Loup Electronics Planter Monitor

LPM II

User Guide

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1. INTRODUCTION

The Loup Full Featured Planter Monitor (LPM II) utilizes a multiplexed data communication system to monitor the functions of a planter. The multiplexed system allows for greater system reliability through a decreased connector count and on the fly system diagnostic. The system also provides a simple upgrade path for adding more functions.

Seed flow for up to 36 rows may be monitored with one monitor, giving readings for each row and generating alarms when appropriate. The monitor collects data on the seeding rates from all active rows and calculates an average. This average will determine the 100% mark. Seed rate for each row is then compared to the average value (the 100%) and the result is displayed on the bargraph. A comparison between the seed rate for each row is possible. The monitor will display rates down to "55% or less" or up to "115% or more".

The monitor supports implements with one or two sections (left/right). The sections are defined during system installation. Each section can monitor up to 18 rows.

For systems with two sections installed the information regarding each section is displayed alternatively every 5 seconds. The display will lock on the section containing the first recognized alarm until the user acknowledges the alarm or the alarm condition is removed.

The monitor supports point row operation and allows the user to lock the display on one section only by pressing **SELECT**. The disabled section icon will flash as long as the section is disabled. The monitor reverts to a two-section operation mode on the next power cycle.

On small implements, the user may program only one section and leave the other disabled. Pressing **SELECT** will have no effect.

The monitor works with a Smart Coil Pick-up Adapter or a True Ground Speed distance sensor. The monitor will detect such sensors as soon as they are plugged in without any assistance from the installer.

Up to two Smart Shaft Sensors are also supported. These can be connected any time during the installation. However, the convention is that the first shaft sensor installed is always for the left side shaft, and the second one is for the right side shaft.

One Smart Fan Sensor may be used in a system to monitor the fan RPM.

The monitor has a battery saving feature and will power down if the planter is stopped and there is no distance (or speed) signal, no seed flow signal and no key entry sensed for more than one hour.

The monitor is packaged in a black ABS plastic case. Three cables exit the rear of the monitor. One two wire power cable connects to the tractor power supply. A three wire cable acts as the communication bus for the system. A four wire cable may connect a standard radar output.

The monitor has ten backlit push buttons under a polycarbonate overlay as shown to the right. Each valid key press is acknowledged by the monitor with a short beep.

The keys are arranged in two rows of five each. The following descriptions are only valid for the normal operating mode. The keys on the first row are arranged from left to right as follows:

SELECT

− Selects the active section (left or right) in normal operation.
− Has no effect in a single section system.
− While editing a numerical entry in SETUP, the key will select the digit to change.
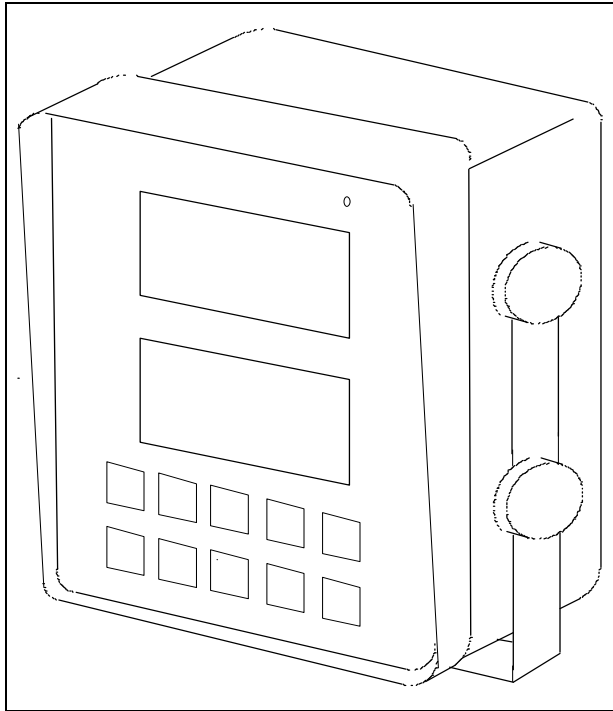
Figure 1 - Monitor housing

SPEED
− Immediately displays the current speed.

SCAN
− If the current average population or average spacing is displayed, pushing **SCAN** key will start the SCAN function: the display will sequentially show the population/spacing on each row from all active sections. Pressing a second time freezes the SCAN function and the display stops on the current row. Pressing a third time brings the current average population or average spacing display and terminates the scan mode.
− If the display shows any function other than average population or spacing, pressing SCAN once will sequentially display fan RPM, speed, average seed population and average seed spacing. Pressing a second time freezes the display on the current function.

SEED SPACING/SEED POPULATION

− Immediately displays the average seed spacing and the average seed population of all active rows.
− Each press alternates between seed spacing and seed population.

AREA FIELD/AREA TOTAL

− Immediately displays the field and total area seeded since the field/total area was last cleared.
− Each press alternates between field area and total area.

The keys on the second row are arranged from left to right as follows:

OK

− Ends and saves the new set-up during installation.
− Selects and saves values while programming select functions.
− Acknowledges alarms or stops LCD information messages in normal operation mode.

UP ARROW and **DOWN ARROW**

− Scrolls sequentially through the display options on the second LCD.
− Freezes on the next row while SCAN function is active.
− Scrolls sequentially through the row population or spacing while SCAN function is frozen.
− Used to enter programmable values under set-up
− The Up and Down Arrow keys can be pressed at the same time to start the CLEAR function (see Section 3.4.2 Clearing a Programmable Parameter).

SETUP ENTER/SETUP EXIT

− Enters and exits the programming of select functions.

ON/OFF

− To power the unit on and off.

This monitor comes equipped with two backlit Liquid Crystal Displays (LCD).

The upper LCD shows the active section, the number of monitored rows per section, the relative seed rate for each row, all the alarms and warnings. A continuous audio alarm will sound upon system malfunction or underflow conditions for any monitored row. The user must acknowledge all alarms. The warnings may sound the buzzer or flash icons. The upper LCD is also used to scroll various warning and alarm text messages when the conditions exist.

_____

The lower LCD is used to display alphanumeric data such as row spacing (or implement width), units, speed, audio volume, seed population, seed spacing, field area, total area, and the pulses per mile/kilometer for the distance sensor.

The monitor can be set-up with the number of sections on the planter and the number of rows in each section. If the system has no sensors attached at power on, it may enter install mode to wait for the sensors to be plugged in, one at a time, in a predetermined order (first section, row 1 first for seed sensors, left shaft first for shaft sensors).

