HM-400

HarvestData System

HDGG-HM1 User's Manual

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Chapter 1
Introduction

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

Features

The HarvestData 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.

- Pop-up FUNCTION ("FTN") helps.

- 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 trouble shooting.

- "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 FieldBook.

- 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 Com patible).

- 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 FieldBook

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

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

NOTE: **Make sure your FieldBook is charged before using it in a HarvestData System. It's a good idea to plug it in the night before in case you'll be using it apart from the HarvestData System.**

Manual Override Switches

HarvestData 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 FieldBook to control bucket movement.

Electrical Transient Protection

HarvestData 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 electronic and mechanical components.

How to Use this Manual

In this manual, keyboard commands are indicated using < > marks that surround the key or keys to be pressed. For example, <ENTER> prompts you to press the Enter key, and a sequence such as <SHF>, <➜> means press the shift key followed by the right arrow key.

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 <SHF>, <➜> command, press the Shift 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 easy. Just remember that <ENTER> is the key command that will take you to the next screen after you have made your selection(s) or entries or simply viewed the message on a screen. <ESC> normally takes you back to the previous screen.

Since different key commands are available at different screens, a listing of available key commands appear beside the screens they are associated with throughout this manual.

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 HarvestData System.

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

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

SHF, ZERO: 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.

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

SHF, 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).

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

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

FTN: "— SELECT FTN —" -causes function menu to pop up.

FTN, 1: "View Help" - provides user context sensitive help.

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

FTN, 3: "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.

FTN, 4: "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 on the field.

FTN, 5: "Advance Paper" - pulse the paper advance solenoid on the field printer.

FTN, 6: "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 zero.

FTN, 7: "Edit Data" - when in harvest mode, this key sequence allows the user to edit harvest data.

FTN, 8: "Show Version" - shows current version of the HarvestData System software.

FTN, 9: "Set Backlight" - allows the user to adjust backlight intensity. Key in a number from 0 (off) to 8 (brightest) to change the backlight. <Enter> accepts the brightness level.

Chapter 2
Installation

This chapter explains in detail how to install your HarvestData 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.

Requirements for Installation

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 your have these 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
- A mounting hole diagram for HarvestData System Console (see Appendix C)
- A mounting hole diagram for the compressor (see Appendix C)
- A 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
- Cable ties
- A carpenters level

Components

The basic components you should have received with your HarvestData System and GrainGage are:

Harvest Data Electronics Group

- HM-401 HarvestData System Signal Conditioning and Control Unit (SCCU) with its console base (referred to as the console), manual, and soft ware on diskette.

- FieldBook hand held computer (which mounts on the console). Along with your FieldBook, you should have these items:

  1. HarvestData System program diskette and DataLink DOS PC-based support software.

  2. FieldBook Operator's Manual

  3. PR-713 RESET / @ @SYS connector

  4. CA-009 RS-232 communications cable

  5. Memory transfer connector

6. PW-WC110 110 V AC wall mount charger or PW-WC220 220 V AC Euro-plug wall mount charger.

• 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-420 System Control Cable:
  beige cable with 37-pin sub-D connectors at each end, 20 ft (6 m) long.

• 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-302 FieldPrinter (also mounted on the console).

GrainGage Group

• HM-1000 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).

Pneumatics Supply Center Group

• HM-1020 Pneumatic Conditioning Center (PCC).

• 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.

■ **Be sure to check and inventory the items to be installed.**

Preparation for Installation

Before installing the HarvestData System and GrainGage, you will need to:

1. Determine the mounting location of:

- HarvestData System Console
- Pneumatic Conditioning Center (PCC)
- Compressor
- GrainGage

2. 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 size from 6 to 30 lbs (3 to 15 kg) are used.

3. Make any necessary modifications to the combine such as removing an existing weigh bucket system.

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

5. 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.

6. 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 above listed preparations for installation, you will be ready to mount the GrainGage, PCC, compressor, and console. The mounting instructions for each components included are given in separate sections below.

Mounting the GrainGage

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

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

Important Advice:
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 these steps to mount the GrainGage on the combine:**

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

1. Install the hopper leading into the top of the GrainGage. This is intended for place-ment 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).

2. Construct mounting brackets for your combine to fit the location selected for mounting the GrainGage. Refer to the drawing of the GrainGage mounting hole locations (see Appendix C) which 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). 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 insure that the bracket is mounted such that the GrainGage will be level with the combine.

4. Mount the GrainGage to the bracket.

Warning:
When mounting the GrainGage to the combine or mounting anything to the bottom of the GrainGage, you should avoid any torsion or twist-ing 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.

5. Construct the exit chute such that it is supported by the Grain Gage mounting brackets or something besides the base of the GrainGage.

Mounting the Pneumatic Conditioning Center

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

Locate a flat, vertical surface large enough to accommodate the 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.

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

1. Drill four mounting holes for 1/4" bolts.

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

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).

- **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 PCC 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. Consult your combine manufacturer, if necessary, 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.

▓ **Select the location for mounting the compressor.**

▓ **Follow these steps to mount the compressor:**

1. Drill holes according to the mounting hole diagram in Appendix C.

2. Securely fasten the compressor in place 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 for the GAST compressor from HarvestMaster.

Mounting the HarvestData System Console

We recommend that you mount the console on a flat surface. The location should be within arm's reach at a convenient height for the operator. The FieldBook 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. Mark where you want the holes drilled on the equipment surface. (See Appendix C for console mounting diagram.)

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

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

Connecting the Components

When the mounting of each of the components is complete, make connections as given in Figure 2-1.

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

NOTE: Skip to step #5 if a mechanical compressor is being used.

1. Run the black cable with the two-pin quick connector (which controls the electrically-driven compressor relay) to the bottom right of the GrainGage and plug it into its mate. Use the access hole in the bottom of the GrainGage chassis to make the connection. Secure all 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. 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, air hose) and run it from the air cleaner on the PCC to the intake of the compressor (cut off the excess air hose).

6. Run the 8 ft. high temp. air hose from the output of the compressor to the intake of the coalescing filter (use teflon tape to seal all threads).

NOTE: It is best to install the swivel closest to the compressor.

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 temp. air hose) are "push-in" and require no fastening or tightening.

8. Fill the lubricator to the indicator line with a non-detergent, non-synthetic, air-tool oil, SAE-10 (90 SSU) or lighter (see Appendix C).

Note: If harvesting below freezing, a special combination of anti-freeze and a synthetic lubricant is recommended. This pneumatic tool anti-freeze lubricant can be purchased from HarvestMaster.

Warning:
Do not over fill! This will cause improper lubricator operation.

9. Plug the system control cable from the SCCU to the GrainGage.

10. Connect the SCCU power cable to chassis ground and +12VDC supply. 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 at 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 the combine.
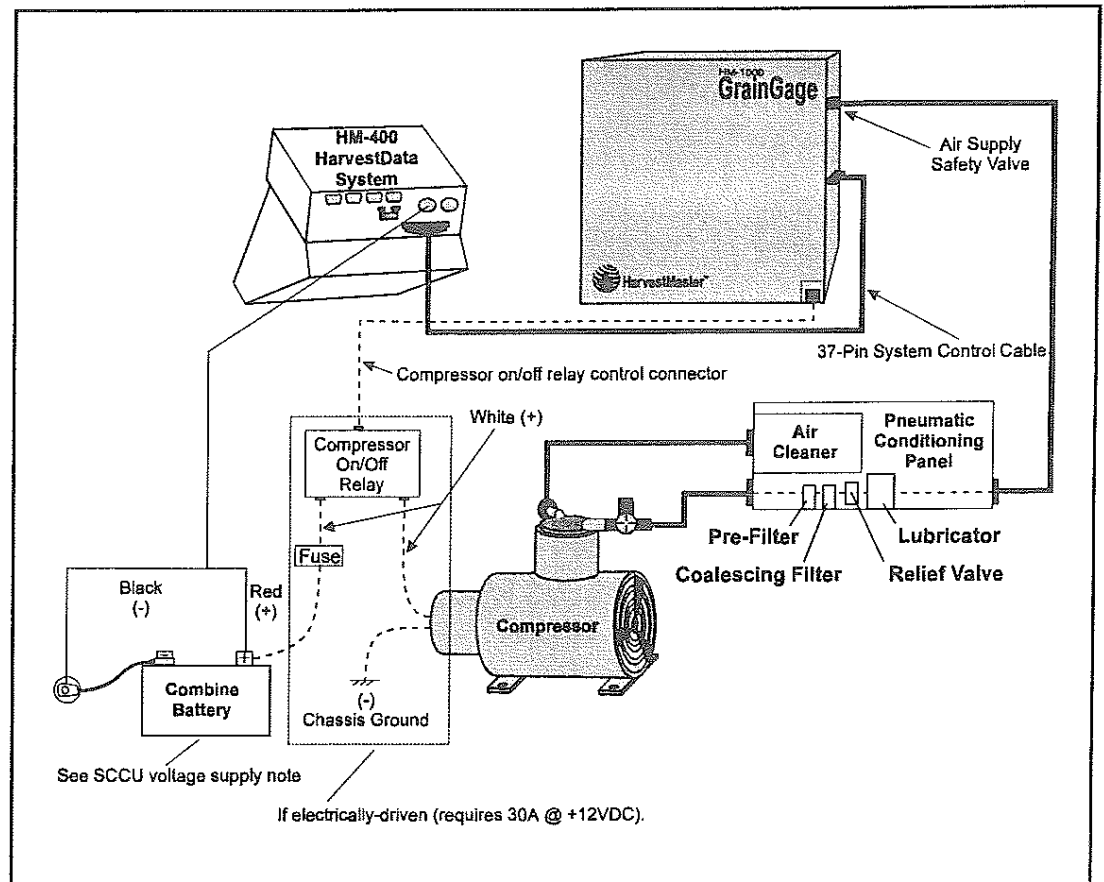
Figure 2-1
Component Connection Diagram

Verifying Operation of the GrainGage

Once the GrainGage is mounted and all connections are made to the SCCU and air compressor, the system can be checked by the following procedure:

GrainGage Start-up

■ **Follow these steps for GrainGage start-up.**

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

2. Connect the FieldBook to the SCCU and turn on the main SCCU power switch. This will power up the FieldBook Harvestmaster models HM-1, HM-286, or Pro-2000).

3. When the Injected Operating System (IOS) is loaded to the SCCU from the FieldBook and the main menu is showing, you may proceed with the checkout.

GrainGage Gate Operation - Panel Switch Method

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 = optional for user installed actuator

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.

■ **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. 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 operation automatically.**

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

2. Use the **UP ARROW** and **DOWN ARROW** keys to select an action and press **ENTER** key of the FieldBook to execute the action.

Alternate Method for GrainGage Gate Checkout - No FieldBook Installed

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

1. Hold the **Auxiliary** panel switch up while switching the power on. This automatically configures the actuators to the PCC 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 checkout mode, the gate positions run in reverse of what is shown on the lights. The main thing to note is that each gate operates fully in each direction. This checks out wiring and pneumatic connections.

Verifying Load Cell Operation

■ **Disable shipping stops:**

1. Remove the two wing nuts from the top of the weigh pan that are on the left side.

2. Loosen the two (left side only) shipping stops completely.

3. Remove the third (right) wing nut.

4. Loosen the last (right side) shipping stop completely.

■ **Follow these steps to verify load cell operation.**

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

```
        -- MAIN MENU --
      5 Diagnostics>----┐
       ┌────────────────┘
       │   -- DIAGNOSTICS --
       └→ 3 Load Cells
```

Current readings will show in millivolts per volt of excitation for left load cells (LC1), right load cells (LC2), and total (the sum of the two). Typical "empty" figures for each are in the range of .600 to 1.200 when the shipping stops are disabled.

2. With the compressor shut off or the air supply safety valve closed to inhibit gate operation, place a known weight of grain, roughly 5 lbs (2 kg) on the weigh pan in the bottom section of the GrainGage. Note the "total" figure on the diagnostics readout.

3. Move the weight to three different positions on the pan (as close to directly over each load cell as possible). The millivolt readings should remain with .006 of each other as the weight is moved around, then allowed to stabilize.

4. Check to see that the zero reading comes back to the same voltage (within ±.002).

```
            mVlts   Lbs
   Ld A:1.000 1.00
   Ld B:0.425 2.35
   Tot:1.425 3.35
```

5. Compute the millivolts per volt full scale for the GrainGage by the following formula:

$$C = D * 22.046 \text{ (lbs.) } / W$$

where D is the millivolt total when loaded or millivolt total when empty and W is the weight of the calibration mass you are using. Normal values for C are in the range of 1.90 to 2.00. This value is keyed in during setup.

6. The weight system can be further checked out by simulating harvest beginning with nothing on the weigh pan, then placing the calibration weight on the pan and simulating chamber cycles by pressing the *<PERIOD>* key on the FieldBook in harvest mode. If you do this test with the PCC shut off (recommended), select the "Weight/ Bucket Control" option from the "SETUP" menu and disable the open and close limit switches for the software to cycle through. Don't forget to re-enable them before field operation or you will lose the protection of these devices.

Level Detector

■ **Follow these steps to verify level detector operation.**

1. Select the "Level" option from the "DIAGNOSTICS" menu.

```
-- MAIN MENU --
5 Diagnostics>

      -- DIAGNOSTICS --
    →7 Level Detect
```

2. Inspect the reading. It should be in the range of 250 to 350 and should change by 10 to 20 when you touch the level detector terminals.

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.

```
Grain level
detect sensor
counts
300.00
```

Moisture Sensor Verification

■ Follow these steps to verify moisture sensor operation.

1. Select the "Moist Volts" option from the "DIAGNOSTICS" menu.

```
-- MAIN MENU --
5 Diagnostics>─────────┐
                       │
         -- DIAGNOSTICS --
     └──>2 Moisture Volts
```

```
Moisture:19.8%
Rel Vlts:2.1
Abs Vlts:-1.8
Tmprture:23.4
```

2. With the chamber empty, you should see 0.00 or 0.01 (plus or minus) after tare (FTN 6). Battery supply must be greater than 13.0V.

> NOTE: The supply voltage to the SCCU must be greater than 13V (preferably above 14.0V) in order to insure proper operation of the grain moisture sensor. Most automotive electrical systems meet this requirement when the engine is running. Test voltage by watching the absolute voltage on "Moist Volts" of the "DIAGNOSTICS" menu with the engine off. Then start the engine. You should see the sensor voltage go more negative until it stabilizes at around -7.20. If it does not reach within .3 volts of this level or if it does not stabilize, you should 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 insure that the grain moisture sensor will not be affected. Changes of .01 volts affect moisture readings about .1 percent of grain moisture.

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's not uncommon 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.
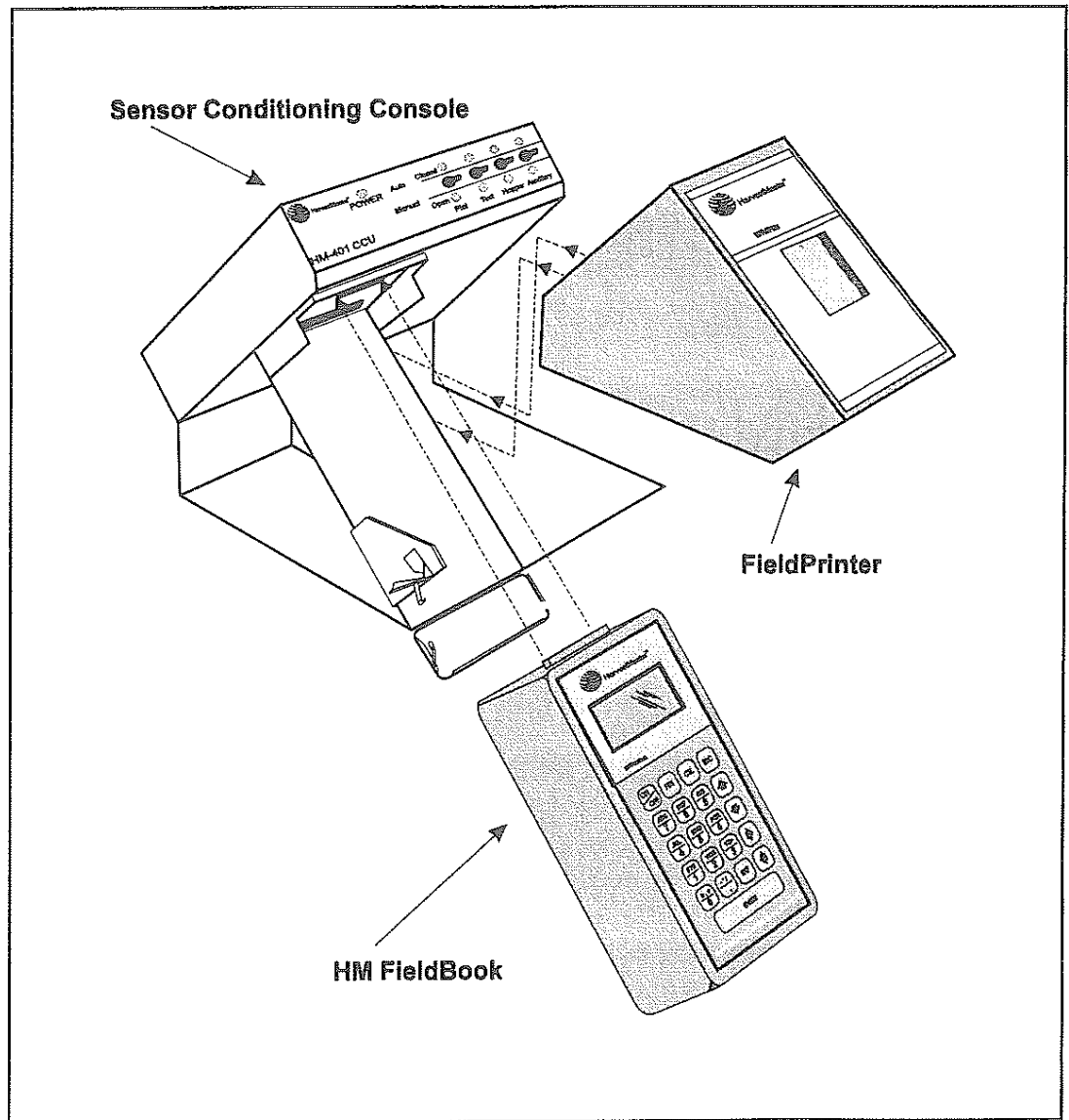
Figure 2-2
The HarvestData System SCCU. The FieldBook and FieldPrinter fit into the console.

How to Install the FieldBook

As you use your HarvestData System, you will probably remove and install the FieldBook on a daily basis.
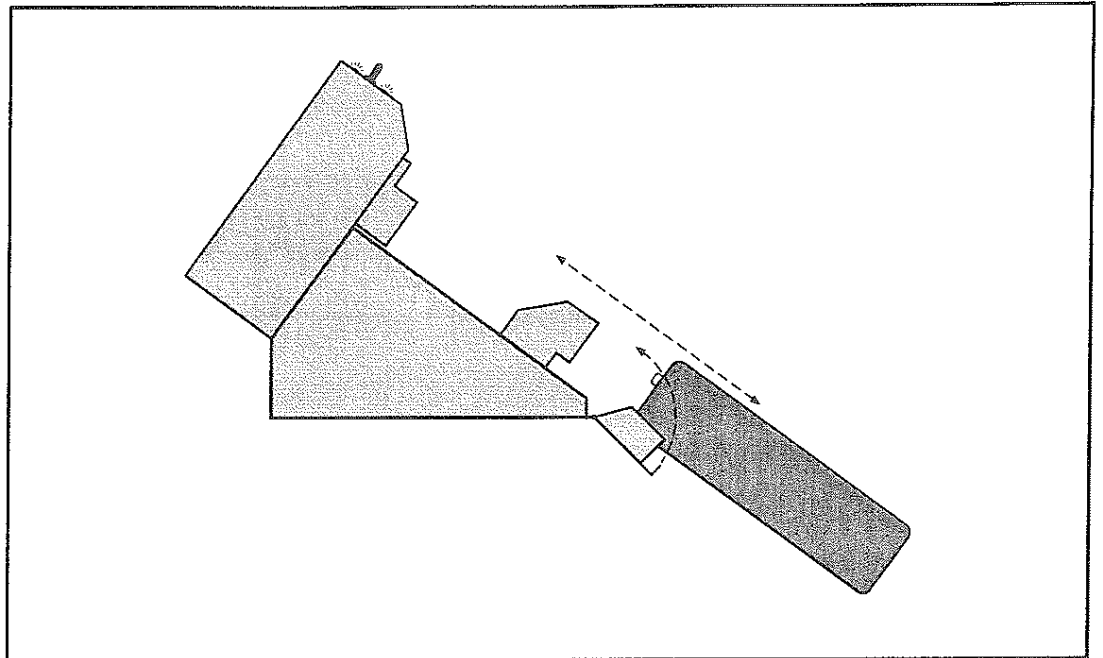
Figure 2-3
FieldBook Installation.
When plugging the FieldBook into the console, be sure to open the drop-down door in order to mate the two connectors at the proper angle to avoid damaging the connectors.

Before installing the FieldBook, turn off the power to the FieldBook and the SCCU.
■ **Then follow these steps to install the FieldBook to the console:**

1. Release the latch on the left side of the console to open the hinged drop-down door so that the console will easily receive the FieldBook (see Figure 2-3).

2. Align the connectors located on the top of the FieldBook with the connectors in the console.

3. Push the FieldBook firmly up to mate with the connectors.

4. Secure the FieldBook by swinging the door up and snapping the latch on the left side shut.

Warning:

To avoid damaging the connector pins when installing or removing the FieldBook, always release the drop-down door and align the Fieldbook connectors directly with the connectors in the console. Do not tilt the instrument at an angle for installation or removal to avoid opening the drop-down door. Make sure the connectors are mated. Do not force the connectors!

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 Figure 2-4.
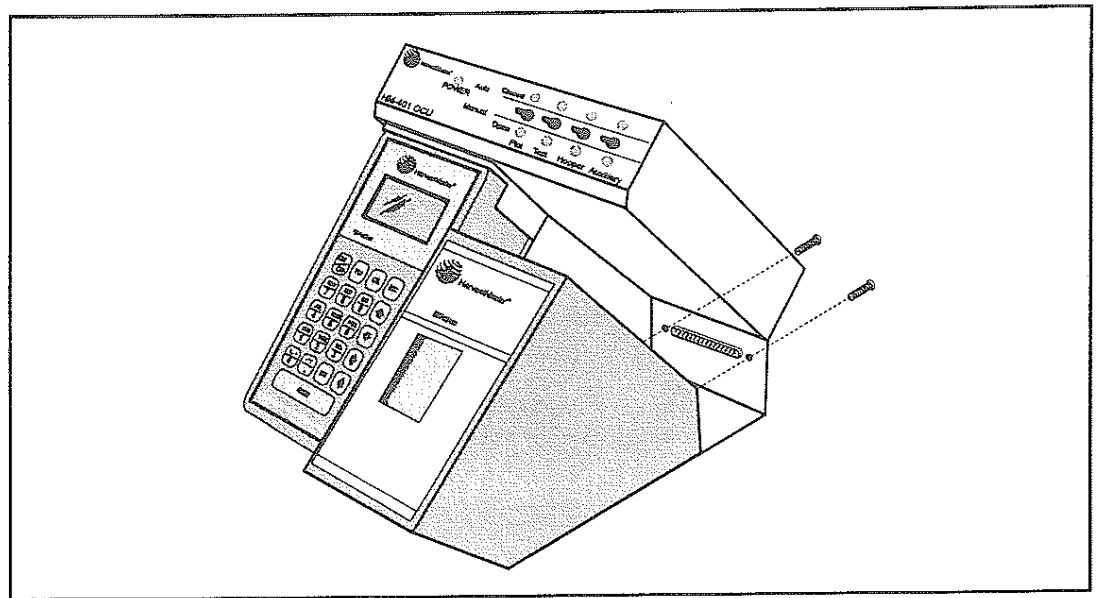
Figure 2-4
Installing the FieldPrinter.
The FieldPrinter and the console cabinet have electrical mating connections.
Two #6-32 x 3/8" Phillips pan head screws hold the FieldPrinter in place.

