HarvestMaster™

Information Machines for Agriculture

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Limited Hardware Warranty

24 Month Warranties

HarvestMaster, Inc. warrants that all *HM-570 Profile Yield Monitor* hardware components (except for the items listed below) shall be free from defects in materials and workmanship for a period of 24 months from the date of shipment when properly installed, calibrated, and operated in accordance with instruction manuals accompanying said hardware and used for the purpose for which said hardware was designed. In the event of a defect in materials or workmanship is discovered and reported to HarvestMaster, Inc. within said 24 month period, HarvestMaster, Inc. will, at its option, repair the defect or replace the defective product. This warranty does not apply where the product has been operating outside of the specifications of the product or where cables, sensors, or other components of the system have been subject to abuse. HarvestMaster's obligation hereunder will be limited to such repair or replacement. Customer shall have the responsibility to ship the defective equipment to HarvestMaster, Inc. at customer's expense, with all cost of shipment prepaid. After repair or replacement, HarvestMaster, Inc. will ship the replacement or repaired item at its cost by the same type of carrier as the item was shipped to us.

Disclaimer of Warranties

The warranties set forth above are in lieu of all other warranties of HarvestMaster, Inc., whether written, oral, or implied. HarvestMaster, Inc. 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, Inc. specifically makes no warranties as to the suitability of its products for any particular application. HarvestMaster, Inc. 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 disclaimer whether such claim is based upon warranty (express or implied) contract, strict liability, negligence, or otherwise. Any responsibility and / or liability of HarvestMaster, Inc. shall, in connection with a warranted product, be limited in maximum amount to the original purchase price of that product.

Removal of Serial Number

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

Factory Sealed Unit

The *HM-570 SCCU* is a factory sealed unit. There are no internal user serviceable parts. If the *HM-570 SCCU* is opened or in any other way tampered with, all warranties are null and void.

Updates or Modifications

HarvestMaster, Inc. shall be under no obligation to update or modify its products except as herein noted to correct defects or errors. Furthermore, the customer agrees that all representations and warranties contained herein shall be immediately null and void in the event of any modification, alteration, or change in or to any product effected by or on behalf of customer except for a change made by HarvestMaster or other direct supervision thereof.

Customer Service

HarvestMaster is dedicated to insuring that your yield monitoring equipment provides high quality performance. If repair becomes necessary, a simple process has been devoloped to get your system up and running again. Simply call one of our customer service representatives to receive an RMA (Return Material Authorization) number and the process will be under way. Please have the following information ready when you call:

- *HM-570* serial numbers (electronic unit)
- Your name
- Name of company / university / agency
- Phone and Fax number
- Clear description of the problem encountered

For equipment that is not under warranty or extended warranty, a purchase order number as well as the billing and shipping address will also be needed.

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Hardware Installation

This section explains how to install your HM-570 hardware. It is important that you follow the installation procedures in the order they are presented.

System Overview

The Profile Yield Monitor operates as a group of functional modules:

• Mobile Computer
• HM-570 Signal Conditioning and Control Unit
• Position Measurement Unit (DGPS Receiver)
• Profile Sensor Array
• Belt Speed Sensor
• Optional Harvester Speed Sensor
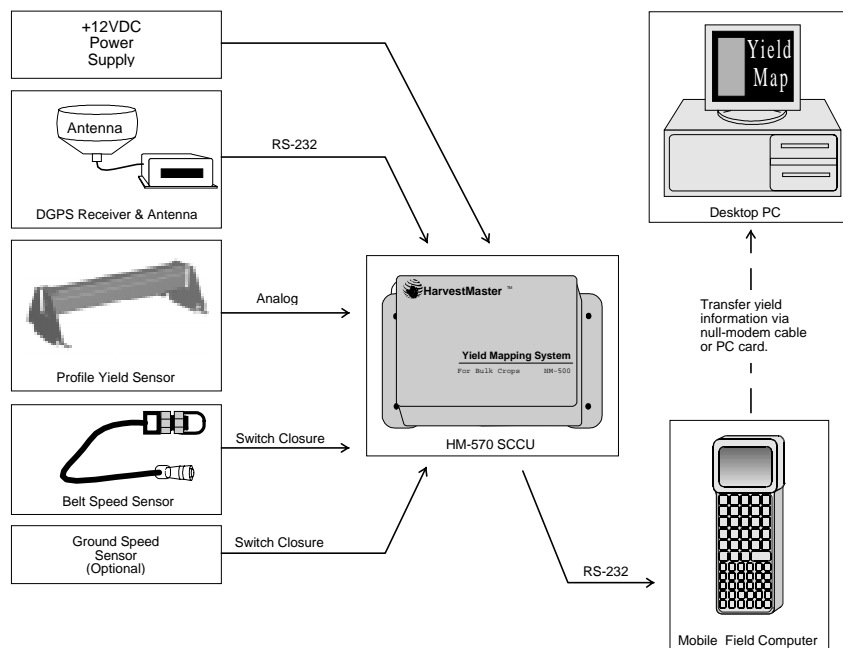
HM-570 Functional System Diagram

Installation Time

Typical time for installation is approximately 3-4 hours. This will vary based on the materials you have on hand for building brackets, access to the appropriate tools needed for installation, and type of harvester.

Required Tools and Materials

- A Phillips-head screwdriver
- A flat-blade screwdriver
- Wrench, 7/16" (13 mm, 14 mm)
- Hardware for mounting GPS and radio antennas (varies according to your equipment)
- Connectors and crimping tool for electrical connections
- Center Punch
- Hammer
- Basic set of drill bits
- Power drill

Components

The HM-570 Profile Yield Monitor includes the following components:

- HM-570 SCCU
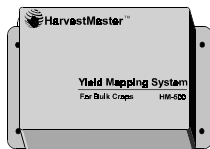
- HM-570 SCCU (Signal Conditioning and Control Unit)
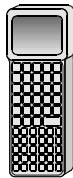
- Mobile Computer

- Mobile Computer Instrument Cradle (optional)
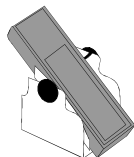
- CA-PW-H5: 20' (6 m) HM-570 Power Cable: 4 pin Trident connector (plugs into the SCCU) to red and black pigtail (black = ground; red = +12V DC).

- Mobile Computer Instrument Cradle

- CA-MC-H5: 40' (12 m) RS-232 serial communication cable (goes from SCCU to the field computer) 8 pin Trident connector to 9 pin sub-D female connector.

- Profile Yield Sensor
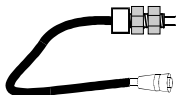
- HM-573 (HM-575): Profile Yield Sensor and mounting brackets.

- CA-BS2-H5: 6' (1.8 m) Belt/Ground Speed Adaptor Cable

- Speed Sensor

- HM-BS-H5: Belt and Ground Speed Sensors, magnets and mounting bracket

Additional Required Equipment

The following equipment (or similar) is required for your HM-570 installation:

• DGPS receiver & antenna (such as: Trimble Ag GPS 122/132 receiver and antenna)

• Type I or II PCMCIA memory cards for data storage on mobile computer (4 MB or 10 MB recommended).

Preparation for Installation

To prepare for installation of the HM-570 Profile Yield Monitor:

■ Determine the mounting location of:

• HM-570 SCCU (on the harvester): The mounting of the HM-570 SCCU, profile sensor, speed sensors and GPS cables must be positioned so they can be connected easily without interfering with any moving parts on the harvester (chains, sprockets, conveyors, etc.)

• Field Computer: Plan the mounting location of the field computer console such that it is in easy view and reach of the operator.

• Belt Speed Sensor: Determine the mounting location of the belt speed sensor. It will need to be on the drive shaft of the belt on which the Profile Yield Sensor is mounted.

• Ground Speed Sensor: The ground speed sensor should be located on a "pulled" wheel (rather than a powered wheel) to minimize speed error due to slippage.

Installation Step #1: Mounting the Profile Sensor Array

Product Flow
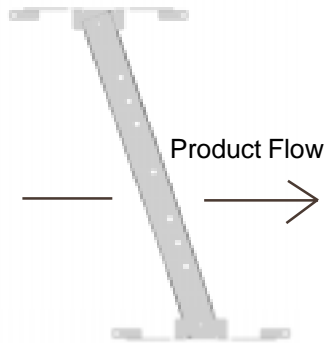
Mount the Profile Yield Sensor array on the discharge conveyor of the harvester. There are 3 or 5 sensors (depending on the model used) on the array. The mounting hardware is designed to allow each sensor exposure to an equal width of the harvester conveyor belt. At 33 inches (83.8 cm) long, the sensor can mount diagonally across narrower conveyors.

Each mounting bracket comes with two sets of bolt holes. Select which ever pair best fits the conveyor and mount the sensor to the conveyor.

Bolt Holes
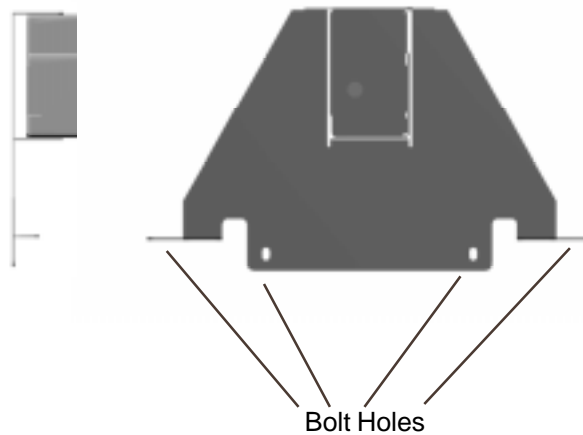
Fit the sensor across the conveyor so that no part of the underside of the array is farther than 9 inches (22.5 cm) above the conveyor belt.

< 9 in. (22.5 cm)
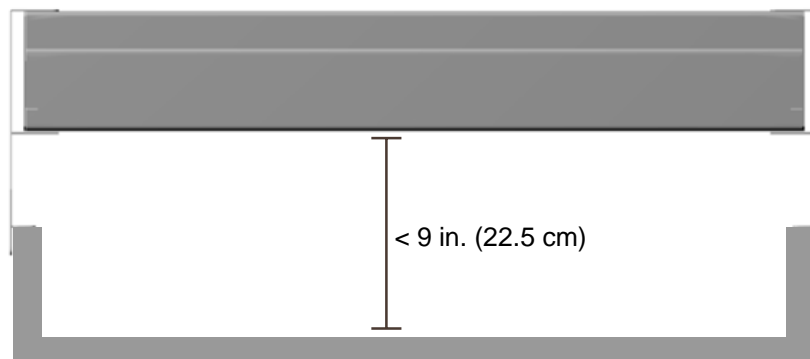
☛ **Note:** *Protect all wiring by tying it such that it will be safe from damage due to conveyor movement, equipment cleaning, etc.*

■ The speed sensor will need to be mounted so that it is pointing directly at the drive shaft on the conveyor on which the Profile Yield Sensor is mounted. There will need to be approximately 1/8"-1/4" (0.6 cm) of clearance between the magnet that will be mounted on the shaft and the end of the speed sensor. The barrel of the speed sensor is threaded for adjustment.

■ The speed sensor will require a hole approximately 7/16" (1 cm) in diameter. The hole may be slotted to allow for adjustment if desired. The mounting bracket may either be welded or bolted to the frame. If you weld the bracket, remove the speed sensor before welding.

