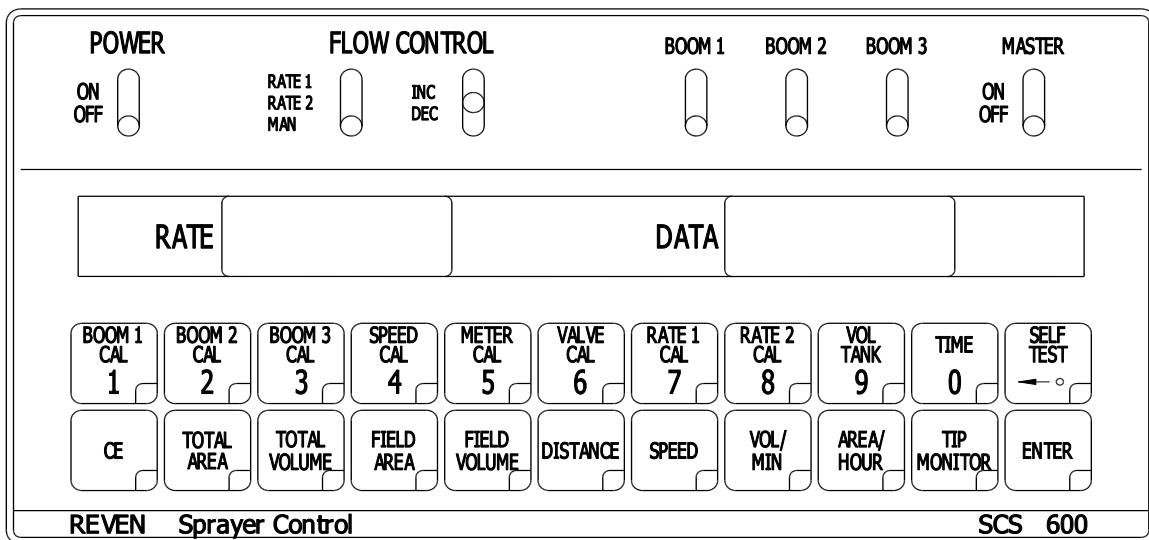


Operator's Manual

For Gandy Orbit-Air 66 Series Hydraulic Speed Controlled Monitor System

By Raven[®]



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INTRODUCTION

The Raven 600 CONTROL SYSTEM in conjunction with Orbit-Air® and Orbit-Flow® applicators is designed to improve the uniformity of granular and seed applications. Its performance relies on the proper installation and preventive maintenance of the complete applicator. It is important that this Installation and Service Manual be reviewed thoroughly before operating the system. This Manual provides a simple step-by-step procedure for installing and operating the SCS 600.

The Raven SCS 600 consists of a computer-based control Console, a Speed sensor, a Motor Control Feedback unit and a Shaft and Air Pressure Monitor. The Console mounts directly in the cab of the vehicle for easy operator use. The Speed Sensor is mounted on a non-driven wheel of the tractor or on a wheel of the implement. (Radar and Speedometer-Drive Speed Sensors also available). The Motor Control Feedback mounts directly to the framework of the applicators. Appropriate cabling is furnished for field installation. Extensions for the cables can be ordered for various applications.

The operator sets the target pounds per area to be applied and the Raven 600 automatically maintains the rate regardless of vehicle speed or gear selection. A manual override switch allows the operator to manually control flow for system check-out and spot application. Actual volume per area being applied is displayed at all times. The Raven 600 may also additionally function as an area monitor, speed monitor, volume totalizer, and shaft and air pressure monitor.

INSTALLATION

Mounting the Wheel Drive Speed Sensor

The Wheel Drive Speed Sensor consists of four magnets, a switch assembly with cable, and mounting hardware.

NOTE: For Speedometer Speed Sensor installation see Appendix 2; for Radar Speed Sensor installation see Radar Installation Instruction Manual enclosed with Radar Cabling.

Sequence of mounting Speed Sensor:

1. Select a non-driven wheel (left front tractor wheel or towed implement wheel).
2. Check for pre-drilled holes in rim. If not pre-drilled, drill per Appendix 2.

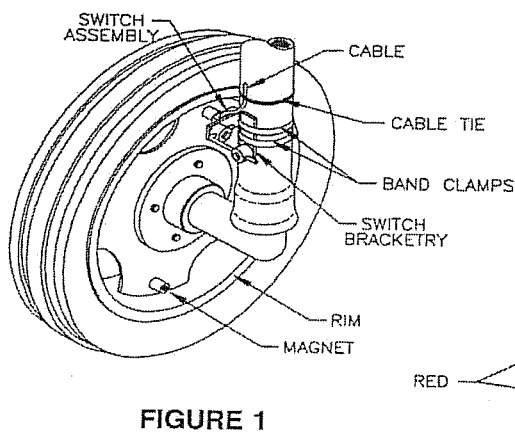


FIGURE 1

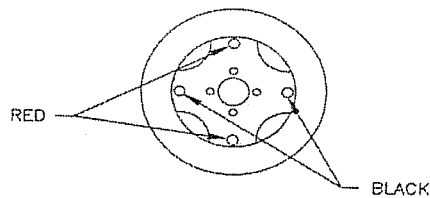


FIGURE 2

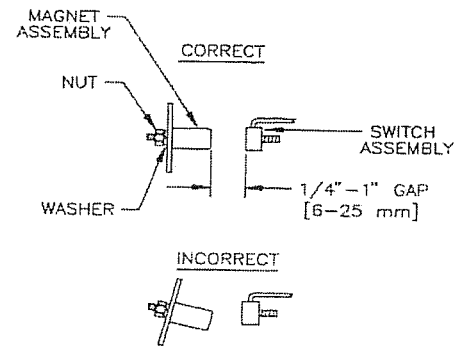


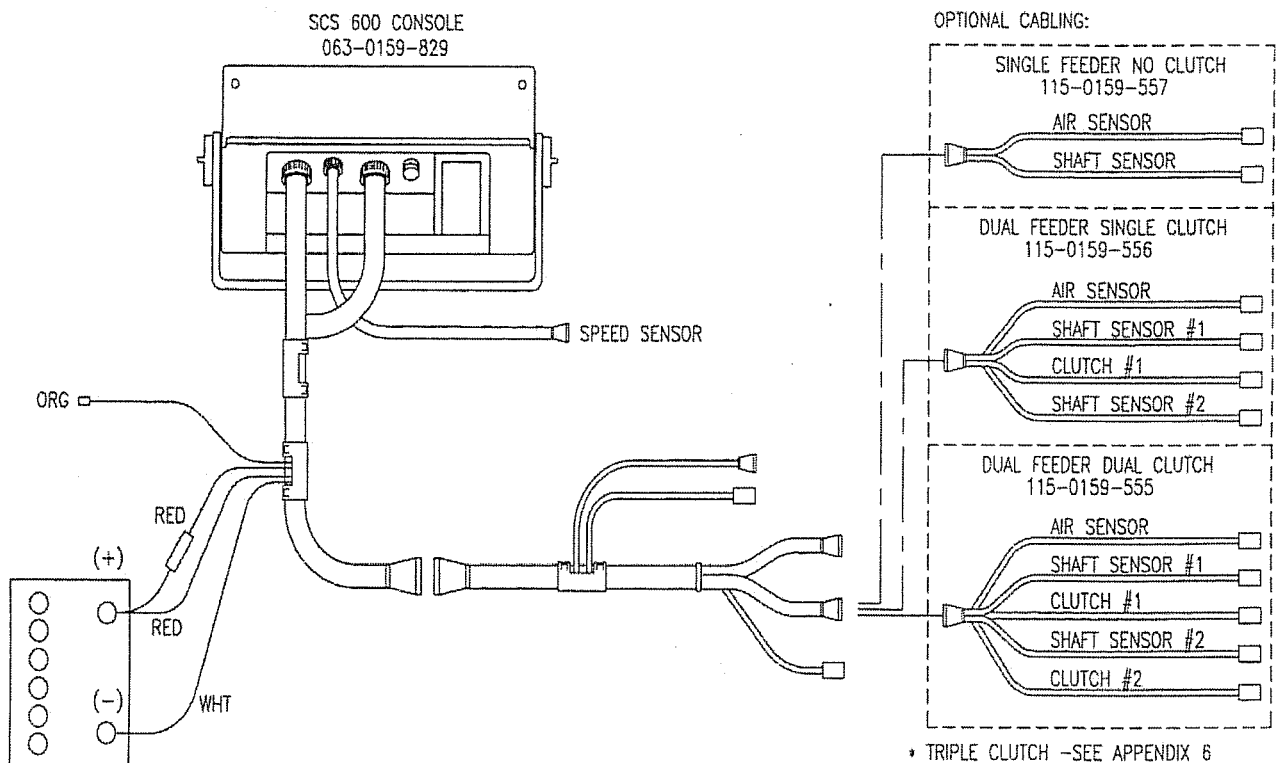
FIGURE 3

3. Mount the four magnets to inside of rim and tighten (Figures 1, 2, and 3). Magnets must be mounted in alternating red-black order.
4. Mount switch assembly to column with hardware provided, (Figure 1). The switch assembly need not pivot with the wheel; it may be mounted on the stationary column.
5. Position switch assembly so that as the wheel rotates, the magnets pass across the center of the black molded switch assembly (Figure 2 & 3). Adjust the switch assembly bracketry to insure proper positioning.
6. Clearance gap between magnets and switch assembly must be between 1/4 - 1 inch [6-25mm]. (Adjust switch assembly bracketry if required). With wheel pointed straight ahead, rotate wheel to insure gap between each of the four magnets and switch assembly is correct. Before driving off, make sure vehicle wheels can be turned to their extremes in each direction without the magnets hitting the switch assembly.
7. Tighten switch assembly bracketry.
8. Secure cable to column with plastic cable ties. Route cable into vehicle cab as far away as possible from the engine generator and voltage regulator.
9. For procedures to test Speed Sensor Extension Cable, see Appendix 4.