Installing a 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.

▇ To install a ribbon cartridge into the FieldPrinter;

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

Warning:
Avoid changing the ribbon cartridge while collecting data since damage could occur to the printhead if the ribbon cartridge is changed during printing.

2. Remove the paper from the printer (refer to page 2-26 for futher instruction).

3. You will notice the word "PUSH" on the right side of the ribbon cartridge. Push down to remove a used cartridge (see figure 2-6).

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

5. Re-insert the paper into the print mechanism (see figure 2-6).

Figure 2-16: Ribbon placement in the HarvestData 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. Put a new ribbon in its place.
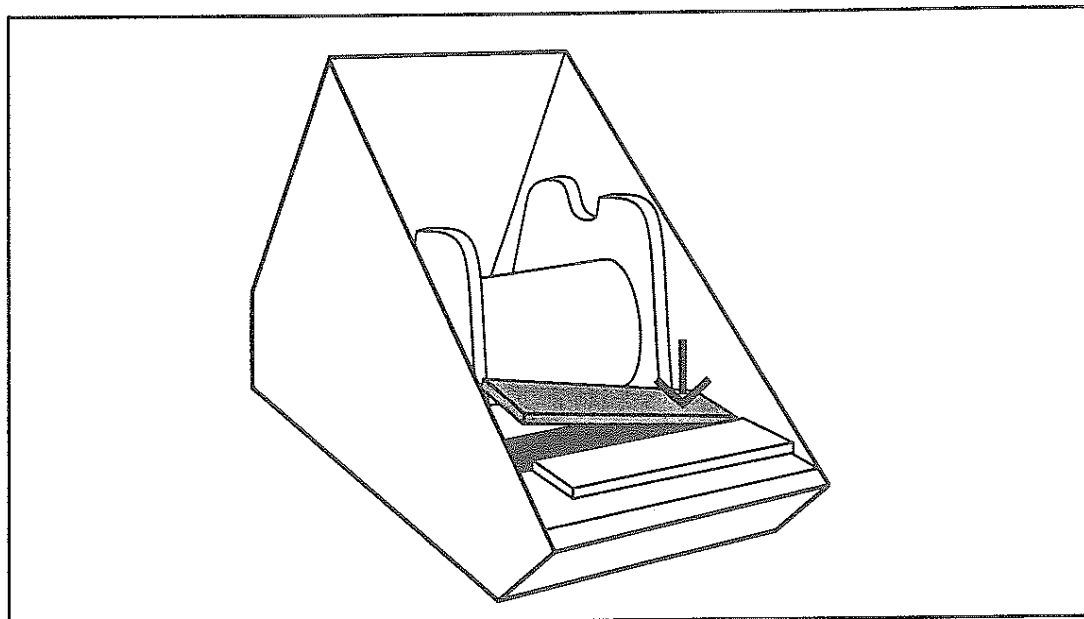
Warning:

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.

Inserting a Paper Roll
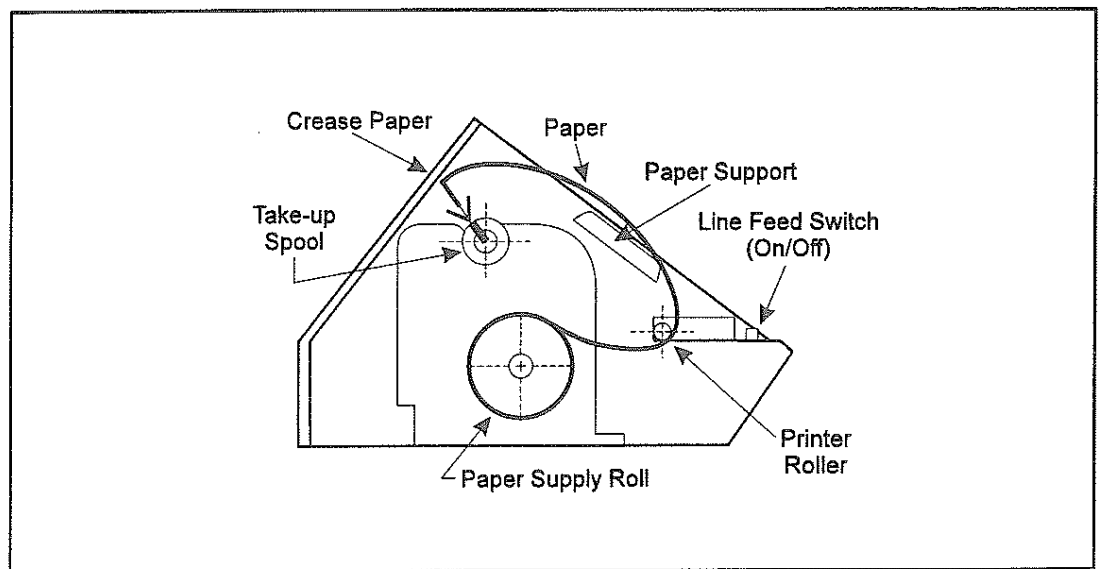
Figure 2-6
Paper Path in the FieldPrinter. Creasing the paper about 1/2" from the end makes it easier to insert into the slot of the take-up spool.

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

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

2. Insert the paper roll onto the supply spool.

3. Unroll several inches of the paper and cut the edge diagonally to a point on one side.

4. Slide the end of the paper into the back of the printer and gently pull the diagonal point up until the full width of the paper is through the printer.

   Note: The take-up spool is controlled by the FieldBook and will not advance with the line feed (LF) switch.

5. Carefully pull the paper through, or switch the paper feed switch to Line Feed (LF), until there is a sufficient amount to start on the take-up spool.

6. Fold the end of the paper and crease it, then insert it into the slot in the take-up spool.

7. Roll the take-up spool a few turns to hold the paper in the slot and place the spool into its position in the take-up assembly.

8. Turn the take-up spool manually or use FTN 5 on the FieldBook to advance the paper until there are several wraps around the take-up spool.

9. 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 FTN 5 on the FieldBook.

2. Tear off printed paper above the printhead.

3. Re-insert the paper on the take-up spool as shown on page 2-24.

■ **To replace the supply roll:**

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

2. Pull the remaining paper through the printer mechanism or advance it with the line feed switch or FTN 5.

3. Insert a new supply roll as shown on page 2-24.

<div align="right">

Chapter 3

Software

</div>

Loading Software

The distribution diskette (MS-DOS, or IBM PC compatible format) contains the programs to support the HarvestData software for plot grain harvest weight and moisture measurement.

The steps to install the software on the HM FieldBook are as follows:

■ **Insure that the battery in the HM FieldBook is adequately charged.**

Leaving it plugged into the charger overnight before use is a good practice.

■ **With the HM FieldBook turned off, plug the RESET connector into the serial port, and turn the HM FieldBook on (press "ON/OFF").**

When the "MODE?" prompt appears on the display of the FieldBook:

■ **Install DataLink and the HarvestData software on your PC (refer to Appendix B, DataLink).**

■ **Make sure the serial cable is connected between the HM FieldBook and one of the serial ports on your personal computer.**

■ On your PC, make sure you are in the directory that DataLink is located. Type "DL" to execute. From the "Applications" menu, select the HarvestData software you wish to install.

Use the "UP" and "DOWN" arrow keys to move the selector in each field of the form. Use the ENTER key to move to the next field. Use SHF-TAB to move to the previous field.

■ Choose the correct FieldBook Memory size, bucket actuator type, and language for your system.
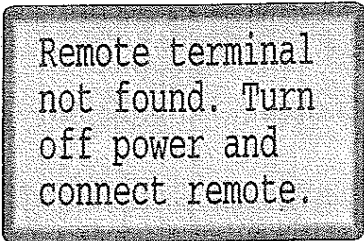
```
Memory Size: 256 Kb          ( • )
             448 Kb          ( • )

Language:    English         ( • )
             French          ( • )
             German          ( • )
             Spanish         ( • )

Load Help:   No              ( • )
```

Warning:

It is critical that you select the proper memory size for your FieldBook to operate correctly. If you are unsure of the memory size, simply turn on the FieldBook. In the bottom left corner the memory size is displayed during the initial sign-on screen.

It requires about 5 minutes for the FieldBook software to load.

When the application software is loaded, the display will show this message (*Remote terminal not found...*). It is to let you know that the FieldBook is ready to be connected the the SCCU.

```
Remote terminal
not found. Turn
off power and
connect remote.
```

■ **Turn the FieldBook off and then back on.**

It will try to connect to the SCCU or PC for 1 minute before displaying this message again. If you wish to use the FieldBook without attaching it to the SCCU, press <ESC> while the HarvestData sign-on banner is being displayed.

This software may remain resident on the HM FieldBook until such time as the FieldBook is reloaded with different software for other applications.

If you don't get the above message, or the application does not appear to be properly installed, refer to *Chapter 5 Troubleshooting* for steps to diagnose the situation, and correct the problem.

HarvestData Menu Structure

The menu presents the various processes with which you will use to set up your
HarvestData System and acquire harvest data.

```
                                                                    -- Set Variables --
                                                                    1 Units
                                      -- Setup --                   2 Standard Vbls
                                      1 Set Variable                3 Set Decimal
                                      2 Weight/Bucket               4 Add Note Vbl
                                      3 Moisture                    5 Delete Vbl
                                      4 System                      6 View Vbls


                                      -- Field Maps --              -- Weight/Bucket --
                                      1 Generate Map                1 Calibrate
                                      2 View Map                    2 Timers
                                      3 Delete Map                  3 Set Retare
   -- Main Menu --                    4 Rename Map                  4 Set Level
   1 Setup                                                          5 Control
   2 Field Maps
   3 Harvest
   4 Data                                                           -- Moisture --
   5 Diagnostics                      -- Data Menu --               1 Create Curve
   6 Poly Op Sys                      1 View Data                   2 Edit Curve
                                      2 Delete Data                 3 Delete Curve
                                      3 Comms                       4 Rename Curve


                                      -- Diagnostics --             -- System --
                                      1 Avlble Memory               1 Delete Setup
                                      2 Moist Volts                 2 Save Setup As
                                      3 Load Cells                  3 Select Setup
                                      4 Buckets                     4 Password
                                      5 Print Moist                 5 Delete Help
                                      6 Print Setup
                                      7 Level Detect
                                      8 Barcode Diag                -- Communications --
                                      9 Terminal Mode               1 Modem Upload
                                                                    2 Comm Params
```

How to Move Through the Menu

"UP ARROW" - causes the previous menu option to be displayed.
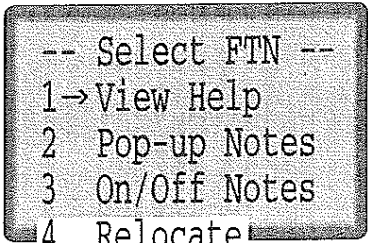
"DOWN ARROW" - causes the next menu option to be displayed.

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

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

FTN Key

When you press the "FTN" key, a pop-up menu of options appears:

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

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

A second sequential press of the "FTN" key exits the function menu, and returns you to the previous activity.

Help Information

Pressing <FTN 1> causes help information to appear on the screen, relating to the current activity in process. For example, pressing <FTN 1> 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 <UP ARROW> or <DOWN ARROW> to scroll up or down 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. Press "SHF" [⅗] for "Y" (yes) and "SHF", "SHF" [⅖] for "N" (no).

> **Note: Depending on the language of the prompts which you selected at program loading time, the "Y" for Yes may be changed.**

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

General File Transfer Procedure

File transfers are controlled completely from HarvestMaster's DataLink software running on a desktop computer (see Appendix B, DataLink). Before attempting to transfer files, ensure that cable connections between the FieldBook and the PC are secure and communications parameters are set correctly.

Moisture Curve & Field Map Selection

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, setting the communication port (baud rate, parity, etc.), 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.

Set Up of the HarvestData System

The remainder of this chapter explains how to set up the HarvestData System. Using the "Setup" menu in the HarvestData Software on the FieldBook computer.

Before proceeding with the set up, make sure that the HarvestData Software has been installed; as explained in the beginning of this chapter. Also, familiarize yourself with the menu structure, thereby giving you an overview of the procedures, activities, and diagnostic functions available. Perform the activities discussed in the following sections to ready the harvestData System for recording harvest data.

Setting (selecting) Variables to Record

Before harvesting or taking field notes, begin by setting the variables.

Setting Units

▓ Make **this menu selection.**

```
--  MAIN MENU  --
1 Setup >┐
         │
         │   --    SETUP    --
         └─> 1 Set Variables >┐
                              │
                              │   -SET VARIABLES-
                              └─> 1 Units
```

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

```
Select unit
of measurement:

ENGLISH
```
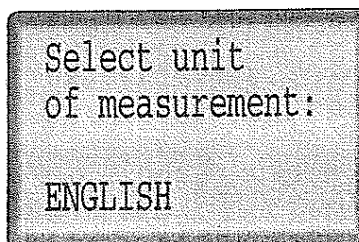
▓ **Press the "LEFT" or "RIGHT" arrow key to toggle between English and Metric. Press "ENTER" to finalize your choice.**

Standard Variables

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

▓ **Make this menu selection.**

```
  -- MAIN MENU --
 1 Setup >─┐
          │
    ┌─────┘
    │   --  SETUP    --
    └─> 1 Set Variables >─┐
                          │
           ┌──────────────┘
           │  -SET VARIABLES-
           └─> 2 Standard Vbls
```

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

■ Press the "LEFT" or "RIGHT" arrow keys to toggle between YES and NO. Press the "UP" or "DOWN" arrow keys to move between selections.

```
Enter test
chamber volume
in cubic inches
0.00
```

This will read "in cubic inches" if the choice of units is "ENGLISH" and "in cc's" if you choose "METRIC". See the chart below for entering the appropriate chamber volume size:

Chamber Size	Cubic Inches	Cubic Centimeters
3 liter	209	3,441
1.5 liter	89	1,458

Note: You may have to adjust the cubic inches/cubic centimeters slightly depending upon the density of the grain sample. Compare the density readings from a bench-top tester with that of the GrainGage to ensure accurate calibration.
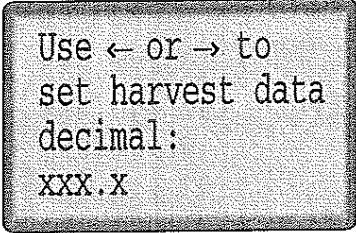
By keying in the test chamber volume, the units of recorded test weight will no longer just be pounds, or kilograms. In English, you will see lbs./bu, and in metric the units will be kilograms per hectoliter.

Set Decimal

The following menu selection gives you a screen to set the decimal position of your printed and saved harvest data.

```
        -- MAIN MENU --
       1 Setup >─┐
                 │
                 │  --   SETUP    --
                 └─> 1 Set Variables >─┐
                                       │
                                       │  -SET VARIABLES-
                                       └─> 3 Set Decimal
```

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:

```
Use ← or → to
set harvest data
decimal:
xxx.x
```

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

▓ Press "Enter" or "ESC" to return to the menu.

Note: If you change the decimal setting, the new setting will only be active in field maps that are downloaded or generated after the change. All previoius field maps will have the old setting recorded.

Additional Note Variables

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

```
        -- MAIN MENU --
        1 Setup>─┐
                 │
                 │   -- SETUP --
                 └─→1 Set Variables>─┐
                                     │
                                     │   -- SET VARIABLES --
                                     └─→4 Add Note Vbl
```

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

```
┌─────────────────────────┐
│                         │
│   Please enter          │
│   name:                 │
│                         │
│                         │
└─────────────────────────┘
```
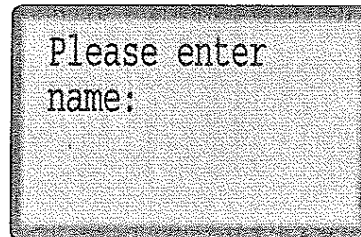
Note: There are two special note names: BARCODE and SEQNO that perform special functions:

> **BARCODE: Lets you scan in (or key in) a value for each plot after the plot has been harvested and 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.**

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

```
Enter width of
variable:

___
```
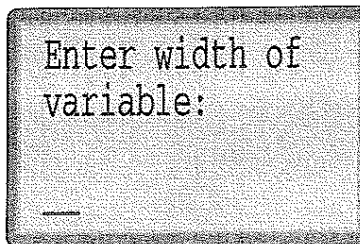
Delete or View Variables

These last two menu items under "SET VARIABLES" allow you to delete any of the additional variables you may have set up, or to simply review them.

```
-- MAIN MENU --
1 Setup>─┐
         │
     ┌───┘
     │  -- SETUP --
     └→2 Set Variables>─┐
                        │
          ┌─────────────┘
          │  -- SET VARIABLES --
          └→5 Delete Vbl
             6 View Vbl
```

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

```
Viewing vbls:

name:   LODGING
type:   NUM NOTES
```

If there are no variables, this screen appears.

```
No variables
have been set
up.  Please set
variables
```

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.

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.

Note: The rule is: The set of variables (as defined in the "SET VARIABLES" menu activity) 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 that map.

GrainGage Setup

Setting the GrainGage Weight Calibration

After setting up the HarvestData System, proceed with the set up of the GrainGage.

■ Check the Weight Calibration of the GrainGage.
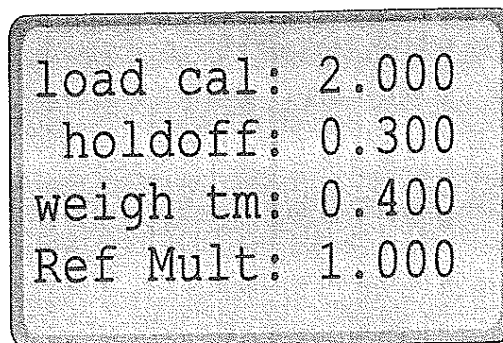
```
   ==  MAIN MENU  ==
   1 Setup >┐
           │
           │  ==   SETUP    ==
           └─> 2 Weight/Bucket >┐
                               │
                               │  -WEIGHT/BUCKET-
                               └─> 1 Calibrate
```

From the calibration label, take the average of the "Net Output" of loadcell A1 and A2. Key in the calibration value under the "Load Cal:" option.

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

You may check its accuracy with a precisely measured weight of 4-6 lbs (2-3 kg). Alternatively, a precisely weighed out quantity of grain (20-30 lbs, 10-15 kg) can be used.

The weight calibration screen for the GrainGage will appear. Refer to the calibration sheet which comes with the GrainGage for the exact calibration values. If replacing one or the other of the load cells, use the average millivolts per volt signal value for the two load cells under the left end. The values are given on the calibration certificate of the load cells.

```
load cal: 2.000
 holdoff: 0.300
weigh tm: 0.400
Ref Mult: 1.000
```

If you don't have a calibration certificate, use the method below to adjust or calculate the "signal value."

Setting the "Signal Value"

The nominal value under "load cal" is 2.000 mv/v and it typically will be from 1.9 mv/v to 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.

Run an actual weighed sample of grain through the system using the "Harvest" menu. Alternatively, use the fixed calibration weight described above. Assume these are your results:

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 under the calibration screen and replace the load cell value of 2.00 with the new derived value, in this instance, 1.965.

Hold Off: 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. You will want to set this time as short as possible without affecting the weight readings of the wettest sample with which 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.

Note: The advantage of using this option is that you may want to set the averaging weigh time higher if you are needing more accuracy under high vibrating environments and lower if you are more concerned with faster cycle time.

Ref Mult: Option Not Available

Setting the Hopper and Bucket Door Timers

▓ **Make this menu selection:**

```
-- MAIN MENU --
1 Setup >┐
         │
    --   SETUP   --
└─> 2 Weight/Bucket >┐
                     │
        -WEIGHT/BUCKET-
    └─> 2 Timers
```

```
┌──────────────────────┐
│ Enter values         │
│ Top            0.6    │
│ Middle         0.6    │
│ Bottom         0.6    │
└──────────────────────┘
```

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.

When you are finished reviewing the values:

■ Press the "DOWN" arrow key or "ENTER" until you return to the "Weight/Bucket" menu if you want to save your changes.
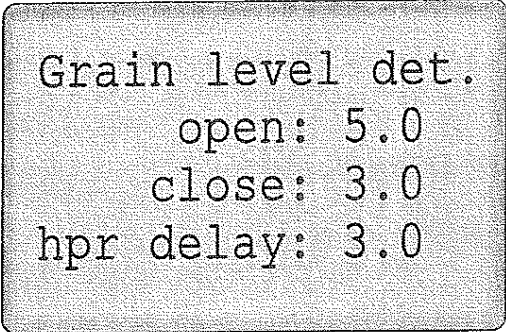
or

■ Press "ESC" if you don't want to save the changes you made.

Setting the Level Detect

■ Make this menu selection:

```
-- MAIN MENU --
1 Setup>─┐
         │
    ┌────┘
    │ -- SETUP --
    └─>2 Weight/Bucket>─┐
                        │
    ┌───────────────────┘
    │ -- WEIGHT/BUCKET --
    └─>4 Set Level
```

```
Grain level det.
     open: 5.0
    close: 3.0
hpr delay: 3.0
```

The open/close values determine the sensitivity of the grain level detector at the top of the GrainGage. A high value corresponds to less sensitive operation allowing 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.

Flow of Grain

Level Detect

10
5
1

Range of
Sensitivity

Gate 1

Gate 2
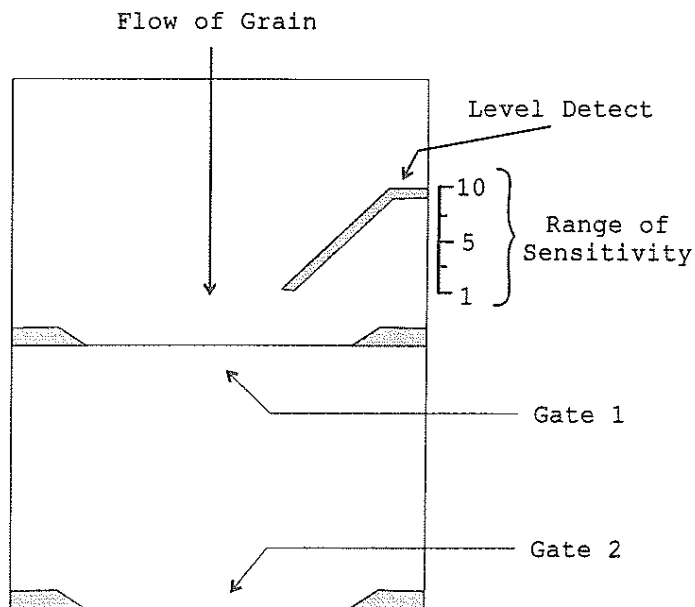
The open level corresponds to the level at which the level detect will generate an open signal, causing gate 1 to open (assuming the other GrainGage chambers are empty). Grain will continue to flow into the GrainGage, accumulating in the middle chamber and then into the top chamber. When the grain reaches 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, which-ever happens last.

> **Note: Typically you will want to set the "OPEN" value higher than the close value so that when gate 1 opens it will completely fill the middle chamber immediately. 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.**

The "hpr delay" is the time between the level detect sensing that it is time to open gate 1 and the time at which the gate actually opens. 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.

