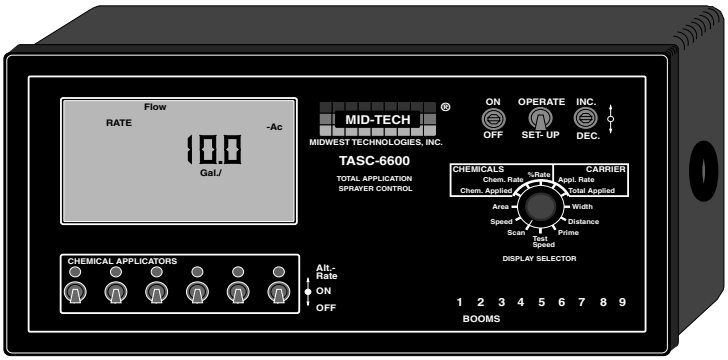
MIDWEST TECHNOLOGIES, INC.

TASC-6000, 6300, & 6600

Total Application Sprayer Control System

User Guide
PN - 98-05010
Rev. # - 1

CE & STANDARD VERSION



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TASC MANUAL - CHANGE LOG

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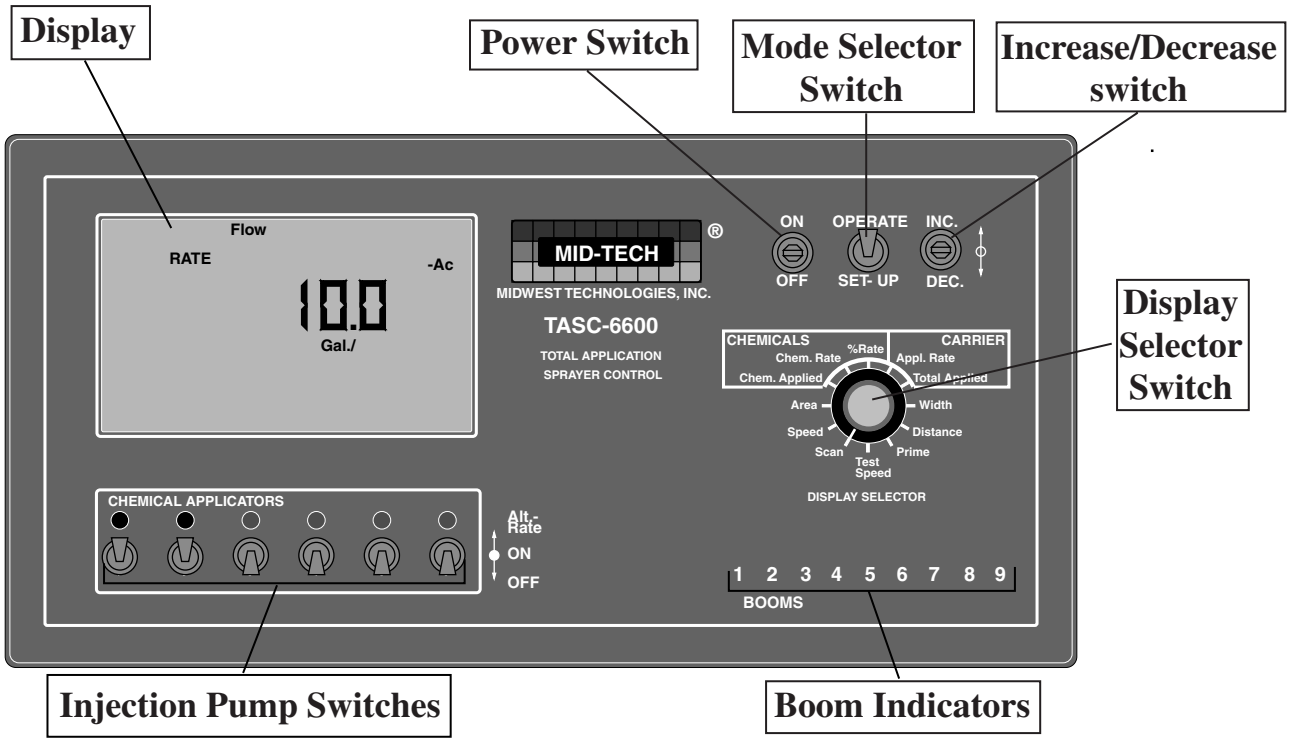
1.0 SWITCHES AND CONTROLS



1.1 POWER SWITCH

The power switch controls power to the console. The console has an "Auto Power Down" feature which powers the console off after an operator selectable time (default is 30 min) has elapsed. The console has a nonvolatile memory so it "remembers" the constants and data previously entered, even if the power is removed.

NOTE: The “Auto Power Down Feature is only available on the CE version of the console (CE designation label on back of console).

1.2 MODE SELECTOR OPERATE/SET-UP SWITCH

The Mode Selector switch (upper right) is used to switch between the **OPERATE** and **SET-UP** modes. When spraying, this switch must be in the **OPERATE** position. The **SET- UP** position is used for entering information into the console. In the **SET-UP** Mode, all pump operations (except calibration) are turned off and an **Err** message appears if a position which can not be programmed is selected.

1.3 INC/DEC SWITCH

The **INC/DEC** switch (upper right) is used to adjust the values appearing in the display. The **INC/DEC** switch is used in both **OPERATE** and **SET-UP** Modes.

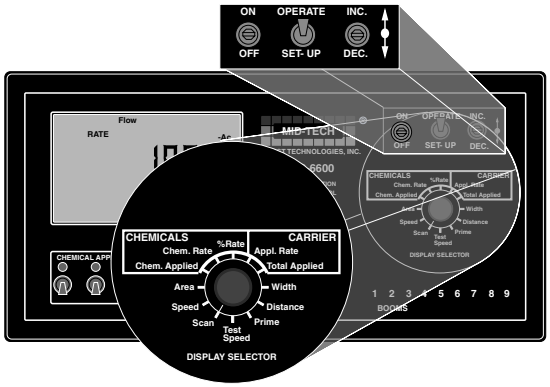
This switch is also used to zero the accumulated areas, distance, and volumes by selecting the desired display and holding this switch in the **DEC** position until the display resets to zero, (approximately 3 sec).

1.4 DISPLAY SELECTOR

The Display Selector (right center) is used to select the various console functions that are to be displayed and adjusted.

1.4.1 DISPLAY SELECTOR FUNCTIONS IN OPERATE MODE

(Refer to Appendix D for these switch functions in "Handgun Mode".)



SPEED: The current vehicle speed.

AREA: Accumulated Area #1.*

CHEMICALS CHEM. APPLIED: The amount of chemical actually pumped by each injection pump. The display cycles through each pump in sequence unless a specific pump switch is selected **ON**.*

CHEMICALS CHEM. RATE: The programmed application rate to be delivered by each injection pump. The display cycles through each pump in sequence unless a specific pump switch is selected **ON**. An alternate rate can also be programmed for each pump. In order to view the Alternate rate, the individual pump switch must be set to the **ALT. RATE** position.

CHEMICALS % RATE: The percent of target application rate at which all active injection pumps are operating. This percentage can be changed up or down a preset amount by operating the **INC/DEC** switch.***

CARRIER APPL. RATE: The target application rate of the main carrier (including chemical). Once spraying operations have started, and main carrier flow is established, the actual measured flow rate of the sprayer will be displayed here.***

CARRIER TOTAL APPLIED: The actual volume of carrier, including chemical applied, as measured by the flow meter.*

WIDTH: The active boom width. Depends on the actual boom sections selected **ON** and the individual widths programed into each section.

DISTANCE: The accumulated distance.*

PRIME: This position is used during priming operations to fill the injector pump lines with chemical or to lock the control valve open during main pump priming.

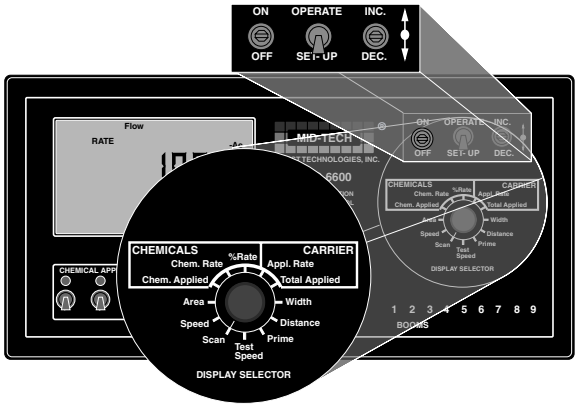
TEST SPEED: The speed the console uses for stationary tests of the sprayer.**

SCAN: The display scans **SPEED**, **AREA**, **CHEMICALS-CHEM. APPLIED** by active pumps, **CHEMICALS-CHEM. RATE** of active pumps, **CARRIER-APPL. RATE** and **CARRIER-VOLUME APPLIED**. The display holds at each position for approximately two seconds.

NOTES: * Totals can be zeroed in this mode.
** Values are programmable in this mode.
*** Values changeable by a % increase or decrease.

1.4.2 DISPLAY SELECTOR FUNCTIONS IN SET UP MODE

(Refer to Appendix D for these switch functions in "Handgun Mode".)



SPEED: Ground Speed Override (GSO) Value

AREA: Accumulated Area #2.*

CHEMICALS CHEM. APPLIED: Injection pump calibration number for the pump that is turned **ON**. **Err** means no pump is selected or more than one pump is selected.**

CHEMICALS CHEM. RATE: The volume per acre to be delivered by an individual injection pump. Each pump must be selected **ON** in sequence. Two rates are programmable, one in each position of the injection pump switch: **ON** - Standard Rate or **Alt. Rate** - Alternate Rate. **Err** means no pump is selected or more than one pump is selected.**

CHEMICALS % RATE: The percent of change applied to all active injection pump application rates for each actuation of the **INC/DEC** switch.**

CARRIER APPL. RATE: The target application rate of the main carrier, including injected chemical.**

CARRIER TOTAL APPLIED: The flow meter calibration number**

WIDTH: Individual boom section widths. The display cycles through the individual boom sections sequentially, unless a particular boom switch is activated.**

DISTANCE: The current distance calibration number.**

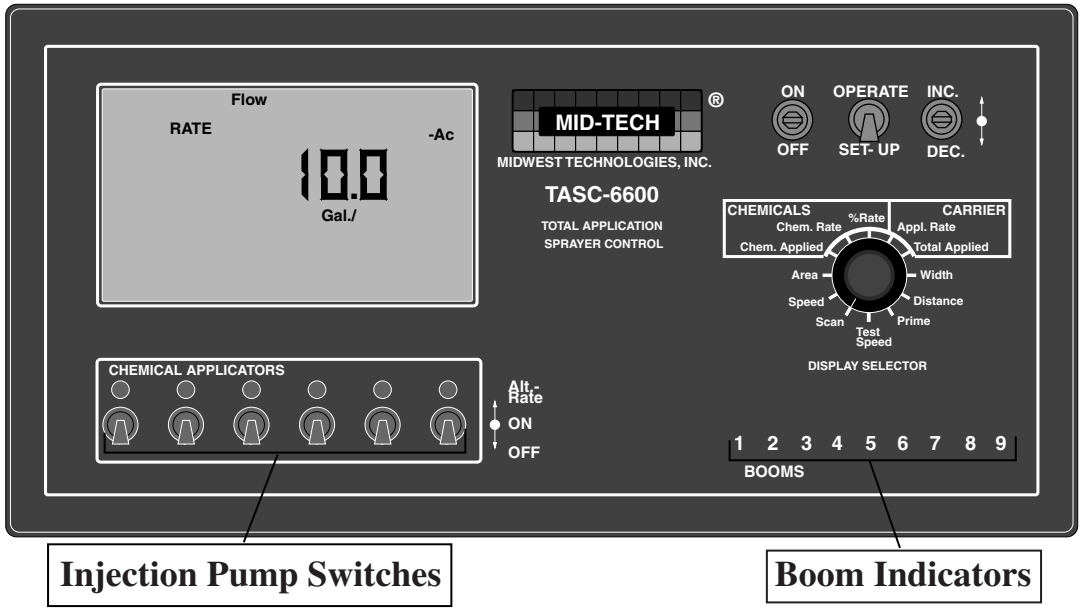
PRIME: The prime volumes for the pump that is turned **ON**. **Err** means no pump is selected or more than one pump is selected.**

TEST SPEED: The speed the console uses for stationary tests of the sprayer.**

SCAN: **Err**: This is an invalid switch combination.

NOTES: * Totals can be zeroed in this mode.
** Values are programmable in this mode.
*** Values changeable by a % increase or decrease.

1.5 BOOM SECTION "ON/OFF" INDICATORS



The boom section on/off indicators (lower right, labeled **BOOMS**), indicate which boom sections are active (turned on). There is a maximum of nine boom section positions available.

1.6 INJECTION PUMP SWITCHES (TASC 6300 and 6600 only)

(Refer to Appendix D for these switch functions in "Handgun Mode".)

The injection pump switches (lower left) are used to activate the injection pumps. Up to six separate injection pumps can be controlled by the TASC console. Each pump has its own product switch and indicator light. When the switch is in the down position, the injection pump is **OFF**. When the switch is in the **ON** position, the pump is pumping at the standard target rate, (the pump indicator light glows steadily). When the switch is in the **Alt. Rate** position, the pump is pumping at the alternate target rate (the indicator light blinks and the console beeps periodically, indicating a non-standard operation).

1.7 STATUS SWITCH

An externally mounted status switch can be used to control the injection pumps and the flow control valve. The switch must present a positive voltage (+12.0 VDC) status on the green or white wire of the boom interface cable. As long as this condition is present, TASC operates normally. If the voltage is interrupted, the TASC automatically stops the injection pumps. At the same time, TASC either "CLOSE's" the flow control valve or "HOLD's" it in its current position, depending on the response selected by the operator (See Section 2.9).

The intent of this feature is to allow the operator to control the operation of TASC through the normal operation of the vehicle. The status switch can be used to sense the "ON"/"OFF" condition of the main vehicle pump or the switch may sense an implement "UP"/"DOWN" condition. Use of the status switch can lessen the operator's work load under certain conditions.

1.8 GROUND SPEED OVERRIDE SWITCH

An optional ground speed override Switch can be used to temporarily operate the sprayer using a pre-selected "minimum (GSO) speed" rather than the actual speed registered by the ground speed sensor. The override feature is used to bring the sprayer on line quickly when starting from a dead stop or to maintain an adequate spray pattern when the vehicle is maneuvering at very low ground speeds. It can also be used to allow the operator to flush the sprayer from the cab with the vehicle stopped.

The control console operates normally as long as the ground speed override switch condition is open (OFF). Whenever the override switch is closed (ON) and the actual ground speed is less than "GSO speed", the control console automatically selects the "GSO speed" value to control both carrier and injected chemical flow rates. As soon as the switch reverts to its normally open (OFF) condition, or the actual ground speed increases above the preset "GSO speed", the control console controls flow rates on the basis of the actual ground speed.