The monitor supports both the metric and the English measuring systems.

2.   LIQUID CRYSTAL DISPLAYS

The Loup Full Featured 36 Row Planter Monitor (LPM II) uses two separate LCD's.

2.1   *Upper LCD*

The information on the upper LCD is organized as 18 numbered bargraphs. Each bargraph is assigned to a monitored row and has seven rectangular segments which indicate the following conditions:

%	Segment comes on when the row's seed rate is:
120	>= 115%
110	>= 105%
100	>= 95%
90	>= 85%
80	>= 75%
70	>= 65%
60	>= 55%, or < 55%, low rate starts an alarm, row number flashing, or = 0%, no flow or seed tube blocked trigger an alarm condition row number flashing if the planter is moving and the average seed rate>0, or = 0%, planter stopped, no flow rate on all rows, or = 0%, while the sensor is calibrating the 60% segment will flash; if calibration was successful the flashing will stop.

Table 1 - Bargraph Display Definition

On the left side of the display there is a percentage scale to attach quantitative information to the bargraphs.

The icons at the bottom of the upper LCD are the numbers from 1 to 18 in ascending order, volume (the ◀ symbol), **SETUP**, **LEFT**, **SAVE?** and **RIGHT**.

The LCD allows the user to view all the monitored rows using two different screens. Each screen shows one section. The monitor will alternatively display the screens showing the rows in each section and the section icon every 5 seconds. When only one section is selected, only one screen will be displayed

continuously and the section name icon will stay on. When only one section is installed the display locks on one screen only and no section icon will show.

One screen will show the relative differences in the seed rate between rows and the alarm conditions on each row.

2.2 Lower LCD

The lower LCD is used to display alphanumeric data at installation time or during programming the monitor.

The LCD can display up to six alphanumeric characters, with up to two decimal places.

At the top of the lower LCD, there are two rows of icons as follows, from left to right, top to bottom: **INCHES**, **per**, **SEEDS per**, **PULSES per**, **SCAN**, **ROW** , **AVERAGE** and **KM/H**, **MPH**, **CM**, **FT**, **ACRE**, **Ha**, **MILE**, **POPULATION** and **SPACING**.

The icons at the bottom of the lower LCD are: volume (◀ symbol), **ROW**, **CLEAR?**, **ACRE**, **SETUP**, **LEFT**, **SAVE?**, **COUNT** and **RIGHT**.

On both sides of the lower LCD, there are 5 arrowhead pointers.

3. OPERATING SPECIFICATION

3.1 Operating Modes

The monitor supports various operating modes that will be shortly described here. For further details please check the sections referred.

Install Mode	The monitor enters this mode if it is powered up with no sensors attached (including radar sensor). The user is prompted to install a new system in Section 3.1.1 System Installation. A special case within this mode is used to learn the distance sensor (see Section Programming Speed).
Demo Mode	The monitor will enter this mode if the install mode is by-passed and sections are saved without connecting any sensors. This mode is useful to demonstrate the displays and some of the features, including monitor setup (see Section 3.1.2 Demo Mode).
Normal Mode	**This is the most usual operating mode for this monitor**. After a successful system installation and thereafter on each power-up the monitor will default to this mode (starting in Section 3.2 Using the Keypad). From this mode the user may also access SET-UP to program new values for select functions (see Section 3.4 Programming the Monitor).
Acre Count Mode	This mode may be used to monitor the field and total areas covered and to display speed (see Section 3.1.3 Acre Count/Speedometer Mode).
Count Mode	The Count Mode may be used to check or adjust the seed meters or to check the accuracy of the seed counting sensors (see Section 3.1.4 Count Mode).
Test Jig Mode	The Test Jig Mode is an enhanced Count Mode that brings out more information about the sensor under test (see Section **Error! Reference source not found.**).
Self Test Mode	This is the mode that runs the in-house test used at VANSCO to verify the functionality of the monitor (see Section **Error! Reference source not found.**).

Table 2 - Possible Operating Modes

3.1.1 System Installation

If the monitor is powered on with no sensors attached, it will automatically enter a mode where a new installation can be carried. The **SETUP**, **LEFT** and **RIGHT** icons will be on.

An installation procedure is required to configure the monitor to the sensors attached to it. The monitor saves the system configuration in non-volatile memory, so the installation has to be done only when the monitor is first used.

Since the system set-up is saved in the monitor's non-volatile memory, **only the monitor used during installation will operate properly on the system**. If a new monitor is installed, the system installation procedure must be repeated.

3.1.1.1   Installation Procedure

1. Initially, all the sensors (including radar) must be unplugged from the harness, and the monitor must be off. When the monitor is turned on, it automatically enters the set-up procedure. The **SETUP**, **LEFT** and **RIGHT** text icons will be solid on and the **NO SENSOR** message scrolls on the upper display. **If the monitor was accidentally powered on with no sensors attached, the user can turn the monitor off at this point and the previous configuration will not lost.**

    ⇒ The user has to press **OK** to confirm a new installation is desired. During the confirmation, the display will alternate between **"NEW"** and **"SYS?"** and the beeper will sound to alert the user that the previous configuration will be lost.

    ⇒ The monitor automatically starts with the left section. The **LEFT** icon shows solid and all the row numbers and the **RIGHT** icon are flashing.

2. At first, the left section of rows will flash the numbers from **1** to **18**. This indicates the monitor is waiting for the sensors mounted on the left section to be plugged in. Up to 18 sensors may be installed on each section.

    ⇒ Each sensor must now be individually recognized by the monitor.

3. The user plugs the sensors into the harness in a predetermined order, row 1 on the left first, row 2 on the left second and so on, up to row 18. When a sensor is plugged in, the corresponding row number will stay solid and the monitor will give a double beep to acknowledge the sensor. The sensors should be left connected after the monitor acknowledges them.

    ⇒ The monitor will communicate with each sensor and save its identification in non-volatile memory.

    ⇒ The order is chosen so that the installer can walk and plug in the sensors as they are encountered.

    ⇒ The order in which the sensors are connected during initial system installation is always the same. Unless there is a faulty sensor, the installer should just have to connect the sensors in the proper order without checking the monitor is acknowledging each sensor.

