DICKEY-john™

CHAPTER 1 – SYSTEM DESCRIPTION

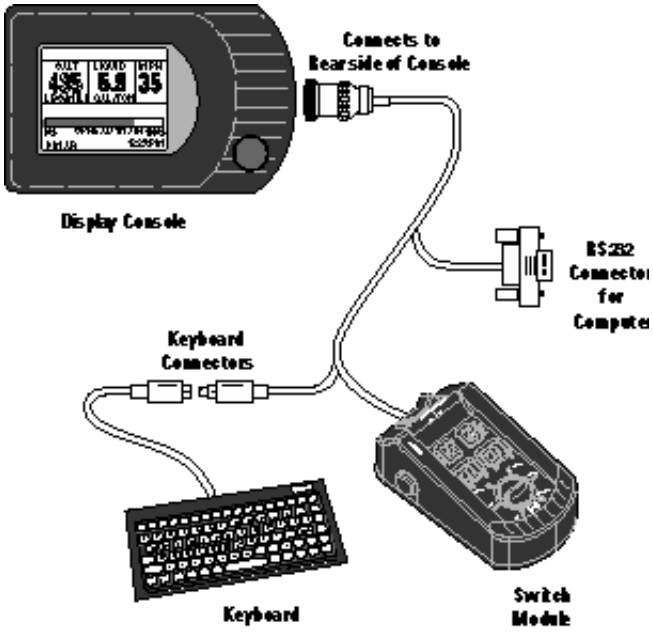
The DICKEY-john Control Point™ system uses three-channels (three separate controlled servo loops) on spreader vehicles to simultaneously control the spreading of granular and liquid ice-control materials. Two channels control granular and liquid application rates and the third channel precisely controls spinner speed to maintain even material coverage over the desired spread width. The dispensing rate varies directly with ground speed to ensure accurate product application.

Material can also be spread at a preset **"BLAST"** application rate. This is normally a very large rate to instantly adjust the target APR (application rate) for covering bridges and intersections with a much heavier amount of material.

GRANULAR CHANNEL CONFIGURATION

The granular channel controls the amount of material dumped onto the spinner plate(s). To do this, the Control Point™ monitors a tachometer style feedback sensor located on the V-box drag chain or tailgate auger. A resultant drive signal adjusts the conveyor mechanism speed to deliver the target application rate (APR) by regulating the hydraulic valve position.

Figure 1. System Components



LIQUID CHANNEL CONFIGURATION

The liquid channel controls the application rate of prewetting or deicing materials. When prewetting, the Control Point™ Console monitors a flowmeter style feedback sensor. When deicing, either a flowmeter or pressure style feedback can be used. Using feedback data, the pumping mechanism output adjusts the target application rate by either regulating pump speed or flow blocking.

Deicing systems use up to five boom inputs for applying material to more than one lane at a time.

SPINNER CHANNEL CONFIGURATION

The spinner channel controls the spinner plate(s) speed with either a closed-loop (precision) or an open-loop configuration. In the closed-loop configuration, a tachometer style feedback sensor, mounted on the spinner assembly, monitors spinner activity. Using the feedback data, the spinner mechanism speed adjusts for the target setting by controlling the hydraulic valve position. In open loop systems, the hydraulic valve position is relative to the WIDTH ADJUST knob setting on the Control Point™ Switch Module.

The customer must determine the spread-width accuracy needed. DICKEY-john Marketing and Product Service personnel are available with additional information to help with this decision.

PRODUCT APPLICATION MECHANISMS

The granular and spinner channels use, in addition to feedback (shaft rotation) sensors, either servo valve actuators or proportional valves to control the product application and spinner speed. The liquid channel uses, in addition to feedback sensors (flowmeter or pressure transducer), a liquid pump to control product application. The liquid pump output is controlled by either a 12 volt DC motor, servo valve actuator, or proportional valve.

SYSTEM FEATURES AND CAPABILITIES

1. Easy installation - surface-mounting Console kit.
2. Switch Module located anywhere in the cab to allow optimum placement for the operator.
3. Large 160X128 dot-matrix LCD display with backlighting for nighttime viewing.
4. Single Console button for system power on/off and screen selection.
5. RS-232 port for PC uploading and downloading of data.
6. Detachable keyboard for easy supervisor programming and calibration using multilevel, menu-driven screens.
7. Custom programming available to minimize setup time.
8. Compatibility with a variety of sensors, servo valve actuators, and proportional valves available from DICKEY-john or other manufacturers.
9. Audible and visual alarms for system and operator errors.

SYSTEM COMPONENT DESCRIPTIONS

A DICKEY-john Control Point™ system consists of six basic components; (1) Console, (2) Switch Module, (3) ground speed sensor, (4) feedback devices to monitor material application, (5) actuator devices to regulate material application, and (6) harnesses to interconnect all system devices. The detachable keyboard (optional) and PC (not provided) are programming aids and not actually a part of a basic Control Point™ system.

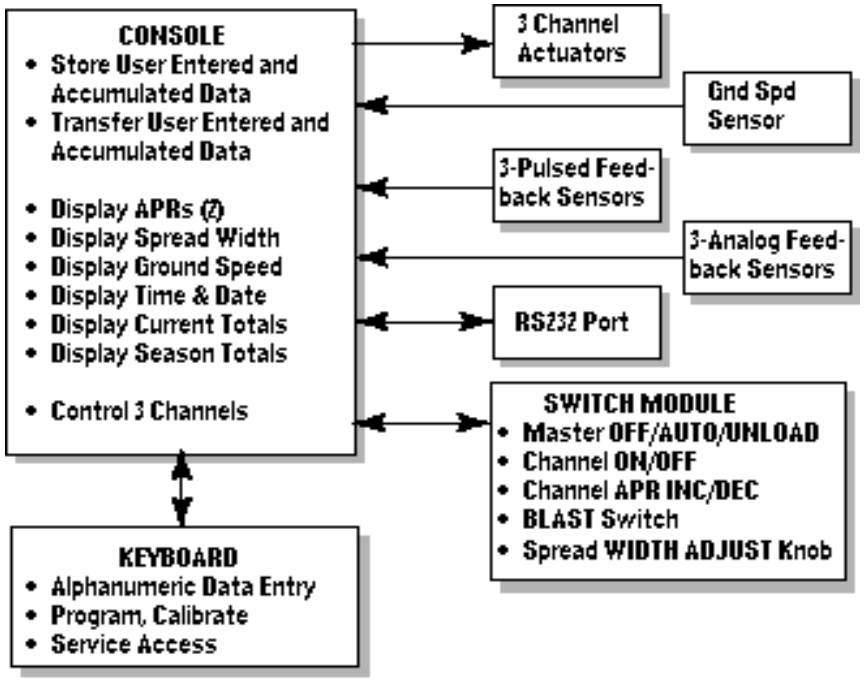
Figure 1 illustrates the Console, Switch Module, and keyboard. Figure 2 shows components in a block diagram. The Console and Switch Module are located inside the truck cab. These two items may be mounted side-by-side or the Switch Module can be positioned for operator convenience.

A. Console

The Console displays information on a dot-matrix LCD and uses a single push-button switch to control system power and to view several operator screens. Using an external keyboard for programming and placing operator controls on the Switch Module greatly simplify the Console.

An RS-232 port connector, located on the Switch Module harness, permits data transfer to and from the Console. This port interfaces to a PC for downloading accumulator and alarm information. When replacing a console or when identical vehicles require programming/calibrating, uploading and downloading configuration information through the port is extremely useful. For multiple units, only one system needs to be programmed and then the constants can be transferred (downloaded) from that console, stored in a PC file, and uploaded to the other vehicle's console. **Note:** This is only useful on identical vehicles.

Figure 2. System Block Diagram



B. Switch Module

The Switch Module harness plugs into the Console and contains connectors for both keyboard and PC interface as described above.

The operator controls the real-time functions of the Control Point ™ system from the seven switches on the Switch Module. (See Figure 3).

C. Keyboard

The keyboard is the means the operator uses to program and calibrate the system. The 86-key, alphanumeric, PC-compatible keyboard has been environmentally hardened for use in the ice-control field. After programming and calibration are finished, the keyboard is usually disconnected and stored.

D. Ground Speed Sensor

The ground speed sensor generates vehicle speed information for the console. Sensor electrical pulses proportional to the vehicle ground speed are vital to system operation because true vehicle ground speed is necessary for accurate product application. The system can function with a wide variety of electronic and mechanical speedometer sensors, including Hall-Effect and Reluctance sensors.

E. Feedback Sensors

The feedback sensors send product flow information to the console for accurate product application. Both granular and spinner channels require pulsed electrical sensors having an output proportional to the mechanism speed. The liquid channel accepts either electrical pulsed sensors or analog sensors with outputs proportional to material flow (pulsed) or system pressure (analog). A liquid prewetting system only accepts pulsed feedback while higher capacity anti-icing systems accept either pulsed or analog.

F. Actuator Devices

Actuator devices regulate material flow for accurate control of product application rates. Normally, granular and spinner channels regulate the hydraulic oil flow rate to a motor. Liquid channels use several different configurations. Many prewetting systems use a DC pump to regulate flow by controlling pump speed. Other systems use hydraulically driven pumps similar to agricultural applications.

G. Hopper Level Sensor (Optional)

The optical light beam of this level sensor is blocked by the granular material in the spreader bed. When the material level falls beneath the sensor mounting level, a repetitive beep sounds and an appropriate message displays in the warning/alarm area of the OPERATE screen.

I. Harnesses

The Main Harness assembly connects the Console to the ground speed sensor, feedback sensors, channel valve (or DC motor) actuators, vehicle battery, ignition, and additional optional connections (including two-speed axle, hopper level sensor, and boom sense inputs). An optional Extension Harness, allows the Main Harness to extend outside the cab, contains duplicate connectors to permit hookup flexibility. Other extension harnesses are available to allow flexible sensor arrangement.

HOW TO OBTAIN TECHNICAL SUPPORT

For prompt and courteous assistance and answers to your questions, call DICKEY-john Technical Support at (217) 438-3371 or Fax (217) 438-6012 or 438-6539. For toll-free calls in either the USA or Canada, dial 1-800-637-3302.

CHAPTER 2 – OPERATING PROCEDURES

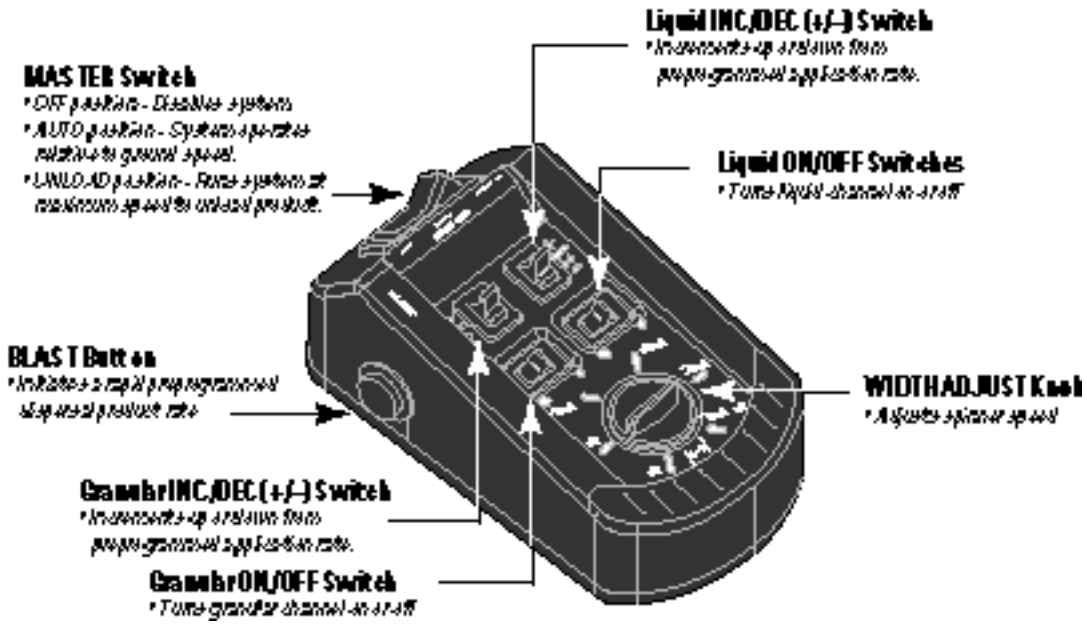
This chapter explains how the operator (driver) of an ice-control vehicle uses the controls on the Switch Module and Console to perform standard operator functions. **Note:** The detachable keyboard (optional) is required to program and calibrate the system as described in the next Chapter.

Depending upon programming, the operator can view three or four different screens of data. The OPERATE screen is the home screen for monitoring spreader operation; the remaining screens are supportive – MATERIAL SELECT/MANUAL SPEED, CURRENT TOTALS, and SEASON TOTALS. The MATERIAL/MANUAL SPEED SELECT screen is only accessible if the system is stationary (no ground speed).

PREPARING FOR OPERATION

Perform the following procedures only after the system is installed, properly programmed and calibrated. Practice the following procedures with the vehicle stationary to gain familiarity with the operating controls and screens before applying product.

Figure 3. Switch Module Controls and Definitions



STARTING THE SYSTEM

1. **Verify the MASTER Switch on the Switch Module is in the OFF position (See Figure 3).**

   If the Master Switch is in the AUTO position during power up, a warning message with audible alarm occurs until the switch is turned OFF (See Figure 4).

Figure 4. Master Switch Warning Message

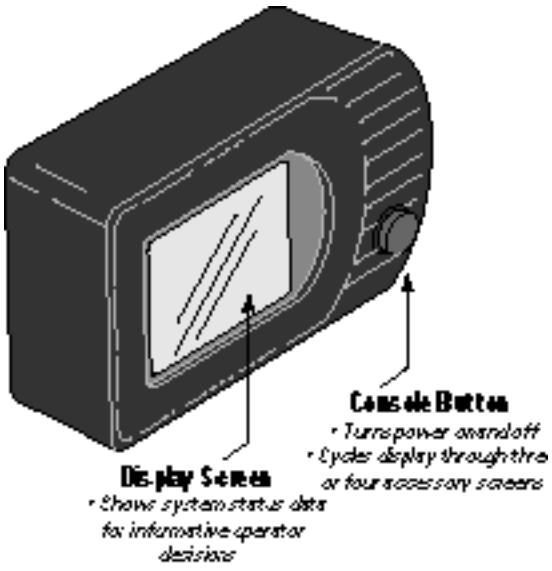
2. **Turn on the ignition switch.**

   If the Console was on when the ignition was last turned off, the display comes on with the ignition switch. A screen briefly shows the DICKEY-john logo followed by the OPERATE screen (See Figure 6).

   If the console does not power on, the console button was used to properly power down the unit. Proceed to Step 3.

3. **Briefly press the Console button (less than a second) to apply power to the Console (See Figure 5).**

Figure 5. Console Showing Functional Items



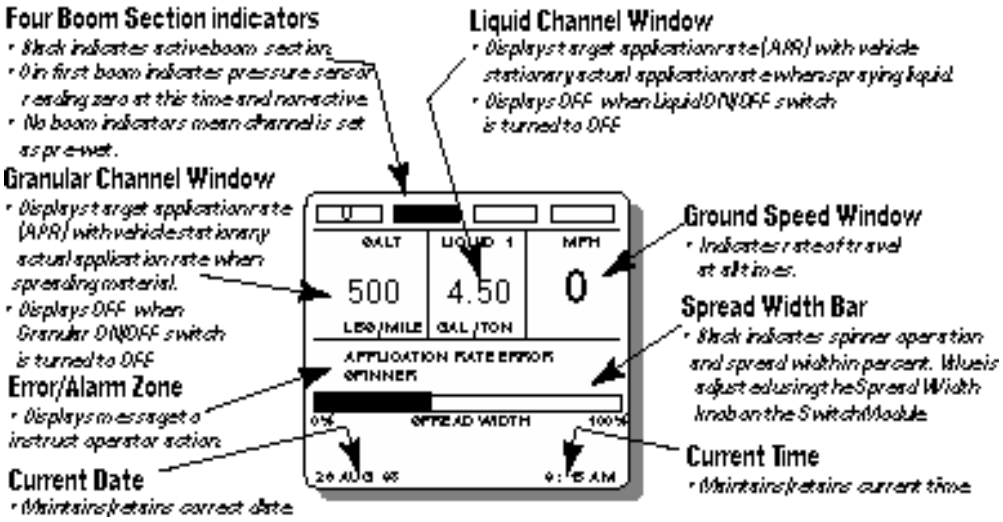
If the button is held too long, a beep sounds indicating the Operate screen is skipped and an accessory screen appears instead (This screen described later). If the beep is heard, turn the console off as indicated in Step 4 and start again.

During start-up (power up), the Console automatically closes all system actuators and performs self-tests, including system configuration and application data. If an error occurs at power up or during operation, an appropriate error message displays with recovery information.

4. Turn the Console off by pressing and holding the Console button until a beep sounds and the text on the screen disappears (approx. 3 seconds) and then release.

Power is removed when the screen goes dark. To restart, repeat Step 3.

Figure 6. Divisions of the OPERATE Screen



OBSERVING THE OPERATE SCREEN DIVISIONS

1. **Study the OPERATE screen layout (See Figure 6).**

   Three windows across the upper portion display Granular, Liquid, and true (actual) Ground Speed data. Directly above, status of the booms graphically display. Below the windows, error messages appear briefly for system errors along with an audible alarm. In the lower third, the Spread Width Bar graphically indicates percentage of spinner activity via a black bar. At the bottom, the current date and time display.

2. **At the Switch Module, turn the Granular and Liquid ON/OFF switches off, then back on again (See Figure 3).**

   Notice, the window for each product reads OFF and then returns to the material and target (APR) values again.

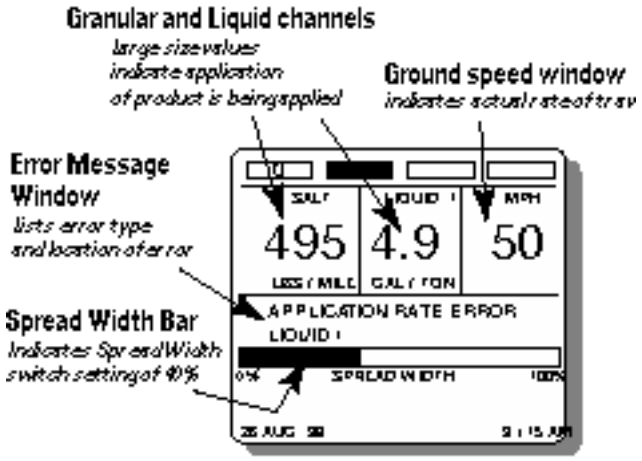
   Ground speed is independent of product application and therefore displays only when the vehicle is moving.

   Product application begins with vehicle motion if the Master Switch is in the AUTO position. The **actual** APRs display in roughly twice the size of the **target** APRs (See Figure 7).

3. **Change the target rate of either product channel by pressing the respective "INC/DEC +/-" switch on the Switch Module.**

   The value increments/decrements as a beep is heard for each inc/des step. If the switch is held, the value repeats until reaching a preset limit. If changed while the vehicle is moving, the new **target** APR displays for approximately two seconds, then reverts to the **actual** APRs.

