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# 1 System Overview

Figure 1A displays the typical components of a Land Manager® SE System.

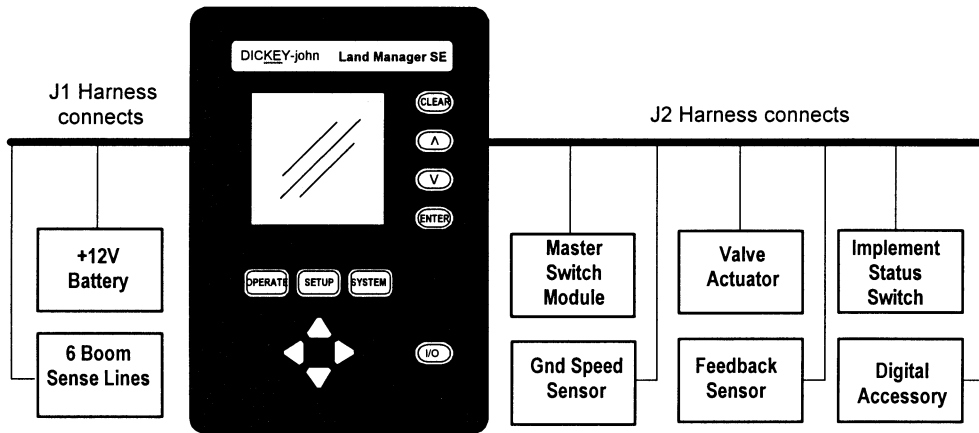


Figure 1A Typical Overall System Configuration

## 1.1 Display Console

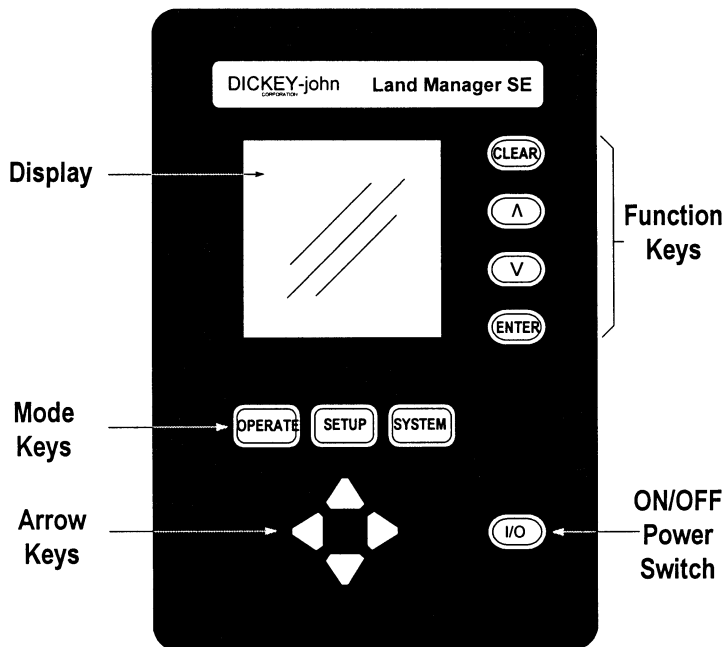


Figure 1B Major Divisions of Display Console

## 1.2 Master Switch Module

The master switch has three positions OFF, AUTO, and MANUAL. AUTO position is where the system is controlling based on actual ground speed and the current application rate. MANUAL is a momentary position that allows the system to control at a preprogrammed manual ground speed. The manual ground speed value can be changed under the setup menu.

The controller can be locked into MANUAL by holding the master switch in the MANUAL position and pressing the RIGHT arrow key. The MANUAL position forces the controller to use the manual ground speed, which minimizes system lags when starting up from slow speeds. To exit this condition and return to AUTO mode, the master switch must be turned OFF then back to AUTO.

**Important:** If the Land Manager® SE system is replacing a CCS 100 system, the CCS switch module **must be replaced** with the new master switch that was shipped with the Land Manager® SE system.

## 1.3 Ground Speed Sensor

This sensor will constantly communicate the current ground speed back to the Land Manager® SE. Based on the ground speed the Land Manager® SE will calculate and adjust the output accordingly.

## 1.4 Feedback Sensor

This sensor communicates back to the Land Manager® SE the amount of product that is being dispersed. I.E. Pressure sensor, Flowmeter, or Application rate sensor.

## 1.5 Control Valve

This is the metering device for the material that is to be controlled by the Land Manager® SE. The control valve can be of many types. I.E. Servo, Proportional, Air, etc.

## 1.6 Harnesses

The harnessing consists of two harnesses. The J1 harness, which is the main implement harness and J2, which is the power and boom sense harness.

# 2 Console Interface

The Land Manager® SE console has three mode keys. These three keys separate the functionality of the unit into Operate, Setup and System menus. See the mode diagrams in Appendix A for screen layout.

## 2.1 Operate Mode

This is the mode where application occurs. The operate mode has multiple screens that can be viewed by pressing the operate button.

### 2.1.1 Primary Operate

This is the screen that the display will default to after the power up sequence.

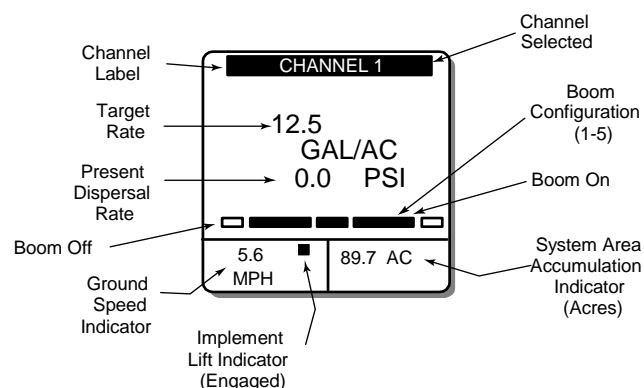


Figure 2A Divisions of the Primary Operate Screen

### 2.1.1.1 Product Flow Indicator

When the master switch is off, the target application rate is in small font as shown in the bottom of figure 2B. When the master switch is turned on, the target rate will be in large font to indicate that product application is occurring as in the top of figure 2B.

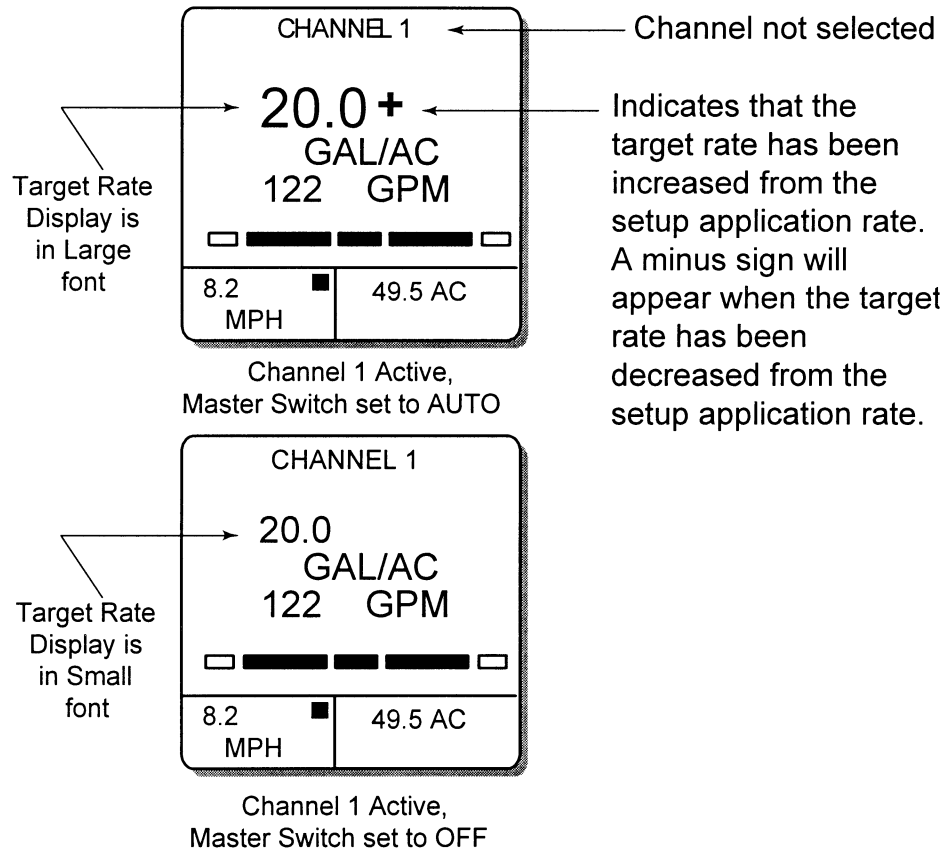


Figure 2B Target Rate Changes for ON/OFF State

### 2.1.1.2 Channel Selection

The blue ^ and v function keys select and deselect the channel on the primary operate screen. If the channel is not selected (figure 2B), the contrast of the display can be adjusted with the UP and DOWN arrow keys. When the channel is selected (figure 2A), the UP and DOWN arrow keys increase and decrease the rate. The RIGHT and LEFT arrow keys will turn the channel ON and OFF.