■ When mounting the magnet to the drive shaft, you may use an epoxy resin, cable ties, or even electrical tape will work. (We recommend bonding the magnet to the shaft using epoxy and securing it with cable ties.)

■ Mount the speed sensor such that the tip is approximately 1/8"-1/4" (0.6 cm) away from the magnet. Secure the sensor in place with the jam nut.

Two types of ground speed sensors may be used with the HM-570. The first is the magnetic ground speed sensor. The magnetic ground speed sensor is essentially the same as the belt speed sensor, only it is mounted on a "pulled" wheel, rather than a conveyor drive shaft. To mount the magnetic ground speed sensor, follow the instructions given below:

■ The ground speed sensor will need to be mounted so that it is pointing directly at the magnet located on the inner side of a "pulled" wheel.

■ The ground speed sensor will require a hole approximately 7/16" (1 cm) in diameter. The hole may be slotted to allow for adjustment if desired. The mounting bracket may either be welded or bolted to the frame. If you weld the bracket, remove the speed sensor before welding.

■ When mounting the magnet to the wheel, you should use an epoxy resin.

■ Mount the speed sensor such that the tip is approximately 1/8"-1/4" (0.6 cm) away from the magnet. Secure the sensor in place with the jam nut.

Installation Step #2: Belt Speed Sensor Mounting

**1/8"-1/4"
0.6 cm**

Speed Sensor — Drive Shaft

Installation Step #3: Ground Speed Sensor Mounting

0.6 cm

1/8"-1/4"

Speed Sensor

Harvester Wheel
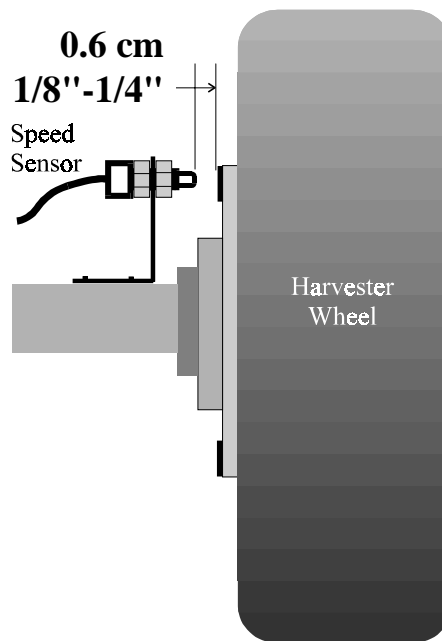
The second type of ground speed sensor that may be used is the Dickey-John radar speed sensor. This sensor can be mounted no higher than 4 feet (1.2 m) off the ground, and at an angle of 35°. Optionally, the speed of the GPS receiver can be selected in software setup. Note that there may be some sacrifice of speed measurement accuracy, depending on the GPS receiver used.

Installation Step #4: HM-570 SCCU Mounting
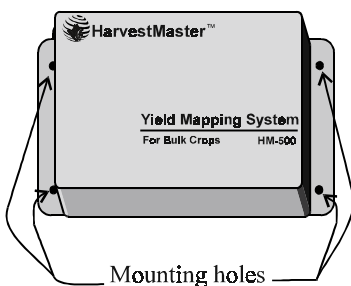
The HM-570 SCCU has four mounting holes. Using the HM-570 Mounting Template and a center punch, mark the location on the harvester of each hole to be drilled.

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Yield Mapping System
For Bulk Crops   HM-500

Mounting holes

■ Using the 9/32" (Φ7) drill bit, drill each of the four holes in the harvester.

■ Bolt the SCCU into place using the 1/4" x 1" (M6 x 25) cap screws and locking nuts.

Installation Step #5: Field Computer Mounting

The HarvestMaster field computer comes with a mounting cradle that should be mounted in the tractor or the harvester near the operator. The cradle base is adjustable and can be mounted to either a horizontal or vertical surface. The operator can adjust the angle of the base for ease of viewing.

Field Computer Mounting Cradle
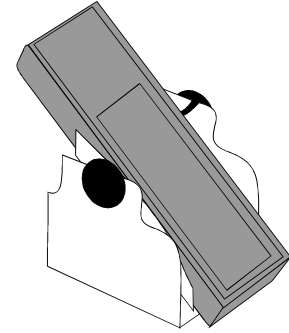
On the front panel of the HM-570 is a diagram of the SCCU connectors. You will need to refer to this diagram to make proper connections.

Connecting the Components

HM-570 SCCU Port	Connects To...
12 V	Power Source
BELT	Speed Sensor
HOST	Field Computer
COM A	GPS Receiver[*]
TILT B	Main Profile Sensor
TILT A	Secondary Profile Sensor
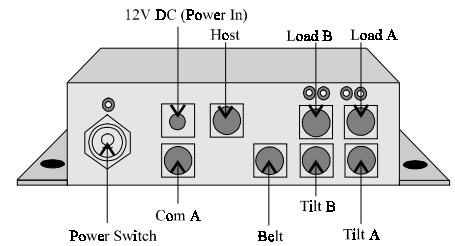
[*]GPS may also be connected directly to the mobile field computer

■ Depending on the model of Profile Yield Sensor used, there will be one or two cables to connect to the SCCU. Locate the lower (or only) cable coming from the Profile Yield Sensor and plug it into the Tilt B port on the HM-570. If there is an upper cable from the Profile Yield Sensor, plug this into the Tilt A port. Twist the connector locking ring into place to secure the connector.

■ Once the connection is made, firmly attach the Profile Yield Sensor cable(s) to the frame of the harvester, if you haven't already done so. Heavy duty tape or plastic cable ties work well. Ensure that the cables won't be caught in any moving parts.

**Belt/Ground Speed Sensor
Connection**

HM-570 SCCU

Plug into "BELT" port

Ground Speed Sensor
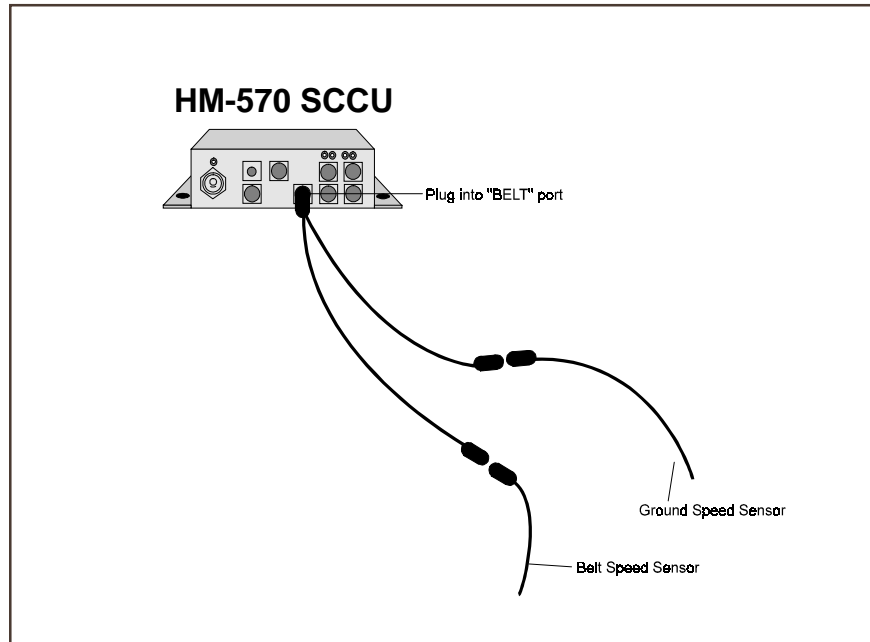
Belt Speed Sensor

If you are going to use the magnetic ground speed sensor:

■ Connect the 2-lead Belt Speed Connector Cable (CA-BS2-H5) to the HM-570 SCCU, as shown above.

■ Connect the Speed Sensor (model #: HM-BS-H5) used for the belt speed into its corresponding lead on the Belt Speed Connector Cable. Repeat this process for the Speed Sensor used for ground speed measurement (model #:HM-BS-H5) along with any other sensors required for your specific application.

If you are not using the magnetic ground speed sensor:

■ Connect the belt speed connector cable (CA-BS2-H5) to the HM-570 SCCU, as shown above.

■ Connect the Speed Sensor (model #: HM-BS-H5) used for the belt speed into the connector labeled "Belt Speed" of the Belt Speed Connector Cable (model #: CA-BS2-H5).

If you are using the Dickey-John ground speed sensor:

■ Connect the belt speed connector cable (CA-BS2-H5) to the HM-570 SCCU, as shown below.

■ Connect the Speed Sensor (model #: HM-BS-H5) used for the belt speed into the corresponding belt speed sensor lead on the belt speed connector cable.

■ Connect the DJ "Y" connector to:
  1) The corresponding ground speed sensor lead on the belt speed connector cable (CA-BS2-H5)
  2) The tractor electronics (or +12VDC power supply)

■ Connect the Dickey-John ground speed sensor into the DJ "Y" connector. (see below)

HM-570 SCCU

Plug into "BELT" port

+12 VDC Power Supply

Belt Speed Sensor

Dickey-John Ground Speed Sensor
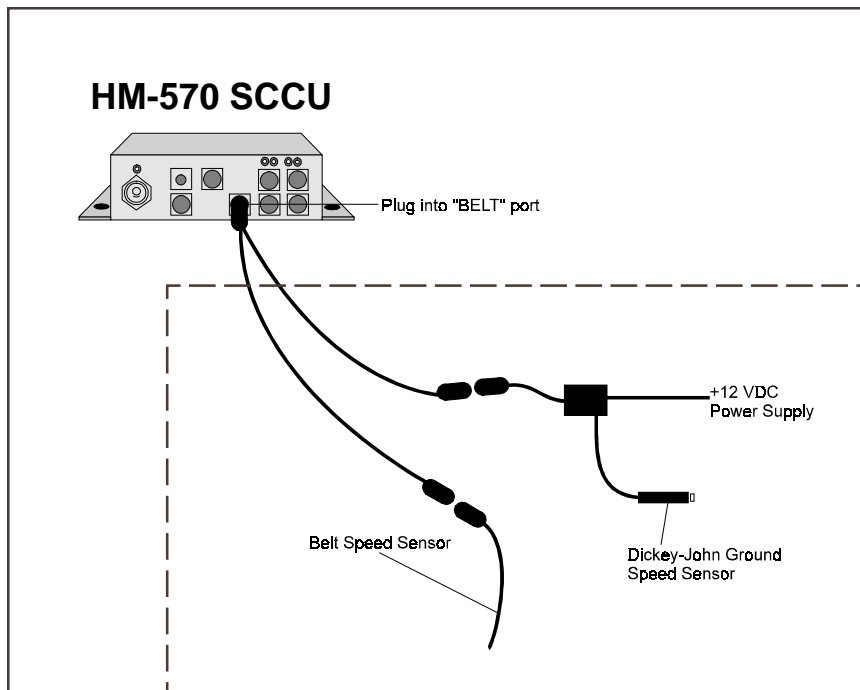
Field Computer to SCCU Connection

■ Locate the 40' (12 m) RS-232 cable and plug the 8-pin Trident connector into the port labled "Host". Twist the connector locking ring to lock in place.