Figure 7. OPERATE Screen Showing Product Application



4. **Rotate the WIDTH ADJUST knob on the Switch Module while observing the SPREAD WIDTH bar on the display.**

   The rotational speed of the spinner changes with the knob setting. The horizontal bar graphically represents the position of the SPREAD WIDTH knob. The bar is at the 100% position when the knob is fully clockwise, corresponding to maximum spinner speed. The operator determines the correct setting by observing the spread pattern. The bar is hollow until the spinner is operating.

5. **Note the date and time across the bottom edge of the screen.**

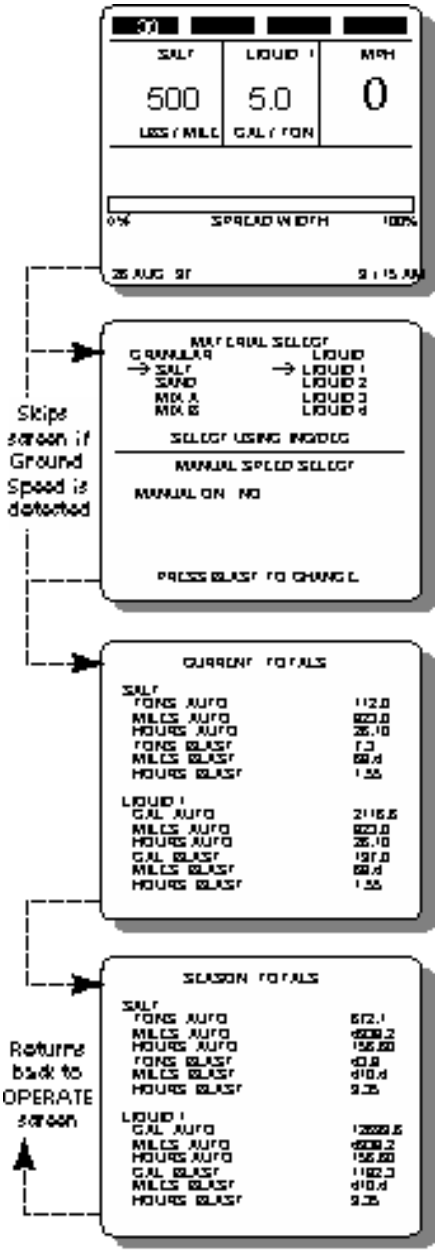
6. **Observe the boom graphics across the top of the screen.**

   All boom sections appear as rectangle blocks during anti-ice operation. Each section is hollow until activated.

7. **Observe the area for alarm messages.**

   Alarm messages appear (flashing) in the middle of the screen, above the SPREAD WIDTH bar (See Figure 7).

Figure 8. Screens Available to Operator by Cycling



MATERIAL/MANUAL SPEED SELECT SCREEN

This screen is divided into two major divisions. The Material Select portion (upper half) lists the products programmed for use. The Manual Speed portion (lower half) allows selecting of an artificial ground speed signal in the event the standard ground speed sensor fails. Without a ground speed signal, the system is inoperative unless manual speed operation is selected.

This screen can only be accessed if (1) the vehicle is stationary (zero ground speed), (2) the MASTER Switch is in the OFF position, and (3) more than one material is listed in either list or manual ground speed has been enabled during programming.

A. Selecting a different Dispersal Material

1. **Press the Console button and release immediately after a beep.**

   Figure 8 illustrates the MATERIAL/MANUAL SPEED SELECT screen showing four materials for each product channel enabled.

2. **Verify that the Granular ON/OFF and/or Liquid ON/OFF switches on the Switch Module are ON.**

   The channel ON/OFF switch must be ON to select a different material.

3. **Press the INC/DEC +/-" switch of the appropriate channel (granular or liquid), in either direction, to move the pointer up or down on the left side of either list.**

B. Substituting Manual Speed for Standard Speed Sensor

If the ground speed signal is lost, the system ceases to function. If this occurs due to a loss of sensor, cabling problems, etc., an artificial ground speed signal can be substituted to continue limited operation. The fixed ground speed must be previously programmed and then can be selected from the MATERIAL/ MANUAL SPEED SELECT screen (See Figure 8).

1. **Stop the vehicle and turn the MASTER switch OFF. From the OPERATE screen, press the Console button and release after the beep to access the MATERIAL/MANUAL SPEED SELECT screen.**
2. **Press the BLAST button to change the selection as prompted at the bottom of the screen.**

   Notice the line stating “MANUAL ON”. As the BLAST button is pressed, NO changes to YES. Releasing the button reverts to the OPERATE screen. The ground speed window now displays the word MANUAL at the bottom.
3. **Continue spreading material, maintaining displayed speed as closely as possible, to ensure accurate application.**

   The system spreads material but no accumulators are updated since system accuracy cannot be assured. The related sensor and harness should be inspected and repaired as soon as possible to restore normal operation.

C. Returning to the OPERATE screen

1. **Press the Console button three times, waiting for the beep before releasing, to cycle back to the OPERATE screen (See Figure 8 for all screens).**

   The OPERATE screen now shows the material name(s) just selected, along with the correct (programmed) target APR.

Figure 9. CURRENT TOTALS Screen

ACCESSING THE CURRENT TOTALS SCREEN

If MANUAL SPEED operation has been selected (see heading MATERIAL/ MANUAL SPEED), this must first be deselected before the CURRENT TOTALS screen can be cleared.

1. **From the OPERATE screen, press and release the Console button after the beep. Press a second time, if necessary, to display the CURRENT TOTALS screen (See Figure 9).**

   The MASTER Switch must be in the OFF position before any other screen can be accessed.

   The CURRENT TOTALS screen (See Figure 9) appears showing totals accumulated for the current product selected.

   To see other totals, return to the MATERIAL/MANUAL SELECT screen and select those products.

CLEARING THE CURRENT TOTALS

The ability to clear the CURRENT TOTALS screen is programmable in the Programming mode (See PROGRAMMING chapter). If so programmed, all totals on this screen should be recorded before clearing, then proceed as follows.

1. **With the Granular switch on, (top half of the screen), press the Granular +/- (left) switch up and release when the beep sounds.**

   A message “PRESS DEC TO CONFIRM CLEAR (product) ACCUMS (accumulators)” appears.

2. **Next, press the same switch down (decrement) and the totals reset to zero (See Figure 10).**

   To clear the bottom half, repeat the steps for the liquid channel with the Liquid +/- (right) switch (See Figure 11). Press the console button to stop the clear operation.

Figure 10. Clearing top half of CURRENT TOTALS Screen

Figure 11. Clearing Bottom Half of CURRENT TOTALS Screen

ACCESSING THE SEASON TOTALS SCREEN

1. **From the OPERATE screen, press and release the Console button after the beep. Repeat until the SEASONS TOTAL screen appears (See Figure 12).**

   This screen shows the amount of material applied, miles traveled during application, and hours elapsed this season for each product in both the AUTO and BLAST modes. The totals can only be cleared in the Program Mode (keyboard).

Figure 12. SEASON TOTAL Screen

USING THE BLAST BUTTON

Pressing the red BLAST button (on the left side of the Switch Module) causes material to dispense at a higher, programmed rate. The BLAST button performs several functions, depending upon programming options.

1. **With the Operate screen displaying, press the Blast button on the side of the Switch Module.**

   When the Blast button is pressed, the Operate screen displays BLAST ON above the SPREAD WIDTH bar.

   This either initiates a **timed** blast cycle (programmed length) or **momentary** (blasts only with the button pressed). A timed blast period can be terminated early by activating the BLAST button a second time. Blasting can be initiated with the MASTER Switch in AUTO or OFF.

   With a timed blast cycle, a programmed minimum ground speed establishes the material flow rate until that speed is exceeded by the actual ground speed.

MASTER SWITCH IN THE UNLOAD POSITION

The UNLOAD position of the MASTER Switch is used to quickly remove material from the truck.

Warning: If the spinner is programmed to operate during UNLOAD, be sure that no one is in the vicinity before performing this procedure to avoid possible injury!

1. **Back up to the appropriate location and momentarily press UNLOAD.**

   The actuators open fully for those channels turned on from the switch module.

2. **To stop the unload operation, move the MASTER switch to the OFF position.**

DICKEY-john™

CHAPTER 3 – KEYBOARD PROGRAMMING

Programming allows the operator to enter rates, limits, and other parameters into the Control Point™ memory for regulating system product application. These parameters are entered through a detachable keyboard. Specifics include (1) calibration constants, (2) configuration parameters (sensor and actuator specifications), (3) granular and liquid material information, and (4) product application rates (APRs). It also includes resetting system accumulators for vehicle mileage, material usage, and time totals.

Programming must be performed before attempting system calibration. Accurate system calibration constants are determined through regular calibration routines. However, known constants at the time of programming can be entered thus reducing the calibration procedures required. Calibration corrections can be revised anytime to fine tune accuracy.

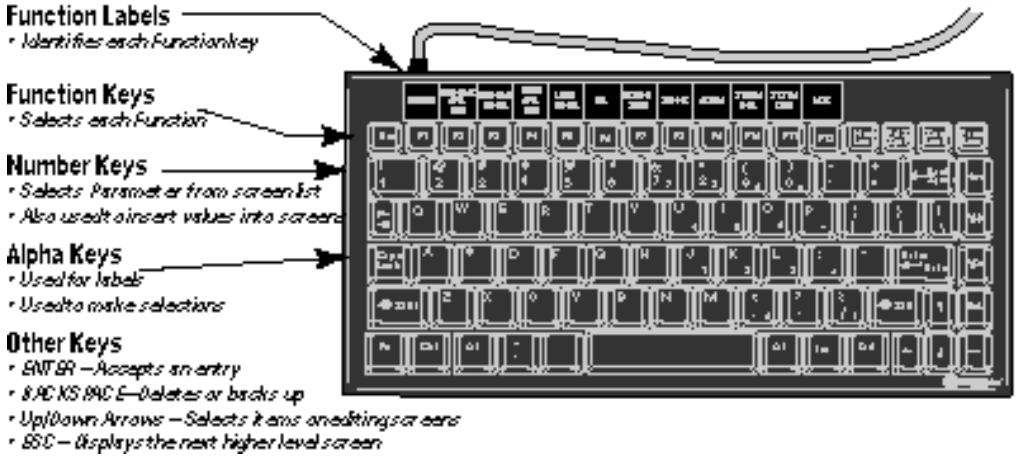
LOGGING CONFIGURATION DATA

All calibration constants and other system parameters should be recorded on the CALIBRATION DATA RECORD sheets at the rear of this manual. In the event of Console damage or lost data, rapid recovery is assured. If the Control Point™ Console ever requires replacement, all values can be transferred directly to the new Console via the keyboard.

PREPROGRAMMING

Each Control Point™ system is shipped from DICKEY-john pre-programmed. Specific parameters can be custom pre-programmed by DICKEY-john to minimize customer programming. This simplifies calibration but final SYSTEM RESPONSE (See CALIBRATION chapter) must be performed after installation on every truck.

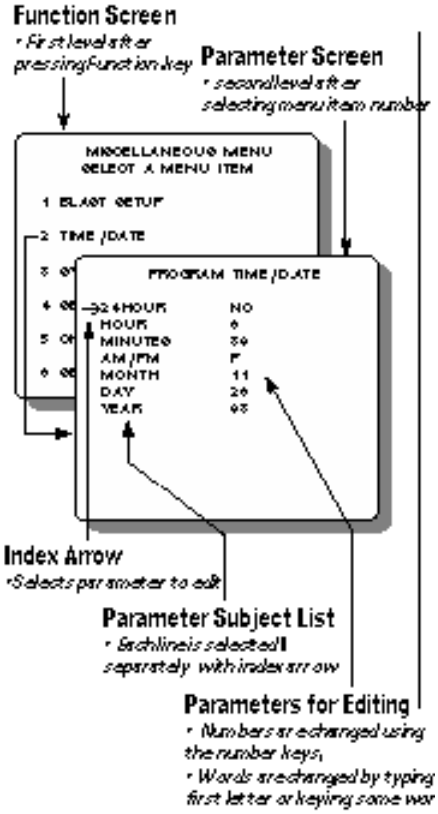
Figure 13. Keyboard Layout and Functions



USING THE KEYBOARD AND SCREENS

Programming and calibration is accomplished using the keyboard and on-screen, menu-driven instructions. The keyboard (See Figure 13) detaches and can be stored after programming and calibration is complete. To use the keyboard, proceed as follows;

Figure 14. Basic Screens Layout



Note: *In some cases, a Sub-Functions screen appears between the Function and Parameter screens with additional selections.*

1. **If the Control Point™ is on, turn the power off and then connect the keyboard to the console harness connector (See Figure 1).**
2. **Place the MASTER Switch on the Switch Module in the OFF position and then turn power back on.**

   Each time power is applied, the Operate Mode (F1) comes up and normal system operation can be performed. However, the remaining functions (F2 through F12) cannot be selected unless the MASTER Switch is in the OFF position.

3. **Examine the keyboard layout and the twelve functions keys (F-keys).**

   The decal immediately above the Function Keys, F1 through F12, identifies each function. Pressing any F-key immediately enters and displays that function. Transferring to another function is as simple as pressing another F-key.

4. **Examine the display for several functions (See Figure 14).**

   a. Function screen (top level) – Each screen lists items with numbers to the left side (except F8). Pressing the indicated key number displays that screen, usually one with parameters for editing.

   b. Parameter screens (second level) – An index arrow appears to the left of the first item and an underscore beneath the first digit of that parameter.

   c. Editing a parameter – The up and down arrow keys move the index arrow to other parameters for editing. To change the selected parameter, key in the desired value. When finished, press the ENTER key to accept the new value and advance the index arrow to the next line. Failing to use the ENTER key (except for YES/NO and serial port configurations) loses the new value.

d. Other keys – The Backspace key erases incorrectly keyed numbers or text. To restore a previous values after keying in a new number, press either arrow key instead of ENTER. Invalid keystrokes are not accepted for entry and cause an audible warning.

Pressing the **Esc** key returns to the previous screen. Pressing any function key (F1 through F12) transfers directly to that function.

e. Screen prompts – If ”MORE...” appears on a screen, additional parameters are on an extended screen. Access this screen by moving the index arrow to the “MORE...” line (See Figure 24).

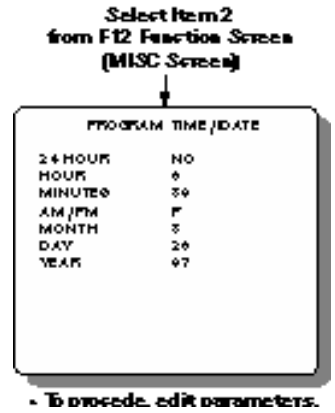
5. Programming system from the keyboard.

Begin with the following paragraphs for programming procedures of each function and explanations of screen parameters. All programming steps should be performed in the order given to ensure proper entries for all parameters. The MASTER Switch must be OFF before functions can be selected with the keyboard.

Figure 15. Displaying Miscellaneous Menu Selections

Figure 16. Verifying BLAST SETUP Menu Adjustments

Figure 17. Setting Time and Date



USING THE MISCELLANEOUS MENU (F12)

Before channel programming begins, a few basic settings require attention. With system on and keyboard connected, proceed as follows:

1. **Press F12 to view the MISC Menu (See Figure 15).**

   This screen displays six subjects. Each subject is accessed with the number key indicated in front of the item.

2. **From MISC MENU, select BLAST SETUP (1) (See Figure 16).**

   Two values require editing; length of blast time and minimum ground speed.

   BLAST TIMER – Determines the length of the BLAST cycle (0 to 99 seconds). When set to zero (0), the blast cycle lasts only as long as the BLAST button is pressed.

   BLAST SPEED – Establishes an artificial vehicle ground speed for computing the rate materials dispenses during blasting when the vehicle is standing still or moving very slowly. For speeds faster than this value, the actual vehicle ground speed determines the spread rate.

   When the BLAST SPEED is set to zero, blasting cannot be initiated with the vehicle stopped. The blast APR is programmed from the material application rate functions (F1, F4).

3. **Select F12 to return to the MISC MENU and select TIME/ DATE (2). (See Figure 17).**

   Verify or correct the following settings;

   a. 24 HOUR – Select YES for 24 hour time; NO for standard 12 hour time.
   b. HOUR – Enter the correct hour.
   c. MINUTES – Enter the correct minutes.
   d. AM/PM – Enter A for AM or P for PM (This selection does not appear for 24 hour time).
   e. MONTH – Enter the correct numerical month.
   f. DAY – Enter the correct day of the month.
   g. YEAR – Enter the last two digits of the year.

4. **Select F12 to return to the MISC MENU and select SYSTEM UNITS (3) (See Figure 18).**

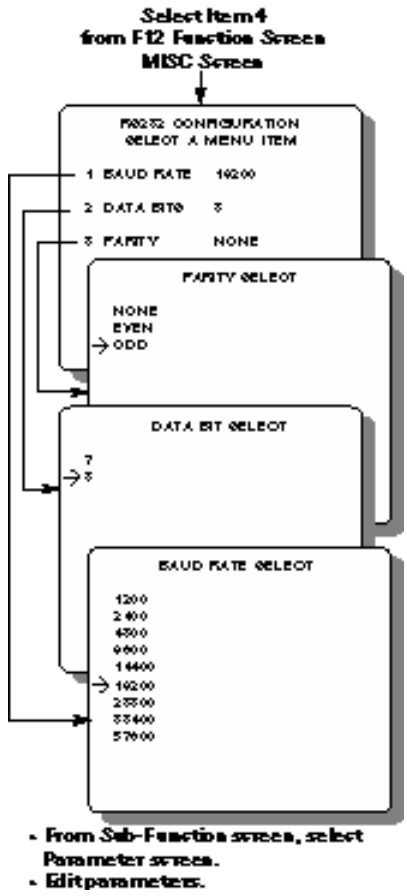
   This screen allows displaying either ENGLISH or METRIC units. Changing causes parameter values on all screens to immediately convert to the equivalent numerical values.

   a. Select either Y(YES) or N(NO). Y changes units to metric; N retains the units in English.

   b. After selecting English or Metric, select units of measure from the remaining list. Choices are in miles, miles-feet, square feet, or square yards. If Metric, choices are in kilometers, kilometers-meter, and square meter. This list only allows one selection. Pressing the ENTER key is not necessary to accept the choice.

Figure 18. Setting up System Units

Figure 19. Configuring RS-232 port



5. Select F12 to return to the MISC Menu and select SERIAL PORT CONFIGURATION using the 4 key. (See Figure 19).

This menu allows setting of the serial port for communicating with other devices. Values must match the serial data format of the other serial devices. The **Esc** key accepts the values instead of the ENTER key. The pre-programmed values are appropriate for use with other Dj equipment and software.

a. Press 1 for the BAUD RATE SELECT screen. Use the up/down arrow keys to change the baud rate. Press **Esc** key when finished.

b. Press 2 for the DATA BIT SELECT screen. Use the up/down arrow keys to change the data bits to be used. Press **Esc** key when finished.

c. Press 3 for the PARITY SELECT screen. Use the up/down arrow keys to change the data bits to be used. Press **Esc** key when finished.

