HM-400
HarvestData System
HDGG-DOS User's Manual

HarvestMaster™
Field Data Collection Tools

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Manual Part #: 11518-03
Release Date: April 2001
Editor: Jan Jardine

Printed in the U.S.A.

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Chapter 1
Introduction

This manual will guide you through installing and using your Harvest Data System. The system is employed on combines to record the weight and moisture content of grains. A Harvest Data System aids research scientists by automating data collection. It is designed for use by seed researchers, chemical treatment researchers, and combine operators.

Features

The Harvest Data System is a powerful, custom-built unit. Major features are as follows:

- Simplified menu structure and menu control, with <ESC> key backing through menus one level at a time.
- Function keys invoke pop-up menu.
- New, flexible field map generator.
- Display positional X-Y relocation upon entry of harvest mode, or with hot-key during harvest.
- Menu selection for renaming field maps.
- Flexible setups for bucket and hopper operation including door actuator signal timers.
- Automatic enable/disable of field printer.
- Enable/disable for hopper door operation on the fly (0 = disable).

- Weigh bucket retare margins are set by the user.
- Upload/download of system setup parameters to/from a host computer (IBM PC Compatible).
- Diagnostics menu to assist in system checkout and troubleshooting.
- "Memory Available" item added to the menu.
- Choice of language (English, French, German, Spanish) for prompts, selectable from the "INSTALL" menu when the program is loaded to the HarvestMaster Field Computer.
- Keyboard entry of visual observations or notes, in addition to taking harvest data.
- Improved temperature compensation for zero drift of the moisture sensor.
- Improved moisture sensor curve editing.
- Upload/download moisture curves to/from a host computer (IBM PC Compatible).
- User selection of moisture curve when entering harvest mode with ability to change selection part way through the field map.
- Settable "freeze reading" timer for the moisture sensor.
- "Rename (moisture) Curve" menu selection.
- Menu selection for moisture curve printing on the field printer.
- New "INSTALL" program.

The Harvest Data System is comprised of many essential components. In the paragraphs that follow you will find a brief description of each of these components.

The Field Computer

The Field Computer, when not in use with the Harvest Data System, functions as a general purpose electronic data recorder/field notebook. Applications include Field Notes Plus and connection to bar code wands for inventory control or electronic calipers for diameter or length measurements.

When the combine is running, the Field Computer is powered externally from the electrical system of the combine. This prevents draining the Field Computer's battery during long usage on the combine.

✏ *Note: When using a Pro 4000 Field Computer, an externally supplied battery pack must be installed in order for you to have external power.*

Manual Override Switches

Harvest Data System's override switches allow manual bucket control. Four switches are used for individual control of the bucket actuator(s). The fifth switch enables either the manual override switches or the Field Computer to control bucket movement.

Electrical Transient Protection

Harvest Data System's electrical transient protectors protect against voltage surges. They also protect the system from transient voltage spikes.

Dust-Resistant Enclosure

The placement of the electronics and the printer in an enclosed environment provides a dust-resistant design for the system's components. This provides protection from dust and grain particles which could cause malfunctions in electrical and mechanical components.

Anti-Alias Filter

An anti-alias circuit is included to aid in the filtering of high frequency noise.

How to Use this Manual

This manual is written and organized in a way to help you find and understand information easily.

In this manual, keyboard commands are indicated using brackets that surround the key or keys to be pressed. For example, <ENTER> prompts you to press the Enter key

✏ *Note: The blue key on the HarvestMaster Field Computers functions the same way a shift key does on other hand held computers.*

To execute any single-key command, simply press the designated key and release it. To execute commands that designate more than one key, press the first key; release it, and then press the next designated key. For example, to execute a **<BLUE>, <RIGHT>** command, press the blue key once, release it, and then press the right arrow key.

In this manual, "select" means to scroll to an option using the up or down arrow key and then press <ENTER>. An arrow on the screen moves from option to option as you scroll with the arrow keys.

Moving forward to the next screen or backward to the previous screen is simple. Pressing <ENTER> will make a selection and take you to the next screen. Pressing <ESC> will take you back to the previous screen.

All direct instructions to the user are in bold print and follow a bullet box, as illustrated by the instruction below:

■ **Follow instructions in bold print.**

Keyboard Commands

The following list gives definitions of the key commands and sequences available in the Harvest Data System. The pictures of the keys at the left are just representation. The keys on your Field Computer may look different but the key commands are the same.

ENTER: Accept individual value and move to the next item or step.

ESC: Escape to next higher menu, or back up to previous screen.

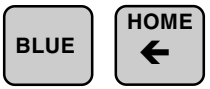
SPACE: Enter a space or blank in text.

UP ARROW: Move cursor to previous entry/selection item within a screen.

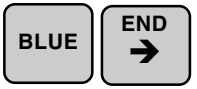
DOWN ARROW: Move cursor to next entry/selection item within a screen.

LEFT ARROW: Delete previous character or step backward through available entries for a selection item.

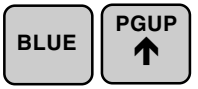
RIGHT ARROW: Step forward through available entries for a selection item.



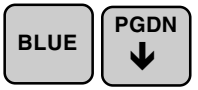
BLUE, LEFT ARROW: Move to the first of the available entries for a selection item. (Press the **Blue** key once; release it, then press the **Left Arrow** key).



BLUE, RIGHT ARROW: Move to the last of the available entries for a selection item. (Press the **Shift** key once; release it, then press the **Right** Arrow key).



BLUE, UP ARROW: Move to the top of the menu item list.



BLUE, DOWN ARROW: Move to the bottom of the menu item list.

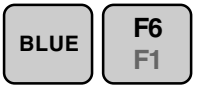
FUNCTION 1 (F1): "View Help" - provides user context sensitive help.

FUNCTION 2 (F2): "Pop-up Notes" - if a numerical or text variable is ACTIVE, but turned off (F 3), this key sequence allows user entry on a request basis.

FUNCTION 3 (F3): "On/Off Notes" - if numerical or text variables are "ACTIVE", this key allows the user to hide the variables temporarily if they don't need to be recorded.

FUNCTION 4 (F4): "Relocate" - when in harvest mode, this key pops up a field map and allows the user to reposition the data acquisition prompts to a new location in the field.

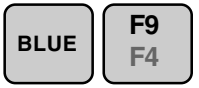
FUNCTION 5 (F5): "Advance Paper" - pulse the paper advance solenoid on the field printer.



BLUE, FUNCTION 6 (F6): "Retare Bucket" - when in harvest mode, selection of this function cycles the plot bucket and records a new tare weight measurement for the weigh bucket and test chamber and a new moisture of zero.

BLUE, FUNCTION 7 (F7): "Edit Data" - when in harvest mode, this key sequence allows the user to edit harvest data.

BLUE, FUNCTION 8 (F8): "Show Version" - shows current version of the Harvest Data System software.



BLUE, FUNCTION 9 (F9): "Set Backlight" - allows the user to turn the backlight on or off. Key in "Y" or "N" to turn the backlight on or off.

Chapter 2
Installation

Requirements for Installation

This chapter explains in detail how to install your Harvest Data System and GrainGage for the first time. It is important to follow the installation procedures in the order they are presented. If you purchased the system already installed, you can skip this chapter.

Typical time for GrainGage installation ranges from 3 to 15 hours. This depends on the type of combine modifications necessary; materials and equipment you have on hand to build brackets and make modifications; and whether grain delivery and removal systems are in place or have to be added.

For ease of installation, make sure you have the following tools on hand:

- A Phillips-head screwdriver
- A flat-blade screwdriver
- A 1/2" open-ended wrench
- A 9/16" wrench and a 9/16" socket with a 12" (30 cm) extension

- Mounting hole diagram for Harvest Data System Console (see *Appendix C*)
- Mounting hole diagram for the compressor (see *Appendix C*)
- Mounting hole diagram for the GrainGage (see *Appendix C*)
- A power drill with 7/32" and 13/32" bits
- A sharp utility knife
- Connectors and a crimping tool for electrical connections
- Black "ultraviolet resistant" cable ties
- A carpenter level

Components

The basic components you should have received with your Harvest Data System and GrainGage include the following:

Harvest Data Electronics Group

- HM-401 Harvest Data System Signal Conditioning and Control Unit (SCCU) with its console base (referred to as the console), manual, and software on diskette.
- Field Computer (which mounts on the console).
- Harvest Data System program diskette and DataLink DOS PC-based support software.
- Field Computer Operator's Manual
- CA-2009 RS-232 communications cable
- Allegro Field PC charger or a PW-110T 110V AC wall mount charger or PW-220T 220V AC Euro-plug wall mount charger (Pro4000 users).
- Field Computer mounting cradle with external power cable.

- CA-HM-335 System Power Cable: black-jacketed cable with a two-pin connector on one end (plugs into the SCCU); black (ground) and red (+12VDC) pigtails on the other end.

- CA-HM-420LF Line Filter Control Cable: beige cable with 37-pin sub-D connectors at each end, 3 ft. long.

- CA-HM-420 System Control Cable: beige cable with 37-pin sub-D connectors at each end, 18 ft. (6 m) long.

- HM-420LFG Line Filter Box.

- 4 each #10-32 x 1/2" threaded bolts and nuts (for securing the SCCU console base to a user furnished platform adjacent to the combine operator).

- Optional: HM-402 FieldPrinter (also mounted on the console).

GrainGage Group

- HM-1000B GrainGage

- 4 each 3/8" x 1 1/2" flat-head bolts, nuts, and lockwashers for mounting the GrainGage.

- Optional: 2" or 6" GrainGage Entry Hopper (one of these, or a user-supplied entry hopper, will be necessary).

- Optional: HMA-SMS Slope and Motion Compensator with mounting bolts (4 each 7/16" x 1/2")

Pneumatics Supply Center Group

- HM-1020 Pneumatic Conditioning Center (PCC).
- Optional: Wilkerson Water Separator (for high humidity operating conditions).
- Optional: 2 to 10 gallon reservoir tank.
- 4 each 1/4" x 1" capscrews, nuts, and lock washers to mount the PCC on the combine.
- Pneumatic Supply Tubing, 1/4" ID, 3/8" OD, 30 ft. (9.1 m) long for connecting the air supply from the air cleaner on the PCC to the compressor inlet, and the PCC outlet to the GrainGage.
- High temperature air hose (with swivel) for connecting the compressor outlet to the inlet on the PCC.
- Air compressor, .8 CFM @ 50 psi minimum (23 liters/min. @ 3.4 bar) electronically or mechanically driven, purchased from HarvestMaster or user-supplied.

**If +12V DC compressor:*

- HM-1000B Pneumatic Control Cable: Compressor ON/OFF relay with +12VDC 10 gauge supply wiring with in-line 30A fuse and relay control connector.

Inventory these items before you begin the installation process.

Preparation for Installation

Before installing the Harvest Data System and GrainGage, you will need to do the following:

1. Inspect the GrainGage load cells for shifting during transport. Make sure the head of the Hex bolt in the end of the load cell rests on the protection pin when pushed downward.

✏ *Note: These are 5 kg load cells. Applying more than 5 kg of pressure may permanently damage them if the protection pin is not properly adjusted.*

2. Determine the mounting location of:

- Harvest Data System Console
- Pneumatic Conditioning Center (PCC)
- Compressor
- GrainGage
- Air Tank (optional)
- Slope and Motion Sensor (optional)

3. Plan the GrainGage location such that you can dump samples of grain in the top and divert the sample out the bottom into a portable container for calibration purposes. Sample sizes from 6 to 30 lbs (3 to 15 kg) are used.

4. Remove any existing weigh bucket system.

Warning:
Use the mounting holes on the backside of the GrainGage. Pressure or mounts against the bottom frame of the enclosure may adversely affect the accuracy of the system.

5. Determine and list materials needed to mount the console, GrainGage, PCC, and compressor. Have these materials on hand when you begin the installation.

6. Construct appropriate mounting brackets for the console, GrainGage, and compressor. Usually the PCC can be mounted on the side of the combine's grain tank or along the body of the machine. It is good to place the PCC in a convenient place for periodic maintenance.

7. You may need to supply bolts, 3/8" times the appropriate length for the mounting materials you have chosen, for mounting the GrainGage and compressor (4 each 3/8" x 1 1/2" bolts come with the system).

Mounting the Components

When you have completed the preparations for installation, you will be ready to mount the GrainGage, Slope and Motion compensator (optional), PCC, compressor, air tank, SCCU console, and Field Computer. The mounting instructions for each of the components are given in the sections that follow.

Mounting the GrainGage

Warning:
When working on the GrainGage, shut off the air supply safety valve and compressor to avoid serious injury to hands and fingers.

■ **Select the location for mounting the GrainGage.**

Mount the GrainGage against a flat, level surface. The location should be at a convenient height for the flow of grain to enter and exit. The front of the GrainGage should be accessible in order to remove the front cabinet door.

✏ *Note: When choosing a mounting location, allow access for pouring calibration samples of grain through the GrainGage and for catching these samples upon the exit so they can be retested for weight and moisture. Also, allow access to both the top and bottom for cleaning out the inside of the GrainGage.*

■ **Follow the steps below to mount the GrainGage to the combine:**

1. Install the hopper leading into the top of the GrainGage. This is intended for placement directly under the grain flow (below a cyclone or clean grain elevator). The volume of the entry unit should be large enough to accommodate roughly one plot worth of the grain being harvested (typically 30 lbs).

Warning:
When mounting the GrainGage to the combine or mounting anything to the bottom of the GrainGage, you should avoid any torsion or twisting on the case or bottom floor to prevent adversely affecting the load cells. This is the reason for the "3-point" mounting of the GrainGage.

2. Construct mounting brackets for your combine to fit the location selected for mounting the GrainGage. Refer to the diagram of the GrainGage mounting hole locations in *Appendix C* to attach the GrainGage to your custom built bracket. The GrainGage should bolt to your bracket using the two upper outside holes and the one lower hole (3-point mount). When mounting the GrainGage, be careful to avoid any torsion or twisting on the case or bottom floor as this will adversely affect the load cells. While constructing the mounting bracket, keep in mind that the GrainGage must be level when the combine is sitting on a level surface.

3. Mount the bracket on your combine. With the combine parked on a level surface, use the carpenter's level to ensure that the bracket is mounted so the GrainGage will be level with the combine.

4. Mount the GrainGage to the bracket.

5. Construct the exit chute so it is supported by the GrainGage mounting brackets or something besides the base of the GrainGage.

Mounting the Slope and Motion Compensator (Optional)

If you purchased the GrainGage with the slope and motion compensating option, the system should already be installed, please skip to step 7 below to enable it.

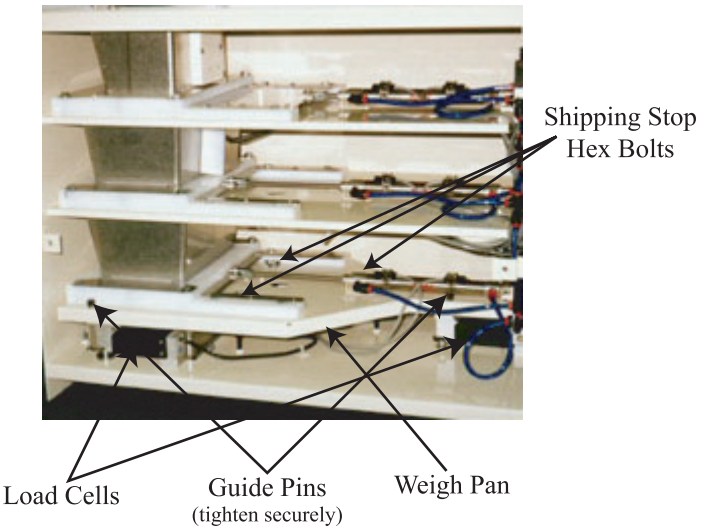
■ **To install the slope and motion box, follow the procedures outlined below:**

1. Remove the three shipping stop Hex bolts.

2. Remove the three PVC spacers between the weigh pan assembly and the bottom of the GrainGage.

✏ *Note: Keep these parts in a convenient place in case you need to ship the GrainGage by mail. This shipping stops are not needed when the GrainGage is mounted on the combine.*

3. Use a 5/32" Allen wrench to remove the right guide pin as shown below.



4. Lift the right side of the weigh pan and slide the HMA-SMS Slope and Motion Sensor under it with the adjusting screw towards you.

5. Align the mounting holes and tighten the 1/4" Hex bolts to 30 inch pounds.

6. Route the load cell cable so that it will not interfere with the weigh pan and any other load cells.

7. Fasten the load cell cable securely to one of the other load cell cables using the plastic tie straps (included). Plug the load cell into the "AUXILIARY" port on the break out box (center port). You may have to remove a few connectors to lock the load cell connector into place. Be sure the lock ring snaps when turned.

8. Loosen the shipping stop on the Slope and Motion Compensator box until the screw is difficult to turn by hand. The screw will have approximately 1/4" gap between the head of the bolt and the box.

✏ *Note: Do not loosen or tighten the shipping stop screw too far as this may cause damage to the Slope and Motion Compensator. DO NOT torque screw more than 5 inch pounds in either direction.*

7. To enable the slope and motion compensation in the software, select "SETUP," "Weight Bucket," and then "Calibrate." Change the "Ref Mult" to 4.00 pounds (to disable the slope and motion compensation in the software, change the "Ref Mult" to 0.00 pounds). Entering any number other than 4.00 or 0.00 may adversely affect weight readings.

✏ *Note: In order for the Slope and Motion Compensator to function properly, you must have IOS Version HDGG 3.3 or later installed on your system. Press <F8> on the Field Computer to display the current IOS version in use.*

If you are unsure if you need a Slope and Motion Compensator added to your system, read through the questions below. If you answer "Yes" to any of the questions, we recommend you add the Slope and Motion Compensator to your system.

- Do you harvest samples that are less than 3 pounds and require test weight and moisture?
- Do you require precision test weight accuracy?
- Do you harvest plots on sloping terrain?
- Does your combine vibrate excessively?

If you would like to add the Slope and Motion Compensator to your system or if you have additional questions regarding this option, please contact our sales department.

Mounting the Pneumatic Conditioning Center

■ **Select the location for mounting the Pneumatic Conditioning Center.**

Locate a flat, vertical surface large enough to accommodate the Pneumatic Conditioning Center (PCC) in an area away from moving parts and as close to the GrainGage as possible (see *Appendix C* for PCC mounting diagram). The further the panel is mounted away from intense dust contamination, the better. Keep it accessible because it must be serviced once or twice per year to assure proper oil level and clean filters.

✏ *Note: If you are mounting the PCC in an area that will exceed 120F near the engine exhaust, you will need to replace the plastic drain bowls with metal ones. Metal bowls can be ordered from HarvestMaster.*

■ **Follow the steps below to mount the Pneumatic Conditioning Center:**

1. Drill four mounting holes for the 1/4" bolts (included).

2. Mount the PCC with the air filter at the top (See *Appendix C* for PCC mounting diagram).

✏ *Note: The air filter can be removed from this bracket and mounted in a better location. It is recommended to mount the filter as high as you can or inside the cab to reduce maintenance. When possible, it is better to use the combine air intake filter to reduce the amount of maintenance required. The air compressor's life expectancy is directly related to the cleanliness of the air supplied to it.*

3. Fasten the PCC securely.

Mounting the Compressor

The GrainGage can operate with either a mechanically-driven compressor or an electrically-driven compressor. Follow the mounting instructions for the type of compressor to be used with your system (see *Appendix C* for mounting diagrams).

■ **Select a mounting location for the compressor.**

- **Mechanical Compressor** - Choose a sturdy surface for a mounting location for the compressor as near to the PCC as possible to accommodate the air hoses which run from the solberg air filter to the compressor, then back to the PCC. Select a pulley to drive the compressor. The manufacturer's recommended operation speed is 1500 - 2000 RPM. Exceeding 2000 RPM will cause premature compressor failure, so be sure to check the RPM of the compressor when it is installed. If necessary, consult your combine manufacturer for the best mounting location and shaft speeds.

- **Electrical Compressor** - Choose a sturdy surface for a mounting location for the compressor within 8 ft. of the PCC to accommodate the high temperature hose which runs from the compressor to the PCC. The electrical compressor requires 30 amps. Typically this requires that you replace your current alternator with a larger capacity alternator. Consult your combine manufacturer for exact specifications. Use at least a #6 AWG wire from the alternator "BATT" terminal to the battery.

■ **Mount the compressor using the steps that follow:**

1. Drill holes using the compressor mounting hole diagram (see *Appendix C*).

2. Fasten the compressor in place securely using 4 bolts.

✏ Note: If using a belt-driven compressor, be sure the compressor's pulley lines up with the drive pulley. Make sure the drive pulley's direction of rotation turns the compressor pulley in the correct direction as shown by the arrow on the compressor. If your drive pulley dictates that you use reverse rotation, you can purchase a reverse cooling fan (white) for the GAST compressor from HarvestMaster.

3. Make sure the one-way air valve is installed on the output port of the compressor. This valve will keep the compressor from having to start under back-pressure, increasing its life. If a one-way valve is not installed, excessive current from the electric compressor during start-up could cause a blown fuse.

Mechanical or Electric Compressor

Below are some suggestions that can improve the operation of your system no matter what compressor you are using.

- Although not required, it is a good idea to place an air reserve tank between the compressor and the pneumatic conditioning center. This tank will provide air to blow the GrainGage out periodically and will keep the operating pressure more constant. If a tank is installed, make sure there is a petcock valve to drain the water as it accumulates. A regulator is not needed since the PCC has a relief valve that will not allow more than 95 PSI.
- When harvesting in very high humidity areas, a "Water Separator" may be needed to keep water from mixing with the air tool oil. This filter can be ordered through HarvestMaster (part #12675).

Mounting the Harvest Data System Console

We recommend that you mount the Harvest Data System console on a flat surface. If placing the bracket on an angle, care should be taken to make sure the printer will function properly under harvest vibrations. The location should be within arm's reach at a convenient height for the operator. The Field Computer screen needs to be positioned at an easily visible angle. The mounting hardware provided is designed for mounting to a surface that is 1/4" thick or less.

- **Select the location for mounting the console.**

- **Follow these steps to mount the console on the combine:**

1. Use the console mounting diagram to mark where you want the holes drilled on the equipment surface. (See *Appendix C*)

2. Drill four 7/32" mounting holes on the desired mounting surface.

3. Position the console over the holes and tighten the mounting screws securely.

Mounting the HM-420LFG Filter Box

- **Follow the procedures below to install the HM-420LFG Filter Box:**

1. Using the four mounting holes provided, mount the filter box within 3 feet of the SCCU.

✏ *Note: It is recommended that this box is mounted in the cab or under a shield to protect it from the weather.*

2. Using the 3-foot 37-pin System Control Cable, connect one end to the port on the filter box labeled "SCCU" and the other end to the 37-pin connector on the SCCU.

3. Using the 18-foot 37-pin System Control Cable, connect one end to the port on the filter box labeled "SENSORS" and the other end to the breakout box on the right side of the GrainGage.

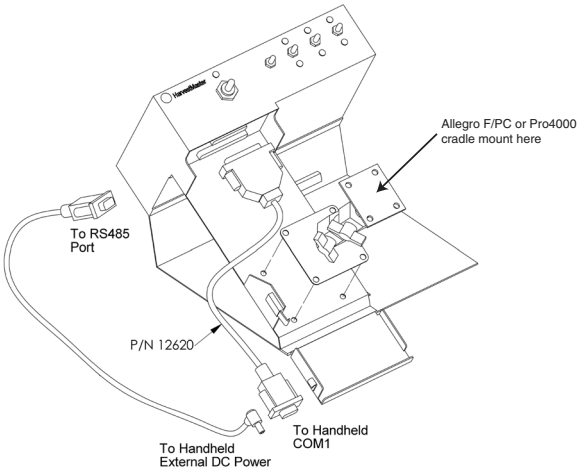
Mounting the Field Computer Cradle Assembly

As you use your Harvest Data System, you will remove and install the Field Computer on a daily basis. For this reason, you will want to choose a mounting location that is easily accessible. The Field Computer cradle assembly can be mounted to the SCCU or on the combine dash, wherever you desire.

■ **Follow the steps below to install the Field Computer cradle assembly:**

1. Turn the power to the Field Computer off.

2. Mount the adjustable arm in the desired location. If you are mounting it to the SCCU, use the pre-drilled holes and supplied screws as shown in the diagram below. If mounting the system away from the SCCU controller bracket, use the paper template in *Appendix C* or the base of the adjustable arm to drill the mounting holes.



3. Place the Field Computer on the mounting cradle.

4. Plug the 9-pin serial cable (P/N 12620) into the 9-pin COM1 port on the Field Computer.

5. Secure the Field Computer in place.

6. Plug the 9-pin power cord into the RS-485 port on the back of the SCCU.

7. Route the 12V DC power plug to the Field Computer's external DC power port.

8. Make sure all cables and contacts are secure.

Connecting the Components

When each of the components are mounted, make connections as outlined in the steps below. You can refer to the *Component Connection Diagram* following these instructions for more information.

■ **Follow these steps to connect the components:**

✏ *Note: Skip to step #5 if you are using a mechanical compressor.*

1. Run the black cable with the two-pin quick connector (which controls the electrically-driven compressor relay) through the access hole on the bottom right of the GrainGage chassis and plug it into its mate. Secure excess cable out of the way of any moving parts.

2. Run the white wire labeled "Battery +12V" to the positive (+) terminal on the battery.

3. Run the other white wire to the positive (+) lead on the compressor and fasten securely.

4. Use a 10 AWG or larger ground strap to connect the compressor's negative (-) terminal to the combine chassis.

5. Take the 3/8" pneumatic supply tubing (hereafter referred to as the air hose) and run it from the air filter to the intake of the compressor. Cut off the excess air hose. We recommend using the engine air filter for your compressor. This provides maximum protection and less maintenance.

6. Run the 8 ft. high temperature air hose from the output of the compressor to the intake of the pre-filter and use teflon tape to seal all threads. If using an air tank, run the hose to the intake of that tank and plumb the exhaust of the air tank to the intake of the pre-filter.

✏ *Note: Install swivel closest to the compressor.*

✏ *Note: In very high humidity environments, a water separator may be required. If water accumulates in the oil (characterized by a milky color), we recommend you order a water separator (P/N 12675). The water separator needs to be mounted as close to the PCC as possible. It is designed to mount between the compressor (or air tank) and the prefilter on the PCC.*

7. Take the excess air hose and run it from the output of the lubricator to the GrainGage air supply safety valve.

✏ *Note: All of the air hose fittings except the high temperature air hose are push-in and require no fastening or tightening. To remove the hose, push in on the hose and pull it back out while holding the lock flange in.*

8. Fill the lubricator to the indicator line with a non-detergent, semi-synthetic or non-synthetic air-tool oil, SAE-10 (90 SSU) or lighter (see *Appendix A*). Do not overfill the lubricator. This could cause improper lubricator operation.

✏ *Note: If harvesting in below freezing temperatures, a special combination of anti-freeze and a synthetic lubricant is recommended. This can be purchased from HarvestMaster or any air tool retail store. We recommend Kil Frost brand. Kil Frost pneumatic tool anti-freeze lubricant is not an additive and must not be mixed with other oils.*

9. Make sure the CA-HM-420LF system control cable from the SCCU to the HM-420LFG line filter box port labeled "SCCU" is plugged into its mate and the thumbscrews are tightened securely.

10. Make sure the CA-HM-420 system control cable from the HM-420LFG line filter box port labeled "Sensors" to the breakout box on the GrainGage is plugged into its mate and the thumbscrews are tightened securely.

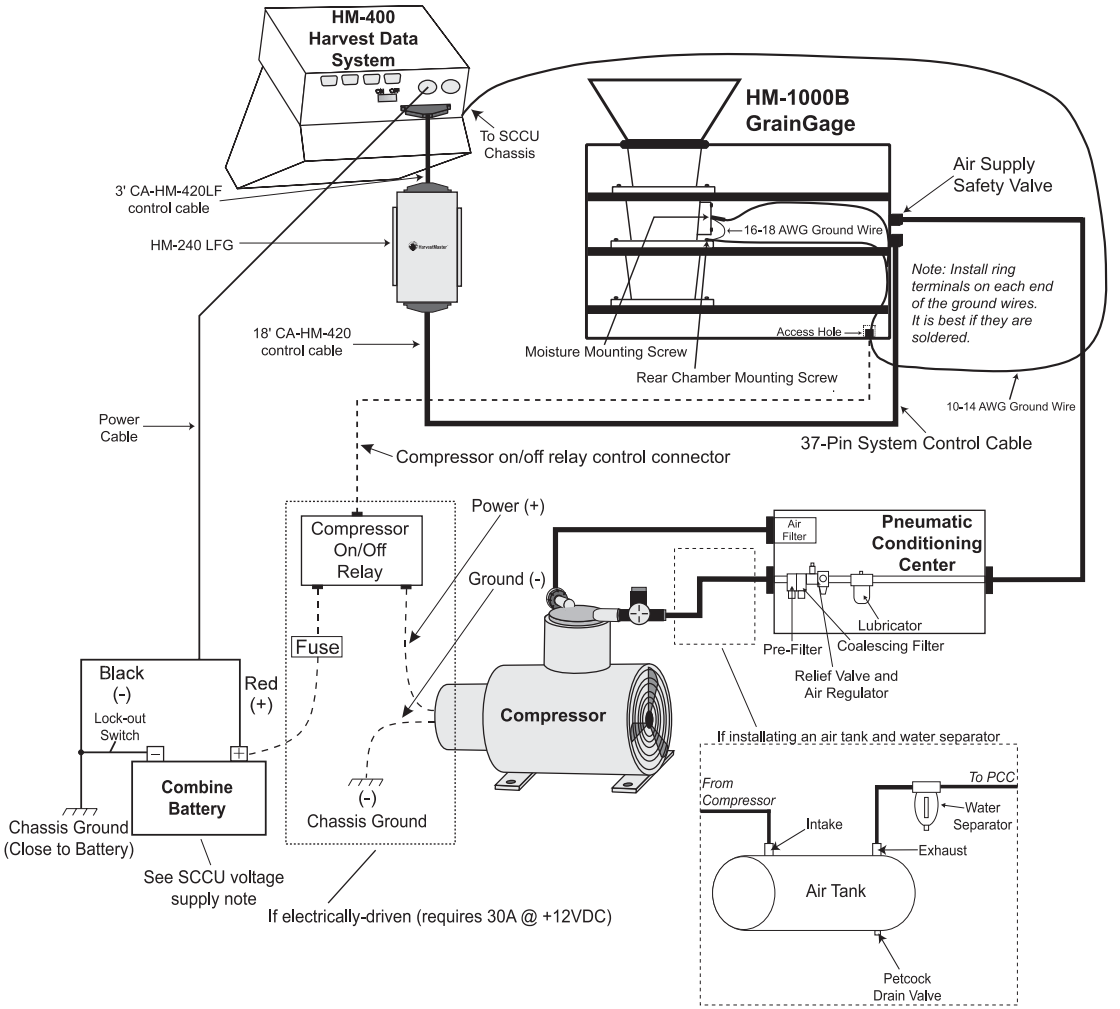
11. Connect the SCCU power cable to chassis ground and +12VDC supply as close to the battery as possible (see Figure 2-1). With all field lights and air conditioner on, the supply line to the SCCU must be greater than 13.0V in order for the moisture sensor to function properly. If the voltage level of the battery is inadequate, connect the SCCU wiring directly to the "BATT" terminal on the combine alternator. If voltage is still insufficient, it may be necessary to install a more powerful alternator on your combine.

12. Make sure the system is grounded properly as outlined below:

- Make sure that the test chamber is grounded by running an 18 AWG ground wire from the back of the moisture sensor to the side of the test chamber. Solder all ring terminals used.

- Make sure the chassis ground to the test chamber is at the same potential as the SCCU by running a 16 AWG wire from the Test Chamber to the “SCCU” mounting screw (See Figure 2-1).

✏ *Note: We recommend you solder all power and ground terminal connections and clean and check all power and ground terminals yearly.*



Component Connection Diagram

Verifying the Operation of the GrainGage

Once your Harvest Data System and GrainGage are mounted and all connections are made, the system components can be checked using the following procedures.

GrainGage Start-up

■ **Follow the steps below to start the GrainGage:**

1. Load the GrainGage operating software onto the Field Computer from your host PC using the "APPLICATIONS" menu selection in DataLink (refer to *Chapter 3, Software*).

2. Connect the Field Computer to the SCCU and turn on the main SCCU power switch. This will power up the HarvestMaster Field Computer.

3. When the Main Menu is displayed, you will know the Injected Operating System (IOS) has been loaded to the SCCU from the Field Computer. You may now proceed with the checkout.

After system power-up, the SCCU panel lights for Hopper, Test, and Plot should be illuminated indicating current position of the gates.

- Hopper = top gate
- Test = middle gate
- Plot = bottom gate
- Aux = user installed actuator (optional)

A blinking panel light indicates that the gate is not fully extended in either the open or closed position. This is typically due to the air compressor not being turned on or the air supply safety valve being shut off.

GrainGage Gate Operation - Panel Switch Method

■ **Follow these steps to verify GrainGage gate operation using the panel switch method.**

1. Switch the **Auto/Manual** switch to **Manual**.

2. Press the **Hopper**, **Test**, and **Plot** switches in each direction and hold them there until the lights go solid. With air pressure on, the gates and panel lights should respond according to the direction the switch is moved. They should stay latched in that position until actuated either manually or by the operating system software.

GrainGage Gate Operation - Automatic

■ **Follow these steps to verify GrainGage gate operation automatically.**

1. Switch the **Auto/Manual** switch to **Auto**.

2. Select the "Buckets" option from the "DIAGNOSTICS" menu ("Buckets" implies gate operation).

3. Use the **<**UP**>** and <DOWN> arrow keys to select an action and press <ENTER> to execute the action. Verify that the doors and lights function as they do in "Manual" mode.

Alternate Method for GrainGage Gate Checkout - No Field Computer Installed

■ **Follow these steps to verify GrainGage gate operation without the Field Computer installed.**

1. Hold the **Auxiliary** panel switch up while switching the power on. This automatically configures the actuators with timed transitions of the gates (limit switches not being used).

