# Field Research Software™

## High Capacity GrainGage™

Reference Guide

# Contents

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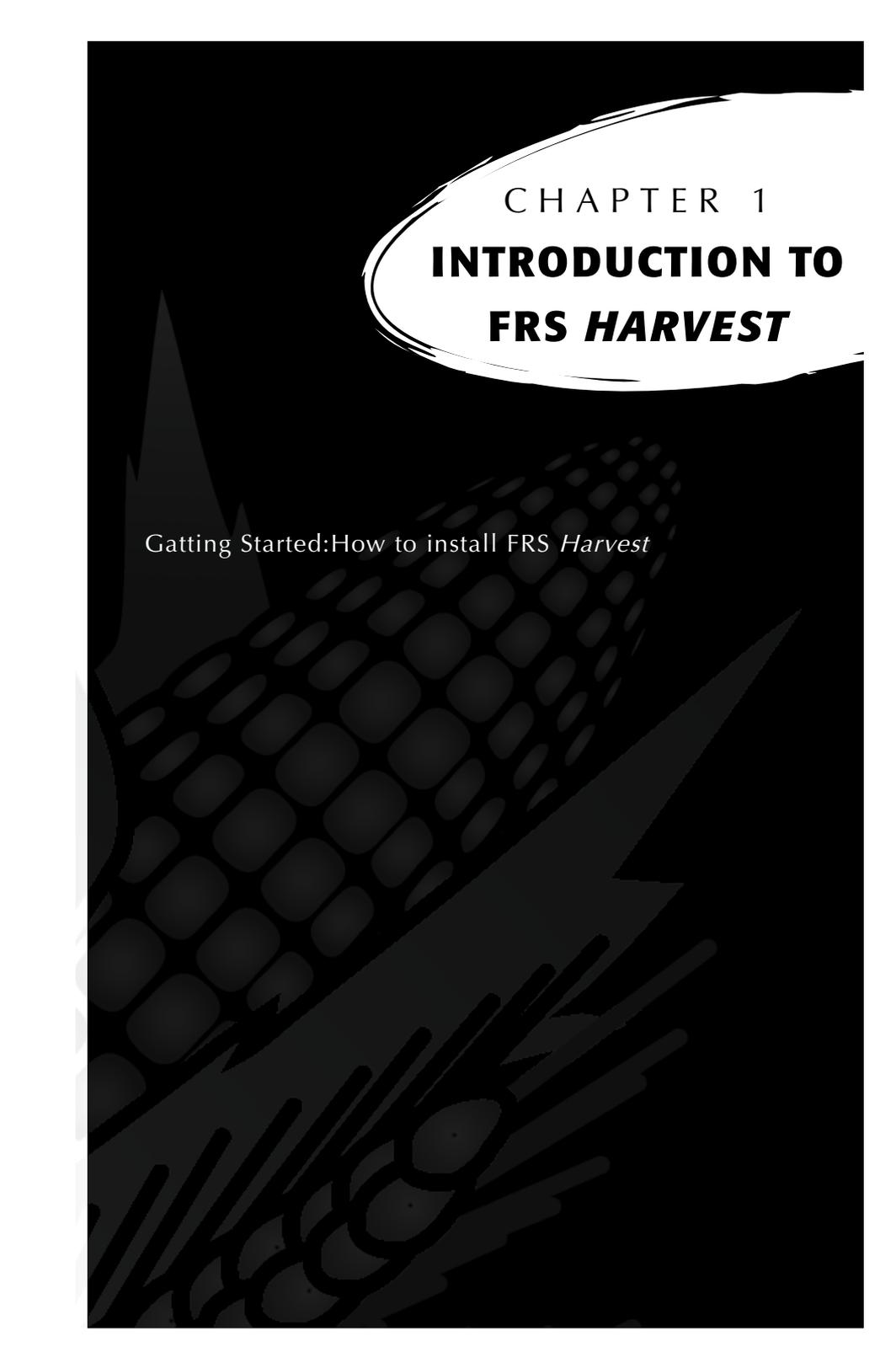
CHAPTER 1

# INTRODUCTION TO FRS *HARVEST*

Gatting Started:How to install FRS *Harvest*

# I n t r o d u c t i o n   t o
# F R S   *H a r v e s t*

Designed by seed researchers, the Windows CE based 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.
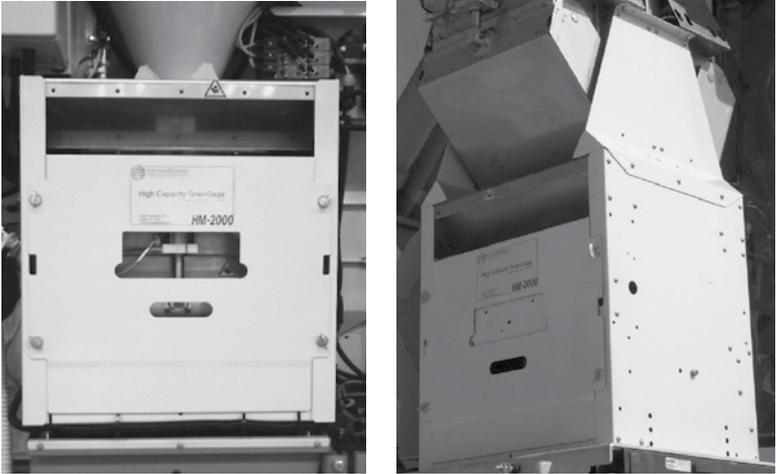
*Figure 1-1: Left: Single HCGG—Right: Twin HCGG*

## Getting Started: How to install FRS Harvest

For instructions on installing the latest FRS Harvest software onto your handheld, follow these steps:

1.  Visit our website at *www.junipersys.com.*

2.  Select *Support,* then select *Downloads* under the HarvestMaster menu.

3.  Choose the version of software from the appropriate menu.

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 B: Cable Wiring for the HM-401** and **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.

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



*Figure 2-4: Devices screen showing the HM401-Twin HCGG as enabled*

6. 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.

   FRS software has an emulation mode to allow software familiarization without being connected to a hardware device.
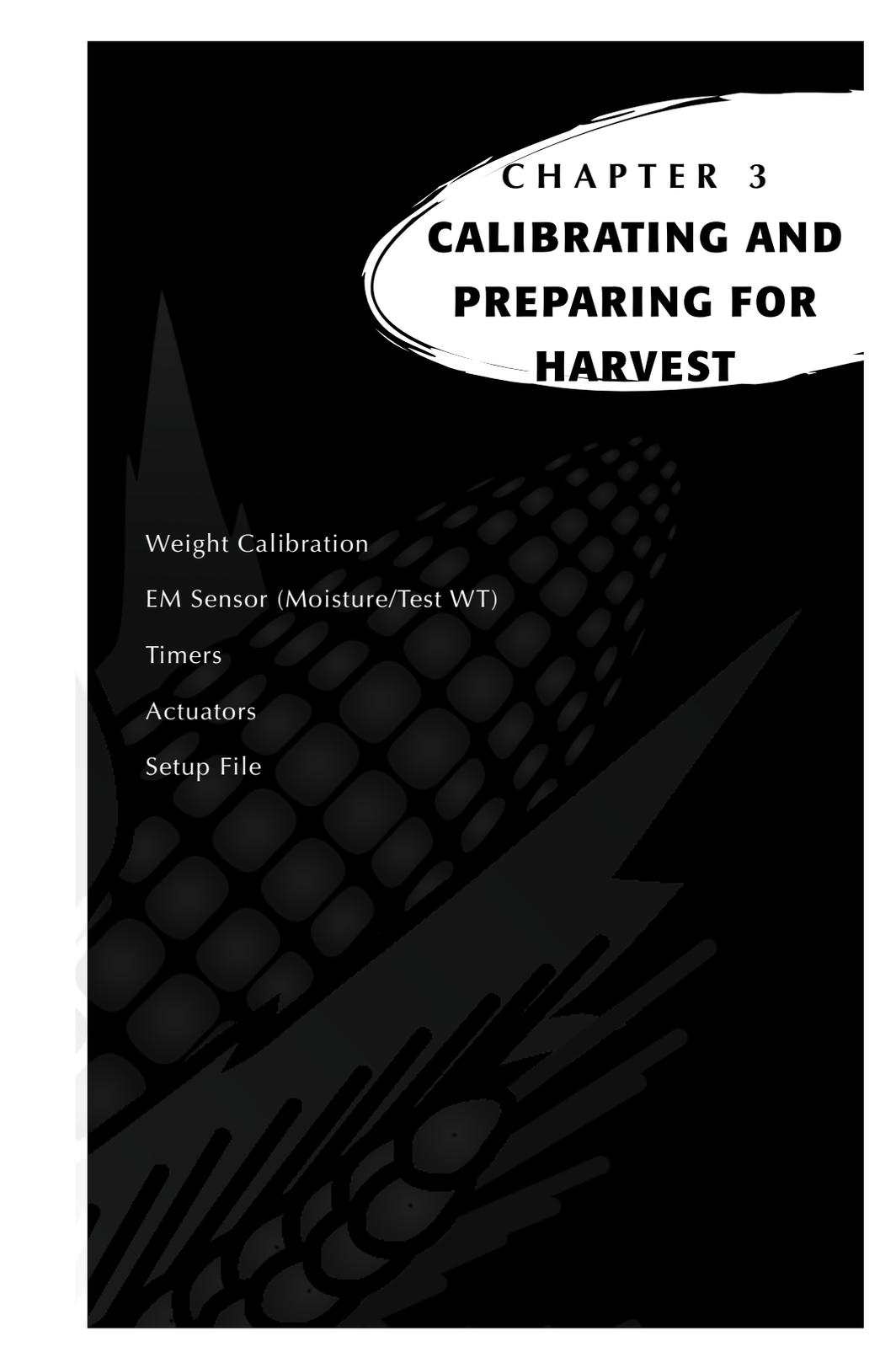
# CALIBRATING AND PREPARING FOR HARVEST

# 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. From the main FRS screen, select **Setup** (F3).

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. Select **Load Cells,** as shown in Figure 3-2. Follow the instructions on the screen.



*Figure 3-2: Setup menu with Load Cells selected*

6.  Enter the known value of your calibration weight in pounds or kilograms to the nearest hundredth. ***Example: 11.56 lbs.***
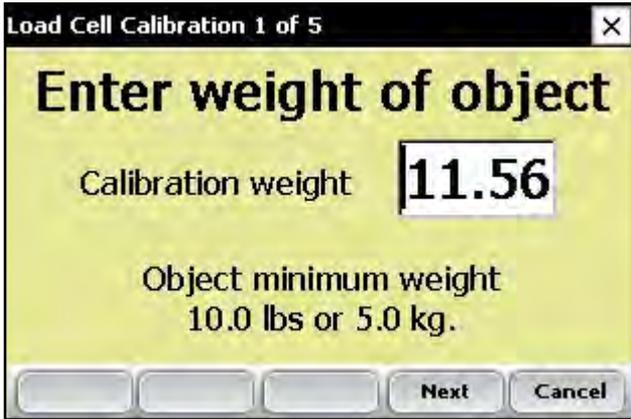


*Figure 3-3: Enter the weight calibration value*

7.  Select or tap ***Next*** (F4) to move to the next screen.
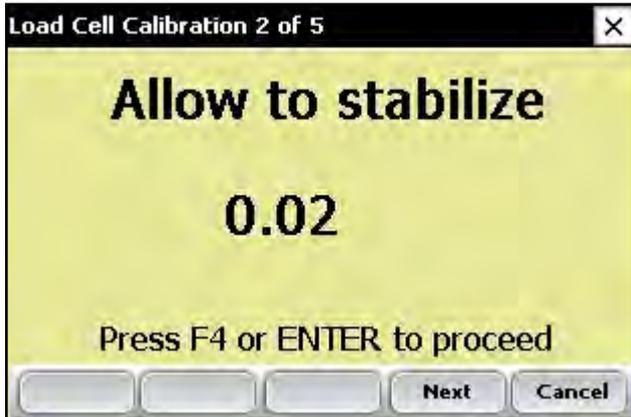


*Figure 3-4: Load Cell Calibration screen 2 of 5*

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

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

    *Note:* If a small grain insert is being used in the HCGG, place the weight under the insert by opening the bucket door then placing the weight on one side.
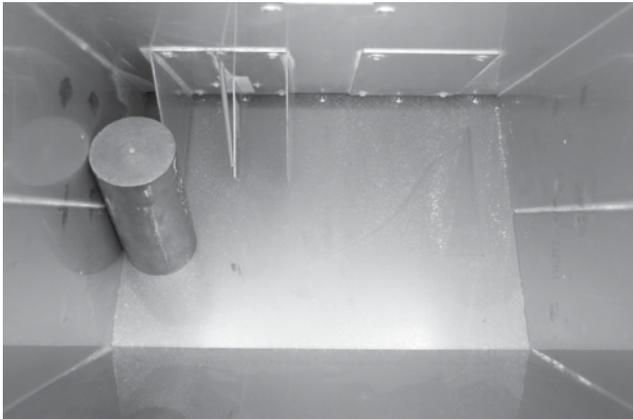


*Figure 3-5: Place the weight on the far side of the weigh bucket*

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.
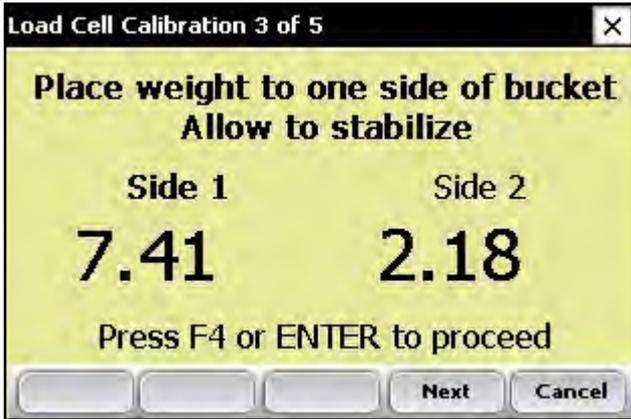


**Figure 3-6: Load Cell Calibration screen after a weight is added**

10. Tap **Next** (F4) to move to the next screen.
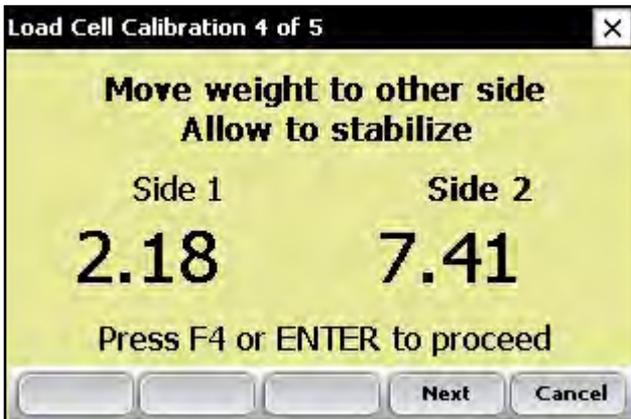


**Figure 3-7: Load Cell Calibration screen 4 of 5**

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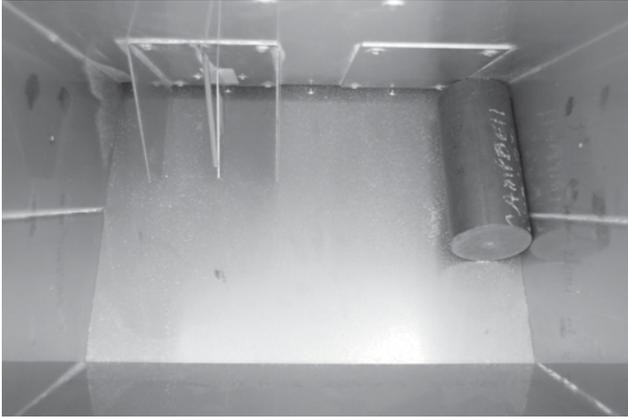


*Figure 3-8: Weight on the other side of the weigh bucket*

12. Tap *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.
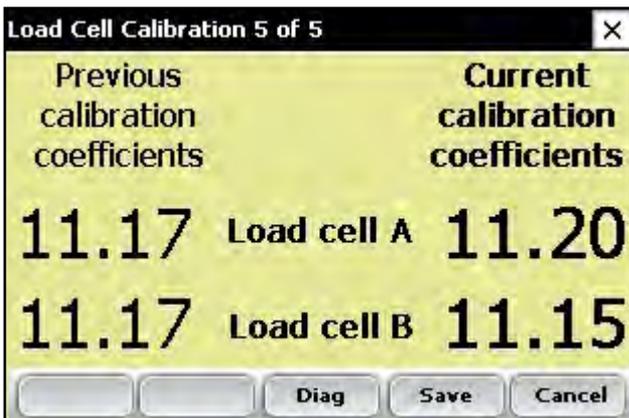


*Figure 3-9: New and current calibration coefficients are displayed*

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

13. Tap *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 *Edit Weight Calibration* under *Weight Calibration* on the Setup menu.
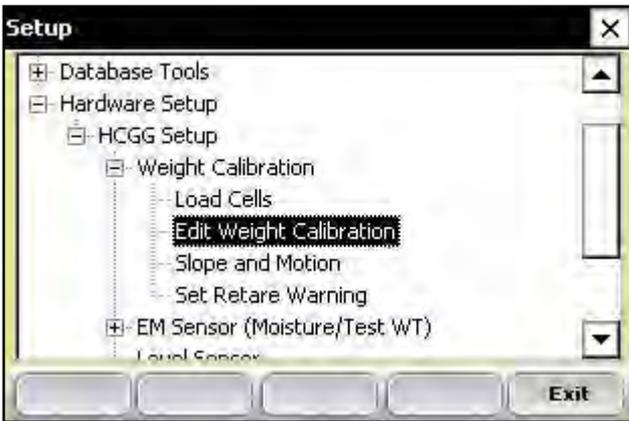


*Figure 3-10: Double-tap* **Edit Weight Calibration** *on the Setup menu*

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.
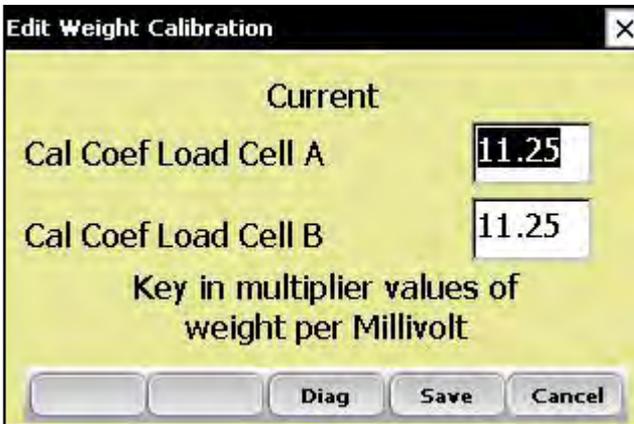


*Figure 3-11: Edit Weight Calibration screen*

### Slope and Motion

The Slope and Motion Sensor refers to patented technology used to eliminate errors created by combine vibrations. The sensor lets you collect weight readings while the combine is

in motion. To set the sensor, follow these steps:

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



*Figure 3-12: Setup menu with Slope and Motion selected*

2.  ***Important:*** Check to make sure—

    -   the shipping stop on the Slope and Motion Sensor is screwed out



Shipping stop screwed out as far as it will go.

    -   the combine is on a level surface with the thresher

    -   the motor is turned off

3. Key in the reference weight with the combine still and level. The default value to enable the Slope and Motion Sensor is 4.0 for the reference weight. For metric enter the equivalent of 4.0 lbs or 1.814 kg.

*Note:* Lighter weights are available for some applications. If the sensor is equipped with a lighter weight, be sure to enter the weight written on the front of the box.
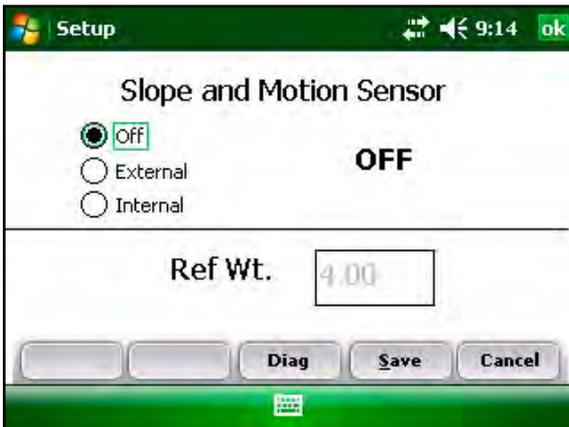


*Figure 3-13: Enter the reference weight in the Slope & Motion Setup screen or select internal for HM800 system*

If your system is equipped with HM800 electronics an internal Slope and Motion is used. Follow the same steps selecting the internal Slope and Motion instead of the external. No weight value is required with internal Slope and Motion but the combine should still be level and the motor turned off.