### 2.1.1.3 Manual Valve Mode

When the manual valve override is selected, the word MANUAL will replace the target rate when the master switch is OFF. When the master switch is ON, the actual rate will only appear in small font on the operate screen to indicate manual mode operation.

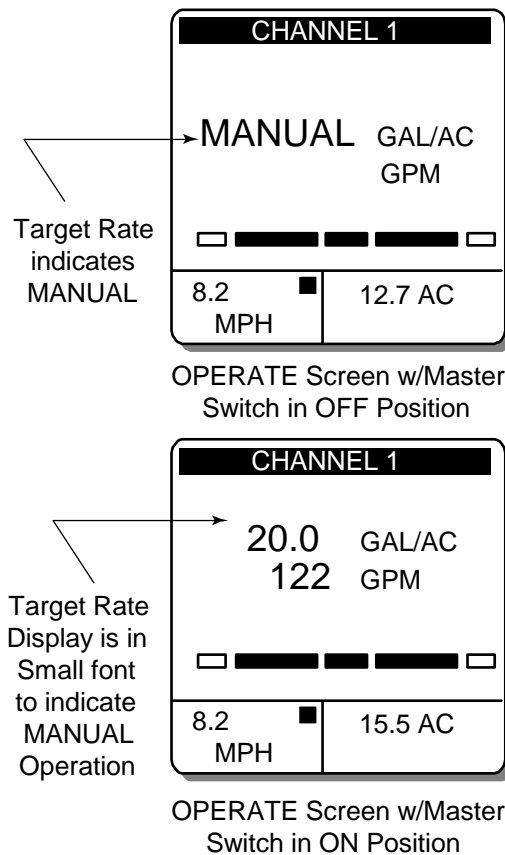


Figure 2C Manual Mode Screens

#### 2.1.1.4 Manual Ground Speed

When manual ground speed is active, the ground speed readout will display MANUAL. The system will control based on the manual ground speed that is entered under the SETUP menu.

#### 2.1.2 Accessory (If Configured)

The screen will display the information from the digital accessory that was configured under the SYSTEM menu.

#### 2.1.3 Accumulators

This screen is divided into two sections. The top section is the current channel accumulator that can be cleared by pressing the ^ function key (selects the channel values) then press the CLEAR function key. The other section of the accumulator screen is the system accumulator that can also be cleared by pressing the v function key (selects the system values) then press the CLEAR function key.

#### 2.1.4 Product Level (If Enabled)

This feature can be enabled under the SETUP menu and displays the product remaining. The product level has a reset and an alarm level. The reset value can be quickly restored by selecting the product level value on the product level OPERATE screen, by pressing the ^ function key, then press the CLEAR function key. The product level will now be set to the reset level configured under the SETUP menu.

#### 2.1.5 Alarm History

The alarm history stores the last 5 alarm occurrences with the most recent alarm at the top. To view all of the alarms, the v function key will scroll the operator down through the alarm list one alarm at a time. The alarm history can be cleared under the SYSTEM, SERVICE menu.

The next press of the OPERATE key will take you back to the Primary Operate screen. If you are on any of the operate screens, the ENTER function key is a shortcut back to the primary operate screen.

## 2.2 Setup Mode

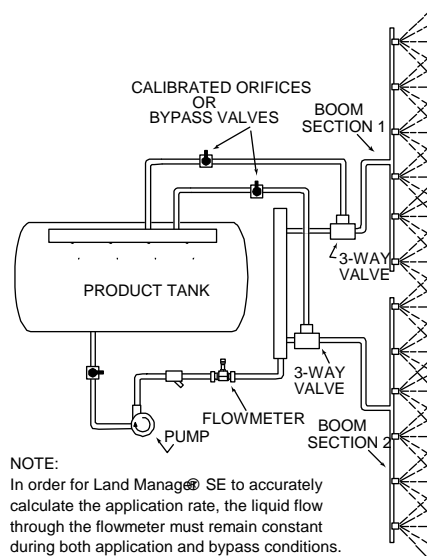
This set of screens is used to setup the desired configuration that has been selected under the SERVICE, CONFIGURATION menu. The master switch **must be OFF** to gain access to this menu.

**NOTE:** Ensure that the channel configuration, drive type, and drive frequency settings under the SYSTEM menu are the desired settings. See section 2.3.4.5. The SETUP constants are **NOT** retained when the configuration is changed and should be recorded in Appendix A.

### 2.2.1 Setup Liquid Pressure

APPLICATION RATE	The target rate for applying product.
NOZZLE CONSTANT	Gallons per Minute (GPM) or Liter at the NOZZLE PRESSURE.
NOZZLE PRESSURE	Pressure at which the NOZZLE CONSTANT was obtained.
MINIMUM PRESSURE	Minimum operating pressure before an alarm occurs.
MAXIMUM PRESSURE	Maximum operating pressure before an alarm occurs.
PRESSURE OFFSET	A correction value that can be set manually or through the ZERO <b>PRESSURE SENSOR</b> . This correction value will allow the Land Manager® SE to read 0 PSI when product is not present. If this value is not set the accuracy can be greatly effected.
ZERO PRESSURE SENSOR	An automatic routine that will adjust the pressure offset so that the Land Manager® SE will read 0 PSI when product is not present.
PRES SENSR RANGE	The operating range of the pressure sensor. The available options are 0-60, 0-100, 0-225, or 0-650 PSI or 0-4, 0-7, 0-15, 0-20, or 0-44 Bar.
DENSITY	Relative density of the liquid product being applied in lbs./gal or Kg/L
INC\DEC RATE	The desired increment/decrement value for changing the application rate during application. Note the channel must be selected on the primary operate screen for the INC/DEC to work.
MINIMUM RATE	Minimum application rate that the system can be decreased to.
MAXIMUM RATE	Maximum application rate that the system can be increased to.
RESET LEVEL	The amount of product loaded each time. (Product Level Enabled Only)
ALARM LEVEL	Minimum level of product remaining before the alarm sounds. (Product Level Enabled Only)
MANUAL SPEED	The ground speed to be used when the master switch is in the MANUAL position. This is also the ground speed used when the ground speed override is enabled.

MIN OVERRIDE	A minimum ground speed that is used by the Land Manager® SE when actual ground speed is below this value.
SHUT OFF SPEED	The minimum ground speed allowed before the system stops operation.
NUM OF SECTIONS	The total amount of boom sections used. Maximum of 6 boom sections.
NOZZLE SPACING	Distance between nozzles. For sections with only one nozzle, the spacing is the effective spray width of the nozzle.
12V ON	YES indicates that 12V activates the solenoid. NO indicates that grounding activates the solenoid.
NUM NOZZLE SEC (1-6)	The number of nozzles for that given section.
BOOM SHUTOFF	TWO-WAY turns the liquid flow on/off to the boom. THREE-WAY directs the flow to the boom in one state and directs the flow back to the tank in the other state. For this to be accurate, the flow out to the boom must be the same as the flow back to tank. See Figure 2D.



**Figure 2D**  
**Three-way Shutoff**  
**Valve Operation**

VALVE LOCKING	When ENABLED, the valve is locked in the last operating position when the boom sections are turned off. This feature maintains constant pressure, so a quick spray pattern can resume when the boom solenoids are turned back on.
PRODUCT LEVEL	When ENABLED, the amount of product remaining is displayed on the PRODUCT LEVEL operate screen. The product level decreases as material is applied. When this is ENABLED the reset level and alarm level values are added to the SETUP menu structure and need to be set. NOTE: After enabling this feature, the product level must be set on the PRODUCT LEVEL operate screen before application is to start, see section 2.1.4.
SYSTEM GAIN	This value is calculated from the auto gain routine. Changing this number will affect the control valve's response to the changes in ground speed, application rate, or active boom sections. The larger the number the faster the response time. If during application the control seems to oscillate, the number needs to be lowered.