Note 1: *The distance sensor may be installed at any point in time. The monitor will communicate with it and display either **"PICKUP"** if a magnetic pickup sensor is installed, or **"RADAR"** if a true ground speed sensor is connected.*

Note 2: *The fan sensor may be installed at any time. The monitor will communicate with the sensor and display **"FAN"**.*

Note 3: *The shaft sensors may be installed at any point. Once the first sensor is plugged in, the monitor will communicate with it and display **"LSHAFT"**, to indicate that the left shaft has been installed. The next shaft installed will display **"RSHAFT"** to indicate that the right shaft has been installed.*

4. When all the sensors for the current section are installed, the installer should check the monitor displays solid numbers for the number of sensors connected. If this condition is satisfied the **OK** key must be pressed to save the setup for the current section. The **SAVE?** icon will show followed by continuous short beeps indicating the monitor is preparing to save. The user has 5 seconds to decide if he wants to save the current configuration. During this time the short beeps will sound. To complete the save, the user has to hold the **OK** key pressed down until the word **"DONE"** shows on the screen followed by a long beep and the **SAVE?** icon turns off. When the user releases the **OK** key, the monitor will continue with the second section installation or exit set-up.

   ⇒ if a faulty sensor is plugged in, the monitor will not be able to learn it, and therefore, will not acknowledge it. If the installer continues to plug in sensors without checking the acknowledge beeps from the monitor, the display must be checked before each save. If the solid numbers or sensor count shown on the display do not match the number of flow sensors connected, one of the sensors was faulty and the installation procedure must be repeated taking care to hear the acknowledge beeps.

5. When both sections are finished, the set-up is complete. If only one section is done, the monitor will continue with the **RIGHT** section. For simple applications, where less than 18 rows in one section are required, the user may disable the second section by going to step 4 now. If more rows or point row operation are needed, the second section should be programmed. Please refer to steps 3 and 4, previously described.

   Note 1: *The monitor will enter <u>demo mode</u> if both sections are saved with no sensors attached. Demo mode is useful to demonstrate some of the features available.*

Note 2: *If only one section is installed the section text icon (LEFT or RIGHT) will not be displayed.*

3.1.1.2 Sensor Replacement

The monitor will alarm the user if there is a faulty row sensor in the system. The corresponding row number will flash, the bargraph will be completely off and the beeper will sound. If the monitor is not moving or planting, it will also display **"CHECK CONNECTION"** on the top LCD. To replace the faulty sensor, **turn the monitor off**, disconnect the faulty sensor, **turn the monitor back on**, and plug in the replacement sensor. The monitor will double beep to acknowledge the new sensor was learned and saved.

If there is more than one faulty row sensor in the system, the monitor will flash all the corresponding row numbers, prompting the user to replace all the faulty sensors. The user should **turn the monitor off**, disconnect all the faulty sensors, **turn the monitor back on**, and plug in all the replacement sensors, beginning with the lowest number row in the left section, continuing in increasing order, then the lowest number row in the right section, continuing in increasing order.

> **Note**: *If the monitor is not turned off and then on, the replacement sensor(s) will be ignored until the next power up, at which point they will be randomly mapped.*

If the monitor detects a faulty distance sensor, the lower LCD will immediately jump to the speed display, show the word **"PICKUP"** or **"RADAR"** depending on the distance sensor installed, and the beeper will sound.

If the monitor detects either one or both shaft sensors faulty, the lower LCD will show the words **"LSHAFT"**, **"RSHAFT"**, or **"SHAFTS"**, depending on what configuration of shaft sensors are missing, and the beeper will sound.

If the monitor detects a bad fan sensor, the lower LCD will immediately jump to the FAN display and show the word **"FAN"**, and the beeper will sound.

The distance, shaft and fan sensors may be replaced at any time. If both shaft sensors are replaced they should be plugged in left first followed by the right shaft.

3.1.1.3 Upgrading the System

To upgrade the system to monitor more (or less) rows (up to the maximum of 18 per section, 36 in total), all the sensors must be unplugged, followed by a complete installation procedure (see Section 3.1.1   System Installation).

The distance or fan sensors can be added, upgraded or replaced at any time without a new system installation being required. If both shaft sensors are added in, they should be plugged in the correct left/right sequence.

3.1.2 Demo Mode

The monitor will enter demo mode if both sections are saved with no sensors attached.
The **demo mode** is useful to demonstrate some of the features available.

3.1.3 Acre Count/Speedometer Mode

If the monitor is powered up (or installed) with only a distance sensor attached, or if the user holds down the **AREA** and power-**ON** keys on power-up, the monitor enters the **acre count mode** and the **"ACRE COUNT"** text icons turn on. The row spacing function becomes the implement width and the user can program it to the correct value (in feet or meters). The seed spacing and seed population functions are not available in this mode. For a standard radar distance sensor, the monitor will count the acres covered (based on implement width) when the MUXBUS communication data line is shorted to ground. Currently the monitor will not count acres with any other type of distance sensor. See Section Programming Row Spacing and Section Programming Speed for further details.

3.1.4 Count Mode

If the user powers up the monitor while holding down the **SEED** and the power-**ON** keys the monitor will display **"COUNT"**, the **COUNT** icon will turn on and the monitor will enter (seed) **count**-ing **mode**. This mode allows the user to test and adjust the seed meters right on the planter without the need to remove them or to use other test stands.

> **Note**: *The Count Mode will only operate properly if a Smart Coil Pick-up Adapter is used to read the metering shaft RPM. If the sensor is installed on a different shaft, this shaft must rotate with the metering shaft and the number programmed under SET-UP SPEED must take the gear ratio between the two shafts into consideration.*

In order for the monitor to correctly calculate the expected number of seeds, the user must go into SETUP and enter the number of ticks per rotation under SPEED and the ideal number of seeds per rotation under SEED POPULATION. Once these values are programmed, the user can run the test.

While the test is running, the SPEED function displays the actual RPM by alternating between the value and **"RPM"** text on the LCD. After the test is stopped, it displays the total number of distance ticks.

While the test is stopped, SEED SPACING SCAN shows the percent difference between the actual number of seeds counted on each row and the ideal number

expected (0% means 100%, +5% means 105% and -5% means 95%). As well, SEED POPULATION SCAN will show the actual number of seeds on each row. This value rolls over, back to zero after it hits 9999. The SEED SPACING or POPULATION will always display the ideal number of seeds. At any point, pressing the OK button can clear all of these values.

