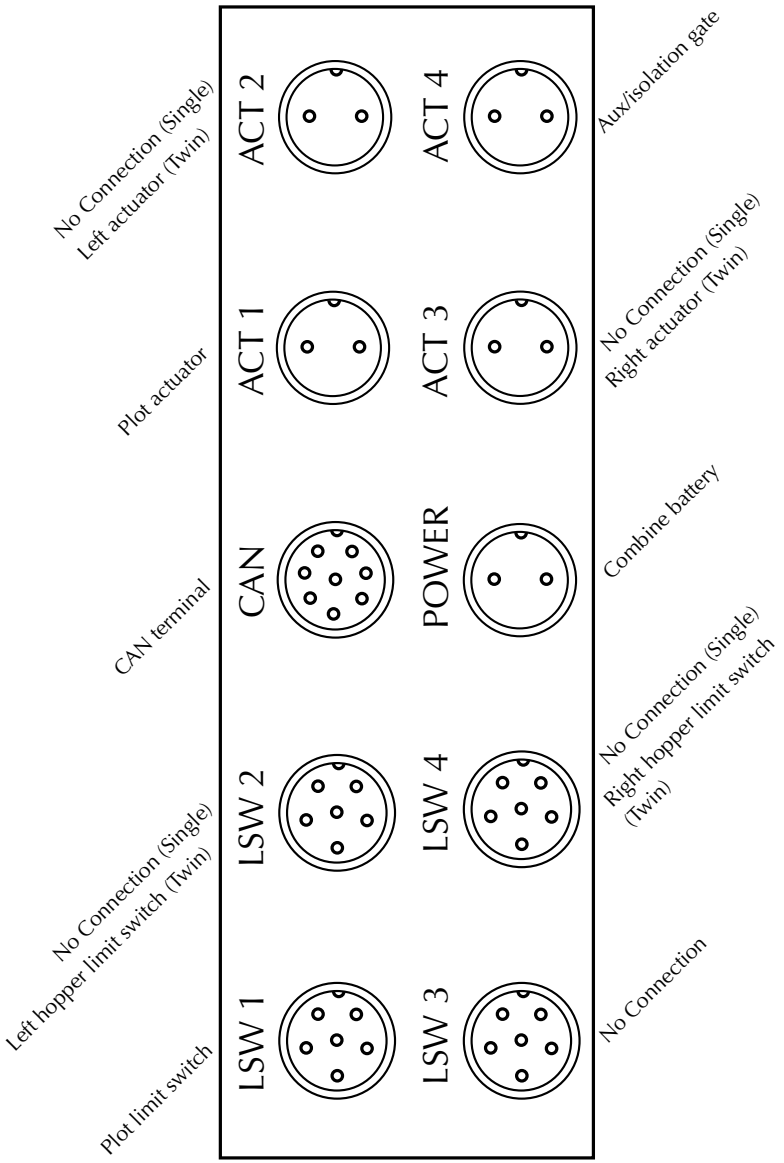


Figure C-2b: Cable connections for the actuator module

ANALOG

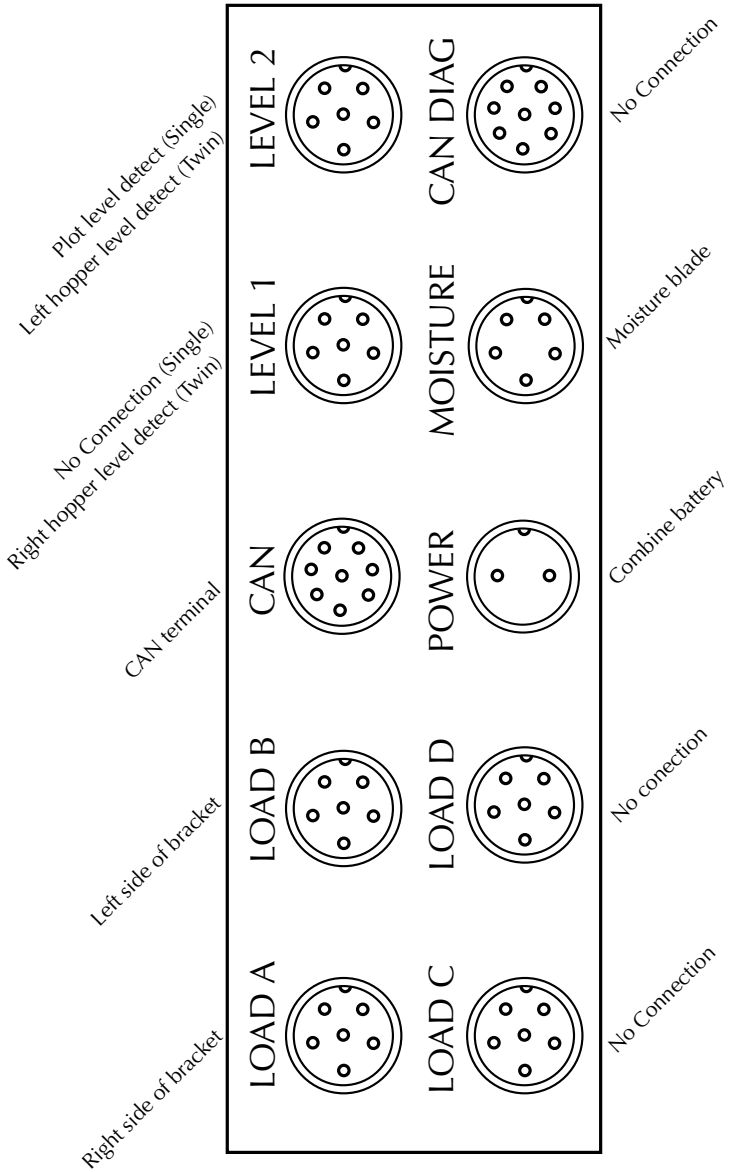


Figure C-2c: Cable connections for the analog module

The HM-800 High Capacity GrainGage is composed of the following hardware:

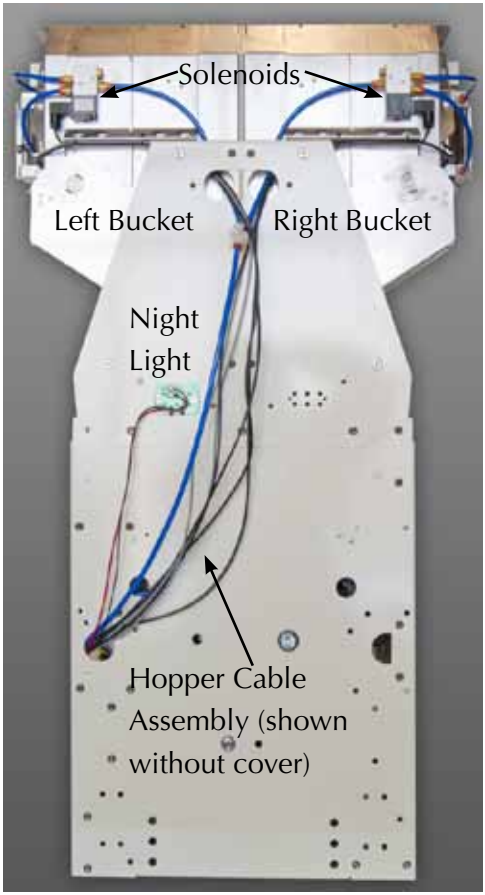


Figure C-3a: HM-800 Twin plot system (side)

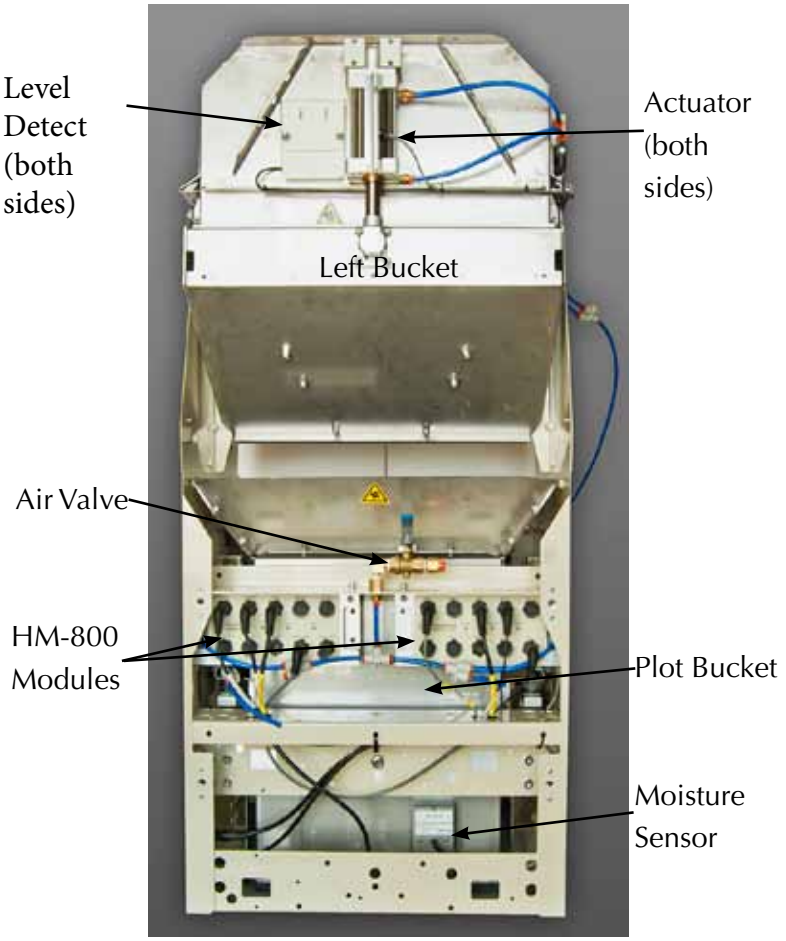


Figure C-3b: HM 800 Twin Plot system (front)

Left and Right Hopper Buckets

Left and Right Hopper Buckets collect the initial harvest loads for reading.

Solenoids

The solenoids convert the electrical signal from the Actuator module into air pressure directed into one of two channels to open or close the bucket door.

Actuators

The Actuators run the mechanical functions of the hopper buckets.

Level Detects

The Level Detects are used to measure grain level within each of the holding hoppers of the High Capacity GrainGage. The Level Detects set the point that the hoppers cycle at during harvest of longer strip plots. The Level Detect is not used with normal Plot Harvest.

Air Shut-off Valve

Air Shut-off Valve shuts off the airflow in the HCGG.

Analog and Actuator modules

Along with the System Console, the modules control the function of the HCGG.

Slope and Motion System

Slope and Motion system is a patented sensor internal to the Analog module that is used to decrease errors caused by combine vibrations or when harvesting on slopes. This results in increased accuracy of the weight readings. The Slope and Motion sensor is enabled via software.

Plot/Weight Bucket

Plot/Weight Bucket rests on two load cells for collecting weight readings from the hopper buckets, which are filled during harvesting.

Moisture Blade

Moisture Blade is a sensor used to measure moisture and density (test weight) in the Plot Bucket on the High Capacity GrainGage.

Night Light

The night light is a high-intensity LED array designed to provide illumination in low-light situations.