CAUTION: When traveling at a speed slower than the GSO speed setting, this feature will cause the product to be applied at a rate consistent with the GSO speed, rather than the true ground speed. When Ground Speed Override is being used and the true ground speed is less than the preselected "GSO Speed", the console will sound an alarm and the display will flash a "Too Slow" message to warn the operator of possible over application.

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2.0 CALIBRATION AND SET UP

NOTE: PLEASE READ THROUGH THE FOLLOWING SECTIONS COMPLETELY BEFORE YOU BEGIN CALIBRATION!

The TASC Control Console must be calibrated for the various sensors used and programmed with certain information before it is ready to be used. The calibration and set up processes are not difficult, however; they must be followed precisely in order to get maximum accuracy out of the system.

2.1 ENGLISH AND METRIC UNITS

The TASC Control Console is capable of operating in two different units of measure, English and Metric.

2.1.1 UNITS FOR EACH POSITION

(Refer to Appendix D for these units in "Handgun Mode".)

FUNCTION	U.S.	METRIC
Speed	Miles/Hour (MPH)*	Kilometers/Hour (KPH)*
Area	Acres (-Ac)*	Hectares (-Ha)*
Chem. Applied	Ounces-U.S. Gallons (TOTAL/Oz)*#	Liters (TOTAL/Liters)*#
Chem. Rate	Ounces/Acre (Oz-Ac)*@	Liters/Acre (RATE/Liters-Ha)*@
Appl. Rate	U.S. Gallons/Acre (Flow/RATE GAL./ -Ac)*	Liters/Hectare (Flow/RATE/ Liters-Ha)*
Total Applied	U.S. Gallons (TOTAL/Flow/Gal.)*	Liters (TOTAL/Flow)*
Width	Inches-Feet (TOTAL/Boom/Ft.)*	Meters (TOTAL/Boom/Meters)*
Distance	Feet-Miles (Dist./Ft.)***	Meters-Kilometers (Dist.)*
Prime	Ounces (Oz)	Liters (Liters)
Test Speed	Miles/Hour (MPH)	Kilometers/Hour (KPH)

* Items in parenthesis are the abbreviations that appear on the screen.
** No units displayed
*** No units displayed after roll over of feet to miles or meters to kilometers
# **TOTAL** when channel in Non-Peristaltic
@ **-Ac** when channel is in Non-Peristaltic

2.1.2 CHANGING UNITS

To change units, set the Mode switch to **OPERATE** and the Display Selector to **SPEED**. The current speed units are be displayed. Holding the **INC/DEC** switch down for approximately 5 sec.causes the display to alternate between U.S and Metric modes (**MPH** and **KPH**). The mode being displayed when the INC/DEC switch is released will be selected.

2.2 PERISTALTIC AND NON-PERISTALTIC INJECTION PUMP MODES

Settingg Channel 1 - 6 Drive Method (TASC 6300/6600 Only)

The TASC 6300 and 6600 Chemical Applicator channels (1 - 6) can use two different drive methods, depending on the type of equipment being controlled by the individual channel. "Peristaltic Drive" is used for peristaltic injection pumps. "Non-Peristaltic Drive" is for future development. You should select the "peristaltic" drive method at this time.

A. Use the following switch settings to select the desired drive method (You should have to do this only once unless you change your equipment configuration.).

Power	OFF
Mode selector	SET-UP
Display selector	DISTANCE

B. Turn the rate selector switches, for any channels (1 - 6) that you want set to non-peristaltic to "ON". Any channels left "OFF" are set to the peristaltic mode.

C. Hold the INC/DEC switch down while turning on the TASC power. After completing the start up routine, the display settles on a series of o's and -'s. The o's correspond to the channels that are set to non-peristaltic drive and the -'s indicate peristaltic channels.

o o -

Indicates channel 1 and 2 are set to non-peristaltic drive and channel 3 is set for peristaltic.

D. If it is ever necessary to reset the channel configuration, simply repeat the above procedure selecting the desired switch configuration.

E. Whenever the TASC power is turned ON, the console momentarily displays the drive status of the chemical applicator channels (unless all channels are in peristaltic mode).

2.3 SETTING APPLICATION RATES

2.3.1 SETTING CARRIER APPLICATION RATE

TASC is designed to maintain a constant, preselected application rate for the carrier, including chemical, as it exits the sprayer. In order for TASC to do this, the operator must enter the desired carrier application rate. **NOTE: The minimum Carrier Rate must exceed the total Chemical Rate by at least one Gal/Ac (L/Ha).**

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**CARRIER, APPL. RATE**

The display shows the current Carrier plus Chemical application rate (Gal/Ac or L/Ha).

B. Use the **INC/DEC** switch to set the value displayed to the new desired rate.

NOTE: Setting the Carrier Application Rate to 0.0 shuts off the flow control function.

2.3.2 SETTING CHEMICAL APPLICATION RATE

The TASC-6300 and 6600 consoles are designed to maintain a preset injection rate for each injection pump. To do this the operator must enter the desired Application Rate (Oz/Ac or L/Ha) for each pump.

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**CHEMICALS, CHEM. RATE**
Pump Switch #1	**CENTER, ON POSITION**

The display shows the current Standard Application Rate (Oz/Ac or L/Ha) for Pump #1.

B. Use the **INC/DEC** switch to set the value displayed to the desired rate.

Example: 64.0 for 64 Fluid Oz. (2 qts.) per acre, (See Appendix A, Fluid Oz. Conversion Chart). Remember this is the actual chemical rate and bears no relationship to the carrier rate.

C. Repeat steps A and B for the remaining injection pumps, turning off each pump off before setting the next one.

NOTE: The Mode switch must be moved back to OPERATE for the new rate to be registered by the console.

2.3.3 SETTING ALTERNATE CHEMICAL APPLICATION RATE

The TASC-6300 and 6600 consoles are also designed to maintain a preset alternate rate for each injection pump. To do this the operator must enter the desired Alternate Rate (Oz/Ac or L/Ha) for each pump.

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**CHEMICALS, CHEM. RATE**
Pump Switch #1	**UP, ALT. RATE POSITION**

The display shows the current Alternate Application Rate (Oz/Ac or L/Ha) for Pump #1.

B. Use the **INC/DEC** switch to set the value displayed to the desired rate. The alternate rate for injection pump #1 is now established.

C. Repeat steps A and B for the remaining injection pumps, turning each completed pump off before setting the next one.

2.4 SETTING THE % RATE CHANGE OF THE CHEMICAL INJECTION PUMPS & THE CARRIER

This feature allows the operator to change the application rate of all active injection pumps or the carrier “ON THE GO” with a simple actuation of the **INC/DEC** switch. The amount of change each switch actuation makes is proportional to the value programmed into this position, (e.g. 5 = 5% change in the target rate). For example, if the chemical application rate is set at 64.0 ounces per acre, a single press of the INC. switch, with the Display Selector in "Chemicals, % Rate", results in a change of application rate to 67.2 ounces per acre (64.0 + 5% = 67.2). If the Display Selector had been in the "Carrier, Appl. Rate" position the carrier rate would have increased by 5% of its programmed rate.

NOTE: It is not recommended that the carrier rate be changed "on the go", while doing chemical injection, as momentary dramatic changes in chemical application rate can result.

A. Set the Console to the following positions;

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**CHEMICALS, % RATE**

The display shows the current % change value.

B. Use the **INC/DEC** switch to set this number to the desired % change.

NOTE: The rate change function will affect either the normal injection rate or the alternate injection rate, depending on which position the pump switch is in.

2.5 SETTING BOOM WIDTHS

The Mid-Tech TASC Control Console is designed to automatically compensate for changes in the swath width, caused by activating or deactivating separate sections of a multi-section spray boom. For the console to automatically respond to changes in swath width, it is necessary for the operator to set the individual boom section lengths into the console. Use the following procedure to define the boom lengths to the console.

A. Set the Console to the following positions;

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**WIDTH**
All Boom Switches (external)	**OFF**

The display cycles through each boom position and displays its current width in inches.

B. As each boom position appears on the display, use the **INC/DEC** Switch to set the display to the appropriate number of inches (meters) covered by that boom. Repeat for each section.

NOTE: Individual boom widths are entered in inches. The control console converts the total boom width to feet when it is switched back to the Operate Mode and the booms are turned on.

C. Set all unused boom sections (up to a total of nine) to a width of zero "0" inches. This insures that an accidental boom switch **ON** does not affect the control console.

D. Let the boom width display cycle through the boom sections until it shows "Boom C". As the width of "C" is displayed, it can be changed with the **INC/DEC** switch. This value is used by the control console to determine the operating speed for the injection pumps during calibration sequences (as long as none of the boom switches are turned **ON**). This value should be the normal operating width of the entire sprayer, in inches (meters).

E. The individual boom section widths are now established. Turn all boom switches to the **ON** position and return to the **OPERATE** Mode, the new total boom width is displayed in feet (meters). If this does not agree with your total sprayer width, check the individual boom widths (steps B and C).

2.6 FLOWMETER CALIBRATION

TASC must be calibrated for the flowmeter being used. The calibration number required by TASC is the actual number of electrical pulses per gallon generated by the flowmeter for each gallon of liquid that passes through the flowmeter. Flowmeters are calibrated for water at the factory. This number is to be considered an initial value. The actual flowmeter calibration number for your system may differ due to plumbing variations or other factors. **If you have any doubts as to the accuracy of the flowmeter calibration number, a field calibration/catch test should be performed using the actual carrier solution.** This is particularly important if you are pre-mixing chemical with the carrier.

2.6.1 TYPICAL FLOWMETER CALIBRATION NUMBERS (for water)

Standard Flowmeters

SIZE	SUPPLIER	CAL.#
.75 inch	(Mid-Tech)	396.9
1.00 inch	(Mid-Tech)	153.1
1.50 inch	(Mid-Tech)	38.8
2.00 inch	(Mid-Tech)	23.8

SIZE	SUPPLIER	CAL.#
3.00 inch	(Mid-Tech)	5.0
1.25 inch	(Raven)	75.0*
3.00 inch	(Raven)	16.4*

Mid-Tech Rapid Check Flowmeters

SIZE	RANGE	CAL#
1.00 inch	0.75 - 5 gpm	3200
1.00 inch	2.5 - 25 gpm	612.4
1.50 inch	2.5 - 16 gpm	800

SIZE	RANGE	CAL#
1.50 inch	2.6 - 53 gpm	361.9
1.50 inch	9 - 90 gpm	155.2
2.00 inch	20.0 - 195 gpm	94.5

* Raven flow meters, use the factory calibration number divided by 10. All other flowmeters use the manufacturers' supplied information regarding the pulses per gallon (usually provided on a tag on the flowmeter).

Use the following procedure to enter the typical flowmeter calibration number.

A. Set the Console to the following positions;

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**CARRIER, TOTAL APPLIED**

B. Use the **INC/DEC** switch to select the desired flowmeter calibration number.

2.6.2 FLOW METER CALIBRATION PROCEDURE

Field calibration of the TASC flowmeter is relatively simple. Operators have successfully performed flowmeter calibrations using a second, calibrated, flowmeter, using a truck scale and calculating volumes based on weight and density of the liquid discharged, and by discharging into a marked, calibrated tank.

A method such as the following is recommended. It is necessary to pump and measure at least 100 gallons (400 liters) and as much as 500 gallons (2000 liters), depending on the accuracy required. The better the measurement accuracy of actual discharge and the more material pumped, the more accurate is the resulting calibration. For example: an actual measurement accurate to within 5 gallons (20 liters) while pumping and measuring 500 gallons (2000 liters) yields an accuracy of 1 %. A result within 5 gallons (20 liters) while using only 100 gallons (400 liters) results in an error of 5 %.

A. Disconnect the line to one of the booms and direct the output to an appropriate catch basin through a manually adjustable valve. Adjust the valve for smooth flow with no error messages on the console.

B. Verify that the boom switches and injection pump switches are **OFF**; turn the Control Console **ON**; select the **SET-UP** mode; rotate the display selector switch to **CARRIER, TOTAL APPLIED**.

C. The current flowmeter calibration number is displayed. Make sure it is the recommended initial calibration number for the flowmeter installed in the system (Refer to the metal tag attached to the flowmeter.). Use the **INC/DEC** switch to adjust as necessary.

D. Select **OPERATE** with the mode selector switch. Hold the **DEC** switch down for three to five seconds to zero the accumulated gallons display.

E. If the "HOLD on All Booms OFF" function has been activated for carrier valve, reset it to "CLOSE". (See section 2.9.2 of the manual if you are unsure about this; the factory setting is "CLOSE").

F. Make sure there is enough liquid in the main tank to do the test; start the main carrier pump; rotate the display selector switch to **TEST SPEED**; turn **ON** the boom switch. Allow the sprayer to discharge until the desired amount has been pumped; turn **OFF** the boom switches.

G. Rotate the display selector switch to **CARRIER, TOTAL APPLIED**. If the total shown on the console agrees with the total discharge actually measured, no further action is necessary. The flowmeter is already calibrated.

H. If the indicated volume pumped does not agree with the actual volume pumped, calculate a corrected calibration number as follows:

(INDICATED AMOUNT / MEASURED AMOUNT) X OLD CAL.# = NEW CAL.#

If the measured amount is more than the indicated amount, the calibration number should decrease. If the measured amount is less than the indicated amount, the calibration number should increase.

I. Set the mode selector to **SET-UP** and correct the calibration number using the **INC/DEC** switch. Return the mode selector to **OPERATE** and the amount displayed should now match the amount measured. The flowmeter is now calibrated.

J. Write this number down for future reference. This is the number to use for these specific conditions (material and sprayer configuration).

K. Further fine tuning of the calibration can be done based on field spraying experience. If liquid is consistently left over after spraying a known number of acres, adjust the calibration number up slightly. If there is consistently too little liquid to cover the desired acres, adjust the calibration number down slightly.

RECORD THE FLOWMETER CALIBRATION NUMBER HERE: _____

2.7 DISTANCE CALIBRATION, GROUND SPEED SENSOR

2.7.1 GENERAL CONSIDERATIONS AND INITIAL CALIBRATION NUMBERS

It is important to field calibrate the distance sensor to insure optimum accuracy! The distance calibration must be periodically checked. This is especially important if the sensor has come loose or been repositioned (Radar Sensor), or if the tires have been changed (Wheel and Speedometer Sensor).

Use the following initial calibration settings to get started. For the radar this number will be pretty close. For the wheel speed sensor and the speedometer sensor the adjustment to this initial calibration number may be very large, depending on the configuration of the vehicle.

Dj RADAR - 1000 MID-TECH COMPACT RADAR - 779
WHEEL SENSOR & SPEEDOMETER SENSOR - 3500

A. Set TASC switches to the following settings:

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**DISTANCE**

The display now shows the current distance calibration value.

B. Use the **INC/DEC** switch to select the initial distance calibration value suggested. You are now ready to perform the distance calibration.

2.7.2 DISTANCE CALIBRATION PROCEDURE

The following procedure is recommended by MIDWEST TECHNOLOGIES for establishing an accurate distance calibration. **NOTE: All pump and boom switches should remain OFF during the entire procedure.**

A. Fill the main tank 1/2 full of water, to approximate actual load conditions. This minimizes the effect on the radar mounting angle and/or actual working diameter of the tires as the main tank empties.