3.2   Using the Keypad

The keypad allows the user to select or change the operating mode, the active displays or the current setup. Depending on the operating mode or the current display selected some keys are valid while some are not. Each valid key press is acknowledged by a short beep and an action is taken. If the key press is invalid for the current operating mode, it is ignored and the user will not get any feedback on it, a beep or otherwise.

3.2.1   Selecting the Active Section(s)

For smaller systems with only one section installed the section icon is turned off, the bargraph display is locked and pushing SELECT will have no effect.

The following applies to larger planter implements only where both left and right sections are installed. Since each section has its own display screen, the monitor allows the user to select which screens to show.

Immediately after a new installation the monitor will alternate between the left and the right screens. To select the left section only, press **SELECT** once. To show the right section is not selected, the **RIGHT** icon starts to flash. The left section is continuously displayed on the LCD and the monitor calculates the average population based on the active rows from this section only.

To select the RIGHT section, press the **SELECT** key again. In this case, **RIGHT** will show solid and the rows from the right section will be displayed continuously on the LCD. To show the left section is deselected, the **LEFT** icon will flash.

Pressing the **SELECT** again will activate both sections.

3.2.2 Changing the Currently Displayed Function

The UP and DOWN arrow keys will sequentially change what is being displayed on the lower LCD. Pressing the **UP** or **DOWN** arrow keys will move the **arrowhead** icon (on the left or right hand side of the display) to another valid item. For example, if the arrowhead icon is pointing to SPEED, ground speed will be displayed on the LCD. Pressing the **UP** arrow key will move the icon to

UNITS. The screen will change to display all the icons used to represent the current measurement system.

> **Note**: *When FIELD area is selected, the UP or DOWN keys must be held in slightly longer than normal so the monitor will not mistake this action with a CLEAR, which consists of the UP and DOWN arrow keys pressed simultaneously.*

The shortcut keys SPEED, SEED SPACING/POPULATION, and AREA FIELD/TOTAL allow direct access to their respective displays. For example, no matter what is currently being displayed on the lower LCD, pressing the **SPEED** key will change the display to the current speed.

Pressing the **SEED SPACING/POPULATION** or **AREA FIELD/TOTAL** keys will alternate between the two functions assigned to each key.

Pressing the **SCAN** key while displaying seed spacing or population will cause a sequential display of each individual row plus the planter average. Pressing **SCAN** while displaying any other function will cause the monitor to sequentially display fan RPM, speed, average seed population and average seed spacing. Pressing the **SCAN** key a second time will freeze the display. The UP and DOWN arrow keys can be used at this time to change the current display. Pressing the **SCAN** key will restart the automatic advancing of the scan function.

3.2.3 Entering and Exiting Parameter Programming

The SETUP key enters and exits programming of select functions. Further details about programming are discussed in Section 3.4   Programming the Monitor.

3.3 The Lower LCD Functions

The following subsections explain the functions that can be displayed on the lower LCD.

3.3.1 Fan RPM

This function displays the fan RPM as a four digit no decimal place number. The signal is picked up from the Smart Fan Sensor installed that reads one pulse per fan revolution.

3.3.2 Row Spacing

This function will display the current spacing between rows in inches (or cm), using a 3 digit (4 digit for metric), no decimal place format. In addition to the icons for the units used, the **ROW SPACING** text icon turns on. In the acre count mode this function displays the implement width in feet (or meters), using a 3 digit, no decimal places format.

3.3.3 Units

This function will display all the icons from the currently selected measuring system. For the imperial system, the icons are **INCH**, **MPH**, **FT**, **ACRE** and **MILE**. For the metric system, the icons are **KM/H**, **M** and **Ha**.

3.3.4 Speed

This function will display the current forward speed in **MPH** (or **KM/H**), using a 3 digit, one decimal place format.

3.3.5 Volume

This function will display the presently selected audio volume. The volume may be set in 10 steps (0 to 9) with 0 turning the beeper off. The ◀ loudspeaker icon is turned on while looking at this function.

3.3.6 Seed Population

This function displays the **planter** or the **row average number of seeds per unit area** (acre or Ha) for all the active rows. The **AVERAGE POPULATION** text icon turns on and the planter average is displayed using a 6 digit, no decimal place format. If **SCAN** key is pressed once it activates the **scan function** and the SCAN **arrowhead** and **SCAN POPULATION** icons will light. The **ROW** text icon with the current row number will be displayed on the left and the row population will be displayed on the right in 1000's using 3 digits with one optional decimal place (e.g. 32.9 means 32900). When the **scan function is stopped**, the

POPULATION text icon will stay on, the **SCAN** text icon turns off while the SCAN **arrowhead** will start to flash. The **UP** and **DOWN** keys may be used to lock on the desired row.

When the planter is stopped and not planting, the planter average seed population since last power-up, or since the field area was cleared, is displayed.

3.3.7 Seed Spacing

This function displays the **planter** or the **row average distance between seeds** for all active rows in distance units (inches or cm) per seed, using a 3 digit, one decimal place format. When the planter average is displayed the **AVERAGE SPACING** and **distance units per SEED** text icons are turned on. When the **scan function** is active, the SCAN **arrowhead** and **SCAN SPACING** icons will be on. The **ROW** text icon with the current row number will be displayed on the left while the row spacing will display on the right. The display will jump to the next row after 5 seconds. When the **scan function is stopped**, the **SPACING** text icon will stay on, the **SCAN** icon turns off while the SCAN **arrowhead** will

start to flash. The **UP** and **DOWN** keys may be used to lock on the desired row.

When the planter is stopped and not planting, the planter average seed spacing since last power-up, or since the field area was cleared, is displayed.

3.3.8 Field Area

This function displays the number of area units (acres or Ha) covered in this field, using a 6 digit, two decimal place format. The field area may be cleared at any time by pressing and holding down both UP and DOWN keys.

3.3.9 Total Area

This function displays the total number of area units (acres or Ha) covered, as a 6 digit, one decimal place number. The total area counter updates every time the field area counter increments.

> **Note**: *Clearing the total area counter will also clear the field area counter.*

3.4   Programming the Monitor

If the currently displayed function has parameters that can be edited, the user

may press and hold down the **SETUP** key to enter monitor setup. The monitor will emit several short beeps, followed by a long beep. On the lower LCD, the **SETUP** icon turns on and the currently displayed function **arrowhead icon** will flash, indicating that the user can select the item to program.

To program one function (or item), the user presses the **UP** or **DOWN** arrow keys to move the flashing arrowhead to the desired item. As the arrowhead icon moves, the lower LCD will display the current settings of the item pointed to.