4.  Press **ON** (F1) to enable the Slope and Motion Sensor. Wait 10 seconds until the ON/OFF label in the center of the screen changes to **ON.**
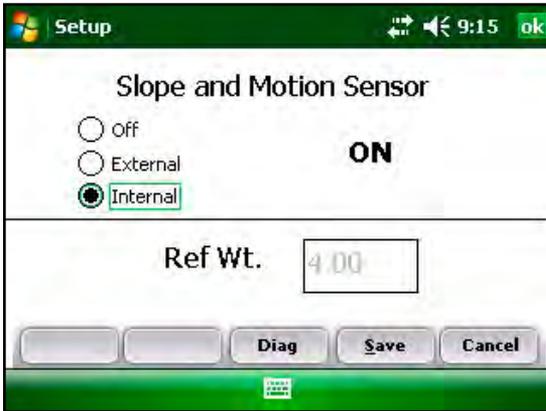


*Figure 3-14: Slope & Motion Setup screen with the Slope and Motion Sensor turned on*

5.  To disable the Slope and Motion Sensor, press the **OFF** (F2) 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.**
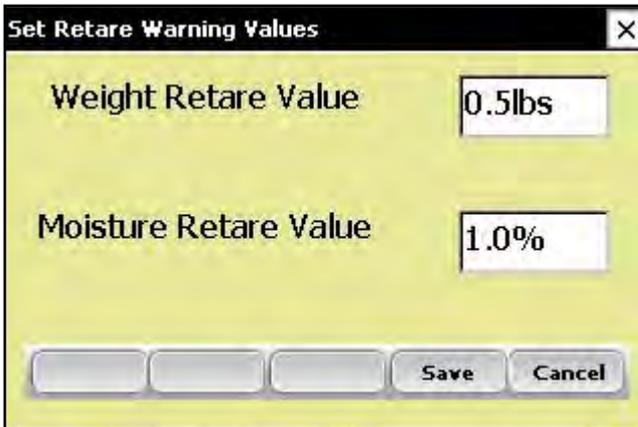


*Figure 3-15: Set Retare Warning Values screen*

2.  Set the weight retare to the desired value.

*Note:* The default retare setting for the HCGG is 0.5 lbs. 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 3-16: 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 3-17: 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:* The check mark next to one of the curves indicates the curve most recently used.
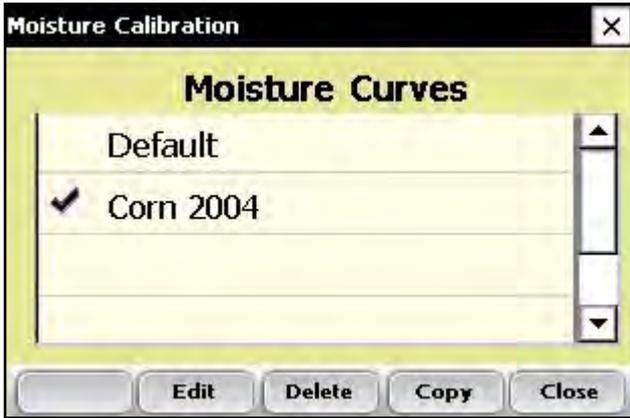


*Figure 3-18: Moisture Calibration main screen*

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 (see Figure 3-19).

### 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 |
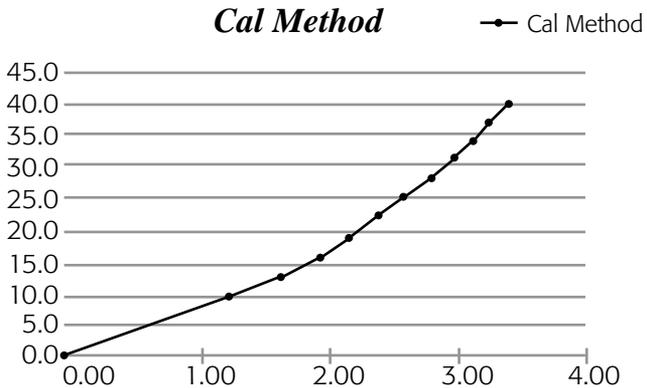


*Figure 3-19: Default moisture curve as it appears in a spreadsheet (top) and as it appears in a graph (bottom)*

To check moisture choose **Diags** (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.
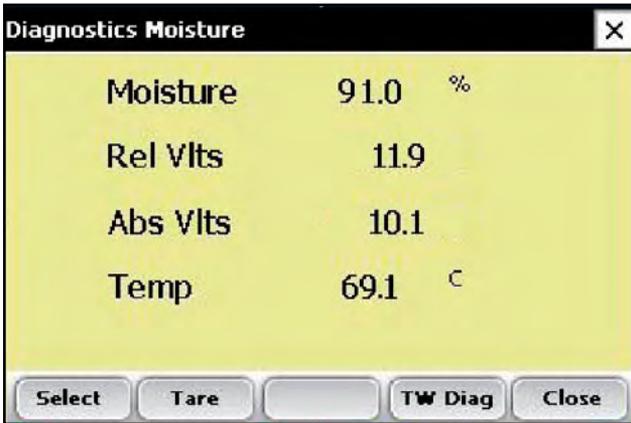


*Figure 3-20: Diagnostics Moisture screen*

2. Adjust the moisture curve by adjusting individual points in the curve or by adjusting the value of the Calibration Temperature. The following sections explain how to make adjustments to individual points, how to adjust the moisture grain temperature, 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 custom spreadsheet to aid in adjusting your moisture calibration can be found on the Juniper Systems web site. This spreadsheet helps you adjust the points on the moisture curve to match your system.

To access the spreadsheet, go to ***www.junipersys.com*** and choose ***Support*** > ***HarvestMaster*** > ***FAQs*** > ***Moisture Sensor (EM, High Capacity GrainGage, Classic GrainGage).*** Choose the link called ***EM Moisture Sensor Calibration*** to view the spreadsheet.

### Adjusting Individual Points

To adjust individual points, follow these steps:

1.  Select the moisture curve you want to edit and press ***Edit*** (F2).
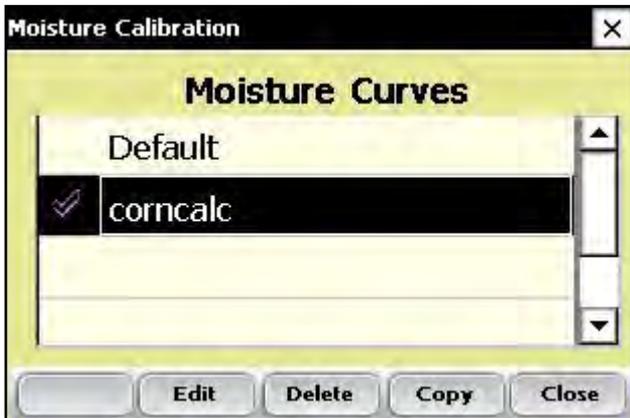


***Figure 3-21: Moisture Calibration main screen***

2. Select the percent or volts you want to adjust, and enter the new values.
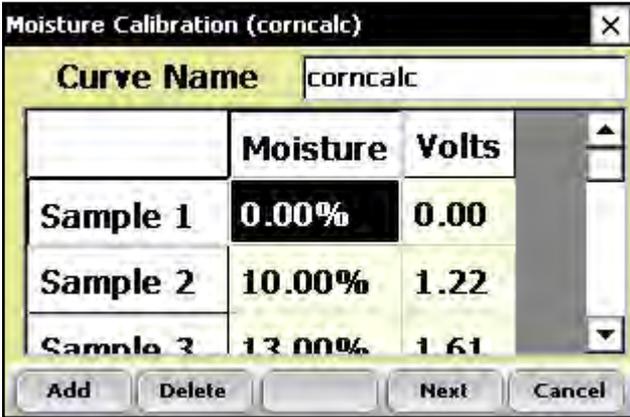


*Figure 3-22: You can edit Moisture or Volts for a sample*

3. Press **Next** (F4) to save your changes to the moisture curve and advance to the Moisture Correction and Temperature screen.
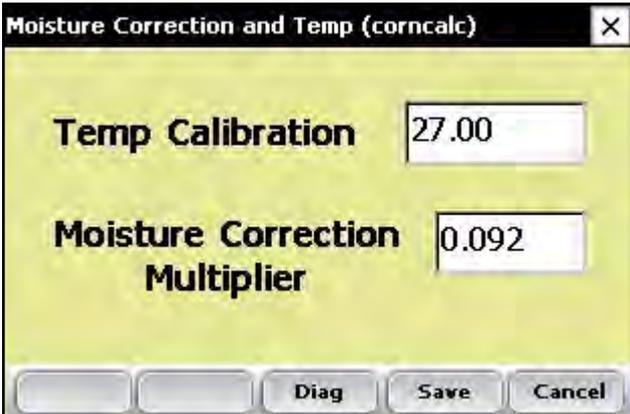


*Figure 3-23: Moisture Calibration Correction and Temperature screen*

**We recommend setting Temp Calibration to the current temp reading found in the diagnostics menu.**

*Note:* When grain moisture readings are harvested at a different temperature than the temperature during the original calibration, the grain moisture measurement needs to be corrected to adjust for this difference. The HCGG System automatically makes this moisture correction based on the Temp Calibration and Moisture Correction Multiplier found in the screen above.

4. When you are finished editing your moisture curve, press *Save* (F4) to exit and save your changes.

### Adjusting the Grain Moisture Temperature

You can also use the temperature calibration to make small adjustments to moisture readings taken by the system. To change the temperature calibration to match your grain samples, follow these steps:

1. From the Main FRS screen, Select *Setup* (F3), then *Hardware Setup* > *HCGG Setup* > *EM Sensor (Moisture/ Test WT)* > *Moisture Curve.*

2. Select a moisture curve then select *Edit* (F2) or *Copy* (F4).

3. Tap **Next** (F4). The Moisture Correction and Temperature screen appears.
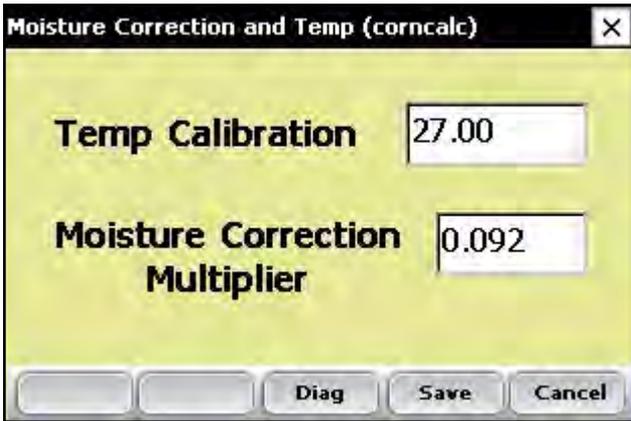


*Figure 3-24: Moisture Correction and Temperature screen for the "corncalc" curve*

Even though the moisture correction is automatic, changing the Temp Calibration shifts all moisture readings up or down, depending on if the temperature was increased or decreased. If you find that your new moisture reading is consistently high over the whole range, you can lower the calibration temperature to decrease all moisture readings. You can also raise the calibration temperature if your moisture is consistently too low. This is an easy way to fine-tune the moisture curve after calibration.

Follow these steps to calculate the proper temperature adjustment:

1. If the HCGG provides a different moisture value than your actual moisture value (e.g., 19.5% instead of 18.5%) and you'd like to adjust it, use this formula to figure out the calibration value:

   (Actual Moisture − HCGG Moisture)/
   Moisture Correction Multiplier =
   Mstr. Temperature Calibration

   18.5%−19.5% / 0.092 = −10.87 C

2. Next, add this value to your existing temperature.

   *Note:* If the calibration value you calculated in Step 1 is negative as in the example above, keep the negative sign.

   In this example, assume the existing temperature calibration is 27 C:

   Temp Calibration + Mstr Temp Cal =
   New Temp Calibration

   27.0 + (−10.87) = 16.13

3. Save any changes you made to the settings on the Moisture Correction and Temperature screen by pressing *Save* (F4). You can check the moisture calibration by pressing *Diag* (F3) before saving your changes.

*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).
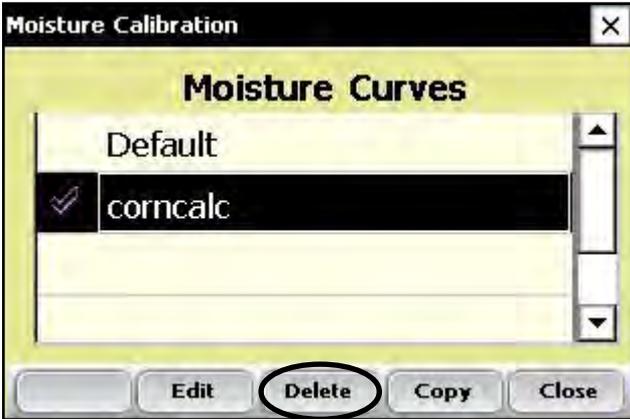


**Figure 3-25: Delete a moisture curve by selecting it and tapping Delete (F3)**

2.  Confirm the delete by tapping Yes or No.



**Figure 3-26: 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.
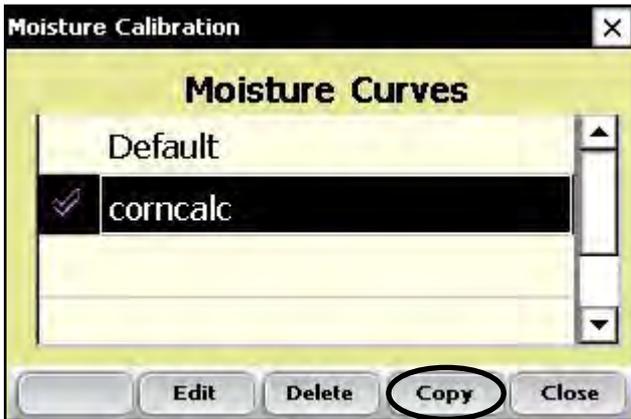


**Figure 3-27: Copy a moisture curve by selecting it and tapping Copy (F4)**

*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:

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 3-28: 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 adjusting Coefficient Z, as explained below.

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 tapping Diag (F3) to see the measured test weight and then pour the grain sample into the weigh bucket

    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 55.62 lbs/bu (pounds per bushel) but the

actual test weight was 54.62 lbs/bu, then you would need to decrease the Coefficient Z value by 1.



*Figure 3-29: Example shows Test Weight*

54.62 lbs/bu − 55.62 lbs/bu = −1.00 lbs/bu

In the Figure 3-30, 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 3-30: 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 20 ft. (6 m).

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.**
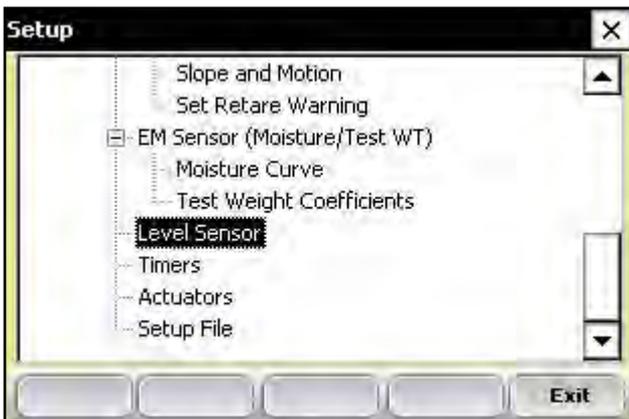


*Figure 3-31: Choose Level Sensor from the Setup menu*

The Level Detect Sensor Settings screen appears (see Figure 3-32).
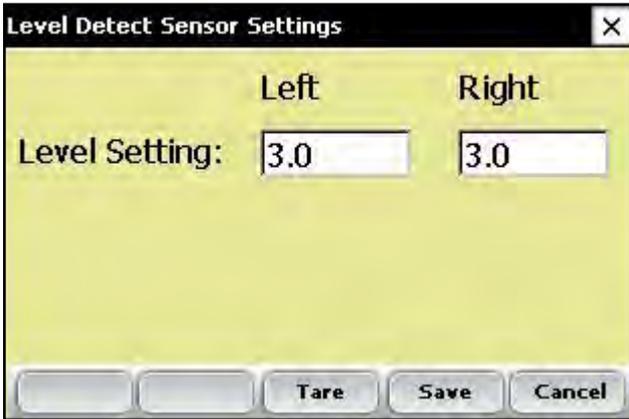


*Figure 3-32: Level Detect Sensor Settings main screen*

2.  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.

3.  Tap **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 tapping *Hardware System* > *HCGG Setup* > *Timers.*



*Figure 3-33: Timer Setup screen*

- **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.

  *Note:* We recommend that you do not set the open times less than 1 second.

- **Weight 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.

## 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 tap *Hardware Setup* > *HCGG Setup* > *Actuators.*



*Figure 3-34: Double-tap 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.
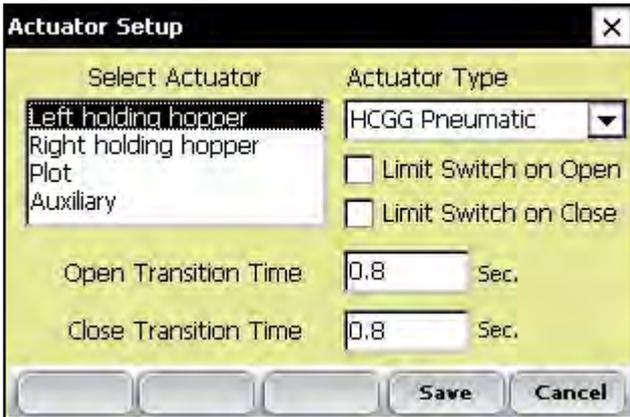


*Figure 3-35: Actuator Setup screen*

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.

## 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.  Enter the Setup File screen by double-tapping **Setup File** in the Setup menu. A list of existing setup files appears.



*Figure 3-36: 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, tap **Save** (F4).
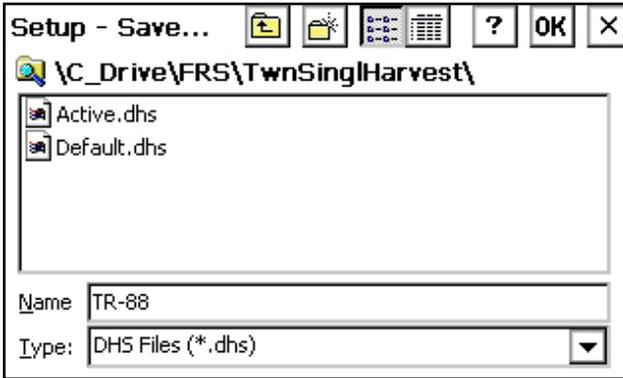


*Figure 3-37: Naming a new setup file*

4.  Create a name for the second setup file.

5.  Repeat steps 1-2. The new setup file appears.



*Figure 3-38: 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 tap **Select.**

   To create setup files for additional machines, repeat the process.
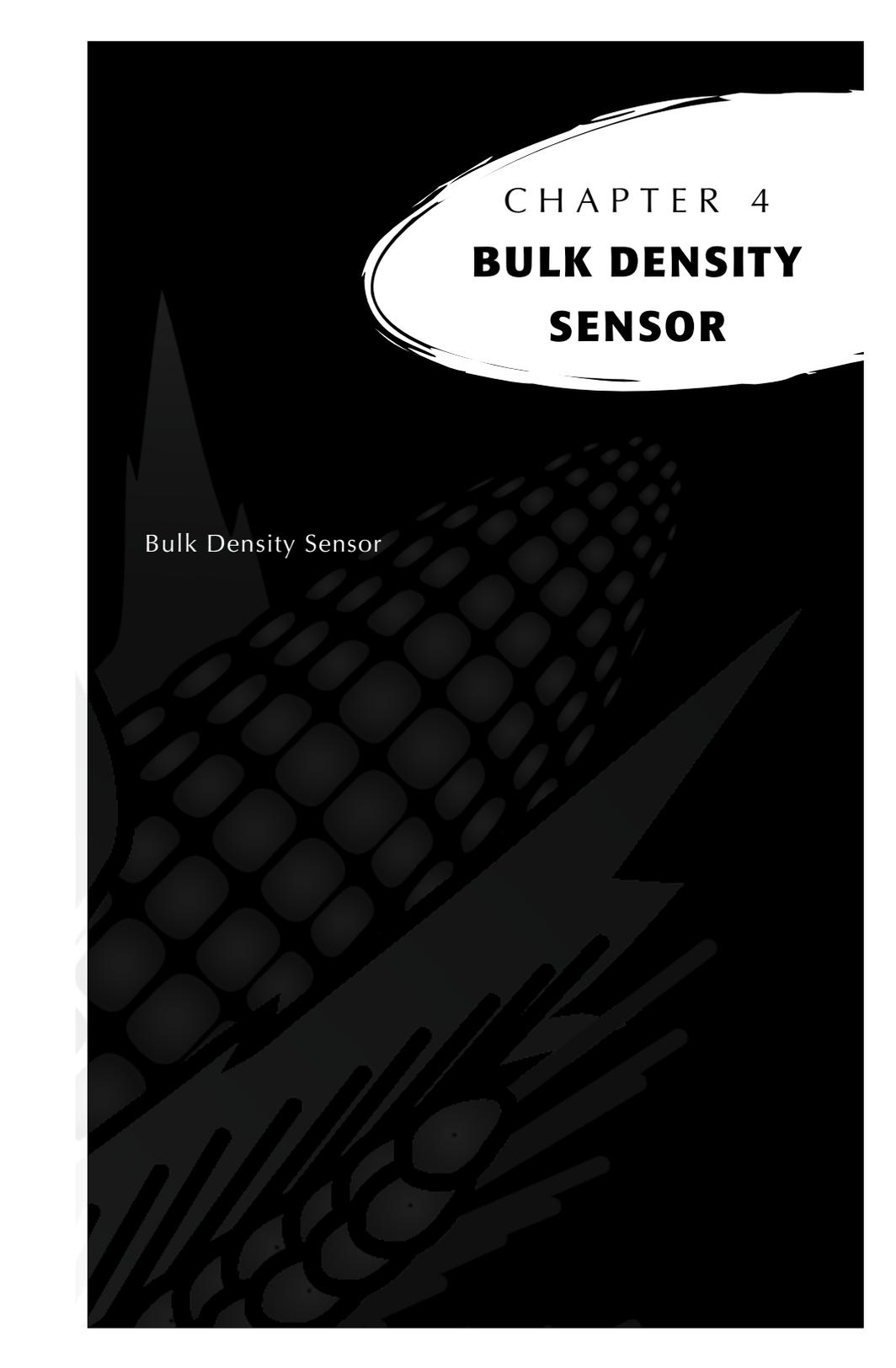
# BULK DENSITY SENSOR

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 HM400 or HM800 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 leveling arm.  These items are mounted inside the weight bucket of the High Capacity GrainGage.
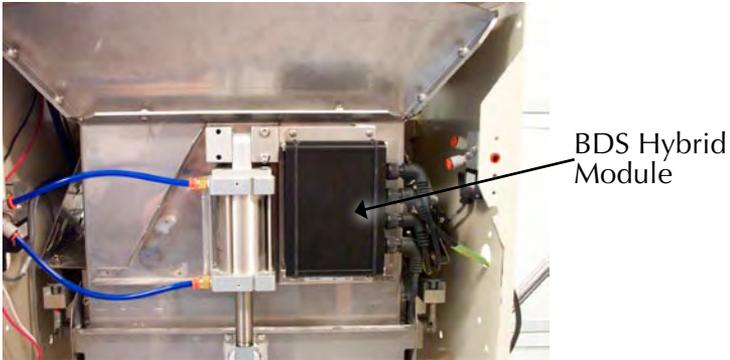
*Figure 4-2: Picture of BDS Hybrid on bucket.*

Electronic control and measurement for the BDS is performed by the HM800 Hybrid Module. This module controls the cycling of the door that empties the BDS cup and sequence of leveling arm used to clear excess grain off the BDS cup. The BDS Hybrid also provides an analog input for the precision load cell.

