

Legacy 6000 User Guide





USER GUIDE

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Chapter 1 - System Introduction

An introduction to the Legacy 6000 System.

Fieldware for the Legacy 6000 Version 1



System Introduction

The Legacy 6000 system allows the control of all product types, plus GPS mapping, guidance, and data collection in a single console. Replacing multiple consoles in the cab with one robust system, Mid-Tech's Legacy 6000 sets a new standard for control systems of the future.

The Legacy 6000 runs Fieldware software in a Windows CE environment, an extremely dependable and stable operating system. Operation is intuitive with on-screen menu choices and prompts. An on-board help menu is built in. The heart of the Legacy console is an Intel processor operating at 206 Megahertz for maximum efficiency.

System Features

System features include:

- Product control with optional integrated guidance
- Three guidance modes, Headland, Parallel and Center Pivot.
- Single console in the cab with a single cable connection to the console
- Simplifies operation of product control and GPS record keeping
- Works with Mid-Tech's Swath XL lightbar
- Comes fully loaded with "Fieldware for the Legacy 6000" software
- Precise control of liquid & dry products on common delivery systems
- Flow- or pressure-based liquid control with multiple sensor inputs for each product
- Handles up to 20 individual boom sections and 4 swaths
- Up to 5 application rates per product can be preset and accessed on the go
- Supports granular application control using 2 rate sensors per product
- Compatible with most sensors, valves, and D.C. drives
- Operates bi-directional or PWM valves
- Operator selectable gain settings for control valves
- Adding additional product control is easy
- Single high speed bus cable coming into cab

CAN Bus Versatility and Value

The Legacy 6000 utilizes CAN Bus technology, a new industry standard, which Mid-Tech uses to execute precise product control in an environment more robust than any of its predecessors.

What is a CAN Bus and why use one?

Controller Area Network (CAN) is a system comprised of independent, intelligent modules connected by a single high-speed cable, known as a bus, over which all the data in the system travels.

CAN was originally developed for the automotive industry to provide a cost effective means for a large number of electronic functions or systems to be interconnected without large, expensive and troublesome wiring harnesses.

Within a CAN system, each module contains its own microprocessor. All modules share a standard protocol or communication sequence, which conforms to the ISO 11898 standard. Since modules have built-in computing power, a CAN system is extremely flexible and easily expands to meet a customer's needs.

Individual modules have a specific and unique function to execute, as well as the responsibility to constantly report that function and its current status. Data on the CAN is available many times a second allowing the operation of a very fast, responsive control system.

The Legacy 6000 uses 4 types of modules, each having a unique function. Each described in more detail below. The console in the cab is one of these modules and serves as the user interface. The remaining modules are positioned around the chassis close to the area they influence. For instance, the Product Control Module (PCM) connects to the actuator and sensor and controls the actual release of the product. To upgrade from one-product to three-product application (or more) is simply a matter of adding additional PCM's to the system.

Fieldware for the Legacy 6000

Plug any standard submeter GPS receiver and Mid-Tech's CAN based Swath XL lightbar into the Legacy 6000 system, and enjoy straight-line, curved or center pivot guidance at your command. Application maps can be viewed on the Legacy 6000 display as you apply. Cross track error, area applied, application rates, and other vital information display on the Swath XL lightbar in real time.

Features of Mid-Tech's Fieldware software, developed specifically for the Legacy 6000, include:

- Application Rate Management - permits precise fixed or variable rate application.
- Extensive Product Control Module setup.
- Full system calibration including, granular, liquid, liquid injection and distance.
- CAN Bus, GPS receiver and lightbar diagnostics.
- Create application jobs keeping track of customer, weather and product information.
- Large product database with over 4000 entries containing product name, formulation, and EPA number.
- Integrated guidance using straight line, headland, or center pivot modes, plus text reporting to the lightbar, in one easy to use format.
- Report generation - full application reports and maps can be generated in Fieldware Map Manager PC software at the end of the day. An application report contains a map of the application, customer information, product information, as well as weather, field, and soil conditions.

Mid-Tech CAN Bus System Overview

The Mid-Tech CAN bus system is comprised of several components (modules). The Console, the Power Speed Module (PSM), the Switch Sense Module (SSM), a Product Control Module (PCM), and a Lightbar. At a minimum, four of these modules are required to have a fully functional Legacy 6000 single product control system. The lightbar is optional. To control more than one product, you will need to add an additional PCM for each additional product you choose to control.

The Legacy 6000 Console

Dimensions: 8.0" Wide x 7.7" High x 4.5" Deep (203 x 196 x 114 mm)

Weight: 2.3 lbs. (1.0 kg)

Enclosure: High impact plastic; back lighted, tactile feed-back switches on front panel

Display: 5.7" diagonal (120 x 90 mm), transfective, QVGA with CCFL back lighting. Brightness and contrast controlled by switches on the front panel of the console.

Input/Output: CAN, Bosch 2.0B, Mid-Tech proprietary protocol

Serial: RS 232 (2)

USB: (1)

Memory: 32 Mbytes DRAM, 32 Mbytes Flash

Microprocessor: 32-bit Intel StrongArm, SA 1110 with SA 1111 companion chip. 206 MHz.

Drives: PCMCIA type II, single slot

Operating System: Microsoft Windows CE 3.0

Power Requirement: 9 to 16 volts DC

Connector: Sealed, 31 pin Deutsch

GPS Receiver Compatibility: Compatible with any differentially corrected submeter GPS (DGPS) receiver which outputs NMEA 0183 at 2 to 10 Hz.

Alarm: Audible alarm

Other:

* Real-time clock with battery back-up

* Simple, yet versatile, RAM mounting system.

Power Speed Module

The Power Speed Module (PSM) is the primary arbitrator of the Bus. This module includes the input point for the speed sensor, the input for power for the CAN bus, a gateway to communicate with a parallel CAN bus and provides a fully functional RS-232 port as alternative I/O.



Figure 1-1: Power Speed Module

Inputs

Speed 1: digital, 0-12 VDC, optimized for 50% duty cycle, 0-5 KHz, primary input

Speed 2: digital, 0-12 VDC, optimized for 50% duty cycle, 0-5 KHz, secondary input

Ignition sense: digital, 0-12 VDC, (Hi state is ON)

Inputs/Outputs

Mid-Tech CAN: Bosch 2.0B, 29 bit ID, 250K baud

Gateway CAN: Bosch 2.0B, 11 or 29 bit ID, 250K baud

Serial RS 232: Txd, Rxd, Rts, Cts and ground.

Switch Sense Module

The Switch Sense Module (SSM) senses the status of switches aboard the machine and transforms the switch state into messages meaningful to the CAN Bus.

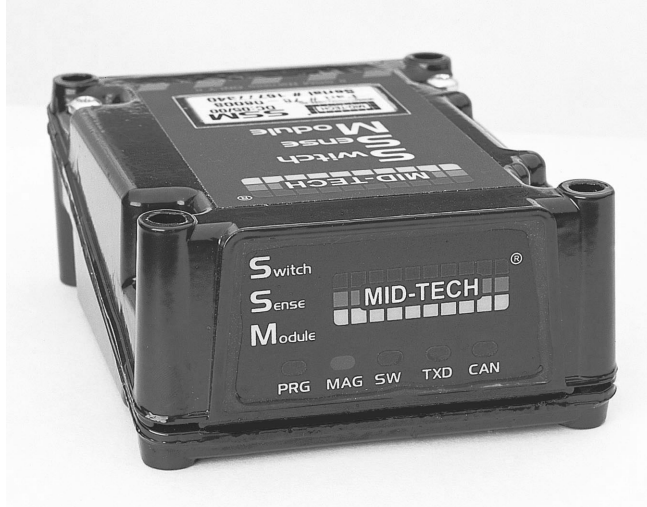


Figure 1-2: Switch Sense Module (SSM)

Inputs

Booms inputs: up to 20, digital, 0-12 VDC, HI/LO sensing

Ground speed override: 1 input, digital, 0-12 VDC, HI/LO sensing

Machine status: 1 input, digital, 0-12 VDC, HI/LO sensing

Input/Outputs

Mid-Tech CAN: Bosch 2.0B, 29 bit ID, 250K baud

Product Control Module

The Product Control Module (PCM) performs the actual control function for the Mid-Tech CAN Bus and connects the actuator and sensor. Control outputs can be bi-directional. One PCM is required for each product you wish to control.



Figure 1-3: Product Control Module

Inputs

Digital sensor: 4 inputs, digital, 0-12 VDC, 0-5 KHz

Analog sensor: 2 inputs, analog, 0-5 VDC. One of these inputs can be converted to a 4-20 ma sensor input by software command.

Battery: 1 Battery Power for the actuator outputs, 12-24 VDC, 10 amp

Outputs

Actuator: 2 outputs, 0-12 VDC, 5 amp each

Regulated: 1 output, 11 VDC, 3 amp

Switched: 1 output, 12 VDC, 5 amp

Sensor power: 3 outputs, 12 VDC, 300 mA total

Input/Outputs

Mid-Tech CAN: Bosch 2.0B, 29 bit ID, 250 K baud

Serial: Asynchronous RS 232, Rxd and Txd only

Swath XL Lightbar

A CAN based Swath XL Lightbar was developed specifically for the Legacy 6000 system. The Lightbar is required for applications using guidance and recommended for non-guidance uses as well. In non-guidance use (logging data only) the lightbar can provide area and rate feed back.



Figure 1-4: Swath XL Lightbar

Dimensions: 16.0" Wide x 3.0" High x 3.0" Deep (405 x 76 x 76 mm)

Weight: 8 oz. (0.22 kg)

Enclosure: Sealed ABS / Poly carbonate alloy construction. Can be mounted to the exterior of the vehicle.

Cable: Mid-Tech proprietary CAN Bus cable. Cable extension available.

Front Panel LEDs: High-lumen red, yellow and green, adjustable brightness.

Text Display: 8-character, high intensity LED alphanumeric text display, brightness adjustment.

Mounting Bracket: Big grippy knobs, can be mounted on dash, from ceiling on vertical plane, interior or exterior.

CAN Bus Cable Specifications

5-wire cable with molded connectors. Male or female terminator required on each end.

Pin 1: Ground

Pin 2: +12V

Pin 3: Reserved

Pin 4: CAN High

Pin 5: CAN Low

Speed: 250k baud message update

Module Processor: Siemens C167

Module CAN interface: Siemens 82C250

Message Protocol: Bosch 2.0B

CAN Modules (PCM, SSM, PSM)

Dimensions: 4.7" W x 2.3" H x 6.0" D (120 x 60 x 150 mm)

Weight: 1.9 lbs. (0.9 kg)

Materials: Powder coated cast aluminum



Figure 1-5: CAN Modules

Cable Harnesses

Power Speed Module (PSM)

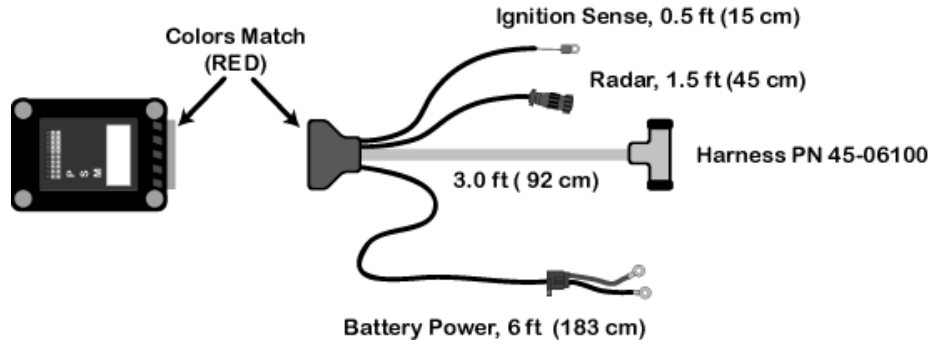


Figure 1-6: Power Speed Module Harness

Switch Sense Module

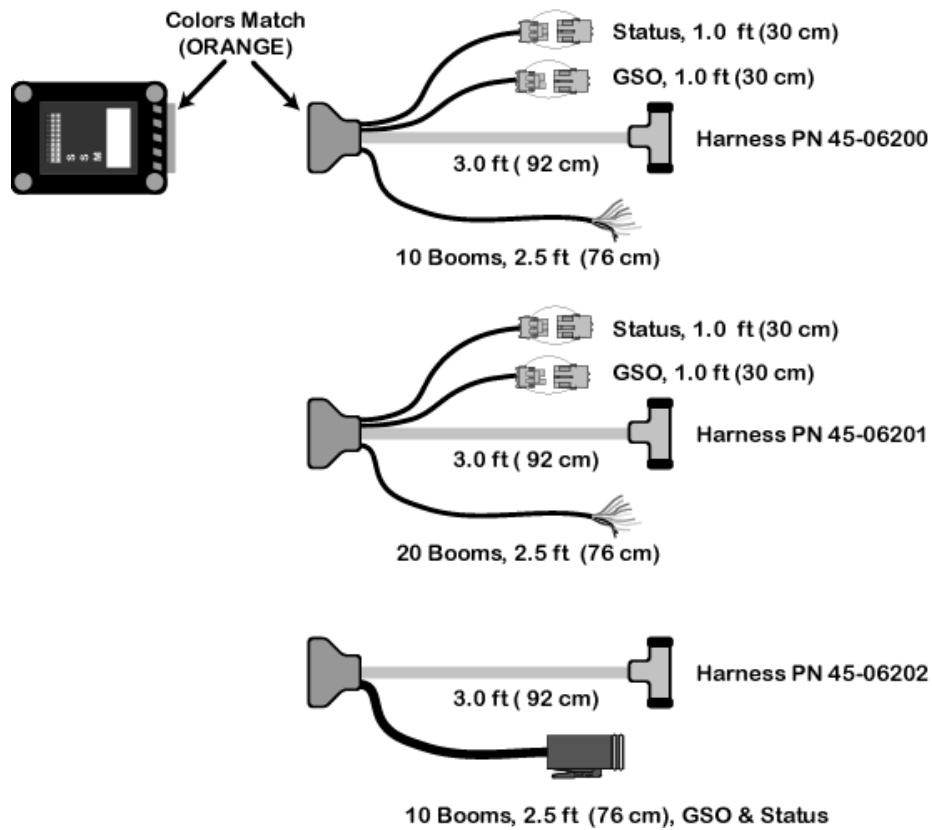


Figure 1-7: Switch Sense Module Harness Options

Product Control Module

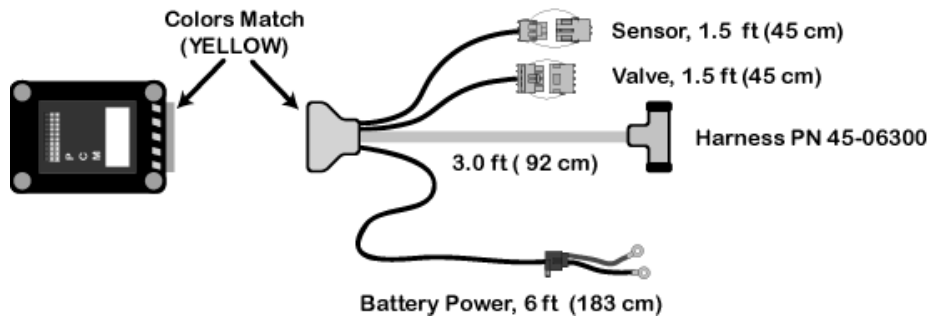


Figure 1-8: Power Control Module Harness

PCM Cable Options											
	Sensor Inputs										
Part Number	A	B	C	D	E	F	CAN	PWR	Valve	Sen.	Description
45-06300	X						X	X	X	1	Single Sensor
45-06301	X			X			X	X	X	2	Single Sensor w/rpm
45-06302	X	X		X			X	X	X	3	Dual Sensor w/rpm
45-06303	X					X	X	X	X	2	Single Sensor w/press
45-06304					X		X	X	X	1	Pressure Control Single
45-06305					X	X	X	X	X	2	Pressure Control, Dual

Table 1-1: PCM Cable Options

Typical Legacy 6000 Configurations

The following schematics reflect some typical Legacy 6000 configurations. Due to the variety of possible configurations, these schematics should be used for general reference. Contact Midwest Technologies or your dealer for detailed information regarding your specific configuration and installation.

Single Channel Liquid Flow Meter

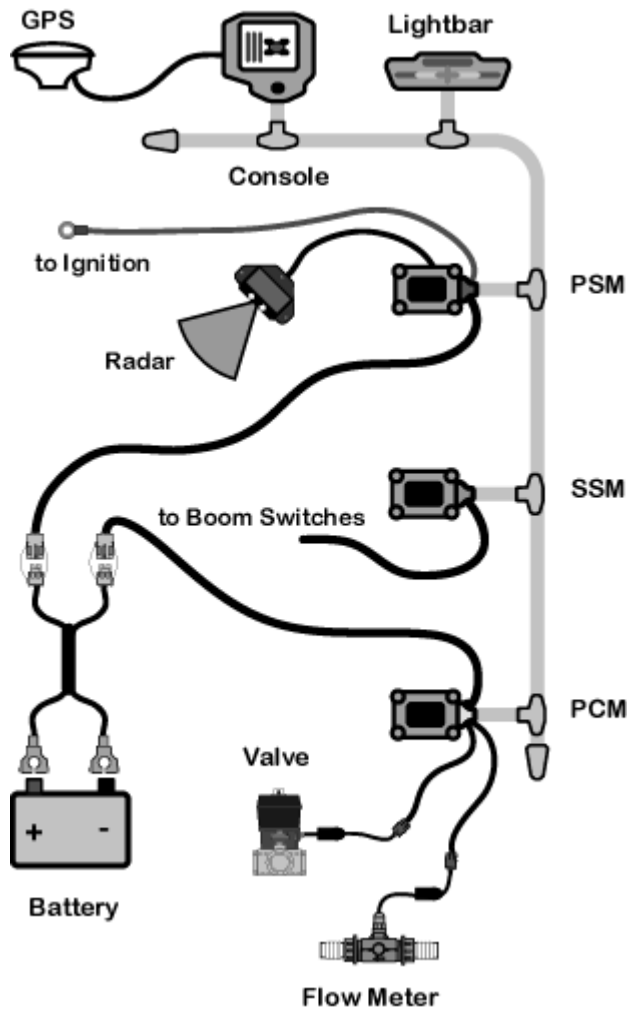


Figure 1-9: Single Channel Liquid Flow Meter Configuration

Single Channel Granular Spreader

This is a typical single product granular configuration with spreader control.

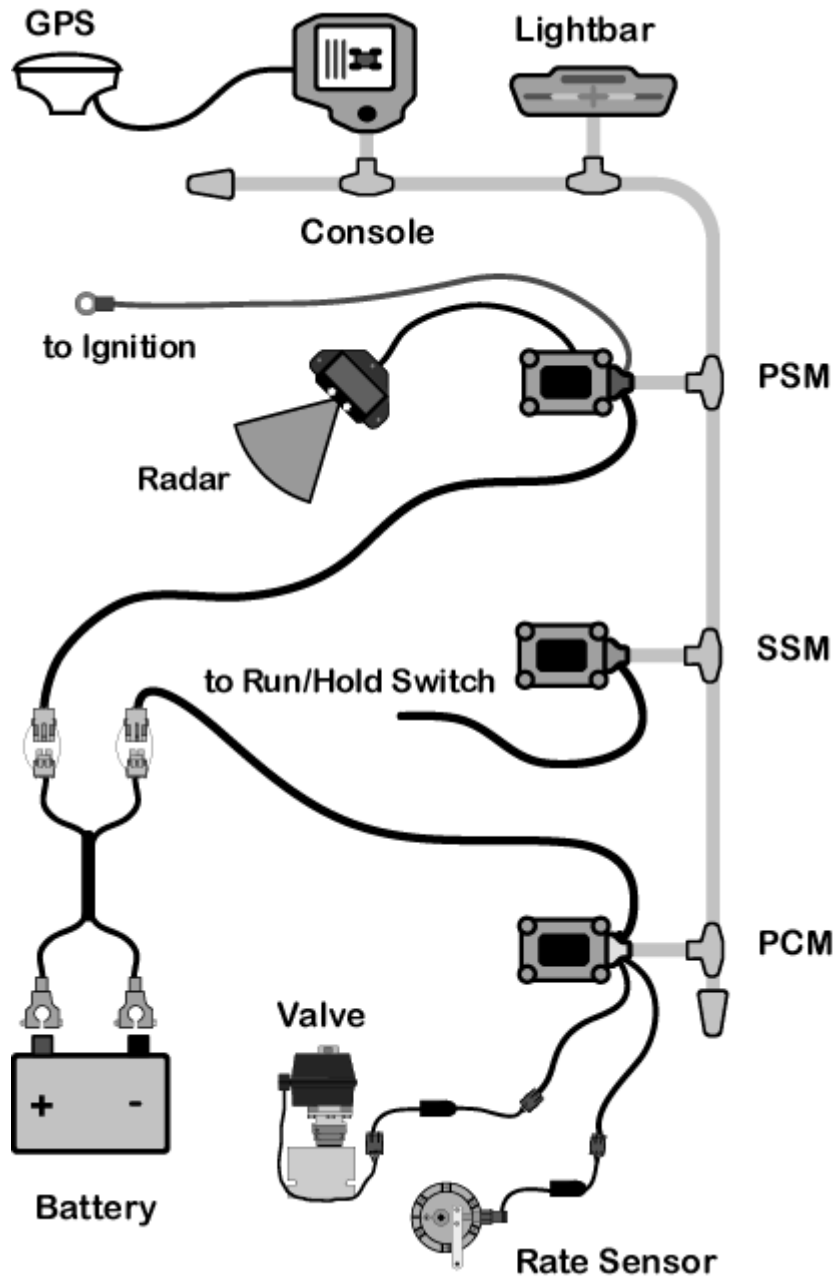


Figure 1-10: Single Channel Granular Spreader Configuration

Dual Channel Granular with Spreader Control

This configuration is typical of a two product granular application with spreader control.

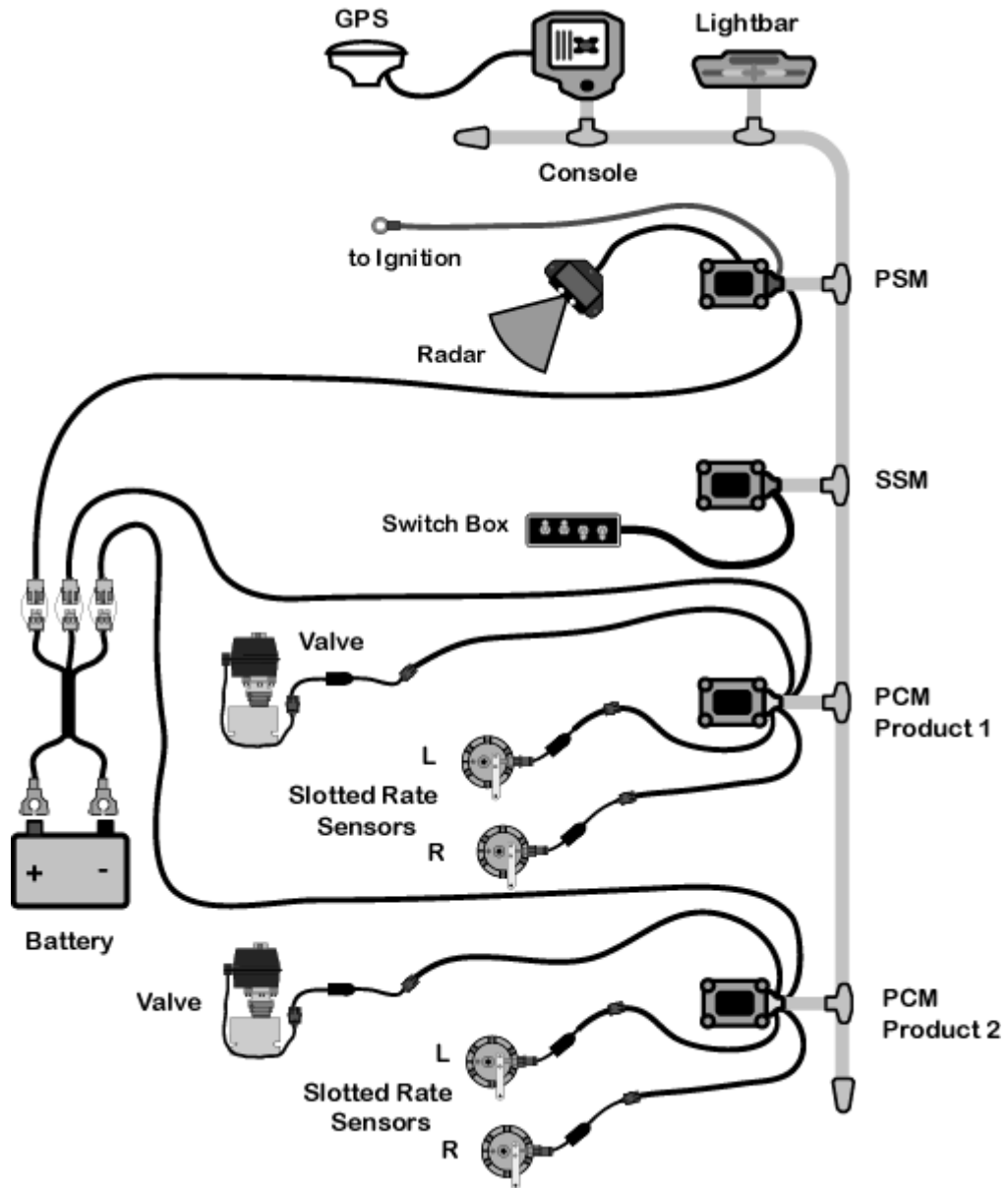


Figure 1-11: Dual Channel Granular Spreader Configuration

Dual Channel with Wet and Dry Booms

This is a typical two product configuration, one liquid and one dry, for a vehicle with wet and dry booms.

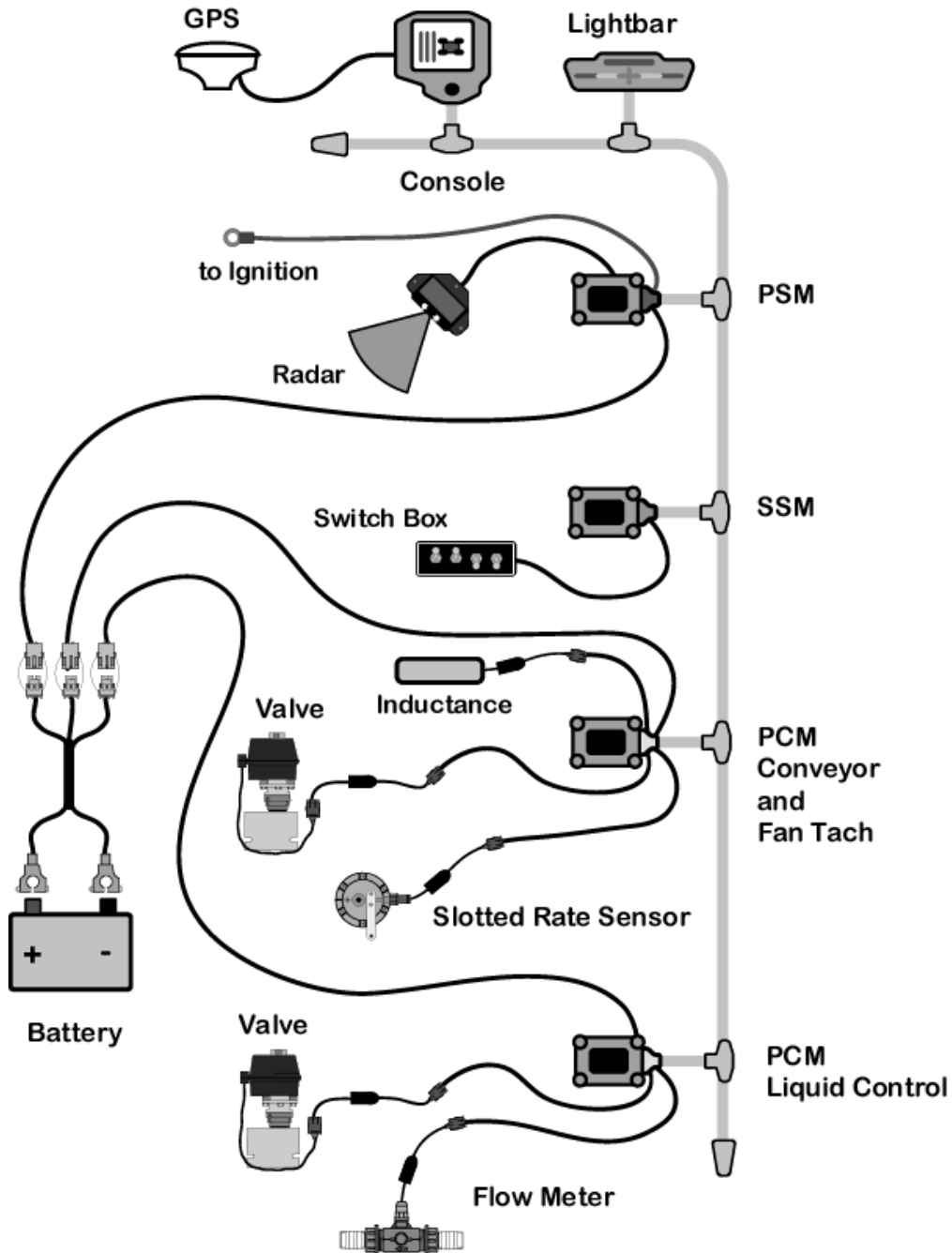


Figure 1-12: Dual Channel Granular Spinner Configuration

Dual Channel Granular with Two Sensors per Channel

This is a typical two product granular layout with two slotted rate sensors per channel.

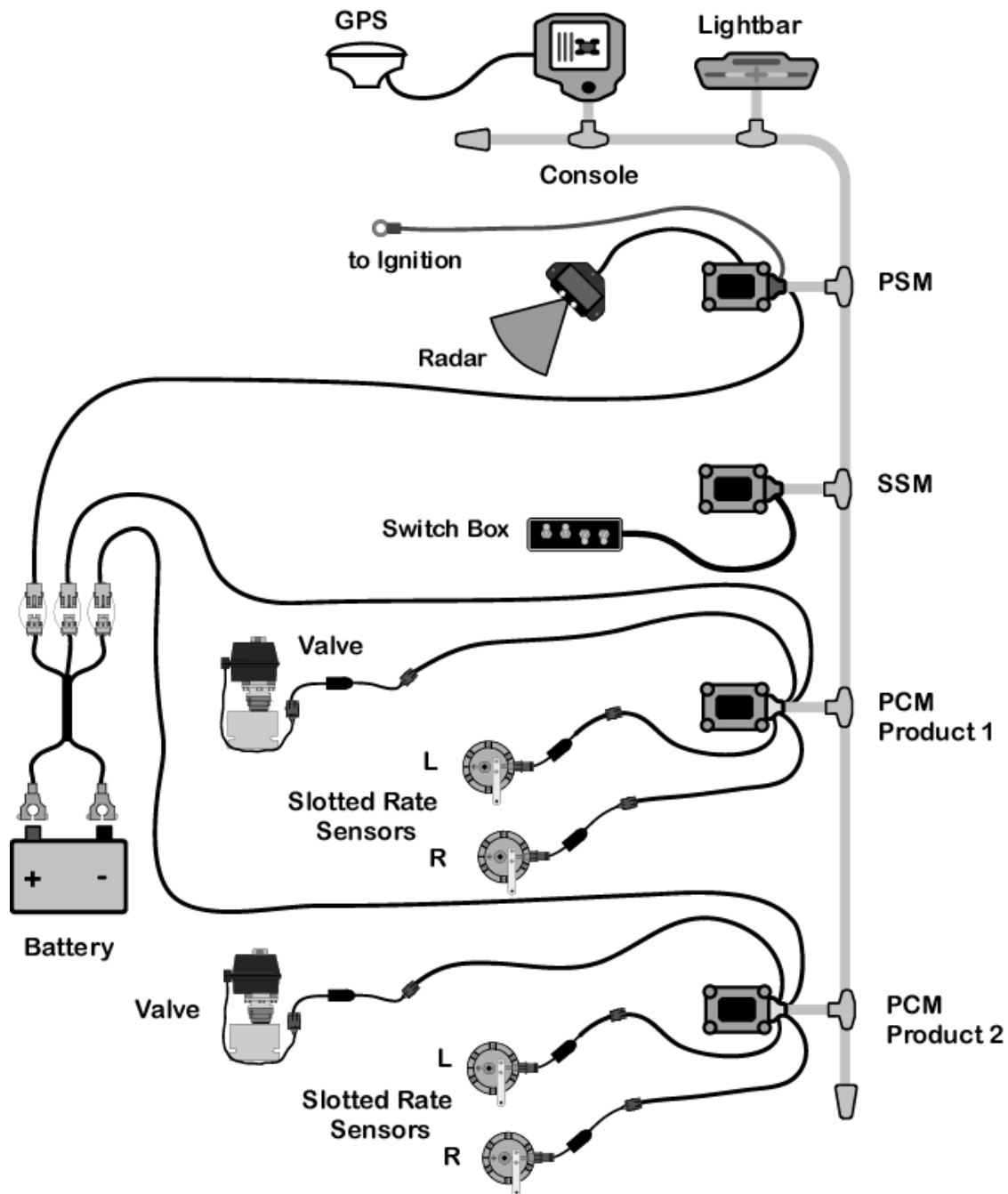


Figure 1-13: Dual Channel Granular with Two Sensors per Channel

Chapter Notes

Chapter 2 - Getting Started

Setting up "Fieldware for the Legacy 6000".

Software Version 1



Software Overview

This section assumes that the Legacy 6000 hardware has been properly installed and clean reliable power has been supplied. For a list of typical hardware configurations (See "Typical Legacy 6000 Configurations" on page 1-13.).

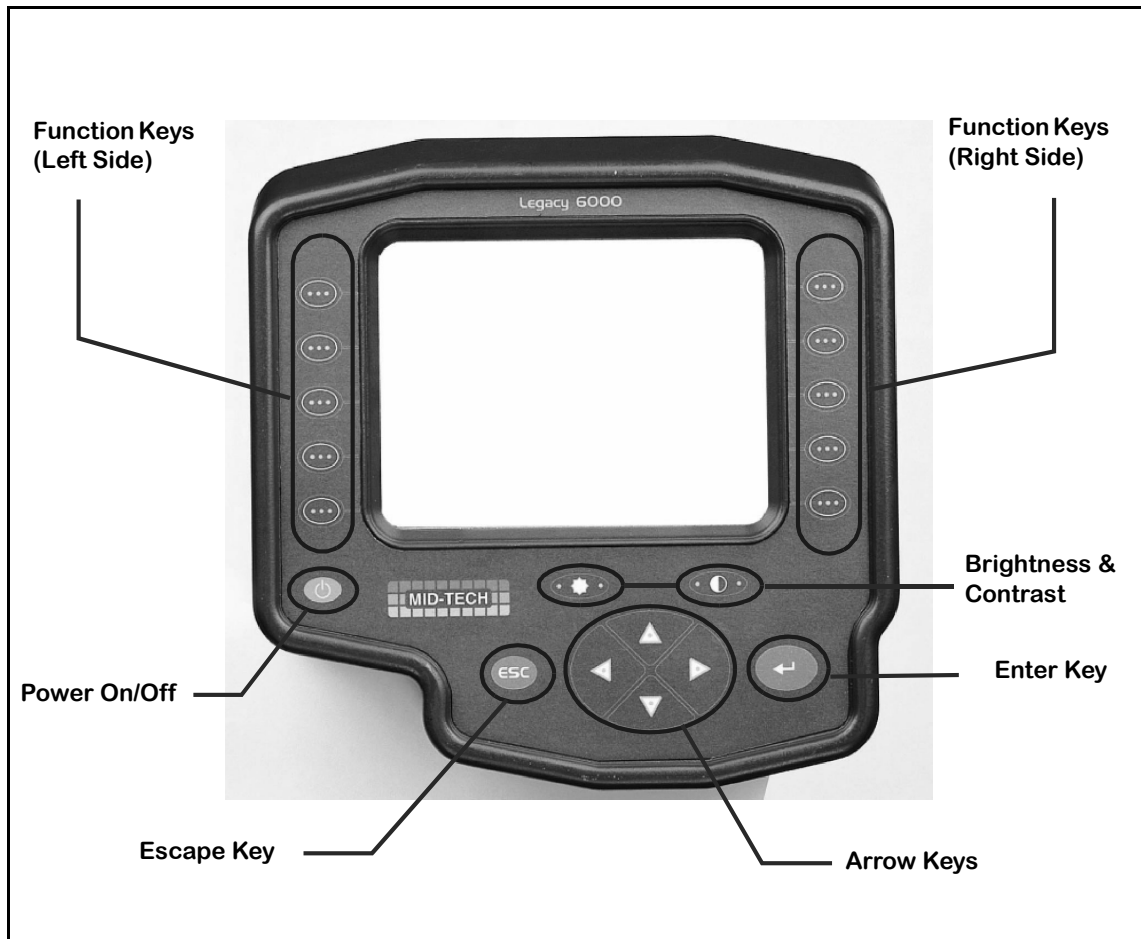


Figure 2-1: The Legacy 6000 Console

Powering Up

To power up the Legacy 6000 console, press the orange button to the left side of the console faceplate (Figure 2-1). When the Legacy 6000 console has been powered up, "Fieldware for the Legacy 6000" will automatically start up. The first software page you will see is the Main Fieldware Launcher (Figure 2-2). System Setup, System Tools, and Application Rate Manager (ARM) are easily accessible from the Main Launcher page. This Chapter focuses on how "Fieldware for the Legacy 6000" operates and how to configure your system using the System Setup application.