■ Run the cable from the SCCU to the field computer in the cab and connect the 9-pin female connector into the 9-pin male connector on the field computer (COM 1 on the Pro4000). See the pin-out diagram (Appendix A, page A-4) to ensure proper host cable connection.

■ Plug the 12V pigtail into the back of the Pro4000.

■ Secure the cable in place so that it does not interfere with any moving parts of the harvester.
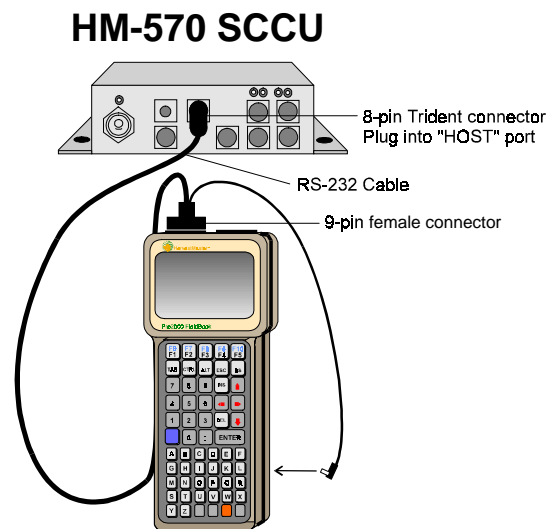
HM-570 SCCU

Power Cable Connection

■ Locate the HM-570 System Power Cable. On the pigtail end, connect the red wire to a positive 12V DC supply and connect the black wire to ground (either chassis ground or negative battery terminal). You may wish to connect the +12VDC(Red) to a switched 12 Volt on the harvester to allow monitor to power off when equipment is not running.

■ Connect the power cable to the HM-570 SCCU in the port labeled "12V" and secure into place.

Warning:

Be certain the power cable is wired correctly before applying power to the HM-570 SCCU.

HM-570 SCCU
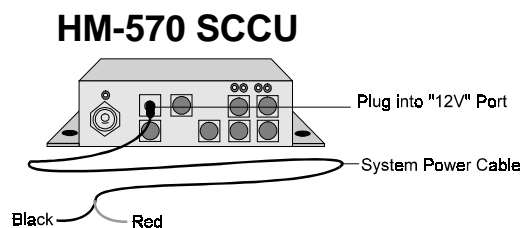
Mounting the GPS Antenna & Receiver

Proper mounting of the GPS antenna is critical to accurate positioning. The antenna should be centered over the picking point as accurately as possible. The antenna should be positioned higher than the tractor/harvester cab in order to have a clear view of the sky and to avoid multi-path signal. Methods for mounting the GPS hardware will vary depending on the type of harvester. The receiver box component can be mounted wherever the user desires (preferably in the cab).

Antenna Mounting Checklist:
> √ GPS antenna is mounted in open view of the sky (360 degrees)
> √ Antenna is mounted where vehicle noise (alternator, etc.) will not interfere with Coast Guard differential signal.

➥**Note: The HM-570 software allows for position correction when the reciever cannot be mounted directly over the harvest/picking point. (See Section II).**
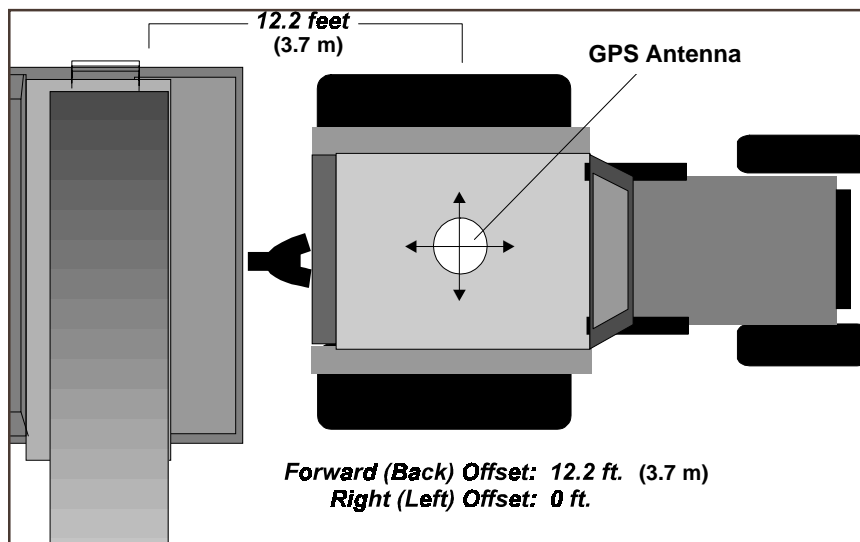
Figure shows hypothetical software correction input for GPS antenna position correction

➡**Note: Skip this section if your GPS receiver connects
directly to your mobile GPS computer (e.g. Pro4000, WAG
VCD, AshTech AgNavigator, etc.)**

The HM-570 is designed to work with with a variety of GPS
equipment. The HM-570 connects to GPS receivers via the GPS
communication cable as shown below:

Appendix A shows the signals on Com A (the port used for com-
munication with the GPS receiver). This is a standard DTE, 9-
pin, RS-232 connection like the serial communication ports on a
PC <u>without</u> the hardware flow controls (CTS, RTS).

The 12 volt power connections allow for automatic power-up
when connected to the GPS receiver
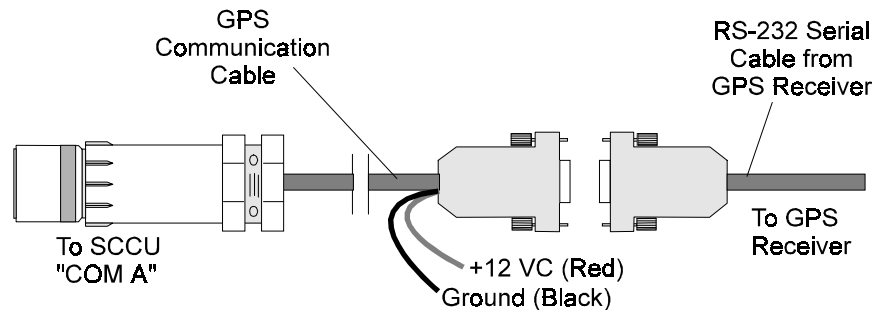
Contact HarvestMaster if you need specific cables or if you have
questions regarding your specific GPS equipment.

Please note that other pins on Com A also serve as a printer port
and external "Enter" button port for system expansion.

Section II:
System Operation

- ❑ Menu Structure Tree
- ❑ Overview of Software Operations
- ❑ Data Storage and File Formats

Menu Tree

```
                          Sign-On
                             |
                         Main Menu
                             |
     ┌───────────┬───────────┼───────────┬─────────────┐
  Screen A      Help         Sys        Load    FSum   Row +
  Screen B                    |           |
  Screen C      ┌──────┬──────┼──────┐    |      ┌──────┬──────┬──────┐
  Screen D    Field   Cal   Sens   GPS   Edit  Row -  Row +  Save
  Screen E                    |     |
                              |     |    LSum   Pick   Ld# -   Ld# +
                          TrVu Tare Next
                                         Del   Add   Edit   Quit   Save
                          Sccu Zero Back
                                         SetP  --->  PgUp  PgDn
                     Time Back Next Retn
                                          <---  --->  PgUp  PgDn  Acal
              Help New Del Save    Screen B
                                   Screen C
         US Metr Quit Save         Screen D
                                         NMEA  Sats  Back
```
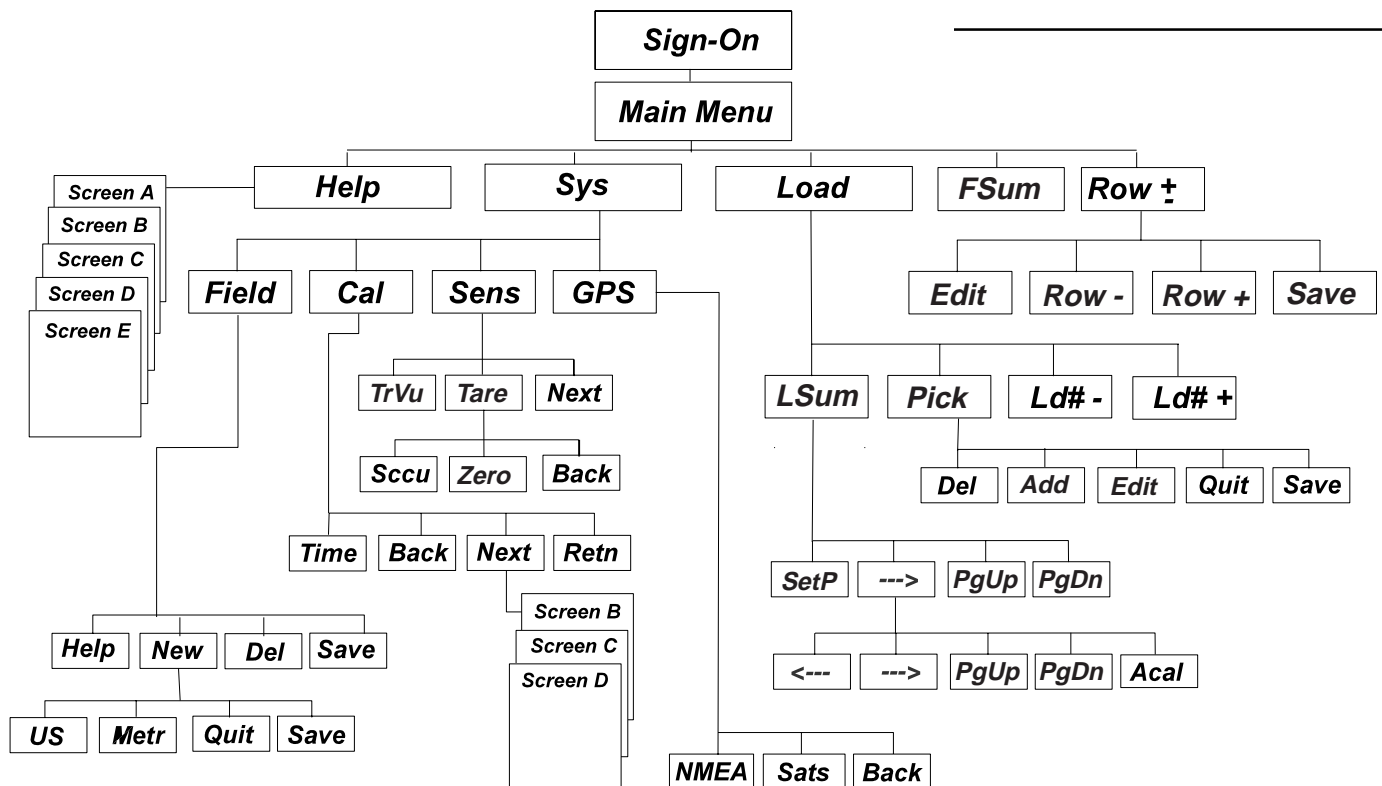
The menu items above appear at the bottom of each user screen and are activated by the corresponding function keys (F1 through F5) on the top row of the handheld computer's key pad. As a new menu item is selected, this "Action Key" legend changes to allow other user options. The [Retn] selection always returns you to the *Main Screen*. [Up], [Down], [Back], and [Next] selections are toggle keys for movement within and among screens. Arrow keys are also used for movement within the various screens. While in any screen, use the ESC key to back up one level on the menu structure. ESC from the Main Screen (see next page) brings up the program shut-down screen.