6. Select F12 to return to the MISC Menu and select the CHANGE LANGUAGE/KEYBOARD screen with the 5 key (See Figure 20).

This menu allows selecting the language for displaying text and the keyboard for entering constants.

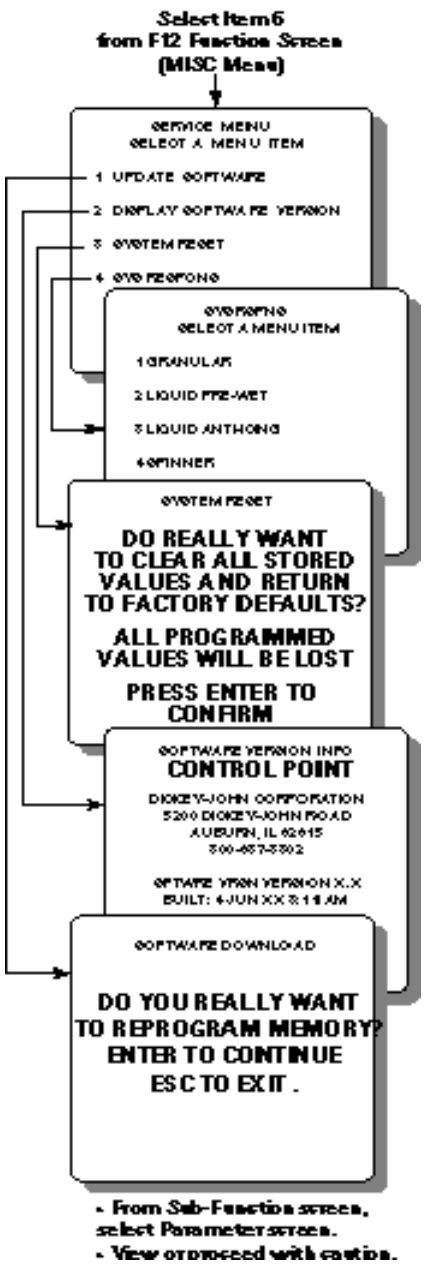
Figure 20. Choosing Displayed Language and Keyboard

a. Select a language and keyboard from the screen. Key in Y (YES) to display **French** (or other), NO to display **English**. The system displays English and one other language, usually French Canadian. Contact DICKEY-john for available alternative languages.

b. Select KEYBOARD from the screen. N (NO) selects an English keyboard, Y (YES) selects French.

7. Select F12 to return to the MISC Menu and select the SERVICE MENU screen with the 6 key (See Figure 21).

Figure 21. Viewing the SERVICE MENU Items



This menu is not intended for general customer use but for ice personnel to incorporate future product enhancements, trouble-shooting, and to identify the currently installed software version.

a. UPDATE SOFTWARE – Used by qualified personnel to install new software or updates.

b. DISPLAY SOFTWARE VERSION – Displays the currently installed software version.

c. SYSTEM RESET – Can be used to return all parameters to factory setting. This is useful in starting over when the present settings become uncertain or confused.

d. SYS RESPONS – Displays System Response data which is useful for troubleshooting. This screen can be viewed but not changed.

ACCESSING THE OPERATE MODE (F1)

F1 accesses the OPERATE screens anytime during programming to verify selections. No programming parameters are available from this screen. The following information is a brief outline of the Operate mode screens. For full details, see Chapter 2.

a. OPERATE screen – Shows programmed values ready for spreading product in a normal fashion with keyboard connected.

b. MATERIAL/MANUAL SPEED SELECT screen – A dual screen showing only items configured. The MATERIAL SELECT half displays if more than one granular and/or liquid products are enabled in the Granular (F2) and Liquid (F4) Application Rate functions. The MANUAL SPEED SELECT appears if MANUAL DRIVER is programmed YES in the Ground Speed Configuration function (F7, selection 1).

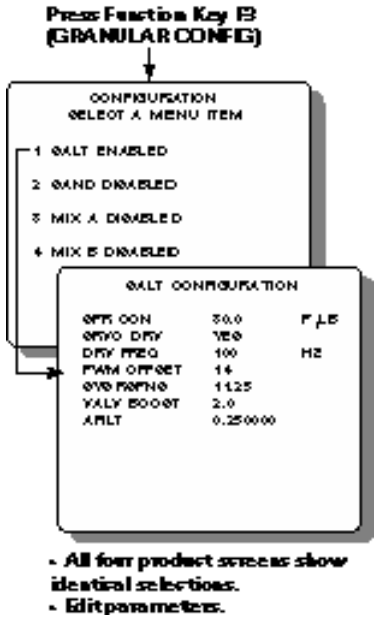
c. CURRENT TOTALS screen – Shows totals accumulated for each product dispensed since the last reset (See Accumulator Function - F9). These totals are those products selected on the Material/Manual Speed Select Screen. To see other totals, select those products from that screen.

d. SEASON TOTALS screen – Shows the amount of material applied, miles traveled during application, and hours elapsed this season for each product in both the AUTO and BLAST modes. The season totals can only be cleared from the Accumulator Function (F9).

SETTING UP GRANULAR CONFIGURATION (F3)

Configuration parameters specify types of actuators and sensors used and related performance specifications. To prepare for system calibration, the granular configuration parameters for each granular material used must be verified or programmed. These parameters do not change unless system hardware changes or related calibration routines are rerun.

Figure 22. Configuring the Granular Channel



1. **From the keyboard, press Function key F3 to obtain the GRANULAR CONFIG screen (See Figure 22).**

   Four (4) granular products names appear with each followed by the word ENABLED or DISABLED. Products are enabled/ disabled from the GRANULAR APPL RATE (F2) screen.

2. **Select a material using the corresponding number key.**

   See Figure 22.

3. **Edit the parameters on the screen.**

Check each following item for a desired setting.

a. SPR CON (Spreader Constant) – Represents the number of pulses generated by the application rate sensor per pound of material (P/LB) discharged from the spreader.

The spreader constant differs for each granular material, spreader vehicle, and gate height setting. If the spreader constant is known, keyboard enter the value so that running the GRANULAR CALIBRATION routine for this material is unnecessary. If the spreader constant is unknown, leave the displayed value. The correct value is automatically corrected later, during GRANULAR CALIBRATION.

b. SRVO DRV (Servo/Proportional Drive) – Identifies the valve type installed in the granular channel. For a servo-controlled valve, key in Y (YES). For a proportional valve, answer N (NO).

c. DRV FREQ (Drive Frequency) – Represents the valve manufacturer's suggested drive frequency, as shown on the valve specification sheet. The rated drive frequency for the DICKEY-john servo valve is 100 Hz.

Note: The following configuration constants (PWM OFFSET, PWM SAT, SYS RSPNS, VALV BOOST, and AFILTR) are for descriptive purposes only. The correct parameters automatically calculate during GRANULAR SYSTEM RESPONSE calibration. Factory defaults shown at this time are adequate until calibration is run. These values can be adjusted any time to fine tuning system performance.

d. PWM OFFSET – Identifies the minimum amount of PWM valve drive required to start the granular mechanism moving.

e. PWM SAT (PWM Saturation) – Identifies the amount of drive the granular valve system requires to operate a PWM valve at full speed. This value is not displayed when SRVO DRV is set to YES.

f. SYS RSPNS (System Response) – Adjusts the control system response time to the hydraulic and mechanical systems of the granular control channel on each particular spreader vehicle.

g. VALV BOOST (Valve Boost)– Increases the amount of system response initially applied to the granular control to reach final operating speed as quickly as possible.

h. AFILT (A Filter) – Filters the feedback signal to minimizes effects of electrical noise and mechanical vibrations. The smaller the number the greater degree of filtering.

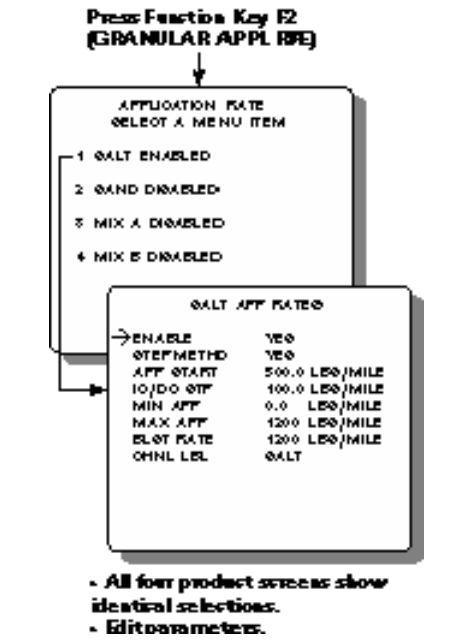
4. Press F3 to return to the GRANULAR CONFIG screen (See Figure 22).

If using other granular materials with known SPR CON (spreader constant), enter those values now.

Note: The system drives only one type of granular mechanism. Variables (SERV DRV, DRV FREQ, etc.) for all four materials remain the same except for the SPR CON.

PROGRAMMING GRANULAR APPLICATION RATES (F2)

Figure 23. Setting up Granular Application Rates (Step Method)



The APPLICATION RATE menu lists four granular materials. Each material screen contains a set of values for product application rate, APR steps, min/max limits, and blast rate. The pre-programmed values are usually the same for all granular materials but may be edited and modified as required.

1. **From the keyboard, press Function key F2 to obtain the GRANULAR APPLICATION RATES screen (See Figure 23).**

   Four (4) granular product names appear, each followed by the word ENABLED or DISABLED (See Step 3).

2. **Select a material using the corresponding number key.**

   See Figure 23.

3. **Edit the parameters on the screen.**

Check each following item for the desired setting.

a. ENABLE - When enabled, the material appears on the MATERIAL/MANUAL SPEED SELECT screen of the Operate mode for selecting. Enter Y for YES (enabled), N for NO (disabled).

At least one granular material must be enabled. All products can be programmed (and calibrated) now and selected from the Operate mode later.

b. STEP METHD - Y (YES) selects the Step method or N (NO) the Rate method to specify application rates (APRs). Since each method performs essentially the same function, the choice becomes a personal preference. However, the parameters for each method are different and all items below change with the selection (See Figure 24 for Rate Method screens).

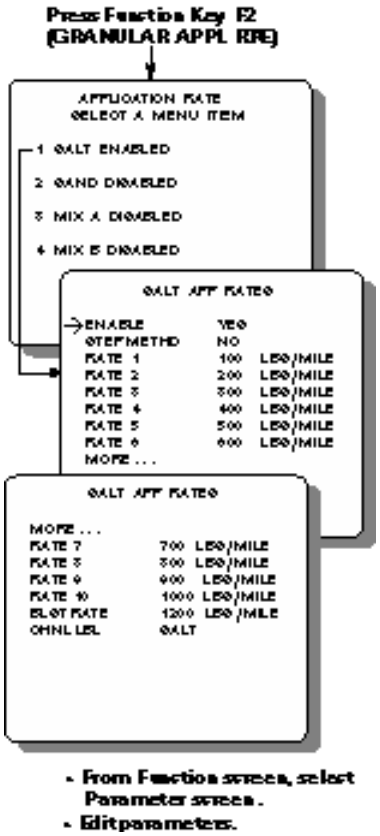
Changing from one APR method to the other for any material automatically clears all previous rates from that method.

The STEP method permits the APR to be changed by a fixed increment using the "+/–" switch on the Switch Module. The RATE method allows programming of up to ten (10) different APRs - RATE 1 through RATE 10. If less than ten rates are chosen, enter a zero (0) for each rate following the last one programmed. The initial rate displayed in the OPERATE mode is RATE 1. Other rates are selected by pressing the "+/–" switch on the Switch Module.

c. APP START (Step method) – Defines the APR starting point.

d. IC/DC STP (Step method) - Sets the increase/decrease step value.

Figure 24. Setting up Granular Application Rates (Rate Method)



e. MIN APP (Step method) – Defines the minimum APR limit for the product.

f. MAX APP (Step method) – Defines the maximum APR limit for the product.

g. RATE 1 through RATE 10 (RATE METHOD) – Defines up to ten individual APR rates.

h. BLAST RATE (Step or Rate method) – Defines a higher than normal, spot-application rate applied when the red BLAST button is pressed.

i. CHNL LBL (Channel Label) (Step or Rate method) – Any product material name of up to nine (9) characters can be keyed in. Pressing the ENTER key stores the name for display on all granular screens including the OPERATE screen wherever that material appears.

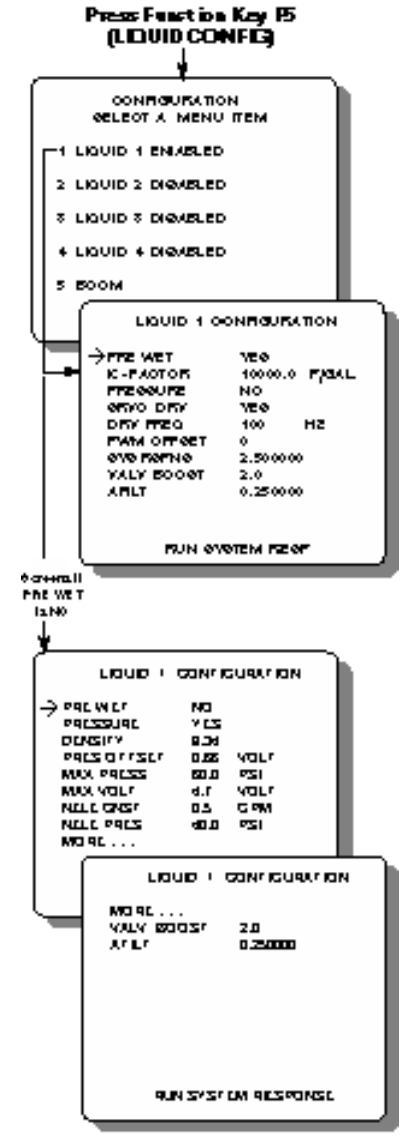
4. Press F2 to return to the GRANULAR APPL RATE screen (See Figure 23).

If other granular materials require programming, repeat the above procedures for those materials.

SETTING UP LIQUID CONFIGURATION (F5)

Configuration parameters specify types of actuators and sensors used including performance specifications. To prepare for system calibration, the liquid configuration parameters for each liquid material used must be verified or programmed. These parameters do not change unless system hardware changes or related calibration routines are rerun.

Figure 25. Configuring Liquid Channel for PREWET YES/NO



1. **From the keyboard, press Function key F5 to obtain the LIQUID CONFIG screen (See Figure 25).**

   Four (4) liquid materials names appear each followed by the word ENABLED or DISABLED. Products are enabled/disabled from the LIQUID APPL RATE screen (F4).

2. **Select a material using the corresponding number key.**

   See Figure 25.

3. **Edit the parameters on the screen.**

   Check each following item the desired setting.

   a. PRE WET - If spraying with the pre-wet spray bar, enter Y (YES). If used with the anti-icing boom, enter N (NO).

   b. K-FACTOR (Flowmeter Constant) - Represents the number of flowmeter pulses generated per gallon (P/GAL) of dispersed liquid (for pre-wet and anti-icing liquids).

   The K-FACTOR number stamped on the flowmeter body is sufficiently accurate for keyboard entry if the viscosity of the liquid is near that of water.

   If the flowmeter constant is unknown, leave the displayed default value shown. A corrected value automatically calculates and enters during LIQUID CALIBRATION.

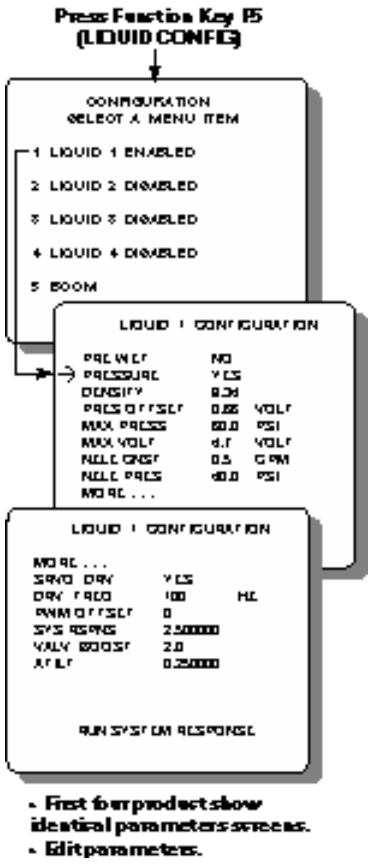
   c. PRESSURE - N (NO) indicates a pressure transducer is not used. Y (YES) indicates a pressure transducer is present and additional items appear on the menu (See items k through p below and Figure 26).

   d. SRVO DRV (Servo/Proportional) - If using a servo drive, press Y (YES). For a proportional valve, answer N (NO).

   e DRV FREQ (Drive Frequency) - Represents the valve manufacturer's suggested drive frequency, as shown on the valve specification sheet. The rated drive frequency for the DICKEY-john servo valve is 100 Hz.

   f. PWM OFFSET - Represents the valve operating range starting point (position flowmeter begins generating pulses). This constant automatically calculates and enters during a LIQUID SYSTEM RESPONSE routine (F11-2 and F11-3) or can be keyboard entered. Anti-icing boom liquids may have a different offset constant than pre-wet bar liquids because of different plumbing components.

Figure 26. Configuring Liquid Channel for PRESSURE



g. PWM SAT (Proportional valve only) - Represent the end point of the valve operating range (maximum flowmeter pulse frequency). The value calculates automatically during the LIQUID SYSTEM RESPONSE routines or can be keyboard entered. Liquids dispensed form the anti-icing boom may have different constants than those from the pre-wet bar because of different plumbing components.

h. SYS RSPNS (System Response) - Adjusts the control system response time to the hydraulic and mechanical systems of the of the liquid control channel for each particular spreader vehicle. The value calculates automatically during calibration routines but can be fine-tuned anytime for optimum performance by keyboard entry.

i. VALV BOOST (Valve Boost) - Increases the amount of system response initially applied to reach final operating speed as quickly as possible.

j. AFILT (A Filter) - Filters the feedback signal to minimizes effects of electrical noise and mechanical vibrations. The smaller the number the greater degree of filtering.

k. DENSITY - Represents the relative density of the material being applied. The number used is the approximate weight of one liquid gallon.

l. PRES OFFSET - Output voltage of pressure transducer for zero output flow which is normally set automatically during calibration.

m. MAX PRESS - Maximum pressure on the system before the alarm sounds.

n. MAX VOLT - Maximum output voltage driving the pressure transducer. The correct number is in the transducer literature.

o. NZLE CNST (Nozzle Constant) - Represents the number of gallons per minute passing through a nozzle.

p. NZLE PRES (Nozzle Pressure) - Represent nominal operating pressure for the installed nozzles. The correct number is found either on the nozzle or in the nozzle literature.