A unique feature of the BDS Hybrid 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 to the HarvestMaster system)
- ACT (actuator input for the BDS Cup Door and Level Arm)

The BDS Hybrid 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. When no data is being sent to the hybrid this LED remain unlit.
- TX—Flashing Red LED indicating data is being transmitted from the BDS Hybrid. When no data is being sent from the hybrid this LED remain unlit.
- IND—Flashing yellow light every second indicates the BDS Hybrid is functioning correctly.

Refer to Figure 4-3 for location of connectors and LEDs.
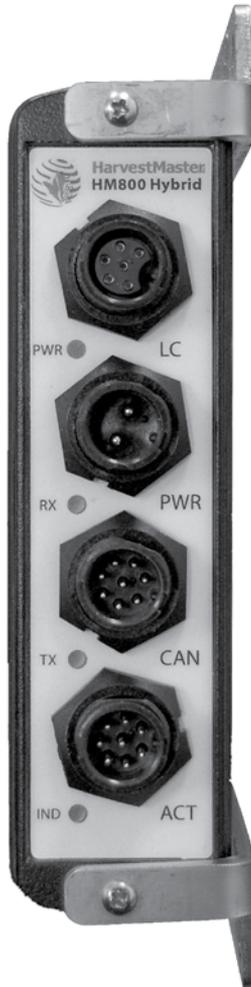
*Figure 4-3: Side view of BDS Hybrid showing connectors and labels.*

## Wire Diagram

### HM400

In applications where the BDS is used with HM400 systems, the BDS Hybrid communicates from the CAN connector via a serial cable to the Display port found on the back of the HM401 SCCU. Refer to the HM400 wire diagram for futher information.



*Figure 4-4: HM400 Wire Diagram*

### HM800

In applications where the BDS is used with HM800 Systems, the BDS Hybrid communicates from the CAN communications connector to the CAN Breakout box located inside the High Capacity. The short CAN Terminator normally installed on the CAN Breakout box should be moved to the CAN Diagnostics port found on the HM800 Analog module. Refer to the HM800 Wire Diagram for further information.
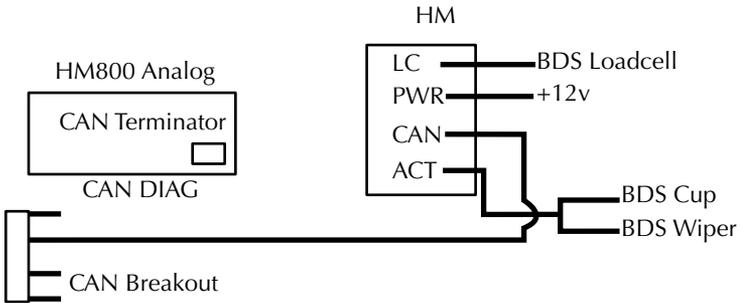
*Figure 4-5: HM800 Wire Diagram*



*Figure 4-6: Analog module showing CAN Terminator*

### FRS with BDS

To start using the BDS system the BDS High Capacity 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 the FRS User's Guide.

### Enable Twin/Single Bulk Density Sensor

To enable the Bulk Density Sensor (BDS), select (F3) from the main FRS Screen. Expand the System tree then 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, then 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. It is recommended to check Test Weight accuracy and adjust 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 450 to 500.

*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.

## 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.
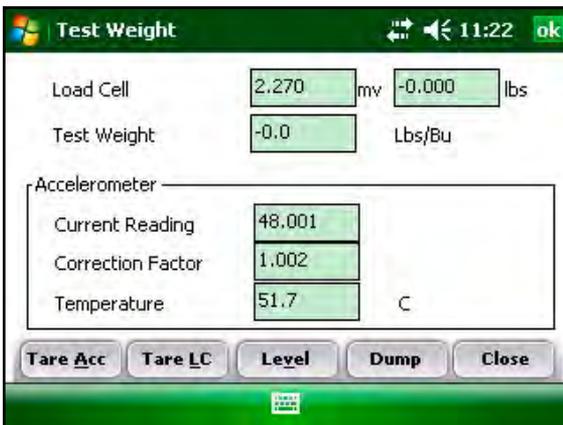


*Figure 4-14: Diag TW screen*

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



*Figure 4-15: Weight being placed in BDS cup*
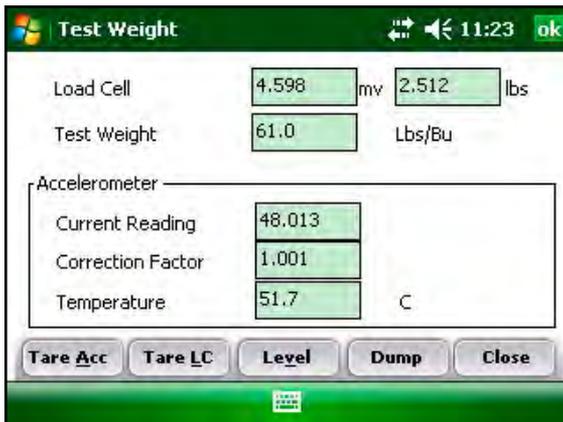


*Figure 4-16: Diag TW Screen*

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**



*Figure 4-17: Test Weight Setup Screen*

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

## Test Weight Calibration
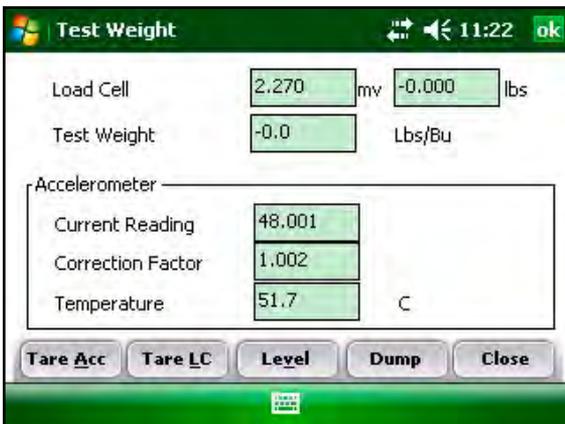


*Figure 4-18: Diag TW with empty cup*

Pour a known test weight sample into the BDS while in the Test Weight Diagnostics screen. Press F3 **Level** 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. It is recommended that the Weigh Bucket be opened when pouring and verifying a grain sample.



**Figure 4-19: 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.

New Cup Volume = BDS Measured TW /
Actual TW from Standard * Cup Volume

*Figure 4-20: 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 which 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 lbs (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.
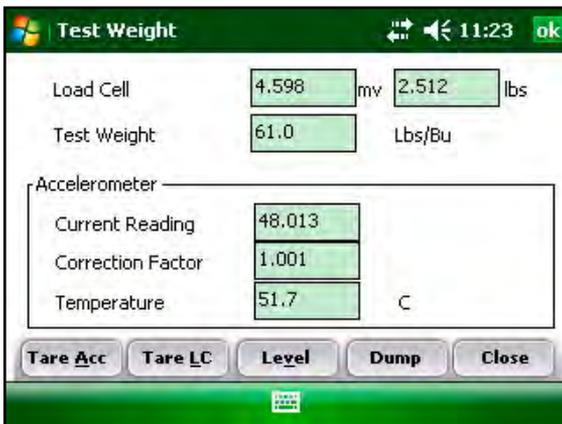


*Figure 4-21: Diag TW*

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 4 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 one would not expect to see them 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 4-22: Diag Setup Screen*
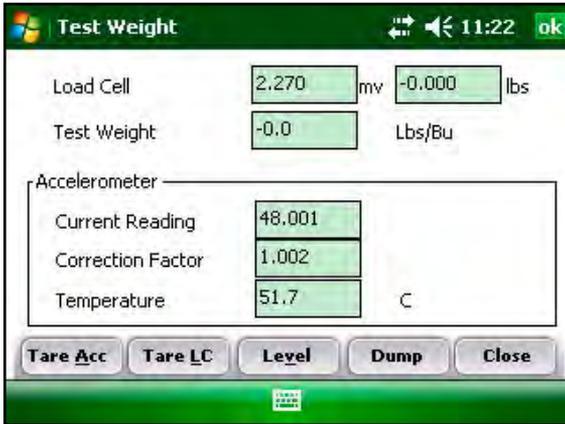
*Figure 4-23: BDS Diag Screen*

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

### Test Weight
Shows the converted test weight in lbs/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 signals no compensation.

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

## Function Keys

- **F1 Tare Acc.** Sets the tare or reference value for the accelerometer. This should only be selected when the combine is turned off and level.

- **F2 Tare LC.** Sets the tare or zero point for the BDS load Cell.

- **F3 Level.** 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 **F3, Level** 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.

- **F4 Dump.** Opens the BDS cup to empty contents in the BDS cup.

- **F5 Close.** Exits the Test Weight Diagnostics screen.

## BDS Harvest Sequence

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



*Figure 4-24: 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 F1 Collect from the main FRS screen. Follow the initialization sequence found in Harvest Data Collection chapter of this manual.

The High Capacity with BDS, cycles in the same manner as a non BDS High Cap except when measuring test weight. Grain is dumped into the weigh bucket and the BDS is filled. Plot weight and moisture are recorded then 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 then the plot door closes. The Plot bucket is now ready to accept grain from the next hopper.

*Note:* For best accuracy it is also recommended to install the wind guard when harvesting with the BDS. Contact HarvestMaster if a wind guard is not available.

CHAPTER 5

# DIAGNOSTICS MENU

Load Cell

Moisture

Test Weight

Level Detect Sensor

Actuators

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.



*Figure 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, and

• 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, double-tap **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).

| Diagnostics Load Cell | | ✕ |
|---|---|---|
| | Volts | lbs |
| Cell A | 1.333 | 0.01 |
| Cell B | 1.360 | -0.02 |
| | Total | -0.01 |
| Slope and Motion ON | | |

Ref 4.00    Q 0.999    Total 4.56

MVolt 2.068    Zero 0.554

| Tare | | | | Close |

*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.



**Diagnostics Load Cell**

|  | Volts | lbs |
|---|---|---|
| Cell A | 1.333 | 0.01 |
| Cell B | 1.360 | -0.02 |
|  | **Total** | **-0.01** |

Slope and Motion **ON**

Ref 4.00    Q 0.999    Total 4.56
MVolt 2.068    Zero 0.554

Tare    Close

*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.

### Lbs 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. 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.
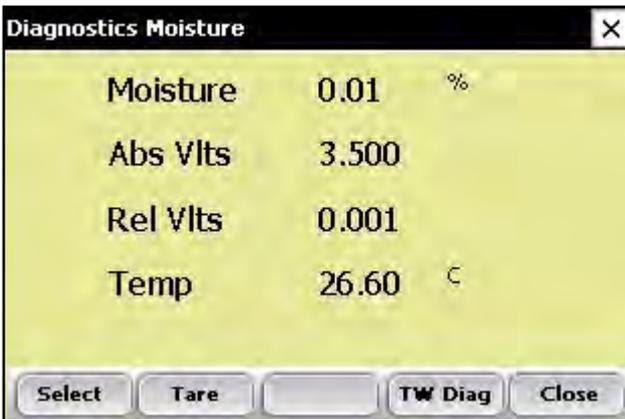


*Figure 5-5: Diagnostics Moisture screen*

### Moisture

The percentage of moisture read by the moisture sensor.

### Abs Vlts (Absolute Volts)

The raw voltage reading from the moisture sensor.

### Rel Vlts (Relative Volts)

The tared-out voltage reading of the moisture sensor.

### Temp (Temperature)

The temperature read from the moisture sensor.

### Tare (F2)

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

### Select (F1)

Tapping 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 SCCU. 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.
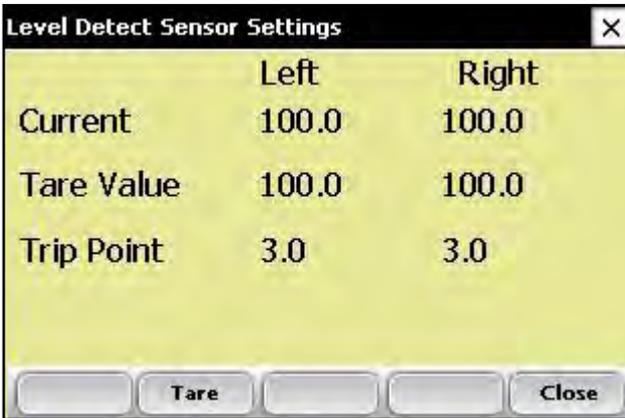
| Level Detect Sensor Settings | | × |
|---|---|---|
| | **Left** | **Right** |
| Current | 100.0 | 100.0 |
| Tare Value | 100.0 | 100.0 |
| **Trip Point** | **3.0** | **3.0** |
| | Tare | Close |

*Figure 5-7: Actuator Setup 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)*

Retares 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.
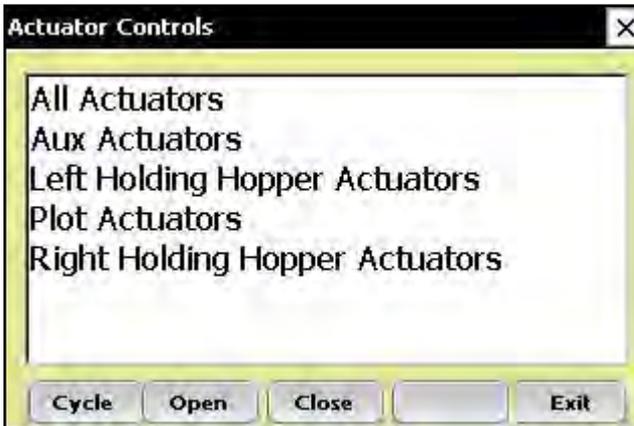
*Figure 5-8: Actuator Controls screen*

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

## Print Calibrations

The Print Calibrations menu allows you to print your calibration settings. To print, simply select one of the calibration options and tap **Print** (F1).
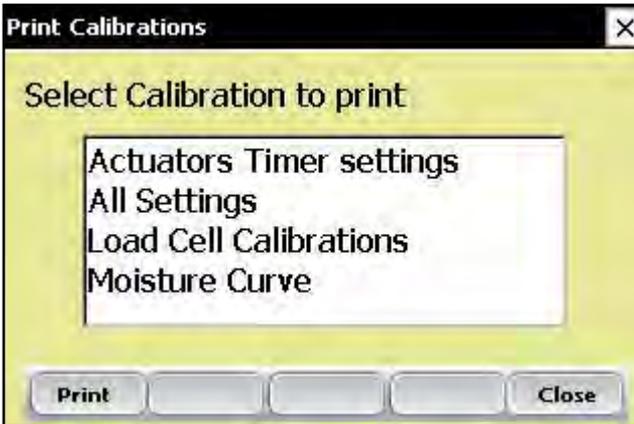


*Figure 5-9: Print Calibrations screen*
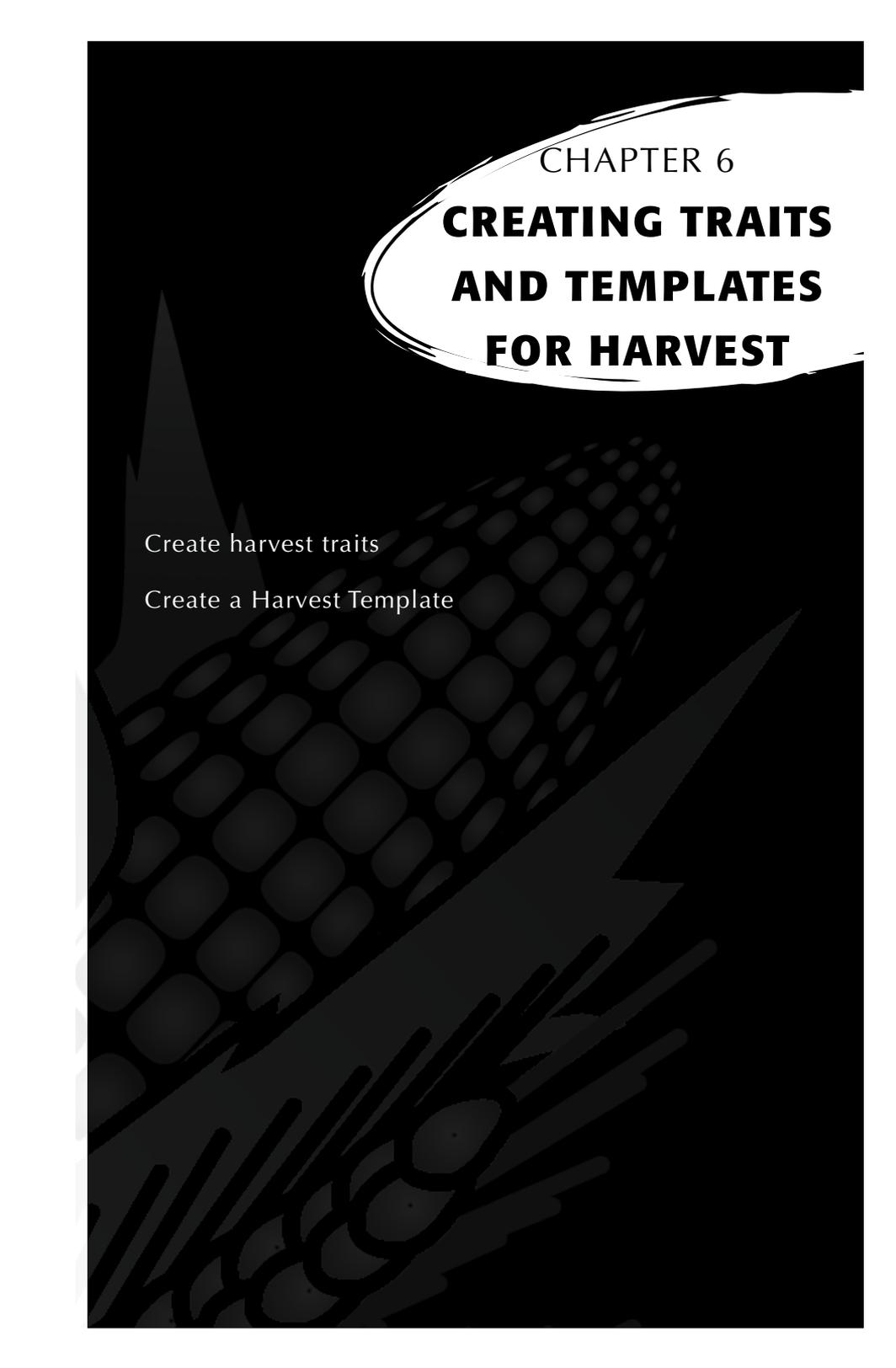
# CREATING TRAITS AND TEMPLATES FOR HARVEST

Create harvest traits

Create a Harvest Template

# Creating Traits and Templates for Harvest

## Create harvest traits

Before you can collect harvest data, you first need to add or select harvest traits from the Master Traits List and then create a harvest trait template for these new traits. FRS includes sample harvest traits and templates. You can create your own traits or modify the traits that are included with FRS.

*Note:* It is especially important that traits that reflect data from the GrainGage, such as moisture and weight, are set up correctly in order for the software to register data from the hardware. If these traits are not set up correctly, data will not be recorded from these devices.