2. Switch the **Auto/Manual** switch to **Manual** and use the **Hopper**, **Test**, and **Plot** switches to run the gates. In this mode, the gate positions run in reverse of what is shown on the lights. Check to make sure the gates operate fully in each direction. This checks out wiring and pneumatic connections.

In order to verify the operation of the load cells and sensors, you will need to disable the shipping stops and make sure the guide pins are installed using the steps below:

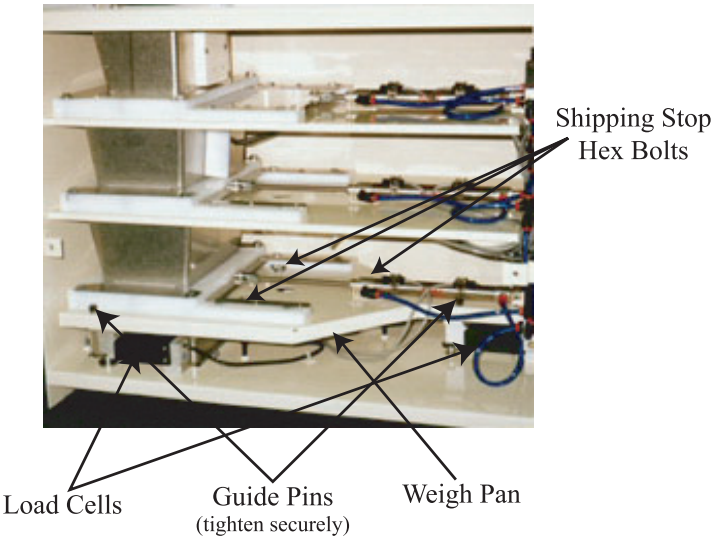
1. Remove the three shipping stop Hex bolts.

2. Remove the three PVC spacers between the weigh pan assembly and the bottom of the GrainGage.

✏ *Note: Keep these parts in a convenient place in case you need to ship the GrainGage by mail. The shipping stops are not needed when the GrainGage is mounted to the combine.*

3. Use a 5/32" Allen wrench to tighten the guide pins in the position shown below. Make sure the weight pan floats freely when the guide pins are installed.

✏ *Note: Do not over tighten these guide pins. Tighten to approximately 10 inch lbs.*



Verifying Load Cell Operation

■ **Follow the steps below to verify load cell operation.**

1. Select the "Load Cells" option from the Diagnostics menu:

```
-- MAIN MENU --
5 Diagnostics>
  --DIAGNOSTICS--
 >3 Load Cells
```

This screen will show urrent readings in millivolts per volt of excitation for left load cells (A), right load cells (B), and total (Tot: sum of the two). Typical "empty" figures for each are in the range of .600 to 1.200 when the shipping stops are disabled. The "R" volt value is the reading from the reference load cell. The information in the "SM" line indicate if the Slope and Motion Sensor is active. The other values are for factory use only.

```
Load Cell Test
   volts  weight
A:  0.623   0.00
B:  0.522   0.00
Tot:1.145   0.00
R:  0.211  4.212
Q:  1.000  0.212
SM: On     4.000
```

2. Observe the readings, then press <F6> to retare the system and set the total weight to 0.00.

✏ *Note: Air pressure must be turned on for the gates to cycle. Otherwise, the system will not retare unless the limit switches are disabled.*

3. Place a 5.00 lb. weight directly over one load cell. If a precision weight is not available, an approximate weight will do.

4. Write down the "Tot:" weight reading and label it for that load cell (For example: Ld A1 = 5.01lbs).

5. Do this for each of the 3 load cells. Each reading should be within .05 lbs.

If the load cells check okay continue to step 6. If they do not, please refer to *Appendix F* to adjust the faulty load cell.

6. The weight system can be checked further by simulating harvest. Begin with nothing on the weigh pan, then place the calibration weight on the pan and simulate chamber cycles by pressing the <PERIOD> key on the Field Computer in harvest mode (please refer to "Weight Calibration" section in Chapter 3). If you do this test with the PCC shut off (recommended), select the "Weight/Bucket" and "Control" options from the "SETUP" menu and disable the open and close limit switches for each gate (use .3 second timers for open and close transitions). Don't forget to re-enable them before field operation or you will lose the protection that these devices provide.

Level Detector

■ **Follow the steps below to verify level detector operation.**

1. Select the "Level Detect" option from the Diagnostics menu.

```
-- MAIN MENU --
5 Diagnostics>
  --DIAGNOSTICS--
 >7 Level Detect
```

2. Inspect the reading. It should be in the range of 300 to 400 and should change by 10 to 20 when you touch the level detector terminals.

```
Grain Level
Sensor Counts:

346.3
```

Warning:
Make sure the air supply safety valve is closed before reaching down into the chamber.

✏ *Note: For checkout purposes, there are two contact terminals on the grain level detector extending out the backside of the sensor. Touch the terminals to trigger a gate actuation in harvest mode, but keep your hands out of the actuator mechanism.*

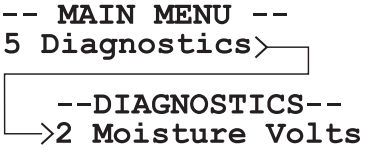
Moisture Sensor Verification

The supply voltage to the SCCU must be greater than 13V (preferably above 14.V) in order to ensure proper operation of the grain moisture sensor. Most automotive electrical systems meet this requirement when the engine is running. To see if the voltage is affecting the moisture readings, watch the absolute voltage by selecting the "Moisture Volts" option from the Diagnostics menu. Start the combine and let it idle for a minute. Read the absolute voltage then throttle up the combine. If the voltage moves more than .1 volts, you need to make changes to the voltage supply until a stable voltage is reached. All electrical devices which will be used during harvest (lights, air conditioner, etc.) should be turned on during this test to ensure that the grain moisture sensor will not be affected.

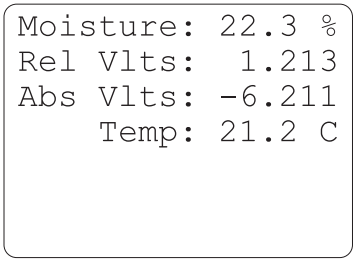
If you are having trouble getting greater than 13V available to the SCCU, check the voltage at the "BATT" terminal on the back of the alternator since this is the highest voltage point in the system. It is common to see .2 to .5 volts drop from the alternator to the battery under heavy electrical system usage. In this case, connect the +12V lead of the SCCU power supply cable directly to the "BATT" terminal on the back of the alternator or exchange your altermator for one with more output capacity.

- **Follow the steps below to verify moisture sensor operation.**

1. Select the "Moisture Volts" option from the Diagnostics menu.



2. Start the combine and throttle it up.



Warning:
Make sure the air supply safety valve is closed before reaching down into the chamber.

3. With the chamber empty, press <F6> to retare the system. The relative volts should be 0.00 (± 0.03) after the tare.

3. Touching the moisture blade with your fingers should produce a positive absolute voltage (about +7 volts).

4. The temperature should be reading the ambient temperature outside (± 3 degrees C).

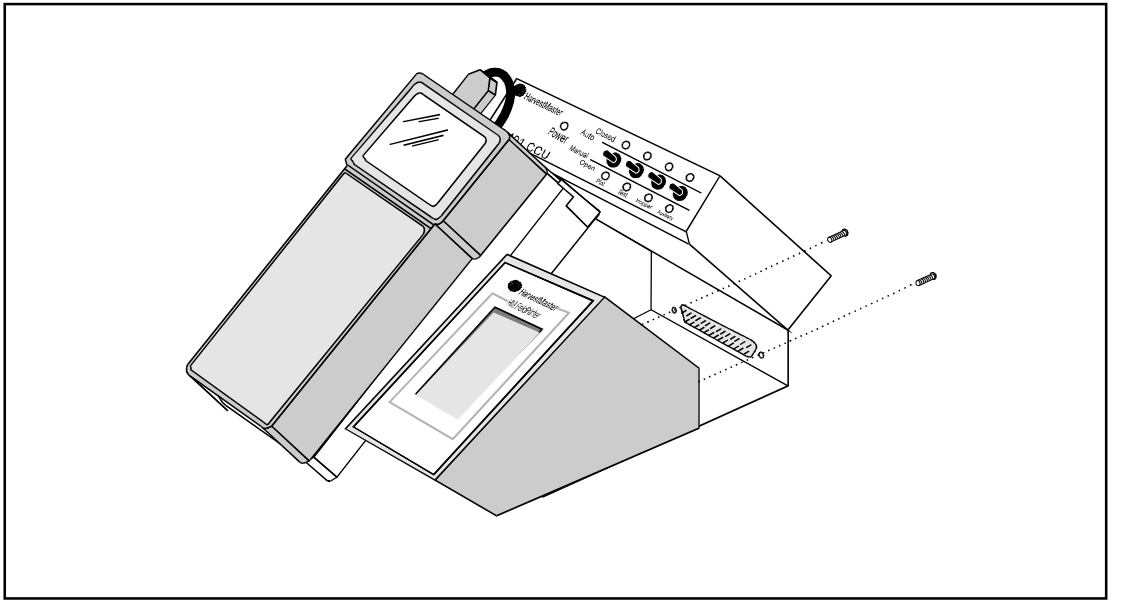
Printer,Ribbon, and Paper Installation

Installing the Printer

■ **To mount the FieldPrinter in the console:**

1. Set the FieldPrinter on the right side of the console and slide it back until it mates with the 25-pin sub-D connector (see Figure 2-4).

2. Install two #6-32 x 3/8" screws to secure the FieldPrinter to the console as shown in the figure below. Make sure the 25-pin connector is seated properly before the mounting screws are tightened.



Installing the Harvest Data System FieldPrinter

Installing a Printer Ribbon

The FieldPrinter comes with an Epson ERC-09 ribbon cartridge installed. This ribbon cartridge is available from business supply stores or HarvestMaster. Replace it when the printing becomes difficult to read or after using one complete roll of paper with one ribbon cartridge.

✏ *Note: Avoid changing the ribbon cartridge while collecting data because this could cause damage to the printhead.*

■ **To install a ribbon cartridge into the field printer:**

1. Make sure the SCCU power switch is in the OFF position.

✏ *Note: The printer does not have a power OFF feature. If you are not using it with the HM-400 SCCU, you will need to disconnect its power source.*

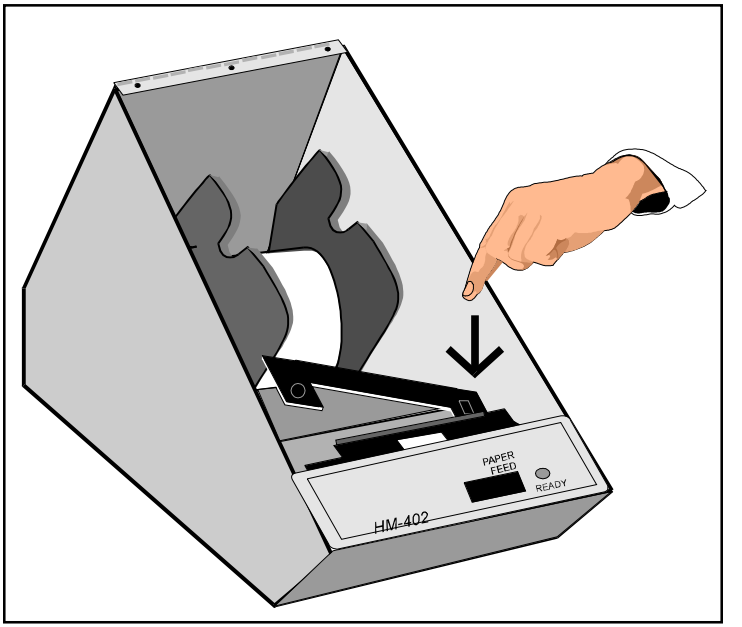
2. Remove the paper and supply roll from the printer (see *Removing a Paper Roll* later in this section).

3. You will notice the word "PUSH" on the right side of the ribbon cartridge. Push down to remove a used cartridge (see the figure on the next page).

4. Situate the replacement ribbon cartridge in the same position as the old one. Making sure the ribbon cartridge is properly aligned, then press down gently to seat it.

✏ *Note: You may have to turn the ribbon slightly to get the gears to mesh as you push down on the new ribbon.*

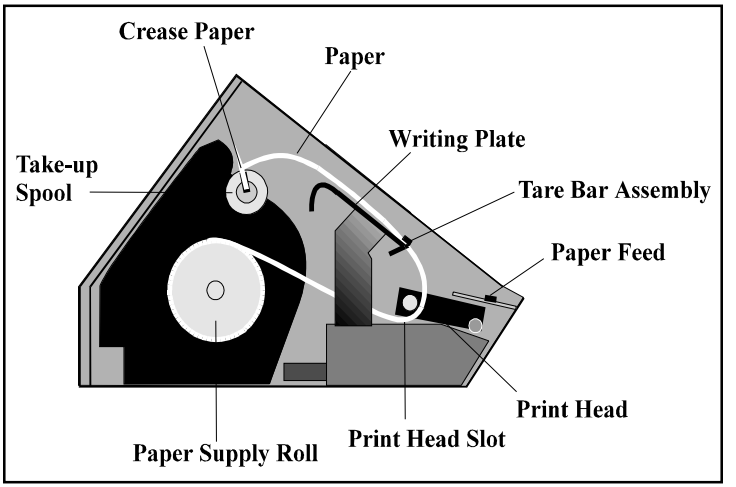
Ribbon placement in the Harvest Data System FieldPrinter. To remove a used ribbon, press down on the right side of the cartridge (as shown by the arrow) and lift it out.



5. Re-insert the paper into the print mechanism (see *Inserting a Paper Roll* later in this section)

✏ *Note: To prevent weak or irregular printing, make sure the ribbon cartridge is firmly inserted. If ribbon ink gets on the printer's case, immediately wipe it off with a cloth.*

Paper Path in the FieldPrinter.



Inserting a Paper Roll

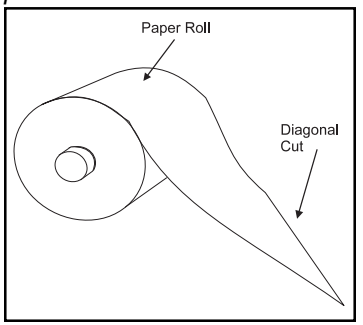
■ **To insert the paper roll, complete the following steps:**

1. Make sure the SCCU power switch is in the ON position.

✏ *Note: The HM-402 does not have a power ON feature. If you are not using it with the HM-400 SCCU, you will need to connect its 12V power source.*

2. Insert the paper roll onto the supply spool. The paper supply roll is rolling toward you as you are facing the front of the printer.

Cut the paper diagonally before feeding it through the print head.



3. Unroll several inches of the paper and cut the edge diagonally to a point on one side as shown in the figure at the left.

✏ *Note: Be careful not to slide the paper under the print head. There is a "V" shaped slot the paper must be inserted into for it to feed correctly.*

4. Slide the end of the paper into the print head slot and gently pull the diagonal point up until the full width of the paper is through the print head.

5. Carefully pull the paper through, or press the PAPER FEED switch until there is a sufficient amount to start on the take-up spool. DO NOT pull the paper out of the printhead backwards as this may cause damage to the printhead.

✏ *Note: The take-up spool is controlled by the Field Computer and will not advance with the paper feed switch.*

6. Place the excess paper out of the way.

7. Insert the right side of the writing plate under the two screws and then squeeze the left side until it slides under the screw on the left. Make sure the writing plate is locked into place.

8. Feed the end of the paper through the tare bar assembly (see the figure on the previous page).

9. Cut the point off of the end of the paper. Fold the end of the paper and crease it, then insert it into the slot in the take-up spool.

10. Roll the take-up spool a few turns to hold the paper in the slot and place the spool into the take-up assembly with the gear on the left side..

11. Turn the take-up spool manually or use <F5> on the Field Computer to advance the paper until there are several wraps around the take-up spool.

12. Close the printer's enclosure cover and secure it with the latch.

Removing a Paper Roll

■ **Proceed through the following steps if you need to remove the printed paper roll before the supply roll is empty.**

1. Advance the paper through the FieldPrinter until all printing clears the printhead by using the line feed switch on the printer or <F5> on the Field Computer.

2. Tear off printed paper above the printhead.

3. Re-insert the paper on the take-up spool as shown in the figure on the previous page.

■ **To replace the supply roll:**

1. Proceed with steps 1 & 2 above.

2. Grab the writing plate with one hand and squeeze the left side until it pops free of the fastening screws.

3. Take the writing plate out of the printer and set it aside.

4. Tear the paper between the supply roll and the printer.

5. Pull the remaining paper through the printer mechanism or advance it with the paper feed switch or by pressing <F5> on the Field Computers.

✏ *WARNING: Do not pull the paper out of the print head backwards. This could cause damage to the printhead.*

6. Insert a new supply roll (see *Inserting a Paper Roll* earlier in this section).

Printer Test and Setup

The HM-402 Printer is tested and set up at the factory. You should not have to make any changes to the setups. However, we have included the following for your information.

Printer test

The rocker switch on the printer performs printer tests and setups. With the power to the HM-402 printer OFF, (the main power switch on the HM-401 controls the power to the printer) press and hold the right side of the rocker switch as you turn the power ON. The printer will print out a list of the configuration as it currently exists and then do a continuous print test. To stop the print test, press either side of the rocker switch.

✏ *Note: Changing the default setups may cause undesirable print formatting when used with the Harvest Data System. Please take note of the current setups before you make any changes.*

Accessing the Setup Menu

To access the setup menu, follow the steps below:

With the power to the HM-402 printer OFF, (the main power switch on the HM-401 SCCU controls the power to the printer) press and hold down the left side of the rocker switch and turn the power to the printer back ON.

The printer will advance the paper. After the paper advance has stopped, count 3-5 seconds and release the switch. The following will be printed:

```
*** SETUP MENU ***
CONFIGURE. . .              [NEXT/OK]
```

If you wait less than 3 or more than 5 seconds, **Ready....** may be printed and you will have to start over.

After you access the setup menu, if you press "**NEXT**" (left side of switch) repeatedly, you will see the following list printed. If you keep pressing "**NEXT**" (left side) this list repeats itself.

The setup menu contains the following items:

- CONFIGURE menu
- CUSTOM menu
- SET CLOCK menu
- RESET SEQ#

The following pages explain these items and how to customize the printer to your needs.

Configure

The first setup menu item reads:

CONFIGURE. . . [NEXT/OK]

[NEXT/OK] is a visual clue so you know that pressing the left side of the rocker switch will go to the **NEXT** part of the menu and that pressing the right side of the rocker switch will accept (or say **OK** to) what this line of the setup menu says.

With the printer in the setup menu and with **CONFIGURE . . . [NEXT/OK]** as the last item printed, press OK (right side) to access the configure menu. The following is printed:

```
*** SETUP MENU ***
CONFIGURE. . .                [NEXT/OK]
*** CONFIGURE MENU ***
LOAD DEFAULTS                 [NEXT/OK]
```

Load Defaults

LOAD DEFAULTS gives you the opportunity to reset the printer to all default settings (shown below).

** The parallel interface does not have these selections.*

```
*** CONFIGURATION MENU ***
LOAD DEFAULTS                [NEXT/OK]
* BAUD=1200                  [NEXT/OK]
* DATA BITS=8                [NEXT/OK]
* STOP BITS=1                [NEXT/OK]
* HSHAKE=BUSY-BUFF           [NEXT/OK]
  COLS=32                    [NEXT/OK]
  INVERT=NO                  [NEXT/OK]
  FONT=5X7                   [NEXT/OK]
  MAG=NONE                   [NEXT/OK]
  Ready...
```

Choose **OK** to do this or **NEXT** to go to the next parameter. The following is printed:

```
          *** SETUP MENU ***
CONFIGURE. . .               [NEXT/OK]
*** CONFIGURATION MENU ***
LOAD DEFAULTS                [NEXT/OK]
BAUD=1200                    [NEXT/OK]
```

Baud Rate

BAUD RATE is the first parameter you can set in the configuration menu. The sample list above shows the current baud rate is 1200. To accept this, press **OK** (right side) or view the next baud rate value by pressing **NEXT** (left side). Press **OK** when the baud rate you want is displayed.

The following baud rates are available:

300, 600, 1200, 2400, 4800, 9600, 19200

Data Bits

DATA BITS is the next parameter. Choose the date bit value the same way baud rate was chosen. Choices are 7 or 8 data bits. If you choose 7 data bits you can select **EVEN** or **ODD** parity. If you choose 8 data bits parity defaults to **NONE**.

Stop Bits

STOP BITS is the next parameter. Choose 1 or 2 stop bits.

Handshake

HANDSHAKE is the next parameter. Choose from the following settings:

BUSY-LINE
BUSY-BUFFER
XON/XOFF-LINE
XON/XOFF-BUFFER
NONE

Columns

COLUMNS is the next parameter. Select the number of characters per line (columns) for this parameter. The choices you have are 24, 32, or 40. Below are samples of each:

24 Column Text
32 Column Text
40 Column Text

Invert

INVERT is the next parameter. Choose **YES** if you want inverted text (upside down) or **NO** if you want non-inverted text (right side up) in your printouts. Below is an example of inverted text:

Inverted Type Sample

Font

FONT is the next parameter. Choose from a 5 x 5, 5 x 7, or 5 x 8 dot matrix print pattern. The 5 x 5 dot pattern produces only upper case (capital) letters. The other two fonts can output upper and lower case letters.

5 x 5 TYPE IS ALWAYS CAPITALS

5 x 8 Upper and Lower Case

Mag

MAGNIFICATION is the last parameter. This refers to the size of printed type from your printer. Your choices (with examples) are:

NONE

NONE

DOUBLE WIDE

DOUBLE WIDE

DOUBLE HIGH

DOUBLE HIGH

DOUBLE WIDE/HIGH

DOUBLE WIDE/HIGH

After you choose one of the magnifications the printer will print **READY...** to show the printer is out of the configuration menu and the setup menu and is ready to print.

Custom

The next setup menu item after **CONFIGURE. . .** is **CUSTOM. . .**. With the printer in the setup menu and with **CUSTOM. . .** as the last item printed, if you press **OK** (right side) the printer will print the following:

```
*** SETUP MENU ***
CONFIGURE. . .                    [NEXT/OK]
CUSTOM. . .                       [NEXT/OK]
***** CUSTOM MENU *******
PRINT CUSTOM SETPUP       [NEXT/OK]
```

If you press **OK** the printer will print the current custom setup. A sample is shown below:

```
*** SETUP MENU ***
CONFIGURE. . .                    [NEXT/OK]
CUSTOM. . .                       [NEXT/OK]
****** CUSTOM MENU *******
PRINT CUSTOM SETUP                [NEXT/OK]
MM/DD/YY  hh:mm ?M DOW            [NEXT/OK]
AUTO T&D=NO                       [NEXT/OK]
AUTO SEQ=NO                       [NEXT/OK]
ZERO=0                            [NEXT/OK]
POUND SIGN=#                      [NEXT/OK]
_(underscore)                     [NEXT/OK]
BUSY INVERT=NO                    [NEXT/OK]
ONLINE/OFFLINE=YES                [NEXT/OK]
EXT CH SET=NO                     [NEXT/OK]
PRINT READY=YES                   [NEXT/OK]
Ready. . .
```

This manual assumes the time and date option is installed and operating. If you do not have this option you will not see references to the clock or date listed in most menus.

This printout shows you how each item is currently set. Following is an explanation of each item and the choices available for each.

T/D Format

TIME/DATE FORMAT is the next parameter. This feature is available only on units with the time/date option installed. Choose from the following formats:

MM/DD/YY hh:mm ?M
MM/DD/YY hh:mm ?M DOW
MM/DD/YY hh:mm
MM/DD/YY hh:mm DOW
DD-MM-YY hh:mm ?M
DD-MM-YY hh:mm ?M DOW
DD-MM-YY hh:mm
DD-MM-YY hh:mm DOW
DD/MON/YY hh:mm ?M
DD/MON/YY hh:mm ?M DOW
DD/MON/YY hh:mm
DD/MON/YY hh:mm DOW
NONE

MM = month
DD = day
YY = year
hh= hour
mm=minutes
?M= AM or PM
DOW= day of week

AUTO TIME AND DATE is the next parameter. Your choices are:

YES - autoprint after **CR** (carriage return)
NO - do not autoprint after **CR**

Autoprint of the time and date will not occur unless three seconds has elapsed since the printer has stopped printing.

AUTO SEQUENCE NUMBER is the next parameter. Choose:

NO - do not autoprint sequence number after **CR**
YES - do autoprint sequence number after **CR**

Autoprint of the sequence number will not occur unless three seconds has elapsed since the printer has stopped printing.

ZERO is the next parameter. Choose how you want the zero character to look in you printouts. Choose between **0 and θ.**

Pound Sign

POUND SIGN is the next parameter. Choose to show pound as **#** or as the British pound symbol £.

_Underscore

_UNDERSCORE is the next parameter. Choose which symbol the same ASCII code will print, an _underscore or a ← left arrow.

Busy Invert

BUSY INVERT is the next parameter.
Choices:

YES - voltage will be in a low state until the unit is busy then voltage level goes high.

NO - voltage will be in a high state until the unit is busy then voltage level goes low.

Online/Offline

ONLINE/OFFLINE is the next parameter.
Choices:

YES - enables the rocker switch to turn the printer offline.

NO - disables the ONLINE/OFFLINE ability.

Ext Ch Set

The choice to use the extended character set is available only when 8 data bits are chosen.

EXT CH SET is the next parameter. This stands for Extended Character Set.
Choices:

YES - Allows you to use hexidecimal numbers above 80 (true only for 8 data bits).

NO - Disables the Extended Character Set ability.

Print Ready

PRINT READY is next.
Choices:

YES - Prints **Ready. . .** upon power up.

NO - Disables printing **Ready. . .**

✏ *Note: If you choose NO, hold the left side of the rocker switch down for 4-6 seconds to access the setup menu. Begin timing when you connect power to the unit and the red light comes on. The paper feed motor does not run upon power up when Ready. . . is disabled.*

Set Clock. . .

This feature is available only on units with the time/date option installed.

The next item in the setup menu is **SET CLOCK . . .**

With the printer in the setup menu and with **SET CLOCK. . .** as the last item printed, if you press **OK** (right side) the printer will print the following:

SET CLOCK. . .	**[NEXT/OK]**
***** SET DATE *****	**[NEXT/OK]**
Set Year: 95	**[NEXT/OK]**

The printer shows the year currently in memory. The **9** is reversed (white on black) to show the position of the cursor. This is the number which will be incremented if **NEXT** (left side) is pressed. If the number is correct press **OK** (right side) and the following is printed:

SET CLOCK. . .	**[NEXT/OK]**
***** SET DATE *****	
Set Year: 95	**[NEXT/OK]**

The cursor now appears over the 2nd position. Press **NEXT** (left side) to increment this number if needed and **OK** if it is correct. Continue this sequence of accepting or changing the year, month, day, and DOW (Day Of Week).

SET CLOCK	**[NEXT/OK]**
***** SET DATE *****	**[NEXT/OK]**
Set Year: 95	**[NEXT/OK]**
Set Year: 95	**[NEXT/OK]**
Set Mon: 09	**[NEXT/OK]**
Set Mon: 09	**[NEXT/OK]**
Set Day: 13	**[NEXT/OK]**
Set Day: 13	**[NEXT/OK]**
Set DOW: 4	**[NEXT/OK]**

When you have completed the **SET DATE** menu the following is printed automatically:

```
*** SET TIME ***
Set Hour:  16                    [NEXT/OK]
```

Choose **NEXT** (left side) to increment the number or **OK** (right side) to accept the **1**. Repeat this same procedure for hours and minutes as shown below.

```
*** SET TIME ***
Set Hour:  16                    [NEXT/OK]
Set Hour:  16                    [NEXT/OK]
Set Min :  36                    [NEXT/OK]
Set Min :  36                    [NEXT/OK]
Start Clock                          [OK]
Ready. . .
```

When everything is as you want it, press **OK** and **"START CLOCK"** is printed. Press **OK** (right side) to start the clock. The printer then prints **Ready. . .** showing you that it is out of the setup menu and ready to print.

Reset SEQ#

RESET SEQ# is the last setup menu item. This menu item lets you reset the sequence number. This number is the number of print transactions since the last reset.

With the printer in the setup menu and with **RESET SEQ#** as the last item printed, if you press **OK** (right side) the sequence number will be reset to zero and the printer will print **Ready. . .** showing it is no longer in the setup menu and that the printer is ready to print.

To skip resetting the sequence number to zero, press **NEXT** (left side). **CONFIGURE. . .** is printed. Unplug and replug in the printer to return to printing mode. **Ready. . .** is printed.

Chapter 3
Loading Software & Creating Set-Ups

Loading Software

The distribution diskette (MS-DOS, IBM PC compatible format) contains the programs to install DataLink for Windows on your desktop PC and, subsequently, the Harvest Data software on your Field Computer. The whole installation process takes between 5 and 15 minutes, depending on your level of familiarity with computers.

Before installing the software you need to do the following:

- **Make sure that your Field Computer is adequately charged.**
- **Have your communication cable (model #CA-2009) on-hand.**

✏ *Note: If you are a DOS or Windows 3.1 user, please refer to* Appendix B, DataLink for DOS *for installation instructions.*

DataLink Installation

If you have Windows 95, 98, 2000, or NT installed on your PC, follow the steps below to install DataLink for Windows:

1. Insert the DataLink for Windows diskette into Drive A:\ or B:\

2. Click on the Start button, then select Run

3. Run the program "Setup.exe" from the DataLink for Windows diskette

4. The Windows installation wizard will guide you through the remaining procedures for this installation.

5. To run DataLink, go to the START menu, PROGRAMS folder, DATALINK for WINDOWS directory and click on the DataLink for Windows program. OR Drag the DLWin application from the Explorer window to the desktop, then double click on the DataLink icon in the desktop area.

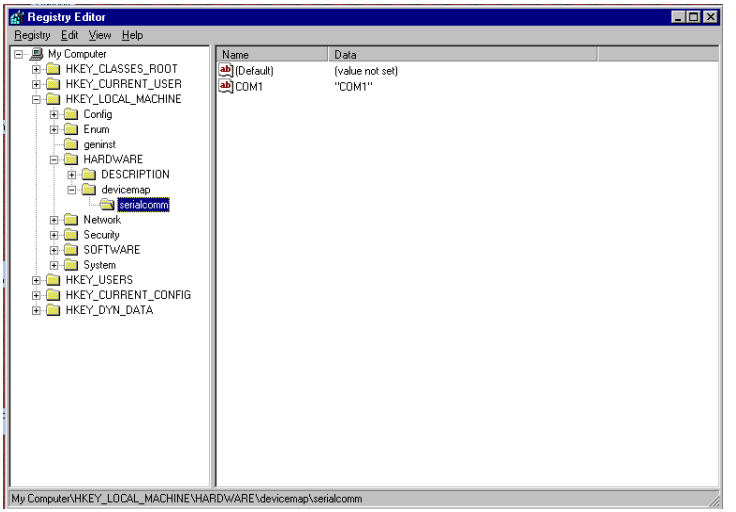
You have now completed the installation of DataLink for Windows. The next few pages of this chapter explain how to use DataLink to install the Harvest Data application on your desktop PC and you Field Computer.

Registry Error

If after running DataLink you receive the following message: "Serial Port Information Not Available in Registry," you need to update your registry. To do this complete the following steps:

1. On your desktop PC, go to the Start Menu and select "Run..." Type in *regedit* to run the Registry Editor.

2. Navigate to the following path: *Hardware\Devicemap\Serialcomm*. Check to make sure the items shown on the right side of the screen shown below are listed in the registry.



3. If you do not see these items, select the Hardware folder, go to the Edit menu and selecting *New\Key*. Name the new key *Devicemap*.

4. Select the new *Devicemap* folder and choose *Edit\New\Key* again. Name this key *Serialcomm*.

5. Open the *Serialcomm* folder then go to the Edit menu and choose *New\String Value*. Name the new string *COM1*.

6. Select *COM1* and go to the Edit menu and choose *Modify*. Type in *COM1* as your value data.

7. Your registry will now look like the figure shown above.

Introduction to DataLink

DataLink is, as the name implies, your link to the data stored on the Field Computer. You may *upload* data (transfer data from the Field Computer to the PC) or *download* data (transfer data from the PC to the Field Computer) using DataLink. DataLink lets your PC and Field Computer communicate via the serial communication cable (model # CA-2009). The communication cable connects your remote data collection unit to your desktop PC and allows the Field Computer and PC to communicate.

DataLink and your Field Computer need to have the proper application installed before they can exchange information. Once the application file has been installed, you can use DataLink to transfer files between the PC and Field Computer. DataLink also contains a program called Pro Link, a means of transferring files other than those associated with your Harvest Data applications (Allegro Field PC and Pro4000 FieldBook only).

Installing the Harvest Data Software on Your Desktop PC

Follow the steps below to install the Harvest Data Software on your desktop PC:

1. Insert the Harvest Data Applications diskette into Drive A:\ or B:\.

2. Run DataLink for Windows.

✏ *Note: If your PC is having problems with communications, check your COM Port setting and communication cable. For additional help on diagnosing communication problems, turn to* Chapter 5, Troubleshooting.

3. Select the location where your application diskette is located (e.g. A:\ or B:\ drive).

4. Click on the "Application Install" tab.

5. Select "Load Application from DISK" and wait as the files are copied to your PC.

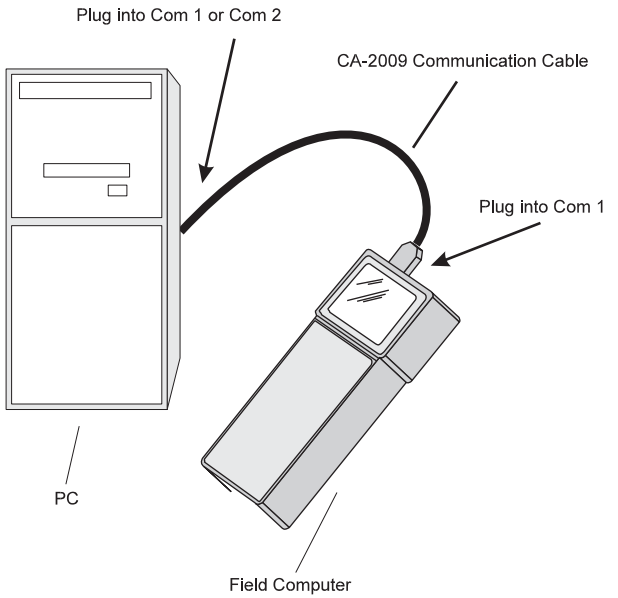
6. Your Application should now be displayed in the "Select Application" pull down menu.