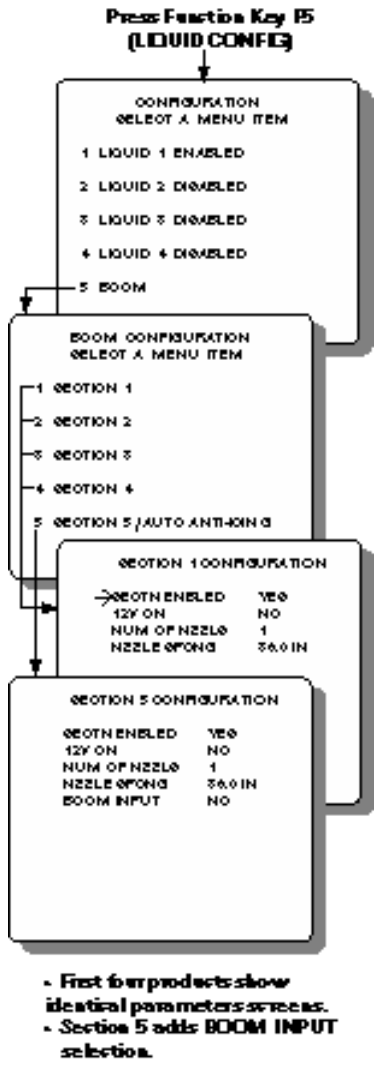
4. Press F5 to return to the LIQUID CONFIGURATION screen.

If other liquid materials require programming, repeat the above procedures for those materials. All pre-wet liquids should be programmed first to avoid confusion.

5. If the anti-icing booms require configuration, select the 5 key from the LIQUID CONFIGURATION screen.

The screen appearing shows five boom sections for selecting (See Figure 27).

Figure 27. Configuring Boom Sections of Liquid Channel



6. Select a boom section and press a key number for the desired SECTION CONFIGURATION screen (See Figure 27).

The parameters for this screen are as follows:

a. SECTN ENBLED (Section Enabled) - Enter Y (YES) to enable the boom section, N (NO) to disable.

b. 12V On - Entering Y (YES) indicates +12 volts activates the section solenoid. N(NO) means grounding activates the section solenoid.

c. NUM OF NZZLS (Number of Nozzles) - Enter the number of nozzles in the boom section.

d. NZZLE SPCNG (Nozzle Spacing) - Enter the distance between nozzles.

e. BOOM INPUT - This parameter only appears for Section 5. Entering N (NO) enables the boom to sense the position setting of a Pre-wet/Anti-ice switch.

If the boom has been enabled to sense the position of a Pre-wet/ Anti-ice Switch, the Liquid channel (while in the OPERATE mode) automatically switches between Liquid 1 (Pre-Wet) and Liquid 2 (Anti-ice) to avoid having to use the Material Select Screen to make the change.

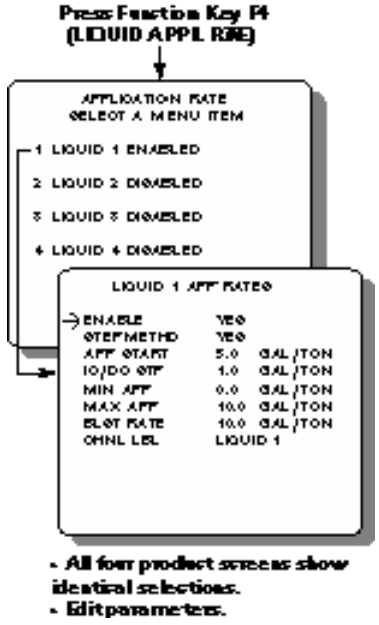
To use the Pre-wet/Anti-icing auto switch input feature, SECTION 5/AUTO ANTI-ICING configuration must be set as follows:

Section Enabled NO
Boom Input NO

PROGRAMMING LIQUID APPLICATION RATES (F4)

The APPLICATION RATE screens lists four liquid materials. Each material screen contains a set of values for product application rate, APR steps, min/max limits, and blast rate. The pre-programmed values for these parameters are usually the same for all liquid pre-wet materials and the same for all liquid anti-icing materials. Each screen should be edited and modified as required. Note: F5 should be used to select between pre-wet and anti-ice for the liquid before proceeding.

Figure 28. Setting Up Liquid Application Rates (Step Method)



1. **From the keyboard, press F4 to obtain the LIQUID APPLICATION RATES screen (See Figure 28).**

   Four (4) liquid product names are shown, each followed by the word ENABLED or DISABLED (See Step 3).

2. **Select a material using the corresponding number key.**

   (See Figure 28).

3. **Edit the parameters on the selected screen.**

   Check each following item for desired settings.

   a. ENABLE - When enabled, the material appears on the MATERIAL/MANUAL SPEED SELECT screen in the Operate mode to allow selecting for use. Enter Y for YES (enabled), N for NO (disabled).

   At least one liquid product must be enabled. All products can be programmed (and calibrated) now and enabled later.

   b. STEP METHD - Y (YES) selects the Step method or N (NO) the Rate method to specify application rates (APRs). Since each method performs essentially the same function, the choice becomes a personal preference. However, the parameters for each method are different and all items below change with the selection (See Figure 29 for Rate Method screen).

   Changing from one APR method to the other for any material automatically clears all previous rates from that method.

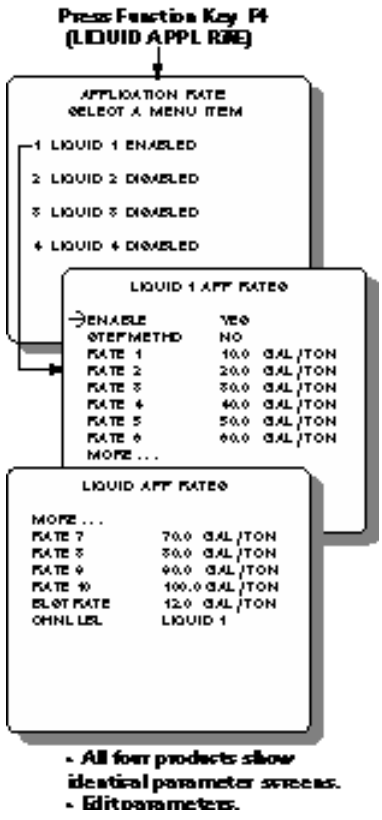
   The STEP method permits the APR to be changed by a fixed increment using the "+/–" switch on the Switch Module. The RATE method allows programming of up to ten (10) different APRs - RATE 1 through RATE 10. If less than ten rates are chosen, enter a zero (0) for each rate following the last one programmed. The initial rate displayed in the OPERATE mode is RATE 1. Other rates are selected by pressing the "+/–" switch on the Switch Module.

   c. APP START (Step method) – Defines the start-point APR.

   d. IC/DC STP (Step method) - Sets the increase/decrease step value.

   e. MIN APP (Step method) – Defines the minimum APR limit for the product.

Figure 29. Setting Up Liquid Application Rates (Rate Method)



f. MAX APP (Step method) – Defines the maximum APR limit for the product.

g. RATE 1 through RATE 10 (Rate Method) – Defines up to ten individual APR rates.

h. BLAST RATE (Step or Rate method) – Defines a higher than normal, spot-application rate applied when the red BLAST button is pressed.

i. CHNL LBL (Channel Label) (Step or Rate method) – Any product material name of up to nine (9) characters can be keyed in. Pressing the ENTER key stores the name for display on all granular screens including the OPERATE screen wherever that material appears .

4. Press F4 to return to the LIQUID APPL RATE screen (See Figure 28).

If other liquid materials require programming, repeat the above procedures for those materials.

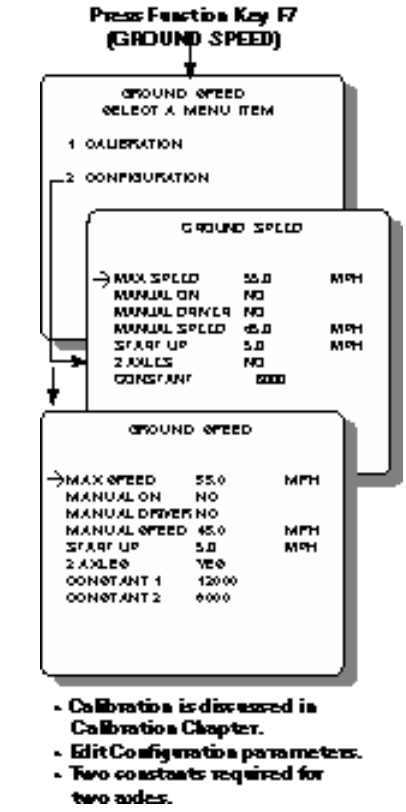
Note: All liquid parameters definitions are the same as granular except APR measurements are in GAL/TON. If the liquid channel is anti-ice, APR units are GAL/MILE instead.

USING THE CALIBRATION MENU (F6)

Calibration is discussed in the next Chapter. All calibration constants not entered in this Chapter during PROGRAMMING must be determined by performing the related calibrations in the next chapter.

CONFIGURING GROUND SPEED (F7)

Figure 30. Configuring Ground Speed Sensors



1. **From the keyboard, select Function key F7 to obtain the GROUND SPEED screen (See Figure 30).**
2. **Press 2 to display the GROUND SPEED screen.**
3. **Edit the parameters on the screen.**

   a. MAX SPEED - Indicates the maximum speed the operator can drive in the AUTO mode before a "MAX SPEED EXCEEDED" warning appears and the alarm sounds. The value entered is arbitrary based upon knowledge of the highest speed giving acceptable system performance. If a zero (0) is entered, the function is disabled.

   b. MANUAL ON - If the ground speed sensor becomes damaged, an internally-generated ground speed signal can be substituted temporarily to continue operation. The artificial ground speed signal activates by entering Y (YES). This signal is also useful for testing, troubleshooting, or calibrating the vehicle while stationary.

   c. MANUAL DRIVER - Y (YES) enables the operator to activate the manual speed mode by adding MANUAL SPEED selection to the bottom of the MATERIAL/MANUAL SPEED SELECT screen. N (NO) removes the choice.

   d. MANUAL SPEED - Represents the ground speed in miles per hour (MPH) to be simulated with an artificial, internally-generated signal. The operator must attempt to maintain vehicle speed near this MANUAL SPEED value to ensure materials are spread near the target APR.

   e. START UP - Represents the speed the system begins using ground speed sensor pulses. Until this threshold is crossed, the STARTUP ground speed signal is used.

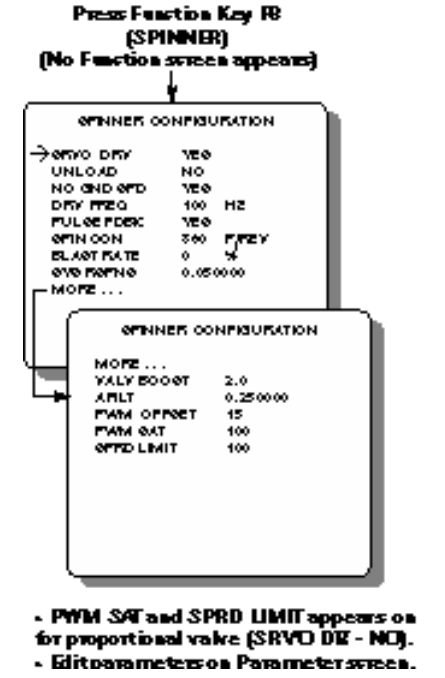
   f. 2 AXLES - If the vehicle is equipped with a two-speed axle, enter Y (YES). Doing so causes two CONSTANTS to appear at the bottom of the screen.

   g. CONSTANT (CONSTANT 1 & CONSTANT 2) - Defines the number of pulses received from the ground speed sensor per mile of travel. If known, this constant can be keyboard entered. If unknown, the value automatically calculates during GROUND SPEED CALIBRATION. Those vehicles equipped with a two-speed axle require two constants, CONSTANT 1 and CONSTANT 2. Depending upon axle-shifter polarity, CONSTANT 1 may be either the Lo-speed axle or the Hi-speed axle.

CONFIGURING THE SPINNER CHANNEL (F8)

Configuration parameters specify actuators and sensors used along with performance specifications. These values do not change unless the system hardware changes or the related calibration routines are rerun.

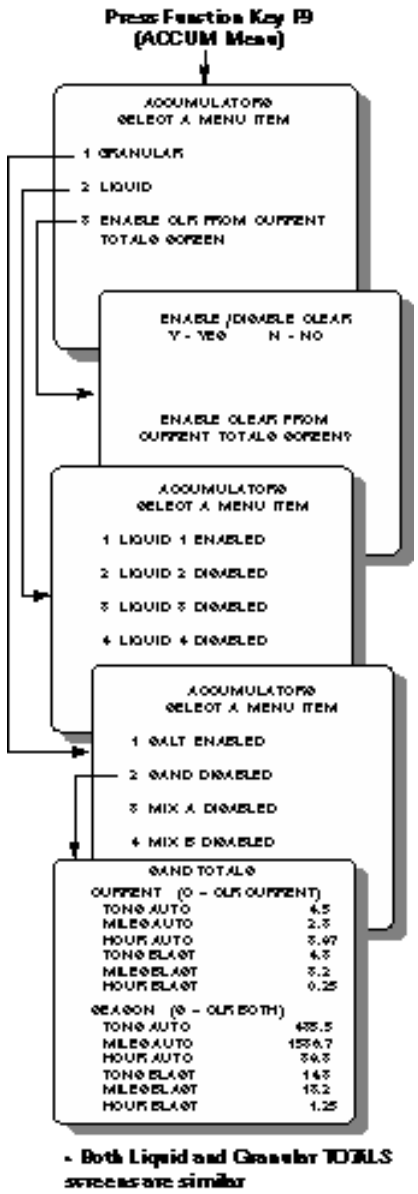
Figure 31. Configuring Spinner Channel



1. **From the keyboard, press F8 to obtain the SPINNER CONFIGURATION screen (See Figure 31).**
2. **Edit the parameters on the screen.**
   a. **SRVO DRV (Servo/Proportional Drive)** - Y (YES) indicates a servo-controlled valve, N (NO) indicates a proportional valve.
   b. **UNLOAD** - YES enables or NO disables the spinner during unloading.
   c. **NO GND SPD** - YES enables spinner operation when ground speed is zero; NO disables at zero speed.
   d. **DRV FREQ** (Drive Frequency) - Represents the valve manufacturer's suggested drive frequency, as shown on the valve specification sheet. The rated drive frequency for the DICKEY-john servo valve is 100 Hz.
   e. **PULSE FDBK** (Pulse Feedback) - YES indicates a pulsed feedback sensor for closed loop control. NO indicates an open loop control.
   f. **SPIN CON** (Spinner Constant) - Represents the number of spinner feedback pulses per revolution. This selection appears only if pulse feedback is selected (YES).
   g. **BLST RATE** (Blast Rate) - If set to 0%, the SPREAD WIDTH ADJUST knob position determines the spinner speed. Other values indicate the percentage of maximum spinner speed, regardless of knob setting.
   h. **SYS RSPNS** (System Response) - Adjusts the control system response time to the hydraulic and mechanical systems for a particular spreader vehicle.
   i. **VALV BOOST** (Valve Boost)– Increases the system gain initially applied to the control channel to reach final operating speed (target APR) as quickly as possible.
   j. **AFILT** (A Filter) – Minimizes the effects of electrical noise and mechanical vibrations on the feedback signal. The smaller the number the greater the degree of filtering. The value can be manually fine tuned for best results.
   k. **PWM OFFSET** – Defines valve operating starting point.
   l. **PWM SAT** – Defines valve operating end point (maximum position). PWM OFFSET and PWM SAT are manually set for proportional valves. The Proportional Valve Spinner Procedure determines the actual values (See Chapter 4).

MONITORING/RESETTING ACCUMULATORS (F9)

Figure 32. Accessing and Resetting the Accumulators



Accumulators store current run and season run totals of distance traveled, material amount, and time spent spreading materials in both the AUTO and BLAST modes. Separate totals are accumulated for each material. All of the current and season accumulators can be cleared (zeroed) from this mode (F9).

1. **From the keyboard, press Function key F9 to display the ACCUMULATORS screen (See Figure 32).**

   Three selections appear - GRANULAR, LIQUID and ENABLE/DISABLE CLR FROM CURRENT TOTALS SCREEN.

2. **Press 1 for GRANULAR or 2 for LIQUID to monitor the accumulators for corresponding materials. Press 3 to enable/disable the clearing of the CURRENT TOTALS screen in the Operate mode.**

   When pressing either the 1 or 2 key, four materials display for monitoring.

   If pressing the 3 key, skip to Step 6.

3. **If GRANULAR or LIQUID is selected from Step 2 above, select the material by pressing the corresponding key.**

   A divided screen appears showing CURRENT totals (top half) and SEASON totals (bottom half).

4. **To clear CURRENT totals, press C. To clear both CURRENT and SEASON totals, press S.**

   The season totals cannot be cleared separately.

5. **To clear accumulators for other materials, press F9 to return to the ACCUMULATOR screen and select the next material.**

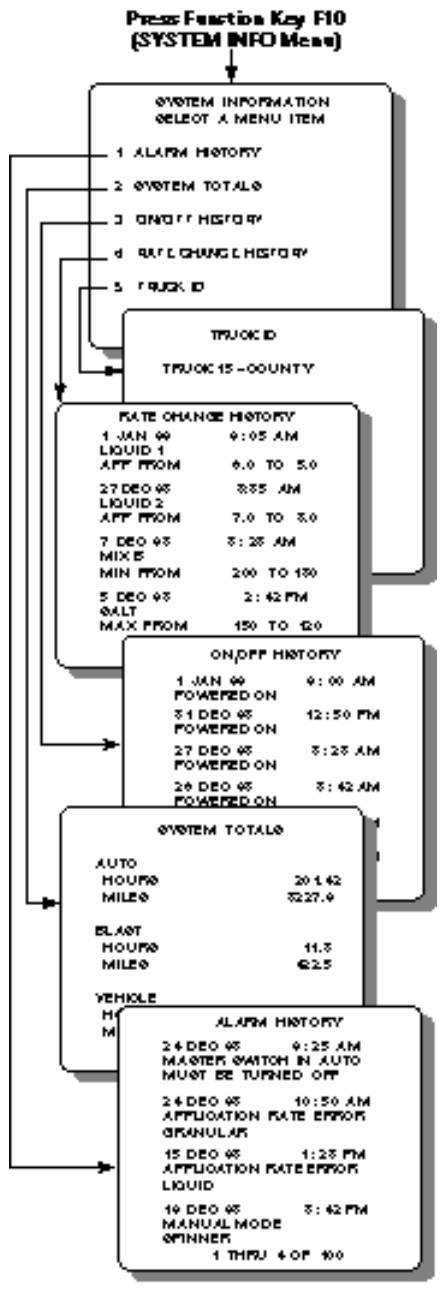
   Continue as before to clear the totals.

6. **To enable clearing the CURRENT TOTALS screen in the OPERATE mode, press F9 to return to the ACCUMULATORS screen and then the 3 key to select the ENABLE/DISABLE CLR FROM CURRENT TOTALS SCREEN (See Figure 32).**

   The question asks if a change from the existing status (enable or disable) is desired. YES causes the ENABLE/DISABLE CLEAR selection to alternate. A setting of NO leaves the ENABLE/DISABLE CLEAR status unchanged.