### Adding a trait to the Master Traits List

Follow these steps to add a trait to the Master Trait List:

1. Open the Master Traits List screen by choosing *Setup* (F3) and double-tapping *Traits Management.*

2.  Select *Add* (F1) from the Master Traits List screen.
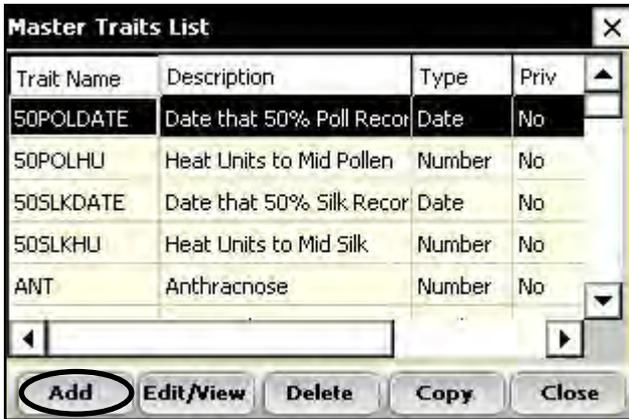


*Figure 6-1: Create a new trait list by tapping Add on the Master Traits List screen*

3.  Type in a name you would like to use for harvest traits. Common names used are *Moisture* for grain moisture, *Weight* for plot weight, and *Test* for the grain test weight.

    *Important:* If you are collecting harvest data, you need to create a trait for weight. Creating traits for moisture and test weight is optional.
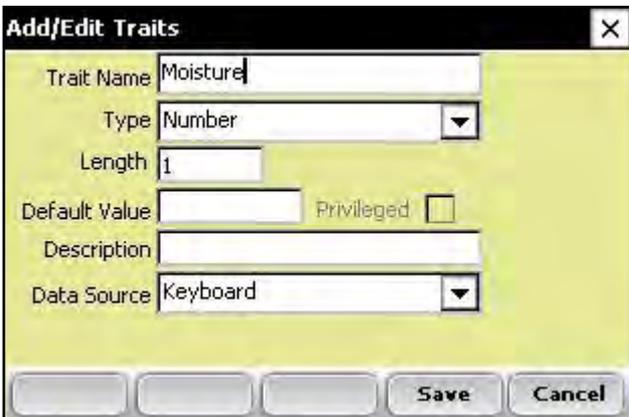


*Figure 6-2: Entering a Trait Name for a new trait*

4.  Skip down to Data Source on the screen and select
    **HM-Moisture, HM-Weight or HM-Test Weight** from
    the drop-down box, depending on which trait you are
    creating. In order for the trait data to be recorded from
    the GrainGage, the correct data source must be selected.
    The Type and Length information is automatic.
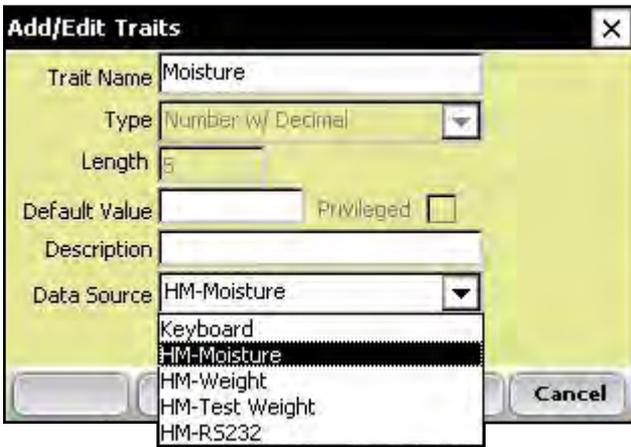


*Figure 6-3: Selecting a Data Source*

5.  *(Optional)* Add a trait description to clarify the type of
    trait that has been created. Example: **Moisture of grain at
    harvest.**

6. Save the new trait by pressing Save (F4).
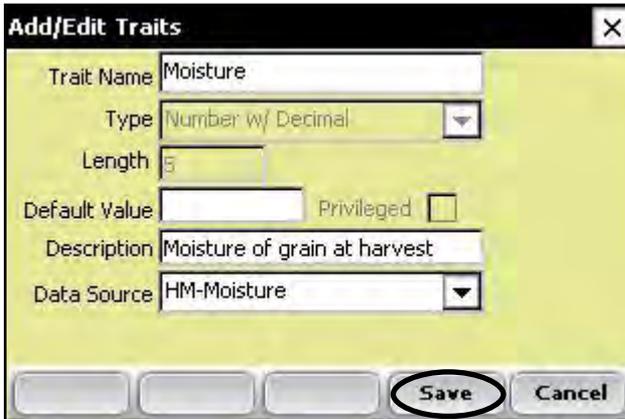


*Figure 6-4: Saving a new harvest trait*

## Create a Harvest Template

After you have added harvest traits to the Master Trait List, create a trait template that contains these new traits.

To create a trait template, follow these steps:

1.  From the Setup Menu, expand the Traits Management option and double-tap ***Trait Templates.***



***Figure 6-5: Double-tap*** **Trait Templates** ***to open the Trait Templates screen***
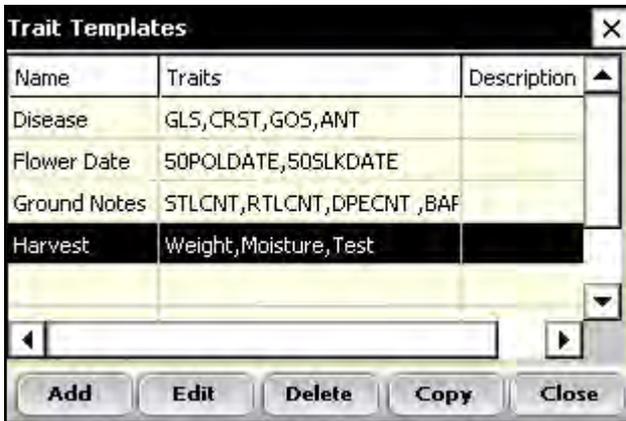


***Figure 6-6: Trait Templates screen***

2.  Select **Add** (F1) to create a blank template. The Add/Edit Trait Templates screen appears.



*Figure 6-7: Add/Edit Trait Templates screen*

3.  Type a Template Name and Description to help identify the template. *(Harvest or Harvest Data are suggested template names.)*

4.  Scroll down through the Master Traits List to find the Weight, Moisture and Test Weight traits you created. Highlight one of the traits, then tap on the Right Arrow in the middle of the screen to move it to the Current Traits window. In the example below, Weight, Moisture, and Test traits have been added as Current Traits.

*Note:* You can change the trait order by tapping on the up or down arrows on the screen.



***Figure 6-8: New template called Harvest***

5.  Press ***Save*** (F4) to save the new template.

CHAPTER 7

# HARVEST DATA
# COLLECTION

Preparing to collect harvest data

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 7-1: The HM401-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.

4. 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.

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



*Figure 7-2: Moisture Calibration screen*

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

    *Note:* The High Capacity GrainGage automatically performs a tare function to zero out readings when entering data collection.

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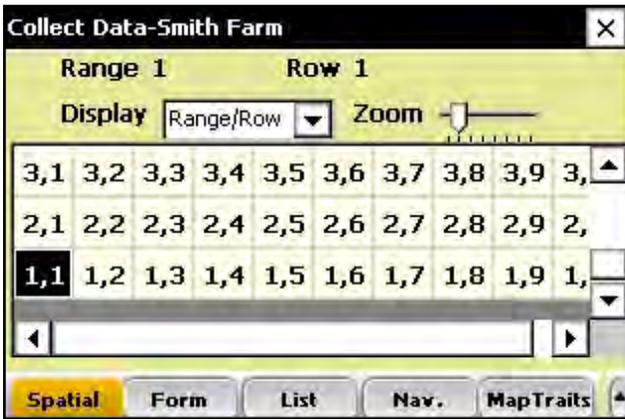


*Figure 7-3: Row 1, Range 5 is selected in the Collect Data Spatial screen*

8.  Choose the starting plot location by tapping on the cell. In Figure 7-1, the selected cell is Row 1, Range 1. After you tap on the starting plot cell, the screen shows the combine's current location in the field and which plots have already been harvested.

    *Note:* For a twin plot combine, the selected cell always represents the left side for the combine, as shown in Figure 7-4. For single plot combines, it represents the starting plot.

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 5,1   | 5,2   | 5,3   | 5,4   | 5,5   |
| 4,1   | 4,2   | 4,3   | 4,4   | 4,5   |
| 3,1   | 3,2   | 3,3   | 3,4   | 3,5   |
| 2,1   | 2,2   | 2,3   | 2,4   | 2,5   |
| 1,1   | 1,2   | 1,3   | 1,4   | 1,5   |
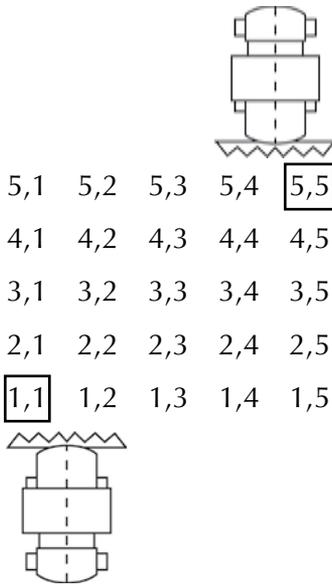
*Figure 7-4 Make sure the left side of your twin plot combine is lined up with the first plot you have scheduled to harvest. For Single Plot combines, the starting range and row correspond to the plot being harvested.*

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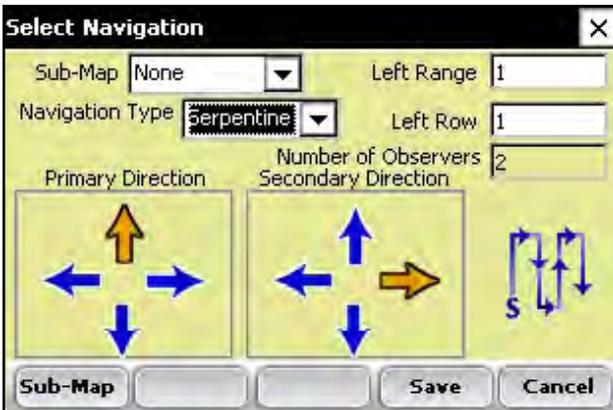


*Figure 7-5: Select Navigation screen for a single plot combine*

## 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.
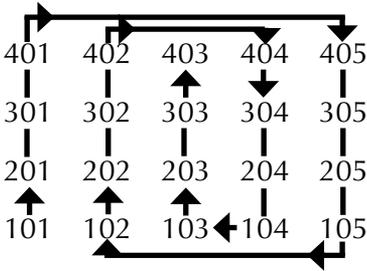


**Figure 7-6: Circular navigation type**
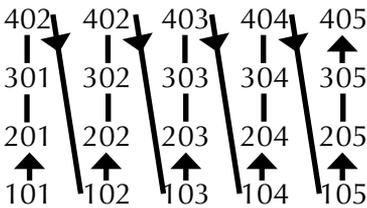


**Figure 7-7: Sequential navigation type**
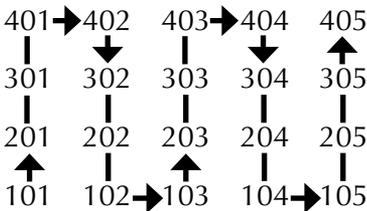


**Figure 7-8: Serpentine navigation type**

## 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.

Tap **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.
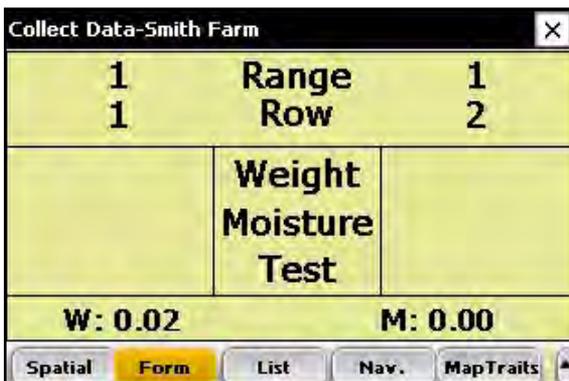


**Figure 7-9: Form screen before data has been collected**

*Note:* Pressing F6 retares the system. To select F6 on an Allegro Field PC, press the blue button and F1 at the same time.

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 7-10: 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.

*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.
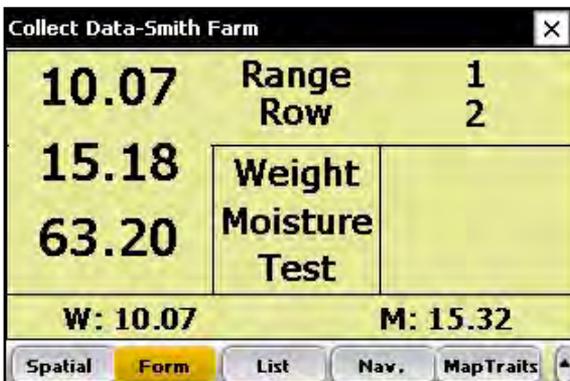


*Figure 7-11: Form screen showing data for left side of the combine*

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.

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.
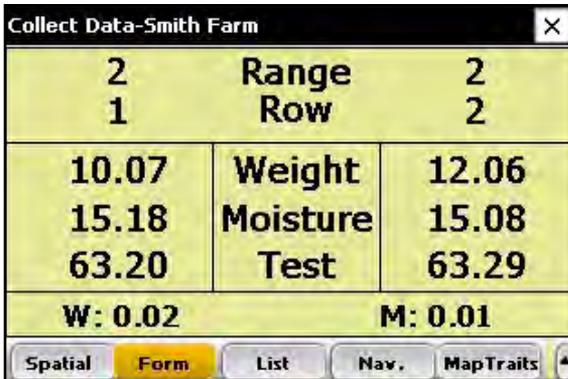
| Collect Data-Smith Farm | | ☒ |
|---|---|---|
| 2 | Range | 2 |
| 1 | Row | 2 |
| 10.07 | Weight | 12.06 |
| 15.18 | Moisture | 15.08 |
| 63.20 | Test | 63.29 |
| W: 0.02 | | M: 0.01 |
| Spatial    Form | List    Nav. | MapTraits  ▲ |

*Figure 7-12: Form screen showing data for both sides of the combine*

## 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.
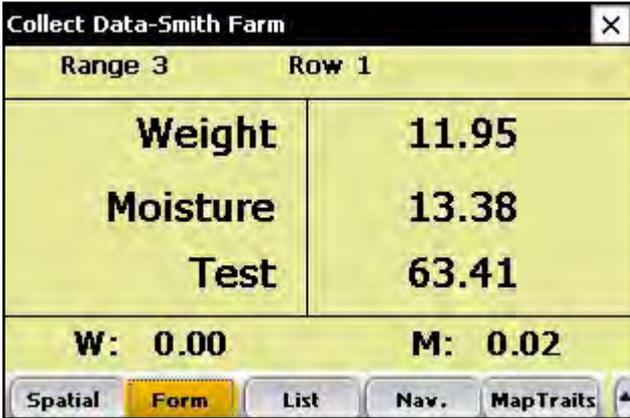


*Figure 7-13: Form screen showing data for a single plot combine*

## 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 45 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 7-14: Double tap* **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 7-15: 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:

- The user drives the combine through the strip plot. Grain is shelled in the combine and routed into the holding hoppers.

- 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.

- During this part of Strip harvest the Countdown Timer is not enabled and the Aux gates remain open.

- The left hopper is cycled first followed by the right hopper.

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

- 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.



*Figure 7-16: Screen showing data while cycling*

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

- 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 7-17: Screen showing data and number of cycles*

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

- 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.

- A complete summary of the Plot with total weight, Moisture average and Test Weight average are stored and printed to the printer



*Figure 7-18: Summary of strip harvest*

- 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.
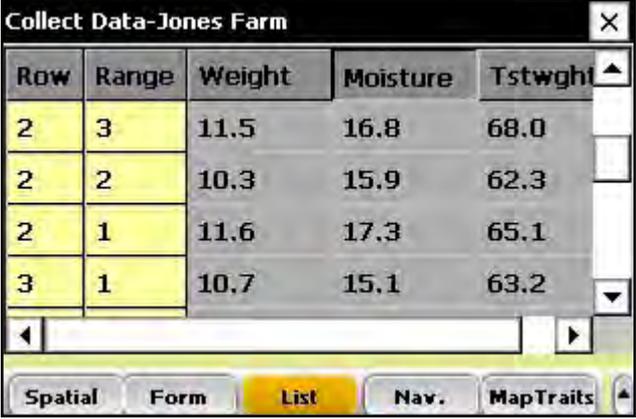
| Collect Data-Jones Farm | | | | | |
|------|-------|--------|----------|---------|---|
| Row | Range | Weight | Moisture | Tstwght | |
| 2 | 3 | 11.5 | 16.8 | 68.0 | |
| 2 | 2 | 10.3 | 15.9 | 62.3 | |
| 2 | 1 | 11.6 | 17.3 | 65.1 | |
| 3 | 1 | 10.7 | 15.1 | 63.2 | |
| Spatial | Form | List | Nav. | MapTraits | |

*Figure 7-19: List screen showing moisture, test weight, and weight values for each plot*
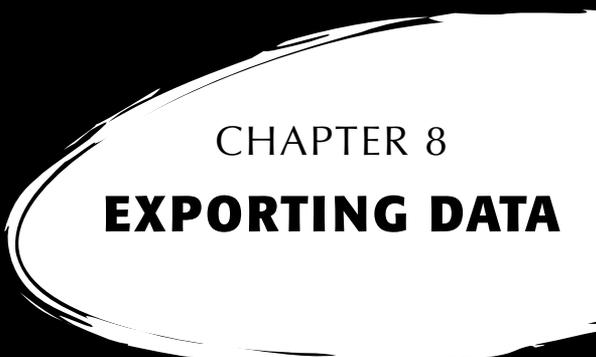
CHAPTER 8
# EXPORTING DATA

Extracting collected data

Backup Log for Harvest Modules

*DataLink for FRS*

# Exporting Data

## 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. Tap *Setup* on the main FRS screen to enter the Setup screen.



*Figure 8-1: Select* Setup *from the main FRS screen*

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



*Figure 8-2: Choose* **Export data to CSV** *from the Setup menu*

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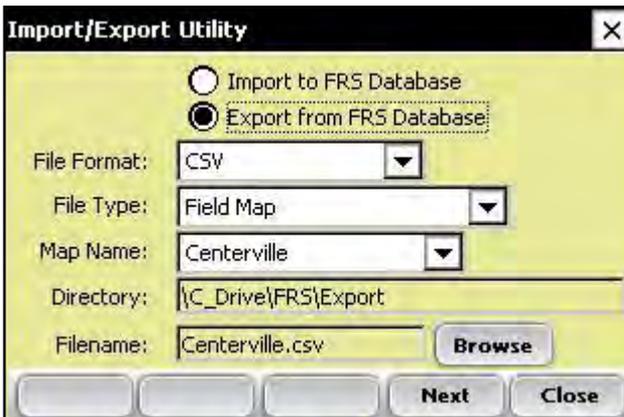


*Figure 8-3: Import/Export Utility screen*

**113**

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. Tap ***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 again at a later time. 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.

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 8-4.

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(ID1) | Row(ID2) | ID3 | Weight | Moisture | Test Weight | ZeroF | ZeroV | CurrentF | CurrentV | SlopeMotionQ | Temp |
| 3 | 1/10/2007 | 15:55:26 | 1 | 28 | | 24.90 | 19.0 | 57.0 | 3.4874 | 0.735 | 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 | 0.735 | 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 | 0.735 | 2.1879 | 0.120 | 0.994498 | 30.9 |
| 6 | 1/10/2007 | 15:55:50 | 2 | 29 | | 31.80 | 21.8 | 56.3 | 3.4874 | 0.735 | 2.0863 | 0.090 | 1.004304 | 30.6 |
| 7 | 1/10/2007 | 15:56:03 | 3 | 28 | | 28.00 | 21.4 | 56.4 | 3.4874 | 0.735 | 2.1087 | 0.098 | 0.998153 | 30.6 |
| 8 | 1/10/2007 | 15:56:10 | 3 | 29 | | 35.10 | 23.6 | 56.1 | 3.4874 | 0.735 | 1.9662 | 0.060 | 1.008031 | 30.8 |
| 9 | 1/10/2007 | 15:56:22 | 4 | 28 | | 25.90 | 20.1 | 56.6 | 3.4874 | 0.735 | 2.1867 | 0.130 | 0.995713 | 30.5 |
| 10 | 1/10/2007 | 15:56:29 | 4 | 29 | | 36.10 | 21.0 | 56.4 | 3.4874 | 0.735 | 2.1492 | 0.102 | 1.000604 | 30.5 |
| 11 | | | | | | | | | | | | | | |

*Figure 8-4: Example of backup log file.*

## DataLink for FRS
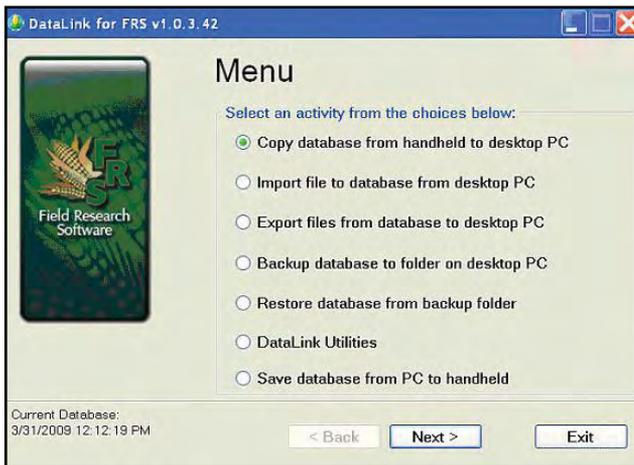


*Figure 8-5: DataLink main menu*

**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. This can result in loss of data if due diligence is not observed.