Appendix D

Getting the HCGG Ready

HCGG Unpacking and Inspecting

After receiving your HCGG, unpack and inspect it by completing the following:

1. Open the boxes in which the HCGG is shipped.
2. Remove the two halves of the HCGG from the packaging.
3. Place the bottom half of the HCGG on the floor and the top half on a table in the "right side up" position.
4. Remove the installation kit from the hopper.
5. Cut the tie that is holding the cables outside the hopper assembly.
6. Inspect the cables, connector ends, and appearance of the system for any damage that might have occurred during shipping.

HCGG Hopper Assembly

Now that you have unpacked and inspected your HCGG, you are now ready to put it together. Juniper Systems, Inc. strongly advises that you have three people to complete the first two steps. Complete the following steps to fully assemble the HCGG hopper.

Remove Panel Covers

There are two removable panels located on the bottom half of the HCGG. Four large screws attach each panel. These screws have a large flat surface so you can unscrew them by hand. Remove these front and back panels by completing the following:

1. Turn each of the four screws counter clockwise until the screws are loose.
2. Pull the panel off of the bottom half of the HCGG.
3. Repeat steps one and two for the other panel on the bottom half of the HCGG.

HCGG Assembly of Top and Bottom Halves

Placing the top half of the HCGG on the base is the next step. Juniper Systems strongly advises that you have three people to complete this assembly process because the top half needs to be held on top of the base until the mounting screws are correctly installed.

Assemble the top and base of the HCGG by completing the following:

1. Position the base of the HCGG so that the Analog and Actuator modules are facing you.
2. Place the top half of the HCGG on top of the base with the light and wiring harness on the right. Carefully position it above the base to allow the third person to

install the six screws.

Figure D-1: Top half of High Capacity GrainGage secured to the base

3. Route the cable bundle down the right side of the HCGG and into the large hole on the side of the HCGG.

Once completed, the placement of the group of wires should resemble figure D-2.

Figure D-2: Wire Harness feed out and feed in points

Now that the two halves of HCGG are combined into one unit, connecting and installing all of the internal wiring is the next step.

Cable Placement

With the top and bottom halves joined and the wire bundle placed through the large hole in the HCGG, route the cables to their respective locations. These should be clearly marked on the individual wires. Wires extending to the Analog module may be routed either on top of or beneath the crossbar as shown.

Note: For additional information on cable placement, refer to the section titled, **Connector Wiring Diagrams for the HM-800** immediately following this section.

Figure D-3: Cables routed to modules

1. Remove the blue hose plug and insert the hopper air line into the "Y" splitter below the Actuator module. If your HCGG has a BDS unit installed, attach the BDS air line to the "Y" splitter below the Analog module.
2. If your HCGG has a BDS unit installed, route the BDS CAN cable down through the square hole in the middle crossbar. Attach the CAN cable to the lower port on the CAN splitter. Make sure that the locking collar is engaged.

Figure D-4: BDS CAN cable installed

3. Once all the cables are correctly routed, install the cable guard over the cable bundle on the outside of the assembled unit. See Figure D-5.

Note: The wires should be tied to the crossbar to prevent interference with the weigh bucket.

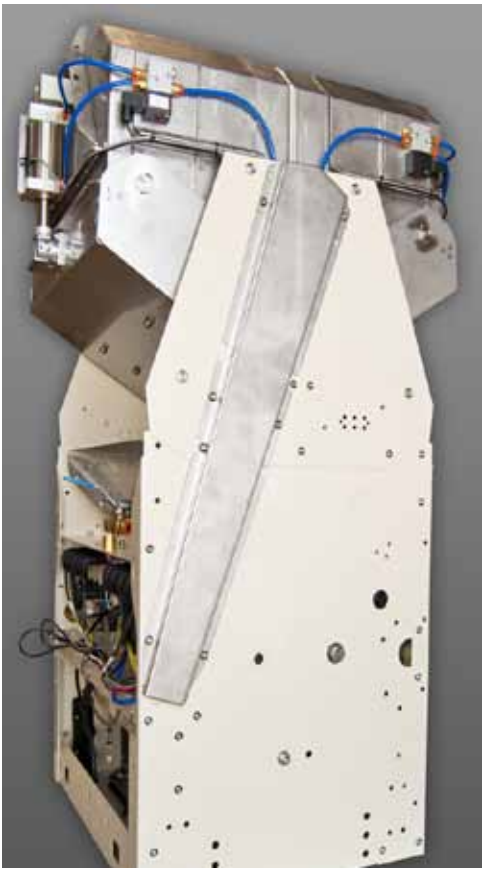
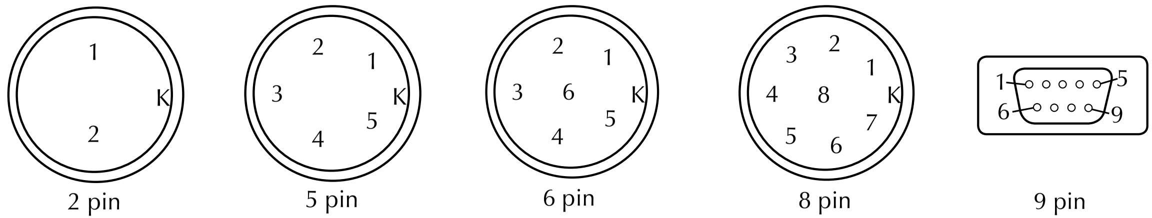


Figure D-5: Cable guard installed on HCGG

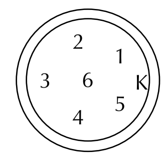
4. Complete the assembly process by installing the side doors.

Your Twin HCGG is assembled and ready for installation.