B. Measure out a known distance of 400 ft. (150 m) or more in a field or roadway. Make it an easy place to maneuver the vehicle. The longer the distance, the more accurately the test can be performed. Keeping the distance in even hundreds of feet will make the calculations easier.

C. Drive the vehicle to the starting point of the distance range and stop.

D. Turn the Display Selector to the **DISTANCE** position and the Mode Select switch to **SET-UP**. The console displays the current Distance Calibration Number. Record this number for future reference. As an example, assume this number is 1000.

E. Return the Mode Select switch to **OPERATE** and check to see that the accumulated distance is set at zero. If not, reset it to zero using the **INC/DEC** switch.

F. Start driving. Drive the vehicle at a speed of between 5 and 10 mph (8 - 16 kph). The distance start to accumulate in the display.

G. Stop the vehicle at the end marker. The display shows the accumulated distance. Compare this distance to the actual Measured distance, to determine how much of a correction is necessary. For example, if an accumulated distance of 396 ft. (149 m) is shown after driving over a 400 ft. (150 m) range, the error in the distance calibration is 1.0% (.7%).

H. Calculate the new Distance Calibration Number using the following formula:

(Measured distance/Accumulated distance) x Old DC# = New DC#

If the accumulated distance is less than the measured distance the new Cal# will be larger.

Example: (400 / 396) x 1000 = 1010, the New DC#

NOTE: The same procedure is used, regardless of the type of distance sensor .

RECORD THE DISTANCE CALIBRATION NUMBER HERE: _____

2.8 INJECTION PUMP CALIBRATION (TASC-6300 & 6600 ONLY)

The pump calibration procedure "fine tunes" the precision injection pumps to ensure the highest possible accuracy of the TASC-6300 or 6600 system for your sprayer. It is important to understand that each of the injection pumps installed on a particular sprayer must be separately calibrated. It is also important to periodically check the calibration of the individual pumps to ensure they continue to perform properly. Checking the calibration is particularly important when the tubing in the pump chamber has been replaced or when the system is being activated after an extended downtime.

2.8.1 TYPICAL PUMP CALIBRATION NUMBERS, PC#

The pump calibration number (PC#) is a value that relates to the volume of chemical output during each revolution of the injection pump and is used by the TASC Control Console to determine each pump's actual discharge rate. Pump calibration numbers will differ slightly from one pump to the next due to variations in plumbing, tube size, pump chambers, etc.

The following values are typical PC#'s you can expect to see after performing the field calibration procedure. If your pump calibration number differs from the typical range, check the calibration. Use these numbers for your initial pump calibration numbers, before conducting the actual prime or pump calibration procedure.

MODEL #	DESCRIPTION	TYPICAL PC# RANGE		
ISC-20 PUMP	0.2 to 20-Oz./Min. (1/4"Dia. Tube)		32.0	27/37
ISC-50 PUMP	2.6 to 53-Oz./Min. (1/4"Dia. Tube)		110.0	100/120
ISC-50 PUMP	1.5 to 29-Oz./Min. (3/16"Dia. Tube)	65.0	58/72	
ISC-100 PUMP	1.0 to 100-Oz./Min. (3/8"Dia. Tube)	145.0	130/160	
ISC-150 PUMP	1.5 to 150-Oz./Min. (3/8"Dia. Tube)	145.0	130/160	
ISC-200 PUMP	6.4 to 128-Oz./Min. (3/8"Dia. Tube)	285.0	256/314	
ISC-200 PUMP	10.7 to 213-Oz./Min. (1/2"Dia. Tube)	485.0	436/534	
ISC-350 PUMP	22.0 to 220-Oz./Min. (3/8"Dia. Tube)	285.0	256/314	
ISC-350 PUMP	37.0 to 370-Oz./Min. (1/2"Dia. Tube)	485.0	436/534	

2.8.2 PUMP CALIBRATION, FIELD PROCEDURE

TO ENSURE AN ACCURATE CALIBRATION, PLEASE FOLLOW THE PROCEDURE EXACTLY!

The following field procedure is recommended to check or calibrate the injection pumps. This procedure requires a catch basin or container of at least 60 Oz. with graduation marks. In this example, a 56 Oz. test is described. There is nothing magic about the 56 Oz. number, in fact, collecting more material leads to smaller measurement errors. However, it is important to get a very accurate measurement of the volume of fluid (Fl. oz.) collected. In this example we will be calibrating Pump #1, the procedure is the same for all pumps.

NOTE: MID-TECH suggests doing all calibrations using water to keep the procedure as simple and safe as possible; however, it may be necessary to calibrate with the actual chemical if it is an extremely thick, heavy or viscous fluid.

Check the current Pump Calibration Number and Application Rate (pump to be calibrated), Boom Width "C", and Test Speed values. These should be typical for your sprayer operations. If not, reset them to a typical value, (Refer to Sections 2.3.2. & 2.5 to view and enter these values).

The calibration is conducted with the vehicle **STOPPED** and the main carrier pump **NOT** running. To safeguard against backflushing and siphoning, **SHUT OFF** the feed line from the main tank to the main pump.

NOTE: Thoroughly flush all injection lines and fill with clean water before performing calibration procedure.

A. Make sure all chemical containers are filled with fresh, clean water, and they are connected to the proper injection pumps. Turn all booms **OFF** (boom width "C" is used.)

B. Set the control console switches as follows:

Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**CHEMICALS, CHEM, APPLIED**
Pump Switch #1	**CENTER, ON POSITION**

The accumulated volume for pump #1 will be displayed.

C. Use the **INC/DEC** switch to reset the display to zero. Select **SET-UP** with the Mode Selector switch. The current pump calibration number is displayed. Now go back to the pump and perform the flush operation.

D. Disconnect the discharge line on the injection pump from the sprayer. (On most installations this can be accomplished by using a calibration valve to redirect the discharge flow.)

E. Open the cover on pump # 1 and place the calibration magnet on the **"*"** target depicted on the motor control module. Allow the pump to run until satisfied the lines are flushed and filled with liquid. Remove the calibration magnet.

F. Return to the control console and select **OPERATE** with the Mode Selector switch. Use the **INC/DEC** switch to zero the accumulated volume for pump #1 and again select **SET-UP** with the Mode Selector switch. Now go back to the pump and perform the test.

G. Be sure the supply tank for the pump being calibrated contains more than enough material to conduct the test. Direct the discharge line from the injection pump into the graduated container.

H. Place the calibration magnet on the "*" target on top of the pump control module and allow the pump to discharge into the calibration container. When enough material has been pumped, remove the calibration magnet. Verify the amount of liquid in the calibration container as observed on the marks on the side of the container (ie. 56 oz)

I. Return to the console. Select the **OPERATE** Mode. The number displayed will be the "Indicated" Ounces from Pump #1. If the console reading agrees with the calibration container the pump is calibrated. If the console reading is incorrect, calculate the new calibration number. For instance, if the Accumulated ounces reads 53 instead of 56 (which we collected), then we would divide the Actual Ounces by the Indicated Ounces and multiply that number by the old PC# to calculate the new PC#.

Actual Oz./Indicated Oz. x Old PC# = New PC#

If the Indicated Ounces is less than the Actual Ounces collected, the Cal# will increase.

Example: 56/53 x 145.0 = 153.2, the New PC#

J. To change the Pump Calibration Number, return to the **SET -UP** Mode and view the old Pump Calibration Number (145.0 for example).

K. Use the **INC/DEC** switch to increase the PC# from 145.0 to 153.2.

L. Set the Mode Select switch back to **OPERATE** and the accumulated ounces will again be displayed. The console recalculates the ounces accumulated and should now show the amount actually collected (56 in our example). If the displayed value of accumulated ounces is still off by a significant amount, repeat the procedure.

M. Turn **OFF** pump #1. Connect the injection pump discharge line to the sprayer.

N. REPEAT THIS PROCEDURE (steps B through M) FOR THE REMAINING PUMPS.

O. **Record the Pump Calibration Numbers Here:**

PUMP 1				
PUMP 2				
PUMP 3				
PUMP 4				
PUMP 5				
PUMP 6				

(NOTE: This calibration procedure can be conducted with one or more boom sections active.. This will not affect the accuracy of the calibration, however; the console will not allow any further operations until the active boom sections are turned "OFF". This ensures the vehicle does not begin to spray by mistake. A message "BOOM OFF" will be displayed to remind the operator to close the boom valves.)

2.8.3 ESTABLISHING THE "PRIME" VOLUME FOR EACH INJECTION PUMP

The "PRIME" volume is the volume of material in the system, between the chemical tank and the injection point at the main boom supply line. Obviously, this volume will depend on the sizes of lines used, the size of the injection pump, and the distance between the tank and the injection point. There are two methods of establishing the "PRIME' value.

A. CALCULATING THE "PRIME" VALUE

Calculate the volume of fluid needed to completely fill the line and pump, and convert this volume to fluid ounces, and use this calculated value directly. Calculate this volume using the following formula (all measurements in inches):

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

For example, let's suppose we have a system where the line from the chemical container to the pump inlet is 1/2 inch diameter hose, 36 inches long. The pump tubing is 3/8 inch diameter, 25 inches long. And, the discharge line is 3/8 inch diameter, 24 inches long. We want to calculate the volume, in ounces, needed to prime the line from the chemical container to the discharge point.

$(0.500/2)^2 \times 3.1416 \times 36 \times 0.5541 = 3.92$ ounces
$(0.375/2)^2 \times 3.1416 \times 25 \times 0.5541 = 1.53$ ounces
$(0.375/2)^2 \times 3.1416 \times 24 \times 0.5541 = 1.47$ ounces
"PRIME" Volume = 6.9 ounces

B. DIRECT MEASUREMENT OF THE "PRIME" VALUE

Actually measuring the amount of fluid needed to prime the injection line is the second, and more accurate method, of determining the "PRIME" value. To do this, first calibrate each injection pump using the procedure outlined in Section 2.8.2.; then, operate the pump in a controlled manner, allowing its discharge to be collected and measured. Ordinarily, this procedure would only need to be done once, unless there are major changes to the plumbing on your sprayer.

NOTE: MID-TECH suggests you do all your calibrations using water to keep the procedure as simple and safe as possible.

The following procedure ensures an accurate measurement of the volume of fluid needed to prime each injection pump. It should be followed exactly. The measurement is conducted with the vehicle stopped and the main carrier pump not running. To prevent backflushing and siphoning, shut off the feed line from the main tank to the main pump.

Check the current Pump Calibration Number and Application Rate (pump to be calibrated), Boom Width "C", and Test Speed values. These should be typical for your sprayer operations. If not, reset them to a typical value, (Refer to Sections 2.3.2. & 2.5 to view and enter these values).

NOTE: Thoroughly flush all injection lines and fill with clean water before performing calibration procedure.

A. Make sure all chemical containers are filled with fresh, clean water, and they are connected to the proper injection pumps. Make sure all boom switches are **OFF**.

B. Disconnect the injection lines at the injection point in the main boom supply line.

C. Set the Control Console switches as follows:

Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**CHEMICALS,CHEM,APPLIED**
Pump Switch #1	**CENTER, ON POSITION** (any individual pump can be selected)

The accumulated volume pumped by pump #1 will be displayed.

D. Use the **INC/DEC** switch to reset the display to zero. Select **SET-UP** with the Mode Selector switch. The current pump calibration number is displayed. Now go back to the pump and perform the flush operation.

E . Open the cover on pump # 1 and place the calibration magnet on the **"*"** target depicted on the motor control module. Allow the pump to operate until satisfied the lines are flushed and filled with fresh liquid. Remove the magnet to stop the pump.

F. Return to the control console and select **OPERATE** with the Mode Selector switch. Use the **INC/DEC** switch to zero the accumulated volume for pump #1 and again select the **SET-UP** mode with the Mode Selector switch. The current pump calibration number is displayed. Now go back to the pump and perform the catch test.

G. Add foam marker dye to the water in each chemical container.

H. Place a collection container, graduated in ounces, under the discharge tube for pump #1.
(A rough calculation of "PRIME" vol. can be used to help chose the right sized container.)

I. Place the magnet provided on the **"*"** target on the pump control module. The pump will begin to operate.

J. Remove the magnet as soon as colored water begins to discharge from the tube. The pump will stop.

K. Read the volume of fluid collected in the graduated container. This volume is the "PRIME" value for pump #1. Record this value.

L. Proceed to measure the prime values for the remaining pumps, in sequence, using the procedure outlined in items C through K above.

M. When all measurements are complete, reconnect the pump discharge lines to the injection points in the main boom supply line.

N. Use the procedure outlined in 2.8.4. below, to set the recorded "PRIME" values into the console.

O. **Record the Prime numbers Here:**

Pump #1 - Prime#		**Pump #4 - Prime#**	
Pump #2 - Prime#		**Pump #5 - Prime#**	
Pump #3 - Prime#		**Pump #6 - Prime#**	

2.8.4 SETTING "PRIME" VALUES IN THE CONSOLE MEMORY

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**SET-UP**
Display Selector	**PRIME**
Pump Switch #1	**CENTER, ON POSITION**

The display will show the current prime volume (Oz) for Pump #1

B. Use the **INC/DEC** switch to choose the value desired. Turn Pump #1 switch **OFF**.

C. View and reset all injection pump **PRIME** values using the procedure in A and B above.

2.9 SETTING THE "HOLD/CLOSE" RESPONSE OF THE FLOW CONTROL VALVE

The operator can select a "HOLD" or "CLOSE" response of the Flow Control Valve to both the Status Switch and to an All Booms "OFF" condition. These responses are independent of each other, allowing the operator to select a "HOLD" condition for one and a "CLOSE" for the other. Careful consideration should be given to both conditions and the appropriate response selected for your spraying application. **NOTE: In both cases the Chemical Injections Pumps will stop automatically.**

2.9.1 STATUS SWITCH

When the "HOLD" condition is selected, activation of the Status Switch will HOLD the Flow Control Valve in its current position. The valve does not close even though the vehicle speed may drop to zero. Then, when the Status Switch is deactivated the Flow Control Valve is already open and Carrier Flow is instantaneous. This response assumes that some other device is used to stop the carrier flow.

When the "CLOSE" condition is selected, activation of the Status Switch automatically causes the Flow Control Valve to CLOSE. This response is preferred when it is necessary to use the Flow Control Valve to stop the Carrier Flow.

A. To select the desired response set the console switches to the following positions:

Booms	**OFF**
Injection pumps	**OFF**
Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**CARRIER, TOTAL APPLIED**

B. Holding the **INC** Switch up displays the current selected response.

C. Continuing to hold the **INC** Switch up causes the display to cycle between the two options at about three second intervals.

D. When the desired response is shown, release the INC switch.

2.9.2 ALL BOOMS "OFF"

When the "HOLD" condition is selected, all booms "OFF" hold's the Flow Control Valve in its current position. The valve does not close even though the vehicle speed may drop to zero. Then, when the booms are selected "ON" again the Flow Control Valve is already open and Carrier Flow is instantaneous.