Figure 2-2: Main Launcher Page

Standard Pages

Three basic types of software pages are used in "Fieldware for the Legacy 6000", a Launcher page (Figure 2-3), a Setup Menu page (Figure 2-4), and a Data Entry page (Figure 2-5). Each is described in more detail below. Each of these page types has its own help window which displays pertinent information about a button or highlighted area of the page. Learning how to use each of these page types allows the competent operation of the Fieldware software.

Launcher Page

A Launcher page typically contains several smaller applications (programs) that are run (launched) from that Launcher page. For example, the Main Launcher page (Figure 2-2) provides access to three other applications, System Setup, System Tools and Application Rate Management (ARM).

Use the arrow keys on the console (Figure 2-1) to navigate around the Launcher page. Help information for a highlighted button or area is displayed in the white text window centered at the top of the Launcher page. Launch an application from a Launcher page by either pressing the function key on the console (Figure 2-1), adjacent to the software button, or highlight a software button using the arrow keys and press the enter key.

The Launcher page below, (Figure 2-3), is the System Setup launcher. Several setup applications, such as the Console and Product Control Module setup, can be accessed from here. In this Launcher page figure, the highlighted software button is GPS Receiver setup and the associated help text is displayed in the help window at the top of the page.

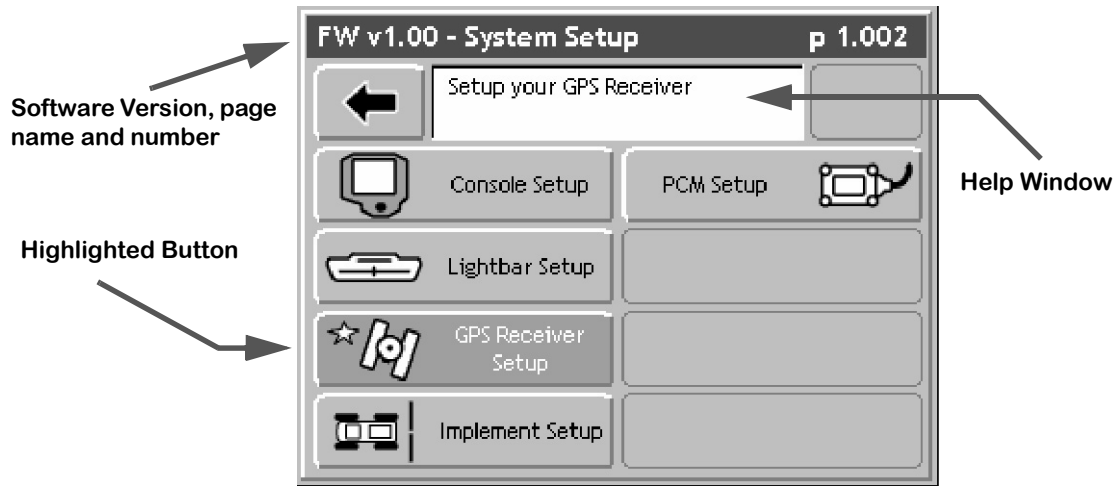


Figure 2-3: Example of a Launcher Page

Setup Menu Page

A Setup Menu page (Figure 2-4) is a page that contains all of the setup parameters associated with a particular setup theme, such as GPS Receiver. A Setup Menu page can be divided into three columns, Left, Center and Right. The Left and Right columns are made up of software buttons adjacent to a physical key on the console. The center column is a scrollable list containing the name of every setup parameter and its current value. Navigate the center column using the up and down arrow keys on the console (Figure 2-1). To edit any of these settings, highlight the desired setting in the center column and press the enter key on the console. This action typically selects a Data Entry page (Figure 2-5).

Setup Wizard

Typically the top item in the center column list is a setup wizard. This setup wizard sequentially steps through each setup parameter Data Entry page, allowing the editing of that setting, and then continuing on to the next setup parameter. This is a convenient method for new users, who are unfamiliar with all of the setup parameters.

Setup Sub-Groups

In some Setup Menu pages there are sub-group buttons in the right and left columns. Pressing one of these displays only the setup parameters associated with that sub-group, in the center column. For example, in GPS Receiver setup (Figure 2-4) there are three sub-group buttons. The Globe button (right column) will display all setup parameters associated with GPS Receiver setup, the next button down is the sub-group for receiver accuracy. Pressing this button reduces the items in the center column to setup parameters associated with GPS accuracy, eliminating all of the items associated with the other sub-groups. The next button is for the COM Port and is associated with communication parameters for the console Com Port that will be connected to the GPS Receiver.

Exiting a Setup Menu Page

There are two ways to exit a Setup Menu page: "Save and Exit" and "Exit with out saving changes". To exit the setup with out saving changes, press the back arrow button located at the top of the left column. To exit and save any changes you made, press the forward arrow at the top of the right column. Either of these methods returns you to the Launcher page that the setup menu was accessed from.

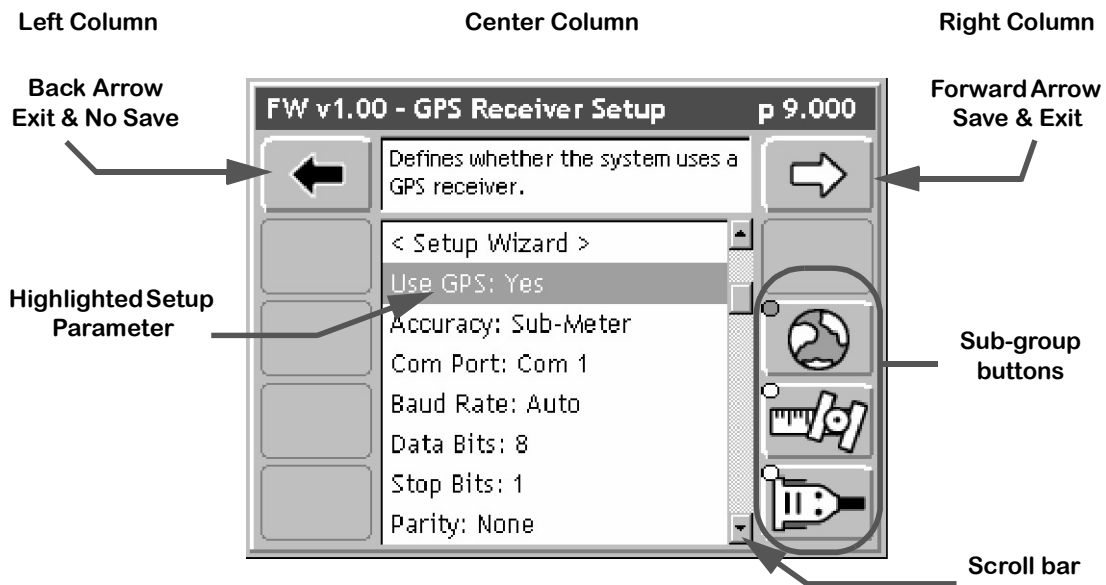


Figure 2-4: Example of a Setup Menu Page

Data Entry Page

The Data Entry page is used throughout the Legacy 6000 software suite. Depending on the setup parameter being edited, a Data Entry page may be an alpha-numeric entry or a pick list (Figure 2-5). The Data Entry page is also divided into three columns: Left, Center, and Right. The left and right columns contain software buttons, typically only the back and forward arrow buttons. The center column is the data entry dialog box. Use the arrow keys on the console to navigate around the Data Entry page. The bottom half of the Data Entry page is comprised of a text window with a white background. This window can contain a description of the current setting as well as some help text.

Pick List Data Entry

To select a setup parameter setting in a Data Entry page that employs a pick list in the dialog box, highlight the dialog box (center column) using the left or right arrow key. Using the up and down arrow keys spin through the available setting selections. When the desired setting is in view in the dialog box press enter to save the setting or press the forward arrow.

Alpha/Numeric Data Entry

To enter a value in a Data Entry page that employs an alpha/numeric dialog box (Figure 2-6), highlight the dialog box using the left or right arrow key. The left most character space will be highlighted. Use the up or down arrow key to spin through the alpha/numeric character list. When the desired character is in view in the dialog box press the right arrow key to move to the next character space in the dialog box. Use the left and right arrow keys to move across the character spaces and edit existing entries.

If you are entering a numeric value, you can use the decimal point in the character set to set the number of digits to the left and right of the decimal point, (E.G. 0.254, 1.00, 10.0, 100.463). This allows you to set the significant digits required by your value.

Exiting a Data Entry Page

There are two ways to exit a Data Entry page: “Save and exit” and “Exit with out saving changes”. To exit the setup with out saving changes, press the back arrow button located at the top of the left column. To exit and save any changes you made, press the forward arrow at the top of the right column or the enter key on the console. Either of these methods will return you to the Setup Menu page that the Data Entry page was accessed from.

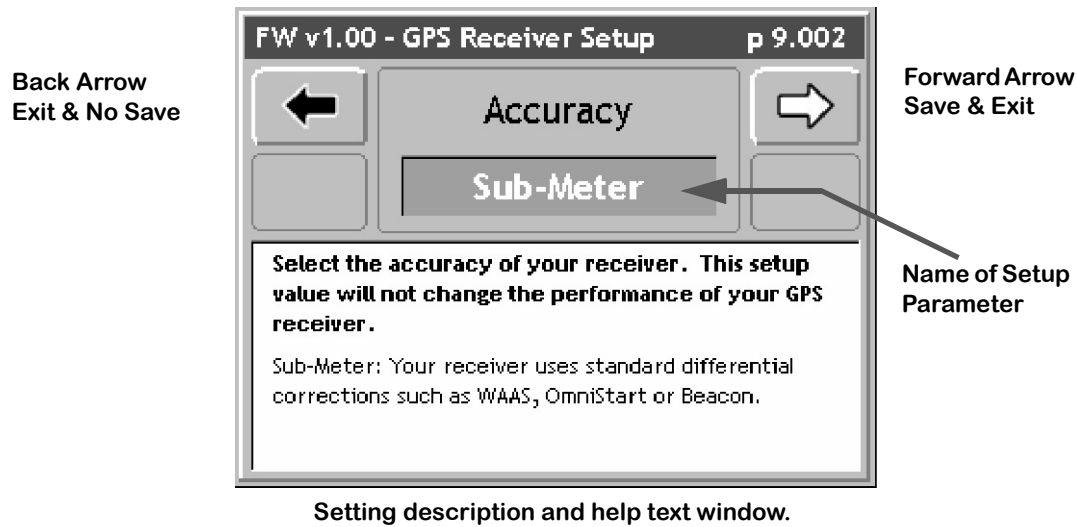


Figure 2-5: Example of Pick List Data Entry Page

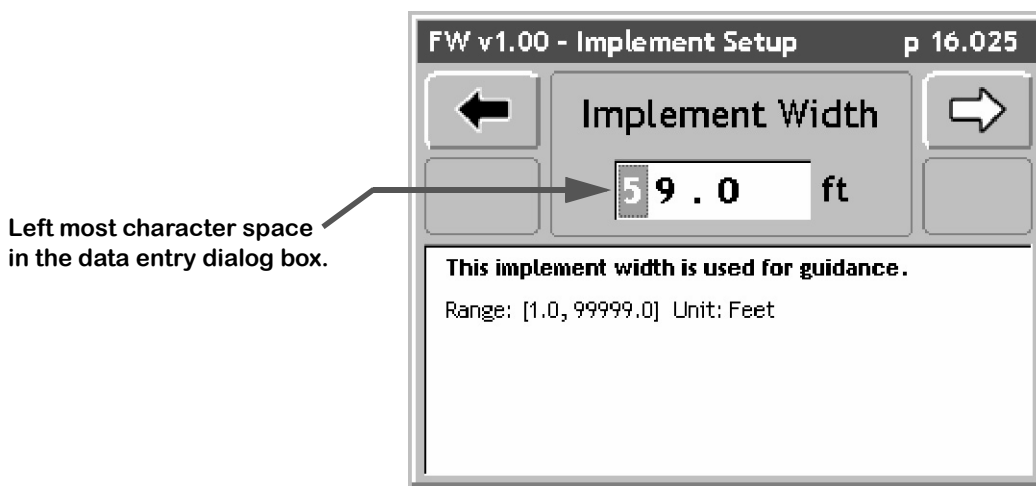


Figure 2-6: Example of Alpha/Numeric Data Entry

System Setup

The Fieldware System Setup allows the configuring of the Legacy 6000 to best suit job needs. To access the System Setup launcher press the top left button in the Main Launcher page (Figure 2-2), the help text should say *Configure System Settings*. This brings up the System Setup Launcher page (Figure 2-7). The table below lists the current system components that can be configured. Each component is covered in more detail in sections below.

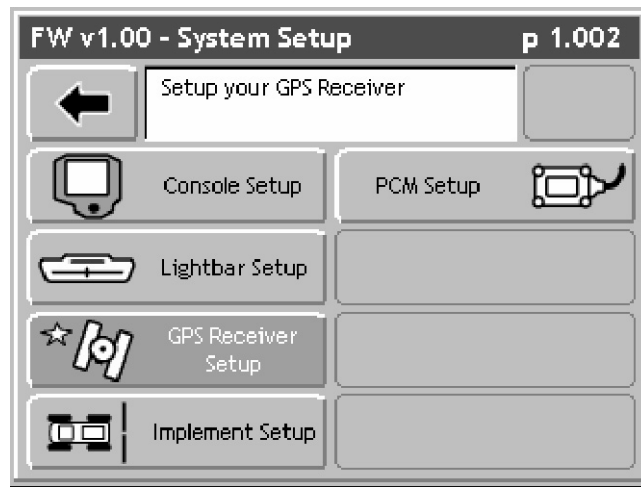


Figure 2-7: System Setup Page

Setup	Description
Console	Defines system environment variables such as units, language, date, and time.
Lightbar	Defines Swath lightbar settings and lightbar messages.
GPS Receiver	Allows you to configure your GPS receiver from the Legacy 6000 console.
PCM	Configures each Product Control Module that is connected to the Legacy 6000 system.
Implement	Defines the vehicle's implement, including implement width, number of swaths and sections.

Table 2-1: Current System Setup Components

Console Setup

Console Setup defines system environment settings (units, language, time) that are displayed on the console and used in the rate control and guidance applications.

To access Console Setup, select System Setup from the Main Launcher page (Figure 2-2), this brings up the System Setup page (Figure 2-7). From the System Setup page, select Console Setup. This brings up the Console Setup page (Figure 2-8). All console setup parameters are listed in Table 2-2.

To change any of the system environment settings, highlight the setting name, listed in the center column of the Console Setup page, and press enter. Use the Setup Wizard to walk through and select the appropriate settings. When done making changes, press the forward arrow to save and exit Console Setup. Press the back arrow to exit and not save any changes



It is recommended that you set the correct date and time prior to any product application and data collection.



Figure 2-8: The Console Setup Menu Page

Setting	Description
PC Card	Indicates to the Legacy 6000 system that a PCMCIA data card is being used.
Units	Defines the system units: Metric or US.
Language	Defines the system language.
System Date	Sets the system date.
Date Format	Defines the date format that will be displayed on the console. Settings are MM/DD/YY or DD/MM/YY.
System Time	Sets the system time.
Time Format	Defines the time format to be displayed on the console. Settings are 12 hr. and 24 hr.
Time Zone	Sets the time zone the Legacy 6000 system is operating in.
Speaker	Sets the system speaker option: internal or external.
Volume	Sets the speaker volume.

Table 2-2: Console Setup Settings

Lightbar Setup

Lightbar setup defines how the Legacy 6000 console configures the lightbar. Lightbar setup parameters are listed in Table 2-3.

To access Lightbar Setup, select System Setup from the Main Launcher page (Figure 2-2). This brings up the System Setup page (Figure 2-7). From the System Setup page select Lightbar Setup. This brings up the Lightbar Setup page (Figure 2-9).

To change any of the Lightbar settings, highlight the setting name, listed in the center column of the Lightbar Setup page, and press enter. Use the Setup Wizard to walk through and select the required settings. When done making changes, press the forward arrow to save and exit Lightbar Setup. Press the back arrow to exit and not save any changes.

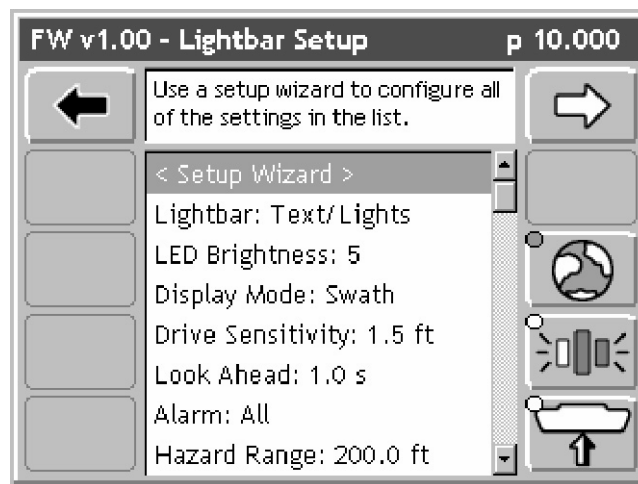


Figure 2-9: The Lightbar Setup Menu Page

Setting	Description
Lightbar	Defines which lightbar features are used. Settings are Text/Lights, Text Only, or Off.
LED Brightness	Sets the brightness level of the lightbar LEDs and text window.
Display Mode	Defines how the user interprets the row of LEDs on the lightbar. The center stack of Green LEDs can represent the current guideline (Swath Mode) or the vehicle (Vehicle Mode).
Drive sensitivity	Sets the distance that a single LED in the row of LEDs represents (Typically 1.5 feet).

Table 2-3: The Lightbar Setup Settings

Setting	Description
Look Ahead	The number of seconds ahead of the vehicle that the cross track error is calculated at (Typically 2.0 seconds).
Alarm	Defines the situation in which the alarm sounds. Settings are Off, Alarm, Hazards, and All.
Hazard Range	Sets the distance prior to an impending feature (Hazard or Applied Area).
Parallel MSG 1	Defines which of several lightbar messages are displayed in the #1 MSG location. Choices are X-Track, Swath #, Heading Error, Ground Speed, Area Applied, Off, Application Rate, and X-Track/Swath#.
Parallel MSG 2	Defines which of several lightbar messages are displayed in the #2 MSG location. Choices are X-Track, Swath #, Heading Error, Ground Speed, Area Applied, Off, Application Rate, and X-Track/Swath#.
Parallel MSG 3	Defines which of several lightbar messages are displayed in the #2 MSG location. Choices are X-Track, Swath #, Heading Error, Ground Speed, Area Applied, Off, Application Rate, and X-Track/Swath#.
Curved MSG	Defines which of several lightbar messages are displayed in the #1 Curved MSG location. Only the Curved MSG is used when in Headlands guidance mode. Choices are Area Applied, Ground Speed, X-Track, Application Rate, and Off.

Table 2-3: The Lightbar Setup Settings

GPS Receiver Setup

GPS Receiver setup defines your DGPS accuracy and how the GPS receiver communicates with the Legacy 6000 console. GPS Receiver setup parameters are listed in Table 2-4.

To access GPS Setup, select System Setup from the Main Launcher page (Figure 2-2). This brings up the System Setup page (Figure 2-7). From the System Setup page select GPS Receiver Setup. This brings up the GPS Receiver Setup page (Figure 2-10).

To change any of the GPS Receiver settings, highlight the setting name, listed in the center column of the GPS Receiver Setup page, and press enter. You can use the Setup Wizard to walk through and select the required settings. When done making changes, press the forward arrow to save and exit GPS Receiver Setup. Press the back arrow to exit and not save any changes.

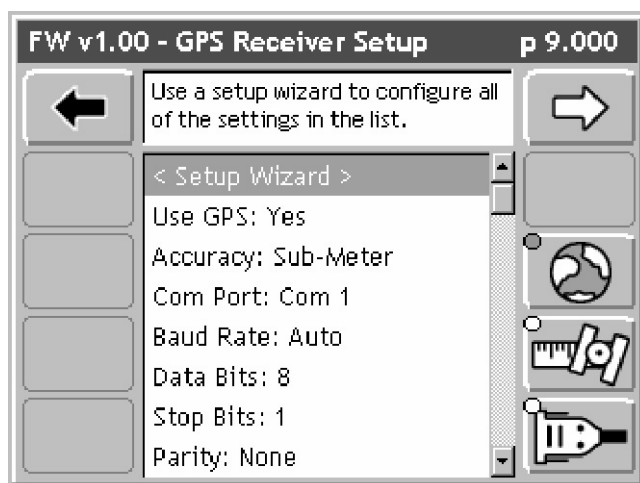


Figure 2-10: The GPS Receiver Setup Menu Page

Setting	Description
Use GPS	Defines whether the Legacy 6000 system is using GPS. If using GPS this setting must be set to Yes.
Accuracy	Defines the accuracy of the DGPS receiver. Choices are RTK and Sub-meter.
Com Port	Defines the com port that your GPS receiver is connected to.
Baud Rate	Defines the selected com port baud rate.
Data Bits	Defines the selected com port data bit setting.

Table 2-4: The GPS Receiver Setup Settings

Setting	Description
Stop Bits	Defines the selected com port stop bit setting.
Parity	Defines the selected com port parity.

Table 2-4: The GPS Receiver Setup Settings

Product Control Module Setup

The Product Control Module (PCM) setup is used to configure a PCM that is connected to the Mid-Tech 6000 CAN Bus. A PCM can not be configured if it is not connected to the Mid-Tech CAN Bus.

Setting up a PCM is typically required in the following scenarios: the initial Legacy 6000 hardware installation, when an additional PCM is added to the system, or to modify an existing, already configured, PCM. PCM setup can be a complex process and will directly effect product application efficiency. Review the setup procedure before running PCM setup. If in doubt, contact your Mid-Tech customer service representative.

The PCM setup process consists of ten data entry pages presented sequentially in a setup wizard fashion. Information entered in a PCM setup Data Entry page may effect subsequent PCM setup pages.

To access PCM Setup, select System Setup from the main Launcher page (Figure 2-2). This brings up the System Setup page (Figure 2-7). From the System Setup page, select PCM Setup. This brings up the PCM Setup page (Figure 2-11). The PCM Setup page will have a button for each PCM the software detects on the CAN bus. Each button will display the PCM number, Serial Number and PCM Name. To setup a specific PCM, press the adjacent function key. This will bring up the first PCM Data Entry page (Figure 2-12).

There are several setup pages in the PCM setup process. Each page is described in Table 2-5, and in further detail in sections below.

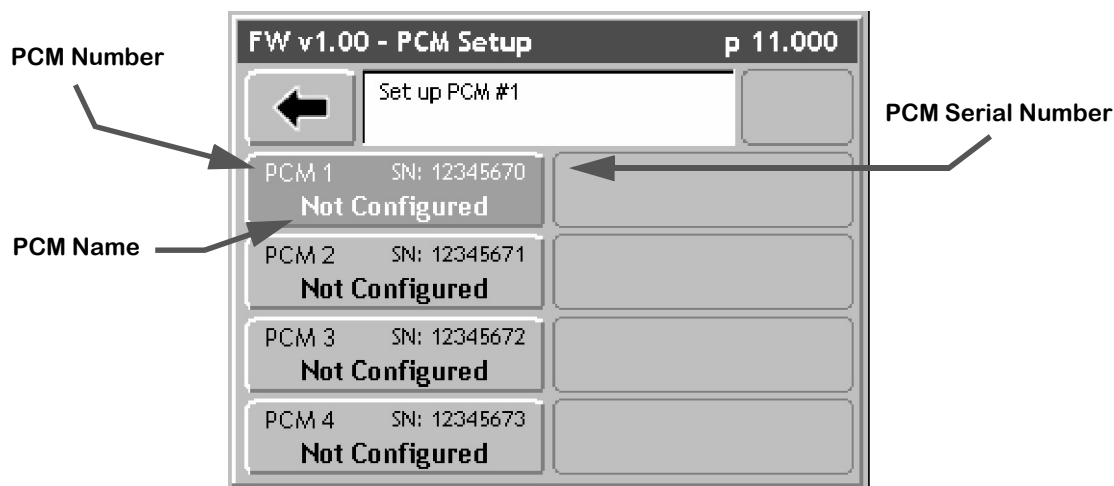


Figure 2-11: The PCM Setup Launcher Page


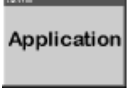

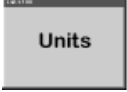

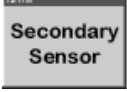
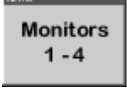
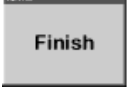
Page Name	Description
	Allows a setup configuration to be selected or saved.
	Defines the type of product application or device being controlled, such as Liquid or Granular.
	Select the drive circuit used to control the product delivery or device.
	Select the units used for the application rates.
	Defines the type of sensor used for the primary control function.
	Defines the type of sensor used for the secondary control function.
	Defines the type of sensor used as a monitor. There are four monitor pages. This sensor is not used for product control.
	Allows the PCM configuration to be saved as a favorite and updates the PCM with the new configuration.

Table 2-5: PCM Setup Page Descriptions

Selecting a PCM Setup Favorite

The first setup page is the PCM Favorite (Figure 2-12). From this page, select a predefined standard PCM configuration. Some of these favorites are supplied by Mid-Tech and some may be created by the user. The default configuration is always the current configuration and is listed as <Loaded> in the dialog pick list. When creating a new configuration, name the configuration, at the end of the setup process, on the Finish page.

To view the settings of the loaded configuration, press the review button (Figure 2-12).

Select the desired favorite and press the Forward arrow to advance to the next PCM Setup page (Figure 2-13). If no other changes are required, press the Finish button and go directly to the last setup page. From the Finish page, update the PCM with the new setup file.

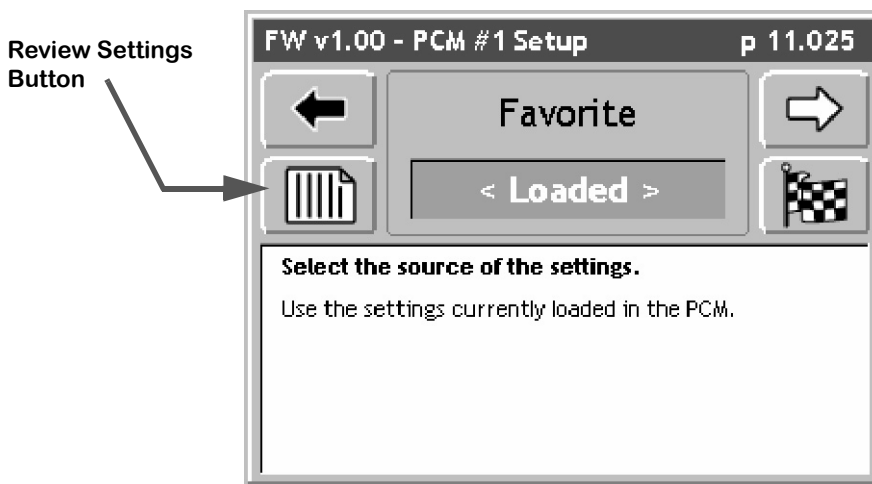


Figure 2-12: The PCM Setup Favorites Page

Setting the Application Type

The Application Setup page (Figure 2-13) allows the selection of the required type of product application. All other setup pages will be based on the type of application chosen on this page. There are five possible applications: Liquid, Granular, Seeder, NH3, and Motor.

For each Application type there is an additional Settings page. To access the Settings page, press the Settings button in the left column of the Application page (Figure 2-13). Typically it will not be necessary to change any parameters found in the Settings page.

Select the Application type and press the Forward arrow to advance to the next PCM Setup page.



When changing the application type, the Finish Flag button may disappear. This button disappears if the change in application type caused additional changes to other PCM setup parameters. It may be necessary to continue viewing the remaining setup parameters prior to finishing the PCM setup process. If no additional PCM parameter changes occurred, the Finish button is presented and a press of this button brings up the last setup page. From the Finish page, update the PCM with the new setup file.

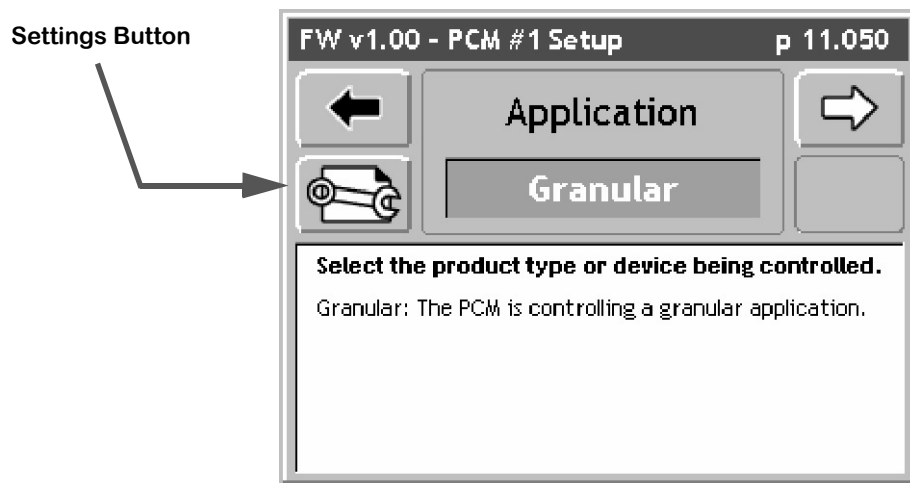


Figure 2-13: The Application Page

Setting the Drive Type

The next PCM Setup parameter is Drive Type. This is the type of drive circuit used to control the delivery of a product. The list of available drive types depends on the Application selected in the previous setup page. Some Drive Types have an additional Drive Types Settings page, (Figure 2-15), accessed from the Settings button on the Drive Type page.

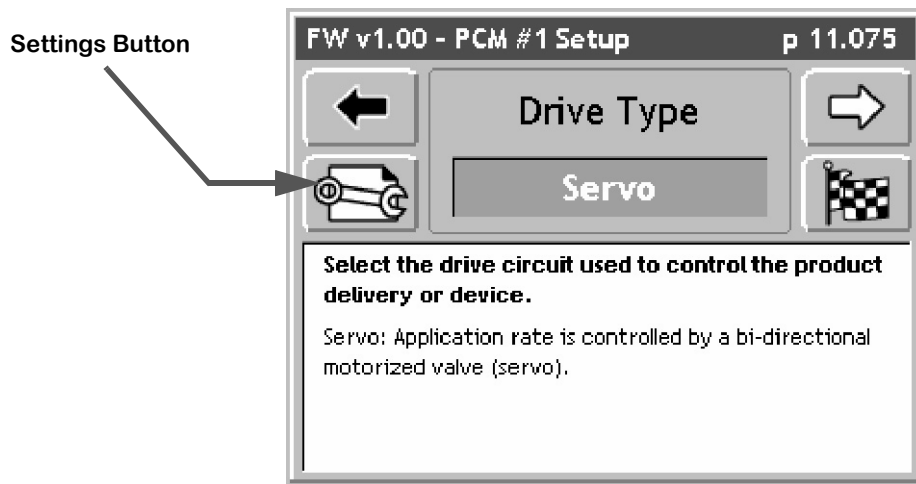


Figure 2-14: The Drive Type Page

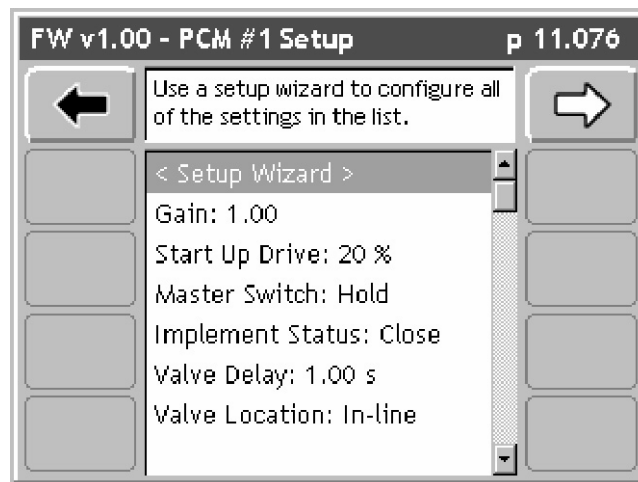


Figure 2-15: The Drive Type Settings Page

Setting the Units

When the Drive Type is selected, the next PCM Setup page is the Units page (Figure 2-16). The available units are based on the Application and Drive Type selected. There is an additional page associated with the Units page. This is the Control Basis page (Figure 2-17). The Control Basis page determines whether the units available to you are Area based, Time based, or Distance based. Set this parameter prior to selecting the application units. When the Control Basis and Units parameters are selected, press the Forward arrow to advance to the next PCM Setup page.

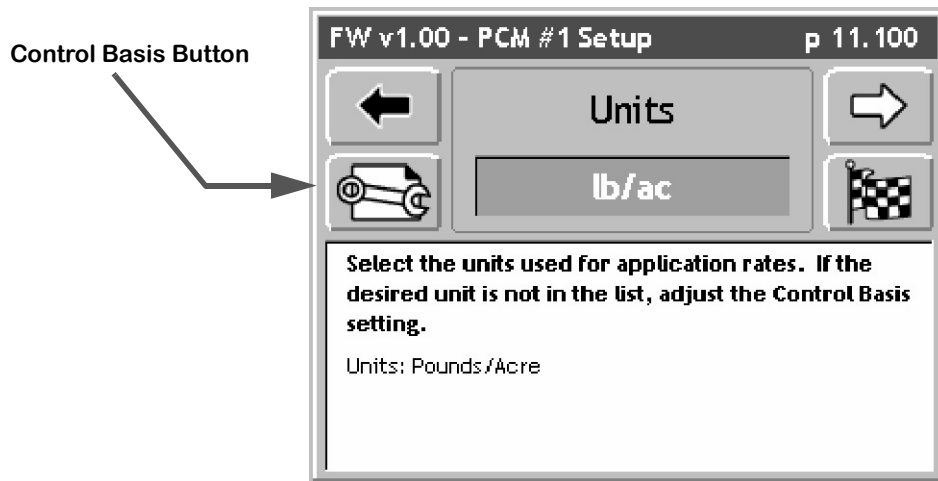


Figure 2-16: The PCM Setup Units Page

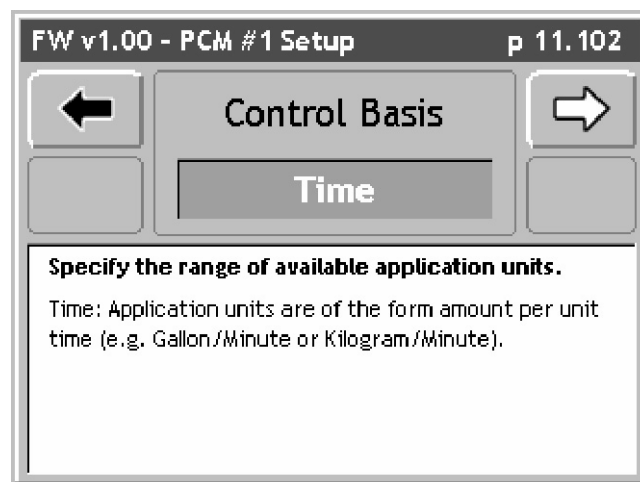


Figure 2-17: The Control Basis Page

Selecting the Primary Sensor

The Primary Sensor is the type of sensor used for the primary control function. The Primary Sensor types available in this pick list are based on the Application type selected. Each Primary sensor type has an associated Settings button (Figure 2-18) which goes to the Sensor Settings page (Figure 2-19). The Sensor parameters depend on the type of Primary Sensor selected.



Each PCM has six input sensors labeled A through F. Sensor inputs A - D are digital and sensor inputs E and F are analog. Your PCM CAN Bus cable harness comes with the sensor input lines labeled A - F. You can set the input line for a sensor in the Sensor Settings page.