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.

```
-- MAIN MENU --
1 Setup>
       ┌─────────┐
       │   -- SETUP --
       └→2 Weight/Bucket>
               ┌─────────────────┐
               │    -- WEIGHT/BUCKET --
               └→5 Control
```

■ 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.

```
Select bucket:



Hopper (top)_
```
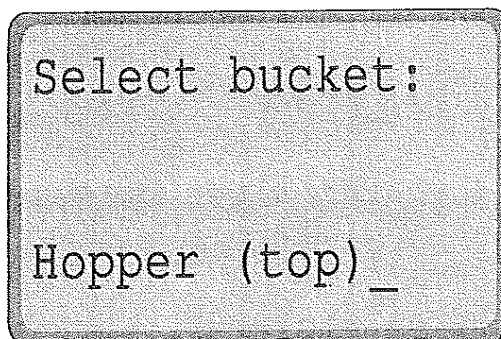
The SCCU needs to know whether or not the acutator for the selected bucket uses a limit switch to end the acutator travel when it is opening the bucket door.

```
Limit switch on
open stroke?


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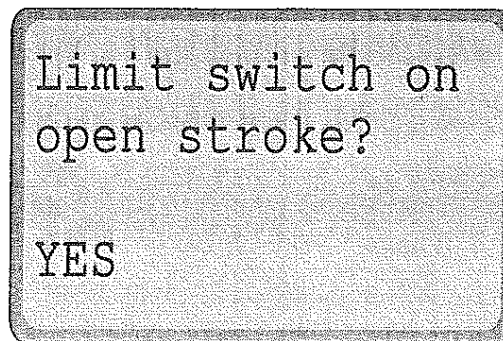
■ Press the "LEFT" and "RIGHT" arrow keys to select either NO or YES in answer to the question or press "ESC" to back up the actuator selection screen.

NOTE: If a limit switch fails on the GrainGage, you can disable it using this menu such that operations may continue. The hazard is that the system can no longer detect jammed gates.

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.

```
Opening
Transition
Time:
X.XX
```
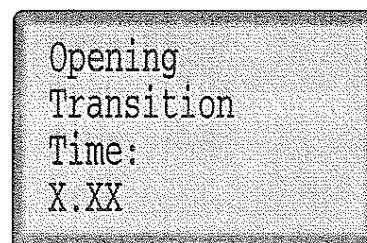
■ Enter the amount of time, in seconds, it takes your actuator to completely open the selected bucket. (Normally 0.2 seconds for the GrainGage. Fractional times, e.g. 2.5, are allowed.)

■ 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.

```
Limit switch on
closed stroke?

NO
```

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

```
Closing
Transition
Time:
X.XX
```

■ 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.)

Creating a Moisture Sensor Curve

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 this:

In the memory of the HM FieldBook, and presented to you for editing, it appears like this:
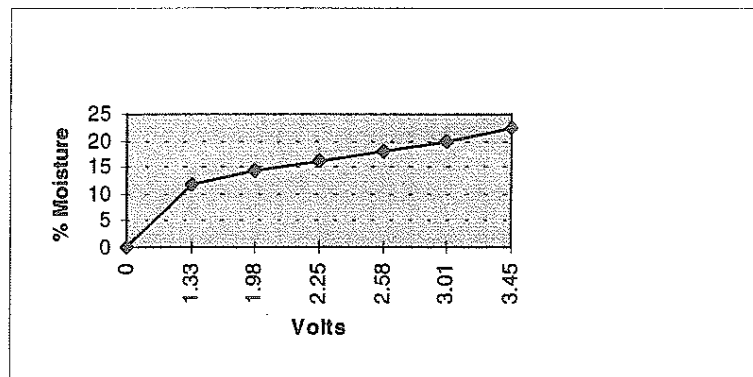
Volts	% Moisture
0.000	0.0
1.330	11.8
1.730	14.5
1.980	16.2
2.250	17.9
2.580	20.0
3.010	22.5

Preparation

In proceeding with this exercise, the entire system must be fully operational with the workings of the moisture sensor completely checked out (see "DIAGNOSTICS" menu).

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

■ **Have at least 3 samples of different moisture content grain available, with each sample marked. Mark each sample. The GrainGage will require sample sizes of about 6 lbs for the large chamber and about 3 lbs for the small chamber.**

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.

Note: Different grain types should have their own moisture curves.

The HarvestData software will accept up to 20 samples for each moisture curve.

■ **Plug the HM FieldBook into the HarvestData system console.**

■ **Turn on the combine and run the engine and thresher at the speed at which 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.**

With a moisture sensor present on the system, this reading 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.

Note: If the reading is not "0", then press "FTN" + "6" to retare the buckets. (Make sure the bucket is empty before pressing "FTN" + "6".) After retaring, the reading will be "0".

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

■ Close the test chamber door.

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

Warning:
Keep your hands and fingers out of the GrainGage! Severe injury may occur if extreme caution is not taken at all times!

Calibration

■ Make this menu selection to create a moisture sensor curve.

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

```
Please enter
name:
```

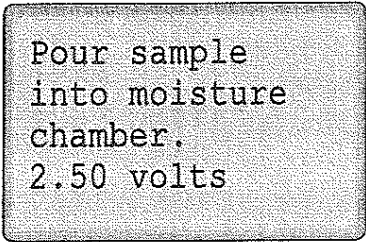The first screen requests that you enter a name for the moisture curve.

■ Key in the alphanumeric name you wish for the moisture curve to be created. Moisture curve names may 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" or "WHEAT", or "WET-CORN".

When entering harvest mode you will be 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 which you will remember, and not confuse with other names in the system. If you key in a name which is already in use, the HM-FieldBook will ask whether you wish to overwrite the existing file.

The lower left corner of the next screen should be showing the percent of moisture full scale reading. With an empty chamber, it should be "0". If it is not "0" you will need to retare your bucket by using a <FTN 6> as explained in the *Retare Bucket* section on page 4-20 of this manual. When the percent full scale 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. Open the hopper gate. Allow the sample to drop into the constant volume chamber.

```
Pour sample
into moisture
chamber.
2.50 volts
```

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 *DIAGNOSTICS*.

■ Press "ENTER" to capture the reading.

■ 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).

```
Enter sample 1
moisture content

10.0
```
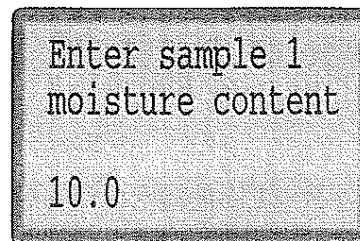
■ Press "ENTER".

■ Use the manual switches to open the test chamber door 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.

■ Press "ESC" when all of the samples are entered.

This completes the moisture sensor calibration.

You may 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 *DIAGNOSTICS*. After gathering the data in *DIAGNOSTICS*, the curve can be edited. This can be done by following the steps in "Editing a Moisture Sensor Curve" on page 3-30. The voltages should be very similar to calibration voltages.

Note: We recommend spending time double-checking and testing the calibration until you are confident that your curve is good. When you are confident with the accuracy of the curve, you should upload and print it immediately for future reference.

Creating a Trial Moisture Sensor Curve

If you have moisture curve 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 do so.

■ Connect the hand held to the SCCU and power it up as if you were going to calibrate moisture.

■ Proceed with the above set of steps (under calibrating moisture) using an empty bucket and 0% moisture for all of the entries.

■ Refer to *Editing a Moisture Curve* (below) to edit your data.

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

Warning:
If you change moisture sensors on a HarvestData System, you must check the calibration for the new sensor.

Editing a Moisture Sensor 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:

▪ **Select "Edit Curve" from the "MOISTURE" menu.**

```
      -- MAIN MENU --
     1 Setup┐
             │
       │   --   SETUP   --
       └─→ 3 Moisture     >┐
                           │
            │   --   MOISTURE  --
            └─→ 2 Edit Curve
```
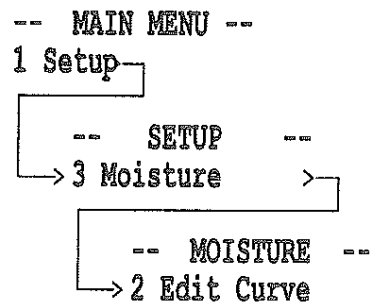
You are now presented with a list of all the existing curves in the FieldBook.

```
      Select moisture
      curve:
         →CORN
          WHEAT
          CANOLA
         (etc.)
```
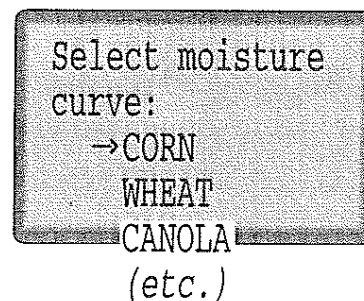
▪ **Select the desired curve using the "UP" or "DOWN"arrow key, followed by "ENTER" once the arrow is opposite the desired selec tion.**

Now the hand held presents you with a double column of numbers representing the moisture curve.

```
% MSTR        VOLTS
  0.0     ← 0.12
 10.2        3.85
 13.5        4.25
 17.1        6.41
 20.4        8.02
      (etc.)
```

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" or any of the ARROW keys 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.

Use "SHF" + "RIGHT ARROW" to insert a blank line into the curve after the selected line.

Use "SHF" + "LEFT ARROW" to delete the selected line from the curve.

Use "ESC" to edit the temperature compensation. If no temperature compensation is desired press "ESC" again.

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.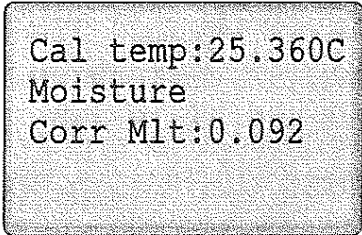 The HM-400 HarvestData System can do this correction automatically. However, you may wish to adjust the correction coefficient.

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.

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

```
Cal temp:25.360C
Moisture
Corr Mlt:0.092
```

 ▓ **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.**

To illustrate how moisture compensation works:

The moisture sensor reads about .092% less moisture for each degree C that the sample is below the temperature at which the system was calibrated. Assuming the calibrations were done at 20° 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 is higher than calibration temperature, a correction needs to be subtracted from the measured value.

The HarvestData Software does the correction automatically if the correction coefficient in the moisture curve after editing that curve in (1)SETUP: (3)MOISTURE: (2)EDIT screen.

The two numbers to which you have access are:

Cal. Temp: 21.2
Corr. Coef: .092

Normally you won't change the calibration temperature (Cal. Temp) from what it was when you did the calibrations. Doing so will shift your entire curve up or down.

> **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 too low. This is an easy way to fine-tune the moisture curve after calibration.**

The correction coefficient 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. = Corr. Coef. * (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) Editing the moisture curve (Menu (1)SETUP: (3)MOISTURE: (2)EDIT).

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

> 3) Adjust the Corr. Coef. as needed for your crop. In the absensce 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.

> 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 HarvestData printer from the *DIAGNOSTICS* menu.

Moisture Compensation Diagnostics

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

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

> **Note: You can select a moisture curve by going into menu *(3)Harvest*, then 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've selected the moisture curve you can view the moisture compensation diagnostics for that curve.

▓ **Make this menu selection:**

```
        -- MAIN MENU --
        5 Diagnostics ─┐
         ┌─────────────┘
         └→ -- DIAGNOSTICS --
             3 Moisture Volts
```

The three temperature compensation coefficients print in the "Print Setups" menu option of the "DIAGNOSTICS" menu, in the same format as shown on the entry screen.

```
Moisture:19.8%
Rel Vlts:2.1
Abs Vlts:-1.8
Tmprture:23.4
```

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

```
TEMP COMP.
Uncor.%Mst:18.9
Correction:0.92+
 %Moisture:19.8
```

Deleting a Moisture Sensor Curve
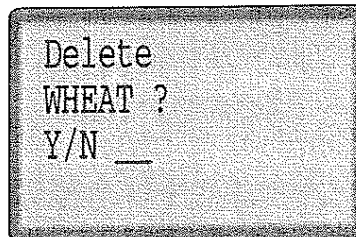
Deleting a curve is accomplished through this menu path:

```
--  MAIN MENU --
1 Setup>─┐
         │
         │   --   SETUP   --
         └─> 3 Moisture >────────┐
                                 │
                   --   MOISTURE   --
                   └─> 3 Delete Curve
```

If you have set up a password, you must supply it before being allowed to continue.
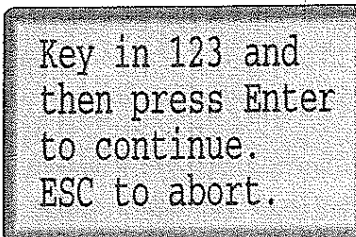
Beyond that point, you are asked to select the name of the moisture curve to delete using the **ARROW** keys and pressing **"ENTER"**.

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

```
Delete
WHEAT ?
Y/N _
```

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

```
Key in 123 and
then press Enter
to continue.
ESC to abort.
```

Renaming a Moisture Sensor Curve

Here is the menu path for renaming a moisture sensor curve.

```
        --  MAIN MENU  --
      1 Setup>┐
        │
        │     --    SETUP    --
        └──> 3 Moisture >────────┐
                                 │
                   --  MOISTURE  --
                 └──> 4 Rename Curve
```

You are requested to select the name of the curve to rename and to key in the new name for the curve.

Creating a Setup File

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-selectet, when desired.

After you've set all the desired system parameters, you can save those setup parameters in a setup file by following this menu path:

```
        -- MAIN MENU --
    1 Setup>─┐
        │
        │       -- SETUP --
        └──> 4 System>──────────────┐
                        │
                        │    -- SYSTEM --
                        └──> 2 Save Setup As
```

▣ 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).

```
┌─────────────────────────┐
│                         │
│   Enter new name        │
│   for current           │
│   setup:                │
│                         │
│                         │
└─────────────────────────┘
```

Deleting a Setup File

After downloading setups to the FieldBook from the PC, you may want to delete one.

```
-- MAIN MENU --
1 Setup>
       -- SETUP --
   > 4 System>
            -- SYSTEM --
        > 1 Delete Setup
```

```
Select File:
-> LOGAN
   PROVO
   OREM
```

The next screen requests verification of the action.

■ Press Y ("SHF", [YZ-3]) for yes.

```
Delete
<filename> ?
Y/N
```

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

```
Key in 123 and
then press Enter
to continue.
ESC to abort.
```

Selecting a Downloaded Setup File
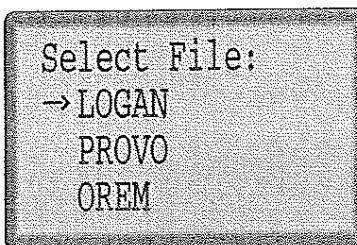
You may upload setup files to your desktop computer to save and later reload them onto the FieldBook. Setup files consist of bucket setup information, weight calibration coefficients, and moisture calibration curves. (See Appendix B for more information.)

■ Make this menu selection to choose one of the setups that you previously downloaded:

```
-- MAIN MENU --
1 Setup>
      -- SETUP --
    →4 System>
          -- System --
        →3 Select Setup
```

Note: When saving setup files, keep in mind that moisture curves are dependent on the sensor used during the calibration. Curves should not be created on one sensor and then used with another sensor.

■ Use the "UP" and "DOWN" arrow keys to scroll through the selections, and the "ENTER" key to make the selection.

```
Select File:
→ LOGAN
  PROVO
  OREM
```

Since the FieldBook uses a special name for the current setup file, you are asked if you want to overwrite the existing setup.
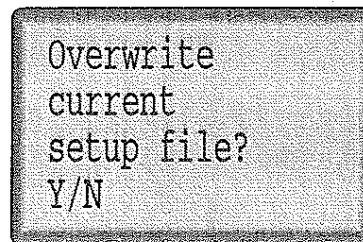
```
Overwrite
current
setup file?
Y/N
```
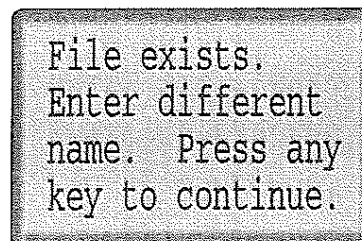
■ Answer Y ("SHF", [YZ- 3]) for yes if you do not want to save the current

setup. Answer N ("SHF", "SHF", [MNO 5]) for no if you want to save the

current setup under a different name.

Pressing "ESC" at this point aborts the operation.

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

Note: You may wish to save the existing setup file before overwriting it. To do this, see Creating a Setup File.

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

```
File exists.
Enter different
name.  Press any
key to continue.
```

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

Set, Use, and Erase the Password

■ **Make this menu selection.**
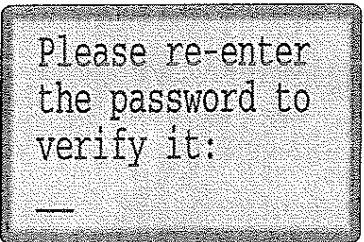
```
      -- MAIN MENU --
     1 Setup>─┐
        ┌──────┘
           -- SETUP --
        └─→ 4 System>──────────┐
                    ┌──────────┘
                      -- System --
                    └─→ 4 Password
```

If there is no password already in existence in the machine, you may enter your choice of password at this time. Dots will appear as each letter of the password is typed.

```
┌─────────────────────┐
│                     │
│   Please enter      │
│   new password:     │
│                     │
│                     │
│   ──                │
│                     │
└─────────────────────┘
```

Just to make sure you haven't made a mistake, the HM-1 asks you to verify your entry. If there's already a password, you must enter that password before being allowed to key in a new one. Should you choose to delete the password, proceed as if you were going to enter your 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.

```
┌─────────────────────┐
│                     │
│   Please re-enter   │
│   the password to   │
│   verify it:        │
│                     │
│   ──                │
│                     │
└─────────────────────┘
```

If you have forgotten your password, and need access to a password protected area, please call HarvestMaster technical support.

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

Under the "Setup" menu, select the option to delete the help files:

```
-- MAIN MENU --
1 Setup>─┐
  ┌──────┘
  │   -- SETUP --
  └─> 4 System>──────────┐
          ┌──────────────┘
          │   -- System --
          └─>5 Delete Help
```

This will create additional space for approximately 240 additional plots worth of data.

Chapter 4

System Operation

This chapter explains how to prepare field maps for harvesting, how to record harvest data, how to record other user observations, and how to transfer data from the HM FieldBook back to your personal computer

Field Maps

Use the Field Maps main menu option to create and manipulate maps of plots within the FieldBook. Each of the Field Map menu items are discussed below.

Generating a Field Map

▮ Make this menu selection:
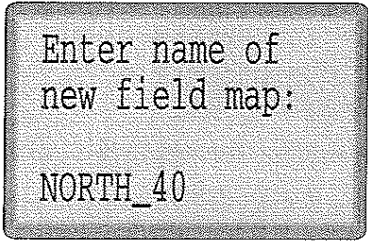
```
   --  MAIN MENU --
   2 Field Maps >┐
         ┌───────┘
         │  -- FIELD MAPS --
         └─> 1 Generate Map
```

The "Field Maps" selection from the main menu presents access to the field map options:

        1 ->   Generate Map
        2   View Map
        3   Download Map
        4   Delete Map
        5   Rename Map

■ **Press "ENTER" to select "Generate Map"**

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

```
Enter name of
new field map:


NORTH_40
```

■ **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 which define the field map you wish created.

```
entries/rep:8
reps:          3
plots/range:6
start value:101
```

A second screen provides further definition for the creation of a field map.

```
plot inc:        1
rep inc:       100
route:SERPENTINE
(Rating Order)
```

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

Following are definitions of these fields.

Definitions

entries/rep:
The number of entries (sometimes termed treatments) to be represented in this map.

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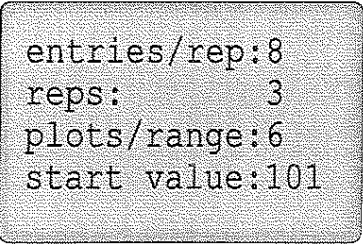The number of replications of the entries (or treatments) of this map. The total number of plots that will be included in this map is entries x reps. For example; if there were 8 entries replicated 3 times, the total number of plots for the field map would be 24.

plots/range:
This is the number of plots wide in the field layout.

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

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.

route:

There are two choices: SERPENTINE and SEQUENTIAL; select the one desired by pressing **"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 (90 degrees orientation to harvest order, usually).
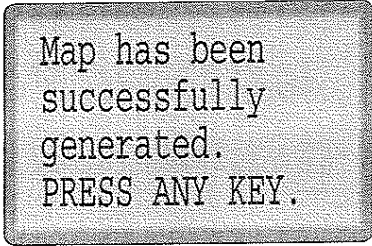
Here is a map resulting from 8 entries, 3 replications, and a layout of 6 plots per range.
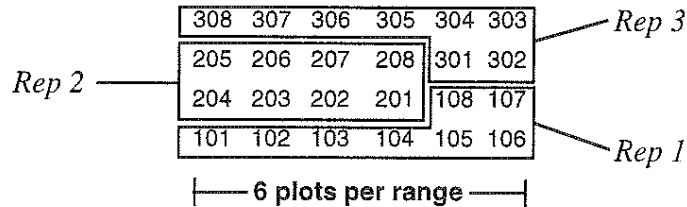
You will be shown a "wait" message while the map generates, which is usually only a few seconds; even for a fairly large sized map.
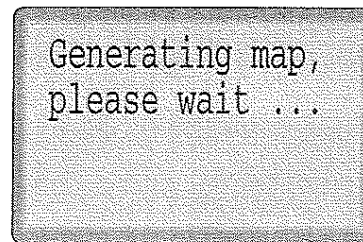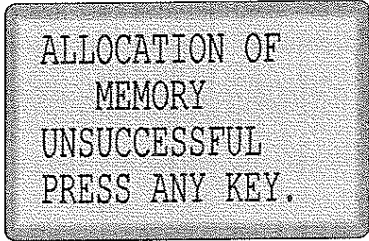
Field map generation is followed by this screen.

```
Map has been
successfully
generated.
PRESS ANY KEY.
```

■ **Press "ESC" or another key to leave this menu activity at this point.**

If you try to generate too large of a field map in the HM FieldBook, you'll see this message. Try again with smaller dimensions.

```
ALLOCATION OF
   MEMORY
UNSUCCESSFUL
PRESS ANY KEY.
```

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". Consult the *Generating a Field Map on the Fly* (later in this chapter) for further details.

Viewing a Field Map

The following 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 the field map to view by using the "UP" or "DOWN" arrow key followed by "ENTER".

```
Select field map
to view:
→NORTH_40
  SW_REW_FM
  BG_HOLLOW
     (etc.)
```

■ Use the arrow keys to position the FieldBook's screen over the portion of the map you wish to see.

```
plt: 1  rng: 1
   121     122
   120     119
→ 101     102
```

If the plot designators are more than 8 characters wide, they will be truncated to 8 characters in the map display.

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. The ENTER key will allow you to view any other identifiers which have been downloaded.

Note: Pressing <SHF> + ARROW KEY will move you 2 plots at a time in the indicated direction. Pressing <SHF>, <SHF> + ARROW KEY will move you a quarter of length of the map in the indicated direction. Pressing <SHF>, <SHF>, <SHF> + ARROW KEY will move you as far as possible in the indicated direction.

Deleting a Field Map

▣ Select this menu option.