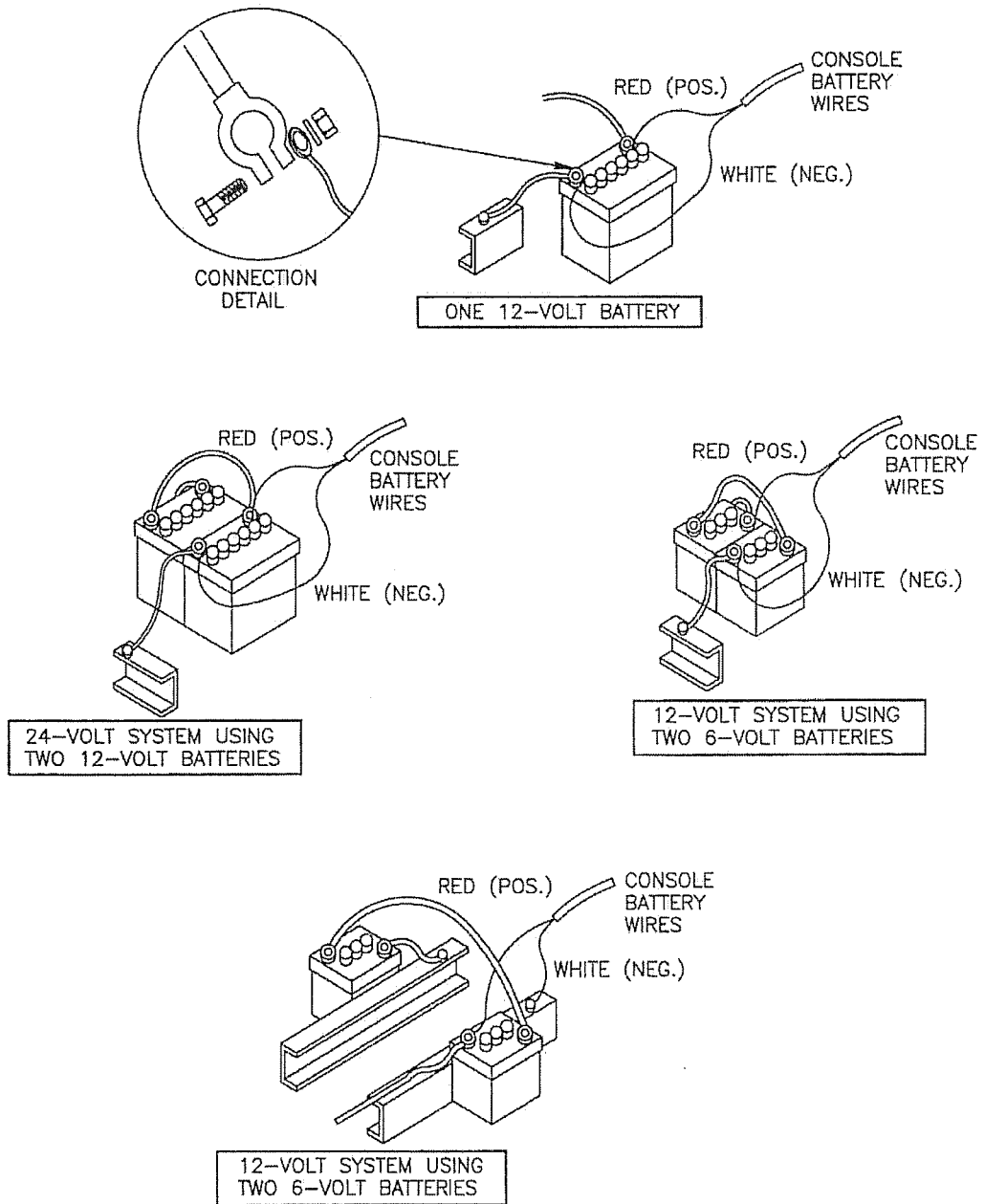
Mounting the Console

1. Mount the console to a secure support inside the cab of the vehicle.
2. Connect the Console Control Cable to the plug in the back of the Console (Figure 4). Run the Control Cable out of the vehicle cab and connect with Flow Control Cable on the applicator. Do the same with the Speed Sensor Cable. Connect remaining cables according to drawing on page 5 (Figure 5). (Extension cables are available from your dealer).
3. Turn POWER ON/OFF switch to OFF and route the Red and White battery wires to a 12-volt battery. Attach the White battery wire to the NEGATIVE (-) terminal and the Red battery wire directly to the POSITIVE (+) battery terminal. (DO NOT CONNECT RED OR WHITE WIRES TO THE STARTER). Secure the battery wires with plastic cable ties. DO NOT tie the battery wires close to the existing battery leads or any other electrical wiring.

(Figure 4)



Battery Connections



4. Secure and tie the Speed Sensor Cable and the Flow Control Cable with plastic cable ties.
5. Initial installation of the system is now complete.

Hydraulic Power Source Hook-Up

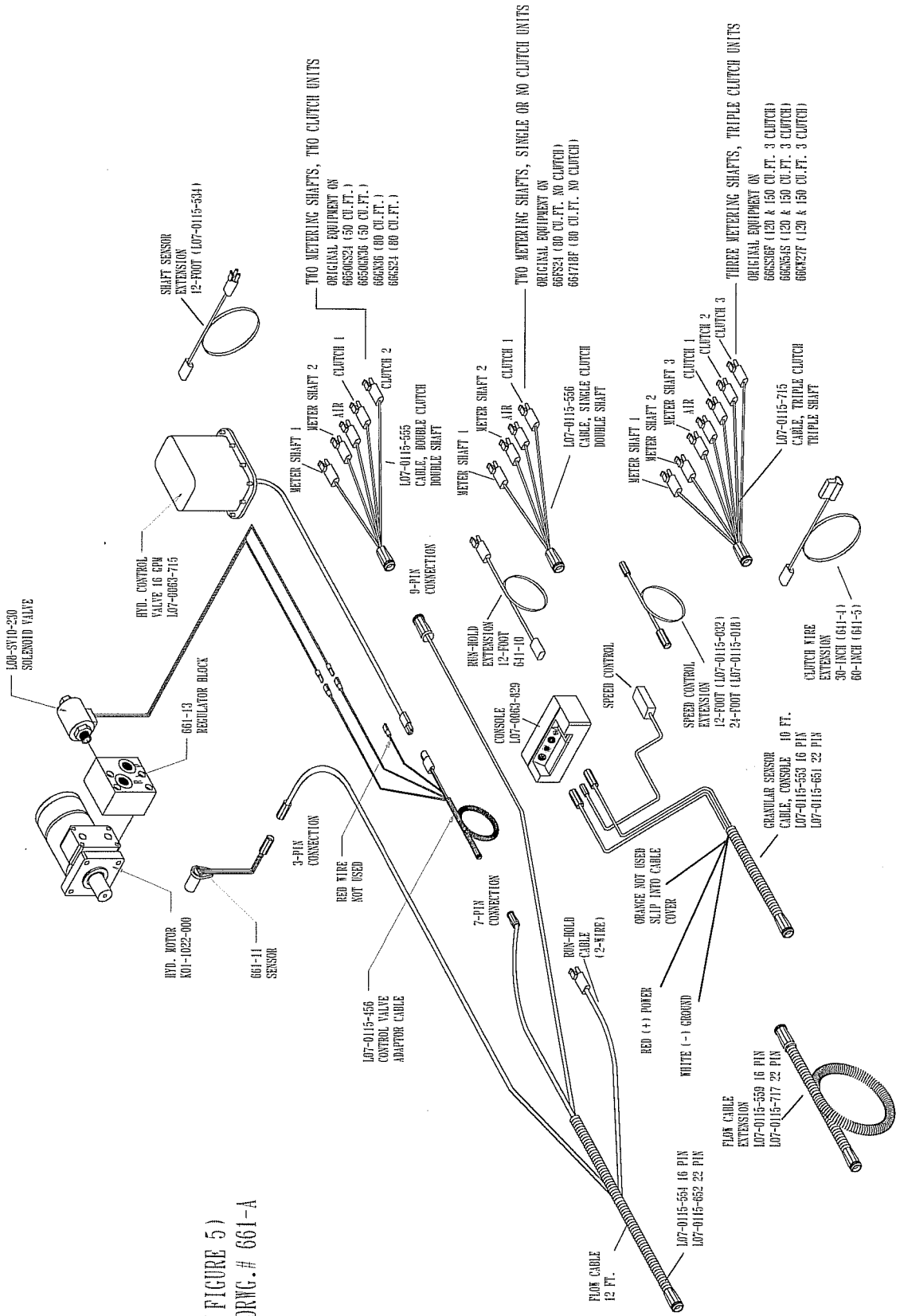
To obtain optimum hydraulic function from your tractor hydraulic system, additional adjustments or equipment may be necessary. Consult your tractor owner's manual or dealer for operation of a hydraulic motor. Determine what flow your tractor is capable of producing, and adjust the CFV (Control Flow Valve) so that no more than 12 gallons is being pumped to the hydraulic motors. (This system can handle up to 16 gallons). Pumping more oil than is used builds up excessive heat. **Excessive heat is a contributing factor in causing hydraulic motor seal failure.**

When hooking up hydraulics to your remotes on the tractor, **always** use couplers designed for your brand of tractor. *Never use a different adapter from your tractor brand.* Adapters generate back pressure and additional heat which shortens seal life in the hydraulic motor.

Check in the tractor owner's manual or with the service manager at your dealership to see whether your tractor brand has a remote outlet designated to be used for continuous hydraulic motor operation. If possible, run the return line from the hydraulic motor back to the tractor and dump directly into the sump, eliminating the valve bank which also can build up heat. Some tractor brands have a special return line for this. For others, you may have to install a "T" in the line from the valve bank to the sump and then connect the return line to the "T".

- * If extra length has to be added to the hydraulic lines, we recommend using a 3/4" size metal tubing capable of handling hydraulic pressures. This fastened to the parent implement can serve as a radiator to dissipate some heat as well.

CABLE AND WIRE CONNECTIONS TO THE HYDRAULIC MOTOR,
MOTOR CONTROL AND MONITOR FOR 66 SERIES APPLICATORS

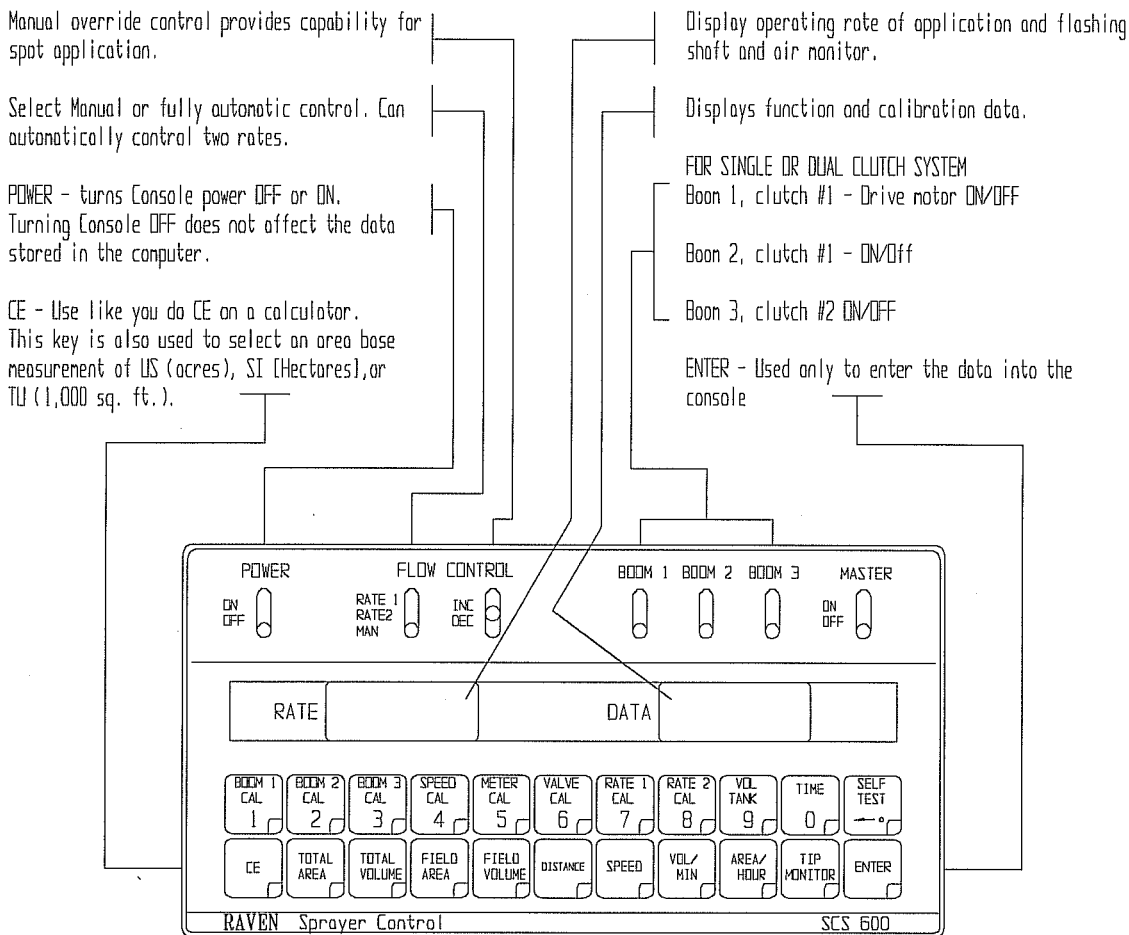


(FIGURE 5)
DRWG. # 661-A

Console Features

IMPORTANT: This Console (REV. A Prog. B) requires selection of US (acres); SI [hectares] or TU {1,000 sq. ft.} area and SP1 (wheel drive, sonars, etc.) or SP2 (radar only) speed sensor.