Pressing **OK,** the arrowhead icon becomes solid and the monitor allows the user to program the item.

3.4.1 Editing a Programmable Parameter

After the user has pressed **OK**, the least significant digit of the displayed value will be blinking. This value can be changed by pressing the **UP** or **DOWN** arrow keys. The digit value will wrap around 9 or 0. Once the value for this digit is correct, pressing the **SELECT** key will move the blinking digit to the next significant one, where the process can be repeated. This function will wrap back to the least significant digit after the most significant digit is programmed.

Most items have minimum and maximum values associated with them. The monitor allows the user to edit the value outside its predefined range but after the save, it defaults to one of the limits.

For example, if the current function value is 050560, the minimum value is 500 and the maximum value is 500000, we could see:

Key Action	Flashing Digit	Display Value
After pressing the **OK** key	right most digit	050560
Pressing and holding the **UP** key	right most digit	050561, 050562, 050563
Press the **SELECT** key	second digit from right	050563
Pressing and holding the **DOWN** key	second digit from right	050553, 050543, 050533, 050523, 050513, 050503, 050593
Press the **SELECT** key four times	left most digit	050593
Pressing and holding the **UP** key	left most digit	150593, 250593, 350593, 450593, 550593, 650593
After pressing and holding **OK** to save	none	500000

Table 3 - Editing a Numeric Value with Max and Min Limits

3.4.2 Clearing a Programmable Parameter

When programming speed, field area, or total area, pressing the UP and DOWN arrow keys at the same time will bring up the CLEAR function. This function allows you to clear the currently displayed function to zero. For example, if the currently displayed data is TOTAL AREA in acres, pressing **CLEAR** will set the TOTAL (and FIELD) acres to zero. The **UP** and **DOWN** arrow keys must be pressed and held down for a short period of time before the data will be cleared. The monitor will beep several times, and the **CLEAR?** icon will be displayed to warn the user. When the data is actually cleared, the monitor will emit a long beep, and the field is reset to all zeros.

3.4.3 Programming Row Spacing

The row spacing item is used to specify the spacing between the rows.

To change this setting, the user moves the flashing arrowhead to ROW. The lower LCD will display the current row spacing (in inches or cm) and **ROW SPACING** text icon turns on. The user must press OK, then use the UP or DOWN and SELECT keys to change the setting as described in Section 3.4.1 Editing a Programmable Parameter above.

The monitor limits the entry of row spacing to a minimum of 5.0 inches (12.7 cm), and to a maximum of 99.9 inches (253.7 cm).

> **Note**: *In acre count mode, this field becomes the implement width and may be programmed from a minimum of 10 feet (3 meters) to a maximum of 200 feet (61 meters).*

After entering the required changes, the user may choose to save or exit without saving them. Section Exiting Programming with or without Saving describes the procedure.

3.4.4 Programming Units

The units item is used to specify whether to use metric or standard measurements. To change this setting, the user moves the flashing arrowhead to the UNITS item and presses **OK**. The user can then use the **UP** or **DOWN** arrow keys to change the setting. The lower LCD display will display all metric icons or all imperial icons, indicating metric or imperial mode respectively. After selecting the desired setup, the user may choose to save or exit without saving. Section 3.4.8 Exiting Programming with or without Saving describes the procedure.

3.4.5 Programming Speed

The speed item is used to specify how many ticks are generated per mile (or kilometer) from the ground speed sensor. To change this setting, the user moves the flashing arrowhead to the SPEED item. The lower LCD will display the current pulses per mile (or kilometer), using a 6 digit, no decimal place format. The **PULSES per MILE** (or **PULSES per KM**) text icons turn on. The user must press OK, then use the UP or DOWN and SELECT keys to change the setting as described in Section 3.4.1 Editing a Programmable Parameter above.

If the user does not know how many ticks the ground speed sensor generates per mile (or kilometer), **the monitor will learn the number**. If the number of ticks is cleared, by pressing both the **UP** and **DOWN** arrow keys for a predetermined time, the user may drive the tractor for 330ft or 100m, depending on the unit selected, and stop. The monitor will count the number of ticks, and display them. After stopping the tractor, the user can edit the number (as described in Section 3.4.1 Editing a Programmable Parameter) to make any desired adjustments for slippage.

> **Note**: *The monitor limits the entry of pulses per mile (kilometer) to a minimum of 500 PPM (310 PPKM), and to a maximum of 500000 PPM (310686 PPKM).*

After entering the required changes, the user may choose to save or exit without

saving them. Section 3.4.8 Exiting Programming with or without Saving describes the procedure.

3.4.6 Changing the Audio Volume

To change the volume, the user moves the flashing arrowhead to the VOLUME item. The lower LCD will display the current volume and the ◀ loudspeaker icon turns on. The user must press OK and then use the UP or DOWN arrow keys to change the setting. After pressing **OK**, the beeper will sound. With every **UP** arrow key push the beeper will increment by one step between the minimum and the maximum. If the maximum is reached the volume rolls over to the minimum level. Pressing the **DOWN** arrow key lowers the volume until the minimum level, at which point the volume rolls over to the maximum level. After entering the required changes, the user may choose to save or exit without saving them. Section 3.4.8 Exiting Programming with or without Saving describes the procedure.

3.4.7 Clearing Field or Total Area

To reset the area counters, the user moves the flashing arrowhead to the FIELD or TOTAL area items, and presses **OK**. The lower LCD display will display the field or total area and the **ACRE** (or **Ha**) icon turns on. To reset the counter follow the procedure described in Section 3.4.2 Clearing a Programmable Parameter.

> **Note 1**: *Clearing the total area counter will also clear the field area counter.*

> **Note 2**: *Once cleared, the user may **not** choose to exit without saving as described in Section 3.4.8. After the long beep, the previous field area and/or total area are **not retrievable**.*

> **Note 3**: *For convenience, the field area can also be cleared without entering set-up by simultaneously pressing the **UP** and **DOWN** keys while in normal operating mode.*

3.4.8 Exiting Programming with or without Saving

After a change has been made to any of the programmable items, the user has the choice of saving, or exiting without saving. In order to **exit without saving** the user must **press and release** the **OK** key. The monitor will restore the lower LCD display to show the setting of the item, and the arrowhead icon will flash, allowing the user to select another item to program.

In order to **save and exit** the user must **press and hold** the **OK** key. The monitor will emit several short beeps and the **SAVE?** text icon is turned on. After a short time a long beep is heard, and the lower LCD will display the word

"DONE". At this point, the user may release the OK key.