✏ *Note: You may load more than one application if you would like. Each application version is displayed in the "Select Application" pull down menu.*

Installing the Harvest Data Software on the Field Computer

To install the Harvest Data software on your Field Computer, follow the steps below:

1. Connect the PC to the Field Computer using the communications cable. To do this, plug the communications cable into one of the serial ports on your computer (preferably COM1).



✏ *Note: DataLink defaults to communicating via the PC's COM1 port. If you have a mouse or other external device connected to COM1, you will need to use COM2. If you choose to use COM2 on your PC, go to the DataLink for Windows Comm Port Setup tab and change the Com Port setting (see* Comm Setup *later in this chapter).*

2. To prepare the Field Computer to receive the HDGG DOS software, turn it on.

3. If you are using an Allegro Field PC, make sure you are booted to DOS mode (see the Allegro User's Manual for detailed information).

✏*Note: Windows CE will not run DOS programs. Do not attempt to run this application with Windows CE.*

4. At the DOS prompt (e.g. C:\), type "FS" to run File Scout (Allegro F/PC users) or "PS" to run ProShell (Pro4000 users).

✏ *Note: Refer to the Field Computer User's Manual for detailed information about the utilities mentioned above.*

5. Create a subdirectory called "HDGG" and change to this directory (this will be the location of the application software).

✏*Note: If you would like, you can install your application on a PC Card. To do this simply change to drive D: then create the directory as outlined above.*

6. In DataLink for Windows on your PC, make sure the application that you would like to load is displayed in the "Select Application" menu.

7. Choose language.

✏ *Note: If you desire a language other than English, please call HarvestMaster's Technical Support Team for further instructions.*

8. Click on "Send Application to Handheld".

9. Wait while the software is transferred to the Field Computer.

10. If you would like the system to boot to this application automatically, locate and execute the "setbat.exe" file to update your Field Computer's "autoexec.bat" file.

11. Reboot the Field Computer.

✏ *Note: The system should run the application automatically on boot-up. After a few seconds the system will display the message "SCCU terminal not found. Turn power OFF and connect SCCU remote." Do not be alarmed; this message is normal when the Field Computer is not connected to the SCCU. Press <ESC> to go to the Main Menu.*

Transferring Files

Now that the software has been installed, you can transfer map and data files between the PC and the Field Computer with a click of a button. To transfer files to and from the Field Computer, follow the steps below:

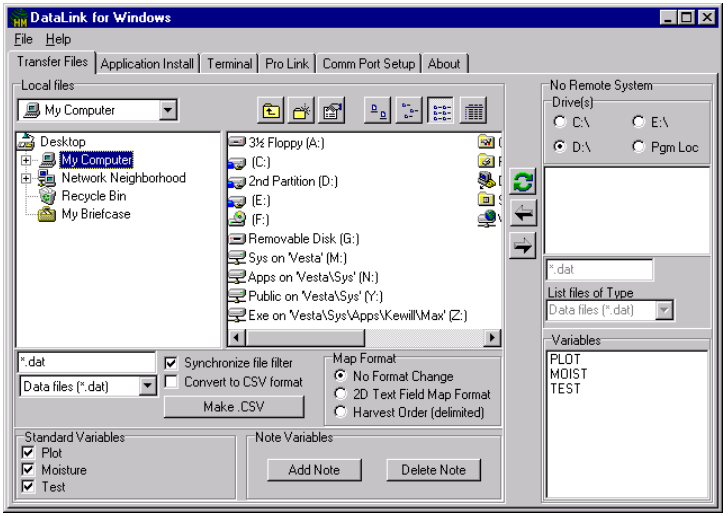
1. Click on the "Transfer Files" tab if it is not already in the foreground.

2. Click "OK" in the "Locating Remote System" box if the Field Computer is on, connected, and running the application software.

✏ *Note: If you are having problems with communication, check your COM Port setting and communication cables. For additional help on diagnosing communication problems, turn to* Chapter 5, Troubleshooting.

3. If the Field Computer is connected correctly and the communication setups are set correctly, the files from the Field Computer will be displayed in the box on the right side of the DataLink screen with the directory and files on your PC displayed on the left side.

✏ *Note: The "Synchronize File Filter" option will make one file filter active. Disabling this option will allow two filters to be active, one for your PC (left side of screen) and one for your Field Computer (right side of screen).*



4. If you are downloading a file, select the download format ("Map Format") to correspond with the type of file you are downloading. See *Appendix E* in this manual for details on the map download options (i.e. "2D Text Field Map" Format and "Harvest Order (delimited)" Format).

✏ *Note: The option, "Convert to CSV format" will convert data files to a comma-separated format which is best used when importing into programs such as Microsoft Excel.*

5. Make sure all the variables you desire are displayed in the "Variables" box in the lower right side of you PC screen. For example: Plot, Moist, and Test.

✏ *Note: When downloading maps, it is required that you download the variables with it. Once downloaded, you will not be allowed to add or modify any variables associated with that map.*

6. Navigate to the file (or files) you would like to transfer to the Field Computer, highlight them, and click on the right-pointing arrow to start the download process.

7. If uploading a file from the Field Computer, highlight the file (or files) to be transferred to your PC, and click on the left-pointing arrow to start the upload process. A file that has been uploaded to your PC can be viewed or edited by highlighting the file and right-clicking on it. This will send the file to your preferred editor.

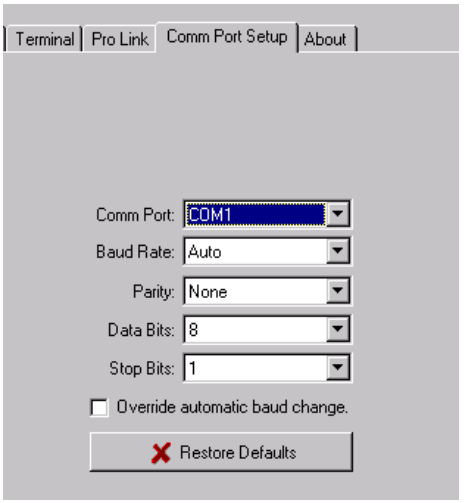
✏ *Note: Refer to Help in DataLink for Windows for specific information on transferring files.*

To send and receive files other than those associated with the Harvest Data software, use Pro Link. See ProLink later in this section.

✏ *Note: Do not alter these settings unless absolutely necessary.*

Comm Setup

If the PC and the Field Computer did not communicate, the communication port settings may need to be changed. To change the communication port settings, click the Comm Port Setup tab in DataLink. A sample Comm Port Setup screen, with the default settings, is shown on the page that follows.



Make the correct selection for your communication setup in this dialog box. For example, if the Field Computer is connected to COM2, use the arrow at the right edge of the Comm Port box to reveal a pull-down menu, then select COM2.

DataLink automatically sets the optimum baud rate for data and map transfers (9600) and Pro Link transfers (115k). If you must use a different baud rate, click the box beside "Override automatic baud change" so a check appears. DataLink will now exclusively use whichever baud rate you select. Use the arrow at the right end of the Baud Rate box to reveal the pull-down menu, then change the setting as needed.

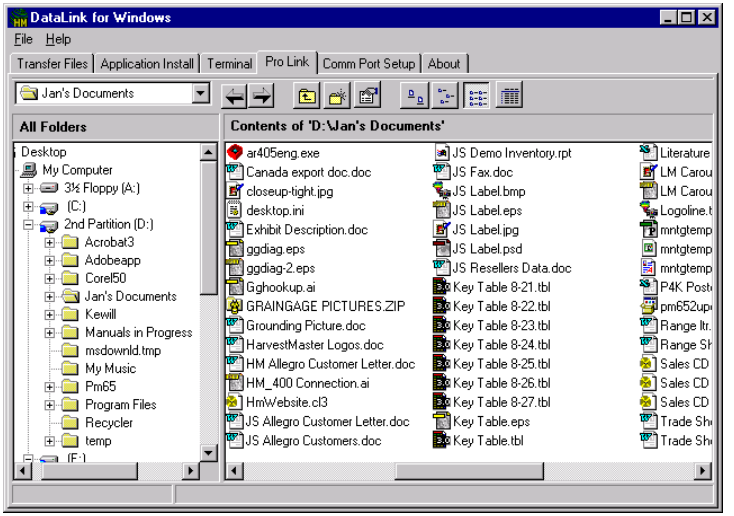
✏ *Note: Changing the baud rate from "Auto" may adversely affect the system communication performance. Use the Restore Defaults button to reset customized settings to their original values.*

For additional help on diagnosing communication problems, refer to Help in Datalink for Windows and *Chapter 5, Troubleshooting* of this manual.

Pro Link

Pro Link is a file transfer utility generally used for files not associated with the Harvest Data application software (e.g. custom DOS programs). To start Pro Link, choose the Pro Link tab in DataLink for Windows.

✏ *Note: This utility can only be used with DOS Field Computers such as the Pro4000 or Allegro Field PC. ProShell (Pro4000) or File Scout (Allegro) must be running on the Field Computer (refer to your Field Computer's User's Manual for details).*



■ **To send files to the Field Computer, follow the steps below:**

1. Select the appropriate drive from the pull-down menu at the top of the screen.

2. Navigate through the folders in the left-hand window. Double-click a folder to open it. Files within that folder will appear in the right-hand window.

3. Select the file(s) you wish to send. To send more than one file, highlight the first file, then hold down the <SHIFT> key and select the last, or use the <CTRL> key to highlight separate files.

4. Click the Right Arrow  . The Transmission Progress window will appear.

5. Click the Send button to initiate communication.

6. The Transmission Progress window shows the current file in transit, its progress, and the overall progress. Click Cancel to stop the transfer.

■ **To receive files from the Field Computer, follow the steps below:**

1. On the PC, select the appropriate drive from the pull-down menu at the top of the screen.

2. Navigate through the folders in the window. Double-click a folder to open it. A received file will be placed in the lowest-ranking open folder.

✏ *Note: Mark multiple files by using the INS key.*

3. Click the Left Arrow  . The Receive File Progress window will appear.

4. Click the Receive button to initiate communication.

✏ *Note: If the files are not sent within 10 seconds, DataLink will time out and the communication transfer will need to be restarted.*

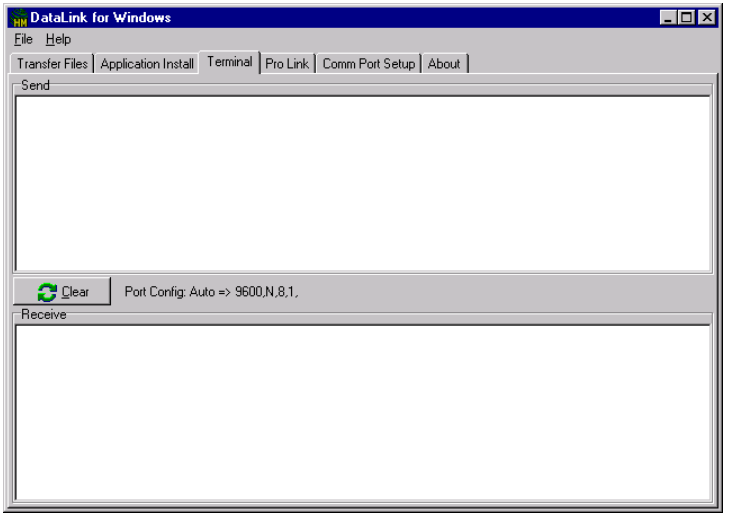
5. The Transmission Progress window shows the current file in transit, its progress, and the overall progress. Click Cancel to stop the transfer.

✏ *WARNING: Make sure the entire file was uploaded before deleting the file on your Field Computer.*

Terminal

Terminal is a diagnostic tool used mainly for troubleshooting communication problems between the PC and the Field Computer. In DataLink, select the Terminal tab.

✏ *Note: For this option to work, both DataLink and the Field Computer must be in terminal mode. (Refer to your Field Computer User's Manual for information on how to set it to terminal mode.)*



■ To test communication between the Field Computer and the desktop PC, follow the steps below:

1. Connect the Field Computer to the appropriate comm port on the PC.

2. Set DataLink and the Field Computer to terminal mode.

3. Type a test message on your PC. The message should appear in the Send window in DataLink and in the Receive window on the Field Computer.

4. Type a test message on the Field Computer. The message should appear in the Send window of the Field Computer and in the Receive window of DataLink.

5. If steps 3 and 4 are accomplished successfully, then the Field Computer and desktop PC are communicating.

6. If these messages do not appear as they should, make sure the connections to the PC and Field Computer are correct. Make sure the Field Computer is plugged into the same comm port as shown on the Comm Port Setup screen. You may also refer to the troubleshooting chapter of the Field Computer User's Manual. Then repeat steps 2 through 4.

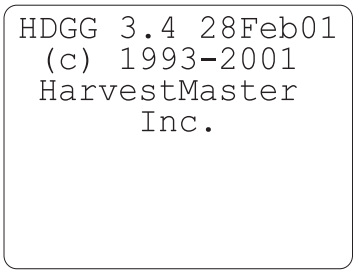
Make sure the Comm Port shown is the port to which the Field Computer is connected. If DataLink has trouble locating the remote system, it may be because the wrong Comm Port is selected here.

DataLink automatically switches between 9600 for normal file transfers and 115k for Pro Link transfers. In general, do not use other settings unless you have advanced knowledge of port settings and transfer rates.

Running the Harvest Data Software on the Field Computer

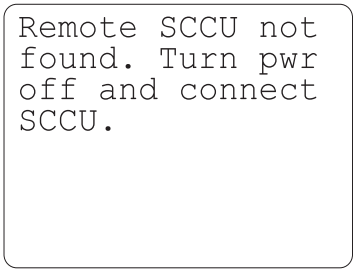
Congratulations on reaching your first milemarker, you have successfully downloaded your first program. Now it is time to put that program to use.

- **With the Field Computer and Harvest Data System turned off, connect the Field Computer to your Harvest Data System (refer to *Chapter 2, Installation* for specific instructions).**



Harvest Data Sign-On Banner

✏ *Note: You can run the Harvest Data software on the Field Computer without attaching it to the SCCU. When the Harvest Data program is started, press <ESC> when the Harvest Data sign-on banner is displayed.*

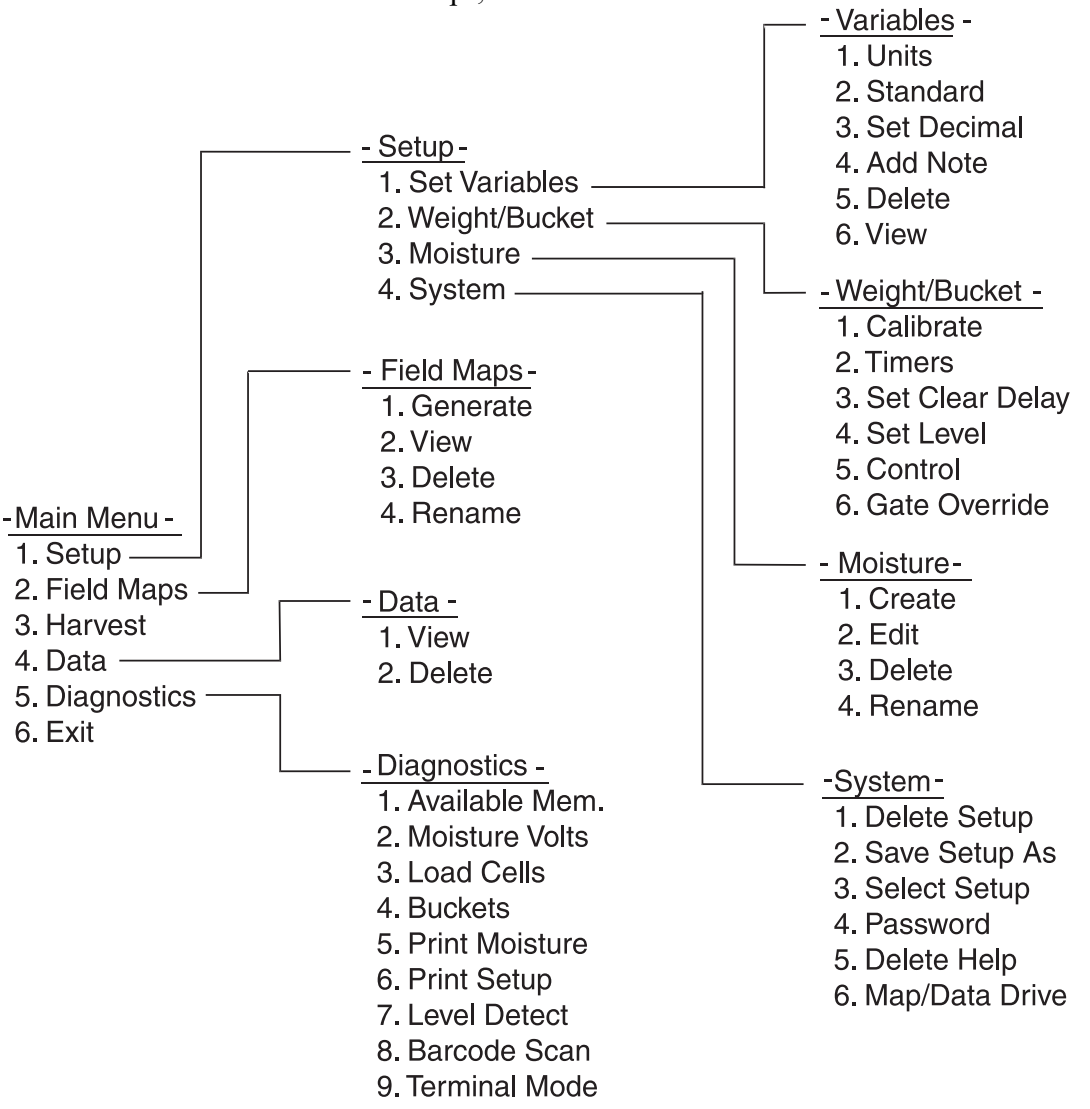


"SCCU Terminal Not Found" message

- **Flip the power switch on the SCCU to the "ON" position. This supplies power to the Field Computer and the SCCU. The Field Computer will attempt to connect to the SCCU for approximately 7 seconds. If it is unable to establish a connection, it will display the "SCCU Terminal Not Found" message will appear. To bypass this screen and run the Harvest Data software, press <ESC>.**

Harvest Data Menu Structure

The menu shown below presents the various menu options you will use to set up your Harvest Data System and acquire harvest data with it. You will notice that the menu structure is set up in levels of priority. For example it is recommended to complete the setup menu (option 1) first, and then work from the first sub-menu to the last. When all of the menu options are completed under setup, then go to field maps, etc.



Moving Through the Menu

UPARROW - causes the previous menu option to be marked.

DOWNARROW - causes the next menu option to be marked.

ENTER - causes the selection or activation of the marked menu option, or display of a lower level of menu.

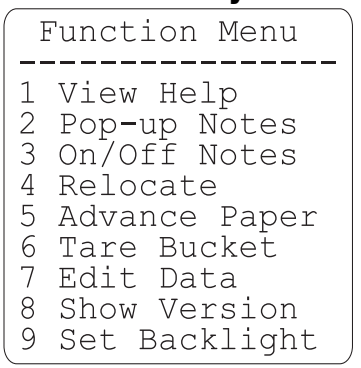
ESC - causes exit from current activity, or transition to a higher level of menu.

Function Keys

When you press a function key, a pop-up menu of options appears.

Press the digit on the keyboard corresponding to the function you wish. Functions 2, and 4 through 7 are only active during the harvest activity.

The <ESC> key exits the function menu, and returns you to the previous activity.



Press a function key to access the function menu

Help Information

Pressing <1> when the function menu is displayed causes help information to appear on the screen, relating to the current activity in process. For example, pressing a function key and the <1> key when prompted for entry of the Map File Name, displays "Enter the name of the field map to be created." To exit help, press <ESC>. Press the <UP> or <DOWN> arrows to scroll through the help information one line at a time.

Answering "Yes" or "No"

In certain places during adjustment of system setups, you may be requested to answer "Y" for Yes, or "N" for No. There is no need to spell out the whole word.

✏ *Note: Depending on the language of the prompts which you selected when you loaded the program, the "Y" for Yes may be changed as indicated in the table below:*

Letter	Meaning	Language
Y	Yes	English
O	Oui	Francais
J	Ja	Deutsch
S	Si	Español
N	No	All Languages

File Transfer

Generally, all file transfers are controlled completely from HarvestMaster's DataLink software running on a desktop computer (see *Appendix B, DataLink for DOS*, if using Windows 3.1 or older). However, there are other ways of transferring files as explained in the Field Computer User's Manual.

Before attempting to transfer files, ensure that the cable connections between the Field Computer and the PC are secure and communications parameters are set correctly.

Selection of Moisture Curves and Field Maps

On many of the field map and moisture curve menu items, you will be prompted to select the field map, or to select the moisture curve. You will be asked to select one of each of these upon entry of the harvest activity on the main menu.

Press the <UP> or <DOWN> arrow to scroll up or down the list of file names to activate. Press <ENTER> to select the file name indicated.

Parameters

You will be requested to make a parameter selection when setting up variables and when setting units of measure.

Press the <Left> or <Right> arrow key to show the previous or next possible selection for the requested parameter. Press <ENTER> to select the parameter showing.

Setting Up the Harvest Data System Software

The remainder of this chapter explains each option in the Setup menu of the Harvest Data Software. Using the Setup menu in the Harvest Data Software on the Field Computer, you will perform the following activities to ready the system for recording harvest data.

```
   L-2 Setup
---------------
1 Set Variables
2 Weight/Bucket
3 Moisture
4 System
```

Setup Menu

1. Set up variables.
   a. Select units, either ENGLISH or METRIC.
   b. Select standard variables.
   c. Set the decimal location for your recorded data.
   d. Add additional text or numeric variables, if desired.

✏ *Note: All variables need to be defined before attempting to download or generate field maps.*

2. Calibrate the weigh bucket and the test chamber weight readings. You will need a known weight of 4-5 pounds.

3. Calibrate the moisture sensor (required if "% MOISTURE" is selected as a standard variable). You will need several samples of the grain to be harvested with known moisture content (wet weight basis).

3. Set a user password for data erasure (optional).

4. Download and generate a field map.

The first 4 steps listed above are explained in this chapter. Downloading and generating field maps (step 5) are discussed in *Chapter 4*, since that is part of day to day operations.

Before proceeding with the set up, make sure that the Harvest Data Software has been installed as explained in the beginning of this chapter. Also, familiarize yourself with the menu structure on page 3-18 to give you an overview of the procedures, activities, and diagnostic functions available.

Setting Variables to Record

Before harvesting or taking field notes, set up the variables that you will be recording.

Units

```
-- MAIN MENU --
1 Setup>
   -- SETUP --
  >1 Set Variables>
     -SET VARIABLES-
    >1 Units
```

The first thing you will need to set is the units you are using.

■ **Make this menu selection.**

```
Select units of
measure:

US Units



Use <- ->, Enter
```

After you have selected "Units", this screen will appear.

■ **Press the <LEFT> or <RIGHT> arrow key to toggle between US Units and Metric. Press <ENTER> to finalize your choice.**

Standard Variables

```
-- MAIN MENU --
1 Setup>
  -- SETUP --
>1 Set Variables>
   -SET VARIABLES-
>2 Standard Vbls
```

Next, select which of the harvest data variables you wish to record.

■ **Make this menu selection**

```
Plot Weight: YES
   Moisture: NO
Test Weight: NO

Use <- ->, Enter
```

■ **Press the <LEFT> and <RIGHT> arrow keys to toggle between YES and NO. Press the <UP> and <DOWN> arrow keys to move between selection.**

✏ *Note: If you plan to use the system to take only field notes (rather than harvest data) it is recommended that you indicate "NO" on all of these harvest variables.*

```
Select Test Wt
conversion ftn:

VOLUMETRIC WT

 Use <- or ->
```

■ **Press the <LEFT> and <RIGHT> arrow keys to toggle between VOLUMETRIC WT and NONE, followed by <ENTER>.**

The volumetric weight will read in cubic inches if the choice of units is "ENGLISH" and in cubic centimeters if the choice of units is "METRIC." See the chart below for conversion of chamber volume size to cubic inches and cubic centimeters.

```
Test chamber
volume in cubic
inches.

207
```

Chamber Size	Cubic Inches	Cubic cm.
3 liter	207	3,392
1.5 liter	87.5	1,434

You may have to adjust the cubic inches or cubic centimeters slightly depending upon the density of the grain sample. To ensure accurate calibration compare the density readings from a bench-top tester with that of the GrainGage and follow the steps below:

1. Cycle a known test weight through the system in Harvest mode.

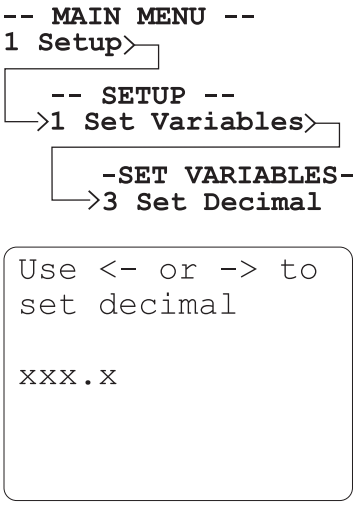
2. Calculate a new volume using the following formula:

$$\text{New Volume} = \frac{\text{GG test weight}}{\text{Actual test weight}} \times \text{current volume}$$

The units of recorded weight are in pounds or kilograms. In English, the test weight is lbs./bu, and in metric the units are kilograms/hectoliter.

✏ *Note: If your total plot weights do not exceed the current volume setting by at least 10 percent, you will not get test weight or moisture. You must reduce the volume of the test chamber (refer to Appendix G).*

Set Decimal



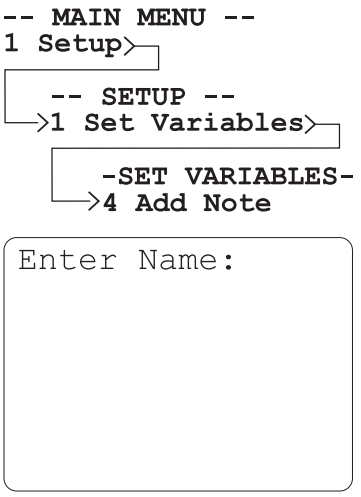
The next menu selection allows you to set the decimal position of your harvest data.

The harvest data fields are always 5 characters wide. Moving the decimal point with the <LEFT> or <RIGHT> arrow keys gives you the following choices:

xx.xx	two digits after the decimal point
xxx.x	one digit after the decimal point (default)
xxxxx	no decimal point

■ **Press <ENTER> or <ESC> to return to the Set Variables menu.**

Additional Notes



The next menu selection is for those who wish to record text or numeric observations only or in addition to the standard harvest data variables.

■ **Key in up to 8 alpha characters for a name of the variable. Press <ENTER> when finished.**

There are two special note names: “barcode” and “SeqNo” that perform special functions:

“Barcode” lets you scan in (or key-in) a value for each plot after the plot has been harvested and the buckets dumped. This is designed for those who wish to bag each sample and scan a corresponding identification to those bagged samples.

"SeqNo" automatically assigns an incrementing value to each harvested plot. This lets you automatically record the order in which the plots were harvested.

```
Enter width of
variable:
```

✏ *Note: The "SeqNo" is set up as a default parameter. If you do not want this variable, simply delete it using the Delete Variables sub-menu.*

■ **Key in the number of characters for a field width of the variable. A maximum of 16 may be used.**

Delete or View Variables

```
-- MAIN MENU --
1 Setup>
   -- SETUP --
  >1 Set Variables>
     -SET VARIABLES-
    >5 Delete
     6 View
```

The last two menu items under the Set Variables menu allow you to delete or view any of the additional variables you may have set up.

In either case, use the <LEFT> or <RIGHT> arrow keys to review the additional variables you have defined. In the case of "Delete", press <ENTER> to delete the variable showing on the display.

```
View Variables
----------------
status:
name..: lodging
type..: NOTE
```

```
No variables
are set up.

 Press any key.
```

If there are no variables, this screen appears.

✏ *Note: The variables and other choices you have set up at the time of first field map usage are those which will remain associated with that field map until the data is erased. Variables cannot be added to or deleted from the set associated with the field map after the map is created!*

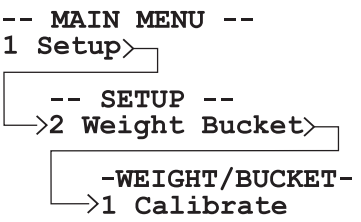
For example, if you set up and use MAP1 after having set up variables PLOT WEIGHT, MOISTURE, and DROPPED EARS, then deselect MOISTURE, and delete DROPPED EARS, you will continue to see all three variables when harvesting with MAP1. However, if you now generate a MAP2 and harvest with it, you'll only see PLOT WEIGHT.

✏ *The rule is: The set of variables (as defined in the Set Variables menu) existing at the time of first map usage is the set which will always be associated with that map until you erase the data or map. If you wish to record a variable for a specific map, make sure that the variable is set up before the map is generated. This rule applies when downloading field maps as well; however, the variables must be defined in DataLink for Windows. The variables defined in DataLink for Windows are used when* downloading *field maps, and the variables defined on the Field Computer are used when* generating *field maps.*

GrainGage Setup

After setting up the variables in the Harvest Data Software, proceed with the set up of the GrainGage.

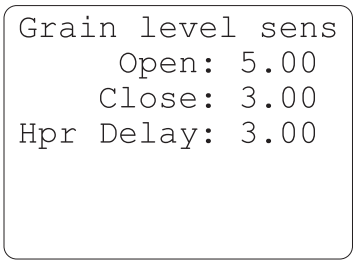
Setting the GrainGage Weight Calibration



■ **Check the weight calibration of the GrainGage.**

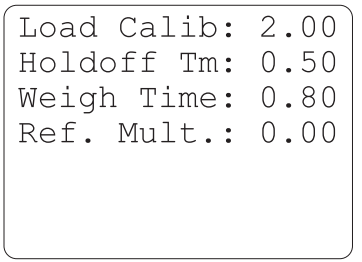
From the calibration label, take the average of the "Net Output" of loadcell A1 and A2. Select the "Calibrate" option from the Weight/Bucket menu then key in the calibration value in the "Load Calib:" option.

✏ *Note: The calibration label is normally located on the upper left inside wall of the GrainGage.*



You may check the accuracy of the calibration value using the steps below. You will need a precisely measured weight (4-6 lbs, 2-3 kg) or a precisely weighed out quantity of grain (20-30 lbs, 10-15 kg).

1. Select Load Cells from the Diagnostics menu.



2. With the combine off (or idle), make sure the total weight reading is zero. If it is not, retare it by pressing <F6>.

3. Place the weight in the middle of the weigh pan as close to the chamber as possible.

4. Read the total weight.

Setting the "Signal Value"

The nominal value under "Load Calib" is 2.000 mv/v and it typically will be between 1.9 mv/v and 2.1 mv/v. This means that the output of a load cell is 2.0 mv/v of excitation for a full scale load (11.023 lbs or 5 kg) on each load cell.

To fine-tune the weight calibration (or match it with your precision scale) calculate a new "Load Calib" as follows:

True weight of the sample: 25.21 lbs.
GrainGage weight readout: 24.77 lbs.
Current signal value: 2.000
Compute a new signal value: signal = 2.000 x (24.77 / 25.21) = 1.965

Use the arrow keys to replace the load cell value of 2.00 with the new derived value, in this instance, 1.965.

Holdoff tm: Hold off is the time (in seconds) the system waits after opening the middle door before a weight reading is taken. It is the actual time it takes the grain sample to drop from the middle chamber to the bottom chamber. Set this time as short as possible without affecting the weight readings of the wettest sample you will be harvesting.

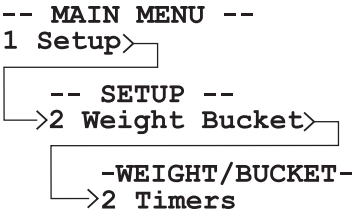
Weigh tm: Weigh tm is the time that it takes (in seconds) to average a number of samples before it records the actual weight reading. The larger the number, the more samples it will average, and the more time it will add to your total cycle time. The advantage of using this option is that you may want to set the averaging weigh time higher if you need more accuracy under high vibrating environments and lower if you are more concerned with faster cycle time.

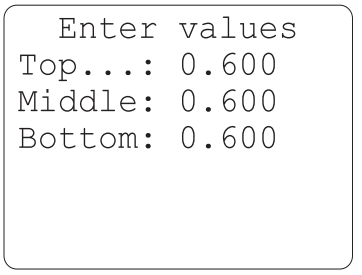
✏ *Note: Setting this reading below .6 seconds may adversely affect your data.*

Ref Mult: The Reference Multiplier allows you to use the HMA-SMS Slope and Motion box. Refer to *Chapter 2, Mounting the Slope and Motion Compensator* to determine if your GrainGage needs this option.

✏ *Note: Do not use any value other than "4.00" to enable or "0.00" to disable. Doing so will adversely affect your data and cause the sensor to operate at less than peak efficiency.*

Setting the Hopper and Bucket Door Timers





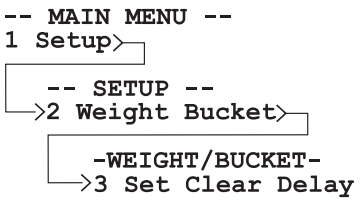
For normal operation, leave the readings as they show. Values are in seconds and indicate how long each gate will remain open allowing grain to flow through.