Console program revision can be determined by label on the back of the SCS Console.



CALIBRATION KEYS - Used to enter data into the console to calibrate the system.

- BOOM 1 CAL Length of Boom 1
- BOOM 2 CAL Length of Boom 2
- BOOM 3 CAL Length of Boom 3
- SPEED CAL Determine by wheel size or radar
- METER CAL Calibration constant**
- VALVE CAL Adjust system
- RATE 1 CAL Auto Application Rate
- RATE 2 CAL Auto Application Rate
- SELF TEST Simulates Speed

**** See Rate Chart**

Display operating rate of application and flashing shaft and air monitor.

Procedures to follow prior to programming the Raven 600 Console

When you first turn on Console power, after all installation procedures have been completed, the Console will flash "CAL" in the RATE displays. This means you must "calibrate" or program the Console before it can be operated. (This is a one-time operation which does NOT have to be repeated unless you disconnect your battery wires. Turning OFF the POWER ON/OFF switch does NOT affect the Console memory. All data is retained).

SCS 600 NEW FEATURE

Nonvolatile Memory

Console memory is now stored in *nonvolatile memory*. To Clear out nonvolatile memory, turn Console POWER switch to OFF. Depress and hold the CE key while turning Console POWER switch to ON. Console will now be in the CAL mode.

1. Display US, SI or TU:

- a. Depressing momentarily [CE] steps the DATA display from US (acres) to SI.
- b. Depressing momentarily [CE] steps the DATA display from SI (Hectares) to TU.
- c. Depressing momentarily [CE] steps the DATA display from TU (1,000 sq. ft.) to US.

2. Selecting US, SI or TU:

- a. To select US, SI or TU, step [CE] until the desired code is displayed in DATA display.
- b. Momentarily depress [ENTER]. The DATA display will now display SP1.

3. Display SP1 or SP2:

- a. Depressing momentarily [CE] steps the DATA display from SP1 (wheel drives, sonar, etc) to SP2.
- b. Depressing momentarily [CE] steps the DATA display from SP2 (Radar Sensor only) to SP1.

4. Selecting SP1 or SP2:

- a. To select SP1 or SP2, step with [CE] until desired code is displayed in DATA display.
- b. Momentarily depress [ENTER]. The DATA display will now display GRAN.

5. Displaying GRAN or 440:

- a. Depressing momentarily [CE] steps the DATA display from GRAN (Granular monitor) to 440 (Spray monitor).
- b. Depressing momentarily [CE] steps the DATA display from 440 (Spray monitor) to GRAN (Granular monitor).

6. Selecting GRAN or 440:

- a. To Select GRAN step [CE] until desired code is displayed in the DATA display.
- b. Momentarily depress [ENTER]. The data display will now display C-Sd. Use this setting for Granular or seed application.

7. Momentarily depress [ENTER]. The DATA display will now display 0. Depress [CE] again for DATA DISPLAY to read "E" now enter your self test speed if you will be doing a calibration.

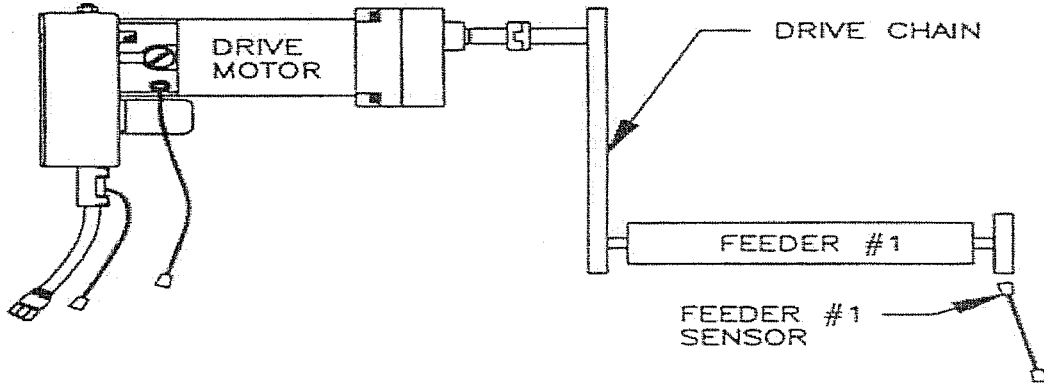
Console Calibration

To Enter DATA, Data key must be pressed, then depress ENTER so both small red lights glow. Enter the data desired, depress ENTER again to lock data into the console. Red light in ENTER key will go out. Proceed to the next DATA key.

8. Calculating "Boom Cal" (Boom 1, Boom 2, Boom 3)

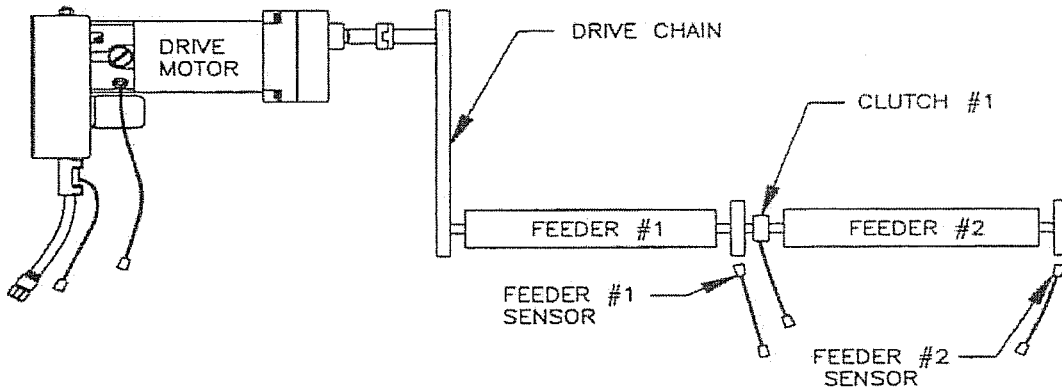
Select the figure below that correspond to the type of system to be used.

FIGURE 1
(No clutch, entire metering system on or off)



BOOM 1 CAL = Total width of applicator in inches.
BOOM 2 CAL = 0
BOOM 3 CAL = 0

FIGURE 2
(One clutch, one-half metering system can be shut off)

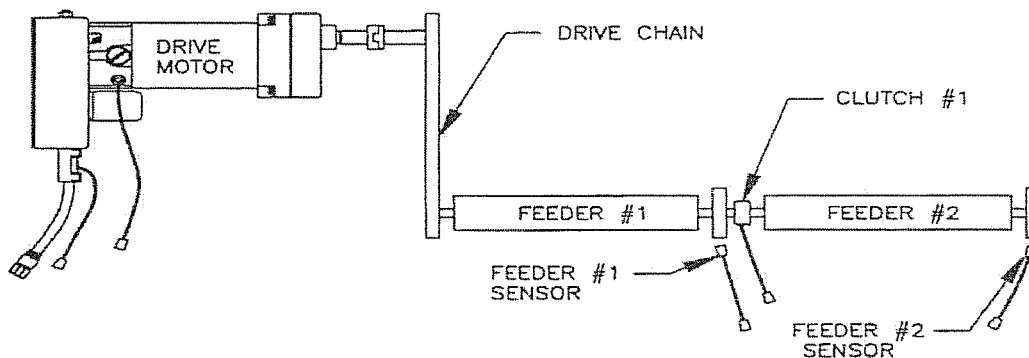


BOOM 1 CAL = one half of total boom width in inches.
BOOM 2 CAL = one half of total boom width in inches.
BOOM 3 CAL = 0

Console Calibration (continued)

FIGURE 3

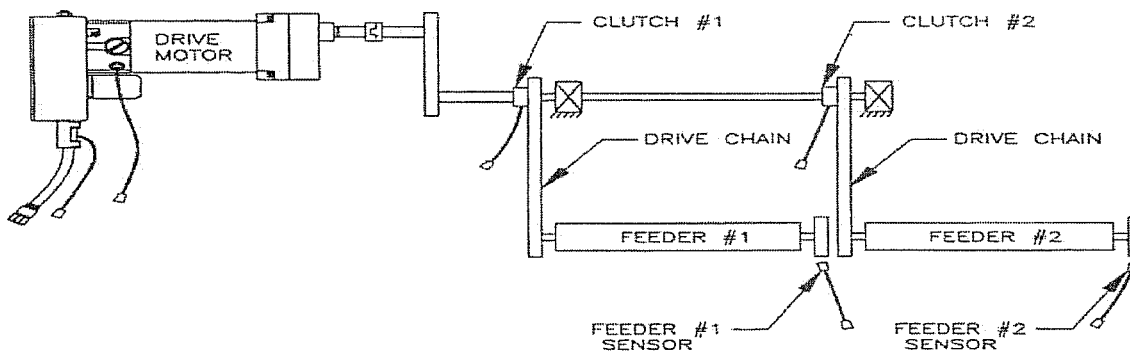
(Two clutches, either half of metering system on or off independently)



BOOM 1 CAL = 0
BOOM 2 CAL = one half of total boom width in inches.
BOOM 3 CAL = one half of total boom width in inches.

FIGURE 4

(Three clutches, 1/3 of metering system on or off independently)



BOOM 1 CAL = one third of total boom width in inches
BOOM 2 CAL = one third of total boom width in inches.
BOOM 3 CAL = one third of total boom width in inches.

10. Enter SPEED CAL in key labeled: [SPEED CAL]. Follow instructions for wheel magnets or radar installations on appendix 3.
11. Enter METER CAL calibration number in key labeled: [METER CAL]. This number is obtained from your rate chart for your product. Please read instructions on first page of rate chart.
12. Enter VALVE CAL [2 1 2 3] in key labeled [VALVE CAL]. See explanation on page 33.
13. Enter RATE 1 and RATE 2. Determine the application rate at which your chemical or seed should be applied. If you will be using two different rates on your field, place the primary rate in RATE 1 and the secondary rate in RATE 2. *If you will be using the same rate for the entire field, place that rate in RATE 1 and RATE 2. There must be a rate entered in each.*

You have now completed programming the console!

The flashing "CAL" will now extinguish. If not, repeat procedure starting at BOOM CAL 1. You may also wish to enter the Data in the keys labeled: [VOL TANK] (volume in hopper) and TIME. Remember to update the VOL TANK number whenever you add material to the hopper. The TIME clock is a 24 hour or military clock. There must be data entered in ALL keys except VOL TANK and TIME.

Other Display Features

1. To display TOTAL AREA covered, momentarily depress key labeled: [TOTAL AREA] . To "zero out" this total, at any time, enter a "0" in this key.
2. To display TOTAL VOLUME applied, momentarily depress key labeled: [TOTAL VOLUME]. To "zero out" this total, at any time, enter a "0" in this key.
3. To display FIELD AREA covered, momentarily depress key labeled: [FIELD AREA]. To "zero out" this total, at any time, enter a "0" in this key.
4. To display FIELD VOLUME applied, momentarily depress key labeled: [FIELD VOLUME]. To "zero out" this total, at any time enter a "0" in this key.
5. To display DISTANCE (feet [meters] traveled) momentarily depress key labeled: [DISTANCE]. To "zero out" this total, at any time, enter a "0" in this key.
6. To display SPEED, momentarily depress the key labeled: [SPEED]
7. To display VOL/MIN., momentarily depress the key labeled: [VOL/MIN]
8. To display AREA/HOUR, momentarily depress key labeled: [AREA/HOUR] . This is an actual calculation of AREA/HOUR at the present speed you are going. It is not an average over time.