## 2.2.2 Setup Liquid Flow

APPLICATION RATE	The target rate for applying product.
INC/DEC RATE	The desired increment/decrement value for changing the application rate during application. Note the channel must be selected on the primary operate screen for the INC/DEC to work.
MINIMUM RATE	Minimum application rate that the system can be decreased to.
MAXIMUM RATE	Maximum application rate that the system can be increased to.
K-FACTOR	Number of flowmeter pulses per gallon or liter.
RESET LEVEL	The amount of product loaded each time. (Product Level Enabled Only)
ALARM LEVEL	Minimum level of product remaining before the alarm sounds. (Product Level Enabled Only)
MANUAL SPEED	The ground speed to be used when the master switch is in the MANUAL position. This is also the ground speed used when the ground speed override is enabled.
MIN OVERRIDE	A minimum ground speed that is used by the Land Manager® SE when actual ground speed is below this value.
SHUT OFF SPEED	The minimum ground speed allowed before the system stops operation.
NUM OF SECTIONS	The total amount of boom sections used. Maximum of 6 boom sections.
NOZZLE SPACING	Distance between nozzles. For sections with only one nozzle, the spacing is the effective spray width of the nozzle.
12V ON	YES indicates that 12V activates the solenoid. NO indicates that grounding activates the solenoid.
NUM NOZZLE SEC (1-6)	The number of nozzles for that given section.
BOOM SHUTOFF	TWO-WAY turns the liquid flow on/off to the boom. THREE-WAY directs the flow to the boom in one state and directs the flow back to the tank in the other state. For this to be accurate, the flow out to the boom must be the same as the flow back to tank. See Figure 2D.
VALVE LOCKING	When ENABLED, the valve is locked in the last operating position when the boom sections are turned off. This feature maintains constant pressure, so a quick spray pattern can resume when the boom solenoids are turned back on.
PRODUCT LEVEL	When ENABLED, the amount of product remaining is displayed on the PRODUCT LEVEL operate screen. The product level decreases as material is applied. When this is ENABLED the reset level and alarm level values are added to the SETUP menu structure and need to be set. NOTE: After enabling this feature, the product level must be set on the PRODUCT LEVEL operate screen before application is to start, see section 2.1.4.
SYSTEM GAIN	This value is calculated from the auto gain routine. Changing this number will affect the control valve's response to the changes in ground speed, application rate, or boom sections. The larger the number the faster the response time. If during application the control seems to oscillate, the number needs to be lowered.

### 2.2.3 Setup Anhydrous

Be sure to read and observe the anhydrous safety precautions under the configuration section 2.3.4.5 before proceeding.

**APPLICATION RATE**                      The target rate for applying product.

**TANK PRESSURE**                      Pressure read from the nurse tank. If gauge is not functioning, see chart below.

Temperature (F)	Pressure (PSI)	Temperature (F)	Pressure (PSI)	Temperature (F)	Pressure (PSI)
-28	0	24	50	77	130
-8	10	42	60	86	155
6	20	50	75	96	185
16	30	58	90	105	215
26	40	68	110		

**INC/DEC RATE**                      The desired increment/decrement value for changing the application rate during application. Note the channel must be selected on the primary operate screen for the INC/DEC to work.

**MINIMUM RATE**                      Minimum application rate that the system can be decreased to.

**MAXIMUM RATE**                      Maximum application rate that the system can be increased to.

**K-FACTOR**                              Number of flowmeter pulses per cubic inch.

**RESET LEVEL**                          The amount of product loaded each time. (Product Level Enabled Only)

**ALARM LEVEL**                          Minimum level of product remaining before the alarm sounds. (Product Level Enabled Only)

**MANUAL SPEED**                      The ground speed to be used when the master switch is in the MANUAL position. This is also the ground speed used when the ground speed override is enabled.

**MIN OVERRIDE**                      A minimum ground speed that is used by the Land Manager® SE when actual ground speed is below this value.

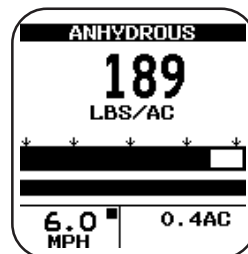
**SHUT OFF SPEED**                      The minimum ground speed allowed before the system stops operation.

**BARGRAPH SCALE**                      The maximum capacity of the system in pounds per hour.

Capacity Calculation: Rate (Lbs./Ac of NH<sub>3</sub>) x Speed (MPH) x Width (Ft) x 0.1212 = Lbs./Hr

3/4" Valve and 1 TTU	4200 Lbs/Hr	1" Valve and 1 TTU	5400Lbs/Hr
1" Valve and 2 TTU's	6800 Lbs/Hr	1 1/4" Valve and 1 Continental	9600 Lbs/Hr

NOTE: The bargraph will display the current level of capacity and is a good instrument for system stability.



**NUM OF SECTIONS**                      The total amount of boom sections used. Maximum of 6 boom sections.

**KNIFE SPACING**                      Distance between knives.

12V ON	YES indicates that 12V activates the solenoid. NO indicates that grounding activates the solenoid.
NUM KNIVES SEC (1-6)	The number of knives for that given section.
USE DENSITY OF	NITROGEN will display in actual pounds of nitrogen per acre. NH <sub>3</sub> will display in actual pounds of NH <sub>3</sub> per acre.
PRODUCT LEVEL	When ENABLED, the amount of product remaining is displayed on the PRODUCT LEVEL operate screen. The product level decreases as material is applied. When this is ENABLED the reset level and alarm level values are added to the SETUP menu structure and need to be set. NOTE: After enabling this feature, the product level must be set on the PRODUCT LEVEL operate screen before application is to start, see section 2.1.4.
SYSTEM GAIN	This value is calculated from the auto gain routine. Changing this number will affect the control valve's response to the changes in ground speed, application rate, or active boom sections. The larger the number the faster the response time. If during application the control seems to oscillate, the number needs to be lowered.

## 2.2.4 Setup for Granular or Seeding

APPLICATION RATE	The target rate for applying product.
DENSITY	Relative density of the product being applied in Lbs./Ft <sup>3</sup> or Kg/L.
INC\DEC RATE	The desired increment/decrement value for changing the application rate during application. Note the channel must be selected on the primary operate screen for the INC/DEC to work.
MINIMUM RATE	Minimum application rate that the system can be decreased to.
MAXIMUM RATE	Maximum application rate that the system can be increased to.
SPREADER CONST	Number of pulses per volume of cubic foot or liter.
RESET LEVEL	The amount of product loaded each time. (Product Level Enabled Only)
ALARM LEVEL	Minimum level of product remaining before the alarm sounds. (Product Level Enabled Only)
MANUAL SPEED	The ground speed to be used when the master switch is in the MANUAL position. This is also the ground speed used when the ground speed override is enabled.
MIN OVERRIDE	A minimum ground speed that is used by the Land Manager® SE when actual ground speed is below this value.
SHUT OFF SPEED	The minimum ground speed allowed before the system stops operation.
NUM OF SECTIONS	The total amount of boom sections used. Maximum of 6 boom sections.
12V ON	YES indicates that 12V activates the solenoid. NO indicates that grounding activates the solenoid.
WIDTH SECTION (1-6)	The application width for that given section.
DRAG BELT	Type of drag belt delivery system. Dual or Single belt/chain.

**PRODUCT LEVEL** When ENABLED, the amount of product remaining is displayed on the PRODUCT LEVEL operate screen. The product level decreases as material is applied. When this is ENABLED the reset level and alarm level values are added to the SETUP menu structure and needs to be set. NOTE: After enabling this feature, the product level must be set on the PRODUCT LEVEL operate screen before application is to start, see section 2.1.4.

**SYSTEM GAIN** This value is calculated from the auto gain routine. Changing this number will affect the control valve's response to the changes in ground speed, application rate, or active boom sections. The larger the number the faster the response time. If during application the control seems to oscillate, the number needs to be lowered.

## 2.2.5 Setup RPM

**APPLICATION RATE** The target RPM.

**INC/DEC RATE** The desired increment/decrement value for changing the RPM during operation. Note the channel must be selected on the primary operate screen for the INC/DEC to work.

**MINIMUM RATE** Minimum target RPM that the system can be decreased to.

**MAXIMUM RATE** Maximum target RPM that the system can be increased to.

**CONSTANT** Number of pulses per revolution.

**AUTO ON/OFF** NO Channel is active even if the master switch is OFF. The channel can then be controlled by either the boom section or selecting the channel with the ^ function key and pressing the RIGHT or LEFT arrow keys to turning the channel ON or OFF.  
Yes Channel is only active if the master switch and boom section are ON.

**RAMP UP/DOWN** This feature allows the operator to extend the shut down time of the system to minimize shock to the equipment.

**12V ON** YES indicates that 12V activates the solenoid.  
NO indicates that grounding activates the solenoid.

**SYSTEM GAIN** This value is calculated from the auto gain routine. Changing this number will affect the control valve's response to the changes in target RPM or boom status. The larger the number the faster the response time. If during application the control seems to oscillate, the number needs to be lowered.

## 2.3 System Mode

This section contains calibrations, configurations, and service modes.