Startup Screen

The startup menu is displayed until the handheld computer has established communication with both the SCCU and the GPS unit. If the handheld computer is not connected to SCCU or GPS, the program begins blinking and displays a message that the HM-570 is not responding. Pressing ESC or F4 allows entry to the Main Screen.

Main Screen

```
Fld: NORTH_40   Rows: 12
DGPS      Yld(tn/ac): 22.1
Hold      Avg Yield: 24.7
Ac: 55.129      MPH: 3.22
Ld#: 45        Lb: 17,170
TrkID            %: 60.4
Marks:<1><2><3><4><5><6>
Help Sys Load FSum Row±
```

The Main Screen is the starting point for all operations. To return to the main screen at any time, press the ESC key or select [Retn] from the "Action Key" legend where available.

The main screen provides the following information:

• [Fld] Displays user-defined field name for field being harvested

• [Rows] The total number of rows currently being harvested. This includes rows being windrowed in.

• [Yield] Displays the instantaneous yield in tons/acre or cwt/acre.

• [Average Yield] shows average running yield, in tons/acre or cwt/acre, for the current field.

• [Ac] and [MPH] display acreage covered and current speed.

• [Ld #], [Lb], [Trk ID], and [%] are statistics referring to the current truck. [%] flashes when it reaches 95% of the load value.

• <1><2>. . . Indicates the active marks. *Marks* are used to mark areas in the field with a specific problem such as weeds or rocks and target them for future treatment. *Marks* appear when "ON". To turn a mark on or off, press the number which corresponds to it.

DGPS Status

Near the upper left corner, under "Fld", is the status of the GPS signal. When the signal is not sufficient for yield data to be recorded, GPS error messages will appear here. For accurate yield maps, this should always read "DGPS".
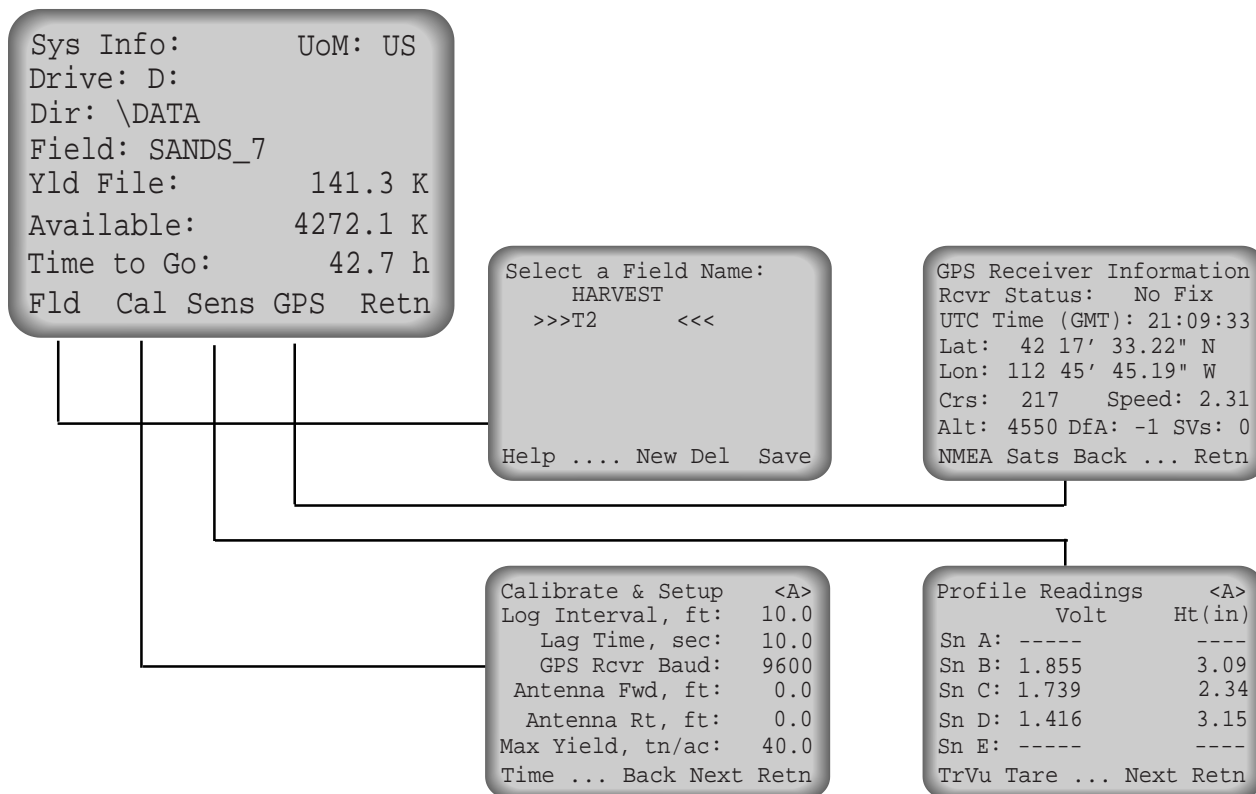
Active Keys for the Main Yield Monitor Screen

The bottom line of the screen has an inscription corresponding to each of the keys F1 through F5 along the top row of the handheld key pad.

Tab:	Increment Load#
SHF-Tab:	Decrement Load#
ESC:	Brings up the "Quit" Yes/No screen for the user
F1 - F5:	Access sub-menus
1 - 6	Toggle user marks on and off

Help

Main Menu Help Screens

The [F1] key at the bottom of the Main Screen accesses the user help screens for assistance in software operation. Using the [More] and [Back] selections (F1 and F2) allows you to toggle between screens. Context-sensitive help is available for other screens, such as the Select a Field Name Screen ([Sys], then [Fld]). Look for the [Help] Action Key as you navigate through the software.

System (Sys)

The System screen is the gateway to view sensor values, change yield monitor calibration, view GPS status and incoming position data, and to set up other operating parameters. Using the [F2] key while on the main screen accesses the System screen (labeled "Sys " on bottom line of main screen). As with most screens, the System screen contains a user menu along the bottom line which coincides with the top row of function keys on the handheld. Keys F1 through F4 access corresponding user screens as depicted here.

```
Sys Info:        UoM: US
Drive: D:
Dir: \DATA
Field: SANDS_7
Yld File:        141.3 K
Available:      4272.1 K
Time to Go:       42.7 h
Fld  Cal Sens GPS  Retn
```

```
Select a Field Name:
      HARVEST
   >>>T2        <<<



Help .... New Del  Save
```

```
GPS Receiver Information
Rcvr Status:   No Fix
UTC Time (GMT): 21:09:33
Lat:   42 17' 33.22" N
Lon: 112 45' 45.19" W
Crs:   217    Speed: 2.31
Alt: 4550 DfA: -1 SVs: 0
NMEA Sats Back ... Retn
```

```
Calibrate & Setup    <A>
Log Interval, ft:   10.0
   Lag Time, sec:   10.0
   GPS Rcvr Baud:   9600
 Antenna Fwd, ft:    0.0
  Antenna Rt, ft:    0.0
Max Yield, tn/ac:   40.0
Time ... Back Next Retn
```

```
Profile Readings     <A>
         Volt     Ht(in)
Sn A: -----        ----
Sn B: 1.855        3.09
Sn C: 1.739        2.34
Sn D: 1.416        3.15
Sn E: -----        ----
TrVu Tare ... Next Retn
```

Select/Name a Field (Fld)

```
Select a Field Name:
    HARVEST
  >>>T2        <<<




Help .... New Del  Save
```

This function of the System menu allows you to select, name or change a field. Pressing F1 allows you to enter a new field. Use the up and down arrow keys to toggle up and down among previously entered field names. Use F3 to enter new field names and units of measure, and F4 to delete field names. Use F5 to save newly entered field names to the list. The [Quit] option cancels any entry and returns you to the list screen.

```
Key in a new field name:
(8 char. max, no spaces,
must be alphas/numeric.)

Field Name: SANDS_7 <--
   Measure: US

.... US METR Quit Save
```

Calibrate & Setup (Cal)

```
Calibrate & Setup    <A>
Log Interval, ft:   10.0
   Lag Time, sec:   10.0
   GPS Rcvr Baud:   9600
 Antenna Fwd, ft:    0.0
  Antenna Rt, ft:    0.0
Max Yield, tn/ac:   40.0
Time ... Back Next Retn
```

Calibrate & Setup is accessed from from the System screen by selecting [Cal] with the F2 key. These screens allow for calibration and set-up of various parameters for calculating yield:

Log Interval: interval per reading of yield measurement. Normally between 10 and 50 feet (3 and 15 meters).

Lag Time: time required, in seconds, for produce to flow from the ground (harvest point) to the load cells.

GPS Rcvr Baud: baud rate from the GPS receiver. Typically either 9600 or 4800. Change the setting with the right arrow key.

Antenna Fwd **and** *Antenna Rt:* GPS antenna position correction relative to the digging or picking point.

Max Yield: parameter set to avoid logging poor or misleading data. Should be set above the expected maximum yield in the field.

Belt Length: total length of the conveyer chain (belt). This provides a tare averaging time equal to one belt revolution.

```
Calibrate & Setup    <B>
  Belt Length, ft: 32.00
 Belt Mult, ft/hz:  1.20
Grnd Speed Sensor:   GPS
 Gspd Mult, ft/hz:  1.22
  Hold/Run Sensor:    No
 Flow Cutoff lb/s:   0.0
... ... Back Next Retn
```

Belt Multiplier: pulses per foot of belt travel detected by the speed sensor. Each pulse is generated by the magnet (located on the drive shaft) passing the speed sensor. To find the Belt Multiplier, multiply the diameter of the drive shaft sprocket by π.

$$Belt\ Multiplier = \text{Sprocket Diameter (ft. or m) x 3.14}$$

Measure the diameter of the sprocket from the low points where the chain rests, not from the tops or ends of the sprocket cogs.

Gspd Sensor: normally, select "Pulse" and use a ground speed sensor on a wheel of the harvester or a radar ground speed sensor and a "Y" cable adaptor. Alternatively, select "GPS" for ground speed data provided by the GPS receiver. **Note: many GPS receivers give ground speed accuracies insufficient for yield data accuracy. Speed data from sub-meter DGPS receivers is typically sufficient.** Change the setting with the right-arrow key.

Gspd Multiplier: feet or meters of travel per sensor pulse.

$$Gspd\ Multiplier = \frac{\text{Tire Diameter (ft. or m) x 3.14}}{\text{No. of magnets}}$$

The diameter is taken from the outside edges of the tire. Ideally, the installation will provide for a pulse at least each 2 to 3 feet of travel. It is common to put 4 magnets equispaced on the wheel.

Hold/Run Sensor: indicates if a Hold/Run sensor is being used during harvest.

Flow Cut-Off: minimum threshhold for recording data.

Profile Yield Mult: method of manually adjusting yield monitor accumulation to match scale net weights of the truck. See **Yield Multiplier** below.

Number of Sensors: number of sensors used. Typically 3 or 5.

Height Mult: height of product required per millivolt. Typically -3.34 inches.

uS Threshold: minimum height for recording data.