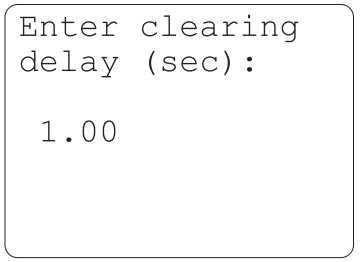
■ **Make this menu selection to set the hopper and bucket door timers.**

When you are finished entering the values:

■ **Press the <DOWN> arrow key or <ENTER> to accept the entered value. Pressing <ESC> will also save your changes unless you were in the middle of entering values. What you see is what you save.**

Setting the Clear Delay





■ **Make this menu selection to set the clear delay.**

Clearing delay refers to the amount of "grain absence" time required to trigger the end-of-plot sequence.

✏ *Note: Setting the clear delay lower than one second may cause the system to clear too soon causing your data to appear lighter than normal.*

SCENARIO: *The combine cuts through a plot and after data from the third chamber full of grain shows on the display, the user presses <Enter>. The <Enter> key tells the system to complete the measurement process after the Clearing Delay time has lapsed. The Clearing Delay timer waits until no further grain is sensed on the grain level detector before beginning its count down. After the Clearing Delay countdown, the plot measurement is completed by doing two more chamber dumps, and sending a total weight, average moisture, and average test weight back to the computer.*

If grain is sensed on the grain level detector after the Clearing Delay timer starts, the Clearing Delay timer resets itself to zero, and begins to time again once it senses the absence of grain.

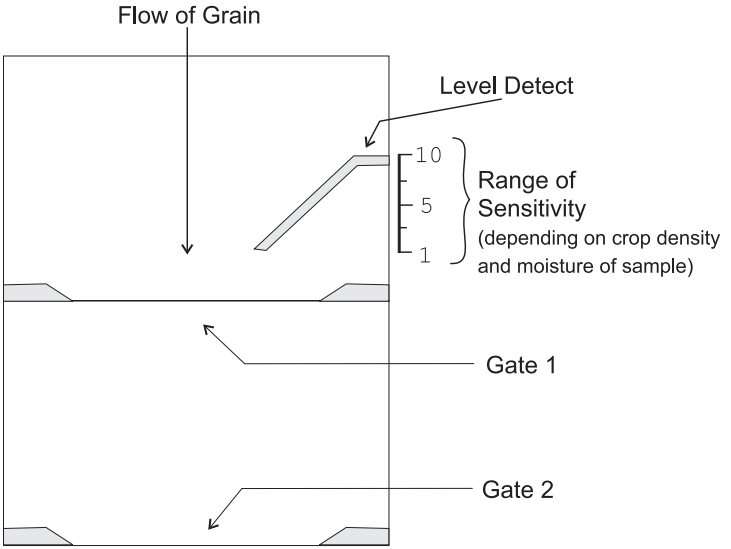
The recommended Clearing Delay time is 1.0 second. However, if the harvester does not clean out quickly and tends to dribble more grain towards the end of the plot processing, you may want to extend the Clearing Delay time to 2.0 seconds or longer. This setting can be used to adjust the timing sequence for your plot-to-plot route.

Setting the Level Detect

```
-- MAIN MENU --
1 Setup>
  -- SETUP --
>2 Weight Bucket>
   -WEIGHT/BUCKET-
  >4 Set Level
```

■ **Make this menu selection to set the level detect.**

The open/close values determine the sensitivity of the grain level detector at the top of the GrainGage. A high value corresponds to a less sensitive operation which allows more grain to fill the top bucket before beginning a measurement sequence. A cut-away diagram is shown below to further explain the level detect.

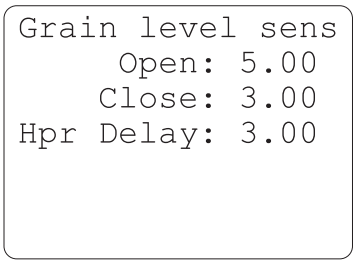


The "open" level corresponds to the level at which the level detect will generate an open signal, causing gate 1 to open (assuming the other GrainGage chambers are empty). Grain will continue to flow into the GrainGage, accumulating in the middle chamber and then into the top chamber. When the grain reaches the designated "close" level, gate 1 will close. Before the GrainGage will open gate 1 again, it will wait until the first sample of grain has cycled through OR until the grain reaches the open level, whichever happens last.

WARNING! Setting the "open" or "close" value less the "1" may cause the system to intermittently cycle continuously. When this happens, you will notice the test weights and moisture to be extremely low. Setting the "open" or "close" value too high may cause the system to not cycle the entire plot through the system. When this happens, your test weight and moisture may be okay, but your plot weights will be low. If the system did not cycle at all, the test weight and moisture will read "0.00."

✏ *Note: If the system records "0.00" moisture and "0.00" test weight, check to make sure there is enough grain to fill the middle chamber and trigger the level detect sensor. There must be enough sample to fill the middle chamber at least once to get test weight and moisture.*

Typically you will want to set the "open" value higher than the "close" value so when gate 1 opens it will immediately fill the middle chamber. By using the open and close timers in conjunction with the "hpr delay", you should get gate 1 to open and close almost immediately for each cycle. Doing this will increase the accuracy of your test weights and moisture samples.



The "Hpr Delay" is the amount of time that passes between the time the level detect senses that gate one should be opened and the time the gate actually opens for the first cycle. This will not affect additional cycles for this plot. For example: if the hopper delay is set to 3, the GrainGage will wait three seconds after the level detect has detected the open state before the gate will open. Hopper delay is user-defined.

To ensure that the "Hpr Delay" is adjusted correctly follow the steps below:

1. Set the value to "0.00."

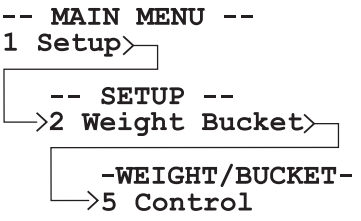
2. Harvest plots as you normally would (plot to plot speed must be consistent)

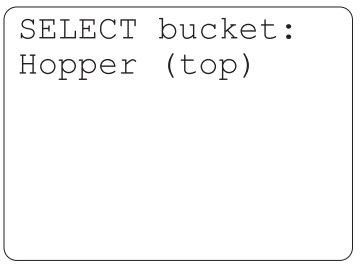
3. Watch the "Hopper OPEN" LED (red light) to see how long it stays on for the first cycle of each plot

4. Repeat step #3 for at least 10 plots and then average the time the Hopper stayed open for each plot.

5. Add .5 seconds to this value and use that number for your "Hpr Delay."

Changing the Bucket Setup





The Control menu allows you to change the bucket setup. The bucket setup controls how the SCCU opens and closes the buckets on the combine since different types of bucket actuators require different signals. With the GrainGage, you shouldn't have to perform this operation unless you are troubleshooting actuators or limit switches.

- **Use the <LEFT> and <RIGHT> to view the four bucket selections: Hopper (top), Test (middle), Plot (bottom), and Auxiliary. Press <ENTER> to change a particular bucket's setup or press <ESC> to save the bucket setup and return to the menu.**

Now the SCCU needs to know whether or not the actuator for the selected bucket uses a limit switch to end the actuator travel when it is opening the bucket door.

```
Limit Switch on
Open Stroke?

YES
```

■ **Press the <LEFT> and <RIGHT> arrow keys to select either NO or YES in answer to the question or press <ESC> to back up the actuator selection screen.**

✏ *Note: If a limit switch fails on the GrainGage, you can disable it using this menu so operations can continue. The hazard is that the system can no longer detect jammed gates. If you get "Gate Obstruction" messages, we recommend that you disable each of the "close" limit switches and use a .3 second timer. There is very little risk in doing this since the "open" limit switch will detect any drop in air pressure or gate malfunctions.*

```
Opening Transit
Time?

0.30
```

If you choose "YES" for the limit switch on the open stroke, you will not see this screen. Go to the next screen. If you choose, "NO," you will have the opportunity to enter the opening transition time for your bucket door.

■ **Enter the amount of time, in seconds, it takes your actuator to completely open the selected bucket (normally 0.2 seconds for the GrainGage). Fractional times, e.g. 2.5, are allowed.**

```
Limit Switch on
Closing Stroke?

YES
```

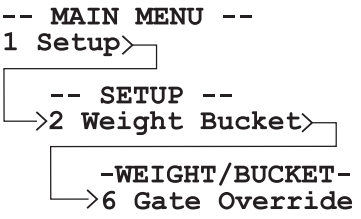
■ **Press the "LEFT" and "RIGHT" arrow keys to choose NO if your actuator for the selected bucket does not require a limit switch to end the closing stroke or YES if it does require a limit switch. GrainGage normally is YES - if it has a limit switch.**

```
Closing Transit
Time?

0.30
```

If you choose "YES" for the limit switch on the closing stroke, you will not see this screen. Go to the next screen.

- **Enter the amount of time, in seconds, it takes your actuator to completely close the selected bucket. (Fractional times, e.g. 3.7, are allowed.) After answering this question, you are returned to the bucket selection screen to continue the bucket setup.**

Gate Override Option



The gate override option is used to override gate obstruction messages. Enabling this option will cause the system to continue processing grain when a gate obstruction occurs. A brief message will flash on the screen as a warning then the GrainGage will proceed with the cycle. Any obstruction messages that occur are printed for future reference.

- **To enable or disable the gate override option, make this menu selection.**

```
Gate Overide?

NO
```

After selecting the Gate Override menu option, this screen appears. Use <RIGHT> and <LEFT> arrow keys to switch between "YES" and "NO" options. Entering "YES" enables the Gate Override option, while entering "NO" disables the option.

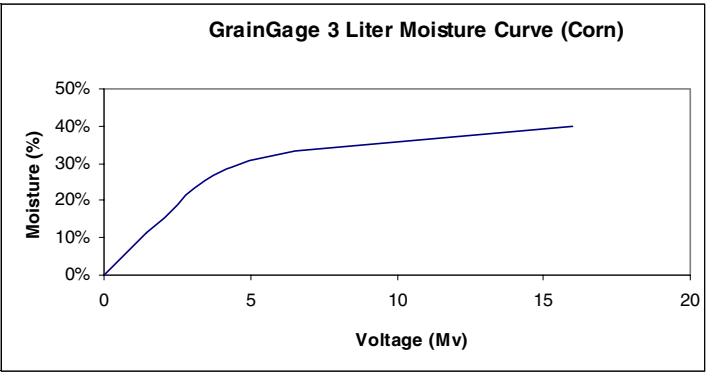
Grain Moisture Sensor Calibration

Creating a Moisture Sensor Curve

Before you proceed with this exercise, the entire system must be fully operational with the workings of the moisture sensor completely checked out (see *Moisture Sensor Verification* in *Chapter 2* of this manual).

A grain moisture sensor curve is a set of "known" data points to which the system refers when doing a measurement of moisture on a sample of grain. Graphically, it would appear like the graph below. In the memory of the Field Computer, and presented to you for editing, it appears as a table of data, as shown at the left.

Moist %	MV
0%	0
11.40%	1.46
15.40%	2.04
17.20%	2.28
18.70%	2.48
21.40%	2.81
23.20%	3.04
25.60%	3.48
26.70%	3.73
28.70%	4.2
29.10%	4.35
30.70%	4.94
33.30%	6.5
40.00%	16



✏ *Note: Different grain types should each have their own moisture curves. Information on pre-calibrated moisture curves is available. If you would like this information check the "Service & Support" section on our website at www.harvestmaster.com or contact our Customer Service department.*

Preparation

Here's a checklist to follow in preparing to create the moisture curve:

- **Have at least 3 samples of different moisture content grain available (the Harvest Data software will accept up to 20 samples for each moisture curve). Mark each sample.**

✏ *Note: Moisture samples must be at the same ambient temperature as the combine. Creating a moisture curve with warmer or colder samples will adversely affect your calibration.*

The GrainGage requires sample sizes of at least 6 lbs for the large chamber and at least 3 lbs for the small chamber. We recommended using approximately the same sample size as at the time of harvest. The samples should be as equally spread over the expected range of measurement as possible. Ideally, they will have been measured with a bench top grain moisture tester within about an hour of the current time and will have been sealed in a container between that calibration measurement time and now. The samples must be large enough to fill the test chamber completely. After recording the sensor reading for each sample, place the sample back in its sealed container to minimize exchange of sample moisture with atmospheric moisture.

- **Plug the Field Computer into the Harvest Data system console.**

- **Turn on the combine and run the engine and thresher at the speed at which it will be used during harvest.**

- **Turn the SCCU power on.**

■ **Select the Moist Volts option in the Diagnostics menu to view the raw moisture sensor reading.**

Warning:
To prevent serious injury, turn the air supply valve, located on the right side of the GrainGage, OFF before reaching inside the Grain Gage.

With a moisture sensor present on the system, the relative volts should be stable, and should settle on "0" with an empty test chamber. This reading should increase as you cover the blade completely with your sample. If the reading is not "0", then press <F6> to retare the system. (Make sure the chambers are empty before retaring). After retaring, the reading should be "0."

✏ *Note: Touching the moisture sensor blade should cause the "relative volt" reading to be +15 volts (± 3 volts).*

■ **Press <ESC> twice to get back to the Main Menu.**

Calibration

```
-- MAIN MENU --
1 Setup>
   -- SETUP --
  >3 Moisture>
      -- MOISTURE --
     >1 Create Curve
```

After completing the checklist for preparation (above), the next step is to create and calibrate the moisture sensor curve.

✏ *Note: If you change moisture sensors on a Harvest Data System, you must check the calibration for the new sensor.*

■ **Make this menu selection and follow the steps below to create a moisture sensor curve.**

```
Enter Name:
```

■ **Key in the alphanumeric name for the moisture curve you are creating. Moisture curve names can be up to 8 characters long.**

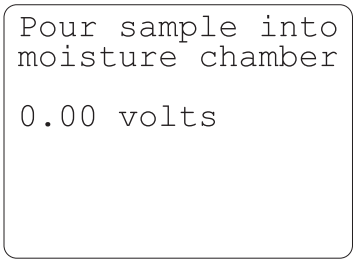
✏ *Note: Use a name that is similar to the type of grain that the moisture calibration curve is being calculated for; such as "CORN", "WHEAT", or "WET-CORN." We recommend adding the year to the end of the curve name (i.e. CORN01).*

Make sure the combine is throttled up with the thresher running at harvest speed. It is very important when creating a moisture curve that you simulate what actually happens in the field. The more consistent your calibration procedures are, the more accurate the moisture calibration will be.

When entering harvest mode you are asked to select one of the moisture curves you have entered (provided that you have included the grain moisture variable in your setups and that it is active upon entering the harvest menu option). Therefore, use a name you will remember and not confuse with other names in the system. If you key in a name which is already in use, the Field Computer will ask whether you wish to overwrite the existing file.

■ **Switch the SCCU console to "MANUAL", so that you can operate the top, middle, and bottom gates under manual control. Open all the gates to ensure the system is empty and then close them again.**

The lower left corner of the next screen should be showing a voltage reading. With an empty chamber, it should be "0". If it is not "0" you will need to retare your bucket by pressing <F6>. When the voltage reading is "0" with an empty chamber, you are ready to proceed with your calibration.



■ **Follow the prompt to pour the sample in the moisture chamber. Pour your entire sample onto the hopper gate then open the hopper gate. Allow the sample to drop into the constant volume chamber (middle level) then close the hopper gate.**

The lower left corner of the display shows the relative volts reading produced by this sample of grain. This reading is the same as the reading displayed in the Diagnostics menu.

- **Count 5 to 8 seconds then press <ENTER> to capture the reading.**

```
Enter moisture
content for
sample #1

      0.0%
```

- **On the next screen, key in the moisture content of this sample, in percent moisture wet weight basis (pct moisture = $MOIST_{wet}$ / ($MOIST_{dry}$ + $MOIST_{wet}$) which is the standard of measure of bench top grain moisture measurement systems).**

- **Press <ENTER>.**

- **Use the manual switches to open the test and plot chamber doors to pass the sample through. Catch the sample, and store it back in the sealed container.**

Repeat the previous steps for each sample of different moisture you have. You should use an empty test chamber for one of the samples, corresponding to 0 percent moisture.

✏ *Note: It does not matter what order you enter the moisture sample. The system will automatically sort them when you are finished.*

- **Press <ESC> when all of the samples are entered.**

This completes the moisture sensor calibration.

You will want to check the sample voltages again in the "Moisture Volts" option of the Diagnostics menu and compare them with the corresponding curve. Data points can be collected manually by cycling the samples through in the Diagnostics menu. After gathering the data in the Diagnostics menu, the curve can be edited. This can be done by following the steps in *Editing a Moisture Sensor Curve* later in this section. The voltages should be very similar to the calibration voltages just created. When checking field moistures during harvest, the curve can be fine-tuned by adjusting the temperature (refer to *Using a Precalibrated Moisture Curve* later in this section)

Creating a Moisture Curve Manually

To create a moisture curve manually, follow the steps below:

✏ *Note: Make sure the combine is throttled up with the thresher running.*

1. Switch the SCCU console to "Manual" so you can operate the top, middle, and bottom gates under the manual control.

2. Open all the gates to ensure the system is empty and then close them all again. Make sure the "Relative Volts" reading is zero (select "Moisture Volts" from the Diagnostics menu).

3. Pour a moisture sample onto the hopper gate.

4. Open the hopper gate and allow the sample to drop.

5. Close the hopper gate and count 5-8 seconds.

6. Manually record the "Relative Volt" reading on a piece of paper.

7. Repeat the process at least 3 times and average the readings.

8. Repeat steps 3 through 7 for each sample and then edit the averaged points into your existing curve.

✏ *Note: We recommend spending time double-checking and testing the calibration until you are confident that your curve is good. Graphing the points to see the shape of the curve is recommended. It may be needed to adjust the curve slightly to eliminate small errors. When you are confident with the accuracy of the curve, you should upload and print it immediately for future reference. When checking field moistures during harvest, the curve can be fine-tuned by adjusting the temperature (refer to* Using a Precalibrated Moisture Curve *later in this section)*

Creating a Trial Moisture Sensor Curve

If you have moisture data that you wish to enter through the "Edit Curve" menu option, but do not have a moisture curve name assigned, you still need to use the "Create Curve" menu option to create a trial moisture sensor curve to edit. Follow the steps below to create a trial curve:

1. Connect the Field Computer to the SCCU and power it up as if you were going to calibrate moisture.

✏ *Note: This step is only needed to record the current temperature reading.*

2. Proceed with the steps under *Creating a Moisture Sensor Curve, Calibration* earlier in this section using an empty bucket and 0% moisture for all of the entries.

3. Refer to *Editing a Moisture Curve* below to edit your data.

Editing a Moisture Sensor Curve

```
-- MAIN MENU --
1 Setup>
  -- SETUP --
 >3 Moisture>
    -- MOISTURE --
   >2 Edit Curve
```

```
  Select Curve
----------------
   ->Corn01
     Wheat01
     Canola01
```

Moisture	Volts
0.00	0.00
11.4	1.46
15.4	2.04
17.2	2.28
18.7	2.48

Double column of numbers representing the moisture curve.

The moisture sensor curve must exist before it is available to edit. If it does not already exist, create it using the steps in the previous sections. If it does exist, you can edit it using the steps below:

■ **Select "Edit Curve" from the Moisture menu.**

■ **Select the desired curve using the <UP> or <DOWN> arrow key, then press <ENTER>.**

■ **Use the following keys to edit the moisture/volts pairs:**

- <UP> and <DOWN> arrows select the line to edit.
- <LEFT> and <RIGHT> arrows select which column to edit.
- Keying numeric keys (including the decimal point and minus (-) sign), followed by <ENTER> replaces data in the curve.

The arrow key applied after entry of a string of digits causes both the <ENTER> function and the cursor to move in the implied direction.

Press <BLUE> key + <RIGHT> arrow key to insert a blank line into the curve after the selected line.

Press <BLUE> key + <LEFT> arrow key to delete the selected line from the curve.

Press <ESC> to edit the temperature compensation.

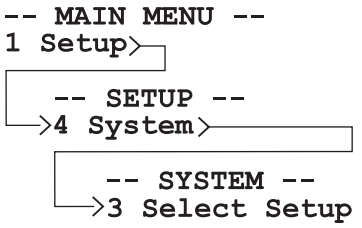
✏ *Note: You will need at least two sets of points in order for the curve name to be saved.*

Using a Pre-Calibrated Moisture Curve

We have supplied three default moisture curves for your convenience. These moisture curves are located in three different setup files (as shown below):

Name	Crop	Chamber Volume
WHT_TST.S	WHEAT	1.5 LITER
SORG_TTS.S	SORGUM	3.0 LITER
CORN_TST.S	CORN	3.0 LITER

✏ *Note: For additional pre-calibrated moisture curves check the "Service & Support" section of our web site at www.harvestmaster.com or contact our Customer Service department.*



To make these pre-calibrated moisture curves active, make the menu selection shown at the left.

Choose the setup file containing the moisture curve you desire.

✏ *Note: Choosing a new setup file will overwrite the existing one. If you have already calibrated weights or made any other changes from the default settings, you will want to save your existing setup files so you can reference them later.*

The pre-calibrated moisture curves are actual calibrations from other systems. Do not use these curves for harvest until you confirm their accuracy on your system using the steps below.

1. Harvest a grain sample (< 20% moisture) under normal conditions and catch the sample.

✏ *Note: If no plots are available to harvest, you can cycle a threshed sample through the system under the Diagnostics menu and get similar results.*

2. Take at least three moisture readings (with a moisture standard) from that sample and average them together.

3. Calculate a new "Cal Temp" (Calibration Temperature) by taking the difference between the recorded GrainGage moisture and the standard moisture reading. Convert the difference in moisture to degrees Celsius (change in moisture calibration temperature) by using the current correction multiplier.

   E.g.: (Standard % Moisture - GrainGage %Moisture) x (1/Correction Multiplier) = Change in Temp

4. Change the moisture calibration temperature by adding (or subtracting) it to the existing "Cal Temp" reading recorded for the moisture curve.

5. Harvest a number of different moisture samples to cover the range desired. Confirm that the samples are within your tolerances.

Setting the Grain Moisture Temperature

Grain moisture readings taken at temperatures different from the temperature at which the calibration curve was calibrated need to be corrected back to the calibration temperature. The HM-400 Harvest Data System can do this correction automatically. However, you may wish to adjust the correction coefficient.

✏ *Note: If you do not want to use temperature compensation set the correction multiplier to 0.0 and press <ESC> to return to the Moisture menu.*

```
Cal Temp C: 22.2
Mstr. Correction
Multiplier:0.092
```

The temperature compensation screen (left) automatically appears after pressing <ESC> in the Edit Moisture screen. "Cal Temp:" displays the temperature (in degrees Celsius) at which the system was calibrated. "Mstr Correction Multiplier" displays the % moisture change for each degree Celsius difference between the calibration temperature and the current temperature.

- **To change the Cal Temp or Moisture Correction Multiplier, use the <UP> and <DOWN> arrow keys to go to the field you would like to change. To save the number that has been keyed in, press <ENTER>. Press <ESC> to exit the compensation screen.**

Here is an example to illustrate how the moisture compensation works. For each degree Celsius that the sample is below the temperature at which the system was calibrated, the moisture sensor reads about .092% less moisture. Assuming the calibrations were done at 30° C and the current corn temperature is 10° C, .092 *20, or 1.84%, moisture needs to be added to the measurement to correct for the cooler temperature. Likewise, if the sample corn temperature was higher than calibration temperature, a correction would need to be subtracted from the measured value.

The Harvest Data Software does this correction automatically if the moisture correction multiplier has been set correctly.

Changing the calibration temperature from what it was when you did the calibrations will shift your entire curve up or down, depending on if you increase or decrease it.

✏ *Note: If your curve is consistently high over the whole range of the curve, you can lower the calibration temperature. Conversely, you can raise the calibration temperature if your moisture is consistently too low. This is an easy way to fine-tune the moisture curve after calibration.*

$$\frac{\text{(Actual moisture - GG Moisture)}}{\text{Mstr. Correction Multiplier}} = \blacktriangle \text{Temperature}$$

The Moisture Correction Multiplier (MCM) is roughly .092 for corn. This may vary slightly for other grains and you may wish to adjust it based on your experience with other grains.

The equation for the moisture correction value for temperature is:

Corr. Moist. = MCM * (Cal Temp - Actual Temp)

From our example above:

Corr. Moist. = .092 * (30.0 -10.0) = 1.84% moisture

Suppose that the system measured 19.5% moisture before the correction. The final recorded and displayed moisture content would be 19.5 + 1.84 = 21.34% moisture.

Temperature Compensation Summary

Complete moisture curve calibration includes:

1. Creating and editing the moisture curve (as described earlier in this section).

2. After having entered the moisture curve, press <ESC> to view the moisture compensation parameters. Make sure the correct temperature setting (°C) is showing for "Cal. Temp:"

3. Adjust the Moisture Correction Multiplier as needed for your crop. In the absence of any further information, use 0.092.

✏ *Note: When checking your moisture over a range of temperature, you may need to adjust this correction coefficient up (more compensation) or down (less compensation) accordingly. Remember that the sample and GrainGage monitor has to be at the same ambient temperature to get accurate moisture.*

4. Make a note of your numbers for future reference in a field notebook, save and upload your setup file, and print the moisture curve on the Harvest Data printer from the Diagnostics menu.

Moisture Compensation Diagnostics

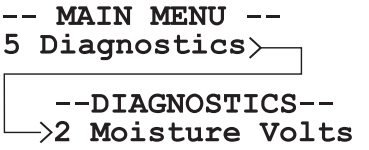
Moisture compensation diagnostics allow you to view the current temperature, the corrected moisture percentage, and the amount of moisture compensation.

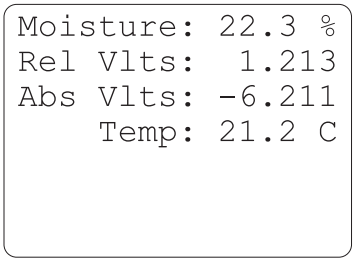
In order for the Harvest Data Software to display the correct diagnostic values of a given moisture curve, you must first make sure the *moisture standard variable* is active (see *Setting Variables to Record* earlier in this chapter) and make sure you have selected the desired moisture curve in the Harvest menu.

✏ *Note: You can select a moisture curve by selecting option 3, Harvest, from the Main Menu. When asked which moisture curve you want to use, highlight the desired curve, press <ENTER> and then press <ESC> until you are back to the Main Menu.*

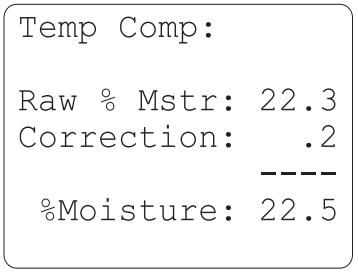
After you have selected the moisture curve, you can view the moisture compensation diagnostics for that curve.

■ **Make this menu selection:**



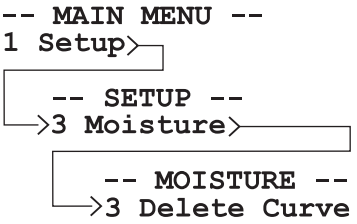


The temperature, Moisture Correction Multiplier, and moisture curve data points print in the "Print Setups" menu option of the Diagnostics menu in the same format as shown on the entry screen.



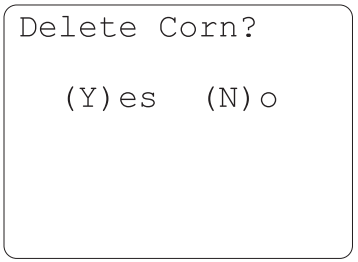
A second screen shows correction information. It is accessed by pressing <ENTER>.

Deleting a Moisture Sensor Curve

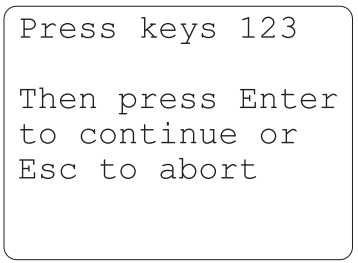


Deleting a curve is accomplished through the menu path shown at the left.

If you have set up a password, you must supply it before being allowed to continue. Then you are asked to select the name of the moisture curve to delete using the arrow keys and pressing <ENTER>.

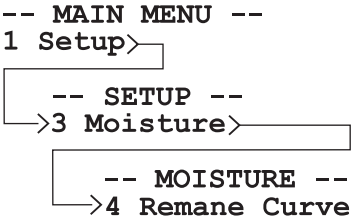


Once you have selected the name of the curve to eliminate, a confirmation is requested.



Upon responding "Y" for yes, the program requests an additional verification. This keeps you from erroneously erasing a moisture curve.

Renaming a Moisture Sensor Curve



The menu path to rename a moisture sensor curve is shown at the left.

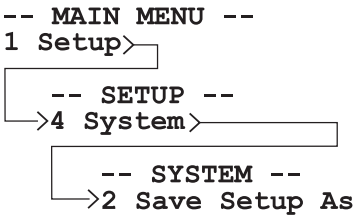
You will then need to select the curve you wish to rename. Then key in the new name for the curve.

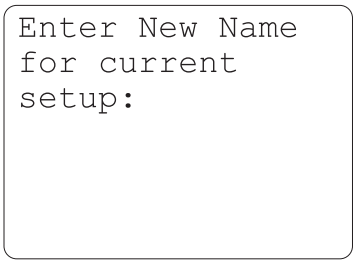
Setup Files

If you have different setups for different applications (for example a smaller chamber for small grains takes a different volume and moisture curve) these setups can be saved and re-selected, when desired.

Saving Setup Files

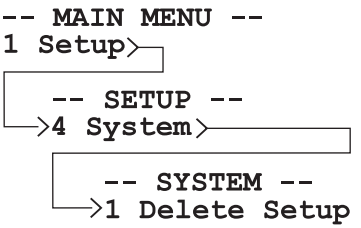
After you've set all the desired system parameters, you can save those setup parameters in a setup file by following the menu path shown at the left.





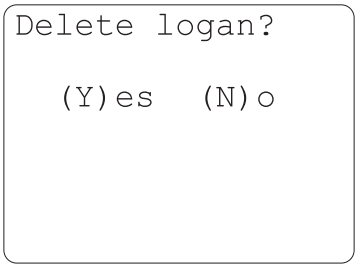
- **You will be prompted to type in the name of the setup file you wish to create. Type in a file name (names can be up to 8 characters long) then press <ENTER>.**

Deleting a Setup File



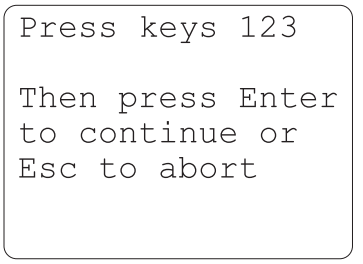
After downloading setups to the Field Computer from your desktop PC, you may want to delete one. To delete a setup file follow the menu path shown at the left.

The first thing you will need to do is select the setup file you want to delete.



The next screen requests verification of the action.

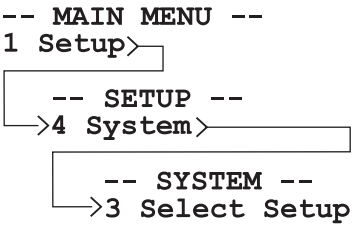
■ **Press <Y> for yes and <N> for no.**



This additional screen gives you one last chance to back out before erasing the selected setup file.

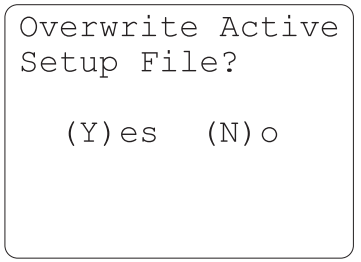
Selecting a Downloaded Setup File

You may upload setup files to your desktop computer to save and later reload them onto the Field Computer. Setup files consist of bucket setup information, weight calibration coefficients, and moisture calibration curves.



■ **Make the menu selection shown at the left to choose one of the setups that you previously downloaded.**

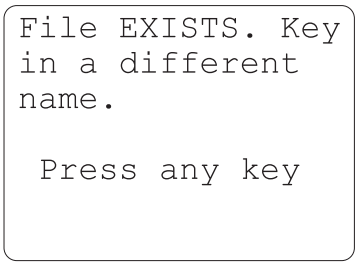
✏ *Note: When saving setup files, keep in mind that moisture curves are dependent on the sensor used during the calibration. Moistures should be verified before using another sensor.*



The Field Computer uses a special name for the current setup file. At this point you are asked if you want to overwrite the existing setup. If you have not saved the current setup file (the one you are working on now) it will be lost when selecting a new setup file. You can save the changes to the current setup file as outlined in *Saving Setup Files* earlier in this chapter.

■ **Press <Y> for yes if you do not want to save the current setup. Press <N> for no if you want to save the current setup under a different name.**

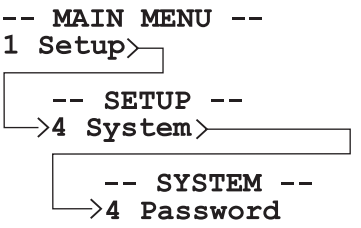
If you answer "No" to the previous question the existing setup file will remain selected until you decide to overwrite it.



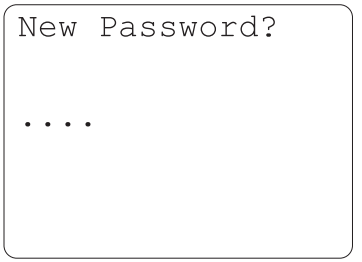
Duplicate names are not allowed. If you type in the name of a setup file that already exists, you will get this message:

■ **Press any key to return to the previous screen and enter a different name.**

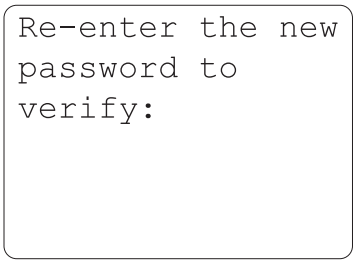
Set, Use, and Erase the Password



■ **To set a password, make this menu selection.**



If there is not a password already in existence in the computer, you may enter a new password at this time. Dots will appear as each letter of the password is typed.



