LEGACY 6000 RMS CAN BUS

USER GUIDE

Software Version 2.01
98-05085-R0

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RMS for The Legacy 6000

Software Version 2.01

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Table of Contents

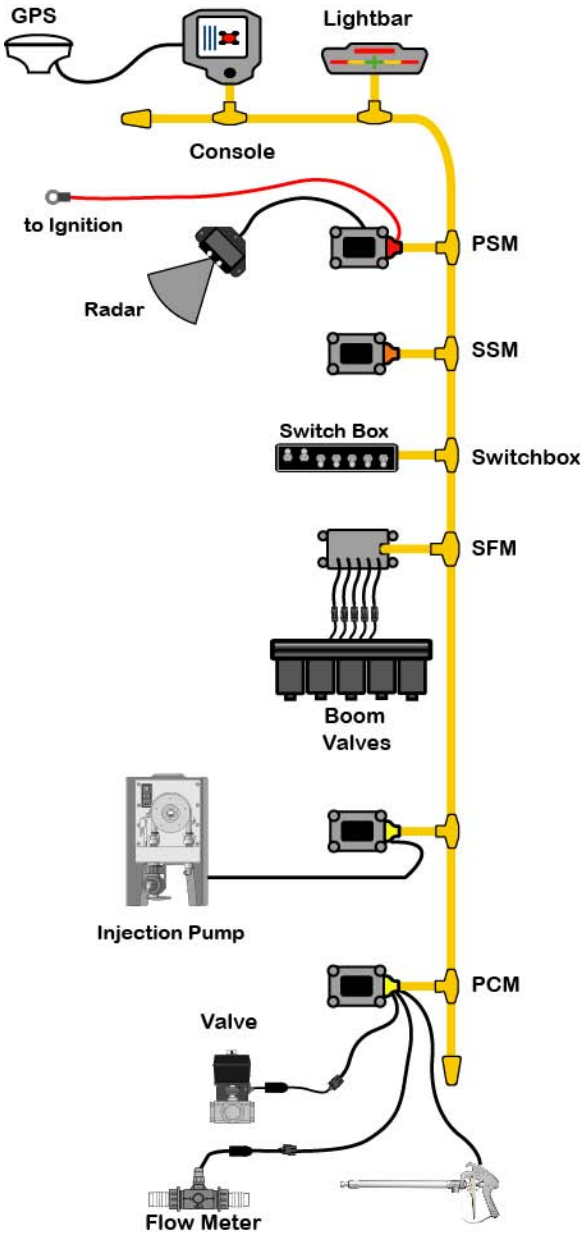
RMS for The Legacy 6000

Software Version 2.01

Chapter 1 - System Introduction

An introduction to "RMS for The Legacy 6000"

Software Version 2.01



About Mid-Tech RMS for The Legacy 6000

Welcome to the Mid-Tech Roadway Management System (RMS). The Mid-Tech RMS product is a comprehensive software package designed specifically for roadway spraying applications. With RMS you will be able to more effectively manage your roadway applications. RMS allows you to map and record vehicle location as well as track the rate and location of chemical applications. RMS allows you to build specific profiles (small data bases) for company personnel, contracting agencies, chemicals and chemical mixes, as well as vehicle and spray configurations. This profile information is combined with a GPS based map created during the actual application process to produce final roadway application report. Maps included with the reports will show all spray activity, including boom and channel activity for an entire roadway spraying session.

The Legacy 6000 system allows the control of all product types, plus GPS mapping, 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 RMS 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

- Product control with optional mapping
- Four real-time on the go mapping options, Weather, Note, Points, and Hazard
- Single console in the cab with a single cable connection to the console
- Simplifies operation of product control and GPS record keeping
- Comes fully loaded with “RMS 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 to10 individual boom sections
- Up to 2 application rates per product can be preset and accessed on the go
- 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
- Mapper option for mapping points, lines, and polygons

Additional RMS Features Include

On Board Help

The Legacy 6000 has an On Board Help information window for highlighted parameters. If the operator is not for sure what value to enter or what the setup parameter does, highlight the data entry location or button and read the On Board help information.

Background Images

You now have the ability to view Geo-Tif (DRG) image files in the background of most of the RMS real-time mapping applications, such as *RMS Mapper* and *RMS Record Spray Session*, as well as *RMS Map Manager*.

Names Data Base Manager

This is a utility application found in the RMS Office User Guide. The Names Manager allows you to construct a list of commonly used attribute names. This data base of names can be exported to the Legacy 6000 and can be used in real-time mapping applications.

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 5 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.

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 Switch Function Module (SFM). 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

Operator Interface: Back lighted, tactile feed-back switches on front panel

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

Communication: CAN, 29 bit ID, 250K baud, Mid-Tech proprietary messages, Serial RS 232 (2), USB: (1)

Memory: 64 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, 0-16 VDC, (Hi state is ON)

Battery Power: 0-16 VDC

Inputs/Outputs

Mid-Tech CAN: ISO 11898 (Bosch 2.0B), 29 bit ID, 250K baud, Mid-Tech proprietary messages

Gateway CAN: ISO 11898 (Bosch 2.0B), 29 bit ID, 250K baud, Mid-Tech proprietary messages

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 (GSO):1 input, digital, 0-12 VDC, HI/LO sensing

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

Communication

Mid-Tech CAN: 29 bit ID, 250K baud, Mid-Tech proprietary messages

Switch Function Module

The Switch Function Module (SFM) enables automated system control of boom sections.

Figure 1-3: Switch Function Module (SFM)

Outputs

Booms outputs: (10) 3amp +12switched

Output Connector: A - Ground, B - N/C, C - +12 Open, D - +12 Constant

Input

Battery Power: 30amp

Communication

Mid-Tech CAN: ISO 11898 (Bosch 2.0B), 29 bit ID, 250K baud, Mid-Tech proprietary messages

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 1-4: 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

Communication

Mid-Tech CAN: ISO 11898 (Bosch 2.0B), 29 bit ID, 250K baud, Mid-Tech proprietary messages

Serial: Asynchronous RXD and TXD only

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: ISO 11898 (Bosch 2.0B), 29 bit ID, 250K baud, Mid-Tech proprietary messages

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)

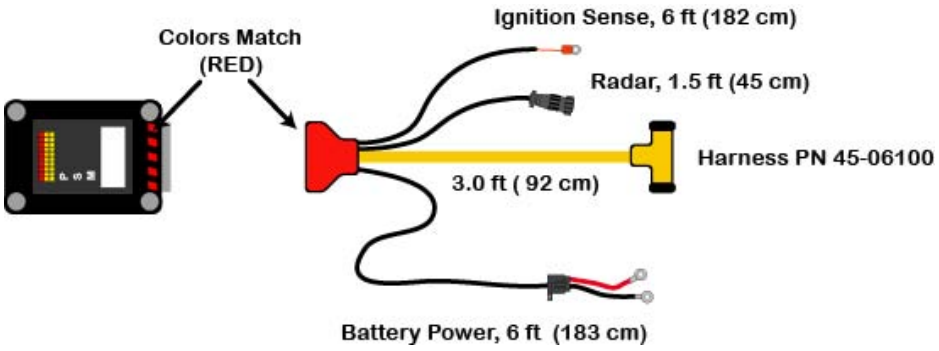


Figure 1-6: Power Speed Module Harness

Switch Sense Module

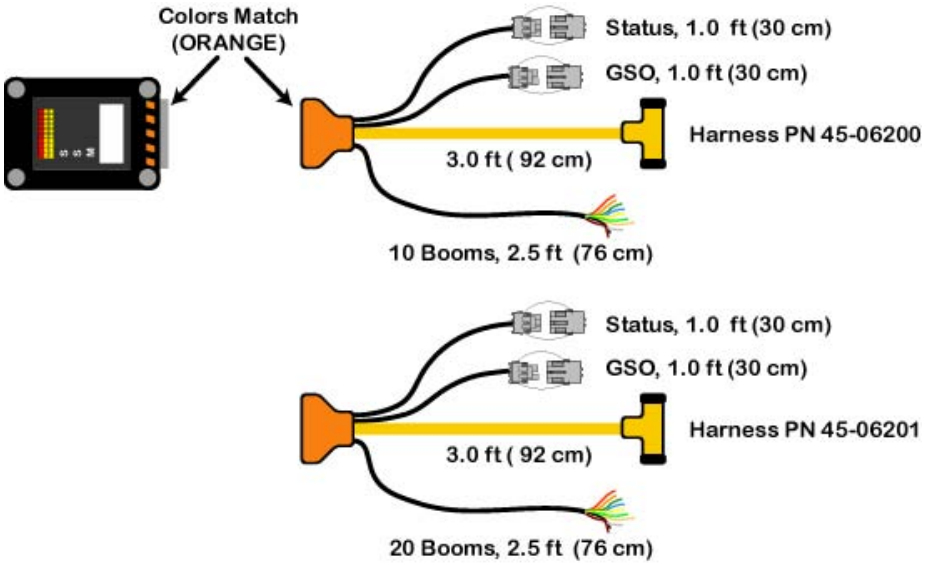


Figure 1-7: Switch Sense Module Harness Options

Product Control Module

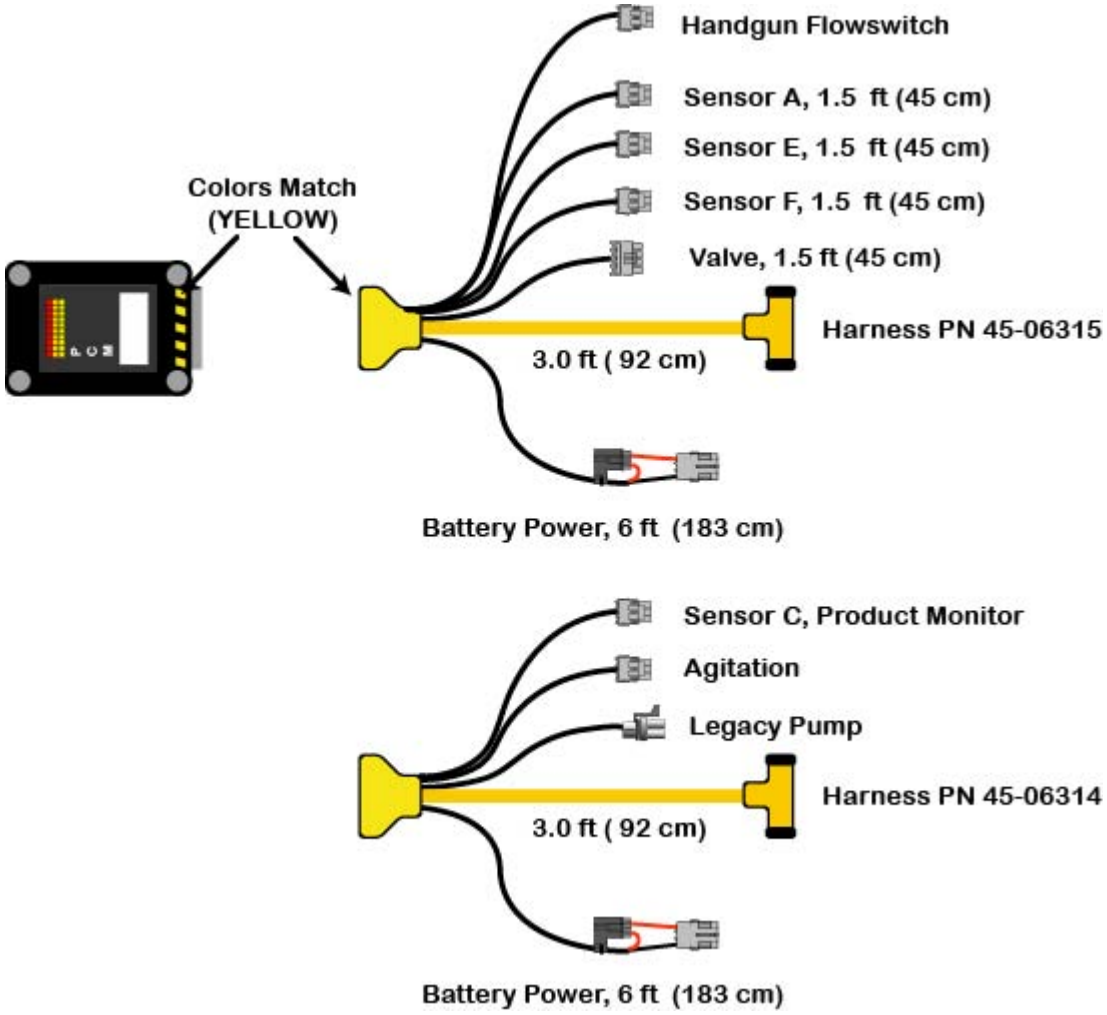


Figure 1-8: Power Control Module Harness

Typical Legacy 6000 Configurations

The following schematics reflect a typical Legacy 6000 injection configurations. Due to the variety of possible configurations, the schematics should be used for general reference. Contact Mid-Tech or your dealer for detailed information regarding your specific configuration and installation.

Dual Channel Injection with Liquid Carrier control with Handgun

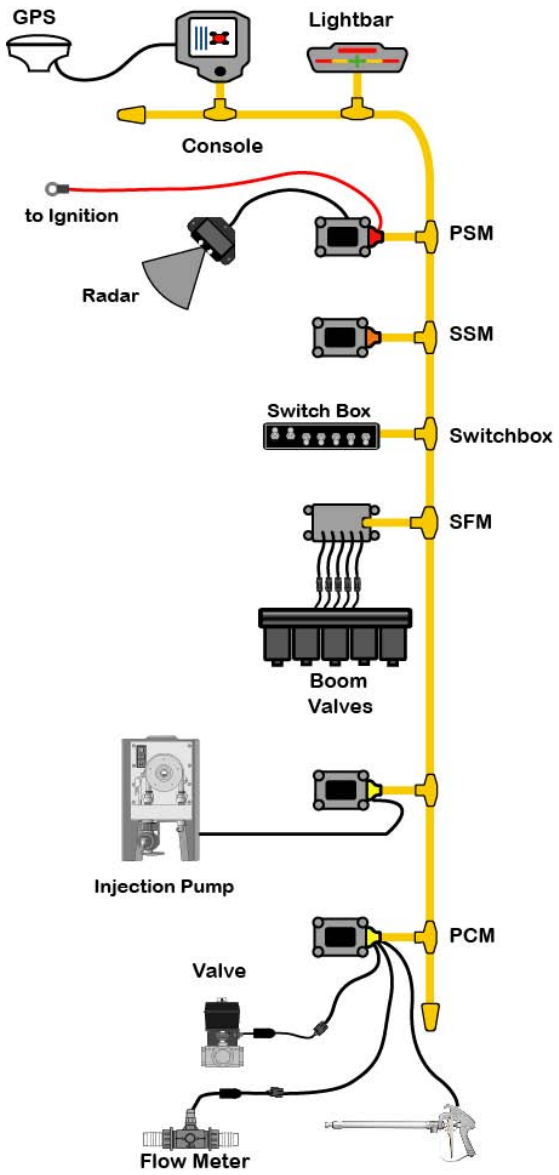


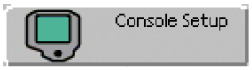
Figure 1-9: Single Channel Liquid with AutoBoom Shutoff

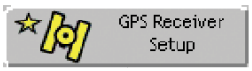
Chapter Notes

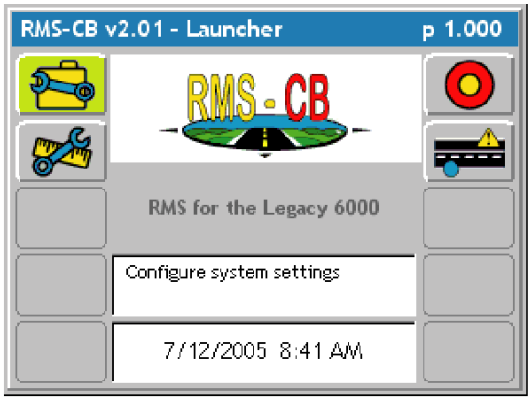
Chapter 2 - Getting Started

Setting up "RMS for the Legacy 6000".

Software Version 2.01







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, "RMS for the Legacy 6000" will automatically start up. The first software page will be is the Main RMS Launcher (Figure 2-2). System Setup, System Tools, Application Rate Manager (ARM) and Mapper are easily accessible from the Main Launcher Page. This Chapter focuses on how "RMS for the Legacy 6000" operates and how to configure your system using the System Setup application.

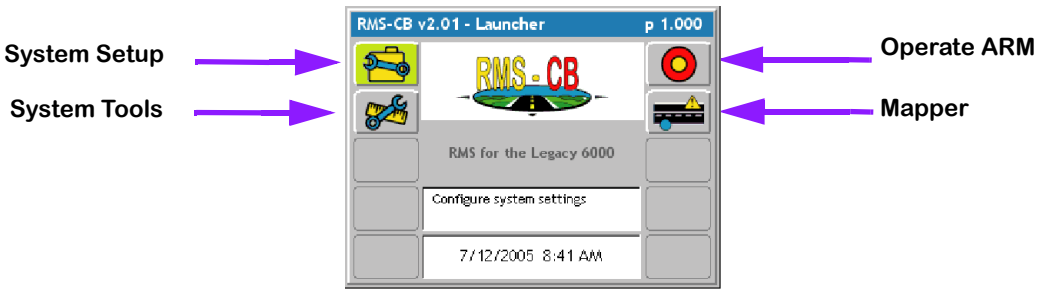


Figure 2-2: Main Launcher Page

Screen Navigation & Selection

An operator can easily navigate around the screen by using the buttons on the face of the Legacy 6000, or with the connection of a USB keyboard. The buttons on the face of the Legacy consist of four navigation arrows, escape (esp), enter, and ten function buttons(Figure 2-3). The ten function buttons, five down the left and five down the right, will be the fastest way to navigate and select items on the screen. When using the USB keyboard the buttons on the keyboard have the same function as those on the screen (Figure 2-4).

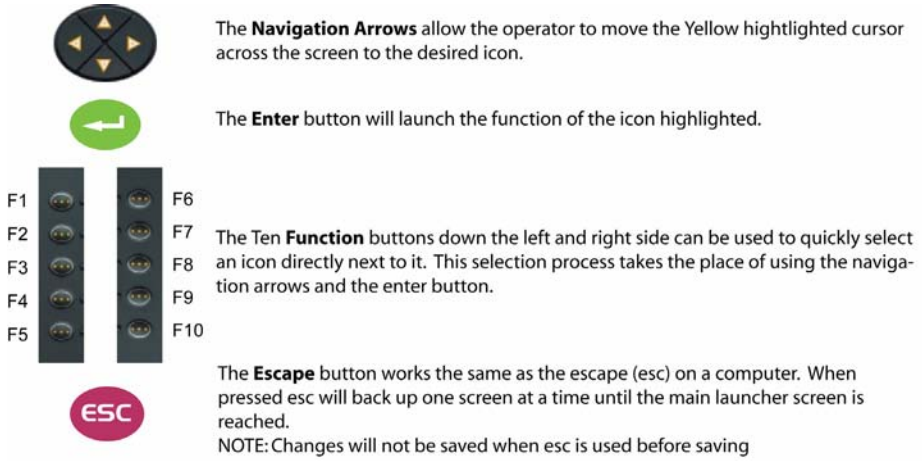


Figure 2-3: Legacy 6000 Screen Navigation & Selection Buttons

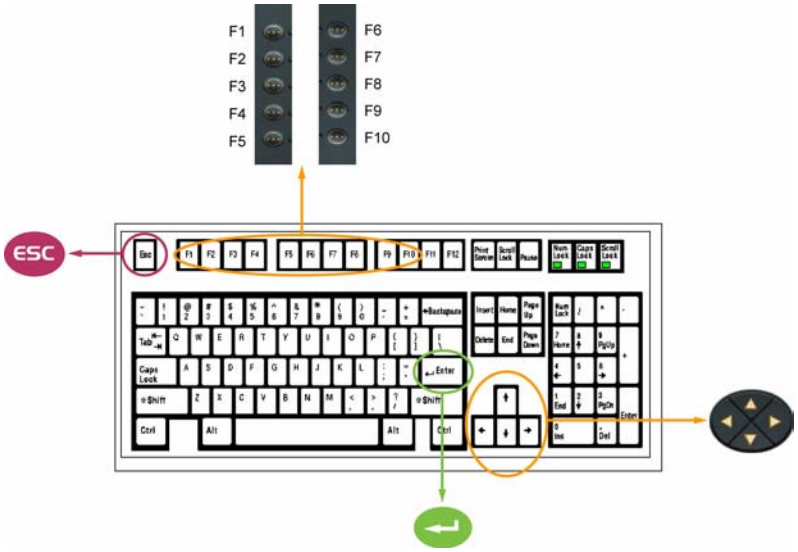


Figure 2-4: USB Keyboard Screen Navigation & Selection Buttons

Standard Pages

Three basic types of software pages are used in "RMS for the Legacy 6000", a Launcher page (Figure 2-5), a Setup Menu page (Figure 2-6), and a Data Entry page (Figure 2-7) and (Figure 2-8). 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 RMS software.

Launcher Page

A Launcher page typically contains several smaller applications (programs) that are run (launched) from that Launcher page. For example, the Launcher page below, (Figure 2-5), is the System Setup launcher from the Main Launcher Page. 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.

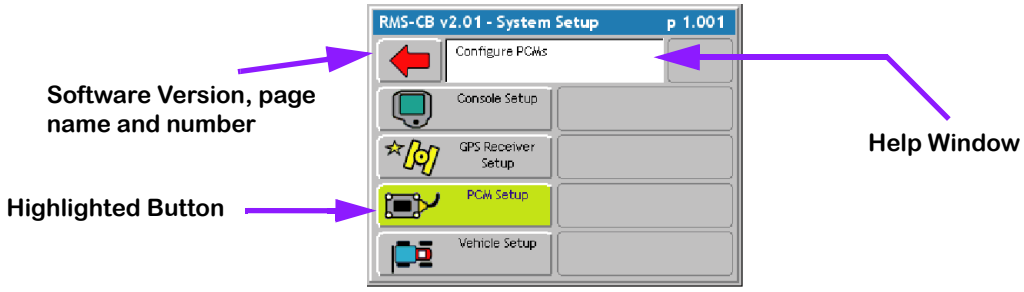


Figure 2-5: Example of a Launcher Page

Setup Menu Page

A Setup Menu page (Figure 2-6) 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 to the center column using the 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 2-7) and (Figure 2-8).

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 the sub-group buttons only displays the setup parameters associated with that sub-group, in the center column. For example, in GPS Receiver setup (Figure 2-6) 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.

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.

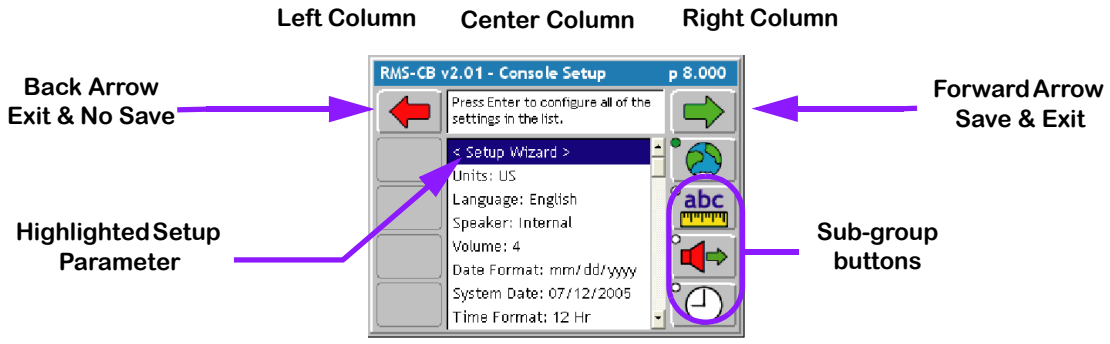


Figure 2-6: Example of a Setup Menu Page

Data Entry Page

Data Entry page may be an alpha-numeric entry or a pick list (Figure 2-7). 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 though 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.

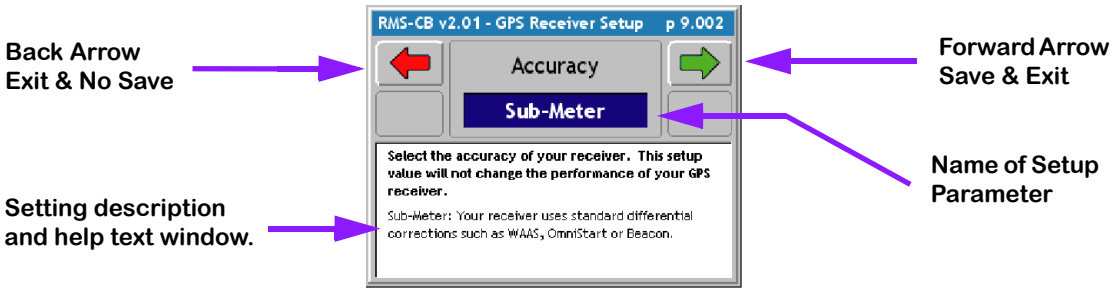


Figure 2-7: Example of Pick List Data Entry Page

Alpha/Numeric Data Entry

To enter a value in a Data Entry page that employs an alpha/numeric dialog box (Figure 2-8), highlight the desired character and 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. When the desired setting is in view in the dialog box press enter to save the setting or press the forward arrow.

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).

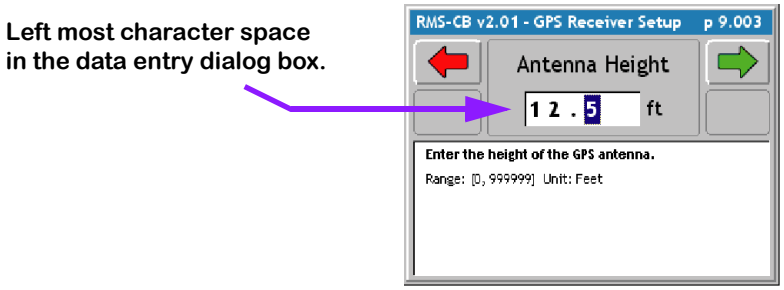


Figure 2-8: Example of Alpha/Numeric Data Entry

System Setup

The RMS 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, see the left image in (Figure 2-9), the help text should say *Configure System Settings*. This brings up the System Setup Launcher page, right image (Figure 2-9). The table below lists the current system components that can be configured. Each component is covered in more detail in sections below.

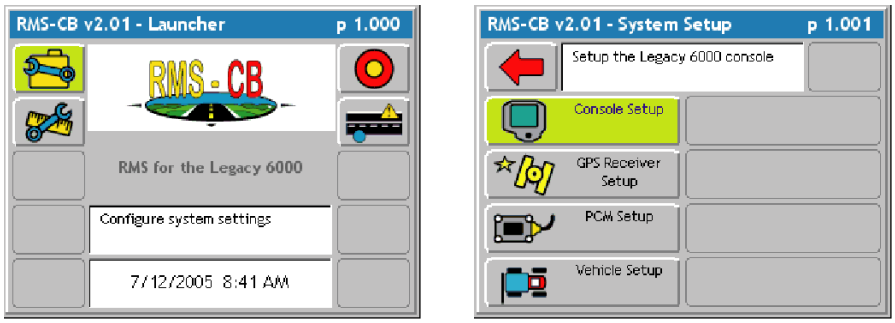


Figure 2-9: System Setup Page

Setup	Description
Console	Defines system environment variables such as units, language, date, and time.
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.
Vehicle	Defines the vehicle's boom arrangement.

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

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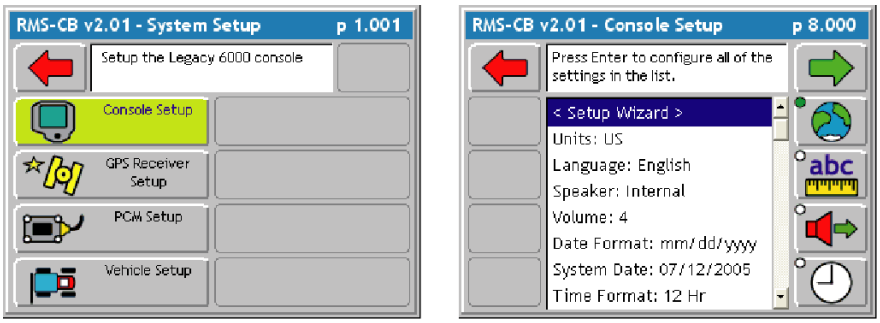


Figure 2-10: The Console Setup Menu Page

Setting	Description
Units	Defines the system units: Metric or US.
Language	Defines the system language.
Speaker	Sets the system speaker option: internal or external.
Volume	Sets the speaker volume.
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 Date	Sets the system Date.
Time Format	Defines the time format to be displayed on the console. Settings are 12 hr. and 24 hr.
System Time	Sets the system time.
Time Zone	Sets the time zone the Legacy 6000 system is operating in.