Yield Multiplier: method of manually adjusting yield monitor accumulation to match scale net weights of the truck. Divide the truck scale weight by the yield monitor recorded weight to find a percentage difference. (For better accuracy, do this several times and find an average difference of several loads.) Multiply this average by the Yield Multiplier and use the resulting number as the new Yield Multiplier. *Automatic Calibration* (Acal) adjusts this automatically. **Note: Load Cell Setup will only appear if load cells are selected in Setup Screen <F>.**

Ld A Mult and *Ld B Mult:* the weight of product required per millivolt. Typically set at 91 lbs. when using 500# load cells and 27.3 when using 150# load cells. **Note: Load Cell Setup will only appear if load cells are selected in Setup Screen <F>.**

Ld A Offset and *Ld B Offset:* this is only needed when using a tilt sensor. Place the conveyor in a vertical position with the load cells pointing down and the weight of the chain is off the idler wheel load cell. Go to the Sensors screen and find the number showing in the "gross" reading for the A and B load cells. These numbers should be used in the Elect Offset for each load cell. **Note: Load Cell Setup will only appear if load cells are selected in Setup Screen <F>.**

Tilt Multiplier: degrees of Tilt per volt of signal from the tilt sensor. Default value is 67. Using a hand-held angle finder, place the portion of the conveyor with the load cells perfectly level. Adjust the position of the tilt sensor until the tilt sensor reading in the software is 0. Again using the hand-held angle finder, change the conveyor to a known angle (such as 30 degrees). Check the gross sensor reading again. If it does not match the known angle, divide the known angle by the sensor reading. Multiply the result by the current Tilt Multiplier. This will be the new Tilt Multiplier. **Note: If your application does not use a tilt sensor, set Tilt Multiplier to zero. Tilt Sensor Setup will only appear if load cells are selected in Setup Screen <F>.**

Tilt Offset (deg): should be set to zero if your application does not use a tilt sensor. If using a tilt sensor, set Tilt Offset only if the tilt sensor cannot be adjusted to read "0" when the conveyor is horizontal. **Note: Tilt Sensor Setup will only appear if load cells are selected in Setup Screen <F>.**

Harvester ID: Labels data with a harvester identification.

Yield Sensor Type: select the type of sensor being used (load cells or profile sensor).

Data Logging Drv and *Data Logging Path:* storage locations of the yield data. Key in the name of the directory where the data should be stored. To log the data program's location, leave both settings blank.

Sync Clk to GPS: synchronizes minutes and seconds with GPS time.

```
Profile Sensor Setup <C>
 Prfle Yield Mult:13.000
  Number of snsrs:      3
Height Mult, in/v: -3.34
 uS Threshold, in: -1.00



... ... Back Next Retn
```

```
Load Cell Setup      <D>
 Yield Mult LdCel: 1.000
 Ld A Mult, lb/mv:  27.2
 Ld B Mult, lb/mv:  27.2
 Ld A Offset,  lb:   0.0
 Ld B Offset,  lb:   0.0

... ... Back Next Retn
```

```
Tilt Sensor Setup    <E>
  Tilt Multiplier:   0.0
 Tilt Offset, Deg:   0.0




... ... Back Next Retn
```

```
Calibrate & Setup    <F>
   Harvester ID:   JENNY
Yield Snsr Type: Profile
     Data Drive:
           Dir:
Sync Clk to GPS:      No


... ... Back ...   Retn
```

Time/Date Setting

Calibrate & Setup screen <A> also contains menu item labeled [Time]. Select [Time] to set the current date and time.

Sensor Readings (Sens)

```
Profile Readings      <A>
         Volt      Ht(in)
Sn A: -----          ----
Sn B: 1.855          3.09
Sn C: 1.739          2.34
Sn D: 1.416          3.15
Sn E: -----          ----
TrVu Tare ... Next Retn
```

Selecting [Sens] on the Sys Info screen by pressing F3 allows you to view two diagnostic screens for verifying operation and correct connection of the profile and other sensors used in your HM-570 system.

Screen <A> shows a volt reading and a height, in inches, for the product flowing on the belt below the profile sensor. These numbers will fluctuate as more or less product flows un der the sensor.

The *Belt* and *Gspd* lines on screen <B> show belt and ground speed as measured by their respective sensors. Readings are given in both Hz (cycles per second) and feet per second and MPH and should fluctuate with an increase or decrease in speed.

Selecting the [Tare] option on screen <A> sets heights to zero, storing a new tare value in the HM-570. Make sure the conveyor is running empty when you press [Tare]. The tare value gets averaged over the belt length, thus it takes several seconds (one complete belt revolution) to complete the tare operation. In many operations, you might initiate a tare operation only once per day, or even once every few days.

```
Profile Readings     <B>
Belt: 2.41 Hz  1.95 ft/s
Gspd: 0.00 Hz  0.00 mph
  Hold/Run:  Hold

Profile Flow:    2.7 lb/s
Profile Wt:        5 lb
SCCU Zero Back ... Retn
```

Selecting [Next] on screen <A> brings up Profile Sensor Readings screen <B>. This screen gives current status of various system inputs. Selecting [SCCU] from this screen allows viewing of raw data. Selecting [Zero] resets the [Weight Sum] to zero. This is useful when first doing calibrations if a known height of material can be run across the conveyor.

➥**Note: Selecting the [Retn] option from any screen automatically returns you to the Main Screen.**

Selecting [GPS] from the "Function Key" legend on the Sys Info Screen is the gateway to the GPS information screens. These screens display GPS time, latitude, longitude, course, speed, altitude, satellites in view, and the age of the differential correction. Here, you can also verify that the Global Positioning System is communicating with the HM-570 and the field computer. If you are receiving information from the receiver, it will be displayed here.

• *RCVR Status* verifies whether or not the GPS receiver is on or connected properly.

• *UTC time (GMT)* displays the UTC (Universal Time Coordinated) time transmitted from the satellite. If the time is 00:00:00, the GPS is not connected or not configured properly.

• *Lat* and *Lon* display latitude and longitude values respectively. If no GPS signals are available, the last computed position will be shown.

• *Crs* displays the current course heading in degrees based on the degree values chart shown at the right.

• *Speed* refers to ground speed (GPS speed only) in miles per hour.

• *Alt* refers to altitude and will show the last computed value if no GPS signal is being received.

• *DifAge* is the age in seconds of the differential correction. The older the correction, the less accurate the position data will be.

Selecting [Sats] from the GPS screen "Function Key" legend brings up the Satellite Constellation screen. This screen displays satellite position data for each of the satellites being used to track ground position.

• *SV* is the space vehicle identification number.

• *Az* displays the respective azimuth for each satellite. Azimuth is the horizontal angle from true North to the object (in this case, a satellite) in degrees. A satellite with an azimuth of 270 would be due West of the GPS ground position, while a satellite due South of the of the GPS ground position would have an azimuth of 180.

• *El* displays the elevation of the satellite in degrees above the horizon. A satellite at an elevation angle of 90 degrees would be directly overhead.

• *Sig* is the strength of the satellite signal. This ranges from 0 (no signal) to around 35 (very strong signal). The stronger your signals, the more reliable your positioning data will be. A signal strength below 5 might be unusable.

GPS Information

```
GPS Receiver Information
Rcvr Status:    No Fix
UTC Time (GMT): 21:09:33
Lat:  42 17' 33.22" N
Lon: 112 45' 45.19" W
Crs:  217    Speed: 2.31
Alt: 4550 DfA: -1 SVs: 0
NMEA Sats Back ... Retn
```

```
          North
           0°

West                    East
270°                    90°

          South
          180°
```
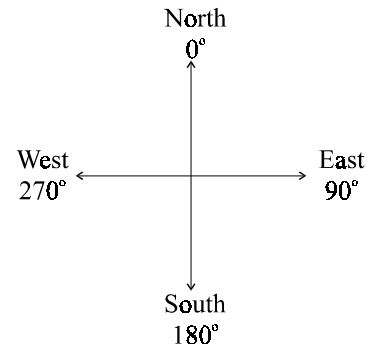
☛ **Note:** *The HM-570 requires NMEA format from the DGPS receiver; GGA and VTG packets are required. Additionally, GSV and GSA packets are recommended.*

Satellite Constellation Screen

```
Satellite Constellation
SV   Az    El   Sig    Used
07  217    43  20.2    Yes
12  328    22  14.1    Yes
15   27    88  22.9    Yes
16  135    64  24.8    Yes
17  223    14   9.3    No



....  Up   Down  Back Retn
```

☛ **Note:** *This data will only be complete if both the GSV and GSA NMEA data packets are being transmitted by the DGPS receiver.*

```
Incoming NMEA Strings
$GPGGA,004430,4143.316,N
,11158,740,W,1,5,001.9,1
362,M,-017,M,,*A
$GPVTG,357,T,343,M,14.9
N,27.7,K*45




.... .... .... Back Retn
```

Selecting [NMEA] from the GPS screen opens up the Incoming NMEA Strings screen. Incoming data verifies receipt of data from the GPS receiver.

Load (Load)

Corresponding with the F3 key on the System Main Screen is the [Load] option. This section of the software is reserved for all truck and load information.

```
Enter Truck ID . . .

Truck Ident: LD_41
     Load #:   41
 Pct Loaded:   0.0

Key in Truck ID or Pick
LSum Pick Ld#- Ld#+ Retn
```

The Load Screen is accessed from the main menu, and displays important data from the current load. Self-explanatory data titles allow you to monitor current load weights (in lbs.), percent loaded, start time, and load time for a particular load and truck.

Selecting [Pick] from the Load Screen brings up the "Select Truck Ident" screen which allows easy scrolling ([Up], [Down]) among previously entered truck names. Selecting [Add] or [Edit] from this screen allows you to enter new truck names and capacities, or edit existing ones. On-screen instructions give directions for data entry and deletion on each of these screens. Arrow keys are used to toggle among options, the key pad is used for data entry, and the enter key completes a given entry. Selecting [Save] completes your request by saving any changes.

Load Summary (LSum)

The system creates a database of truck load information which looks like this when printed (see below). It can be imported to a spread sheet program for further summaries by the user. The file name will be <fieldname>.TRK.

```
Ld# Trk_ID Fld_Wt Scl_Wt Yr Mo Da Hr Mn Sc Ld_Tm Cal
--- ------ ------ ------ -- -- -- -- -- -- ----- ---
107 000051 29,127 29,235 98 08 13 09:13:27 11:23  Y
108 000054 30,225 30,325 98 08 13 09:24:33 10:01  N
109 000017 28,777        98 08 13 09:38:14 07:12  N
110 000010 28,785        98 08 13 09:47:54 08:54  N
111 000051 29,002 29,100 98 08 13 09:55:44 09:32  Y
112 000054 28,010        98 08 13 10:14:11 10:47  N
```

The LSum screens of the harvest data software let the user view load

information. These screens are accessed by selecting [LSum] from the Load Screen. The data is displayed across several screens, and the [--->] and [<---] selections allow you to move among the screens.

Load Setup [SetP]

Enter [SetP] from the [LSum] screen to set the following parameters:

TAB Key: customize the task the TAB key will perform.

Load Screen: select either brief (abbreviated) or full screen.

Save New TkID: select Yes or No.

Dflt Weight: default truck weight for maximum load weight.

Auto Incrmt: % over truck weight for auto increment.

US Yld Unit: either ton/acre or cwt/acre.