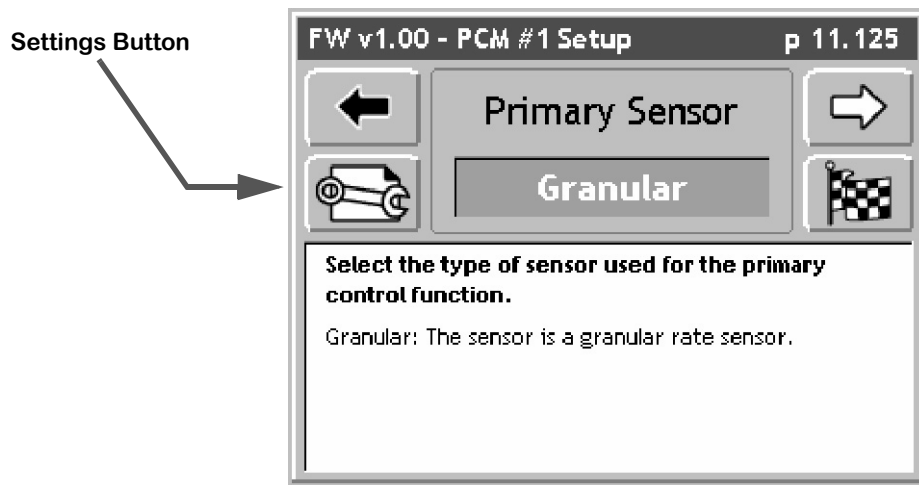


Figure 2-18: The Primary Sensor Page

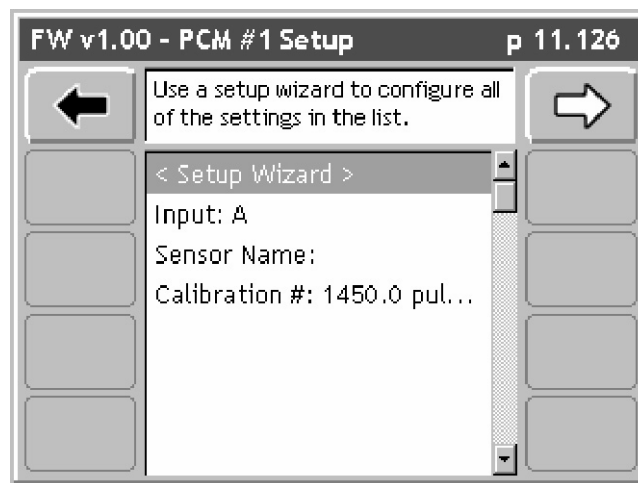


Figure 2-19: The Primary Sensor Settings Page

Sensor Setting Definitions

As mentioned, each sensor has an associated settings page. The settings in this page vary based on the type of sensor selected. Table 2-6 is a list of sensor setting definitions. The sensor selected may not have all of these settings on its associated settings page. Some settings are for secondary sensors only and some settings are for monitors only.

Setting	Definition
Sensor Label	A user defined name used to label a particular sensor or monitor. This information is not stored in the PCM and is used for messaging to the user only.
Calibration Number (Nozzle Constant)	A value used to calibrate a sensor. This value should come from the sensor manufacturer, a proven chart, or be determined with a calibration process.
% Dual Warning	Used with the Secondary sensor only. A warning is issued if this secondary sensor differs by a certain % from the Primary sensor.
% Dual Warning Delay	Used with the Secondary sensor only. The dual warning delay is used to prevent error messages due to short term (spikes) in a % value difference between the Primary and Secondary sensors, i.e. the user is not interested in short term sensor differences.
Alarm Units	Units associated with the Sensor. This information is not stored in the PCM and is used only for sending messages to the user. The Primary sensor uses the Application Units.
Alarm Status	Monitor only. Typically used with a monitor that is On/Off or Open/Closed.
Max Alarm	Monitor only. A user defined, upper alarm limit.
Min Alarm	Monitor only. A user defined, lower limit.
Alarm Delay	Monitor only. A time delay associated with the Alarm Status, Max and Min alarm settings. Used to filter out short epochs that may violate an alarm setting.
Intercept	The intercept value used in the equation of a line. Primarily used for pressure transducers and temperature sensors.
Slope	The slope value used in the equation of a line. Primarily used for pressure transducers and temperature sensors.

Table 2-6: Sensor Setting Definitions

Selecting the Secondary Sensor

The Secondary sensor is used in conjunction with a Primary sensor. The Secondary Sensor types, available in this pick list, are based on the Application type and Primary Sensor type selected (Figure 2-20). Each Secondary sensor type has an associated Settings button which brings up the Sensor Settings page (Figure 2-21). The Sensor parameters depend on the type of Secondary Sensor selected (Table 2-6).



Each PCM has six input sensors labeled A through F. Sensor inputs A - D are digital and sensor inputs E and F are analog. The PCM CAN Bus cable harness comes with the sensor input lines labeled A - F. The input line for a sensor can be set on the Sensor Settings page.

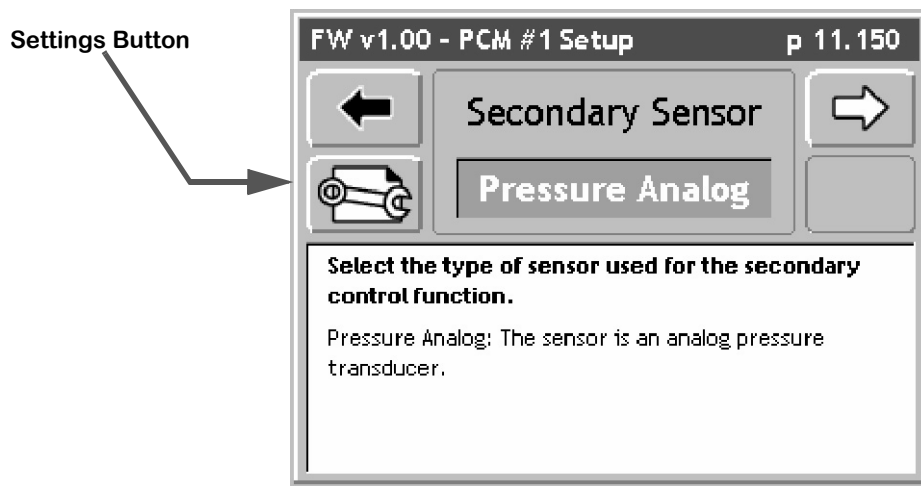


Figure 2-20: The Secondary Sensor Page

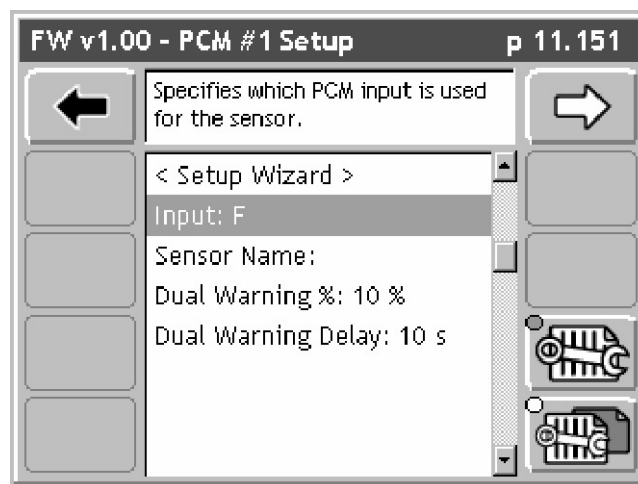



Figure 2-21: The Secondary Sensor Settings Page.

Selecting a Monitor

A Monitor is a sensor that is not a Primary or Secondary sensor and is used to monitor the status of some element of the application delivery system, such as RPMs on a shaft sensor. Up to four monitor sensors can be used in the delivery system. The Monitor types available in this pick list are based on the Application, Primary sensor, and Secondary sensor types selected (Figure 2-22). Each Monitor type will have an associated Settings button which brings up the Monitor Settings page (Figure 2-23). The Monitor sensor parameters depend on the type of Monitor sensor selected.

PCM setup contains four Monitor setup pages; Monitor 1 thru Monitor 4. It is not necessary to setup four monitors. Select the monitor(s) used and press the forward arrow to save the settings. If there is no monitor, select the None setting and continue to the next page.

 Each PCM has six input sensors labeled A through F. Sensor inputs A - D are digital and sensor inputs E and F are analog. The input line for a sensor can be set on the Sensor Settings page.

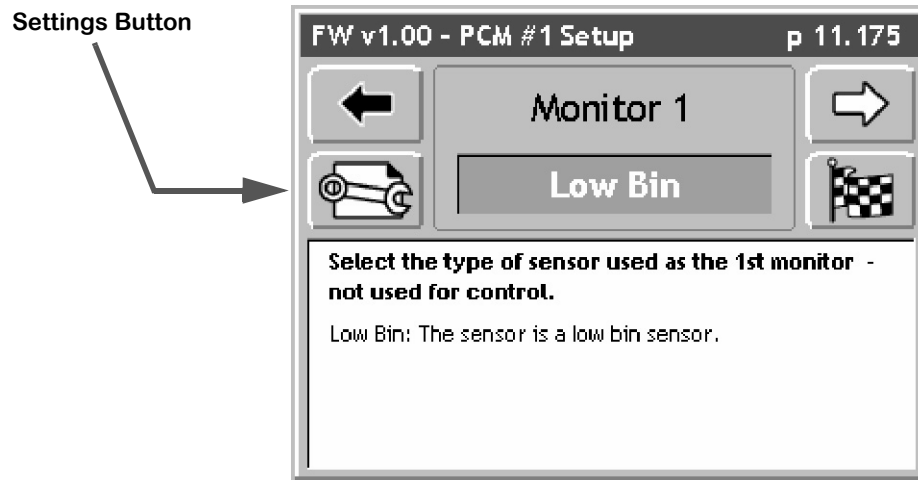


Figure 2-22: The Monitor Sensor Page

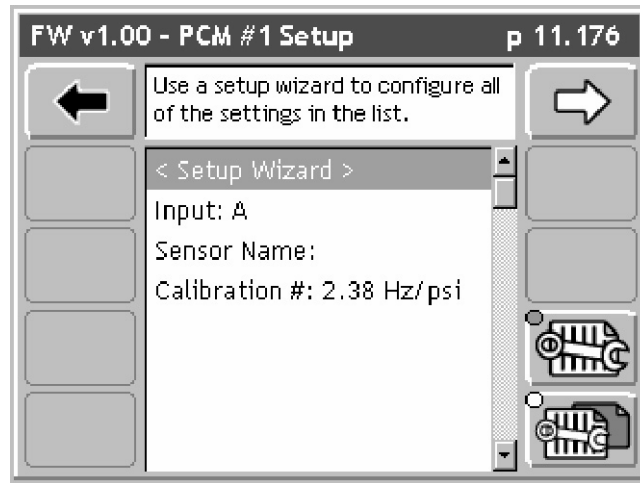


Figure 2-23: The Monitor Sensor Settings Page

Finishing the PCM Setup

The final page in the PCM setup process is the Finish page (Figure 2-24). From the Finish page, save the PCM setup to a file for use later, or send the new settings directly to the PCM. Also review the current settings prior to saving or flashing the new settings (Figure 2-25).

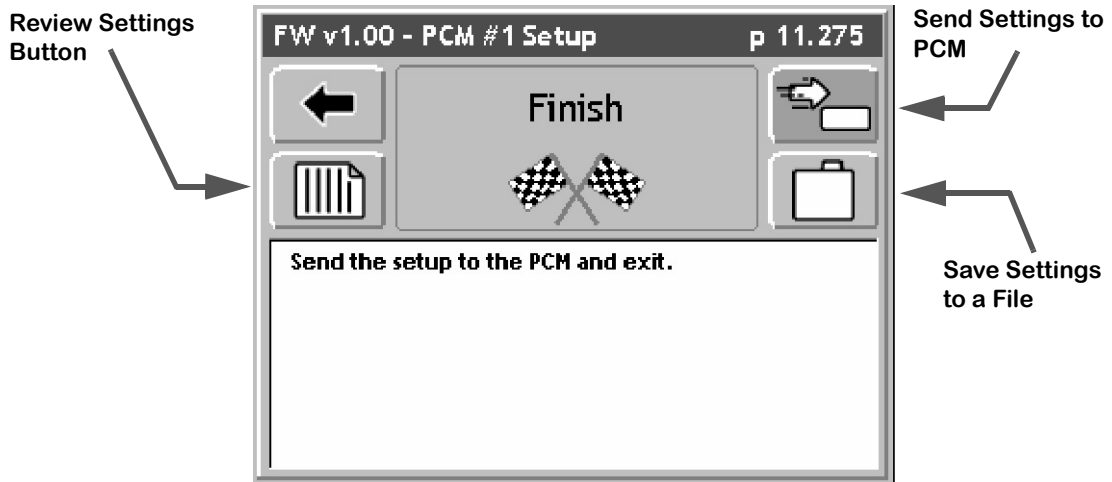


Figure 2-24: The PCM Setup Finish Page

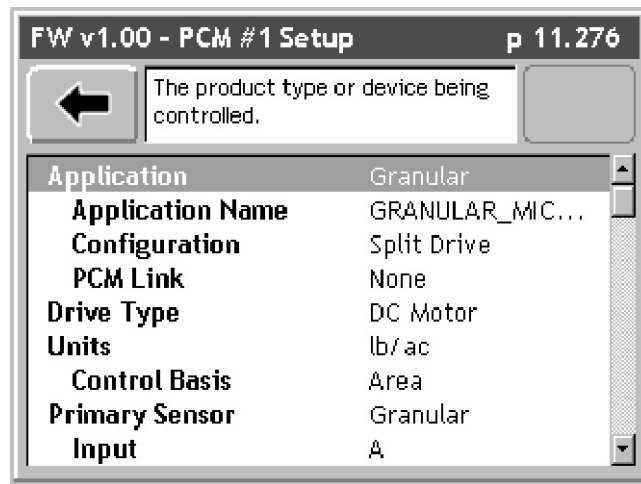


Figure 2-25: The PCM Setup Summary Page

Saving the PCM Setup to a File

Pressing the Save to a File button in the Finish page takes you to a Save As page (Figure 2-26). Press the Save As button to save the current PCM configuration to a file. The Save As page allows the naming of the PCM Setup file, such as My Sprayer. You can select this setup the next time PCM setup is run by selecting My Sprayer as your PCM Favorite.

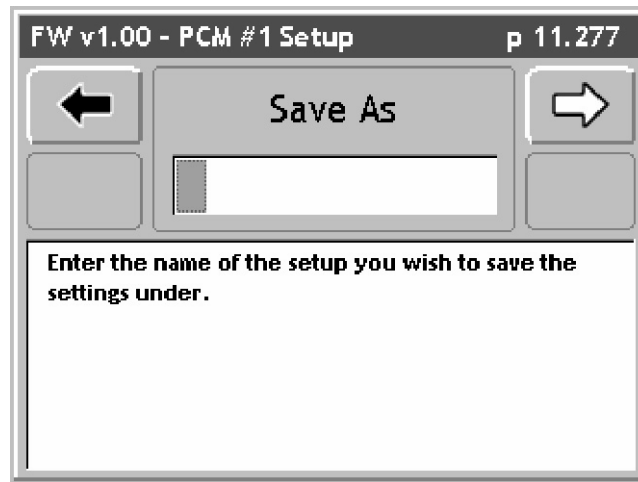


Figure 2-26: The PCM Setup Save As Page

Implement Setup

Implement Setup is where the number of Swaths, number of Sections per Swath, and the physical relationship (distance and direction) of a Swath to the position of the GPS antenna are defined. Implement Setup is a step by step (Wizard fashion) process.

To access Implement Setup, select System Setup from the main Launcher page (Figure 2-2), this brings up the System Setup page (Figure 2-27). From the System Setup page, select Implement Setup. This brings up the first page in the Implement Setup process (Figure 2-29).

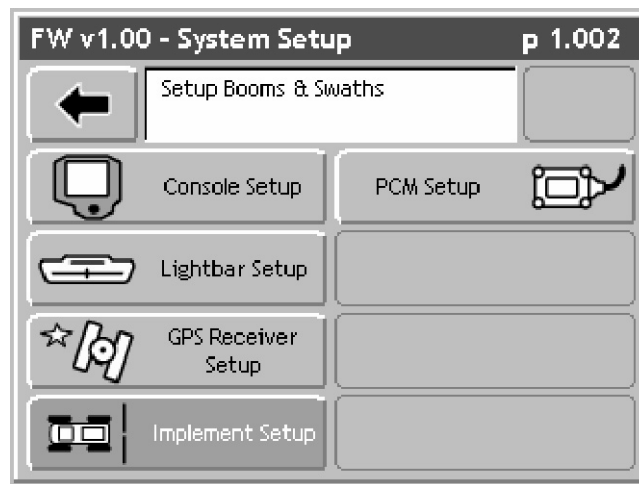


Figure 2-27: The System Setup Launcher Page

The Vehicle Coordinate System

In order to properly capture the relationship between swaths and the GPS antenna on the vehicle, "Fieldware for the Legacy 6000" has defined a coordinate system based around the center line of the vehicle (Figure 2-28). Review this Vehicle Coordinate System prior to running Implement Setup. It is also a good idea to make all of measurements, such as distance from GPS Antenna to Swath, prior to running Implement Setup.

The X and Y Axes

In "Fieldware for the Legacy 6000", a vehicle has two axes: an X and a Y. The X axis runs perpendicular to the center line of the vehicle and the Y axis is the center line of the vehicle (Figure 2-28). Directions along the X axis are referred to as right and left, while directions along the Y axis are referred to as forward and back.

Location of GPS Antenna

The GPS Antenna must be mounted along the center line, the Y-Axis, of the vehicle (Figure 2-28).

Swaths and Sections

In version 1 of "Fieldware for the Legacy 6000" a vehicle can have as many as four swaths and and up to 20 sections total across all swaths. A vehicle with a single swath divided into three sections is shown in Figure 2-28.

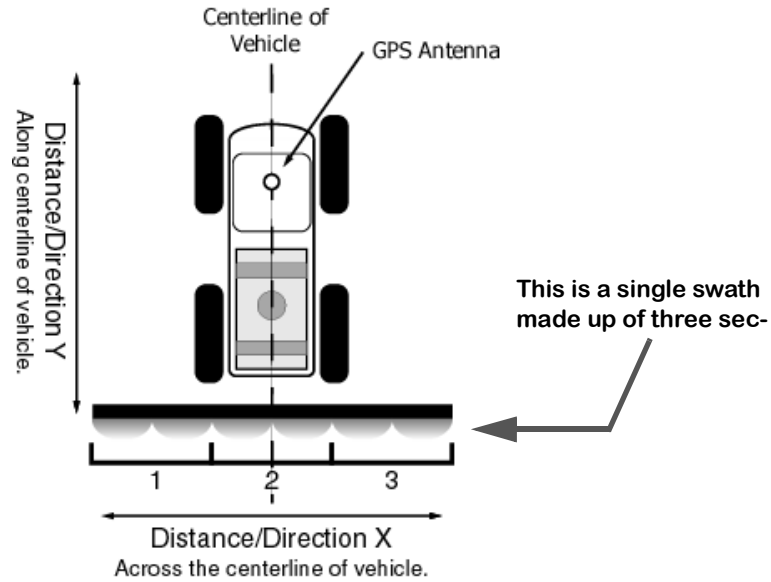


Figure 2-28: The Vehicle-Swath-GPS Antenna Relationship

Entering the Implement Width

The first page in the Implement Setup process is the implement width (Figure 2-29). This width is used for guidance purposes and is considered the distance between guidelines. This width is typically determined by the vehicle swath or spread width. Setting the Implement width slightly smaller than the actual width reduces skips. Setting the Implement width slightly larger than the actual swath width reduces overlap. Setting the implement width to a width other than the actual width reduces the accuracy of the area applied.

The Implement Width page also contains a Review Configuration button. Pressing this button brings up a page that details the current Implement configuration (Figure 2-30).

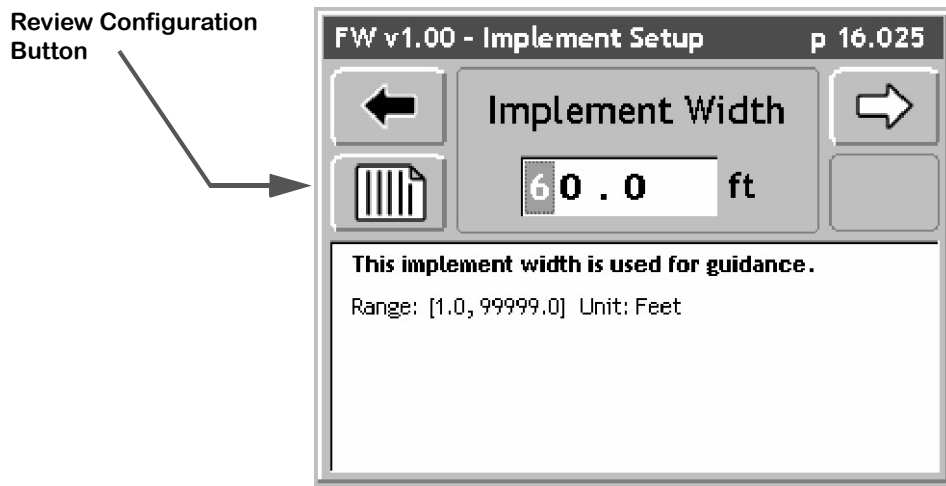


Figure 2-29: The Implement Width Page

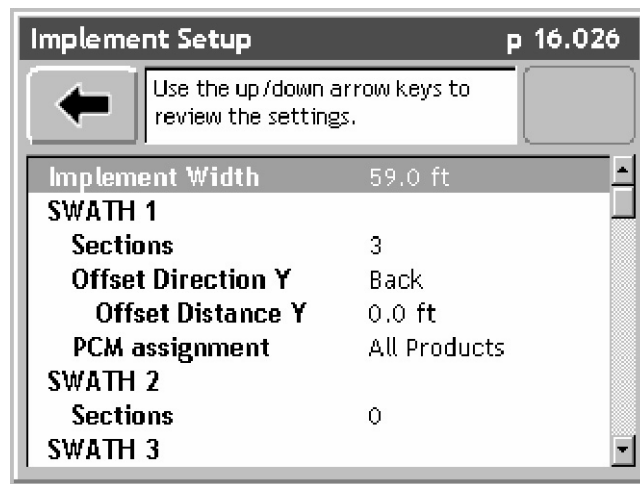


Figure 2-30: Review of Implement Configuration

Number of Swaths Page

The next page is Number of Swaths. Currently the maximum number of swaths that "Fieldware for the Legacy 6000" can handle is four. Select the desired number of swaths and press the forward arrow to move to the next Implement Setup page.

After entering the number of Swaths, the next phase of Implement Setup is setup each swath. For each Swath, set the number of sections, assign a boom switch to each section, enter the width of each section, enter the offset distance and direction to the Swath from the GPS antenna, and assign a PCM to the Swath. Implement setup loops through all of these settings for each swath. This User's Guide steps you through one swath setup.

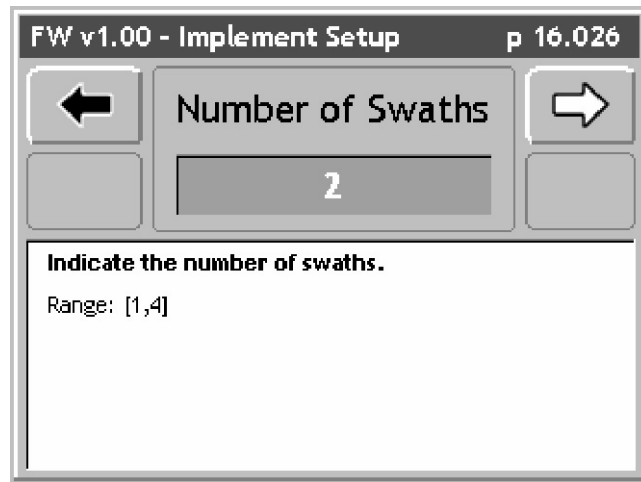


Figure 2-31: The Number of Swaths Page

Entering the Number of Sections in a Swath

The Sections page is where the number of sections are in a swath is entered. The maximum number of sections is 20 (not 20 sections per swath, 20 sections for the entire system). When the correct number of sections is entered in Swath 1, press the forward arrow button to move to the next setup page.



Swath sections are ordered left to right with respect to a forward facing vehicle. The left most section is assigned number 1 and section numbers increase moving to the right across the swath (Figure 2-28).

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Sections

3

How many sections make up swath 1?
Range: [0, 23]

Figure 2-32: The Number of Sections in Swath 1 Page

Setting the Section to Switch Assignment

The Section to Switch page allows you to assign a physical boom switch to the current Swath Section. This allows the control of individual sections. This boom section activity is properly displayed in the real-time map view as well as properly recorded in the application file (.RCD).

When the correct section to switch assignment has been entered, press the forward arrow button to move to the next setup page.



Swath sections are ordered left to right with respect to a forward facing vehicle. The left most section will be assigned number 1 and section numbers increase moving to the right across the swath (Figure 2-28).

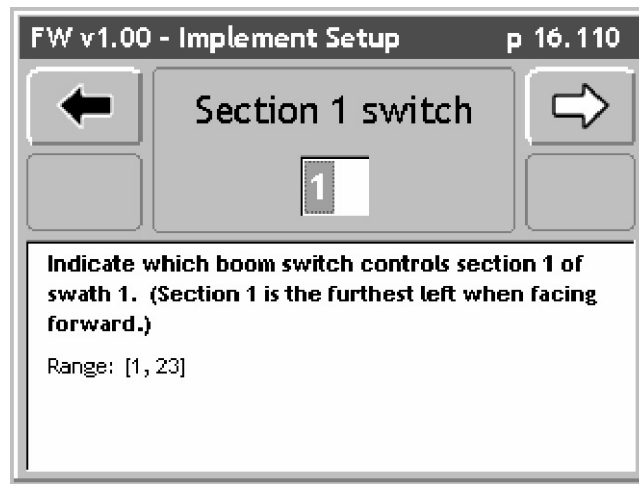


Figure 2-33: The Section to Switch Assignment Page

Entering the Section Width

The Section Width page is where the width of a section is entered. When the correct section width is entered, press the forward arrow button to move to the next setup page.

If there is more than one section for a swath, Implement setup will loop through the Section to Switch Assignment and Section Width pages for each section. This User's Guide will assume you have looped through the previous two setup pages for each section entered.

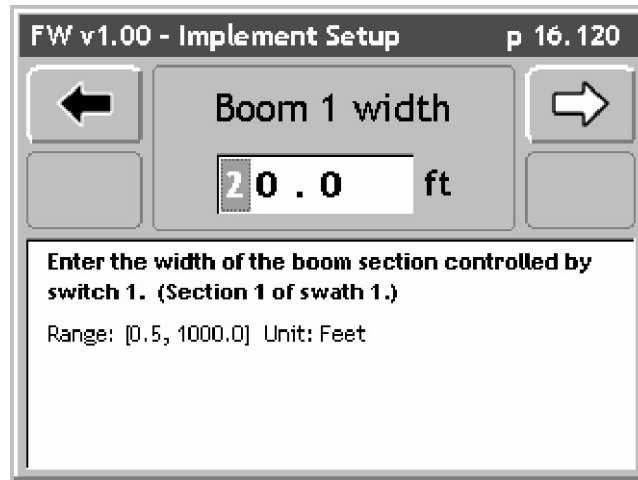


Figure 2-34: The Section Width Page

Entering the Offset Direction Y

The Y direction offset is the direction, (along the center line of the vehicle) from the GPS antenna to the center of a swath (Figure 2-35). Refer to “The Vehicle Coordinate System” on page 2-29 for a description of the offset directions and distances.

When the correct direction has been entered, press the forward arrow button to move to the next setup page

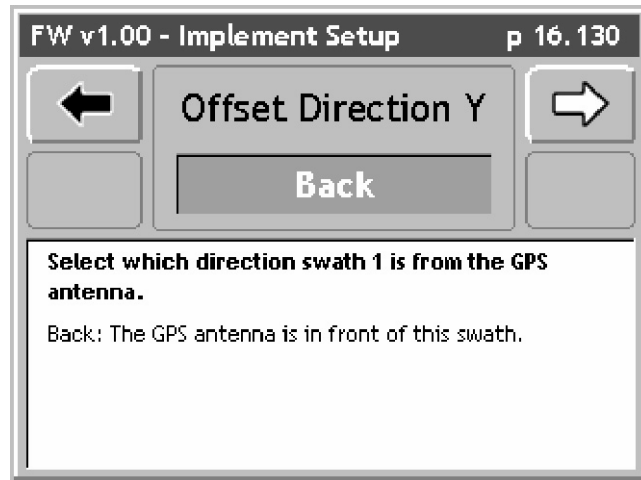


Figure 2-35: The Offset Direction Y Page

The Offset Distance Y

When the Y Offset Direction has been entered, enter the Y Offset Distance. This is the distance from the GPS antenna along the vehicle center line to the swath. Refer to “The Vehicle Coordinate System” on page 2-29 for a description of the offset directions and distances. To obtain the most accurate application files and maps, we recommend that this distance be measured and not estimated or guessed.

When the correct direction has been entered, press the forward arrow button to move to the next setup page.

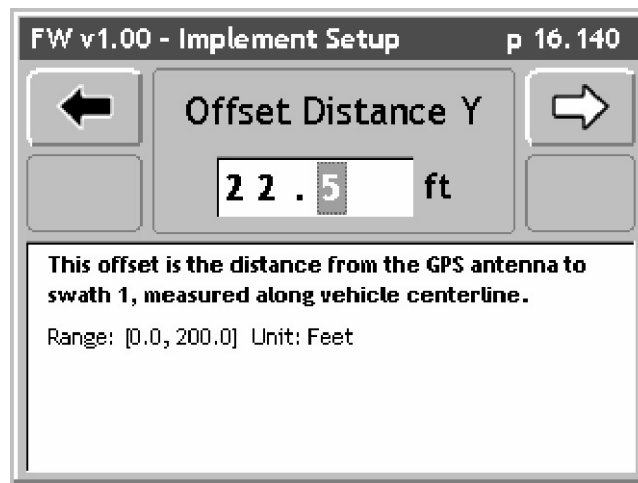


Figure 2-36: The Offset Distance Y Page

Entering the Offset Direction X

The Offset Direction X (Figure 2-37) is the direction perpendicular (left or right) of the vehicle center line that the center of a swath is offset. Typically this will be set to Centered, as most swaths are centered on the vehicle's center line. Refer to "The Vehicle Coordinate System" on page 2-29 for a description of the offset directions and distances.

If an Offset Direction X of either Right or Left is selected, the next setup page (Figure 2-38) will ask for the distance of this offset. If Centered is selected, there is no distance and therefore an input a distance is not asked for.

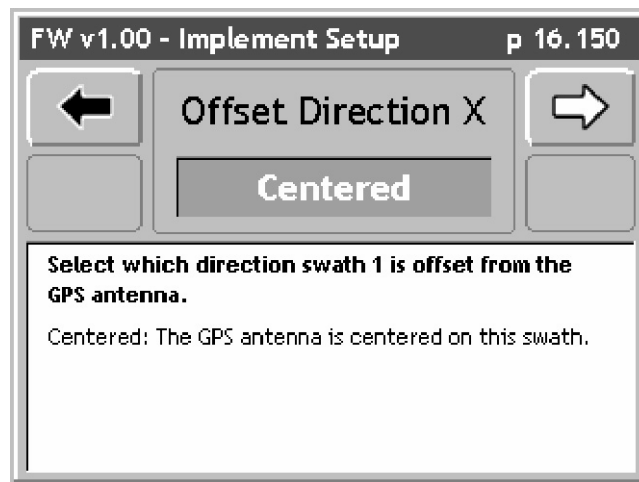


Figure 2-37: The Offset Direction X Page

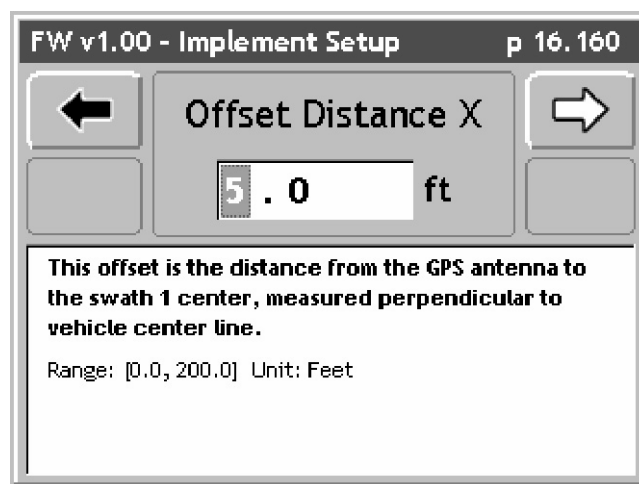


Figure 2-38: The Offset Distance X Page

Setting the PCM Assignment

The PCM Assignment page allows the assigning of a Product Control Module (PCM) to a swath or swaths. The PCM must be setup prior to assigning it to a swath. A swath can have a single PCM assigned to it or all PCMs assigned to it.

When a PCM has been assigned to a Swath, press the forward arrow button to move to the next setup page.

This completes the single swath setup. Implement Setup will loop through several of the previous setup pages based on the number of swaths entered and number of sections for each swath.

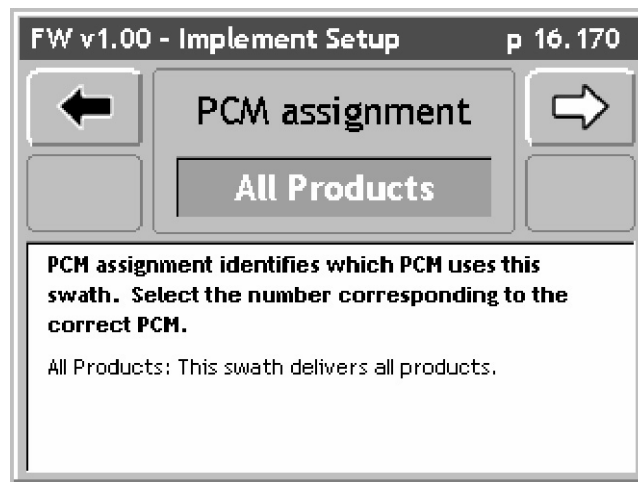


Figure 2-39: The PCM Assignment Page

Completing Implement Setup

When all swaths and sections have been properly setup, the last Implement Setup page is the Finish page. There are two buttons on the Finish page: a Review Configuration button and a Save to SSM button.

Pressing the Review configuration button will display all of the implement setup settings that have just been entered (Figure 2-30).

The Save to Switch Sense Module (SSM) button will send the current Implement configuration parameters to the Switch Sense Module.

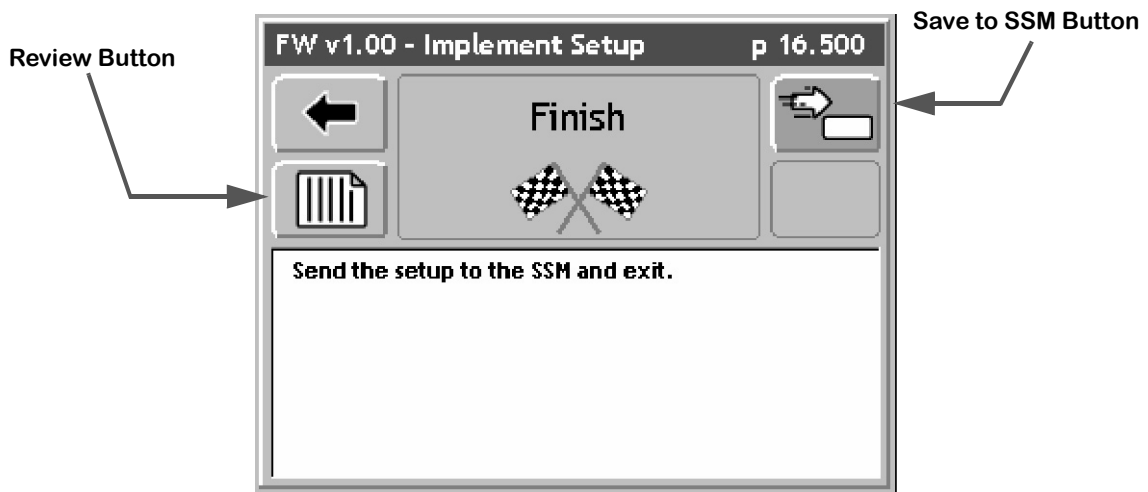


Figure 2-40: The Implement Setup Finish Page

System Tools

System Tools perform some basic system diagnostics. System Tools is accessed from the Main Launcher page (Figure 2-41). To access the System Tools launcher, press the Tools button in the Main Launcher page. The help text should say *View System Tools*. This action brings up the System Tools Launcher page (Figure 2-42). Table 2-7 below lists the current System Tools. Each tool is covered in more detail in sections below.