Self-Test Feature

SELF-TEST allows speed simulation for testing the system while the vehicle is not moving. Enter the simulated operating speed in the key labeled: [SELF TEST].

If 6 MPH [10 km/h] is desired, enter 6.0 [10.0]. Then depress ENTER.

Verify speed by depressing key labeled: [SPEED]

The SELF-TEST speed will clear itself when motion of vehicle is detected by the Speed Sensor. A SPEED CAL Value of 900 [230] or greater is recommended when operating in this mode.

NOTE: To prevent nuisance clearing of self-test speed, disconnect speed connector on back of console when Radar speed sensors are used.

Alarm Definitions

1. Out of range error . . . alarm sounds when actual rate differs from target rate by 30% or more.
2. Flow alarm alarm sounds and Rate Display flashes "Flo Err" if flow is registered while booms are turned off.
3. Shaft 1 alarm alarm sounds and Rate Display flashes "SHa1" if shaft 1 should be turning, but is not.
4. Shaft 2 alarm alarm sounds and Rate Display flashes "SHa2" if shaft 2 should be turning, but is not.
5. Shaft 3 alarm alarm sounds and Rate Display flashes "SHa3" if shaft 3 should be turning, but is not.
6. Air alarm alarm sounds and Rate Display flashes "Air" if air pressure falls below pre-set pressure.
7. *Bin Level alarm . . . alarm sounds and Rate Display flashes "bin" if bin level falls below set level.
*not available at this time

Programming Alarm Features

To program Alarm Features depress [BOOM 1 CAL] for 5 seconds. Depress "Enter" key to advance to next Alarm Feature. *All shaft and air alarms come from the factory in the OFF position.*

Alarm Menu

1. Selecting A/ ON or A/ OFF (enabling and disabling alarm buzzer).
 - a. To select A/ ON or A/ OFF step with [CE] until desired code is displayed in DATA display.
 - b. Depress "ENTER" key to advance to next Alarm Feature.

Display Menu

Depress [BOOM 1 CAL] for 7 seconds until DATA display shows "d on". Depressing momentarily the [CE] key steps the DATA display between "d on" and "d off".

"d on" means RATE displays target rate when actual rate is within a percentage of target rate. This percentage is determined by the third digit of VALVE CAL value as shown:

Break Point Digit

(3rd digit) of VALVE CAL 2 1 @ 3

0 = 1% + Deadband	5 = 25% + Deadband
1 = 3% + Deadband	6 = 30% + Deadband
2 = 7% + Deadband	7 = 35% + Deadband
3 = 10% + Deadband	8 = 40% + Deadband
4 = 20% + Deadband	9 = 45% + Deadband

Actual rate is displayed if unit does NOT reach deadband within 10 seconds. "d off" means RATE displays actual rate at all times.

Displaying Shaft 1 Alarm (1 ON or 1 OFF)

1. Selecting 1 ON or 1 OFF.
 - a. To select 1 ON or 1 OFF step with [CE] until desired code is displayed in DATA display.
 - b. Depress "ENTER" key to advance to next Alarm Feature.

Displaying Shaft 2 Alarm (2 ON or 2 OFF)

1. Selecting 2 ON or 2 OFF.
 - a. To select 2 ON or 2 OFF step with [CE] until desired code is displayed in DATA display.
 - b. Depress "ENTER" key to advance to next Alarm Feature.

Displaying Shaft 3 Alarm (3 ON or 3 OFF)

1. Selecting 3 ON or 3 OFF.
2. To select 3 ON or 3 OFF step with [CE] until desired code is displayed in DATA display. Depress "ENTER" key to advance to next Alarm Feature.

Displaying Air Alarm (4 ON or 4 OFF)

3. Selecting 4 ON or 4 OFF.
4. a. To select 4 ON or 4 OFF step with [CE] until desired code displayed in DATA display.
b. Depress "ENTER" key to advance to next Alarm Feature.

Displaying Bin Level Alarm (5 ON or 5 OFF)

(Not available at this time)

1. Selecting 5 ON or 5 OFF.
 - a. To select 5 ON or 5 OFF step with [CE] until desired code is displayed in DATA display.
 - b. Depress "ENTER" key to advance to next Alarm Feature.

Sequence to Activate Data-Lock

1. Depress [CE] for 5 seconds, NEW CODE message will appear.
2. Enter 4-digit code within 15 seconds. *EXAMPLE:* For 1058, press:[BOOM 1 CAL] [TIME] [METER CAL] [RATE 2 CAL] [ENTER]

Sequence to Change Data-Lock

1. Depress [CE] for 5 seconds, OLD CODE message will appear.
2. Enter 4 digit code within 15 seconds: :[BOOM 1 CAL] [TIME] [METER CAL] [RATE 2 CAL] [ENTER]

NEW CODE message will appear. Enter 4 digit code within 15 seconds.

EXAMPLE: For 1258, depress: [BOOM 1 CAL] [BOOM 2 CAL] [METER CAL] [RATE 2 CAL] [ENTER]

Enter Mode Sequence with activated Data-Lock

1. Depress the key into which you wish to enter data.
2. Depress [CE], CODE message will appear. Enter your DATA LOCK CODE. If code is correct, "E" will appear.
3. Now enter data normally.

*The DATA LOCK feature prohibits the entry of data without first entering the DATA LOCK CODE. If DATA LOCK is not desired, omit 5, 6, 7. *The DATA LOCK CODE may be cleared by entering a code of "0" or by removing Console power.*

Power Down Delay Time Feature

If the console is not used for 10 days. It will go into a power down (low power) mode of operation. In this mode, all data will be retained, but the time of day clock will reset to 1:00. The delay time is initially set at 10 days, but can be changed by the user.

1. Displaying delay time.
Depress [TIME] for 5 seconds, the current delay time (in days) will appear.
2. Changing delay time.
 - a. Depress [TIME] for 5 seconds, the current delay time will appear.
 - b. Enter new delay time (0 to 200 days) using the same procedure as that for entering other data.

NOTE: In the event of a power loss to the console, the power down delay time will go back to 10 days.

Low Limit Flow Set Point and Low Limit *(For Liquid Application Only!)*

Depress [VOL/MIN] until DATA display flashes. A low limit flow rate may now be entered.

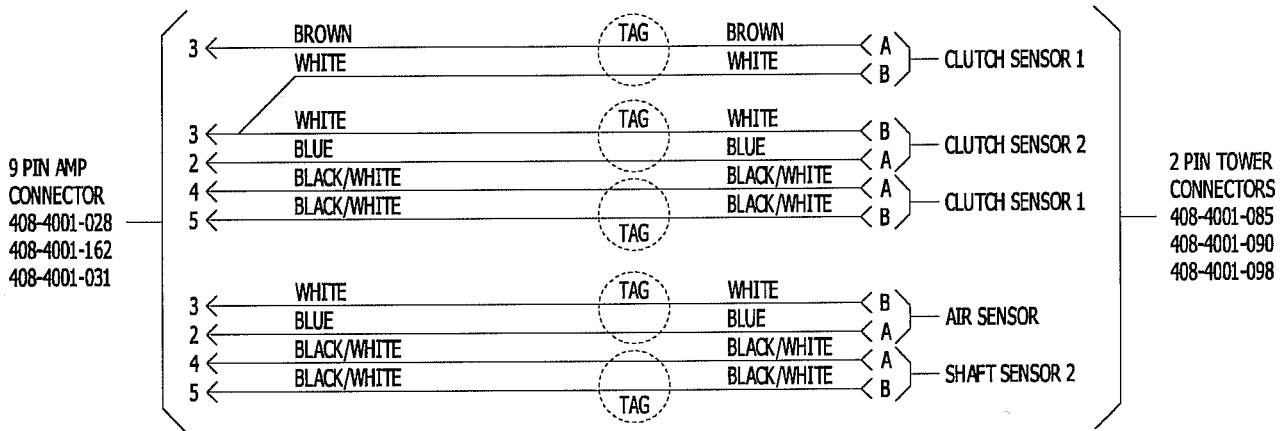
If the actual Volume Per Minute falls below this limit, the Control Valve stops closing, an Alarm sounds, and the display flashes "LL". The low limit value should be determined with all booms "on". This value is automatically proportional to the percentage of booms that are "on". (i.e. If the entered low limit is 4 GAL/MIN and half the total boom length is shut off, the Console automatically reduces the low limit to 2 GAL/MIN).

Control Valve Delay *(For Liquid Application Only!)*

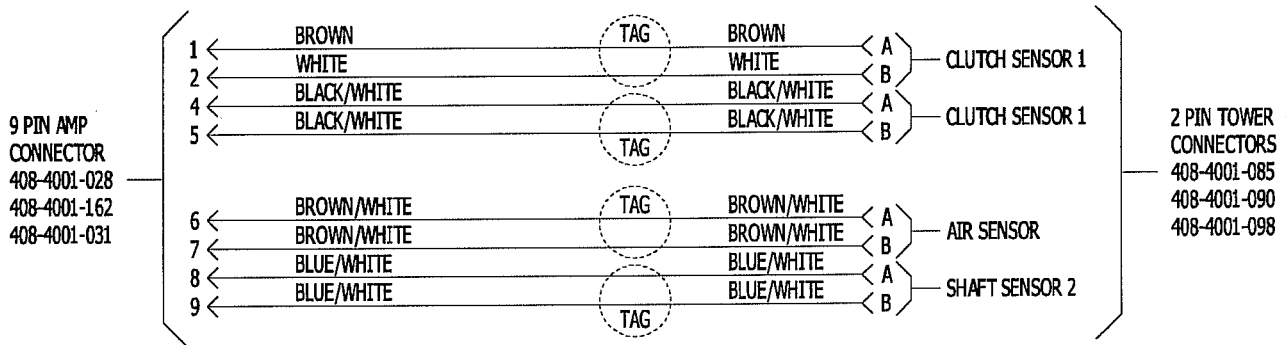
Depress [SPEED CAL] until DATA display flashes. The first digit, (X0 0 0), is the Control Valve delay digit. This feature allows the user to set a delay between the time the booms are turned on and when the console begins to control the flow rate. A value of 1 - 9 means a delay of 1 - 9 seconds respectively. A value of 0 means no delay. This delay is active if the time between turning off and turning on the booms is less than 30 seconds.