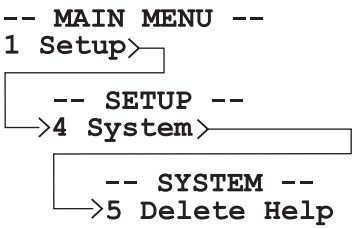
Just to make sure you have not made a mistake, you are asked to verify your entry. If there is already a password, you must enter that password before being allowed to key in a new one.

If you choose to delete the password, proceed as if you were going to enter a new password, but simply press <ENTER> instead of keying in any letters or numbers. It will ask you verify as shown in the screens above; just press <ENTER> again.

If you have forgotten your password, and need access to a password protected area, please call our Customer Service department.

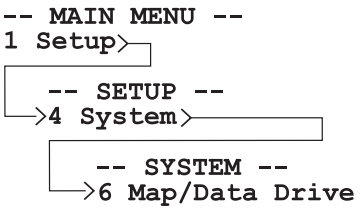
Password protection applies to erasure of data files, field maps, moisture curves, and changing from an existing password to another.

Deleting the Help File to Free Memory

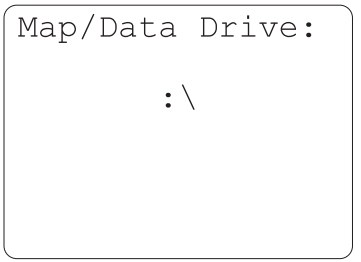


You can delete the help file by following the menu path shown at the left. This will create additional space for approximately 240 additional plots worth of data.

Choosing Map/ Data Drive



■ **To select the drive where maps and data information will be stored, make the menu selection shown at the left.**



If you enter a space, your information is stored on the drive in which the Harvest Data program is running. If you enter a drive letter, your information is stored on the root directory of that drive. For example, entering "D" will dave the data to the D: drive.

✏*Note: Saving data and maps to subdirectories is not allowed with the exception of the program locations.*

Chapter 4
System Operation

This chapter explains how to prepare field maps for harvesting and how to record harvest data and other user observations.

Field Maps

Use the "Field Maps" main menu option to create and manipulate maps of field plots within the Field Computer. Each of the Field Map menu items are discussed in this section.

✏ *Note: Remember that the set of variables (as defined in the "SETUP" menu) existing at the time of first map usage is the set which will always be associated with that map until the data or map is erased. For this reason, it is imperative that you have all of your variables set up before you generate a field map.*

Selecting "Field Maps" from the main menu allows you access to the following field map options:

1 Generate Map
2 View Map
3 Delete Map
4 Rename Map

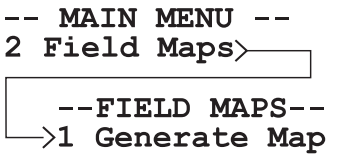
Generating a Field Map

Before you begin to generate field maps, please make sure you have done the following:

- Defined all variables you wish to have associated with the field map you are about to generate.
- Calibrated load cells.
- Generated moisture curves.

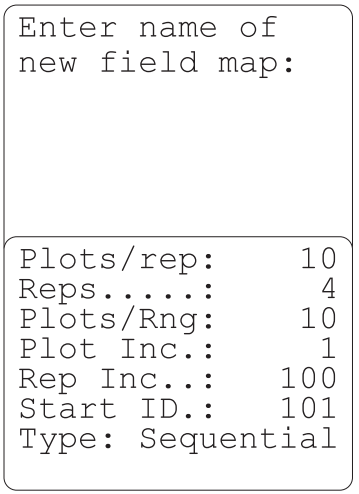
When you create field maps, the Harvest Data software sets aside enough memory for you to collect data for each plot in your map. This eliminates the risk of running out of memory on your Field Computer.

✏ *Note: For instruction on generating field maps using your PC, see* Appendix E, Field Maps Generated from ASCII.



■ **Select the "Generate Map" menu option from the Field Maps menu.**

You will be presented with this screen requesting the name of the new field map.



■ **Key in a name of up to 8 characters in length.**

After keying in an alpha-numeric name, under which the system will store your harvest data, you are requested to enter in values that define the field map you wish to create.

■ **Key in the values which represent the field map.**

Map Parameters

Following are definitions of each map parameter.

entries/rep:

The number of entries (sometimes termed treatments) to be represented in a replication.

reps:

The number of replications of the entries (or treatments) of this map. The total number of plots that will be included in this map is entries multiplied by reps. For example; if there were 8 entries replicated 3 times, the total number of plots for the field map would be 24.

plots/range:

This is the number of plots wide in the field layout.

plot inc:

Plot increment is typically 1, and is the counting increment applied to the 1's place as the sequencing is advanced from one entry to the next in a single replication.

rep inc:

Replication increment is usually 100, with the hundreds place denoting replication in the plot number. However, it may be 1000 if there are more than 99 entries per replication.

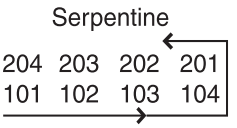
start value:

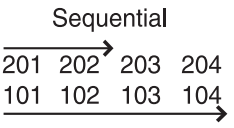
The plot number to be placed in the lower left corner of the map.

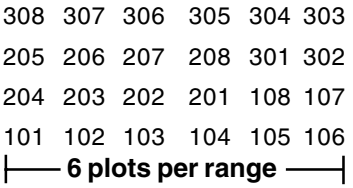
route:

There are two choices: SERPENTINE and SEQUENTIAL. Select the appropriate option by pressing the <LEFT> or <RIGHT> arrow key. Note that this implies the sequencing of plot number sideways across the study field, in the order that plots are usually rated (usually 90 degrees orientation to harvest order).

✏*Note: The map generator creates plots in a pattern from left to right.*







Here is a map resulting from 8 entries, 3 replications, and a layout of 6 plots per range.

```
Generating Map..

Please Wait.....
```

You will be shown a "wait" message while the map generates, which is usually only a few seconds; even for a fairly large sized map.

```
Map SUCCESSFULLY
generated

Press any key.
```

When the field map is generated, you will see this screen.

■ **Press any key return to the main menu.**

```
OUT of memory

Press any key.
```

If you try to generate a field map that is too large for the memory available on the Field Computer, you will see this message. Try again with smaller dimensions.

✏ *Note: You don't have to pre-generate or download a field map. Once you have defined the harvest, or rating variables, you can go directly to menu option 3, "Harvest." Refer to* Generating a Field Map on the Fly *later in this section for further details.*

Viewing a Field Map

This menu option allows you to see the X-Y configuration of the selected field map.

```
-- MAIN MENU --
2 Field Maps>
  --FIELD MAPS--
  >2 View Map
```

```
   Select Map
----------------
    North40
```

■ **Select the field map to view by using the <UP> or <DOWN> arrow key followed by <ENTER>.**

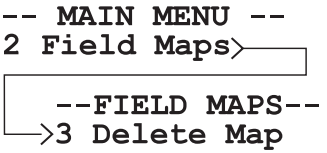
```
  Row:  1
Range:  1

   305    306
   304    303
  >101    102
```

■ **Use the arrow keys to position the Field Computer's screen over the portion of the map you wish to see (you may also use <CTRL> + <arrow key> to move all the way to the edges, or <BLUE KEY> + <arrow key> to move by the 20's).**

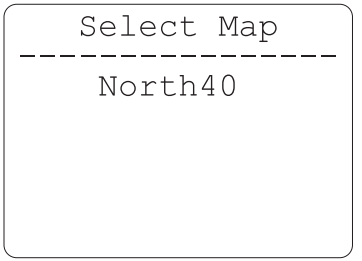
The arrow on the display points to the current plot position. As you move the arrow right and up to see the other plots, the display will window over the set of available plots in the map. Pressing <ENTER> allows you to view any other identifiers which have been downloaded.

If the identifier is more than 8 alphanumeric characters then the identifier will be broken into groups of 8 characters and placed in multiple identifier holders in the data file.

Deleting a Field Map



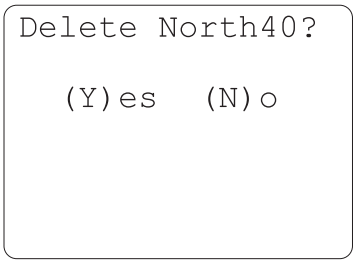
■ **Select the "Delete Map" menu option from the Field Maps menu.**



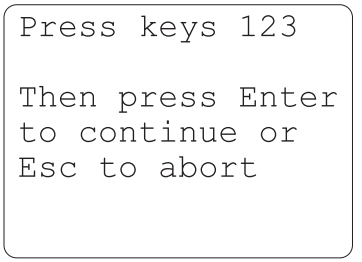
You are then presented with a screen showing the field maps on your system.

■ **Use the <UP> and <DOWN> arrows to scroll through the selections.**

■ **Press <ENTER> to make the selection.**

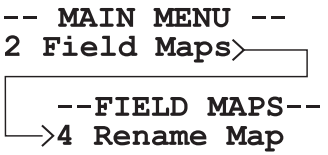


The next screen requests verification of the action.

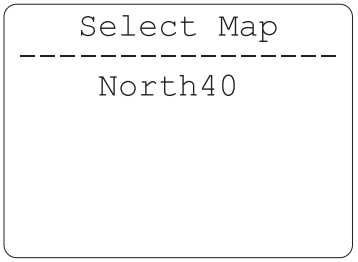


This additional screen allows you to confirm that you actually want this map and any recorded data that is associated with it to be deleted. Pressing <ESC> on this screen cancels the deletion process and returns you to the Field Maps menu.

Renaming a Field Map



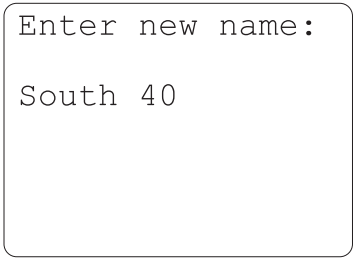
■ **Select the "Rename Map" menu option from the Field Maps menu.**



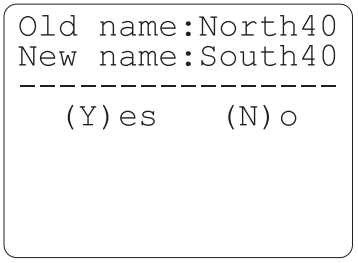
You are then presented with a list of map names.

■ **Use the <UP> and <DOWN> arrows to scroll through the selections.**

■ **Press <ENTER> to select the map you wish to rename.**



■ **Enter your new map name.**



■ **Confirm the change of map names by pressing <Y> for "Yes" and <N> for "No."**

The Harvest Operation

■ **Select this menu option to collect harvest data.**

```
-- MAIN MENU --
3 Harvest
```

```
   Select Map
----------------
    North40
```

■ **Use <UP> or <DOWN> arrows to scroll through the fields maps that are available. Press <ENTER> to make the selection.**

✏ *Note: At this point you have the option of generating a "Map on the Fly." To do this press <BLUE> + <RIGHT> arrow key and follow the steps in the next section,* Generating a Field Map on the Fly.

Generating a Field Map on the Fly

The Harvest Data software also allows you to generate a field map quickly while already in the harvest menu. At the time you are requested to select a field map, press **<BLUE>** key then the **<RIGHT>** arrow key.

```
Enter name of
new field map:
```

■ **Key in a name of 1 to 8 characters, then press <ENTER>.**

```
Plots/rep:    10
Reps.....:     4
Plots/Rng:    10
```

Specify the size of the quick map by entering the number of entries in the experiment, the number of replications of these entries, and the number of plots wide to make the field.

After this has been completed, you can follow the instructions for harvest as presented in the remainder of this section.

✏ Note: When using a "Map on the Fly" you will be prompted to enter the plot IDs manually or via barcode wand. The plot identifier is restricted to 8 characters or less. The barcode wand is plugged into the "wand" port on the back of the SCCU (controller in combine).

Activating and Deactivating Variables

After you have selected the field map you will be using, you will be presented with a screen that asks you if you would like to view the variables that have been set up. Press <ENTER> to view your variables or <ESC> to exit the harvest sequence.

```
View Variables

then press enter
to continue, or
Esc to quit:
```

When viewing variables, use the <UP> and <DOWN> arrow keys to activate or deactivate each variable. Normally you would leave them ACTIVE. The system will not allow you to enter harvest without at least one variable active.

```
Note Variables
---------------
status: ACTIVE
name..: SeqNo
type..: HARVEST
```

- **Press <ENTER> to continue the harvest sequence, or use the <LEFT> and <RIGHT> arrow keys to view the other variable names that will be included in the collection of harvest data.**

- **To deactivate a variable, press the <DOWN> arrow key. To activate, press the <UP> arrow key.**

✏ Note: We recommend you leave all notes variables active. If you decide you do not need them later, you can turn them off by pressing <F3> while harvesting and use Pop-Up Notes <F2> when necessary.

The variables you have set up in the master variables template, will be those associated with a specific map name from the point in time where that map was first selected. This is not changeable unless you delete the associated map file.

If you have deactivated the harvest variables (plot, test, and moisture), you must have notes turned on. To turn on notes, press <F3>.

Selecting the Moisture Curve for Harvest Data

```
  Select Curve
----------------
   ->Corn01
     Wheat01
     Canola01
```

Use the <UP> and <DOWN> arrow keys to select the moisture curve to use for this session of collecting harvest data. This can be re-selected each time you enter a field map.

```
Moisture file
  NOT found

Press any key
```

If you get this screen, it means you have not entered any moisture curves. You have 2 choices:

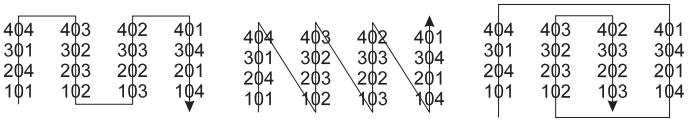
1) Go back and define a moisture curve (refer to *Chapter 3* of this manual).

2) Hit <ESC>, restart *Harvest*, scroll to the moisture variable, and set it to "NOT ACTIVE".

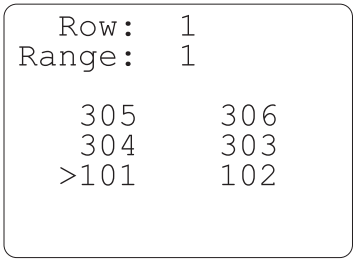
Selecting Harvest Routes (or Rating Routes)

```
Set travel route
----------------
Type: SEQUENTIAL
```

■ **Use the <LEFT> and <RIGHT> arrow keys to select between the choices of "SERPENTINE", "SEQUENTIAL", or "CIRCULAR". Press <ENTER> to proceed.**



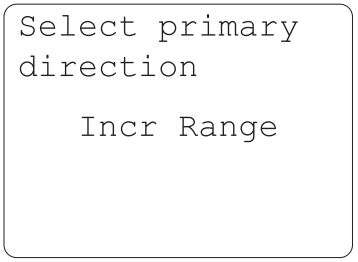
Serpentine *Sequential* *Circular*



This screen shows where you are on the field, and allows you to reposition your starting point.

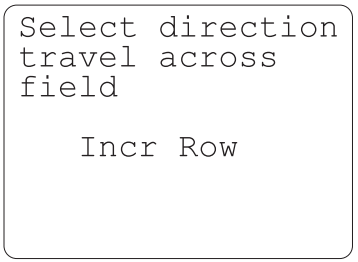
■ **Use the arrow keys to move the cursor to the desired position.**

✏ *Note: Pg ↑↓→← will move by 20's; CTRL ↑↓→← will move to the extreme ends.*



■ **Use the <LEFT> and <RIGHT> arrow keys to determine the direction of travel from plot to plot. You can choose to either increase the range or decrease the range.**

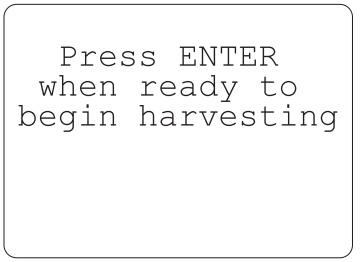
■ **Press <ENTER> when you see the desired choice.**



Now select the direction to travel across the field. Your choices here are to either increase the row or decrease the row.

■ **Use the <LEFT> and <RIGHT> arrow keys to view the selections, and press <ENTER> to make the choice.**

Harvesting



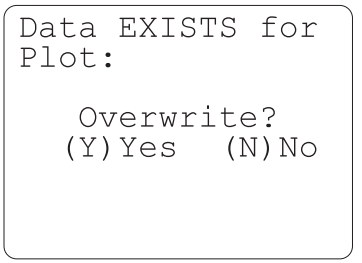
This screen lets you know it is time to prepare your machine for harvest. Follow the steps below to prepare your system for harvest:

1. Pull up to the plot to be harvested.

2. Throttle combine up without the thresher running.

3. Press <ENTER>.

4. When the doors finish cycling, throttle the combine back down to idle, start the thresher, and harvest the plots.



If the data storage cell for the plot on which you have chosen to start already has data in it, you will get this message. Choosing "N" for "No" brings back the repositioning menu.

You are now ready to harvest. When grain feeds into the GrainGage, it will automatically start cycling according to the timer and level sensor settings adjusted earlier in *Chapter 2*. The system will process the grain as long as it is being fed. You will see the number of cycles displayed as it processes.

✏ *Note: If the system does not cycle, check to make sure the level sensor probes are covered with grain. If they are, you will need to increase the level sensor sensitivity setting as outlined in* Chapter 2.

When you have finished harvesting the plot, press *<ENTER>* to tell the system to finish the plot and clear the system. A "Total" screen will appear for approximately 2 seconds and then you may proceed to the next plot.

✏ *Note: If the* <ENTER> *key is pressed when the system has not cycled at least once, zero moisture and zero test weight will be recorded. Any partial chambers will not be included when calculating moisture or test weights.*

A typical harvest sequence proceeds as follows:

1. Harvest through the plot.

2. Watch the screen on the Field Computer until it displays the second to the last count, then press <ENTER>.

3. Wait for the printer to start printing and then proceed to the next plot.

✏ *Note: Be sure to verify data between each plot.*

If a "Gate Obstruction" message occurs, place the controller in "Manual" mode and cycle the gate that has a flashing green light until it goes solid. Flip the switch back to "Auto" mode. The system will pick up where it left off and continue processing the plot.

WARNING: If an LED is NOT flashing and a gate is cycled, plot data may be adversely affected. If no light is flashing, press <F1> to bypass.

For more troubleshooting tips, refer to *Chapter 5* of this manual.

Function Keys

```
 Function Menu
----------------
1 View Help
2 Pop-up Notes
3 On/Off Notes
4 Relocate
5 Advance Paper
6 Tare Bucket
7 Edit Data
8 Show Version
9 Set Backlight
```

The function keys provide several useful benefits, most of which come in handy during the collection of data, whether it be harvest data, pre-harvest notes, or post harvest observations.

Pressing a function key on the Field Computer brings up this menu of quick action functions. The various functions are selected by pressing their respective number. For example: To "Relocate" press a function key and then "4."

✏ *Note: Some function keys are only available in certain menus (F2, F4-F7 are available only in harvest).*

View Help - F1

Context sensitive help is available by pressing <F1> for most features of the Harvest Data software.

- **Press <ESC> to get back to the activity you left when you invoked "Help".**

Pop-up Notes - F2

There is no screen for this selection. If you have toggled your notes variables off with <F3> (On/Off Notes), but need to key in a one time observation, **<F2>** allows you to do so without having to turn the notes variable on and off again.

- **Key <F2> for one time entry of a notes variable.**

On/Off Notes- F3

You must have a notes variables selected and "ACTIVE" in order for this function to work. If there are no note variables defined from your setup activities, this function will have no effect.

- **Key <F3> to toggle the notes variable on and off. Activating or having notes on will also print the notes to the printer.**

Relocate - F4

- **Key <F4> to set a new start point.**

```
  Row:  1
Range:  1

   305     306
   304     303
  >101     102
```

- **Use the arrow keys to move the cursor to the desired position.**

✏ *Note: Pg ↑↓→← will move by 20's; CTRL ↑↓→← will move to the extreme ends.*

- **Use the <LEFT> and <RIGHT> arrow keys to determine the direction of travel from plot to plot. You can choose the either increase the range or decrease the range.**

The arrow symbol (>) indicates the plot number where the next data acquisition will take place.

```
Data EXISTS for
Plot:

   Overwrite?
  (Y)Yes   (N)No
```

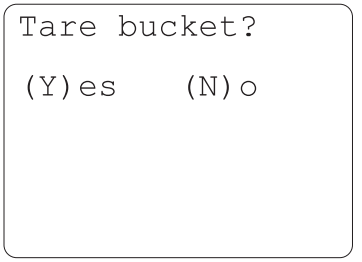
If the data storage cell for the plot which you have chosen to start already has data in it, you will get this message. Pressing <N> for "No" takes you back to the repositioning menu.

Advance Paper - F5

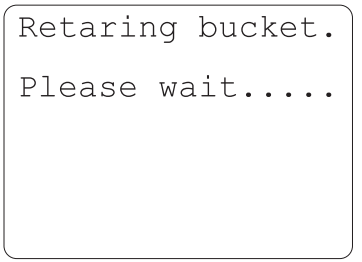
Pressing <F5> provides a line feed character over the serial port to the printer, causing the paper to advance 1/6th of an inch.

■ **Key <F5> to advance the paper in the FieldPrinter.**

Retare Bucket - F6



Pressing <F6> will bring up the retare option. Selecting yes after pressing <F6> will retare your bucket.



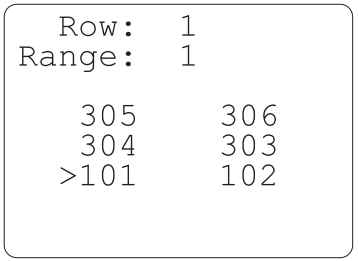
The next screen will show for a few seconds while the bucket doors open and close and a new TARE weight is being sampled and recorded.

When the limit switches are enabled you must have the air turned on to allow the gates to cycle. If the Auto/Manual switch is in "Manual" mode, the system will not tare.

WARNING*: When using <F6> to retare bucket, the moisture voltage also returns to zero. Do not use <F6> when grain is in the moisture chamber.*

Edit Data - F7

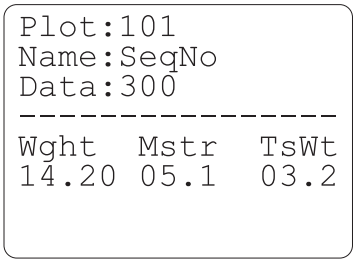
<F7> allows you to edit recorded harvest data from the keyboard. The first screen you see after pressing <F7> is a location screen.



■ **Use the arrow keys to move the cursor to the desired position.**

✏ *Note: Pg ↑↓→← will move by 20's; CTRL ↑↓→← will move to the extreme ends.*

■ **Use the <LEFT> and <RIGHT> arrow keys to determine the direction of travel from plot to plot. You can choose to either increase the range or decrease the range.**



■ **Key in the desired numbers. Pressing <ENTER> moves the cursor to the next field.**

■ **Use the <LEFT> arrow key to return to the previous field.**

Pressing **<ESC>** returns you to the positioning map. Pressing <ESC> again takes you back to the harvest data acquisition screen.

Show Version - F8

```
----------------
HDGG 3.4 28Feb01
IOS  3.5 10Apr01
FOS  3.3 10Apr01

----------------
 Press any key
----------------
```

Press <F8> to display the current HDGG-DOS software version, the current FOS (fixed operating system) version, and the current IOS (injected operating system) version.

The FOS is the operating system that is resident on the HM-400 SCCU. The IOS is on the Field Computer and is "injected" into the FOS on the SCCU when the two are connected. The IOS essentially tells the FOS how to interact with the Field Computer and other hardware.

✏*Note: You will only see the IOS and FOS software version if your Field Computer is connected to the SCCU controller.*

Set Backlight - F9

When you run the Harvest Data software, the backlight is automatically turned on.

Press <F9> to turn the backlight on and off.

```
Backlight? y/n
```

■ **After pressing <F9>, key in "Y" or "N" to turn the backlight on or off, respectively.**

✏ *Note: When using the Field Computer away from the Harvest Data System Console, turn the backlight off to conserve power since it creates a significant increase on system power drain.*

The backlight can also be controlled using the hot keys on your Field Computer. Allegro F/PC users press <GOLD> + <F3> to turn the backlight on and off and Pro4000 users, press <GREEN> + <BS>.

Transferring Harvest Data From the Field Computer

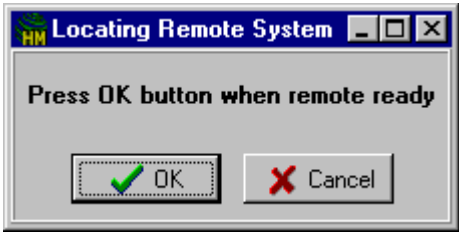
Uploading Data

Uploading data from the Harvest Data System requires a desktop computer running DataLink. Refer to *Chapter 3* for information about installing DataLink for Windows.

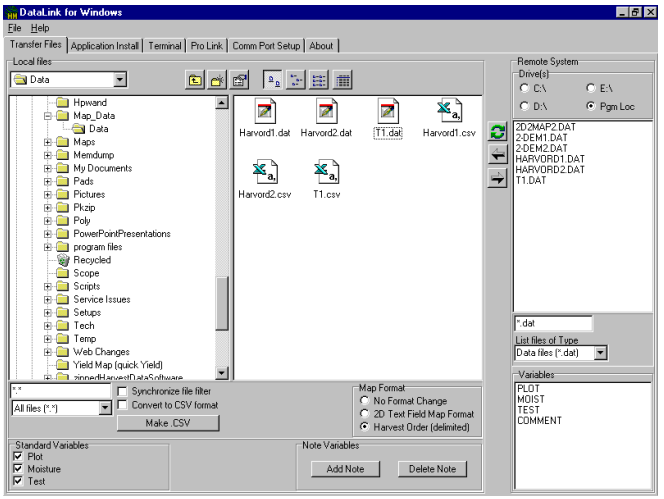
- **Connect the Field Computer to the PC's communication port and turn it ON. Make sure it boots to the main menu of the Harvest Data program**

- **Open the "Transfer Files" tab in DataLink for Windows.**

- **When the "Remote Systems" dialog box appears, click OK.**



■ **Make sure the correct drive is selected. If you have not changed your current drive in the Harvest Data Program, the default setting will be the program location (Pgm Loc).**



■ **Your data files are viewed in the Remote System box on the right side of your screen.**

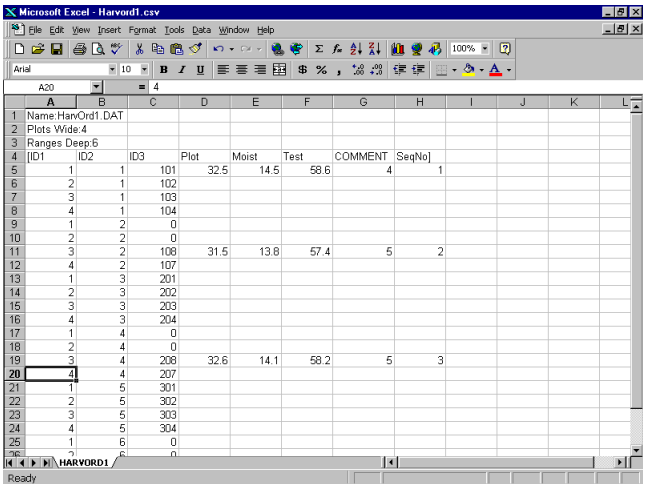
■ **Mark each file that you desire to have uploaded.**

✏ *Note: Holding the <CTRL> key down while you click on each file will allow you to mark individual files. The <SHIFT> key will enable you to mark all files.*

■ **When the "Convert to CSV" option is not selected, the system will upload the data in a standard TAB delimited TEXT format. When the "Convert to CSV" option is selected, the system will automatically open the file with any program you would like.**

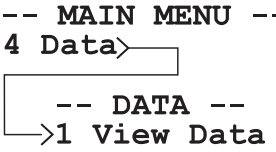
✏ NOTE: Comma separated format files can automatically be imported to Excel. Using "My Computer," it is possible to change the file types (under "VIEW") to allow your system to automatically open the file with any program you would like.

■ **When you double click the file that you would like to open, the system should automatically start the program and import the data for you like the example below.**

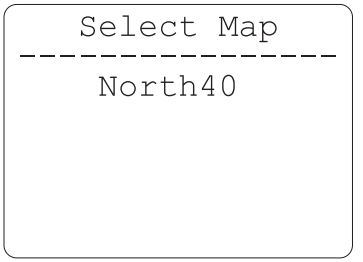


Viewing data lets you scroll back through a set of collected data using the arrow keys to move from range to range and row to row within the selected field.

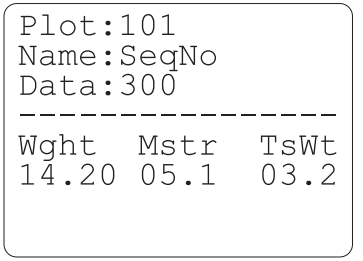
Viewing Data on the Field Computer



■ **Select "View Data" from the Data menu to view a field map on the Field Computer.**



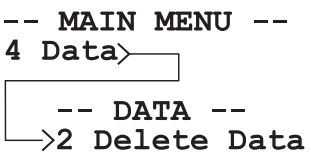
■ **Use the <UP> and <DOWN> arrow keys to scroll through the field maps available, and press <ENTER> to select the one desired.**



■ **Use the arrow keys to move range to range, and row to row through the field viewing the data. Press <ENTER> to view other variables in the same plot.**

■ **Press <ESC> when you are finished.**

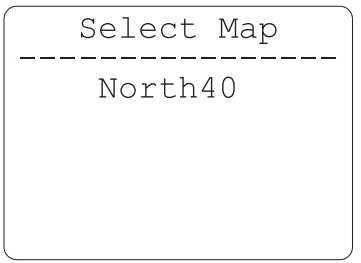
Deleting Harvest Data Files



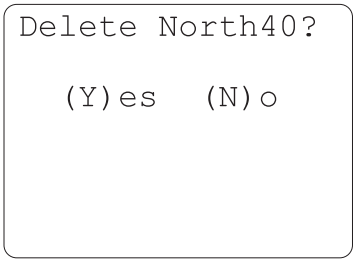
Once the data have been transferred from the Field Computer to the host PC, you can erase the data and the map if you wish.

✏ *Note: Verify that all the data have been transferred before deleting this data on the Field Computer.*

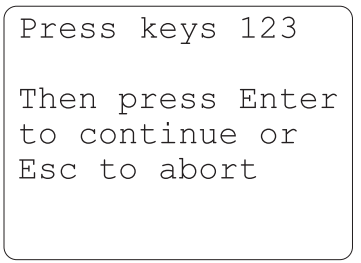
■ **Select "Delete Data" from the Data menu.**



■ **Select the file you would like to erase and press <ENTER>.**



■ **Confirm the action by pressing a <Y> for Yes or a <N> to abort.**



■ **Confirm the action one more time by pressing <1>, <2>, <3> or <ESC> to abort.**

✏ *Note: Do not be alarmed if the data file is still there. After the data file has been erased, the name of the data file remains until the corresponding field map has been deleted. If you were to edit the data, you would see that the actual data does not exist.*

Chapter 5
Troubleshooting

If you believe you have determined the reason for a problem, refer to *Chapter 2, Installation* or *Chapter 3, Software* for guidance. If it is apparent that your equipment needs to be returned to the factory for repair, an RMA (Return Material Authorization) number will need to be authorized. To receive your RMA number call our customer service department at 435-753-1881 (8 am - 5 pm MST, Monday - Friday).

Symptoms

SCCU Power Failure (No Power LED)

- Check the power cord connection to see that it is plugged into the SCCU correctly.
- Check the power cord connections and polarity to the battery.
- Check the 6 AMP circuit breaker on the back of the SCCU controller. Reset if needed.
- Check the battery voltage (should be no less than 14.0V with the combine running).

Field Computer Communication Failure with the PC

- Check to make sure that you are using the CA-2009 communications cable from HarvestMaster. Any standard RS-232 communications cable will not work. You will need a Null Modem cable to communicate with the Field Computer.
- Check the communications port that has been selected on the PC and/or Field Computer, and make sure it matches the communication port that the Null Modem cable is plugged into.
- Make sure there is no other program installed that is disabling the use of the COM port. For example, when using the Allegro F/PC, ActiveSync needs to be disabled so other program can use the COM port.
- Make sure that you are following the communication procedures correctly for the Field Computer. Refer to the Field Computer User's Manual, if necessary.
- Try the other communication port on the Field Computer to eliminate a possible hardware problem with the Field Computer.
- Try another PC to verify a possible hardware problem with the PC.

Field Computer Communication Failure with the SCCU

- Check to see that the SCCU and the Field Computer are off. Then turn on the SCCU and make sure that the Field Computer is powered up with it. When the Harvest Data program runs, the system should come to the "Main Menu" automatically without pressing any keys. Pressing <F8> should display 3 versions of software. If there is any problems with the above outlined procedures, continue with the following instructions.

- Check to see if the LED's (red and green lights) on the front panel of the SCCU are flashing in the same sequence as when it is first powered up. If they are, the IOS (Injected Operating System) did not load.

✏ *Note: If LED's are not flashing at all, and the power LED is the only one that is illuminated, the problem is in the SCCU HM-401 console. Please call HarvestMaster's customer service department for an RMA.*

- Check to make sure that the Field Computer cradle is securely plugged into the SCCU console and the bottom door is latched tightly against the bottom of the cradle.

- Check to make sure that the cradle's 9-pin connector is securely plugged into the communications port #1 on the Field Computer.

- Transfer files from the PC to the Field Computer through the communications port #1 to insure that the port on the Field Computer is operational.

- Make sure your communication ports are turned on in the setup mode on the Field Computer.

Inaccurate Moisture and Weight Readings

- Check to see that the injected operating system (IOS) is loaded correctly by pressing <F8> to show its version.

- Check the software versions on the Field Computer by pressing <F8>. Make sure that the first number on the fixed operating system FOS) is the same as the first number on the IOS.

  e.g. FOS ver. 3.xxx Dy-Mon-Yr
  IOS ver. 3.xxx Dy-Mon-Yr

  These numbers must match on both the IOS and FOS.