Table 2-2: Console 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 2-3

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

NOTE: If changes are made is GPS Receiver Setup the Legacy will need to be shutdown and restarted before operation.

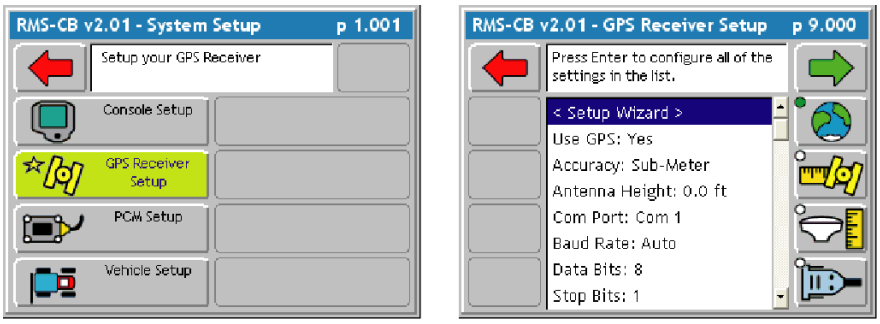


Figure 2-11: The GPS Receiver Setup Menu Page

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.
Antenna Height	defines the height of the GPS antenna from the ground surface
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.
Stop Bits	Defines the selected com port stop bit setting.
Parity	Defines the selected com port parity.

Table 2-3: The GPS Receiver Setup Settings

Vehicle Setup

Vehicle Setup allows the operator to select a vehicle profile created using RMS Office software. The vehicle profile can NOT be changes using the Legacy 6000, all changes to vehicle profiles must be done using RMS Office. The operator does have the option to review the vehicle profile settings to ensure the correct profile has been selected.

To select a profile enter Vehicle setup and select Spray Config. A pick list screen will appear and the operator can use the Up and Down arrows on the Legacy to spin through the possible vehicle profiles. Once the desired vehicle profile is located review the vehicle setup illustration or press the review button to review actual boom values, if all settings are correct press the green forward arrow to accept and save the vehicle configuration.

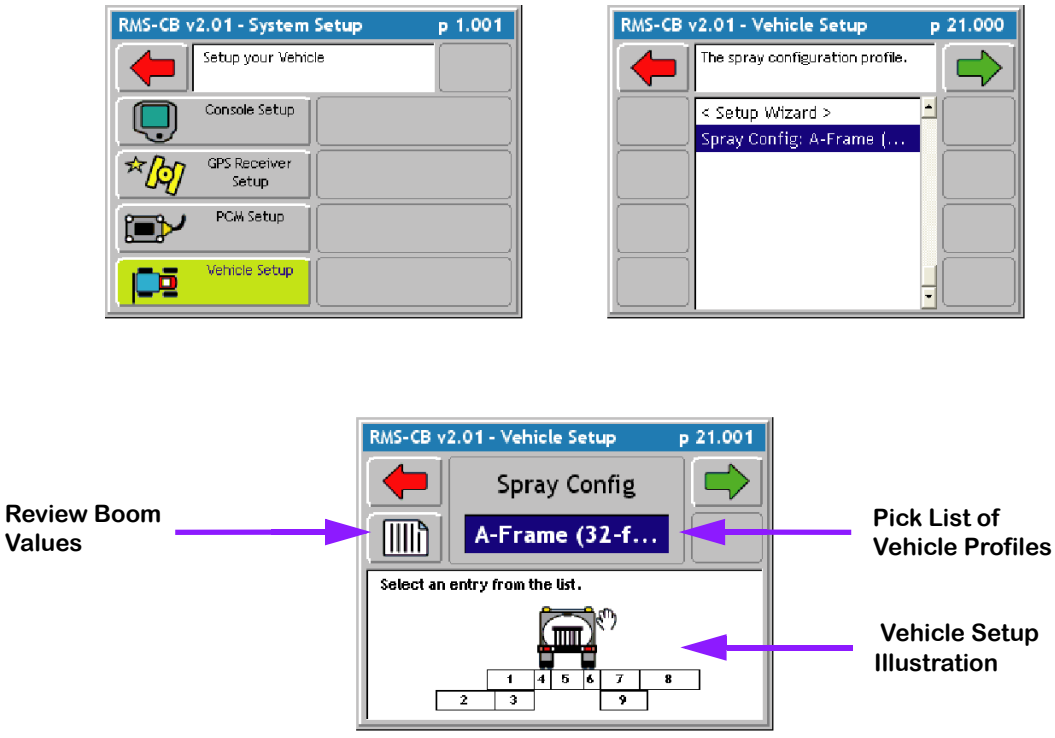


Figure 2-12: Selecting a Vehicle Profile

Product Control Module (PCM) Setup

The Product Control Module (PCM) setup is used to configure a PCM that is connected to the Mid-Tech Legacy 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 consists of ten Main Setup Headers, (Favorites, Application, Drive Type, Units, Primary Sensor, Secondary Sensor, Monitors 1, Monitors 2, Monitors 3, and Monitors 4.) See Table 2-4, each Header has detailed setup parameters to fit the operators application. Information entered in a PCM setup Main Setup Header, may effect subsequent PCM settings and pages. Review the setup procedure before running PCM setup. If in doubt, contact your Mid-Tech customer service representative.

To access PCM Setup, select System Setup from the main Launcher page. This brings up the System Setup page. From the System Setup page, select PCM Setup. This brings up the PCM Setup page. The PCM Setup page will have a button for each PCM the software detects on the CAN bus. If there is only one PCM connected this page will not appear and will advance directly to the First Main Setup Header (Favorite). Each button will display the PCM number, Serial Number and PCM Name(Figure 2-13). Select the desired PCM to be setup and press enter.

NOTE: The PCM will say "Not Configured" if it has never been setup or after a software reset.

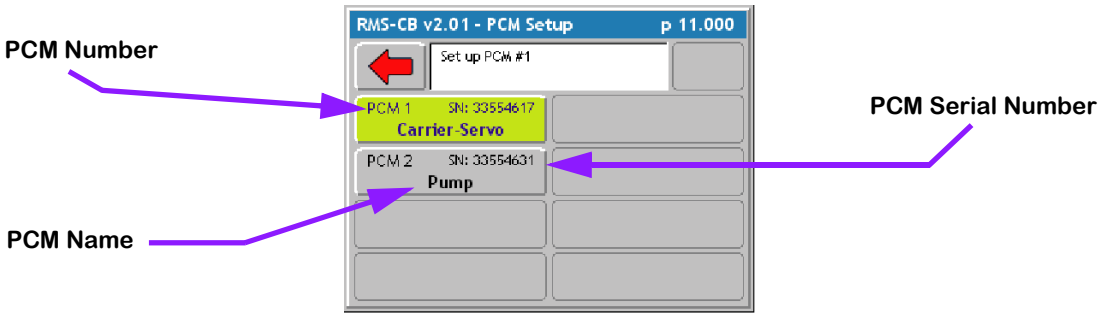


Figure 2-13: The PCM Setup Launcher Page

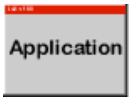
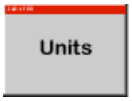
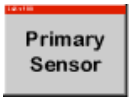
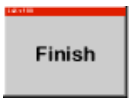
Page Name	Description
	Allows a setup configuration to be selected or saved.
	Defines the type of product application or device being controlled, such as Liquid or Granular.
	Select the drive circuit used to control the product delivery or device.
	Select the units used for the application rates.
	Defines 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 2-4: PCM Setup - Main Setup Headers

Selecting a PCM Setup Favorite

NOTE: *The Legacy has the capability of many product applications. All product applications are included in the PCM setup instructions, only use the information that pertains to your application.*

The first setup page is the PCM Favorite (Figure 2-14). When the operator configures all PCM Setup parameters the settings can be saved as a Favorite. Favorites are completed saved versions of PCM setup. Mid-Tech has taken the time to provide some very basic PCM setups for Injection and Carrier applications see Table 2-5. To view all the default settings for the pre-created favorites (See “Appendix A - PCM Favorites Settings” on page A-1.) One of the favorites may come close to fitting your application, it will be very helpful to use the closest pre-created favorite to your application as a starting point and adjust as needed. When PCM setup is complete save the setup as your own personal Favorite. This is very useful if the Legacy is used in more than one application. This feature will prevent the operator from setting up the PCM every time the application changes, just select the favorite created for the application and press the Finish flag, apply the settings, and GO!

The configuration listed as <Loaded> in the dialog pick list is the current configuration of the PCM. 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 2-14).

Select the desired favorite that best matches the application and press the Forward arrow to advance to the next PCM Setup page (Figure 2-15). If no other changes are required, press the Finish button and go directly to the last setup page “Finishing the PCM Setup” on page 2-28.

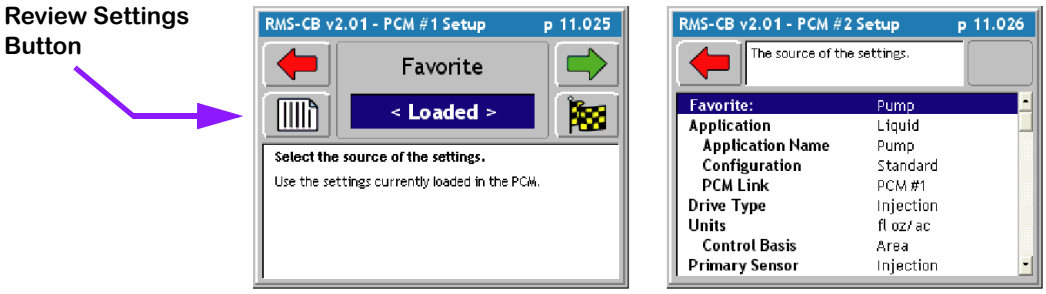


Figure 2-14: The PCM Setup Favorites Page

Favorites	Description
CARRIER	Defines a liquid application with a flowmeter sensor and no drive type
CARRIER-SERVO	Defines a liquid application with a flowmeter sensor and Servo drive type
PUMP	Defines an Injection application.

Table 2-5: PCM Pre-Created Favorites

Setting the Application Type

The Application Setup page (Figure 2-15) 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 on the Application page (Figure 2-15). 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.

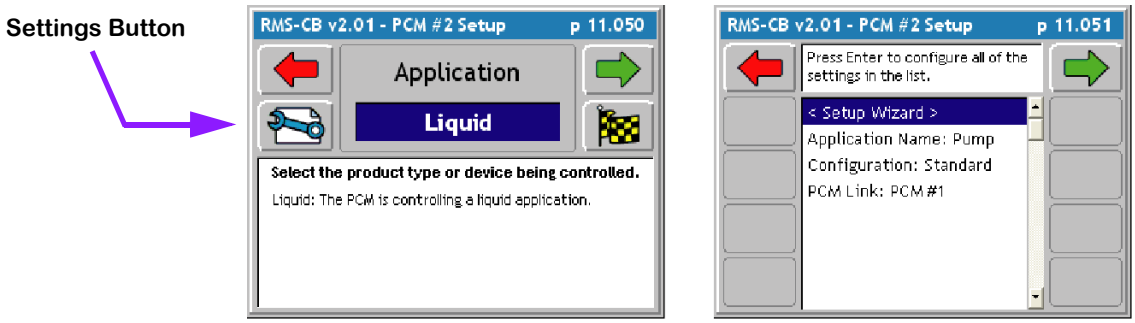


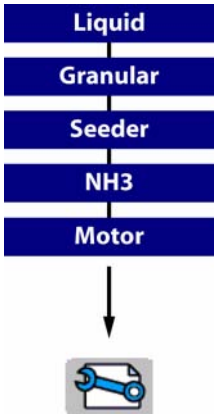
Figure 2-15: The Application Page

Application Type Options

- Liquid
- Granular
- Seeder
- NH3
- Motor

Application Type Settings

All Application Types have the same setting options when the settings button is pressed, review (Table 2-6) for a detailed description of the settings.When the Application Type settings and parameters are selected, press the Forward arrow to advance to the next PCM Setup page



Application Settings	Description
Application Name	A user defined name used to label a particular application (PCM). Users typically label this the same as the PCM favorite name.
Configuration	Defines the relationship between the sensor and the product. **Standard Liquid -** All material that is recorded by the rate sensor is discharged through the boom. **Standard Granular -** Material shaft speed should change as booms are turned off. **Split -** Only used in a granular application. Material shaft speed does not change as booms are turned off. **Reflow -** Only used in a liquid application. Material from a closed boom valve is recirculated back to the tank or pump.
PCM Link	If more than one PCM is in use the PCM can be linked to one another. This is used if one product is dependent on the other product for proper application. When PCM's are linked and one would fail, both PCM's would shut down.

Table 2-6: Application Type Detailed Settings

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, (See “Drive Type Settings” on page 2-17.), accessed from the Settings button on the Drive Type page

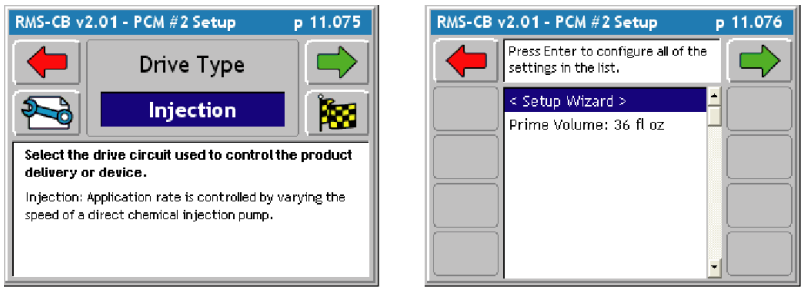


Figure 2-16: The Drive Type Page

Drive Type	Description
Servo	Application rate is controlled by a bi-directional motorized valve.
PWM	Application rate is controlled by a pulse-width modulated hydraulic valve.
DC Motor	Application rate is controlled by varying the speed of a DC motor. (Does not include injection)
Injection	Application rate is controlled by varying the speed of a direct injection pump.

Table 2-7: Drive Type Options

Drive Type Settings

Three of the Drive Types have setting options, Servo, Injection and PWM. Review (Table 2-9) for detailed Servo settings, (Table 2-10) for detailed PWM settings, and (Table 2-8) for detailed Injection settings. When the Drive Type settings and parameters are selected, press the Forward arrow to advance to the next PCM Setup page

Injection Settings	Description
Prime Volume	Define the amount of liquid needed to prime the pump. This is the volume needed to fill plumbing lines from chemical tanks to the injection point, use the formula below to calculate the Prime Value. The Prime feature is located on the ARM launcher page (See “Priming The Injection System” on page 3-15.)

Table 2-8: Drive Type - Injection Detailed Settings

Calculating the Prime Value

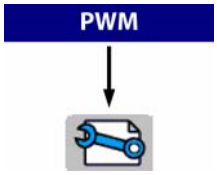
(Line diameter/2) X 3.1416 X Line length X 0.5541 = Volume in Fluid Ounces

Servo Settings	Description
Gain	Defines the speed at which the PCM reacts to an off target condition. Decrease to postpone reaction and Increase to speed up reaction. (Gain setting too high can result in oscillation)
Start Up Drive	Defines the level used to open valve from full closed position. Increase if valve open too slowly and decrease if valve opens too quickly.
Master Switch	Control valve response to all booms off. **Hold -** Control valve will hold in the same position **Closed -** control valve will drive full close
Implement Status	Defines control valve response when implement status is open (Off) **Hold -** Control valve will hold in same position **Closed -** Control valve will drive full closed

Table 2-9: Drive Type -Servo Detailed Settings

Servo Settings	Description
Valve Delay	Enter delay in resuming control after turning all booms on. When the control valve is set to close this feature is activated when resuming control and the rate exceeds the target rate the valve will delay control for the set value.
Valve Location	Defines the location of the control valve in the plumbing (In-Line or Bypass). Also used with combination in-line / bypass valve like the Autorange and most hydraulic servos.

Table 2-9: Drive Type -Servo Detailed Settings



PWM Settings	Description
Gain	Defines the speed at which the PCM reacts to an off target condition. Decrease to postpone reaction and Increase to speed up reaction. (Gain setting too high can result in oscillation)
Frequency	Defines the frequency of the drive signal specified by the manufacturer.
Minimum Duty Cycle	Defines the min. duty cycle the valve will respond to, specified by the valve manufacturer.
Maximum Duty Cycle	Defines the max. duty cycle the valve will respond to, specified by the valve manufacturer.
Ramp Time	Defines the time it takes the valve to go from min. duty cycle to max. duty cycle. Decrease if the valve reacts too slowly when off target. Increase if control reacts too quickly (overshooting target rate).
Dither	Prevents valve from sticking. This value is specified by the valve manufacturer.
Master Switch	Control valve response to all booms off. **Hold -** Control valve will hold in the same position **Closed -** Control valve will drive full close **Resume -** Control valve will close when booms are turned off, but will resume at the last duty cycle setting when booms are turned on again.
Implement Status	Defines control valve response when implement status is open (Off) **Hold -** Control valve will hold in same position **Closed -** Control valve will drive full closed **Resume -** Control valve will close when booms are turned off, but will resume at the last duty cycle setting when booms are turned on again.
Valve Delay	Enter delay in resuming control after turning all booms on. When the control valve is set to close this feature is activated when resuming control and the rate exceeds the target rate the valve will delay control for the set value.

Table 2-10: Drive Type - PWM Detailed Settings

Setting the Units

When the Drive Type is selected, the next PCM Setup page is the Units page (Figure 2-17). 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) right image. 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

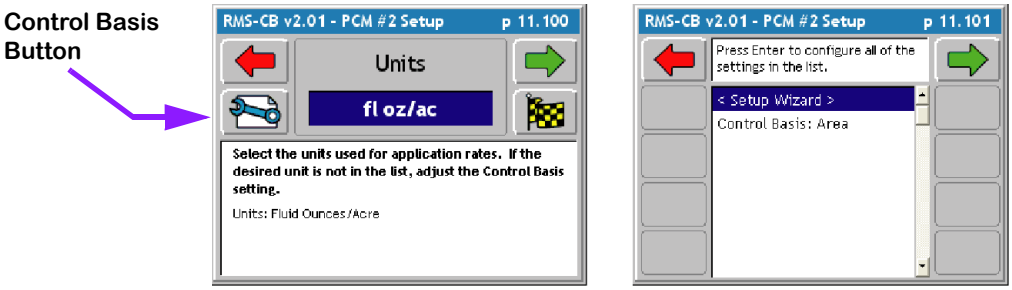
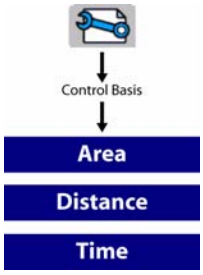


Figure 2-17: The PCM Setup Units Page



Application Types	Description
Liquid	**Area -**gal/ac - gal/1000ft^2 - gal/100yd^2 - l/ac **Distance -** gal/lmi **Time -** gal/min
Granular	**Area -** lb/ac - lb/1000ft^2 - lb/100yd^2 - tn/ac - kg/ac **Distance -** lb/mi - lb/lmi - tn/lmi - tn/mi **Time -** lb/min - tn/h -
Seeder	**Area -** lb/ac - sd/ac - tubers(tb)/ac - kg/ac
NH3	**Area -** lb/ac - kg/ac
Motor	**Time -** rpm
Injection	**Area -** fl oz/ac - fl oz/1000ft^2 - fl oz/100yd^2 - l/ac **Distance -** fl oz/lmi **Time -** fl oz/ min

Table 2-11: Application Type Options

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.

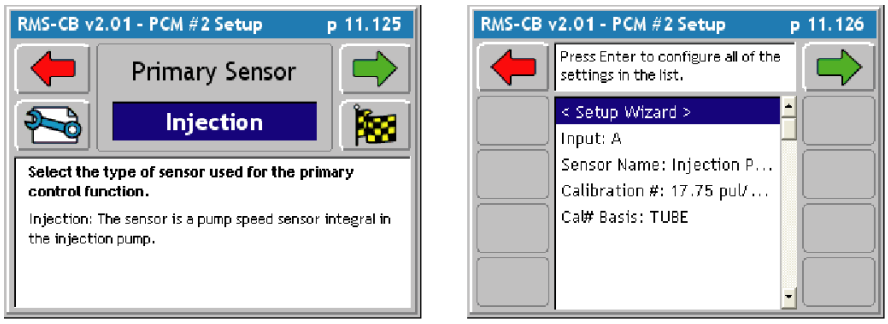


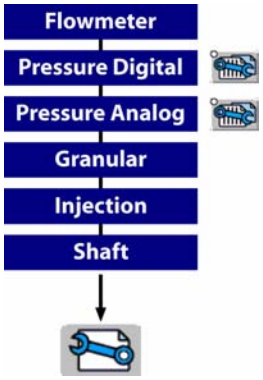
Figure 2-18: The Primary Sensor Page

Application Type	Primary Sensor Options
Liquid	Flowmeter, Pressure Digital, and Pressure Analog
Granular	Granular
Seeder/Motor	Shaft
NH3	Flowmeter
Injection	Injection

Table 2-12: Primary Sensor Options

Primary Sensor Settings

Primary Sensors Flowmeter, Granular, Injection and Shaft have detailed settings that are the same. Review (Table 2-6) for a detailed description of the settings. The two other Primary Sensors, Pressure Digital and Pressure Analog, have the initial settings as well as a sub settings. To access the sub settings locate the two Settings Buttons on the right side of the screen, use the two buttons to swap between settings.(Figure 2-19). Review (Table 2-13) for a detailed Description of the initial settings and (Table 2-14) for a detailed description of the sub settings for Pressure Digital and Pressure Analog senors.When the Primary Sensor settings and parameters are selected, press the Forward arrow to advance to the next PCM Setup page



Sensor Settings	Definition
Input	Defines digital and analog sensors. Senor inputs A-D are digital (flowmeter, and slot sensors) and Senors E-F are analog (pressure).
Sensor Name	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	Enter calibration number in units specified, this number is normally found on the sensor. Physical calibration will further fine-tune this number.
Cal# Basis	**Table of preset calibration numbers. This can be used to rapidly change a calibration number. Mid-Tech has pre-created and loaded in RMS for the Legacy 6000 a Cal Table for the injection Tube sizes. See Appendix B for Cal# Basis setup.**
Nozzle Constant	Only use for Pressure application. Enter the gal/min rating of your nozzle at 10mph at 30psi

Table 2-13: Primary Sensor Settings

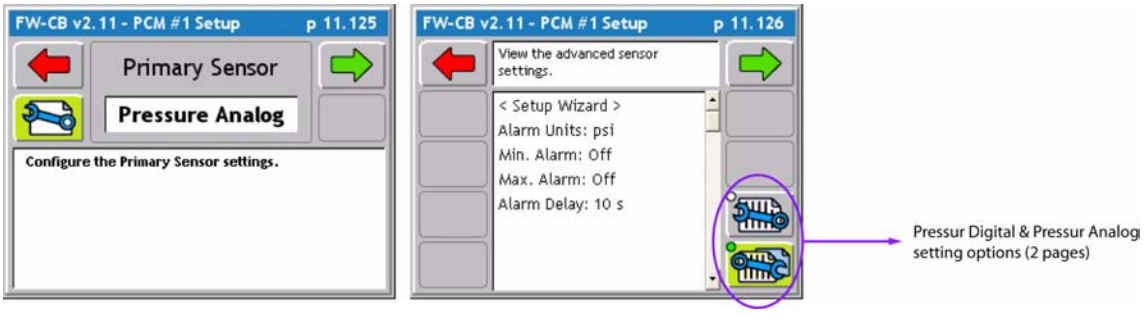


Figure 2-19: Pressure Digital & Analog Sub Settings Pages

Sensor Settings	Definition
Alarm Units	Pounds Force / Square Inch (PSI)
Min Alarm	Defines the limit below which the min. alarm will be active.
Max Alarm	Defines the limit above which the max. alarm will be active.
Alarm Delay	Defines the duration the alarm condition must exist before triggering tan alarm.
Sensor Output	Define the output signal type of the sensor. Contact the machine supplier for this information.

Table 2-14: Primary Sensors - Pressure Digital & Analog Sub Settings

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 a Settings Button which brings up the Sensor Settings page. The Secondary Sensor parameters depend on the type of Primary Sensor selected (Table 2-15).

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.

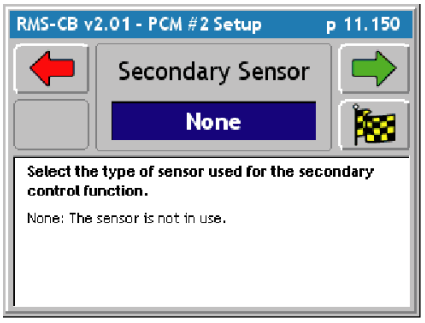


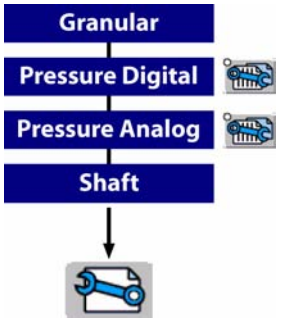
Figure 2-20: The Secondary Sensor Page

Primary Sensor	Secondary Sensor Option
Flowmeter	None
Pressure Digital	Pressure Digital
Pressure Analog	Pressure Analog
Granular	Granular
Shaft	Shaft
Injection	None

Table 2-15: Secondary Sensor Options

Secondary Sensor Settings

Secondary Sensors Granular, Shaft, Pressure Digital, and Pressure Analog have detailed settings that are the same. Review (Table 2-16) for a detailed description of the settings that are the same. The two Pressure Sensors, Pressure Digital and Pressure Analog, have the initial settings as well as an sub settings. Accessing the sub settings locate the two Settings Buttons on the right side of the screen, use the two buttons to swap between settings.see (Figure 2-19) above. Review (Table 2-17) for a detailed description of the sub settings for Pressure Digital and Pressure Analog Secondary Senors. When the Secondary Sensor settings and parameters are selected, press the Forward arrow to advance to the next PCM Setup page



Sensor Settings	Definition
Input	Defines digital and analog sensors. Senor inputs A-D are digital (flowemeter, and slot sensors) and Senors E-F are analog (pressure).
Sensor Name	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.
Dual Warning%	Defines the maximum acceptable % difference between the primary and secondary sensor outputs before the operator is warned.
Dual Warning Delay	Defines the time that the primary and secondary senors outputs can exceed the dual warning % before initiating the alarm.

Table 2-16: Secondary Sensor - Settings

Sensor Settings	Definition
Alarm Units	Pounds Force / Square Inch (PSI)

Table 2-17: Secondary Sensor - Sub Settings

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 (Figure 2-21) are based on the Application, Primary sensor, and Secondary sensor types selected. Each Monitor type will have an associated Settings button which brings up the Monitor Settings page right image in (Figure 2-21). The Monitor sensor parameters depend on the type of Monitor sensor selected. Review (Table 2-18) for a list and description of the Monitor options.

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.