## 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
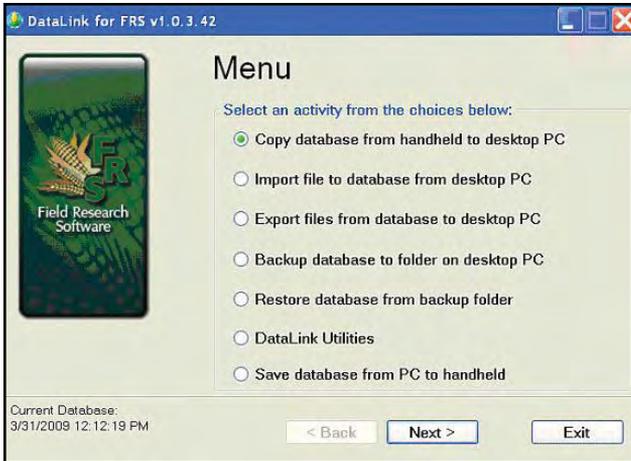
*Figure 8-6: DataLink main menu*

### Installing DataLink

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

1. Go to http://www.junipersys.com/support/faq.cfm?id=236

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) 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:
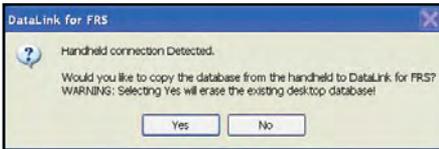


*Figure 8-7: Handheld connection detected prompt*

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 8-8: Warning screen*
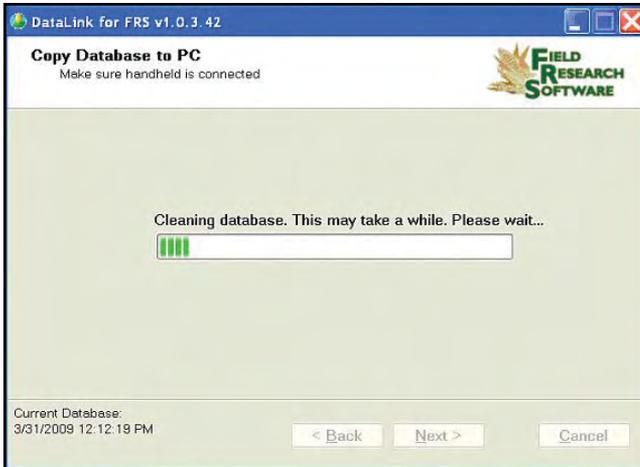
*Figure 8-9: Clean Database screen*

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
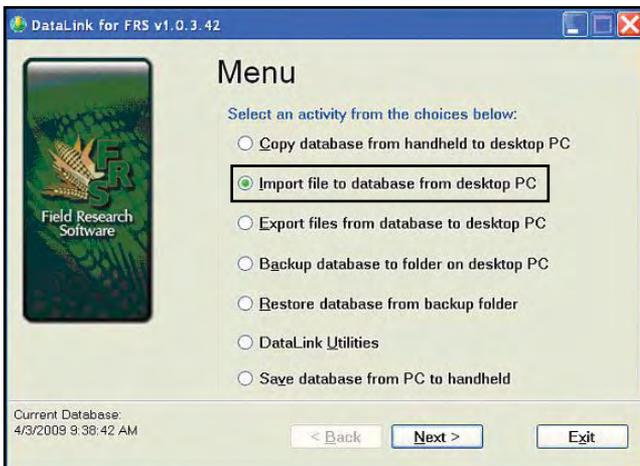


*Figure 8-10: Importing file to database*

**119**

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

Several types of files can be imported to the database.
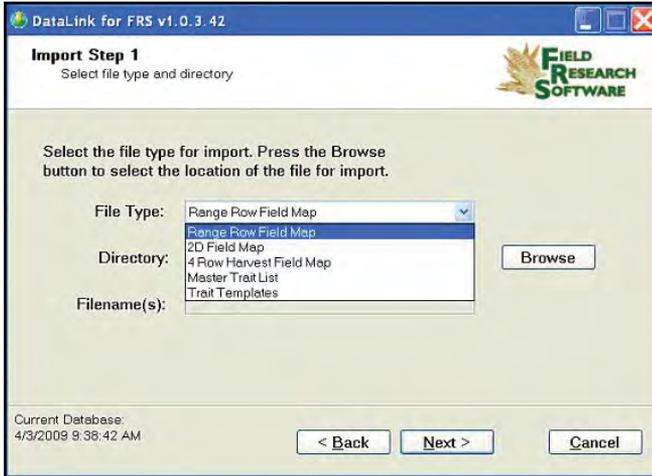


*Figure 8-11: Select file type*

• 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.
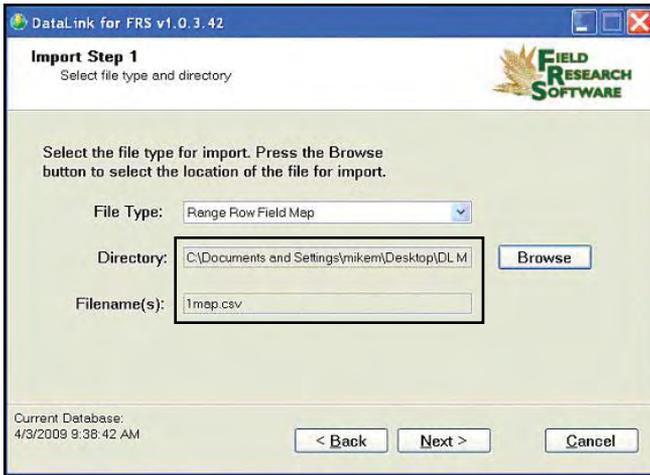


*Figure 8-12: Select file*

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.
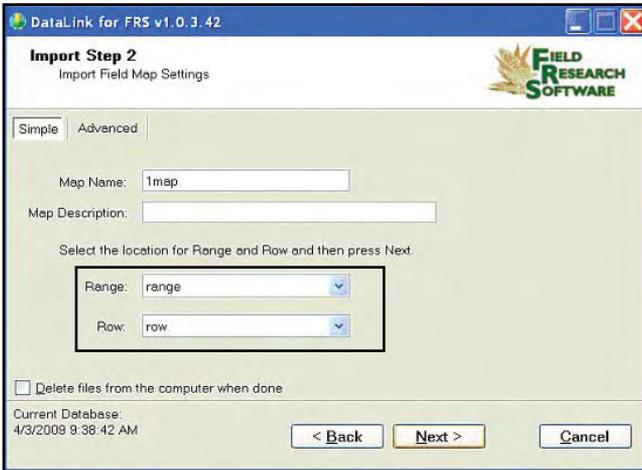
*Figure 8-13: Range and Row headings*

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 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.
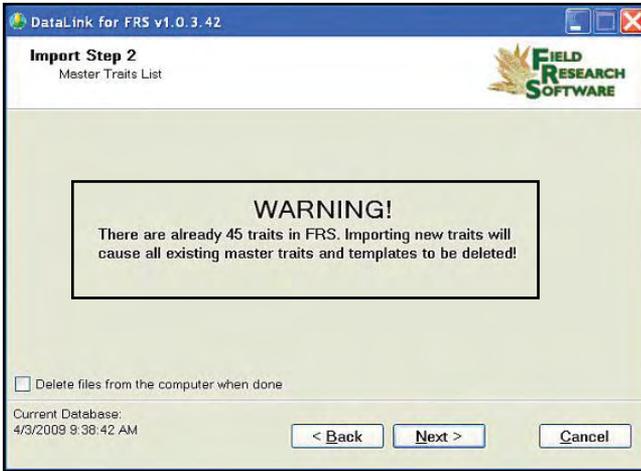


*Figure 8-15: Warning on importing traits*

## Exporting a File from the Database
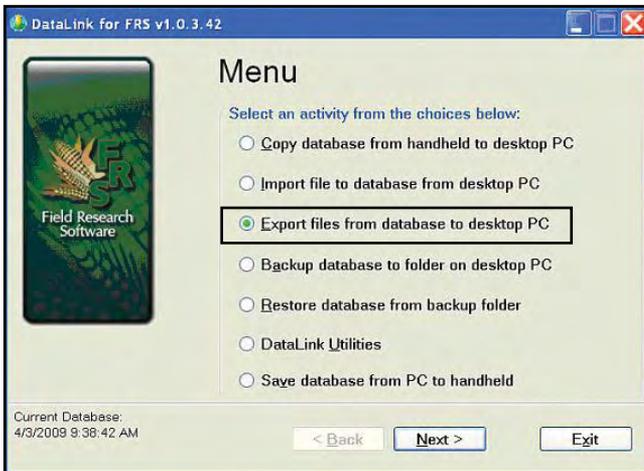


*Figure 8-16: Export files from database*

Select the Export option and hit Next.
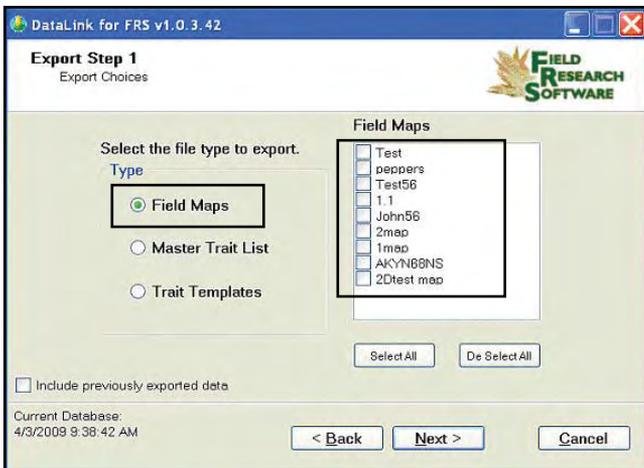


*Figure 8-17: File types and files*

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.
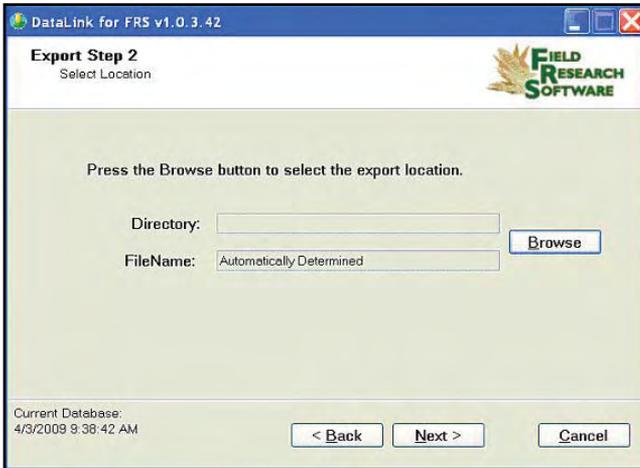
*Figure 8-18: Exported file location*

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.
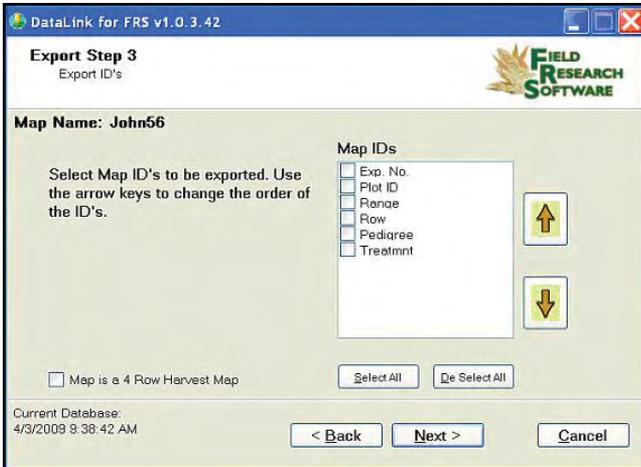
*Figure 8-19: Choose which row to export*

### 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.
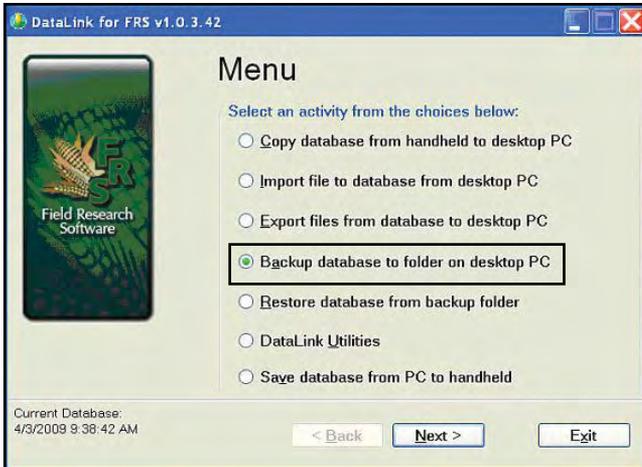
*Figure 8-20: Backup database*

## DataLink Utilities

Select DataLink Utilities and press *Next.*
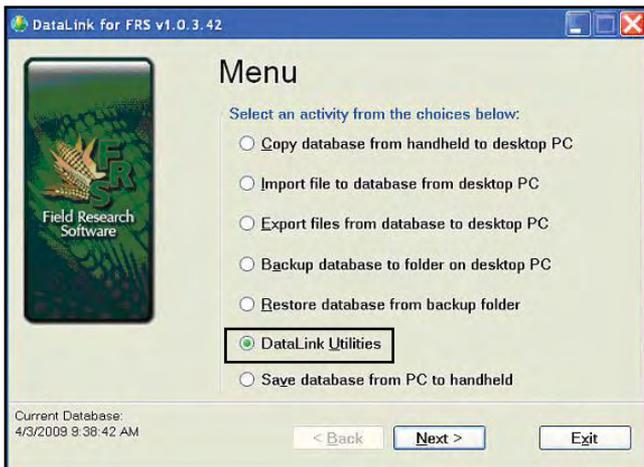


*Figure 8-21: Datalink Utilities*

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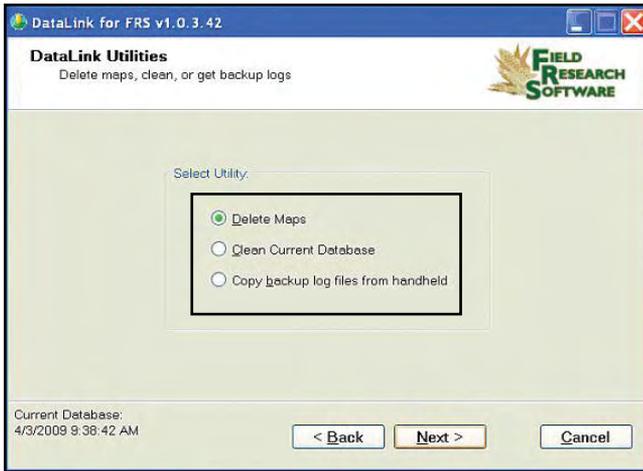


*Figure 8-22: Utility choices*

• Delete Maps

  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

  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

    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.*
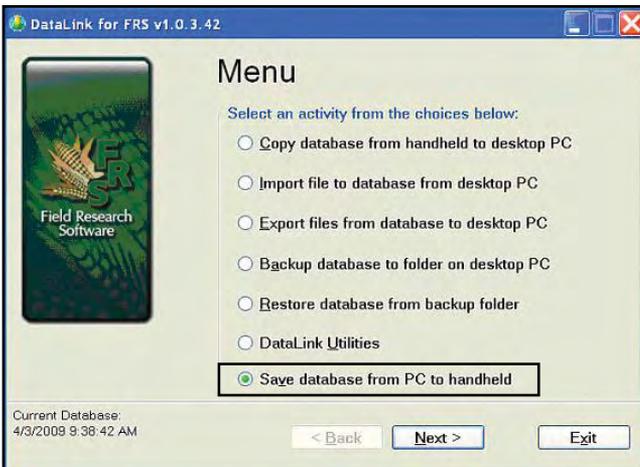


*Figure 8-23: Save database*

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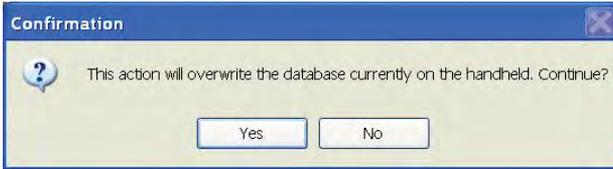


*Figure 8-24: Warning*

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.
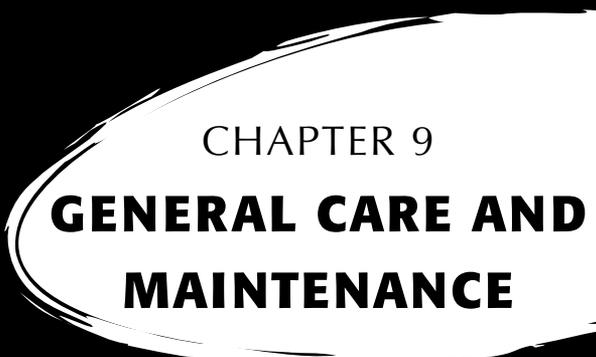
CHAPTER 9

# GENERAL CARE AND MAINTENANCE
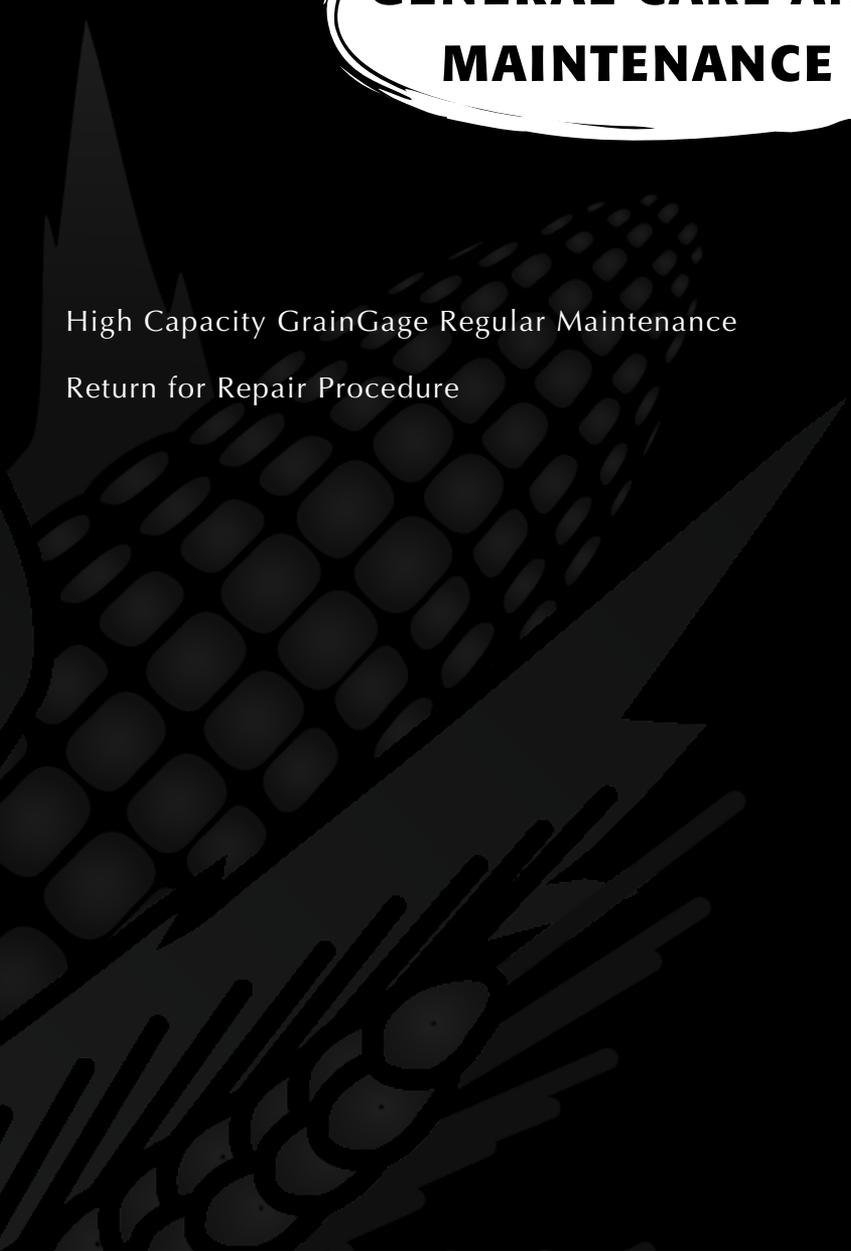
High Capacity GrainGage Regular Maintenance

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 tap **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. Voltage values should be aprox 1.3 to 1.7 volts and the weight should be 0.00 +/– 0.04. Place a known weight, we recommend at least 10 lbs, 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 SCCU 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 50PSI.

- 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. With the Classic GrainGage, be sure to get around the

back load cell. 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:

- Install a 3 to 5 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).

- Clean filter bowls using kerosene or cleaning solvent. Replace the oil in the lubricator if contaminants collect in the bottom of the lubricator bowl or yearly. Contaminates from dirty oil may collect at the siphon tube filter, requiring the filter to be washed in kerosene and blown off with an air blow gun.

    *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.

- Adjust the oil delivery rate to one drop for every 15 to 20 cycles of a gate. The operation of the oil delivery rate may drop after an extended period of use. If this happens, clean the lubricator and all its air and oil distribution tubes with kerosene. We recommend replacing the lubricator every 5-6 years or if the color becomes white or cloudy.

- Set the drip rate on the lubricator as explained later in this section of User's Guide.