```
      -- MAIN MENU --
      2 Field Maps>┐
             ┌──────┘
             │  -- FIELD MAPS --
             └─> 3 Delete Map
```

You are then presented with a field map name choice screen.
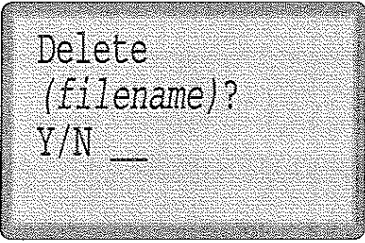
```
Select map:

→NORTH_40
  SW_REW_FM
  BG_HOLLOW
     (etc.)
```

- Use the "UP" and "DOWN" arrows to scroll through the selections.
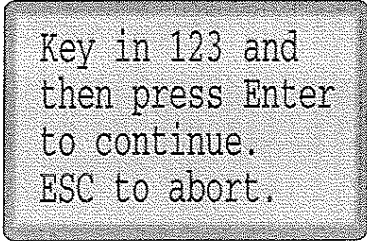
- Press "ENTER" to make the selection.

The next screen requests verification of the action.

```
Delete
(filename)?
Y/N __
```

This additional screen gives you one last chance to back out before erasing the selected map, and any recorded data which you may have acquired with it.

```
Key in 123 and
then press Enter
to continue.
ESC to abort.
```

Renaming a Field Map

■ **Select this menu option.**

```
        -- MAIN MENU --
        2 Field Maps>──────┐
                           │
            -- FIELD MAPS --
        └─→ 4 Rename Map
```

You are then presented with a list of map names:

```
Select Map:


→North_40
  SW_RES_FM
```

■ **Use the "UP" and "DOWN" arrow keys to scroll, and press "ENTER"
to select.**

■ Enter your new map name.

```
Please enter
new name:

NEWNAME
```

■ Confirm the change of map names.

```
rename OLDNAME
to NEWNAME ?
Y/N __
```

The Harvest Operation

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".

■ Select this menu option to collect harvest data.
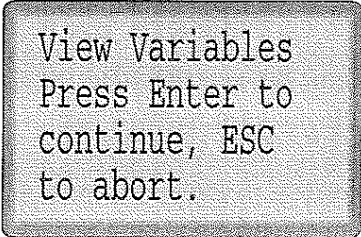
```
--  MAIN MENU --
 3 Harvest
```

■ Use the "UP" and "DOWN" arrows to scroll through the selections. Press "ENTER" to make the selection.

```
Select Map:

→North_40
  SW_RES_FM
```
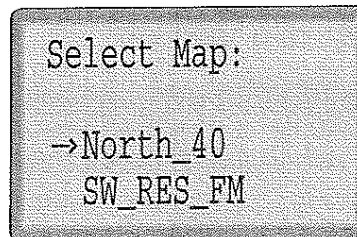
Note: If you do not have a map created at this point, it is possible to do so on the fly by pressing "SHF" + "RIGHT" arrow key. For more information on this sequence, see the section , *Creating a Field Map on the Fly* (page 4-18).

Activating and De-Activating Variables
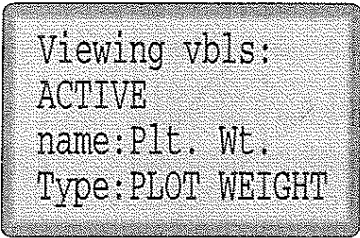
```
View Variables
Press Enter to
continue, ESC
to abort.
```

This screen is to remind you to review the variables which you have set "active".

■ Press "ENTER" to continue.

At this point, you can use the "UP" and "DOWN" arrow keys to activate or deactivate the variable. Normally it would be left "ACTIVE".
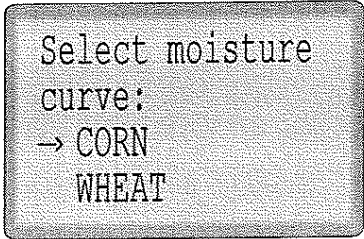
```
Viewing vbls:
ACTIVE
name:Plt. Wt.
Type:PLOT WEIGHT
```

■ Press "ENTER" to continue the beginning 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.

Important:

Whatever 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 data file.

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.

```
Select moisture
curve:
→ CORN
   WHEAT
```

If you get the screen shown below, it means you have not entered any moisture curves.
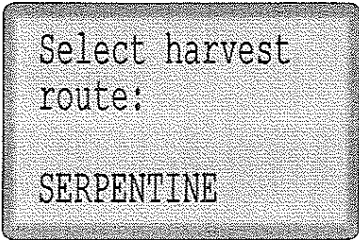
```
Moisture File
Not Found.
```

You have 2 choices:

1) Go back and define a moisture curve.

2) Hit "ESC", restart "Harvest", scroll to the moisture variable, and set it to "NOT ACTIVE".
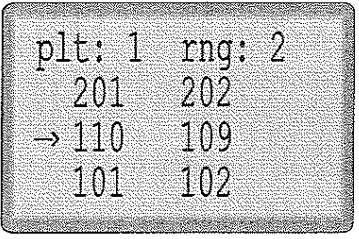
Selecting Harvest Routes (or Rating Routes)

```
Select harvest
route:


SERPENTINE
```

■ Use the "LEFT" and "RIGHT" arrow keys to select between the choices of "SERPENTINE", "SEQUENTIAL", or "CIRCULAR". Press "ENTER" to proceed.
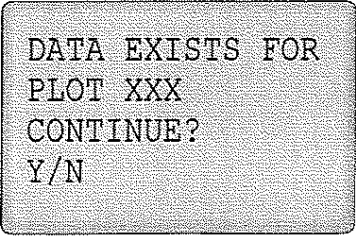
```
plt: 1   rng: 2
     201   202
  → 110   109
     101   102
```

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

■ Use the arrow keys to move the " → " on the screen to the desired position.
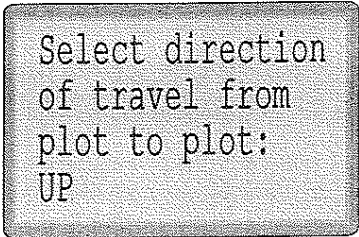
If the data storage cell for the plot on which you have chosen to start already has data in it, you will get this message:

```
DATA EXISTS FOR
PLOT XXX
CONTINUE?
Y/N
```

Choosing "N" for "no" brings back the repositioning menu.
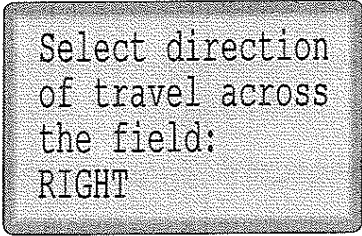
■ Use the "LEFT" and "RIGHT" arrow keys to scroll through the selections of "UP", "DOWN", "RIGHT", "LEFT".

```
Select direction
of travel from
plot to plot:
UP
```

■ Press "ENTER" when you see the desired choice. Normally, this would be UP or DOWN for collecting harvest data.
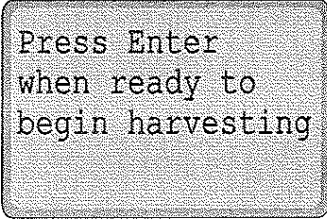
Now select the direction to travel across the field. Having selected "UP" or "DOWN" in the previous screen, your choices here will be "LEFT" or "RIGHT".

```
Select direction
of travel across
the field:
RIGHT
```

■ Use the "LEFT" and "RIGHT" arrows to view the selections, and press "ENTER" to make the choice.
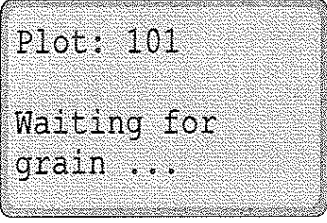
Harvesting

```
Press Enter
when ready to
begin harvesting
```

At this prompt, press "ENTER" and begin harvesting the first plot.

Here is the starting harvest screen:
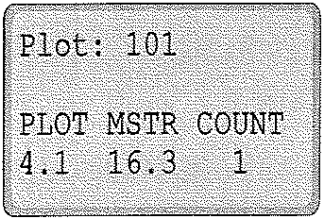
```
Plot: 101

Waiting for
grain ...
```

When you have selected the option to generate the map on the fly, you will be prompted before this screen to key in a plot "ID" or identification.

■ **Use the "LEFT" and "RIGHT" arrow keys to view other IDs.**

At this point, the GrainGage is waiting for grain to reach the level detect sensor. As the combine cleans, more grain falls into the GrainGage until the level detect sensor "sees" it.

When enough grain to fill the test chamber has entered the GrainGage, it will start dumping portions of grain into the weighing chamber. You will see this screen:
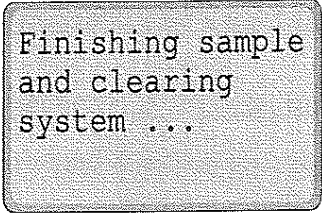
```
Plot: 101

PLOT MSTR COUNT
4.1  16.3    1
```

As each sub-sample of grain passes through the GrainGage, the "COUNT" on the screen will increment and the weight and moisture content of the sub-sample will show on the screen.

The GrainGage will continue processing portions of the grain until there is insufficient grain to fill the test chamber.
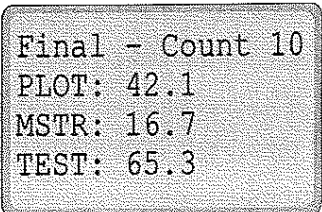
■ **Press "ENTER".**

The screen shown below will appear while the GrainGage finishes processing the current plot.

```
Finishing sample
and clearing
system ...
```
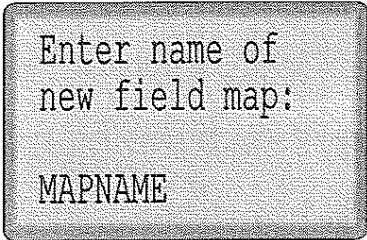
A final screen appears for the plot showing the weight and moisture totals. These totals are saved on the FieldBook and printed on the FieldPrinter.

```
Final - Count 10
PLOT: 42.1
MSTR: 16.7
TEST: 65.3
```

Generating a Field Map on the Fly
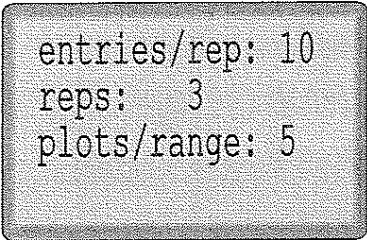
The HarvestData software also allows you to generate a field map quickly while already in the harvest menu (provided at least one (1) conventional map has already been created). At the time you are requested to select a field map, press **"SHF"** then **"RIGHT ARROW"**.

```
Enter name of
new field map:

MAPNAME
```

■ **Key "SHF" + "RIGHT ARROW" for a quick map. Key in a name of 1 to 8 characters, followed by the "ENTER" key.**

```
entries/rep: 10
reps:        3
plots/range: 5
```
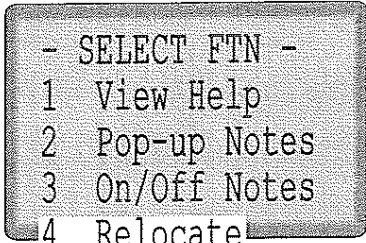
Specify the size of the quick map by responding to number of entries in the experiment, how many replications of these, and how many plots wide to make the field.

At this point, the harvest data collection sequence follows as described earlier except that you will be prompted to enter each plot number. This number can be hand-keyed or barcoded into the system.

The FTN Key

The FTN key provides 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 the "FTN" key on the HM FieldBook brings up this menu of quick action functions.

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

■ **The various functions are selected by scrolling with the "UP" and "DOWN", followed by "ENTER" at your choice.**

Alternatively, a press of the numeric key corresponding to the function will access it directly.

View Help - FTN 1
Context sensitive help is available through FTN 1 for most features of the HarvestData software.

■ Press "ESC" to get back to the activity you left when you invoked "Help".

Pop-up Notes - FTN 2
There is no screen for this selection. If you have toggled your notes variables off with FTN 3 (On/Off Notes), but need to key in a one time observation, FTN 2 allows you to do so without having to turn the notes variable(s) on and off again.

■ Key "FTN" + "2" for one time entry of a notes variable.
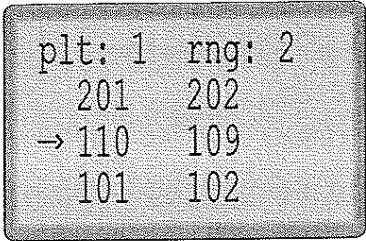
On/Off Notes - FTN 3
You must have the notes variables selected and "ACTIVE" in order for this function to work. If there are no "notes variables" defined from your setup activities, this function will have no effect.

■ Key "FTN" + "3" to toggle the notes variable on and off.
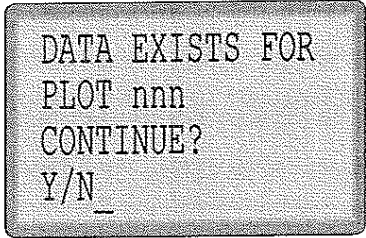
Relocate - FTN 4
■ Key "FTN" + "4" to set a new start point.

■ Use the arrow keys to reposition yourself on the field map.

```
plt: 1   rng: 2
      201    202
  →  110    109
      101    102
```

The symbol "→" indicates the plot number where the next data acquisition will take place.

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

```
DATA EXISTS FOR
PLOT nnn
CONTINUE?
Y/N_
```
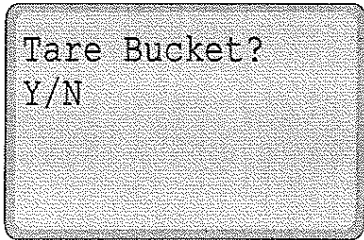
Advance Paper - FTN 5
FTN 5 provides a line feed character over the serial port to the printer, causing the paper to advance 1/6th of an inch.

■ **Key "FTN" + "5" to advance the paper in the FieldPrinter.**
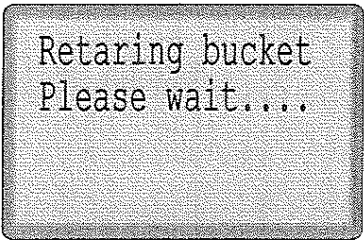
Tare Bucket - FTN 6

Selecting yes after pressing "FTN" + "6" will retare the GrainGage.

```
Tare Bucket?
Y/N
```

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.

```
Retaring bucket
Please wait....
```
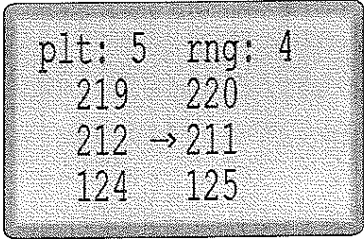
Warning:

When using FTN 6 to retare bucket, the moisture voltage also returns to zero.

Note: Do not use FTN 6 when grain is in the moisture chamber.
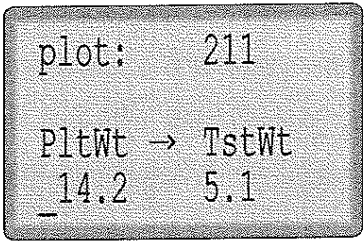
Edit Data - FTN 7

FTN 7 allows you to edit recorded harvest data from the keyboard. The first screen you see after pressing this function key, is a location screen.

```
plt: 5   rng: 4
   219    220
   212 → 211
   124    125
```

■ Use the arrows keys to position the arrow (→) on the plot to be edited.

■ Key in the desired numbers. Upon pressing "ENTER", the cursor moves to the next field.
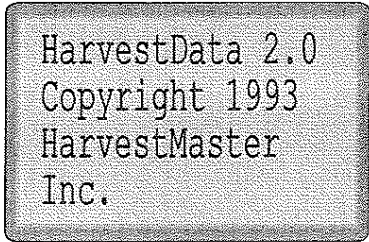
```
plot:    211


PltWt → TstWt
_14.2   5.1
```

■ Use the "LEFT" arrow key to return to the previous field.

Pressing "ESC" returns you to the positioning map. A second press gets you back to the harvest data acquisition screen.
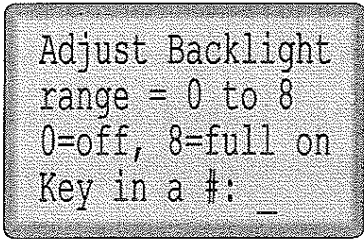
Show Version - FTN 8
Use FTN 8 to see the current software version.

```
HarvestData 2.0
Copyright 1993
HarvestMaster
Inc.
```

Set Backlight - FTN 9
When the HM FieldBook powers on, the system remembers and returns to the last backlight intensity set.

```
Adjust Backlight
range = 0 to 8
0=off, 8=full on
Key in a #: _
```

Use FTN 9 to adjust the intensity of the backlight or to turn it off.

■ **After pressing FTN 9, key in the desired number, then press "ENTER".**
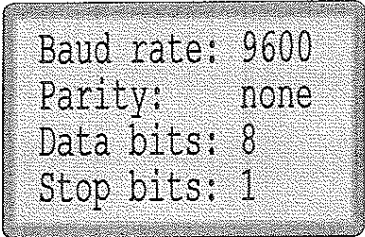
Note: When using the HM FieldBook away from the HarvestData System Console, turn the backlight off to conserve power, since it creates a significant increase on system power drain.

Transferring Harvest Data from the FieldBook

To transfer data from the HM FieldBook to the host computer, you should first set the communication parameters.

Setting Communication Parameters for Upload

```
--  MAIN MENU --
4 Data >─┐
         │
         │   -- DATA MENU --
         └─> 3 Comms >────────────┐
                                  │
                  -COMMUNICATIONS-
                  └─> 2 Comm Params
```

```
Baud rate:  9600
Parity:     none
Data bits:  8
Stop bits:  1
```

Your first time transferring data, you need to double check the system communication parameters, insuring that they match those of the host. Using HarvestMaster's DataLink PC support program (refer to *Appendix B, DataLink*), you'll need to leave the parameters at the default settings shown above.

The values you see are standard. If you need to change them, use the "LEFT" and "RIGHT" arrow keys to change the settings, and the "UP" and "DOWN" arrow keys to move the cursor to the various settings.

The "Comm Params" (communication parameters) setup screen will revert back to the menu when you scroll vertically past "Stop bits", or when you hit "ESC".

> Note: Changing communications parameters here does not affect the FieldBook System communications parameters set using MODE 5-2 and vice versa, as explained in the HM-1 Manual.

Uploading Data

Uploading data from the HarvestData System requires a desktop computer running DataLink. Refer to *Appendix B: DataLink* for information on retrieving data from the FieldBook.
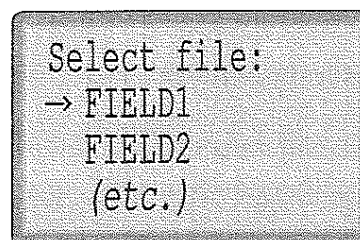
Viewing Data in the FieldBook Files

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.

▓ **To view data, make this menu selection.**

```
        -- MAIN MENU --
     4 Data>──────┐
             ┌─────┘
             │    -- DATA MENU --
             └──→1 View Data
```
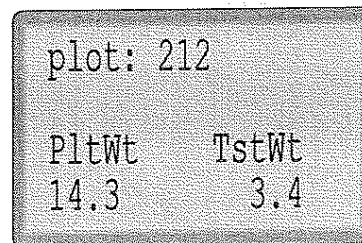
▓ **Use the "UP" and "DOWN" arrow keys to scroll through the field maps available:**

```
   Select file:
   → FIELD1
     FIELD2
     (etc.)
```

▓ **Press "ENTER" to select the desired field.**

■ 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.

```
plot: 212


PltWt      TstWt
14.3         3.4
```

■ Press "ESC" when you're done.

Deleting Harvest Data Files

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

■ Make this menu selection:

```
-- MAIN MENU --
4 Data>─┐
        │
        │ -- DATA MENU --
        └→2 Delete Data
```

■ Select the file to erase from this screen:

```
Select file:
→ FIELD1
  FIELD2
  (etc.)
```

■ Confirm the action:

```
Delete data from
FIELD1 ?
Y/N _
```

■ Confirm all the action:

```
Key in 123 and
then press Enter
to continue.
ESC to abort.
```

Chapter 5
Troubleshooting

If you believe you have determined the reason for a problem, refer to the Specifications or Installation chapter for guidance; whichever is applicable. If there is a hardware problem, an RMA (Return Material Authorization Number) will need to be authorized. For further instructions on any of the outlined problems below or for an RMA, please call HarvestMaster's Customer Service Department at (801) 753-1881.

Problems

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.

- With a volt meter, check the voltage to the SCCU at the end of the power cable that connects into the system. Make sure this voltage is above 11VDC (desired 14.8VDC with the combine running).

- Check the 6 AMP circuit breaker ("RESET" if needed).

HM-1 FieldBook Communication Failure with the PC

- Check to make sure that you are using the CA-009 communications cable from HarvestMaster. Any standard communications cable will not work. You will need a Null Modem cable to communicate with the HM-1 .

- Check the communications port that has been selected on the PC and/or HM-1 . Does it match the communications port that the CA-009 cable is plugged into?

- Make sure that you are following the communication procedures correctly for the HM-1. Refer to the Appendix B in this manual.

- Try the other communications port on the HM-1 to eliminate a possible hardware problem with the HM-1 .

- Try another PC to verify a possible hardware problem with the PC.

- If using Windows 95, make sure you have properly installed the software and settings as explained in Appendix G.

HM-1 Communication Failure with the SCCU

- Check to see that the SCCU and the HM-1 are "OFF". Now, turn "ON" the SCCU and make sure that the HM-1 is powered up with it. When the HarvestData program runs, the system should come to the "Main Menu" automatically without pressing any keys. Pressing the "F8" key should display 3 versions of software. If there is any problems with the above outlined procedures, please continue as outlined below.

- When the HarvestData System is powered up it will open all gates and then close them one at a time. Check to see if the LED's (Red and Green lights) on the front panel are flashing in the same sequence as when the SCCU is first powered up. If they 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. If the LED's are flashing in the same sequence as first powered up, the FOS (Fixed Operating System) in the SCCU and IOS (Injected Operating System) are incompatible. Make sure that both the FOS and IOS version numbers start with the same number. Upgrade the lower number to the newer version.

• Check to make sure that the HM-1 is securely plugged into the SCCU console and the bottom door is latched tightly against the bottom of the HM-1 case.

Inaccurate Moisture and Weight Readings

• Check to see that the injected operating system (IOS) is loaded correctly by pressing "F8" to show its version as outlined in the previous step.

• Check the software versions on the HM-1 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

This number 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 GrainGage. Inspect the pins on the SCCU and GrainGage for damage or corrosion.

• Check the moisture and weight calibration process.

☞ Note: When calibrating, the combine should be running at the same RPM as it is in the field during harvest.

Inaccurate Weight Readings (Moisture is Fine)

- Make sure the shipping stops are turned all the way down allowing the weigh pan to sit on the load cells. Loosen the two shipping stops on the left (when facing the GrainGage) first, and then the shipping stop on the right side.

- Check the weight calibration as outlined under the calibration section in Chapter 3 of this manual.

- 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 GrainGage for chaff build up or binding.

- 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 (+ or - .5V) with an empty chamber and when 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 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 H: "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. 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.

- 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.**

Will Not Cycle in "Harvest Mode Only"

- Check the level detect "counts" in the "DIAGNOSTICS" menu to make sure they are stable. When the probes are touched, the reading should increase by 8-15 counts. (Refer to verifying the level detector procedures in Chapter 2 of this manual).

- 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 SETUP>WEIGHT/BUCKET>SET LEVEL; level 1 is the most sensitive, level 10, least sensitive).

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 "DIAGNOSTICS" 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).

- 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 Limit Switch Setup* section 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 as outlined below.)

- Adjust limit switches if needed.

- Make sure the safety valve on the side of the GrainGage is fully open.

Gate Obstruction Message

☞ **Note: This error message occurs when the closed limit switch on the top, middle, or bottom level does not respond. One or more than one green LED will be flashing to let you know of the gate that did not close.**

- Check the air pressure to make sure it is between 50-85 PSI.

- Trash, a corn cob, or a corn stock may have gotten in the way of the gate closing (the top gate would be the most likely). Simply place the Auto/Manual switch into manual mode and then open and close the gate that is flashing.

Warning:
Only cycle the gate that is flashing! If others are cycled it could result in a lost plot!

- When all the lights are steady, flip the Auto/Manual switch back to Auto mode and hit the <ENTER> key to return to normal harvest.

- If there is no obstruction and the LED is still flashing, the limit switch on that actuator may have failed or moved. Loosen the clamp on the limit switch that is closest to the gate (close sense) and move it towards the center to see if the small red LED within it lights up.

- If the small LED within the limit switch is "on" and the close LED is still flashing on the SCCU, there is a connection problem between the limit switch and SCCU. Check all connections including the system control cable and limit switch molex connector. It is very easy to swap limit switches with another level to see if the problem follow the limit switch. If the problem follows, the limit switches and harness will need to be replaced. If the problem does not follow, the problem is between the SCCU and limit switch connector. Wiggle all the cables while watching the SCCU. If the LED stops flashing intermittently you will have found the problem area.

- If a limit switch does not respond at all, the same procedures as outlined above can be followed by swapping the limit switch with one from another level.

Check Compressor Error Message

☞ **Note: This error message occurs when an "open" limit switch was not detected. The same procedures under "Gate Obstruction Message" can be followed. Simply substitute the word "OPEN" in place of "CLOSE".**

Compressor Running, But Air Pressure Fails to Build

- Check to see if the leak is inside the GrainGage or outside by closing the safety valve on the side.

- Insure that the air hoses are seated completely in the push-in sockets both inside the GrainGage and outside.

- Check for damaged pneumatic tubing or loose fittings.

- Using soapy water, check for leaks around the Pneumatic Conditioning Center component and connections.

Electric Compressor (if used) 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. Check to see if there is voltage across the relay coil (replace relay as needed).

- Listen for the relay on the PCC to switch on and off as the power on the SCCU is toggled (replace relay as needed).

- Check the control cable connection from the SCCU to the GrainGage. 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 as needed.

Printer Does Not Respond (Power LED is Off)

- Make sure the SCCU power is turned "ON".

- Check the manual "LF/ON/OFF" switch in the printer to see that it is in the "ON" position.

- Check the cable connections to the SCCU to make sure they are not loose or damaged.

- Check the printer connector to make sure it is lined up properly with its mate.

- Check the printer mounting screws to make sure that they are tight.

Printer Does Not Respond (Power LED is On)

- This is a sign of a printer hardware failure and will need to be sent in for repair.

If you have performed all of the necessary troubleshooting steps and the system is still not operating correctly, please call HarvestMaster Customer Service, 801-753-1881, for further assistance.

Chapter 6
General Care & Warranty

Maintenance

Harsh Weather

If your HarvestData System console is mounted in a location which is exposed to the elements, we recommend removing or covering the HarvestData System console during inclement weather. If the winter in your area is quite cold, remove the HarvestData System console during cold months. It's best to store them in a warm, dry environment.

We recommend that the HarvestData System be returned to the factory once every two or three years (depending on field usage) for re-calibration and a system check up.

SCCU

The electronics console can be left in the combine if it is enclosed in a cab; however, it is recommended that 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.

Cover any open connectors that are exposed to the outside elements.

HM-1 FieldBook

It is recommended that you store the HM-1 indoors during the off-season.

The static memory requires about 0.2 mA of continuous current flow which, in time, will discharge the Ni-Cad batteries. It is recommended that you charge the batteries at least once every two months.

Return the HM-1 to HarvestMaster for a back-up lithium battery change every five years.

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.

The printer's cartridge ribbon will need to be replaced when the printing becomes faint or difficult to read. For instructions on replacing the cartridge ribbon, refer to page 2-34.

Pneumatic Conditioning Center
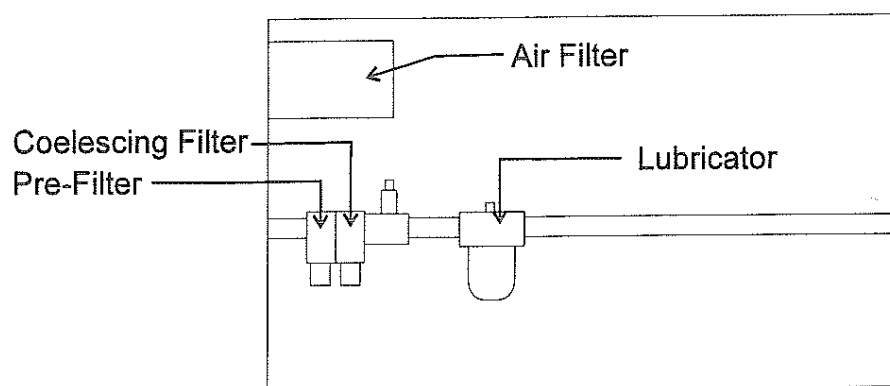
If you are using the Solberg compressor air filter, you will need to check this filter 2-3 times per season. We recommend replacing this filter rather than blowing it out. Replace the filter yearly or as needed.

The pre-filter element is located to the left of your pneumatic conditioning center when facing it. This filter should be replaced at least yearly.

The coelescing 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 at least once every 4 years.

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.

Warning:
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 (inset about 1/4") and then unscrew it 3.5 turns.

Pre-Filter / Coelescing Filter Changing Instructions

■ Grasp the bowl firmly and turn it 1/4 turn counter-clockwise (or until it stops. Gently work the bowl down, rocking it back and forth slightly until it pops off. Unscrew the filters counter-clockwise.

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.

GrainGage

During Harvest
The inside of the GrainGage housing should be checked periodically for chaff and broken grain kernel build-up. By using high-pressure air, the system should be blown out as needed.

> **Warning:**
> There should not be a lot of oil residue inside the GrainGage. If there is, it should be wiped clean and the lubricator should be adjusted properly (see maintainence section on lubricator).

After Harvest
Blow any chaff and broken grain kernels out of the inside of the GrainGage.

Note: Be sure to get behind the grain shoot and around the back of the load cells.

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. Lift the right shipping stop and install the wing nut to lock it into place and then lift the other two shipping stops so that the entire pan is off of the load cells.

Cover the GrainGage to keep it away from the outside elements if the combine is not stored in a shop.

Cold Weather Maintenance for the GrainGage
During cold weather, it is recommended that you 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. It is also recommended that you increase the air pressure to 75 - 85 lbs for operating temperatures below 35°F.

Compressor

Both the electric 12VDC compressor and mechanical belt driven compressor are maintenance free. Do not oil these compressors. They have sealed bearings and do not require periodic lubrication.

Return Procedure

If your HarvestData System needs repairs, contact HarvestMaster's Customer Service Department for a Returned Materials Authorization (RMA) number. Under the Express Service Agreement, HarvestMaster will ship you a replacement loaner Next Day Federal Express or UPS Red. Once you receive the loaner unit, package your equipment in the same box and ship it Federal Express, Next Day or UPS Red. Fill out the shipping and RMA forms that were included with your loaner equipment. 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 have 1 week to return the loaner unit before you will be billed for it.

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 1 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. 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 for a period of one year from date of delivery not to fail to execute their programming instructions due to defects in materials or workmanship. If HarvestMaster receives notice of such defects during the 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. Further, 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 effected by or on behalf of 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 said instrument. HarvestMaster will not repair or update an instrument and return it to an individual if the instrument is without said serial number label.

Appendix A
Specifications

For additional specifications on the FieldBook, refer to the FieldBook user's manual.

Measurement Performance

Grain Moisture

Repeatability: Typically ±.5% given constant density and temperature of sample.

Accuracy: Dependent upon accuracy of user calibration using samples of known moisture content. Typically ±1%

Range: 0-45%

Weight

Accuracy: Load cells and electronics measure to within .1% of the full scale
             range (for example: using a 50 lb scale, measurements will be
             accurate to within .05 lbs).

Data Storage

256K (448K optional)

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

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)

Moisture Sensor

Temperature range: 0 to +45° C
                      (+41 to +113° F)

Printer

Interfaces
Serial: BAUD rate — 2400
                     Voltage levels — RS-232C: -10 V to +5 V
                     Busy signal — Clear to Send (CTS)

Line Buffering
Full column width character buffering is provided for line-at-a-time printing.

Print Method
Impact dot matrix

Character Matrix
6 x 8 dot matrix

Line Feed Spacing
7.6 lines per inch — character mode
9.1 lines per inch — graphic mode

Print Speed
42 lines per minute (24 columns)

Power
1.5 W (idle), 10 W (while printing)

DC Voltage
9 to 12 VDC
150 mA idle, 850 mA typical, 1.5A peak

Operating Temperature
+5 to +40° C (+41 to +104° F)

Print Head Life
500,000 lines (mean character before failure)

Ribbon
Epson ERC-09 (available at business machine stores)

Ribbon Life
black — 200,000 characters
purple — 250,000 characters

Paper
2.25"W x 2.75"D 0.44" I.D.

Large roll — 12,500 lines
Small roll — 3,000 lines

RS-232C Serial Interface Signal Connections for the Printer

Pin	Signal	Description
2	(TD) Transmitted Data	Printer data output line
5	(CTS) Clear to Send	Signal (equivalent to BUSY) indicating that printer is ready for operation and can receive data
7	(SG) Signal	Signal ground
9	Positive Paper Takeup	Advances paper takeup
10	Negative Paper Takeup	Advances paper takeup
25	Positive 12 VDC	Printer power

Appendix B
Using DataLink for DOS
Personal Computer Support Software for
HarvestMaster Products

Description

In order for your HM-1 computer to communicate with your personal computer, you need to execute a terminal emulator program, such as DataLink, on your PC. DataLink is designed as a field partner for your HM-1 and your personal computer. It is a communications software package which allows your computer system to act as a smart terminal to the HM-1, and lets you transfer files between your computer and your HM-1 FieldBook.

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 512Kb of system RAM. It is not executable from floppy diskettes.

Installation

DataLink is distributed on a single 1.44 Mb 3½" diskette. Installation instructions are listed below (they're also on the disk label for your convenience).

Note: If you have Windows 95, please refer to Appendix G to install DataLink using Windows 95.

1. Insert the Disk in drive A: or B: of your PC.

2. If you're in Windows, exit to DOS and change to drive A: or drive B: by typing *A:* or *B:* followed by *<ENTER>*

3. Type *SETUP* to initiate the installation procedure

4. The setup screen appears (see below). The "Install from:" drive should be the drive where the HDRB-HM1 disk is located.

```
              DataLink setup program
          Copyright (C) 1995, HarvestMaster, Inc.
   HarvestMaster, Inc., Information Machines for Agriculture




              Install from: A:\
              Install to:   C:\DATALINK\




Enter the drive from which to install this program, press ESC to abort
```
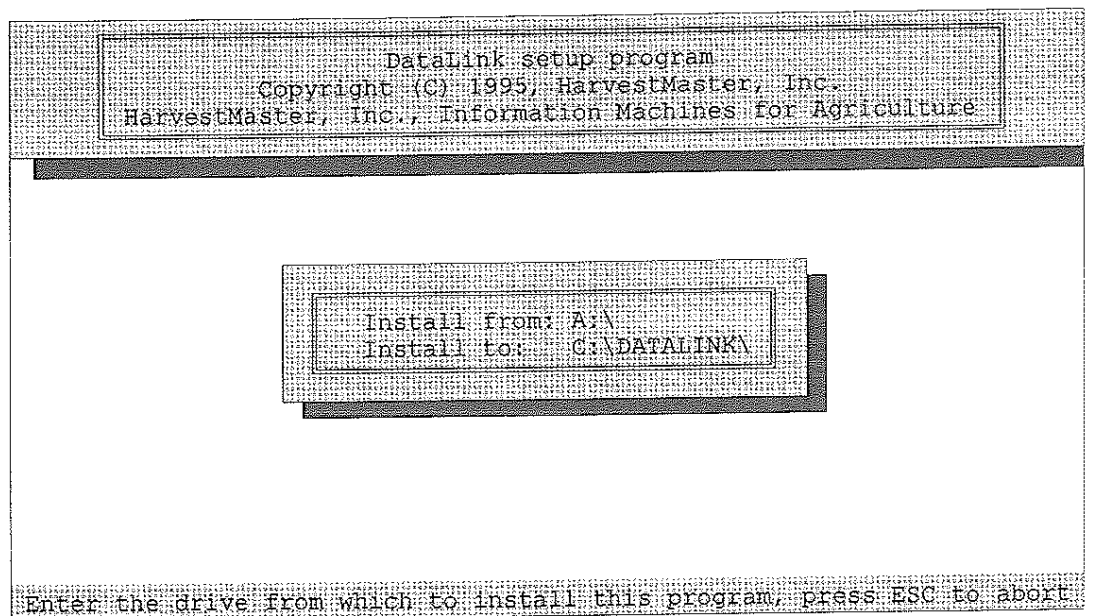
DataLink Setup Screen

The "Install to:" drive and directory is, by default, set to install on your hard drive under the DATALINK directory. It should read similar to:

Install to: C:\DATALINK

Drive   Directory Name

☞ 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.*

■ Press *<Enter>* when the "Install from:" and "Install to:" locations are set as desired.

■ A display window appears, displaying files being installed on to your hard drive. When DataLink has been successfully installed, a "Program Installed" window appears:

```
Program Installed
Press any key
```
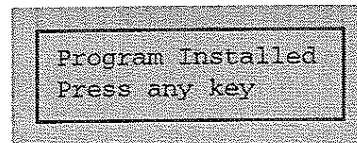
■ Press *any key to continue*.

■ You're returned to the DOS prompt where DataLink resides (in most cases this is C:\DATALINK or D:\DATALINK). If you are in another directory, you can change directories by typing *cd\ <ENTER>* and then *cd datalink <ENTER>*.

■ Type *DL <ENTER>* to run DataLink.

The title screen appears briefly and then advances to the DataLink Main menu (you can make the title screen disappear immediately by pressing the *space bar*).

Introduction to DataLink

Welcome to the DataLink Main Menu. DataLink is, as the name implies, your link to the data stored on the HM-1. You may *upload* data (transfer data from the HM-1 to the PC) or *download* data (transfer data from the PC to the HM-1) using DataLink lets your PC and the HM-1 communicate via the serial communication cable (model # CA-009). The communication cable connects your remote data collection unit to your desk-top PC, and DataLink is the communication software that allows the HM-1 and PC to communicate.

DataLink 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.

File	Edit	Applications	Utilities	Quit

DataLink Menu Bar

Following are the sub categories of activities under each of the main menu items. The subcategories are discussed in the order you will use them during a typical usage scenario.

Utilities Menu

File	Edit	Applications	Utilities	Quit

```
Comm port:     Com1    (•)      Comm Params
               Com2    ( )      Terminal
                                Poly Upload
Baud rate:     9600    (•)      Poly Download
               4800    ( )      Set Editor
               2400    ( )      PolyTran
               1200    ( )
                600    ( )
                300    ( )

Parity:        None    (•)
                Odd    ( )
               Even    ( )

Data Bits:      7      ( )
                8      (•)

Stop Bits:      1      (•)
                2      ( )
```

Com Params

Set the communication parameters on your PC. The UP and DOWN arrow keys will allow you to move from sub-item to sub-item. The <ENTER> key will move to the next item in the menu.

☞ **Note: If any changes are made, each of the items will need to be entered (with the <ENTER> key) to save the data. The <ESC> key will abort 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 HarvestData applications the baud rate, parity, data bits, and stop bits will stay at the default setting (9600, None, 8, &1).

Terminal

Test the communications between the hand held computer and the PC.

▓ **When the TERMINAL option is entered, there will be three boxes on the display: The "Send" box will display any characters sent to the hand held computer, and the "Receive" box will display any characters received from it. The "Comm Parameter" box displays the current communication parameters.**

▓ **Plug the CA-009 (25 to 25 pin female) or CA-009-9 (9 to 25 pin female) communication cable into the 25-pin connector on top of the FieldBook.**

By entering terminal mode on the hand held computer it is possible to send characters back and forth to insure proper communications before loading any files (please refer to the HM-1/HM-2 FieldBook Manual for terminal mode operations. To use this option, both the computer and the HM-1 will need to be set up in terminal mode.

■ From the HarvestData main menu on the HM-1, select (5)DIAGNOSTICS, then select (9)TERMINAL.

```
Send:


Receive:
```

*Terminal mode brings up a screen with 2
sections, similar to the screen on the PC.*

■ Go into Terminal Mode in DataLink under the Utilities menu.

■ Key in a test message on the hand held. It should appear in the "SEND" section of the HM-1 display and in the "RECEIVE" box on the PC.

■ Key in a test message on the PC. It should appear in the "SEND" box on your PC and the "RECEIVE" section on the HM-1.

If these messages do not appear on both displays, refer to *Chapter 5: Troubleshooting* in this manual.

☞ Note: The Terminal mode is used mainly for troubleshooting communi-
cation 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.

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.

Set Editor

Set the path and file name to 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 hand held computer. Please refer to the HM-1/HM-2 FieldBook Users Manual for operating instructions.

Applications

This menu option will allow you to install the software application of your choice into the hand held.

■ **Connect the PC to the hand held using the communications cable. To do this, plug the communications cable into one of the serial ports on your computer (preferably port 1).**

Plug into Com 1 or Com 2

CA-009 Communication Cable

Plug into 25-pin connector

PC   HM-1
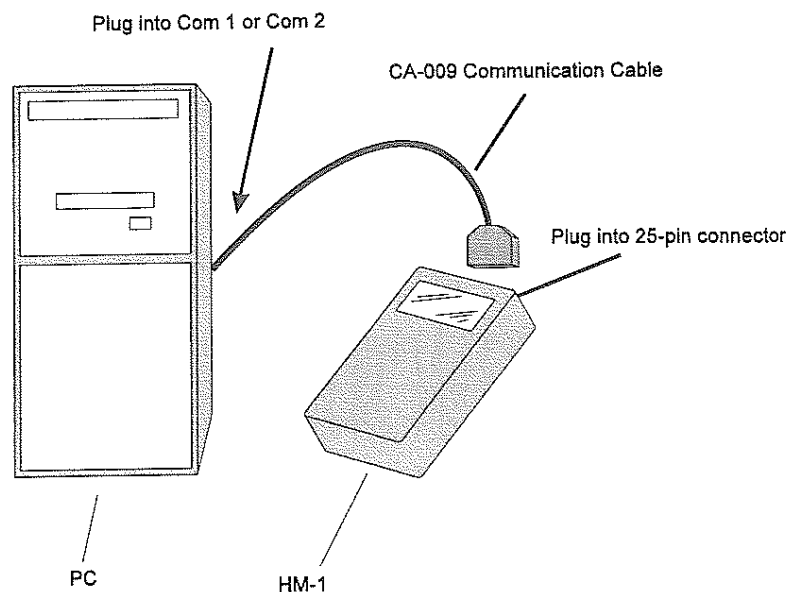
☞ Note: DataLink automatically defaults to communicating via the PC's com1 port. Some computers may have a mouse or other external devices connected to com1. If this is the case, it will be easier to plug the communications cable into com2. Then, on your PC, go into the DataLink Utilities menu by using the left/right arrow keys and pressing <ENTER> when the Utilities menu is highlighted. A drop-down menu appears. Select the first highlighted item on the list, Comm Params (communication parameters) by pressing <ENTER>.

File	Edit	Applications	Utilities	Quit

```
Comm Params
Terminal
Poly Upload
Poly Download
Set Editor
PolyTran
```

This brings up the communication parameters window:

```
┌─────────────────────────────────────────────────────────────────┐
│   File      Edit      Applications    ░Utilities░   Quit          │
├───────────────────────────────────────┬────────────────┐────────┘
        Comm port:   Com1    (•)        │░Comm Params░  │
                     Com2    ( )        │Terminal       │
                                        │Poly Upload    │
        Baud rate:   9600    (•)        │Poly Download  │
                     4800    ( )        │Set Editor     │
                     2400    ( )        │PolyTran       │
                     1200    ( )        └───────────────┘
                      600    ( )
                      300    ( )

        Parity:      None    (•)
                     Odd     ( )
                     Even    ( )

        Data Bits:   7   ( )
                     8   (•)

        Stop Bits:   1   (•)
                     2   ( )
```

Now you have to tell DataLink that you're using Com2 to communicate with the hand held rather than com1. To do this, press the *down arrow*. The bullet indicator on the right will shift down to com2. Now press *<ENTER>* to save this setting. Press *<ENTER>* to scroll through the baud rate, parity, data bits, and stop bits sections, and to save those settings.

■ Use the left/right arrow keys to move the highlighted cursor to the applications menu.

☞ Note: You may also press the highlighted letter in a menu title move to that menu (Example: Press *A* to go to the Applications menu, press *Q* to quit, etc.).

■ Once the Applications Menu is highlighted, press *<ENTER>*. A drop-down menu appears displaying HarvestData RB DOS. This is the application to be downloaded to the hand held computer.

File	Edit	Applications	Utilities	Quit
		HarvestData GG HM-1 VER 2.0		

☞ 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>* gets you back to the previous menu.

■ Press *<ENTER>* to prepare DataLink to download the HarvestData GG HM-1 software.

File	Edit	Applications	Utilities	Quit

M-1 Ver. 2.0

```
Memory Size:    256 Kb  (•)
                448 Kb  ( )


Language:       English (•)
                French  ( )
                German  ( )
                Spanish ( )


Load Help:      No  ( )
                Yes (•)
```

■ DataLink prompts you to select the appropriate memory size of your FieldBook, language, and whether or not to load the help screens. Use the *up/down arrow* keys to make your selection in each section. Press *<ENTER>* when you wish to make the selection and move to the next section. Press *<ENTER>* after the *Load Help* section to proceed with

downloading the HDGG software to the HM-1.

▉ Follow the on-screen instructions to complete the download.

☞ Note: If the HDGG software is not downloaded to the HM-1, check all cable connections. Make sure you have specified the correct communication port on your PC by going into *Utilities > Comm Params* in DataLink. The settings should be as follows:

Com Port:	Either 1 or 2, whichever port to which the communication cable is connected.
Baud Rate:	9600
Parity:	None
Data Bits:	8
Stop Bits:	1

File

Set Paths
Set the paths to the Upload and Download directories.