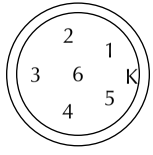
Connector Wiring Diagrams for the HM-800

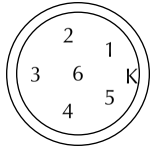


Analog Module	Twin	Single	Pin	Connection	Description
			1	Red	Excite
			2	Shield	Ground
Level 1	Level 1	Level 1	3	Black	Digital In
6 pin	Right Hopper	Right Hopper	4	N/C	N/C
			5	N/C	N/C
			6	N/C	N/C

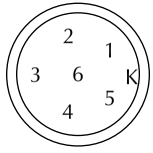


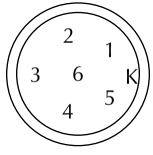
Analog Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Level 2 *6 pin*	Level 2 Left Hopper	Plot Level Detect	1 2 3 4 5 6	Red Shield Black N/C N/C N/C	Excite Ground Digital In N/C N/C N/C
Load A *6 pin*	Load A Right Load Cell	Load A Right Load Cell	1 2 3 4 5 6 N/C N/C	Green N/C Red White Black Shield Brown Blue	Excite N/C Signal + Signal – Excite Gnd Chassis Gnd N/C N/C



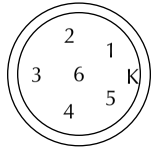


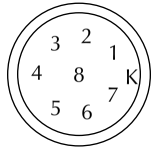
Analog Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Load B *6 pin*	Load B Left Load Cell	Load B Left Load Cell	1 2 3 4 5 6 N/C N/C	Green N/C Red White Black Shield Brown Blue	Excite N/C Signal + Signal – Excite Gnd Chassis Gnd N/C N/C
Load C *6 pin*			1 2 3 4 5 6 N/C N/C	Green N/C Red White Black Shield Brown Blue	Excite N/C Signal + Signal – Excite Gnd Chassis Gnd N/C N/C



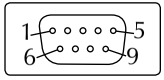


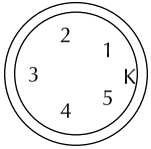
Analog Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Load D *6 pin*	Load D SMS	Load D SMS	1 2 3 4 5 6 N/C N/C	Green N/C Red White Black Shield Brown Blue	Excite N/C Signal + Signal – Excite Gnd Chassis Gnd N/C N/C
CAN *8 pin*			1 2 3 4 5 6 7 8	Red Yellow Black Green N/C N/C N/C N/C	CAN Power CAN + CAN Gnd CAN – N/C N/C N/C N/C

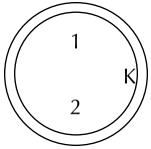




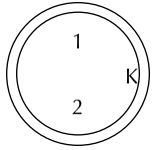
Analog Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
CAN-DIAG *8 pin*	CAN	CAN	1 2 3 4 5 6 7 8	Red Yellow Black Green N/C N/C N/C N/C	CAN Power CAN + CAN Gnd CAN – N/C TX RX GND
Moisture *5 pin*	Moisture EM Sens	Moisture EM Sens	1 2 3 4 5	Red Black Green White Shield	Excite Ground Signal + Signal – Ground
Power *2 pin*	Power	Power	1 2	Black Red	Ground +12 V

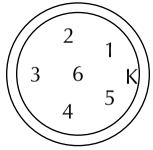




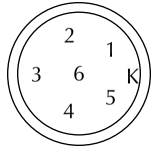


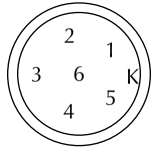
Actuator Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Act 1 *2 pin*	Act 1 Plot Act	Act 1 Plot Act	1 2	Red Black	Power Ground
Act 2 *2 pin*	Act 2 Left Act		1 2	Red Black	Power Ground
ACT 3 *2 pin*	Act 3 Right Act		1 2	Red Black	Power Ground
Act 4 *2 pin*	Act 4 Aux Act	Act 4 Aux Act	1 2	Red Black	Power Ground
LSW 1 Open *6 pin* Close	LSW 1 Plot	LSW 1 Plot	1 2 3 4 5 6	N/C N/C N/C Brown Blue Black	N/C N/C N/C Excite Ground Signal

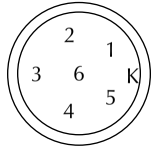




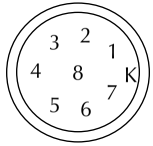
Actuator Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
LSW 2 Open / Close *6 pin*	LSW 2 Left LSW		1	N/C	N/C
			2	N/C	N/C
			3	N/C	N/C
			4	Brown	Excite
			5	Blue	Ground
			6	Black	Signal
LSW 3 Open / Close *6 pin*	LSW 3 Right LSW		1	N/C	N/C
			2	N/C	N/C
			3	N/C	N/C
			4	Brown	Excite
			5	Blue	Ground
			6	Black	Signal
LSW 4 Open / Close *6 pin*			1	N/C	N/C
			2	N/C	N/C
			3	N/C	N/C
			4	Brown	Excite
			5	Blue	Ground
			6	Black	Signal

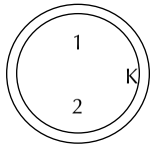




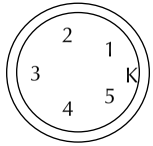


Actuator Module	*Twin*	*Single*	*Pin*	*Connection*	*Description*
CAN *8 pin*	CAN (patch Cable)	CAN	1 2 3 4 5 6 7 8	Red Yellow Black Green N/C N/C N/C N/C	CAN Power CAN + CAN Gnd CAN – N/C N/C N/C N/C
Power *2 pin*	Power	Power	1 2	Black Red	Ground +12 V