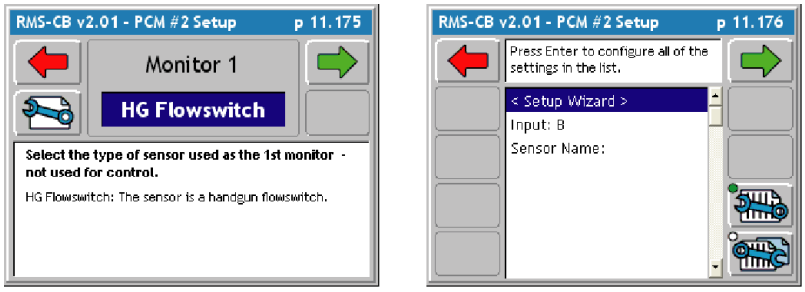


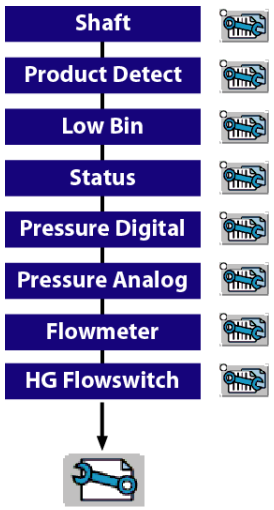
Figure 2-21: The Monitor Page

Monitors	Description
Shaft	Monitor a shaft rotation speed.
Product Detect	Monitor that product is discharging.
Low Bin	Monitor low product level left to apply.
Status	Monitor engaged or disengaged status.
Pressure Digital	Monitor pressure related or not related to application.
Pressure Analog	Monitor pressure related or not related to application.
Flowmeter	Monitor flow of liquid using a flowmeter.
HG Flowswitch	Monitor flow of liquid using a Handgun

Table 2-18: Monitor Options

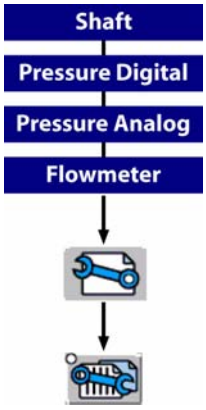
Monitor Settings

Monitors Shaft, Product Detect, Low Bin, Status, Pressure Digital, Pressure Analog, and Flowmeter have detailed settings that are the same. Review (Table 2-19) for a detailed description of the settings that are the same. All Monitors have initial settings as well as an sub settings. Accessing the sub settings locate the two Settings Buttons on the right side of the screen, use the two buttons to swap between settings.see (Figure 2-21) above right image to locate the two buttons. Review (Table 2-20) and (Table 2-21) for a detailed description of the sub settings for all Monitors. When the Monitor settings and parameters are selected, press the Forward arrow to advance to the next PCM Setup page



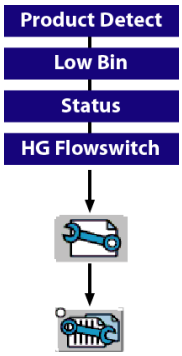
Monitor Settings	Description
Input	Defines digital and analog sensors. Senor inputs A-D are digital (flowemeter, and slot sensors) and Senors E-F are analog (pressure).
Sensor Name	A user defined name used to label a particular sensor or monitor. This information is not stored in the PCM and is used for messaging to the user only.
Calibration #	Enter calibration number in units specified, this number is normally found on the sensor. Physical calibration will further fine-tune this number.

Table 2-19: Monitors - Initial Settings



Monitor Sub-Settings	Description
Alarm Units	**Pressure -** psi **Flowmeter -** gal/min **Shaft -** rpm
Min. Alarm	Defines the limit below which the min. alarm will be active.
Max. Alarm	Defines the limit above which the max. alarm will be active.
Alarm Delay	Defines the duration the alarm condition must exist before triggering tan alarm.

Table 2-20: Monitor - Sub Settings



Monitor Sub-Setting	Description
Alarm Status	**Off -** Disabled **Low -** Sensor state goes low to trigger alarm. Contact the sensor or machine supplier for this information. **High -** Sensor state goes high to trigger alarm. Contact the sensor or machine supplier for this information.
Alarm Delay	Defines the duration the alarm condition must exist before triggering tan alarm.

Table 2-21: Monitor - Sub Settings

Finishing the PCM Setup

The final page in the PCM setup process is the Finish page (Figure 2-22). From the Finish page, select the Review all settings button to confirm setup is accurate with the machines application (Figure 2-23). Next from the Finish Page, save the PCM setup to a file for use later (See “Saving the PCM Setup to a File” on page 2-29.)

PCM setting can be directly applied to the PCM without saving by selecting the Send Settings to PCM button (Figure 2-22). The PCM will use the changes made during application. If a new application is needed and the PCM favorite or settings need to be changed all settings previous will be lost. Saving the PCM favorites take very little time and can save much time in the future.

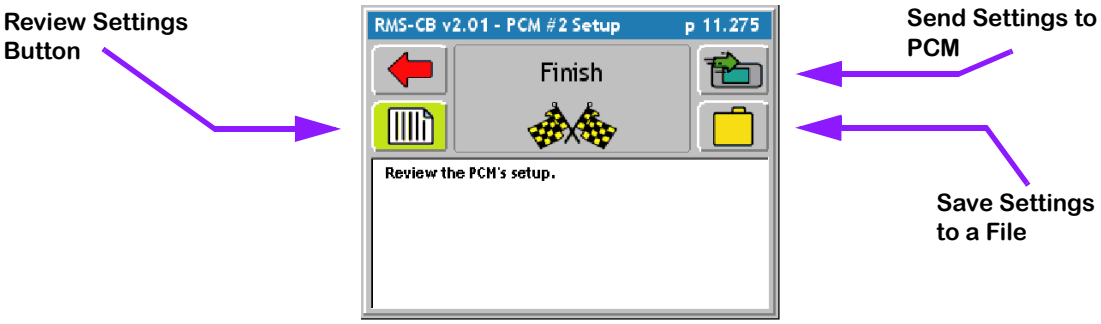


Figure 2-22: The PCM Setup Finish Page

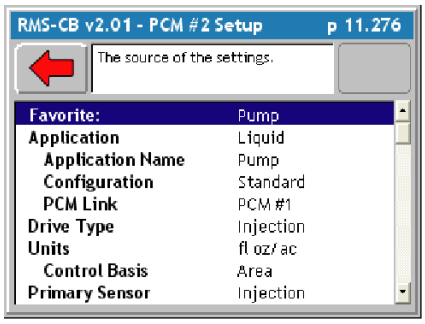


Figure 2-23: The PCM Setup Summary Page

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 2-24) right image. The Save As page allows the naming of the PCM Setup file, such as My Sprayer. Once the PCM setup settings have been saved by pressing the green forward arrow after entering a name, this name will appear as a PCM favorite. This helps to quickly set PCM settings without going through each step. The next time these settings are needed select the favorite from the pick list and proceed by pressing the finish flag and all settings will be updated.

If updating an existing favorite and the operator wants to save the favorite as the same name, select the Favorite Folder button and find the favorite to be updated. Press the green forward arrow to save the settings

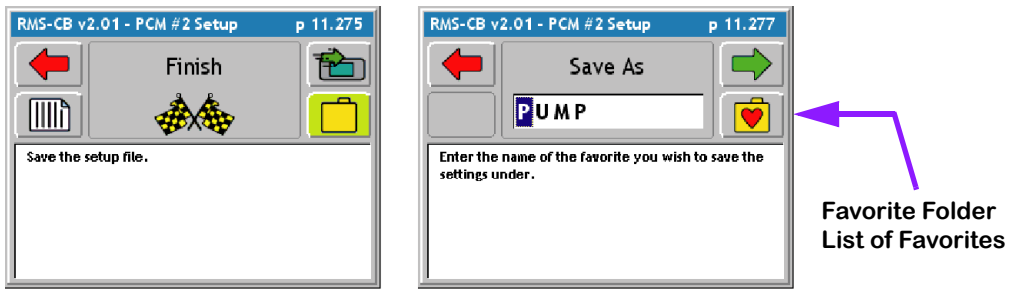


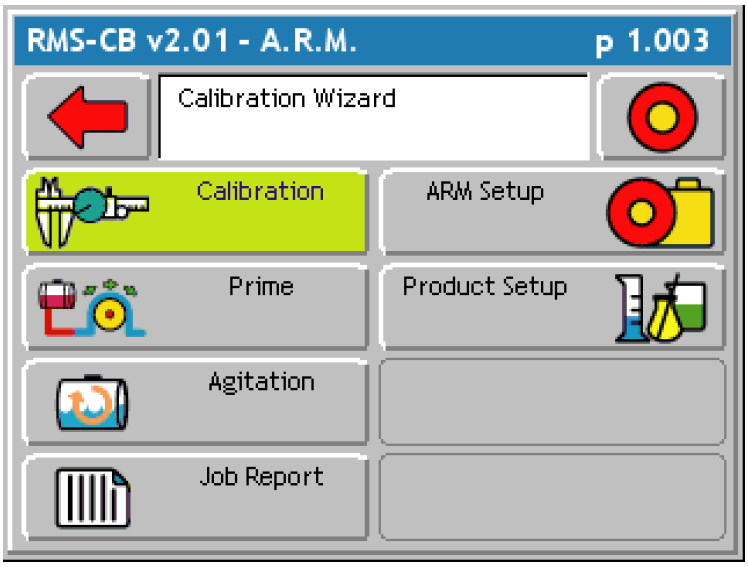
Figure 2-24: The PCM Setup Save As Page

Chapter Notes

Chapter 3 - Real-time Setup

Setting up RMS ARM for the Legacy 6000.

Software Version 2.01



Operation Overview

When the System Setup process is complete, product application setup can begin. This is accomplished by pressing the Operate ARM Bullseye located in the RMS 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 Calibration, Job Report, ARM setup, Product setup. When ARM is setup properly product application can begin. Prior to starting real-time product application (See “Chapter 4 - Real-time Operation” on page 4-1.)

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 setup steps can be accomplished in just a minute or two.

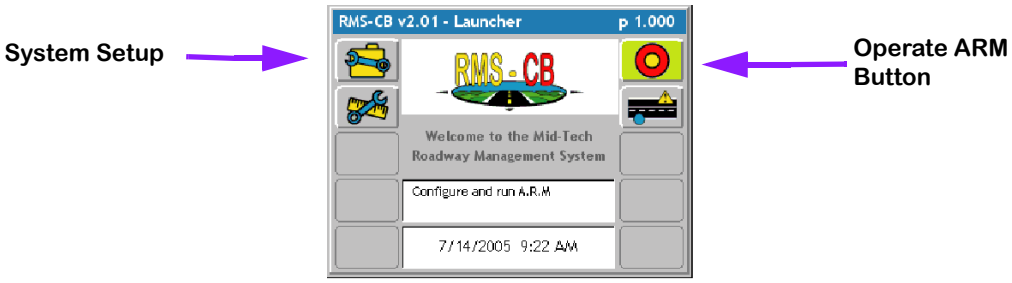


Figure 3-1: RMS Main Launcher

Starting a Job

Pressing the Bullseye button in the RMS 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 "Console Setup" on page 2-8), no Job number is asked for (see "ARM Launcher" on page 2-5). A PC card is necessary in order to have a job number and save files.

When a Job is created a folder is created on the PC card labeled with same name. All files related to this job (Record, Guideline, and Map Object) will be stored in this folder. These files are talked about in more detail (See “ARM Setup Detailed Description” on page 3-27.)

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

Creating a New Job

To create a new job, press the Create Job button in the Job page (Figure 3-2). This brings up the Create a Job page. There are two methods of naming a job: manually and automatically (Figure 3-3).

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.

Creating a Job Based on an Existing Job

A new job can be created based on the settings of an existing job. This helpful when starting a new job and no settings need to be changed. This allows the operator to create a new job and GO! To do this, select the desired job to base the new job from. Press the (Create a job off last job settings) button see (Figure 3-2). Create a new job name or auto name the job and then press the green forward arrow. All settings from previous job can now be viewed from the ARM launcher page or press the ARM bullseye to start application based on last job settings.

Figure 3-2: The Job Page

Manually Naming a Job

From 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.

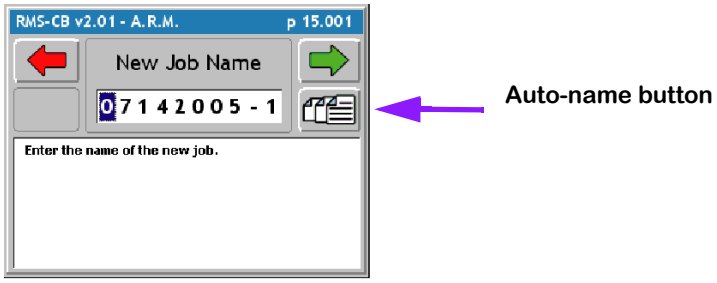


Figure 3-3: The Job Name Page

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 January 31st 2005 would automatically be named 01312005-1. The second job for the same day would be named 01312005-2.

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 3-4). 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 3-4: The ARM Launcher Page

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.

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.

The Common Calibration Procedure

The calibration procedure for application types share the same basic calibration steps, see (Figure 3-5). Each procedure has the option of performing a Static or In-Field calibration.

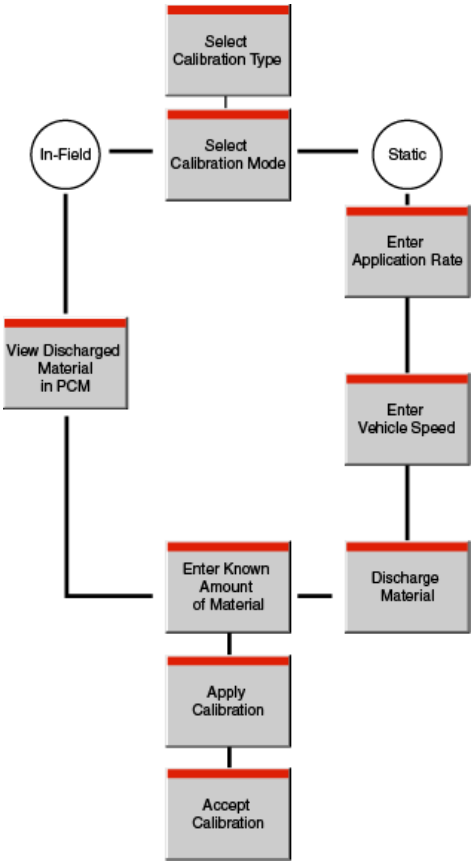
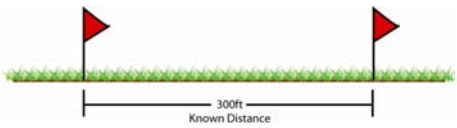


Figure 3-5: Typical Calibration Process

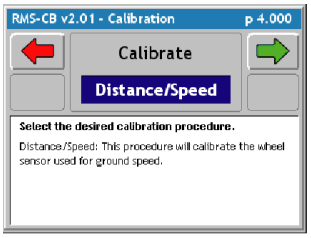
Distance/Speed Calibration

The Distance/Speed calibration process is used to calibrate a speed sensor. When setting the system up for the first time perform the procedure below and for best results repeat this procedure until the reported distance and known distance match or are very close. To make a Quick adjustment to the Calibration number follow steps 2-4 and select Quick as the calibration mode.

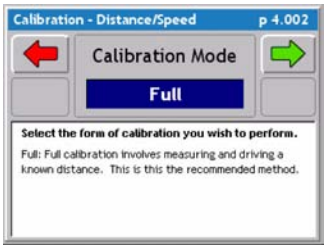


1. Mark off a known distance of at least 300ft on a ground surface similar to your field application. Place a flag to mark your start and end point.

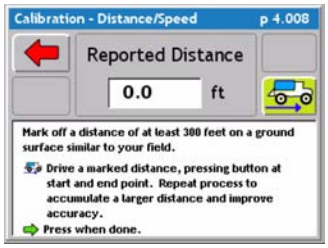
2. From the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.



3. From the Calibration page select the Distance/Speed option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.

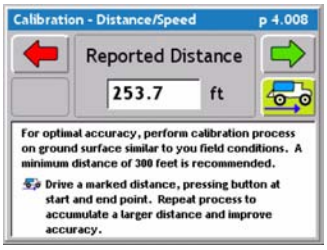


4. From the Distance/Speed page select Full from the pick list in the middle of the screen. Press the green forward arrow to cotinue to the next calibration step
- **Full** - involves driving a known distance. Recommended for first time setup
- **Quick** - allows the operator to change the calibration number without driving. This is helpful if quick adjustments need to be made to an existing calibration number.

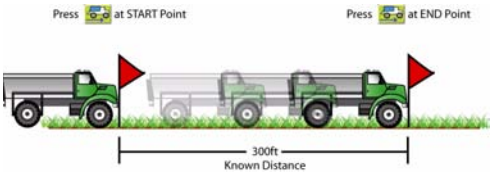


5. When driving the marked distance it is best to have the vehicle close to normal operating speed before reaching the start point. When the vehicle reaches the start point press the truck button. The truck button will begin to flash and feet will begin to accumulate.

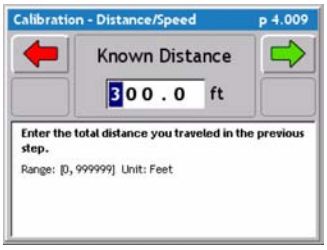
Distance/Speed Calibration Continued



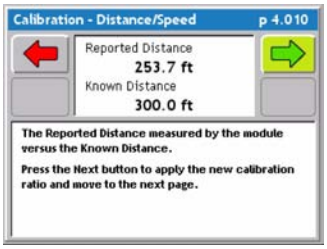
6. Maintain speed through the end point, when crossing the end press the Truck button to stop the distance accumulation. The distance displayed is the consoles reported distance. Press the green forward arrow key to continue to the next calibration step.



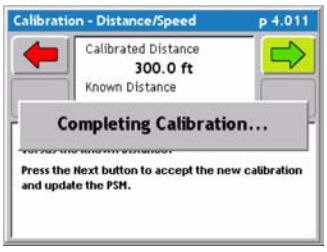
Be sure to hit the Truck button at the same location the vehicle crosses the Start and End Point. Example: If the Truck button is pressed when the front edge of the vehicle reaches the Start Point, then the Truck button must be presses When the front of the Vehicle reaches the End Point.



7. Enter the Known Distance. This is the path marked by the operator prior to calibration. Press the green forward arrow to continue to the next calibration step.



8. Reported Distance Vs. Known Distance. This page is only a information page to show the operator the Reported Vs. the Know. Press the green forward arrow to automatically recalculate the calibration number so the two distances match.

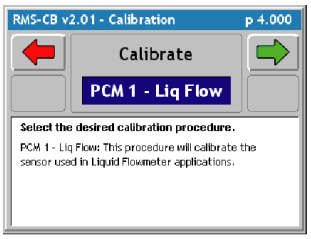


9. When the two distances match press the green forward arrow and the distance calibration procedure is complete.

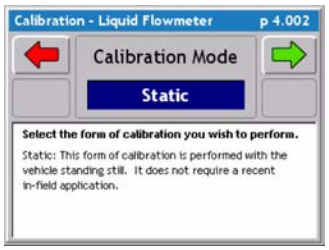
Liquid Flow Static Calibration

The Liquid Flow Static Calibration process is a stationary calibration for a liquid flowmeter. There are two calibration modes to choose from, Static or InField, only one is needed for accurate calibration. Static calibrations does not involve movement of the vehicle and can be repeated very easily to ensure an accurate calibration.

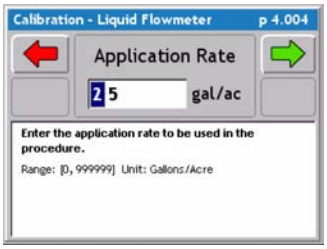
1. Fill the machine's tank with a know amount of liquid. From the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.



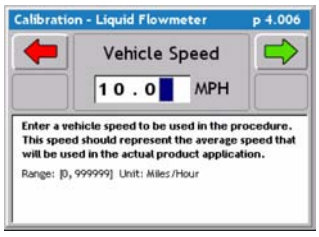
2. From the Calibration page select the PCM - Liq Flow option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.



3. From the Calibration Mode page select Static from the pick list in the middle of the screen. Press the green forward arrow key to continue to the next calibration step.
- **Static** - Does not require the vehicle to move. This is a stationary test.
- **In Field** - Is for adjusting after a known amount is applied in an actual application.

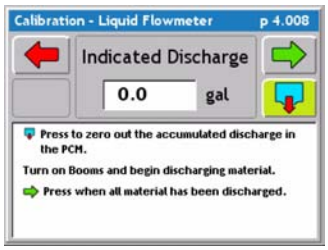


4. Enter the application rate that will be used in a real time application. Press the green forward arrow key to continue to the next calibration step.

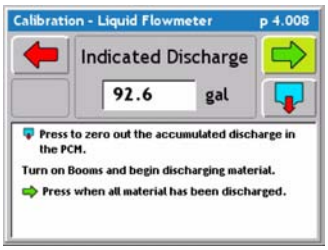


5. Enter the normal operating speed when applying. Press the green forward arrow to continue to the next calibration step.

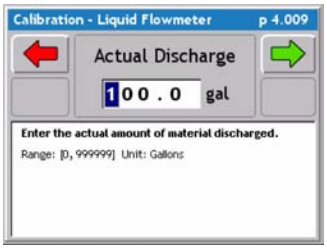
Liquid Flow Static Calibration / Continued



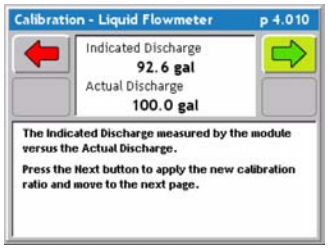
6. This is the indicated discharge, if there is any product accumulation prior to calibration it will show here. Press the empty tank button to zero the indicated discharge. Once zeroed, turn the product pump on and all booms. Product should begin to accumulate on the screen. The system should now be spraying at the speed and rate entered before.



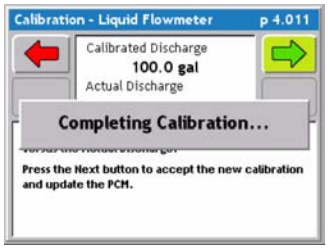
7. When a know amount has been discharged shut the booms off and accumulation will stop. Press the green forward arrow to continue to the next calibration step



8. Enter the Actual amount discharged. This is the known amount put in the tank before calibration or know amount discharged by using the sight gage on the tank. Press the green forward arrow to continue to the next calibration step



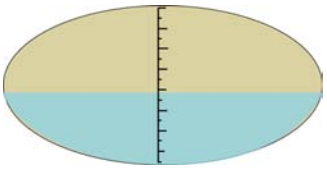
9. Indicated Discharge Vs. Actual Discharge. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match.



10. When the two volumes match press the green forward arrow and the Liquid Flow Calibration procedure is complete.

Liquid Flow In-Field Calibration

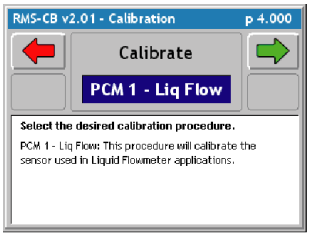
The Liquid Flow In-Field Calibration process is used to calibrate a liquid flowmeter after a real-time spray application. In-Field calibrations involves discharging a know amount of liquid in a real-time application and then performing a calibration based on the material discharged. Repeating the procedure below will ensure an accurate calibration.



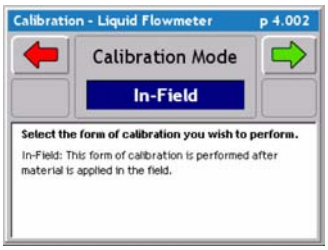
1. Load tank with a know amount of product. Record this amount for later use.

2. With the product loaded, apply the product. Make sure before starting the application all accumulated volumes are zero. This can be done by creating a new job when using a data card or if no data card is in use select Field Reset to set volumes to zero. The volume accumulated will be used in the In-Field Calibration procedure. For best results apply product at the rate and speed of normal operation.

3.Once the product has been applied, from the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.

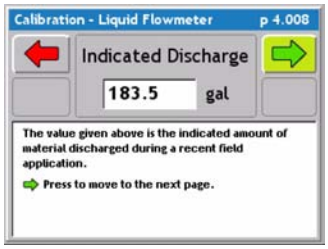


4. From the Calibration page select the PCM - Liq Flow option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.

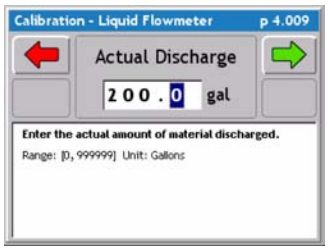


5. From the Calibration Mode page select In-Field from the pick list in the middle of the screen. Press the green forward arrow key to continue to the next calibration step.
- **In Field** - Is for adjusting after a known amount is applied in an actual application.
- **Static** - Does not require the vehicle to move. This is a stationary test.

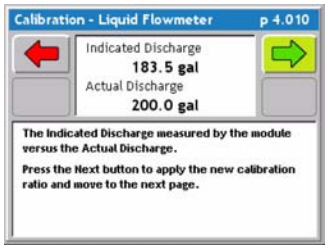
Liquid Flow In-Field Calibration Continued



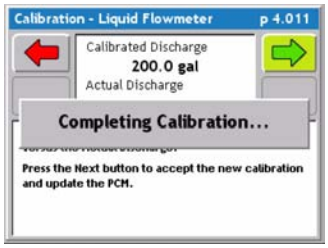
6. This is the indicated discharge. This value is obtained from the accumulated volume during the real-time application. This is why it is important to have the volume zeroed before application starts. Press the green forward arrow to continue to the next calibration step



7. Enter the Actual amount discharged. This is the known amount put in the tank before application. Press the green forward arrow to continue to the next calibration step.



8. Indicated Discharge Vs. Actual Discharge. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match.

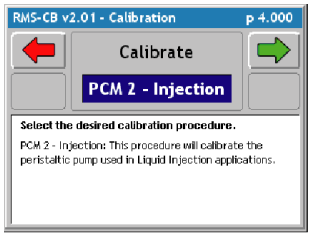


9. When the two volumes match press the green forward arrow and the Liquid Flow Calibration procedure is complete.

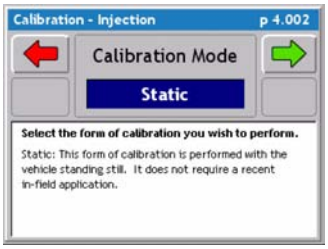
Injection Static Calibration

The Injection Static Calibration process is a stationary calibration for a liquid injection pump. Static calibrations does not involve movement of the vehicle and can be easily repeated to ensure an accurate calibration.There are two calibration modes to choose from, Static or InField, The In-Field calibration procedure is not recommended by Mid-Tech.

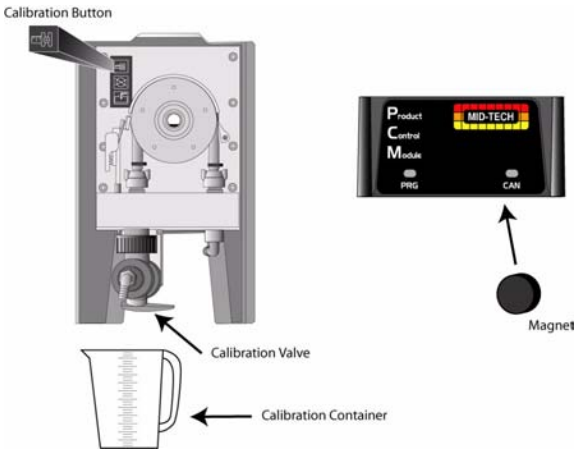
1. Fill the injection tank with product. From the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.



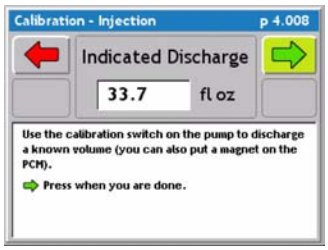
2. From the Calibration page select the PCM - Injection option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.



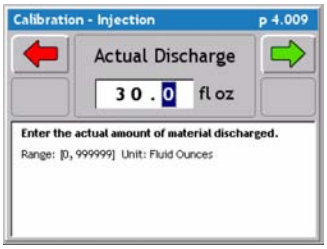
3. From the Calibration Mode page select Static from the pick list in the middle of the screen. Press the green forward arrow key to continue to the next calibration step.
- **Static** - Does not require the vehicle to move. This is a stationary test.
- **In Field** - Is for adjusting after a known amount is applied in an actual application.