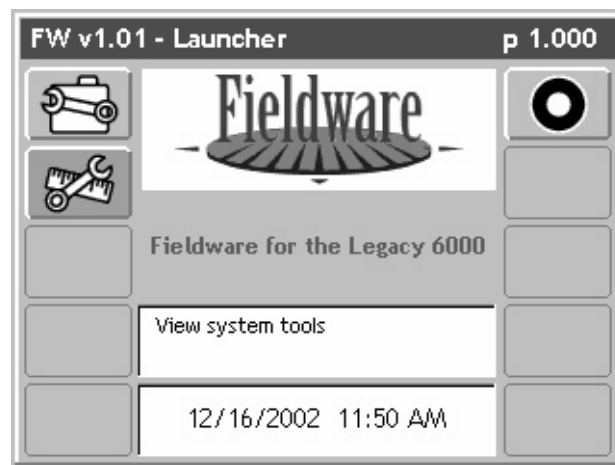


Figure 2-41: The Main Launcher

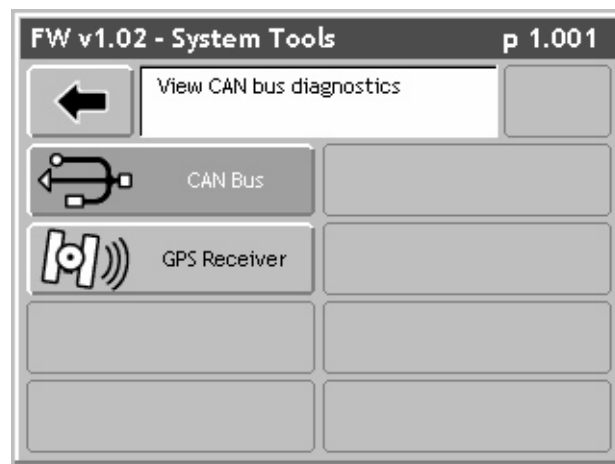


Figure 2-42: The System Tools Launcher

Tool	Description
CAN Bus	This selection allows the viewing of all components on the Mid-Tech CAN Bus. Because this is Fieldware-SA, the only components available on the CAN Bus are the Console and Lightbar.
GPS Receiver	This selection allows the viewing of incoming GPS data which helps to determine if the GPS Receiver is setup properly.

Table 2-7: System Tools

The CAN Bus Tool

This tool allows the viewing of any components connected to the Mid-Tech CAN Bus. See Table 2-8 for a complete list of CAN components.

To access the CAN Bus Diagnostic page, select System Tools from the Main Launcher page (Figure 2-41), this brings up the System Tools page (Figure 2-42). From the System Tools page select CAN Bus. This brings up the CAN Bus Module page (Figure 2-43).

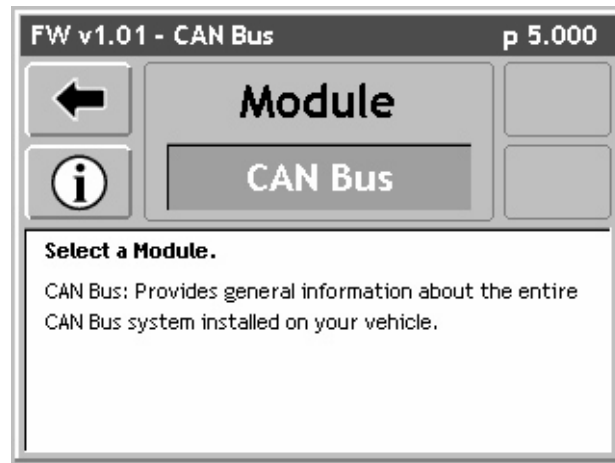


Figure 2-43: CAN Bus Module Page

From the CAN Bus Module, select a module using the up and down arrow keys. Press the enter key to view the Module Diagnostics page (Figure 2-44).

Component	Description
CAN Bus	This selection displays information about the entire CAN Bus system and which components (PCM's, Lightbar, etc.) are currently connected to the Mid-Tech CAN Bus. All of the Mid-Tech CAN modules can be reset to their factory settings.
PSM	This selection displays the current Power Speed Module (PSM) information, such as serial number and software version, certain flags set for that module, the current configuration, any real-time messages and error flags. The module software can also be updated from this page.
SSM	This selection displays the current Switch Sense Module (SSM) information, such as serial number and software version, flags set for that module, the current configuration, and any real-time messages and error flags. The module software can also be updated from this page.

Table 2-8: CAN Bus Diagnostics Components

Component	Description
PCM	This selection displays the current Product Control Module (PCM) information, such as serial number and software version. There is one PCM listing for each PCM connected to the CAN Bus. Certain flags set for that module, the current configuration, any real-time messages and error flags can be viewed. The module software can also be updated from this page.
Console	This selection displays general information about the Legacy 6000 console. To setup specific console parameters, go to System Setup and make any changes there.
Lightbar	This selection displays lightbar model number and software version. A lightbar diagnostic test can also be run from here, to make sure the lightbar is running properly.

Table 2-8: CAN Bus Diagnostics Components

Updating the Software in a CAN Module

The need may arise to update the software in a CAN module such as a PCM. A typical reason for updating a module's software is to install the latest release of the Mid-Tech CAN Bus software. A typical module update preserves all of your set-up data. Certain update situations may require that some system setups be run, when the update process is complete and power to the CAN Bus has been cycled.

To update a module at least one update file is needed on the root of a PCMCIA card. This card must be inserted in the Legacy console to perform a module update. If more than one module is being updated there will be an update file for each module. It is possible to have several update files for a single module. Select the update you want to perform. This makes it easy to go back to a previous version of module software if the need arises.

Insert the PC card into the console, go to the CAN Bus Module page, (Figure 2-43), and select the module to be updated. This brings up the module's diagnostic page, (Figure 2-44). To get to the module's flash page, from the diagnostics page, press the Module Flash button. In the module's flash page select the update file to be used in the update process. Press the Flash button to begin the updating process. There is one prompt prior to the process, asking if you want to continue. During the updating process, current information about the update process is displayed in the module's flash page.

When a module is updated it is necessary to cycle the power to the CAN Bus. If more than one module is being updated, wait until all modules are updated and then cycle power to the entire CAN Bus.

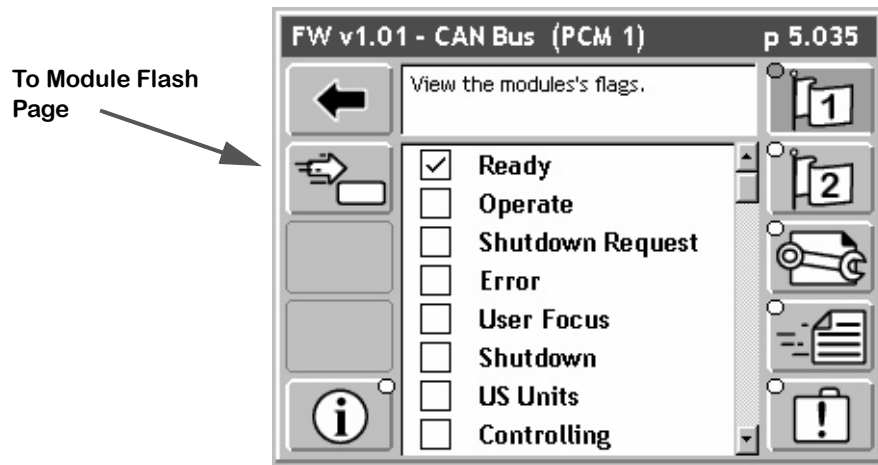


Figure 2-44: The PCM Diagnostics Page

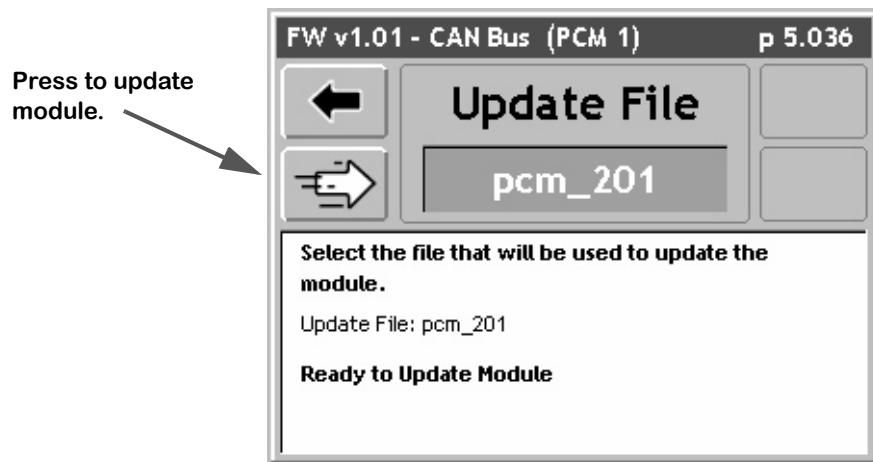


Figure 2-45: Typical Module Flash Page

GPS Tool

This tool allows the viewing of any GPS data coming into the com port on the Legacy 6000. This tool is useful when first connecting your GPS receiver to the Legacy 6000 console. It is recommended that this diagnostic be run the first time that the GPS receiver is connected to the Legacy 6000 console.

To access the GPS Receiver Diagnostic page, select System Tools from the Main Launcher page (Figure 2-41), this brings up the System Tools page (Figure 2-42). From the System Tools page select GPS Receiver. This brings up the GPS Receiver Diagnostics page (Figure 2-46).

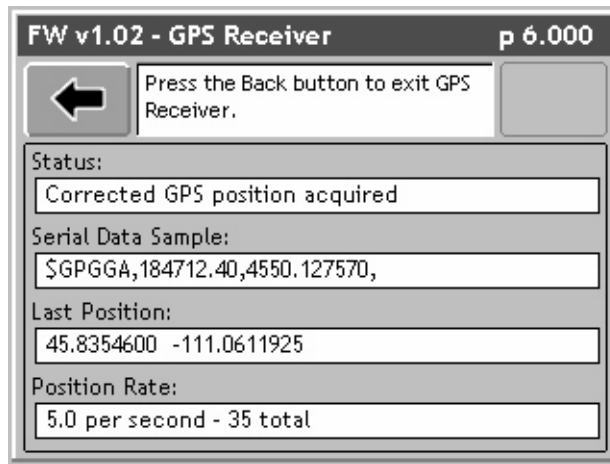


Figure 2-46: The GPS Receiver Diagnostic Page

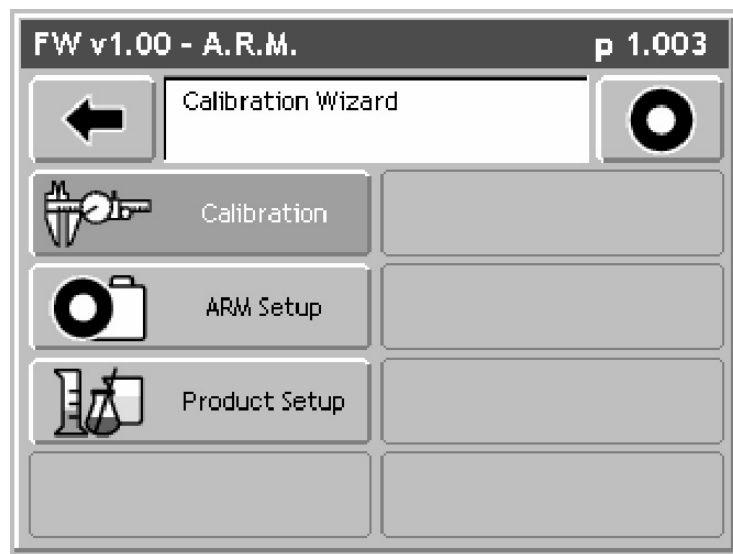
This concludes the section on Fieldware System Tools and Diagnostics for the Legacy 6000 console.

Chapter Notes

Chapter 3 - Real-time Setup

Setting up Fieldware ARM for the Legacy 6000.

Software Version 1



Operation Overview

When the System Setup process is complete (See “Chapter 2 - Getting Started” on page 2-1.), product application setup can begin. This is accomplished by pressing the ARM Bullseye located in the Fieldware Main Launcher page (Figure 3-1).

Prior to actually starting product application it is necessary to follow a short setup process. The steps in this process will vary based on how the software is setup, how many products are being applied, and most importantly whether the delivery system has been calibrated. This Chapter covers setting up Fieldware Application Rate Management (ARM) for real-time product application, guidance and mapping. When ARM is setup properly product application can begin. Prior to starting real-time product application we recommend that (See “Chapter 4 - Real-time Operation” on page 4-1.) be reviewed.

The first time through these operate setup steps will take the longest amount of time. When the system has been calibrated and are file naming and product setup is understood, these operate setup steps can be accomplished in just a minute or two. Table 3-1 outlines the operate setup steps. Each step listed in the table is described in more detail in specific sections of this chapter.



Figure 3-1: Fieldware Main Launcher



Prior to starting product application, verify that Implement Setup has been run, PCM Setup and the CAN stack is operating properly, and that all of the required files are on your PC card.


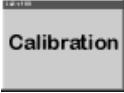




Step	Description
	<p>Job: When the ARM Bullseye button is pressed, the Job page appears. Select or create the desired job. A PC Card must be inserted in the console to store a job. Press the forward key to continue to the ARM Launcher page.</p>
	<p>System Calibration: If the delivery system (PCMs) has not been calibrated it will be necessary to do this prior to starting product application. Distance calibration can also be accomplished here. If the system is calibrated, skip this step.</p>
	<p>Job Report: If an application report will be generated when the job is complete, it will be necessary to run Job Report to enter Weather, Crop, Field and Soils information.</p>
	<p>ARM Setup: This is where all files to be generated for the current job are automatically named. There are two ARM settings: Auto Hold and System Delay. When these settings are selected, they may not need to change. If the auto-named files are satisfactory, skip ARM setup.</p>
	<p>Product Setup: Allows the assigning of a products name, density and starting quantity to a PCM. If using a prescription map, the product name can be automatically extracted from the prescription file. Five preset application rates (A-E) can also be defined.</p>
	<p>When the above steps are accomplished and the console is properly setup, begin product application by pressing the ARM Bullseye. (See “Chapter 4 - Real-time Operation” on page 4-1.).</p>

Table 3-1: Start Product Application Process

Starting a Job

Pressing the Bullseye button in the Fieldware Main Launcher brings up the Job page (Figure 3-2). If no PC card will be used and the Console Setup PC Card setting is set to NO, (see "Software Overview" on page 4-2), no Job number is asked for (see "No PCMCIA Card Setup" on page 4-6). A PC card is necessary in order to have a job number and save files.

Each Job created with a unique job name has an associated file folder placed in the ARM folder on the inserted PC card. All data files associated with a job is stored in this folder on the PC card.

There are three methods for entering/selecting a job name.

Selecting an Existing Job

From the Job page (Figure 3-2), select an existing Job by using the up and down arrow keys. An existing Job has an associated file folder located on the PC card. The name of the job folder is the same as the job name.

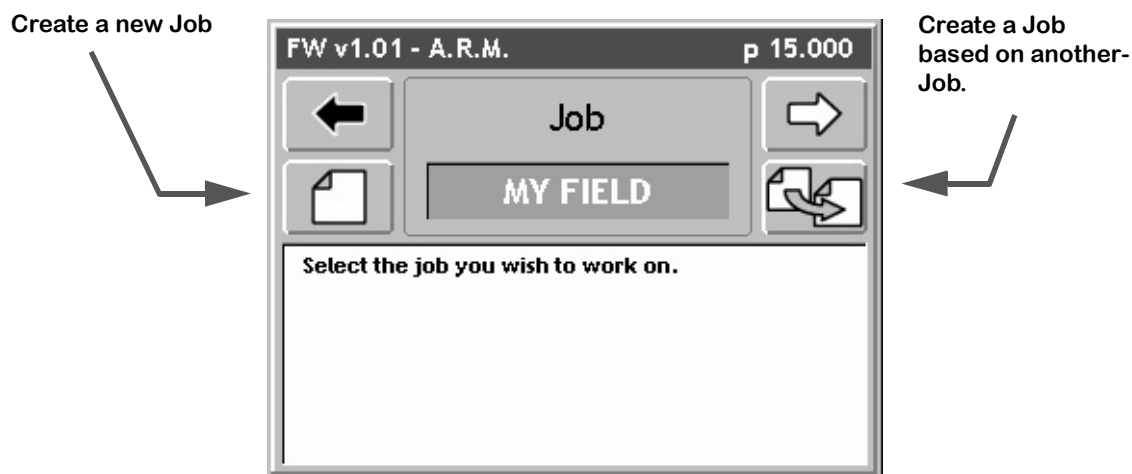


Figure 3-2: The Job Page

Creating a Job Based on an Existing Job

A new job can be created based on the settings of an existing job. To do this, select the desired job in the main Job page window and press the Create a Job button in the Job page. Manually enter a new job name or let the system auto-name the job.

Creating a New Job

To create a new job, press the Create Job button in the Job page. This brings up the Create a Job page. There are two methods of creating a job: manually and automatically.

Manually Naming a Job

To manually name the job, press the Manual Job Name button on the Job page. This brings up the New Job Name page (Figure 3-3). Using the arrow keys enter the name of your job. It is not necessary to use all numbers in the job name. It can contain alpha-numbers characters. When the desired job name is entered, press the Forward Arrow to save the name and return to the Job page.

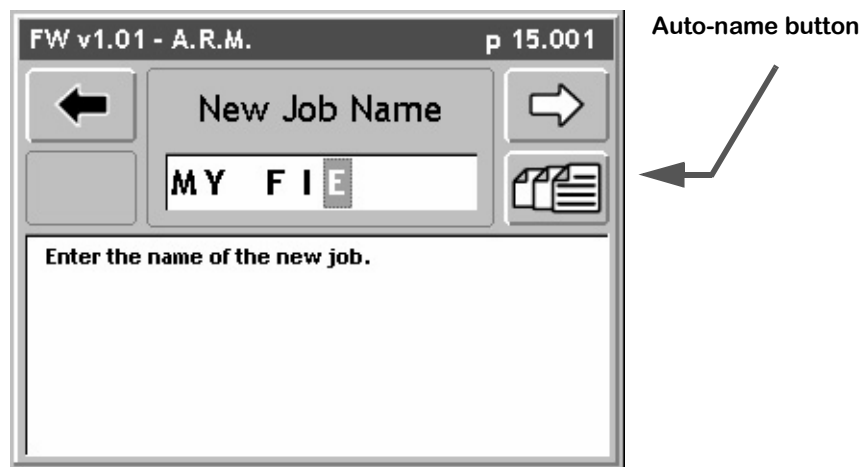


Figure 3-3: The Job Name Page

Automatically Naming a Job

The second method to create a job is to press the Auto-name button in the Create Job page. This will name the job based on the current date followed by the number that job is for the day. Therefore the first job on November 21st 2002 would automatically be named 11212002-1. The second job for the same day would be named 11212002-2.

No PCMCIA Card Setup

If no PC Card is setup in Console setup there is no prompt for a Job name when starting ARM. Instead the opportunity is given to reset some product related volumes and area totals (Figure 3-4), (Table 3-2).

Settings	Description
None	No volume or area totals stored in the PCM will be reset.
Total Reset	This will reset the field area, field volume and total volume stored in all PCMs to zero.
Field Rest	This will reset the field area and field volume stored in all PCMs to zero.

Table 3-2: The Rest Page Settings

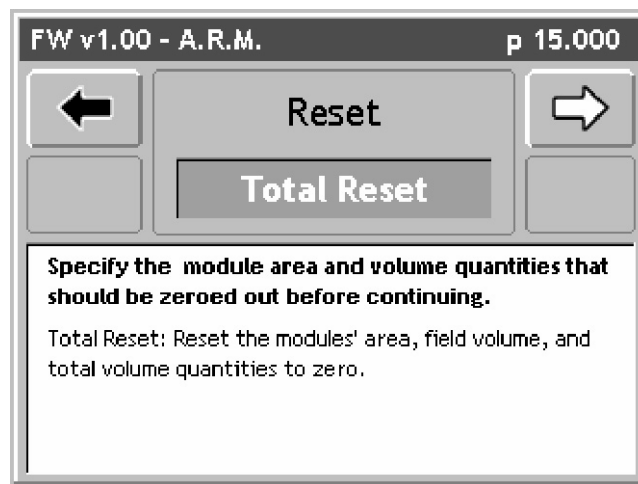


Figure 3-4: The Reset Page

ARM Launcher

When the appropriate Job name has been selected, press the Forward Arrow in the Job page to move to the ARM Launcher page (Figure 3-5). Several applications can be launched from this page that are required prior to starting up real-time product application. Each real-time setup application is discussed in detail below.



Figure 3-5: The ARM Launcher Page

No PCMCIA Card Setup

If the PC Card setting in Console Setup is set to NO, the ARM Launcher looks slightly different. Because no data is stored to the PC cards there is no need to name any files or setup any report information that would be stored in the (.RCD) file. Therefore the Job Report application will not be included, and any file selections in ARM Setup will not be included.

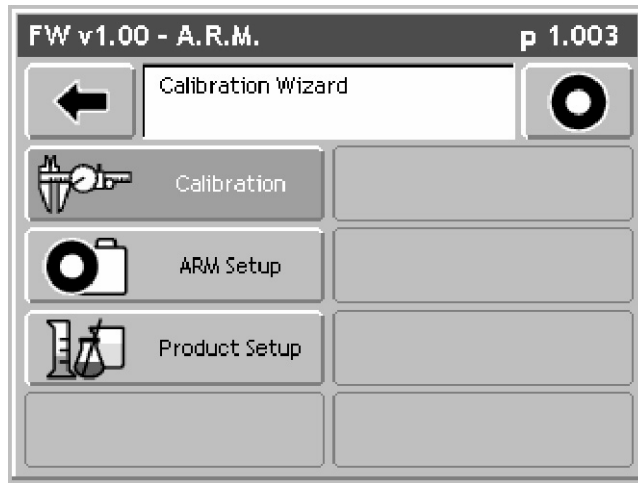


Figure 3-6: ARM Launcher (No PC Card)

Performing a Calibration

Introduction

This section describes the sensor calibration procedures that are required prior to performing accurate product application. Each sensor calibration is discussed in detail below, and each follows a wizard step by step process. The “Fieldware for the Legacy 6000” is capable of performing the following calibrations:

Distance/Speed, Liquid Pressure, Granular, Liquid Based Flow meter, NH3 Flow meter, Seeder.

All calibrations (except status monitors) result from a comparison of an actual value and a reported value. Calibration units are based on the units selected in PCM Setup. Prior to calibration, the PCM must be setup using PCM setup.

Selecting a Calibration Process

The first page in the calibration process is the Select Calibration page (Figure 3-7). The desired calibration is selected from a list of available calibration procedures. The Calibration application determines the type of control system each PCM is setup as. From this it determines which, of all of the Fieldware calibration procedures, is the appropriate procedure for your product application. For example, if two PCMs are setup as Liquid application types, the Granular calibration procedures are not available in the Calibrate pick-list.

Select the desired calibration and press the Forward Arrow to save and move to the next calibration page.



The PCM number that the calibration is associated with precedes the calibration name, E.G. PCM 1 - Granular indicates that a granular calibration process will be performed on PCM #1.

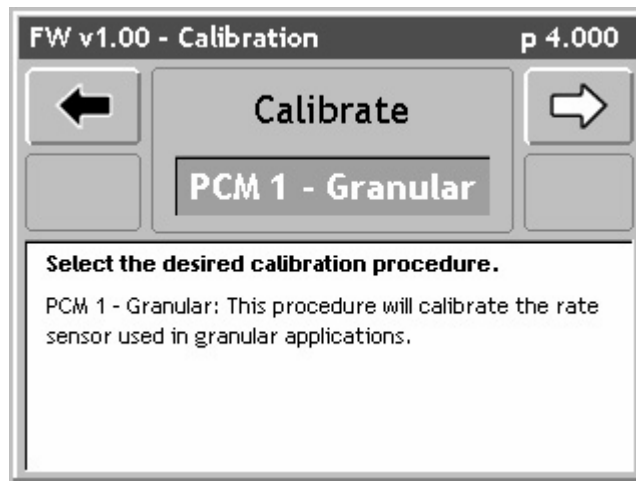


Figure 3-7: The Select Calibration Page

Distance/Speed Calibration

The Distance/Speed calibration process is used to calibrate a wheel speed sensor. This procedure contains five wizard pages and can be completed in as little as 6 button presses, not including entering the actual/measured distance.

In the Calibrate page(Figure 3-7), select the Distance/Speed calibration from the pick list and press the Forward Arrow button to begin the distance/speed calibration process. The first page is the Reported Distance page

Drive the Measured Distance

Typically a specific distance is measured and the start and end points are marked. A minimum distance of 300 feet is recommended.

The measured distance can be driven several times in order to use an average distance in the calibration process. Line up at the start of the known distance and press the Vehicle button (Figure 3-8). The button starts flashing. Drive the length of the known distance. When the vehicle stops at, or passes, the end point, press the Vehicle button again. The button should stop flashing. This records one distance. If the known distance is to be driven again, simply repeat the same steps. The calibration process keeps track of the number of times the known distance is driven and computes the average. Each time the known distance is driven, the updated average is displayed in the Reported distance dialog window. When ready to enter the actual (known) distance value, press the Forward Arrow to move to the next page.

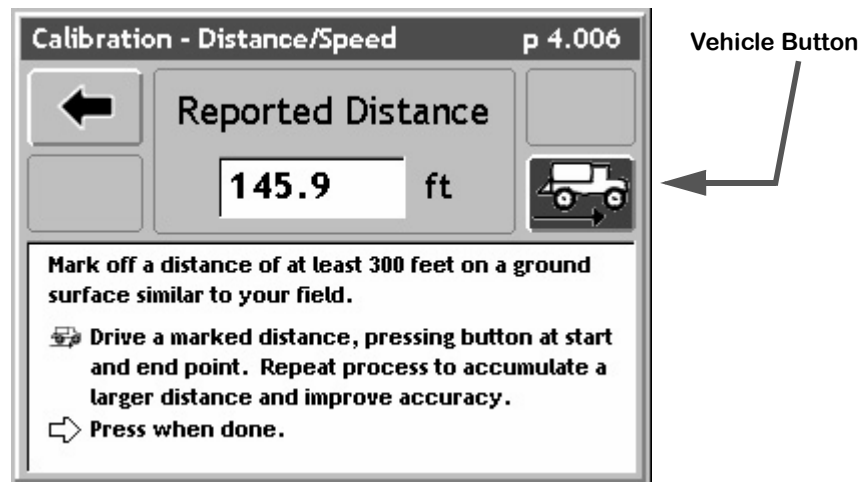


Figure 3-8: Driving the Known Distance

Entering the Known Distance

When the desired calibration distance has been driven, the next step is to enter the known distance value, (Figure 3-9). Enter the known distance using the console arrow keys. When the known distance is entered press the Forward Arrow button to advance to the next page.

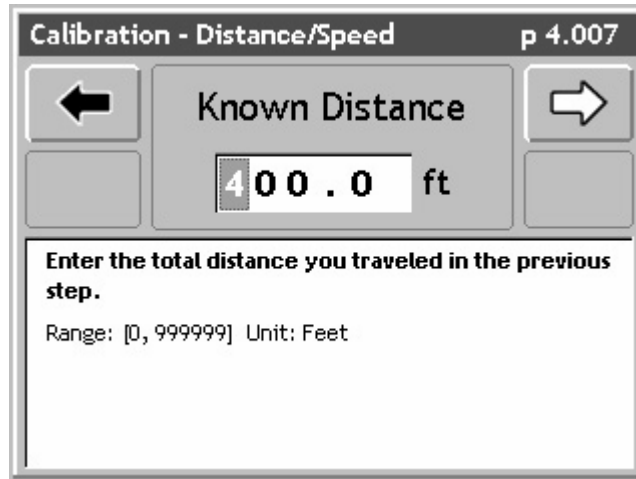


Figure 3-9: Entering the Known Distance

Applying the Calibration

When the known distance has been entered, the next step is to apply the calibration. This page (Figure 3-10) displays the distance driven (reported distance) and known distance (measured distance). If these numbers look reasonable, press the Forward Arrow to apply the calibration and move to the next page. The results of the calibration are displayed on the next page.



To abort the calibration procedure at this point, press the Back Arrow button. This defaults the Power Speed Module (PSM) to the original calibration value, and returns to the previous calibration page.

The screenshot shows a screen titled "Calibration - Distance/Speed" with a page number "p 4.008" in the top right corner. The screen is divided into several sections. At the top, there are two buttons: a left-pointing arrow on the left and a right-pointing arrow on the right. Below these buttons, the text "Reported Distance" is followed by the value "407.6 ft". Below that, the text "Known Distance" is followed by the value "400.0 ft". At the bottom of the screen, there is a text box containing the following instructions: "The Reported Distance measured by the module versus the Known Distance. Press the Next button to apply the new calibration ratio and move to the next page."

Figure 3-10: Applying the Calibration

Accepting the Calibration

When the calibration has been applied, the Calibration page (Figure 3-11) displays the calibrated distance and the known distance. This allows the operator to determine if the calibration was successful. If satisfied with the calibration results, accept the calibration by pressing the Forward Arrow button. This brings up the initial Select Calibration page (Figure 3-7). Accepting the calibration automatically updates the PSM. This concludes the Distance/Speed calibration process

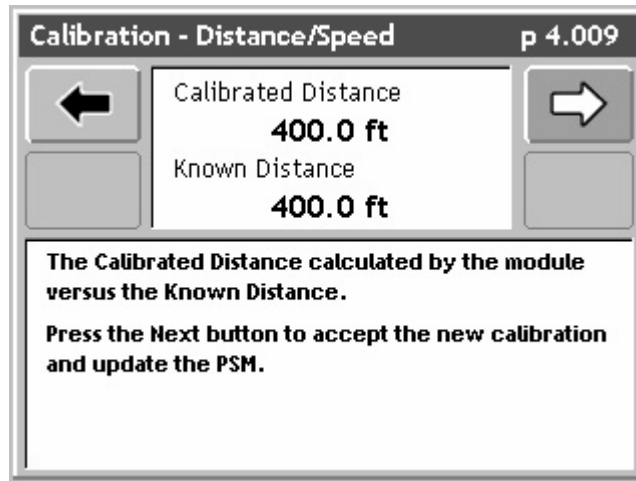


Figure 3-11: Accepting the Calibration Results

The Common Calibration Procedure

The calibration procedure for the application types Granular, Liquid Flow Based, NH3, and Seeder, share the same basic calibration steps, see (Figure 3-12). Each procedure has the option of performing a Static or In-Field calibration.

Because the calibration steps are the same for several application types, the application type Granular will be used as a calibration example. These steps can be applied to your specific application type.

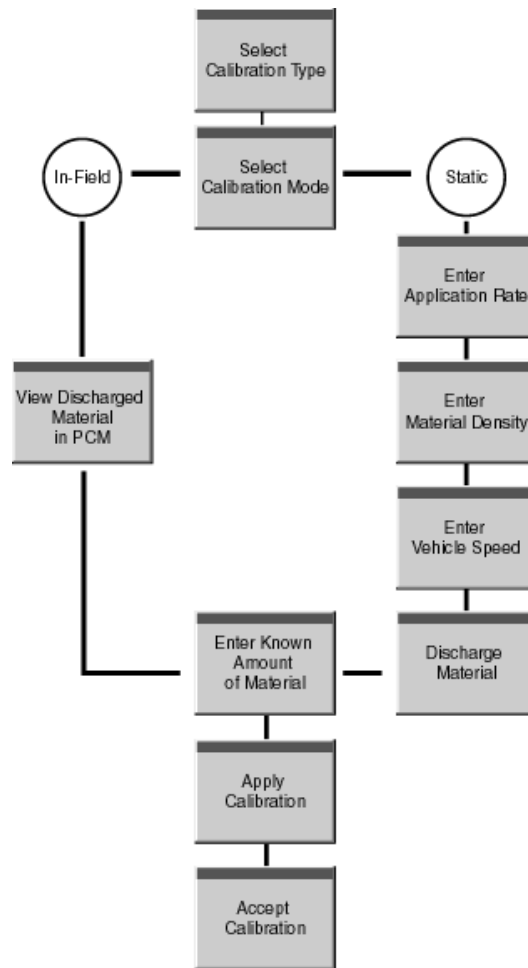


Figure 3-12: Typical Calibration Process

Granular Static Calibration

This section covers the Static Granular calibration process. This calibration process follows the flow diagram described in Figure 3-12, and has two modes; Static and In-Field. Static calibration is intended to be done in a controlled environment, such as back at the plant or dealership. The In-Field calibration is intended to be accomplished after the operator has finished applying a field and knows the amount of material discharged during that application.

Selecting the Granular Calibration Procedure

The first step is to select the granular calibration for the appropriate PCM, from the Calibrate pick list.

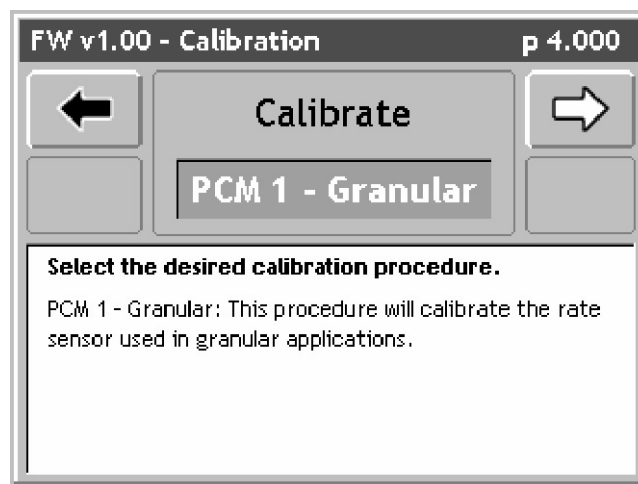


Figure 3-13: Selecting the Granular Calibration Procedure

Calibration Mode

Select calibration mode; Static or In-Field. Static is selected for this example.

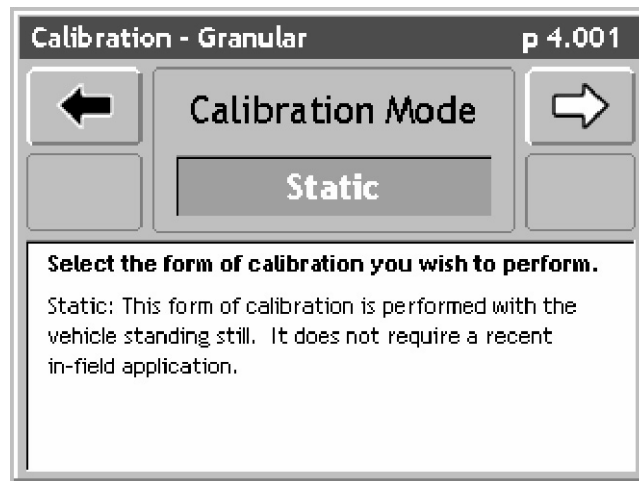


Figure 3-14: Selecting Calibration Mode

Application Rate

Enter the Application Rate. The units for the Application Rate are taken from PCM setup Units.

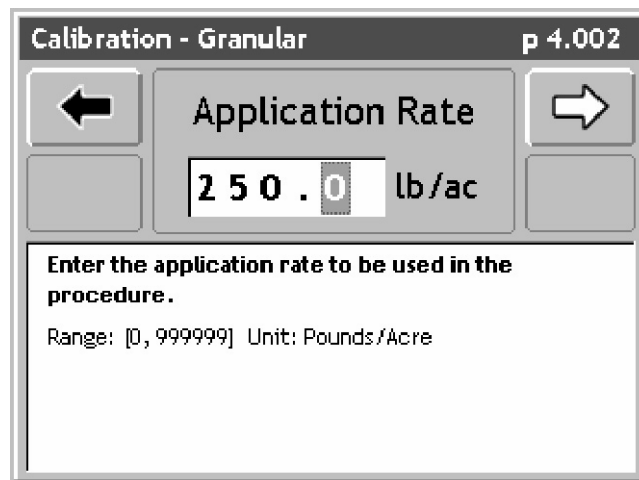


Figure 3-15: Entering the Application Rate

Material Density

Enter the Material Density.

Calibration - Granular p 4.003

← Material Density →

65.0 lb/ft3

Enter the material density to be used in the procedure.
Range: [0, 999999] Unit: Pounds/Cubic Foot

Figure 3-16: Entering the Material Density

Vehicle Speed

Enter the Vehicle Speed. It is recommended that the average vehicle speed for applying that material be used.