Wiring Schematics

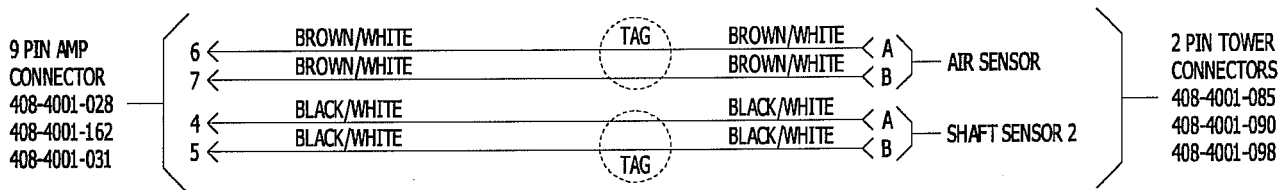
Gandy 66 Series Using Raven Model 600 (Revised 440) Controller Schematic Diagram Sensor Cables



DOUBLE CLUTCH - L07-0115-555



SINGLE CLUTCH - L07-0115-556



NO CLUTCH - L07-0115-557

Trouble Shooting Guide

Raven Industries Technical Services

Phone# 800-243-5435

Problem	Corrective Action
1. No Display lights with power ON.	Check fuse on back of console. Check battery connections. Check operation of POWER ON/OFF switch. Return console to your dealer to replace processor board assembly.
2. All keyboard lights on at same time.	Return console to your dealer to replace processor board assembly.
3. A digit cannot be entered via keyboard.	Return console to your dealer to replace face plate sub-assembly.
4. An indicator light on key will not illuminate.	Return console to your dealer to replace face plate sub-assembly and /or processor board assembly.
5. Console displays flashing "CAL" whenever vehicle engine is started.	Check battery voltage and battery connections. Install stand-by 9-v alkaline battery in box at rear of console, (Duracell MN1604 or Eveready 522). Install CB radio suppressor kit on vehicle's ignition system.
6. Console displays flashing "CAL" whenever master switch is turned ON or OFF.	Check battery voltage and battery connections. Obtain electrical noise suppressor from CB radio shop and install on boom solenoid valves.
7. Console displays flashing "CAL" whenever speed is changed.	Check battery voltage and battery connections. Check for bad spark plug wires with engine analysis computer. Obtain electrical noise suppressor from CB radio shop and install on spark plugs and generator. Install grounding strap from engine hood to chassis.
8. "TIME" function is inaccurate or drifting.	Return console to dealer to replace processor board assembly.
9. One display digit has one or more missing segments.	Return console to dealer to replace LCD display board assembly.
10. Speed display "0".	Check speed sensor cable connector and plug on back of console for loose pins. Clean pins and sockets on speed sensor cable connectors. If no extension cable is used, replace speed sensor switch assembly. If 24-foot speed sensor extension cable is used. See Appendix 4.

11. Speed inaccurate or unstable. (wheel drive speed sensor)

Run speed check on hard surface road. If SPEED is accurate, investigate mounting speed sensor on different wheel.

Remove one red magnet and one black magnet from the wheel. (Reposition remaining red and black magnets directly across from each other). Enter a SPEED CAL number in the console twice as large as the correct SPEED CAL number. Run speed check on hard surface road. Remove these two magnets and replace with others two. Run speed check. If SPEED is inaccurate with only one set of magnets, replace the bad set. If SPEED is inaccurate with both sets, replace speed sensor switch assembly. NOTE: Re-enter original SPEED CAL number after testing is complete.

12. Speed inaccurate or unstable.

Wiggle cable at the speed sensor connector. If speed is (speedometer drive speed sensor) displayed, tighten connector or replace transducer assembly. Check speedometer cable adapter, key, and transducer assembly for proper connections and engagement.

Check for kinked speedometer cable or too short of a bend.

Check for bad spark plug wires with engine analysis computer.

Obtain electrical noise suppressors from CB radio shop and install on spark plugs and generator. Install grounding strap from engine hood to chassis.

Replace speedometer transducer assembly.

13. Rate reads "0000".

Verify SPEED is registering accurately. If SPEED is zero, refer to trouble-shooting, problem 12.

14. Rate inaccurate or unstable.

Verify that all numbers *keyed in* console are correct. Verify SPEED is registering accurately. If SPEED is inaccurate, refer to troubleshooting problems 11 or 12.

15. Cannot vary rate in manual operation or in auto.

Check cabling to motorized feedback control for breaks.

Check connections in cabling for cleanliness.

Verify that there is voltage at the valve connector by placing MASTER switch ON; RATE1/RATE2/MAN switch to MAN; and POWER switch to ON.

Manually operate INCR/DECR switch to verify voltage.

Verify that feedback control is turning. If not, replace motorized feedback control.

APPENDIX 1

INSTALLATION RUN-HOLD ASSEMBLY *(for 16 pin connector)*

The Run-Hold feature in the Raven 600 Controller will stop and start the Gandy Orbit Applicator automatically when the tillage equipment is raised or lowered. This means that the tractor operator does not have to manually control the applicator by moving the MASTER ON/OFF switch to OFF or ON. To accomplish this, it is necessary for a magnet and a switch to be mounted on the hydraulic lift mechanism with the mounting straps provided.

Install either the magnet or the switch on the hydraulic ram and the other on a non-moving part of the implement where the two will come in close proximity when the implement is in the ground. Be sure that the wire from the switch is not in the way of moving parts and that there is enough slack to take up the hydraulic ram motion if it is mounted on the ram. There is a two-wire cable in the main Console Cable for connecting the Run-Hold Switch. For certain applications, an extension cable may need to be purchased, depending on the location of the mounting.

In order for the **Hydraulic motor** to turn the metering wheels, these steps must be taken by the operator. They are:

1. The Power switch must be in the ON position
2. The BOOM 1 switch must be in the " down" or OFF position.
3. The BOOM 2 switch must be in the " up" or ON position
4. The BOOM 3 switch must be in the " up" or ON position
5. The MASTER ON/OFF switch must be in the " up" or ON position.
6. The Run-Hold Magnet and Switch must be in close proximity. The ideal distance is from ¼ to ½-inch apart.

Be sure the Run-Hold Switch will close by testing the location before making a permanent installation. At that time, final adjustments can be made.

INSTALLATION RUN-HOLD ASSEMBLY *(for 22 pin connector)*

In order for the **Hydraulic motor** to turn the metering wheels, these steps must be taken by the operator. They are:

1. The Power switch must be in the " up" or ON position
2. The BOOM 1 switch must be in the " up" or ON position.
3. The BOOM 2 switch must be in the " up" or ON position
4. The BOOM 3 switch must be in the " up" or ON position
5. The MASTER ON/OFF switch must be in the " down" or OFF position.
6. The Run-Hold Magnet and Switch must be in close proximity. The ideal distance is from ¼ to ½-inch apart.

Be sure the Run-Hold Switch will close by testing the location before making a permanent installation. At that time, final adjustments can be made.

APPENDIX 2

RIM DRILLING INSTRUCTIONS FOR SPEED SENSOR MAGNETS

On wheels which do not have pre-punched mounting holes, proceed as follows:

RIMS WITH FOUR OR EIGHT HOLE STUD PATTERN

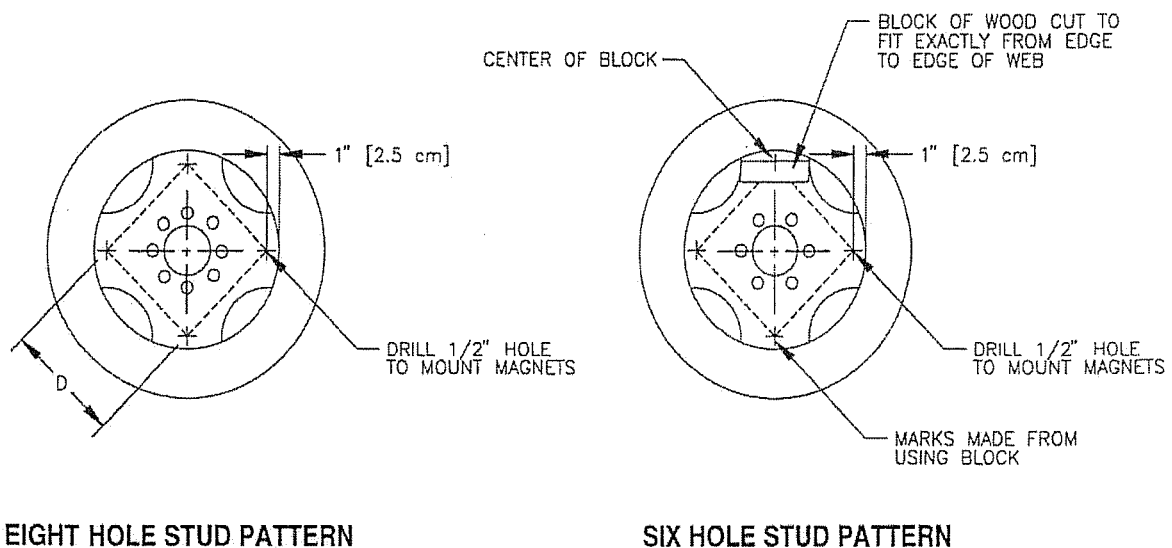
Choose stud holes that are opposite each other as shown in Figure 6. Using the center of opposite holes, scribe two lines on the rim web to divide the circumference into four equal parts. Measure in one inch [25 mm] from the outer edge of web on each of the lines drawn. Mark this point as the center. Drill four $\frac{1}{2}$ " [13 mm] holes for mounting the magnets or break bead on tire and weld nut to rim.

NOTE: Distance (d) between each set of drilled holes must be equal within $\frac{1}{8}$ " [3 mm] to insure accuracy of system.

RIMS WITH SIX-HOLE STUD PATTERN

Locate the center of the holes to be drilled by using the rim webbing as a guide. (See Figure 7). Obtain a small piece of wood and cut to fit exactly over the web as shown in Figure 7. Measure the length of the piece of wood and mark the center of one edge. Using the center mark on the piece of wood, mark each of the four webs. Measure in one inch from the outer edge of the web on each of the lines drawn. Mark this point as center and drill four $\frac{1}{2}$ " [13 mm] holes for mounting the magnets or break bead on tire and weld nut to rim.

NOTE: Distance (d) between each set of drilled holes must be equal within $\frac{1}{8}$ " [13 mm] to insure accuracy of system.



APPENDIX 3

SPEEDOMETER DRIVE SPEED SENSOR INSTALLATION/CALIBRATION AND RADAR CALIBRATION

NOTE: For Radar Speed Sensor see RADAR CALIBRATION on page 29 of this manual.

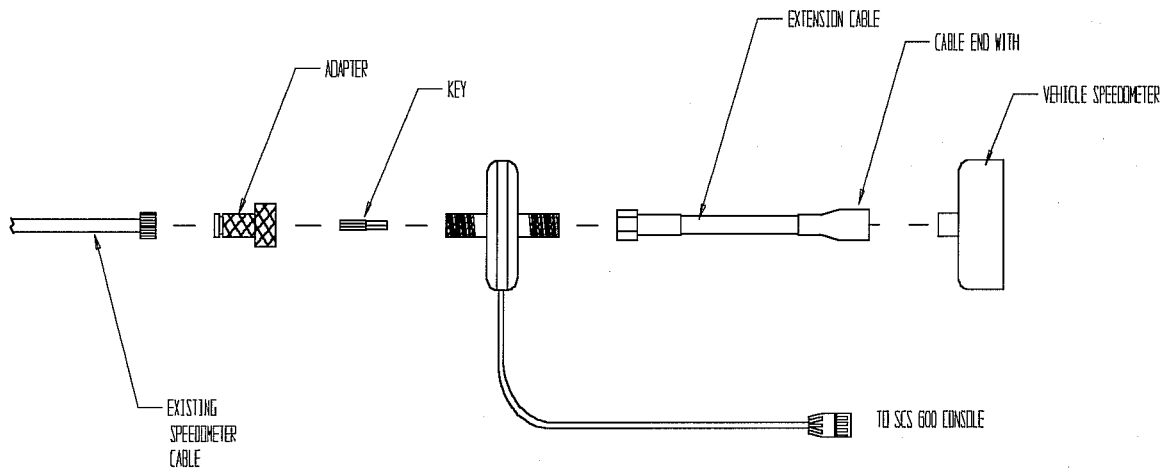
INSTALLATION:

1. Remove the existing speedometer cable from the back of the vehicle speedometer. Pull cable through firewall into engine compartment.
2. Install adapter and key on speedometer cable and connect to Transducer Assembly. (Some units do not require adapter key).
3. Connect Extension Cable to Transducer Assembly.
4. Push Extension Cable through firewall and reinstall on speedometer.
5. Connect the cable on the Transducer Assembly to the SCS 600 Console.
6. Secure all cables with plastic cable ties.