READING SYSTEM INFORMATION (F10)

Figure 33. Accessing System Information



1. **From the keyboard, press F10 to display the SYSTEM INFORMATION screen (See Figure 33).**

   The five items display - ALARM HISTORY, SYSTEM TOTALS, ON/OFF HISTORY, RATE CHANGE HISTORY and TRUCK ID.

2. **Select and press the corresponding number key to view the related screen.**

3. **Review the information of each screen.**

   a. ALARM HISTORY - Records all alarms encountered by the system including the time and date of each occurrence with a brief alarm description. A maximum of the latest 100 error events are logged with the oldest ones dropping out as new ones occur. The up/down arrow keys scroll the events for viewing.

   b. SYSTEM TOTALS - Displays time and distance totals for all materials combined. Totals display for three categories - AUTO, BLAST, and VEHICLE. These totals are ongoing and cannot be reset.

   c. ON/OFF HISTORY - Lists each occurrence for power on, power off, manual speed, MASTER Switch module on/off, and channel on/off with time and date for each event. A maximum of the latest 100 events are logged with the oldest events dropping out as new events occur. The up/down arrow keys scroll the events for viewing and the bottom line of the screen indicates the group of events displaying.

   d. RATE CHANGE HISTORY - Records each occurrence with time and date of target application rate (APR) changes. A maximum of the latest 100 events are logged with the oldest dropping out as new ones occur. The up/down arrow keys scroll the events for viewing.

   e. TRUCK ID - This screen allows entering an identifying name for the truck which can be changed at anytime. The entry is changed by typing the new name and then pressing the ENTER key to accept the change.

PERFORMING SYSTEM RESPONSE (F11)

After all configuration constants have been entered for a given vehicle, the SYSTEM RESPONSE must be performed in preparation for spreading materials (See Chapter 4).

CHAPTER 4 – SYSTEM CALIBRATION

Due to the many combinations of hydraulic/liquid pumps, valves and motors plus the different material delivery systems, each spreader truck becomes unique. System calibration defines the spreader configuration characteristics for optimum accuracy of the Control Point system. Performing the following procedures in the order outlined ensures the greatest accuracy when finished.

RECORDING CALIBRATION DATA

After finishing each routine, record the calibration constant on the CALIBRATION DATA RECORD sheets at the rear of this manual. If console replacement becomes necessary, most system parameters can be quickly transferred to the new unit via keyboard entry. If additional sheets are required, make copies and keep them with this manual.

REPEATING CALIBRATION RUNS

To minimize operator and other procedural errors, most tests should be repeated several times (three times), average the results, and keyboard enter the constants. The SYSTEM RESPONSE CALIBRATION does not require repeating.

CALIBRATING GROUND SPEED (F7-1)

Figure 34. Ground Speed Calibration, Single Speed Axle

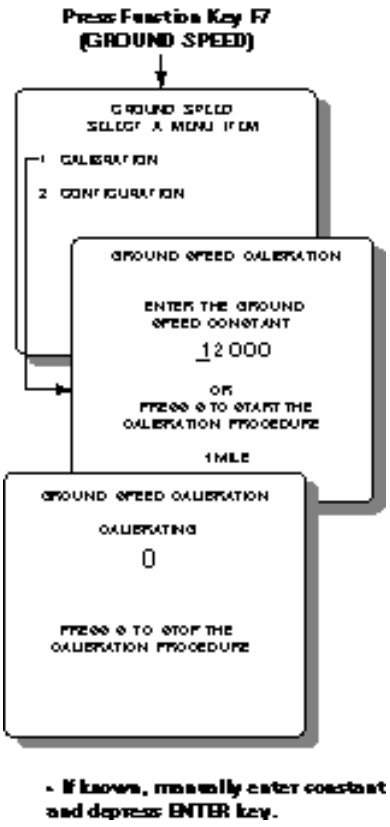


Figure 35. Ground Speed Calibration, Two Speed Axle

Ground speed calibration establishes a ground speed constant(s) for the vehicle. The constant is determined by counting the number of ground speed sensor pulses generated in a distance of one (1) mile. For those vehicles having a two-speed axles, two ground speed constants must be determined, CONSTANT 1 and CONSTANT 2.

To determine a correct constant, proceed as follows:

1. **Accurately measure one mile, plainly marking the start and finish points.**

   Markers should be plainly visible from the cab while driving past. Alternatively, two highway mileage markers may be used.

2. **Press F7 and then the 1 key to obtain the GROUND SPEED CALIBRATION screen (See Figure 34).**

   The screen appearing allows keyboard entry of the ground speed constant, if the correct value is known. To enter a number, key in the value and press ENTER. If ENTER is not pressed, a prompt screen appears asking for a Y (YES) or N (NO) before proceeding. To calculate the constant, proceed to the next step.

3. **Drive up to the start of the course at a minimum speed of 5 MPH (8 Km/hr). When exactly even with the start marker, press "S" on the keyboard as prompted. (See Figure 34).**

   The number on the screen resets to zero (0) and begins counting up as the vehicle is moving.

4. **Continue driving at a speed typical of normal operation. At the finish marker press "S" again to stop pulse counting.**

   The accumulated number on the screen is the new ground speed constant.

5. **To ensure accuracy, repeat the calibration procedure three times and average the results. Keyboard enter the average value.**

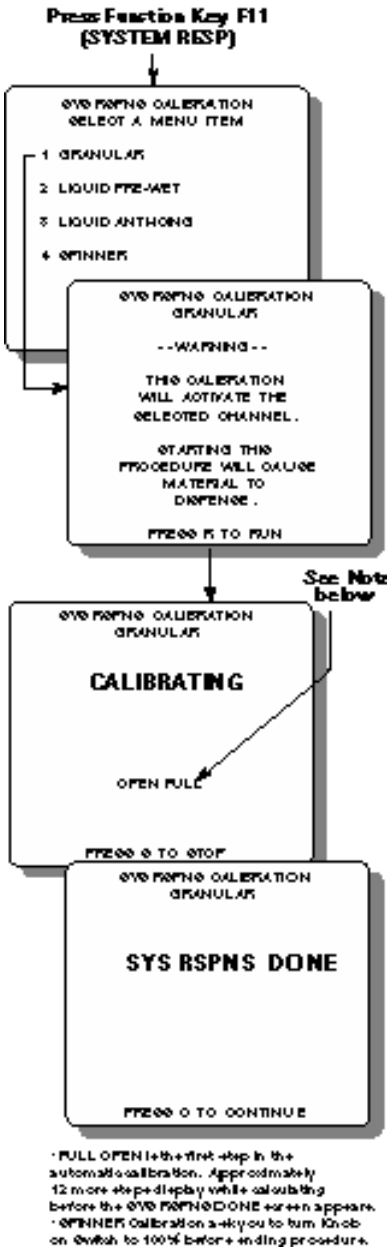
6. **Record the GROUND SPEED CONSTANT on the CALIBRATION DATA RECORDS sheets at the rear of this manual.**

   On vehicles equipped with a 2-speed axle, the ground speed calibration procedure must be performed in both the Hi-speed and Lo-speed axle settings (See Figure 35). The console automatically detects when the axle ratio has been changed. To calibrate, simply change the axle ratio and rerun.

   Press the ESC key or any F key to leave the Calibration screen.

CALIBRATION SYSTEM RESPONSE (F11)

Figure 36. System Response Calibration Screens



These constants adjust the response time of the Control Point™ system to the hydraulic and mechanical systems. This procedure determines the System Response (SYS RSPNS) and related constants (VALV BOOST, PWM OFFSET, PWM SAT, and AFILT) for each of the three control channels (granular, liquid, and spinner).

Constants normally vary slightly each time a SYSTEM RESPONSE CALIBRATION is run. Manual fine-tuning for optimum performance is permissible (See paragraph "Fine-tuning System Response Parameters"). To maintain a performance history, always record new constants on the CALIBRATION DATA RECORD sheets each time a routine is run or fine-tuned .

a. GRANULAR - During calibration, a set of values for SYS RSPNS, VALV BOOST, PWM OFFSET, PWM SAT (servo only), and AFILT automatically calculate, store, and display on the GRANULAR CONFIGURATION screens for all (up to four) granular materials.

b. LIQUID PR-WET - The pre-wet spray bar and anti-icing boom liquids require separate procedures due to differences in flowmeters, nozzles, and plumbing components. Calibration establishes a similar set of parameters as above for all pre-wet liquid materials.

c. LIQUID ANTI-ICING - Calibration establishes a similar set of parameters as above for all anti-ice materials used on the system.

d. SPINNER - Calibration determines the spinner channel parameters and correlates the fully clockwise position of the WIDTH ADJUST knob with the 100% mark on the SPREAD WIDTH bar display.

The following procedure outlines GRANULAR SYSTEM RESPONSE CALIBRATION. Liquid prewet and liquid anti-ice channels are very similar and, therefore, not specifically described or shown.

1. **Press F11 to obtain SYSTEM RSPN CALIBRATION menu.**

   Four choices display (See Figure 36).

2. **Press 1 to select GRANULAR.**

   A warning screen states CALIBRATION WILL ACTIVATE THE SELECTED CHANNEL when the test begins.

3. **When ready to start, press “R” on the keyboard.**

   A screen appears to indicate CALIBRATING. When finished, a screen appears stating SYS RSPNS DONE.

4. When the calibration is complete, press the "C" key to continue as prompted at the bottom of the screen.

The resulting values automatically record in the proper locations. Access the GRANULAR CONFIG Function (F3) and copy the numbers to the CALIBRATION DATA RECORD SHEET in the rear of the manual.

5. Repeat this procedure for the remaining control channels.

Multiple runs and averaging results are unnecessary. Liquid must be primed before running a system response. The UNLOAD feature can be used to prime the pump.

FINE TUNING SYSTEM RESPONSE CONSTANTS

The automatic System Response routines are not necessarily exact. Operators may want the system to respond faster or slower than calculated by the automatic routines. These values can be adjusted slightly to tailor the response to operator needs. It is important to note that automatic routines must always be run prior to modification to establish basic values. The following are a few general guidelines.

A. SYS RSPNS Constant

If the control system responds slowly to changes in speed and is slow to start, the SYS RSPNS value should be increased. If the system is oscillating around the target APR, the SYS RSPNS may be too large and should be decreased. Excessive oscillation should be limited to ±5% of the target APR to minimize wear on both the PWM and servo valve actuators. Most systems can be tuned by altering only this value.

B. VALV BOOST

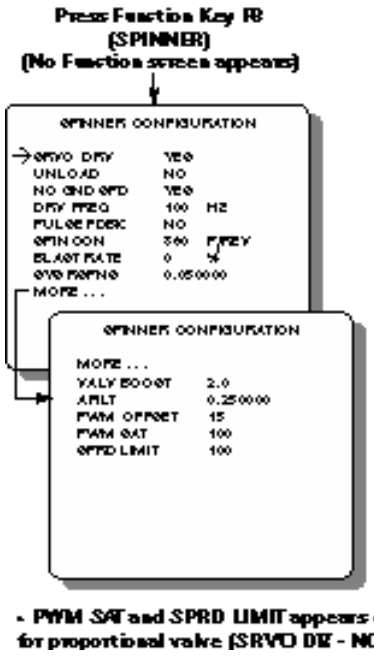
This value increases SYS RSPNS only at start-up to more quickly start system spreading. The value does not affect stability when operating at the target APR and does not normally require changing.

C. AFILT

This value defines the amount of feedback noise rejection. The smaller the number the greater the filtering. Noisy feedback sensors cause the APR's to randomly jump around. Decreasing the AFILT may reduce the problem but also causes the system to become more sluggish. Typically, this value does not require changing but check the response time if fine tuning becomes necessary.

CALIBRATING PROPORTIONAL VALVE SPINNER (F8)

Figure 37. Proportional Valve Spinner Calibration Screens



- PWM SAT and SPRD LIMIT appears on for proportional valve (SRVO DIR - NO).

This calibration determines appropriate values for PWM OFFSET and PWM SAT when using a proportional valve with no feedback sensor to drive the spinner channel (See Figure 37).

1. **With the spinner WIDTH ADJUST knob fully counterclockwise (CCW), verify the spinner is not rotating.**

   These checks must be performed in the Operate mode. Rotate spinner WIDTH ADJUST knob clockwise (CW) one position and verify spinner rotates slowly. If it rotates too fast decrease OFFSET by one (1). If it rotates too slowly increase OFFSET by one (1).

2. **With the spinner WIDTH ADJUST knob fully clockwise (CW), verify the spinner is running at full speed.**

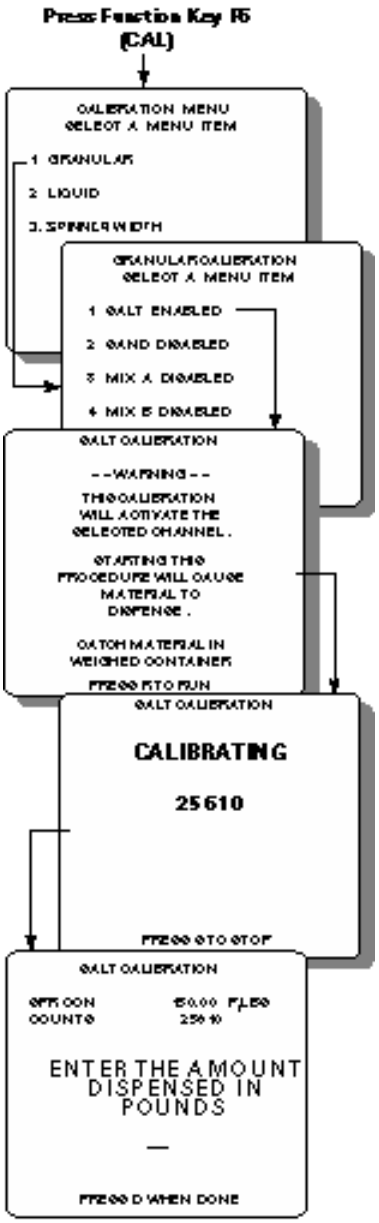
   If it is rotating too slowly, increase the SAT value by one (1) and recheck. Repeat as necessary. The maximum value for SAT is 100.

3. **If the spinner turns too fast, decrease the SAT value until a satisfactory maximum speed is obtained.**

   The SAT value must be greater than the OFFSET value.

CALIBRATING GRANULAR MATERIALS (F6)

Figure 38. Granular Calibration



The GRANULAR CALIBRATION determines the spreader constant (SPR CON) for a given granular material. The spreader constant is the number of pulses generated by the application rate sensor per pound of granular material discharged. A separate calibration routine must be run for each granular material used.

GRANULAR CALIBRATION (also referred to as a granular "catch test") causes the control system to run the conveyor/auger mechanism, dispensing material while the vehicle is stationary. When a sufficient amount of material has been discharged, the operator stops the spreader mechanism, weighs the material discharged, and keyboard enters the amount. The system then calculates, stores, and displays the SPR CON. The procedural steps are as follows:

1. **Load the vehicle hopper with the desired material and verify the gate height is adjusted to the proper setting.**

   Load enough material to provide a uniform flow throughout the calibration procedure.

2. **Position a suitable container or drop cloth to catch all dispensed material from the conveyor/auger.**

   The container must be large enough to obtain a good, representative sample. The larger the sample weighed, the better the accuracy. Alternatively, if a vehicle scale is available, weigh the truck before and after dispensing material.

3. **Press Function key F6 to access the CALIBRATION MENU screen (See Figure 38). Press the 1 key to select GRANULAR CALIBRATION.**

4. **Select the granular material for calibration (keys 1 - 4).**

   The words ENABLED and DISABLED after the selected product have no significance to the calibration. Figure 38 illustrates the SALT CALIBRATION selection. Other selections are equivalent.

   A warning message displays stating STARTING THIS PROCEDURE WILL CAUSE MATERIAL TO DISPENSE. Ensure all personnel are clear before starting the next step.

5. **With the vehicle stationary, engage the hydraulic system. Increase engine RPMs to normal operating range.**

6. **Press “R” on the keyboard to run the conveyor/auger and start the calibration.**

   Press the granular channel “+/-” switch on the Switch Module, as required, to obtain a normal discharge rate. The number in the middle of the screen shows the counts accumulating from the APR sensor.

7. **When a sufficient amount of material has been dispensed, press “S” to stop the system.**

   A screen appears showing the previous SPR CON and the sensor COUNTS accumulated during the current run. The screen asks for an entry of pounds before proceeding. Perform the next step while the screen waits for the results.

8. **If using a vehicle scale, reweigh the truck and calculate the amount of material dispensed in pounds.**

9. **Enter that number into the console and press ENTER. Press “D” when finished.**

   The spreader constant (SPR CON) is now stored and displayed on the SALT CALIBRATION screen and on the GRANULAR CONFIGURATION screen for this material.

10. **For maximum accuracy, repeat the entire procedure at least three times.**

    Temporarily write down the resulting SPR CON each time. Average the results and keyboard enter the average as the final SPR CON. Then record the SPR CON for this material on the CALIBRATION DATA RECORDS sheets at the rear of this manual.

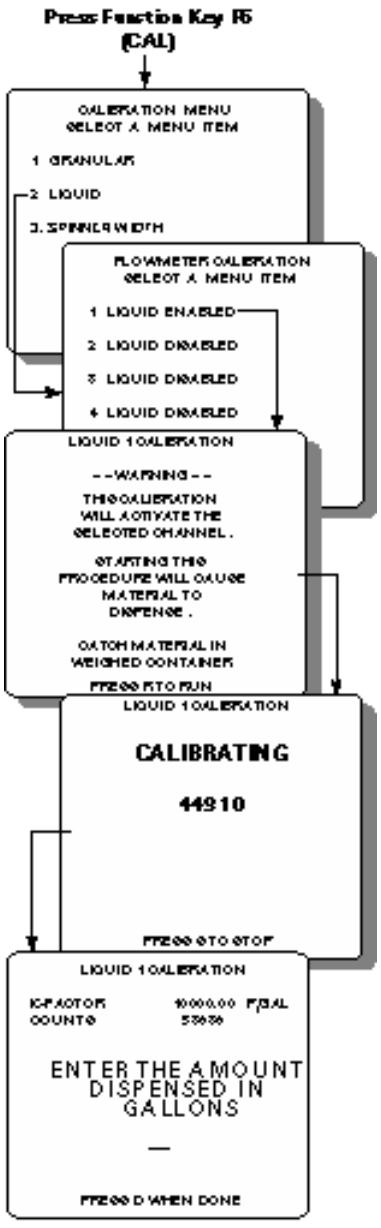
11. **Repeat this procedure for each granular material used.**

FINE-TUNING THE GRANULAR CALIBRATION

If small but consistent application rate errors are observed over a period of time, the spreader constant can be modified to fine-tune application accuracy. See Appendix A, Item 1 for steps required to calculate the new spreader constant, which is then keyboard entered on the (F3) GRANULAR CONFIGURATION screen. Alternatively, the GRANULAR CALIBRATION routine can be repeated to correct this type of APR error.