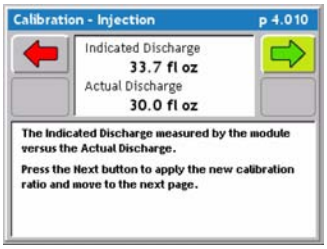
Injection Static Calibration / Continued



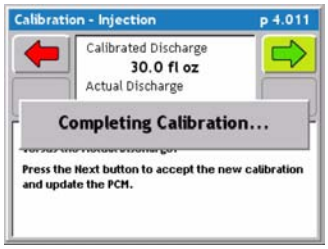
4. Place the calibration container under the calibration valve if using a MT500 peristaltic pump. If using a MT600 piston pump remove injection line place in calibration container. Use the Calibration button or switch on the pump or place a magnet on the PCM to start discharging product. As product discharges volume should accumulate on the Legacy. When a significant amount of material has been discharged let go of the calibration button or remove the magnet. Press the green forward arrow to advance to the next calibration step.



6. Enter the Actual amount Discharged. This is the known amount captured in the calibration container. Press the green forward arrow to continue to the next calibration step



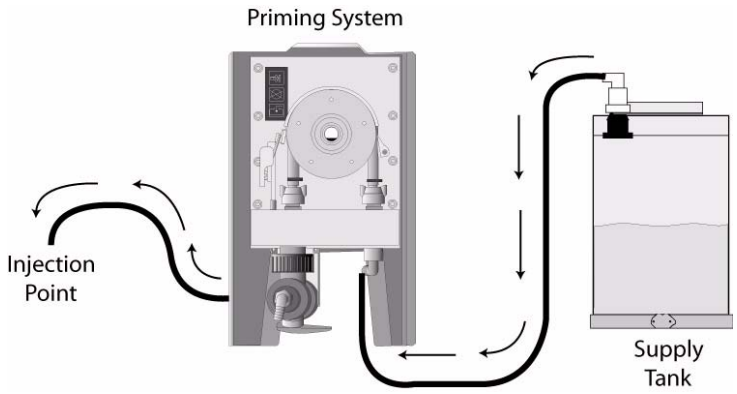
7. Indicated Discharge Vs. Actual Discharge. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match.



10. When the two volumes match press the green forward arrow and the Injection calibration procedure is complete.

Priming The Injection System

Priming feature will only appear as an option if Injection has been selected as the Drive type during PCM setup. Priming is an Injection feature only. Priming the injection system can be done in three easy steps for both the MT500 peristaltic and MT600 piston pump. Priming the system will take chemical from the injection storage tank directly to the injection point to ensure chemical is injected instantly upon the start of an application. **NOTE: Injection Calibration must be completed prior to priming for the system to properly prime. The example shown is using a MT500 peristaltic injection punp.**



1. Calculate Prime value

Calculate the Prime value using the formula below, this value should be entered during PCM setup Drive Type Injection (See “Drive Type Settings” on page 2-17.)

Calculating the Prime Value
(Line diameter/2) X 3.1416 X Line length X 0.5541 = Volume in Fluid Ounces

2. Setup System for Priming

Select the Prime button from the ARM launcher page, this will bring up the % Prime page. The prime page has two buttons (Prime State and Reset Values to Zero.) Prime State provides a detailed set of values of the priming process. During priming view this page to see the pump priming progress. The zero button will reset values to zero.

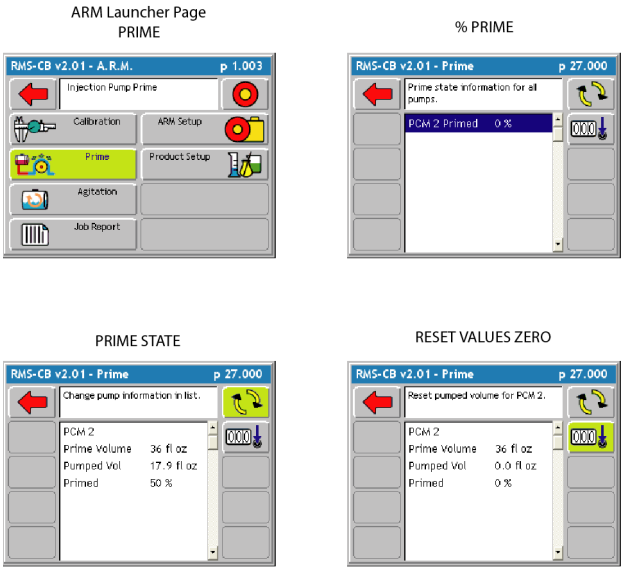


Figure 3-6: Setup System for Priming

3. Start Prime

From the prime page each pump is ready to prime. Press the calibration button or switch on the pump or place a magnet on the front of the PCM to start the pump. The pump will stop automatically once the pump volume reaches the prime volume. To view the live prime process select the Prime State button. Repeat this procedure for each pump.

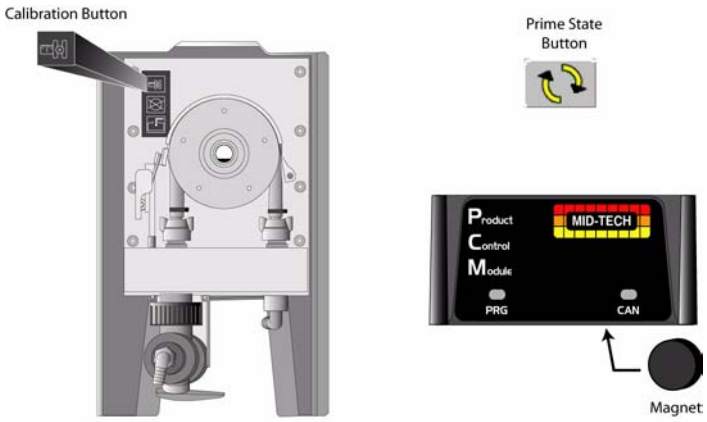
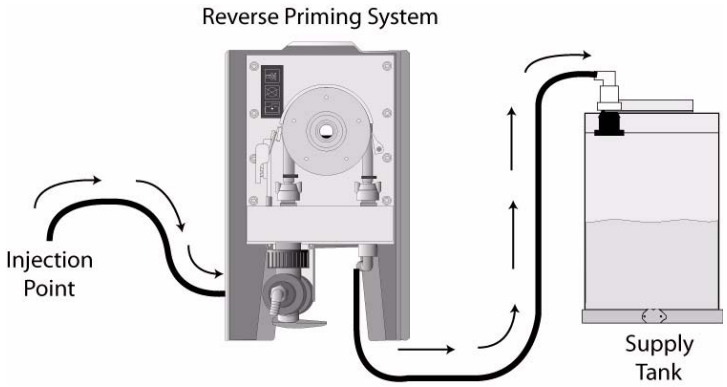


Figure 3-7: Prime and Prime State Button

Reverse Priming The Injection System

Reverse Prime can only be used with the MT500 peristaltic pump and does not come standard on the pump. Reverse Prime can be added as a feature. Call your local Mid-Tech distributor to order the reverse prime feature using Part# 54-02015.

Reverse prime works very similar to the priming procedure. Reverse Priming the system will take chemical from the injection point directly back to the storage tank to save as much chemical as possible. To Reverse Prime the system use the Prime button from the ARM Launcher page, this button will only appear as an option if Injection has been selected as the Drive type during PCM setup. Priming and Reverse Priming is an Injection feature only. Reverse Priming the injection system can be done in two steps if the system has been properly primed and a prime value has been calculated (See “1. Calculate Prime value” on page 3-15.)



1. Setup System for Reverse Priming

Select the Prime button from the ARM launcher page, this will bring up the % Prime page. The prime page has two buttons (Prime State and Reset Values to Zero.) Prime State provides a detailed set of values of the priming process. During priming view this page to see the pump priming progress. The zero button will reset values to zero.

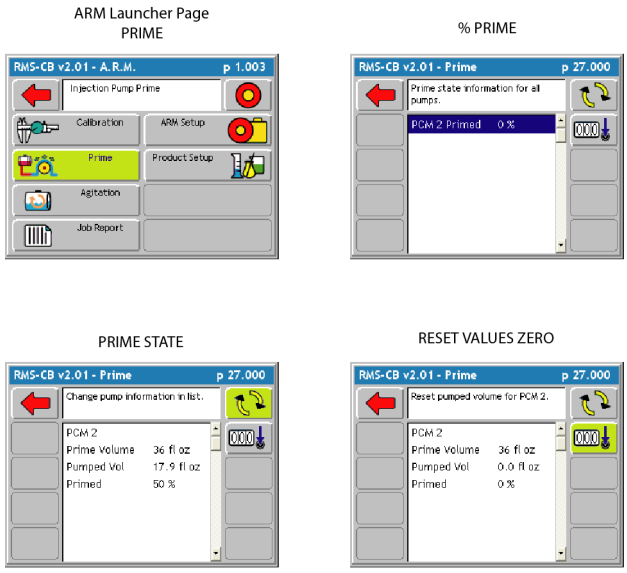


Figure 3-8: Setup System for Reverse Prime

2. Start Reverse Prime

From the prime page each pump is ready to reverse prime. Press the Reverse Prime button on the front of the pump (bottom button) and the pump should start turning. The pump will stop automatically once the pump volume reaches the prime volume. To view the live prime process select the Prime State button from the prime page.

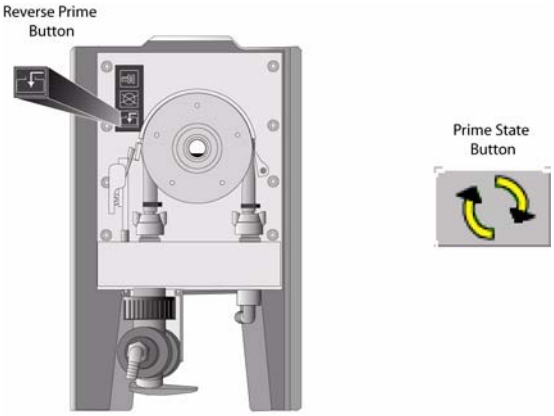
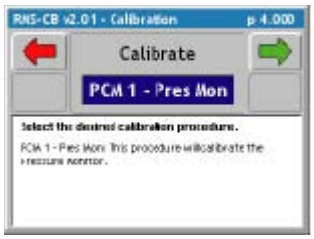


Figure 3-9: Reverse Prime & Prime State Button

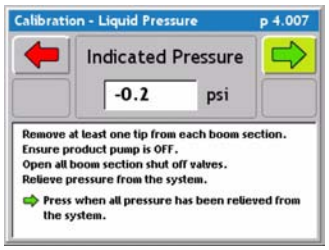
Pressure Calibration

The Pressure Calibration process is a stationary calibration for a pressure sensor. This procedure involves the discharge of material for the most accurate calibration. The use of water is recommended when calibrating.Repeating calibration procedure will ensure accurate calibration.

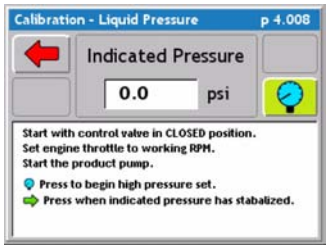
1. Fill machine with enough water to perform calibration and have a manual pressure gage mounted in-line with the booms. The most ideal location for a manual pressure gage is as close to the boom delivery point as possible. From the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.

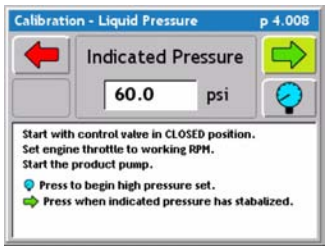


2. From the Calibration page select the PCM - Liq-Press or Pres Mon option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.



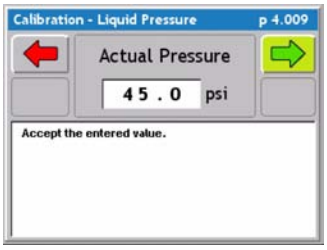
3. The Indicated Pressure is the current pressure reading on the system. This reading should be zero. With the product pump off open all boom valves and remove at least one to relieve pressure from the system. When pressure has been relieved press the green forward to set a zero value and to continue to the next calibration step.



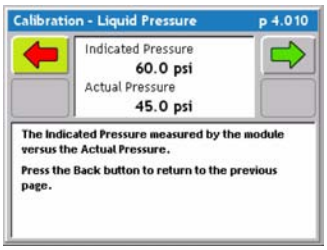


4. Start with all booms on and the control valve closed. Sart the product pump, and press the blue pressure gage button to begin high pressure setting. The control valve will fully open and product will be discharging out the boom. Rev engine to typical running RPM. When the pressure stabilizes, read and record the pressure from the manual gage, and press the green forward arrow to continue to the next calibration step.

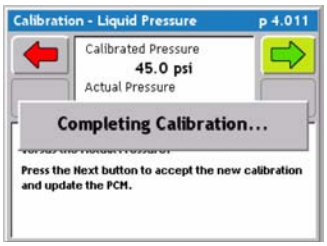
Pressure Calibration / Continued



5. Enter the recorded pressure from the manual gage. Press the green forward arrow to continue to the next calibration step.



6. Indicated Pressure Vs. Actual Pressure. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match



7. When the two pressures match press the green forward arrow and the Liquid Flow Calibration procedure is complete.

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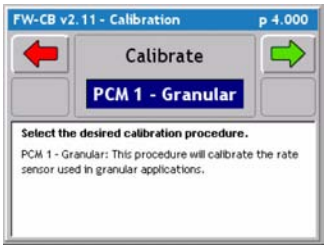
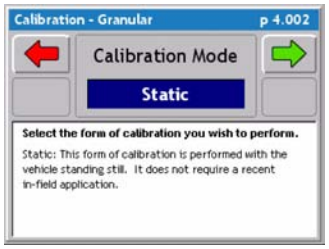
Granular Static Calibration

The Granular Static Calibration process is a stationary calibration for a granular sensor. There are two calibration modes to choose from, Static or InField, only one is needed for accurate calibration. Static calibrations does not involve movement of the vehicle and can be repeated very easily to ensure an accurate calibration.

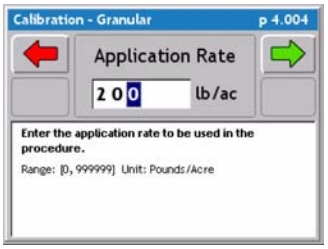
1. Fill the machine's tank with a know amount of weighed product. From the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.



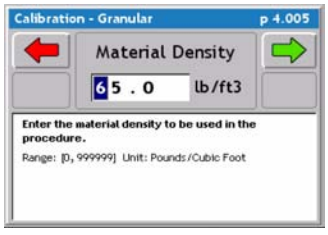
2. From the Calibration page select the PCM - Granular option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.



3. From the Calibration Mode page select Static from the pick list in the middle of the screen. Press the green forward arrow key to continue to the next calibration step.
- **Static** - Does not require the vehicle to move. This is a stationary test.
- **In Field** - Is for adjusting after a known amount is applied in an actual application. .

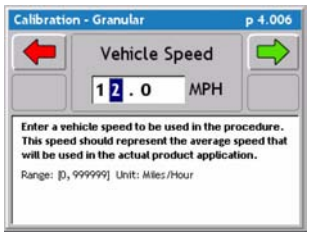


4. Enter the application rate that will be used later in a real time application. Press the green forward arrow key to continue to the next calibration step.

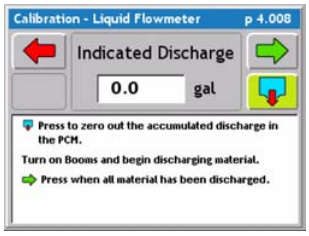


5. Enter the product density. Press the green forward arrow to continue to the next calibration step.

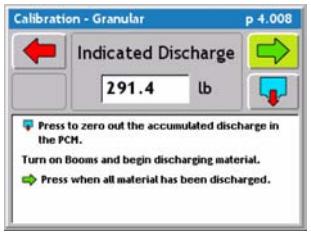
Granular Static Calibration / Continued



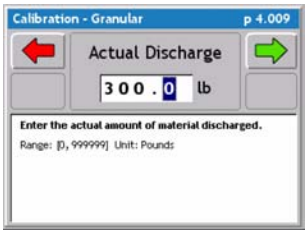
6. Enter the normal operating speed when applying. Press the green forward arrow to continue to the next calibration step.



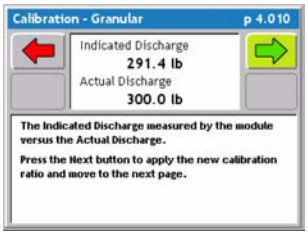
6. This is the indicated discharge, if there is any product accumulation prior to calibration it will show here. Press the empty tank button to zero the indicated discharge. Once zeroed, turn the product on. Product should begin to discharge and accumulate on the screen. The system should now be applying at the speed and rate entered



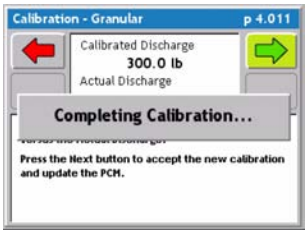
7. When a know amount has been discharged shut the product off and accumulation will stop. Press the green forward arrow to continue to the next calibration step



8. Enter the Actual amount discharged. This is the known amount loaded before calibration or know amount discharged by weighing the machine. Press the green forward arrow to continue to the next calibration step



9. Indicated Discharge Vs. Actual Discharge. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match.



10. When the two weights match press the green forward arrow and the Liquid Flow Calibration procedure is complete.

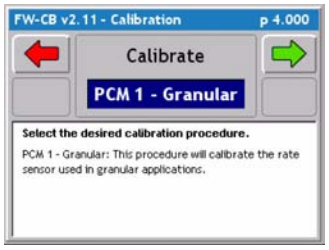
Granular In-Field Calibration

The Granular In-Field Calibration process is used to calibrate a Granular sensor after a real-time product application. In-Field calibration involves discharging a know amount of product in a real-time application and then performing a calibration based on the material discharged. Repeating the procedure below will ensure an accurate calibration.

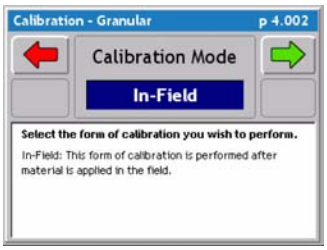
1. Load machine with a know amount of product. Record this amount for later use.

2. With the product loaded, apply the product. Make sure before starting all accumulated volumes are zero. This can be done by creating a new job when using a data card or if no data card is in use select Field Reset to set volumes to zero. The volume accumulated will be used in the In-Field Calibration procedure. For best results apply product at the rate and speed of normal operation.

3.Once the product has been applied, from the ARM Launcher page select the Calibration button by using the function key or by highlighting Calibration and pressing the green enter button.

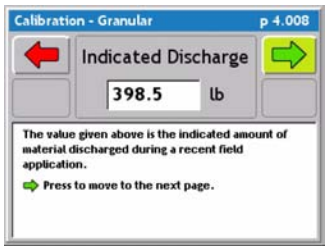


4. From the Calibration page select the PCM -Granular option from the pick list in the middle of the screen. Press the green forward arrow to continue to the next calibration step.

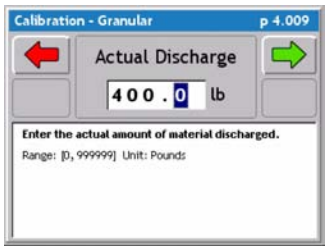


5. From the Calibration Mode page select In-Field from the pick list in the middle of the screen. Press the green forward arrow key to continue to the next calibration step.
- **In Field** - Is for adjusting after a known amount is applied in an actual application.
- **Static** - Does not require the vehicle to move. This is a stationary test.

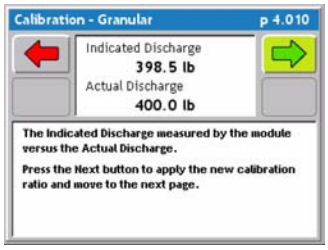
Granular In-Field Calibration Continued



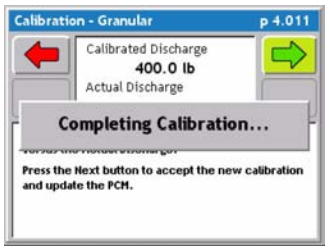
6. This is the indicated discharge. This value is obtained from the accumulated volume during the real-time application. This is why it is important to have the volume zeroed before application starts. Press the green forward arrow to continue to the next calibration step



7. Enter the Actual amount discharged. This is the known amount put in thebin before application or know amount discharged by weighing after application. Press the green forward arrow to continue to the next calibration step.



8. Indicated Discharge Vs. Actual Discharge. This page is only a information page to show the operator the Indicated Vs. the Actual. Press the green forward arrow to automatically recalculate the calibration number so the two volumes match.



9. When the two volumes match press the green forward arrow and the Liquid Flow Calibration procedure is complete.

Agitation

Agitation is only used when agitation has been added to the injection storage tanks. The agitation option can be added to any existing MID-TECH pump. Agitation is regulated by a % of the drive; Example: The highest speed setting for agitation would be 100% with the lowest setting being 1%.

Set the pumps to the desired agitation drive. The agitation drive speed can be changed prior to starting a job and during real-time operation On-The-Go.

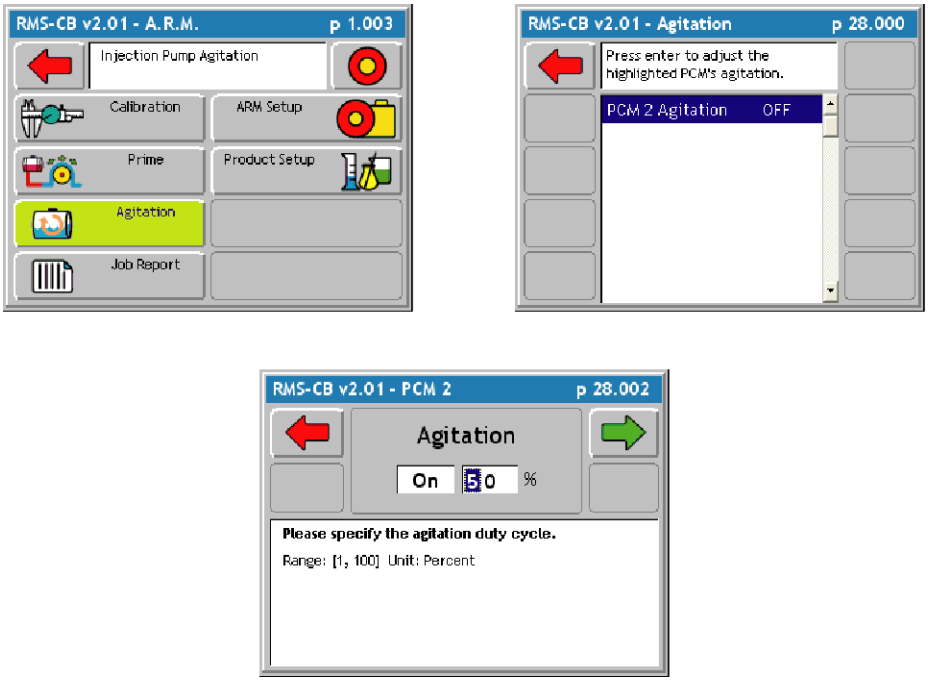


Figure 3-10: Setting Agitation Drive % (Speed)

Job Report Setup

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

Job Report is accessed from the ARM Launcher page. Select the Job Report tab and move to the Main Job Report Page (Figure 3-11). Table 3-1 describes each Job Report menu item.

Running the Job Report Wizard

The Main job Report Setup page is the page seen when Job Report is first entered (Figure 3-11) right image. The Job Report page contains Agency, Operator, and Driver profiles created using RMS Office. The profiles can only be edited using the RMS Office software. Highlight and select the desired parameter and use the Up and Down arrows to scroll through the profiles. Use the review button check profile information. With the desired profile showing press the green forward arrow. Use The setup wizard to step the operator through each setup parameter.

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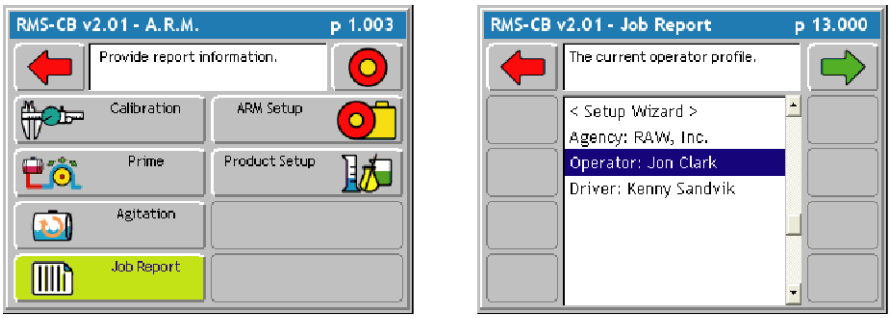


Figure 3-11: ARM Launcher / Job Report Page

Job Report Detailed Description

Item	Description
Agency	Enter the current Agency profile set in RMS Office
Operator	Enter the current Operator profile set in RMS Office.
Driver	Enter the current Drive profile set in RMS Office.

Table 3-1: Job Report Item Descriptions

ARM Setup

ARM Setup handles data file names as well as a product application parameters. To run ARM Setup, select the ARM Setup tab in the ARM Launcher page (Figure 3-12). This brings up the Main ARM Setup page (Figure 3-12) right image.

Running the ARM setup Wizard

The Main ARM Setup page is the page seen when ARM Setup is first entered (Figure 3-12) right image. 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.

Table 3-2 lists all of the ARM Setup items and their descriptions

.

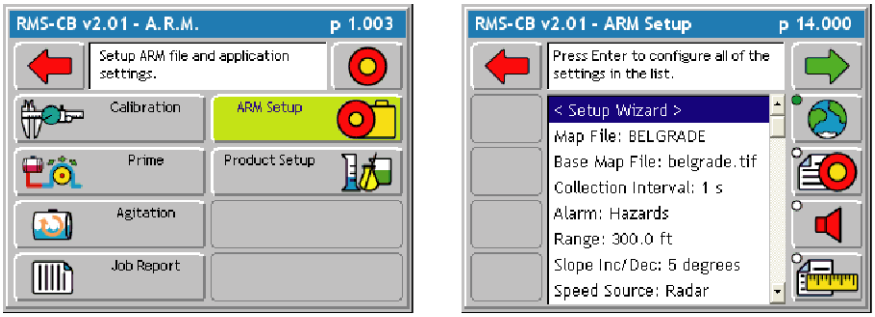


Figure 3-12: The ARM Launcher / ARM Setup Page

ARM Setup Detailed Description

Setup Item	Description
Map File (.GMF)	A Map file is used to store additional spray session features which might be necessary to locate during product application. (See “Product Setup” on page 3-31.)
Base Map File (.TIF)	A Base Map File can be used to supply a map of roadways, waterways, elevation, etc. in the background during a spray session
Collection Interval	How often data is collected and written to file. The lower the Collection Interval the larger the file size.
Alarm	The Alarm can warn the operator when approaching a pre-mapped point or hazard.

Table 3-2: ARM Setup Item Description

Setup Item	Description
Range	The alarm range is the distance to the impending hazard or point that the operator will be notified.
Slope Inc/Dec	Slope Increase / Decrease is the number of degrees to increment / decrement the roadside slope each time the slope inc/dec switch is employed. See Slope operation for more details.
Speed Source	Select if the speed source is from GPS or Radar
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 3-2: ARM Setup Item Description

Map File & Base Map File

A Map file is used to store additional spray session features such as points and hazards, created by the operator, which might be necessary to locate during product application. Map Files will have a file ending of .gmf (general mapping file), and will be stored in the job folder.

Example: During a spray session the operator notices a patch of noxious weeds and does not have the proper chemical on board to spray the weeds. The operator can place and name a point to this location, allowing the operator to return to the point. Another example may be large pot holes that are hard for the driver to see. The operator can mark and name the pot holes as hazards and the driver will be warned at the distance set for the alarm range.

Base Map Files are pre-created .tiff files created by outside agencies. Some .tiff files can be found free of charge on the internet but most are found on pay sites.

A Base Map File can be used to supply a map of roadways, waterways, elevation, etc. in the background during a spray session, No data is added or stored to the Base Map File.

Naming Map File

The Map file name will have a file extension of (.GMF). 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 (Figure 3-13). When the desired file has been selected, press the Forward Arrow to return to the ARM Setup Page or the next Wizard page if used.