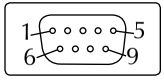


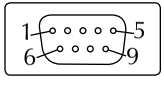


System Console	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Allegro Power *2 pin*			1 2	Stria Black	+12 V Ground
Remote *5 pin*			1 2 3 4 5	Black Green Red N/C N/C	Input Ground Power N/C N/C

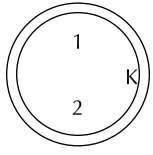


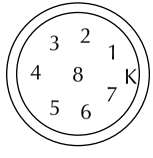
System Console	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Com 3			1	N/C	N/C
			2	RXD	Receive Data
			3	TXD	Transmit Data
			4	DTR	Data Terminal Ready
			5	GND	Ground
			6	DSR	Data Set Ready
			7	RTS	Request to Send
			8	CTS	Clear to Send
			9	N/C	N/C
Com 4			1	N/C	N/C
			2	RXD	Receive Data
			3	TXD	Transmit Data
			4	DTR	Data Terminal Ready
			5	GND	Ground
			6	N/C	N/C
			7	RTS	Request to Send
			8	CTS	Clear to Send
			9	RI	Ringing In





System Console	*Twin*	*Single*	*Pin*	*Connection*	*Description*
Power *2 pin*	Power	Power	1 2	Black Red	Ground +12 V
CAN *8 pin*	CAN	CAN	1 2 3 4 5 6 7 8	Red Yellow Black Green N/C N/C N/C N/C	CAN Power CAN + CAN Gnd CAN – N/C N/C N/C N/C





Appendix E

FRS Update for Allegro CX

Important notes

The process of updating FRS will erase all data associated with the current installation of FRS on the handheld. Please review the items in this section to understand which data is at risk and be sure to make backup copies so that you can restore files that are critical to your FRS setup. Please review the RELEASE NOTES associated with the latest software version located on the HarvestMaster website. These notes will recommend optimal settings and instructions to maximize the efficiency of your Harvest Data System.

This update will:

- Remove all existing versions of FRS stored on your handheld.
- Remove the FRS database on the handheld. This includes field maps, customized trait list, trait templates, and other associated data. This data needs to be exported and saved so that they can be imported back into FRS after the new software is installed.
- Erase special harvest script files (GHM, Kincaid air diverter, Wintersteiger subsampler, etc.). These instructions will guide you through how to either download the latest script file, or save your original

script files and import them into the newest version of FRS.

- Erase the harvest calibrations and handheld settings, including load cell coefficients, chamber volumes, actuator settings, level detect sensor settings, timers, and moisture curves. In order to avoid having to recalibrate after the update, be sure to record the current harvest calibrations and handheld settings so that they can be entered in FRS after the update.

Requirements

- Original FRS Note Taking serial number and registration codes found on the back of CD case or laminated card sent at the time of purchase
- Allegro CX Field PC
- Microsoft ActiveSync (for Windows XP) or Windows Mobile Device Center (for Windows Vista)
- Either a USB Power Dock (recommended)

Saving your original script file

There may be an updated version of your script file. Please consult our website to determine if this is the case. If so, then you will not need to worry about saving your original script file.

1. Go to ***My Computer > C_Drive > FRS*** on handheld.
2. Go into your Harvest Module's folder.

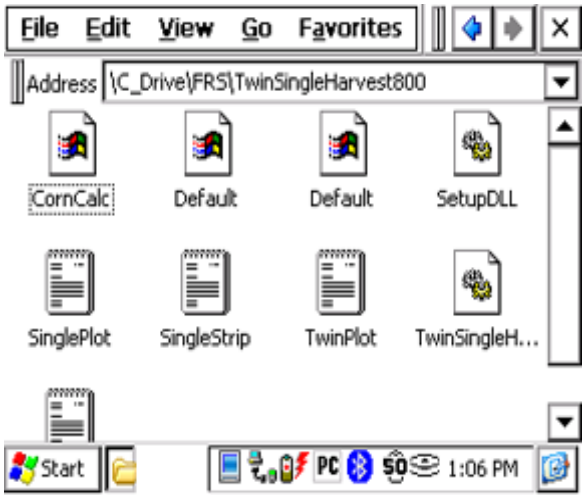


Figure E-1: Select module folder

3. Hold Ctrl on the handheld keyboard and select the appropriate text files by tapping once on each file. Text files are represented by an icon of a notebook.
4. Click ***Edit***; click ***Copy***
5. Go back to C:_Drive and go into ***C_MyDocs***.
6. Click ***Edit***; click ***Paste***.