```
  File        Edit        Applications      Utilities      Quit
 Upload
 Download
 Set Upload Format
 Set Download Format
 Set Paths
    Upload Path
    Download Path
```
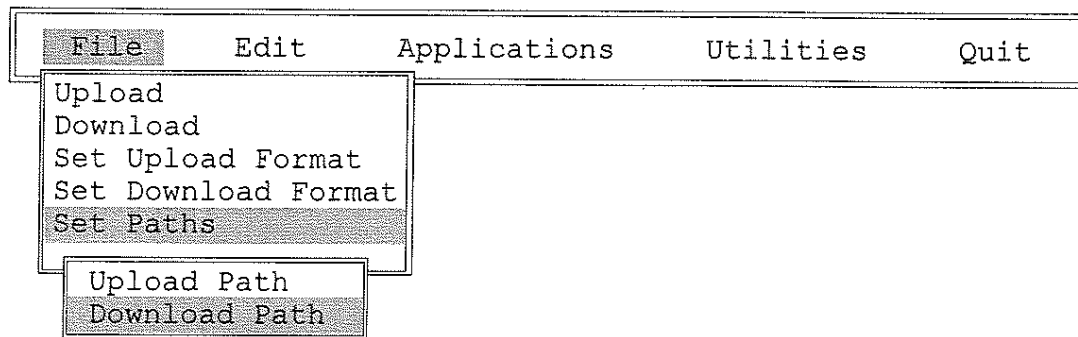
Download Path: Set the path to the directory where the file to be downloaded is located. This option allows you to store data and map files in a subdirectory you designate, so as not to merge them in the same directory as the program files.

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: Set 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 hand held computer. This tells the HarvestData software how to interpret the file you're about to download. There are three formats to choose from:

```
┌─────────────────────────────────────────────────────────────────────┐
│  File        Edit        Applications      Utilities      Quit        │
├──────────────────────────────┬──────────────────────────────────────┘
│ Upload                       │
│ Download                     │
│ Set Upload Format            │
│ Set Download Format          │
│ Set Paths                    │
└──────────────────────────────┘
```

```
┌─────────────────────────────────────────────────────────────┐
│  ┌─────────────────────────────────────────────────────────┐ │
│  │  No format change                              ( • )    │ │
│  │  2D Text field map format                      (   )    │ │
│  │  Harvest Order space delimited format          (   )    │ │
│  └─────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────┘
```
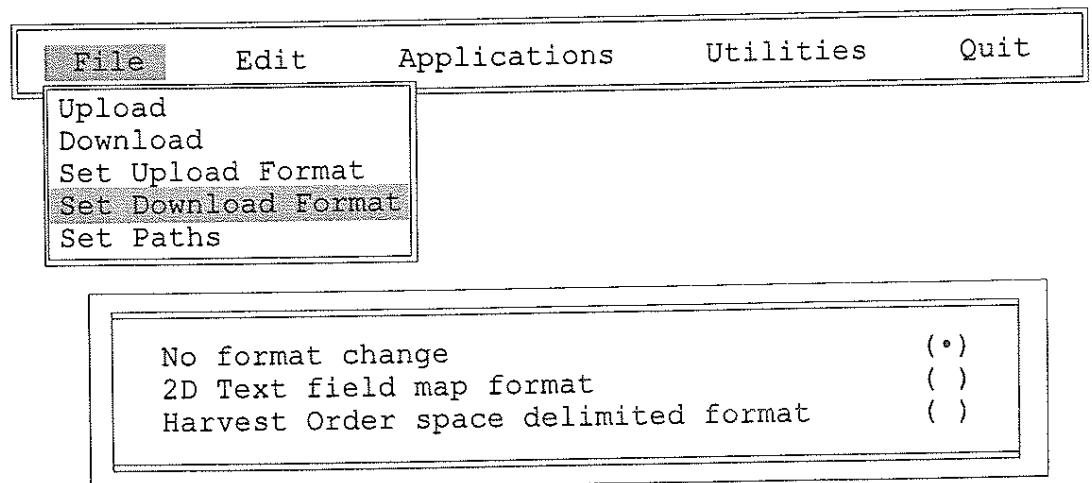
No Format Change

The "NO FORMAT CHANGE" option directly transfers a file to the hand held as is. 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 and 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 F: Field Maps.

When selecting "2D Text Field Map Format" in the "Set Download Format" option, you will see a box in the middle of your screen 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. After selecting, the file will automatically be transferred to your hand held to the directory as specified in the "map/data drive" option in the HarvestData 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 hand held 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 F.

When selecting "Harvest Order Space Delimited" in the "Set Download Format" option, you will see a box in the middle of your screen that will prompt you for the drive destination for the map.

```
Enter drive specification for map..:


Enter the number of plots per range: 5
Enter the number of ranges.........: 6



Serpentine harvest ( )
Sequential harvest (•)
Circular harvest   ( )
```

☞ **Note:** **The drive specification feature is not used with the HM-1 FieldBook.**

Now enter the plots per range, number of ranges, and whether you map is going to be harvested as 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                    (•)
Comma Separated Variable Format    ( )
```

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 hand held. In the "NO FORMAT CHANGE", the data is essentially a space delimited ASCII text file.

Comma Separated Variable Format

The second upload format available is a 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.

Download

To initiate a file download from the computer to the hand held:

■ **Connect the hand held to the computer's communication cable.**

Plug into Com 1 or Com 2

CA-009 Communication Cable

Plug into 25-pin connector

PC   HM-1
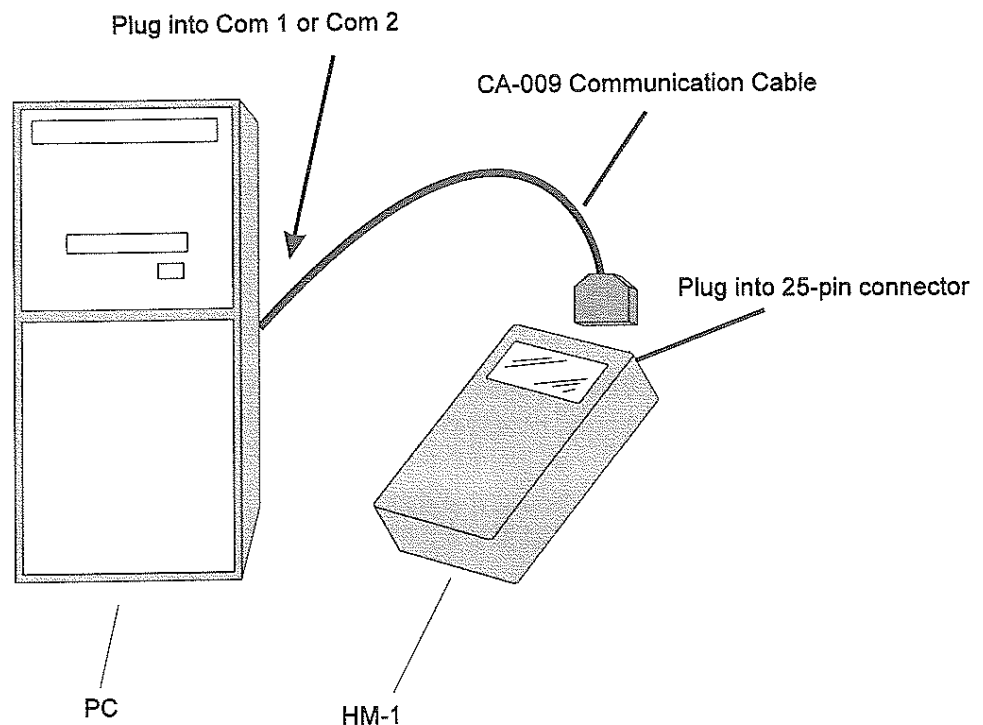
■ Run DataLink on the PC, then turn the hand held "ON".

■ Entering the "DOWNLOAD" option in DataLink will give a menu in the middle of your computer display that shows the files that are available for downloading:

```
ASCII.EXE  (•)
DL.EXE  ( )
DTERM.EXE  ( )
HD1-EM.1  ( )
HD1-HYDR.1  ( )
HD1-PNEU.1  ( )
HD1-WW.1  ( )
```

■ 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.

Upload

To initiate a file upload to the PC from the HM-1.

■ **Connect the HM-1 to the computer's communication cable.**

Plug into Com 1 or Com 2

CA-009 Communication Cable

Plug into 25-pin connector

PC   HM-1

■ **Run DataLink on your PC, then Turn the hand held "ON".**

■ **Entering the "UPLOAD" option in DataLink will give a menu in the middle of your computer display that shows the files that are available for uploading:**
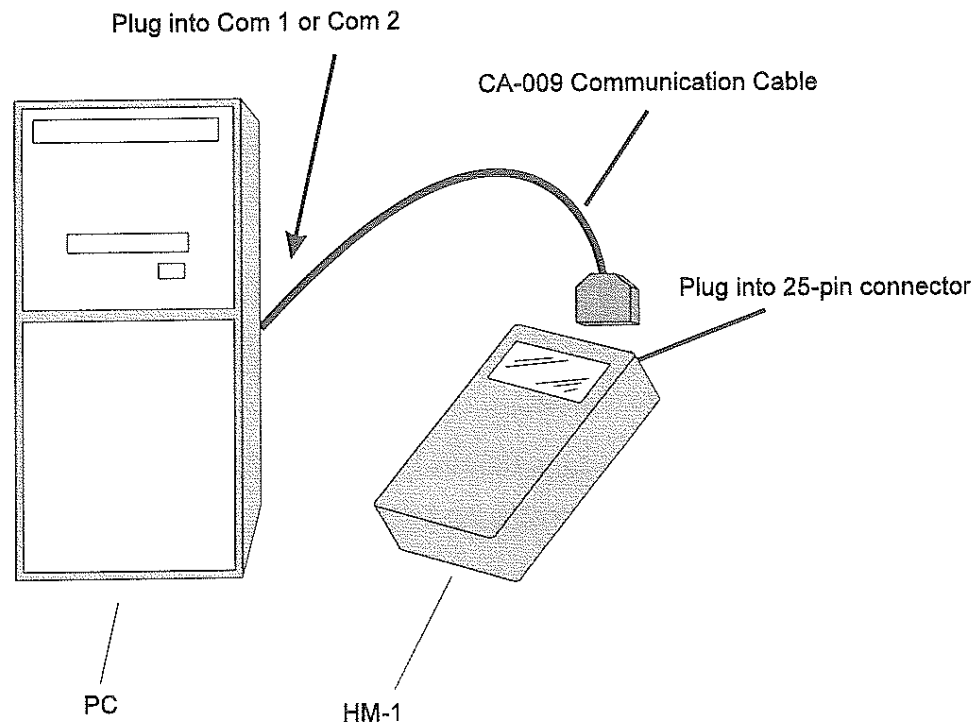
```
FieldMap1 | DATA[X]
FieldMap1 | SETUP[ ]
BigCreek  | DATA[X]
BigCreek  | Map[ ]
```

■ 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 the files. (Note: pressing the *<SPACE>* bar after a file has been marked will unmark the file). You may mark as many files as you wish. Once you've marked all the files you wish to upload, press *<ENTER>* to initiate the file transfer from the hand held to the PC.

☞ Note: The file 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 *UTILITIES >*
SET EDITOR 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 Diagram

Console Mounting Diagram

This drawing shows hole placement for mounting the HarvestData System console to the mounting base on a combine.

⁷/₃₂" DIA THRU
4 PLACES
(5.56 mm DIA.)

4"
(10.16 cm)

2¹/₄"
(5.72 cm)

4"
(10.16 cm)

1³/₄"
(4.5 cm)
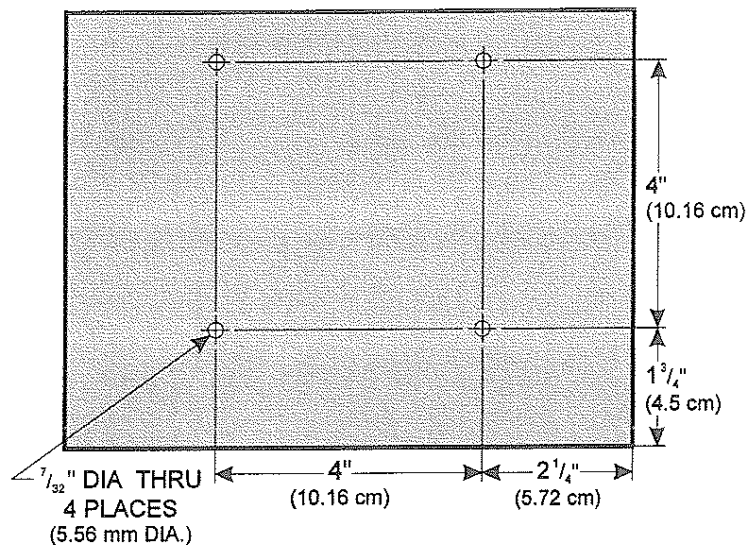
GrainGage Mounting Diagram

This drawing shows placement for mounting the GrainGage.

.406" DIA THRU
4 PLACES
(1.031 cm DIA.)
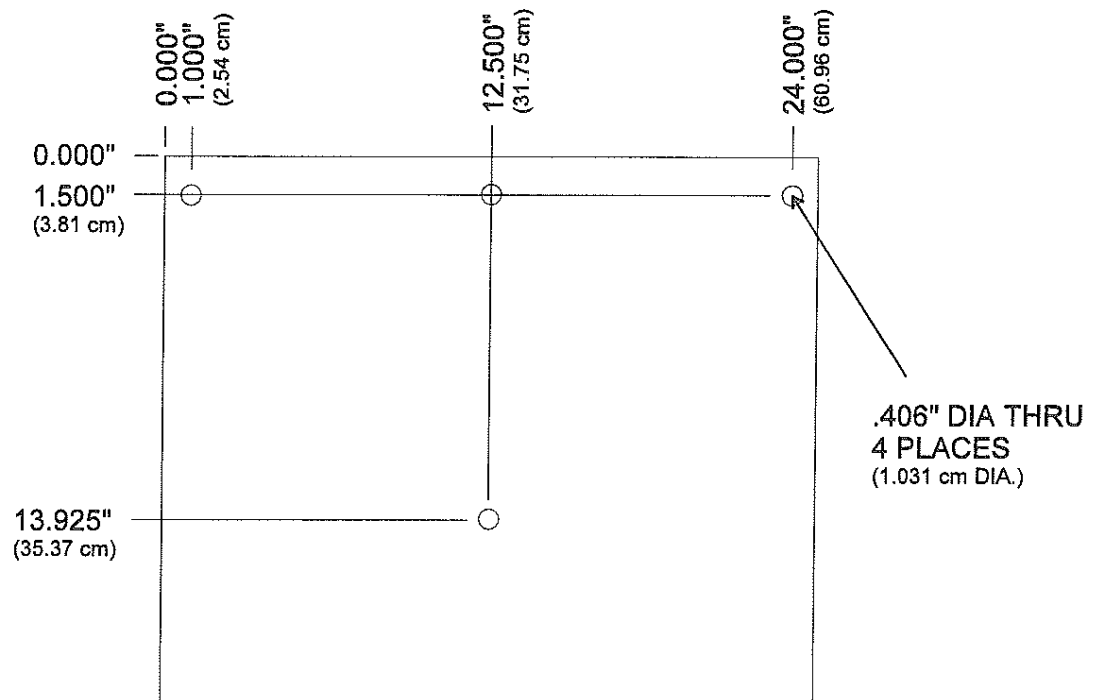
Pneumatic Cond. Center Mounting Diagram

This drawing shows placement for mounting the Pneumatic Conditioning Center.

.438" DIA THRU
4 PLACES
(1.113 cm DIA.)
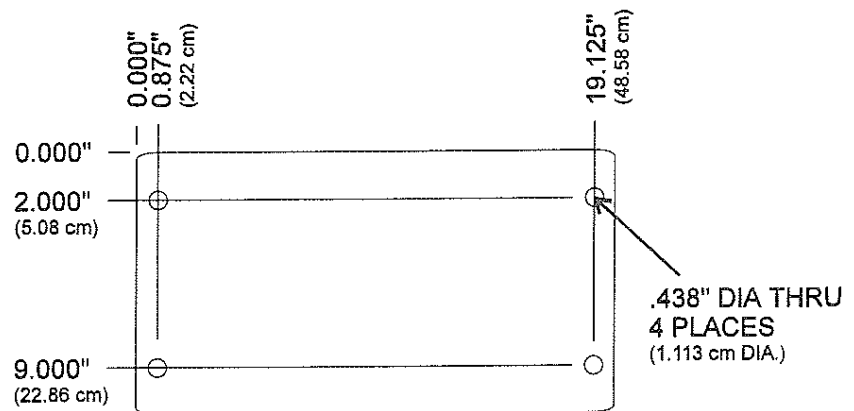
Electric Compressor Mounting Diagram

This drawing shows placement for mounting the electric compressor.

2.75"
(6.99 cm)

4.25"
(10.80 cm)

.34" x 1.22"
MOUNTING SLOTS
4 PLACES
(.864 cm x 3.099 cm)
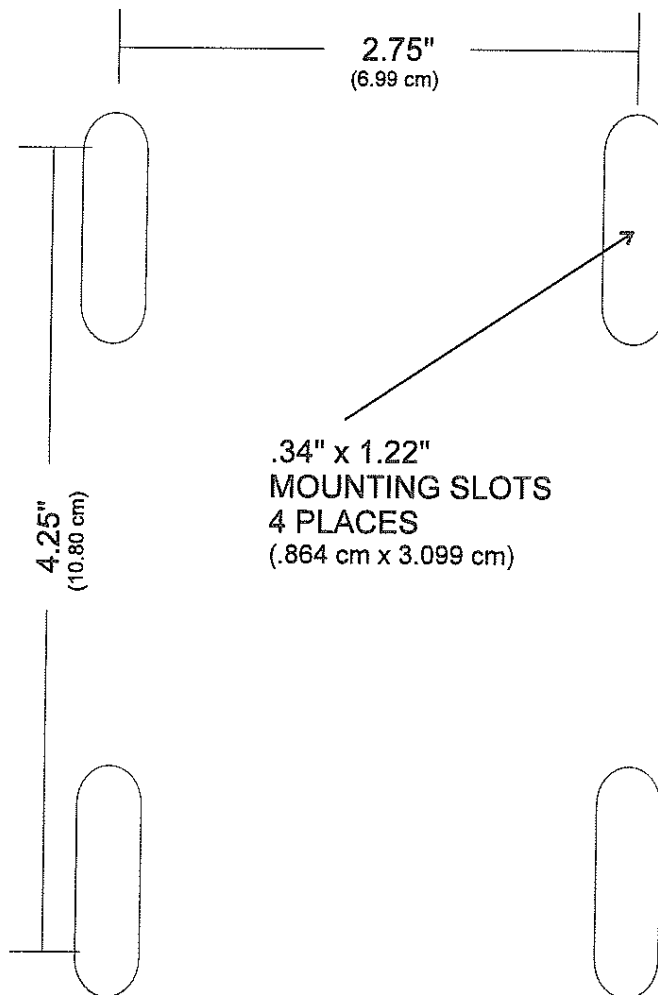
Actual Size

Mechanical Compressor Mounting Diagram

This drawing shows placement for mounting the mechanical compressor.

2.00"
(5.08 cm)

.28" DIA. THRU
4 PLACES
(.71 cm)

5.00"
(12.7 cm)
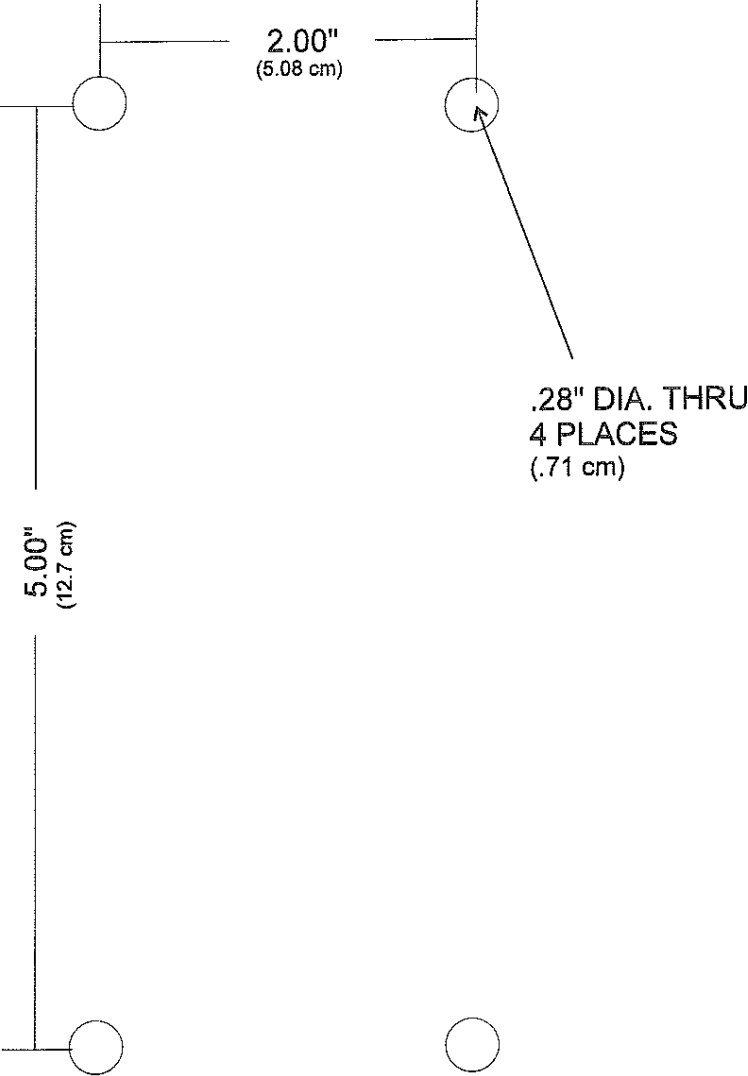
Actual Size

Appendix D

Keyboard Commands &

Menu Structure

Menu Structure

The menu presents the various processes you will use to set up your HarvestData
System and acquire harvest data with it.
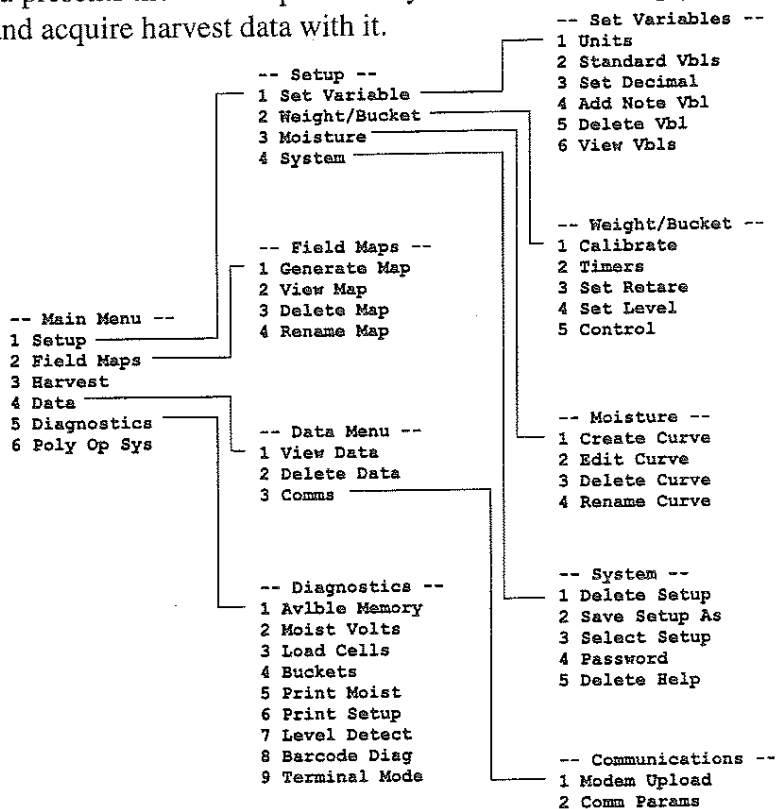
```
                                                                    -- Set Variables --
                                                                    1 Units
                                                                    2 Standard Vbls
                                   -- Setup --                      3 Set Decimal
                                   1 Set Variable ──────────────    4 Add Note Vbl
                                   2 Weight/Bucket ───────────      5 Delete Vbl
                                   3 Moisture ────────────          6 View Vbls
                                   4 System ──────────────


                                                                    -- Weight/Bucket --
                                   -- Field Maps --                 1 Calibrate
                                   1 Generate Map                   2 Timers
                                   2 View Map                       3 Set Retare
        -- Main Menu --            3 Delete Map                     4 Set Level
        1 Setup ───────────        4 Rename Map                     5 Control
        2 Field Maps ──────
        3 Harvest
        4 Data ────────                                             -- Moisture --
        5 Diagnostics ──────       -- Data Menu --                  1 Create Curve
        6 Poly Op Sys          └── 1 View Data                      2 Edit Curve
                                   2 Delete Data                    3 Delete Curve
                                   3 Comms ──────────               4 Rename Curve


                                                                    -- System --
                                   -- Diagnostics --                1 Delete Setup
                                   1 Avlble Memory                  2 Save Setup As
                                   2 Moist Volts                    3 Select Setup
                                   3 Load Cells                     4 Password
                                   4 Buckets                        5 Delete Help
                                   5 Print Moist
                                   6 Print Setup
                                   7 Level Detect
                                   8 Barcode Diag                   -- Communications --
                                   9 Terminal Mode                  1 Modem Upload
                                                                    2 Comm Params
```

Keyboard Commands

The following list gives definitions of the key commands and sequences available in the HarvestData System.