When the "CLOSE" condition is selected, all booms "OFF" will automatically cause the Flow Control Valve to CLOSE. This response would be preferred when it is necessary to use the Flow Control Valve to positively stop the Carrier Flow.

A. To select the desired response set the console switches to the following positions:

Booms	**OFF**
Injection pumps	**OFF**
Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**WIDTH**

B. Holding the **INC** Switch up displays the currently selected response.

C. Continuing to hold the **INC** Switch up causes the display to cycle between the two options at about three second intervals.

D. When the desired response is shown, release the INC switch.

2.10 SETTING THE GROUND SPEED OVERRIDE "GSO" VALUE.

A. To set the desired GSO speed use the following steps:

Display Selector	**SPEED**
Mode Switch	**SET-UP**

The console displays the current GSO Value.

B. Use the **INC/DEC** Switch to set the desired value. If you intend to use this feature, set the value to the minimum Ground Speed desired when the GSO Switch is activated. This should be the minimum speed at which the sprayer can operate smoothly and provide a good nozzle pattern. **NOTE:** If you do not intend to use this feature, set this value to Zero (0.0).

CAUTION: When traveling at a speed slower than the GSO speed setting, this feature will cause the Product to be applied at a Rate consistent with the GSO speed, rather than the true ground speed, possibly resulting in serious over application. When Ground Speed Override is being used, and the true ground speed is less than the pre-selected "GSO" Speed, the console will sound an alarm and the display will flash a "Too Slow" message to warn the operator of possible over application.

2.11. SETTING AUTO POWER DOWN TIME

The console has an "Auto Power Down" feature which powers the console off after an operator selectable period (default is 30 min) has elapsed. If no input is received from the speed sensor or any console switch during this time the APD feature is activated. The APD time can be set from 15 to 60 minutes. Selecting a period less than 15 minutes disables the APD feature.

A. Use the following switch settings to adjust the Auto Power down time:

Power	**OFF**
Mode selector	**SET-UP**
Display selector	**% Rate**
Hold the INC switch	**UP while turning the power on**

The display will show the current Auto Power Down time.

B. Select the desired time using the INC/DEC switch.

C. Exit this set-up mode by moving the Display Selector to another position, the Mode Selector to OPERATE, or turning the console OFF and back ON.

NOTE: The "Auto Power Down Feature is only available on the CE version of the console (CE designation label on back of console). If you have the standard console model always turn the console power off when not in use to prevent unnecessary drain on the battery.

2.12 REFLOW MODE

2.12.1. DESCRIPTION

The TASC Reflow Option changes the standard method of accumulating total volume applied. In the Reflow condition, the TASC Control Console can automatically, and accurately, accumulate total volume applied through a reflow sprayer (reference the reflow sprayer plumbing diagram in the appendix). In a reflow sprayer, the mixed product that ordinarily would be sprayed is diverted back to the suction side of the main pump whenever an individual boom section is deactivated. The Reflow Option allows the TASC Control Console to adjust the flowmeter calibration constant in proportion to the amount of flow actually escaping through the spray boom. When this adjustment is made, the calculation of total applied volume remains accurate.

The adjustment is described as follows:

Adjusted Cal# = (TOTAL BOOM WIDTH) / (SELECTED BOOM WIDTH) X (Cal#)

Whenever boom sections are brought on or off line, the TASC Control Console will adjust both the injection pump metering rates and the flowmeter calibration number in order to maintain the proper application rate, and an accurate measure of the total volume of material applied.

2.12.2. REFLOW SET UP

Before operating the sprayer in the Reflow mode, there are some critical set-up steps which must be taken.

1. Using the methods recommended by the sprayer manufacturer, adjust the reflow bypass valves so that they will allow reflow at the same flow rate that the individual boom section would apply, if it were activated. For example: if the boom section would ordinarily spray 1 gallon per minute at normal working pressure, then the reflow valve should be adjusted to reflow 1 gallon per minute, at the same pressure, when the flow to that boom section is diverted to the reflow line.

2. Make sure all reflow boom widths are properly established in the TASC Console (see section 2.5).

3. Make sure that boom section **"C"** is set to the total width of the boom when all reflow boom sections are operating. For example; if the sprayer is using 6 booms in the reflow operation, each boom being 10 feet in length, the total Boom Width "C" is be 720 inches.

4. **All** TASC Console boom positions which are **not** being used in the reflow spraying operation, **must** be set to 0.0 width. For example; if only booms 1 through 6 are being used for reflow, booms 7, 8 and 9 must be set to zero for the TASC Console to work properly.

5. Make sure the proper Flow Meter Calibration number is entered in the TASC Console. See section 2.6. of the TASC Manual (Flow Meter Calibration).

2.12.3. ESTABLISHING THE REFLOW OPTION

The following procedure will establish the Reflow in the TASC Console. Once the Reflow Option has been selected, the Console will remain in the Reflow Option, even through normal Power Down and Power Up, until Reflow is cancelled.

Power	**OFF**
All pumps	**OFF**
All booms	**OFF**
Display Selector	**CARRIER, TOTAL APPLIED**
Mode Switch	**SET-UP**
Hold INC./DEC. Switch to **INC.** while turning Power **ON**	

The TASC Console powers up and displays its initial test sequence and the software level installed. After approximately two seconds, the display reads **"rEFLO"**, and that message continues to be displayed until the INC. Switch is released. The TASC System is now set to the Reflow Option.

When the INC. Switch is released, the display shows 0.0 for the flow meter calibration number. When all reflow boom sections are turned "ON", the flow meter calibration number is displayed normally. As boom sections are turned "OFF", the flow meter calibration number will increase proportionately to the boom width which is still active.

2.12.4. CANCELLING THE REFLOW OPTION

The Reflow Option is cancelled with the following procedure.

Power	**OFF**
All boom switches	**OFF**
All product pumps	**OFF**
Display Selector	**CARRIER, TOTAL APPLIED**
Mode Switch	**SET-UP**
While holding the INC./DEC. Switch to **DEC**, turn Power **ON**	

The TASC Console display cycles through its normal Power Up testing routine and momentarily displays the software level installed. After about two seconds the display changes to **"Stnrd"**, and remains in this condition until the DEC. Switch is released. The Console then displays the current Flow Meter Calibration Number.

The TASC System is now back to its standard configuration. The system remains in standard until the Reflow Option is activated again.

2.12 OPERATING UNDER EXTERNAL RATE COMMANDS

When the TASC 6000 series console is operating under external rate commands, it must be connected to the computer running the field mapping program, through a 405-0069-96V or 78-05077 Data Link. Minimum and maximum rates must be programmed into the Rate Switch STANDARD RATE and ALT.-RATE positions respectively and the Rate Switch must be placed in the Alt.-Rate position. The instructions, received with the Data Link, explain in more detail, how to set up the control console and Data Link. **NOTE: The "Percent Rate Change" function is disabled when operating in the "External Control" mode.**

3.0. OPERATION

Under normal operating conditions, TASC is automatic. It performs precisely, according to the information and directions it receives from the operator. It is important to verify that TASC has the proper instructions before beginning spraying operations each day.

3.1. NORMAL START UP AND OPERATION

A. **CONSTANTS:** With all boom switches in the **OFF** position, verify that the proper constants are still entered in the console. Refer to section 2.0. of this manual to review the procedure for entering these constants. It is a good idea to write the constants down in a convenient location.

B. **APPLICATION RATES:** With all boom switches in the **OFF** position and the Mode Selector switch in the **SET-UP** position, review the standard and alternate application rates for each injection pump, and the carrier application rate. Use the procedure outlined in Section 2.3 of this manual to select and change the rates as required.

C. **ACCUMULATED AREA:** If desired, the accumulated acres can be reset to zero by selecting **AREA** and holding the **INC/DEC** switch down until the display resets to zero. **NOTE**: There are two Area Accumulators, one in the **OPERATE** Mode and one in the **SET-UP** Mode. These can be zeroed independently to keep track of two separate areas.

D. **ACCUMULATED VOLUMES:** If desired, the accumulated volumes for the carrier, and for each chemical pump, can be reset to zero by selecting **CARRIER, TOTAL APPLIED** or **CHEMICALS, CHEM. APPLIED** while in the in the **OPERATE** Mode and using the **INC/DEC** switch to reset.

E. Now, TASC is ready to begin spraying. Set the Mode Selector Switch to the **OPERATE** position. If a TASC-6300 or 6600 is being used, select the desired injection pumps by turning those injection pump switches to **ON** or **Alt. Rate**. Select an appropriate display using the Display Selector, **AREA** for example.

F. Start the carrier pump and pressurize the sprayer.

G. When you reach the starting point of the first swath turn the desired boom switches **ON**. TASC automatically controls both carrier and chemical application. If an area or volume accumulator is selected on the Display Selector, the accumulator begins to register.

H. Upon reaching the end of the swath, turn the boom switches, or the Master Switch, to the **OFF** position to temporarily stop spraying. All injection pumps and accumulators will stop. When the vehicle has been turned and is ready to start spraying on the next swath, turn the booms **ON** and the sprayer, injection pumps and accumulators start again.

3.2. CHANGING ACTIVE BOOM SECTIONS

The active boom sections can be changed at any time by turning the appropriate boom switches **ON** or **OFF**. TASC automatically adjusts the carrier flow rate and the injection rate of each pump as individual boom sections are activated or deactivated. When all the boom section switches, or the Master Switch, are **OFF**, the injection pumps are stopped also. This allows the operator to select active boom sections "ON THE GO", while depending on TASC to apply the proper chemical rates on the area actually being sprayed.

3.3. SELECTING DIFFERENT CHEMICAL COMBINATIONS

The TASC-6300 or 6600 allows the operator to select different chemical combinations while spraying. This is done by activating or deactivating the appropriate injection pumps.

Switching individual injection pumps **ON** cause the TASC-6300 or 6600 to activate those particular pumps at the predetermined application rates you have selected. Switching an injection pump switch to the **OFF** position, positively stops that particular injection pump. The TASC-6300 will control up to three individual injection pumps, while the TASC-6600 will control up to six pumps.

3.4. CHANGING THE APPLICATION RATE "ON THE GO"

TASC allows the operator to change the Application Rate of the main carrier, or the rates of individual injected chemicals, "ON THE GO", using the **INC/DEC** switch. The amount of change caused by each actuation of the **INC/DEC** switch is predetermined in the **SET-UP** Mode, (see Section 2.4).

We will use an illustration to demonstrate the ability to change application rates "On The Go".

3.4.1. CHANGING APPLICATION RATE OF THE MAIN CARRIER

The operator has chosen a desired application rate for the main carrier and entered this value into the TASC Control Console using the procedure outlined in Section 2.3.1 of this manual. Anticipating the need to increase or decrease the application rate, the operator has also established a % rate change, using the procedure described in Section 2.4 of the manual. As an example, assume the TASC Control Console has been set up to apply 10.0 gallons per acre of carrier with a % rate change set at 20%.

During normal spraying, the TASC Control Console maintains the application rate of the carrier at 10.0 gallons per acre. However, let's suppose the operator is spraying an aqueous fertilizer as the carrier. A soil type change in the middle of the field requires a 40% higher application of fertilizer (carrier) in order to reach desired fertility levels. As the sprayer crosses into the new soil type, the operator selects **CARRIER, APPL. RATE** with the Display Selector. The display shows the current application rate of the carrier, in this case 10.0 Gal./Ac. Cycling the **INC/DEC** switch up twice increases the application rate by 2 X 20% or 40%. The flow control valve opens until the flow meter measures 14.0 gallons per acre.

None of the other TASC control functions are affected. Thus, a TASC-6300 or 6600 still controls the injected chemical at the preset application rate, regardless of changes to the carrier application rate. The new carrier application rate is maintained until a further movement of the **INC/DEC** switch calls for additional change, or a movement of the Display Selector away from the **CARRIER, APPL. RATE** position cancels the rate change. When the rate change command has been cancelled, TASC resumes controlling the carrier application rate according to the target rate established by the procedure in Section 2.3.1 of the manual.

NOTE: It is not recommended that the carrier rate be changed "on the go", while doing chemical injection, as momentary dramatic changes in chemical application rate can result.

Operation at a changed carrier application rate is not a normal condition. TASC continuously alerts the operator that an abnormal rate function is selected. The alert is both visual (a flashing "**% *RATE***" on the LCD display) and audible (a periodic "beeping" of the alarm).

3.4.2. CHANGING APPLICATION RATE OF THE INJECTED CHEMICALS (TASC 6300/6600 ONLY)

The operator has chosen a desired standard and alternate application rate for each injected chemical and entered these values into the TASC Control Console using the procedure outlined in Section 2.3.2 and 2.3.3 of this manual. Anticipating the need to simultaneously increase or decrease all injected chemical application rates, the operator has also established a % rate change of the chemical injection pumps, using the procedure described in Section 2.4 of the manual.

3.4.2.1. CHANGING ALL INJECTION RATES SIMULTANEOUSLY

The application rates of all active injection pumps can be changed simultaneously by selecting the **CHEMICALS, % RATE** function with the Display Selector and cycling the **INC/DEC** switch up or down to effect the change. The actual application rates of all the active injection pumps are changed by the predetermined percent. Changing the injection rates of the active injection pumps do not affect the application rate of the main carrier. Thus, a TASC-6300 or 6600 still controls the carrier application rate at the preset rate, regardless of changes to the injection application rate. The new injection rate is maintained until a further movement of the **INC/DEC** switch calls for additional change, or a movement of the Display Selector away from the **CHEMICALS, % RATE** position cancels the rate change. When the rate change

command is cancelled, TASC resumes controlling the injection application rate according to the target rate established by the procedure in Section 2.3.2 of the manual.

Operation at a changed chemical injection rate is not a normal condition. TASC continuously alerts the operator that an abnormal rate function is been selected. The alert is both visual (a flashing "**% *RATE, Pump***" on the LCD display) and audible (a periodic "beeping" of the Sonalert).

3.4.2.2. ALTERNATE RATES FOR INDIVIDUAL CHEMICALS

The alternate application rate for any individual injection pump can be activated, at any time, by simply selecting the **ALT.-RATE** position for that particular pump switch. The injection pump applies chemical at the alternate rate until the pump switch is moved back to the **ON** position or the **OFF** position. Selection of an alternate rate for a particular injection pump does not affect the application rates of the other injection pumps or of the main carrier. If an injection pump is operating at the alternate rate and a percent rate change is called for by the operator (see Section 3.4.2.1), the percent change is applied to the alternate rate also.

Operation at a changed chemical injection rate is not a normal condition. TASC continuously alerts the operator that an abnormal rate function is selected. The alert is both visual (a flashing "**% *RATE, Pump***" on the LCD display) and audible (a periodic "beeping" of the Sonalert).

3.5. PRIMING THE INJECTION LINES (TASC 6300/6600 ONLY)

Use the following procedure to "PRIME" the chemical injection pumps and lines prior to spraying.