### 2.3.1 Ground Speed Cal

**GS CONSTANT** This value is the number of pulses accumulated over 400 feet or 100 meters. This number can be entered manually, if known, or captured while driving over a premeasured 400 feet or 100 meters.

START CAL To capture the pulses over the defined course, select the START CAL by pressing the  $\vee$  function key. When you are up to the operating speed and even with the start of the predefined course, press the ENTER function key. The calibration routine will start accumulating the pulses. When even with the end of the course press the ENTER function key again. The operator will then have an option of accepting the value or aborting the calibration. For better accuracy, repeat the calibration two more times and average the calibration number and manually enter that number in as the GS CONSTANT.

### 2.3.2 Auto Gain Cal

This routine **will** operate the system to define the systems characteristics. This calibration will require material to be dispensed.

YES Allows the operator to set the maximum output of the system during the auto gain routine. To set the maximum output select YES and press the ENTER function key. Now use the UP and DOWN arrow keys to adjust to the maximum output. After the output has been obtained select CONTINUE and press the ENTER function key. The system will shut down and the auto gain procedure will start.

NO The auto gain routine will be performed across the system's total operating range.

**NOTE:** Anhydrous has a special auto gain routine that requires the system to be traveling over 1MPH with the toolbar in the ground. This routine requires two to three minutes to complete. The operator will be asked to enter the maximum application rate and maximum ground speed. Since the application rate varies during the routine, the area covered during the auto gain should be reapplied. Be sure to read and observe the anhydrous safety precautions under the configuration section 2.3.4.5 before proceeding.

### 2.3.3 Digital Acc 1

This feature allows monitoring of a digital pulse or logic level accessory.

#### 2.3.3.1 Digital Pulse

This selection is used for a sensor like a fan speed or a shaft speed sensor.

ACC NAME An eleven character name for the accessory.

Constant A number used in calculations to display the desired units.  
Pulse per Unit Readout Constant =  $60/\text{Number of pules per unit}$ .  
IE. RPM constant =  $60/360$  (sensors pulses per revolution) = .16667

INPUT FILTER This value affects the response time of the accessory sensor. A filter value of 1.0 is the maximum value and is not filtering the input. Numbers from 0.01 to .99 filter the amount of new feedback that will be used.

UNITS The label for the units that have been calculated.

ALARM Enables or disables the alarm function.

ALWAYS TEST YES means that the accessory will be monitored regardless of the master switch state.  
NO means that the accessory will **only** be monitored when the master switch is **not** OFF.

MINIMUM	Minimum value before an alarm occurs.
MAXIMUM	Maximum value before an alarm occurs.
REPEAT TIME	Time interval before the alarm repeats.

### 2.3.3.2 Logic Level

This selection is for a sensor like a hopper level or a vapor detector sensor.

ACC NAME	An eleven character name for the accessory.
LOW LABEL	An eleven character name for the LOW condition.
HIGH LABEL	An eleven character name for the HIGH condition
ALARM	Enables or disables the alarm function.
ALWAYS TEST	YES means that the accessory will be monitored regardless of the master switch state. NO means that the accessory will <b>only</b> be monitored when the master switch is <b>not</b> OFF.
ALARM IF	Determines what logic level to alarm at.
REPEAT TIME	Time interval before the alarm repeats.

### 2.3.4 Service

This section contains system overrides, trouble shooting, configuration and system settings.

#### 2.3.4.1 Accumulators

This set of accumulators is used for long term record keeping. These values can be cleared by selecting the values through the ^ or the v function keys and pressing the CLEAR function key.

#### 2.3.4.2 System Overrides

GROUND SPEED	This forces the Land Manager® SE to use the manual speed entered under the SETUP menu.
VALVE POSITION	Enabling this feature allows the user to open and close the valve by using the UP and DOWN arrow keys on the primary operate screen when the channel has been selected and the master switch is in AUTO.

#### 2.3.4.3 System Information

This screen provides the software version of the Land Manager® SE along with the DICKEY-john address and technical support phone number.

#### 2.3.4.4 Trouble Shooting

This menu has tests that can help the operator trouble shoot the Land Manager® SE system.

DISPLAY TEST	This test will test all of the segments of the display by moving the cursor with the 4 arrow keys.
--------------	--

ALARM TEST	This test will activate the alarm until the ENTER function key is depressed.
KEY PAD TEST	This test will identify each key as it is pressed. To end the test, press any key twice.
LOW LEVEL TEST	This test will actively display the status of all inputs and outputs.
AUTO GAIN PARAMETERS	This screen requires a special password to view and change the numbers that have been calculated from the auto gain routine.
CLEAR ALL STORED VALUES	This function will clear all of the operator established values and restore the unit back to factory default values.

### 2.3.4.5 Configuration

This menu item allows the operator to change the application of the Land Manager® SE system. The configuration type, drive type and drive frequency are to be changed here.

CHANNEL CONFIGURATION	The choices are Liquid Pressure, Liquid Flow, Anhydrous, RPM, Spreader, and Seeding.
DRIVE TYPES	The choices are Servo, Rawson, Non-linear Proportional, Servo N Return, Air, and Proportional.
DRIVE FREQUENCY	The range is 40 to 250 Hz.

**NOTE:** The anhydrous configuration will not have a choice for drive type or frequency. The anhydrous configuration is only for DICKEY-john servo valves. Be sure to read and observe the following safety precautions before proceeding.

### Basic Rules When Handling Anhydrous Ammonia

**Important:** Be sure to read and observe the following safety precautions before proceeding.

Anhydrous ammonia can cause severe injury if improperly handled. (See sidebar on next page). Any person engaged in handling ammonia can reduce risk of serious accidents by observing a few basic rules:

1. A fail safe valve (hydraulic or electric) is required to provide shutdown capability in the event of an electrical failure.
2. Know the product, its characteristics and behavior.
3. Use only equipment suitable for anhydrous ammonia service, and make sure it is properly installed never try to just get by.
4. Make regular inspections of equipment to ensure everything is fully maintained. Always perform corrective measures immediately to maintain a high level of safety.
5. Use and maintain standard protective equipment necessary to safely handle anhydrous ammonia.
6. Obtain proper training in handling and application of anhydrous ammonia.

7. Store and handle anhydrous ammonia in accordance with state and local regulations. Where no state or local regulations exist, use only equipment that is constructed in accordance with The Fertilizer Institute Standards.
8. Ensure all ammonia is out of the system before disconnecting or disassembling any parts. Be alert for frosting which is a certain indication of trapped liquid ammonia vaporizing. Depressurize all hoses when not in use. Lack of frost does not always indicate a lack of ammonia.
9. Always repair ammonia leaks immediately.
10. Inspect hoses thoroughly before each season or when the hose has been subjected to abnormal abuse. Ensure hoses are not kinked. Check for breaks or softening in the cover, blistering, swelling, loose couplings or damage to the hose reinforcement. Correct any defects or retire the hose from service. Replace hoses as recommended by the manufacturer.

***Important Notice:***  
**Physiological Responses to Ammonia Vapor**

Concentrations for ammonia in air is measured by parts per million (ppm) and 10,000 ppm = 1%. Exposure levels tolerated by average persons can produce severe respiratory damage to others. First aid for all ammonia victims consists of fresh air and plenty of water for affected areas. Competent medical assistance must be obtained immediately for anyone who has been burned or overcome by ammonia.

The average persons response when exposed to different concentration levels of ammonia vapor are -

- 5 ppm - Least perceptible odor.
  - 20-50 ppm – Readily detectable odor.
  - 50-100 ppm – No discomfort or impairment of health for prolonged exposure.
  - 150-200 ppm – General discomfort and eye tearing; no lasting effect on short exposure.
  - 400-700 ppm – Severe irritation of eyes, ears, nose, throat; no lasting effect on short exposure.
  - 1,700 ppm - Coughing, bronchial spasms.
  - 2,000-3,000 ppm -Dangerous, less than 1/2 hour exposure may be fatal.
  - 5,000-10,000 ppm - Serious edema, strangulation, asphyxia, rapidly fatal.
  - 10,000 ppm - Immediately fatal.
11. Always pick up a hose by the valve body or coupling, never by the valve handwheel.
  12. Always stay clear of valve or hose openings, particularly safety relief valves. This is true even when you believe you have depressurized the system.
  13. Use only proper capacity safety relief and excess flow valves. Do not tamper with them or other safety devices.
  14. Never use wrenches in closing handwheel operated valves.
  15. Always stand on the upwind side of ammonia transfer operations.