Automatic Calibration [Acal]

The Automatic Calibration [Acal] function gives a comparison of field and scale weight for each load and allows you to choose loads to use for calibration. Once you have the scale weight from one or more loads harvested in a field, key these into the program, as explained above, and have the program automatically calculate a new calibration factor, and update the current load and yield files in the active field. Calibration factors will likely change for each variety of grapes being picked.

Ld#	Fld_Wt	Scl_Wt	Cal
1	1146	0	*
2	8,301	8,791	Y
3	2,013	0	*
4	774	0	*
5	5,049	5,570	Y
6	5,111	0	*
<--- ---> PgUp PgDn Acal			

Select [Load] [LSum], then press [--->] to move you to the screen showing load weights as measured by the yield monitor, and also scale weights (to be entered by the user). Key in the known scale weight next to the yield monitor measured scale weight, followed by ENTER. Use the arrow keys to navigate within the screen. Under the "Cal" label, enter "Y" if you wish to include a given scale weight in the calibration adjustment.

Use three or four loads to a calibration. It is recommended that you tare the conveyor before each load being used for calibration. There is no harm in calibrating with one load only, then calibrating again a few loads later when more data is available.

Calibration Adjustment	
Cal Load Count:	1
Old Cal Factor:	1.000
New Cal Factor:	1.103
Change:	10.3%
Key 'DoIt' to invoke the change, 'Back' = Cancel	
DoIt .... Back	

After entering the scale weights, and changing the "Cal" indicator to "Y" for those loads you wish to use, press [Acal]. This will bring up a screen which gives a summary of the calibration adjustment to be made. Selecting [DoIt] will update and adjust the current field files (load and yield) by the amount shown.

☞**Note: Practice these steps on an empty file by pressing TAB a few times to increment load numbers, then going to the second LSum screen and keying in *both* "Weight" and "Scale" values (use the left arrow to move the back to the "Weight" column).**

Row+/-

```
Change Row Count .....

 Row Setting:   1
 Min Row Cnt:   1
 Max Row Cnt:   1
 Total Swath:  10.00 ft


... Edit Row- Row+ Save
```

```
Edit Working Swath ...
 Row Spacing:  120.0 in
 Min Row Cnt:    1
 Max Row Cnt:    1
Norm Row Cnt:    1
Chg Multiple:    1
edit: keys, Up, Dn, Entr
.... .... Back ... Retn
```

The final option on the Main Screen is [Row+/-]. This allows you to select or adjust the number of rows currently being harvested. This number appears in the upper right hand corner associated with the "Row:" title. Press F5 to enter [Row+/-]. Adjust the number of rows being harvested by pressing [Row+] or [Row-]. Edit the displayed information with the [Edit] function.

The settings in the Edit Working Swath Screen are as follows:

Row Spacing: width between row centers.

Min Row Cnt: fewest number of rows harvested at one time.

Max Row Cnt: maximum number of rows harvested at one time.

Norm Row Cnt: number of rows most commonly harvested at one time.

Chg Multiple: number by which row count changes by pressing **Row+** or **Row-**.

Data Storage and File Formats

Data files from the HM-570 Yield monitor Program

If you are using a mobile field computer other than a HarvestMaster handheld or a Windows computer running the HarvestMaster HM5 software, the data formats will be specific to the mobile computer, and you need to consult the operations guide for that other machine (e.g. WAG Vision System, Ag Leader PF-3000, AgNavigator, etc.)

If you are reading beyond this point, it is assumed that you are logging yield data using HarvestMaster HM5 software. This section would not be complete without some discussion of the data collected by the HM-570 Yield Monitor Program, since to a great extent, the goal of the yield monitor system is to generate data from which yield maps can be produced. The other objective is to generate information which can be used by the harvester operator to properly load trucks, and to give truck and acreage statistics throughout the day.

It is normally recommended that you use a PCMCIA ATA Flash Card (available from HarvestMaster or through a mail order computer supplies house). We recommend the SanDisk brand, but many other brands will work fine, just make sure it is an "ATA Flash" card. We recommend a card size of 10 or 20 megabytes. In a 10 hour day of

harvest, you will use a half to one megabyte of data storage depending on the data recording interval.

To insure quality and security of data, it is recommended that data be transferred to "high ground" (i.e. to your PC) as often as every day or two, and at the longest interval of once per week. When you first start, you should transfer your first few hours of data to the PC and make a map, to insure that all the systems are operating correctly. Remember the old addage, "Garbage in, Garbage out!"

The HM5 software creates 4 files for each field from which crop material is harvested and from which data is logged into the system:

<field_name>.YLD	Contains the actual yield data.
<field_name>.TRK	Contains truck data.[*]
<field_name>.LOG	Contains event information, such as calibration data when calibrations are changed, or time/date of exception messages.
<field_name>.ERR	Yield data is stored here when the GPS receiver information is less than DGPS, or missing.

[*]The .TRK file contains binary data that must be converted to .txt format before being used. To do this, run the file LDCON.EXE on the handheld computer. Additional instructions are found in the README.TXT file.

All of these files are comma delimited ASCII files, which may be easily imported into a spread sheet if desired by the user, for analysis. The .YLD file format is standard on some farm GIS software packages (e.g. SS Toolbox). Normally, after acquiring data, a user would use a text editor such as Microsoft's NotePad to review the .LOG file. If a .ERR file exists at all, or is of size larger than a few hundred bytes, it is cause for alarm; the problems needs to be found and rectified. In general practice, the .LOG file should be reviewed for any exception messages indicating a sub normal level of system performance.

Data Retrieval

Data can be moved from the HarvestMaster FieldBook to your PC in two fashions.

1) Remove the PCMCIA card, and read it via your laptop computer's PCMCIA slot, or a PCMCIA reader attached to your desktop PC. Use of Windows Explorer can get the job done.

2) The HarvestMaster FieldBook computer has accompanying utilities programs that support transfer of multiple files at a time from the FieldBook to the PC. Details on this program are found in the handheld's operator's manual.

Here is the format of the <field_name>.YLD file (spring, 1998):

```
Date    Time    Latitude    Longitude   Alt  Yld —Marks— QP Spd Flow Swth Dist
yrmoda  hrmnsc  Deg_WGS84    Deg_WGS84    ft  T/A 6 5 4 3 2 1 | MPH Lb/S   ft   ft
980813  124131  42.351123 -112.123456 4222 23.2 0 1 0 0 0 0 2 3.2 45.2 12.8 35.1
980813  124136  42.351123 -112.123476 4223 23.1 0 1 0 0 1 0 2 3.2 45.0 12.8 34.7
980813  124141  42.351123 -112.123496 4224 23.0 0 1 0 0 1 0 2 3.2 44.8 12.8 35.3
```

Notes

Yld refers to yield units in Tons per acre.

Marks: There are 6; a 0 implies no present, 1 implies that a trait is present.

QP means quality of position: 0 => position invalid, 1 =>position is autonomous GPS, 2 => position is DGPS (Any data values with QP not equal to 2 (DGPS) will be stored in a second file with a type suffix .ERX.

The last four columns are for quality checking of data, and normally not used for mapping purposes.

Spd is harvester speed in miles per hour.

Flow is harvested product flow in lbs/second

Swth is the currently entered harvester swath. The operator has console control of this value, in increments of row width. In case it might be found that the operator overlooked properly setting this value, the yields would be artificially high, or low, and could be corrected in a spread sheet after the fact, if necessary.

Dist is distance traveled for the yield value mapped in each record.

Section III
Testing and TroubleShooting

❑ Procedures, Tools and Components

❑ HM-570 Yield Monitor Test

❑ Symptoms

❑ HM-570 Operating System Update Procedures

Procedures, Tools, and Components

If you believe you have determined the reason for a problem, refer to the Specifications or Installation chapter for guidance; which ever 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 a Return Material Authorization (RMA) number, please call HarvestMaster's Customer Service Department at (435) 753-1881 (8 am – 5 p.m. MST, Mon.-Fri).

Troubleshooting Tools needed:

- Digital volt meter
- 24 AWG jumper wires stripped and tinned (paper clips will work also)
- Notebook PC

Isolate the faulty component:
- Sensors
- Interconnecting cables
- HM-570 electronics
- Mobile computer

By far, the easiest way to troubleshoot faulty modules is to swap them with a known working one. Whenever you have extra components that you can replace, it is always easier to find a problem using the process of elimination. If you do not have any extra components, the below outlined procedures will aid in eliminating the faulty component.

HM-570 Yield Monitor Test

- Make sure that the green Light Emitting Diode (LED) labeled "A" is blinking approximately once ever 1.5 seconds.

➥ **Note: This tells you that the HM-570 Central Processing Unit (CPU) is running properly.**

Otherwise, turn the power OFF and then ON again to reset the HM-570 system. If this LED is still not blinking, check to make sure that you have proper power to the HM-570 electronics (Refer to HM-570 Power troubleshooting tips above).

If the LED is blinking in any other sequence than described above, the Injected Operating System (IOS) may not have been loaded properly. Check the IOS and Fixed Operating System (FOS) version numbers by viewing them on your sign-on screen as the software powers up.

If the software version numbers are absent, the IOS and FOS will need to be reloaded (Please refer to the FOS and IOS update procedures).

The sensor screens ("Sens" button from the "Sys" button on the main screen) allow you to view raw sensor values and verify sensor operation. Normally, you would have already set the calibration values in the "Cal" option (also under the "Sys" button). The profile sensors are analog ultrasonic height sensors whose output varies proportionally with distance of an object from the face of the sensor. Multiplication by the "inches/volt" value in the calibration structure, and offsetting by a "tare" height yields the desired measurement in engineering units.

The Yield Profile System operates by measuring the height of material above the conveyor belt, and numerically integrating the instantaneous height readings from each sensor with respect to time (in effect, belt passage). The result is a number proportional to volume of material flowing over the conveyor. The calibration factor of the calibration data structure scales this value to mass flow, assuming a constant density of material over the conveyor.

The scan frequency per sensor is roughly 16.67 samples per second. Thus if the conveyor is traveling at 1 meter per second (typical for a grape harvester), the result would be one height measurement per 6 cm of product passing by. The target area of the ultrasonic distance sensors depends on height of product above the belt, but would typically be something like 2.5 to 6 cm in diameter. The width of the inferred measurement area is dependent of the conveyor width, and number of sensors on the array. The sensor array is designed so as to provide an equal sensor width coverage per sensor. Thus, if the conveyor is 30 cm wide, and there are 3 sensors, the coverage per

sensor would be 10 cm. If there are 5 sensors, the coverage width per sensor would be 6 cm each, on a 30 cm wide conveyor.

To verify operation of the profile yield sensors, select the "Sensor Readings <A>" screen of the user display. A Profile Yield Sensor of three cells will only show readings for sensor positions B, C, and D. The 5 sensor array includes readings for sensor positions A and E. With the belt empty, these sensors should read essentially zero (roughly + / - 0.08 cm). If the conveyor is rolling, this value may vary more due to irregularities in the belt profile. With the belt still, set a known thickness of material on the conveyor belt, beneath one of the sensors. It should read out the thickness of the "calibration object". Moving of the calibration block to various sensors should result in movement of the reading on the display in a corresponding fashion.