- Use #10 (90 SSU) or lighter oil in your lubricator. We recommend using non-detergent, semi-synthetic or non-synthetic air-tool oil (replace yearly). Do not over fill the lubricator bowl.

- Use special anti-freeze lubricant if you are using the system in temperatures below freezing. This oil is a special blend that can be purchased from Juniper Systems or most retail stores. The anti-freeze oil is not an additive and must not be mixed with other oils.

### 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. 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.

## Lubricator

### Changing the Oil

*Note:* Cylinder manufactures no longer recommend adding lubrication oil.

To change the oil, complete the following steps:

1. Release the air pressure from the air lines (through the HM-1020 Pneumatic Conditioning Center).

2. Remove the four mounting screws that hold the plastic bowl securely to the metal housing.

3. Gently pull down on the bowl while gradually tipping the bowl back and forth until it is removed.

   *Note:* Be careful not to drop the plastic bowl from the metal bowl guard when emptying the oil.

4. Inspect the plastic bowl for deterioration or cracks. Replace as necessary.

5. Clean with a dry or water dampened cloth.

6.  Refill the bowl to the level as indicated on the metal bowl guard. Do not overfill the lubricator. This causes it to malfunction and results in not providing the proper lubrication to the cylinders.

    **CAUTION:** Install the metal bowl guard be installed to minimize the danger of flying fragments. Be sure the lubricator has a metal bowl guard before pressurizing the system.

### *Adjusting the Lubricator*

Your Bosch combination filter/ lubricator assembly is adjusted at the factory. If you are getting too much oil, you can adjust the assembly. To adjust the lubricator, follow these steps:

Adjustment set screw and oil viewing dome



*Figure 9-1: Filter/lubricator assembly and set screw*

For a simple adjustment, turn the oil flow adjustment screw clockwise until it stops. Turn the screw counterclockwise ½ turn to finish adjustment. If you wish to adjust the oil using a more thorough method, follow these steps:

1.  The air system must be pressurized to operating pressure (approximately 50- 80 PSI).

2. Turn on the electronics of the Harvest Data system. On the handheld, go to the main FRS screen.

3. On the system, switch the Auto/Manual switch to Manual mode so you can cycle the system manually.

4. While watching the dropper in the oil viewing dome on top of the lubricator, cycle one of the gates 15 times using the Open and Close switches. Complete one cycle every 1-2 seconds.

   *Note:* The gates can be cycled while standing by the GrainGage by pressing the red button on the top of the control solenoid (mounted to the right inside wall of the GrainGage). If the lubricator is not mounted close enough to the GrainGage to cycle the door and watch the site dome, find an assistant to set the oil delivery drop rate.

5. Using a short handled flat-head screwdriver, adjust the set screw in the lubricator so that a drop of oil falls inside the oil viewing dome every 15-20 cycles (cycle one door at a rate of one complete cycle ever 1-2 seconds).

## 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 Serial Control and Conditioning Unit (SCCU). When this starts happening, its time to remove your old cylinders and install new ones.

### Tools Needed
Tools needed for cylinder removal:

• Small Flathead Screwdriver

• 5/32″ Allen wrench

• 3/8″ Socket wrench

• 7/16″ Socket wrench

• Crescent 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.
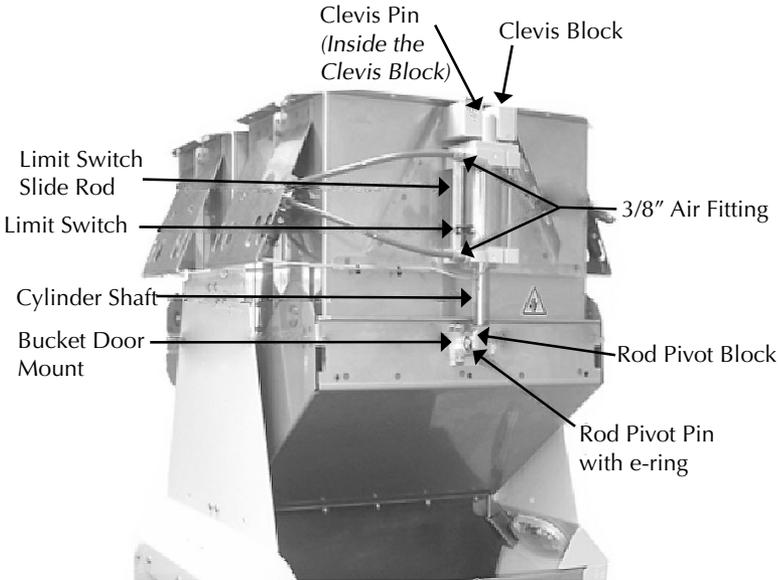


**Figure 9-2: Elements of the HCGG**

### 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 sliding air valve to the center position.

3. Using a permanent marker, mark which air hose is attached to the top 3/8" air fitting and which air hose is attached to the bottom 3/8" 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 3/8″ air fitting (commonly red or orange) while pulling the air hose out of the fitting.
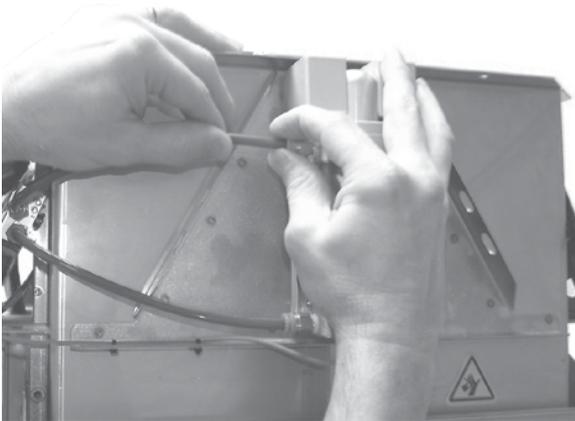


*Figure 9-3: Removing the air hose*

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.
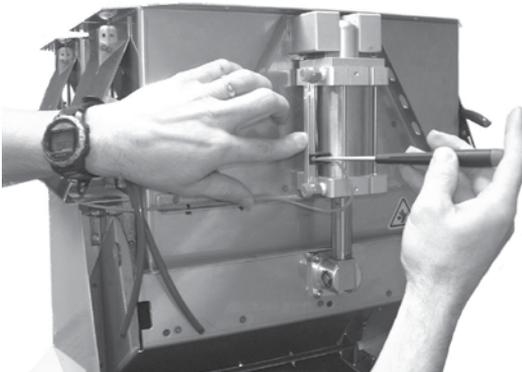


*Figure 9-4: Loosening the limit switch*

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.
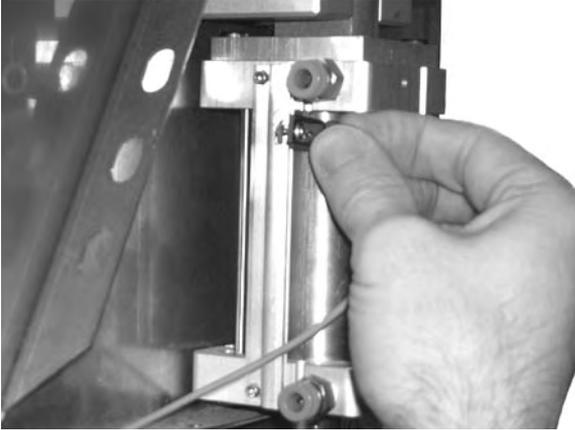


*Figure 9-5: Removing the limit switch*

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.
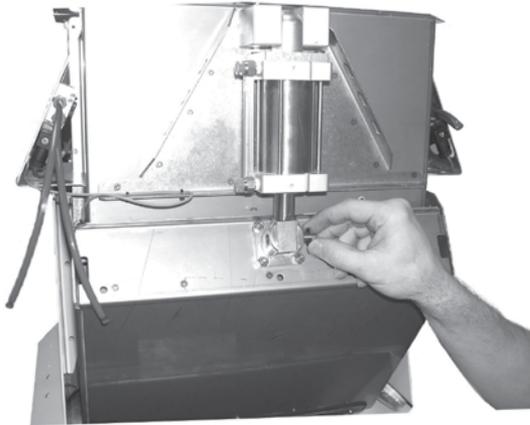


*Figure 9-7: Remove the rod pivot pin*

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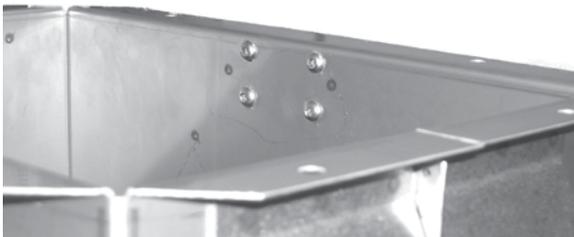


*Figure 9-8: Pan head screws (far side)*

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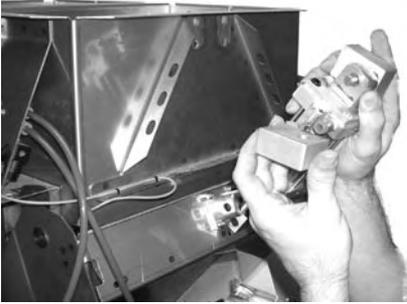


**Figure 9-9: Slide the cylinder off the clevis rod**

11. Use a 7/16″ socket to unscrew and remove the two 3/8″ air fittings from 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. Using a crescent wrench, grab hold of the Rod Pivot Block. Turn the block counter clockwise while using the vise-grips to hold to 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. 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.

3. Using a crescent wrench, grab hold of 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.

4. Using a 7/16″ socket, tighten the two 3/8″ air fittings onto the new cylinder.

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

5. Slide the top of the new cylinder on to Clevis Block Pin and place the other side of the Clevis block onto the pin, clamping the cylinder in the middle.

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

   *Note:* Do not tighten the 1/4″ pan head screws all the way; the cylinder needs to be adjusted first.

7. 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 5/32" 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*

8. Using a 5/32" Allen wrench, securely tighten the 1/4" pan head screws into place.

9. Adjust the Rod Pivot Block lining it up with the bucket door mounts.

10. 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.

11. 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.

12. 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.

13. Slide the limit switch back through the small notch opening in the top of the slide rod but do not tighten it.

14. Turn on the air source to the HCGG.

15. 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 by 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.
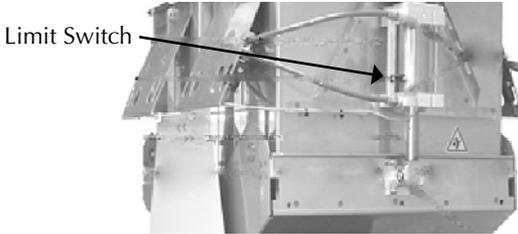
Limit Switch 

***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 make 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 SCCU 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 SCCU for the light to stop blinking for the bucket door you just closed. *Note:* If the light on the SCCU continues to blink the limit switch needs to be readjusted. If the SCCU 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 weigh buckets removal, complete the following steps to correctly remove the weigh bucket.

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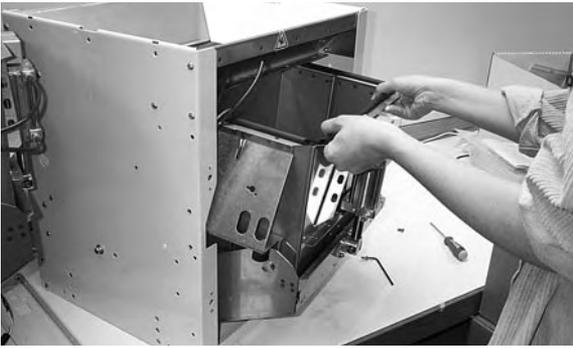


*Figure 9-13: Removing the front brace*

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

Locked                    Unlocked
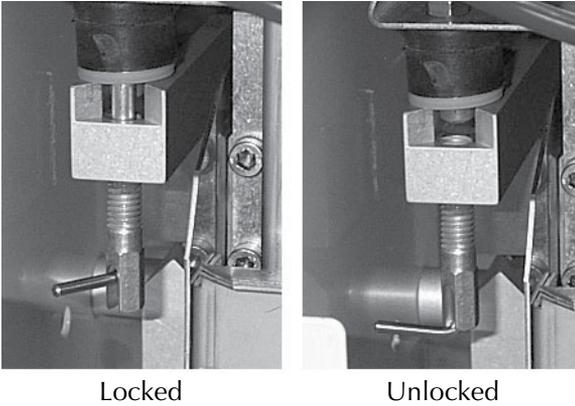
*Figure 9-14: Unlocking retractable locks*

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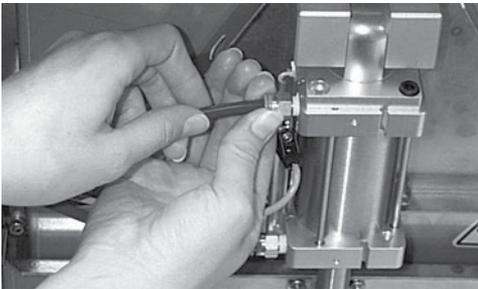


*Figure 9-15: Removing the air hose*

**157**

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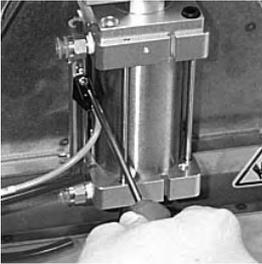


Loosen Screw          Slide Out Limit Switch

*Figure 9-16: Removing the Limit Switch*

5. Disconnect the "Moisture Sensor" connector from the break out box.

   *Note:* A plastic lock that allows the Moisture Sensor connector to be released. This lock must be pushed before pulling on the connector.



*Figure 9-17: 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.
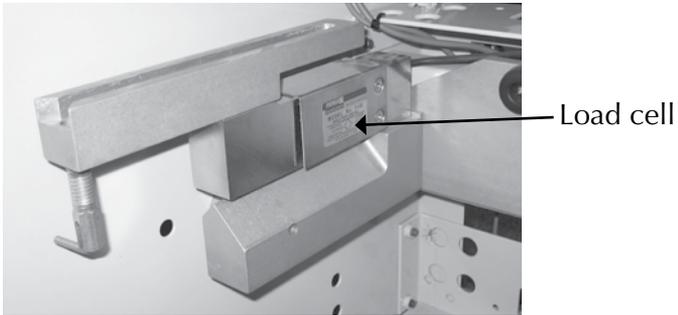

— Load cell

*Figure 9-18: Load cell*

2. Remove the two screws that attach to the bottom of the load cell using a 7/64″ Allen wrench.
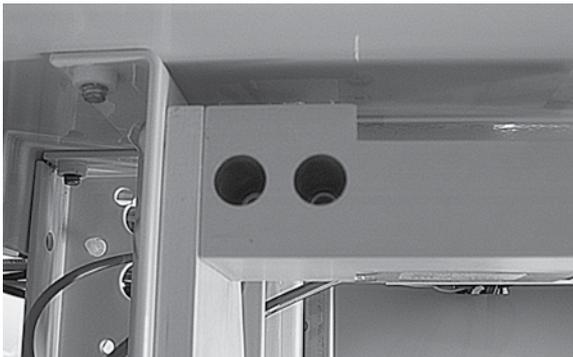


*Figure 9-19: Bottom two screws of load cell*

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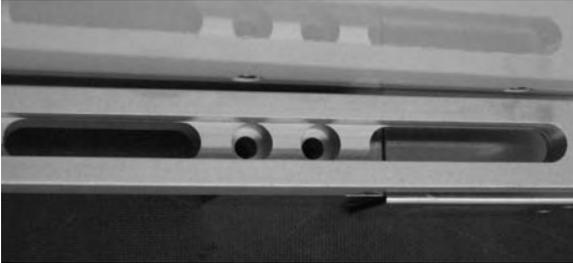


*Figure 9-20: Two top screws of load cell*

4. Remove broken load cell and replace with new load cell.

5. Reattach screws. We recommend using lock tight to keep screws snug.

## Reinstalling the Weigh Bucket

Now that all of the wiring is installed, the weigh bucket and air hoses are ready for reinstallation. To do this, complete 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 break out box.

3. Connect the coaxial cable connector to the coaxial bulkhead fitting on the lower cross member brace.

4. Return the limit switch by sliding the loosened mount screw into the Mounting bracket and slide it down. Use a flat head screwdriver and tighten the screw.

5. Return the two air hoses by pushing on the plastic locks and at the same time, pushing on the hoses into the air hose holes until they cannot go in any further.

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 front brace of the bottom half of the HCGG, and screw it back into place.

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 email 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, package your equipment (if the existing box is still good) in the same box and ship it Federal Express, Next Day Air Mail, or UPS Red.

2.  Fill out the shipping and RMA forms that were included with your loaner equipment and 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.

3.  Package the unit properly to avoid shipping damage.

4.  Write the RMA# on the package you ship.

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

# A p p e n d i x   A
# W a r r a n t y

## 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 MST, Mon-Fri).

# **A p p e n d i x   B**
# **M o u n t i n g   D i a g r a m s**

This diagram shows placement for mounting the Field
Computer cradle.

1.94″
(5.00 cm)

2.00″
(5.10 cm)

.218″ (.50 cm) Diameter
4 Places
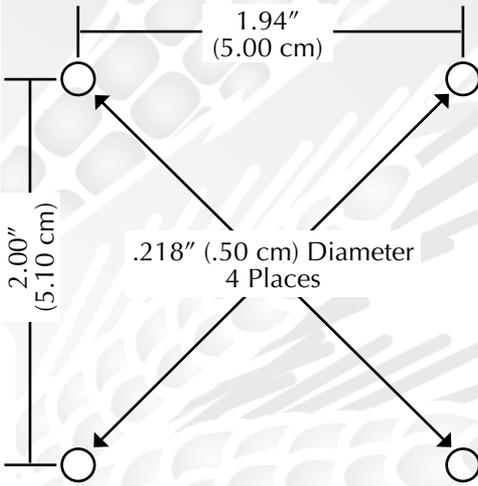
Below is pictured the system console mounting diagram.

10X ⌀0.201

1.750
1.475
1.375

0.868

0.375
0.275
0

0

0.745
0.956

2.500

3.850
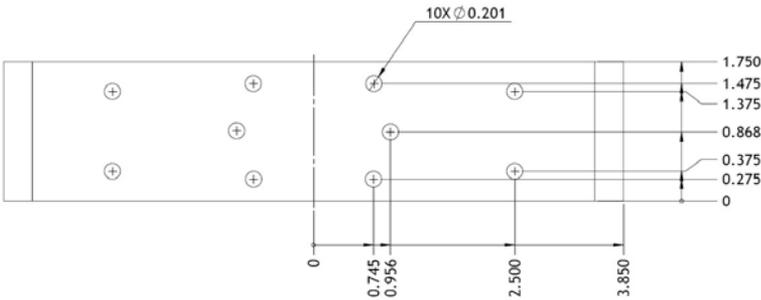
The next two diagrams are for mounting the printer.
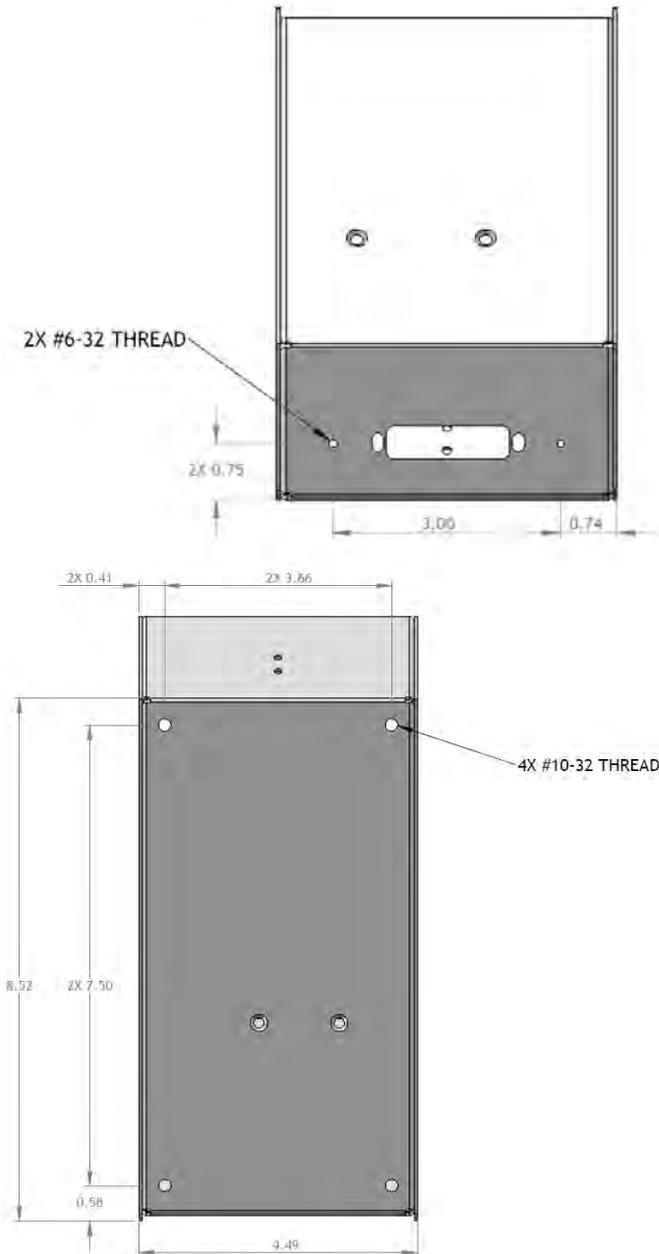
The following diagrams are for mounting the HCGG.