Removing and Installing Latest Version of FRS and Related Firmware

Removing FRS and Firmware on Handheld

1. Tap on ***Start > Settings > Control Panel.***

Figure E-2: Select Control Panel

2. Scroll down to ***Remove Programs***. Press ***ENTER***.

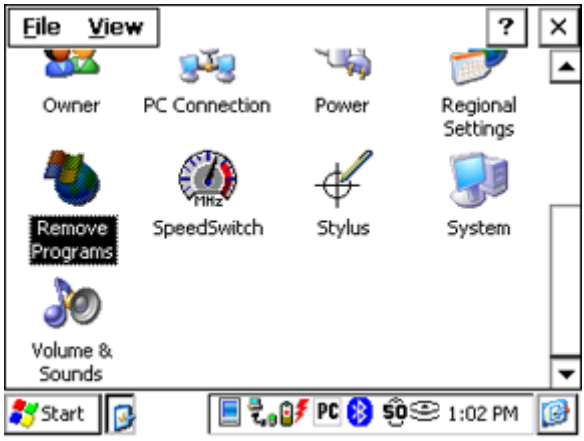


***Figure E-3: Select* Remove Programs**

3. Choose to remove the Harvest Module.

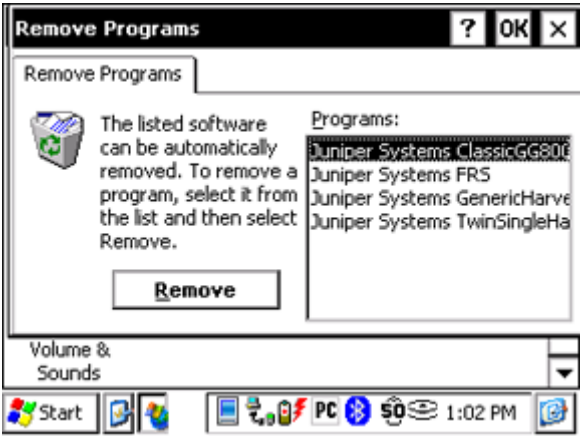


Figure E-4: Select program to remove

4. Confirm your intention to remove the program.
5. Choose to remove ***FRS Notes***.
6. Confirm your intention to remove the program.
7. Choose to remove all application data.
8. Go to ***My Computer*** on handheld's desktop.
9. Open ***C_Drive.***

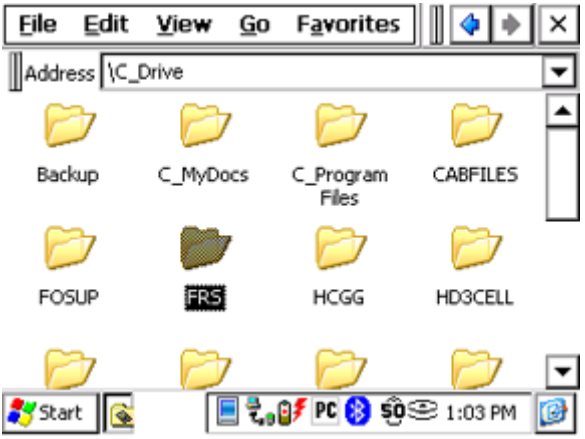


Figure E-5: Delete FRS folder

10. Delete ***FRS*** folder.
11. Choose ***Yes*** to whatever questions it asks about removing files.

Set handheld to factory defaults

This action will remove any other programs you have loaded onto the handheld

1. Select ***Start > Programs > Utilities > Set Factory Defaults.***
2. Click ***Yes.***
3. Recalibrate the touch screen.
4. Enter the last known battery charge.

??

Downloading and Installing Updated FRS

1. Visit http://www.harvestmaster.com/updates.
2. Download the FRS Note Taking EXE file, making sure you select the correct version of the software for your handheld OS (ex. CX vs. MX).
3. Make an Activesync or Mobile Device Center connection between your handheld and PC.
4. Run FRS Note Taking setup on PC.
5. Choose installation location on PC.
6. Choose ***Yes*** to allow program to install in default location on handheld.
7. Give it a minute or two to download onto your handheld.
8. Run FRS on handheld.
9. Enter name and previously obtained serial number, and registration key.

Downloading and Installing Harvest Module

1. Visit http://www.harvestmaster.com/updates.
2. Download CAB file associated with your harvest module and correct handheld OS (example: 400 vs. 800 and CX vs. MX).
3. Make an Activesync or Mobile Device Center connection between your handheld and PC.

4. Click Explore (XP) / File Management (Vista).
5. Click and drag the CAB file from the PC to the handheld to a location where you can find later with File Explorer.
6. Allow file to convert to handheld format.
7. Run file on handheld.
8. Tap ***OK*** to allow program to install in default location on handheld.

HM-400 Users:

If you are using an HM-400 system without a BDS test weight cup, you are ready to connect the handheld to the device. After a connection has been made to the Harvest Data System (HDS), the IOS on the HM-400 will automatically update If your Graingage has a BDS test weight cup, you must also update the firmware on the Hybrid module. See instructions below.

You can key in your calibration settings that were previously copied down and verify the calibration and operation. If you never changed the transition timers on the actuators, we recommend leaving them at default to speed up operation.

Hybrid Module Firmware update:

1. Must also load HM-800 harvest module software for your appropriate handheld and harvest data system w/ BDS.
2. Connect Allegro via CAN-serial cable to a breakout

box. Unplug CAN cable from hybrid module and plug directly into breakout box. Plug a short CAN cable from breakout box to the now open CAN port on the hybrid module.

3. Turn power on to the system and follow the steps outlined below to update the firmware on only the Hybrid module.

After installing the software and getting everything set up, go to ***Start > Programs > Utilities > Save System***. This will permanently burn FRS to the permanent storage so the program will not be lost if the battery runs dead.

HM-800 Users:

- For HM-800 Systems, the firmware must be manually updated using a utility on the handheld. Follow the steps below to complete the HM-800 update.
- Using both the battery with a full charge and the external power cord is ideal before updating the firmware. Also make sure the Auto suspend is disabled (***Start>Settings>Control Panel>Power>Schemes***). If you do not have an external power cord, you can use the Console charge cord. Failure to power the Allegro during the full firmware update process could lock the Console module.