The sensors are labeled "A" through "E" from the end of the profile yield sensor where the sensor lead wires exit:

```
'================================='
 '   #     #     #     #     #
      A     B     C     D     E
```
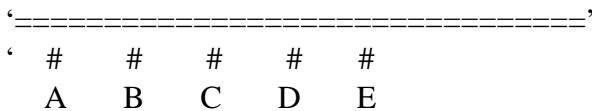
Corresponding nomenclature appears on the "Sensor Readings <A>" screen.

Another quick check for proper operation of the ultrasonic height sensors, is to peer into the transparent window above each sensor, while holding your hand in front of the sensor. Moving your hand further away, or closer to the sensor face will change the brightness of the LED indicator that you see in the window. No light, or no variation in LED light intensity during this operation would indicate sensor problems. If problems occur, check power supplies, connectors, and if the problem is sensor specific, one might change out a specific sensor.

The power supply for the ultrasonic sensors themselves is a 15 volt regulated supply, sourced from a DC – DC converter in the sensor array head. The HM-570 supplies 12 volts, unregulated, to the sensor array box, from whence it is converted and distributed to each of the sensors. The output of each sensor varies from 0 to 5 volts, but is actually divided down by a factor of two (2.5 volts full scale) before feeding back into the HM-570.

Each of the ultrasonic sensors is connected inside of the sensor array mounting unit with a 6 pin Con-X-all connector. The pin-out of this connector is as follows (looking into the face of the connector on the PC board):

Pin Number	Wire Color
1	Shield
2	White
3	Black
4	Blue
5	Brown

Shield   +15V

Sensor Common

Power Ground

Sensor V out
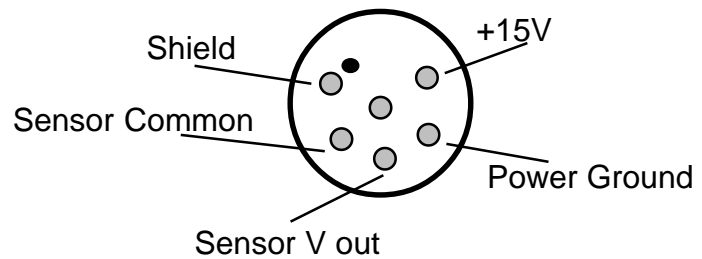
If you need to verify that 12 Volts DC is present for the ultrasonic sensors, for example, you will have already disassembled the halves of the array mount, by first dismounting the sensor array from it's end mounts. Secondly, you will have removed the screws from the front and back of the sensor array, and will have removed the protective half from the electronics half. At this point, any of the sensors may be disconnected by rotating the Con-X-all locking ring, and tugging lightly on the connector. The pins in the socket that are then exposed, match the diagram above for further system verification and trouble shooting.

If the profile height sensors don't respond

 • Check the sensor array power by viewing the LED indicators through the tiny circular windows at the top of the sensor array bar, and by following the procedures above.

Insure that the Profile Yield Sensor leads are plugged into the proper connectors on the HM-570 SCCU. The three point (HM-573) array will have only one cable, and plugs into "Tilt B" of the HM-570. The five point (HM-575) array will have two cables and connectors. They will be labeled "Tilt A" and "Tilt B". Insure that the cables are plugged into the respectively annotated connector on the HM-570 SCCU.

Check to make sure the power of the HM-570 is turned on, by observing that the little red power LED by the HM-570 power switch is continuously on, and that the inside green LED on the HM-570 SCCU is blinking about once each 1.5 seconds.

Symptoms

The following section outlines the symptoms of several possible problems along with troubleshooting solutions for each.

HM-570 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 power source.

• With a voltmeter, check the voltage on the HM-570 Console at the end of the power cable that connects into the system. Make sure this voltage is at least a positive 11VDC (desired 14.8VDC with the implement running).

Communication Failure (Mobile Computer "Host" port with the HM-570 System)

• Make sure that the green Light Emitting Diode (LED) labeled "A" is blinking approximately once ever 1.5 seconds.

➥ **Note: This tells you that the HM-570 Central Processing Unit (CPU) is running properly.**

Otherwise, turn the power OFF and then ON again to reset the HM-570 system. If this LED is still not blinking, check to make sure that you have proper power to the HM-570 electronics (Refer to HM-570 Power troubleshooting tips above).

If the LED is blinking in any other sequence than described above, the Injected Operating System (IOS) may not have been loaded properly. Check the IOS and Fixed Operating System (FOS) version numbers by viewing them on your sign-on screen as the software powers up.

If the software version numbers are absent, the IOS and FOS will need to be reloaded (Please refer to the FOS and IOS update procedures).

• Check to make sure that the green LED labeled "B" is blinking approximately once every 1.5 seconds. This tells you that the HM-570 is sending a string of information to the mobile computer every time the LED blinks. The same procedures as outlined above should be used to troubleshoot this LED.

• Check the cable to see that it is plugged into the correct port on your mobile computer (COM 1 for the Pro-2000 hand held).

• Check the cable to make sure that it is not damaged in any way.

• Unplug the communications cable from the HM-570 system and inspect the pins in the ITT Cannon Trident connector to assure that all of the pins are locked into place, and not damaged. Refer to the "Host Cable" wiring diagram in "Appendix A" for pin placement. If you suspect the cable, you can ohm the cable from pin to pin according to the wiring diagram.

• Connect the cable to a notebook PC and run a terminal program such as Window's Hyper Terminal. Make sure that the HM-570 system is sending information to the PC. Send the command "$qu,ii,fi" to see if the system responds by giving you the correct Injected Operating System (IOS) and Fixed Operating System (FOS) version numbers.

GPS Receiver Status is "OFF"

• Check to make sure the receiver is getting power.

• Check to make sure that you have the correct cable attached between the "COM A" port of the HM-570 and GPS Receiver. A wiring diagram of a standard "GPS Communication Cable" is supplied with this manual in Appendix A. Using the ohmmeter, check the communications wiring (RXD, TXD, and GND) from pin to pin for possible cable faults.

• From the "Main Menu" of the HM-570 Yield Monitor software, select "SYS", "SENS", "GPS", and "NMEA" to get to the screen that will allow you to view the information that is being sent from the receiver. An NMEA string should look similar to *"$GPGGA,004430,4143.316,N,11158.740,W,1,5, 001.9,1362,M,-017,M, ,*4a"*.

➥ **Note: The "Host" communications cable can be attached to a notebook PC and the communication string can be viewed by running a terminal program such as Window's Hyper Terminal, or any NMEA GPS utility program.**

• Refer to GPS receiver manual for troubleshooting.

GPS Receiver Status "No Fixes"

• Check to see if you have enough satellites being used by entering "Sats" in the "GPS" menu of the HM-570 Yield Monitor Program.

☛ **Note: Four satellites will need to be "used" to receive latitude, longitude, and altitude.**

- Make sure your GPS antenna is mounted in an open view of the sky (360 degrees) and that it is not mounted where vehicle noise (alternator etc.) can interfere with the Coast Guard differential signal.

- Check the GPS antenna cable for nicks, scratches, or severs.

☛ **Note: Signal will be lost if the cable is smashed or bent in any way.**

- Refer to GPS receiver manual for troubleshooting.

- Check subscription; it may have expired.

- GPS receiver is configured improperly.

- Refer to GPS receiver manual for troubleshooting.

Receiver Status "GPS"

In the HM-570 software program (Main Menu), select "SYS", "CAL", and "NEXT" until you come to the Calibrate & Setup <B>" screen. Check to see if there is a belt multiplier entered. Refer to the "Verifying System Operation & System Calibration" section in this manual.

Belt Speed Reading is Zero (LED Red "A" Blinks)

☛ **Note: The belt speed multiplier must be the length of the belt travel per pulse from the sensor. A zero multiplier in the calibrations will cause the belt speed to be zero. It can be calculated by taking the diameter of the drive gear and multiplying it by PI. If you used any units other than feet, you will need to convert them to feet.**

*For Example: 5" diameter drive gear * 3.1416 (PI) = 15.73"
15.73" / 12" = 1.3108 ft/sec

Belt Speed Reading is Zero (LED Red "A" does not blink)

- Make sure that the green Light Emitting Diode (LED) labeled "A" is blinking approximately once ever 1.5 seconds.

➥ **Note: This tells you that the HM-570 Central Processing Unit (CPU) is running properly.**

> Otherwise, turn the power OFF and then ON again to reset the HM-570 system.   If this LED is still not blinking, check to make sure that you have proper power to the HM-570 electronics (Refer to HM-570 Power troubleshooting tips above).

> If the LED is blinking in any other sequence than described above, the Injected Operating System (IOS) may not have been loaded properly. Check the IOS and Fixed Operating System (FOS) version numbers by viewing them on your sign-on screen as the software powers up.

> If the software version numbers are absent, the IOS and FOS will need to be reloaded (Please refer to the FOS and IOS update procedures).

- Check to make sure the magnet is on the shaft and it is turning past the belt speed sensor.

- Check the speed sensor distance from the magnet to make sure that it is approximately ¼" and that the speed sensor lock nut is securely tightened.

➥ **Note: Usually just any magnet will not work. Use the magnet that comes with the sensor (HM Part #: 9483). The magnet should pass no greater than 3/8"(1 cm) from the end of the belt speed sensor and should cause a "closed" circuit, which turns on the "A-Red" Light Emitting Diode (LED).**

- To check the integrity of the HM-570 electronics, disconnect the belt speed sensor and use a small wire to short from pin L to pin M of the socket. Refer to the "Belt Speed Cable" wiring diagram in "Appendix A".

➥ **Note: If shorting these two sockets together does not turn red "A" LED "ON", then the HM-570 electronics are likely the fault.**

- If the electronics check out, then inspect the speed sensor cable for damage. You may want to check the pin to pin wiring as compared with the "Belt Speed Cable" as outlined in Appendix A.

HM-570 Operating System Update Procedures

Checking your FOS software version:

- Plug your "Host" communications cable into the serial port of a desktop PC or a laptop.
- Restart your computer in DOS mode or shell out to a DOS prompt.
- Place the FOS Update Diskette release diskette into the A:\ drive of your laptop and change to the A:\ drive.

  *For Example: Type "A:" <Enter>

  ▲**CAUTION: Be sure the connection is from COM1 or COM2 of the PC (NOT the parallel port!). Connecting the HM-570 communications cable to your PC's parallel port will cause your PC irreparable damage!**

- Type "FOSUP," and wait for the program menu. If you need to use COM2, make that menu selection at this time.

- With the serial cable connected between your PC and the HM-570 "Host" port, turn the power to the HM-570 system "ON". Select menu item #3, to view the version of FOS currently installed, and to ensure that your PC is communicating properly with the HM-570 system. Do not try to update until you have successfully viewed the information from menu item #3.

Updating the FOS

- Complete each step in from the above document "Checking your FOS software version"

- Select menu item #5, to "Reset HM-570".

- Once you have seen the version identification string on the display and the HM-570 system is reset, go to the main menu and select menu item #4 (Burn New FOS). You should see a string of dots move across the display as the new FOS is being loaded. The process is completely automatic, and takes about one minute.

  ▲**CAUTION: DO NOT interrupt the transfer process. Doing so may corrupt the program in the FLASH PROM. This would require you to send it back to the factory for updating**.

- The activities taken place will be updated from your PC screen. The last of which is "Waiting for new FOS Identification." It takes about 20 seconds.