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

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

SHF, ZERO: 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.

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

SHF, 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).

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

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

FTN: "— SELECT FTN —" -causes function menu to pop up.

FTN, 1: "View Help" - provides user context sensitive help.

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

FTN, 3: "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.

FTN, 4: "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 on the field.

FTN, 5: "Advance Paper" - pulse the paper advance solenoid on the field printer.

FTN, 6: "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 zero.

FTN, 7: "Edit Data" - when in harvest mode, this key sequence allows the user to edit harvest data.

FTN, 8: "Show Version" - shows current version of the HarvestData System software.

FTN, 9: "Set Backlight" - allows the user to adjust backlight intensity. Key in a number from 0 (off) to 8 (brightest) to change the backlight. **<Enter>** accepts the brightness level.

Appendix E
System Control Cable

Standard System Control Cable

Shielded twisted pair (SH).

22 AWG twisted pair.

20 AWG twisted pairs.

22 AWG single wire.

24 AWG single wire.

24 AWG single drain wire (gnd).
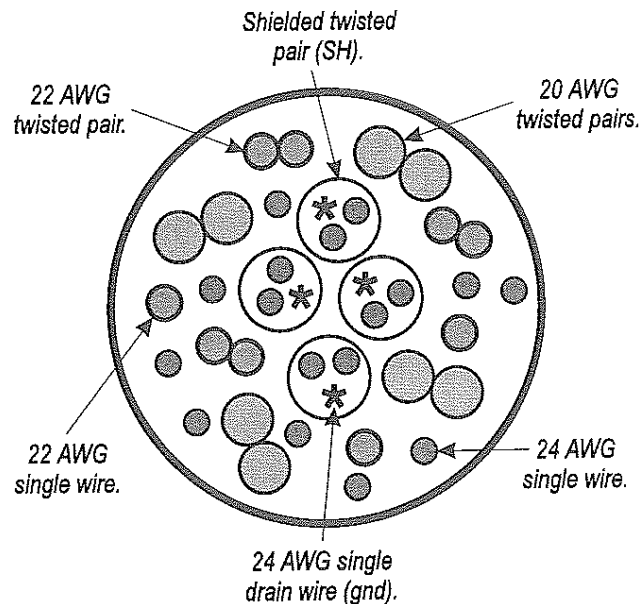
In a standard system control cable there are:
- four pairs of shielded cables
- nine 24 AWG single wires
- four 24 AWG single drain wires for the shielded twisted pairs

- 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 (+)

System Control Cable E-2

Pin	Wire Name
20	vehicle sense
21	grain level sense
22	sensor ground
23	compressor relay (+)
24	compressor relay (-)
25	accelerometer ground (-)
26	accelerometer excitation (+)
27	top gate "open" sense
28	top gate "closed" sense
29	accelerometer signal (+)
30	accelerometer shield
31	accelerometer signal (-)
32	moisture sensor signal (+)
33	moisture sensor signal (-)
34	load cell "B" ground
35	load cell signal (A+)
36	load cell signal (A-)
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

System Control Cable Pin #	Signal Name	Con-X-All Connector Pin #
35	load cell "A1 and A2" signal (+)	5
36	load cell "A1 and A2" signal (-)	6
19	load cell "A1 and A2" excitation (+)	1
37	load cell "A1 and A2" ground (-)	2
18	load cell "A1 and A2" shield	3
	no connection	4

"B" Load Cell

System Control Cable Pin #	Signal Name	Con-X-All Connector Pin #
14	load cell "B" signal (+)	5
15	load cell "B" signal (-)	6
17	load cell "B" excitation (+)	1
34	load cell "B" ground	2
16	load cell "B" shield	3
	no connection	4

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

Accelerometer Connector Wiring

System Control Cable Pin #	Signal Name	Molex Connector Pin #
29	accelerometer signal (+)	5
31	accelerometer signal (-)	6
26	accelerometer excitation	1
25	accelerometer ground	2
30	accelerometer shield	3
	no connnection	4

Moisture Sensor Connector Wiring

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

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

Appendix F

Field Maps Generated
from ASCII

A field map to be downloaded to the FieldBook and into the HarvestData 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 a 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.

The HarvestData software version 3.X accepts two distinct ASCII file formats to load as maps to the FieldBook. The first is a two dimensional text representation of the map. The second format, called Harvest Order Space Delimited format, is the same as the format accepted by version 1.9X of the HarvestMaster software. Both formats are discussed here.

No Format Change

The "NO FORMAT CHANGE" option directly transfers a file to the hand held. This is generally used when downloading setup files rather than field map files.

Two Dimensional Text Representation

A 2-D (two dimensional) 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 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. A simple example is shown here.

```
                Columns

310    309    308    307    306
301    302    303    304    305
210    209    208    207    206
201    202    203    204    205 ──  Rows
110    109    108    107    106
101    102    103    104    105

          Separated by
          spaces or tabs
```
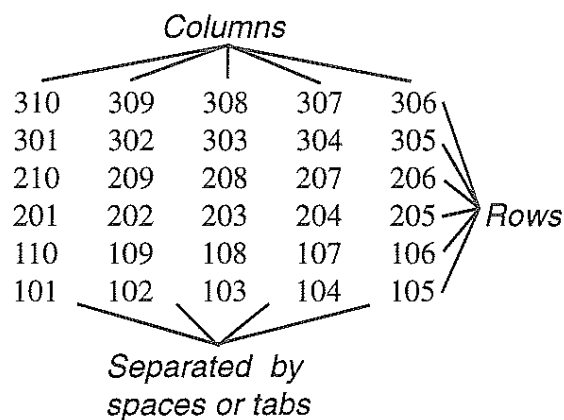
The map to be downloaded would be entered into a text file exactly as shown. If you required multiple identifiers for a single plot (for example, plots which were divided into studies), the text file could contain the following:

304,study1	303,study1	302,study1	000,study2	305,study2
203,study1	204,study1	301,study1	303,study2	304,study2
202,study1	201,study1	104,study1	302,study2	301,study2
101,study1	102,study1	103,study1	204,study2	205,study2
304,study3	303,study3	302,study3	203,study2	202,study2
203,study3	204,study3	301,study3	105,study2	201,study2
202,study3	201,study3	104,study3	104,study2	103,study2
101,study3	102,study3	103,study3	101,study2	102,study2

After downloading the above 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 which 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, this map is just fine.

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 below would cause abnormal behavior if loaded.

301	304			
201	202	203	204	
101		103	104	border
001		003		

When downloading a 2-D text representation of a field map, you will be asked which corner of the map corresponds to range 1, row 1 of the field. Since the HarvestData software always considers range 1, row 1 to be the lower left corner of a map, if any corner besides the lower left is chosen, the map will be rotated accordingly.

Harvest Order Space Delimited

The second type of map file that may be generated in the DOS text editor and subsequently downloaded to the hand held 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. Here's an example:

101
110
201
210
301
310
102
109
202
209
302
309
103
108
203
208
303
308
104
107
204
207
304
307
105
106
205
206
305
306

This is the actual harvest sequence

Note: You cannot have an opening header line as with our earlier versions of software

This sample field map file uses any variable set up on the hand held. Here is the field map that the download file on the previous page represents (assuming it was laid out sequentially):

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

For additional clarification, here is another example of a Harvest Order space delimited map that is comma separated. Suppose you have more than one study in a field, and wish to include the study name with the plot identifiers. For this example, we can use a field map like this:

Study 611123

304	303	302		000	305
203	204	301		303	304
202	201	104		302	301
101	102	103		204	205
				Study 845223	
304	303	302		203	202
203	204	301		105	201
202	201	104		104	103
101	102	103		101	102

Study 799971

The Harvest Order space delimited field map to download would, in the DOS text editor, look like the one shown on the following page.

```
101,799971 ———————— Study Identifier
202,799971
203,799971 ———— Plot# Identifer
304,799971
101,611123
202,611123
203,611123
304,611123
303,611123
204,611123
201,611123
102,611123
303,799971
204,799971
101,799971
102,799971
103,799971          `
104,799971
301,799971
302,799971
103,611123
104,611123
301,611123
302,611123
000,845223
303,845223
302,845223
204,845223
203,845223
105,845223
104,845223
101,845223
102,845223
103,845223
201,845223
202,845223(etc.)
```

Harvest Order Space Delimited
map for downloading

Downloading Maps

A format must be selected before downloading a map file to the hand held computer. This tells the HarvestData software how to interpret the field map file you're about to download. To select a format:

■ **In DataLink, highlight the FILE menu. Then select SET DOWNLOAD format by pressing _<ENTER>_ after highlighting that menu option.**

```
  File        Edit       Applications      Utilities        Quit
 Upload
 Download
 Set Upload Format
 Set Download Format
 Set Paths
```

```
    No  format  change                           ( • )
    2D  Text  field  map  format                 (   )
    Harvest  Order  space  delimited  format     (   )
```
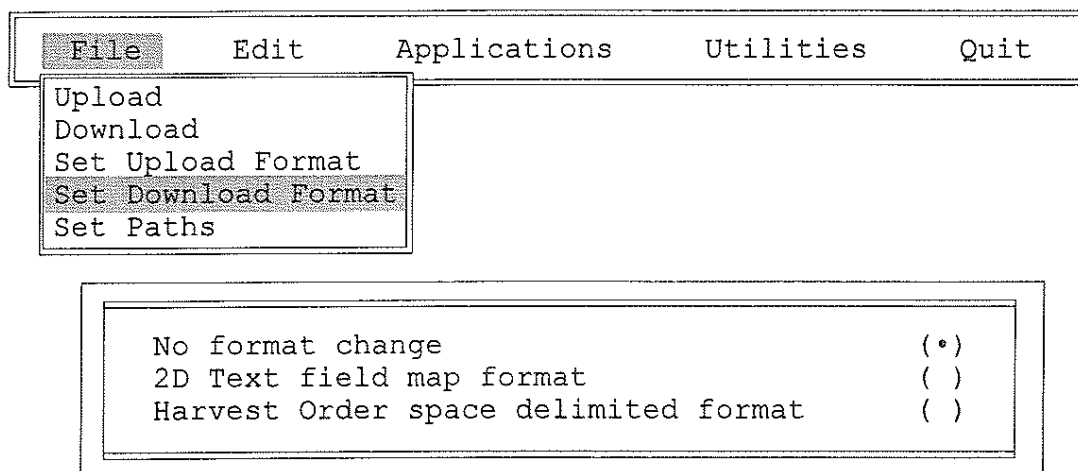
■ **Using the arrow keys, move the bullet indicator on the right to correspond with the map format you're going to download.**

☞ **Note: The hand held must be running the HarvestData software and connected to the PC through the communication cable before you can download maps. The active variables set on the hand held (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 hand held. If you desire any variables to be associated with the map you will need to set them up before the transfer begins.**

To download the map:

■ In the DOS text editor, type in the plot numbers (and any associated identifers with those plot numbers) in a format consistent with what you selected in the DataLink Download File format menu (either 2D or Harvest Order format).

■ Save the map file in the text editor and return to DataLink.

■ Make sure your hand held computer is connected to the PC correctly and that you're running the HarvestData software on the hand held.

■ Select DOWNLOAD in the DataLink FILE menu.

■ If you're downloading a Harvest Order space delimited map, you will be presented with the following window (if you are downloading a 2D map, skip the next step):

```
Enter drive specification for map..:

Enter the number of plots per range: 5
Enter the number of ranges.........: 6



Serpentine harvest  ( )
Sequential harvest  (•)
Circular harvest    ( )
```

Harvest Order Space Delimited Download Screen

■ Follow the directions at the bottom of the screen to adjust the settings (Note: The drive specification is not used with the HM-1 FieldBook).

☞ Note: When loading a Harvest Order space delimited field map, you will be asked to supply the width of the field, the number of ranges in the field and the harvest direction or route that will be taken when the field is harvested. The three available harvest routes are serpentine, sequential, and circular. (NOTE: Circular can be designated clockwise or counter-clockwise depending upon your starting position.)

```
404    403    402    401
301    302    303    304
204    203    202    201
101    102    103    104
```

Serpentine

```
404    403    402    401
301    302    303    304
204    203    202    201
101    102    103    104
```

Sequential

```
404    403    402    401
301    302    303    304
204    203    202    201
101    102    103    104
```
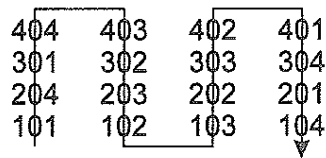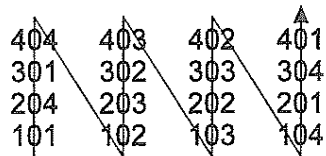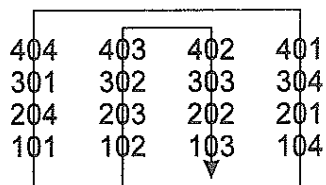
Circular

■ If you're downloading a 2D map, you will be presented with this screen:

```
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 ( )
```

■ Use the arrow keys to select the appropriate option.

■ Press <ENTER> after you've set the parameters to download the field map.

Appendix G
Installing DataLink with Windows 95

Loading Software

The distribution diskette (MS-DOS, IBM PC compatible format) contains the programs to install DataLink on your PC and (subsequently) the HarvestData software on your HM-1 FieldBook. The whole installation process takes 10-20 minutes, depending upon your level of familiarity with computers.

■ Make sure that your HM-1 is adequately charged (Leaving it plugged into the charger overnight before use is a good practice.)

■ Have your communication cable (model # CA-009) on-hand.

DataLink Installation

The steps to install DataLink are as follows:

■ **Turn your computer on.**

■ **Insert the 3.5" HDGG-HM1 Installation Disk into your PC.**

On your PC, begin the DataLink installation by running the setup program on the diskette:

■ **Go to the START menu and click on Run...**
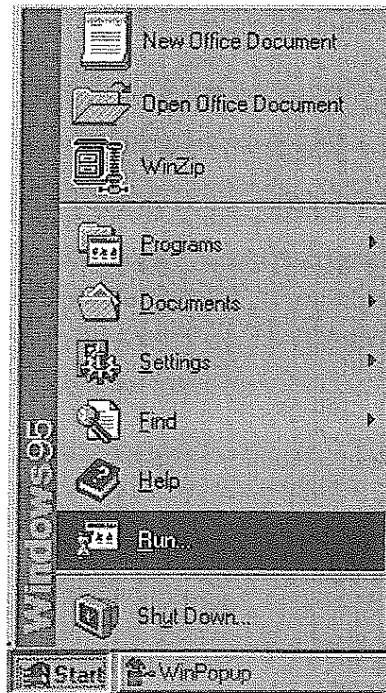
■ In the RUN window, type in the letter of the drive containing the HDGG-HM1 Installation Disk (A:\ or B:\), followed by *SETUP*, then click *OK*.
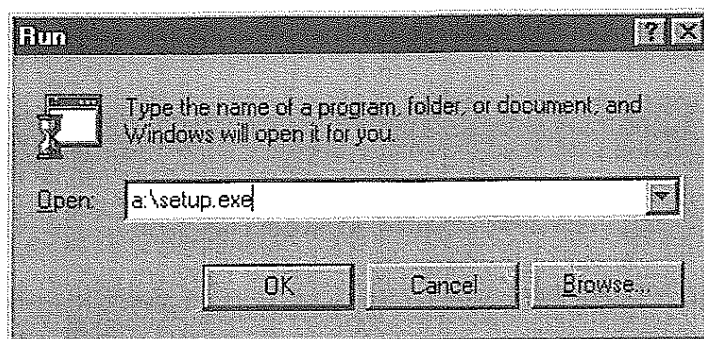
■ The setup screen appears (see below). The "Install from:" drive should be the drive where the HDGG-HM1 disk is located.
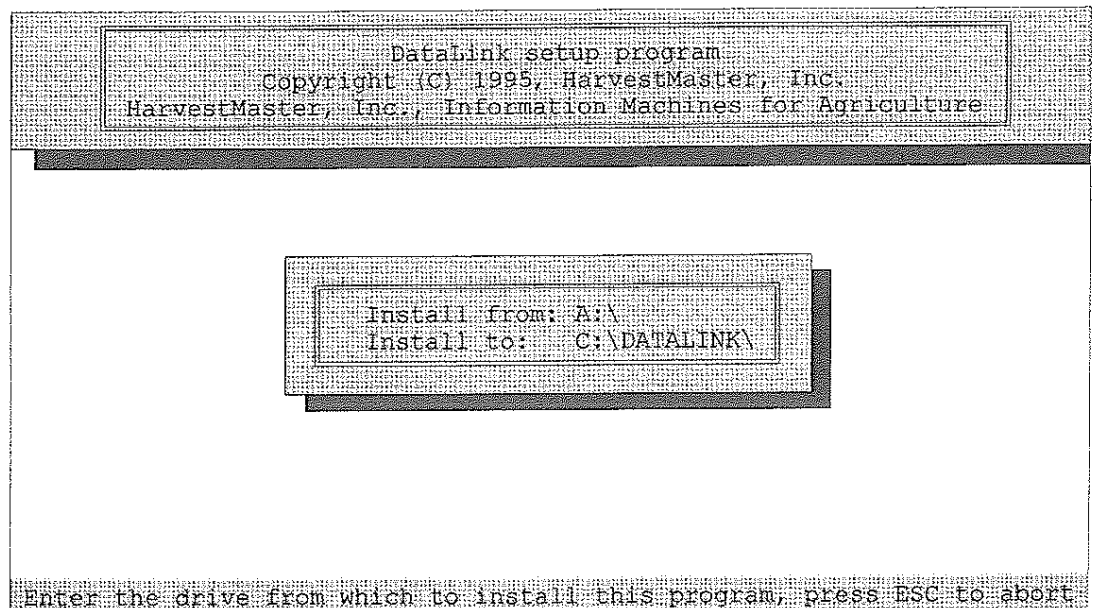
■ The "Install to:" drive and directory is, by default, set to install on your hard drive (in most cases this is c:\ or d:\) under the DATALINK directory. It should read similar to:

Install to: C:\DATALINK\

Drive   Directory Name

☞ 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.

■ Press *<Enter>* when the "Install from:" and "Install to:" locations are set as desired.

■ A display window appears, displaying files being installed on to your hard drive. When DataLink has been successfully installed, a window appears:

```
Program Installed
Press any key
```
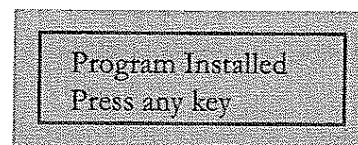
■ Press *any key to continue*.

Now you need to adjust the IDLE SENSITIVITY for the DL.EXE and PCL.COM files in the DATALINK directory. This will better facilitate the communication between the Windows 95 operating system on your PC and the hand held computer.

To adjust the IDLE SENSITIVITY:

- **Use the Windows Explorer to select the DATALINK directory.**

- **Click once on the DL file to highlight it.**

- **Now click the right mouse button and click on PROPERTIES or go to the FILE...PROPERTIES menu and click once.**

DI Properties ? X

General | Program | Font | Memory | Screen | Misc |

Foreground
☑ Allow screen saver

Mouse
☐ QuickEdit
☐ Exclusive mode

Background
☐ Always suspend

Termination
☑ Warn if still active

Idle sensitivity
Low   High

Other
☑ Fast pasting

Windows shortcut keys
☑ Alt+Tab   ☑ Ctrl+Esc   ☑ Alt+PrtSc   ☑ Alt+Space
☑ Alt+Esc   ☑ PrtSc   ☑ Alt+Enter

OK   Cancel   Apply
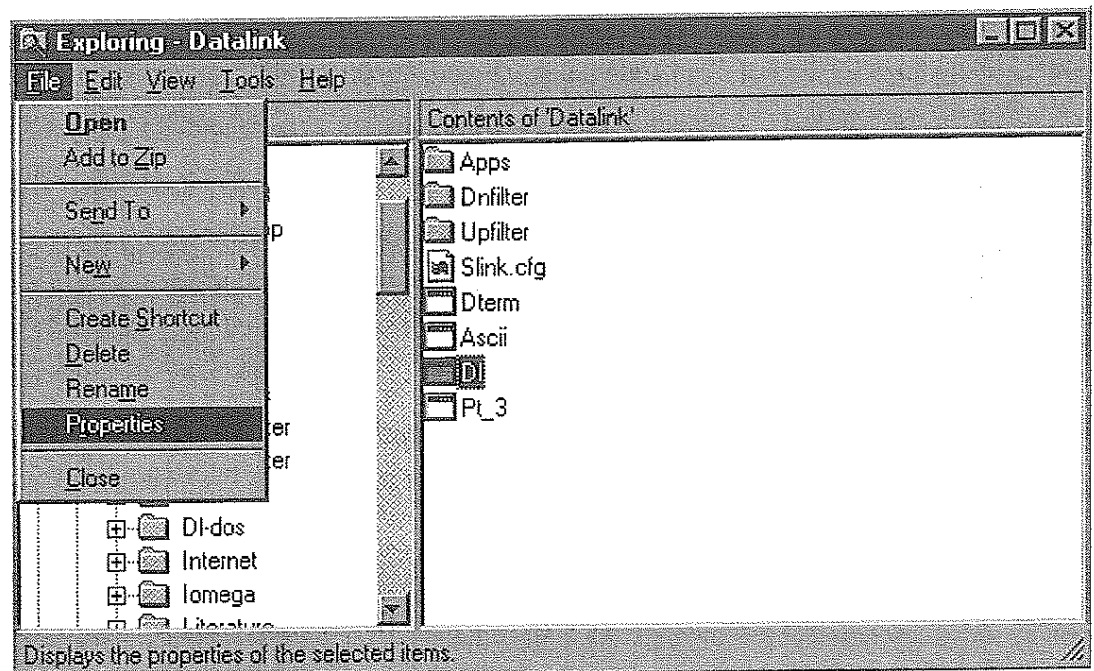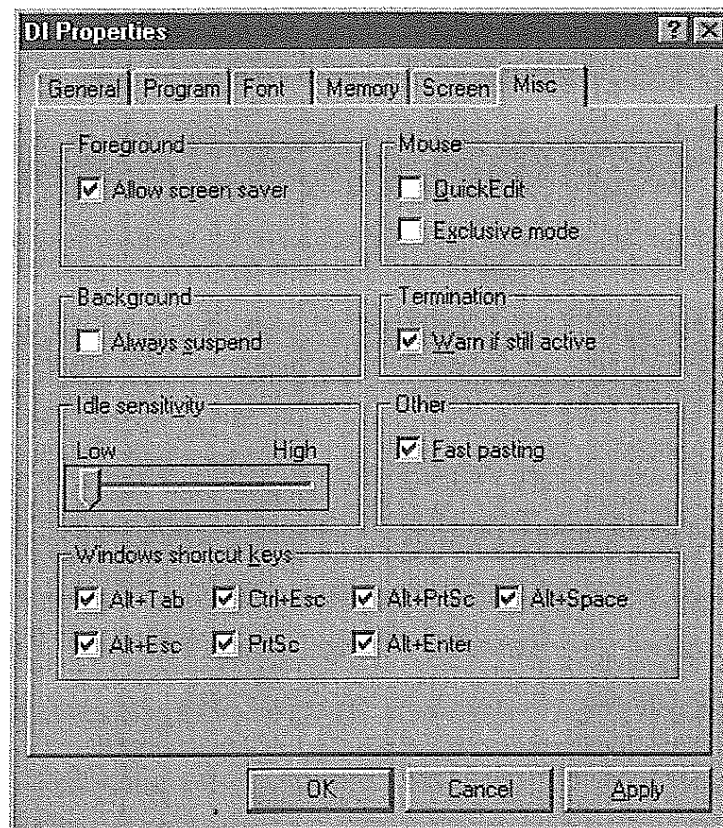
■ Click on the MISC tab and move down to the IDLE SENSITIVITY bar. Slide the indicator over to LOW.