CHANNEL SETUP	There are three access states for the SETUP menu ACCESS, NO ACCESS, OR PARTIAL.
ACCESS	All of the SETUP constants can be accessed without the password.
NO ACCESS	None of the SETUP constants can be accessed until the password is entered.
PARTIAL	Requires a password for all of the SETUP constants except FOR APPLICATION RATE, K-FACTOR, RESET LEVEL, ALARM LEVEL, ZERO PRESSURE SENSOR, DENSITY and TANK PRESSURE.
CAILBRATION MENU	This menu can have ACCESS or NO ACCESS which requires a password to do a ground speed calibration or auto gain.
SERVICE MENU	There are three access states for the SERVICE menu ACCESS, NO ACCESS, or PARTIAL.
ACCESS	All of the SERVICE constant can be accessed without the password.
NO ACCESS	None of the SERVICE constants can be accessed without the password.
PARTIAL	Only requires a password for the accumulators and clear all stored values. All of the other service constants can be accessed without the password.
CONFIG MENU	This menu can have ACCESS or NO ACCESS which will require the operator to enter the password before accessing the configuration.
CLEAR ALARMS	This menu can have ACCESS or NO ACCESS which will require the operator to enter the password before clearing all of the alarms.

## 2.4 Application Calibration and Fine Tuning

This section will describe the calibration of flowmeters, nozzles, and spreader constants. The ground speed and auto gain calibrations have been covered in previous sections and need to be done prior to this section to ensure accuracy.

### 2.4.1 Nozzle Calibration

In order to do a nozzle calibration the manual ground speed needs to be set at the maximum application speed along with the correct application rate. Add water to the tank and locate the sprayer where stationary water will not cause any damage. Start the vehicle and set the engine RPM to normal operating speed that will be used in the application. Place the master switch into MANUAL position and press the RIGHT arrow key. This will lock the unit into manual ground speed. Allow time for the air to purge out of the lines and verify that all of the nozzles are spraying correctly. Verify that the control is stable and proceed with the calibration. The nozzle calibration can be done 3 ways.

### **Nozzle Calibration Device**

Measure and record the output of all of the nozzles along with the nozzle pressure. Average all of the nozzles and use that number as the NOZZLE CONSTANT. Then enter the pressure used while calibrating as the NOZZLE PRESSURE.

### **Catch Test Using a Calibrated Container**

The second method of nozzle calibration is to catch the water in a calibrated container. Collect the output from each nozzle for one minute. Record the fluid ounces per nozzle. Convert the fluid ounces to gallons by dividing by 128 or convert ounces to milliliters by multiplying by 29.57. Average the output of the nozzles and enter that value for the NOZZLE CONSTANT and enter the pressure while calibrating as the NOZZLE PRESSURE.

### **Catch Test Using Scales**

The third method of nozzle calibration is to catch the water and weigh it. Weigh the empty container and record that weight. Collect the water from one nozzle for one minute. Take the pounds of water in one minute and divide by 8.34. For metric, one Kg of water equals one liter. Repeat this on all of the nozzles. Average the output of all the nozzles and enter that value as the NOZZLE CONSTANT and enter the pressure while calibrating as the NOZZLE PRESSURE.

### **Fine Tuning the Calibration**

If the actual application is 5% above the TARGET APPLICATION rate the NOZZLE CONSTANT needs to be increased by 5%. Therefore if the NOZZLE CONSTANT is 0.5 a 5% increase would be  $0.5 \times 1.05$  and the new NOZZLE CONSTANT is 0.525. The opposite applies for under application.

## **2.4.2 Liquid Flowmeter Calibration**

Every flowmeter has a K-factor which represents the pulses per unit of measure. The K-factor may be marked on the housing or labeled somewhere on the assembly. Some flowmeters have K-factors that are in imperial liters. The conversions of imperial liters to gallons is 1 liter equals 0.2641721 gallons. This K-factor is a good starting point before doing a flowmeter calibration. In order to do a flowmeter calibration the manual ground speed needs to be set at the maximum application speed, along with the correct application rate. Add water to the tank and locate the sprayer where stationary water will not cause any damage. Start the vehicle and set the engine RPM to normal operating speed that will be used in the application. Place the master switch into MANUAL position and press the RIGHT arrow key. This will lock the unit into manual ground speed. Allow time for the air to purge out of the lines and verify that all of the nozzles are spraying correctly. Verify that the control is stable and proceed with the calibration. The calibration can be done 3 ways.

### **Nozzle Calibration Device**

Measure and record the output of all of the nozzles. Add up the output of all of the nozzles and take that times 5. Clear the accumulators and run the system for 5 minutes with the master switch in manual mode then turn the controller off. Compare the accumulated value to the calculated value that was previously made. Determine the percent of error and adjust the K-factor accordingly.

### **Catch Test Using a Calibrated Container**

The second method of flowmeter calibration is to catch the water in a calibrated container. Collect the output from each nozzle for one minute. Record the fluid ounces per nozzle. Convert the fluid ounces to gallons by dividing by 128 or convert ounces to milliliters by multiplying by 29.57. Add the output of the nozzles and take that times 5. Clear the accumulators and run the system for 5 minutes with the master switch in manual mode, then turn the controller off. Compare the accumulated value to the calculated value that was previously made. Determine the percent of error and adjust the K-factor accordingly.

### **Catch Test Using Scales**

The third method of nozzle calibration is to catch the water and weigh it. Weigh the empty container and record that weight. Collect the water from one nozzle for one minute. Take the pounds of water in one minute and divide by 8.34. For metric, one Kg of water equals one liter. Repeat this on all of the nozzles. Add the output of all the nozzles and take that times 5. Clear the accumulators and run the system for 5 minutes with the master switch in manual mode, then turn the controller off. Compare the accumulated

value to the calculated value that was previously made. Determine the percent of error and adjust the K-factor accordingly.

#### **Fine Tuning the Calibration**

If the actual application is 5% above the TARGET APPLICATION rate the K-FACTOR needs to be decreased by 5%. Therefore if the K-FACTOR is 1500 a 5% decrease would be  $1500 \times 0.95$  and the new K-FACTOR is 1425. The opposite applies for under application.

### **2.4.3 Spreader Constant Calibration**

The manufacturer of the spreader will have a SDF (Spreader Discharge Factor). The SDF can be used to calculate the spreader constant as follows:  $\text{Spreader Constant} = 360/\text{SDF}$ . Therefore if the SDF is 0.18 then the spreader constant is  $360/0.18$  which is 2000. If the system is replacing a CCS 100 / CMS 100 system the old spreader constant can be converted over. To convert a CCS spreader constant to a Land Manager® SE spreader constant the calculation is as follows:  $\text{CCS spreader constant} \times 1728$ . If the CCS spreader constant was 0.5787 then the new SPREADER CONSTANT is  $0.5787 \times 1728$  which is 999.99.

#### **Fine Tuning the Calibration**

If the actual application is 5% above the TARGET APPLICATION rate the SPREADER CONSTANT needs to be decreased by 5%. Therefore if the SPREADER CONSTANT is 1500 a 5% decrease would be  $1500 \times 0.95$  and the new SPREADER CONSTANT is 1425. The opposite applies for under application.

### **2.4.4 Anhydrous Flowmeter Calibration**

Every flowmeter has a K-factor, which represents the pulses per unit of measure. The K-factor may be marked on the housing or labeled somewhere on the assembly. This k-factor is a good starting point before doing a flowmeter calibration. In order to do an anhydrous flowmeter calibration the system must be ran in the field. With the K-factor entered and accumulators cleared, record the weight of the nurse tank and proceed to apply anhydrous on at least ten acres at normal operating speeds and conditions. Verify that the control is stable during the calibration. Once the area is covered, record the tank weight. Calculate the amount of anhydrous used and compare that to the controllers accumulated values. Determine the percent of error and adjust the K-factor accordingly. A typical DICKEY-john anhydrous flowmeter K-factor starting point is 2.15 P/In<sup>3</sup>.

#### **Fine Tuning the Calibration**

If the actual application is 5% above the TARGET APPLICATION rate the K-FACTOR needs to be decreased by 5%. Therefore if the K-FACTOR is 2.250 a 5% decrease would be  $2.250 \times 0.95$  and the new K-FACTOR is 2.1375. The opposite applies for under application.