✏ *Note: After turning the system on, it should come to the "Main Menu" automatically.*

- Check the system control cable connection between the SCCU and the HM-420LF filter box and between the HM-42LF and the HM-1000B GrainGage. Inspect the pins on the SCCU and HM-420LF ends for damage or corrosion.

Inaccurate Weight Readings (Moisture is Fine)

- Make sure the shipping stops are disabled (see *Chapter 2, Installation*).
- Make sure the two weigh pan guide pins are installed (see *Chapter 2, Installation*).
- Check the weight calibration as outlined in *Chapter 3, Software, Weight Calibration*.
- Check each individual load cell by selecting "Load Cell" from the DIAGNOSTICS menu.

✏ *Note: LDA1 is the load cell closest to the door on the left side when facing the front of the GrainGage, LDA2 is the load cell furthest to the back , and LDB is the right load cell. To check LDA1 or LDA2 individually, one of the load cells must be disconnected.*

- Check the control cable connections for bent, broken, or dirty pins and sockets. Clean with an electrical parts cleaner or tuner cleaner as needed.

- Check the inside of the GrainGage for chaff build up or weigh pan binding.

- Check cables and hoses for weigh pan interference (must be very loose).

- Select the "Load Cells" option in the DIAGNOSTICS menu and check to see that the total load cell voltage readings are in the range of .800V (± .5V) with an empty chamber and the weigh pan is in its operation position. When a weight is placed on the chamber, this voltage should increase to a certain point and stabilize. When the weight is removed, the voltage should return to the original voltage level.

  To verify which load cell is malfunctioning, place a 4-5 lb. weight above each load cell (one at a time) and watch the total voltage. The problem load cell will not yield readings consistent with the other load cells.

  If there is no response on two or more load cells, try unplugging two of the load cells and test one load cell at time. You may plug one load cell into another port to verify that it is a load cell problem and not a cable or part of the electronics.

✏ *Note: If any adjustments need to be made or if a load cell needs to be replaced, please refer to* Appendix F, Replacing a Load Cell.

Inaccurate Moisture Readings (Weight Readings are Fine)

- Check all cable connections from the moisture sensor to the SCCU for dirt or damage.

- Make sure all of the calibration points are entered correctly and that they produce a near linear line when graphed (refer to *Calibrating Moisture* in *Chapter 3* of this manual).

✏ *Note: The combine should be running at the same RPM when calibrating as it is in the field when harvesting. This insures that there are greater than 13V supplied to the SCCU which insures a regulated voltage to the moisture sensor.*

- With an empty chamber, make sure the sensor always reads zero volts before calibration. If not, do a retare <F6>. When calibrating, an empty chamber should always produce 0% moisture (which corresponds to 0 volts).

- With an ohm meter, check to see that the sensor chamber has a good ground connection to the back plate of the moisture blade. The chamber is grounded by the two mounting screws threaded into it. If needed, run a ground strap from the back of the moisture blade to the chamber housing.

- Check to make sure the moisture sensor back plate is at the same potential as the SCCU controller. Run a 14 AWG ground wire from the sensor to the SCCU controller bracket.

- Select the "Moisture" option in the DIAGNOSTICS menu and check the relative moisture volts of each sample to see that they are stable and consistent with the calibration samples.

✏ *Note: Make sure the top chamber door is fully closed when checking the moisture voltage.*

If the moisture reading is stable and consistently lower or higher than normal, recalibration or fine-tuning of the moisture curve is advised (refer to *Chapter 3* for details).

Will Not Cycle in "Harvest Mode Only"

Warning!
Be sure to turn off the air valve on the side of the GrainGage before reaching into the chamber with your hand.

- While in the harvest mode, check the level detect by touching the two terminals on the back of the level detect sensor to start cycling the gates. If the gates cycle when touched with your fingers, pour a sample of grain through the system. Adjust the level detect threshold as needed (in the "SETUP" menu, choose "Weight/Bucket," "Set Level"; level 1 is the most sensitive, level 10, least sensitive).
- If the sensitivity needs to be set to a "1" or lower in order for the system to cycle reliably, the level sensor will need to be replaced. Please call HarvestMaster Technical Support.
- To get a moisture and test weight before exiting harvest, check to make sure grain is covering the probes. If it is press the period key to manually cycle the system until you see the probes, then press <ESC> to exit harvest.

Cycles Continuously

- Place the Auto/Manual switch in Manual mode and take note of how many counts are on the screen.
- Check to make sure nothing is shorting the probes together.

- Check the level detect "counts" in the "DIAGNOSTICS" menu to make sure they are stable. When the probes are touched with wet fingers, the reading should increase by 8-15 counts. (Refer to *Chapter 2, Installation, Verifying the Level Detector*).

- Make sure the level sensitivity is not set lower than "1". Decrease sensitivity setting (by raising the number) as needed. Setting the sensitivity lower than "1" may cause false trips and adversely affect the moisture readings and test weights.

Gate Doors Do Not Operate Correctly

- Check the System Control Cable connections for bent, broken, or dirty pins. Clean as needed.

- Check the Auto/Manual switch to make sure that it is in the manual mode. Run the actuators in manual mode.

- Make sure the Auto/Manual switch on the front of the SCCU is in Auto mode. In the DIAGNOSTICS menu run the actuators automatically, one at a time, to see if they operate correctly.

- Check to see that the air pressure is normal (50-85 PSI).

- Check for leaks in the air system.

- Check the compressor for efficiency.

- Check the air filters and coalescing filters to see that they are not restricting air flow.

- If using limit switches, disable them in the "Control" menu option to see if they are causing the actuators to malfunction. Refer to *Changing the Bucket Setup* in *Chapter 3* of this manual.

✏ *Note: Use a transition time of at least 0.3 seconds.*

- If the limit switches are the problem, enable them one at a time to find the one that is causing the problem.

- With a DC Volt-Meter, check the voltage at the solenoid to make sure that it is approximately 12V when the actuator is enabled.

Warning:
To avoid possible injury, release the air pressure to the GrainGage with the safety valve before checking the gates.

- Release air pressure using the air supply safety valve and check the gates for binding by sliding them back and forth with your hand.

- Make sure the LEDs on the limit switches correspond to those on the SCCU. (Refer to "Gate Obstruction" procedures outlined below.)

- Adjust limit switches on pneumatic actuators if needed. (See *GrainGage Gate Operation - Panel Switch Method,* in *Chapter 2* of this manual for a description of panel light indications.)

- Make sure the safety valve on the side of the GrainGage is fully open.

Gate Obstruction Error Messages

The "Gate Obstruction" error message occurs when the "close" limit switch on the top, middle, or bottom level is not detected. One or more green LED (Light Emitting Diode) on the HM-401 SCCU will be flashing to let you know the gate that did not close.

When getting "Gate Obstruction" messages that cannot be corrected, HarvestMaster recommends that you disable each of the "close" limit switches and use a .3 second timer. There is very little risk in doing this since the "open" limit switch will detect any drop in air pressure and gate malfunctions.

■ **Follow the steps outlined below to see if the "Gate Obstruction" message is an actual obstruction or simply a faulty or misadjusted sensor:**

1. When you receive an error message, an LED on the front panel of the HM-401 SCCU should be flashing. Observe which LED this is (Plot "Open" or "Closed", Test "Open" or "Closed", or Hopper "Open" or "Closed").

2. Remove the front cover of the GrainGage and check the open or closed limit switch of the gate that corresponds to the flashing LED on the front panel of the HM-401 SCCU (Plot, Test, or Hopper) to see that it has been triggered. A red light inside the limit switch will illuminate if it has been triggered.

3. If the limit switch has been triggered (light ON) and the LED on the front panel of SCCU is still flashing, gently move all the cable connections between the limit switch and the back of the SCCU to see if it will stop the flashing LED.

4. If it does not stop flashing, unplug the limit switch that is causing the problem by using the white Molex connector closest to the limit switch.

5. When the switch is plugged back in, the LED on the front panel of the HM-400 system should stop flashing.

If you completed step 5 and the LED stopped flashing; you have experienced a false message that can be corrected by a software update (IOS Version 3.3 or later). Contact HarvestMaster for this update.

If the limit switch light is not ON:

A. Check for an Obstruction:

✏ *Note: Vines, trash, a corn cob, or a corn stock may have gotten in the way of the gate closing (the top gate would be most likely).*

1. Place the Auto/Manual switch into Manual mode and then open and close the gate that is flashing repeatedly until the LED is steady.

2. When all the LEDs are steady, flip the Auto/Manual switch back to Auto mode and the system should start where it left off automatically.

3. If the LED continues to flash, check to see if the gate is closed all the way (compare it to the other gates).

4. If it is not closed, turn the air off with the valve on the outside of the GrainGage and reach your hand down through the grain to see if you can feel what could be obstructing it. Remove the obstruction.

B. Check the air pressure to make sure it is between 50-85 PSI:

Warning:
Only cycle the gate that is flashing! If others are cycled it could result in a lost plot!

1. While cycling the GrainGage, check the air pressure to see that it does not drop below 50 PSI.

✏ *Note: Operating pressure should be between 50 and 85 PSI. Closer to 50 PSI when above 60 Deg Fahrenheit and closer to 85 PSI when below 60 Deg. Fahrenheit.*

2. If necessary, adjust the pressure by pulling down on the lower housing of the pressure gauge on the pneumatic conditioning center and turning it clock-wise (tighten) for more pressure, and counter-clockwise (loosen) for less pressure.

C. Check for a binding gate:

1. Turn the air pressure off using the control valve on the side of the GrainGage.

2. Slide each gate back and forth with your hand. Feel for any binding on each level.

✏ *Note: There will be a slight restriction when starting to close the gate. This is because the gate must push by the bristles of the brushes used to clean the gates. This is completely normal.*

3. If the gate feels tight, blow high-pressure air through the brushes (both sides) to loosen it.

4. Push dry graphite into the slides of the gate to keep any wet debris from accumulating. This should also be done at the beginning of each season.

D. Check for a leaking or faulty actuator:

1. Listen for air leaking out of the ends of each cylinder. If there is air leaking, the cylinder will need to be replaced.

2. Turn the air pressure off using the control valve on the side of the GrainGage.

3. Disconnect the gate from the cylinder ram.

4. Slide the cylinder ram back and forth while taking note of any rough, scared, or dry movement. The cylinder will need to be replaced if there is not a very distinct smooth stroke both open and closed.

E. Check limit switch adjustments:

1. Turn the air pressure off using the control valve on the side of the GrainGage.

2. With your hand, gradually push each actuator to its fully open and fully closed positions very slowly.

3. When the LED comes on for the limit switch, stop immediately.

4. Next, measure the distance that the gate moves to the fully open or the fully closed position. It should be 1/4" ± 0.1". Do this for all three levels.

✏ Note: If the small light within the limit switch is on and the close LED is still flashing on the HM-401 SCCU, there is a possible connection problem between the limit switch and the SCCU. Check all connections including the system control cable and limit switch Molex connector. Clean these connections, if necessary. It is very easy to swap limit switches with another level to see if the problem follows the limit switch. If the problem follows, it is probably due to the SCCU controller, control cable, or GrainGage harness. If the problem does not follow, then it is probably due to the limit switch or its connector. Wiggle all the cables while watching the SCCU's flashing LED. If the LED stops flashing intermittently, you will have found the problem area.

5. If the limit switch does not respond at all, the same procedures as outlined above can be followed (swapping the limit switch with one from another level).

F. Check air cushion adjustments:

1. Place the Auto\Manual switch on the HM-401 SCCU in Manual mode and open all of the gates.

2. For each gate, push the red button on the top of each electronic solenoid and watch the open and close stroke of the gate for air restriction or a bouncing effect.

✏ Note: Check to see that the actuator has an air cushion on each end. Make sure that it opens and closes without a rebounding bounce when it hits the end of the actuator on both ends. If the actuator slows at the end of the stroke and creeps forward, it has excessive air cushion and needs to be backed off.

3. If the actuators need adjusted, there is an adjusting screw on each end of the actuator (Open and Close adjustments). Adjust this screw out, in 1/4 turn increments, for less cushion and in for more air cushion.

✏ *Note: Be sure to adjust the screws when the gates are cycling. If the gates cannot be adjusted properly, the actuator cylinders will need to be replaced.*

Check Compressor Error Message

The "Check Compressor" message occurs when an "open" limit switch on the top, middle, or bottom level is not detected. One or more red LED on the HM-401 SCCU will be flashing to let you know of the gate that did not open. The same procedures used for "Gate Obstruction" messages can be followed. Simply substitute the word "open" in place of "close."

Compressor Runs, But Air Pressure Fails to Build

- Check to see if the leak is inside or outside the GrainGage by closing the safety valve on the side.
- Ensure that the air hoses are seated completely in the push-in sockets both inside and outside the GrainGage.
- Check for damaged pneumatic tubing or loose fittings.
- Using soapy water, check for leaks around the Pneumatic Conditioning Center component and connections.
- Check the air compressor efficiency.

Electric Compressor Fails to Run

- Check to see that the SCCU is turned on.
- Check the compressor fuse on the electric compressor control cable near the GrainGage (30 amps).
- Check the compressor relay control wire from the GrainGage to the relay to see if there is voltage across the relay coil (replace relay if needed).
- Listen for the relay on the PCC to switch on and off as the power on the SCCU is toggled (replace relay if needed).
- Check the control cable connection from the SCCU to the GrainGage and inspect the pins and sockets on each end.
- Check to see that the compressor is correctly wired (refer to *Chapter 2, Installation*).
- Check the voltage at the compressor (+12VDC). Repair or replace the compressor if needed.

Printer Does Not Respond (Power LED is OFF)

- Make sure the SCCU power is turned on.
- Check the cable connections to the SCCU to make sure they are not loose or damaged.
- Check the printer mounting screws to make sure that they are tight.

Printer Does Not Respond (Power LED is ON)

- Run the self test and check the parameter settings as outlined in *Chapter 2, Installation, Printer Test and Setup*.
- This is a sign of a printer hardware failure and may need to be sent in for repair.

If you have performed all of the necessary troubleshooting steps and your system is still not operating correctly, please contact our Customer Service Department at 435-753-1881.

Chapter 6
General Care and Warranty

Maintenance

Harsh Weather

If your Harvest Data System console is mounted in a location that is exposed to the elements, we recommend removing or covering the Harvest Data System console during inclement weather. If the winter in your area is quite cold, remove the Harvest Data System console during cold months. It is best to store your system in a warm, dry environment.

We recommend that the Harvest Data System be returned to the factory once every two or three years (depending on field usage) for recalibration and a system check up.

SCCU

The electronics console can be left on the combine if it is enclosed in a cab; however, we recommended the SCCU console be stored at a temperature above freezing. For combines that are stored outside, it is recommended that you remove the console and store it inside. You should cover any open connectors that are exposed to the outside elements.

Printer

The printer mechanism should last about three years under heavy usage. When the printer mechanism fails, you will need to have a new print head installed. Contact HarvestMaster's Customer Service Department for an RMA (Return Materials Authorization) number before sending the printer in for repair.

Be sure to mount the printer on a flat surface (no greater than 10 degrees of angle) to avoid failure of the take-up assembly.

The printer's cartridge ribbon needs to be replaced when the printing becomes faint or difficult to read. For instructions on replacing the cartridge ribbon, refer to *Chapter 2, Installing a Ribbon*.

Field Computer

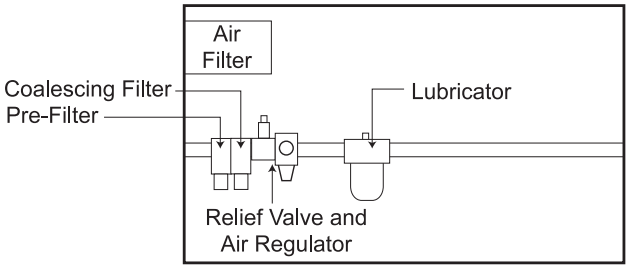
The Field Computer is a factory-sealed unit. There are no internal, user-serviceable parts. If the Field Computer is opened or in any other way tampered with , the system should be sent back to the factory for inspection.

The PC card cover and battery door (Allegro Field PC only) allow the unit to be exposed to the elements. Operation without these doors or with these doors not properly fastened will void all warranties associated with the unit. Make sure all doors remain intact and secure during operation or storage.

The plastic keyboard cover can be removed from the Allegro F/PC for periodic cleaning. Please see the Allegro F/PC User's Manual for more detailed instructions.

During the off season, we recommend you store the Field Computer in a clean, dry environment.

Pneumatic Conditioning Center



Filters

If you are using the Solberg compressor air filter, you will need to check this filter 2-3 times per week. We recommend replacing this filter rather than blowing it out. Replace the filter yearly or as needed.

✏ *Note: A dirty air filter can cause premature compressor failure and loss of efficiency. When available, we recommend running the air intake from your compressor to the combine filter.*

The pre-filter element is located to the far left of the pneumatic conditioning center when facing it. This filter should be replaced when discolored or yearly (whichever comes first).

The coalescing filter is located to the right of the pre-filter. This filter should last much longer if the other filters are maintained properly. It is recommended to replace this filter once every 2-4 years.

To remove the prefilter or coalescing filter, follow the steps below:

1. Drain the air pressure.
2. Turn the housing bowl 1/4 turn counter clockwise (when looking at the bowl from the bottom up).
3. Wiggle the bowl back and forth while pulling down on it until the bowl pops off.
4. Unscrew the filter and remove it from the assembly. The plastic nut on the prefilter assembly will need to be reused.

✏ *Note: Be careful not to use too much force when pulling off the bowl. This may crack or break the fins on the pre-filter housing. When re-assembling, you may want to apply a thin coat of grease to the O-ring and plastic tabs for ease of installation.*

When installing the new filters, be careful not to overtighten them, but make sure they are secure. To insert a new filter, follow the steps below:

1. Clean the bowl assembly thoroughly and check the auto drain piston for functionality (replace if necessary).
2. Push the bowls on securely and turn 1/4 turn clockwise to lock into place

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

The lubricator is located to the right side of the pneumatic conditioning center. Periodically check the bowl to see that the oil level is up. Replace the oil yearly.

To remove the bowl, follow the steps below:

1. Drain the air pressure.
2. Pull down on the plastic lock and turn it counter clockwise.
3. Remove the bowl.
4. Clean and refill the bowl to the fill level as indicated on the metal shroud.

✏ *Note: Do not overfill the lubricator. This will cause it to malfunction and it will not provide the proper lubrication to your cylinders.*

The lubricator is preset at the factory for proper lubrication. If you need to set the oil flow, simply turn the set screw on the top of the bowl completely in (it will be inset about 1/4") then unscrew it 3.5 turns.

✏ *Note: When adjusted properly, the sight glass on top of the lubricator will show approximately 1 drop of oil every 10 cycles.*

WARNING: Too much oil will cause premature air cylinder or solenoid failures. It is better to have too little oil than too much. Be sure the oil is not injecting more than 1 drop per every 10 cycles.

GrainGage
Before Harvest

■ **Go through the following checklist to prepare the GrainGage for the harvest season:**

1. Clean combine battery terminals to assure a good power and ground.
2. If the three shipping stops are lifted, make sure that they are loosened completely to allow the weigh pan to rest on each load cell freely.
3. If your system is stored in a shed during the off season, inspect all cables for mice damage.
4. Clean all connectors between the sensors (Moisture, Load Cells, Level Detect, and Limit Switches) and the SCCU Controller with quality, non-residue, electronics grade cleaner/degreaser.

✏ *Note: There should not be a lot of oil residue in the GrainGage. If there is, it should be wiped clean and the lubricator should be adjusted properly (see general care instructions for the lubricator earlier in this section).*

5. Make sure all cables are locked into place securely and not interfering with the weigh pan assembly.
6. Make sure all cable thumbscrews are securely tightened. Moving cables should not affect the moisture or weight readings.
7. Replace the prefilter (white).
8. If you are using the Solberg air filter, replace it. Check this filter periodically during the season and replace again as necessary.
9. Replace the Coalescing filter every 2-4 years.
10. Check the lubricant level. Do not overfill past the fill line. Anti-Freeze lubricant should be used if freezing temperatures are expected.

11. Make sure the lubricator is functioning properly (see general care instructions for the lubricator earlier in this section).

12. Check all actuators and slides for proper function and adjustment. If needed, lubricate the slides with dry graphite to minimize gum or chaff buildup.

✏ *Note: Do not use any wet lubricants on the gate assemblies.*

13. Check all limit switches for proper function and adjustment.

14. Check compressor efficiency and pressure. Check for air leaks by making sure the system stays pressurized when it is shut off.

15. Setup software (if needed) and check calibrations.

During Harvest

During harvest, the inside of the GrainGage housing should be checked periodically for chaff and broken grain kernel buildup. The system should be blown out using high pressure air as needed. To reduce the accumulation of wet debris, push some dry graphite into the slides of each level during the harvest season.

After Harvest

■ **Go through the following checklist when the harvest is completed:**

1. Make sure any standing water in the pneumatic filter bowls is drained.
2. Disconnect the air hose from the GrainGage and let the air run free-flow for at least 5 minutes to ensure all moisture is out of the lines.
3. If the combine is not protected from the weather, the SCCU controller should be removed and stored in a clean and dry environment. If the combine is stored in a shed, the SCCU controller should be covered with plastic to keep it clean.
4. Cover any exposed cable ends and connectors with plastic bags and secure the bags tightly with twist-ties or rubber bands.
5. Place mice poison or traps in areas where mice might appear.
6. With an air blower and high pressure air, blow all chaff and broken kernels out of the GrainGage. Be sure to get behind the grain shoot and around the back of the load cells
7. If the combine is not protected from the weather, the GrainGage should be covered with a heavy grade plastic or tarp to keep moisture out of the system.
8. Print, save, and upload the current setups for your system.
9. Print all usable moisture curves.
10. Upload any data that has not been saved.
11. Store your Field Computer in a clean, dry environment. The programs and data will be safe on the non-volatile disk.

GrainGage Cold Weather Operating Tips

If you are operating in temperatures below 35° Fahrenheit, you will want to check the following things:

1. Close the air shut-off valve on the side of the GrainGage and open all of the gates so the ram is inside the cylinder.

2. Store the GrainGage in a shop or cover it with plastic or a tarp to keep it away from the outside elements.

3. Open the valve on the side of the GrainGage and let the compressor run free-flow for at least 5 minutes before letting it sit overnight. This helps clear out any residual moisture in the filters and bowls. The coalescing filter and pre-filter can be taken off each evening and re-installed each morning, if necessary.

4. Increase the air pressure to between 75 and 85 PSI if operating temperatures are below 35° Fahrenheit.

5. Use a special combination of anti-freeze and a synthetic lubricant in your lubricator. We recommend using Kil Frost's Anti-Freeze Air Line Lubricant. This pneumatic tool anti-freeze lubricant can be purchased from HarvestMaster or most air tool retail stores.

Compressor

Both the electric 12VDC compressor and the mechanical belt-driven compressor are maintenance free. Do not oil these compressors. They have sealed bearings and do not require periodic lubrication.

To increase life expectancy, mount the compressor in an area away from the bulk of dust and debris (i.e. in a box, under a shield, or near a fan).

Remember to check the rotation speed of the compressor. Rotating the compressor in excess of 2000 RPMs will result in premature failure.

Return Procedure

In the event that your Harvest Data System needs repairs, contact HarvestMaster's Customer Service Department 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. 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. 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. Package the unit properly to avoid shipping damage. Write the RMA# on the package you ship. Your equipment will be repaired and returned to you. After receiving your repaired equipment, you will 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.

Limited Warranty

Hardware

All products manufactured by HarvestMaster, 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 HarvestMaster within the one year period, HarvestMaster will at its option repair the defect or replace the defective product. HarvestMaster's obligation hereunder will be limited to such repair or replacement. The customer shall have the responsibility to ship the defective equipment to HarvestMaster with all cost of shipment prepaid. After repair or replacement HarvestMaster will, at their own expense, ship the replacement or repaired item back to the customer using the same type of carrier.

Software

Software products which are designed by HarvestMaster for use with a hardware product, when 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 HarvestMaster receives notice of such defects during the one year warranty period, HarvestMaster shall, at its option, repair or replace the defective 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 HarvestMaster 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 HarvestMaster 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 HarvestMaster, whether written, oral or implied. HarvestMaster 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. HarvestMaster specifically makes no warranties as to the suitability of its products for any particular application. HarvestMaster 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

HarvestMaster 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 HarvestMaster or other direction supervision thereof.

Removal of Serial Number

Removal of the HarvestMaster serial number label from an instrument will void any warranty on the said instrument. HarvestMaster 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

HarvestMaster offers a variety of warranty options to extend coverage beyond the standard warranty. Contact HarvestMaster Customer Service Department for details.

Appendix A
Specifications

Measurement Performance

This chapter provides specifications for the components of the Harvest Data System. For specifications on your Field Computer, refer to the Field Computer User's Manual.

Grain Moisture

Repeatability: Typically ±.5% given constant density and temperature of sample.

Accuracy: Typically ±1%; dependent upon accuracy of user calibration using samples of known moisture content.

Weight

Range: 0-45%

Accuracy: Load cells and electronics measure to within .1% of load cell full scale range (e.g. using a 100 lb load cell, measurements will be accurate to within .1 lb).

✏ *Note: Weight measurement accuracy may be degraded due to friction of weigh bucket against stabilizing guides, etc. and by motion of the weighing platform. The Harvest Data System software has a user-adjustable option ("Weigh Time") that will allow up to a 5 second running time average of weights to minimize measurement error due to platform motion.*

Data Storage

8 M, 16 M, or 32 M RAM, ATA Flash Card, or PCMCIA card option.

Load Cell Capacities

3 Load Cells @ 5 kg. (11.023 lbs.) each.

System Power Requirement

12 volts DC (automotive)
.5 amp typical
6 amp maximum (depends on actuators being driven)

Physical Dimensions

SCCU Size: 12" x 8.75" x 7.75"

Environmental

Operating Temperature Range

System: 0 to +50° C (+32 to +122° F)
Printer: +5 to +45° C (+41 to +113° F)

Storage Temperature Range

System: -20 to +70° C (-4 to +158° F)
Printer: -20 to +70° C (-4 to +158° F)

Humidity Range

0-95% relative, non-condensing

Accessories

Load Cells

Temperature range: -18 to +66° C
(-0.4 to +151° F)

Cable length: 20’

Moisture Sensor

Temperature range: 0 to +45° C
(+32 to +113° F)

Cable length: 10’

Pneumatic Tool Lubricant

Ingersoll-Rand:

Class I air tool lubricant / non-synthetic
Petroleum based
CAS# 64742-65-0
SAE-10 (90SSU)
Safety Data Sheet available upon request

Kil Frost Pneumatic Anti-Freeze Lubricant:

SAE-10 (90SSU)
Safety Data Sheet available upon request

✏ *Note: Kil Frost is not an additive! It should not be mixed with ordinary tool oils and the tool reservoir must be emptied before use so that its de-icing & extreme pressure properties are not impaired.*

Printer

Interface-Serial	BAUD rate - 2400 (300, 600, 1200, 2400, 4800, 9600, 19200 available) Voltage Levels - RS-232C: -9 to 9V Busy Signal - Clear to Send (CTS) 20mA current loop
Character	1.5 Kb
Buffering	Impact dot matrix
Print Method	24 Column: 12.8 Characters/inch 32 Column: 17 Characters/inch 40 Column: 21 Characters/inch
Character Spacing	130 lines per minute for 24 column 110 lines per minute for 32 and 40 column
Print Speed	Tabletop: 2.25”Wx2.75”D;0.44” I.D. Large Roll - 12,500 lines Small Roll - 3,000 lines
Paper	1.5 Watts (idle), 15 Watts maximum while printing
Power DC Voltage	Optional 9-12 VDC 140 mA idle, 1 amp with 100% printing, 5.5 Amp peak with 100% printing

Print Head Life 1,500,000 lines mean character before failure.

Ribbon Life Black - 200,000 characters
Purple - 250,000 characters

Communications

Wiring Diagram

Pin #	Signal	DTE Direction	Description
2	(TD) Transmitted Data	From Printer	Printer data output line.
5	(CTS) Clear To Send	From Printer	Signal (equivalent to BUSY) indicating that the printer is ready for operation and can receive data.
7	(SG) Signal Ground	-----	Signal Ground
9	(PTV) Paper Take-up Volt.	To Printer	Paper Take-up solenoid supply voltage.
10	(D01) Digital Out	To Printer	Digital output pulse to control the paper take-up.
12	(PTG) Paper Take-up Grnd.	-----	Pins 12,19, and 25 are Paper Take-up Ground.
19	(PTG) Paper Take-up Grnd.	-----	
22	(PTG) Paper Take-up Grnd.	-----	
25	(VSB) +12 Volt Print Supp.	To Printer	Printer Supply Voltage (12 VDC).

Appendix B
DataLink for DOS

Personal Computer Support Software for HarvestMaster Products

Description

In order for your Field Computer to communicate with your personal computer, you need to execute a terminal emulator program on your PC. DataLink is designed as a field partner for your Field Computer and your personal computer. It is a communications software package which allows your computer system to act as a smart terminal to a Field Computer, and lets you transfer files between your computer and your Field Computer

DataLink saves you time setting up your data collection system because the software you purchase is specific to your computer. In most cases, you will need to load the DataLink program, add utility routines, and set several user-defined parameters before you can download data.

System Requirements

DataLink for DOS requires 2 MB of hard disk space on a DOS (version 2.1 or higher) based computer with at least 512 KB of system RAM. It is not executable from floppy diskettes.

✏ *Note: If you are using Windows 95/98/NT, refer to* Chapter 3 *to install DataLink on your desktop PC.*

Installation

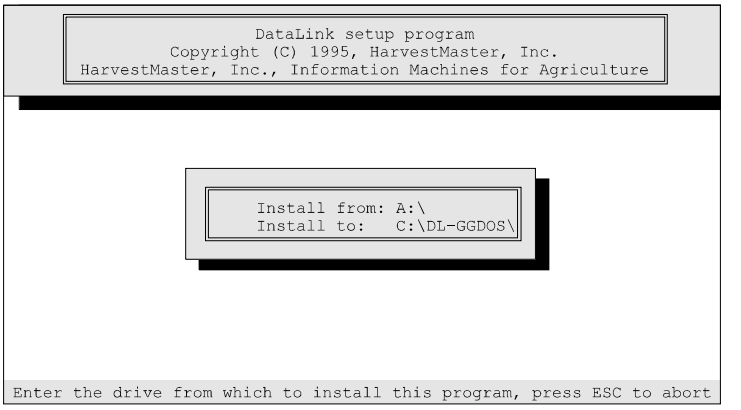
DataLink is distributed on a single 1.44 Mb 3½" diskette. Installation instructions are listed below (they are also on the disk label for your convenience).

1. Insert the Disk in drive A: or B: of your PC.

2. If you're in Windows, exit to a DOS prompt and change to drive A or B by typing "A:" or "B:" then pressing **<ENTER>.**

3. Type "Setup" then press <ENTER> to initiate the installation procedure

4. The setup screen shown below will appear. The "Install from:" line should show the drive where the HDGG-DOS installation disk is located.



DataLink Setup Screen

The "Install to:" drive and directory is, by default, set to install on your hard drive under the DL-DOS directory. It should read similar to the example below:

✏ *Note: You may change the drive and directory name where the DataLink program will be installed. To do this, press the down arrow to highlight the "Install to:" line. Type in the drive and directory name to which you wish to install the DataLink software.*

5. Press <ENTER> when the "Install from:" and "Install to:" locations are set as desired.

6. A display window appears, displaying files being installed on your hard drive. When DataLink has been successfully installed, a "Program Installed" window appears.

```
Program Installed
Press any key
```

7. Press any key to continue.

8. You will be returned to the DOS prompt where DataLink resides (in most cases this is C:\DL-GGDOS or D:\DL-GGDOS). If you are in another directory, you can change directories by typing *cd* <ENTER> and then *cd DL-GGDOS* <ENTER>.

9. To run DataLink, type *DL* then press <ENTER>.

The title screen appears briefly and then advances to the DataLink Main menu. To make the title screen disappear immediately by press the <Space Bar>.

Introduction to DataLink

DataLink is, as the name implies, your link to the data stored on the Field Computer You may *upload* data (transfer data from the Field Computer to the PC) or *download* data (transfer data from the PC to the Field Computer) using DataLink. DataLink lets your PC and Field Computer communicate via the serial communication cable (model # CA-2009). The communication cable connects your remote data collection unit to your desktop PC, and DataLink is the communication software that allows the Field Computer and PC to communicate.

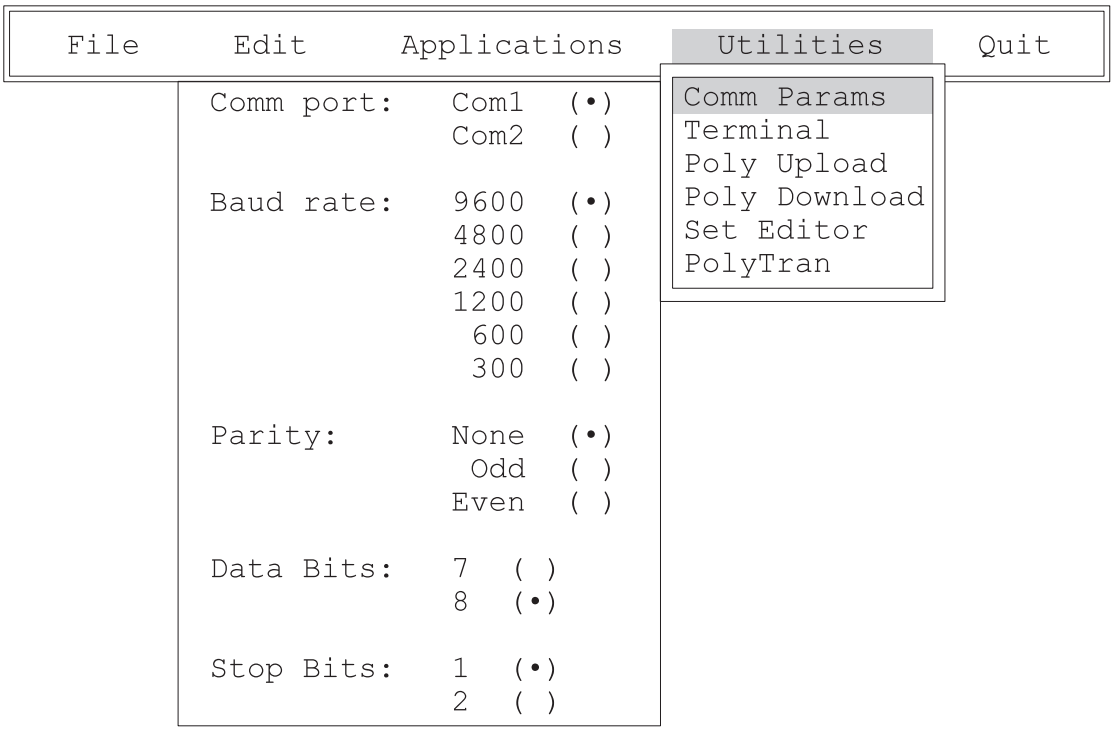
DataLink Menu Overview

Using the arrow keys or striking the key of a letter that is highlighted on the display moves you to another option. Pressing <ENTER> completes the selection and pressing <ESC> cancels the selection and/or moves you to the previous menu. The banner on the bottom line of the screen contains further instructions.