  ➥ **Note: If the new software version is not displayed, use the "ESC" key to get out of the program, turn the SCCU off and then on again, and then re-enter the program. By pressing option #3 "Display FOS Version", you should see the updated FOS displayed as "FOS Version x.x".**

- After loading the FOS, an IOS must be injected in order for the system to operate correctly, please follow the "Injecting a New IOS" procedures.

Injecting a New IOS

- It is assumed that you have just completed the FOS update and you still have the cable attached to the HM-570 system.

- At the DOS prompt and with the IOS upgrade diskette inserted into drive A:\, type "IOSUP," and wait for the program menu. If you need to use COM2, make that menu selection at this time.

- With the serial cable connected between your PC and the HM-570 "Host" port, turn the power to the HM-570 system "ON". Select menu item #3, to view the version of FOS currently installed, and to ensure that your PC is communicating properly with the HM-570 system. Do not try to update until you have successfully viewed the information from menu item #3.

- Select menu item #5, to "Reset HM-570".

- Once you have seen the version identification string on the display and the HM-570 system is reset, go to the main menu and select menu item #4 (Burn New IOS). You should see a string of dots move across the display as the new IOS is being loaded. The process is completely automatic, and takes about one minute.

  ▲**CAUTION: DO NOT interrupt the transfer process. Doing so may corrupt the program in the FLASH PROM. This would require you to send it back to the factory for updating.**

- The activities taken place will be updated from your PC screen. The last of which is "Waiting for new FOS Identification." It takes about 20 seconds.

Appendix A
Wiring Diagrams

❏ Host Cable
❏ Power Cable
❏ Belt Speed Connector Cables
❏ Load Cell Cable
❏ GPS Communication Cable
❏ COM A Pin-Out Diagram
❏ BELT SPEED Pin-Out Diagram

Host Cable   Model #: CA-MC-H5

8-Pin Trident
Host Port

Pin	Description
A:	No Connect
B:	Transmit Data (TXD) to SCCU (Green)
C:	Receive Data (RXD) from SCCU (White)
D:	Ground
E:	No Connect
F:	Shield
G:	Host Ring from SCCU (Red)
H:	Host Charge +12VM (Brown)

9-Pin Sub "D"
Female Connector

Pin	Description
1:	No Connect
2:	RXD to Handheld (White)
3:	TXD from Handheld (Green)
4:	No Connect
5:	Ground
6:	No Connect
7:	No Connect
8:	No Connect
9:	Host Ring from SCCU (Red)

Ground
+12 V DC

+12V DC (Inside Contact)

Ground (Outside Contact)
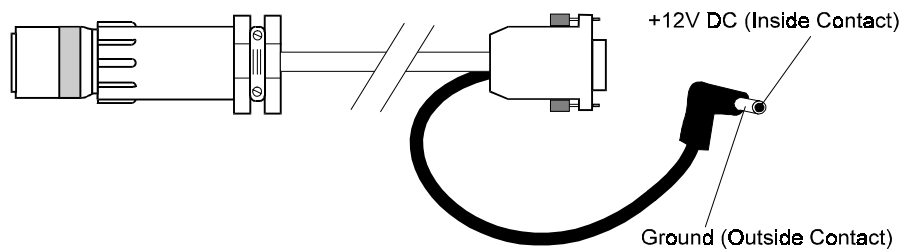
Power Cable

4-Pin Trident
+12 V Main Power Port

Black & Red Pigtail

Pin	Description
A:	+12VBS (Red)
B:	No Connect
C:	No Connect
D:	Ground #2 (Black)
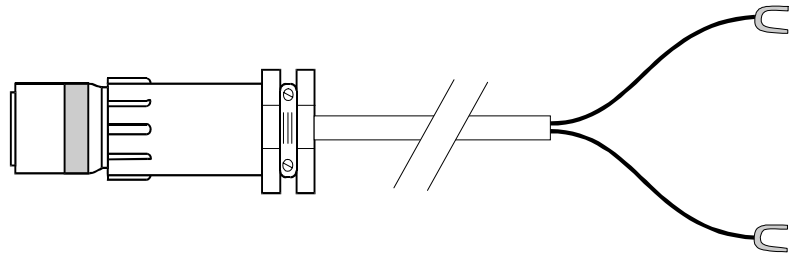
Belt Speed Connector Cable (2 lead)

12 Pin Trident
Connector

3 Pin Cannon Sure-Seal

Pin	Description
A:	No Connect
B:	No Connect
C:	No Connect
D:	No Connect
E:	No Connect
F:	No Connect
G:	No Connect
H:	No Connect
J:	Ground
K:	Ground Spd
L:	Belt Spd
M:	Ground

1:	Pin
2:	Socket
3:	Socket

1:	Pin
2:	Socket
3:	Socket

Ground Speed

Belt Speed
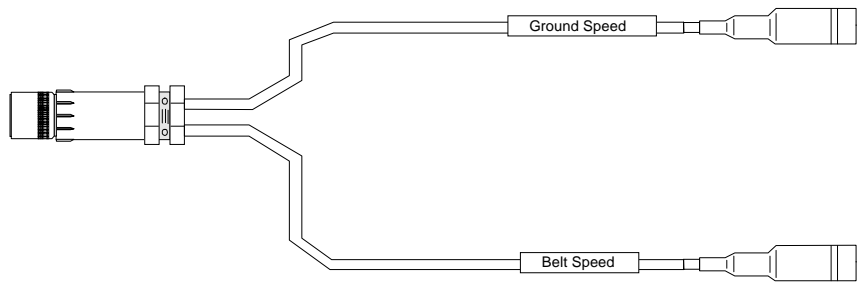
Profile Sensor Cable (HM-573)

J15
Tilt Sensor Moisture Sensor Input

Yield Sensor
HM-573

Pin	Description
A:	n/c
B:	+12 VDC (cut EX2, feed +12 VDC from filter board)
C:	Profile Sensor B (M_DATA +)
D:	Signal Ground
E:	Power Ground
F:	Shield
G:	Profile Sensor C (M_DATA -)
H:	Profile Sensor D (TEST_LOAD -)
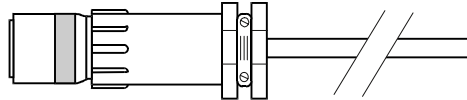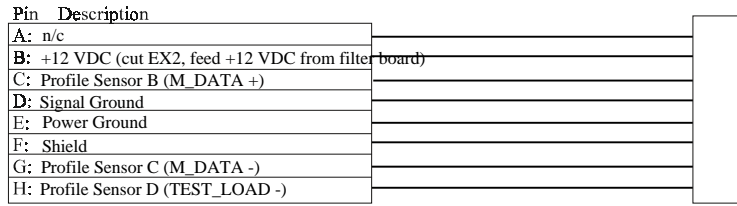
Profile Sensor Cable (HM-575)

J15
Tilt Sensor Moisture Sensor Input

Yield Sensor
HM-575

Pin	Description
A:	n/c
B:	+12 VDC (cut EX2, feed +12 VDC from filter board)
C:	Profile Sensor B (M_DATA +)
D:	Signal Ground
E:	Power Ground
F:	Shield
G:	Profile Sensor C (M_DATA -)
H:	Profile Sensor D (TEST_LOAD -)
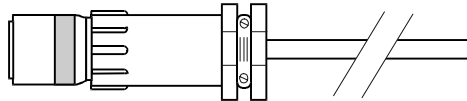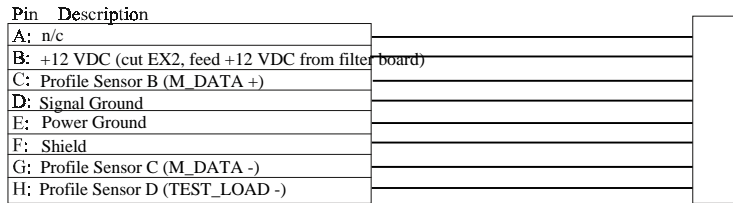
J14
Load Ref Sensor Input

Yield Sensor
HM-575

Pin	Description
A:	n/c
B:	n/c
C:	Profile Sensor A (AL +)
D:	Signal Ground
E:	Power Ground
F:	Shield
G:	Profile Sensor E (AUX_LOAD -)
H:	n/c
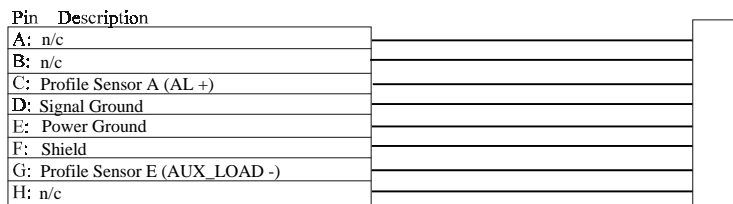
COM A Pin-Out Diagram
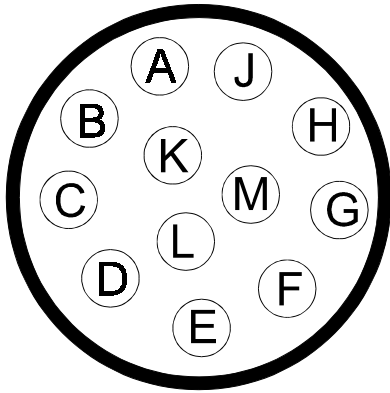
Pin   Signal

A .... +12V Excitation
B .... GPS Receive Data (RXD) to SCCU
C .... GPS Transmit Data (TXD) From   SCCU
D .... Paper Take-Up
E .... Ground
F .... External "Enter" Switch
G .... +5VDC Excitation
H .... Printer Receive Data (RXD) to SCCU
J .... Printer Transmit Data (TXD) from SCCU
K .... Printer RTS
L .... Ground
M .... Printer CTS

Belt Speed Pin-Out Diagram
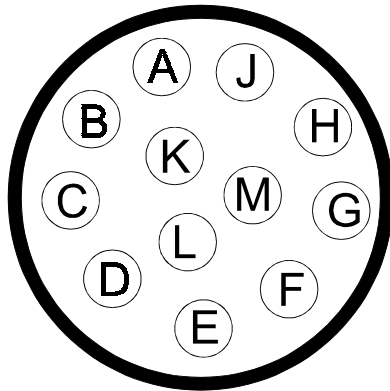
Pin   Signal

A .... Hold / Run
B .... Status Condition
C .... Signal Ground
E .... Head RPM
D .... Discharge Speed
F .... Signal Ground
G .... Tank Empty
H .... Belt Direction
J .... Signal Ground
K .... Ground Speed
L .... Belt Speed
M .... Signal Ground

12 Pin Trident Connector
(connects to COM A)

Pin   Description
A: +12VBSP (Red or Brown)
B: GPS Receive Data Into the SCCU (GRN)
C: GPS Trans Data From the SCCU (WHT)
D: No Connect
E: GPS Ground (Black)
F: No Connect
G: No Connect
H: No Connect
I: No Connect
J: No Connect
K: No Connect
L: No Connect

9-Pin Sub "D"
Male

Pin   Description
1: No Connect
2: GPS RXD Into the SCCU (GRN)
3: GPS TXD From the SCCU (WHT)
4: No Connect
5: Ground
6: No Connect
7: No Connect
8: No Connect
9: No Connect

Ground (Black)
+12VBSP (Red)

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