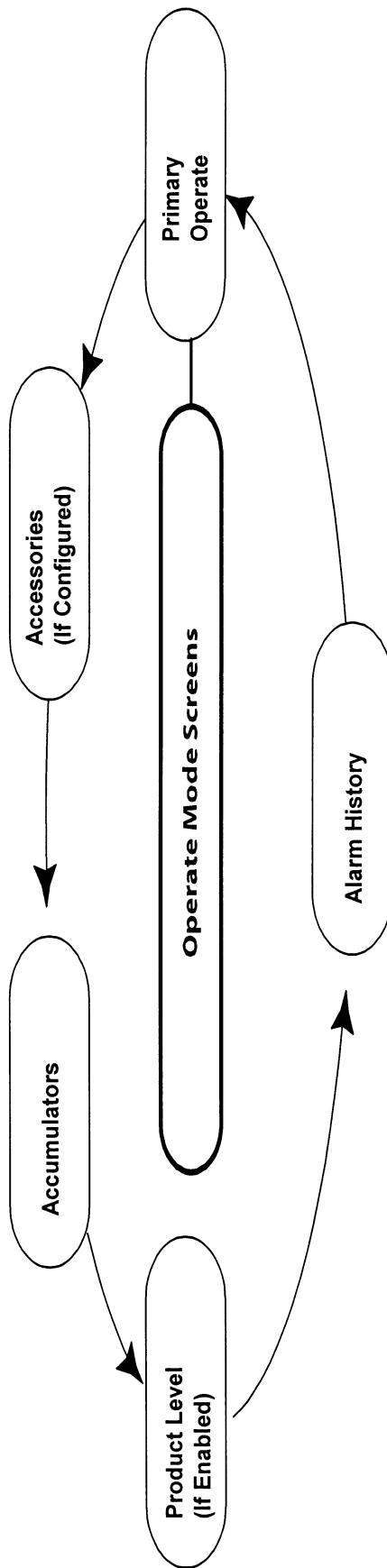
## **Appendix A**

The following diagrams show the screen layout of the three mode keys. The following table has spaces for entering the unit's constants.

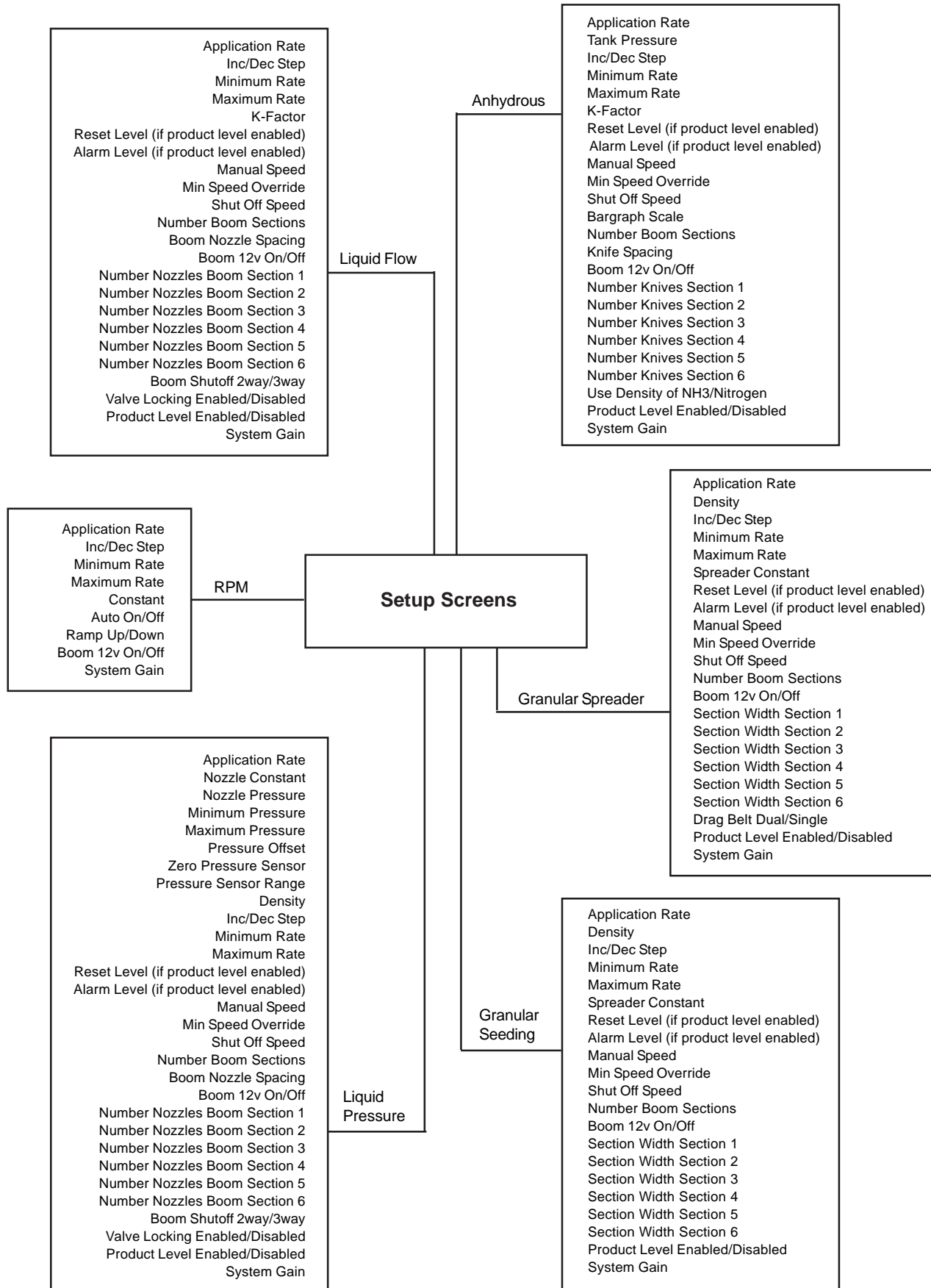
**NOTE: The SETUP constants are not retained when changing configurations.**