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**PRIME**
Pump Switch #	**CENTER, ON POSITION**.

(Any number of pumps may be selected at the same time.)

B. A series of five dashes (- - - - -) will appear on the display.

C. Hold the **INC/DEC** switch down for about five seconds. The display shifts to 0.0 Oz. The display cycles through the pumps that have been selected.

D. Place the cal. magnet on the **"*"** target on one of the pump control modules. That pump begins to operate. It automatically stops when the preset prime volume is pumped. Remove the magnet and move to the next pump. Continue until all selected pumps are primed.

E. Return to the console, it is displaying the actual volume pumped by each selected pump during the priming operation. As in step C., the display cycles through the pumps that are selected.

F. Select any normal position of the Display Selector Switch and TASC is ready to begin spraying.

3.6. GROUND SPEED OVERRIDE

An optional Ground Speed Override Switch can be used to temporarily operate the sprayer using the "**GSO** Speed" instead of the actual speed registered by the Ground Speed Sensor, (See Sec. 2.10). The override feature is used to bring the sprayer on line quickly when starting from a dead stop or to maintain an adequate spray pattern when the vehicle is maneuvering at very low ground speeds. It can also be used to allow the operator to flush the sprayer from the cab with the vehicle stopped.

The Control Console operates normally when the Ground Speed Override Switch is in the **OFF** (open) condition.

When the Override Switch is **ON** (closed) and the actual ground speed is less than the "**GSO** Speed", the Control Console automatically uses the "**GSO** Speed" value to adjust both Carrier and Injected Chemical flow rates. If the actual ground speed increases above the preset "**GSO** Speed", the Control Console reverts to controlling flow rates based on the actual ground speed.

Examples:

GSO Switch	"GSO Speed"	Actual Ground Speed	Control Speed
"OFF"	5 mph	6 mph	6 mph
"OFF"	5 mph	4 mph	4 mph
"ON"	5 mph	6 mph	6 mph
"ON"	5 mph	4 mph	5 mph

CAUTION: When traveling at a speed slower than the GSO speed setting, this feature will cause the Product to be applied at a Rate consistent with the GSO speed, rather than the true ground speed, possibly resulting in serious over application. When Ground Speed Override is being used, and the true ground speed is less than the pre-selected "GSO" Speed, the console will sound an alarm and the display will flash a "Too Slow" message to warn the operator of possible over application.

3.7. PRIMING THE MAIN PUMP AND BOOM

Use the following procedure to "PRIME" the main pump and boom lines prior to spraying (VERSION 2.8 and higher).

A. Set the console switches to the following positions:

Power	**ON**
Mode Selector	**OPERATE**
Display Selector	**PRIME**
Pump Switches	**OFF**

B. A series of five dashes (- - - - -) will appear on the display.

C. Hold the **INC/DEC** switch up for about three seconds. The main control valve opens and remains in this position. While operating in this mode, there is no accumulation of area, distance or carrier.

D. The main pump can be run, with the booms open, to prime the sprayer. TASC does not try to shut down the sprayer because it doesn't see any flow. The control valve remains "OPEN".

E. Select any normal position of the Display Selector Switch and TASC is ready to begin normal spraying.

3.8. MANUAL OVERRIDE OF FLOW CONTROL VALVE

There may be times when it will be necessary to control the product flow manually (To run "Speed & Pressure", unload the carrier tank, etc.).

A. To enter this mode do the following:

MODE SELECTOR SWITCH	**CARRIER APPL. RATE**
MODE SWITCH	**SETUP**
Use INC/DEC SWITCH to set rate to 0.0	
MODE SWITCH	**OPERATE**

B. Console reads "**Flow Contl OFF Auto**".

In this mode the Flow Control Valve only responds to the INC/DEC Switch. The valve moves toward full open as long as the INC Switch is being held up. Holding the DEC Switch down moves the valve toward full closed.

When in Manual Mode, carrier flow rate is monitored by turning the Display Selector to "Carrier Application Rate". The flow rate reads out in gallons per minute, when the actual ground speed is less than one MPH, and in gallons per acre when ground speed is above one MPH.

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4.0. MAINTENANCE

Mid-Tech recommends the following maintenance to keep your TASC system operating at peak efficiency.

4.1. FLUSHING AND CLEANING

NOTE: It is important to keep your chemical applicator clean. Chemicals are becoming more potent and environmental considerations are becoming more demanding. Keeping the equipment clean also makes it easier to maintain the vehicle and extends its working life.

Always refer to the chemical manufacturer's directions regarding cleaning and flushing.

> **WARNING: Failure to follow the manufacturer's recommended cleaning and flushing procedures may result in chemical damage to crops receiving later treatment. Of course, all flushed liquid should be collected and disposed of in accordance with the applicable federal, state and local regulations for your area.**

As a general rule MID-TECH recommends the following:

A. Do not leave chemical in the injection pump or application lines overnight. The system should be flushed and cleaned at the end of each day's operation. Some chemicals actually bind to the walls of the containers and lines. The longer the chemical is in contact, the greater the possibility that this will occur. Bound chemical has been known to release during subsequent spraying operations with detrimental affects on the crop being sprayed. Flushing and cleaning so that chemical is not left in the sprayer for long periods of time will make this less of a concern.

B. All of the injection pumps should be flushed daily, regardless of use. Running the pumps frequently helps to keep the pumps in good working order. Unless the injection line from the pump has a positive shut off valve, some of the chemical applied that day may have migrated up the injection line to the pump. Flushing all the pumps helps guard against contamination.

4.2. INJECTION PUMPS

For the best tube and pump life, clean and lubricate the flexible tubing in the injection pumps prior to each day’s operation (use only the Tube Lube from your supplier).

At the end of each day’s use, disconnect the line from the chemical tank (or turn off the valve at the outlet of the chemical tank) and remove the tube from the pump housing to prevent it from developing a hard spot under the roller. This is particularly important in cold weather or if the pump will not be operated again the next day.

> **CAUTION: BE SURE THE CHEMICAL LINES ARE DISCONNECTED OR TANK VALVES ARE “OFF”, SO THAT LIQUIDS CANNOT DRAIN OR SIPHON INTO THE MAIN BOOM SUPPLY LINE WHEN THE TUBES ARE REMOVED FROM THE INJECTION PUMP.**

4.2.1. WEEKLY PUMP MAINTENANCE

Check the flexible pump tubing carefully for wear each week during frequent operations. Check for cracking, side splits, or other signs of material fatigue. If any signs of deterioration are seen, the tubing must be replaced immediately (replacement tubing kits are available from your MID-TECH dealer).

If the tubing has been changed, the pump must be calibrated to ensure system accuracy. Use the field calibration procedure specified in Section 2.8.2 of this manual to calibrate the pump.

4.2.2. SEASONAL PUMP MAINTENANCE

Always replace the flexible pump tubing before beginning spraying operations each season. This is particularly important if the sprayer has been sitting idle for an extended period of time. Replacement tubing kits are available from your MID-TECH dealer.

The Pump Calibration must be checked and calibrated at the start of each season. Use the field calibration procedure specified in Section 2.8.2 of this manual to calibrate your pumps.

4.2.3. PERIODIC PUMP MAINTENANCE

Injection pumps should be checked for proper calibration anytime there is reason to suspect system accuracy or anytime the internal pump tubing is changed. Use the field calibration procedure specified in Section 2.8.2 of this manual to check and calibrate the injection pump.

4.3. CONTROL CONSOLE

The console can be kept clean by wiping with a damp cloth and by covering unused connectors with the attached dust covers. Console set-up information should be checked periodically (Refer to Section 2.0., Calibration and Set-Up.)

NOTE: It is unlikely that set-up information will require reentering. However, there have been rare cases of its being distorted by random electromagnetic interference. For this reason, Mid-Tech strongly recommends recording the current set-up information in a convenient location and checking them daily, before operating the sprayer.

4.4. GROUND SPEED SENSOR

WHEEL SENSOR: Check the sensor daily for loose or bent fittings. Mud or trash build up can push the sensor out of alignment or knock the magnets off. Repair or replace any damaged components immediately and calibrate the sensor (Refer to section 2.7, Distance Calibration).

RADAR SENSOR: Check the sensor daily to make sure the face of the sensor is relatively clean (no dirt build up) and that the mounting bracket and hardware is tight and has not shifted in position. The sensor can be cleaned using a damp cloth. While inspecting and cleaning the radar speed sensor, take care not to look directly into the face of the unit. The radar generates a low level microwave signal when it is operating and it may be dangerous to the eyes.

If it is suspected or found that the radar sensor mounting position has shifted, the mounting bracket must be tightened and the sensor must be calibrated. (Refer to Section 2.7, Distance Calibration)

4.5. FLOWMETER

Prior to each day's spraying, the flowmeter should be inspected to ensure there are no leaks around the attachment fittings. At the end of the day, care should be taken to thoroughly flush the flowmeter with clean water.

The impeller type flowmeters supplied by MIDWEST TECHNOLOGIES are inherently rugged. However, continued use will eventually wear the internal bearings and shafts until the flowmeter becomes inaccurate. Replacement kits are available. Contact your MID-TECH dealer for these parts.

BE CAREFUL THAT WATER OR SEDIMENT IS NOT TRAPPED IN THE FLOW METER, PARTICULARLY IN COLD WEATHER, AS DAMAGE TO THE MECHANISM MAY OCCUR.

4.6. FLOW CONTROL VALVE

Prior to each day's spraying, the flow control valve should be inspected to ensure there are no leaks around the attachment fittings. At the end of the day, care should be taken to thoroughly flush the flow control valve with clean water.

BE CAREFUL THAT WATER OR SEDIMENT IS NOT TRAPPED IN THE FLOW CONTROL VALVE, PARTICULARLY IN COLD WEATHER, AS DAMAGE TO THE MECHANISM MAY OCCUR.

4.7. WIRING HARNESS

Most failures of electronic systems like the TASC are the result of broken wires or poor connections. Taking some time to periodically inspect and clean the wiring harness will help prevent this type of failure.

Inspect the external cabling for abrasion, stretched or pinched wires. If damage is seen, reroute the cabling and wrap it to protect it from further damage. If a broken wire is found, it can be temporarily repaired by stripping the wire back on each side of the break, twisting it together and **SOLDERING** the connection' (**Do not use acid core solder**). The bare connection must be well insulated with heat shrink material or electrical tape.

MID-TECH strongly recommends replacement of damaged cables as soon as possible. Once the cable insulation is damaged, moisture and chemicals can work their way under the insulation and cause corrosion to the conductor. In the end, continued problems will be experienced with the cable if it isn't replaced.

The connectors at the ends of the cables must be periodically inspected and cleaned. Use a non-lubricating spray solvent (such as a tuner cleaner) to clean the connections. Lubricating sprays leave a film which collects dirt and can eventually lead to failure of the contact. If the contact is so dirty it must be wiped clean, use a non abrasive swab (like a Q-TIP), along with the solvent, to avoid wear to the connector contact.

Sometimes connectors become damaged or worn out from many years of service. In this case, contact your MID-TECH supplier for a replacement connector kit.

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5.0 TASC ERROR MESSAGES, COMMON CONDITIONS AND SOLUTIONS

FIRST Check the battery connections, this is the MOST common fault.

ERROR CODE	CAUSE	REMEDY
Err 0	A required constant is set to zero. **Sometimes this is caused by poor power connections at the battery.**	Err 0, Pump ?: Reset Cal# for that channel. The affected channel is shut down. Err 0, Dist. Cal#: Reset distance Cal#. Sprayer will shut down. Err 0, Boom #: Reset boom widths (including boom width C.
Err 1 **(PUMP F)** (Main Product Pump) (Flashing "Too Fast") **(PUMP 1, 2, 3)**	Flow control valve is fully open. Traveling too fast for desired application. Nozzles too small for rate, speed and boom width. (Boom pressure reads high). Too much product being diverted to sparge. Strainer or nozzle screens plugged. (Boom pressure low - Main strainer.) (Boom pressure high. - Nozzle screens.) If displayed at normal operating speeds this may indicate a bad spot in the pump tubing which causes the pump to stall. Pump tubing too small.	Slow down, or check hydraulic flow to an hydraulically driven pump. Change to larger nozzles. Reduce sparging or turn up product pump output. Clean screens. Inspect tubing and replace if necessary. If replaced, re-calibrate pump before using. Change to larger tubing.
Err 2 (Flashing "Too Slow")	Speed and rates too low to do an accurate job of product delivery.	Speed up, change to smaller tubes or lower capacity pumps.
Err 3 **(PUMP-F)** (Main Product Pump) (Shuts down system after about 15 seconds) (Requires "All Booms OFF", "Imp. Status OFF", or "zero ground speed" to clear)	Error three indicates the console is not receiving any pulses from the flowmeter. Check for actual flow in the product line, if none:	Check Flow control/Boom connections on the back of the console. Secure if loose. Turn product pump ON. Check for empty tank. Verify that the boom valves are opening. Check for power, ground, and proper signal polarity. Check for correct operation of hydraulic valve controlling the pump motor. Check for power, ground, and proper signal polarity.

TASC ERROR MESSAGES, COMMON CONDITIONS AND SOLUTIONS
FIRST Check the battery connections, this is the MOST common fault.

ERROR CODE	CAUSE	REMEDY
Err 3 (PUMP-F) (Cont.)		Check for air lock in the product pump, causing no output. Purge pump using the Prime function.
		Clear blockage in product strainer.
	If there is flow in the product line but no flowmeter signals registered.	Check Flow control/Boom connections on the back of the console. Secure if loose.
		Clear blockage of the flowmeter rotor.
		Test flowmeter sensor & replace if faulty. See test procedure in the service manual.
	Pump does not turn at all. Rate sensor is generating no signals.	Check channel control connections on the back of the console. Secure if loose.
(PUMP-1,2,3) Liquid injection pumps		Check for power and ground at the pump motor. If no power, check fuse and battery connection for the pump driver module. If fuse and battery connections check ok and there is still no power to the motor, replace the pump driver module.
		Check for obstruction in the pump that may be keeping it from turning.
	Pump runs for 10 to 15 seconds and stops. Console is receiving no signals from the rate sensor.	Check channel control connections on the back of the console. Secure if loose.
		Pump RPM sensor is faulty. Check sensor wiring, connections, and mounting location for proper clearance.
	Console senses that the pump is running when it shouldn't be.	If the pump is actually running when it is not turned on, unplug the pump power cable at the battery and call for service help.
Err 4 PUMP-1,2,3	Will shut down system after 5 seconds of Err 4. If ERR 4 corrects itself, then system will recover by itself. If ERR 4 doesn't last for 5 seconds, then system will not be affected.	If pump is not running, check sensor mounting for excessive vibration and sensor wire routing to make sure it is not running near a source electrical pulses which could cause false rate signals to the console.
		Check battery connections.
	Carrier application rate has been exceeding the target rate by 15% for at least 10-15 sec. Valve is stuck.	Verify that the flow control valve is responding. Check, at the valve connector, for the proper voltages during the OPEN and CLOSE commands to the valve. Replace faulty wiring or the valve if necessary.