The unit is now ready for calibration with your vehicle. See CALCULATION OF SPEED CAL on next page.

TRANSDUCER ASSEMBLY

TRANSDUCER ASSEMBLY



APPENDIX 4

CALCULATION OF SPEED CAL FOR SPEEDOMETER SPEED SENSOR

Complete Initial Programming of Console Computer before doing this procedure.

NOTE: Numbers in [] brackets are the metric equivalents.

1. Set RATE 1/RATE 2/MAN switch to MAN, POWER switch to ON, MASTER switch OFF, BOOM switches OFF.
2. Enter "0" in key labeled: [DISTANCE]
3. Enter 612 [1550] in key labeled: [SPEED CAL]
4. Drive 1 mile [1 kilometer]. (Caution: Do not use vehicle odometer to determine distance). Use section lines or highway markers.
5. Read DISTANCE by depressing key labeled: [DISTANCE]

It should read a value of approximately 5,280 [1,000]. If it reads between 5,200 - 5,350 [990 - 1,010], the SPEED CAL for your vehicle is 612 [1,550]. Note that the metric SPEED CAL is [155] not [1,550]. Entering [1,550] in Step 1 permits driving 1 kilometer instead of 10 kilometers.

If the DISTANCE display reads any other value, divide SPEED CAL by the value observed in DISTANCE, then multiply by 5,280 [1,000]. This will give you the correct value to enter for SPEED CAL. You must round off to the nearest 3 digit number. For example: Assume Distance reads 5,000 [980].

FOR ENGLISH UNITS

$$\text{Then } 612 \times \frac{5,280}{5,000} = 646.3$$

1. The number to enter for SPEED CAL is 646 [158].

2. Recheck the new SPEED CAL derived in Step 3.

a. Zero out DISTANCE display as in Step 3.

b. Enter the new SPEED CAL number as in Step 1. *Note:* To drive 1 kilometer instead of 10, enter [1,580] for SPEED CAL instead of [158].

c. Repeat Steps 4, 5, and 6.

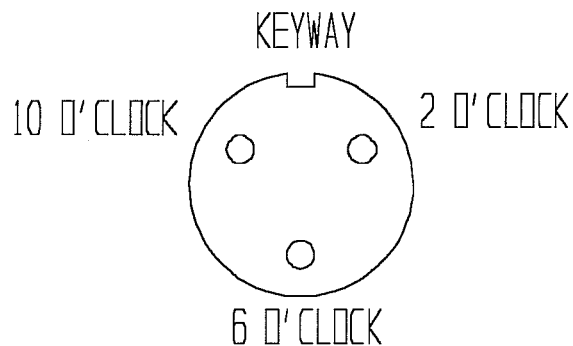
FOR METRIC UNITS

$$\text{Then, } [1,550] \times \frac{1,000}{980} = 1,582$$

APPENDIX 5

PROCEDURE TO TEST SPEED SENSOR EXTENSION CABLE

Disconnect extension cable from Speed Sensor Assembly cable. Hold extension cable connector so that key way is pointing in the 12 o'clock position.



-
- (1) 2 o'clock socket is power.
 - (2) 10 o'clock socket is ground.
 - (3) 6 o'clock socket is signal.

VOLTAGE READINGS

- (1) 10 o'clock to 6 o'clock (+5 VDC)
 - (2) 10 o'clock to 2 o'clock (+5 VDC)
-

Procedure to check cable:

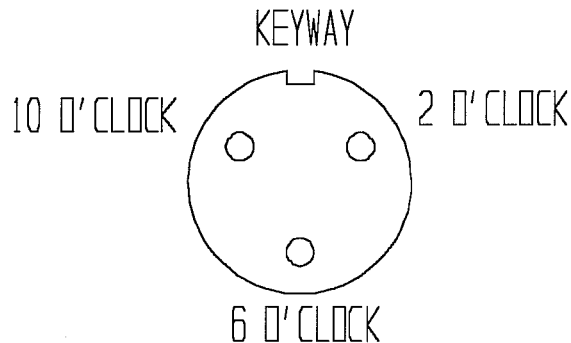
1. Enter SPEED CAL number of 1000 in key labeled: [SPEED CAL]
2. Depress key labeled: [DISTANCE]
3. With small jumper wire (or paper clip), short between 10 o'clock and 6 o'clock sockets with a "short" "no-short" motion. This should cause a speed reading to be displayed in the Console. Each time a contact is made, the DISTANCE total should increment up 1 or more counts.
4. If DISTANCE does not count up, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.
5. Perform above voltage checks.
6. If cables all test good, replace speed sensor.

NOTE: After testing is complete, re-enter correct SPEED CAL number before applying granules.

APPENDIX 5 (Continued)

PROCEDURE TO TEST CHEMICAL FLOW CABLES

Disconnect cable from Flow Sensor. Hold Flow Sensor cable so that the key way is pointing in the 12 o'clock position.



-
- (1) 2 o'clock socket is ground.
 - (2) 10 o'clock socket is power.
 - (3) 6 o'clock socket is signal.

VOLTAGE READINGS

- (1) 2 o'clock to 6 o'clock (+5 VDC)
 - (2) 2 o'clock to 10 o'clock (+5 VDC)
-

Procedure to check cable:

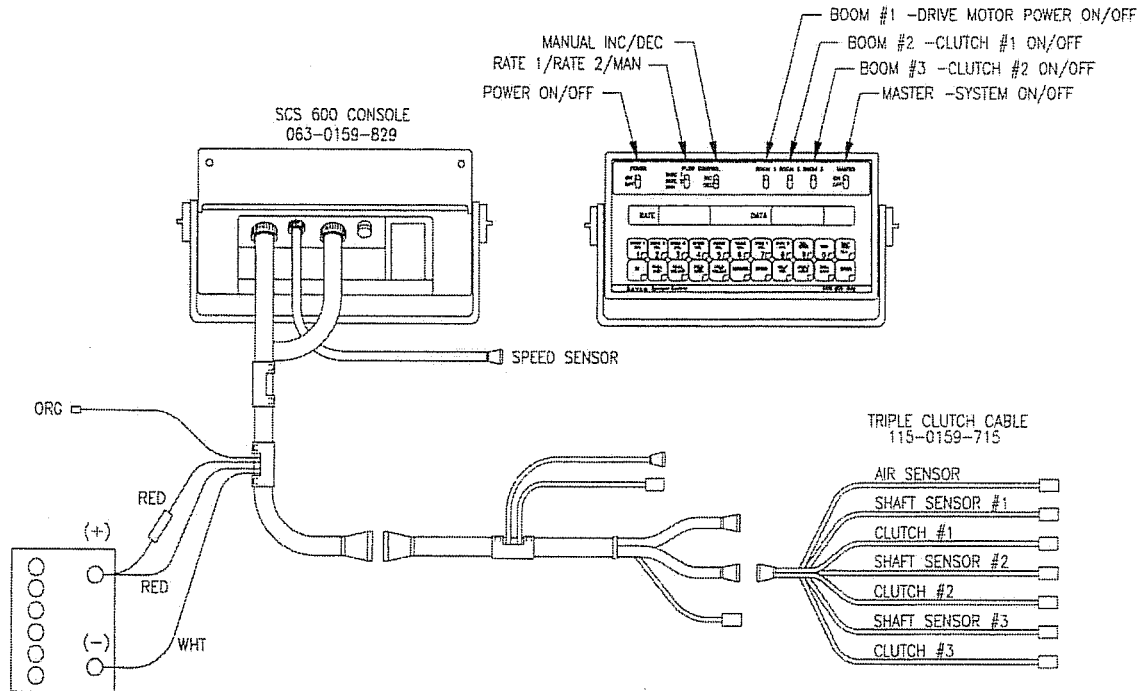
1. Enter a METER CAL number of one (1) in key labeled: [METER CAL]
2. Depress key labeled: [TOTAL VOLUME]
3. Position MASTER switch and BOOM switches ON.
4. With small jumper wire (or paper clip), short between 2 o'clock and 6 o'clock sockets with a "short - no short" motion. Each time a contact is made, the VOLUME total should increment up 1 or more counts.
5. If VOLUME does not count up, remove the section of cable and repeat test at connector next closest to Console. Replace defective cable as required.
6. Perform above voltage checks.
7. If cables all test good, replace Flow Sensor.

NOTE: After testing is complete, re-enter correct METER CAL numbers before starting to apply granules.

APPENDIX 6

TRIPLE CLUTCH MODELS

1. Mount the Console to a secure support inside the cab of the vehicle.
2. Connect the 10-foot [3m] Console Control Cable to the plug in the back of the Console. Run the Control Cable out of the vehicle cab and connect with 6-foot [1.8m] Flow Control Cable on the unit. (Extension cables are available from your dealer.)



3. Turn Power On/Off switch OFF and route the Red and White battery wires to a 12-volt battery. Attach the White battery wire to the **Negative (-)** terminal and the Red battery wire directly to the **Positive (+)** battery terminal. See page 8. (**Do Not Connect Red or White Wires to the Starter**). Secure the battery wires with plastic cable ties. Do Not tie the battery wires close to the existing battery leads or any other electrical wiring.

Note: Whenever battery wires are disconnected, remove the optional 9-volt back-up battery from the Console.

4. Connect the Speed Sensor Cable to the plug in the back of the Console.
5. Secure and tie the Speed Sensor Cable and the Flow Control Cable with plastic cable ties.
6. Initial installation of the system is now complete.

APPENDIX 6 (Continued)

Important: This Console requires selection of **US** (acres), **SI** (hectares, or **TU** (1,000 sq. ft.) area; **SP1** (Wheel drive, etc.); or **SP2** (radar) speed sensor; the selection of **GRAN** (granular) or **440** (spray) operating modes; and also **C-Sd** (Standard), **C-F** (Fast), or **C-FC** (Fast Close Valve).



Console Revision can be determined by the letter stamped in REV box on label.

Console Program can be determined by the letter stamped in PGM box on label.

Selects manual or fully automatic control.

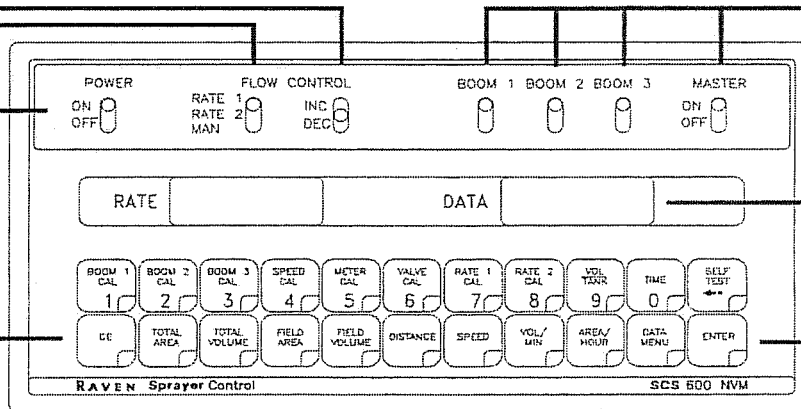
Manual override control provides capability for spot applications.

BOOM 1 - Drive motor On/Off

BOOM 2 - Clutch #1 On/Off

BOOM 3 - Clutch #2 On/Off

MASTER - System/Drive Motor On/Off



CE - Use like you do the CE key on a calculator. This key is also used to select features listed in IMPORTANT box above.