DataLink Menu Bar

Following are the sub categories of activities under each of the main menu items. The sub-categories are discussed in the order you will use them during a typical usage scenario.

Utilities Menu



Com Params

This option allows you to set the communication parameters on your PC. The <UP> and <DOWN> arrow keys will allow you to move from sub-item to sub-item. Pressing <ENTER> moves you to the next item in the menu.

✏ *Note: If any changes are made, each of the items will need to be entered using the <ENTER> key to save the data. Pressing <ESC> aborts without saving the changes.*

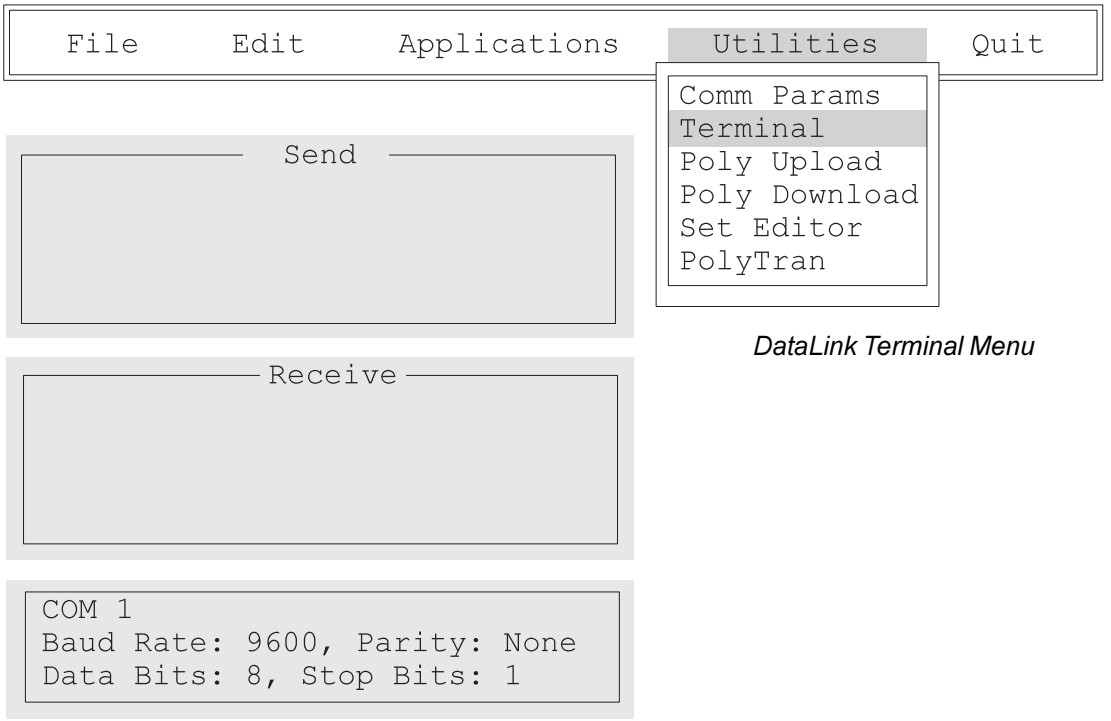
■ **Set the "Com Port" by moving the solid dot within the parenthesis, to "Com1" or "Com2."**

✏ *Note: On most PC's the nine pin male connector is Com1 and the 25 pin male connector is Com2.*

Generally, for all Harvest Data applications the baud rate, parity, data bits, and stop bits will stay at the default setting (9600, None, 8, &1). If you need to change these settings do so in the same way you changed the com port.

Terminal

This option tests the communication between the Field Computer and the PC.



DataLink Terminal Menu

■ **When the TERMINAL option is entered, there will be three boxes on the display (as shown in the figure above).**

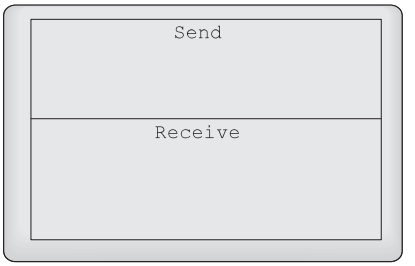
The "Send" box will display any characters sent to the Field Computer and the "Receive" box will display any characters received from it. The "Comm Parameter" box displays the current communication parameters.

■ **To ensure that your Field Computer and PC are communicating, follow the steps below:**

1. Plug the CA-009 (25 to 25 pin female), CA-009-9 (9 to 25 pin Female), or the CA-2009 (9 to 9 pin female) communication cable into the Field Computer com port (Com1 or Com2).

By loading DataLink on the Field Computer (or any other terminal communications package), it is possible to send characters back and forth to insure proper communications before loading any files. To use this option, both the computer and Field Computer will need to be set up in terminal mode.

2. On your Field Computer select "Terminal" mode under the Diagnostics menu.



   Terminal mode brings up a screen with 2 windows, similar to the screen on the PC.

3. Key in a test message on the Field Computer. It should appear in the "SEND" box on your Field Computer display and in the "RECEIVE" box on the PC.

4. Key in a test message on the PC. It should appear in the "SEND" box on your PC and "RECEIVE" box on the Field Computer.

If these messages do not appear on both displays, refer to *Chapter 5, Troubleshooting*.

✏ *Note: The Terminal mode is used mainly for troubleshooting communication problems.*

Poly Upload

Upload an ASCII text file from the HM-1 or HM-2 FieldBook. This option is used to upload data to the HM-1 or HM-2 FieldBook. Please refer to the HM-1/HM-2 Users Manual for further information.

✏ *Note: This option is not used with DOS Field Computers such as the Pro2000 Field Computer.*

Poly Download

Download a Polycode executable file or other ASCII text file to the HM-1 or HM-2 FieldBook. This option is generally used only by programmers writing their own applications. Please refer to the HM-1/HM-2 User's Manual for further information.

✏ *Note: This option is not used with DOS Field Computers such as the Pro2000 Field Computer.*

Set Editor

Set the path and file name of the ASCII editor of your choice. The editor is defaulted to the DOS editor (EDIT). To change the default, type the complete path and executable name of the editor that you prefer (e.g. c:\brief\b.exe).

Poly Tran

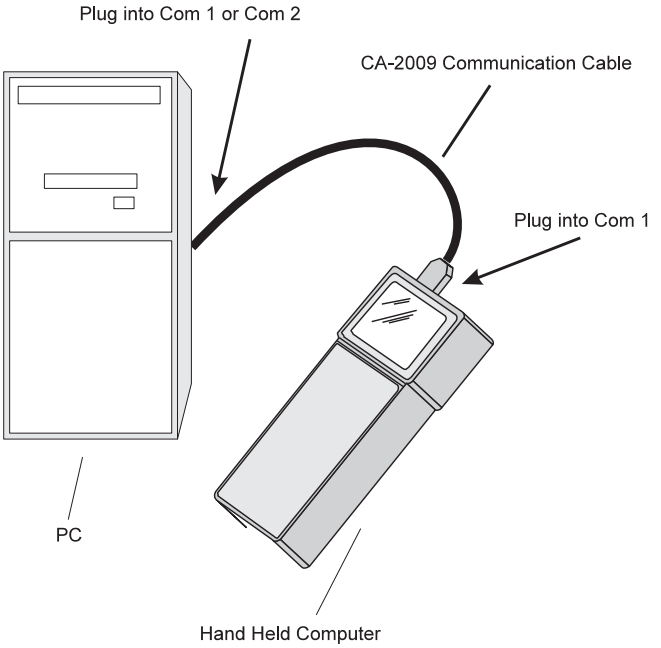
Polycode language compiler for the HM-1 and HM-2 FieldBook Field Computer Please refer to the HM-1/HM-2 FieldBook Users Manual for operating instructions.

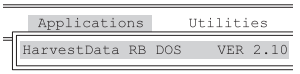
✏ *Note: This option is not used with DOS hand held computers such as the Pro2000 Field Computer.*

Applications Menu

This menu option allows you to install the software application of your choice into the Field Computer. To do this complete the steps below:

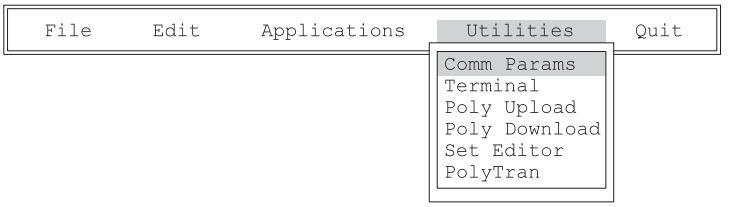
1. Connect the PC to the Field Computer using the communications cable. To do this, plug the communications cable into one of the serial ports on your computer (preferably COM1).





✏ *Note: DataLink automatically defaults to communicating via the PC's com1 port. If you have a mouse or other external device connected to COM1, you will need to use COM2. If you choose to use the COM2 port, change the communication parameters in the Utilities menu (refer to* Com Params *earlier in this chapter).*

DataLink Utilities Menu

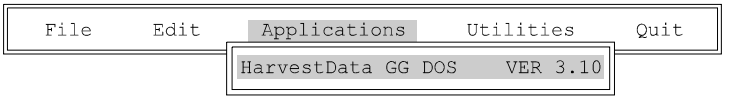


2. Use the left or right arrow key to move the highlighted cursor to the applications menu.

✏ *Note: You may also press the highlighted letter in a menu title to move to that menu (Example: Press* <A> *to go to the Applications menu, press* <Q> *to quit, etc.).*

3. Once the Applications Menu is highlighted, press <*ENTER*>. A drop-down menu appears displaying Harvest Data GG DOS. This is the application to be downloaded to the Field Computer

DataLink Applications Menu

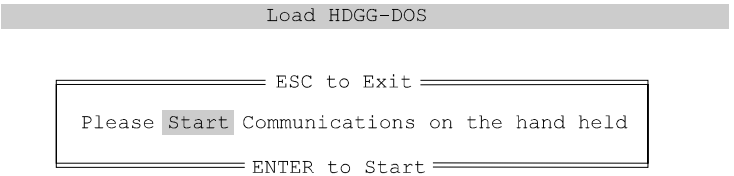


✏ *Note: Pressing* <ESC> *sends you back to the previous menu, so if you make a mistake in one menu and accidentally press* <ENTER>*, pressing* <ESC> *takes you back to the previous menu.*

4. Press <*ENTER*> to prepare DataLink to download the Harvest Data GG DOS software.

5. DataLink prompts you to select a language. Use the up or down arrow key to highlight a language. Press <ENTER> when finished.

6. DataLink now displays the following message:



7. To prepare the Field Computer to receive the Harvest Data GG DOS software, turn it on by pressing the <ON/OFF> key.

8. For specific instructions on how to transfer files with your Field Computer, consult the Field Computer User's Manual. For the Pro4000 FieldBook, you will want to type "PS" to run PolyShell followed by <*ENTER*>.

9. Press <F5> Xfer, then <F4> Recv on the Field Computer and then immediately press <ENTER> on your PC. This tells the Field Computer that you wish to 1) transfer information; and 2) receive (rather than send) the information being transferred. Pressing <ENTER> on your PC tells the PC to transfer the information.

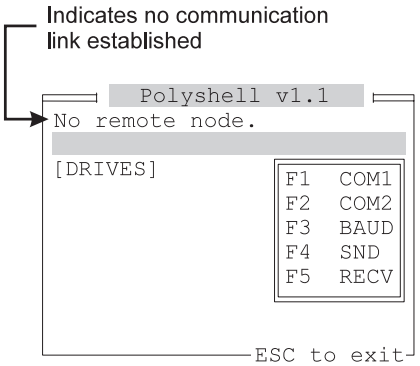
✏ *Note: After pressing <F4> on the Field Computer, you have 30 seconds to commence the data transfer process by pressing <ENTER> on the PC. If you wait for more than 30 seconds, the Field Computer will "time out" and close down the communication channel. To re-open this channel you must press <F4> again.*

10. DataLink briefly displays the message below:

```
PCLink v.1.0  <<PC Version>>
Omnidata International, Inc.
Connected.
```

This is followed by a list of the files being sent. The Field Computer simultaneously displays the files being received. When the transfer process is complete, you are returned to the DataLink main menu on the PC. The Field Computer remains in PolyShell, displaying the newly acquired file names.

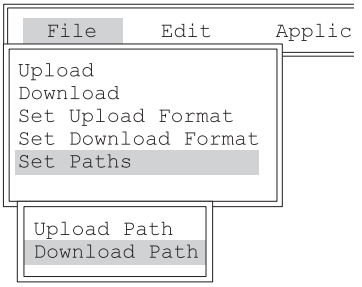
If the Field Computer and the PC did not transfer information, the Field Computer will display the "no remote node" message below:



In this case, your communication parameters probably need to be changed. Refer to *Com Params* earlier in this chapter. Then return to the beginning of this section (*Applications Menu*) to download the Harvest Data software.

File Menu

Set Paths



Set the paths to the Upload and Download directories.

Download Path: Sets the path to the directory where the file to be downloaded is located. This option allows you to store data and map files in a subdirectory you designate, so as not to merge them in the same directory as the program files.

E.g. C:\DL-DOS\DNLOAD

To create a directory, type the name of the directory you wish to create. DataLink will ask you if you would like to create it. Answer "YES" and it will create it for you.

Upload Path: Sets the path to the directory where the file to be uploaded is going to be sent.

E.g. C:\DL-DOS\UPLOAD

To create a directory, type the name of the directory you wish to create. DataLink will ask you if you would like to create it. Answer "YES" and DataLink will create it for you.

Set Download Format

Set Download Format allows you to specify different formats for files to be downloaded. A format must be selected before downloading a map file to the Field Computer This tells the Harvest Data software how to interpret the file you are downloading. There are three formats to choose from:

No Format Change

The "NO FORMAT CHANGE" option directly transfers a file to the Field Computer. This is generally used when downloading setup files (rather than field map files).

2D Text Maps

A 2-D (two dimensional) text map is used for creating maps on the PC that consist of rows and columns of plot identifiers separated by spaces or tabs. The identifiers consist of up to 8 alphanumeric characters. If the identifier is more than 8 alphanumeric characters then the identifier will be broken into groups of 8 characters and placed in multiple identifier holders in the data file. There is no header information. Each row ends with an ASCII carriage return/ line feed pair. Each plot may have one or more identifiers with multiple identifiers for a single plot being separated by commas. For more information on 2-D maps, see *Appendix E, Field Maps*.

When selecting "2D Text Field Map Format" in the "Set Download Format" option, you will see a box that will ask where row 1, range 1 is in your map text file:

```
row 1, range 1 corresponds to lower-left text file corner (•)
row 1, range 1 corresponds to upper-left text file corner ( )
row 1, range 1 corresponds to lower-right text file corner ( )
row 1, range 1 corresponds to upper-right text file corner ( )
```

The default is in the lower-left text file corner. Use the up or down arrow keys to make your selection. After making your selection, the file will automatically be transferred to your Field Computer to the directory as specified in the "map/data drive" option in the Harvest Data Software.

Harvest Order Space Delimited

The second type of map file that may be generated in the DOS text editor and subsequently downloaded to the Field Computer is called Harvest Order space delimited format. You enter the plot numbers (and any associated identifiers) into the DOS text editor in the order in which they will be harvested. For more information on Harvest Order space delimited maps, see Appendix E.

When selecting "Harvest Order space delimited format," you will see a box that will prompt you for the drive destination for the map.

```
Enter drive destination for map....:

Enter the number of plots per range: 5
Enter the number of ranges.........: 6

Serpentine harvest ( )
Sequential harvest (•)
Circular harvest   ( )
```

✏ *Note: Leave the drive destination blank to place the file in the directory where GG2.EXE resides on your Field Computer.*

Then you will need to enter the plots per range, number of ranges, and harvest route (serpentine, sequential, or circular). After selecting all of the information the system will download your map and lay it out as specified.

Set Upload Format

Set Upload Format tells the PC how to interpret the file that you're about to upload. There are two options available:

No Format Change

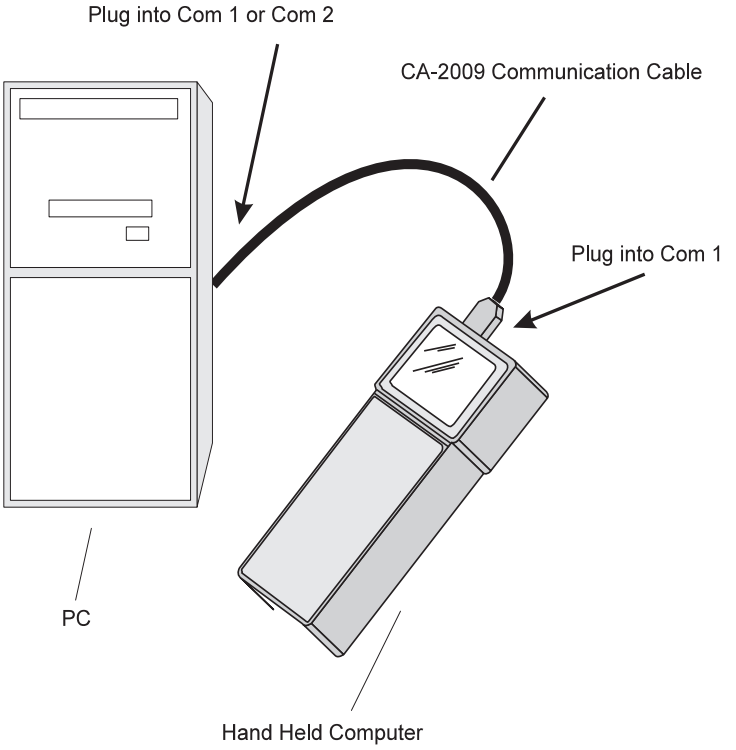
No format change is just that. The data is transferred on to the PC in the same format as it was on the Field Computer. When you select "NO FORMAT CHANGE," the data is essentially space delimited.

Comma Separated Variable Format

The second upload format available is comma separated variable format (CSV format). Although both the "NO FORMAT CHANGE" and the CSV format import into spreadsheet packages, the CSV also works for software packages that only import comma delimited ASCII files.

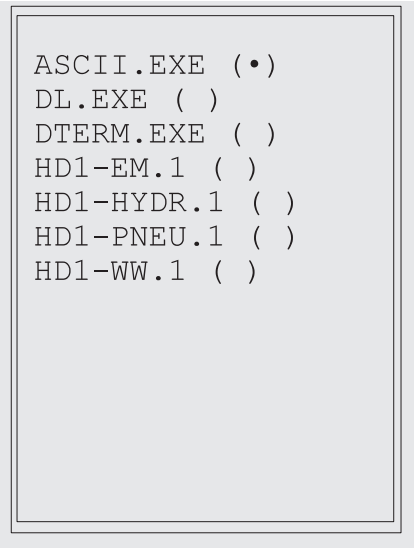
■ **To initiate a file download from the desktop PC to the Field Computer follow the steps below:**

1. Connect the Field computer to the desktop PC using the CA-2009 communication cable.



2. Turn the Field Computer on and run the Harvest Data System software program.

3. On your desktop PC, enter the “DOWNLOAD” option in DataLink. This will display a menu that shows the files that are available for downloading:



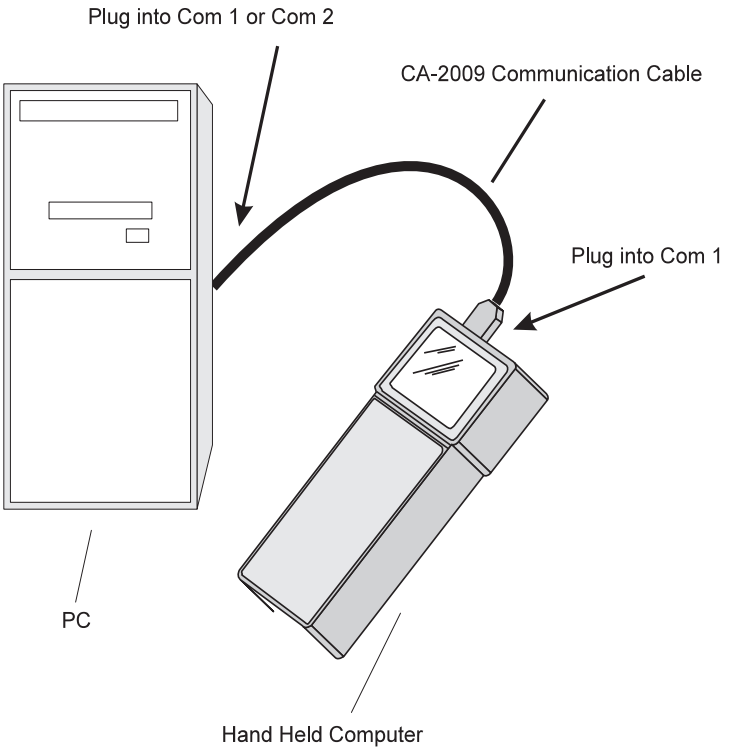
4. Use the <UP> and <DOWN> arrow keys to move the solid dot in the parenthesis to the file that is to be downloaded, then press <ENTER> to initiate the file transfer from the PC.

✏ *Note: The file will be downloaded to the directory where GG2.EXE resides on your Field Computer unless you have specified a different map/data drive in the Harvest Data software (see* Map/Data Drive *in* Chapter 3 *of this manual for details).*

Upload

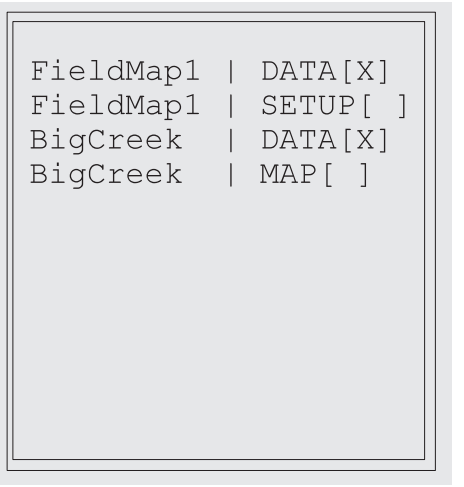
■ **To initiate a file upload to the PC from the Field Computer follow the steps below:**

1. Connect the Field Computer to the desktop PC using the CA-2009 communication cable:



2. Turn the Field Computer on and run the Harvest Data System software program.

3. On your desktop PC, enter the "UPLOAD" option in DataLink. This will display a menu that shows the files that are available for uploading:



4. Use the <UP> and <DOWN> arrow keys to move the cursor to the files that are to be uploaded. Press the <SPACE> bar to mark or unmark the files. You may mark as many files as you wish. Once you have marked all the files you wish to upload, press <ENTER> to initiate the file transfer from the Field Computer to the PC.

✏ *Note: The file(s) will be uploaded to the directory on your PC that is specified under the DataLink menu option "Set Paths".*

Edit Menu

The edit menu allows you to edit files using the editor specified in the "Set Editor" option of the Utilities menu. There are no sub-menus for this option. DataLink will ask you to enter a file name. If the file that you wish to edit is in the DataLink directory (the directory that DL.EXE is in), then type in the file name with the extension.

E.g. CACHE2.DAT

If the file name is in a sub-directory of the main DataLink directory, you need not enter the full directory path. Simply enter the sub-directory and file name.

E.g. DATA\CACHE2.DAT

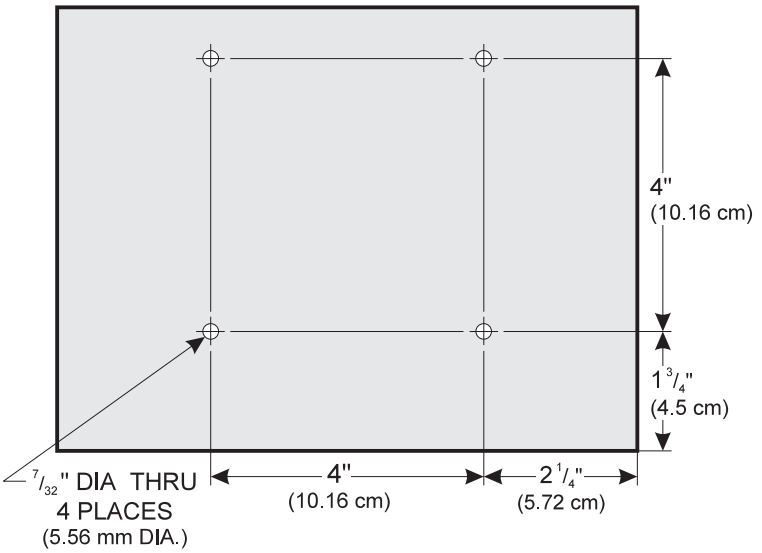
If the file is in another directory outside the DataLink directory, then the entire path will need to be specified.

E.g. C:\N-CACHE\DATA\CACHE2.DAT

Appendix C
Mounting Diagrams

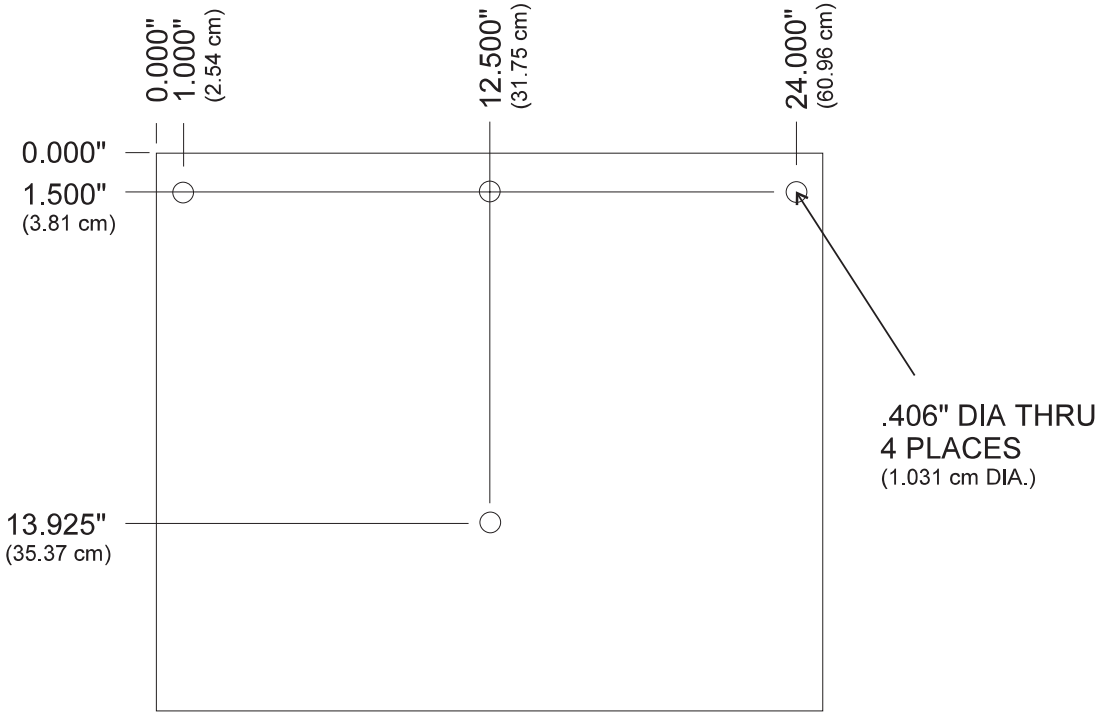
Console Mounting Diagram

This drawing shows hole placement for mounting the Harvest Data System console to the mounting base on a combine.



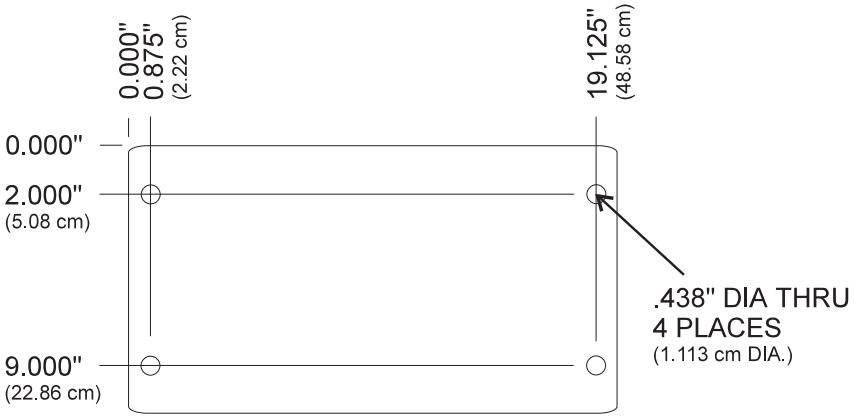
GrainGage Mounting Diagram

This drawing shows placement for mounting the GrainGage.



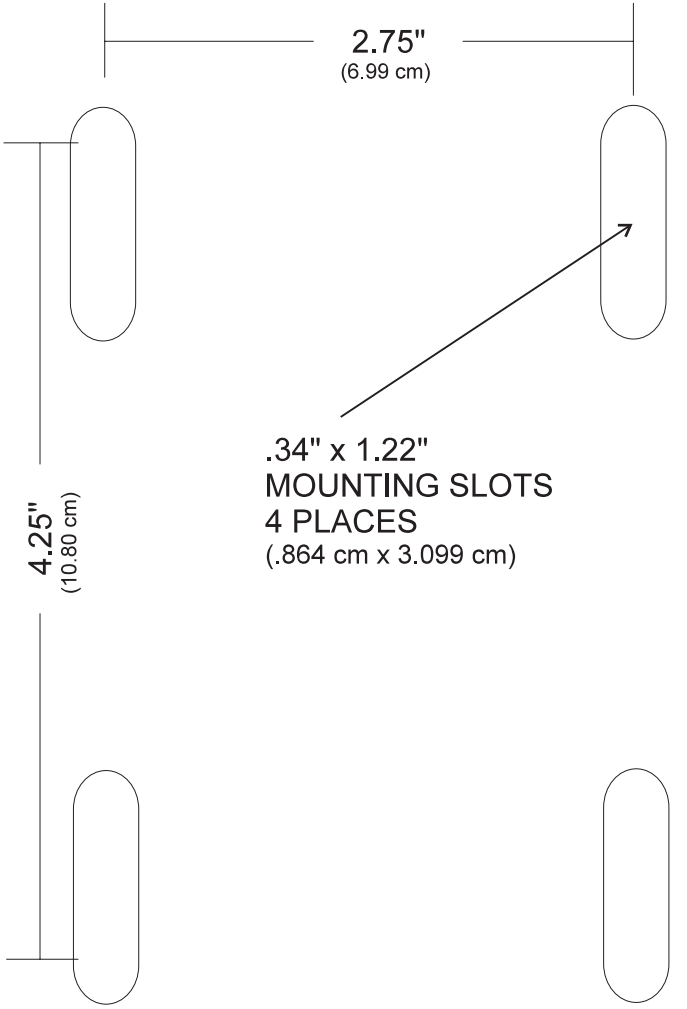
Pneumatic Cond. Center Mounting Diagram

This drawing shows placement for mounting the Pneumatic Conditioning Center.



Electric Compressor Mounting Diagram

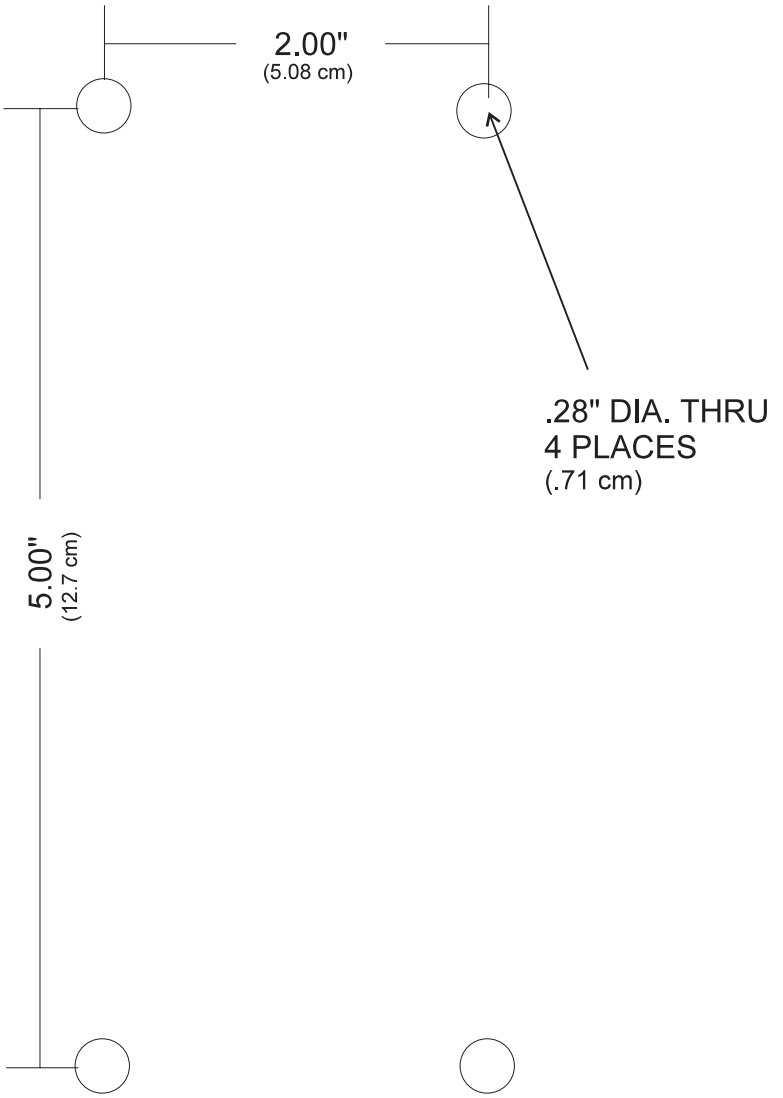
This drawing shows placement for mounting the electric compressor.