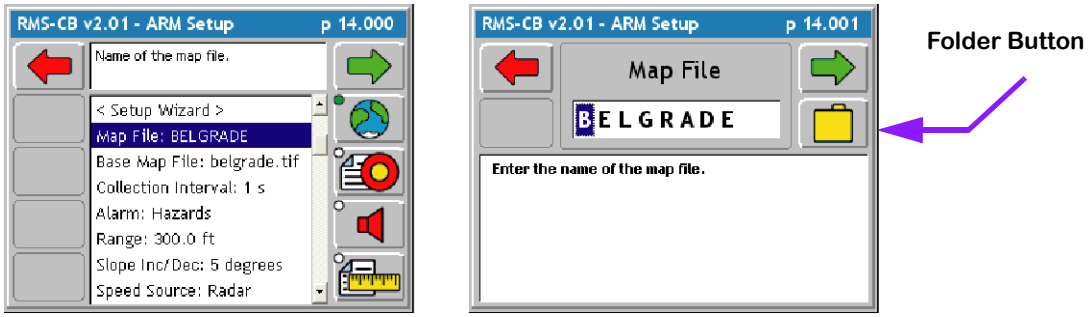


Figure 3-13: The ARM Setup Record File Page

Slope Operation

In ARM Setup set the increments the slope will adjust with every engagement of the slope switch on the product switchbox. In real-time application the operator can view the degree of slope the system is currently applying. From the real-time page use the page advance button (Blue Arrow) to advance to the slope and active boom layout.

Example: In ARM setup if Slope Inc/Dec was set to 10 degrees. Below shows the operator going from 0 degree application to a decreased 10 degree down application. This was done by using the slope switch on the product switch box. As the spraying surface slopes down the active will cover a larger area, when the slope switch is pressed to change the slope downward the Legacy calculates the width change and adjusts the carrier control and Injection pump to compensate for the extra width.

Note: on a upward slope the Injection pumps speed should slow down because the spray width will decrease and on a downward slope the Injection pump speed should increase because the spray width is increased.

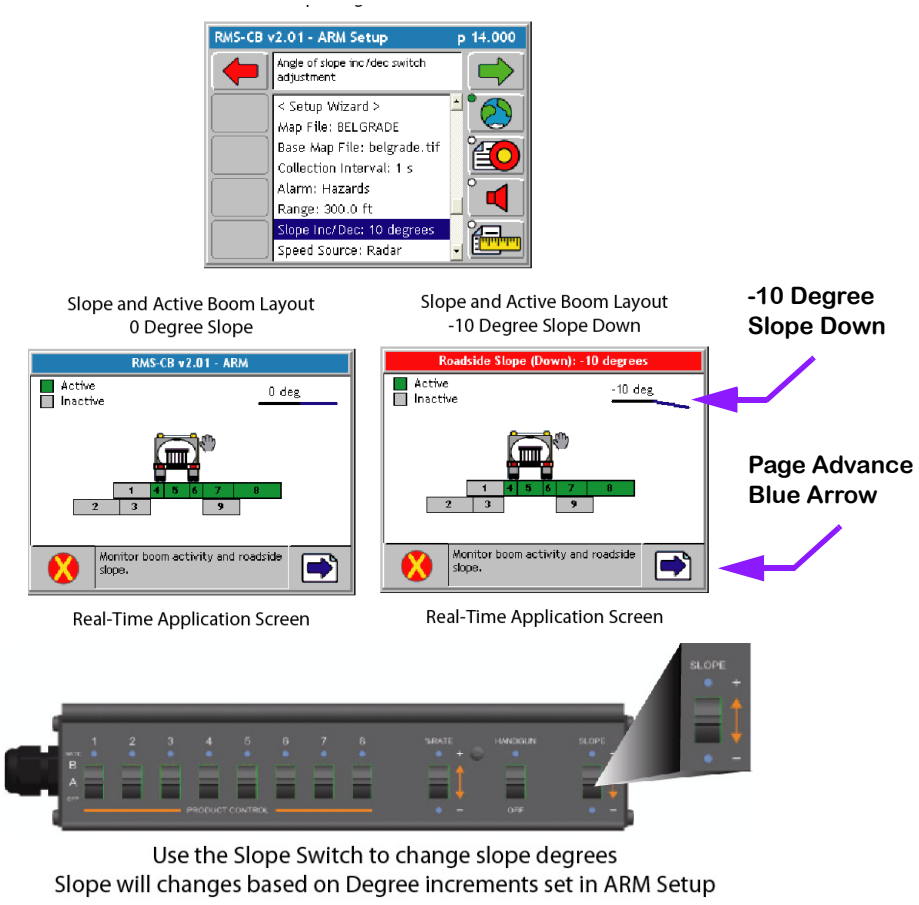


Figure 3-14: Slope Operation

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 3-15). This brings up the Select PCM page (Figure 3-15).

Select PCM Page

The Select PCM page (Figure 3-15) 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. If there is only one PCM connected this page will not appear and will advance directly to Product Setup parameters. Select the desired PCM to begin the Product Setup process for that PCM.

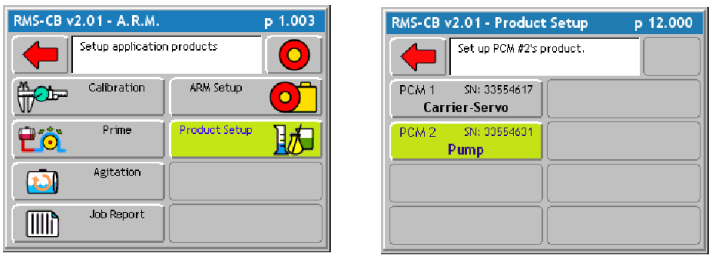


Figure 3-15: The Select PCM Page

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 Product Setup

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.

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

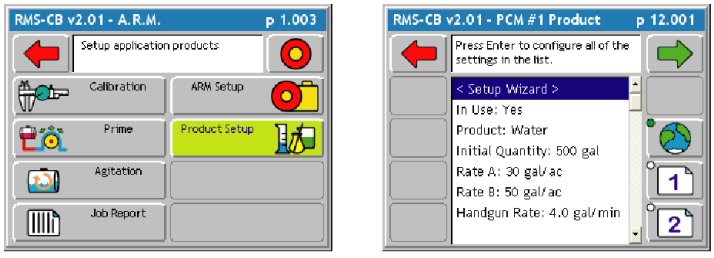
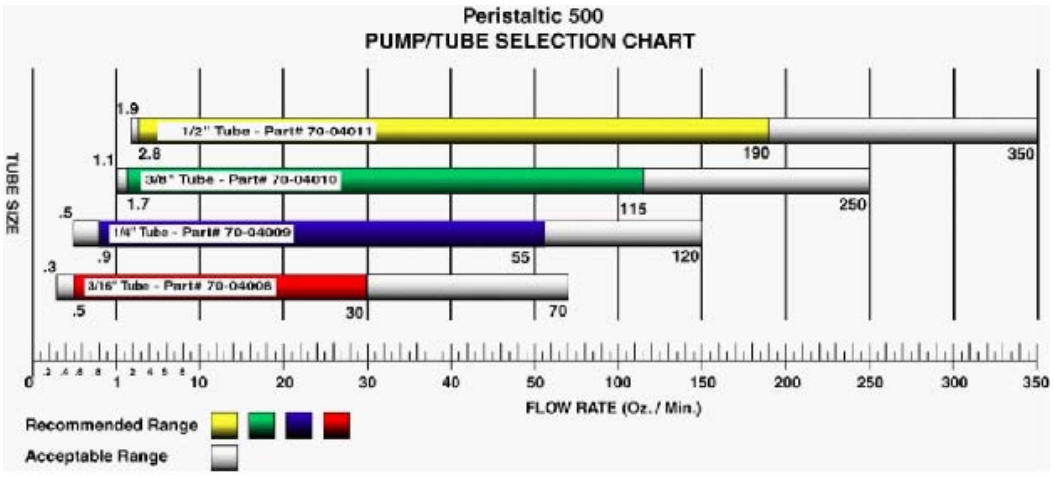


Figure 3-16: The ARM Launcher / Product Setup Page

Product Setup Detailed Description

Setup Item	Description
In Use	Defines whether the currently selected PCM is used in product application. Choose Yes or No.
Product	Product Setup contains a product data base consisting of product profiles created using RMS Office software. All products must be added using RMS Office, products can not be added using the Legacy 6000
Initial Quantity	The initial quantity in the tank/bin/hopper. The ARM software keeps track of the amount of product remaining and displays this on the Real-time Products page.
Rates A - B	The ARM software allows 2 preset application rates to be selected. These rates can be changed on the go using the product switchbox.
Handgun Rate	A Handgun flow rate is set for the carrier and for each pump. The carrier Handgun rate is always entered in (Gallons/Minute). When entering a Handgun rate for a pump the units are selectable see the next setup item in this table “Handgun units” (See “Handgun Operation” on page 3-33.)
Handgun Unit	Handgun Units is only used in product setup for a Pump. The operator can select between the following units.(See “Handgun Operation” on page 3-33.) Fluid Ounces / 100 gallons Gallon / 100 gallons Fluid Ounce / Fluid Ounce
Tube	Tube is only used in product setup for a Mid-Tech 500 Peristaltic Pump. Select the Tube size that will be used on the Mid-Tech peristaltic pump (See tube chart below.) Preset calibration numbers in relation to the Tube size have been created by Mid-tech and entered in the form of a calibration table for the convenience of the operator. (See “Appendix B - Creating a Calibration Table” on page B-1.) To ensure the pre-created calibration numbers are accurate, run calibration for each tube size.

Table 3-3: Product Setup Item Descriptions



Select the Product Name

The name of the product being applied can be selected from the Products data base created using RMS Office. The product name is written to the header portion of the (.RCD) file.

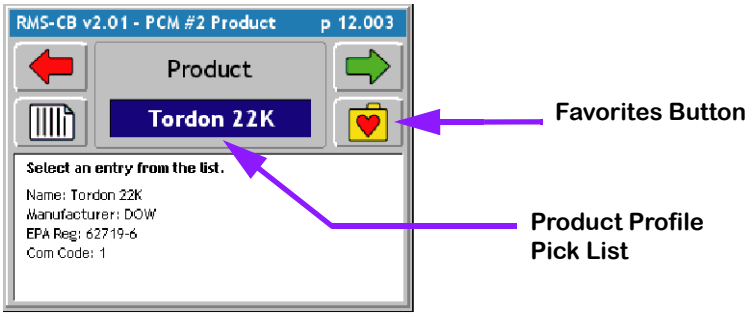


Figure 3-17: The Product Setup Select Product Page

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.

Handgun Operation

When setting up the handgun for operation the operator must do the following:

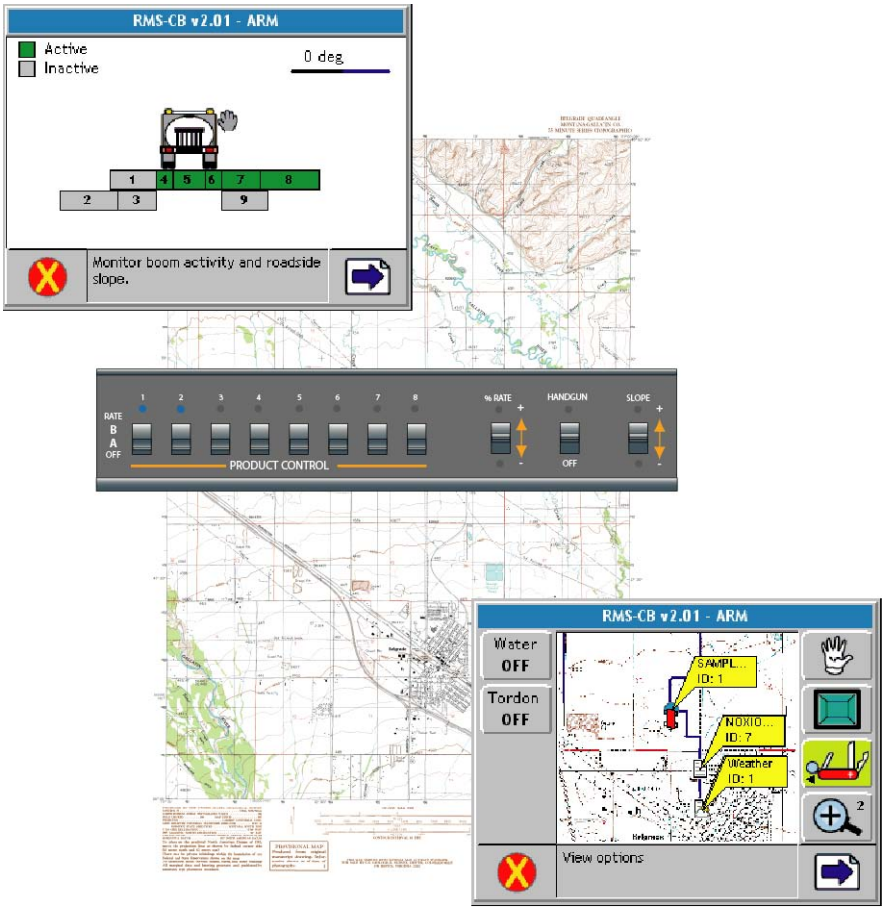
- During PCM setup for the Carrier PCM, one of the Monitors must be set to ***HG Flowswitch***
- In Product Setup, for the Carrier, a Handgun rate must be entered in gallons / minute. Use the Handgun nozzle and pressure rating to enter the carrier Handgun rate.
- In Product Setup for each of the Chemical Pumps, chemical rate ***Units*** must be set. There are three unit options to choose from (Fluid Ounces / 100 gallons, Gallons / 100 Gallons, or Fluid Ounce / Fluid Ounce)
- In Product setup for each of the Chemical Pumps a Handgun Rate must be entered. Rate will be dependent on the units selected.
- To activate handgun mode during real-time operation locate the handgun switch on the product switchbox and switch to Handgun. Start spraying with the handgun, when flow is recognized through the flow switch the pumps will activate.

Chapter Notes

Chapter 4 - Real-time Operation

Operating RMS for the Legacy 6000.

Software Version 2.01



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)

When the ARM Bull’s-eye soft-key is pressed, the RMS 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.

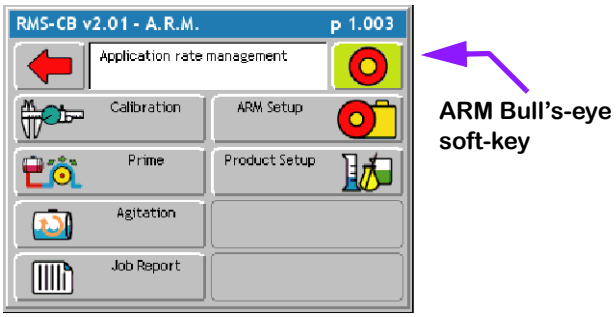


Figure 4-1: The ARM Launcher Page

Real-time pages

There are three types of real-time pages, Information pages, Map pages and one Active Boom and Slope page. Each will be described in more detail.

Information Pages

There are three information pages consisting of two Rate pages and a GPS page.

Rate Pages

The Rate pages display various information related to the product and associated PCM. Highlighting a Product Control Soft-key determines which rate information is displayed on the rate page. The Rate 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. To view the remaining amount of product, the initial volume of material must be entered in Product Setup. For each product (PCM) there is also an alternative rates page (Figure 4-2) Right image. Information on this page varies based on the PCM configuration. This page typically displays the active swath width and additional sensor or monitor status information.

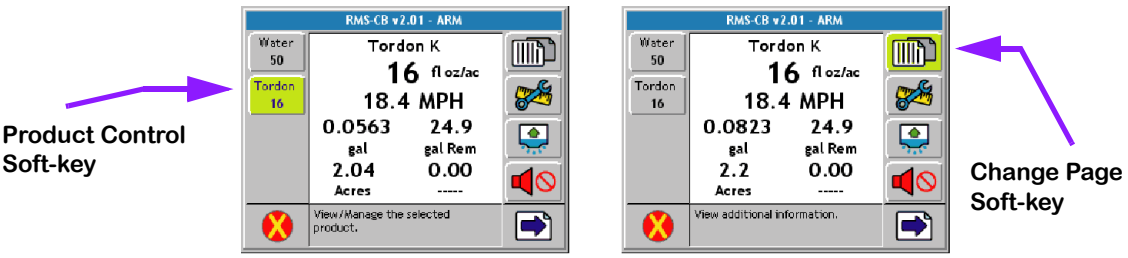


Figure 4-2: The Main Rate Page and Alternate Rate Page

GPS Page

The GPS page displays the vehicle's current Latitude and longitude position, Antenna Height, GPS Speed, Course in degrees (North 0^{o}), and available Card Space.

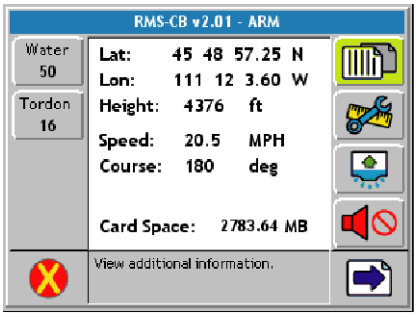


Figure 4-3: The GPS / Boundary Page

Adjusting the Product Application Rate

A product rate or carrier rate can be adjusted while applying. In product setup the operator had the option of entering two rates (A and B) per product or PCM, to adjust a product rate use the Product Switchbox to select rate A or B. Rate A will display a solid Blue LED and Rate B will display a Flashing Blue LED. The product Swtichbox switch numbers relate to each PCM (PCM 1 is linked to switch one .....ect).The operator can see the rate change on the rate page or in the product control softkeys.

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

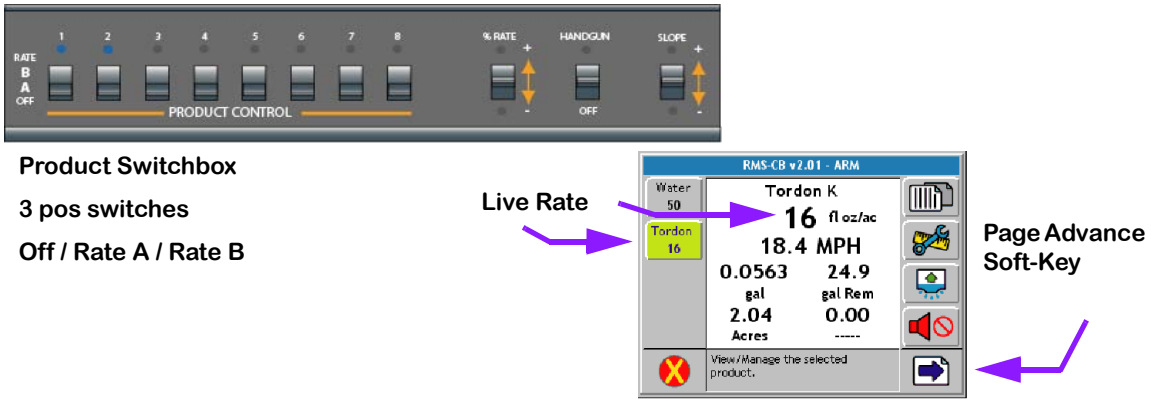


Figure 4-4: Adjusting a Product Rate

Manual Control

The control valve can be manually adjusted while applying or stationary for testing and trouble shooting purposes. To manually adjust a product rate, press the appropriate product control soft-key, which pops-up a side menu, the Manual rate option is selected in the side menu,. 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. When using a Servo or PWM as the drive type to control the product, (+) should open the valve and (-) should close the valve

NOTE: Injection pumps can not be set to manual mode. The only two drive types that can be set to manual mode are Servo and PWM.

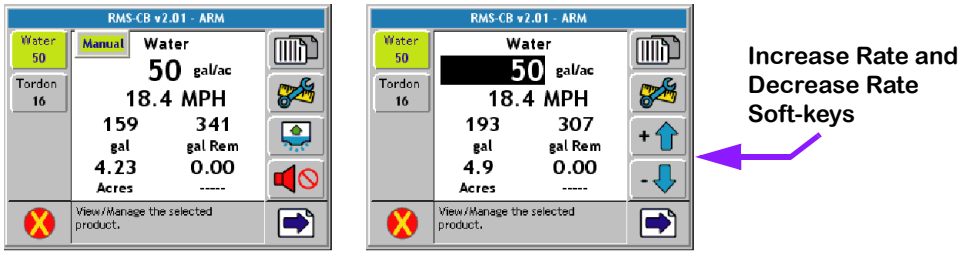


Figure 4-5: Manually Adjusting an Application Rate

Adjusting Agitation

The agitation motor for the chemical tank can be manually adjusted while applying for optimum tank mixing. To manually adjust agitation speed, press the appropriate product control soft-key, which pops-up a side menu. The agitation option is selected in the side menu. When agitation has been selected the agitation data entry page will be displayed at the current % drive. Adjust the % drive for the agitation motor and press the enter or the green forward arrow to apply changes back to the real-time page.

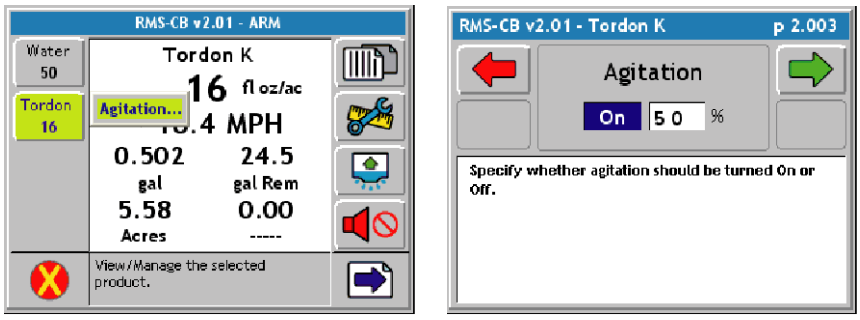


Figure 4-6: Adjusting Agitation

Test Speed

To simulate a speed without moving the operator can use a function call Test Speed. Test Speed is accessed by pressing the CAN Process button. Locate the PSM device and press the Test Speed button. Turn Test Speed on and enter the speed for simulation. NOTE: once setting are applied the system will start to operate at the entered test speed. If boom and pump are on the system will begin to apply. Apply the settings by pressing the green forward arrow. Press the red back arrow to return to the rate page and start using test speed. The rate page will show the speed highlighted black to indicate Test Speed is active.

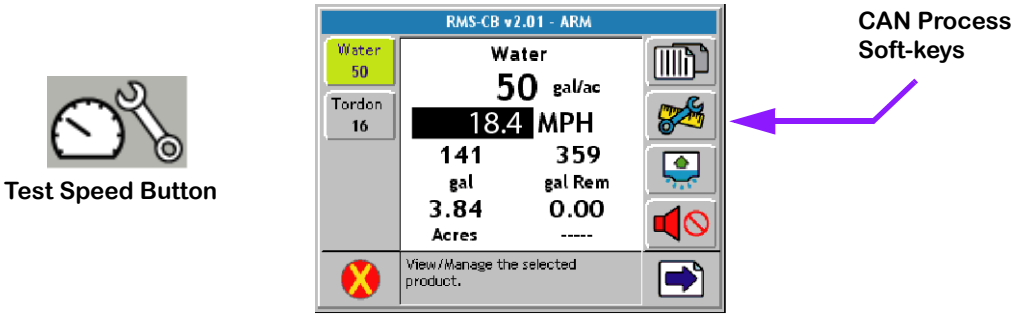


Figure 4-7: Activate Test Speed Using CAN Process

Reset Initial Quantity

Initial quantity is a feature used to count down the product remaining to be applied. To reset this value press the reset Initial Quantity button. Initial Quantity is set during Product Setup.

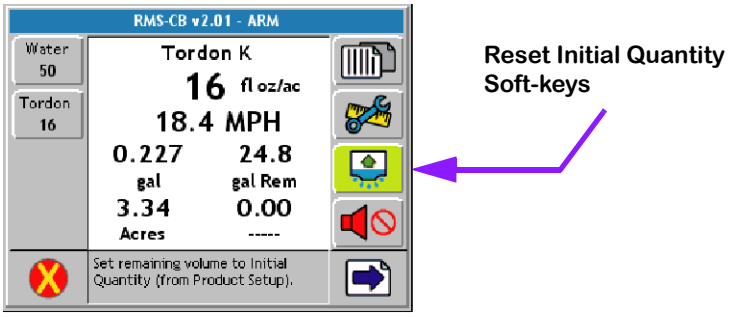


Figure 4-8: Reset Initial Quantity

Information Page Soft Keys Descriptions

Soft-key	Description
	The Exit soft-key. When pressed RMS ARM exits out of the real-time process and returns to the Main Menu page.
	The Page Advance 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 Mainly to access **Test Speed** but can be used to trouble shoot the CAN modules when running in real-time.
	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 Map Pages

To access the Map page from the information pages select the Next Page (Blue arrow on the bottom right of the screen). 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 using a Base Map File, it will be seen in the background.

The Map Page has two views, Coverage View and Product View. Coverage and Product View can be selected by locating the swiss army knife button down the right side of the map page. When the swiss army knife is selected a display option menu will appear, all options will be talked about in more detail later, the first two options are Coverage View and Product View. Use the arrows on the Legacy to highlight the desired view and press enter.

Product View displays the map page associated with the selected product control soft-key on the left side of the screen that is currently highlighted. Blue hash marks are dropped that represent the spray pattern width. The Product view page also displays boom activity, if boom section are turned off adjustments will be made to the width of the hash marks. To best see boom activity (See “Generate Note, Weather Log, Point, or Hazard” on page 4-12.)

Coverage View displays the sprayed areas represented by a solid purple line with a red hashed pattern on the side of the road that was sprayed.

All 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.

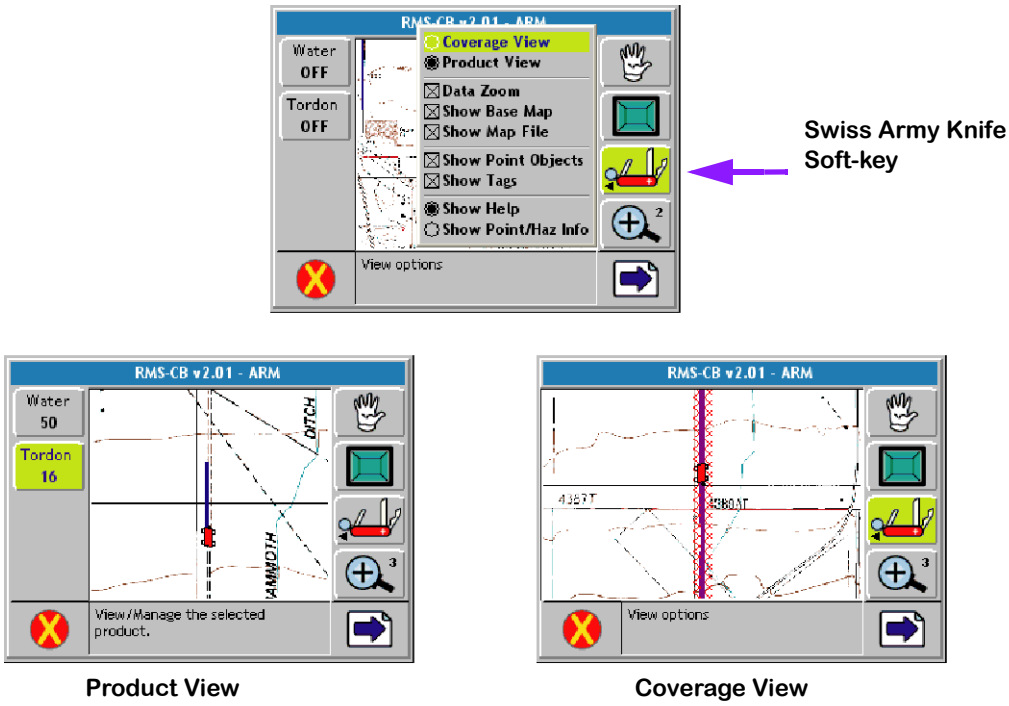


Figure 4-9: The Map Page

Boom & Slope Page

Active and Inactive Booms

To advance to the Boom and Slope page press the page advance button (Blue Arrow) on the bottom right of the screen. The Boom and Slope page is a quick and efficient way to review active and inactive booms along with the degree of slope the boom is spraying.

Active booms will be displayed as solid green and inactive booms will remain grey in color.