## Side View
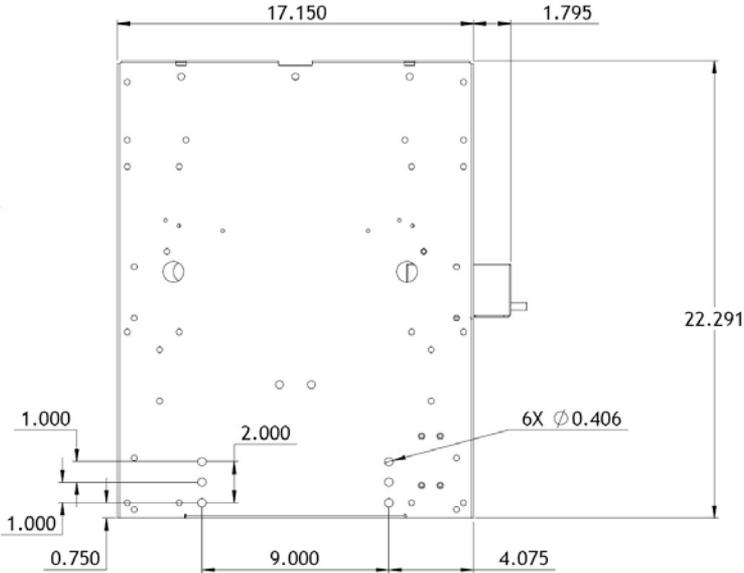


## Bottom View
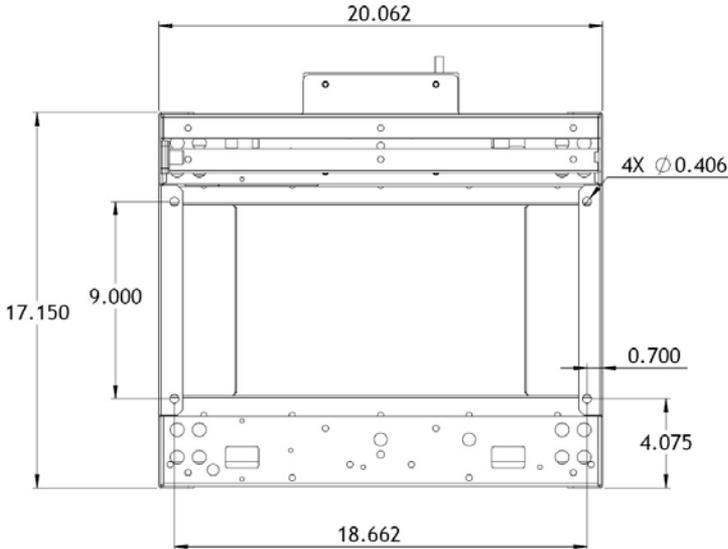
# Appendix C
# Cable Wiring Diagrams
# for the HM-401

## Breakout Box labels

### Breakout Box



Top Gate Sensor (Right)

A2 - (NL)

Speed Sensor

Mid Gate Sensor (Left)

A1 Load Cell

Bot Gate Sensor

Grain Level Detect

Moisture Sensor

Bot Gate Act

Mid Gate Act (Left)

Top Gate Act (Right)

B Load Cell
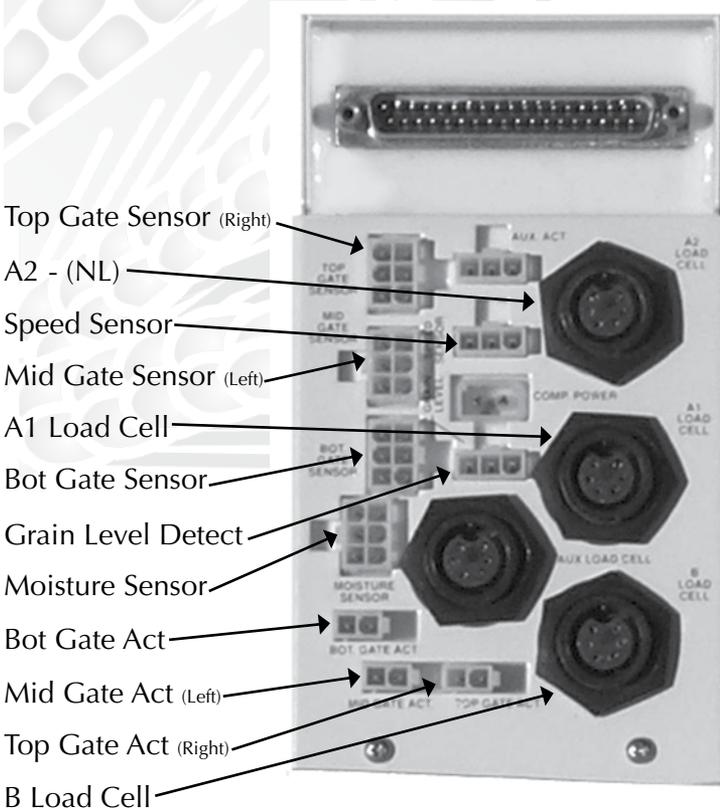
*Figure C-1: Breakout Box Labels*

*Note:* Each cable is labeled with two descriptions. One is the exact same label that is on the break out box.

### Install Cables from Wiring Harness Table

| *Breakout Box* | *Cable Function* |
| --- | --- |
| Top Gate Sensor | Top RT Sensor |
| Mid Gate Sensor | Top Left Sensor |
| Bot Gate Sensor | Plot BKT Sensor |
| Aux Actuator | Isolation Gate Act |
| Speed Sensor | Left Hopper Level |
| Grain Level Detect | RT Hopper Level |
| Moisture Sensor | Moisture Sensor |
| Bot Gate Act | Plot BKT Act |
| Mid Gate Act | Top Left Act |
| Top Gate Act | Top RT Act |

## The Harvest Data System Console

### *Sensor Control and Conditiong Unit (SCCU)*
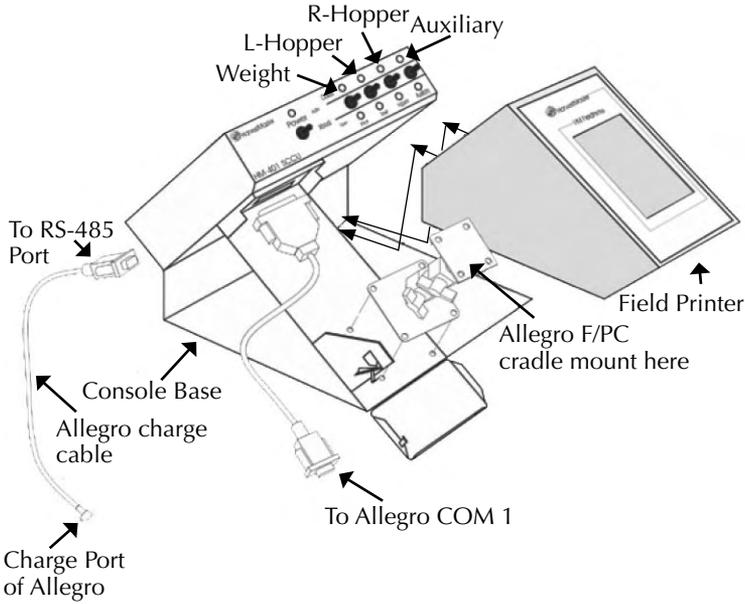


*Figure C-2: Cables connecting SCCU*

The Allegro and Harvest Data System Field Printer fit into the Harvest Data System console base.

The Field Printer is an optional component for convenient field use.

## Supporting Hardware

The High Capacity GrainGage is composed of the following hardware:



- Right Hopper Bucket
- Actuator
- Level Detect
- Left Hopper Bucket
- Air Shut-off Valve
- Breakout Box
- Slope and Motion Box
- Plot/Weight Bucket
- Moisture Blade
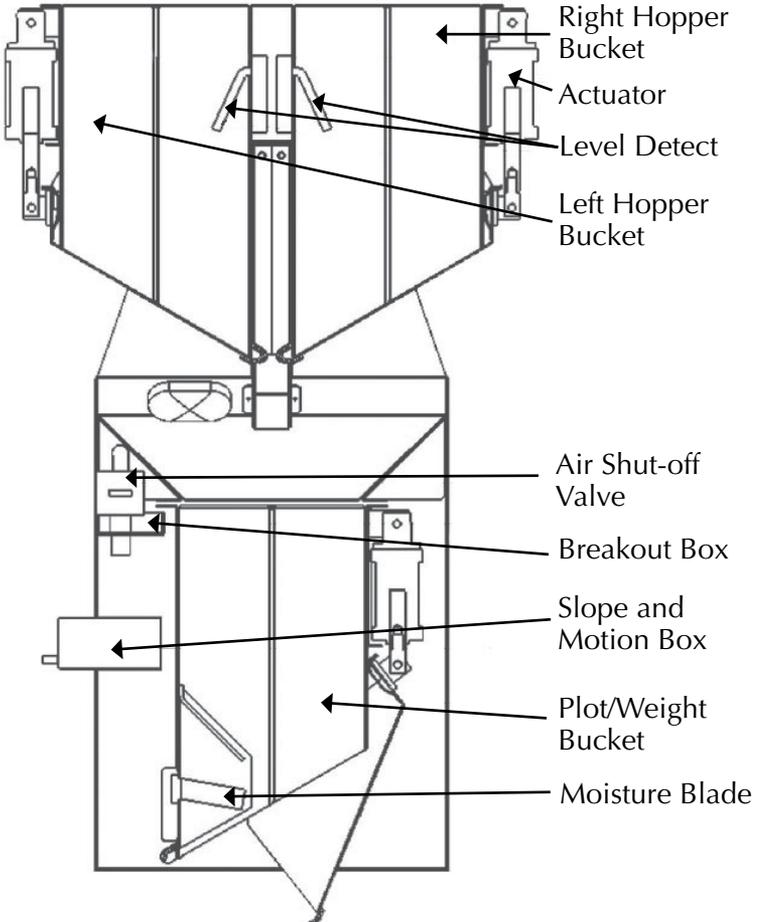
*Figure C-3: A Basic HCGG System*

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

### Actuator
Actuator runs the mechanical functions of the hopper buckets.

### Level Detect
Level Detect is used to measure grain level within each of the holding hoppers of the High Capacity GrainGage. The Level Detect sets the point that the hoppers cycle at during harvest of longer strip tests. 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.

### Breakout Box
Breakout Box connects to the SCCU enabling the harvesting functions of the HCGG.

### Slope and Motion Box
Slope and Motion Box is a patented sensor 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 box is enabled via software and has a hardware-shipping stop.

### Plot/Weight Bucket

Plot/Weight Bucket contains a moisture blade for collecting weight and moisture 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) on the High Capacity GrainGage.

## Cable Connection to the SCCU

Connecting the system control cable and the power cable is the next step. The system control cable connects to the breakout box inside the HCGG.

### System Control Cable Connection

The system control cable ends in a 37-pin connector on both ends. Plug one end into the back of the SCCU and the other end into the top of the breakout box.

1.  Using wire ties, tie the cable in place on the combine to help protect them from possible damage.

2.  Twist the thumbscrews on the connectors to secure the 37-pin connectors to the SCCU and the breakout box.

## Power Cable Connection

To connect the power cable, complete the following steps:

1.  Attach the pigtail end of the power cable to the combine battery (12V power supply). It is recommended to connect the negative side of the power cable to the end of the ground cable furthest away from the battery (connected to the chassis—refer to figure on the next page). If your system is equipped with a lockout system, this eliminates any potential problems.

2.  Plug the power supply cable into the SCCU, and twist the locking ring to secure the connector to the SCCU.

3.  If you haven't done so already, attach the Allegro DC power plug to the Allegro's charge port.

You need to make sure the polarity of the positive and negative battery terminal are wired correctly. Reversing the polarity could cause possible hardware damage. Also, the 12V power supply wire is red or white (+). The ground wire is black (–).
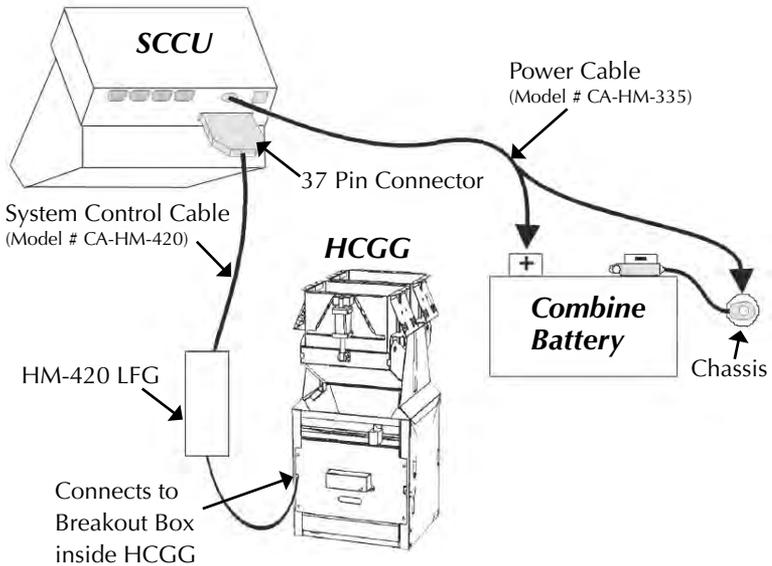
*Figure C-4: Cable Connectors for the SCCU. This shows the connector for the system control cable and the plug for the power cable.*

## HM-420 37-pin System Control Cable

In a standard system control cable there are:
Four pairs of shielded cables

- Four 20 AWG twisted pairs

- Nine 24 AWG single wires

- Three 22 AWG twisted pairs

- Two 22 AWG single wires

- Four 24 AWG single drain wires for the shielded twisted pairs

**179**

## Connector Wire Codes - Standard

| Pin | Wire Name |
| --- | --- |
| 1 | bottom gate actuator (+) |
| 2 | bottom gate actuator (-) |
| 3 | right hopper actuator (+) |
| 4 | right hopper actuator (-) |
| 5 | left hopper actuator (+) |
| 6 | left hopper actuator (-) |
| 7 | bottom gate "open" sense |
| 8 | bottom gate "closed" sense |
| 9 | right hopper "open" sense |
| 10 | right hopper "closed" sense |
| 11 | moisture sensor excitation (12V reg.) |
| 12 | moisture sensor control |
| 13 | moisture sensor shield |
| 14 | load cell signal (B+) |
| 15 | load cell signal (B-) |
| 16 | load cell "B" shield |
| 17 | load cell "B" excitation (+) |
| 18 | load cell "A1" shield |
| 19 | load cell "A1" excitation (+) |
| 20 | left grain level sense input |
| 21 | right grain level sense input |
| 22 | sensor ground |
| 23 | auxiliary output or compressor relay (+) |

| 24 | auxiliary output or compressor relay (-) |
|----|------------------------------------------|
| 25 | slope and motion sensor ground (-) |
| 26 | slope and motion sensor excitation (+) |
| 27 | left hopper "open" sense |
| 28 | left hopper "closed" sense |
| 29 | slope and motion sensor signal (+) |
| 30 | slope and motion sensor shield |
| 31 | slope and motion sensor signal (-) |
| 32 | moisture sensor signal (+) |
| 33 | moisture sensor signal (-) |
| 34 | load cell "B" ground |
| 35 | load cell signal + (A1) |
| 36 | load cell signal - (A1) |
| 37 | load cell "A1" ground |

*Helps*

- Pins 1-6 and 23-24 are 20-gauge outer wires for actuator drivers.

- Shielded pairs for sensors are on pins 14 and 15, 32 and 33, 35 and 36, and 29 and 31.

# Load Cell Connector Wiring

These cables come pre-wired. The following information on wiring configurations is included for reference only.

### "A1" Load Cell

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 35 | load cell "A1" signal (+) | 3 |
| 36 | load cell "A1" signal (-) | 4 |
| 19 | load cell "A1" excitation (+) | 1 |
| 37 | load cell "A1" ground (-) | 5 |
| 18 | load cell "A1" shield | 6 |
|  | no connection | 2 |

### "B" Load Cell

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 14 | load cell "B" signal (+) | 3 |
| 15 | load cell "B" signal (-) | 4 |
| 17 | load cell "B" excitation (+) | 1 |

| 34 | load cell "B" ground | 5 |
| 16 | load cell "B" shield | 6 |
| | no connection | 2 |

## Auxiliary Load Cell

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 29 | aux load cell signal (+) | 3 |
| 31 | aux load cell signal (-) | 4 |
| 26 | aux load cell excitation (+) | 1 |
| 25 | aux load cell excitation (-) | 5 |
| 30 | aux load cell shield | 6 |
| | no connection | 2 |

## Left Hopper Level Detect Wiring

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 11 | level detect excitation | 1 |
| 22 | level detect ground | 2 |
| 21 | level detect signal | 3 |

## Right Hopper Level Detect Wiring

| *System Control Cable Pin #* | *Signal Name* | *Box Pin #* |
|---|---|---|
| 11 | speed sense excitation | 1 |
| 22 | speed sense ground | 2 |
| 21 | speed sense signal | 3 |

## Moisture Sensor Wiring

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 32 | moisture sensor signal (+) | 3 |
| 33 | moisture sensor signal (-) | 4 |
| 12 | moisture sensor control | 5 |
| 11 | moisture sensor excitation (12V reg.) | 1 |
| 13 | moisture sensor shield & ground | 6 |
|  | No connection | 2 |

## Slope and Motion Connector Wiring

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 29 | slope & motion signal (+) | 3 |
| 31 | slope & motion signal (-) | 4 |
| 26 | slope & motion excitation | 1 |
| 25 | slope & motion ground | 5 |
| 30 | slope & motion shield | 6 |
|  | no connection | 2 |

# 25-pin Host Port

This cable comes pre-wired. The following information on wiring configurations are included for reference only.

| System Control Cable Pin # | Signal Name | Box Pin # |
|---|---|---|
| 1 | N/C |  |
| 2 | RXD (red) | 2 |
| 3 | TXD (green) | 3 |
| 4 | DTR | 20 |
| 5 | GND | 7 |
| 6 | DSR | 6 |
| 7 | RTS |  |
| 8 | CTS |  |
| 9 | N/C |  |

# RS-232 Expansion Ports

These cables come pre-wired. The following information on wiring configurations is included for reference only.