Updating HM-800 Firmware

1. Connect handheld to Harvest Data System.

2. Open ***My Computer> C_Drive> FRS> Firmware***.
3. Run ***HM-800 Updater.***

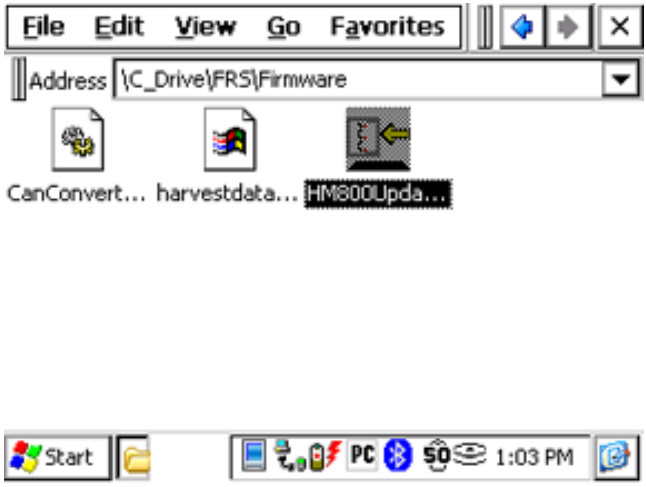


Figure E-6:Select **HM-800 Updater**

4. Choose the file that contains the updated information.

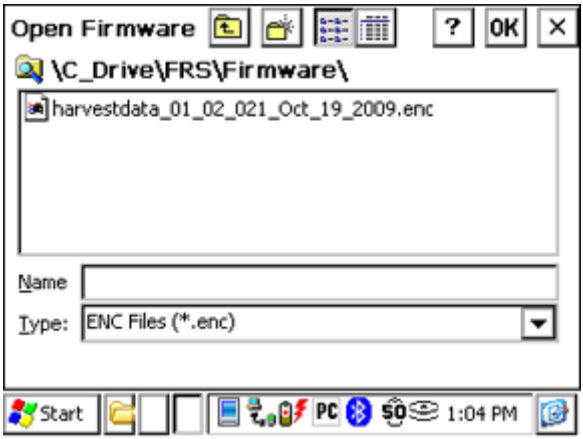


Figure E-7:Select .enc file

5. Select the module you wish to update.

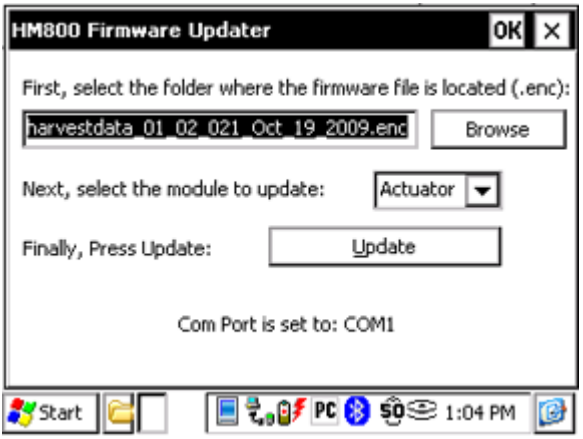


Figure E-8: Select module to update

6. Click on ***Update*** and it will show the current firmware version installed and give you the option of continuing.
7. If the versions do not match and the current firmware version is older than the new firmware version, select ***Yes***.

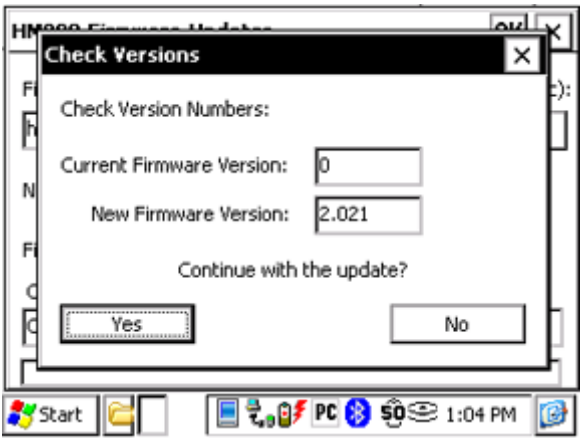


Figure E-9: Continue update

8. Continue the firmware update for all HM-800 modules.

When the firmware update is complete, open FRS and type in your calibration settings that were previously recorded. If you never changed the transition timers on the actuators, we recommend leaving them at default to speed up operation. Verify the calibration and operation of the system. You will also need to import any data that you exported earlier such as maps, customized trait list, trait templates, existing data, etc. Refer to chapter 7 of the FRS Field Reference Guide: Note Taking manual for further instructions on importing and exporting files.

After installing the software and getting everything set up, go to ***Start > Programs > Utilities > Save System***. This will burn FRS to the permanent storage and will not lose the program if the battery runs dead.

Replacing the original script files

If there are no updated script files specified in the release notes,you can now copy/paste the original script files from the storage folder into the new harvest module folder .

1. Go to ***My Computer > C_Drive > C_MyDocs.***
2. Hold ***Ctrl*** on the handheld's keyboard and click all the text files there.
3. Click ***Edit***; click ***Cut.***
4. Go into ***C_Drive > FRS.***
5. Go into your Harvest Module's folder.
6. Click ***Edit***; click ***Paste*** and answer ***yes*** when prompted.

If there are updated script files, download them from the website and paste them into your harvest module folder as previously instructed from steps five to seven.

Updating Datalink for FRS

1. First you will need to uninstall the original version of Datalink for FRS off of your PC.
2. After uninstalling the original Datalink for FRS, visit http://www.harvestmaster.com/updates and download the latest version of Datalink for FRS.
3. Run and install this latest version and your Datalink for FRS will be updated and compatible with the latest Datalink for FRS version.

Appendix F

FRS Update for Laptop

Important notes

The process of updating FRS will erase all data associated with the current installation of FRS on the laptop. Please review the items in this section to understand which data is at risk and be sure to make backup copies so that you can restore files that are critical to your FRS setup. Please review the RELEASE NOTES associated with the latest software version located on the HarvestMaster website. These notes will recommend optimal settings and instructions to maximize the efficiency of your Harvest Data System.