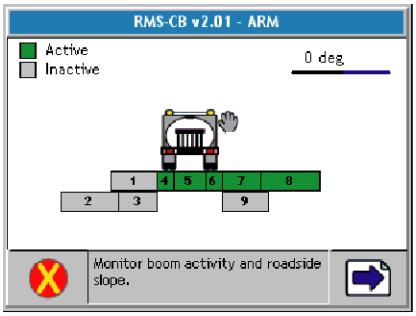


Figure 4-10: Active and Inactive Booms

Slope Operation

Slope can be observed in two locations. On is the small illustration in the upper right-hand corner of the Boom and Slope page. The second is the Top Menu line. The Top Menu Line will change to Red and state “Roadside Slope Up: 10 degrees” or ““Roadside Slope Down: -10 degrees.” The top line will remain Red and can be viewed on all real-time pages (information, map, and Boom pages) until slope returns to zero.

In ARM Setup set the increments the slope will adjust with every engagement of the slope switch on the product switchbox. In real-time application the operator can view the degree of slope the system is currently applying.

Example: In ARM setup if Slope Inc/Dec was set to 10 degrees. Below shows the operator going from 0 degree application to a decreased 10 degree down application. This was done by using the slope switch on the product switch box. As the spraying surface slopes down the actual width covered is a larger area, when the slope switch is pressed to change the slope downward the Legacy calculates the width change and adjusts the carrier control and Injection pump to compensate for the extra width.

Note: on a upward slope the Injection pumps speed should slow down because the spray width will decrease and on a downward slope the Injection pump speed should increase because the spray width is increase

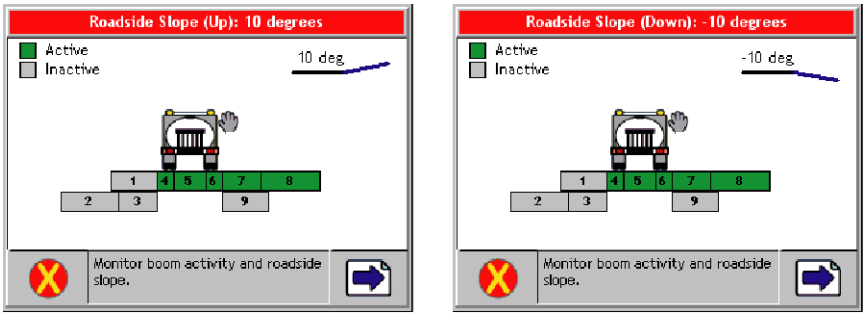


Figure 4-11: Slope Up / Down

Real-Time Map Page Soft-Keys

Soft-key	Description
	The Exit soft-key. When pressed RMS ARM exits out of the real-time process and returns to the Main Menu page.
	The Page Advcance soft-key. Pressing this soft-key switches between the map page and the rates page.
	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.
	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.
	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.
	The Swiss Army Knife or Tool soft-key. When pressed a side menu option appears. The menu has selectable display options for viewing preferences. For a detailed description and function of menu options (See “Display Options Menu (Swiss Army Knife)” on page 4-16.)
	The Generate Note soft-key. When pressed a side menu will appear and the operator has the choice of four note options. For a detailed description of each note option (See “Generate Note, Weather Log, Point, or Hazard” on page 4-12.)
	The Pan Mode soft-key. When pressed the operator can pan across the screen using the arrow keys and review detailed information of mapped locations. For more details on how to use Pan Mode (See “Pan Mode” on page 4-17.)

Table 4-1: Real-Time Soft-Keys

Generate Note, Weather Log, Point, or Hazard

RMS has provided some mapping features to assist the operator and driver during real-time spray sessions. Notes, Points, Hazards, and Weather Logs can be generated at any time during a spray session. The mapped items will later display in the generated report if desired.

Note

Mapping a note allows the operator to type a note about a particular situation and place. To make a note, drive to the location the note will be associated with, locate the Note button down the right side of the Legacy. When the Note button is selected a side menu will appear with all the possible mapping options. Select the note button from the side menu. A data entry page will appear and a note up to 250 characters can be typed.When the note is finished press the enter button or the green forward arrow to return to the real-time page. A note icon will be displayed on the real-time map page where the note was entered.

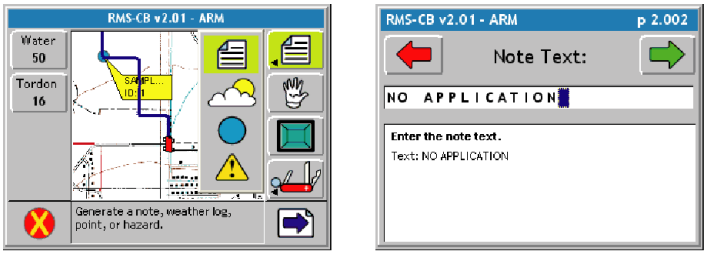


Figure 4-12: Mapping Note

Weather Log

Weather Log is a very important feature for roadside applicators. Weather log allows the driver or operator to collect weather data at any time and as many times as needed throughout the spray session. To make a weather log, locate the Note button down the right side of the Legacy. When the Note button is selected a side menu will appear with all the possible mapping options. Select the Weather Log (Cloud & Sun) button from the side menu. A wizard entry page will appear with a list of all possible weather parameters. Use the Setup wizard to step through all weather settings or select the desired weather parameter to make changes. When the weather log is finished press the enter button or the green forward arrow to return to the real-time page. A weather log icon will be displayed on the real-time map page where the log was entered.

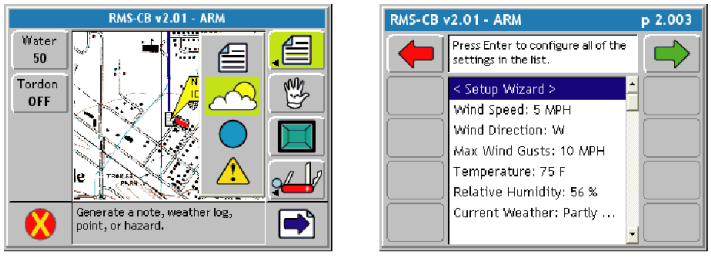


Figure 4-13: Mapping Weather Log

Marking a Point

The Map Object Point allows a point to be marked 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. To map a Point, locate the Note button down the right side of the Legacy. When the Note button is selected a side menu will appear with all the possible mapping options. Select the Point (Blue Dot) button from the side menu. When Enter is pressed, the Point Name dialog box appears. Enter the name of the point using the arrow keys, when the point is named press the enter button or the green forward arrow to return to the real-time page.

The Name Point 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 point name. If the point is not named, 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 a new name to be entered.

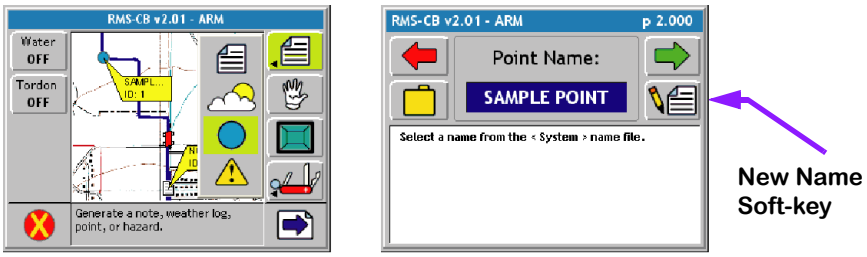


Figure 4-14: The Map Point and Naming Point

Marking a Hazard

The map object Hazard allows a hazard to be marked 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. Hazard detection does not work with point objects. Hazard range can be set on the ARM Launcher Page under ARM Setup.

To map a Hazard, locate the Note button down the right side of the Legacy. When the Note button is selected a side menu will appear with all the possible mapping options. Select the Hazard (Yellow Triangle) button from the side menu. When Enter is pressed, the Hazard Name dialog box appears. Enter the name of the hazard using the arrow keys, when the hazard is named press the enter button or the green forward arrow to return to the real-time page.

The Name Hazard 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 object name. If the object is not named, 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 a new object name to be entered.

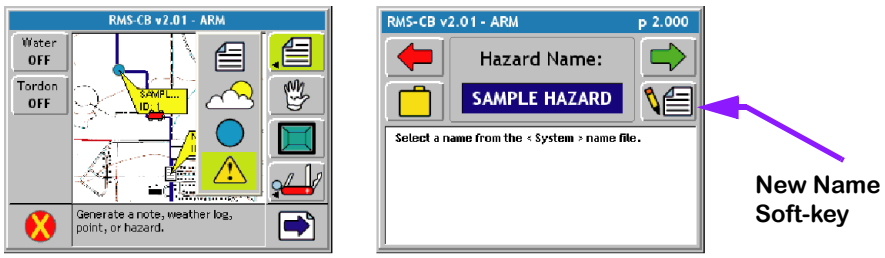


Figure 4-15: Naming the Hazard

Points & Hazards Using RMS Office Name Manager (Object Name Files)

RMS Office Tools has a section called Name Manager. Name Manager gives the operator the ability to pre-create Object Name Files with a list of related names to the file. For example a file can be created and named “Noxious Weeds” within this file will be a list of all the possible noxious weeds that may appear in your region. When files are exported from RMS Office to be loaded on the Legacy 6000 the file created in Name Manager can be exported as well. Exporting pre-created name Object Name Files allows for quick point and hazard naming. Use the RMS Office user guide to create files using RMS Office Tools Name Manager (User Guide Part# 98-05065).

When the point or hazard data entry page appears a file folder is located on the left side, this file will be a list of all the pre-created folder such as “Noxious Weeds.” Select the desired database name and then select the desired name for the point or hazard.

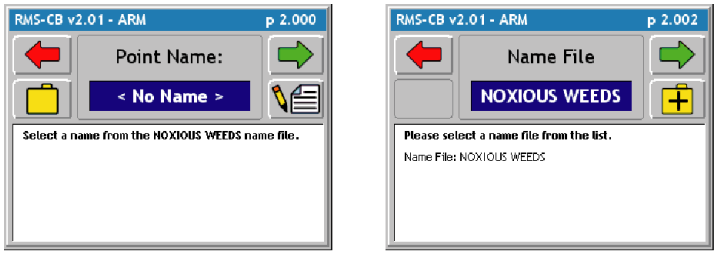


Figure 4-16: Object Name File Using RMS Office

Object Name Files can be created using the Legacy by selecting the file folder from the point or hazard data entry page and selecting the file folder with a plus on it. When the folder with a plus is selected a name for the file must be entered (e.g. Noxious Weeds.) Once the file name has been created a point or hazard name will need to be entered (Bind Weed), this will be the first name in the folder.

Note: The Legacy will default to the last folder location each time a new point is added. If Noxious weeds was the last folder used to find a point or hazard name this will be the default folder of names the Legacy will use for the next point. If a new point is created it will be stored in Noxious Weed folder unless the file location is changed by pressing the folder button and selecting the desired folder location.

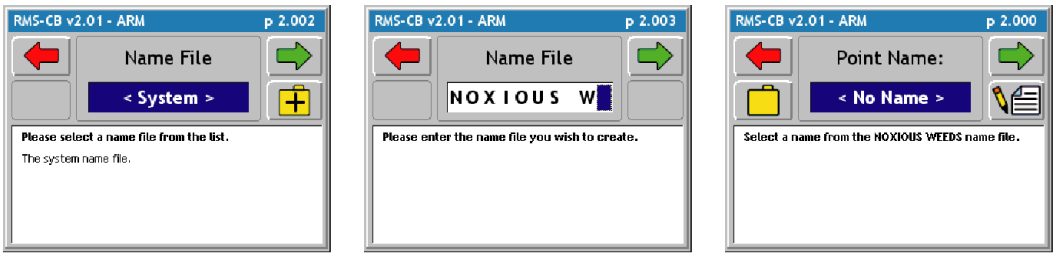


Figure 4-17: Creating Object Name Files Using the Legacy

Display Options Menu (Swiss Army Knife)

On the Map Page is an Options soft-key (Swiss Army Knife). Pressing the Options soft-key “pops-up” a small menu window on the Map page (Figure 4-18). The options menu contains several mapping aides and tools that can be used without exiting out of the real-time process. All items in the Option menu are toggle type; the item is set to either on or off. To activate an Option item, simply arrow down to the item and press enter. Pressing enter switches the state of the Option item. For example, if the item was on, it is switched to off. Table 4-2 describes each Options menu item.

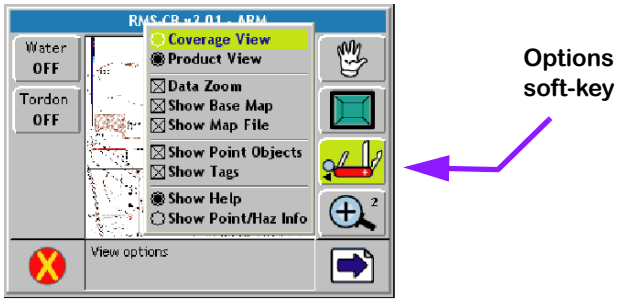


Figure 4-18: The Options Menu

Option	Description
Coverage View	Coverage View displays the sprayed areas represented by a solid purple line with a red hashed pattern on the side of the road that was sprayed.
Product View	Product View displays the map page associated with the selected product control soft-key on the left side of the screen that is currently highlighted. Blue hash marks are dropped that represent the spray pattern width.
Data Zoom	When activated, the map page uses collected data, not the background map, as its Zoom extents.
Show Base Map	When activated, the base map file is displayed in the background. When turned off the base map file is not displayed.
Show Background File	When activated, the background file(.tif) is displayed in the background. When turned off the background file is not displayed.
Show Point Objects	When activated, all point objects, contained in the Map file (GMF) named in Mapper setup, are displayed in the Map page.
Show Tags	All mapping objects have an associated tag, which contains the mapping object type and some associated attributes. When this item is activated, a tag is shown with each mapping object. This is useful if it is necessary to see the attributes of a particular object.
Show Help	When activated, help information is displayed in the bottom half of the map page. The help text corresponds to the highlighted soft-key.
Show Edit Info	When activated, attribute information for the nearest map object is displayed in the bottom half of the Map page.

Table 4-2: Display Option Menu Descriptions

Pan Mode

The Pan Mode allows the operator to Pan across the screen to review spray area and mapped objects. To Pan across the screen select the Hand button, this will bring up the pan screen. The Pan screen consists of three buttons (Zoom in, Zoom out, and the Options Button “Army Knife”). Placed in the middle of the screen will be the Pan Tool (plus sign). Move the Pan Tool using the Legacy direction arrows to a mapped objected (Note, Weather Log, Point, Hazard). When the Pan Tool is close to the mapped object press the enter button to display detailed information about the mapped object.

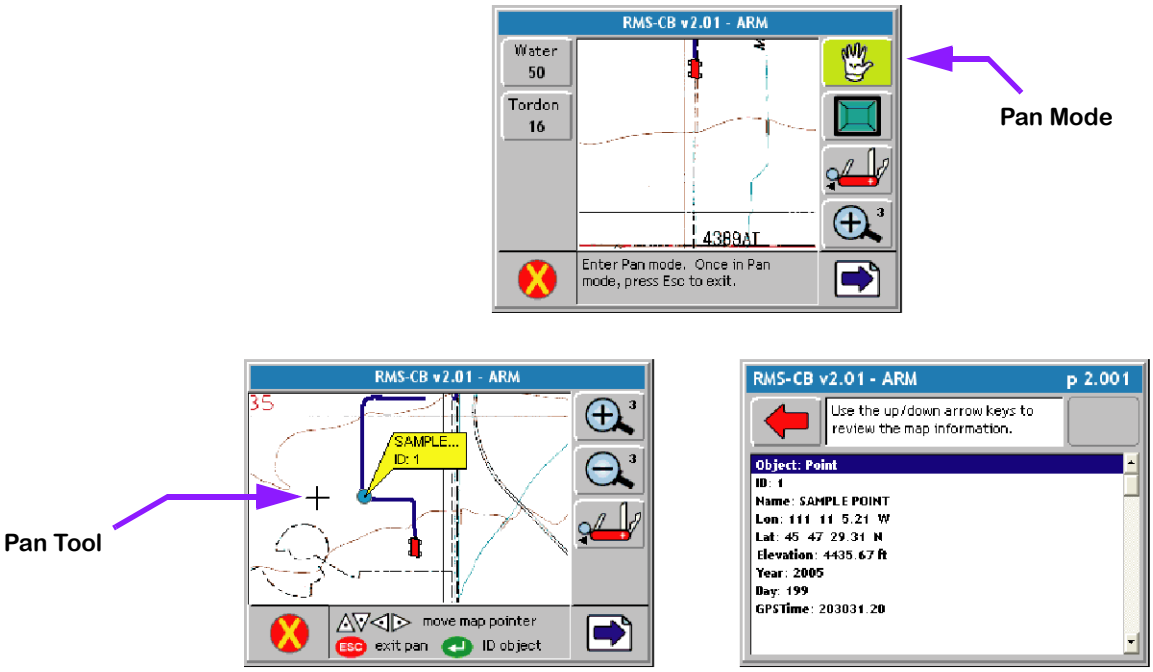


Figure 4-19: Pan Mode Operation

System, Warning and Error Messages

RMS 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 (Top Menu Line) of the rates page and map page. Some messages are displayed on the lightbar, see (Chapter Notes on page 5-21) 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, 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.

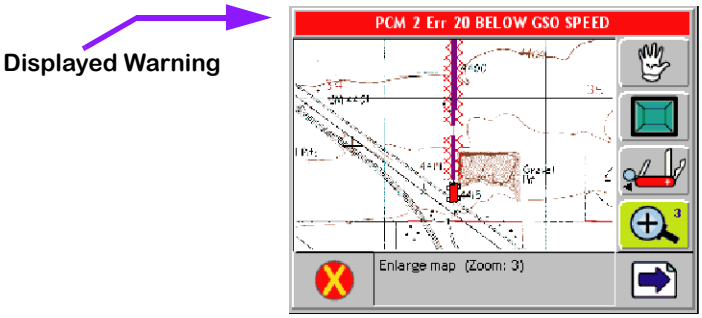


Figure 4-20: GSO Speed Warning Message

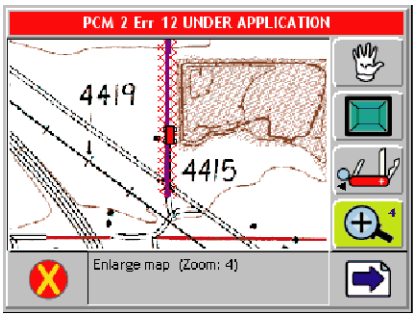


Figure 4-21: Under Application Warning Message

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 4-22), 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 4-22 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 4-23).

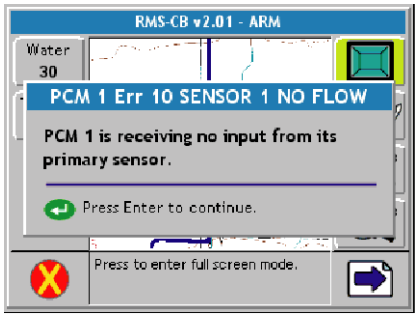


Figure 4-22: Sensor No Flow Error Message Dialog

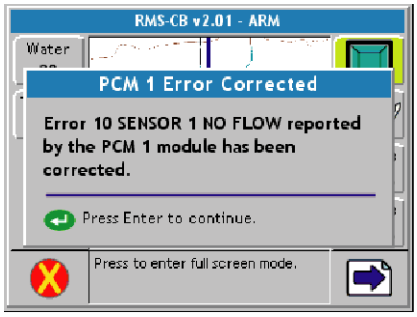


Figure 4-23: Error Corrected Message

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 data is being stored to the PC card, the exiting process may take a minute or so to properly store this data.

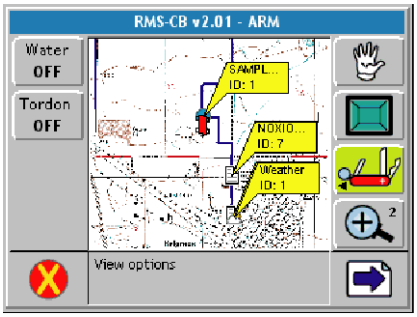


Figure 4-24: Exiting Real-time Application

RMS - Report Wizard

RMS Office Report Wizard can be used to generate reports based on spray session application. Figure 4-25 shows a report field. To generate a report take the data storage card from the Legacy and reference the RMS Office user guide Report Wizard.

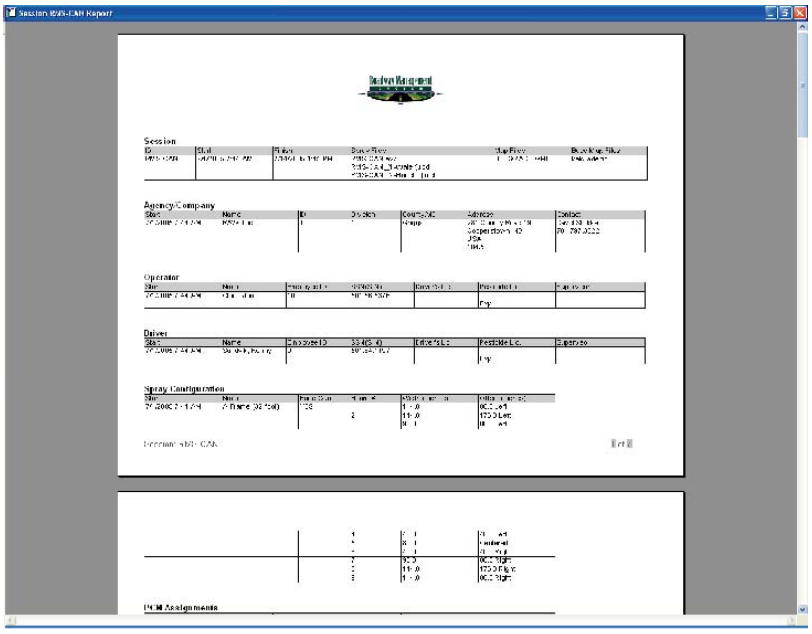


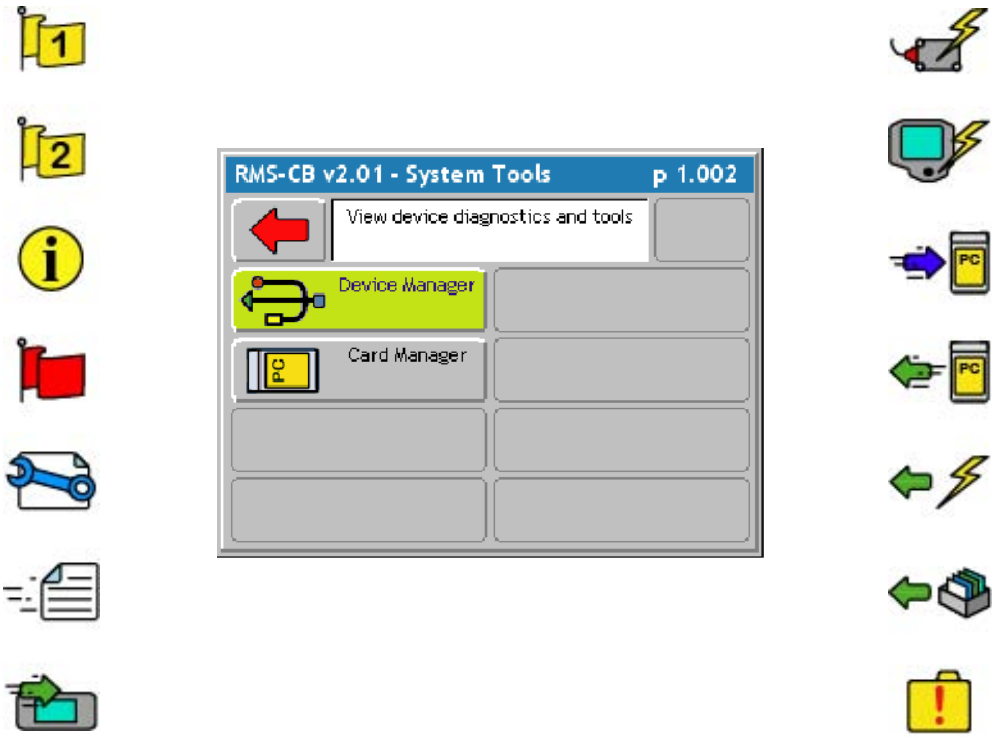
Figure 4-25: RMS Report

Chapter Notes

Chapter 5 - System Tools

System Diagnostics "RMS for the Legacy 6000".

Software Version 2.01



System Tools

System Tools allows some basic system diagnostics to be performed. System Tools is accessed from the Main Launcher page. 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. Table 5-1 below lists the current System Tools. Each tool is covered in more detail in sections below.

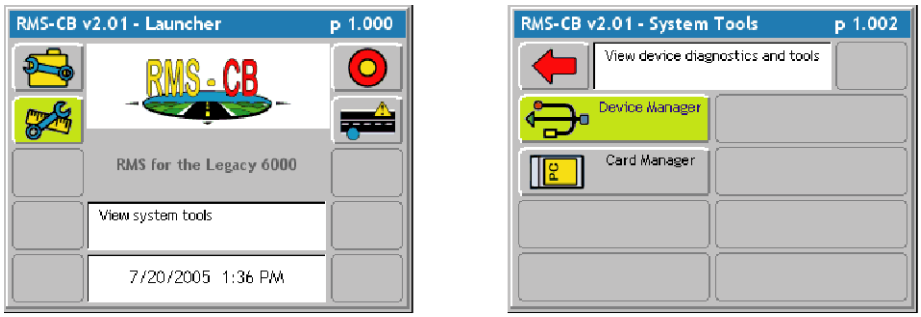


Figure 5-1: The Main Launcher

Tool	Description
Device Manager	This tool allows the viewing of all components on the Legacy system including the Mid-Tech CAN Bus, external rate controller, and GPS receiver.
Card Manager	This application runs in conjunction with the PC card. The card must be inserted to run this application. Card manager allows basic file manipulation.

Table 5-1: System Tools

Device Manager

This tool allows the viewing of all components connected to the Mid-Tech Legacy 6000 system. In RMS - CB, the CAN Bus, GPS Receiver, Lightbar, PCM, SSM, PSM and Console are available for diagnostics. Scroll through all of the connected devices and review the current status of these devices by selecting the Information “i” button. From the information page detailed information about each device can be viewed.

Information “i”

CAN Bus

When selecting CAN Bus as the device for diagnostics, a CAN Bus Information page is displayed, listing all components connected to the CAN Bus serial number and version number.

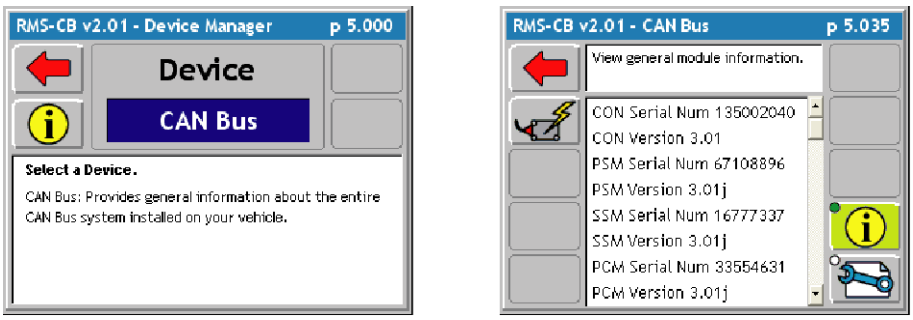


Figure 5-2: The Console Information Page

CAN Bus SofKeys and Description

Button	Description
	Reset all Modules to factory settings. There are two types of resets, Settings and Arbitration. **Settings -** This will reset all modules to factory defaults. Bus history will be retained in the PSM so modules will not be seen as new. **Arbitration -** Erase Bus history so all modules are seen as new. All other module settings will be retained.
	View general module information. View serial numbers and software versions of all components connected to the Bus.
	View CAN Bus statistics.

Table 5-2: Console System File Functions

GPS Receiver

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

To access the GPS Receiver diagnostic page from the Main Launcher page / System Tools page / GPS Receiver.