TASC ERROR MESSAGES, COMMON CONDITIONS AND SOLUTIONS
FIRST Check the battery connections, this is the MOST common fault.

ERROR CODE	CAUSE	REMEDY
Err 5 PUMP-F	**This is often caused by loss of power to the valve.**	Check fuse at battery and on valve (optional). Replace if defective. Check wiring and battery connections.
Err	Incorrect switch sequence is selected on the console.	Consult Operator's Manual for the correct switch sequence.
Err C	Communications problem with pump Channel slave board or Data Link.	Return console to Mid-Tech for repairs.
Err E	Memory error. **This is often the result of a poor battery connection.**	Hold down the decrease switch until the alarm stops. Check to see which constants have been set to zero and re-enter the correct values.
Err L	The vehicle electrical system voltage has fallen below about 10.0 VDC.	**Establish good ground and battery connections. This is the most common fault when system is acting erratically.** Check and service or replace the vehicle battery. Check and service or replace the vehicle alternator/ voltage regulator.
Err n, hook (backward 7)	Internal diagnostics.	May appear from time to time. A momentary appearance, followed by no other problems, can be safely ignored. If occurs frequently, or if comes on and stays on, contact your Mid-Tech dealer.
Err P	Unable to print.	This message should appear only if you have a Mid-Tech printer attached to the TASC console. Console has received a print request from the printer but cannot respond until the current control function is completed.
OFLO	Value to be displayed exceeds the maximum allowable size.	Hold down the decrease switch until the display re-sets to zero.
-FLO	Occures when the vehicle is setting still with the GSO, booms and any injection pump turned on.	Error will clear as soon as the vehicle starts moving or GSO, booms or pumps are turned off.
none (TASC 6000 Only)	The Display Selector on a TASC 6000 console has been set to one of the CHEMICAL (injection pump) positions and this type of console has no injec-tion capabilities.	Use a TASC 6300 or 6600 console if injection capabilities are required.

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6.0. EMERGENCY OPERATIONS

MIDWEST TECHNOLOGIES has strived to make TASC as fool proof and reliable as possible. However, we realize that problems can occur. If the operator is experiencing a failure of the ground speed sensor, the main flow control valve or, the flow meter, the first step is to carefully check the wiring harnesses for obvious problems and follow the suggested troubleshooting advice outlined in Section 5.0. in this manual. Assuming there is no success in getting the failed component to respond, MIDWEST TECHNOLOGIES suggests the following procedures **as a temporary measure** until the component can be fixed or replaced.

If the operator chooses to use any of the following procedures, he should recognize that the accuracy of application is reduced. If this reduced accuracy is acceptable these procedures will allow the operator to continue on a temporary basis.

6.1. GROUND SPEED SENSOR FAILURE

The TASC Control Console internally generates a speed signal when operated with the Ground Speed Override (GSO) feature activated and the sprayer moving. When the unit is operated in the GSO mode, TASC establishes the rate as if the vehicle were actually moving across the field at the programmed GSO speed. This feature can be used to operate the sprayer in the event of a failure of the speed sensor. **Application rate accuracy is reduced when operating under these conditions.**

A. **With the vehicle stopped**, set the console switches to the following positions:

All booms	**OFF**
Power	**ON**
Mode Selector	**SET UP**
Display Selector	**SPEED**

Using the **INC/DEC** switch, set the GSO speed for the normal spraying speed, (See Section 2.10 for additional information).

B. Set the Mode Selector switch back to **OPERATE** and make sure the appropriate chemical injection switches are selected to the desired rate. Start the vehicle and proceed to the application area, accelerating to normal spraying speed (as close as possible to the GSO speed value). As the vehicle reaches the start of the desired swath, turn on the booms and begin spraying.

C. TASC controls application of the carrier and the injected chemicals as if the vehicle were moving at the established GSO speed. The actual accuracy of application therefore depends upon the ability of the operator to maintain the desired vehicle speed. If the vehicle is traveling at exactly the established GSO speed, the application is nearly exact. If the vehicle is traveling faster or slower than the established GSO speed, the application rate is under or over the desired rate by a proportional amount.

D. All TASC functions, other than responding to speed changes, operate normally. The console still keeps track of the total chemical and carrier applied by the sprayer, and the application rate responds normally to changes in boom width. The readout of instantaneous application rate is meaningless under these conditions.

E. The console display continues to flash "**Too Slow**", and an audible alarm sounds ,to indicate abnormal operation.

6.2. FLOW CONTROL VALVE FAILURE

The TASC can still be operated in the event of a flow control valve failure. To operate the sprayer, it is necessary to manually adjust the flow control valve so that sufficient pressure is available to the booms to give a good spray pattern. Thus, there is no longer positive control over the main carrier flow, but; the chemical injection control system continues to operate in a normal, fully controlled manner. Use the following procedure to manually position the flow control valve. **Application rate accuracy is reduced when operating under these conditions.**

A. Stop the sprayer, turn all booms **OFF** and put the console into Manual Override (see section 3.8).

C. Disconnect the flow control valve at the cable connector.

D. Use a nozzle chart to determine the boom pressure that gives the desired application rate of carrier at the target speed. Turn **ON** the normal boom sections and allow the carrier to spray. Manually rotate the stem of the flow control valve (**It may be necessary to remove the electric actuator to adjust the valve. Be sure to mark the valve position before removing the power head.**) and/or adjust the pump bypass valve to generate the desired pressure downstream of the main carrier pump. Turn all boom sections **OFF**.

CAUTION: NEVER USE A SPARGE LINE WHILE OPERATING THE INJECTION PUMPS.

E. Turn **ON** the desired chemical injection pumps, to the rate desired, start the vehicle and proceed to the application area, accelerating to normal spraying speed. As the vehicle reaches the start of the desired swath, turn on the booms and begin spraying. At this point, the operator is enjoying all the control and monitoring functions of TASC, with the exception of positive control of the flow control valve.

F. All volumes and areas will accumulate normally. The chemical injection pumping rates respond normally to changes in boom configuration, ground speed or pump application rate changes commanded by the operator. Carrier flow rate can be monitored by turning the Display Selector to "Carrier Application Rate". The flow rate reads out in gallons per minute, when the actual ground speed is less than one MPH, and in gallons per acre when ground speed is above one MPH. Thus, although this is at best a temporary solution to the valve failure, the application accuracy of the injected chemicals is still maintained.

G. To exit the Manual Override Mode reenter some Carrier Application Rate, other than zero, into the console.

6.3. FLOWMETER FAILURE

The TASC 6300 or 6600 can still be used to control chemical injection rates, even if the system experiences a failure of the flow meter. The procedure is very similar to operating without the flow control valve, except, in this instance, the flow control valve is cycled using a manual override procedure. **Application rate accuracy is reduced when operating under these conditions.**

A. Stop the sprayer, turn all booms and injection pumps **OFF** and put the console into Manual Override (see section 3.8). Disconnect the flowmeter wiring harness at the first connector back from the flowmeter (3 pin connector).

B. The Flow Control Valve now responds only to manually activated commands from the **INC/DEC** switch on the Control Console. The TASC console remains in this configuration until some Carrier Application Rate other than zero is entered into the Control Console

C. Use a nozzle chart to determine the boom pressure that gives the desired application rate of carrier at the target speed. Turn **ON** the desired boom sections and allow the carrier to spray. Adjust the boom pressure using the **INC/DEC** switch on the Control Console. **INC** opens the Flow Control Valve and **DEC** closes the valve. The rate of movement of the valve increases the longer the switch is held. Once the desired pressure is attained, turn all boom sections **OFF**.

CAUTION: NEVER USE A SPARGE LINE WHILE OPERATING INJECTION PUMPS.

E. Turn **ON** the desired chemical injection pumps, to the rate desired, proceed to the application area, accelerating to normal spraying speed. When the vehicle reaches the starting point of the desired swath, turn on the appropriate boom switches and the sprayer starts to spray. At this point, the operator is enjoying all monitoring functions of TASC, with the exception of Carrier Application Rate and automatic control of the flow control valve. The console is not able to adjust carrier flow based on speed and boom width changes. The operator must drive at the correct speed and readjust the pressure manually if the boom width changes.

F. All volumes and areas, with the exception of **CARRIER, TOTAL APPLIED**, accumulate normally. The chemical injection pumping rates respond normally to changes in boom configuration, ground speed or pump application rate changes commanded by the operator. The carrier flow rate will read 0.0

G. To exit the Manual Override Mode reenter some Carrier Application Rate, other than zero, into the console.

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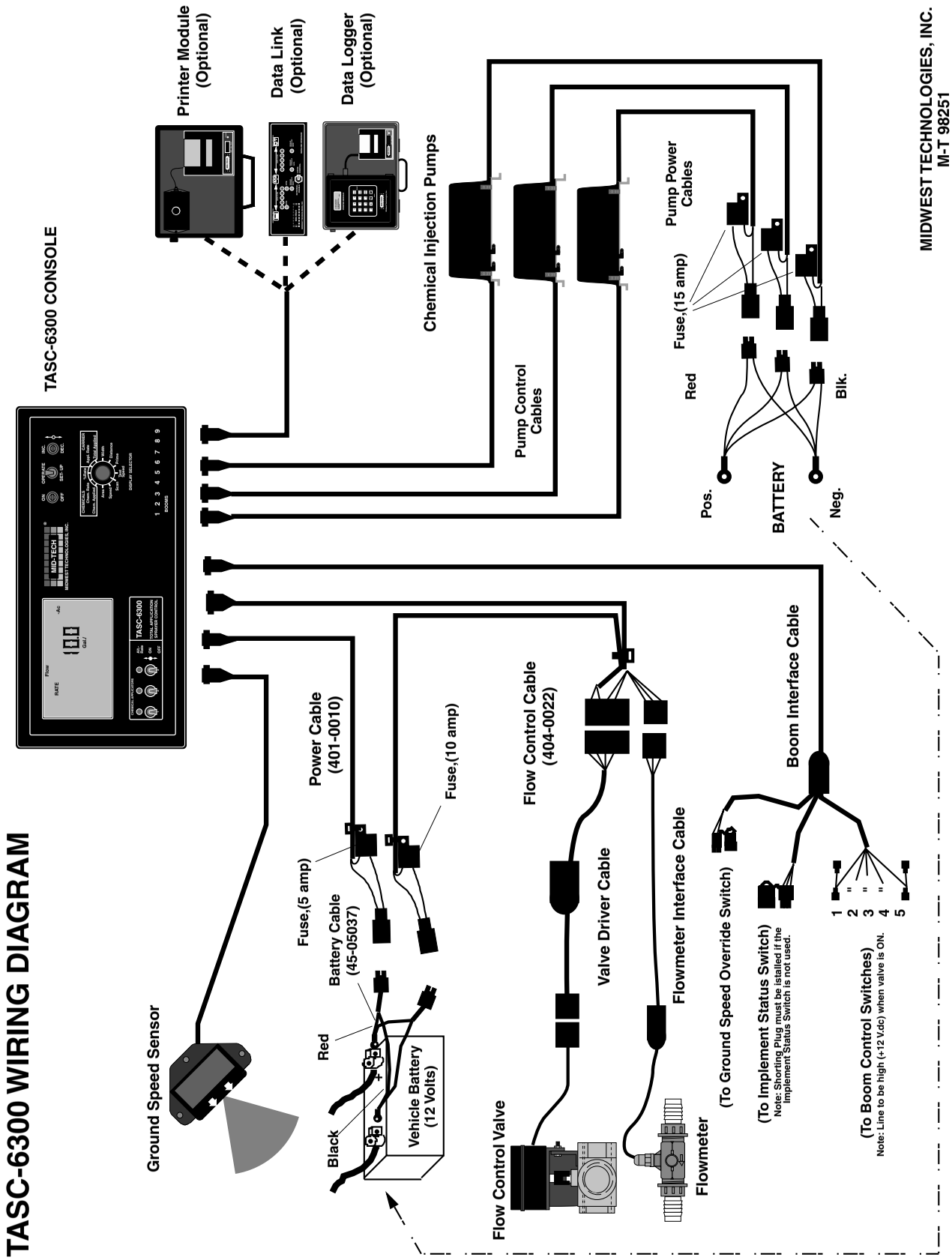
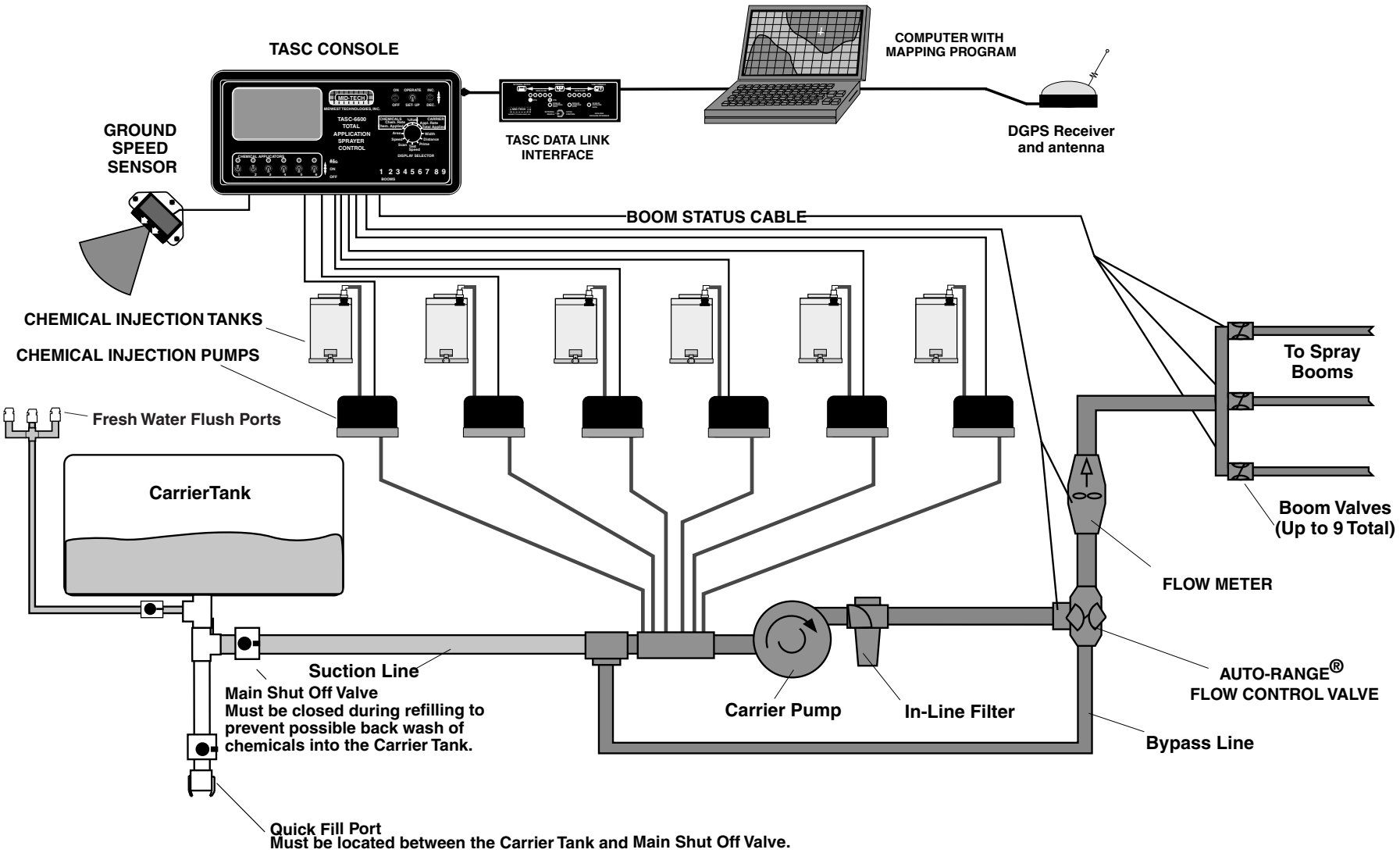
APPENDIX-A