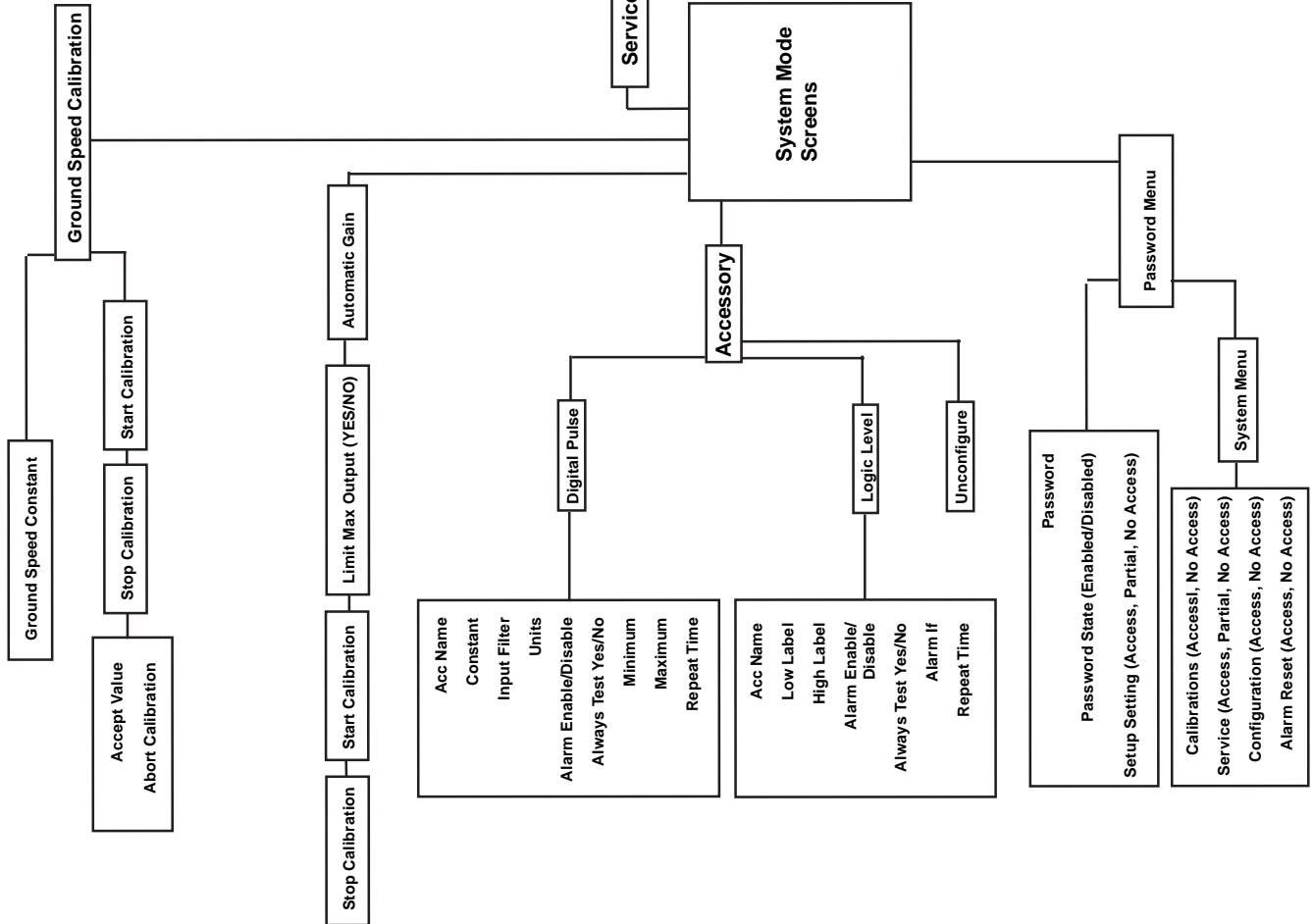
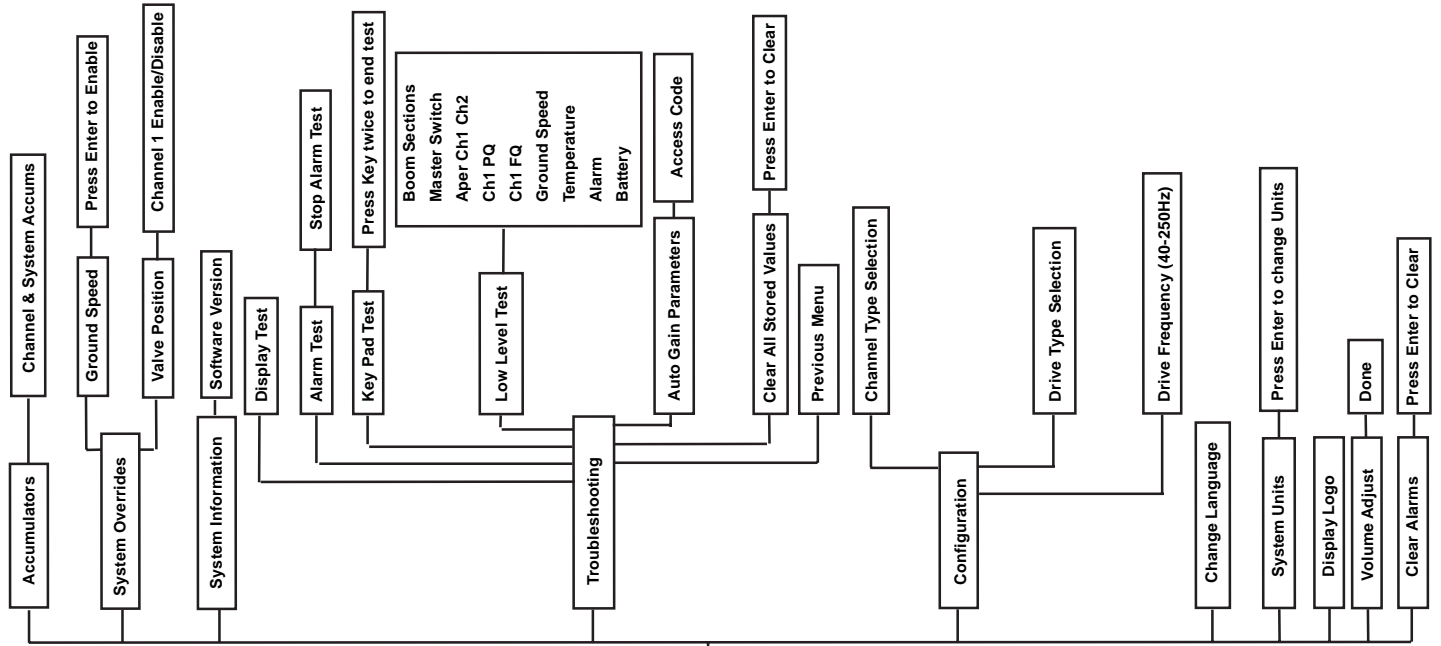
CONSOLE STATISTICS		SERIAL NUMBER	SOFTWARE VERSION
<b>Anhydrous</b>		<b>Granular Spreader</b>	<b>Granular Seeding</b>
Application Rate		Application Rate	Application Rate
Tank Pressure		Density	Density
Inc/Dec Step		Inc/Dec Step	Inc/Dec Step
Minimum Rate		Minimum Rate	Minimum Rate
Maximum Rate		Maximum Rate	Maximum Rate
K-Factor		Spreader Constant	Spreader Constant
Reset Level		Reset Level	Reset Level
Alarm Level		Alarm Level	Alarm Level
Manual Speed		Manual Speed	Manual Speed
Min Speed Override		Min Speed Override	Min Speed Override
Shut Off Speed		Shut Off Speed	Shut Off Speed
Bargraph Scale		Number Boom Sections	Number Boom Sections
Number Boom Sections		Boom 12v On/Off	Boom 12v On/Off
Knife Spacing		Section Width Section 1	Section Width Section 1
Boom 12v On/Off		Section Width Section 2	Section Width Section 2
Number Knives Section 1		Section Width Section 3	Section Width Section 3
Number Knives Section 2		Section Width Section 4	Section Width Section 4
Number Knives Section 3		Section Width Section 5	Section Width Section 5
Number Knives Section 4		Section Width Section 6	Section Width Section 6
Number Knives Section 5		Drag Belt Dual/Single	Product Level Enabled/Disabled
Number Knives Section 6		Product Level Enabled/Disabled	System Gain
Use Density of NH3/Nitrogen		System Gain	
Product Level Enabled/Disabled			
System Gain			
<b>Liquid Pressure</b>		<b>Liquid Flow</b>	<b>RPM</b>
Application Rate		Application Rate	Application Rate
Nozzle Constant		Inc/Dec Step	Inc/Dec Step
Nozzle Pressure		Minimum Rate	Minimum Rate
Minimum Pressure		Maximum Rate	Maximum Rate
Maximum Pressure		K-Factor	Constant
Pressure Offset		Reset Level	Auto On/Off
Zero Pressure Sensor		Alarm Level	Ramp Up/Down
Pressure Sensor Range		Manual Speed	Boom 12v On/Off
Density		Min Speed Override	System Gain
Inc/Dec Step		Shut Off Speed	
Minimum Rate		Number Boom Sections	<b>System Mode Settings</b>
Maximum Rate		Boom Nozzle Spacing	Ground Speed Constant
Reset Level		Boom 12v On/Off	Password
Alarm Level		Number Nozzles Boom Section 1	Password Setup Setting
Manual Speed		Number Nozzles Boom Section 2	Password Calibration Setting
Min Speed Override		Number Nozzles Boom Section 3	Password Service Setting
Shut Off Speed		Number Nozzles Boom Section 4	Password Configuration Setting
Number Boom Sections		Number Nozzles Boom Section 5	Password Alarm Reset Setting
Boom Nozzle Spacing		Number Nozzles Boom Section 6	Acc. Type
Boom 12v On/Off		Boom Shutoff 2way/3way	Acc. Name
Number Nozzles Boom Section 1		Valve Locking Enabled/Disabled	Acc. Constant
Number Nozzles Boom Section 2		Product Level Enabled/Disabled	Acc. Input Filter
Number Nozzles Boom Section 3		System Gain	Acc. Units
Number Nozzles Boom Section 4			Acc. Low Label
Number Nozzles Boom Section 5			Acc. High Label
Number Nozzles Boom Section 6			Acc. Alarm
Boom Shutoff 2way/3way			Acc. Always Test
Valve Locking Enabled/Disabled			Acc. Minimum
Product Level Enabled/Disabled			Acc. Maximum
System Gain			Acc. Alarm If
			Acc. Repeat Time

Press the OPERATE button to scroll through the following screens.



# Land Manager SE Ver 1.5 Setup Screens





# APPENDIX B ERROR CODE DEFINITIONS

## QUICK REFERENCE TROUBLESHOOTING

### SELF-TEST ERROR MESSAGES

All self-tests must successfully pass at start-up before the system becomes operational. A self-test failure appears on the display with an error message. Other types of errors show error messages as listed below.

Two types of self-test errors may occur during start-up. The more serious type causes the alarm to sound continually and cannot be cleared. The proper action for this type of error is to shut the system down and secure technical assistance.

A second type of error causing an alarm can be cleared. Operation may be able to continue but with unpredictable results. Try powering down and starting again. If the problem persists, secure technical assistance.

#### ***Error Messages***

***Displaying error messages makes problem isolation much easier for the operator. When one occurs, generally follow the instructions on the screen and continue operation.***

#### **Operational Errors (Correctable)**

Correctable errors are caused by incorrect settings or a component on the applicator system has failed. The following lists the error messages encountered with the cause of each.

##### **Type 1 Error - 100 thru 199 series - System Critical**

Shutdown all systems.

- Alarm 110 - CONTROL NOT RESPONDING CHANNEL
- Alarm 170 - MASTER SWITCH ERROR
- Alarm 181 - LOW VOLTAGE ALARM
- Alarm 182 - HIGH VOLTAGE ALARM

##### **Type 2 Error - 200 thru 299 series - Error has occurred.**

Corrective action should be taken by operator.