■ Click OK.

■ To run DataLink, go to the START...RUN menu from the Windows 95
Desktop.   Type in: C:\datalink\dl.exe and click OK.
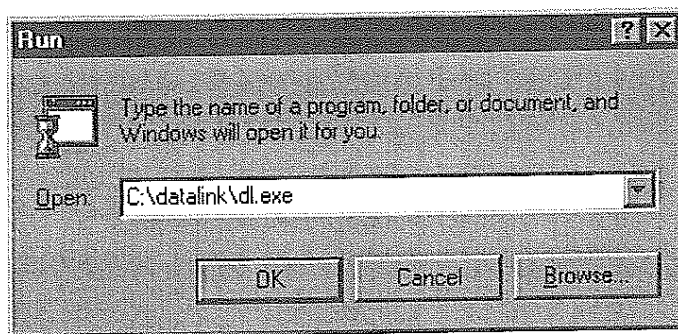
OR

■ Drag the DL application from the Explorer window to the desktop, then
doubleclick on the DL icon in the desktop area.

Introduction to DataLink

The title screen appears. Don't worry - this goes away in a few seconds (you can
make it disappear immediately by pressing the *space bar*).

Welcome the DataLink Main Menu:

File	Edit	Applications	Utilities	Quit
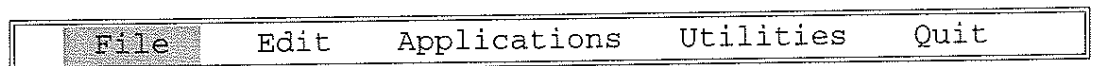
DataLink is, as the name implies, your link to the data stored on the handheld com-
puter. You may *upload* data (transfer data from the hand held to the PC) or *download*
data (transfer data from the PC to the hand held) using DataLink. DataLink lets your
PC and HM-1 FieldBook communicate via the serial communication cable (model #

CA-009). The communication cable connects your HM-1 to your desk-top PC, and DataLink is the communication software that allows the HM-1 and PC to communicate.

In addition to facilitating communication between the PC and hand held, DataLink is used to install the HDGG-HM1 software on the hand held computer (which is what you're going to do next). It is also useful for creating and editing maps. We strongly recommend that you take a moment to review the Appendix B for a complete overview on how to use DataLink.

Installing the HarvestData Software

The steps to install the HarvestData Software on the hand held computer are as follows:

■ **Connect the PC to the HM-1 using the communications cable. To do this, plug the communications cable into one of the serial ports on your computer (preferably port 1).**

Plug into Com 1 or Com 2

CA-009 Communication Cable

Plug into 25-pin connector

PC

HM-1
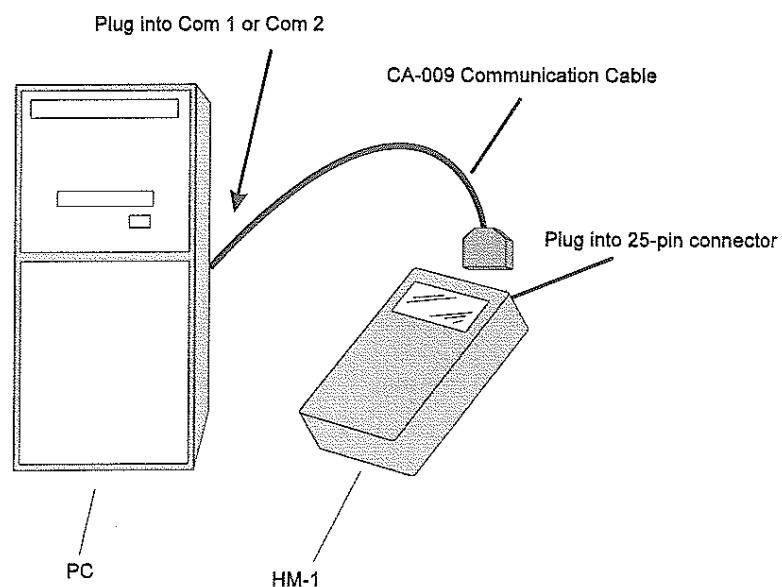
☞ Note: DataLink automatically defaults to communicating via the PC's com1 port. Some computers may have a mouse or other external devices connected to com1. If this is the case, it will probably be easier to plug the communications cable into com2. Then, on your PC, go into the DataLink Utilities menu by using the left/right arrow keys and pressing <ENTER> when the Utilities menu is highlighted. A drop-down menu appears. Select the first highlighted item on the list, Comm Params (communication parameters) by pressing *<ENTER>*.

File	Edit	Applications	Utilities	Quit

```
Comm Params
Terminal
Poly Upload
Poly Download
Set Editor
PolyTran
```

This brings up the communication parameters window:

```
┌──────────────────────────────────────────────────────────────┐
│  File      Edit      Applications    Utilities      Quit      │
└──────────────────────────────────────────────────────────────┘
        ┌──────────────────────────────┬────────────────┐
        │ Comm port:   Com1    (•)     │ Comm Params    │
        │              Com2    ( )     │ Terminal       │
        │                              │ Poly Upload    │
        │ Baud rate:   9600    (•)     │ Poly Download  │
        │              4800    ( )     │ Set Editor     │
        │              2400    ( )     │ PolyTran       │
        │              1200    ( )     └────────────────┘
        │               600    ( )     │
        │               300    ( )     │
        │                              │
        │ Parity:      None    (•)     │
        │              Odd     ( )     │
        │              Even    ( )     │
        │                              │
        │ Data Bits:   7    ( )        │
        │              8    (•)        │
        │                              │
        │ Stop Bits:   1    (•)        │
        │              2    ( )        │
        └──────────────────────────────┘
```

Now you have to tell DataLink that you're using Com2 to communicate with the hand held rather than com1. To do this, press the *down arrow*. The bullet indicator on the right will shift down to com2. Now press *<ENTER>* to save this setting. Press *<ENTER>* to scroll through the baud rate, parity, data bits, and stop bits sections, and to save those settings.

▓ Use the left/right arrow keys to move the highlighted cursor to the applications menu.

☞ Note: You may also press the highlighted letter in a menu title move to that menu (Example: Press *A* to go to the Applications menu, press *Q* to quit, etc.).

■ Once the Applications Menu is highlighted, press *<ENTER>*. A drop-down menu appears displaying HarvestData GG HM-1. This is the application to be downloaded to the hand held computer.

File	Edit	Applications	Utilities	Quit

HarvestData GG HM-1 Ver. 0.91

☞ 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>* gets you back to the previous menu.

■ Press *<ENTER>* to prepare DataLink to download the HarvestData GG HM-1 software.

File	Edit	Applications	Utilities	Quit

```
Comm port:    Com1    (•)     Comm Params
              Com2    ( )     Terminal
                              Poly Upload
Baud rate:    9600    (•)     Poly Download
              4800    ( )     Set Editor
              2400    ( )     PolyTran
              1200    ( )
               600    ( )
               300    ( )

Parity:       None    (•)
               Odd    ( )
              Even    ( )

Data Bits:    7    ( )
              8    (•)

Stop Bits:    1    (•)
              2    ( )
```

■ DataLink prompts you to select the appropriate memory size of your FieldBook, language, and whether or not to load the help screens. Use the *up/down arrow* keys to make your selection in each section. Press *<ENTER>* when you wish to make the selection and move to the next section. Press *<ENTER>* after the *Load Help* section to proceed with downloading the HDGG software to the HM-1.

■ Follow the on-screen instructions to complete the download.

☞ Note: If the HDGG software is not downloaded to the HM-1, check all cable connections. Make sure you have specified the correct communication port on your PC by going into *Utilities > Comm Params* in DataLink. The settings should be as follows:

Com Port:	Either 1 or 2, whichever port to which the communication cable is connected.
Baud Rate:	9600
Parity:	None
Data Bits:	8
Stop Bits:	1

Appendix H
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

1. Allen wrenches (5/32" and 3/16")
2. Socket set (3/8" drive with 7/16" socket and short extension)
3. 7/16" end wrench
4. .020 feeler gage or load cell adjusting shim.
5. Loc-Tite 242 Thread Locker
6. Flat head Screw Driver (4.0 x 60 mm)
7. #3 Phillips Screw Driver
8. Pair of long nosed needle nose pliers.

Procedures

1. Disconnect the air supply to the GrainGage by turning the air control valve on the GrainGage to the off position.

2. Position the HM-401 SCCU HarvestData system so that you can see the hand held display while working on the GrainGage.

3. Enter the HarvestData program and at the Main Menu, select "Diagnostics" and then "Load Cells". Your display will show 3 voltages:

      Ld A: ——   This is the combination of the 2 left hand load cells

      Ld B: ——   This is the total of the right load cell.

      Tot: ———   This is the Total of all three load cells.

4. As you are following the below outlined procedures, watch the "Tot:" (total) voltage column to make sure that this does not exceed a specification of + or - 1.5mVlts. Ideally, you would like the readings to stay as close to 0.00 mVlts as possible. This procedure is very important to ensure that you are not inadvertently exerting any upward or downward pressure on the load cells. When working on the left-hand load cells (Ld A:), disconnect the opposite cell from the one you are working on. This will allow you to see the voltage of each individual Load Cell.

5. 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).

3/16" or 5/32" Allen Head
Load Cell Protection Pin

3/16" Allen Head or
#3 Phillips Screw Driver
Load Cell Mounting Bolts
(2 PLC)

7/16" Hex Head
Exit Sleeve Bolts
(4 PLC)

Thumb Screw
Shipping Stops
(3 PLC)

Exit Sleeve

**Figure #1
GrainGage Exit Sleeve (Bottom View)**
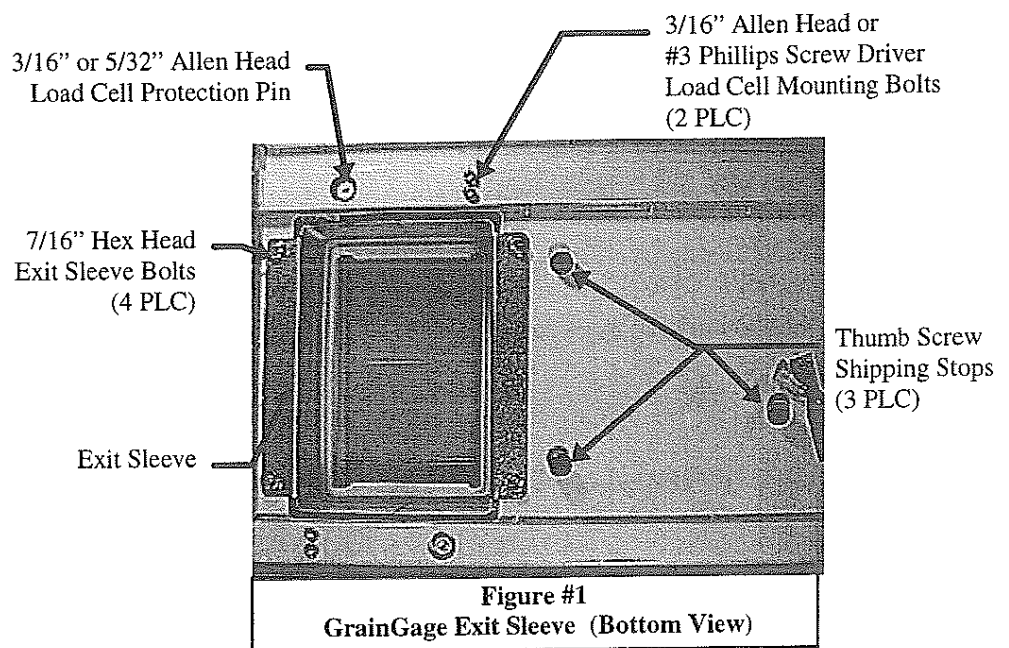
6. Slide the *Bottom Gate* half-way open so that the *Gate Connecting Pin* on the actuator aligns with the hole in the *Weigh Pan* (Refer to Figure #2 GrainGage Weigh Pan Assembly).

7. Remove the *E-Rings* from the *Bottom Gate Connecting Pin* and push the pin out. Close the B*ottom Gate*.

8. Disconnect the air hoses from the actuator cylinder (making note of their proper positions).

9. Using the 7/16" socket and ratchet (with out extension), remove the two 1/4" bolts on the *Front Gate Guide* and then remove the three 1/4" mounting bolts for *the Bottom Weigh Chamber* (2 in front and 1 in back). Set the *Gate Guide* aside for future reference (Refer to Figure #2).

Test Chamber Base — Bottom Weigh Chamber

Bottom Gate
Connecting Pin
and E-Ring.

7/16" Hex Head
Bottom Weigh Chamber
Mounting Bolts
3 (PLC)

7/16" Hex Head
Front Gate Guide
(2 PLC)

5/32" Allen Head
Guide Pin
(4 PLC)

Weigh Pan

White Weigh Chamber
Base

Shipping Stops
(3 PLC)

Tedea Load Cell
Part #8617
(3 PLC)

Figure #2
GrainGage Weigh Pan Assembly
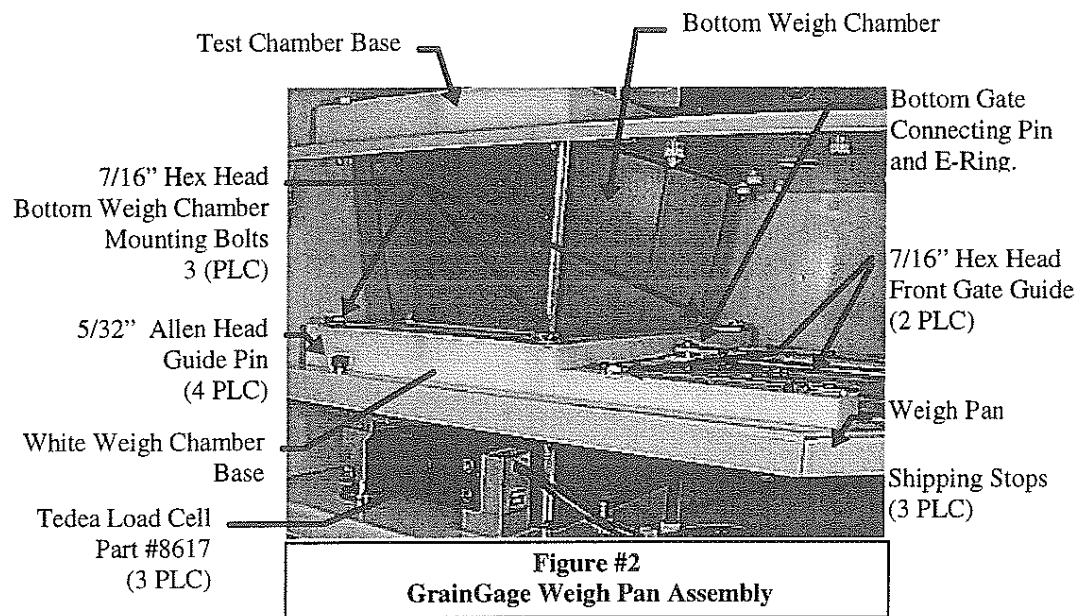
10. Using a 5/32" Allen wrench, remove the *Guide Pin* located at the top left front corner of the *Weigh Pan*, being careful not to exert pressure on the *Load Cell*.

11. Adjust the three *Shipping Stops* up until the rubber bumpers just touch the weigh pan. Most of the weight (but not all of the weight) should be resting on the *Shipping Stops* (Refer to Figure #1 & #2).

> **NOTE: If you adjust them too far up, it will make it more difficult to remove the *Test Chamber* Base as outlined below.**

12. Lift the *Bottom Weigh Chamber* up firmly against the top of the *Test Chamber Base* and carefully slide the *White Weigh Chamber Base* out of the GrainGage.

13. Remove the *Bottom Weigh Chamber.* Set it and the *Weigh Chamber Base* aside for future reference.

14. Using the 5/32" Allen wrench, remove the two *Guide Pins* located on the right side of the *Weigh Pan* (one on each side of the actuator).

15. With the same Allen wrench, remove the remaining *Guide Pin* located on the left rear of the *Weigh Pan.*

16. Disconnect the actuator limit switch cable.

   Note: The connector is located underneath the weigh pan.

17. Disconnect the accelerometer cable (the thin silver cable).

   Note: The connector is located to the right rear of the weigh pan.

18. Carefully lift the *Weigh Pan* up and out of the GrainGage.

19. Carefully remove the top *E-ring* from the *Load Cell* that is being replaced. If you use a corner of the flat head screw driver between the *E-ring* and *Protection Pin* and pry outward, it will get the *E-ring* started so that it can be removed easier (refer to Figure #3 Over Load Protection Pin).

CAUTION
Make sure you are watching the total voltage on the hand held when you are doing this so that you do not stress this Load Cell (Refer to Figure #3 Over Load Protection Pin).

20. Lift the *Stainless Steel Cap* up and remove the bottom *E-ring* .

CAUTION
Be careful not to put any up or down pressure on the *Load Cell!*

21. While using a 5/32" or 3/16" Allen wrench to keep the *Protection Pin* from turning, use the 7/16" end wrench to loosen the *Protection Pin* lock nut. Then carefully unscrew the *Protection Pin* from the *Load Cell* and remove the pin from the hole.

22. Using the 3/16" Allen wrench or #3 Phillips screw driver, remove the *Load Cell Mounting Bolts* and remove the *Load Cell* (Refer to Figure #1).

23. Remove the two 3/16" Allen screws from the *Aluminum Spacer* attached to the *Load Cell* and re-install them on the new one.

> **NOTE: Clean all screws with a fine wire brush before re-assembling. Use #242 Lock-Tite on all screws during reassembly. After placing the loc-Tite on the threads it is recommended to run your finger around it so that you will remove any excess. This will make it easier to keep the Loc-Tite off of *the Stainless Steel Cap*, around the outside of the *Protection Pin*, and other parts that can not have any residue on them as you are assembling them (Refer to Figure #3).**

24. Place Loc-Tite on the two *Load Cell Mounting Bolts* and install the new *Load Cell* into the GrainGage in reverse order that it was removed.

> **NOTE: Do not tighten these bolts until the *Protection Pins* are installed.**

25. Insert the *Protection Pin* through the GrainGage hole and genly screw the pin up into the load cell until tthe bottom *E-ring* groove just clears the botttom of the GrainGage. Hold the *Load Cell* with the *Protection Pin* carefully centered in the hole and securely tighten both load cell mounting bolts (taking care that you do not move the *Protection*

26. Remove the *Protection Pin* from the hole and place a small amount of Loc-Tite on its threads.

27. Insert the *Protection Pin* through the GrainGage hole, placing *the Stainless Steel Cap* on the pin as it comes up thorough the hole.

   NOTE: Be carefull not to get any Loc-Tite on the *Stainless Steel Cap.*

28. Adjust the Lock Nut down about 3/8" and put a thin coat of Loc-Tite on the exposed threads.

29. Using a 5/32" or 3/16" Allen wrench, gently screw the *Protection Pin* up into the *Load Cell until* the bottom *E-ring* groove just clears the bottom of the GrainGage. Be careful that the *Lock Nut* does not contact the *Load Cell* at this time.

30. Snap the bottom *E-ring* onto the *Protection Pin* with the long needle nose pliers.

31. Screw the *Pin* up gently until you can just slide the *.020 Shim* between the *E-ring* and the bottom of the GrainGage. Adjust the *Pin* so that if fits snug and then back it off about 1/4 turn. The *Shim* should slide out with very little resistance. You should also be able to slide this *Shim* into place with very little voltage change on the display of the hand held under the Diagnostics menu (Refer to Figure #3).

Figure #3
Over Load Protection Pin

Labels around figure:
5/32 Allen Head Mounting Screws (2 PLC)
Alluminum Spacer
7/16" Hex Head Stabalizer Pin Lock Nut
E-Ring (2 PLC)
Stainless Steel Cap
Load Cell Protection Pin
.020 Shim
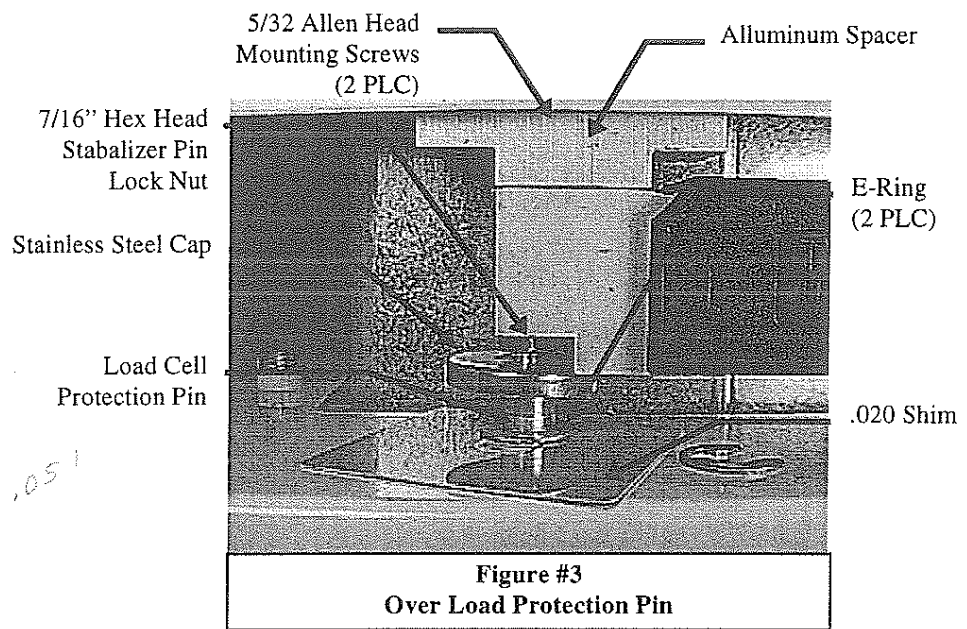
32. Gently snug the *Lock Nut* up against the *Load Cell*. Not too tight. Watch the voltages.

33. Snap the upper *E-ring* above the *Stainless Steel Cap*.

> A. After the load cell is completely installed, it is a good practice to check it before continuing to assemble the weigh pan. To check the load cells please follow the procedures as outlined below:

> 1. If you are working on one of the left load cells you will need to unplug the opposite load cell that you are working on.

> 2. Looking at the hand held display, you should still be in "Diagnostics" and "Load Cells". Read the appropriate voltage for the load cell under test to verify that it is between 0.00 V and +.150V (this is its Zero Offset).

3. Write down the reading of the total voltage of all three load cells.

4. Place a 4-5lb weight on each load cell and write down the total voltage each time.

NOTE: These voltages should be very similar and should repeat this same reading each time the weight is placed on it, and should return to its same zero reading.

33. Install the *Weigh Pan* assemblies in reverse order of disassembly. Remember to place Loc-Tite on all *Mounting Bolts*.

34. Check out the system as outlined in the Installation section in Chapter 2 of this manual.

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