CALIBRATING LIQUID MATERIALS (F6)

Figure 39. Liquid Calibration



The LIQUID CALIBRATION determines a flowmeter constant (K-FACTOR) or nozzle constant (pressure based system) for each liquid material used. The K-FACTOR represents the number of pulses generated by the flowmeter per gallon of liquid dispensed. The NZLE CNST is a measure of flow rate through the nozzle at a standard pressure. Separate calibrations are necessary for each liquid material because of viscosity differences.

The LIQUID CALIBRATION routine (also referred to as a liquid "catch test") causes the control system to run the liquid pump, dispensing material while the vehicle is stationary. When a sufficient amount of liquid has been discharged, the operator stops the system, weighs the discharged liquid, and keyboard enters the amount. The system then calculates, stores, and displays the K-FACTOR (NZLE CNST). The procedural steps are as follows:

1. **Load vehicle tank with the material.**
2. **Position a suitable container to catch all the material dispensed through the liquid pump.**

   The container must be large enough to obtain a good, representative sample. The larger the sample weighed, the higher degree of accuracy. When calibrating a pre-wet liquid material, the pre-wet bar may be removed from its mounting and placed inside the catch container. Alternatively, especially for flowmeter based anti-ice liquid materials, temporarily disconnect an appropriate hose and place inside the catch container.

3. **Press Function key F6 to access the CALIBRATION MENU screen. Press the 2 key to select LIQUID for the FLOWMETER CALIBRATION screen (See Figure 39).**
4. **Select the liquid material for calibration (key 1 - 4).**

   The words ENABLED and DISABLED after the selected product have no significance to the calibration. Figure 39 illustrates the LIQUID 1 CALIBRATION selection. Other selections are equivalent.

   A warning message displays stating STARTING THIS PROCEDURE WILL CAUSE MATERIAL TO DISPENSE. Ensure all personnel are clear before starting the next step.

   For pressure based anti-ice systems, it is necessary to enter a target pressure. This should be the nozzle manufactures rating pressure, typically 40 psi (2.75 bar).

Note: If running pressure, make sure booms are drained prior to running “OFFSET”.

5. **In the case only where the liquid channel is propelled by the hydraulic system, start the engine, keeping the vehicle stationary. Engage the hydraulic system, and increase engine RPMs to normal operating range.**

6. **Press “R” on the keyboard to run the liquid pump and start the calibration routine.**

   For flowmeter based systems, use the liquid channel “+/-” switch on the Switch Module, as necessary, to obtain an adequate discharge rate. The number displayed indicates the accumulating count from the APR sensor.

7. **When a sufficient amount of liquid has been dispensed, press “S” to stop.**

   For a flowmeter based system, a screen appears showing the previous K-FACTOR and the sensor COUNTS accumulated during the current run. For a pressure based system, the previous NZLE CNST and collection time are displayed. The screen asks for an entry of gallons before proceeding. Perform the next step while the screen waits for the results.

8. **Weigh the material caught and calculate the amount dispensed in gallons.**

9. **Enter that number into the console and press “ENTER”. Press “D” when finished.**

   The flowmeter constant (K-FACTOR or NZLE CNST) is now stored and displayed on this screen and on the LIQUID CONFIGURATION screen for this material.

10. **For maximum accuracy, repeat the entire procedure at least three times.**

    Temporarily write down the resulting K-FACTOR (NZLE CNST) each time. Average the results and keyboard enter the average as the final K-FACTOR (NZLE CNST). Then record the K-FACTOR (NZLE CNST) for this material on the CALIBRATION DATA RECORDS sheets at the rear of this manual.

11. **Repeat this procedure for each liquid material used.**

FINE-TUNING THE LIQUID CALIBRATION

If, after using a flowmeter or nozzle constant over a period of time, small but consistent application rate errors are observed, its value can be manually changed to fine-tune application accuracy. See Appendix A, Item 2 to calculate the modified flowmeter constant, which is then keyboard entered on the LIQUID CONFIGURATION (F5) screen. Alternatively, the LIQUID CALIBRATION routine can be repeated to correct this type of APR error.

CALIBRATING SPINNER WIDTH (F6)

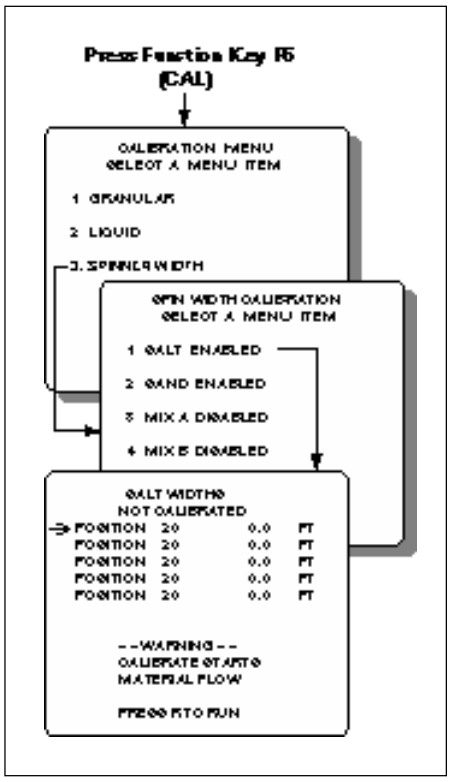


Figure 40. Spinner Width Calibration

The spinner width calibrtation determines the spread width as indicated by the spinner knob position for area based units (i.e. MILE-FEET, SQ FEET, SQ YARD, KILOMETER-METER, and SQ METER). Area based units are selected in the MISCiscellaneous menu (F12) under SYSTEM UNITS (Item 3). Since vehicles vary, a multi-point calibration is necessary to assure accurate spreading throughout the spinner knob range. Also, material densities vary requiring a separate calibrations.

1. **Load the vehicle with material.**
2. **Press Function key F6 to access the CALIBRATION MENU. Press the 3 key to select SPINNER WIDTH.**
3. **Select a material for calibration (Items 1 through 4).**

   The words ENABLED and DISABLED after the selected product has no significance to the calibration. Figure 40 illustrates SALT CALIBRATION; other selections are equivalent.

4. **Place the Spinner Knob at 0 and press R.**

   The spinner mechanism actives after pressing R. Placing the knob at 0 shuts the spinner off. This verifies the valve OFFSET value is correct.

5. **Rotate the Spread Width knob to 20. Measure and record the width material is spread. Repeat at 40, 60, 80, and 100.**

   The arrow on the left side of the screen automatically follows the Spread Width knob setting. The arrow position allows measured widths to be entered into the proper location.

6. **Press S to stop the routine when finished.**

MAINTAINING CALIBRATION ACCURACY

If a new material is added and the spreader, nozzle, or flowmeter constant is not accurately known, the GRANULAR or LIQUID CALIBRATION routine must be run. Also, if wear of the conveyor/auger mechanism, actuator valves, flowmeter, nozzles, or other system components is suspected, a new catch test (GRANULAR or LIQUID CALIBRATION) should be performed to re-establish APR accuracy.

After installing new or different tires, the GROUND SPEED CALIBRATION should be repeated. Each known physical (mechanical) change in the system should be followed immediately by a SYSTEM RESPONSE calibration on the related control channel (granular, liquid pre-wet, liquid anti-ice, or spinner).

Repair or replacement of any system components, including hydraulic hoses, fluid changes and even normal wear, make it necessary to periodically recalibrate the system. Even without known changes, the SYSTEM RESPONSE CALIBRATIONS should be performed at minimum intervals of one year. A good rule of thumb is to recalibrate all three control channels at the start of each spreader season.

DICKEY-john™

CHAPTER 5 – SYSTEM INSTALLATION

These instructions describe the installation of the Control Point™ Console, Switch Module, and system harness assemblies. The Console mounts on the vehicle dashboard or other surface suitable for operator viewing using an U-bracket. The **standard** (combination) **mounting plate** secures the Switch Module immediately to the left of the Console. An **optional mounting plate** mounts the Console only.

The Switch Module cable, which plugs into the Console, is long enough to allow the Switch Module to be placed near the vehicle seat or elsewhere for operator convenience. If the combination mounting plate is used, the option remains to later remove the Switch Module from the mounting plate and to relocate it for convenience.

The system Main Harness, with an optional extension (Extension Harness), is laid out and connections are made to the sensor and actuator cables, battery, ignition switch, and additional options (two-speed axle, hopper level sensor, and boom sense inputs), as required. First, verify all items in the appropriate hardware mounting kit are present:

Standard Hardware Kit (46649-0380) for Console and Switch Module:

(1) Combination mounting plate (46649-0580)
(2) U-bracket (46649-0590)
(3) Two 1/4 - 20 x 1 inch hex bolts
(4) Five 1/4 inch split washers
(5) Two rubber washers (46390-0900)
(6) Two knob screws (20072-0022)
(7) Three 1/4 - 20 x 3/4 inch hex bolts
(8) Retaining clip (46649-0350)
(9) Two #6 self-locking hex nuts
(10) Three #6 plastite screws

Optional Hardware Kit (46649-0390) for Console only:

(1) Console mounting plate (46649-0370)
(2) U-bracket (46649-0590)
(3) Two 1/4 - 20 x 1 inch hex bolts
(4) Five 1/4 inch split washers
(5) Two rubber washers (46390-0900)
(6) Two knob screws (20072-0022)
(7) Three 1/4 - 20 x 3/4 inch hex bolts
(8) Retaining clip (46649-0350)
(9) Two #6 self-locking hex nuts

SELECTING THE CONSOLE LOCATION

The Console mounts inside the cab on any surface permitting easy readability of the display without obstructing the operator's view while driving (See Figure 41). Be sure the opposite side of the mounting surface chosen has clearance for installing and tightening the mounting bolts. Remember, the combination mounting plate positions the Switch Module to the left of the Console.

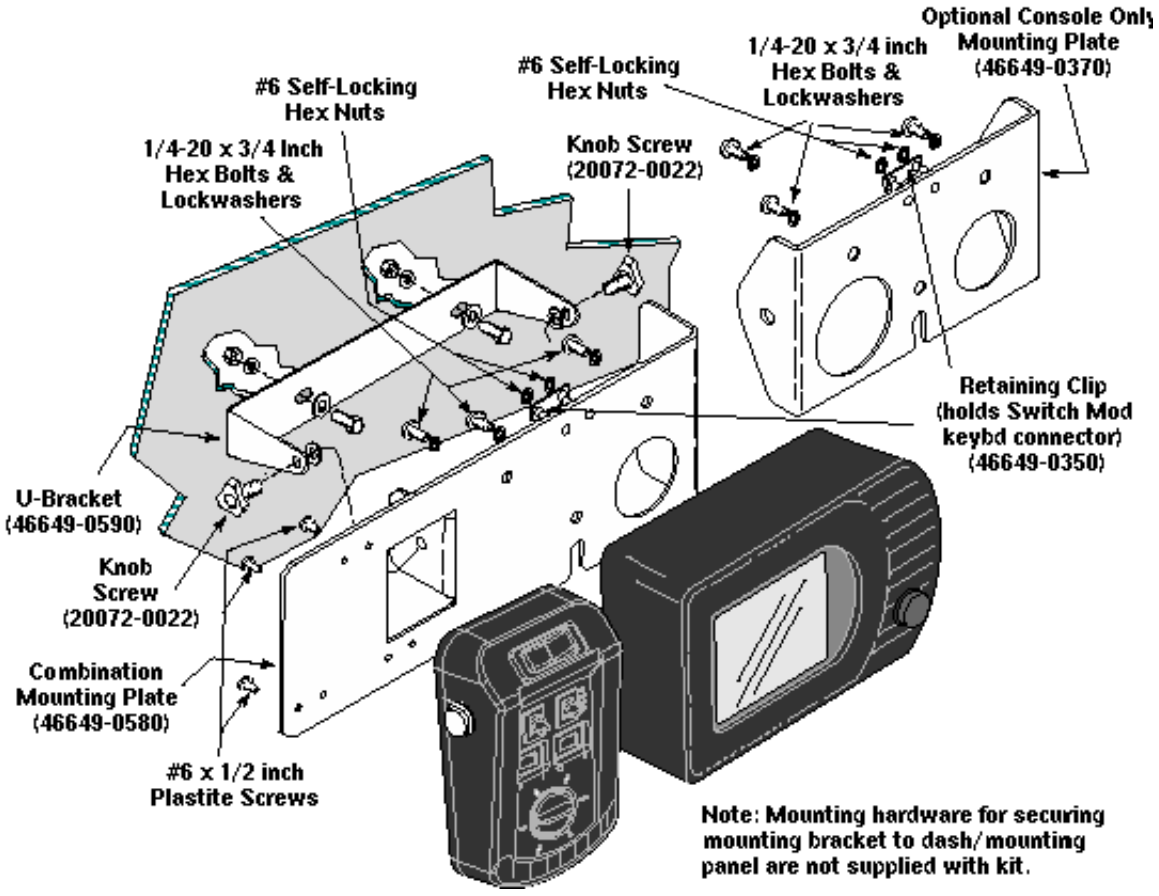
MOUNTING THE U-BRACKET

Place the U-bracket in the exact location for mounting and mark both drill holes with a pencil or scribe. If the Console is being mounted on the dash, move and secure wiring and other obstructions located beneath the dash. Drill two $^{9}/_{32}$ inch holes. Position the U-bracket in place on the mounting surface and insert the two 1 inch bolts. Install the lockwashers and nuts and tighten them.

INSTALLING CONSOLE AND SWITCH MODULE

Install the Console onto the mounting plate using three $^{3}/_{4}$ inch bolts and lockwashers. When using the combination mounting plate, install the Switch Module onto the mounting plate using three plastite screws. Note that two sets of holes exist in the mounting plate to allow for optional spacing between the Switch Module and Console. If the Console (only) mounting plate is used, install the Switch Module at the desired location. If placed on the vehicle seat, it must be secured in a suitable manner (possibly using Velcro™ strips) to ensure the control settings are not accidently changed or activated.

Figure 41. Console Mounting



CONNECTING SWITCH MODULE TO CONSOLE

Plug the circular connector of the Switch Module cable into the rear of the Console, rotating the connector collar fully-clockwise to lock it. Place the keyboard mating connector (with its pins pointing upward) between the two studs on the rear of the mounting plate. Capture this connector with the retaining clip and two self-locking nuts. The 9-pin RS-232 connector can be secured to the Switch Module cable with a cable tie, if desired. Figure 42 shows how the Switch Module cable connects to the Console and keyboard.

MOUNTING THE CONSOLE

Secure the Console and mounting plate (and Switch Module if the combination mounting plate is being used) to the U-bracket using the two knob screws. The rubber washers fit between the U-bracket and the mounting plate tabs. Pivot the Console for the best viewing angle and tighten the two knob screws.

ROUTING AND CONNECTING THE HARNESSES

First, verify all required "exterior system cables" are installed on the spreader vehicle according to their separate, individual instructions. These are defined as the sensor, actuator, ground speed, boom sense, and hopper level cables.

CAUTION: Make the Control Point™ battery connections last to ensure no accidental shorts occur during harness handling.

Two harnessing alternatives exist, depending upon whether the exterior system cable connectors need to be inside or outside the cab of the truck. If they need to be outside, skip to the heading "Using the Extension Harness". Figure 43 shows the Main and Extension harnesses.

Notes:

- *Use dust caps provided on all unused connectors, both internal and external. This includes keyboard and RS-232 connectors.*
- *Labels have been supplied in the dust cap kit to be placed on external extension cables routed to the flowmeter, granular and spinner sensors.*

LAYING OUT THE MAIN HARNESS (46649-0480)

Plug the largest circular connector of the Main Harness into the Console, rotating the connector collar fully-clockwise to lock it. Then route the harness to a clean, safe area (inside the cab) suitable for connection to the exterior system cables (from the sensors and actuators).

All connectors on the Main Harness are identified with labels to simplify hookup. If a suitable "punch-out" hole in the rear cab wall or floor is not available to bring in the exterior system cables, cut a hole approximately two and one-half ($2^1/_2$) inches in diameter. The edges of this hole should be covered with a piece of plastic or rubber U-channel material to protect the insulation of the cables passing through the hole. Anchor all cables suitably with nylon cable ties to prevent damage due to flexing and scraping. RTV or silicone caulk can be used to seal the hole.

CAUTION: Do not mistakenly connect the following lead directly to the battery voltage because this will prevent the system from storing data properly!

Connect the RED Ignition lead to the “switched “ terminal of the ignition switch. The correct terminal is at 12 volts DC or higher only when the ignition switch is turned on.

If the vehicle has a two-speed axle, connect the terminal of the YELLOW 2-Speed Axle lead to the appropriate terminal on the axle-shifter switch. If the vehicle does not have a two-speed axle, insulate the terminal with electrical tape and tie back this YELLOW lead with a cable tie.

Connect the hopper level sensor and boom sense inputs, if used. The Boom Sense 5 (gray wire) line can be connected to a pre-wet/anti-ice selector input switch.

Notes:

- *Use dust caps on all unused connectors, both internal and external. This includes keyboard and RS-232 connectors.*

CAUTION: Verify battery voltage is 12 volts, NOT 24 volts.

Finally, connect both Control Point™ Main Harness battery leads directly to the vehicle battery. Attach the RED wire to the positive battery terminal and the BLACK wire to the negative terminal.

USING THE EXTENSION HARNESS (46649-0460)

The Extension Harness is used only when the exterior system cable connectors need to be located outside the cab of the truck. If the Extension Harness is not used, skip to the next heading, “Checking Operation”.

Plug the Extension Harness into the Console, rotating the connector collar fully-clockwise to lock it. Then route the harness to the rear cab wall. The male circular connector of the Extension Harness is usually panel-mounted on the rear cab wall or floor with the jamb-nut included on this connector. Alternatively, a clearance hole can be cut. If using a clearance hole, cover the edges of this hole with a piece of plastic or rubber U-channel material to protect the insulation of the cables passing through the hole.

CAUTION: Do not mistakenly connect the following lead directly to the battery voltage because this will prevent the system from storing data properly!

Connect the RED Ignition lead to the switched side of the ignition switch. (The correct terminal is at about 12 volts DC only when the ignition switch is turned on.)

If the vehicle has a two-speed axle, connect the terminal of the YELLOW 2-Speed Axle lead to the appropriate terminal on the axle-shifter switch. If the vehicle does not have a two-speed axle, insulate the terminal with electrical tape and tie back this YELLOW lead with a cable tie.

Plug the Main Harness into the Extension Harness at the rear cab wall or floor. On the Main Harness, insulate with electrical tape and tie back the RED Ignition lead and the YELLOW 2-Speed Axle lead. Also, tie back the spare Boom Sense and Ground Speed connectors on the Main Harness and Extension Harness. Anchor the harnesses with nylon cable ties to prevent damage due to flexing. If using a clearance hole through the cab wall or floor, RTV or silicone caulk can be used to seal this hole.

The connectors at the opposite end of the Main Harness are clearly marked

with labels identifying mates for the external system cables. While these weatherproof connectors need not be protected further from the elements, they can be placed inside a vehicle box or other enclosure.

Connect the hopper level sensor and boom sense inputs, if used. The Boom Sense 5 line can be connected as a pre-wet/anti-ice selector input.

CAUTION: Verify battery voltage is 12 volts, NOT 24 volts.