> **Note**: *If the user releases the OK key **before** the word **"DONE"** is displayed, the changes **will not be saved**. The text **"DONE" must** be displayed in order for the save to have occurred.*

The user can also exit programming at any time, by pressing the **SETUP** key. Pressing this key will return the monitor to its normal operation. All items changed and saved will come into effect immediately. Any items changed, but not saved are thrown away.

3.5 Warnings and Alarms

There are five possible warnings:

Section Not Selected Warning - this warning occurs if the monitor was programmed with two sections and only one is currently displayed (see Section 3.5.1   Section Not Selected Warning).

Seed Planting Stopped Warning - this warning occurs when monitor detects the seed rate going to zero on all rows. This will normally occur when planting stops (see Section 3.5.2   Seed Planting Stopped Warning).

Row Sensor In Calibration Warning - this warning occurs while the row sensor runs its own internal self check. This usually occurs on power up only (see Section 3.5.3 Row Sensor in Calibration Warning).

Row Sensor Too Dirty Warning - this happens after the monitor detects one or more row sensors being too dirty or possibly blocked. This will usually occur after a successful self-check on power-up. The user is advised to clean up the tubes since the seed counting sensors may not work reliably from then on (see Section 3.5.4   Row Sensor Too Dirty Warning).

Low Battery Warning - this happens when the monitor detects that the battery voltage level has gotten too low (see Section 3.5.5   Low Battery Warning).

There are two types of possible alarms:

System Alarms - the monitor detects one or more faulty sensors, or one of several other communication or internal faults (see Section 3.5.6   System Alarms)

Underflow Alarms - the monitor detects one or more rows are metering seeds out at a lower rate than the rest of the planter (see Section 3.5.7   Underflow Alarms).

When a new alarm condition arises the monitor beeps repeatedly and the LCD's display the appropriate condition. To acknowledge the alarm the **OK** button must be pressed. This will silence the audible alarm, but the LCD's will continue to display the alarm condition until it is removed.

3.5.1 Section Not Selected Warning

If the monitor was programmed for two sections and only one is currently selected for display (by pressing **SELECT**), the icon of the disabled section will flash. On consecutive power up the monitor reverts back to monitor both sections.

~~This warning never becomes activate on single section installations.~~

3.5.2 Seed Planting Stopped Warning

When the monitor detects no seed flow on all the rows, it will emit 3 short beeps to alert the user. This warning will occur each time the planter is stopped or each time the planter is raised at the end of a row or if the mechanical drive fails while planting (also check Section 3.5.7Underflow Alarms for more details).

> **Note:** *This warning will not trigger unless a minimum time of continuous planting had passed.*

3.5.3 Row Sensor in Calibration Warning

All seed counting sensors run a self-calibration sequence on power-up. While in calibration the bottom segment of each corresponding bargraph will flash. If the monitor does not detect movement or planting activity the message **"WAIT CALIBRATION"** will be scrolled on the top LCD.

> **Note**: *It is advisable the planter is not moved while the system performs a self-calibration. This is because any material flow through the seed tubes during this time will make them fail the test prompting the monitor to continue to flash the associated bargraph(s) and to advise the user to clean sensors.*

3.5.4 Row Sensor Too Dirty Warning

After the seed counting sensors end their internal self-calibration the monitor may detect one or more row sensors either too dirty or blocked and will keep the corresponding bargraphs flashing. The monitor will scroll **"CLEAN SENSORS"** on the top LCD if the implement is not moving or planting, prompting the user to clean the tubes.

When the tubes are dirty their counting accuracy decreases. If the tubes are blocked the user will get an underflow alarm as soon as planting starts.

The corresponding bargraph will remain flashing until the problem is corrected and the monitor is powered down and back up.

3.5.5 Low Battery Warning

The monitor is constantly monitoring its input voltage to quickly detect power loss conditions. If the monitor detects that the input voltage has dropped below 10.5V it will display **"LOW POWER"** on the top LCD, provided that the monitor does not detect speed or planting.

> **Note**: *System reliability may degrade if battery voltage falls below 10.5V.*

3.5.6 System Alarms

A system alarm is entered when the monitor detects a faulty sensor. There are seven system alarms possible:

3.5.6.1   Row Alarms

If a row sensor is faulty the corresponding row number starts flashing, the beeper sounds and all segments on the corresponding bargraph are turned off. If the monitor detects no movement and no planting, the top LCD will scroll the text **"CHECK CONNECTION"**.

When the user pushes **OK** to acknowledge the alarm, the beeper will turn off, and the message will stop scrolling but the row number will continue to flash until the alarm condition is removed.

A faulty row sensor will not affect the values displayed by the SEED functions (POPULATION or SPACING).

3.5.6.2   Speed Alarms

If the ground speed sensor is detected as faulty, the monitor will display either **"PICKUP"** or **"RADAR"** on the bottom LCD, depending on the type of sensor installed, and the beeper will sound. When the user pushes **OK** to acknowledge the alarm, the beeper will turn off. The arrowhead on SPEED will continue to flash until the alarm condition is removed.

> **Note**: *When the distance sensor is faulty, the monitor will change to a bargraph only mode where the rows are still displayed relative to each other. The SEED POPULATION and SPACING functions are not available during this time. The AREA functions will freeze on the last values saved.*

3.5.6.3   Shaft Alarms

If the monitor detects either one or two faulty shaft sensors, the lower LCD will show the words **"LSHAFT"**, **"RSHAFT"**, or **"SHAFTS"**, depending on what shaft sensors are missing, the arrowhead icon will start to flash on the ROW function and the beeper will sound. When the user pushes **OK** to acknowledge the alarm, the beeper will turn off. The arrowhead on ROW will continue to flash until the alarm condition is removed.

3.5.6.4   Fan Alarm

If the fan sensor is faulty the monitor will display **"FAN"** on the bottom LCD, the arrowhead icon will start blinking on FAN and the beeper will sound. When the user pushes **OK** to acknowledge the alarm, the beeper will turn off. The arrowhead on FAN will continue to flash until the alarm condition is removed.

3.5.6.5   Communication and Internal Failure Alarms

Other system alarms occur when the monitor detects a communication bus error or an error while attempting to access the internal non-volatile memory. The three possible errors are:

LCD Display	Error Condition
SYS HI	The communication line has been shorted to the power line.
SYS LO	The communication line has been shorted to the ground line.
SYS EC	An internal error has been detected.