POWER - Turns Console power ON or OFF. Turning Console OFF does not affect the data stored in the Console.

CALIBRATION KEYS -- Used to enter data into the Console to calibrate the system.

BOOM 1 CAL	--	Length of Boom 1
BOOM 2 CAL	--	Length of Boom 2
BOOM 3 CAL	--	Length of Boom 3
SPEED CAL	--	Determined by Speed Sensor
METER CAL	--	Meter Calibration Number & Spreader Constant
VALVE CAL	--	Valve Response Time
RATE 1 CAL	--	Target Application Rate
RATE 2 CAL	--	Target Application Rate

ENTER - Used only to enter data into the Console.

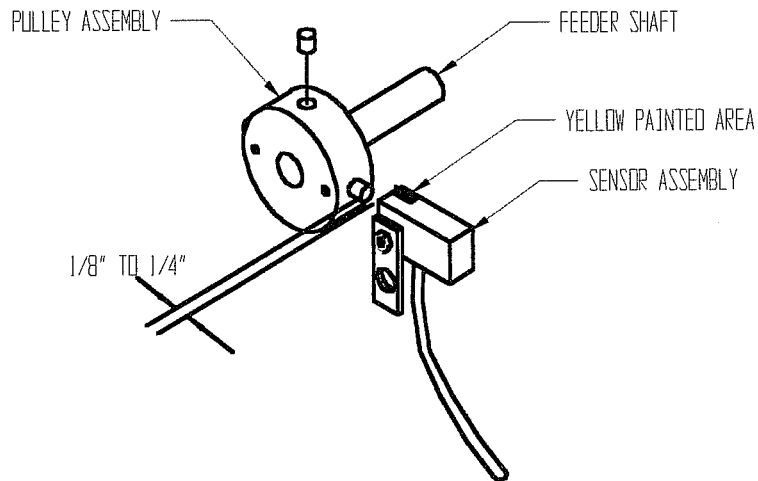
Displays function and calibration data.

FUNCTION KEYS -- Used to Display Data

TOTAL AREA	--	Total Area Applied
TOTAL VOLUME	--	Total Volume Applied
FIELD AREA	--	Field Area Applied
FIELD VOLUME	--	Volume Applied to Field
DISTANCE	--	Distance Traveled
SPEED	--	Speed of Vehicle
VOL/MIN	--	Volume Per Minute
TIME	--	24 Hour Clock (Military Time)
DATA MENU	--	Printer Option

Meter wheel shaft sensor mounting

1. Secure sensor wheel assembly to metering shaft using ¼ - 20 set screw.
2. Use an appropriate bolt to fasten sensor assemble to frame of granular applicator. Additional brackets may need to be constructed to accommodate mounting sensor assembly.
3. Adjust sensor assembly so magnets pass by yellow painted area of sensor. Maintain a clearance between magnets and sensor of ⅛" to ¼".



Dwg Shaft Sensor

SHAFT SENSOR

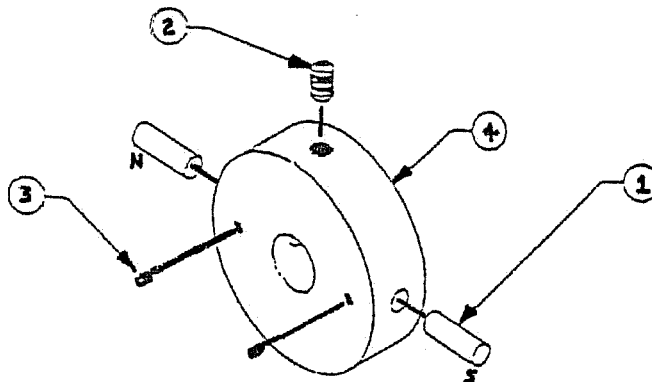
SHAFT SENSOR REPLACEMENT PARTS (Package L07-0117-484)

GANDY PARTS LIST

<u>Item</u>	<u>Description</u>	<u>Part#</u>
	Shaft Sensor	L07-0117-929

RAVEN PARTS LIST

<u>Item</u>	<u>Description</u>	<u>Raven Part#</u>
1	Magnet	418-0000-004
2	Set screw	311-0015-008
3	Set screw	311-0015-335
4	Wheel-shaft sensor	107-0159-680



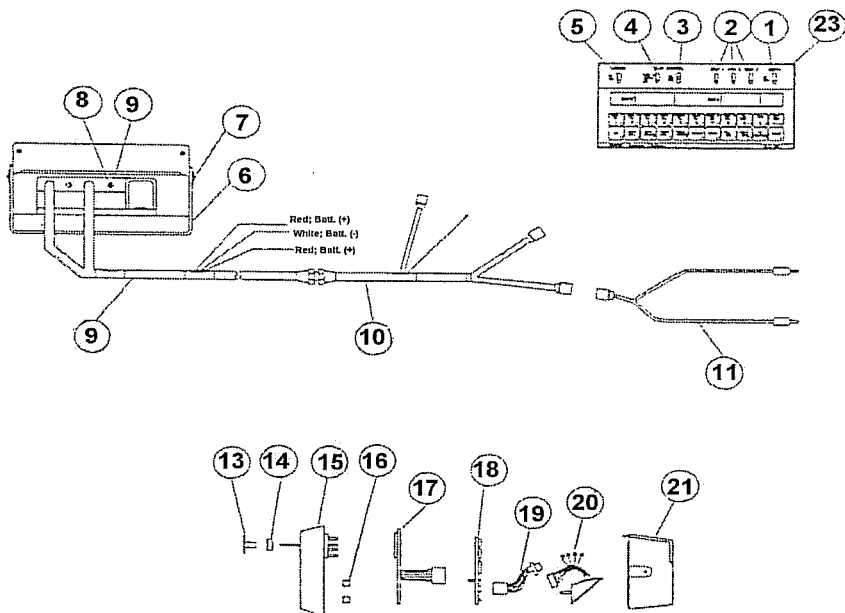
SCS 600 REPLACEMENT PARTS LIST

GANDY PARTS LIST

ITEM	DESCRIPTION	PART#
9	Console Cable	L07-0115-553
10	Flow Control Cable	L07-0115-554
11	Single Feeder Cable	L07-0115-557
	Single Clutch	L07-0115-556
	Double Clutch	L07-0115-555
15	Face Plate Assembly	L07-0063-526
20	Connector Plate Assembly	L07-0063-827
21	Back Assembly	L07-0063-530
22	Ext. Cable (24 Ft.)	L07-0115-559
23	Console Only	L07-0063-829

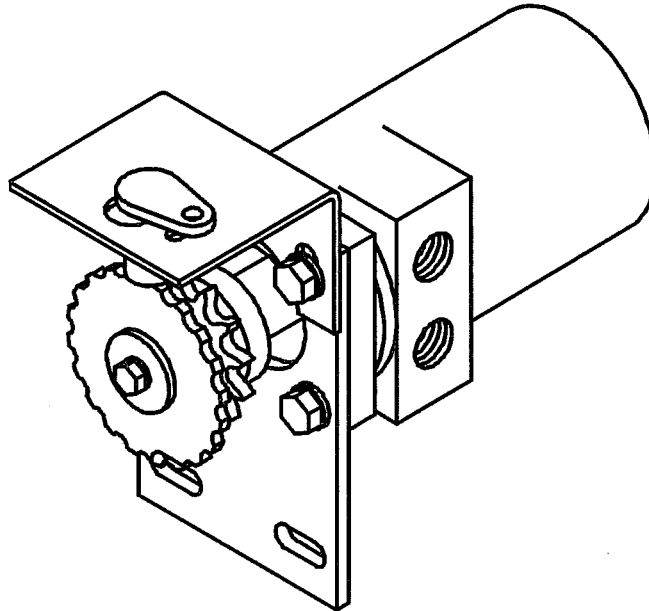
RAVEN PARTS LIST

ITEM	DESCRIPTION	PART#
1	Master Switch	412-2011-046
2	Boom Switch	412-2011-047
3	Manual Adj. Switch	412-2011-049
4	Rate 1 \Rate 2\ Man. Switch	412-2011-050
5	Power Switch	412-2011-048
6	Mounting Bracket	106-0159-438
7	Fuse Holder	510-2001-018
8	Fuse Fast Blow (AGC 15)	510-1003-003
12	Assorted Terminal Kit	117-0159-402
13	Switch Cover	106-0159-433
14	1-Set Filler Spacers	117-0159-421
16	Display Board Spacer	107-0159-478
17	LCD Display Board	064-0159-428
18	Processor Board	064-0159-498
19	Shaft Sensor Interface	064-0159-499



Installing hydraulic drive motor

Mount drive motor to feeder drive shaft on granular applicator using roller chain and sprockets. Secure drive motor with four 3/8 - 16 unc bolts.



Calculation of Speed Cal for Radar Installations

The switches and keys referred to below are on the Raven SCS Console. Use steps 1, 2, and 3 if console has SP1/SP2 Select.

NOTE: Numbers in [] brackets are the metric equivalents.

1. Remove 9-volt battery and fuse from rear of console. This will allow for reprogramming of SCS Console.
2. Replace the 9-volt battery and fuse after it has been disconnected for a period of 30 seconds.
3. See INITIAL PROGRAMMING OF CONSOLE COMPUTER, in the INSTALLATION AND SERVICE MANUAL for our console. Complete steps 1 thru 3.
4. Enter SPEED CAL number (see table 1) in key labeled: [SPEED CAL]
5. Set POWER switches to ON, all other switches to OFF.
6. Enter "0" in the key labeled: [DISTANCE]
7. Drive 1 mile [1 kilometer]. *CAUTION:* Do not use vehicle odometer to determine distance. Use section lines or highway markers.
8. Read DISTANCE by depressing key labeled: [DISTANCE]

It should read a value of approximately 5280 [1000]. If it reads between 5260 - 5300 [990 - 1010], your SPEED CAL for your vehicle is 612 [1550]. Note that the metric SPEED CAL is [155] not [1550]. Entering [1550] in step 1 permits driving 1 kilometer instead of 10 kilometers.

If the DISTANCE display reads any other value, divide SPEED CAL by the value observed in DISTANCE, then multiply by 5280 [1000]. This will give you the correct value to enter for SPEED CAL. You must round off to the nearest 3 digit number. *EXAMPLE:* Assume DISTANCE reads 5000 [980].

FOR ENGLISH UNITS

FOR METRIC UNITS

$$\text{then } \frac{612 \times 5280}{5000} = 646.3$$

$$\text{then } \frac{[1554] \times 1000}{980} = 158.5$$

9. The number to enter for SPEED CAL is 646 [159].
10. Recheck the new SPEED CAL derived in step 8 as follows:
 - a. Zero out DISTANCE display as in step 6.
 - b. Enter the new SPEED CAL number as in step 4. Note: To drive 1 kilometer instead of 10, enter [1590] for SPEED CAL instead of [159].
 - c. Repeat steps 6, 7, and 8.

TABLE 1

Radar Manufacture	Speed Cal Number (A) (B)	
	English	Metric
Dickey John	820	[2070]
Magnavox	612	[1550]
TRW	612	[1550]
Raven	590	[1494]

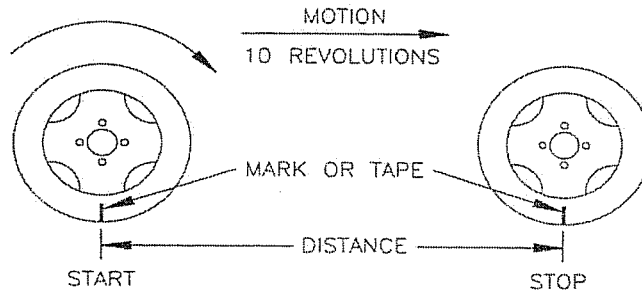
1. For SCS 500 enter speed cal equal to 1/2 of value in table 1.
2. Final speed cal may vary with radar mount.