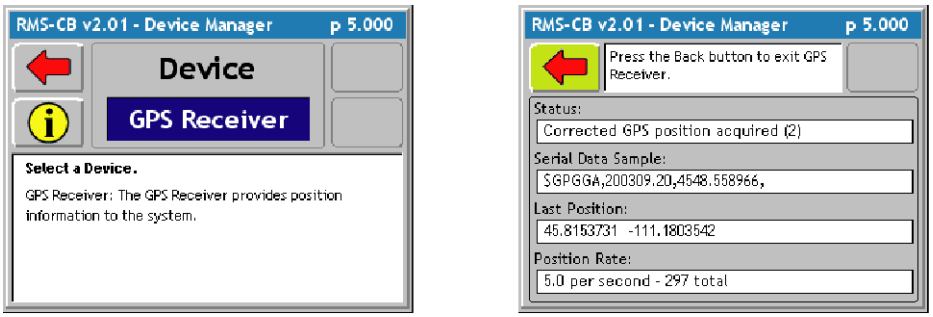


Figure 5-3: The GPS Receiver Diagnostic Page

SFM

When selecting SFM Switch Function Module as the device for diagnostics, an update module flash page appears. Contact Mid-Tech for more information.

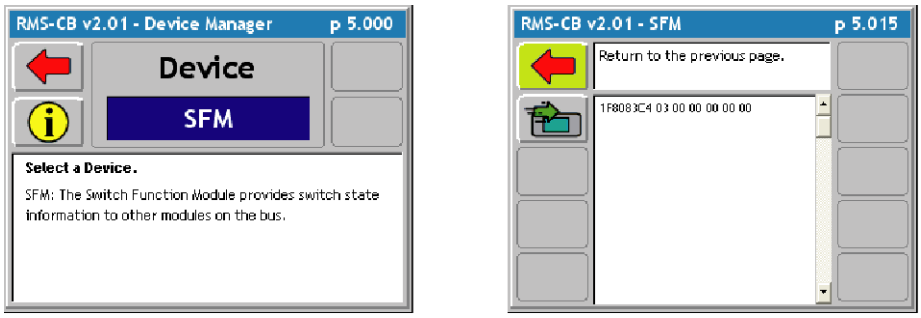


Figure 5-4: The SFM Diagnostic Page

Lightbar SoftKeys and Description

Button	Description
	Update the module's flash. Software must be loaded on the PC card for the Module to be updated. Contact Mid-Tech for update support.

PCM, SSM, and PSM

When selecting one of the Modules as the device for diagnostics, a Module Information page is displayed, listing the Module serial number and version number.

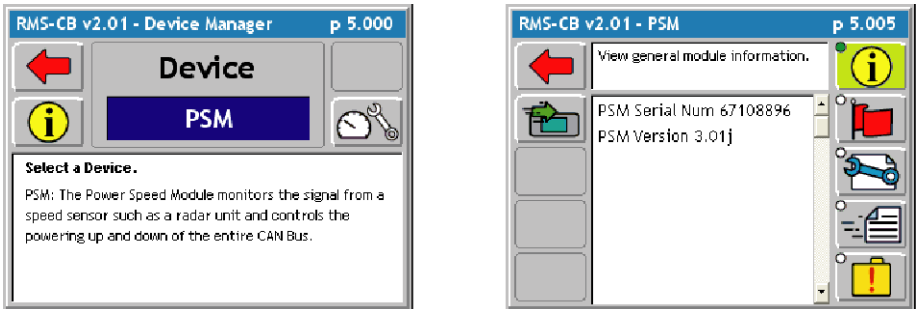


Figure 5-5: The PCM, SSM, & PSM Diagnostic Page

PCM, SSM, & PSM SoftKeys and Description

Button	Description
	Update the module's flash. Software must be loaded on the PC card for the Module to be updated. Contact Mid-Tech for update support.
	View general module information. Module serial numbers and software version.
	View Module Flags 1. System diagnostic tool that identifies the active functions on the PCM.
	View Module Flags 2. System diagnostic tool that identifies the active functions on the PCM.
	View Module Flags. System diagnostic tool that identifies the active functions on the PSM and SSM.
	View modules current configuration.
	View Messages currently being sent by the module
	View the error log from this module.

Table 5-3: Module System File Functions

Console

When selecting Console as the device for diagnostics, a Console Information page is displayed, listing the console serial number and version number

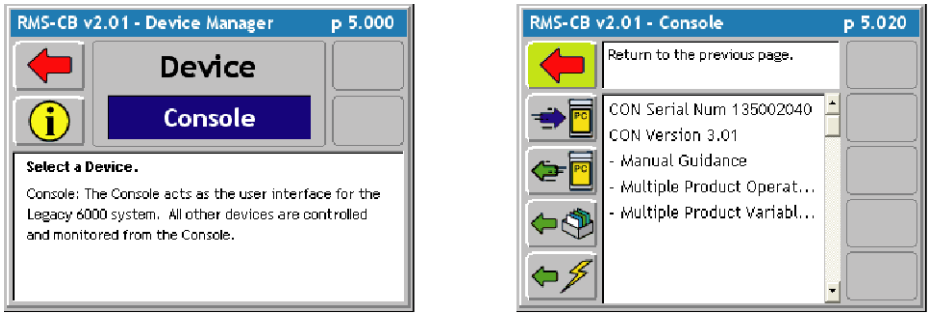
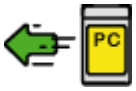


Figure 5-6: The Console Diagnostic Page

Console SoftKeys and Description

Button	Description
	System File Backup. Press this button and the console system files are backed up to the PC card.
	Update Console System Files. Press this button to update the console system files with system files located on the PC card.
	Imports Profiles created using RMS Office.
	Erase Removable System files. Press this button to remove system files from flash. System files for RMS - SA include Name files. Also Press this button to see a list of files that can be erased.
	Reset Console. Press this button to reset the console to its default factory settings.

The Plug-Ins activated can be reviewed from the Console Information page.

Backing up Console System Files

The Legacy 6000 (L6K) system files can be backed up to a PC card. This allows the system to be restored at a later date or transferred to another L6K console if necessary.

Required Items:

- 20 Meg (or larger) ATA Flash PC Card

CAUTION: ***Always make sure that the console is powered off before inserting or removing the PC card.***

With the console powered down, insert a blank PC card into the Legacy 6000 console and power up the console.

From the Main Launcher page, select System Tools / Device Manager / Console / Backup Console System Files. The message “Performing console backup” appears. When the backup operation has completed, turn the console off and remove the PC Card.

Restoring Console System Files

With the console powered down, insert the PC card, containing the desired system files, into the Legacy 6000 console and power up the console.

From the Main Launcher page, select System Tools / Device Manager / Console / Update Console. The message “Update Files” appears. Select ALL and press the Enter key. The message “Updating console” appears. When the restore operation has completed, turn the console off and remove the PC Card.

Card Manager

Card Manager is an application that allows basic file manipulations such as cut, copy, and paste to files on a PC card. The PC card must be inserted into the Legacy console prior to using Card Manager.

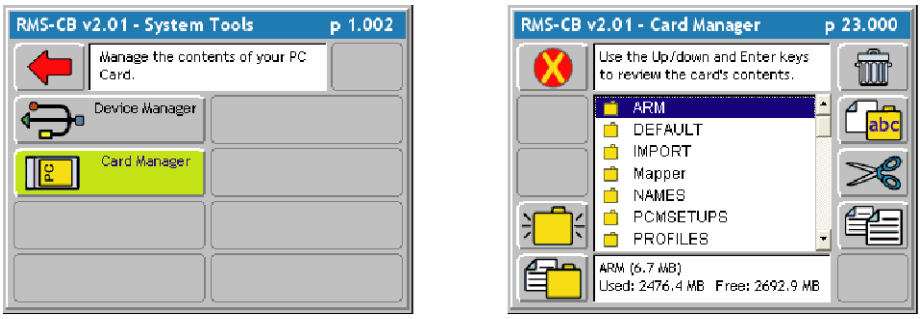


Figure 5-7: The Card Manager Page

Card Manager SoftKeys and Description

Button	Description
	Create a New Folder - Press this button to create a new folder at the current location on the PC card. A prompt to name the folder appears when this button is pressed.
	Move Up - Press this button to close the current folder and move up one folder level. To move down a folder level from the current position, highlight the desired folder name in the File/Folder list and press the Enter key.
	File/Folder properties - Press this button to display a properties dialog box listing specific information about the highlighted file or folder.
	Delete File or Folder - Highlight the file or folder to be deleted and press this button.
	Rename File/Folder - Highlight the file or folder to be renamed and press this button. A rename file or folder dialog appears.
	Cut File or Folder - To cut a file or folder and move it to a new location, press this button. Then move to the desired location and press the Paste button.

Table 5-4: Card Manager Functions

Button	Description
	Copy File or Folder - To copy a file or folder and paste it to a new location press this button. Then move to the desired location and press the Paste button
	Paste File/Folder - When the desired File/Folder has been Cut or Copied, navigate to the target location and press this button to paste it.
	Exit - Press this button to exit the Card manager application.

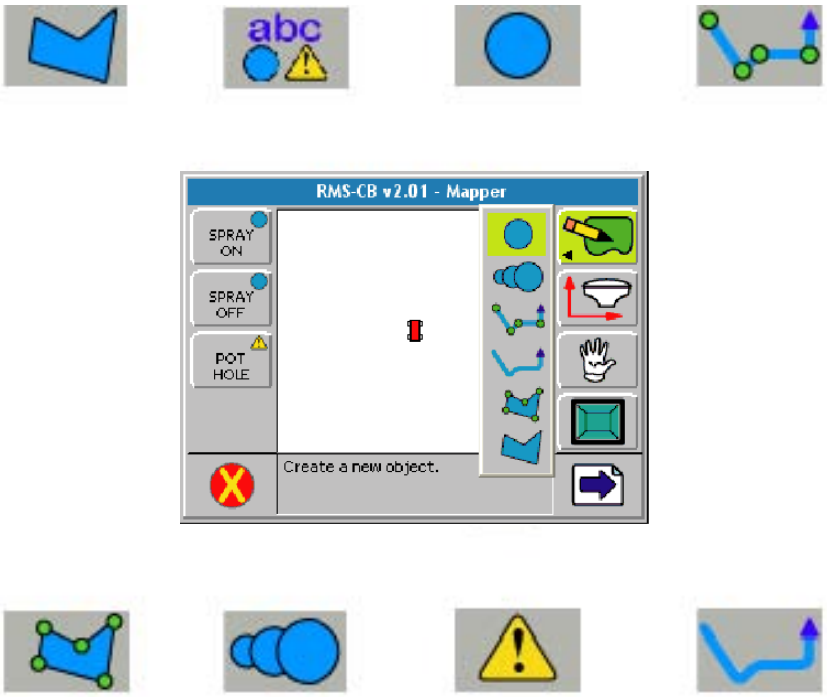
Table 5-4: Card Manager Functions

Chapter Notes

Chapter 6 - Running Mapper

Mapper for the Legacy 6000.

Software Version 2.01



Mapper Introduction

Mapping specific locations in a field is an important requirement in precision agriculture. The Mapper program allows the operator to Map specific locations or more generalized areas of a field. Once a desired location is mapped the operator can then return to that location at a later date or use that map as a background for future use. The primary use of the Mapper program will be for mapping specific items such as boundaries, weed patches, insect infestation, wet areas, tile lines, tile risers, poles, rocks, holes, etc. The items mapped will be stored as a .gmf file on the data card that can be used as a background file during a Real-Time application.

The Mapper application is used without the lightbar but the data card must be inserted in the Legacy 6000.

Starting Mapper

To access the mapper application select the Highway (Mapper) button from the main launcher page. If the Mapper button is not shown on the main launcher page the PC Card option in console setup is set to No (See “Console Setup” on page 6-8.). Once the Mapper button is selected a Job name will be required.

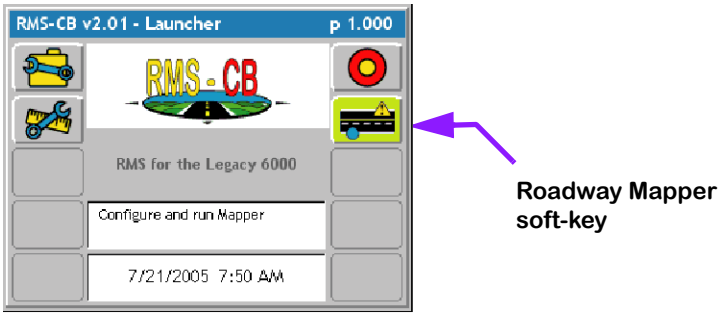


Figure 6-1: The ARM Launcher Page

Starting a Job

Pressing the Mapper button in the RMS Main Launcher brings up the Job page (Figure 6-2). When a Job is created a folder is created on the PC card labeled with the same name. All files related to this job (Map File, Background File, and Base map File) will be stored in this folder.

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

Creating a New Job

To create a new job, press the Create Job button in the Job page (Figure 6-2). This brings up the Create a Job page. There are two methods of creating a job: manually and automatically (Figure 6-3).

Selecting an Existing Job

From the Job page (Figure 6-2), 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.

Creating a Job Based on an Existing Job

A new job can be created based on the settings of an existing job. This is helpful when starting a new job and no settings need to be changed. This allows the operator to create a new job and GO! To do this, select the desired job to base the new job from. Press the (Create a job based on last job settings) button see (Figure 6-2). Create a new job name or auto name the job and then press the green forward arrow. All settings from previous job can now be viewed in the Mapper launcher page or press the Mapper Field button to start mapping based on last job settings.

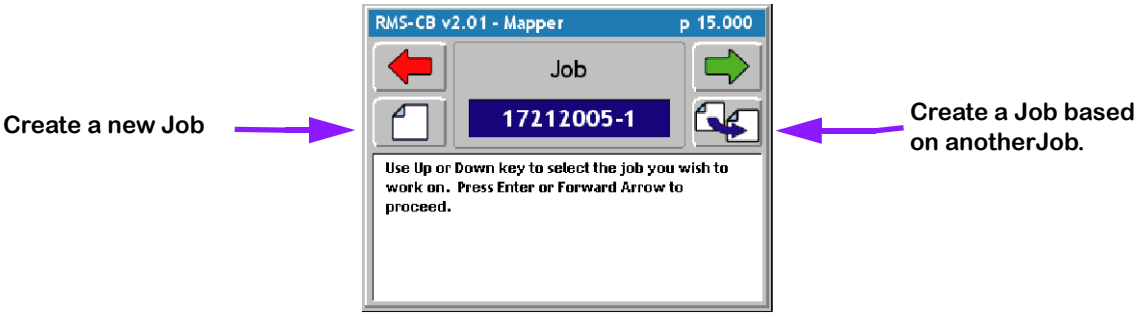


Figure 6-2: The Job Page

Manually Naming a Job

From the New Job Name page (Figure 6-3) use the arrow keys to 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.

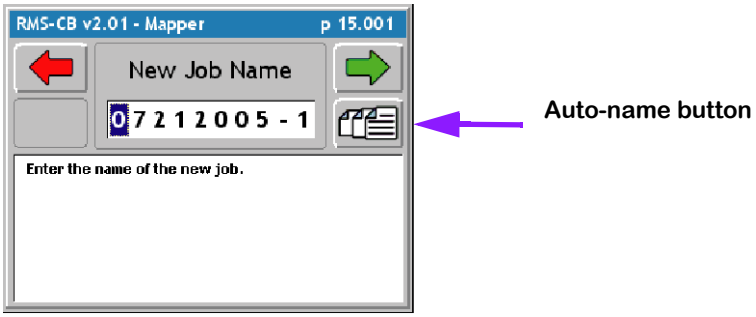


Figure 6-3: The Job Name Page

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 January 31st 2005 would automatically be named 01312005-1. The second job for the same day would be named 01312005-2.

When the Mapper Field soft-key is pressed, the RMS Mapper software loads the setting, parameters and data files. This loading process may take a few seconds to complete. When the loading process is complete, the Map page (Figure 6-10) is the first real-time page seen.

Mapper Setup

There are two optional setup features for Mapper that can make the Mapper application more detailed and efficient, Mapper Setup and Road Markers. No settings are needed in either of the two options for the Mapper session to begin (Table 6-1).

Mapper Setup and Operation Steps

Soft-key	Step Description
	**Mapper Setup**. Run this setup to name data files and set the data collection rate. You must name a Map File prior to starting the real-time mapping process.
	**Road Markers**. Run this setup to pre-define point and hazard objects. A pre-defined point or hazard object has its own soft-key in the real-time Map page. Define commonly mapped objects here.

Table 6-1: Mapper Setup

Mapper Setup

Mapper Setup consists of four setup parameters involving file names, importing background and Base map files as well as the collection interval time. Please review Table 6-2 for a more detailed description of each option.

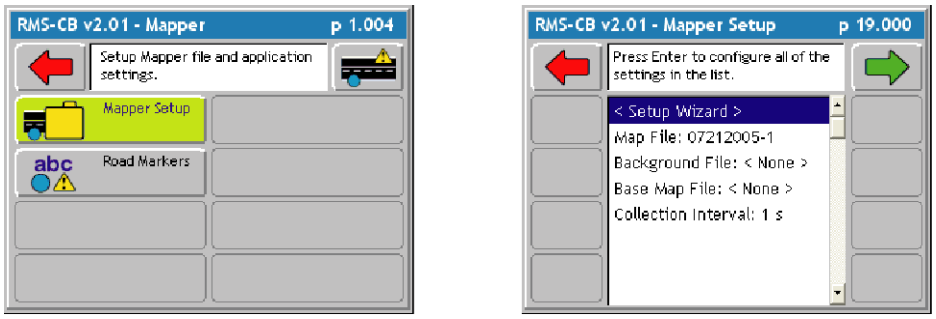


Figure 6-4: Mapper Setup

Mapper Setup Options	Description
Map File	The Map File will have the same file name entered for the Job Name. The file name can be changed to better describe the application. All mapping functions, Lines, Points, Hazards, and Polygons will be stored in this file as a .gmf on the PC Card.
Background File	The Background file is a file that has been created prior to the mapper session and has been transferred to the root directory of the PC Card. An example would be points or hazards mapped during a product application such as rocks that the operator would like to return to pick up. The background file can also be a boundary file (.bnd). The files format accepted for a background are (.gmf, .bnd).
Base Map File	The Base Map File is similar to the Background file but uses a GeoTif file (.tif). This file is usually downloaded from the internet and placed on the root directory of the card. A .tif file is a picture with georefrenced coordinates to provide location. Typical Base map files are elevation maps and roadway maps.
Collection Intervals	The Collection Interval is how often data is written to the PC Card. The selection can range from 1/sec to 5/sec.

Table 6-2: Mapper Setup Option Description

Road Markers

To help make the mapper session more efficient the Road Markers option allows the pre-naming of commonly used points and hazard. These names will appear on the left side of the real-time map page (Figure 6-12).

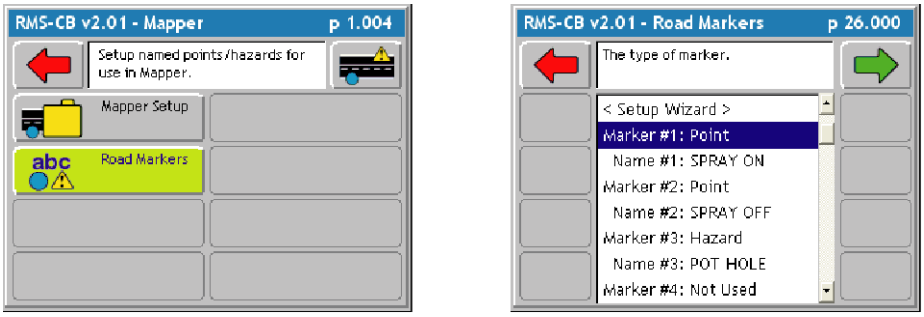


Figure 6-5: Selecting Road Markers

Parameter	Description
Marker #	The type of marker being defined: Point, Hazard, and Not Used.
Name #	The name of the marker defined above.

Table 6-3: Road Marker Setup Description

Enter Road Marker Name

To enter a road marker name select the Marker #1 and press the green enter button. Use the Up and Down arrows to select Point or Hazard and press the green forward arrow or the enter button. Next select Name #1 and enter the desired name (See “Creating Object Name” on page 6-9.) for the Point or Hazard (Figure 6-6)

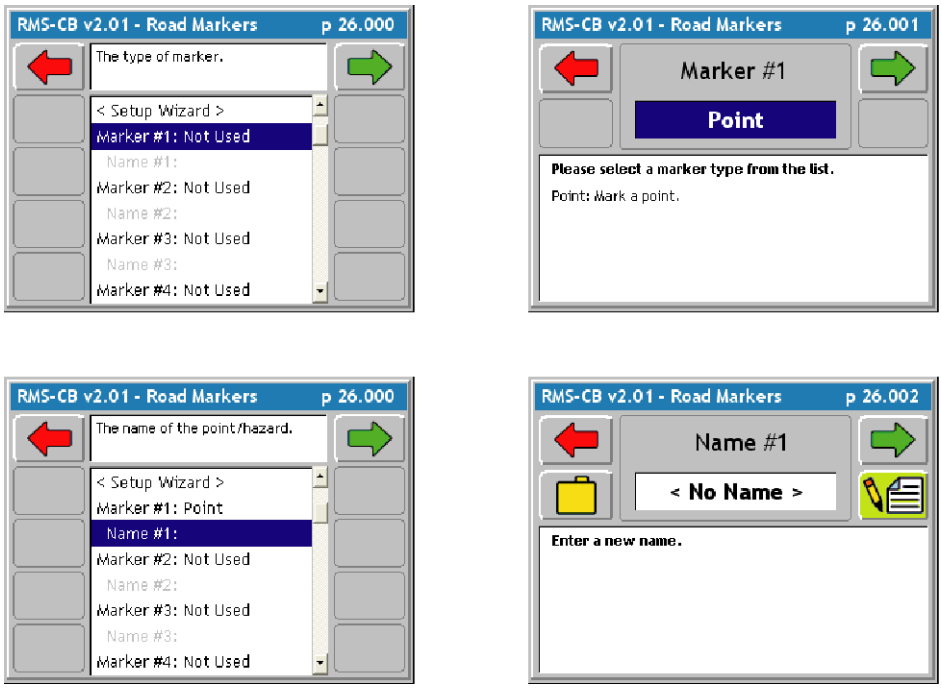


Figure 6-6: Entering Road Marker Name

Creating Object Name

Creating New Object Name

From the object name page the operator can select from existing object names or create a new name by selecting the Pencil and Paper button (Figure 6-7) left image. Enter the object name and press the green forward arrow to advance to the next page.

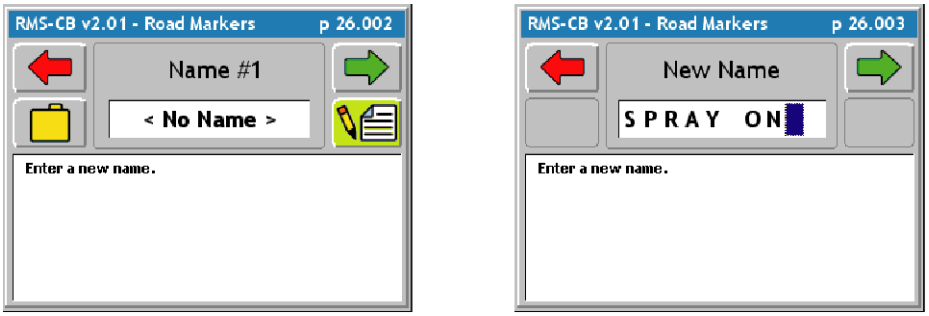


Figure 6-7: Creating a New Object Name

Creating a Folder for Object Names

From the Object Name page notice the folder button on the left side of the screen, this button allows the operator to create a folder name to store all related object names in. For example, a folder can be create called Noxious Weeds and within that folder the Object Names created will be a list of Noxious Weeds that may be seen. (Figure 6-8)

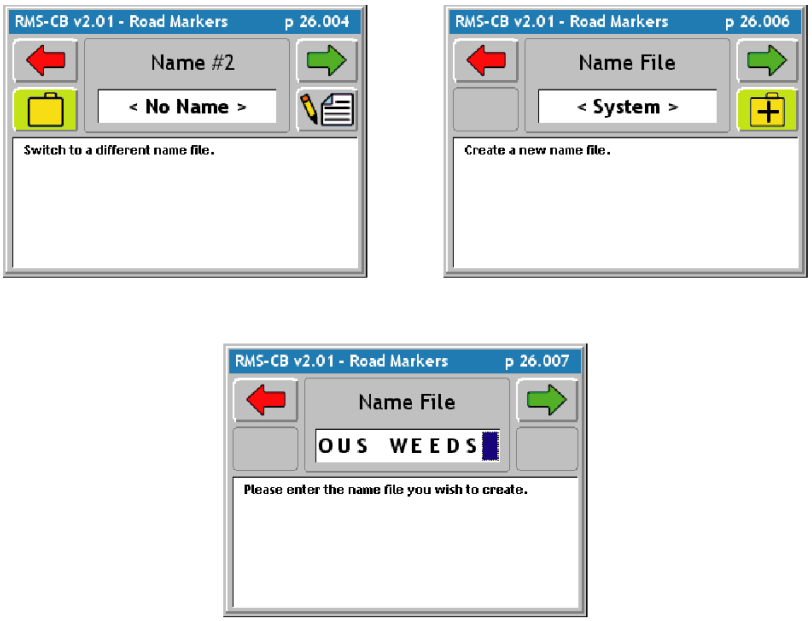


Figure 6-8: Create a Folder for Object Names

Real-time pages

To access the Mapper real-time page select the green Field button from the mapper launcher page. There are two real-time pages, an Information page and Map page. Each will be described in more detail.

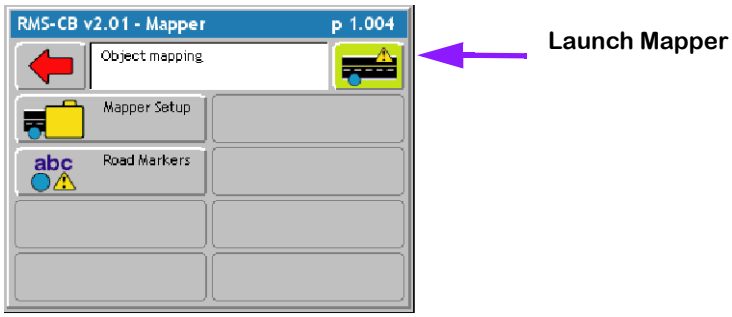


Figure 6-9: Mapper Launcher Button

Map page

The Map page is the first page the operator will view when entering the mapper session. The map page allows the mapper 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 displaying a Base map or back Ground Map the map is seen in the background.

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

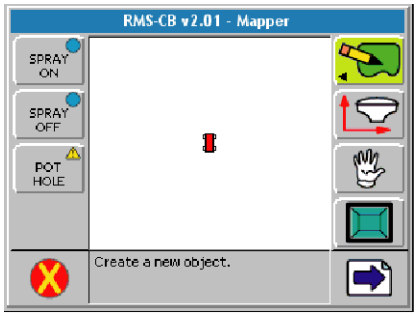


Figure 6-10: Real-Time Map Page

Map Page Soft Keys Descriptions

Soft-key	Description
	**The Exit soft-key**. Press to exit the Mapper real-time process and return to the Mapper Launcher page.
	**The Next Page soft-key**. Press to alternate between the Map page and the Navigation page.
	**The Stop Alarm soft-key**. Press to mute an alarm.
	**The Device Manager soft-key**. Press to launch Device Manager diagnostics. This is used when it is necessary to trouble shoot the devices connected to the console, including the console and GPS receiver, when running in real-time.
	**The Options soft-key**. Press to bring up the Options menu (see Table 6-5).
	**The Zoom In soft-key**. Press to decrease the area displayed in the view page. There are a total of 5 zoom levels.
	**The Zoom Out soft-key**. Press to increase area displayed in view page. There are a total of 5 zoom levels.
	**The Full Screen soft-key**. Indicates that the current display mode is “Full Screen”. When pressed, the map area is reduced to allow the message area to appear at the bottom of the screen. This is useful when you want to view the descriptions of the soft-keys found on the right side of the screen.
	**The Partial Screen soft-key**. Indicates that the current display mode is “Partial Screen”. When pressed, the map view is expanded to include the message space at the bottom of the screen. This is useful when you want to see more of the vehicle trajectory.
	**The North Up View soft-key**. Indicates that the current display mode is “Course On Ground” which keeps the vehicle stationary in the view page with the heading (course) of the vehicle pointing to the top of the view page. Pressing this soft-key changes the view to North Up.
	**The Course on Ground (COG) View soft-key**. Indicates that the current display mode is “North Up” which keeps North at the top of the view page. When pressed this soft-key changes the view to COG.