3.5.7 Underflow Alarms

3.5.7.1   Row Underflow Alarms

If the seed rate for one or more rows is less than 55% of the calculated average, the corresponding 60% segments will stay on, the corresponding row numbers start to flash, and the beeper sounds.

When the user pushes **OK** to acknowledge the alarms, the beeper turns off. The 60% segments of the bargraph remain on and the row numbers continue to flash until the alarm condition is corrected.

> **Note 1**: *All alarms present within a short time before planting stops are frozen on the screen and either the text "FAIL" or "LOW" will display on the top LCD, depending on the severity of the low under flow condition. If the under flow is between 0% and 10%, this warrants a "FAIL" condition, and if it is between 10% and 55%, a "LOW" condition is generated. This allows the user to identify and fix the problem rows.*

Note 2: *If all the rows on the planter show a seed rate of zero, the condition will not generate an alarm but it will generate a Planting Stopped Warning. It will be assumed the planter has stopped. The row numbers and the bottom 60% segment will remain on for all selected rows.*

3.5.7.2 Section Not Planting Alarm

On a planting, two-section system with both sections enabled for display if all the rows from one section show a seed rate of zero the condition will generate an alarm. It will be assumed the particular shaft driving mechanism has failed. The bottom 60% segment will remain on for all selected rows and the row numbers will flash. Once the user pushes **OK**, the beeper turns off and the row numbers stay solid on. The alarm will re-trigger as soon as planting starts again.

If the user locks the display on the section that continues to plant, the monitor switches to point row operation and blocks off any alarms from the disabled section.

This alarm never triggers on single section implements.

3.5.8 Multiple Alarms

If more than one alarm condition occur at the same time, pushing the **OK** button will acknowledge all alarms that are currently displayed. For example, if one row on the LEFT and one row on the RIGHT are alarming, pushing **OK** will only acknowledge one of them. However, if there are two alarms on the LEFT, both alarms would be acknowledged with one push of the **OK** key.

The LCD will continue to display the alarm for the duration the alarm condition is still present, even after the alarms have been acknowledged.

3.6 Point Row Operation

The monitor supports the use of point rows while planting. This is accomplished by programming the row sensors into two different sections, LEFT and RIGHT, even for planter implements with less than 18 rows in all.

This feature is greatly enhanced by the addition of the optional shaft sensors. Further more it is assumed that the optional left shaft drives the LEFT section and the right shaft drives the RIGHT section. When the monitor detects that a shaft has stopped turning, it immediately drops all the bargraphs associated with that shaft down to zero, regardless of planting activity on those rows.

Note: *The shaft RPM threshold is set to 12 RPM. The monitor detects shaft rotation after the actual shaft RPM is above this minimum.*

The feature is also available without shaft sensors, or with just one shaft sensor. On any section without a shaft sensor the monitor simply looks at planting activity on that section to decide whether the entire section should be planting or not.

Regardless of how the monitor detects the point row condition, the no planting alarm will sound for one of the sections. Once the user pushes **OK** this alarm is disabled for that section for as long as the section continues to not plant and the planter continues to move and the row numbers will stop flashing. The alarm rearms when the planter stops.

If point row activity is intense the user may choose to push the **SELECT** key and lock the display on the one section that will be used. This way all alarms will be blocked off for the section disabled.

4. TECHNICAL SPECIFICATION

Monitored Rows: 2x18, organized into two sections.

Available configurations: LEFT and RIGHT with support for point row operation, or single section installations.

Monitoring Method: Continuous monitoring of each row.

Display Method: *Top LCD*:

    7 segment bargraph for each row.
    Up to 18 rows displayed simultaneously in each section.
    When both sections are selected they display alternatively every 5 seconds.
    One active section displayed continuously if half of the implement is deselected or not configured.

Bottom LCD:

    6 alphanumeric characters.
    14 segments/character, two decimal places.

Reading Resolution: Each segment has a predetermined weight and shows by how much the seed rate on a particular row is different from a calculated average which sets the 100% (see Table 1 - Bargraph Display Definition on page 8).

Sensors Attached: *Smart Row (Seed Counting) Sensors*, one sensor per row, up to 18 sensors per section, 36 in total per system.

One Distance sensor:
    Smart Coil Pick-up Adapter, standard.
    True Ground Radar Sensor with standard 4 wire output, optional.

Smart Shaft Sensors, one sensor per shaft, up to 2 sensors per system

One *Smart Fan Sensor.*

Warnings:

Section Not Selected Warning – On two section implements, when one section is configured, but not selected, the associated text icon will flash. Monitor reverts to monitor both sections on consecutive power up cycles.

Seed Planting Stopped Warning - When the seed rate drops to zero on all rows, 3 beeps are emitted to alert the user of a possible problem.

Row (Seed Counting) Sensor in Calibration Warning - When the sensor runs its internal calibration the bottom bargraph segment flashes. If the planter is stopped the top display scrolls WAIT CALIBRATION.

Row (Seed Counting) Sensor Too Dirty Warning - After a self-calibration detects the tube is too dirty or blocked, the associated bargraph of the row will continue to flash. If the planter is stopped the user is prompted to clean the tubes.

Low Battery Warning - Triggers when the battery voltage drops below a minimum acceptable level. If the planter is stopped the monitor scrolls LOW POWER.

Alarms:

System alarms come up when the monitor detects a faulty sensor, a communication failure or an internal failure:

Row Alarms - The row numbers start flashing, the associated bargraphs are turned off and the beeper sounds. If the planter is stopped the top display scrolls CHECK CONNECTION.

Speed Alarms - The monitor displays PICKUP or RADAR on lower LCD and the beeper sounds.

Shaft Alarms - The monitor displays LSHAFT or RSHAFT or SHAFTS on lower LCD and the beeper sounds.

Fan Alarm - The monitor displays FAN on lower LCD and the beeper sounds.

Communication Alarms - The monitor displays SYS HI or SYS LO on the lower LCD and the beeper sounds.

Monitor Failure Alarm - The monitor displays SYS EC on the lower LCD and the beeper sounds.

Underflow Alarms - When some rows or one entire section shows planting rates lower than normal.

Row Underflow Alarms - When the seed rate for a row is less than 55% of the calculated average, the 60% segments stays on, the corresponding row numbers start to flash, and the beeper sounds. The top LCD may display FAIL or LOW when the planter stops.