This update will:

- Remove all existing versions of FRS stored on your laptop.
- Remove the FRS database on the laptop. This includes field maps, customized trait list, trait templates and other associated data. This data need to be exported and saved so that they can be imported back into FRS after the new software is installed.
- Erase special harvest script files (GHM, Kincaid air diverter, Wintersteiger subsampler, etc.). These instructions will guide you through how to either download the latest script file, or save your original

script files and import them into the newest version of FRS.

- Erase the harvest calibrations and laptop settings, including load cell coefficients, chamber volumes, actuator settings, level detect sensor settings, timers, and moisture curves. In order to avoid having to recalibrate after the update, be sure to record the current harvest calibrations and handheld settings so that they can be entered in FRS after the update.

Requirements

- Original FRS Note Taking serial number and registration codes at the time of purchase
- Laptop PC running Windows XP, Vista, or 7 (minimum resolution of 1280 x 1024)
- Full administration rights to install software on Laptop (contact your network administrator if you do not have administration rights)
- Microsoft ActiveSync (for Windows XP) or Windows Mobile Device Center (for Windows Vista)

Saving your original script file

1. Select ***Start Menu>Programs>Juniper Systems> FRS>Harvest Module Folder***.
2. Copy the appropriate text files from this folder and paste into a folder outside of the FRS program.

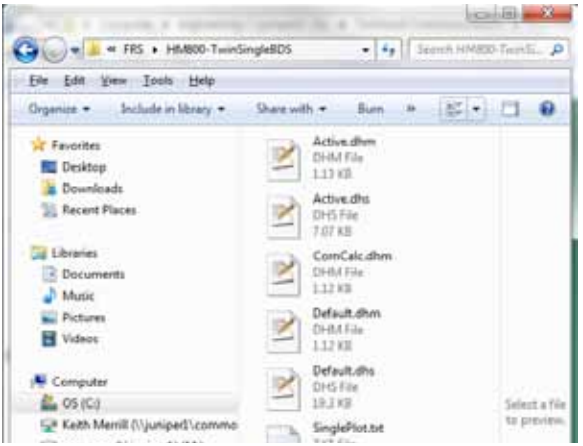


Figure F-1: Harvest Module Script Files'

Removing and Installing Latest Version of FRS and Related Firmware

Removing FRS and Firmware on Laptop.

1. Select ***Start Menu > Programs >Juniper Systems > FRS >Uninstall.***
2. When uninstall is selected, you will be prompted to confirm your selection.
3. Select ***Uninstall*** to begin the process.

Loading updated version of FRS laptop.

1. Visit ***http://www.harvestmaster.com/HarvestMaster/support/Downloads/FRS-Suite.***
2. Select ***FRS 2.2 Laptop for harvest systems***.

3. Select your harvest system type (HCGG, CGG, GHM).
4. Select MAIN SOFTWARE (Note Taking) and download this first.
5. You will now be prompted to RUN the software and it will begin installing.
6. You will then be prompted to choose components that you want to install with the program. Default is all checked.
7. Select ***Next***. You may choose an install location, but default location is automatic. Click ***Install***.
8. Once installation is complete, you should see an FRS icon on your desktop.

Loading update Harvest Module software

1. Return to the website and download the appropriate Harvest Module for your application.
2. Once, downloaded, run the install software and follow the same prompts as the note-taking software.

HM-800 Users: Firmware Update

- The firmware must be updated manually using a utility that was installed with the software. Follow the steps below to complete the HM-800 Firmware update.
- It is critical that the laptop's battery is fully charged and the external power cord is connected before updating firmware. If a power failure occurs to the laptop during

the firmware update process, the system console will become locked.

1. Connect laptop to Harvest Data System.
2. Select ***Start Menu >Programs >Juniper Systems >FRS>Data Folder >Firmware***.
3. Select the Firmware Utility.

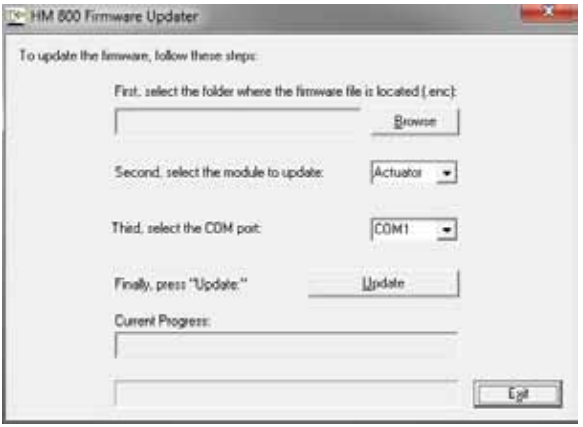


Figure F-2: HM Update screen

4. Select ***Browse***, and then select the ENC. file from the window.
5. Select the module to update.
6. Select your COM port. You may have to configure your laptop's com port settings.
7. Select ***UPDATE.***

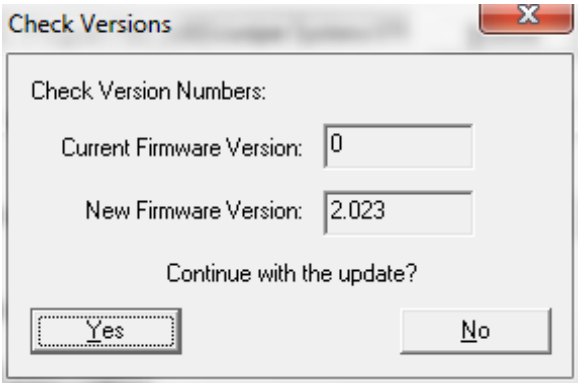


Figure F-3: Check Version screen

8. The Firmware updater will check the current versions and prompt you to continue with update. Select ***YES*** to load current firmware.
9. Continue update on all HM-800 modules on your system.

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