SYSTEM DRAWINGS

A.1 TASC 6300 SYSTEM WIRING DIAGRAM





NOTES:
* Injection Hose lengths should be kept to a minimum to reduce the amount of chemical required to fill the lines. However, be sure to allow enough length, so as to not bind or stretch the hose when raising or lowering the boom.
** Upstream injection for Non-Compatible Chemicals (e.g. Atrazine when using an Atrazine product and 2-4D). There must be an in-line strainer between the Non-Compatible injection point and the other injection points

TASC-6600 Control System

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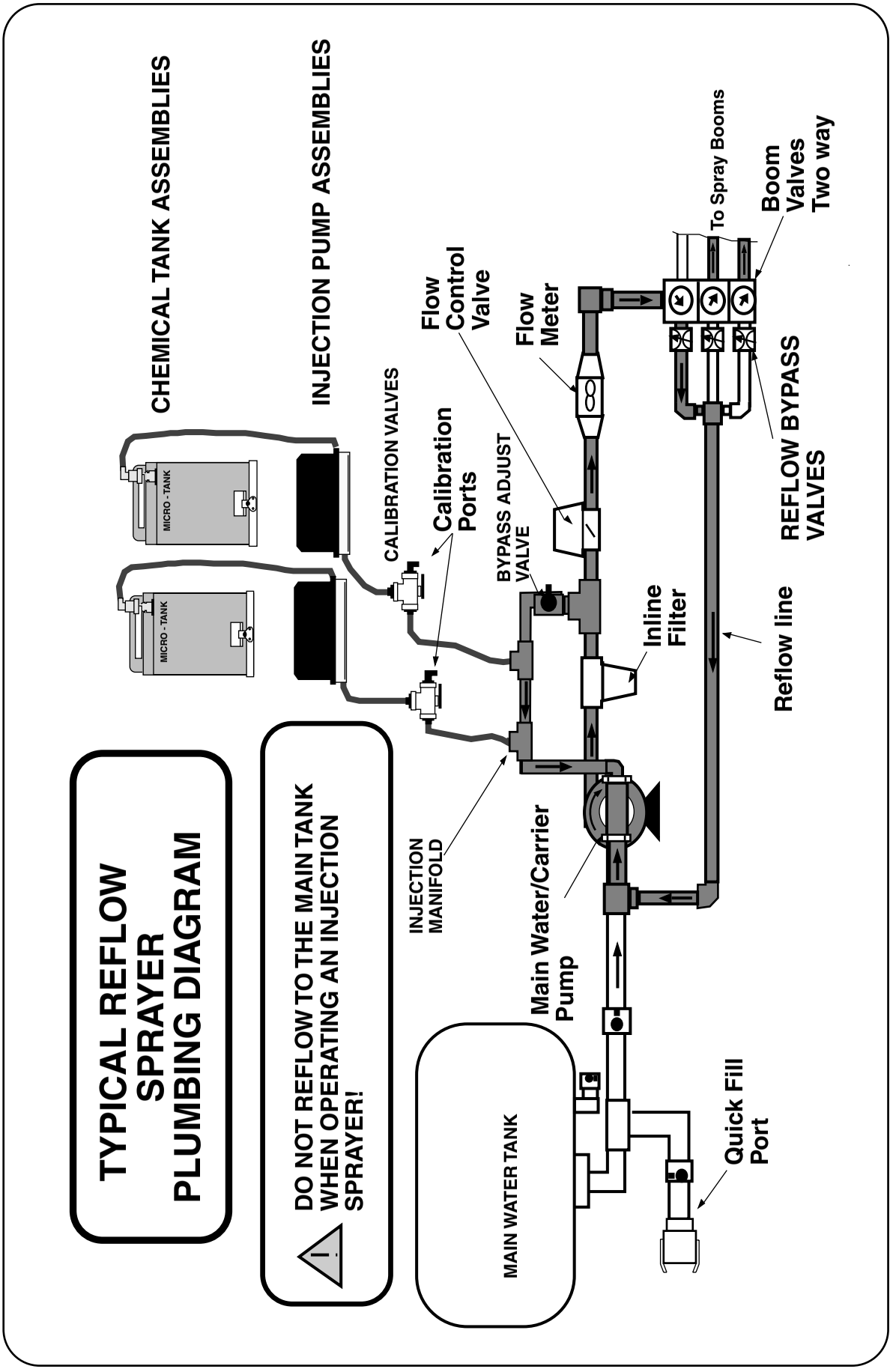
A.3 REFLOW PLUMBING DIAGRAM



A.4 FLUID OUNCES CONVERSION TABLE

1/8 Pint	=	2 Fluid Ounces
1/4 Pint	=	4 Fluid Ounces
1/3 Pint	=	5.33 Fluid Ounces
1/2 Pint	=	8 Fluid Ounces
2/3 Pint	=	10.67 Fluid Ounces
3/4 Pint	=	12 Fluid Ounces
1 Pint	=	16 Fluid Ounces
1 1/2 Pint	=	24 Fluid Ounces
2 Pints/1 Quart	=	32 Fluid Ounces
2 1/2 Pints	=	40 Fluid Ounces
3 Pints	=	48 Fluid Ounces
4 Pints/2 Quarts	=	64 Fluid Ounces
5 Pints	=	80 Fluid Ounces
6 Pints/3 Quarts	=	96 Fluid Ounces
7 Pints	=	108 Fluid Ounces
8 Pints/4 Quarts/1 Gallon	=	128 Fluid Ounces
1 Liter	=	33.8 Fluid Ounces

LIQUID MEASURE WEIGHT TABLE (WATER)

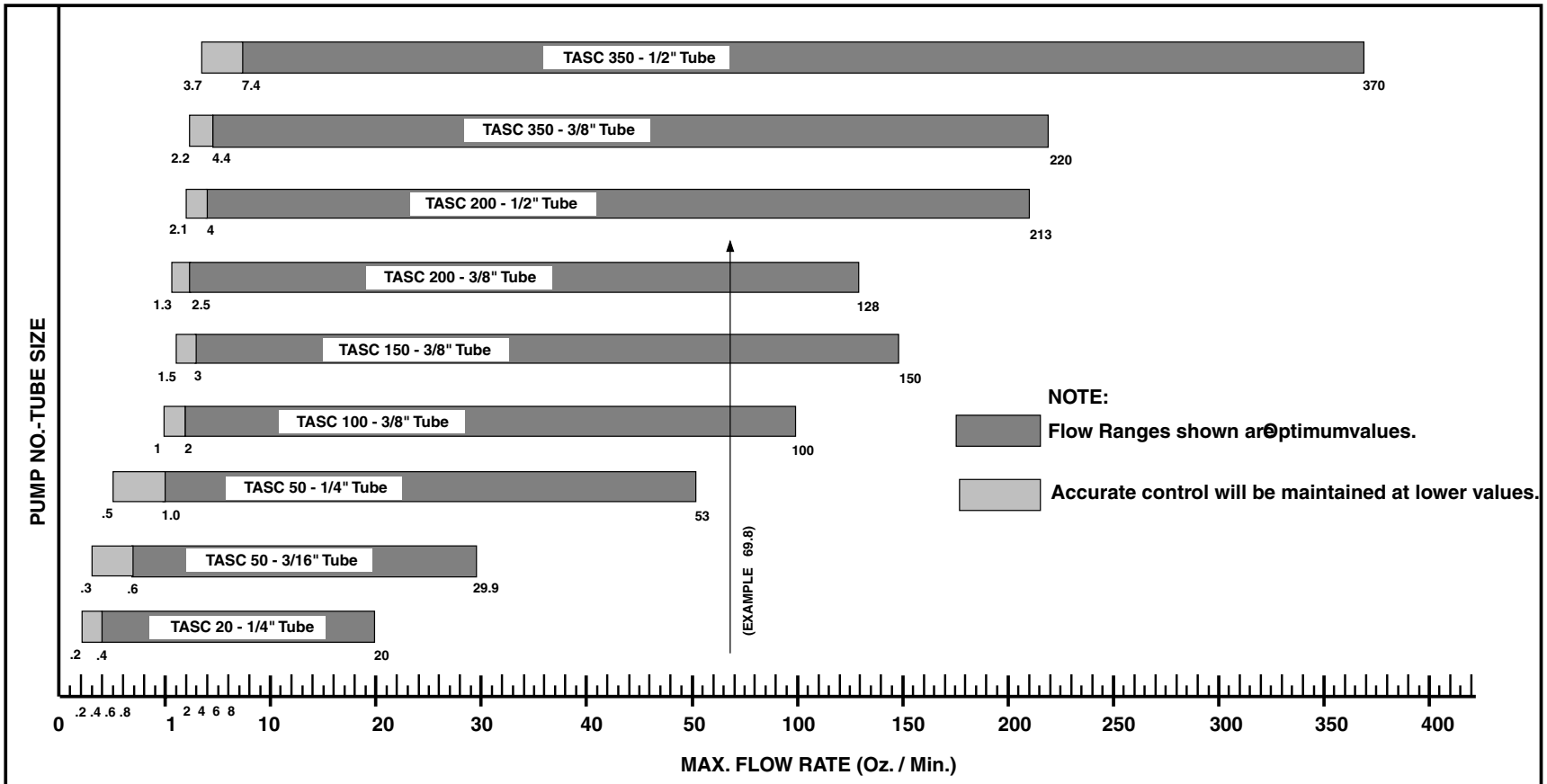
1 Pint Water 60F = 16 Fl. Oz. = 1.042 Lbs.

1 Quart Water 60F = 32 Fl. Oz. = 2.084 Lbs.

1 Gallon Water 60F = 128 Fl. Oz. = 8.337 Lbs.

(Note: Fluid Ounces are not = Dry Weight Ounces)

PUMP/TUBE SELECTION CHART for TASC SERIES PUMPS



EXAMPLE:

Max. Flow Rate = Max. Boom Width x Max. Speed x Appl. Rate x .00202
(Oz./Min.) (Feet) (MPH) (Oz./Acre) (Conv. Factor)

= 36 Ft. x 15 MPH x 64 Oz./Acre x .00202
= 69.8 Oz./Min.

Locate 69.8 on the horizontal axis of the chart, then draw a vertical line intersecting the Pump/Tube Sizes. In this example, you would need at least a TASC #100 or larger pump.

APPENDIX-B

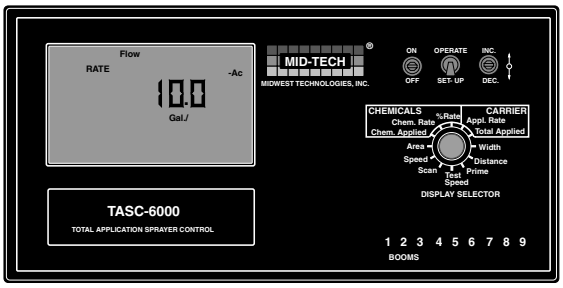
SYSTEM OVERVIEW

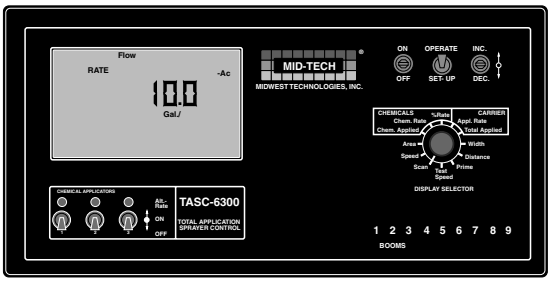
B.0. SYSTEM OVERVIEW

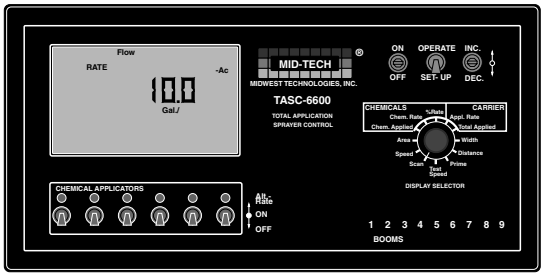
Mid-Tech has drawn upon many years of experience in electronically controlled chemical application to design and build this spraying system. We rely on the experiences of our users as well as ourselves to help us continually improve our systems. Please contact us to let us know what you like or don't like about the TASC. We appreciate your comments, and THANK YOU for purchasing a MIDWEST TECHNOLOGIES Total Application Sprayer Control (TASC).

B.1. THE TASC SYSTEM CONTROLS BOTH CARRIER FLOW AND CHEMICAL INJECTION RATES

TASC is available in three different models, depending on the operator's requirements. These models are the: TASC-6000, TASC-6300, or TASC-6600.







TASC-6000 is a basic sprayer flow control system. TASC-6000 performs both monitoring and control functions, freeing the operator from the requirement to maintain a constant vehicle speed and a constant sprayer pressure. TASC-6000 assures a constant and precise application rate for the material from the main tank. Because of its modular design, a TASC-6000 can be upgraded to either a TASC-6300 or a TASC-6600.

TASC-6300 or 6600 are chemical injection controls as well as sprayer flow controls. These two units automatically introduce and mix active chemicals into the main carrier flow during spraying operations. The TASC-6300 and 6600 are simple, easy to use, and virtually automatic. TASC-6300 can simultaneously control up to three separate chemical injection pumps, while TASC-6600 can control up to six injection pumps.

Chemicals are not mixed in the main tank when using either TASC-6300 or TASC-6600. The operator uses chemical only where it's needed and at just the rate necessary to do the job. The operator finds he is doing a more precise job of application, with less wasted chemical, and minimum exposure to dangerous or toxic materials.