Calibration - Granular p 4.004

← Vehicle Speed →

15.0 MPH

Enter a vehicle speed to be used in the procedure.
This speed should represent the average speed that will be used in the actual product application.
Range: [0, 999999] Unit: Miles/Hour

Figure 3-17: Entering Vehicle Speed.

Discharging Material

To discharge material, turn swaths off at the boom switch and zero out the current indicated discharge by pressing the Zero out button (Figure 3-18). Turn the swath and sections on to begin discharging material. The indicated discharge value in this dialog should begin increasing. When the desired amount of material has been discharged, turn the swath switches off (Figure 3-19). Press the Forward Arrow to save indicated discharge and move to the next calibration page.

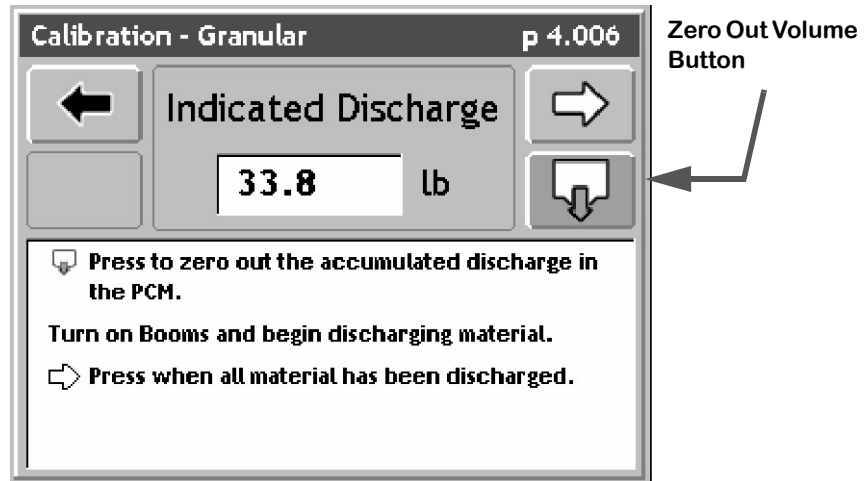


Figure 3-18: Discharging Material

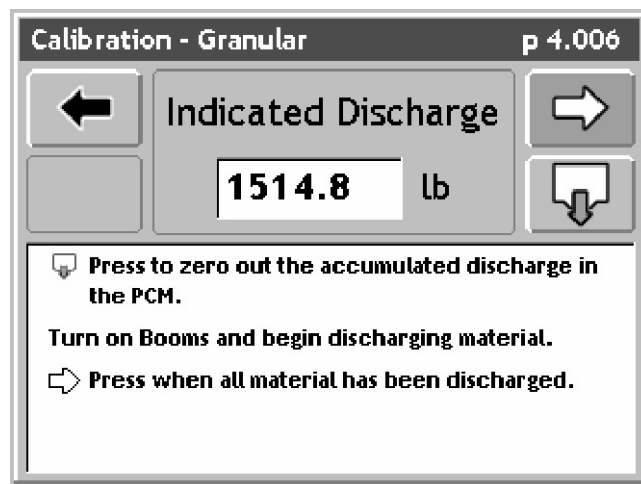


Figure 3-19: Discharging Material Completed

Actual Volume

Enter the Actual (known) Volume discharged, using the arrow keys on the Legacy 6000 console (Figure 3-20). Press the Forward Arrow to advance to the next page.

Calibration - Granular p 4.007

← Actual Discharge →

1500.0 lb

Enter the actual amount of material discharged.
Range: [0, 999999] Unit: Pounds

Figure 3-20: Entering the Actual Volume Discharged

Applying the Calibration

This page shows the Indicated vs. Actual Volume. If satisfied with the values displayed in this page, press the Forward Arrow to apply the new calibration.

Calibration - Granular p 4.008

← Indicated Discharge →

1514.8 lb

Actual Discharge

1500.0 lb

The Indicated Discharge measured by the module versus the Actual Discharge.
Press the Next button to apply the new calibration ratio and move to the next page.

Figure 3-21: Applying the Calibration

Accepting the Calibration

The new calibration has been applied to the indicated value. If the values in this page are satisfactory, press the Forward Arrow to accept the calibration. If not satisfied with the new calibration, either press the Back Arrow until the routine exits, or the page is reached, where the indicated value can be zeroed and the material discharged again. You could also finish running this calibration, even though you are not satisfied, and then rerun the calibration process making any necessary changes to achieve a proper calibration value for your sensor.

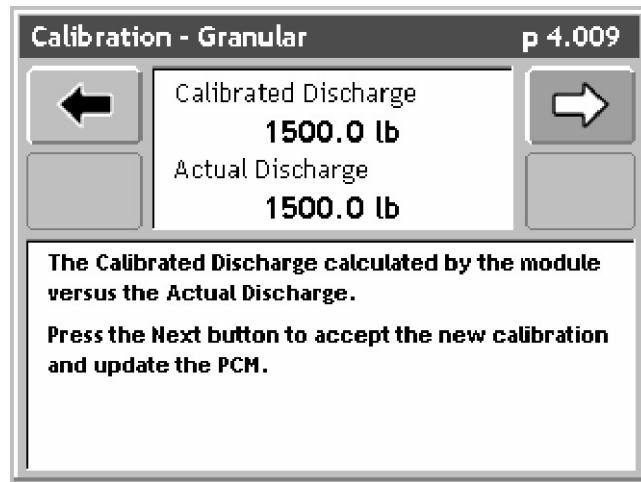


Figure 3-22: Accepting the Calibration

Pressing the Forward Arrow to accept the calibration brings back the first Calibration page (Figure 3-13). From there the calibration routine can be exited or another routine started. This completes the static calibration process for a Granular application

Granular In-Field Calibration

This calibration is performed in field. The operator knows the actual amount of material discharged in a field and wants to perform a calibration when the field is completed.

Select Granular Calibration Procedure

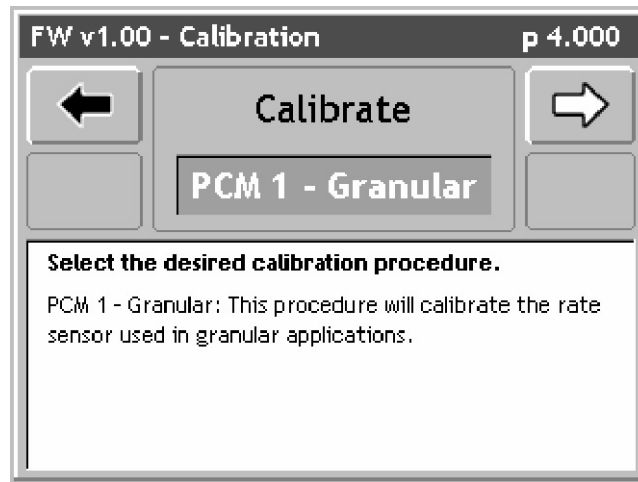


Figure 3-23: Selecting the Calibration Procedure

Select In-Field Calibration Mode

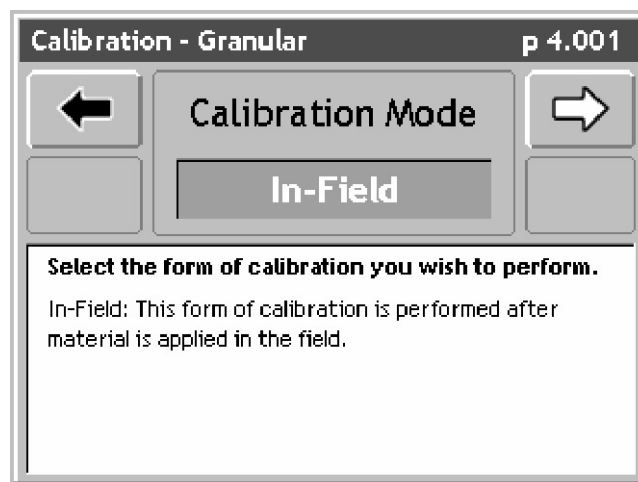


Figure 3-24: Selecting the Calibration Mode

Viewing the Indicated Amount of Material Discharged

This page displays the amount of material discharged as stored in the PCM. This value should be the amount of material discharged during the field application. It is assumed that the operator zeros out the PCM prior to discharging in the field and does not zero out the PCM prior to starting the In-Field Calibration.

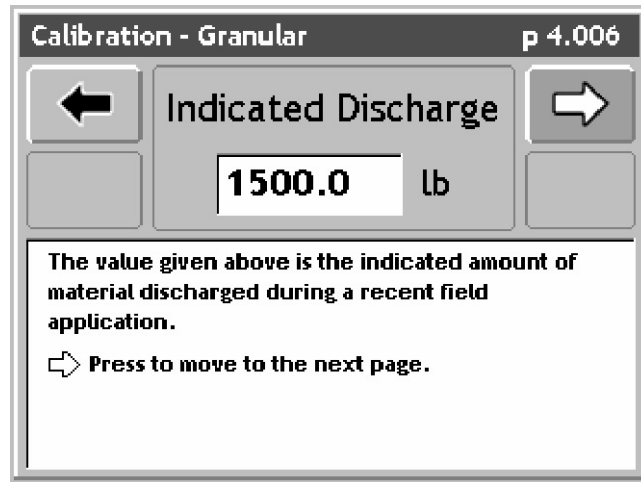


Figure 3-25: Discharging Material

Entering the Actual Amount of Material Discharged.

Using the arrow keys on the Legacy 6000 console, enter the actual amount of material discharged. Press the Forward Arrow to advance to the next page.,

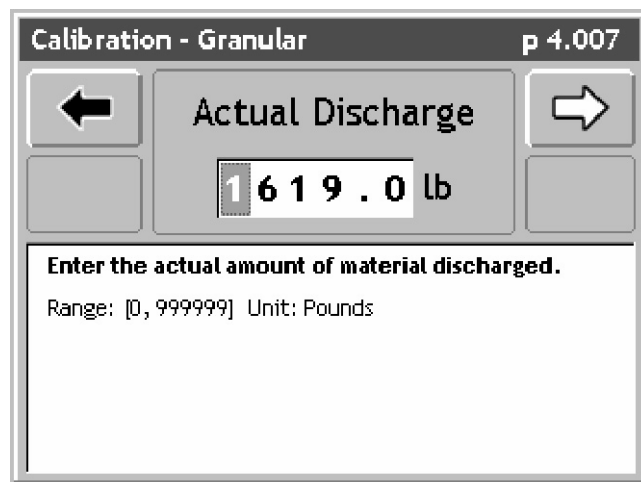


Figure 3-26: Entering the Actual Amount of Material Discharged

Apply the New Calibration Ratio

Review the indicated vs. Actual values. If these number are satisfactory, press the Forward Arrow to apply the calibration and advance to the next page.

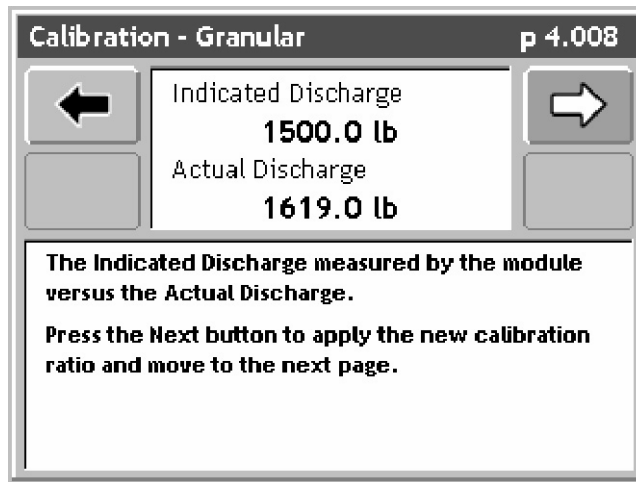


Figure 3-27: Applying the Calibration

Accepting the New Calibration

If satisfied with the calibration results, press the Forward Arrow to accept the calibration and send the new calibration value to the PCM.

This completes the In-field Granular calibration process.

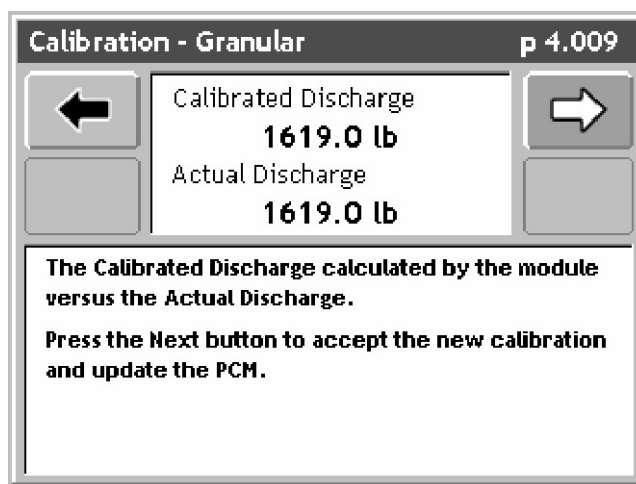


Figure 3-28: Accepting the New Calibration

Entering Job Information

A Job Report contains all the necessary information to build an application report after the job is completed. Application reports are generated in the Fieldware Map Manager desktop program.

Job Report is accessed from the ARM Launcher page (Figure 3-29). Select the Job Report tab and move to the Main Job Report Page (Figure 3-30). Table 3-3 describes each Job Report menu item.



It is not necessary to fill out any Job Report information in order to start applying products. The Job Report Information should be filled out if it is desired to write this data to the header of the record file (.RCD).

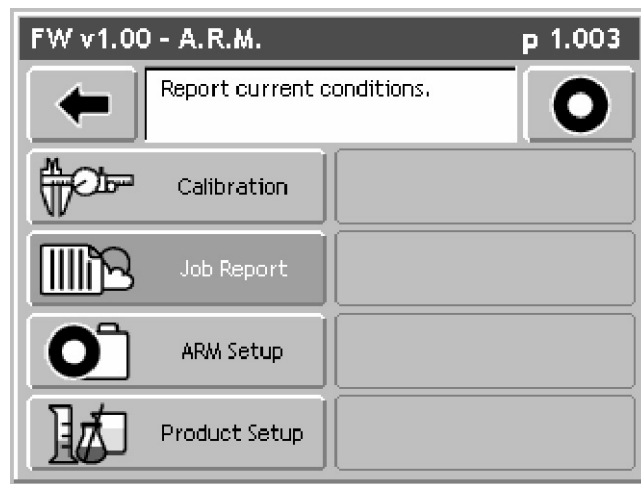


Figure 3-29: ARM Launcher

Item	Description
Wind Speed	Enter the observed Wind Speed. Units are based on the Units set in Console Setup. If no wind speed is to be entered, set this to NO.
Wind Direction	Enter the observed Wind Direction from the following directions NE, E, SE, S, SW, W, NW, N and Not Observed.
Temperature	Enter the observed Temperature. Units are based on the Units set in Console Setup. If no temperature is to be entered, set this to NO.
Current Weather	Select the appropriate weather condition from the following conditions: Sunny, Cloudy, Partly Cloudy, and Not Observed.

Table 3-3: Job Report Item Descriptions

Item	Description
Soil Moisture	Select the appropriate Soil Moisture from the following conditions: Dry, Moist, Wet, and Not Observed.
Soil Texture	Select the appropriate Soil Texture from the following textures Fine, Medium Course, and Not Observed.
Soil Tillage	Select the appropriate Soil Tillage from the following conditions: No Till, Min Till, Conv Till, and Not Observed.
Soil Condition	Select the appropriate Soil condition from the following conditions: Good, Trashy, Smooth, Rough, and Not Observed.
Crop Name	Enter the name of the Crop.
Growth Stage	Select the appropriate Growth Stage from the following stages Pre-Plant, Pre-Emergence, Post Emergence, and Not Observed.

Table 3-3: Job Report Item Descriptions

Running the Job Report Wizard

The Main Job Report page contains every Job Report item in a list. The top item in the list is the Job Report Wizard. The Job Report Wizard steps through the entire Job Report item list. If any of the Job Report Items are not needed, set that item field to Not Observed.

Figure 3-31 through Figure 3-40 illustrates the Job Report wizard.

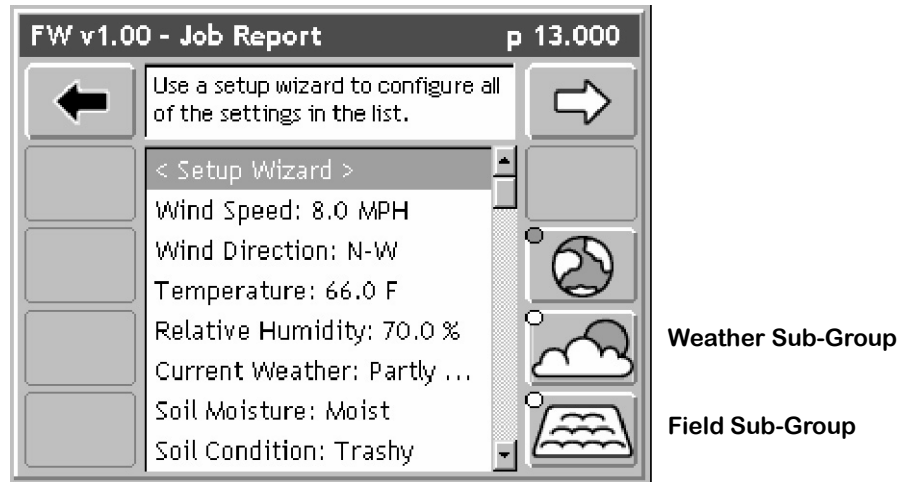


Figure 3-30: The Main Job Report Page

Enter the Wind Speed

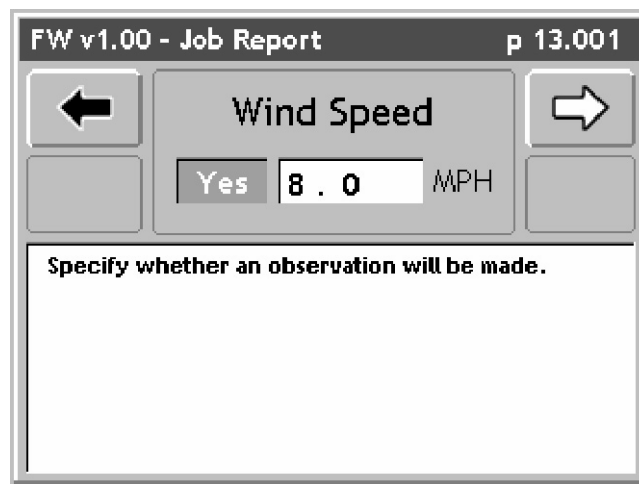
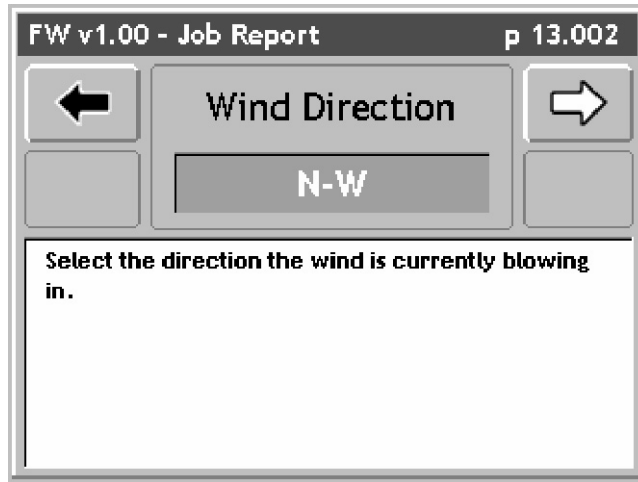


Figure 3-31: Job Report Wind Speed Page

Enter the Wind Direction



FW v1.00 - Job Report p 13.002

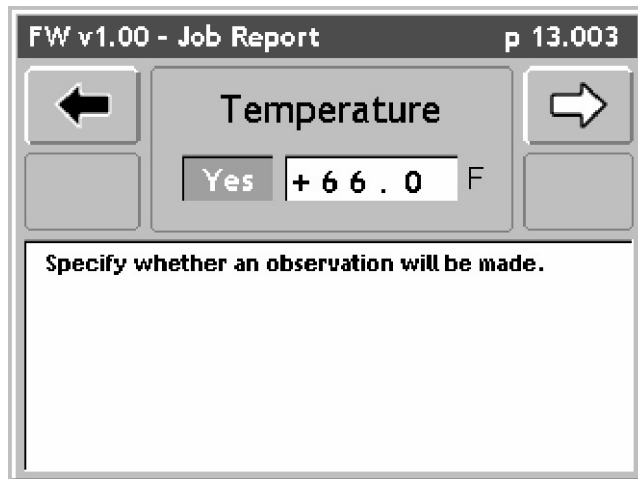
← Wind Direction →

N-W

Select the direction the wind is currently blowing in.

Figure 3-32: Job Report Wind Direction

Enter the Temperature



FW v1.00 - Job Report p 13.003

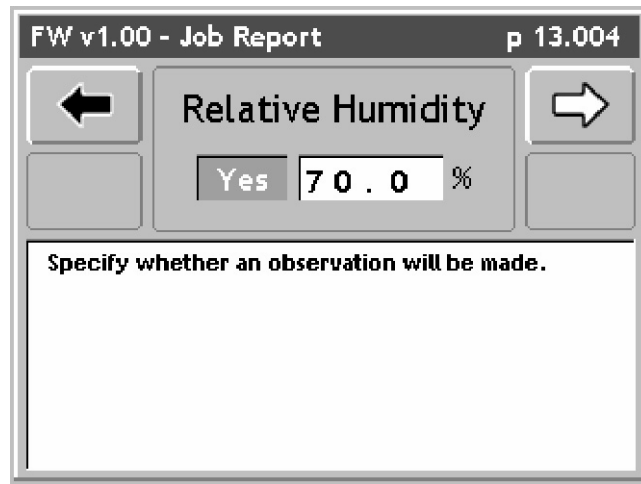
← Temperature →

Yes + 6 6 . 0 F

Specify whether an observation will be made.

Figure 3-33: Job Report Temperature

Enter the Relative Humidity



FW v1.00 - Job Report p 13.004

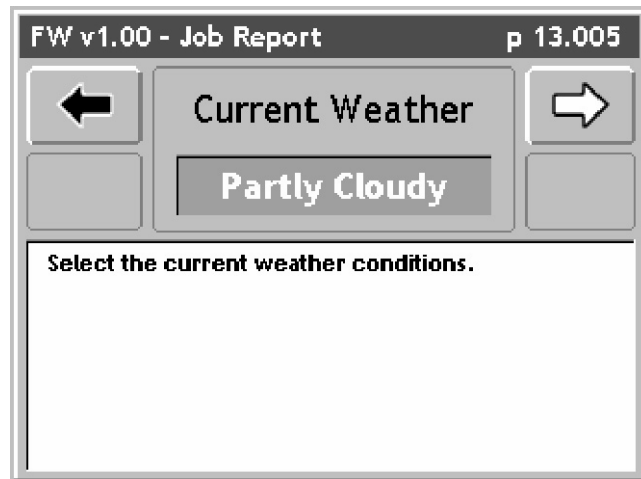
← Relative Humidity →

Yes 70.0 %

Specify whether an observation will be made.

Figure 3-34: Job Report Humidity

Select the Current Weather Condition



FW v1.00 - Job Report p 13.005

← Current Weather →

Partly Cloudy

Select the current weather conditions.

Figure 3-35: Job Report Current Weather

Select the Soil Moisture

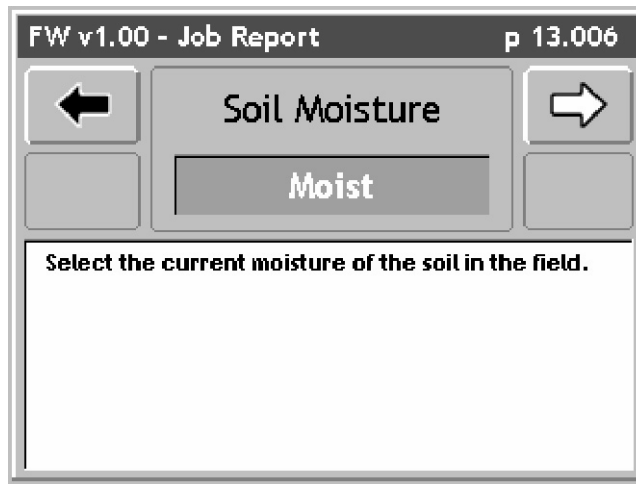


Figure 3-36: Job Report Soil Moisture

Select the Soil Condition

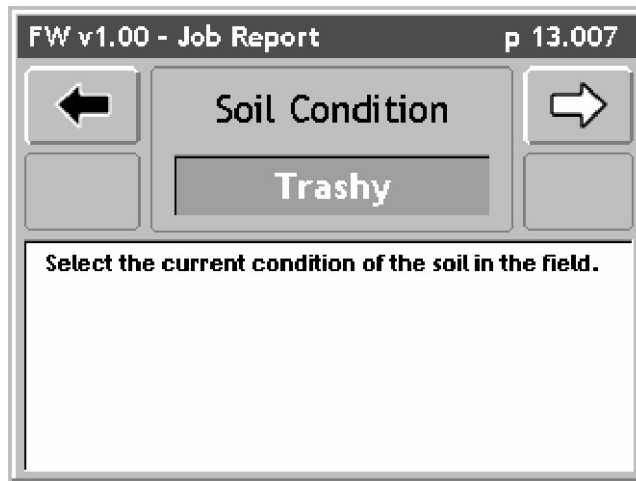


Figure 3-37: Job Report Soil Condition

Select the Soil Texture

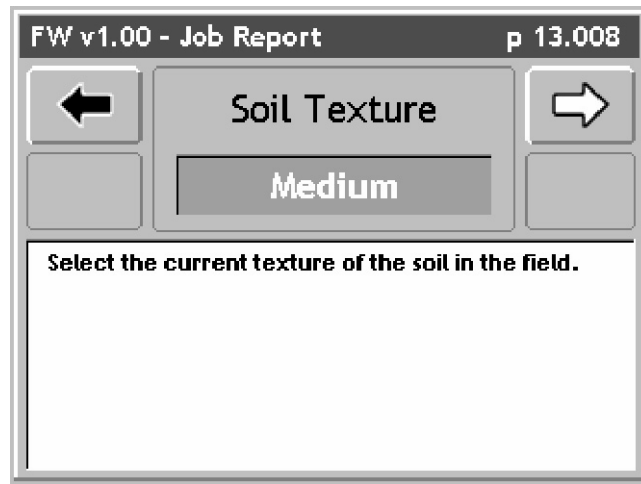


Figure 3-38: Job Report Soil Texture

Select the Soil Tillage

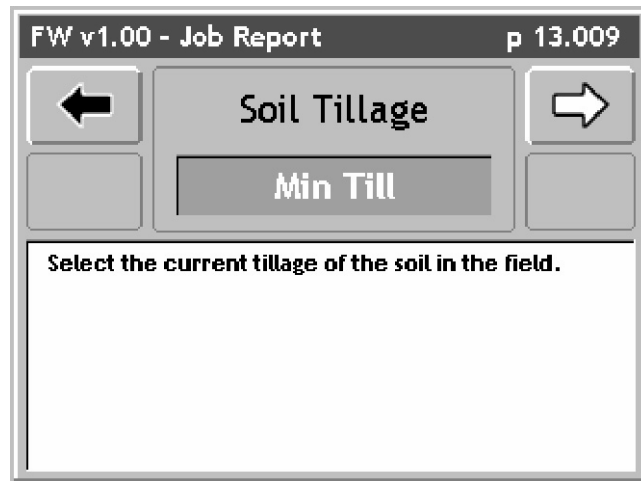


Figure 3-39: Job Report Soil Tillage

Select the Growth Stage

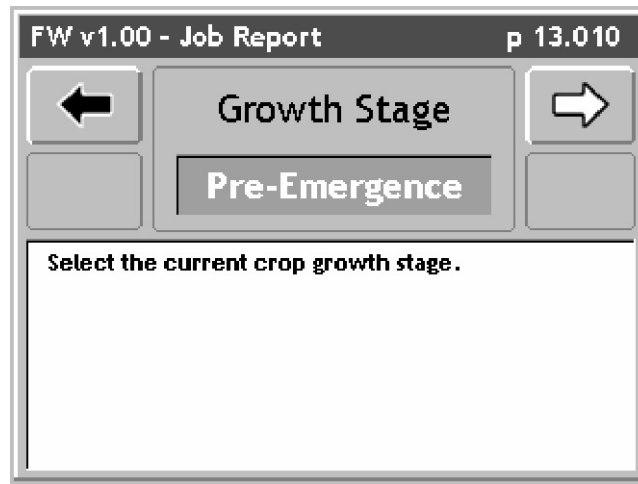


Figure 3-40: Job Report Growth Stage

This completes the Job Report Wizard. Pressing the Forward Arrow from the Growth Stage page returns the screen to the Main Job Report page (Figure 3-30). To save the Job Report information, press the Forward Arrow. This returns the screen to the ARM launcher page.

Running ARM Setup

ARM Setup handles all data file names as well as a few product application parameters. To run ARM Setup, select the ARM Setup tab in the ARM Launcher page (Figure 3-41). This brings up the Main ARM Setup page (Figure 3-42).

When ARM is first started, it asks the operator to enter/select a job name (see "Starting a Job" on page 4-4). This job name is used to automatically name all of the job related files.

Table 3-4 lists all of the ARM Setup items and their descriptions.

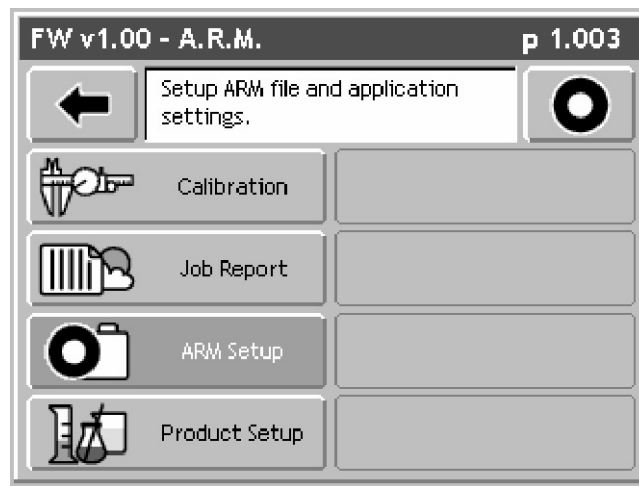


Figure 3-41: The ARM Launcher Page

Setup Item	Description
Record File (.RCD)	The spray trajectory data for a particular PCM/product application is stored in the Record file. The Record file contains rate, spray on and spray off data, and report data entered in the Job Report, as well as total boom width information. This file can be imported into the <i>Fieldware Map Manager</i> program where an application report can be generated. Maps of a (.RCD) file are known as "as applied" maps.
Guideline File (.GLN)	The Guideline file contains all information required to reconstruct the guidelines created and used during product application. This file can contain multiple guidelines in any orientation and can contain guidelines for any application task.
Map File (.GMF)	A Map file is used to store additional field features which might be necessary to locate during product application.

Table 3-4: ARM Setup Items

Setup Item	Description
Boundary File (.BND)	The Boundary file can be used to show an existing field boundary or create a new field boundary. Mapping the filed boundary provides valuable area information.
Auto Hold	Auto Hold has two options: Center of Full Swath and Ends of Full Swath, each allows the controller to automatically turn spray activity off when the vehicle drives over a previously applied area. Center of Full Boom requires that the center of the boom be in an already applied area. Ends of Full Boom requires that the left end, right end and center of the boom be in an already applied area. Both options use the System Delay to compute the position of the boom.
System Delay	The System Delay is the number of seconds that the <i>ARM</i> program looks out in front of the vehicle. Based on the vehicles trajectory and this system delay value, the <i>Application Rate Management</i> program can determine where the vehicle is with respect to the prescription map. By looking out in front of the vehicle, the <i>ARM</i> program can identify the required rate for an upcoming prescription map region and notify the rate controller of any changes. This can help minimize lag times in the product delivery system when changing product rates. A value of two seconds is recommended.
GSO Speed	The Ground Speed Override (GSO) Speed is a desired minimum speed. When the vehicle speed drops below the GSO Speed, the GSO Speed is used. When the vehicle speed increases above the GSO Speed, then the vehicle speed is used.

Table 3-4: ARM Setup Items

Running the ARM Setup Wizard

The Main ARM Setup page is the page seen when ARM Setup is first entered. The ARM Setup page contains every setup item in a list. From this list each ARM Setup item can be edited individually or the ARM Setup Wizard can be run. The top item in the list is the Setup Wizard. To run the Setup Wizard, highlight <Set Up Wizard> in the main list and press the enter key. The Setup Wizard will walk through the entire ARM Setup item list.

Figure 3-44 through Figure 3-51 step through the entire ARM Setup wizard.

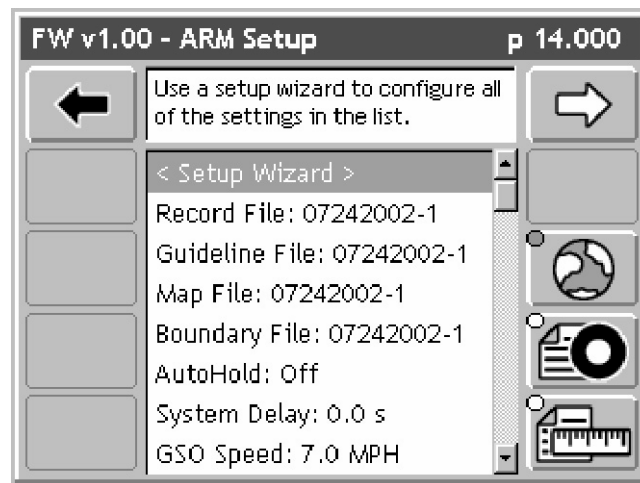


Figure 3-42: The Main ARM Setup Page

No PCMCIA Card Selected

If you have the PC Card setting in Console setup set to NO, the ARM Setup main page looks slightly different (Figure 3-43). All ARM setup items related to files and naming files are omitted from the main page.

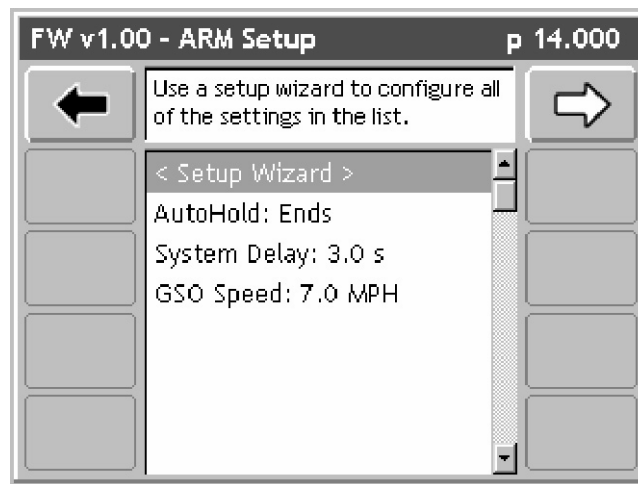


Figure 3-43: The Main ARM Setup Page with NO PC Card

Select / Enter a Record File

The Record file name defaults to the Job name (Figure 3-44) with file extension (.RCD). If the job name is not used for this file name a new Record file name can be entered using the arrow keys on the Legacy 6000 console. To use an existing Record file, press the Folder button. The Folder button brings up a filename dialog from which an existing Record file can be selected (Figure 3-45). When the desired file has been selected, press the Forward Arrow to return to the Record File Wizard page. Press the Forward Arrow again to advance to the next wizard page.