Calculating "Speed Cal" for Magnetic Speed Pick-up from a wheel

This section applies only to the Wheel Drive Speed Sensor. (Instructions for Speedometer or Radar Speed Sensors are included on pages 21, 22, 29.

1. Place chalk mark or tape on vehicle tire, on which Speed Sensor is mounted, as shown on Figure 9.
2. Mark initial spot on the ground.
3. Drive vehicle straight ahead counting 10 revolutions of the wheel with the mark stopping at the same position as starting.
4. Measure distance from start mark to stop mark in inches. [Centimeters]. (Round off fractions).
5. Write down this SPEED CAL calibration number for future reference when programming the Console.

NOTE: This measurement is critical to the performance of the SCS 600. **MEASURE CAREFULLY.** Be sure tire is properly inflated before measuring. Measure tire in type of soil in which you will be spraying. Circumference of tire will vary when measured in soft soil versus hard packed soil. For best results, measure several times and average the results. Re-measure periodically.

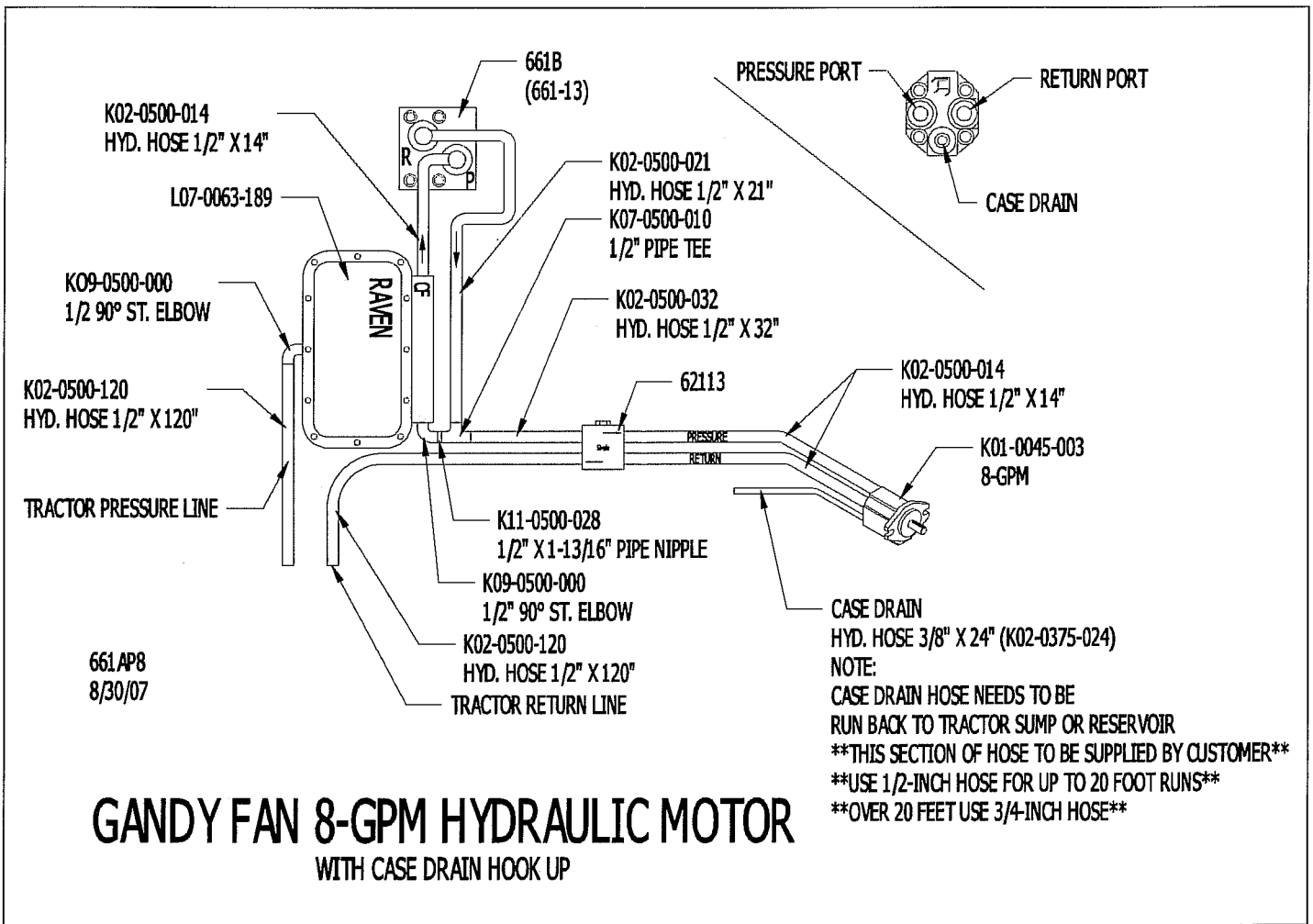


Calculating "Valve Cal "

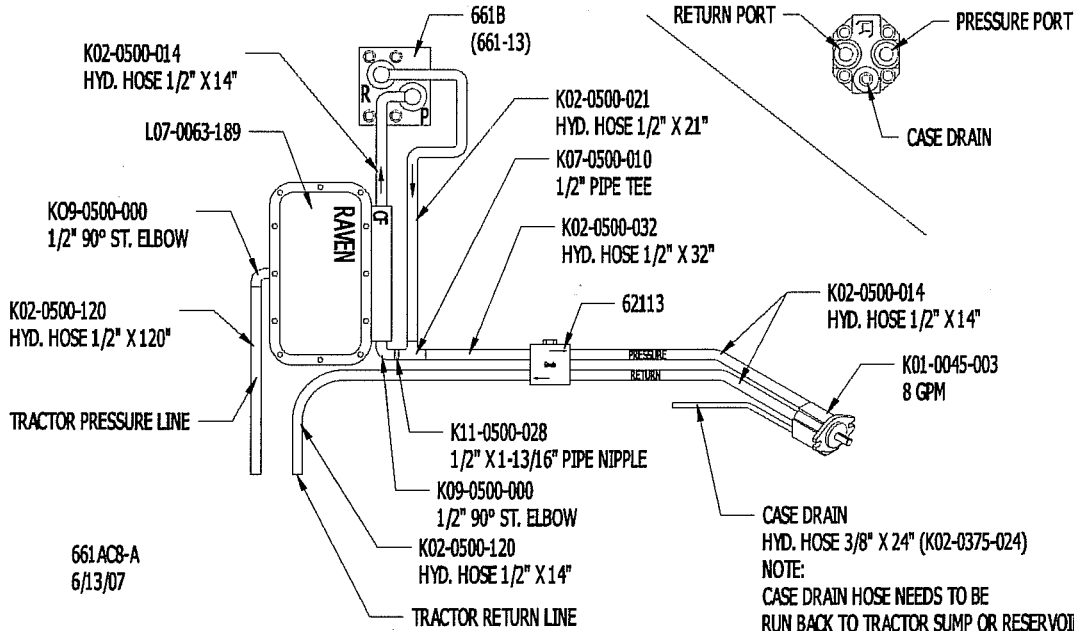
The initial control valve calibration number is 2123 [2123]. After operating the system, you may desire to refine this number. See definitions below.

Valve backlash	Controls the time of the first correction pulse after a change in direction is detected. Increase to decrease or decrease to increase. Range: 1 to 9; (1) short pulse, (9) long pulse.
Valve speed digit	Controls the speed of the control valve motor, CAUTION: Running the control valve too fast will cause the system to oscillate. Range: 1 to 9; (1) slow, (9) fast
Brake point digit percent	Sets the point at which the control valve motor begins braking, so as not to over shoot the desired rate. Digit is percent away from target rate. Range: 0 to 9; 0=5%, 1=10%, 9=90%.
Dead-band digit	Allowable difference between target and actual application rate, where rate correction is not performed. Range: 1 to 9; 1=1%, 9=9%.

Hydraulic Motor Connections for Gandy Plastic Housing Fan



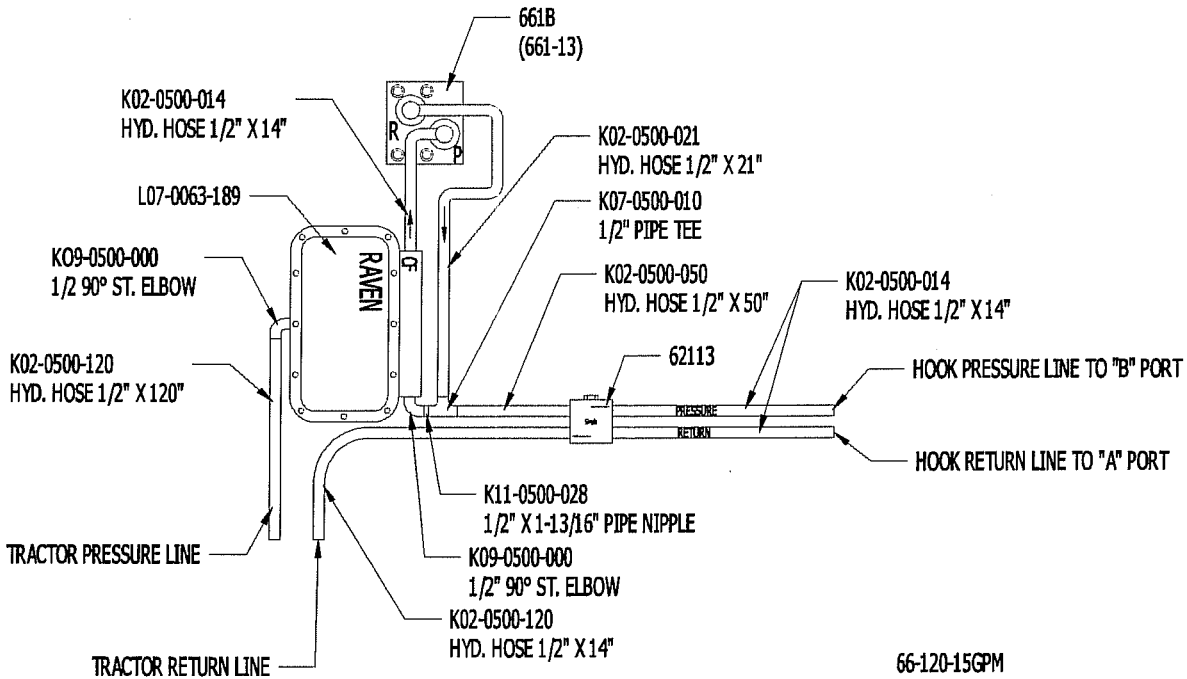
Hydraulic Motor Connections for Cary Cast Housing Fan



NOTE:
CASE DRAIN HOSE NEEDS TO BE
RUN BACK TO TRACTOR SUMP OR RESERVOIR
THIS SECTION OF HOSE TO BE SUPPLIED BY CUSTOMER
USE 1/2-INCH HOSE FOR UP TO 20 FOOT RUNS
OVER 20 FEET USE 3/4-INCH HOSE

CRARY FAN 8 GPM HYDRAULIC MOTOR

WITH CASE DRAIN HOOK UP



66-120-15GPM
2/14/06

CRARY FAN WITH 15 GPM HYDRAULIC MOTOR