Soft-key	Description
	**The Center Vehicle soft-key**. Press to center the vehicle in the map page.
	**Generate Object soft-key**. Press to bring up a menu that allows you to set up a map object to be mapped (see (Mapper Tools on page 4-14)).
	**The Pan soft-key**. Press to pan around in the map page, using the arrow keys.
	**Antenna Offset soft-key**. Press to change the antenna offset.
	**Erase Object soft-key**. Press to erase the last object or object vertex created.

Information Page

There is one information page which displays the current Latitude and Longitude vehicle position, Antenna Height, GPS speed, Course in degrees (North 0^{o}), and file size.

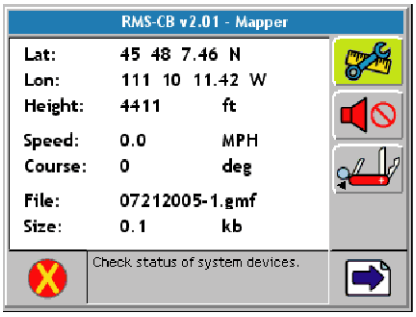


Figure 6-11: Real-Time Information Page

Information Page SoftKeys and Description

Soft-key	Description
	The Exit soft-key. When pressed RMS 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 CAN Process soft-key. When pressed this soft-key launches the CAN Process diagnostic. This can be used to troubleshoot the CAN modules when running in real-time.
	The Stop Alarm soft-key. Press this to mute an alarm.
	Allows the GPS coordinates to be viewed as Latitude / Longitude or UTM (North / East)

Mapper Tools

The primary task performed in the Map page is object mapping. In Mapper, objects include points, polylines, or polygons. As explained before, you can pre-define some point and hazard objects in the Road marker setup. Each pre-defined object has a corresponding soft-key in the Map page. Mapping objects are also accessed via the Map Objects soft-key. Pressing this soft-key activates a menu containing all graphical object types. Each mapper tool selected will prompt the operator for an object name. The object name is the label for the item being mapped (See “Creating Object Name” on page 6-9.) Each object type is described in Table 6-4.

To select an object, use the up and down arrow keys on the Legacy 6000 to highlight the desired object. Press the Enter key.

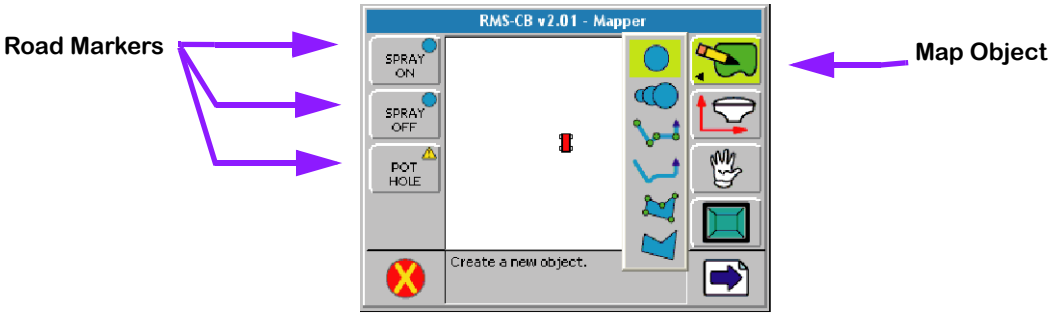


Figure 6-12: The Mapper Map Page

Object	Description
	**Point-Mark**. Maps a single point to the Map file. The Map Object soft-key changes to a Point soft-key. Press to mark a point. A prompt asks for a point name each time a point is marked.
	**Point-Stream**. Maps a stream of points at the data collection interval rate. The Map Object soft-key changes to the Points Stream soft-key. Press to turn stream on and off. A prompt asks for an object name.
	**Polyline-Mark**. Use to map or locate features that can be represented by a line of discrete points. The Map Object soft-key changes to the Polyline-Mark soft-key. Press to mark a point along the polyline. A prompt asks for an object name.
	**Polyline-Stream**. Use to map or locate features that can be represented by a line of streaming points. The Map Object soft-key changes to the Polyline-Stream soft-key. Press to turn streaming on and off. A prompt asks for an object name.

Table 6-4: Mapping Object Description

Object	Description
	**Polygon-Mark**. Use to map or locate features that can be represented by a closed shape made up of discrete points. The Map Object soft-key changes to the Polygon-Mark soft-key. Press to mark a point along the polygon perimeter. A prompt asks for an object name.
	**Polygon-Stream**. Use to map or locate features that can be represented by a closed shape made up of streaming points. The Map Object soft-key changes to the Polygon-Stream soft-key. Press to turn streaming on and off. A prompt asks for an object name.

Table 6-4: Mapping Object Description

Mapping Points and Hazards

Mapping points and hazards during a spray session is another feature of RMS for the Legacy 6000. Each of these object types are described in more detail below.

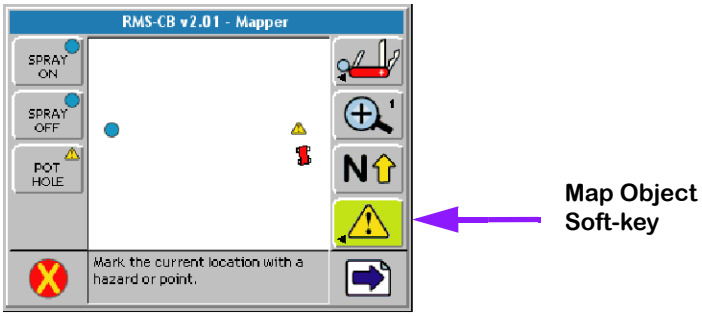


Figure 6-13: The Point Soft-key

Marking a Point

The map object Point allows a point to be marked 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 6-13). Select the Point symbol to map a point. When Enter is pressed, the Point Name dialog box appears, (Figure 6-14). Enter the name of the point using the arrow keys and press Enter to accept the point name and return to the map page.

The Name Point 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 point name. If the point is not named, 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 a new name to be entered.

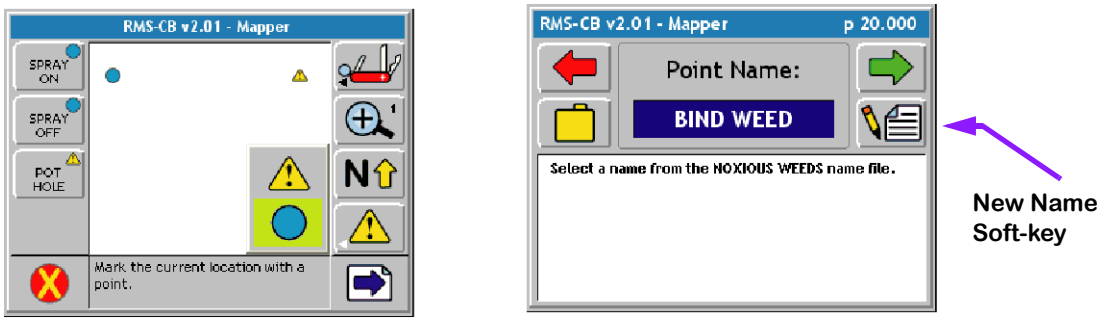


Figure 6-14: The Map Point and Naming Point Page

Marking a Hazard

The map object Hazard allows a hazard to be marked 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. 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 the GPS antenna. Press the Map Object soft-key. A side menu appears with the point and hazard symbols in the list (Figure 6-13). Select the Hazard symbol to map a hazard. When Enter is pressed, the Hazard Name dialog box appears (Figure 15). 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 the 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 the object is not named, 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 a new object name to be entered.

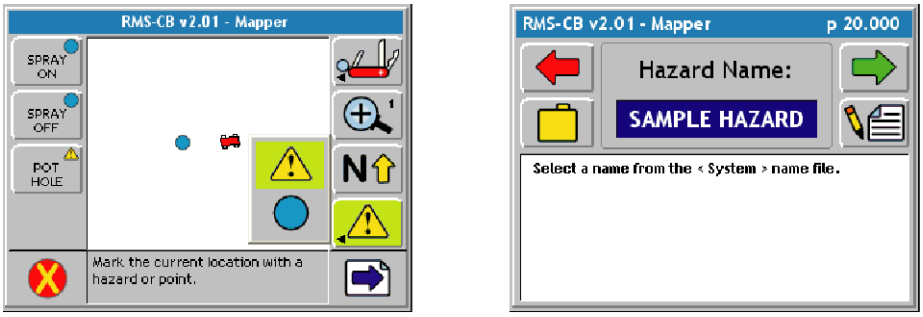


Figure 6-15: Naming the Hazard

Points & Hazards Using RMS Office Name Manager (Object Name Files)

RMS Office Tools has a section called Name Manager. Name Manager gives the operator the ability to pre-create Object Name Files with a list of related names to the file. For example a file can be created and named “Noxious Weeds.” Within this file will be a list of all the possible noxious weeds that may appear in your region. When files are exported from RMS Office to be loaded on the Legacy 6000 the file created in Name Manager can be exported as well. Exporting pre-created name Object Name Files allows for quick point and hazard naming. Use the RMS Office user guide to create files using RMS Office Tools Name Manager (User Guide Part# 98-05065).

When the point or hazard data entry page appears a file folder is located on the left side, this file will be a list of all the pre-created folder such as “Noxious Weeds.” Select the desired database name and then select the desired name for the point or hazard.

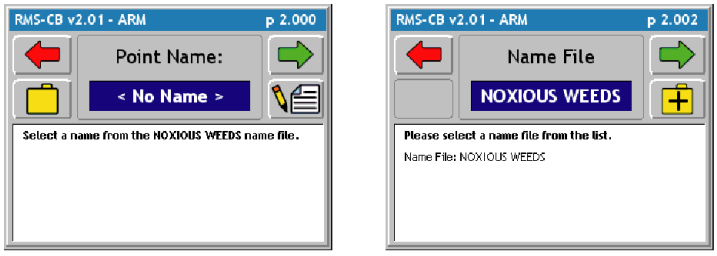


Figure 6-16: Object Name File Using RMS Office

Object Name Files can be created using the Legacy by selecting the file folder from the point or hazard data entry page and selecting the file folder with a plus on it. When the folder with a plus is selected a name for the file must be entered (e.g. Noxious Weeds.) Once the file name has been created a point or hazard name will need to be entered (Bind Weed), this will be the first name in the folder.

Note: The Legacy will default to the last folder location each time a new point is added. If Noxious weeds was the last folder used to find a point or hazard name this will be the default folder of names the Legacy will use for the next point. If a new point is created it will be stored in Noxious Weed folder unless the file location is changed by pressing the folder button and selecting the desired folder location.

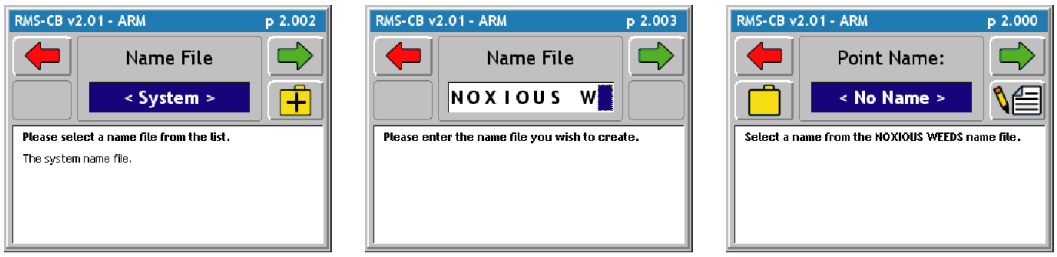


Figure 6-17: Creating Object Name Files Using the Legacy

The Options Menu

In the Map Page is an Options soft-key (Swiss Army Knife). Pressing the Options soft-key “pops-up” a small menu window on the Map page (Figure 6-18). The options menu contains several mapping aides and tools that can be used without exiting out of the real-time process. All items in the Option menu are toggle type; the item is set to either on or off. To activate an Option item, simply arrow down to the item and press enter. Pressing enter switches the state of the Option item. For example, if the item was on, it is switched to off. Table 6-5 describes each Options menu item.

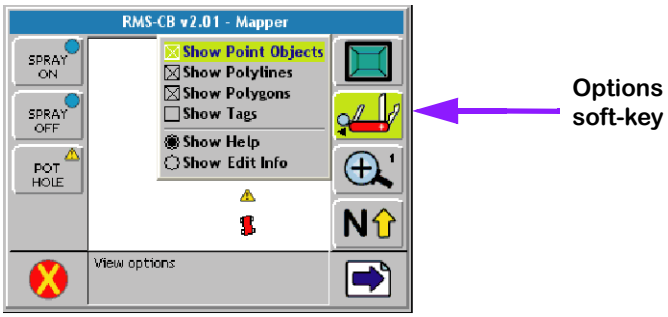


Figure 6-18: The Options Menu

Option	Description
Data Zoom	When activated, the map page uses collected data, not the background map, as its Zoom extents.
Show Base Map	When activated, the base map file is displayed in the background. When turned off the base map file is not displayed.
Show Background File	When activated, the background file(.tif) is displayed in the background. When turned off the background file is not displayed.
Show Point Objects	When activated, all point objects contained in the Map file (GMF), named in Mapper setup, are displayed in the Map page.
Show Polylines	When activated, all polylines contained in the Map file (GMF), named in Mapper setup, are displayed in the Map page.
Show Polygons	When activated, all polygons contained in the Map file (GMF), named in Mapper setup, are displayed in the Map page.
Show Tags	All mapping objects have an associated tag, which contains the mapping object type and some associated attributes. When this item is activated, a tag is shown with each mapping object. This is useful if it is necessary to see the attributes of a particular object.
Show Help	When activated, help information is displayed in the bottom half of the map page. The help text corresponds to the highlighted soft-key.
Show Edit Info	When activated, attribute information for the nearest map object is displayed in the bottom half of the Map page.

Table 6-5: Options Menu Description

Exiting Real-Time Operation

To exit real-time operation, press the Exit button, located on the bottom left corner of the current page.When data is being stored to the PC card, the exiting process may take a minute or so to properly store this data.

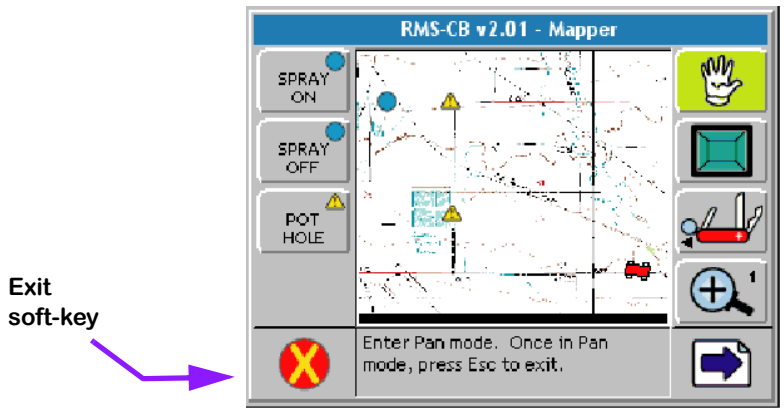


Figure 6-19: Exiting Real-time Application

Map Manager

RMS Legacy 6000 system kits include RMS Tools. This program can be used to view application “as-applied” and “mapper” maps. To view “as-applied” and “mapper” maps, copy the record files (RCD), event files (EVP) and Map files (GMF) from the PC card to a desktop or laptop computer. Consult the RMS Office user’s guide for instructions on how to generate application reports from the data.

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Chapter Notes

Appendix A - PCM Favorites Settings

CARRIER-SERVO

Favorite:	CARRIER-SERVO
Application	Liquid
Application name	CARRIER-SERVO
Configuration	Standard
PCM link	None
Drive Type	Servo
Gain	3
Start Up Drive	20%
Master Switch	Hold
Implement Status	Close
Valve Delay	1.00s
Valve Location	In-Line
Units	gal/ac
Control Basis	Area
Primary Sensor	Flowmeter
Input	A
Sensor Name	CARRIER FLOWMETER
Calibration #	199 pul/gal
Cal# Basis	NONE
Secondary Sensor	None
Monitor 1	HG FLOWSWITCH
Input	C
Sensor Name	FLOW
Alarm Delay	3s
Monitor 2	None
Monitor 3	None
Montior 4	None

CARRIER

Favorite:	CARRIER
Application	Liquid
Application name	CARRIER
Configuration	Standard
PCM link	None
Drive Type	No Drive
Units	gal/ac
Control Basis	Area
Primary Sensor	Flowmeter
Input	A
Sensor Name	CARRIER FLOWMETER
Calibration #	300 pul/gal
Cal# Basis	NONE
Secondary Sensor	None
Monitor 1	HG FLOWSWITCH
Input	C
Sensor Name	FLOW
Alarm Delay	3s
Monitor 2	None
Monitor 3	None
Montior 4	None

PUMP

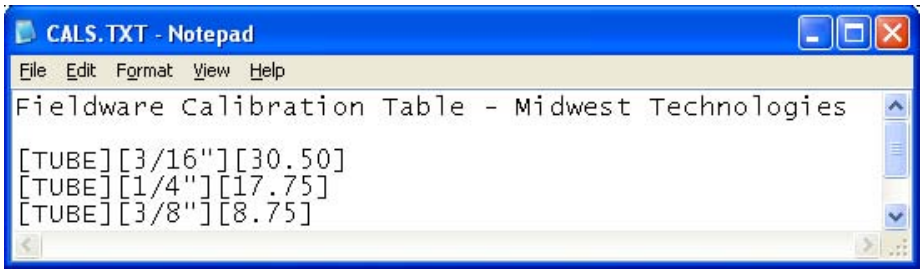
Favorite:	PUMP
Application	Liquid
Application name	PUMP
Configuration	Standard
PCM link	PCM#1
Drive Type	Injection
Units	fl oz/ac
Control Basis	Area
Primary Sensor	Injection
Input	A
Sensor Name	INJECTION_PUMP
Calibration #	17.75 pul/fl oz
Cal# Basis	TUBE
Secondary Sensor	None
Monitor 1	None
Monitor 2	None
Monitor 3	None
Monitor 4	None

Appendix B - Creating a Calibration Table

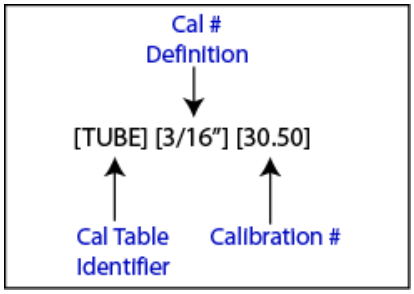
A Calibration Table can be created two ways, Midwest Technologies recommends the table be created on a PC and loaded on the Legacy. The second option is to create the table Using the Legacy 6000. A Calibration Table allows the operator to select from a predefined set of calibration #'s that are commonly used. An example would be a granular application in which the gate height changes frequently resulting in the change of the calibration #. The instructions below will use a gate height Calibration Table as an example.

Creating a Calibration Table on a PC

Create a calibration table with a text editor such as NOTEPAD and save the file as **"CALS.TXT"** in folder labeled **"SYS"** on PC Card for the Legacy 6000**.**

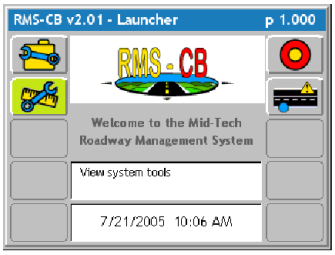


Above is a calibration table providing nominal calibration numbers for a granular system that employs Gate Height ranging from 1 to 12 inches. A valid entry **must** have three fields separated by square brackets. Within the bracket there **must** be some text [TUBE][3/16"][30.50]. The Calibration Identifier will be the table name or label when loading the table in the Legacy 6000. Cal # Definition defines the calibration # related to it. The calibration number **must** be greater than zero and the units must relate to those selected in PCM Sensor Setup on the Legacy 6000. For example; if the sensor units are lbs/ac the Cal Table calibration #'s must be pul/lb.

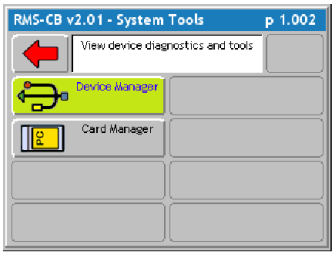


Loading Calibration Table into The Legacy 6000

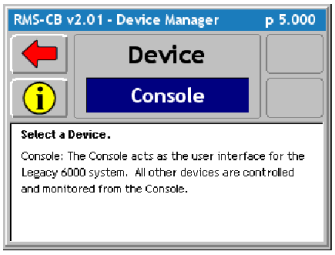
Loading the Calibration Table can be done in Five simple steps. With the console off place the PC Card in the Legacy 6000 and power the console on.



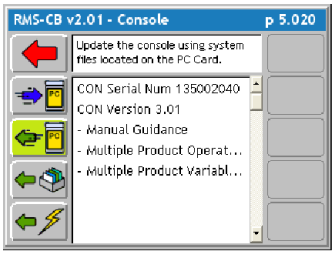
1. From the Main launcher page select the View Systems Tools button (wrench and ruler).



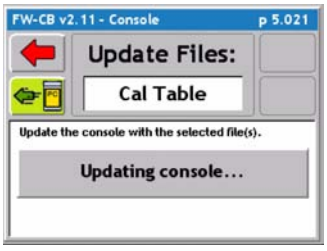
2. Select Device Manager from the system tools page.



3. From the device manager page select the Console device. Use the Up and Down arrows to scroll through the devices in the middle of the screen.



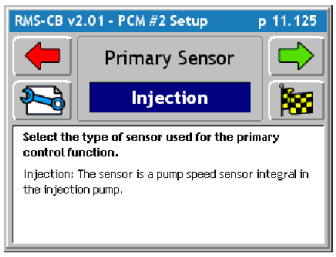
4. Locate and select the Update Console Using System Files button. This button will be the PC Card with a green arrow pointing to the left.



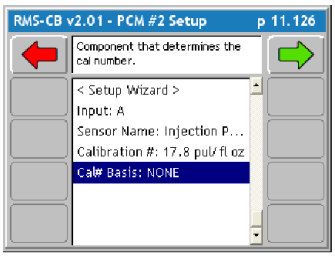
5. From the Update Files page, use the Up and Down arrows to locate Cal Table in the middle of the screen. Once Cal Table has been located press the Update Console button (PC Card with green arrow pointing to the left). Once pressed an information bar will appear stating the console is being updated, when this bar is gone the console has been updated and the Cal Table has been loaded on the Legacy 6000.

Using the Calibration Table

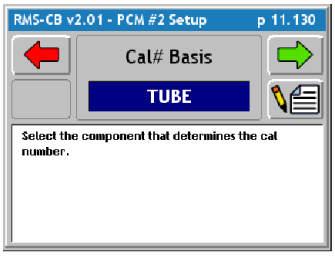
To implement the Calibration table the table must be activated during PCM Primary Sensor setup. Once activated the Cal# can be changed in Product setup before any application. Midwest Technologies recommends that each Cal Table setting be calibrated using the calibration procedure from the ARM Launcher page.



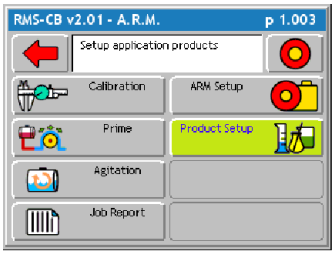
1. Enter PCM Setup and navigate through PCM setup to Primary Sensor. Select the Tools Button from the Primary Sensor page.



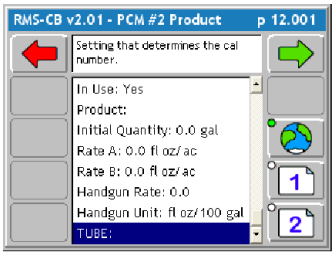
2. Use the Down arrow to highlight Cal# Basis and Press the Enter button.



3. Select the Cal Table to be used. The Name of the Cal Table is the Cal Table Identifier (The first column in the brackets when creating the Cal Table). After the Cal# Basis has been selected continue forward through PCM setup and **Apply the Settings**. The Cal Table is now ready for use.



4. To use the Cal Table enter Product setup from the ARM Launcher page.



5. Use the Down arrow to highlight GATE HEIGHT (This name is dependent on the Cal Table Identifier) and press the enter button. Select the desired gate height or calibration# description. This selection will automatically change the Cal# in the system.

Creating a Calibration Table Using the Legacy 6000

- From PCM Setup navigate to the Primary Sensor page and select the tools button.
- Use the Down arrow to highlight Cal# Basis and press enter.
- Name the Cal# Basis, this will be the Name of the Cal Table. Once a name has been established continue forward through PCM Setup and apply the settings.
- Advance to the ARM Launcher page and select the Calibration button. Choose the calibration procedure for the application and press the green forward arrow.
- Because Cal# Basis is not NONE in PCM Setup, a new screen appears in calibration. This screen will have the same name that was entered for Cal# Basis in PCM Setup. From this screen name a parameter to be calibrated. In the example above GATE HEIGHT was the Cal Table name and each parameter was described in inches (1 INCH, 2 INCH,...etc.)
- Proceed through calibration, once calibrated name the next parameter in the Cal Table and Calibrate. Repeat this step for each Cal Table parameter.

NOTE: If GATE HEIGHT is used for the Cal# Basis name in PCM Setup, Midwest Technologies has pre-named the parameters in Calibration 1 INCH - 12 INCH.

RMS LEGACY 6000 CAN BUS
3 Pump Injection System
w/ Carrier Control

RX 350p
78-50104

GPS
Power/Date
Cable
45-05340

Com 1

USB

L6K Main Harness
45-06005

Legacy 6000 Controller
75-05017

Flash Card
78-50049

Legacy
Ram Bracket
90-02161

RMS Office
Software
90-02228

Switch Sense Module
78-08029

Boom Sense 1 - 10

GSO

Imp. Stat.

SSM Harness
45-06200

Power Ext.
Cable (20')
45-05162

CAN Ext. Cable (6')
45-08006

Terminator
45-08001

CAN Ext. Cable (6')
45-08006

Power Speed Module
78-08028

PSM Harness
45-06100

Ignition
Sense

Speed
Input

Boom Switchbox
78-30001

Product Switchbox
78-30000

Switch Function
Module
78-08026

Switch Function
Harness
45-05302

CAN Ext. Cable (12')
45-08012

CAN Ext. Cable (12')
45-08012

CAN Ext. Cable (12')
45-08012

Terminator
45-08002

Power Ext.
Cable (10')
45-05160

Power Cable
401-0011

Black

White

Vehicle Battery
(12 Volts)

Product Control
Module
78-08030

Legacy
Injection Pump
90-06018

PCM Harness
Pump
45-06314

Power Cable
45-05302
(Included w/pump)

To Battery
Power

Power Ext.
Cable (10')
45-05160

Agitation Control

160-0006
Coupling, Female .5" SST

160-0021
Tank 7.5gal .5" fittings
w/ agitation

160-0015
Mounting Base, SST, Dual

Product Control
Module
78-08030

Legacy
Injection Pump
90-06018

PCM Harness
Pump
45-06314

Power Cable
45-05302
(Included w/pump)

Power Ext.
Cable (10')
45-05160

To Battery
Power

160-0006
Coupling, Female .5" SST

160-0033
Tank 25gal .5" fittings

160-0015
Mounting Base, SST, Dual

Product Control
Module
78-08030

PCM Harness
Carrier
45-06315

Valve Input

Handgun
Input

Adapter Cable
(Included w/FM)
45-05315

Flow Meter
90-02176

Power Ext.
Cable (10')
45-05160

To Battery
Power

Flush
To Fresh Water

500-0013
Dual Flush Kit

500-0013
Dual Flush Kit

NOTE: Actual arrangement of components may vary.