## Barcode Wand

| System Control Cable Pin # | Signal Name |
|---|---|
| 1 | External Switch Input |
| 2 | Wand RXD |
| 3 | TXD |
| 4 | DTR |
| 5 | GRD |
| 6 | N/C |
| 7 | Wand RTS |
| 8 | Wand CTS |
| 9 | +5VM |

## Printer

| System Control Cable Pin # | Signal Name | 25-pin Socket |
|---|---|---|
| 1 | N/C | 1 |
| 2 | RXD | 3 |
| 3 | TXD | 2 |
| 4 | 12 VSB | 9 |
| 5 | Printer Ground | 25 |
| 5 | Printer Ground | 7 |
| 6 | Printer Take-up | 12 |
| 7 | RTS | 4 |
| 8 | CTS | 5 |
| 9 | N/C | |

## HVD

| System Control Cable Pin # | Signal Name |
|---|---|
| 1 | N/C |
| 2 | RXD |
| 3 | TXD |
| 4 | +12 VBSP |
| 5 | Ground |
| 6 | N/C |
| 7 | N/C |
| 8 | CTS |
| 9 | +5VM |

## RS-485

| System Control Cable Pin # | Signal Name |
|---|---|
| 1 | N/C |
| 2 | RS485 Low |
| 3 | RS 485 High |
| 4 | +12 VBSP |
| 5 | Ground |
| 6 | N/C |
| 7 | N/C |
| 8 | N/C |
| 9 | N/C |

# Appendix D 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 D-1: Front view of HM-800 components*

Figure D-2 shows the cable connections from the HM-800 System Console and modules to other components.
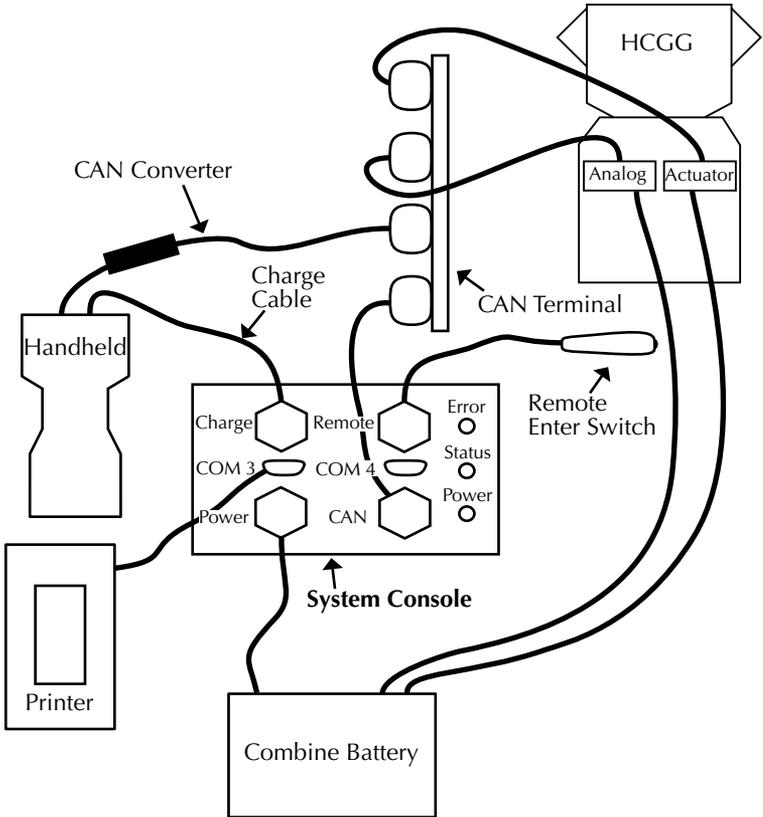


**Figure D-2a: Cable connections for the HM-800**

# ACTUATOR
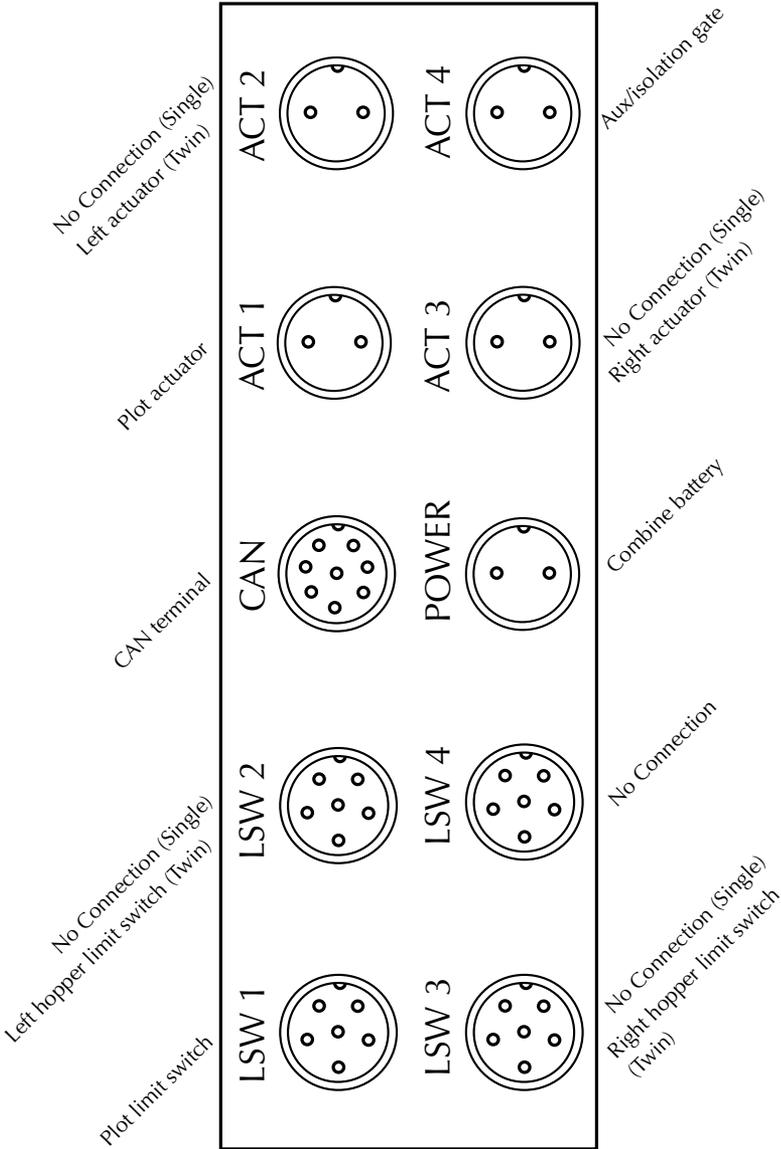


*Figure D-2b: Cable connections for the actuator module*

# ANALOG
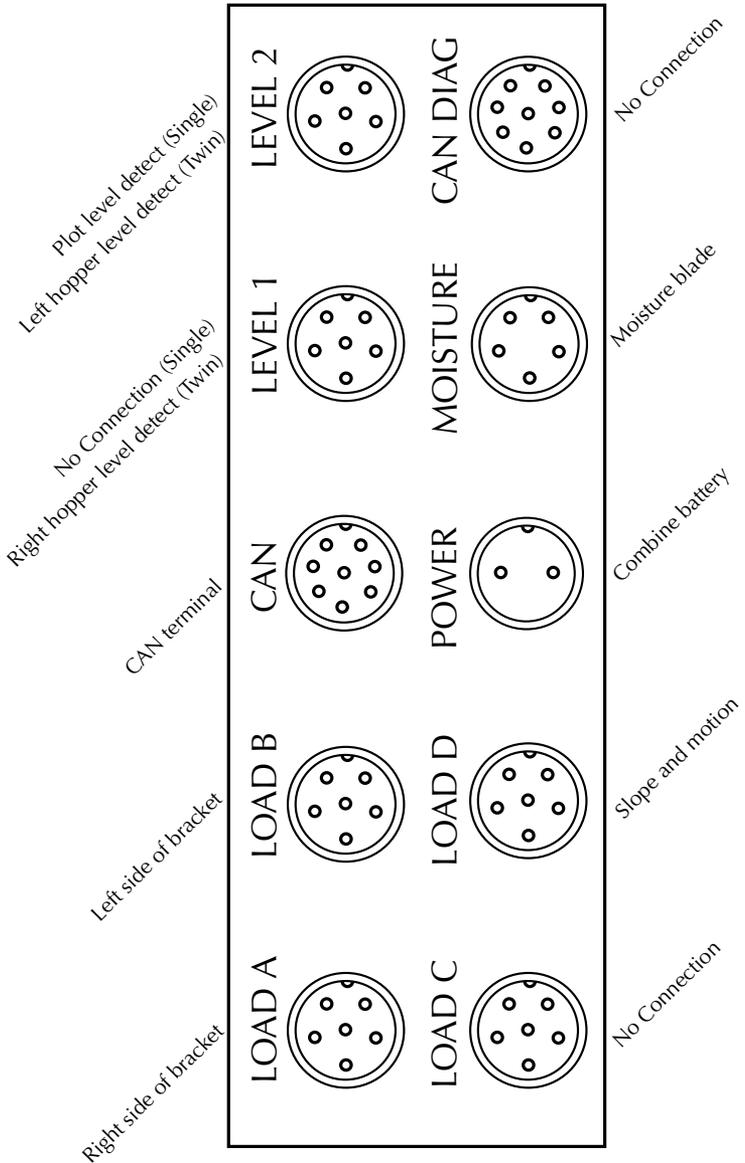


*Figure D-2c: Cable connections for the analog module*

## Supporting Hardware

The High Capacity GrainGage is composed of the following hardware:



Right Hopper Bucket

Actuator

Level Detect

Left Hopper Bucket

Air Shut-off Valve

Breakout Box

Slope and Motion Box

Plot/Weight Bucket

Moisture Blade
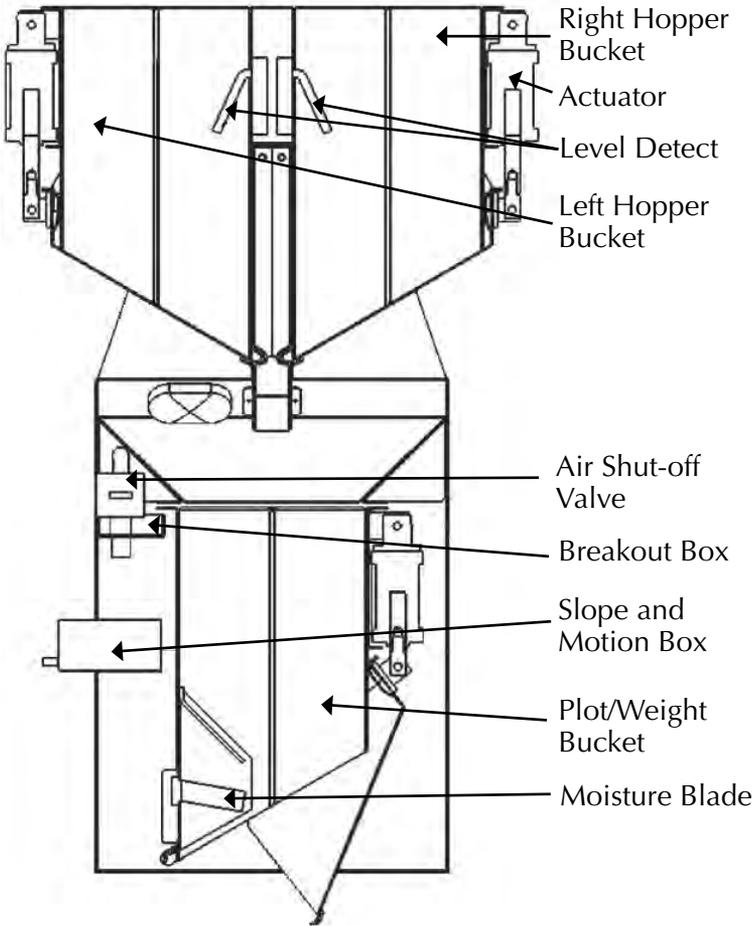
*Figure D-3: A Basic HCGG System*

### Left and Right Hopper Buckets

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

### Actuator

Actuator runs the mechanical functions of the hopper buckets.

### Level Detect

Level Detect is used to measure grain level within each of the holding hoppers of the High Capacity GrainGage. The Level Detect sets the point that the hoppers cycle at during harvest of longer strip tests. 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.

### Breakout Box

Breakout Box connects to the SCCU enabling the harvesting functions of the HCGG.

### Slope and Motion Box

Slope and Motion Box is a patented sensor 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 box is enabled via software and has a hardware-shipping stop.

*Plot/Weight Bucket*

Plot/Weight Bucket contains a moisture blade for collecting weight and moisture 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) on the High Capacity GrainGage.

## HM-800 in HCGG

Figure D-4 shows the HM-800 installed in the HCGG.
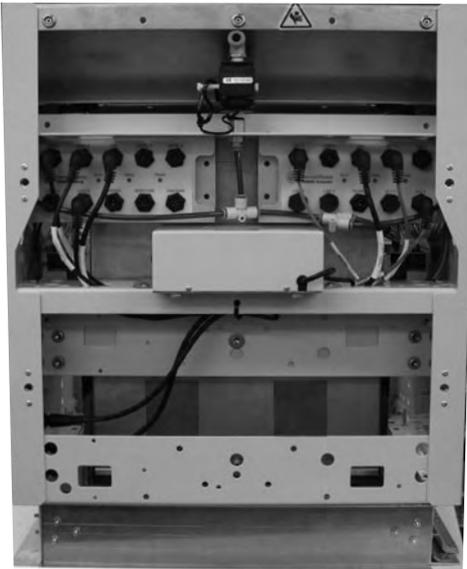


*Figure D-4: HM-800 installed in the HCGG*

2 pin   5 pin   6 pin   8 pin   9 pin

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

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

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

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

| Analog Module | Twin | Single | Pin | Connection | Description |
|---|---|---|---|---|---|
| CAN-DIAG<br>*8 pin* | CAN | CAN | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8 | Red<br>Yellow<br>Black<br>Green<br>N/C<br>N/C<br>N/C<br>N/C | CAN Power<br>CAN +<br>CAN Gnd<br>CAN –<br>N/C<br>TX<br>RX<br>GND |
| Moisture<br>*5 pin* | Moisture<br>EM Sens | Moisture<br>EM Sens | 1<br>2<br>3<br>4<br>5 | Red<br>Black<br>Green<br>White<br>Shield | Excite<br>Ground<br>Signal +<br>Signal –<br>Ground |
| Power<br>*2 pin* | Power | Power | 1<br>2 | Black<br>Red | Ground<br>+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 *6 pin* | Open Close | LSW 1 Plot | LSW 1 Plot | 1 2 3 | N/C N/C N/C | N/C N/C N/C |
| | | | | 4 5 6 | Brown Blue Black | Excite Ground Signal |
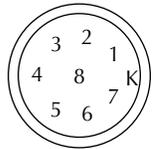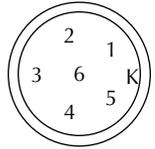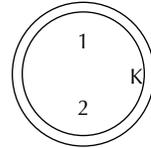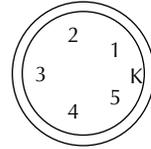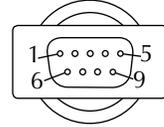
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| Actuator Module | | Twin | Single | Pin | Connection | Description |
|---|---|---|---|---|---|---|
| LSW 2<br>*6 pin* | Open | LSW 2<br>Left LSW | | 1 | N/C | N/C |
| | | | | 2 | N/C | N/C |
| | | | | 3 | N/C | N/C |
| | Close | | | 4 | Brown | Excite |
| | | | | 5 | Blue | Ground |
| | | | | 6 | Black | Signal |
| LSW 3<br>*6 pin* | Open | LSW 3<br>Right LSW | | 1 | N/C | N/C |
| | | | | 2 | N/C | N/C |
| | | | | 3 | N/C | N/C |
| | Close | | | 4 | Brown | Excite |
| | | | | 5 | Blue | Ground |
| | | | | 6 | Black | Signal |
| LSW 4<br>*6 pin* | Open | | | 1 | N/C | N/C |
| | | | | 2 | N/C | N/C |
| | | | | 3 | N/C | N/C |
| | Close | | | 4 | Brown | Excite |
| | | | | 5 | Blue | Ground |
| | | | | 6 | Black | Signal |

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

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

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| System Console | Twin | Single | Pin | Connection | Description |
|---|---|---|---|---|---|
| | | | 1 | N/C | N/C |
| | | | 2 | RXD | Receive Data |
| | | | 3 | TXD | Transmit Data |
| | | | 4 | DTR | Data Terminal Ready |
| Com 3 | | | 5 | GND | Ground |
| | | | 6 | DSR | Data Set Ready |
| | | | 7 | RTS | Request to Send |
| | | | 8 | CTS | Clear to Send |
| | | | 9 | N/C | N/C |
| | | | 1 | N/C | N/C |
| | | | 2 | RXD | Receive Data |
| | | | 3 | TXD | Transmit Data |
| | | | 4 | DTR | Data Terminal Ready |
| Com 4 | | | 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<br>*2 pin* | Power | Power | 1<br>2 | Black<br>Red | Ground<br>+12 V |
| CAN<br>*8 pin* | CAN | CAN | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8 | Red<br>Yellow<br>Black<br>Green<br>N/C<br>N/C<br>N/C<br>N/C | CAN Power<br>CAN +<br>CAN Gnd<br>CAN –<br>N/C<br>N/C<br>N/C<br>N/C |
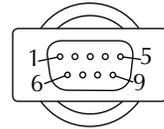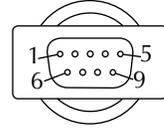
## Getting the HCGG Ready

### HCGG Unpacking and Inspecting

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

1.  Open the boxes that the HCGG is shipped in.

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 inside the hopper assembly.

6.  Remove the cables from the hopper bucket, and 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 two 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 2 and 3 for the other panel on the bottom half of the HCGG.

*Note:* We recommend removing the weigh bucket prior to assembly

### 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 two people to complete this assembly process because the top half needs to be tilted back and not fully resting on the base, until the power cables are correctly installed.

*Note:* Do not place the top of the HCGG flat on the base or you will damage the cable assembly.

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

1. Position the base of the HCGG so that the Slope and Motion box and Breakout box 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. Tilt it back so the top is balanced on only one edge, as shown below.



Light
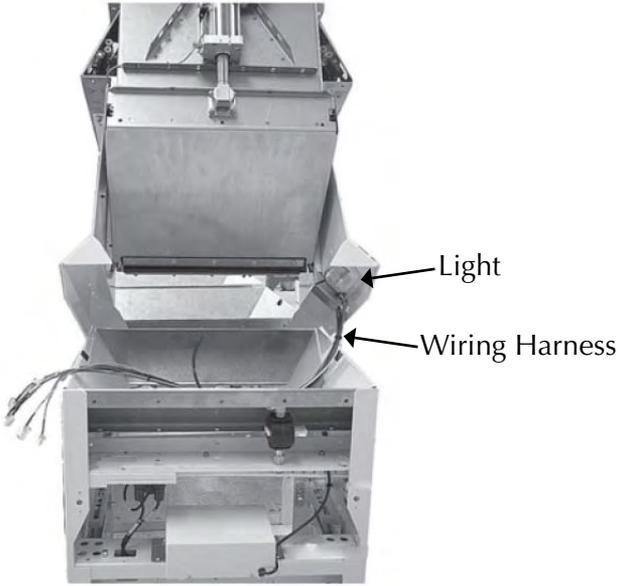
Wiring Harness

*Figure D-5: Top half of High Capacity GrainGage tipped and balanced on the base*

3.  Feed the group of wiring cables, or wiring harness, through the access hole located directly below the wires. Feed the largest wires first and the smaller wires last.

4.  Feed the wiring harness out of the HCGG by the Slope and Motion box, making sure none of the wires are wedged by the bottom half of the HCGG.

Once completed, the placement of the group of wires should resemble the picture below.



Feed wires in here
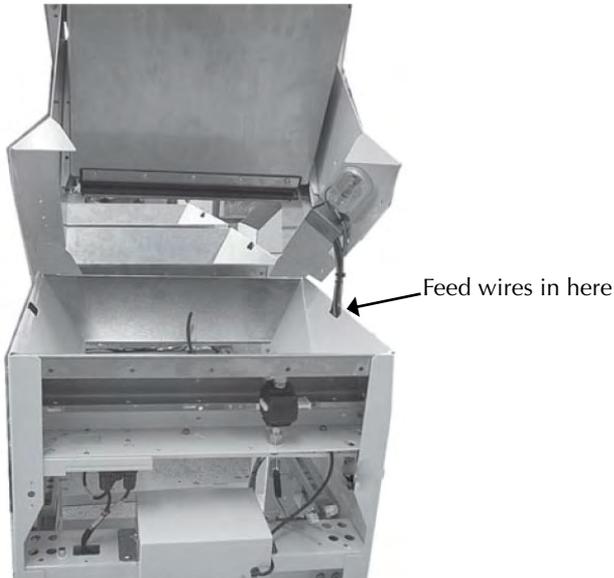
*Figure D-6: Wire Harness feed in and feed out points*

5.  Lower the top half of the HCGG slowly until it rests flat on the base while watching the wiring harness, making sure they do not get between the top and bottom sections of the HCGG.

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*

When assembling the HCGG there are specific locations for cables to feed from the top half to the modules.

1.  Attach the top of the HCGG to the base. Make sure that the cables come down and feed through the hole in the top of the base.



**Figure D-7: Cables coming down from top to the base of the HCGG**

2.  The cables run down the inside and feed through the side where the modules are located.



**Figure D-8: Cables running down inside HCGG towards the modules**

3.  To keep the cables in place, secure them with a tie to the frame.
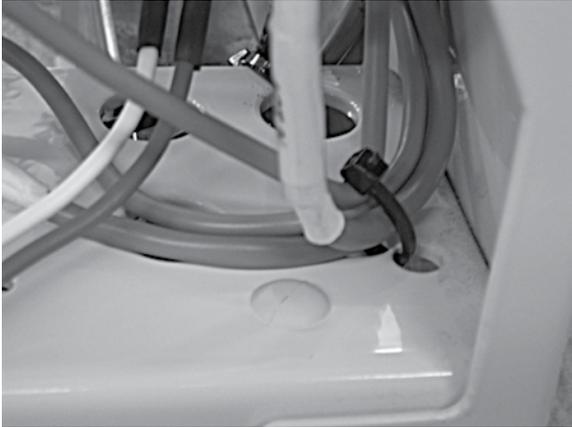


*Figure D-9: Cables secured to frame with tie*

4.  Remove the blue hose plug and fit it into the "Y" to the right of the slope and motion sensor. Attach the cables to the actuator module. The cables are labeled to help with this process.
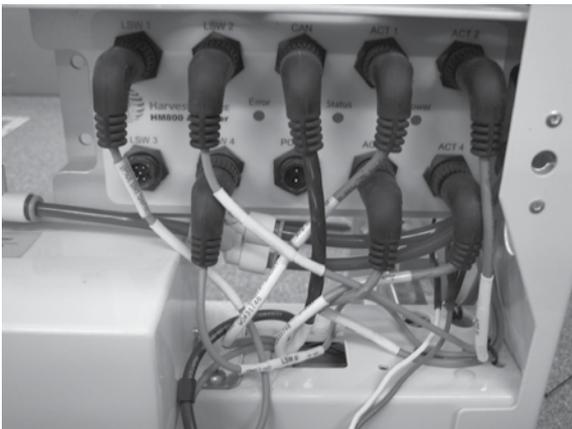


*Figure D-10: Cables attached to actuator module and blue hose behind cables attached to "Y"*

**211**

5. Run the analog cables below the cross beam and bring them up through hole and attach to analog module.



*Figure D-11: Cables under cross beam and attached to analog module*

# Index

# **I n d e x**

harvest template. *See* traits template screen
HCGG  8, 206
  assembly  207
  automatic moisture correction  35
  cable connection  177, 179
  calibrating  16
  hardware  175, 192
  maintenance  136, 145, 156
  preparing for harvest  16
  sequence  103
High Capacity GrainGage. *See* HCGG
HM-800
  HCGG  194
  system console  189
  wiring diagram  196
hopper
  assembly  206
hopper buckets  176, 193

# I

import/export utility  113
installing
  cylinder  145, 150
  FRS  9
  harvest data system  140

# K

Keaser filter  144

# L

level detector sensor screen  84
  current  84
  tare  85
  tare value  84
  trip point  84
level sensor  43, 106, 110, 172, 175, 176, 192, 193
  settings screen  43
light emitting diode. *See* moisture sensor LED codes