- Alarm 200 - BOOM SECTION NOT ENABLED
- Alarm 230 - VALVE IS FULL OPEN CHANNEL
- Alarm 240 - MAX SHAFT SPEED CHANNEL
- Alarm 250 - CHECK HYDRAULIC DRIVE CHANNEL
- Alarm 260 - MAX VALVE LIMIT CHANNEL
- Alarm 270 - MAX FLOW CAPACITY

**Type 3 Error - 300 thru 399 series - Reminder.**

- Alarm 310 - PRESSURE OUT OF RANGE CHANNEL
- Alarm 340 - COMMUNICATIONS LOST WITH REMOTE CONTROL
- Alarm 360 - ACCESSORY: (Label for accessory) OUT OF RANGE ALARM
- Alarm 365 - ACCESSORY: (Label for accessory) LOGIC ALARM STATE
- Alarm 370 - PRODUCT LEVEL CHANNEL

**Type 4 Error - 400 - Alternate Function Active.**

- Alarm 410 - MINIMUM GROUND SPEED OVERRIDE IS ACTIVE

**Type 5 Error - 500 thru 599 series - System disabled.**

- Alarm 500 - MASTER IN AUTO TURN OFF
- Alarm 510 - SYSTEM TIMEOUT CYCLE MASTER SWITCH

**Type 6 Error - 600 thru 699 series - System failure.**

Restart system to see if error failure clears. If it cannot be cleared after several attempts, record all the information on the screen and then call DICKEY-john Service for assistance.

- Alarm 635 - MEMORY READ ERROR
- Alarm 640 - MEMORY WRITE VERIFY ERROR
- Alarm 650 - UNEXPECTED INTERRUPT NUMBER
- Alarm 660 - WATCHDOG TIMEOUT BY TASK
- Alarm 670 - STACK OVER FLOW
- Alarm 680 - ALARM LOG CORRUPT
- Alarm 690 - VIDEO MEMORY ERROR

## APPENDIX C DRIVE TYPE DESCRIPTIONS

### DEFINITIONS/APPLICATIONS (LIQUID/GRANULAR)

The following paragraphs describe each drive type available for liquid and granular systems. During Channel Configuration, select the Valve DRIVE TYPE that matches your system. Types appearing on the channel configuration menu are system dependant.

**SERVO** – Selected for most systems using a standard servo valve.

**PROPORTIONAL** – Selected for a PWM Proportional Hydraulic valve.

**NON LIN VLV** – The Nonlinear Valve drive type is selected for a PWM Proportional Hydraulic valve exhibiting nonlinear flow characteristics. A valve with nonlinear flow characteristics can cause excessive oscillation in the system at specific flow rates. Performing an Autogain with this drive type allows Land Manager® SE to compensate for nonlinear flow properties of the valve. Be sure to follow the installation instructions included with the PWM valve.

**SERVO-RETURN** – This type is selected for a servo type flow valve installed in the return or sparge line of a sprayer system (See Figure C1).

Figure C1 Return Line Installation for Sprayer System

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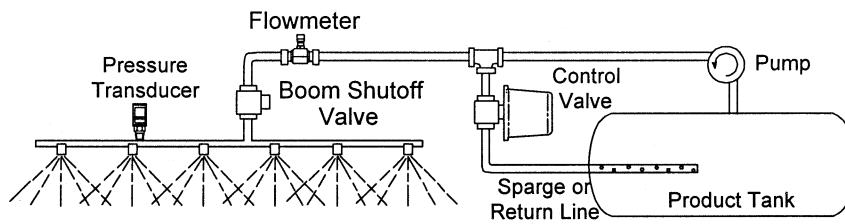


Figure C2. Ball Valve in Open Position

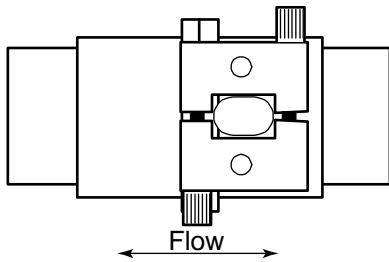
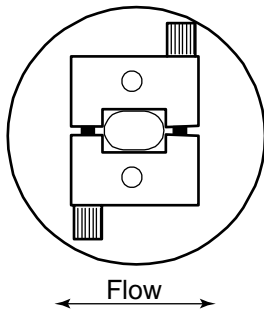


Figure C3. Butterfly Valve in Open Position



During installation of a servo return valve, the valve assembly must be in the open position when the actuator is placed on the valve body as shown in Figure C2. If using a 2-inch or 3-inch butterfly valve, remove the four bolts at the bottom of the actuator and rotate until the coupling posts are in the position shown in Figure C3.

Place the round molded coupling on the coupling posts of the valve assembly. Reinstall the actuator by aligning the coupling posts of the actuator 90 degrees from the valve assembly coupling posts (See installation Instructions). Performing an Autogain with this drive type compensates for the different flow characteristics of the servo valve operating in the return line.

**AIR** – This type is chosen for an air style "pinch" valve installed in the return or sparge line of the sprayer system (See Figure 2D). Performing an Autogain allows Land Manager® SE to compensate for the flow characteristics of the air type valve in the return line.

**RAWSON** – This drive type is selected for a Rawson valve installed on the system. To use this valve, the Rawson Valve Adapter must be installed according to the installation instruction with the adapter. Performing an Autogain allows Land Manager® SE to compensate for the flow characteristics of the Rawson Valve.

# APPENDIX D COMMON OPERATOR PROBLEMS

## TROUBLESHOOTING TIPS

### Clearing Minor Problems

Until you become familiar with the basic functions of Land Manager® SE, small problems may arise. If a problem does occur, follow the approach outlined below:

- Carefully define the problem.
- Make sure you have not overlooked something simple.
- Scan through the list below to find the problem or something similar.
- If the problem can not be resolved, call for assistance and have the following information available.
  - 1) System Configuration and constants.
  - 2) List of errors logged in the Alarm History.
  - 3) Model number (Located on decal on rear of console)
  - 4) List of events leading up to the problem.

### Console won't turn on.

- Bad fuse or no battery voltage. Check the fuses first and then the battery voltage to the Display Console.
- Battery terminal corrosion can result in poor battery connection. Clean the battery connections.

### Alarm sounds but display is dark.

- Try adjusting the contrast on the display.

### Alarm sounds continuously but does not sound normal.

- Vehicle battery voltage is low (Below 10V).

### Application continues even after power is turned off.

- Display Console has lost communications with the system control devices. Problem could be a broken wire or even a bad actuator valve. Manually shut everything down and check all connections. The problem may be in the cabling or electronics – suspect faulty cabling or a bad sensor/actuator.

### Alarm sounds (Beeps).

- Normal alarm condition for application error (Valve wide open). Reduce ground speed. If it persists, check valve for missing or faulty components.
- Master Switch Module is in the AUTO or MANUAL position and control valve is wide open. Check the feedback sensor or reduce speed.
- The Master Switch Module was left in the AUTO position after the vehicle has come to a stop and the shutdown time has elapsed. Turn the master switch off.

**Alarm sounds and the display indicates an application error while driving through the field.**

- Console doesn't see the correct application rate for the speed you are driving. Lower the driving speed; check the application rate entered into the Setup mode.

**System won't run in AUTO.**

- Vehicle must be moving for the system to run in AUTO. Check to see if Land Manager® SE operates in Manual.
- Check for adequate hydraulic oil flow.
- Check for a blown fuse to the actuator power input.

**Alarm beeps and display indicates an application error.**

- Control valve may be wide open.
- Blockage is caused by something other than the system or control valve.
- Manual or electric valves closed.
- Tank empty or faulty pump.

**Ground speed is incorrect.**

- No or very low ground speed appears on the display. Check for either an incorrect constant or a faulty ground speed sensor.

# DICKEY-john<sup>®</sup> WARRANTY

DICKEY-john warrants to the original purchaser for use that, if any part of the product proves to be defective in material or workmanship within one year from date of original installation, and is returned to DICKY-john within 30 days after such defect is discovered, DICKY-john will (at our option) either replace or repair said part. This warranty does not apply to damage resulting from misuse, neglect, accident or improper installation or maintenance. Said part will not be considered defective if it substantially fulfills the performance specifications. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. DICKY-john neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part and will not be liable for consequential damages. Purchaser accepts these terms and warranty limitations unless the product is returned within fifteen days for full refund of purchase price. In no case shall DICKY-john be liable for any incidental, special, consequential, or similar damages.

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call 1-800-637-3302 in either the U.S.A. or Canada



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Pat Number 4,555,624