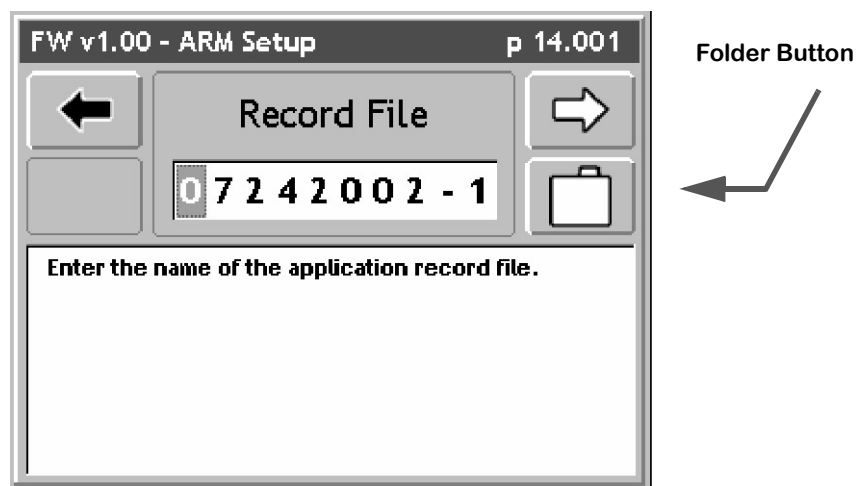


Figure 3-44: The ARM Setup Record File Page

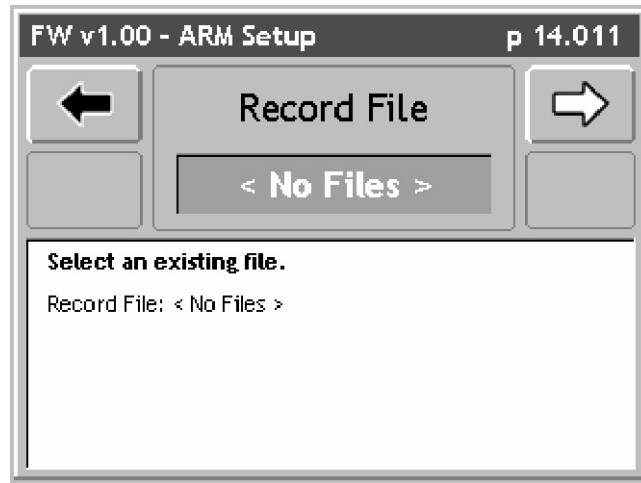


Figure 3-45: The Select Existing Record File Page

Select Enter a Guideline File

The Guideline file name defaults to the Job name with file extension (.GLN) (Figure 3-46). If the job name is not used for this file name a new Guideline file name can be entered using the arrow keys on the Legacy 6000 console. To use an existing Guideline file press the Folder button. The Folder button brings up a filename dialog from which an existing Guideline file can be selected. When the desired file has been selected, press the Forward Arrow to return to the Guideline File Wizard page. Press the Forward Arrow again to advance to the next wizard page.

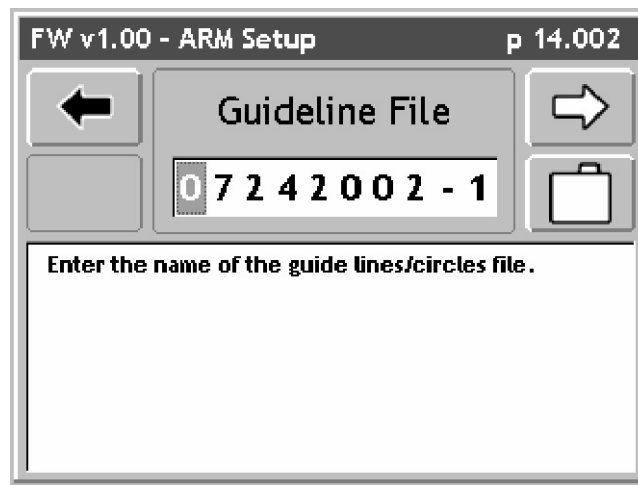


Figure 3-46: The ARM Setup Guideline File Page

Selecting / Entering the Map File

The Map file name defaults to the Job name (Figure 3-47) with file extension (.GMF). If the job name is not used for this file name, a new Map file name can be entered using the arrow keys on the Legacy 6000 console. To use an existing Map file press the Folder button. The Folder button brings up a filename dialog from which an existing Map file can be selected. When the desired file has been selected, press the Forward Arrow to return to the Map File Wizard page. Press the Forward Arrow again to advance to the next wizard page.

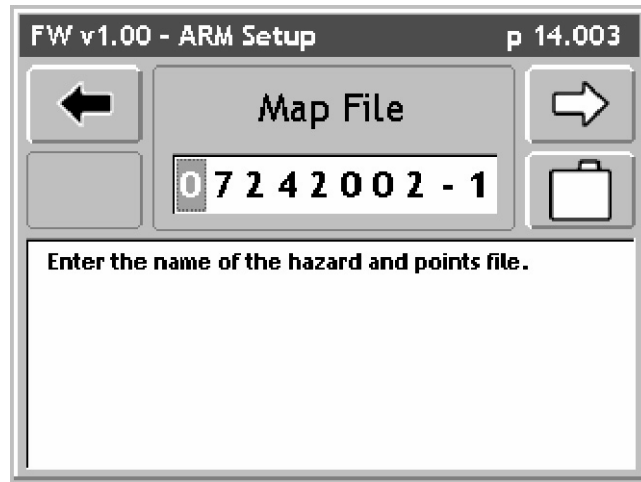


Figure 3-47: The ARM Setup Map File Page

Selecting / Entering the Boundary File

The Boundary file name defaults to the Job name (Figure 3-48) with file extension (.BND). If the job name is not used for this file name, a new Boundary file name can be entered using the arrow keys on the Legacy 6000 console. To use an existing Boundary file press the Folder button. The Folder button brings up a filename dialog from which an existing Boundary file can be selected. When the desired file has been selected, press the Forward Arrow to return to the Boundary File Wizard page. Press the Forward Arrow again to advance to the next wizard page.

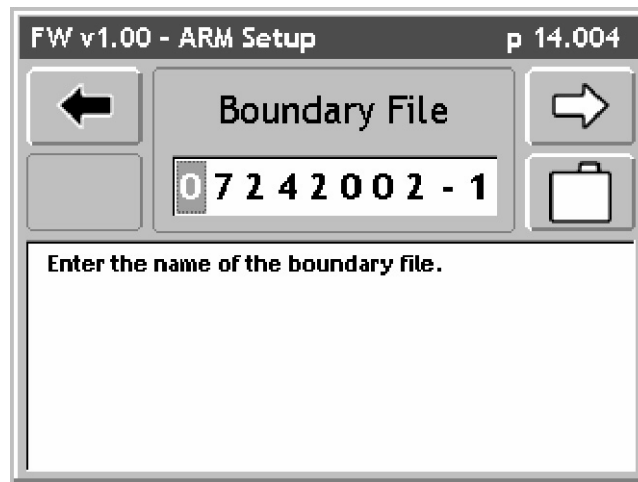


Figure 3-48: The ARM Setup Boundary File Page

Select the Desired Auto Hold Setting

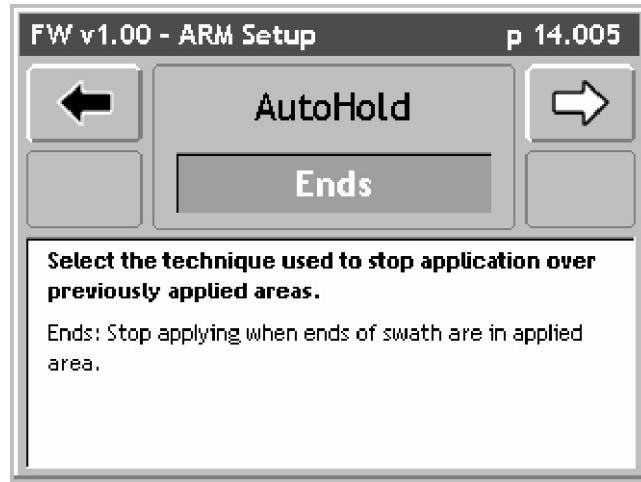


Figure 3-49: The ARM Setup Auto Hold Page

Enter the System Delay Value

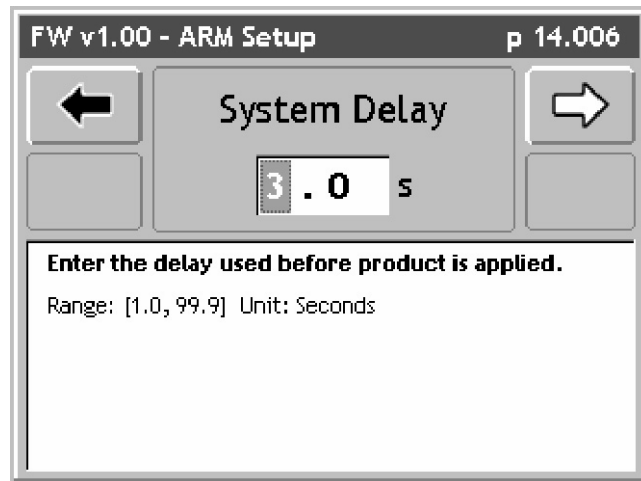


Figure 3-50: The ARM Setup System Delay Page

Enter The GSO Speed

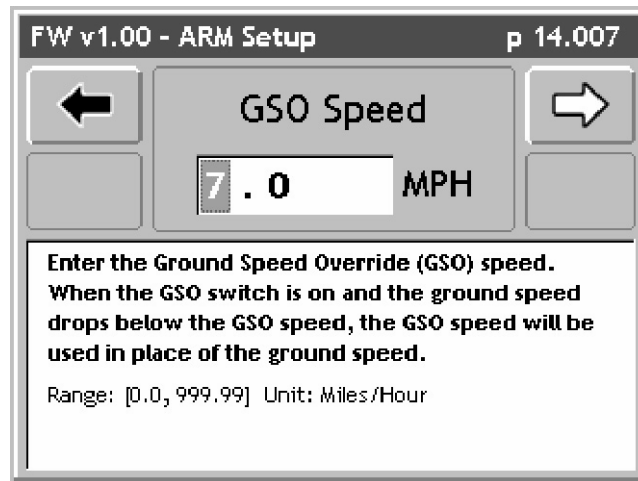


Figure 3-51: The ARM Setup GSO Speed Page

This completes the ARM Setup Wizard. Pressing the Forward Arrow in the GSO Speed page brings up the Main ARM Setup page (Figure 3-42). To save the ARM Setup information, press the Forward Arrow. This returns to the ARM Launcher page (Figure 3-41).

Running Product Setup

Product setup is used to associate a product to a Product Control Module (PCM), as well as setup preset product application rates. To run Product Setup, select the Product Setup tab in the ARM Launcher page (Figure 3-52). This brings up the Select PCM page (Figure 3-53).

Table 3-5 lists all of the Product Setup items and their descriptions.



Figure 3-52: The ARM Launcher Page

Setup Item	Description
In Use	Defines whether the currently selected PCM is used in product application. Choose Yes or No.
Prescription	If doing Variable Rate product application, select the prescription file (.ARM) that contains the prescription information for that PCM. The (.ARM) file must be on the root of the PC card, and the PC card must be inserted into the Legacy 6000 console. If not doing variable rate, then leave this setting at <None>.
Layer	Some prescription files (.ARM) can contain several products in a single file. A single product is associated to a single PCM. In a multiple product prescription file it is necessary to set which product layer is associated with the currently selected PCM. If there is only one product layer in the (.ARM) file, this setup item is automatically set to layer 1 and this page is skipped in the Product Setup wizard process.

Table 3-5: Product Setup Item Descriptions

Setup Item	Description
Product	Product Setup contains a product data base containing approximately 4000 product names and their associated EPA number. A product name can be selected from this setup page. If using a prescription map (.ARM), product setup automatically extracts the product name from the (.ARM) product layer. In the Product page select <From Map> setting.
Product Density	The density of the product being applied.
Calibration	If this is a new job the calibration number is retrieved from the PCM. You can change the calibration number here if desired. When starting ARM, this cal number is compared to the cal number in the PCM. If they are different you will be prompted to select which cal number to operate with.
Initial Quantity	The initial quantity in the tank/bin/hopper. The ARM software keeps track of the amount of product remaining and displays this in the Real-time Products page.
Rates A - E	The ARM software allows 5 preset application rates to be selected. These rates can be accessed in the Real-time page and over-ride the current rate.

Table 3-5: Product Setup Item Descriptions

The Select PCM Page

The Select PCM page (Figure 3-53) displays all PCMs that are setup and running when Product Setup is entered. Product setup must be run for each PCM to be used in the application process. Select the desired PCM to begin the Product Setup process for that PCM.



Figure 3-53: The Select PCM Page



If a PCM that is already setup is not going to be used in real-time product application, it is recommended that PCMs In Use setting is set to No.

Running the Product Setup Wizard

When the PCM has been selected, the first page in Product Setup is the Main Product Setup page. The Main Product Setup page contains every setup item in a list. From this list each Product Setup item can be edited individually or the Product Setup Wizard can be run. The top item in the list is the Setup Wizard. To run the Setup Wizard, highlight <Set Up Wizard> in the main list and press the enter key. The Setup Wizard walks through the entire Product Setup item list.

Figure 3-55 through Figure 3-67 step through the entire Product Setup wizard. Refer to Table 3-5 for a description of each Product Setup item.

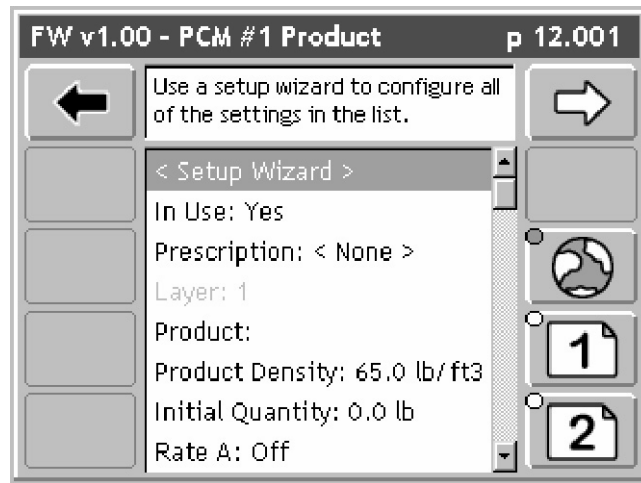


Figure 3-54: The Main Product Setup Page

Set PCM

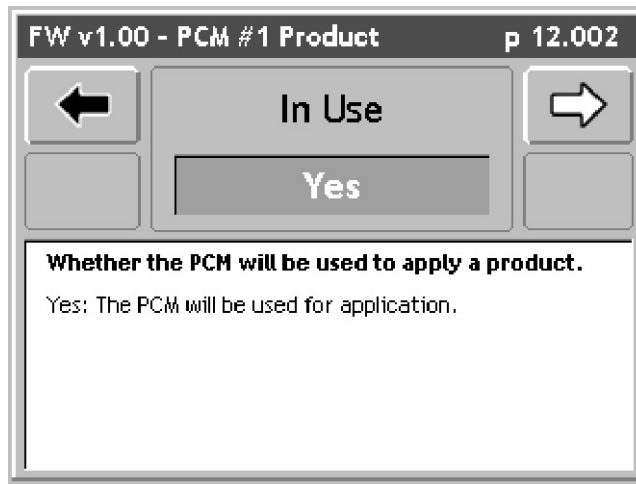


Figure 3-55: The Product Setup In Use Page

Select Prescription Map

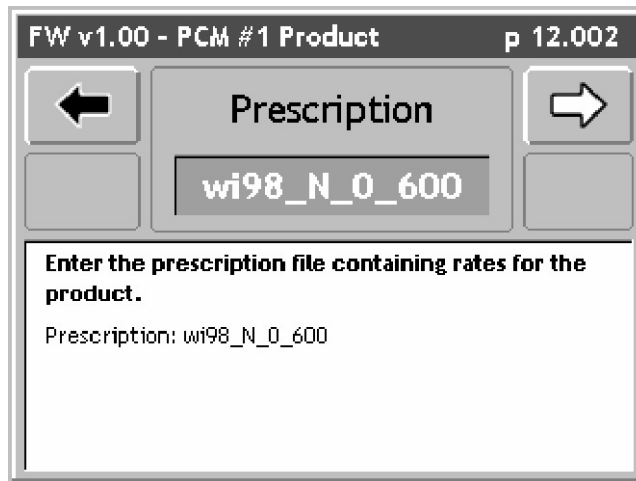


Figure 3-56: The Product Setup Prescription Map Page

Select the Prescription Map Layer

If Variable Rate product application is not being done, it will not be necessary to set anything in this page.

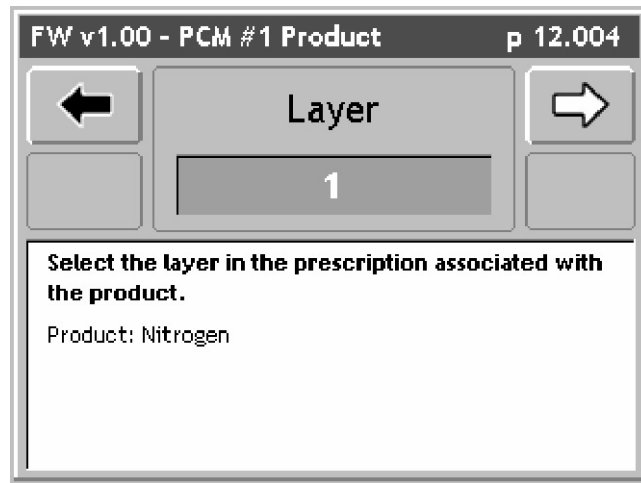


Figure 3-57: The Product Setup Layer Page

Select the Product Name

If variable rate product application is being done, the product name can be extracted from the (.ARM) file (Figure 3-58). If variable rate product application is not being done, the name of the product being applied can be selected from the Fieldware Products Data base. The product name is written to the header portion of the (.RCD) file.

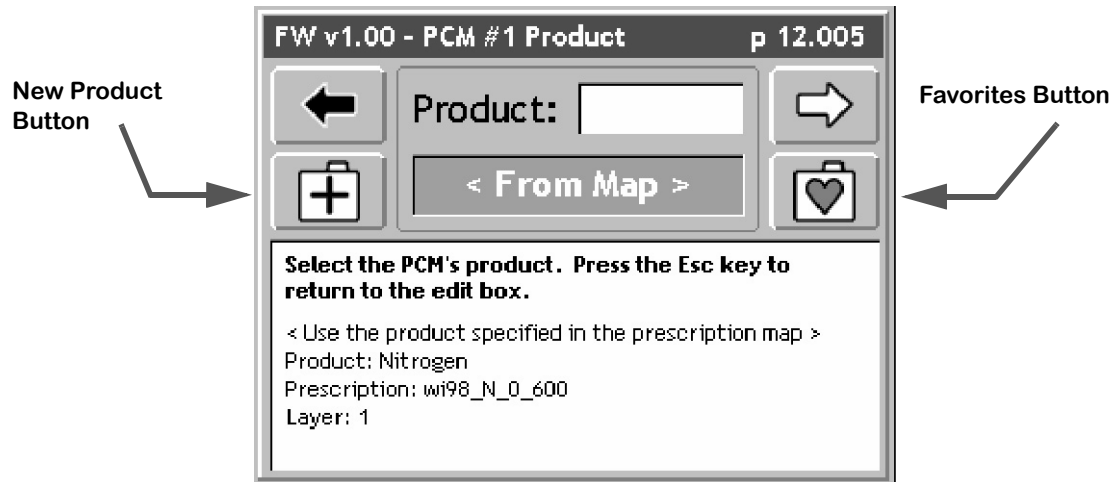


Figure 3-58: The Product Setup Select Product Page

Selecting a Product from the Products Database

To select a product from the products data base, start spelling the product name in the window next to Product. This is a fast method for selecting a product. As characters are typed in, the data base displays the closest entry to the character you type in. E.G. in Figure 3-59 the first character entered was R, which jumped the database search to the area in the database where products start with the letter R. The next character entered was O. Now the database jumps to where products starting with RO are located. The next character entered was U, which jumped the database to the location where all products start with ROU. If applying Round-up, then arrow to the Product name dialog and, using the up and down arrow keys on the Legacy 6000 console, scroll through all of the different Roundup entries in the products data base. When the desired product name is selected, press the Forward Arrow to save and move to the next page.

Favorites

Product Setup keeps track of the product names commonly selected. The ten most common product names are saved in a Favorites list. Quickly select a product name from this Favorites list by pressing the Favorites button opens the favorites list. If the product name is in this list, select it here and continue running the Product Setup wizard.

New Product

If the product being applied is not in the Products data base, it can be added to the database by pressing the New Product button and following the short wizard to enter the new product information.

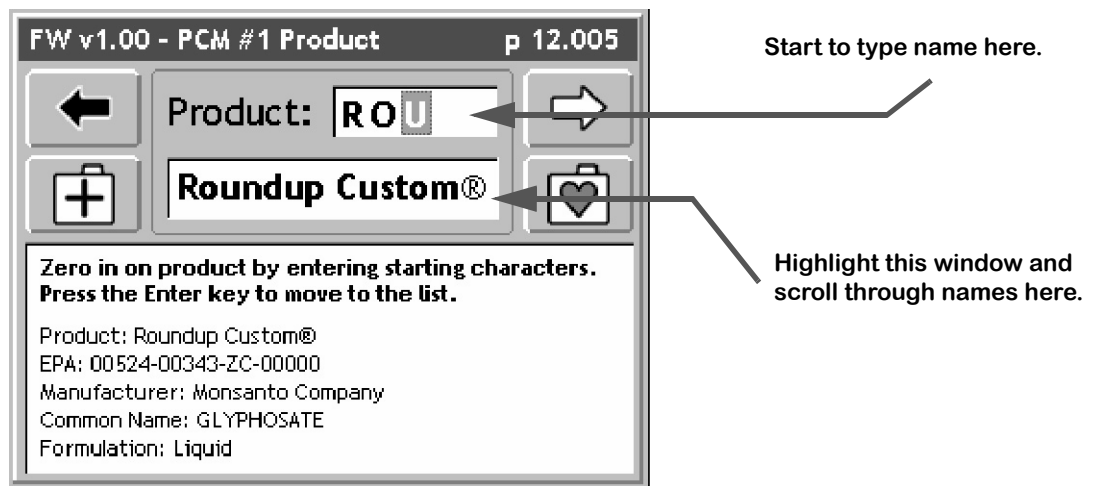
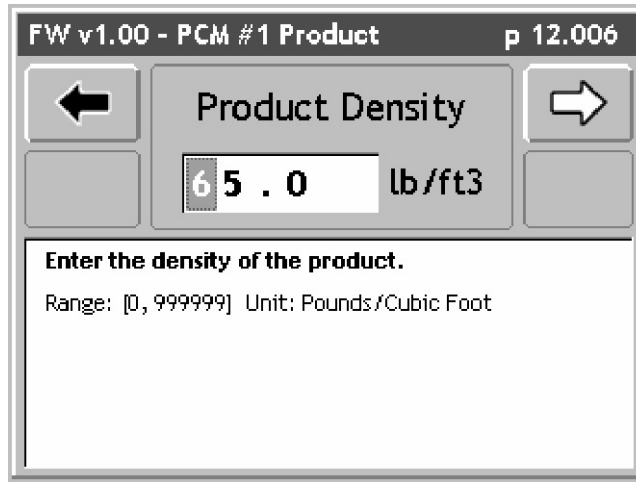


Figure 3-59: Typing in the Product Name

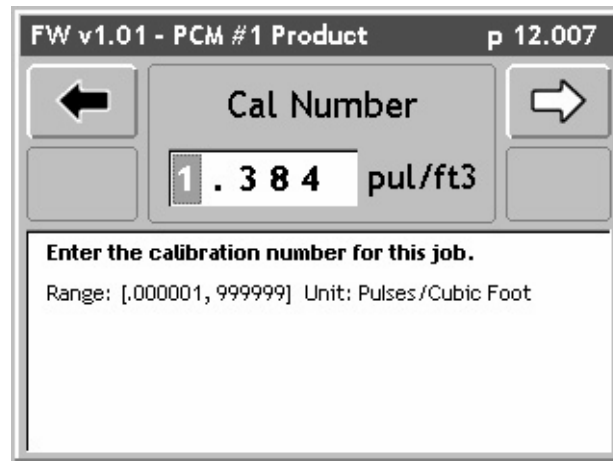
Enter the Product Density



The screenshot shows a software interface for setting product density. At the top, it reads "FW v1.00 - PCM #1 Product" on the left and "p 12.006" on the right. Below this is a header bar with a left arrow, the text "Product Density", and a right arrow. In the center, there is a numeric input field containing "65.0" followed by the unit "lb/ft3". Below the input field, a text box contains the instruction "Enter the density of the product." and the range and unit information "Range: [0, 999999] Unit: Pounds/Cubic Foot".

Figure 3-60: The Product Setup Product Density Page

Calibration Number



The screenshot shows a software interface for setting the calibration number. At the top, it reads "FW v1.01 - PCM #1 Product" on the left and "p 12.007" on the right. Below this is a header bar with a left arrow, the text "Cal Number", and a right arrow. In the center, there is a numeric input field containing "1.384" followed by the unit "pul/ft3". Below the input field, a text box contains the instruction "Enter the calibration number for this job." and the range and unit information "Range: [.000001, 999999] Unit: Pulses/Cubic Foot".

Figure 3-61: The Calibration Number Page

Enter the Initial Product Quantity

FW v1.00 - PCM #1 Product p 12.007

← Initial Quantity →

5000.0 lb

Enter the initial quantity of the product in the bin.
Range: [0, 999999] Unit: Pounds

Figure 3-62: The Product Setup Initial Quantity Page

Enter the Five Preset Application Rates (A - E)

FW v1.00 - PCM #1 Product p 12.008

← Rate A →

On 100.0 lb

Enter the 1st preset rate.
Range: [0, 999999] Unit: Pounds/Acre

Figure 3-63: The Product Setup Rate A Page

FW v1.00 - PCM #1 Product p 12.009

← Rate B →

On 150.0

Enter the 2nd preset rate.
Range: [0, 999999] Unit: Pounds/Acre

Figure 3-64: The Product Setup Rate B Page

FW v1.00 - PCM #1 Product p 12.010

← Rate C →

On 250.0

Enter the 3rd preset rate.
Range: [0, 999999] Unit: Pounds/Acre

Figure 3-65: The Product Setup Rate C Page

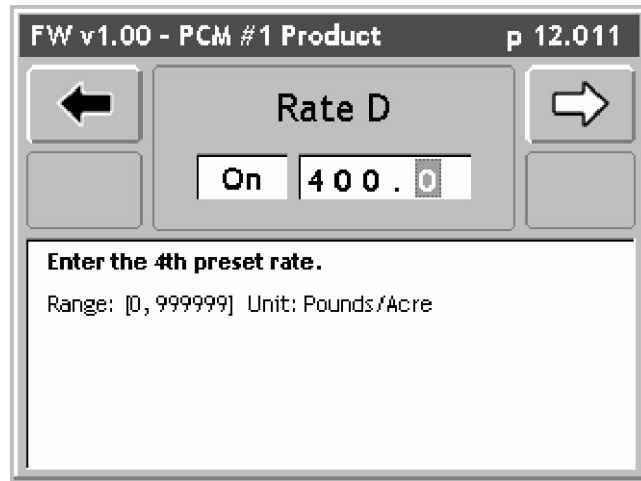


Figure 3-66: The Product Setup Rate D Page

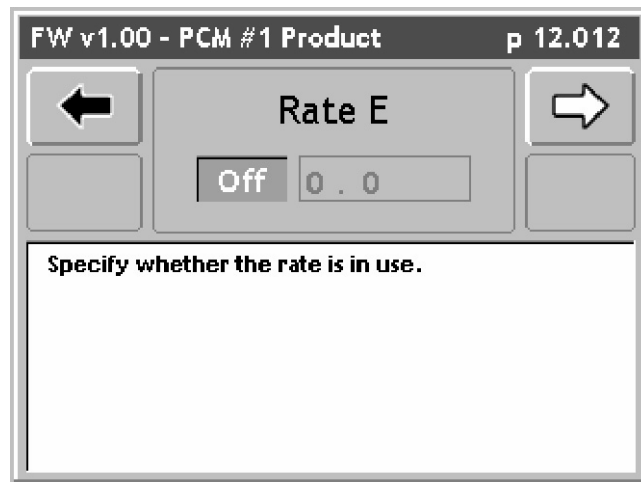


Figure 3-67: The Product Setup Rate E Page

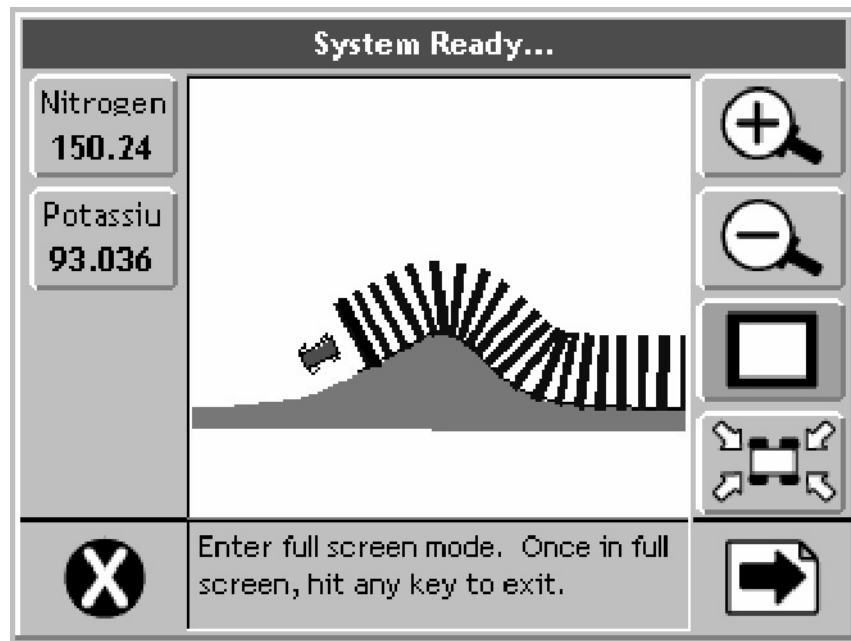
This completes the Product Setup Wizard. Pressing the Forward Arrow in the Rate E page returns to the Main Product Setup page (Figure 3-54). To save the Product Setup information, press the Forward Arrow. This returns to the ARM Launcher page (Figure 3-52).

Chapter Notes

Chapter 4 - Real-time Operation

Operating Fieldware for the Legacy 6000.

Software Version 1



Product Application

When the Real-time Setup process is complete, (See “Chapter 3 - Real-time Setup” on page 3-1.), product application can begin. This is accomplished by pressing the ARM Bull’s-eye located in the ARM Main Launcher page (Figure 4-1).

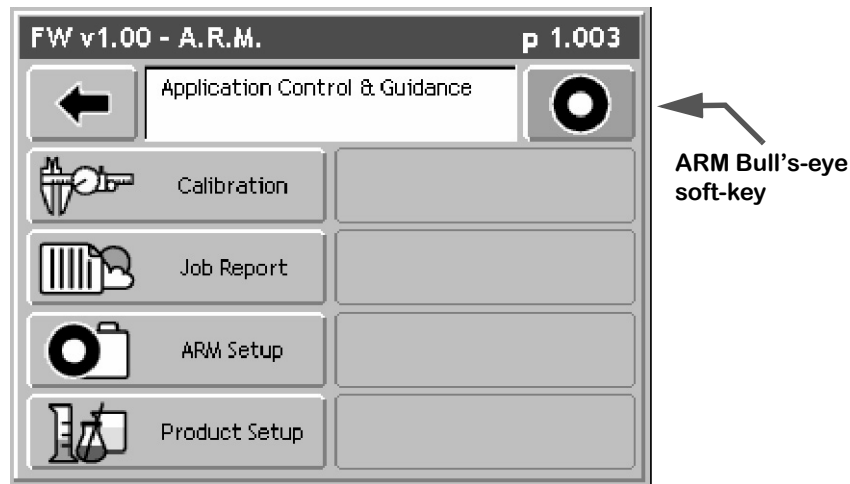


Figure 4-1: The ARM Launcher Page

When the ARM Bull’s-eye soft-key is pressed, the Fieldware ARM software loads the PCM and Implement setup information and Control parameters and data files. This loading process may take a few seconds to complete. When the loading process is complete, the Rates page (Figure 4-2) is the first real-time page seen.

Real-time Pages

There are two real-time page types: the Rates page (Figure 4-2) and the Map page (Figure 4-6). Each page has the same layout; a left column of soft-keys, a center column that displays rate or map information, and a right column of soft-keys.

The left column is reserved for product control soft-keys. There is a soft-key for each PCM that is used in the current product application. E.G. if a Legacy 6000 is configured as a two product system, there will be two product control soft-keys. If there are more than four products being applied, the left column becomes scrollable to access the additional product control soft-keys. The left column is the same for the Rates page and the Map page, this allows the control of a product while viewing the application map. A product control soft-key contains the product name and the current rate being applied.

The right column soft-keys vary depending on which page is being viewed. When viewing the map page, the right column contains all of the mapping, guidance and general viewing soft-keys. See Table 4-1 for a description of each soft-key. When viewing the Rates page, the right column contains various utility soft-keys, such as an Alternative rates page soft-key and the Alarm Off soft-key.

The Rates Page

The Rates page displays various information related to the product and associated PCM. Highlighting a product control soft-key determines which rate information is displayed on the rates page. The Rates page displays the product name at the top of the page as well as the current rate, current speed, material applied, acres applied, and remaining amount of material and acres. A completed field boundary must exist to calculate the remaining acres. To view the remaining amount of product, the initial volume of material must be entered in Product Setup. For each product there is also an alternative rates page (Figure 4-3). Information in this page varies based on the PCM configuration. This page typically displays the active swath width and additional sensor or monitor status information.

Adjusting the Product Application Rate

A product's rate can be adjusted while applying. To adjust a product rate, press the appropriate product control soft-key, which pops-up a side menu (Figure 4-4). This menu varies based on how the PCM is setup. Typically this side menu contains any preset rates defined in Product Setup, an On or Off setting, a Manual mode, and a VR mode if doing variable rate application. To adjust a rate, move up and down in the side menu using the up and down arrow keys on the Legacy 6000 console. When the desired rate is highlighted, press the enter key on the Legacy 6000 console. This will send the new rate command to the PCM.

If the Manual rate option is selected in the side menu, it is possible to manually adjust the product rate (Figure 4-5). When Manual mode has been selected, the current rate is displayed with a Black background. An increase rate and a decrease rate soft-key appears in the right side column. Press either of these soft-keys to adjust the rate.

To switch from the Rates page to the Map page, press the Change Page soft-key.

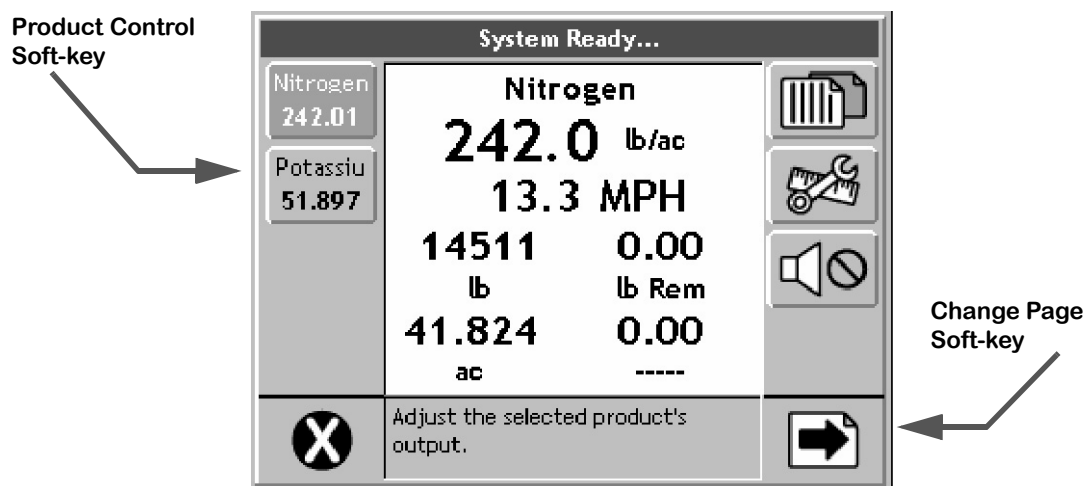


Figure 4-2: The Rates Page

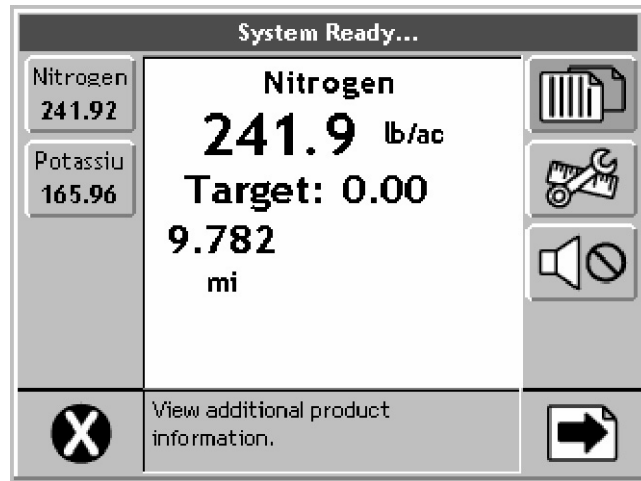


Figure 4-3: The Alternate Rates Page

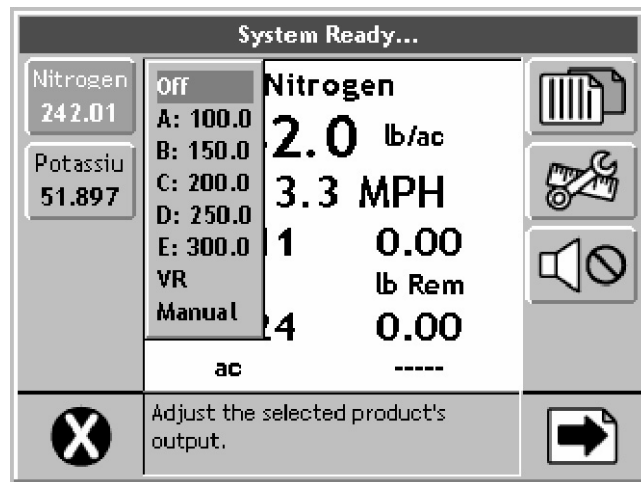


Figure 4-4: Adjusting a Product Rate

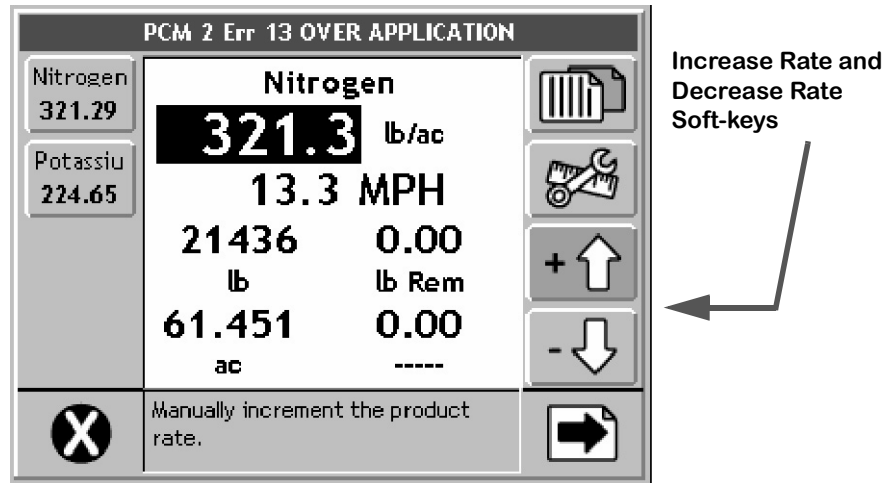


Figure 4-5: Manually Adjusting an Application Rate

The Map Page

The Map pages allows the product application progress to be viewed. This page displays the vehicle at its current location, as well as current implement status. The application trajectory is also displayed. If doing variable rate application using a prescription map, the prescription map is seen in the background. The Map page is associated with the product control soft-key that is currently highlighted.