Actual Size

Mechanical Compressor Mounting Diagram

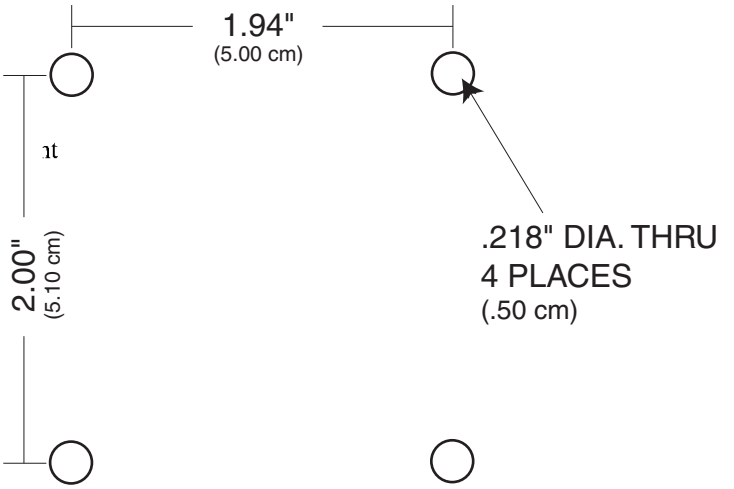
This drawing shows placement for mounting the mechanical compressor.



Actual Size

Field Computer Cradle Mounting Diagram

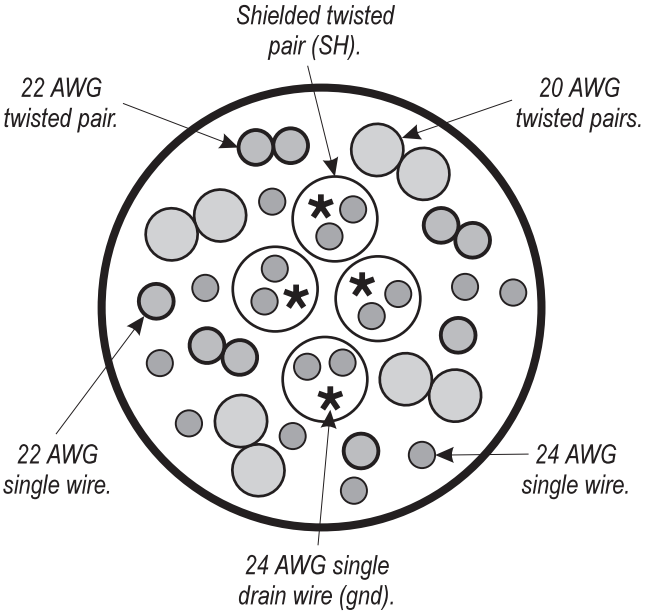
This drawing shows placement for mounting the Field Computer cradle away from the SCCU.



Actual Size

Appendix D
Cable Wiring

HM-420 37-pin System Control Cable



In a standard system control cable there are:

- four pairs of shielded cables
- nine 24 AWG single wires
- four 24 AWG single drain wires for the shielded twisted pairs
- four 20 AWG twisted pairs
- three 22 AWG twisted pairs
- two 22 AWG single wires

Connector Wire Codes - Standard

Pin	Wire Name
1	bottom gate actuator (+)
2	bottom gate actuator (-)
3	middle gate actuator (+)
4	middle gate actuator (-)
5	top gate actuator (+)
6	top gate actuator (-)
7	bottom gate “open” sense
8	bottom gate “closed” sense
9	middle gate “open” sense
10	middle gate “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+A2” shield
19	load cell “A1+A2” excitation (+)
20	speed sense input
21	grain level sense input
22	sensor ground

Pin	Wire Name
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	top gate “open” sense
28	top gate “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 + A2)
36	load cell signal - (A1 + A2)
37	load cell “A1+A2” 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 are included for reference only.

"A1 and A2" Load Cells (Left Front and Left Back)

System Control Cable Pin #	Signal Name	Con-X-All Connector Pin #
35	load cell "A1 and A2" signal (+)	3
36	load cell "A1 and A2" signal (-)	4
19	load cell "A1 and A2" excitation (+)	1
37	load cell "A1 and A2" ground (-)	5
18	load cell "A1 and A2" shield	6
	no connection	2

"B" Load Cell (Right)

System Control Cable Pin #	Signal Name	Con-X-All Connector 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

Level Detect Wiring

System Control Cable Pin #	Signal Name	Molex Connector Pin #
11	level detect excitation	1
22	level detect ground	2
21	level detect signal	3

Speed Sensor Wiring

System Control Cable Pin #	Signal Name	Molex Connector Pin #
11	speed sense excitation	1
22	speed sense ground	2
20	speed sense signal	3

Moisture Sensor Wiring

System Control Cable Pin #	Signal Name	Molex Connector 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	Molex Connector 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 connnection	2

Limit Switch Wiring

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

Top Level

System Control Cable Pin #	Signal Name	Molex Connector Pin #
11	moisture sensor excitation (12V reg.)	1
22	sensor ground	2
27	top gate “open” sense	3
22	sensor ground	5
28	top gate “closed” sense	6

Middle Level

System Control Cable Pin #	Signal Name	Molex Connector Pin #
11	moisture sensor excitation (12V reg.)	1
22	sensor ground	2
9	middle gate “open” sense	3
22	sensor ground	5
10	middle gate “closed” sense	6

Bottom Level

System Control Cable Pin #	Signal Name	Molex Connector Pin #
11	moisture sensor excitation (12V reg.)	1
22	sensor ground	2
7	bottom gate “open” sense	3
22	sensor ground	5
8	bottom gate “closed” sense	6

Auxiliary Actuator

System Control Cable Pin #	Signal Name	Molex Connector Pin #
23	auxiliary output (-)	1
24	auxiliary output (+)	2

25-pin Host Port

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

9-pin Socket	Signal Name	25-pin Socket
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 cable come pre-wired. The following information on wiring configurations are included for reference only.

Barcode Wand

SCCU 9-pin Socket	Signal Name
1	External Switch Input
2	Wand RXD
3	TXD
4	DTR
5	Ground
6	N/C
7	Wand RTS
8	Wand CTS
9	+5VM

Printer

SCCU 9-pin Socket	Signal Name	25-pin Socket
1	N/C	1
2	RXD	3
3	TXD	2
4	12 VSB	9
4	12 VSB	25
5	Printer Ground	7
5	Printer Ground	12
6	Printer Take-up	10
7	RTS	4
8	CTS	5
9	N/C	

HVD

SCCU 9-pin Socket	Signal Name
1	N/C
2	RXD
3	TXD
4	+12VBSP
5	Ground
6	N/C
7	N/C
8	CTS
9	+5VM

RS-485

SCCU 9-pin Socket	Signal Name
1	N/C
2	RS485 Low
3	RS485 High
4	+12VBSP
5	Ground
6	N/C
7	N/C
8	N/C
9	N/C

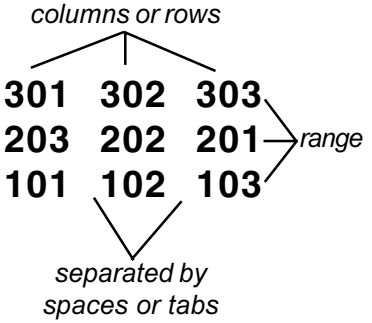
Appendix E
Fieldmaps Generated from ASCII

A field map to be downloaded to the Field Computer and into the Harvest Data software consists of an ASCII file. An ASCII file is simply a DOS text file. It is created on a PC with a text editor, a word processor in non-document mode or DOS text mode, or it may be created in a spreadsheet and saved in tab delimited, space delimited, or CSV (comma delimited) format.

ASCII File Formats

The Harvest Data software version 3.x accepts two distinct ASCII file formats to load as maps to the Field Computer: two dimensional text representation and Harvest Order Space Delimited format. Both of these formats are discussed in this section.

Two Dimensional Text Representation



A two dimensional (2-D) text map consists of rows and columns of plot identifiers separated by spaces or tabs. The identifiers consist of up to 8 alphanumeric characters. If the identifier is more than 8 alphanumeric characters, it will be broken into groups of 8 characters and placed in multiple identifier holders in the data file. There is no header information included in the file and each row ends with an ASCII carriage return/line feed pair. Each plot may have one or more identifiers with multiple identifiers for a single plot being separated by commas. The map to be downloaded would be entered into a text file exactly as it is shown in the examples below.

Field Map with only one identifier per plot

```
310 309 308 307 306
301 302 303 304 305
210 209 208 207 206
201 202 203 204 205
110 109 108 107 106
101 102 103 104 105
```

Field Map with more than one identifier per plot

```
304,study1 303,study1 302,study1 000,study2
203,study1 204,study1 301,study1 303,study2
202,study1 201,study1 104,study1 302,study2
101,study1 102,study1 103,study1 204,study2
304,study3 303,study3 302,study3 203,study2
203,study3 204,study3 301,study3 105,study2
202,study3 201,study3 104,study3 104,study2
101,study3 102,study3 103,study3 101,study2
```

These maps can be generated using a spreadsheet program such as Microsoft Excel. Place each plot ID in a separate cell, separating more than one ID with a comma. Save the file as a "Tab Delimited" file. Use a text editor (such as NotePad) to check the layout before downloading it. It should look like the one of the examples above.

After downloading the field map and collecting harvest data, you can upload the data file back to your PC. When viewed in the text editor on the PC, the data file would look like this:

```
[ID1      ID2        Plot      Moist   ...]
101       study3     14.2      5.4
102       study3     14.4      5.8
103       study3     12.8      4.5
101       study2     17.4      6.5
:
```

If there are portions of a field that have border rows, or rocks, these should be marked with an easily identified word or groups of words. Do not leave holes or unfinished rows in the map. For example, the following map is acceptable.

```
xxxx    xxxx    xxxx    xxxx    xxxx    xxxx
border  301     302     303     304     border
border  201     202     rocks   204     border
border  101     102     rocks   104     border
xxxx    xxxx    xxxx    xxxx    xxxx    xxxx
```

However, the incomplete map shown below would cause abnormal behavior if loaded.

```
301     304
201     202     203     204
101             103     104     border
001             003
```

Harvest Order Space Delimited

The second type of map file is Harvest Order Space Delimited. It may be generated in Microsoft Excel or a DOS text editor by entering the plot numbers (and any associated identifiers) in the order in which they will be harvested.

For example, the field map shown below was downloaded to the Field Computer from a Harvest Order Space Delimited file.

```
310  309  308  307  306
301  302  303  304  305
210  209  208  207  206
201  202  203  204  205
110  109  108  107  106
101  102  103  104  105
```

This file could be generated by typing each plot in sequential order into Microsoft Excel or a text editor. When using Microsoft Excel, enter each identifier into a separate cell. If any identifiers are missing fill in the empty cells with x's. After creating you map in harvest order (from top to bottom), save the file in "Comma Separated Value" format, then use a text editor to check the layout before downloading. The following example shows the order that the above field map was entered.

```
101
110
201
210
301
310
102
109
202
209
etc.
```

The field map file uses the variables set up on the Field Computer

If you are harvesting in a field that has more than one study (like the example below), enter the plots with a comma separating the study identifier.

Field map with more than one identifier per plot:

Study 611123

304	303	302
203	204	301
202	201	104
101	102	103

304	303	302
203	204	301
202	201	104
101	102	103

Study 799971

000	305
303	304
302	301
204	205

Study 845223

203	202
105	201
104	103
101	102

Map with multiple plot identifiers as would be entered into Microsoft Excel or a text editor:

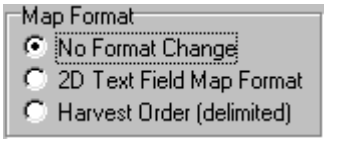
101,799971
202,799971
203,799971
304,799971
101,611123
202,611123
203,611123
304,611123
303,611123
204,611123
201,611123
102,611123
303,799971(etc.)

No Format Change

The "No Format Change" option directly transfers a file to the Field Computer. This is generally used when downloading setup files rather than field map files.

Downloading Maps

You must select a format before downloading a map file to the Field Computer. This tells the Harvest Data software how to interpret the field map file you're about to download.

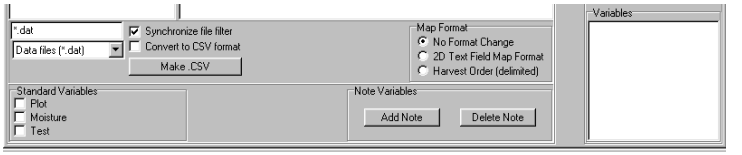


The Field Computer must be running the Harvest Data software and connected to the PC through the communication cable before you can download maps. The active variables set on the Field Computer (i.e. Plot Wt, Moisture, Test Wt) and any note variables will be used to set up the map file during the transfer process to the Field Computer. Any variables that you would like associated with the map will need to be set up before the transfer begins.

■ **To select variables, use the steps that follow:**

1. Open DataLink and select the "Transfer Files" tab.

2. The variable options are shown in the bottom half of your screen.



Select the standard variables you wish to record. If you would like to add note variables (such as stand counts), select "Add Note" then type in the name of the desired note.

The variables that you have selected are displayed in the "Variables" box at the bottom right of your screen.

✏ *Note: Downloading notes to a field map does not mean you are required to take notes. They can be deactivated. However, if you decide to take notes and do not have the variable created, you will be required to reload the entire map. Note variables cannot be added or modified with the Harvest Data combine software. This must be done before you download the map.*

■ **Use the following steps to download a map:**

1. In a text editor or Microsoft Excel, type in the plot numbers (and any associated identifiers with those plot numbers) in one of the formats described earlier in this chapter (2-D Text or Harvest Order Space Delimited).

2. Save the map file in the text editor or Microsoft Excel (as explained earlier in this chapter).

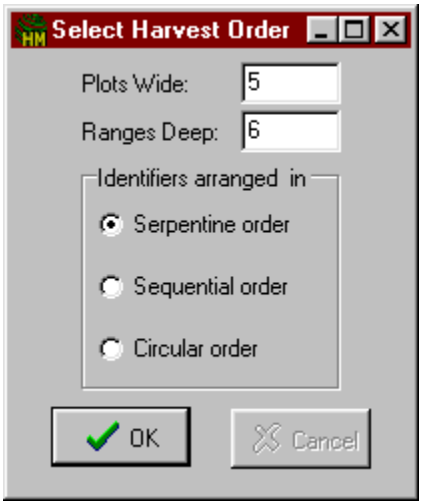
3. Make sure your Field Computer is connected to the PC correctly and that you are running the Harvest Data software on the Field Computer.

4. Open DataLink for Windows on your PC and click on the "Transfer Files" tab. Click "OK" on the Locating Remote window.

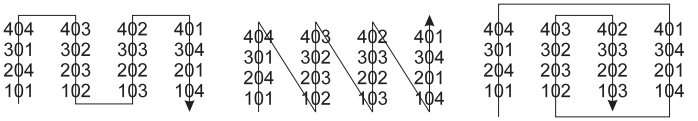
5. Select the proper map file, then click on the right-pointing arrow to begin downloading.

✏ *Note: If you have already selected the "Transfer Files" tab, press the refresh button to connect to the remote without exiting and reentering.*

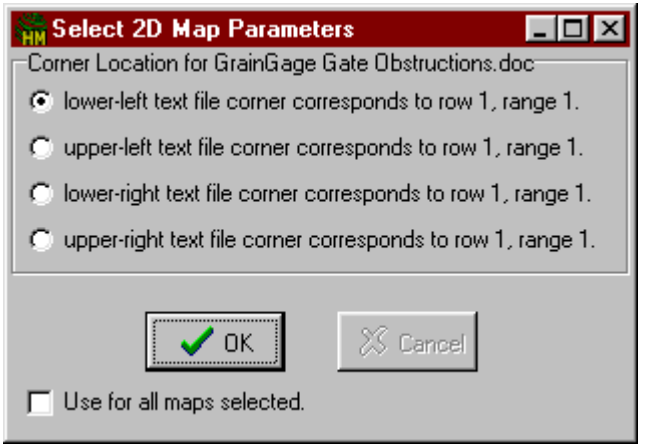
6. If you are downloading a Harvest Order Space Delimited map, you will be presented with the following window:



This window allows you to set up the width of the field, the number of ranges in the field, and the harvest direction or route that you will take when the field is harvested. The three available harvest routes are shown below.



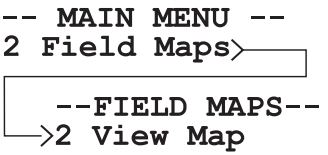
7. If you are downloading a 2-D map, you will be presented with the following screen which allows you to specify which corner of the map corresponds to range1, row 1 of the field.



8. Select the appropriate option, then click the right-pointing arrow, to begin downloading.

✏ *Note: Always view your maps to ensure that they were downloaded correctly.*

Viewing a Field Map



To view your field map, select the "View Map" menu option from the FIELD MAP menu, then follow the steps below.

1. Select the field map to view by using the <UP> or <DOWN> arrow key followed by <ENTER>.

2. Use the arrow keys to position the Field Computer's screen over the portion of the map you wish to see (you may also use <CTRL> + arrow key to move all the way to the edges, or <BLUE> + arrow key to move by 20's).

The arrow on the display points to the current plot position. As you move the arrow right and up to see the other plots, the display will window over the set of available plots in the map. Pressing <ENTER> allows you to view any other identifiers which have been downloaded.

Appendix F
HM-1000B Load Cell Replacement Procedures

CAUTION: The load cells in this system are extremely delicate. DO NOT allow your arms or tools to press upon the weigh pan or individual load cells at any time.

Tools Needed

We recommend you have the following tools on hand to aid in replacement of the load cells:

- Allen wrenches (5/32" and 3/16")
- Socket set (3/8" drive with 7/16" socket and short extension)
- 7/16" end wrench (preferrably 2" long)
- .020 feeler gage or load cell adjusting shim.
- Loc-Tite 242 Thread Locker
- Flat head Screw Driver (4.0 x 60 mm)
- #3 Phillips Screw Driver

Procedures

1. Disconnect the air supply to the GrainGage by turning the air control valve to the off position.

2. Position the SCCU so that you can see the Field Computer display while working on the GrainGage.

3. Position the shipping stops (PVC block) under the weigh pan so the weight is OFF the load cells.

```
Load Cell Test
   volts  weight
A:  0.623   0.00
B:  0.522   0.00
Tot:1.145   0.00
R:  0.211  4.212
Q:  1.000  0.212
SM: On     4.000
```

4. Enter the Harvest Data program and at the Main Menu, select "Diagnostics" and then "Load Cells." Your display will show 3 voltages:

A: —— This is the combination of the two left hand load cells. (LdA1 = front and LdA2 = back)

B: —— This is the total of the right load cell.

Tot: —— This is the total of all three load cells.

5. Take note of the "A:," "B:," and "Tot:" voltages. This is the zero offset for each load cell.

✏ *Note: During the following procedures watch the total voltage column to make sure that it does not exceed a specification of + or - 1.5mV. Ideally, this reading should stay as close to 0.00 mV as possible.*

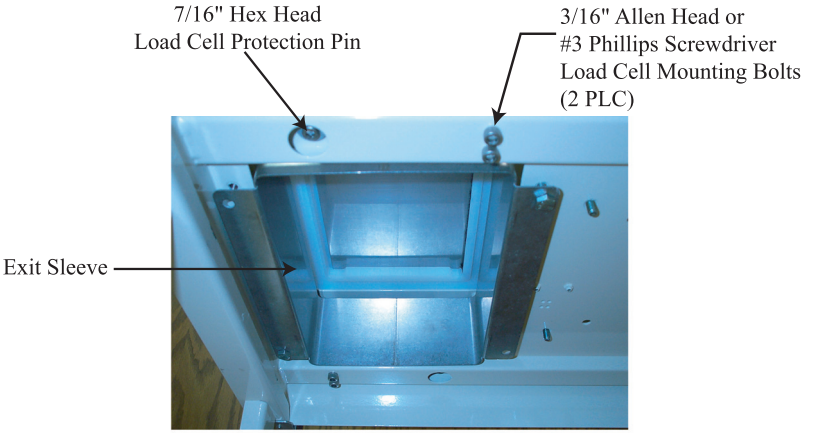


Figure #1
GrainGage Exit Sleeve (Bottom View)

This procedure ensures that you are not inadvertently exerting excessive upward or downward pressure on the load cells. When working on the left-hand load cells (LdA1 and LdA2), disconnect the load cell you are not working on. This allows you to see the voltage of each individual load cell.

6. Using the 7/16" end wrench or 7/16" socket and extension, remove the four 1/4" exit sleeve bolts from the bottom of the GrainGage and remove the exit sleeve (refer to Figure #1 GrainGage Exit Sleeve).

7. Slide the bottom gate halfway open so the gate connecting pin on the actuator aligns with the hole in the weigh pan (refer to Figure #2 GrainGage Weigh Pan Assembly).

8. Remove the E-rings from the bottom gate connecting pin and push the pin out. Close the bottom gate.

✏*Note: The E-ring can be removed by using a screwdriver to pry the edge of the E-ring away from the pin until it snaps free.*

9. Disconnect the black air hoses from the actuator cylinder by pressing the orange into the hose and pulling the hose out (take note of their proper positions).

10. Using the 7/16" socket and ratchet (without extension), remove the two 1/4" bolts on the gate guide closest to you (front gate guide) and then remove the three 1/4" mounting bolts from the bottom weigh chamber (two in front and one in back). Set the gate guide aside for future reference (Refer to Figure #2).

11. Using a 5/32" Allen wrench, remove the guide pin located at the left front corner of the weigh pan, being careful not to exert any pressure on the load cell.

12. Using the 5/32" Allen wrench, remove the guide pin located on the right side of the weigh pan (in front of the actuator).

13. Make sure the shipping stops are disabled by following the procedures outlined below:

a. Remove the three shipping stop Hex bolts.

b. Remove the three PVC spacers between the weigh pan assembly and the bottom of the GrainGage.

✏*Note: Keep these parts in a convenient place in case you need to ship the GrainGage by mail. The shipping stops are not needed when the GrainGage is mounted to the combine.*

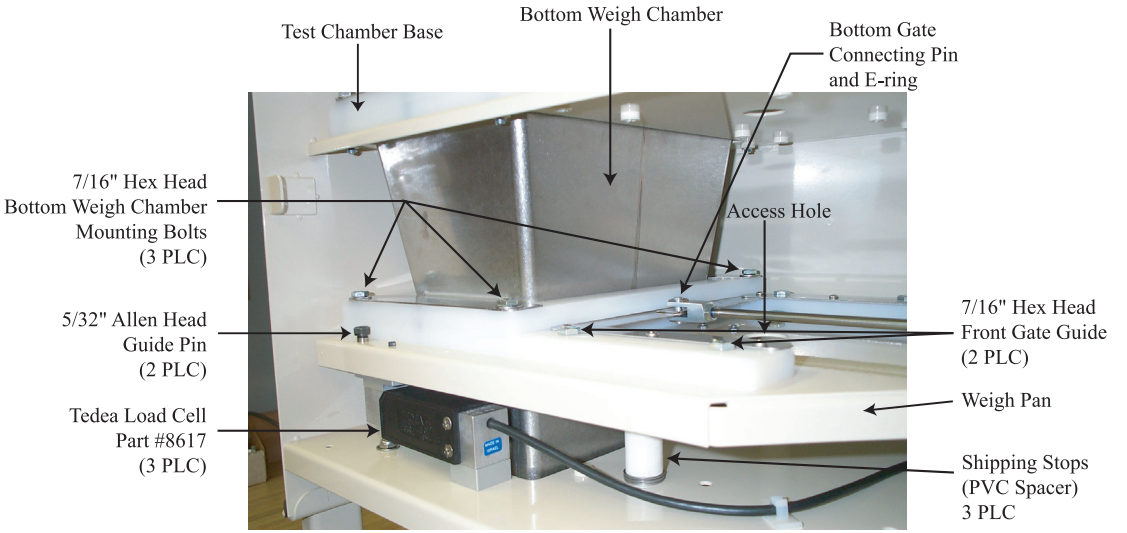


Figure #2
GrainGage Weigh Pan Assembly

14. Lift the lower chamber up firmly against the top of the test chamber base and carefully slide the white weigh chamber base out of the GrainGage. The lower stainless steel chamber has a 1/8" lip on the bottom skirt. When removing, make sure to lift the base high enough to clear this lip. You will need to lift the white base over the protruding rubber nipple on the weigh pan.

CAUTION: Be careful not to exert too much downward pressure on the load cell when removing the weigh chamber base.

✏ *Note: If removing the base is too difficult, the top and middle 1/4" chamber mounting bolts (3 PLC on each level) can be loosened to allow more movement.*

15. Remove the bottom weigh chamber. Set the chamber and the base aside for future reference.

16. Disconnect the actuator limit switch cable. The connector for this cable is located on the break out box on the middle level. There is a lock on one side that needs to be released before removing.

WARNING!
Be careful not to put any up or down pressure on the *load cell.*

17. Carefully lift the weigh pan up and out of the GrainGage.

18. Using the 3/16" Allen wrench or #3 Phillips screw driver, remove the load cell mounting bolts. Then remove the load cell (refer to Figure #1).

19. Remove the two 3/16" Allen screws from the aluminum spacer attached to the load cell and re-install the spacer on the new load cell.

✏ *Note: Make sure the spacer is aligned with the edge of the load cell before tigtening the bolts.*

✏ *Note: Before re-assembling, clean all the screws with a fine wire brush. Use #242 Loc-Tite on all screws during reassembly (refer to Figure #3).*

20. Remove the load cell stop (hex bolt) from the end of the load cell.

21. Install the load cell stop in the end of the new load cell until there is a 1/16" gap between the load cell and the hex head. Use #242 Lock-Tite when reassembling.

22.Disconnect the old load cell cable and secure the new load cell cable in its place (use plastic ties to hold the cable away from the weigh pan).

23. Place Loc-Tite on the two load cell mounting bolts and install the new load cell on top of the load cell mounting spacer. Make sure the loac cell protection pin is centered under the load cell stop bolt.

WARNING: Make sure the load cell stop is not touching the overload protection pin when tightening the load cell mounting bolts as this may cause the load cell to stretch or overload.

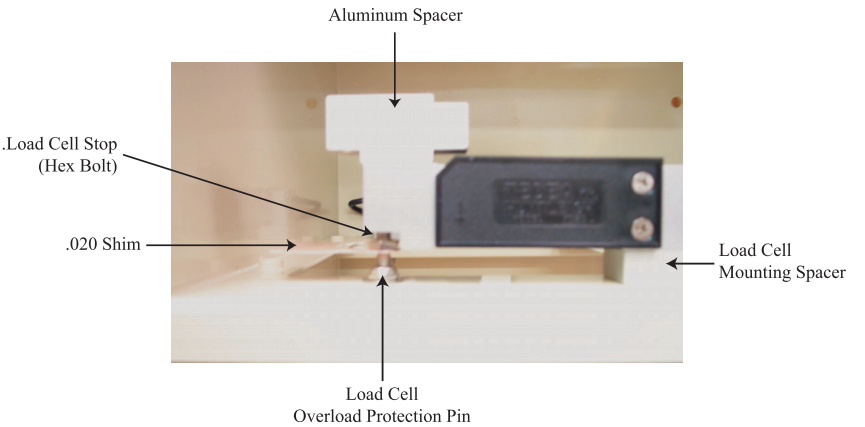


Figure #3: Load Cell

23. Adjust the overload protection pin down (or load cell stop up if the pin will not adjust) until you can just slide the .020 shim between the overload protection pin and load cell stop. The shim should slide out with between 0.010 and 0.020 voltage change on the display of the Field Computer in the "Diagnostics" menu (refer to Figure #3).

✏ *Note: Make sure the protection pin and load cell stop are locked securely in place with #242 Loc-Tite.*

24. After the load cell is completely installed, use the following procedures to check that the load cell is functioning properly:

b. Select "Load Cells" from the "Diagnositc" menu and make sure the voltage for the load cell you are testing is between 0.00 mV and +.150 mV (this is the zero offset).

c. Make sure all three load cells are plugged in and lock collars are secure.

d. Retare the weights.

✏*Note: If the limit switches are enabled, you will need to press <ESC> three time to bypass the "Gate Obstruction" message.*

e. Write down the reading of the total weight of all three load cells (should be 0.00 lbs).

f. Place an 8 lb. weight on each load cell and write down the total weight each time.

✏ *Note: The weight should be similar (8 lbs.) on each load cell and should repeat the same reading each time the weight is placed on it. When the weight is removed it should return to its same zero reading.*

g. Place an 11 lb. weight on each load cell and note the total weight each time.

✏*Note: The total weight should not exceen 1.5 lbs. at any times. The overload protection pin should limit the weight on each load cell.*

36. Install the weigh pan assemblies in reverse order of disassembly (starting with step17 and working backward to step 1). Remember to place Loc-Tite on all mounting bolts.

✏*Note: When installing the weigh pan, skip step 13. You do not need to reinstall the shipping stops.*

37. Check out the system as outlined in *Chapter 2, Installation*.

Appendix G
GrainGage Chamber Installation

Preparation

Following are the instructions for removing the chambers on the GrainGage and installing new chambers. During this process you will either be installing 3 liter chambers in place of 1.5 liter chambers or 1.5 liter chambers in place of 3 liter chambers. When removing your existing chambers make sure that you keep track of all the screws you remove because you will use these same screws when you install the new chambers.

Typically this process takes about forty minutes. For ease of installation have the following tools on hand:

- medium Phillips screwdriver
- medium standard screwdriver
- 7/16" shallow socket (recommended) or 7/16" combination wrench.

Procedure

Removing the Existing Chambers

■ **Use the following steps to remove the exisiting chambers:**

1. Remove the GrainGage door.

2. Using a Phillips screwdriver, remove the two screws holding the level detect sensor to the hopper on the top shelf. Rotate the sensor out of the way toward the back right corner.

3. Remove the side screws from the moisture sensor on the middle level using a Phillips screwdriver. Slide the moisture sensor out and place it out of the way.

4. Starting with the top level gate, slide the pneumatic actuator rod to the right until the pin connecting the actuator rod and the gate is directly over the access hole on the bottom of the shelf. Using the standard screwdriver, remove the E-ring from the actuator pin assembly. Remove the pin from the actuator and slide the actuator rod back toward the actuator. (If you remove the slides from the plastic housing, recognize that the top shelf slide is 2" shorter than the middle shelf slide.)

5. Repeat step 4 with the middle level gate.

6. Remove the 1/4" cap screws from the slide guides on both levels, and remove the guides.

7. Remove the three 1/4" cap screws from the plastic slide housing on both levels.

8. Lift the middle chamber up toward the top of the GrainGage and remove the middle level plastic slide housing from the shelf. Pull the chamber down and remove from the GrainGage. **CAUTION: Be careful not to put weight on the bottom chamber or the weigh pan. This may damage the load cells.**

9. To remove the top chamber, repeat step 7 above (substituting "top" for "middle").

Installing the New Chambers

■ **Use the following steps to install the new chambers:**

1. Slide the top level chamber into place making sure it fits into the groove in the gasket.

2. Lift the top chamber up toward the top of the GrainGage and push the plastic slide housing into place beneath the chamber.

3. Repeat steps 1 and 2 to insert the middle chamber. **CAUTION: Be careful not to put weight on the bottom chamber or the weigh pan. This may damage the load cells.**

4. Insert the three 1/4" cap screws into the holes on the plastic slide housing on each level and tighten them.

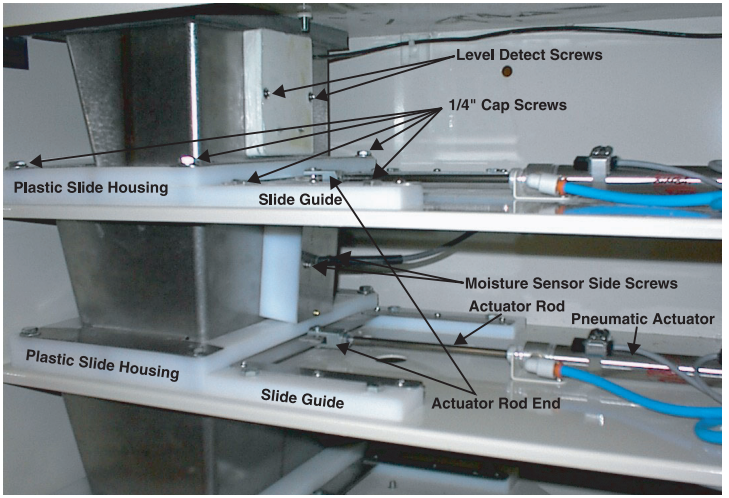
5. Place the plastic slide guides in place (use the inner holes for 1.5 liter chamber and the outer holes for 3 liter chamber). Insert the 1/4" cap screws into the holes and tighten them. Do this for both levels.

6. Starting with the middle level gate, slide the pneumatic actuator rod to the left until the hole for the pin is directly above the access hole. Slide gate to meet actuator rod end and replace pin. Snap E-ring back into place. Repeat this step for the top level gate.

7. Slide the moisture sensor into place. Insert the screws into the side holes on the moisture sensor and tighten them. (The screws for the moisture sensor are longer than the screws for the level detect sensor.)

8. Rotate the level detect sensor into place. Insert the screws and tighten them.

9. Replace the GrainGage door.



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