Finally, connect both Control Point™ Main Harness battery leads directly to the vehicle battery. Attach the RED wire to the positive battery terminal and the BLACK wire to the negative terminal.

CHECKING OPERATION

After completing the installation, turn on the ignition switch. The Console display should light, showing first the DICKEY-john name and logo screen and then the OPERATE screen (See Figure 6). See the OPERATION chapter of this manual for additional testing.

Figure 42. Switch Module Cabling

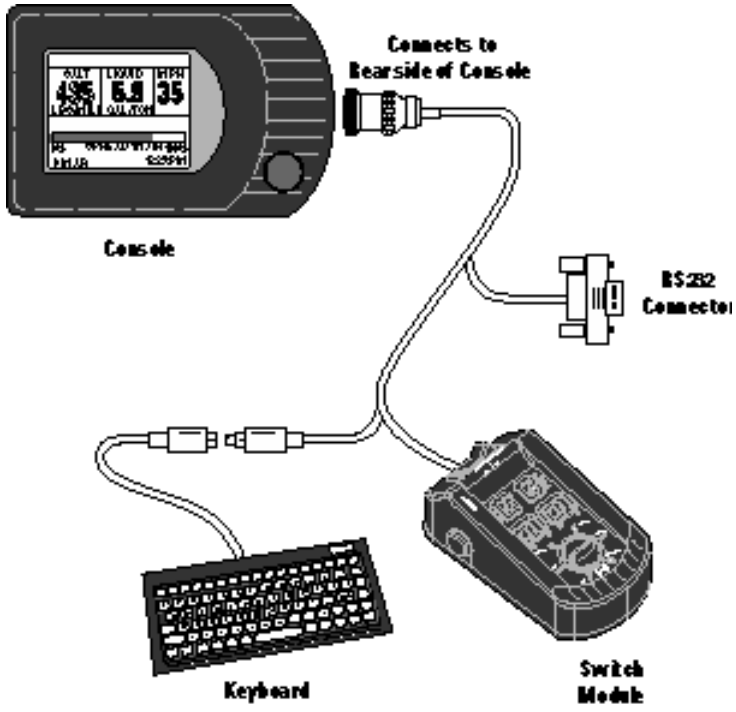
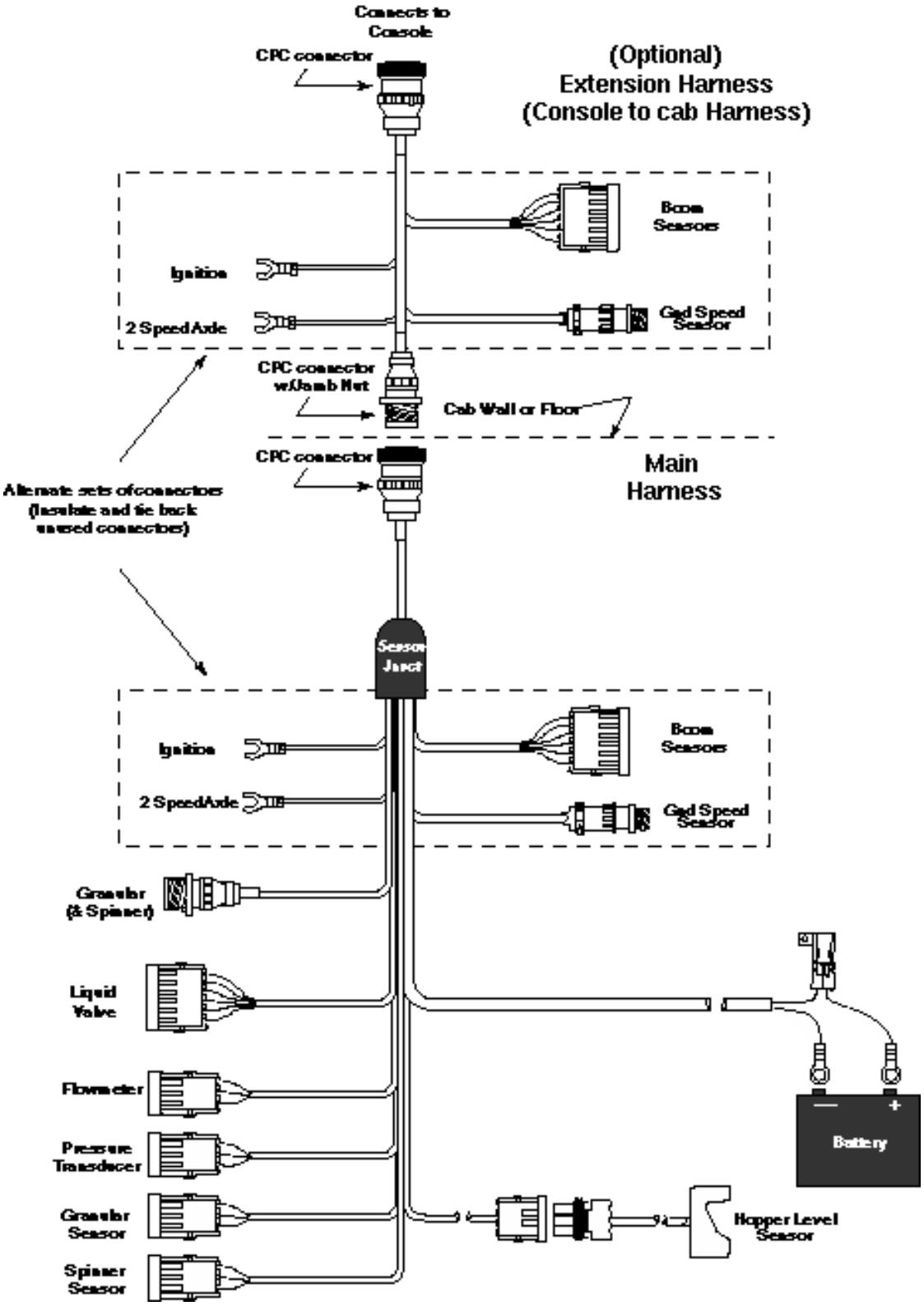


Figure 43. System Harness Layout



DICKEY-john™

CHAPTER 6 – SYSTEM TROUBLESHOOTING

The Control Point™ system contains six basic components, each with a specific function. Component failures normally react in predictable ways, making fault isolation relatively easy. If certain components are not operating properly, such as a hydraulic pump or motor, system performance is degraded and the console may incorrectly appear to be at fault.

Table 1. Component Interconnections

Component	Connected To	Function
Console	12V DC vehicle battery and all components of control system.	Compares vehicle ground speed to conveyor/auger and liquid pump speeds and controls the liquid valves (or DC motor for liquid) for the desired application ra
Switch Module	Console	Provides operator controls for system real-time func
Vehicle Ground Speed Sensor	Mechanical or electronic speedometer.	Indicates vehicle ground speed to console.
Sensors for Application Rate	Conveyor/auger and spinner or related hydraulic motor shafts, plumbing after liquid pump.	Indicate conveyor/auger speed, spinner speed, and liq and Spinner Speed rate or pressure to Console.
Actuators for Servo or Proportional Valves and Liquid Pump	Conveyor/auger and spinner hydraulic control valves and liquid pump.	Regulate conveyor/auger speed, spinner speed, and liquid flow rate.
Harnesses	All components	Connect all components.

Table 2. Common Spreader Problems (Control System Normal)

Symptom	Probable Cause	Corrective Action
Conveyor/auger does not run in either AUTO or UNLOAD	1. Hydraulic pump off. 2. Manual valve closed. 3. Hydraulic quick-connects loose. 4. Conveyor/auger jammed 5. Relief valve operating at low pressure. 6. Loss of hydraulic oil.	1. Engage pump. 2. Open valve. 3. Reconnect. 4. Clear jam. 5. Adjust or replace. 6. Repair leak and refill oil.
Convey/auger does not reach maximum speed	1. Faulty hydraulic system. 2. Conveyor/auger binding. 3. Relief valve defective or set lower than specified. 4. Material lumping and jamming conveyor/auger. 5. Engine RPM low because using wrong gear or axle.	1. Repair hydraulic system. 2. Eliminate binding. 3. Adjust to proper pressur or replace valve. 4. Clear. 5. Shift to lower gear and/or axle.
Inaccurate application (APR error exceeds 10%)	1. Material density changed from original calibration. 2. Feed-gate setting changed. 3. Inaccurate ground speed input because tire size or axle ratio has been changed.	1. Repeat Granular Calibrat 2. Set gate to position used during Granular Calibrati 3. Repeat Ground Speed Calibration.

Symptom 1: Console does not power on.

Corrective Action:

1. Check for blown fuse, located in positive battery lead. If blown, replace with blade-type, same size fuse.
2. Check for poor connections to the battery; remove any corrosion. Also check battery polarity.
3. Check the red ignition wire.
4. Visually inspect power cable from rear of Console to battery. If damaged, replace cable/repair.
5. If no problem can be found with power connection or power cable, console may be at fault.

Symptom 2: "MANUAL MODE" flashes on display.

If the words "MANUAL MODE" are flashing on the display, the Control Point™ system may have reverted to the manual override function to compensate for a sensor failure (liquid flowmeter, conveyor/auger sensor or spinner sensor). If so, the system is operating in open loop control to allow spreading/spraying to continue until sensor repair/replacement is possible.

Corrective Action for Granular System:

1. If material is not spreading (Conveyor or auger stopped).
   - Make sure the PTO is engaged.
   - Check for lodged obstacles in conveyor or auger.
   - Check for a hydraulic system failure (pump, valve, hydraulic motor).
2. If material is spreading (conveyor or auger turning)
   - Check for a disconnected or slipping conveyor sensor coupling.
   - Unplug connector nearest the conveyor sensor. Check for +12V between the RED and BLK wires and +8V between the GRN and BLK wires. Absence of either voltage indicates a broken or shorted wire within the cable assembly or a corroded pin in the connector. If voltages are present, replace the conveyor sensor.

Corrective Action for Liquid System:

1. If liquid is not spraying.
   - Check tanks for proper level.
   - Check liquid filters for plugging.
   - Check pump and wires to pump for corrosion and correct. voltage.
2. If liquid is spraying.
   - Check flowmeter for debris jamming the paddle wheel.
   - Unplug the connector nearest the flowmeter sensor. Check for +12V between the RED and BLK wires and +8V between the GRN and BLK wires. The absence of either voltage indicates a broken or shorted wire within the cable assembly or a corroded pin in the connector. If voltages are present, repair/replace the flowmeter sensor.

Symptom 3: AUTO Inoperative; UNLOAD operates

If the spreader/sprayer does not function when the MASTER Switch is in AUTO but does in the UNLOAD position, the ground sensor may have failed.

Corrective action:

1. Check the ground speed reading (MPH) on the console. If the ground speed reading is 0 when the truck is moving;
   - Check wires and connections between the DICKEY-john ground speed sensor and the console.
   - Check wires and connections between the DICKEY-john ground speed sensor and the transmission speed sensor.
2. Check the ground speed calibration number programmed in the console (F7). Compare the number to the original setting. Typically, the constant should be between 35000 to 60000.
3. Next, replace the ground speed sensor.
4. If the failure continues, replace the MASTER switch module and then the console.

Note: The Control Point™ system can continue operating without a “true” ground speed sensor input by setting the MANUAL SPEED to YES in the GROUND SPEED CONFIGURATION (F7) screen. With this enabled, the console simulates an artificial ground speed signal which appears on the display.

To spread/spray in this mode, set the MASTER Switch to the AUTO position and drive the truck at the displayed SPEED. To stop spreading, switch the MASTER Switch back to the OFF position.

Symptom 4: Displayed APR fluctuates

If the actual APR displaying on console fluctuates more than 5% above and below the target APR while the vehicle maintains a steady speed, the System Response should be investigated.

Corrective Action:

1. System Response (SYS RSPNS) constant is too large. See heading "Fine-tuning System Response Constants" in Chapter 4.
2. Check APR sensor for loose coupling or slipping on shaft.

Symptom 5: Displayed APR responding slowly

If the actual APR displaying on the console is slow responding to ground speed or target APR changes or stabilizes at the wrong value, the System Response may require fine tuning.

Corrective Action:

1. System Response (SYS RSPNS) constant may be too small. See heading "Fine-tuning System Response Constants" in Chapter 4.

Symptom 6: Spinner rotational speed incorrect.

Corrective Action:

1. Check PWM OFFSET and PWM settings in SPINNER mode (F8) for incorrect setting.
2. Check for variations in granular material density dropping onto the spinners from the conveyor/auger.
3. On proportional valves, increases in electrical coil resistance due to heat buildup can cause valve position shifts, resulting in speed changes.
4. On servo valves, increases in hydraulic fluid temperature heats up the valve and result in speed variations.
5. Check for drag due to snow and ice buildup.

Symptom 7: APPLICATION RATE ERROR

If an APPLICATION RATE ERROR flashes on the display and the alarm sounds, a fully open valve is indicated but the target APR can not be achieved.

Corrective Action for Granular System:

1. Reduce the truck ground speed to allow the system to catch up and the error to clear.
2. Shift to a lower gear to increase engine RPM and hydraulic pump rotation.
3. Check hydraulic disconnects and filter.
3. Ensure correct spreader constant is programmed into console. Check original setting or run a Granular Calibration (F6).
4. Incorrect PWM SAT setting (See Granular Configuration screen - F3). Compare against original setting or run System Response on the Granular channel (F11) setting.
5. Check for insufficient hydraulic oil flow at normal engine RPM.
6. Check spreader valve, electrical connections to the valve coil, resistance of the coils (See manufacturers specifications), and verify voltage from control console.

Corrective Action for Liquid System:

1. Check to see if the liquid tanks are low, shut off valves are partially closed, bypass valves are open too far, or an obstruction is in the liquid tank outlet.
2. Check filters between the liquid tank and suction side of the liquid pump for blockage.
3. Check for plugged nozzles or nozzles that are too small to supply sufficient gallons per minute.
4. If using a electric liquid pump, check that the nozzle pressure (spray bar pressure) does not exceed 40 psi. Some electric pumps have an internal pressure switch to shut pump off high back pressure conditions.
5. Ensure a correct K-FACTOR is programmed. Compare it against the number stamped on the flowmeter body or recorded on the Calibration Data Record Sheet. If original settings are not available, run a Liquid Calibration (F6).
6. Observe the PWM SAT under the Liquid Configuration screen (F5). Compare against original setting. If not available, run a System Response on the Liquid Channel, (F11).

Symptom 8: System does not operate

If the system does not respond with the MASTER switch in AUTO or UNLOAD or the BLAST button has no effect, the hydraulic valve may not be opening to supply hydraulic oil to the conveyor motor (spreader system) or the pump may not be rotating to supply liquid to the spray bar (liquid system).

Corrective action for a PWM valve:

The following four steps describe repair for a pulse width modulated hydraulic valve (Rexroth, Gresen, Vickers, Parker, etc.). Begin by disconnecting the electrical connections at the solenoid coil and then set the MASTER Switch into UNLOAD position to prevent possible damage to the PWM valve driver and coil.

1. Check voltage readings on the granular valve connector of the main harness at pin 16 and 8. Use pin 15 as ground. Pin 16 should read battery voltage (+12V); pin 8 reads a percentage of +12V determined by PWM SAT value entered under Granular Configuration (F3). (i.e. If PWM SAT is 40, then a reading of +4.8 V. –12 x .40 = 4.8 be present).
2. Check voltage readings at the solenoid valve coil. The WHT wire supplies the PWM voltage signal to the coil; the GRY wire is signal ground. Voltage reading should be equal to reading in step above. If voltages are not present, check wiring harnesses for cuts or shorts.
3. If voltages are present a hydraulic valve or hydraulic flow problem is indicated.
4. If the above checks are normal, replace the PWM valve driver. If this does not the solve problem, replace the console.

Corrective action for an actuator:

Begin by disconnecting the electrical connections at the solenoid coil. Then set the MASTER switch to the UNLOAD position for the following two steps to prevent possible actuator damage.

1. Check voltage readings on the granular valve connector of the main harness at pins 16 and 8. Use pin 15 as ground. Pin 16 and 8 should read battery voltage (+12V).
2. If voltages are present and actuator does not rotate, replace the actuator.

   If voltages are not present replace main harness, valve extension cable, or console.

Corrective action for a Sprayer system

If the sprayer system is not spraying, begin by disconnecting the electrical connections at the pump or solenoid coil. Then switch the MASTER switch to the UNLOAD position for the following checks to prevent possible damage to the liquid valve driver and coil.

1. Check voltage reading on the RED and BRN wires at the liquid valve connector of the main harness. Use the BLK wire as ground.

   The RED wire should read battery voltage (+12V) and the BRN wire should read a voltage equal to a percentage of +12V determined by PWM SAT value entered under LIQUID CONFIGURATION (F5) (i.e. If PWM SAT is 90, then a reading of +10.8V – 12 x .9 = 10.8 should be present).

   Check voltage readings at the pump or solenoid coil on the valve. The RED wire supplies the PWM voltage signal to the pump or solenoid coil, while the BLK wire is signal ground. Voltage reading should be equal to those above.

2. If voltages are present but sprayer does not spray, the pump, solenoid coil, hydraulic valve, or hydraulic flow may be faulty.

   If voltages are not present, check wiring harnesses for cuts or shorts, then replace the liquid valve driver. If this does not solve problem, replace the console.