All guidance related soft-keys are displayed in the right side column of the map page. See Table 4-1 for a description of each soft-key that can be displayed in the Map page.

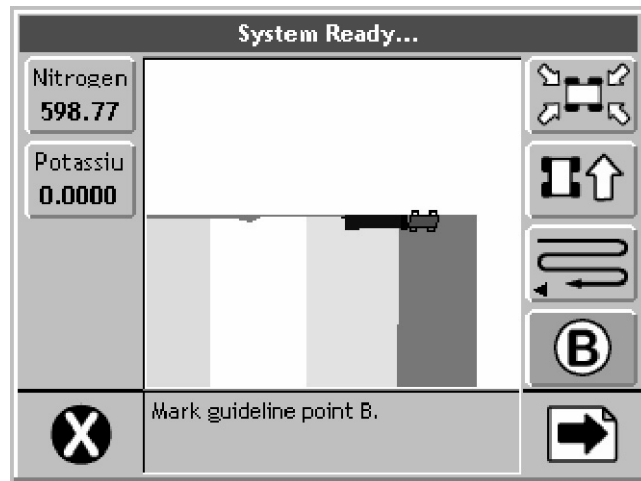


Figure 4-6: The Map Page

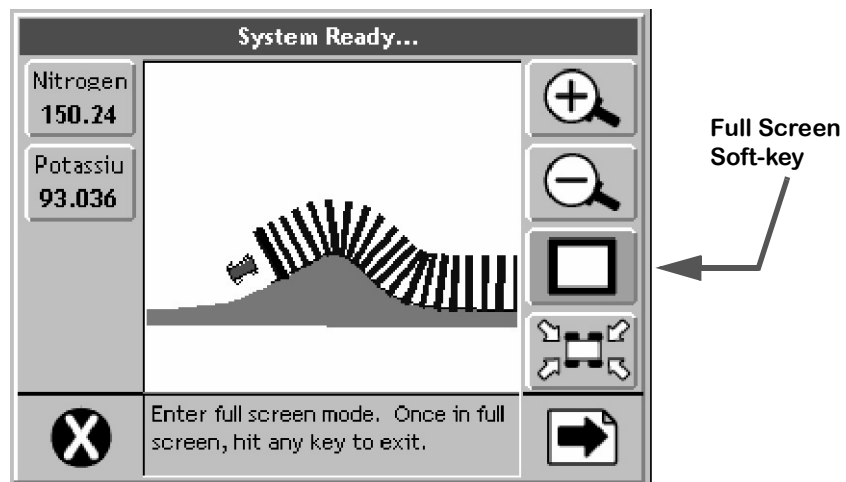


Figure 4-7: The Map Page

Real-time Soft-key Descriptions





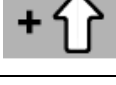
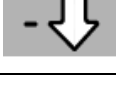






Soft-key	Description
	The Exit soft-key. When pressed Fieldware ARM exits out of the real-time process and returns to the Main Menu page.
	The Next Page soft-key. Pressing this soft-key switches between the map page and the rates page.
	The Alternate Rates Page soft-key. Press this to view additional product information, such as sensor and monitor status and current implement width.
	The Stop Alarm soft-key. Press this to mute an alarm.
	Manual Rate Increase soft-key. This soft-key is visible when the product control is set to Manual mode. Use this soft-key to manually increase the product application rate.
	Manual Rate Decrease soft-key. This soft-key is visible when the product control is set to Manual mode. Use this soft-key to manually decrease the product application rate.
	The CAN Process soft-key. When pressed this soft-key launches the CAN Process diagnostic. This is used to trouble shoot the CAN modules when running in real-time.
	The Zoom In soft-key. When pressed decreases the area displayed in the view page. There are a total of 5 zoom levels.
	The Zoom Out soft-key. When pressed increases area displayed in view page. There are a total of 5 zoom levels.
	The Full Screen soft-key. When pressed, the entire map page space is replaced by the map view. This is useful when it is desired to see more of the vehicle trajectory. Press any key to return back to the normal view page.
	The Partial Screen soft-key. When the Full Screen Soft-key is pressed, the soft-key graphics change to the Partial Screen. When pressed the console display area contains the map view and the right-hand mapping button column.
	The North Up View soft-key. This map page display option, keeps North pointing to the top of the view page. When pressed this soft-key changes to the COG View soft-key.

Table 4-1: Real time Soft-key Description






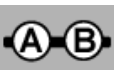





Soft-key	Description
	The Course on Ground (COG) View soft-key. This view page option, keeps the vehicle stationary in the view page with the heading (course) of the vehicle pointing to the top of the view page. When pressed this soft-key changes to the North Up View soft-key.
	The Center Vehicle soft-key. Press this to center the vehicle in the map page.
	Re-fill soft-key. When this soft-key is visible and pressed the remaining volume is reset to the Initial Quantity entered in the Product Setup.
	The Mark A soft-key is used with the Parallel pattern. This soft-key is pressed to mark the first end point of the initial guideline. When pressed, this soft-key changes to the Mark B soft-key.
	The Mark B soft-key is used with the Parallel and Headland patterns. This soft-key is pressed to mark the end point of the initial guideline. When pressed, this soft-key changes to the New Guideline soft-key.
	The New GuideLine soft-key. This soft-key appears after the initial guideline has been created. When pressed, this soft-key changes to the Mark A soft-key and guidance is disabled until a new guideline is created by pressing Mark A and then Mark B.
	The Switch Guideline soft-key. This soft-key appears when more than one guideline has been created.
	Straight-line Parallel Guidance soft-key. This soft-key indicates the current guidance pattern is straight-line parallel guidance. The initial guideline is defined by marking end points A and B. Pressing this soft-key pops-up a side menu to allow the selection of a different guidance mode, such as Headland or Circle Pivot.
	Curved-line Parallel Guidance soft-key. This soft-key indicates that the current guidance pattern is Curved guidance. Used in the Headland pattern only. Pressing this soft-key pops-up a side menu to allow the selection of a different guidance mode, such as Straight-line or Circle Pivot.
	Circle Pivot Parallel Guidance soft-key. This soft-key indicates the current guidance pattern is Circle Pivot parallel guidance. The initial guideline is defined by marking points A and B along a circle. Pressing this soft-key pops-up a side menu to allow the selection of a different guidance mode, such as Headland or Straight-line.
	The Circle Mark A soft-key is used with the Circle Pivot pattern. This soft-key is pressed to mark the first end point of the initial circle guideline. When pressed this soft-key changes to the Circle Mark B soft-key.

Table 4-1: Real time Soft-key Description








Soft-key	Description
	The Circle Mark B soft-key is used with the Circle Pivot pattern. This soft-key is pressed to mark the end point of the initial circle guideline. When pressed this soft-key changes to the New Circle Guideline soft-key.
	The Circle Mark B Wait soft-key. This soft-key appears when the Circle Mark A has been pressed and the software is collecting enough points (approximately 12 seconds) to describe a circle. After approximately 12 seconds has passed, this soft-key is replaced by the Circle Mark B soft-key.
	The Switch Circle Guideline soft-key. This button appears when the guidance mode is circle pivot and there is more than one circle guideline created. Pressing this allows the selection of a different existing circle guideline.
	The Map Field Boundary Off soft-key. When this soft-key is displayed, the field boundary is not being mapped. When pressed this soft-key changes to the Map Field Boundary On soft-key.
	The Map Field Boundary On soft-key. When this soft-key is displayed, the field boundary is being mapped and stored to file. When pressed this soft-key changes to the Map Field Boundary Off soft-key.
	The Point soft-key. This is the point map object. When pressed a point is placed at the vehicle location.
	The Hazard soft-key. This is the hazard map object. When pressed a hazard is placed at the vehicle location.

Table 4-1: Real time Soft-key Description

System, Warning and Error Messages

Fieldware for the Legacy 6000 provides system operation feedback in the form of System messages, Warnings, and Error Messages. This system information is displayed in the top portion (banner bar) of the rates page and map page. Some messages are displayed on the lightbar, see (Lightbar Index on page 2-35) for more information about these messages.

System Message

A system message does not obstruct real-time operation. The most common system message is the System Ready, (Figure 4-7), message that occurs when the Legacy 6000 system is operating properly.

Warning Message

A warning message does not obstruct real-time operation. When a warning message first appears in the banner bar, the alarm sounds. The alarm can be muted by pressing the Alarm Mute soft-key. The warning message remains in the banner bar until the situation causing the warning is resolved. The alarm does not sound again until a new warning appears. Typical warning messages relate to product application rates and speeds.

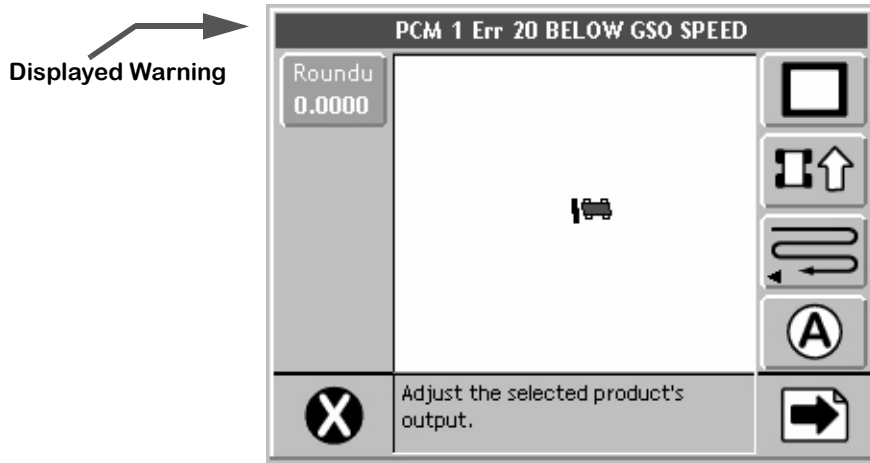


Figure 4-8: GSO Speed Warning Message

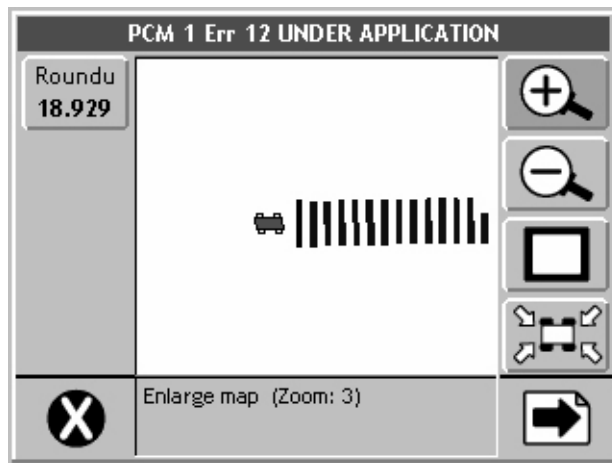


Figure 4-9: Under Application Warning Message

Error Message

An error message stops real-time operation until the problem is resolved. The alarm sounds, a dialog is presented to the user (Figure 4-10), and the user must respond to the dialog. The response to the dialog is typically an acknowledgement of the error. The error message in Figure 4-10 is a result of a sensor on PCM #1 being disconnected. The operator is asked to acknowledge this error by pressing the enter key. If the error is resolved prior to the acknowledgement, an error correct dialog will replace the error message dialog, (Figure 4-11).

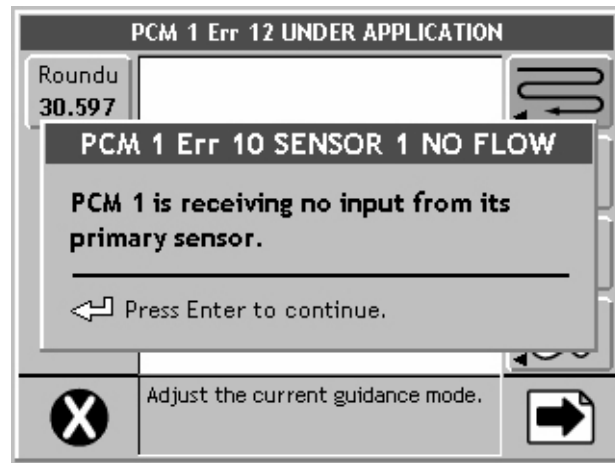


Figure 4-10: Sensor No Flow Error Message Dialog

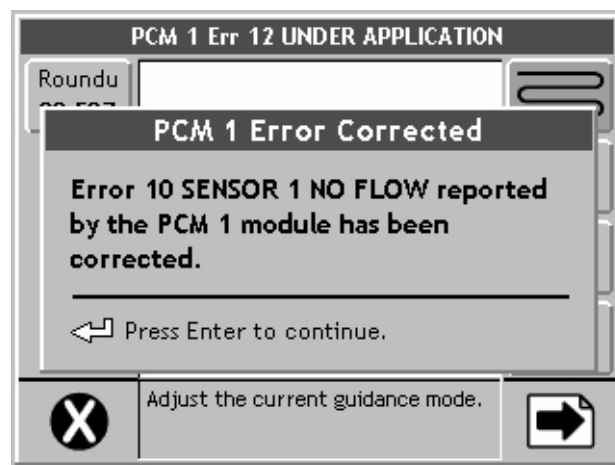


Figure 4-11: Error Corrected Message

Exiting Product Application

To exit from product application operation, press the Exit soft-key, located in the lower left-hand corner of the page. At this point any data files are stored to the PCMCIA card. To learn how to transfer data files between the Legacy console and a desktop or lap-top computer, (See “Transferring Data” on page 4-38.). When data files have been transferred to a desktop computer, they can be used to generate an application report using Fieldware Map Manager.

Real-time Guidance Operation

Fieldware for the legacy 6000 allows product application and vehicle guidance simultaneously. To run guidance while applying a product, you must have the Lightbar setting set to Text/Lights, (See "Lightbar Setup" on page 2-12.).

At this stage a DGPS receiver should be connected to the Legacy 6000 console and running properly. It is always a good idea to verify that the DGPS receiver is running properly and communicating with the console prior to driving out to the field. To do this, run the system diagnostic tool Receiver Process, (See "System Tools" on page 2-42.).

Starting Guidance

When product application is started, by pressing the ARM Bull's-eye, guidance automatically starts. The initial guidance pattern is the Parallel pattern (straight-line guidance). It is possible to switch between any of the three guidance modes while in real-time operation (Figure 4-12). The three guidance patterns to choose from are Parallel, Headland, and Circle-pivot. Each is described in more detail below.

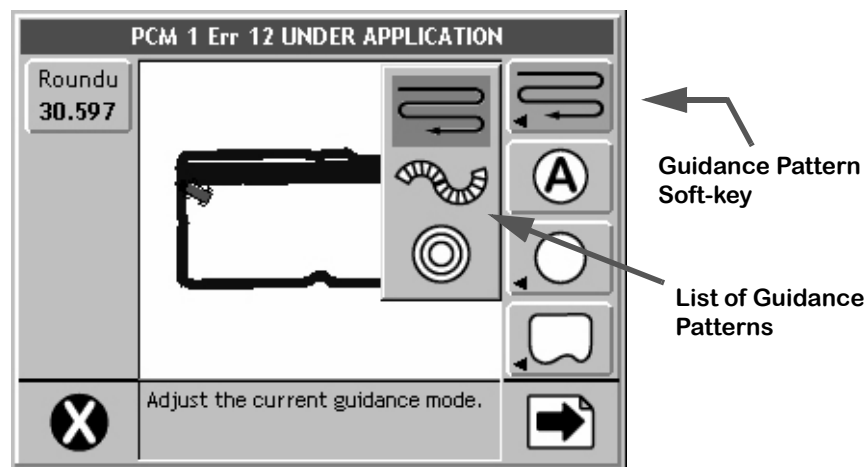


Figure 4-12: Selecting a Guidance Pattern in Real-time

Changing Guidance Pattern

To change from one guidance pattern to another, press the Guidance Pattern soft-key (Figure 4-12). This soft-key displays the current pattern selection on the key itself. Pressing this soft-key pops-up a sub-menu. This side menu displays the available guidance patterns. To select a pattern, high-light the desired pattern using the up and down arrow keys. When high-lighted, press the enter key. This switches to the new guidance pattern.

The Parallel Pattern Option

This section describes how to run the Parallel pattern option. This options provides guidance along straight lines based on an initial A-B reference line. This is the default guidance pattern when first starting real-time operation. The first step is to establish the initial A-B guideline. This initial baseline is used to calculate all other parallel guidelines.

Mark Point A

To mark the initial point A, begin driving along the first swath path. Typically this would be along a straight edge of a field boundary. While the vehicle is driving along the initial swath, the lightbar displays the MARK A message. This message appears until the guideline point A is established. To establish the guideline point A, press the Mark A soft-key. When pressed, the Mark A soft-key in the button column automatically changes to the Mark B button soft-key and the lightbar displays the MARK B message.

Mark Point B

The next step is to establish guideline point B. To establish guideline point B, press the Mark B soft-key in the button column. The B point is displayed in the map page. This establishes the initial swath baseline. When the baseline is established (Figure 4-13), the lightbar begins displaying the user defined messages that were selected in the setup process.

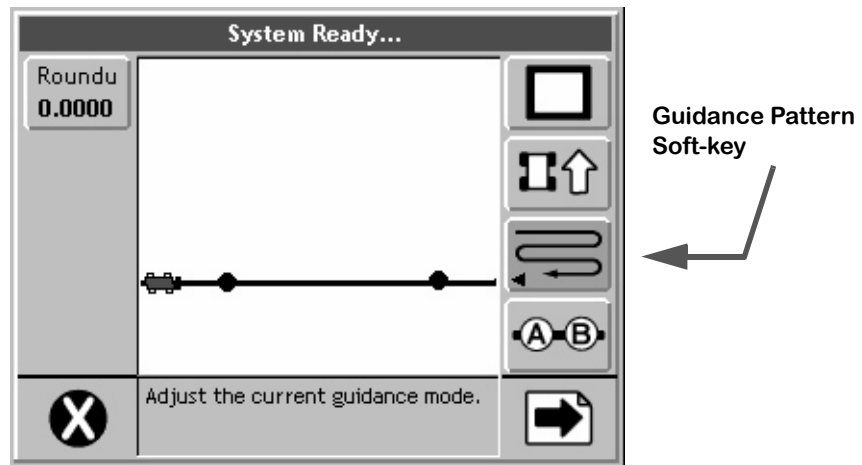


Figure 4-13: Establishing the Initial A-B Line

A new A-B line can be created by pressing the New A-B soft-key and repeating the Mark A Mark B process described above.

The Headland Pattern Option

This section describes how to operate the Headland guidance pattern. The Headland pattern is selected when the operator wants to drive several circuits around the field boundary and be guided around all circuits that occur after the first one. When several headland circuits have been completed, the operator then has the choice of switching back to the Parallel pattern. The Headland pattern is also selected when a user wants to do product application on terraced fields. In the Headland curved guidance pattern, the operator can pull along side any previous applied swath and be guided parallel to that swath.

Applying Multiple Headland Circuits

Figure 4-14 shows the Map page when the Headland pattern is selected. While operating in the Headland pattern, the user has the option to mark the A and B points for the Parallel pattern (straight-line parallel swath guidance). This feature makes it easier for the operator to Mark the A and B points while in curved mode applying the headlands. It is always best to mark the A and B points for the Parallel pattern while driving along a straight edge of a field.

The operator remains in the Headland pattern mode until the pattern is changed using the Guidance Pattern soft-key, see (Changing Guidance Pattern on page 2-14). The A and B points are only required for the Parallel pattern. The Headland pattern does not require an A-B line.

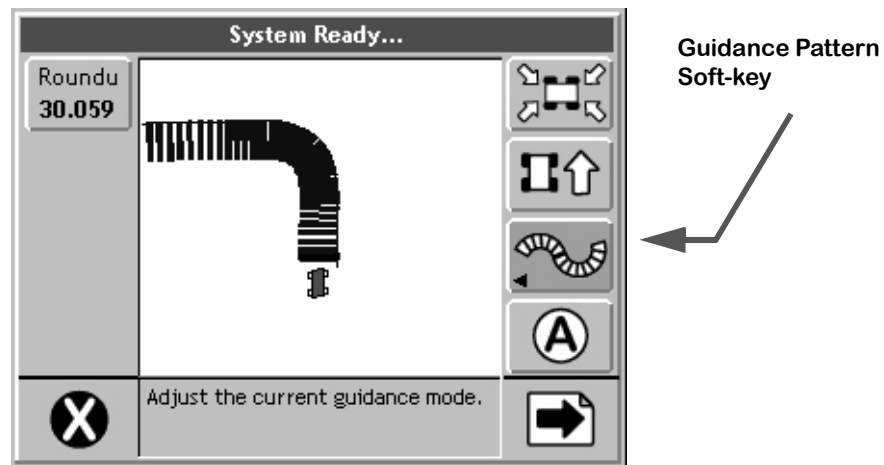


Figure 4-14: Operating in Headland Pattern

Headland Pattern Example

In this example, the operator wants to apply two headland passes to the field and then switch to Parallel mode and apply the remainder of the field with straight-line parallel swath guidance. After the first headland circuit, the operator pulls parallel to the first circuit swath and begins applying the second circuit while being guided parallel to the first circuit.

Figure 4-15 shows the operator just finishing the first headland circuit. When the operator pulls along side the first headland circuit, curved guidance automatically starts. The operator is now able to drive the second headland circuit parallel to the first circuit by following the guidance information displayed on the lightbar.

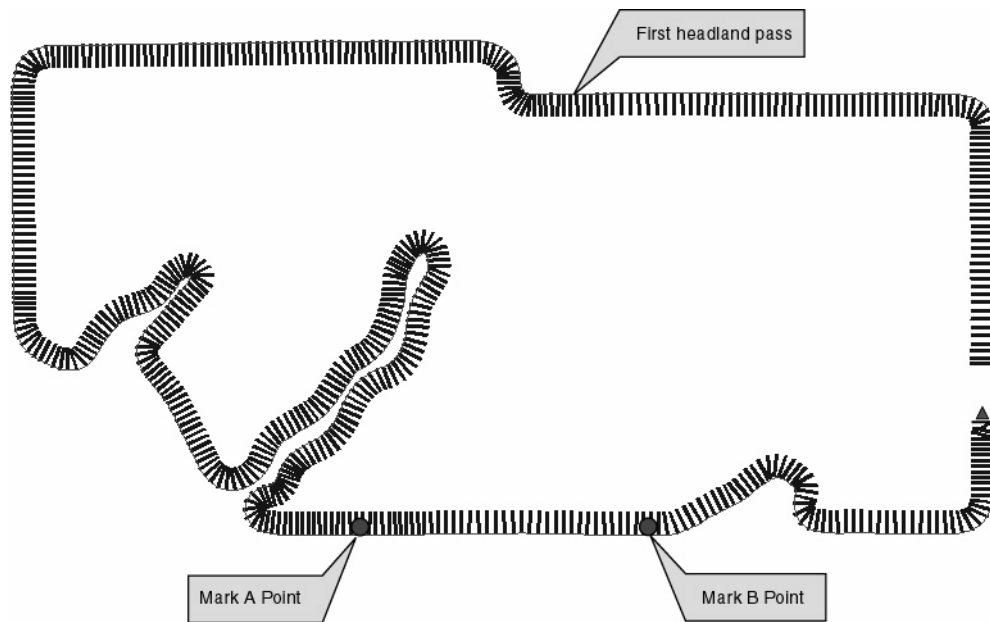


Figure 4-15: Completing the First Headland Circuit

Figure 4-16 shows the operator being guided along side the initial headland circuit. The lightbar automatically supplies guidance information. For more details on how to interpret curved guidance information on the lightbar (See "Lightbar Curved Guidance Graphics" on page 4-26.).

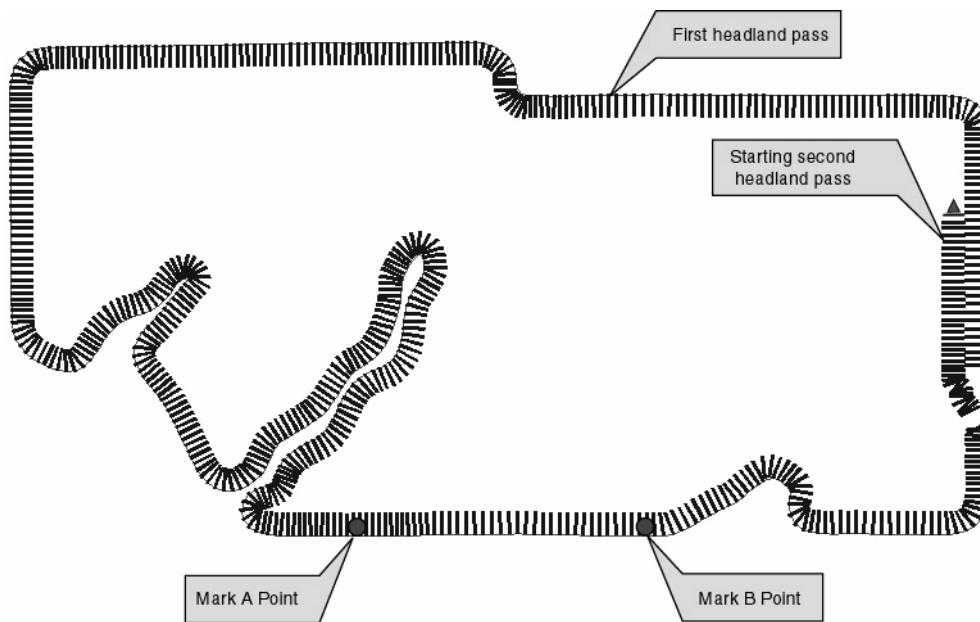


Figure 4-16: Starting the Second Headland Pass

Figure 4-17 shows the operator continuing to drive around the second headland circuit.

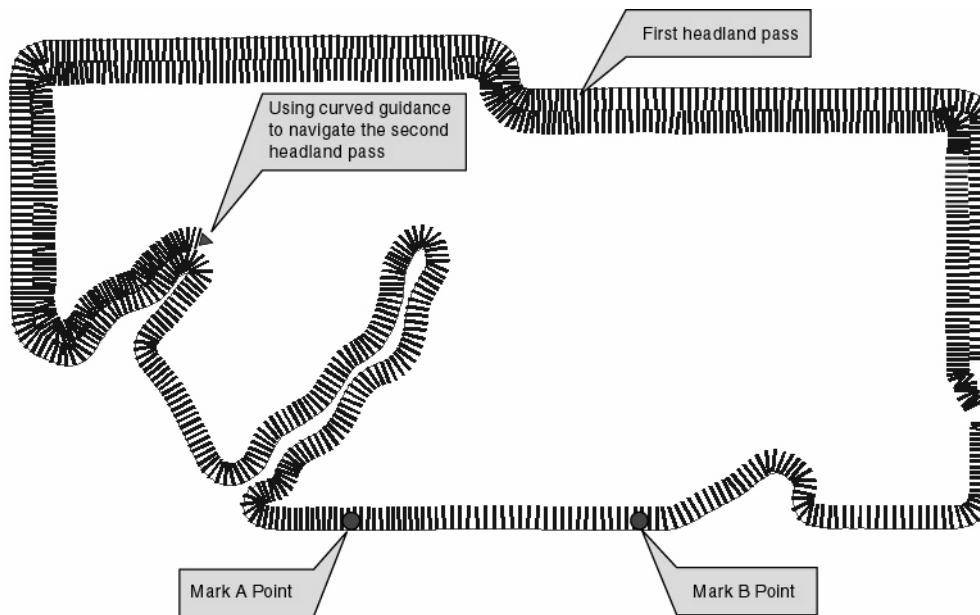


Figure 4-17: Continuing Around the Second Circuit.

Switching from Headland to Straight-line A-B Pattern

When the operator has completed the desired number of headland circuits, two circuits in our current example, the system can be switched to the Parallel Pattern (straight-line A-B guidance) to apply the remainder of the field in that pattern.

To switch from the Headland Pattern to another pattern, (See “Changing Guidance Pattern” on page 4-14.) If the operator is being guided along a curved path when the pattern is switched, the lightbar will no longer guide them along the curved path.

If the A and B points were marked while in the Headland Pattern, the software automatically guides the vehicle along the closest parallel line, as soon as the operator switches to the Parallel Pattern. If no A B points were marked during the curved guidance process, the operator must mark the A B points. The lightbar displays the MARK A message, indicating that no initial A B line exists.

Figure 4-18 shows the operator applying product in the Parallel pattern. Because the initial A B line was established during the curved guidance process, the user can immediately start straight-line guidance as soon as the guidance mode button is pressed.

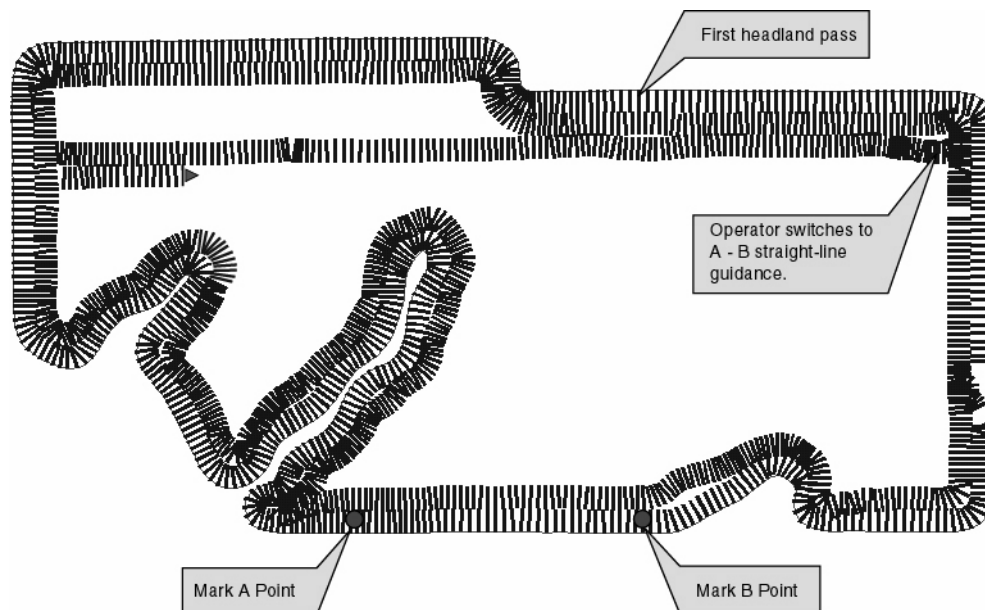


Figure 4-18: Switched from Headland Pattern to Parallel Pattern.

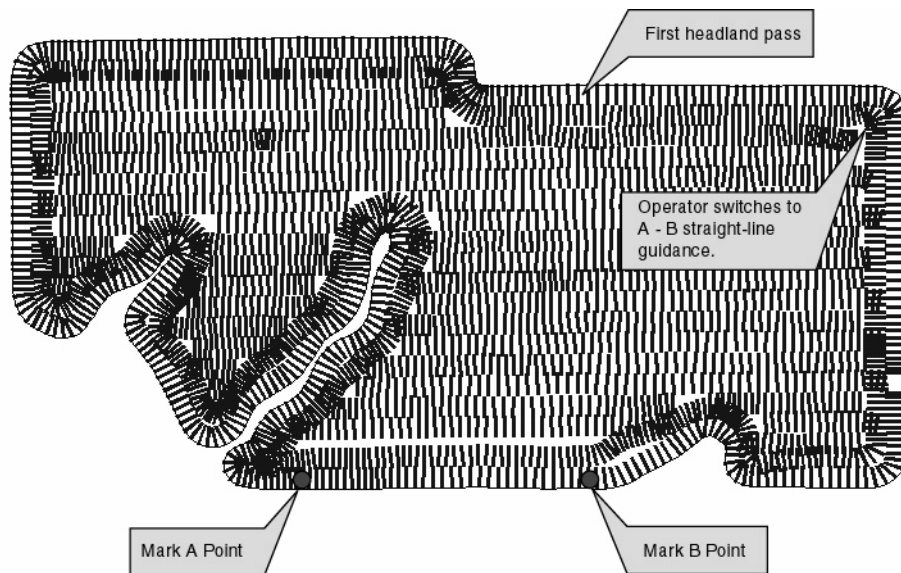


Figure 4-19: Completed Field Application

Figure 4-19 shows the completed field, notice there are several areas of the field where the operator turned spray off to avoid double application on previously applied areas.

The Circle Pivot Pattern

This section describes how to operate the Circle Pivot pattern. The Circle Pivot pattern is used when the operator wants to apply product in a center pivot field while being guided along a circular guideline that matches the center pivot radius.

The Circle Pivot pattern operates very similar to the Parallel pattern. The operator marks an A point, drives along the arc that the pivot would create, a wheel track is a good guide, then marks a B point. When the B point is marked, a circular guideline appears in the Map page and the operator is guided along this circular guideline. As the operator completes one circular pass and moves in either direction (left or right) to the next guideline, the software automatically creates the next circular guideline.

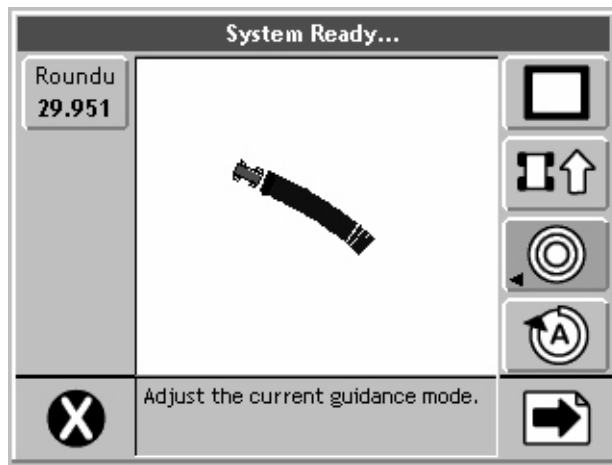


Figure 4-20: Operating in Circle Pivot Pattern

Circle Pivot Example

Marking Point A

In this example the operator wants to apply product to a portion of a field that has a center pivot on it. The operator drives around this portion creating a headland. While driving parallel to an existing wheel track the operator marks the initial A point. Figure 4-20 shows the operator beginning to drive the along the center pivot perimeter. The operator has not pressed the Mark A button yet and is notified on the lightbar to do so. Figure 4-21 shows the vehicle beginning to drive along the existing wheel track and marking point A. In this example the operator has elected to drive a single headland pass. This is not necessary, the operator could have driven along the wheel track and marked points A and B and then started driving back and forth moving towards or away from the center of the pivot.