Section Not Planting Alarm - If all the rows on a current shaft section show a seed rate of zero, the condition will generate an alarm if the section is enabled for display.

5. GENERAL ELECTRICAL SPECIFICATION

Nominal Power Supply: Protected 12 VDC (auto-resetable polyswitch), estimated current consumption: 3A or less, depending on the actual configuration.

The AWG 14 power cable is ended with a 3 terminal AMP CPC female connector (shell P/N 206037-2, pins P/N 66740-9): ground to pin 3, +12V power supply to switched terminal, pin 1.

Power Supply Range: 10.5 to 16 VDC (as per ASAE EP455 5.10.2).

Auto Power Off: The monitor will automatically power down if there is no activity for one hour.

MUXBUS Output: The 3 AWG 14 wire jacketed MUXBUS cable is ended with a 3 pin Packard WeatherPak tower connector (P/N 12015793) with the following pin assignment: A - 12V, B - ground, C - data.

Radar Output: The 4 wire AWG 18 jacketed cable is ended with a 4 pin AMP female connector (P/N 206430-2) with the following pin assignment: 1 -ground, 2 - radar signal, 3 - 12VDC, 4 - radar enable.

Transient Protection: The monitor and the attached sensors, when properly installed, will not be damaged by the transients present in the mobile agricultural environment (as per ASAE EP455 5.11 and 5.12).

6. GENERAL ENVIRONMENTAL SPECIFICATION

Operating Temperature: Monitor: from -10 to +70 degrees Celsius
                                  Sensors: from -10 to +70 degrees Celsius

Storage Temperature: From -40 to +85 degrees Celsius (as per ASAE EP455 5.1.2).

7. GENERAL MECHANICAL SPECIFICATION

The monitor case is black ABS plastic with a matched color metal mounting bracket.

The front panel overlay is polycarbonate over a metal plate.

The SJTW 14-3 signal cable is mounted on the rear of the unit with a circular strain relief, and terminated with a 3 terminal Packard WeatherPak connector plug.

The SJTW 14-2 power cable is mounted on the rear of the unit with a circular strain relief, and terminated with a 3 terminal AMP CPC female connector.

The UL2509 18-4 signal cable for the optional standard radar sensor is mounted on the rear of the unit with a circular strain relief, and terminated with a 4 terminal AMP CPC connector.

An internal auto-resetable polyswitch is mounted on the circuit board. There are no user serviceable parts inside the unit.

The printed circuit boards are coated against humidity.

LOUP PLANTER MONITOR REFERENCE GUIDE

CONNECTING SEED SENSORS
NOTE: All seed sensors and distance
Input must be disconnected initially

[ON/OFF] Turn monitor ON

[SELECT] Press SELECT key to choose LEFT/RIGHT configuration. Selected configuration will display solid.

[OK] Press and hold OK key until flashing row numbers appear and left shows solid.
Plug all section (left/right) seed sensors into planter harness in sequence beginning with row #1.
NOTE: Monitor alarm should chirp twice and sensor LED should light to show connection is made.
Check to be sure monitor displays solid numbers for sensors connected. Install shaft rotation sensors if applicable

[OK] Press and hold OK key to save setup for current section. SAVE? icon turns off.
When OK key is released, monitor will continue with second section. Repeat above for second section. If second section is not used, press and hold OK key.

REPLACING SEED SENSORS

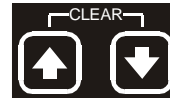**[ON/OFF]** Turn monitor OFF

Disconnect faulty seed sensor

[ON/OFF] Turn monitor ON

Plug in new sensor.

CONNECTING SEED SENSORS

[SETUP / ENTER / EXIT] Press and hold SETUP key

[CLEAR ↑ ↓] Press UP or DOWN arrow keys to move flashing arrow to choose VOLUME, SPEED, UNITS, ROW SPACING or TOTAL AREA.

[OK] Press OK and flashing arrow displays solid

[CLEAR ↑ ↓] CHANGING AUDIO VOLUME
Press UP or DOWN arrow keys to raise or lower volume
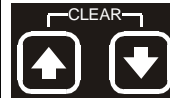Press and hold OK key to save change. Go to next change or press SETUP key to exit setup mode.

[CLEAR ↑ ↓] PROGRAMMING SPEED
Press UP and DOWN arrow keys at same time and hold until CLEAR? Icon displays and monitor emits long beep. Travel 330ft. Record speed constant number in Operator's Manual. Press and hold OK key to save.

[CLEAR ↑ ↓] PROGRAMMING UNITS
Press UP or Down keys to change setting for English or Metric. Press and hold OK key to save change.

[CLEAR ↑ ↓] PROGRAMMING ROW SPACING
Press UP or DOWN arrow keys to change flashing least significant digit.

[SELECT] Press SELECT key to move to next significant digit, etc. Press and hold OK key to save change.

[CLEAR ↑ ↓] CLEARING TOTAL AREA
Press UP and DOWN arrow keys at same time and hold until CLEAR? Icon displays and emits a long beep.

To exit without saving, press and release SETUP key.

To exit and save, press and hold the OK key until the word DONE displays. Then press the SETUP key.

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TURN MONITOR ON/OFF   *Press*   [ON/OFF]

TURN OFF LEFT ROWS   *Press*   [SELECT]

TURN ON FRONT ROWS   *Press*   [SELECT]

NOTE: SELECT has no function when only a single section is being used

SILENCE ALARMS   *Press*   [OK]

KEY FUNCTIONS

NOTE: The following short cut keys apply only when starting at the MPH screen. MPH appears upon initial power up of the monitor or by pressing the "SPEED" key at any time.
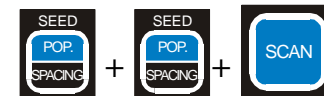
SHORT CUT KEYS:

MPH   [SPEED]

AVERAGE SEED POPULATION   [SEED POP. SPACING]

SPACING PER ACRE   [SEED POP. SPACING] + [SEED POP. SPACING]

ROW POP/ACRE   [SEED POP. SPACING] + [SCAN]

ROW SEED SPACING   [SEED POP. SPACING] + [SEED POP. SPACING] + [SCAN]

LOCK ON ROW   [SEED POP. SPACING] + [SCAN] + [▲] or [▼]

RETURN TO PLANTER AVG FROM LOCKED ON ROW   [SCAN]

CLEAR FIELD ACRES   [AREA FIELD TOTAL] + [CLEAR ▲ ▼]