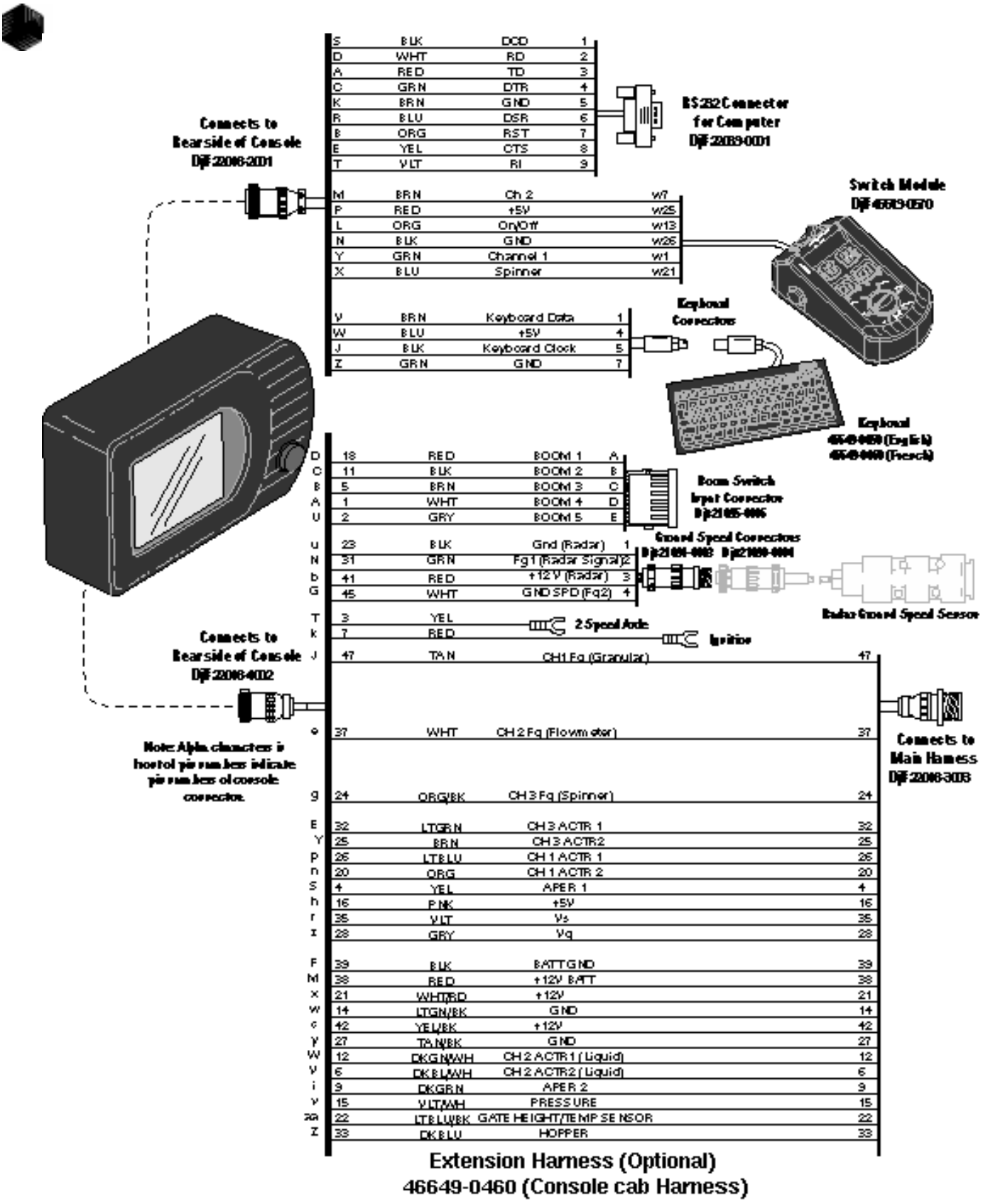


Figure 44. System Wiring Diagram, Console and Cab Harness

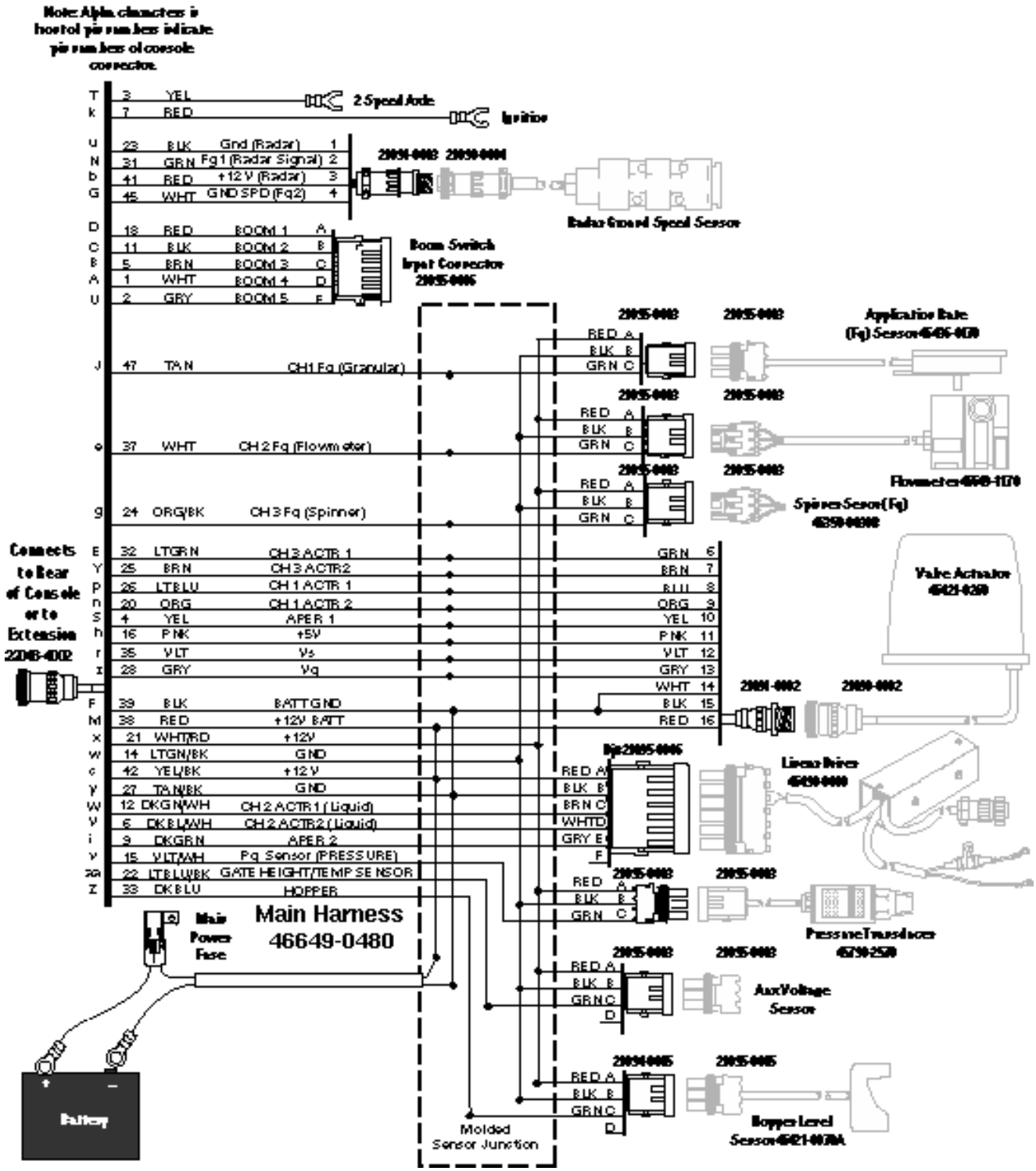


Figure 45. System Wiring Diagram, Truck Harness and Sensors

DICKEY-john™

APPENDIX A – CONVERTING CONSTANTS

FINE TUNING APPLICATION

A. Adjusting Granular Constants

If small (less than 10%) but consistent granular APR errors (either high or low) are observed over a period of time, fine-tuning of the system can be performed by adjusting the value of the spreader constant by the same percentage as follows:

$$\text{New SPR CON} = \text{Old SPR CON} \times \frac{\text{Target APR}}{\text{Actual APR}}$$

EXAMPLE: If SPR CON is 100 and Target APR is 300 LBS/MILE but Actual APR is known to be 315 LBS/MILE, adjust SPR CON using the above formula:

$$\text{New SPR CON} = 100 \times \frac{300}{315} = 95.2$$

NOTE: Keyboard enter the new SPR CON on the appropriate (GRANULAR) CONFIGURATION screen.

B. Adjusting Liquid Constants

In a manner similar to that for granular (shown above), liquid APR errors can be corrected by fine-tuning the flowmeter constant (K-FACTOR) as follows:

$$\text{New K-FACTOR} = \text{Old K-ACTOR} \times \frac{\text{Target APR}}{\text{Actual APR}}$$

EXAMPLE: If K-FACTOR is 1,000 and Target APR is 10 GAL/MILE but Actual APR is known to be 9.5 GAL/MILE, adjust K-FACTOR using the above formula:

$$\text{New K-FACTOR} = 1000 \times \frac{10}{9.5} = 1053$$

C. Adjusting Nozzle Constants

Similarly, the nozzle constant can be adjusted for a pressure based system as follows:

$$\text{New NZLE CNST} = \text{Old NZLE CNST} \times \frac{\text{Target APR}}{\text{Actual APR}}$$

EXAMPLE: If NZLE CONT is 0.8 and Target APR is 50 GAL/MILE but Actual APR is known to be 45 GAL/MILE, adjust nozzle constant using the above formula:

$$\text{New NZLE CNST} = 0.8 \times \frac{50}{45} = 0.89$$

CALCULATING SPREADER CONSTANTS

The spreader constant can be calculated if the following is known:

A = Number of pulses per revolution of the sensor shaft.

B = Turns of the sensor shaft for each turn of the final shaft.

C = Pounds of material discharged per revolution of the final shaft.

$$\text{SPR CON} = \frac{A \times B}{C} \quad \text{Pulses Per Pound}$$

EXAMPLE:

A = 360 pulses per revolution (for Dj sensor P/N 46436-017X).

B = 25 turns of the sensor shaft for each turn of the final shaft.

C = 50 pounds of material discharged per revolution of final shaft.

$$\text{SPR CON} = \frac{360 \times 25}{50} = 180 \text{ P/LB}$$

NOTES:

1. V-Box spreaders have a different SPR CON for each gate setting.
2. The number of pulses per revolution for several Dj shaft sensors are:
   360 for P/N 46436-017X (standard Control Point™ shaft sensor).
   60 for P/N 10844-000X.
   900 for P/N 10837-00XX.

APPENDIX B – MECHANICAL ADJUSTMENTS

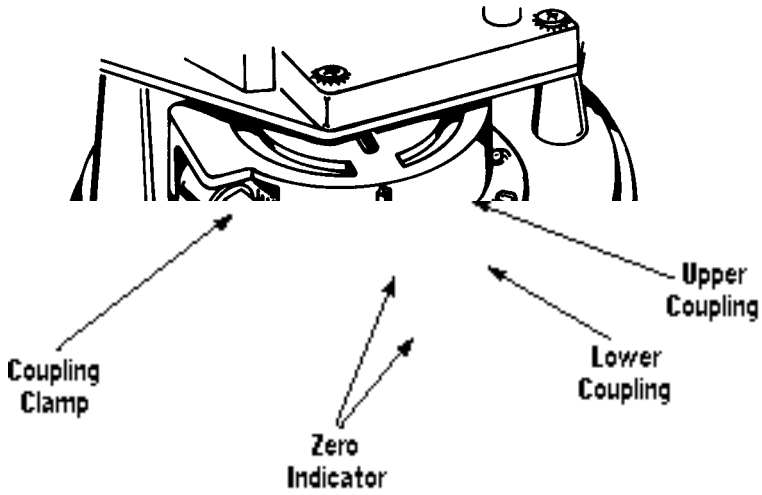
ADJUSTING VALVE MANUALLY

If the system contains a DICKEY-john dual servo valve which does not open in either AUTO or UNLOAD, manual adjustment of the valve position is possible to allow continued spreading. The procedure is as follows:

1. **Clean all dirt and foreign matter from the valve actuator cover and clamp.**
2. **Remove the clamp, cover, and gasket.**
3. **Loosen the valve coupling clamp and rotate the lower part of the coupling (See Figure 46). Rotating the lower coupling clockwise to the stop completely closes the valve; counter clockwise opens it.**
4. **Adjust the valve position until the approximate conveyor speed is obtained for the desired vehicle speed and target APR. Tighten the coupling clamp.**
5. **Set the spinner speed using the same procedure.**
6. **Reinstall the gasket and cover and secure with clamp.**

NOTE: This procedure may require some “trial-and-error” adjustment until the correct setting is obtained.

Figure 46. Valve Coupling



ELIMINATING CONVEYOR OR SPINNER CREEP

If the system contains a DICKEY-john dual servo valve which “creeps” (moves slowly when it should be stationary), correct as follows:

1. **Park the vehicle and place the system in MANUAL SPEED operation.**
2. **Perform all steps indicated under the heading “MANUAL VALVE ADJUSTMENT” above except change Step 4 to:**

   Rotate the lower coupling clockwise until the creeping stops. Tighten the coupling clamp.

DICKEY-john™

CALIBRATION DATA RECORD SHEET

SYSTEM STATISTICS
Owner Name _____
Date of Setup _____
Software Revision _____
Display Console Serial Number _____

ACCUMULATORS (F9)	
ENABLE CLR	

SYSTEM INFORMATION (F9)	
TRUCK ID	

MISCELLANEOUS (F12)	
BLAST SETUP	
BLAST TIMER	_____
BLAST SPEED	_____
SYSTEM UNITS	_____
SERIAL PORT	
BAUD RATE	_____
DATA BITS	_____
PARITY	_____

GRANULAR APPLICATION RATE (F2)

Parameter	Salt	Sand	Mix A	Mix B
Granular Material	_____	_____	_____	_____
STEP METHD	_____	_____	_____	_____
APP START/RATE 1	_____	_____	_____	_____
IC/DC STP/RATE 2	_____	_____	_____	_____
MIN APP/RATE 3	_____	_____	_____	_____
MAX APP/RATE 4	_____	_____	_____	_____
RATE 5	_____	_____	_____	_____
RATE 6	_____	_____	_____	_____
RATE 7	_____	_____	_____	_____
RATE 8	_____	_____	_____	_____
RATE 9	_____	_____	_____	_____
RATE 10	_____	_____	_____	_____
BLST RATE	_____	_____	_____	_____
CHN LBL	_____	_____	_____	_____

GRANULAR CONFIGURATION (F3)

Parameter	Salt	Sand	Mix A	Mix B
Granular Material	_____	_____	_____	_____
SPR CON	_____	_____	_____	_____
DRV FREQ	_____	_____	_____	_____
PWM OFFSET	_____	_____	_____	_____
PWM SAT	_____	_____	_____	_____
SYS RSPNS	_____	_____	_____	_____
VALV BOOST	_____	_____	_____	_____
AFILT	_____	_____	_____	_____

DICKEY-john™

GROUND SPEED CONFIGURATION (F7)	
MAX SPEED	_____
MANUAL DRIVER	_____
MANUAL SPEED	_____
START UP	_____
CONSTANT 1	_____
CONSTANT 2	_____

SPINNER CONFIGURATION (F8)	
UNLOAD	_____
NO GND SPD	_____
DRV FREQ	_____
PULSE FDBK	_____
SPIN CON	_____
BLST RATE	_____
SYS RSPNS	_____
VALV BOOST	_____
AFILT	_____
PWM OFFSET	_____
PWM SAT.	_____
SPRD LIMIT	_____

LIQUID CONFIGURATION (F5)				
Parameter	**Liquid 1**	**Liquid 2**	**Liquid 3**	**Liquid 4**
Liquid Material	_____	_____	_____	_____
K-FACTOR/DENSITY	_____	_____	_____	_____
PRES OFFST	_____	_____	_____	_____
MAX PRES	_____	_____	_____	_____
MAX VOLT	_____	_____	_____	_____
NZLE CNST	_____	_____	_____	_____
DRV FREQ	_____	_____	_____	_____
PWM OFFSET	_____	_____	_____	_____
PWM SAT.	_____	_____	_____	_____
SYS RSPNS	_____	_____	_____	_____
VALV BOOST	_____	_____	_____	_____
AFILT	_____	_____	_____	_____

LIQUID APPLICATION RATE (F4)				
Parameter	**Liquid 1**	**Liquid 2**	**Liquid 3**	**Liquid 4**
Granular Material	_____	_____	_____	_____
STEP METHD	_____	_____	_____	_____
APP START/RATE 1	_____	_____	_____	_____
IC/DC STP/RATE 2	_____	_____	_____	_____
MIN APP/RATE 3	_____	_____	_____	_____
MAX APP/RATE 4	_____	_____	_____	_____
RATE 5	_____	_____	_____	_____
RATE 6	_____	_____	_____	_____
RATE 7	_____	_____	_____	_____
RATE 8	_____	_____	_____	_____
RATE 9	_____	_____	_____	_____
RATE 10	_____	_____	_____	_____
BLST RATE	_____	_____	_____	_____
CHN LBL	_____	_____	_____	_____

DICKEY-john™

CALIBRATION DATA RECORD SHEET

SYSTEM STATISTICS
Owner Name _____
Date of Setup _____
Software Revision _____
Display Console Serial Number _____

ACCUMULATORS (F9)	
ENABLE CLR	

SYSTEM INFORMATION (F9)	
TRUCK ID	

MISCELLANEOUS (F12)	
BLAST SETUP	
BLAST TIMER	_____
BLAST SPEED	_____
SYSTEM UNITS	_____
SERIAL PORT	
BAUD RATE	_____
DATA BITS	_____
PARITY	_____

GRANULAR APPLICATION RATE (F2)

Parameter	Salt	Sand	Mix A	Mix B
Granular Material	_____	_____	_____	_____
STEP METHD	_____	_____	_____	_____
APP START/RATE 1	_____	_____	_____	_____
IC/DC STP/RATE 2	_____	_____	_____	_____
MIN APP/RATE 3	_____	_____	_____	_____
MAX APP/RATE 4	_____	_____	_____	_____
RATE 5	_____	_____	_____	_____
RATE 6	_____	_____	_____	_____
RATE 7	_____	_____	_____	_____
RATE 8	_____	_____	_____	_____
RATE 9	_____	_____	_____	_____
RATE 10	_____	_____	_____	_____
BLST RATE	_____	_____	_____	_____
CHN LBL	_____	_____	_____	_____

GRANULAR CONFIGURATION (F3)

Parameter	Salt	Sand	Mix A	Mix B
Granular Material	_____	_____	_____	_____
SPR CON	_____	_____	_____	_____
DRV FREQ	_____	_____	_____	_____
PWM OFFSET	_____	_____	_____	_____
PWM SAT	_____	_____	_____	_____
SYS RSPNS	_____	_____	_____	_____
VALV BOOST	_____	_____	_____	_____
AFILT	_____	_____	_____	_____

DICKEY-john™

GROUND SPEED CONFIGURATION (F7)	
MAX SPEED	
MANUAL DRIVER	
MANUAL SPEED	
START UP	
CONSTANT 1	
CONSTANT 2	

SPINNER CONFIGURATION (F8)	
UNLOAD	
NO GND SPD	
DRV FREQ	
PULSE FDBK	
SPIN CON	
BLST RATE	
SYS RSPNS	
VALV BOOST	
AFILT	
PWM OFFSET	
PWM SAT.	
SPRD LIMIT	

LIQUID CONFIGURATION (F5)				
Parameter	**Liquid 1**	**Liquid 2**	**Liquid 3**	**Liquid 4**
Liquid Material				
K-FACTOR/DENSITY				
PRES OFFST				
MAX PRES				
MAX VOLT				
NZLE CNST				
DRV FREQ				
PWM OFFSET				
PWM SAT.				
SYS RSPNS				
VALV BOOST				
AFILT				

LIQUID APPLICATION RATE (F4)				
Parameter	**Liquid 1**	**Liquid 2**	**Liquid 3**	**Liquid 4**
Granular Material				
STEP METHD				
APP START/RATE 1				
IC/DC STP/RATE 2				
MIN APP/RATE 3				
MAX APP/RATE 4				
RATE 5				
RATE 6				
RATE 7				
RATE 8				
RATE 9				
RATE 10				
BLST RATE				
CHN LBL				

DlCKEY-john® WARRANTY

DlCKEY-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 DICKEY-john within 30 days after such defect is discovered, DlCKEY-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 product 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. DlCKEY-john neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said product 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.

For DICKEY-john Service Department,
call 1-800-637-3302 in either the U.S.A. or Canada

DICKEY-john®

P.O. BOX 10 • 5200 DICKEY-john Road • Auburn, IL. 62615
Telephone: (217) 438-3371 • Fax: (217) 438-6012
Website: www.dickey-john.com