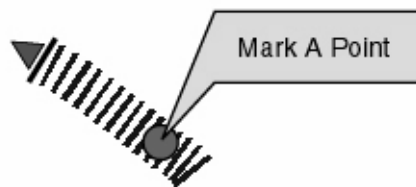


Figure 4-21: Marking Point A in Circle Pivot Pattern

Marking Point B

When point A is marked, the operator should drive along the pivot circle until they feel they have described the circle as well as possible. The Mark A button has changed to Mark B button, (Figure 4-22). Fieldware does not allow the user to mark point B within 12 seconds of marking point A. After 12 seconds, the Mark B button becomes active and the operator can mark point B anytime.

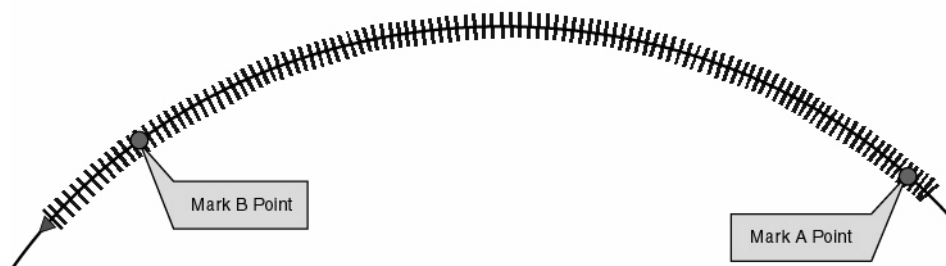


Figure 4-22: Operating in Circle Pivot Pattern

Driving in the Circle Pivot Pattern

When the operator has marked point B, the circle guideline appears in the Map page and the lightbar begins providing guidance instructions. It is not necessary to drive the entire circumference of the center pivot in order to initiate guidance. As shown in this example, the operator drove only a portion of the circumference, marking points A and B, and then used the guideline to continue driving the remainder of the circle, see Figure 4-22.

In Figure 4-23 the operator has completed driving the headlands. Next the operator lines up to drive the first swath to the inside of the headlands. Circle Pivot mode works very similar to Parallel mode, the software automatically guides the vehicle along the closest circle guideline, see Figure 4-24.

When applying in Circle Pivot pattern, the lightbar displays the curved vehicle path in the text display (top section of lightbar) and cross track error information is conveyed via the cross track LEDs. For more information on the curved vehicle path see (Lightbar Curved Guidance Graphics on page 2-26).

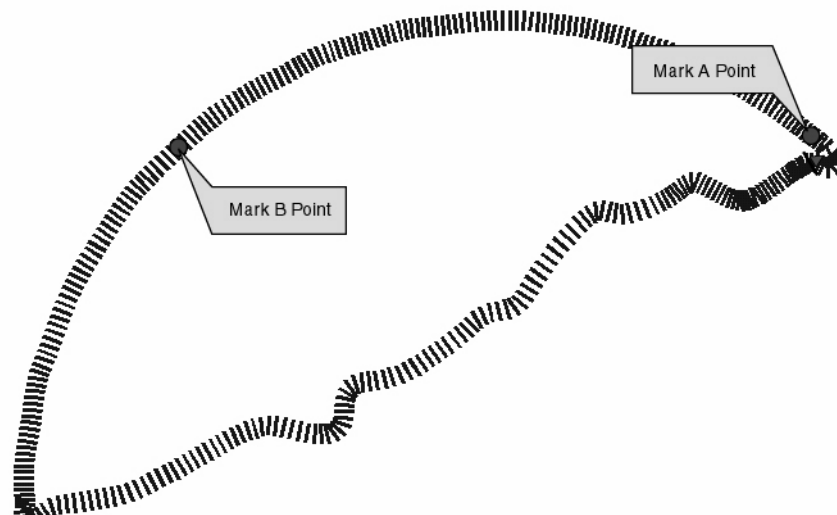


Figure 4-23: Completing Headland Circuit in Circle Pivot Pattern

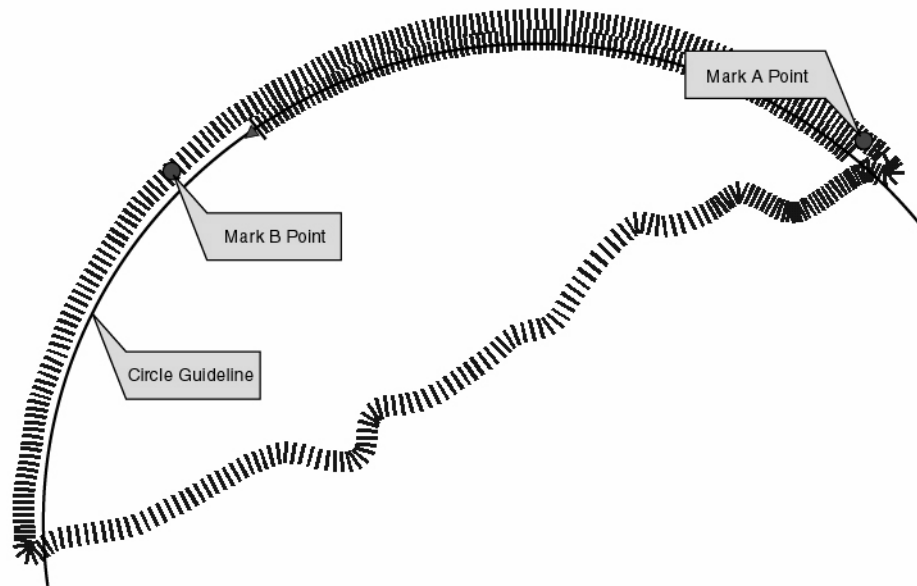


Figure 4-24: Guiding Along Field Headland

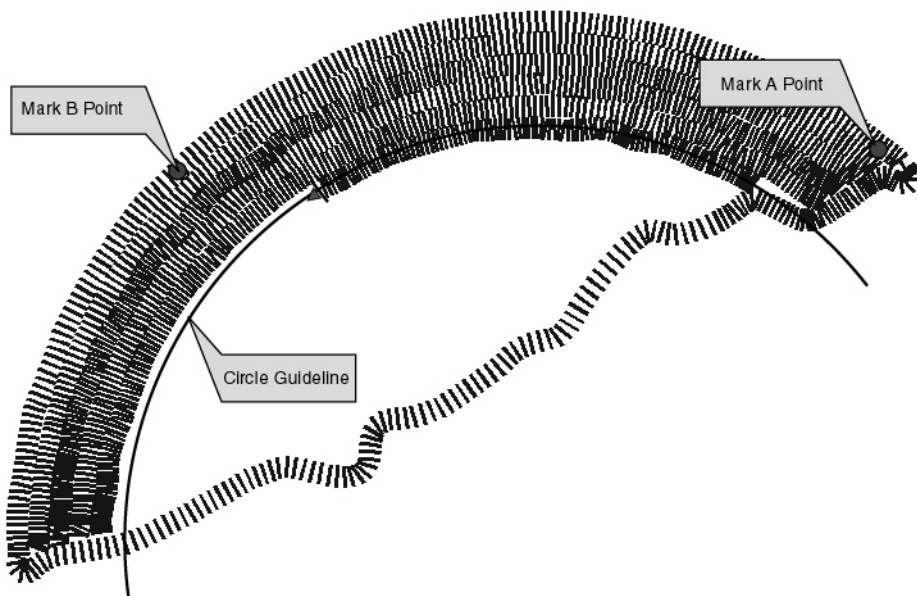


Figure 4-25: Operating in Circle Pivot Pattern

Figure 4-25 shows product application in progress and Figure 4-26 shows the completed portion of the center pivot.

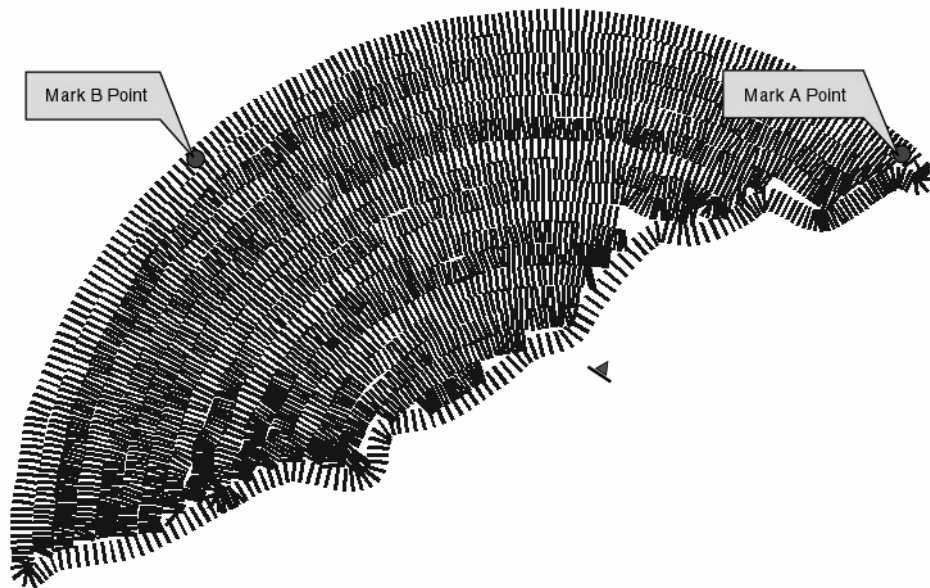


Figure 4-26: Completed Field in Circle Pivot Pattern

Lightbar Curved Guidance Graphics

Fieldware's two curved guidance techniques employ a lightbar text display graphic that aids the operator when navigating parallel to a curved swath. The X-Track LED method that is employed in Parallel mode is also employed when driving curved guidance.

A projected swath-path graphic is displayed in the text display area of the lightbar, see Figure 4-27. This projected path is made up of four horizontal bars. The bottom bar is closest to the vehicle and the top bar is the path furthest away. The width of the bars decrease as they move away from the vehicle. This adds a perspective view to the path ahead of the vehicle. The projected distance the first bar is from the front of the vehicle is based on the vehicle speed. The lightbar in Figure 4-27 informs the user to drive straight, and there are no turns approaching. In Figure 4-28 the lightbar indicates the vehicle is approaching a turn to the right. The X-Track LEDs indicate that the vehicle is slightly to the right of the guideline. Lightbar X-Track LEDs were set up in Swath mode. Therefore the user must correct to the left to get back on line. The X-Track LEDs do not provide any information relating to the curved path ahead of the vehicle, they only indicate where the vehicle is with respect to the guideline at the current vehicle location.

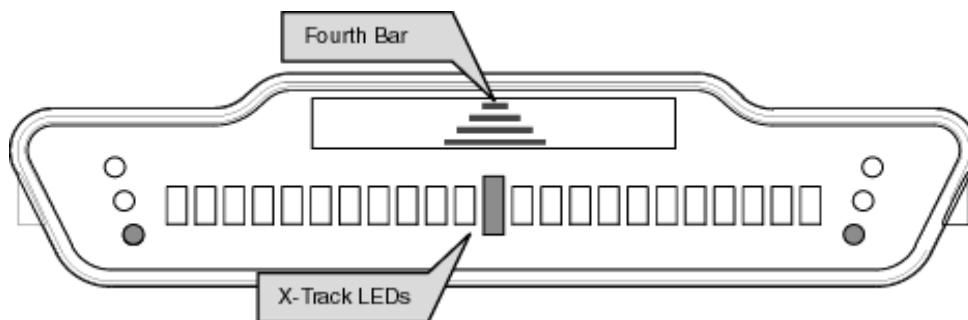


Figure 4-27: Curved Guidance Lightbar Graphics

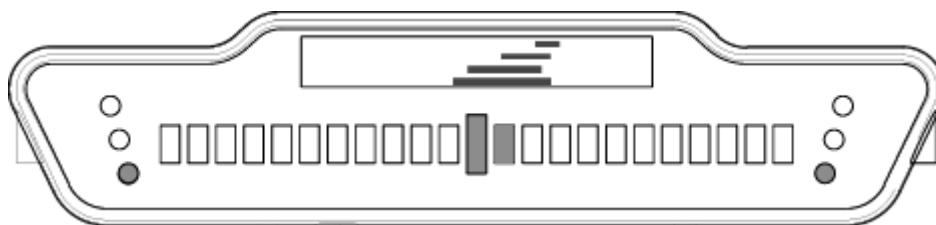


Figure 4-28: Right-Hand Turn Ahead

Applied Area Detection

Fieldware detects when the vehicle has entered a previously applied area and can also be setup to notify the operator when approaching a previously marked hazard. To use applied area detection the Lightbar Setup - Alarm menu field must be setup prior to starting guidance. See (Lightbar Setup on page 2-12) of this User Guide for more details on how to set up this menu field.

Detecting A Previously Applied Area

Figure 4-29 shows how previously applied area detection works. As the vehicle enters a previously applied area, the lightbar displays the message APPLIED and the Red stop lights illuminate. If the vehicle continues to apply product while driving in a previously applied area the console alarm sounds. If product application is turned off while in a previously applied area, the alarm will not sound. When the vehicle exits the previously applied area, the Red stop light turns off or changes to Green if product application is turned on. The Green illuminated stop light indicates that the vehicle is completely outside a previously applied area and product application should be underway.

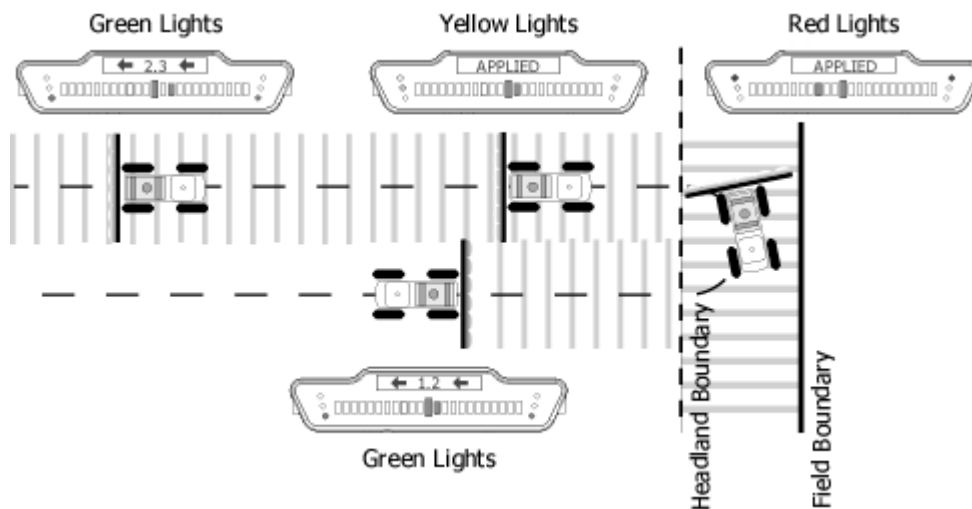


Figure 4-29: Applied Area Detection in Headlands

Detecting Neighboring Swath

Applied area detection does not notify the user if the vehicle crosses into a previously applied neighboring swath. Figure 4-30 shows an Applied Area Overlap example. The vehicle can overlap up to 25% of the Swath Width with out being notified. When the edge of the vehicle swath overlaps 25% or more into a neighboring swath, the lightbar displays the APPLIED message and the Red stop lights illuminate. The alarm sounds only if product application continues. No Yellow warning lights occur in this situation.

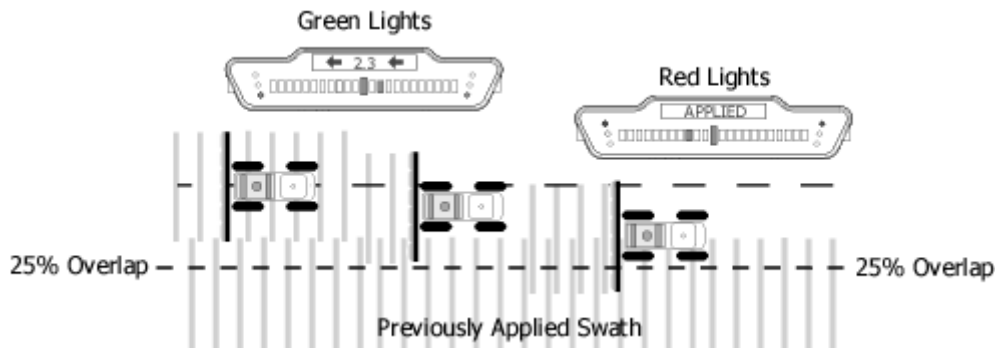


Figure 4-30: Applied Area Overlap in Neighboring Swath

Mapping a Field Boundary

Fieldware for the Legacy 6000 allows the creation of a map of the field boundary while applying product around the perimeter of the field. A field boundary can be created in all three guidance options; Parallel, Headland, and Circle Pivot. The field boundary data is stored in the file that was named in the ARM Setup menu, (See “Running ARM Setup” on page 3-33.).

When product application is started, a Map Boundary soft-key is added to the right-hand button column in the Map page, (Figure 4-31). To start mapping the field boundary, first align the edge of the vehicle swath with the edge of the field boundary. Press the Map Boundary soft-key and select which edge of the swath the field boundary is on. When the vehicle begins moving, a line representing the field boundary is drawn off the edge of the swath, (Figure 4-31). When the boundary mapping process has started, the lightbar displays MAP BND, as well as an arrow indicating which side of the vehicle is being used to create the boundary. Typically the operator will also want to apply product and establish the initial guideline while driving the field perimeter. Figure 4-32 shows the vehicle creating the field boundary while establishing the initial guideline and applying product.

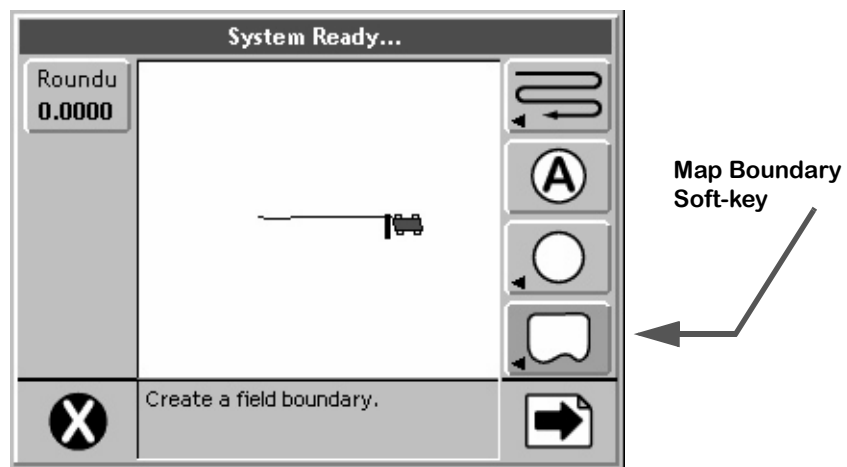


Figure 4-31: Mapping a Field Boundary

Closing or Pausing the Boundary Mapping Process

To close or pause the boundary mapping process, press the Map Boundary soft-key. A side menu will appear with the menu choices Close or Off. Selecting Close will stop the boundary mapping process and draw a line between the starting point and the vehicle location where the boundary was closed. Pressing Off temporarily stops mapping the boundary. To start mapping the boundary again, press the Map Boundary soft-key and select Create on Right or Create on Left. This starts mapping the boundary again, and draws a line between where the system stopped mapping and where it started mapping.

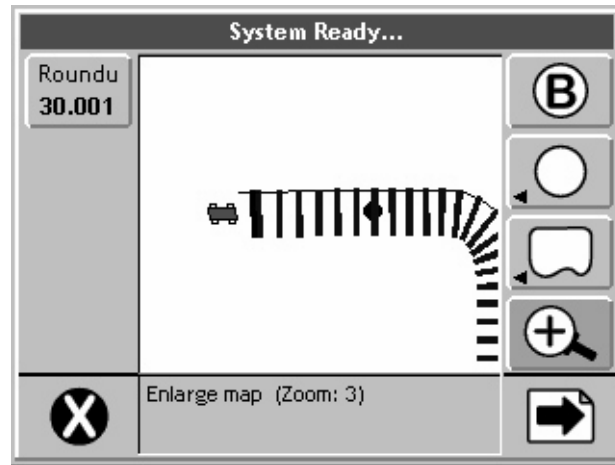


Figure 4-32: Marking Initial Guideline

Figure 4-33 shows the vehicle about to complete driving the field perimeter. The initial guideline has been established and a product application map is also being created while mapping the field boundary. When the vehicle approaches the starting point (within approximately 15 m) of the field boundary, the boundary will automatically close.

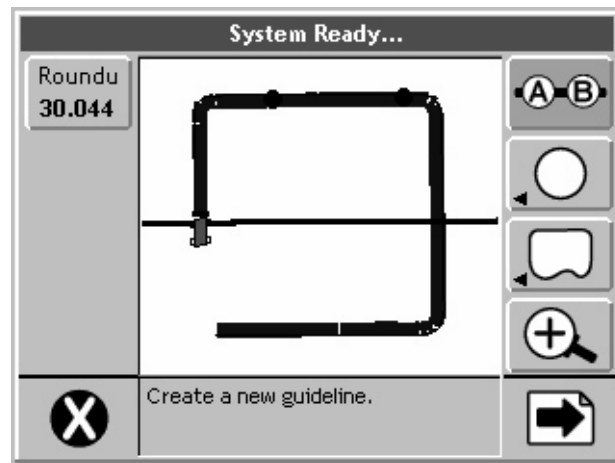


Figure 4-33: Mapping Boundary while Applying Product

Mapping Points and Hazards

Mapping points and hazards during the product application process is another feature of Fieldware for the Legacy 6000. There are two types of mapping objects to select from: Point, and Hazard. Each of these object types are described in more detail below.

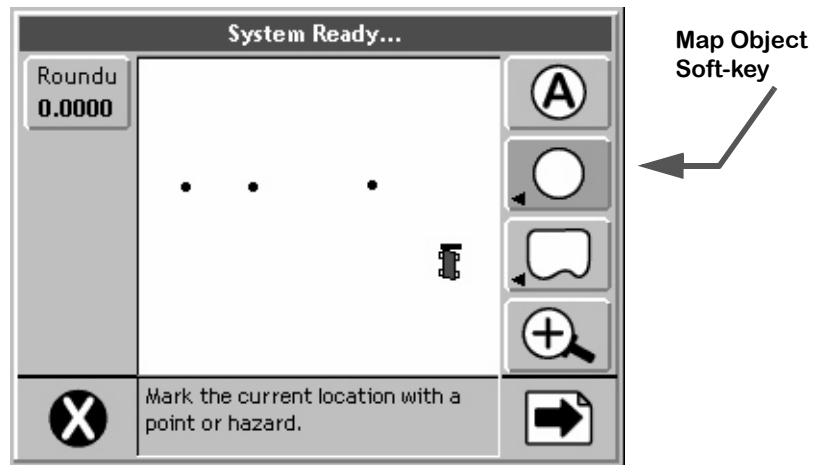


Figure 4-34: The Point Soft-key

Marking a Point

The map object Point allows the marking of a point at the vehicle location. To map a point drive to the location of the object or feature to be mapped. This location should coincide with the location of the GPS antenna. Press the Map Object soft-key. A side menu appears with the point and hazard symbols in the list (Figure 4-35). Select the Point symbol to map a point. When enter is pressed, the Point Name dialog box appears, Figure 36. Enter the name of the point using the arrow keys. Press enter to accept the point name and return to the map page.

The Name Point dialog remembers the 10 most recent entries. To select a recent entry, scroll through the dialog window using the arrow keys and select the desired point name. If no name is to be assigned to the point, select the No Name setting in the dialog window and press enter.

To add a new name, press the New Name soft-key. This will bring up a name input dialog that allows the entering of a new name.

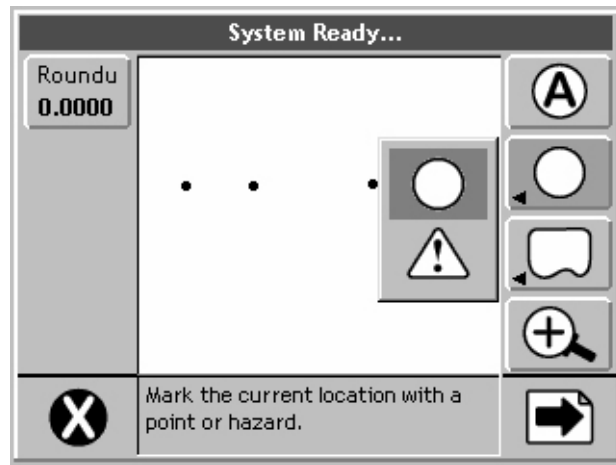


Figure 4-35: The Map Point Menu

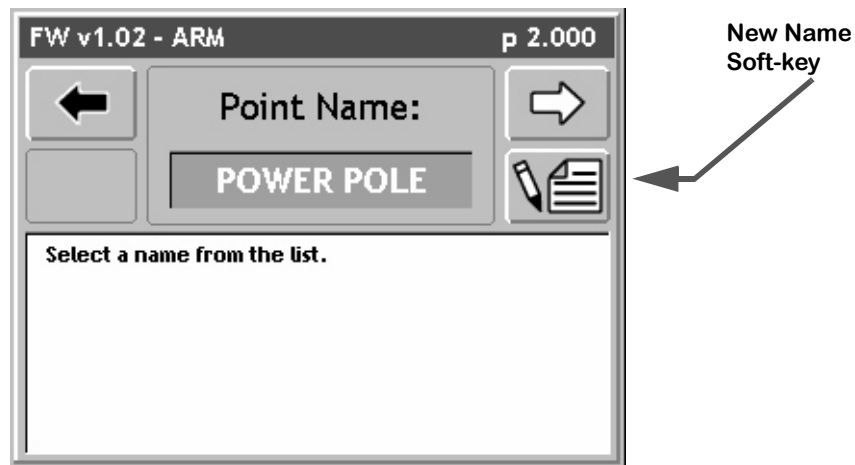


Figure 4-36: Naming the Point

Marking a Hazard

The Map Object Hazard allows the marking of a hazard at the vehicle location. The Map Object Hazard can be used later in Hazard Detection to notify the operator of potentially hazardous objects or features within the field. Hazard detection does not work with point objects.

To map a hazard, drive to the location of the object or feature to be mapped. This location should coincide with the location of your GPS antenna. Press the Map Object soft-key. A side menu appears with the point and hazard symbols in the list (Figure 4-35). Select the Hazard symbol to map a hazard. When enter is pressed, the Hazard Name dialog box appears, Figure 37. Enter the name of the hazard using the arrow keys. Press enter to accept the hazard name and return to the map page.

The Name Hazard dialog remembers your 10 most recent entries. To select a recent entry, scroll through the dialog window using the arrow keys and select the desired object name. If a name is not going to be assigned to the object, select the No Name setting in the dialog window and press enter.

To add a new name, press the New Name soft-key. This brings up a name input dialog that allows the entry of a new object name.

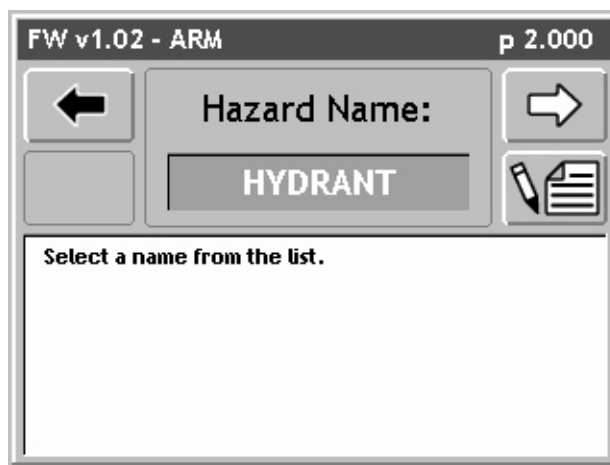


Figure 4-37: Naming the Hazard

Exiting Real-Time Operation

To exit from real-time operation, press the Exit button located on the bottom left hand corner of the current page. If storing data to the PC card. The exiting process may take a minute or so to properly store this data.

Some Legacy 6000 system kits include Fieldware Tools for the office computer or laptop. Fieldware Map Manager tools can be used to view the application as applied maps. Figure 4-38 shows an as-applied map (RCD) and field boundary (BND) in the Map Manager view. To view the as applied maps, it is necessary to copy the record files (RCD) from the PC card to a desktop or laptop computer. Consult the Fieldware User Guide for Map Manager instructions.

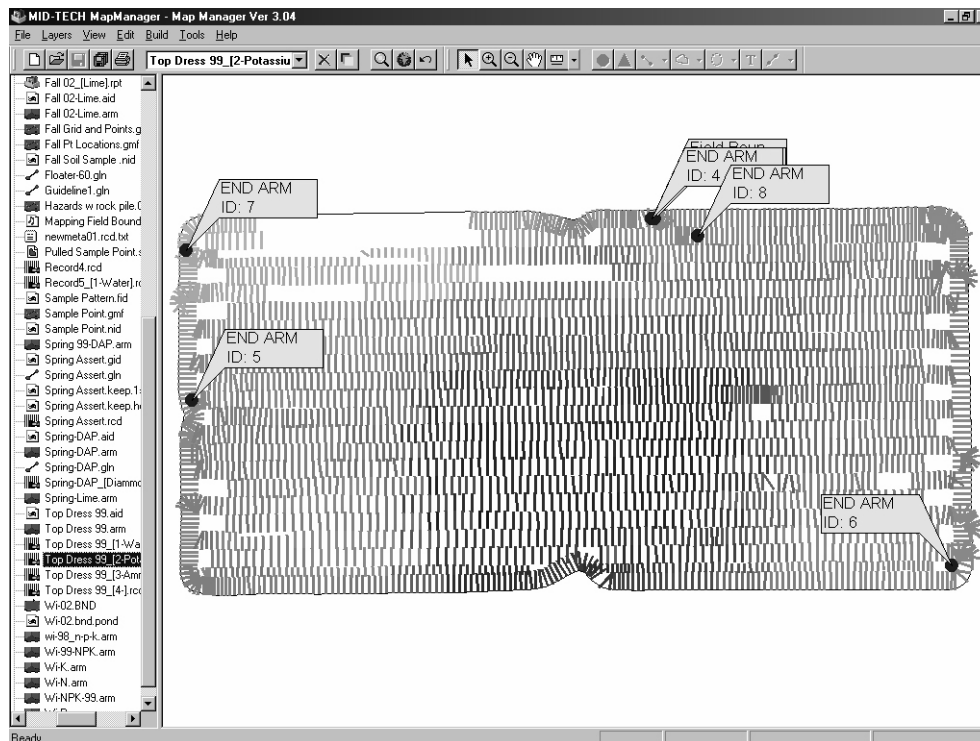


Figure 4-38: As- Applied Data Viewed in Map Manager

Lightbar Index

The Swath XL Lightbar is capable of displaying a considerable amount of information to the user. This information can be represented as text in the display window, illuminated lights on the stop light or cross track LEDs, or a combination of text and lights. Information displayed on the lightbar depends on both user defined settings and system warnings not controlled by the user. Table 4-2 describes each possible lightbar state and possible information that could be displayed.

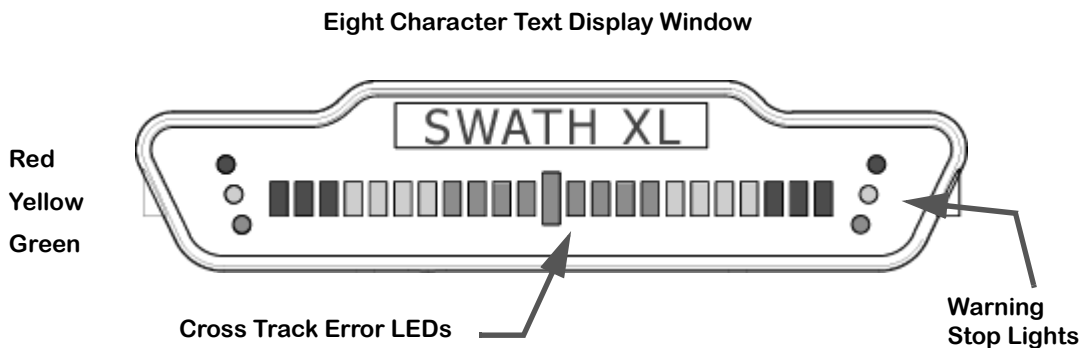


Figure 4-39: The Swath XL Lightbar

Lightbar State	Description
	Mark A: Displayed when establishing the guidance point A of the initial guideline.
	Mark B: Displayed when establishing the guidance point B of the initial guideline.
	Swath #: A user selected lightbar message. When not on the initial guideline the first character is either L or R for Left and Right of the initial guideline. The number identifies how many lines left or right of the initial guideline.

Table 4-2: Swath XL Lightbar Index

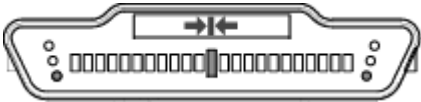


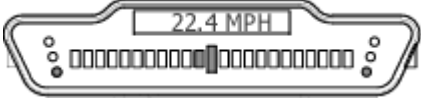

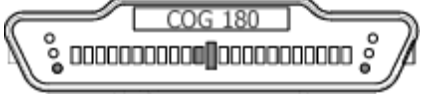
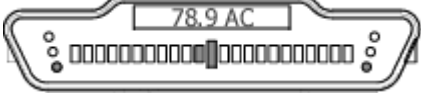
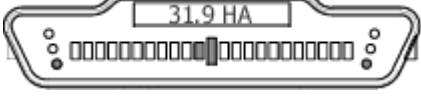


Lightbar State	Description
	<p>X-Track Error: A user defined lightbar message. This cross track error message is displayed when the vehicle is on the guideline and there is no error.</p>
	<p>X-Track Error: A user defined lightbar message. In this example the operator should steer to the left 2.3 ft. (Assuming the system unit is set to US and Lightbar is set to Swath mode.)</p>
	<p>Vehicle Heading Error: A user defined lightbar message indicating the current heading error between vehicle heading and the bearing of the guideline in degrees and decimal degrees. The arrow indicates steering direction.</p>
	<p>Ground Speed: A user defined lightbar message indicating the vehicle speed in Miles per Hour (MPH). System unit is set to US.</p>
	<p>Ground Speed: A user defined lightbar message indicating the vehicle speed in Kilometers per Hour (KPH). System unit is set to Metric.</p>
	<p>Course on Ground (COG): A user defined lightbar message indicating the vehicles heading in degrees 0 to 359. The example to the left indicates the vehicle's course on the ground is due South (180 degrees).</p>
	<p>Area Applied: A user defined lightbar message indicating the current amount of area applied in Acres. System unit set to US.</p>
	<p>Area Applied: A user defined lightbar message indicating the current amount of area applied in Hectares. System unit set to Metric.</p>
	<p>Applied Area Detection: This message is displayed when the vehicle is within a previously applied area. Note that the Red stop lights are illuminated. At this point an alarm should sound. See (Applied Area Detection on page 2-27).</p>
	<p>Curved guidance information graphics. The four horizontal bars in the text display represent a perspective view of the swath ahead of the vehicle. The bars skew left or right to represent the curved path ahead.</p>

Table 4-2: Swath XL Lightbar Index








Lightbar State	Description
	<p>Hazard Detection: The name of the hazard is displayed when the vehicle is approaching an existing hazard. Note the Yellow stop lights are illuminated indicating the initial warning.</p>
	<p>Hazard Detection: The name of the hazard is displayed when the vehicle is approaching an existing hazard. Note the Red stop lights are illuminated indicating the final warning.</p>
	<p>Mapping Boundary: This message is displayed when the user is mapping the field boundary. The arrow symbol on the left indicates the field boundary is on the left side of the vehicle. (See "Mapping a Field Boundary" on page 4-29.)</p>
	<p>Mapping Boundary: This message is displayed when the user is mapping the field boundary. The arrow symbol on the right indicates the field boundary is on the right side of the vehicle. (See "Mapping a Field Boundary" on page 4-29.)</p>
	<p>System Warning: The message is displayed when there is loss of GPS differential corrections. Guidance calculations are stopped until differential corrections resume.</p>
	<p>System Warning: This message is displayed when there is a complete loss of GPS signal to the GPS receiver or Smart-pad. Guidance calculations are stopped until DGPS signal resumes.</p>
	<p>Lightbar Version Message: This message is displayed when the user runs the Lightbar Test. M 4 indicates the lightbar model number and the 2.0 indicates the lightbar protocol version number. This number varies and is based on lightbar version and model.</p>

Table 4-2: Swath XL Lightbar Index

Data Transfer and Report Generation

Data collected to the PC card in the Legacy 6000 console can be transferred to a desktop or laptop computer. When transferred to a computer, an Application Report can be generated using the Fieldware Map Manager program.

Transferring Data

Creating an Application Report in Map Manager

Chapter Notes



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