B.1.1. HOW A TASC-6000, 6300 or 6600 CONTROLS CARRIER APPLICATION RATE

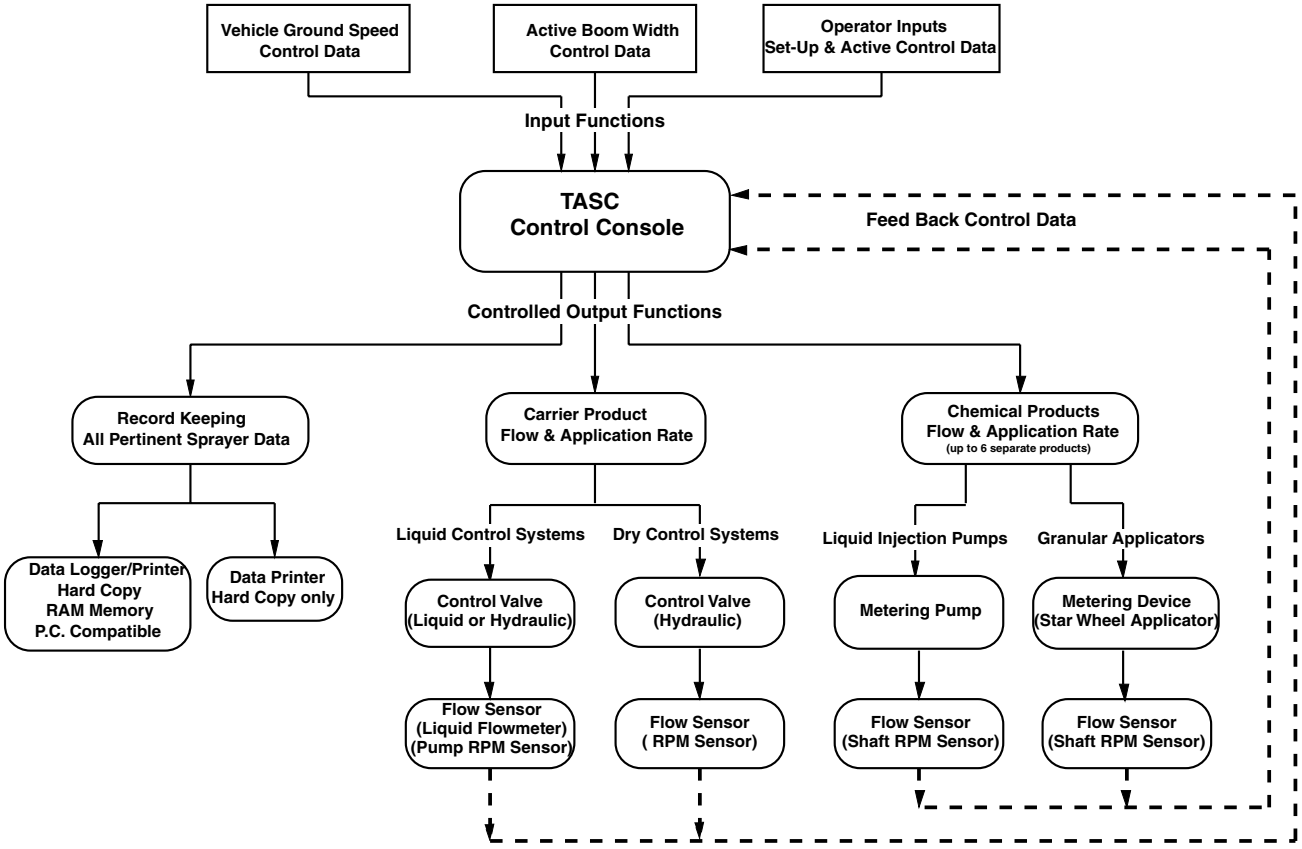
TASC senses ground speed, active boom width, and carrier flow rate. When a change in ground speed or boom width is detected, TASC changes the carrier flow rate to maintain a constant, pre-selected rate per area. An increase in ground speed results in a proportional increase in flow rate. A decrease in ground speed results in a proportional decrease in flow rate. Comparisons of flow rate, active boom width, and ground speed are made approximately four times each second and corrections are made to the flow rate as soon as an imbalance is seen.

B.1.2. HOW A TASC-6300 AND 6600 CONTROLS CHEMICAL APPLICATION RATE

The theory behind controlled, chemical injection spraying is simple. Each chemical is stored in a separate container until it is actually applied. Chemical is injected into the carrier as needed using a precision metering pump. Injected chemical mixes rapidly and thoroughly with the carrier before it leaves the sprayer through the nozzles.

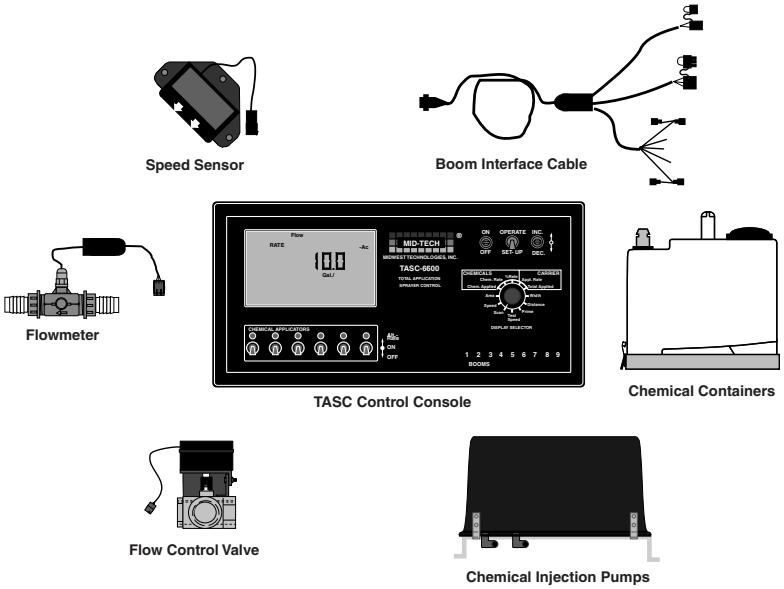
A TASC-6300 or 6600 automatically maintains the desired chemical application rate by sensing changes in ground speed or active boom width and adjusting the rate of chemical injection accordingly. For example, if the ground speed of the sprayer increases or decreases, the injection pump speed increases or decreases accordingly to keep the amount of chemical applied per unit area at a constant value. Likewise, as more boom sections are switched on or off line, the injection pump speeds up or slows down accordingly, to assure the proper application rate. TASC makes these comparisons and adjustments approximately four times each second. The speed and accuracy of TASC allows it to precisely control the application rate of each chemical being injected.

TASC CONTROL SYSTEM FLOW SCHEMATIC



B.2. TASC SYSTEM COMPONENT PARTS

There are seven major components in a complete TASC Injection Control System, a console, ground speed sensor, flowmeter, flow control valve, boom interface cable, chemical containers, and injection pumps. Each of these components is described below so that the operator, will have a general understanding of how each of the parts performs its job.



B.2.1. THE TASC CONTROL CONSOLE

The TASC Control Console is the heart of the system and actually performs three separate functions. The console is a small computer with a sophisticated program developed by MIDWEST TECHNOLOGIES. The console continually monitors ground speed, boom width, and current flow rate. As these values change, the console recalculates the required carrier flow rate and the chemical injection rate of each injection pump and commands the necessary corrections. Changes in valve settings and pump speeds are almost immediate.

The Control Console allows the operator to command rate changes “ON THE GO”. The operator has complete and immediate control over the application rate of the main carrier and of each injected chemical. Rates can be altered independently while the sprayer is operating.

The Control Console informs the operator about the status of the sprayer. TASC Control Console immediately warns the operator if the system can no longer maintain accurate application. The warnings are both visual and audible, to attract immediate attention. The large, backlighted LCD also displays instant readouts of carrier application rate and volume applied, application rate and volume of each chemical applied, vehicle ground speed, active boom width, distance traveled, and the total area covered while spraying.

B.2.2. FLOWMETER

TASC requires a flowmeter in the main boom feed line to sense and display carrier flow rate. The flowmeter is an impeller device. This means a specific volume of liquid flowing through the sprayer rotates an impeller a specific number of revolutions. TASC is able to count the revolutions of the impeller very accurately, allowing the console to calculate the precise flow rate of the liquid in the main boom supply line.

Sometimes a sprayer is already equipped with a flowmeter. TASC can usually be adapted to work with existing flowmeters, as long as they measure the total liquid flow to the sprayer nozzles. Check with your dealer, or the factory, regarding the adaptability of a specific flowmeter.

B.2.3. FLOW CONTROL VALVE

TASC requires a flow control valve in the main boom supply line to provide automatic carrier control. This valve throttles the carrier flow in response to commands from the control console. To be effective in controlling carrier flow, the valve must be fast acting and precise in its movements.

The flow control valve may take the form of a hydraulic flow control valve controlling the flow rate by controlling the speed of the product pump.

Sometimes a sprayer is already equipped with an electronically controlled flow control valve. If the valve meets the necessary speed and precision requirements, it can be adapted for use with TASC. Check with your MID-TECH dealer, or the factory, regarding the adaptability of a specific valve.

B.2.4. GROUND SPEED SENSOR

TASC requires an accurate ground speed sensor. A magnetic pickup, wheel sensor is standard equipment. This sensor, mounted on a non-driven wheel, has proven to be very accurate and dependable for most spraying operations.

An optional radar ground speed sensor is available from MIDWEST TECHNOLOGIES for applications where wheel slippage and variations in ground conditions are a concern. The radar sensor does not depend on ground contact and is unaffected by these variables.

Some sprayers may already be equipped with a ground speed sensor. If the speed sensor meets the accuracy requirements, it can be adapted for use with TASC. Check with your MID-TECH dealer, or the factory, regarding the adaptability of a specific sensor.

B.2.5. BOOM INTERFACE

TASC needs to know when each boom section is activated, in order to adjust chemical flow rates appropriately. The console recognizes the activation of each boom section, whenever it receives a positive voltage on the boom interface connection corresponding to that boom position. The console is capable of sensing and responding to nine separate boom sections. The console can also sense the operation of an independent, status switch which would result in a shut down of all chemical injection pumps and a selectable response by the Flow Control Valve (position held or full closure). Finally, the Boom Interface can be equipped with an optional Ground Speed Override switch.

The standard TASC System is supplied with a five position boom interface cable. The cable plugs directly into the rear of the TASC console and allows connection to up to five boom sections, an optional ground speed override switch and an optional status switch. A nine boom interface cable is available for larger sprayers.

An optional boom control switch panel, with interface, serves those sprayers not already equipped with electrical boom control devices. The switch panel can power up to nine boom control valves, and acts as an interface for an independent status switch. The switch panel plugs directly into the back of the TASC Control Console and receives power from the vehicle battery. Models are available to control both solenoid and rotating valves.

B.2.6. PRECISION INJECTION PUMPS

MID-TECH uses precision peristaltic pumps to meter individual chemicals into the main boom supply line of the sprayer. Peristaltic pumps use rollers to squeeze a flexible tube, forcing a volume of fluid through the tube ahead of the advancing roller. Each pass of a roller over the tube forces out a consistent volume of chemical. The inherent precision and broad operating range of the peristaltic pump makes it work extremely well as the metering device used with TASC.

The pumps MIDWEST TECHNOLOGIES supplies with TASC include their own DC motor and motor control module. The motor control module uses modern, solid state electronics to switch power to the motor directly from the battery. Special, high torque motors are used to provide positive rotation at all speeds.

B.2.7. CHEMICAL CONTAINERS

MIDWEST TECHNOLOGIES has designed special chemical containers for use with chemical injection sprayers. These containers are available in either 7.5 gallon or 25.0 gallon capacities and can be equipped with optional agitation devices. The tanks are mounted in optional stainless steel racks and are easily removed from the vehicle for filling, cleaning or storage. The containers are equipped with chemical resistant couplings for fast, safe, positive, connection to the injection pump intake hoses.

The patented tanks are unique features of all MIDWEST TECHNOLOGIES injection spraying systems, including TASC. These portable chemical containers offer tremendous flexibility to the operator, since switching from one chemical to another is as easy as removing one container and replacing it with another holding a different chemical. Exposure to raw chemical is kept to a minimum.

Some sprayers may already be equipped with separate holding tanks for raw chemicals. If the operator desires, these can be plumbed directly to the injection pumps.

APPENDIX-C

INSTALLATION

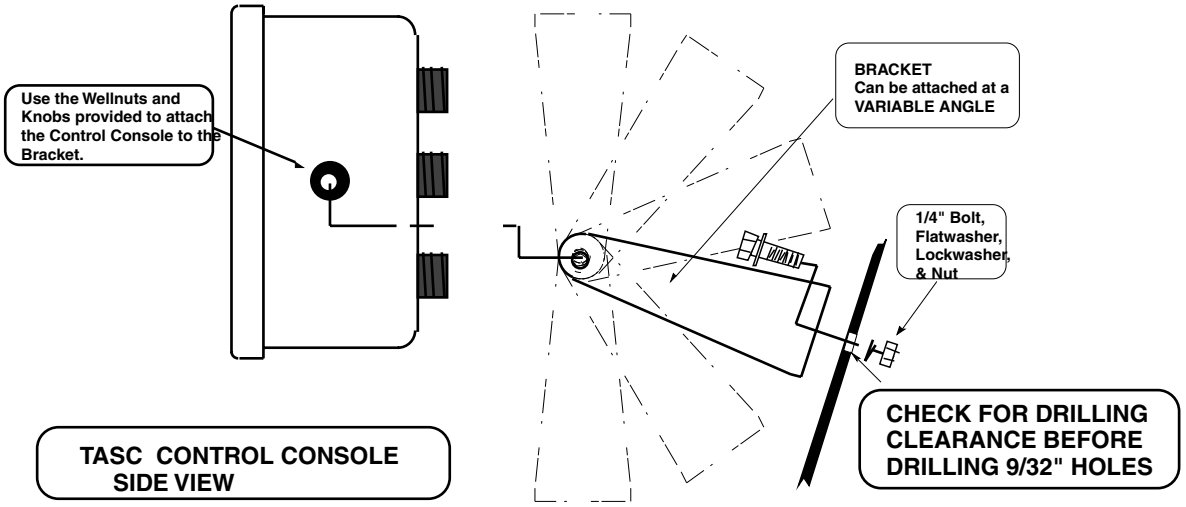
C.0. INSTALLATION

C.1. CONTROL CONSOLE INSTALLATION

The Control Console should be located inside the vehicle cab, when possible. It can be mounted on or below the dash, or any other location where it is accessible to the operator without diverting or obstructing his view. The mounting bracket may be attached to the console with the mounting face of the bracket up or down as required.

C.1.1. CONSOLE MOUNTING

After selecting a suitable location for the console, drill two 9/32" diameter mounting holes, using the mounting bracket as a template to mark the locations. Attach the mounting bracket to the mounting surface using two 1/4" bolts, lock washer and nuts. Then mount the console to the mounting bracket using the well nuts and the knobs supplied.



CAUTION: Make certain the opposite side of the drilling surface has plenty of clearance for the fasteners and is free of wiring or hoses.

WARNING: FOR POSITIVE GROUNDED VEHICLES; DO NOT select a mounting location that will allow the console rear panel or the front panel toggle switches to come in contact with the vehicle frame. The parts are negatively grounded and **MUST NOT** contact the frame of a positively grounded vehicle.

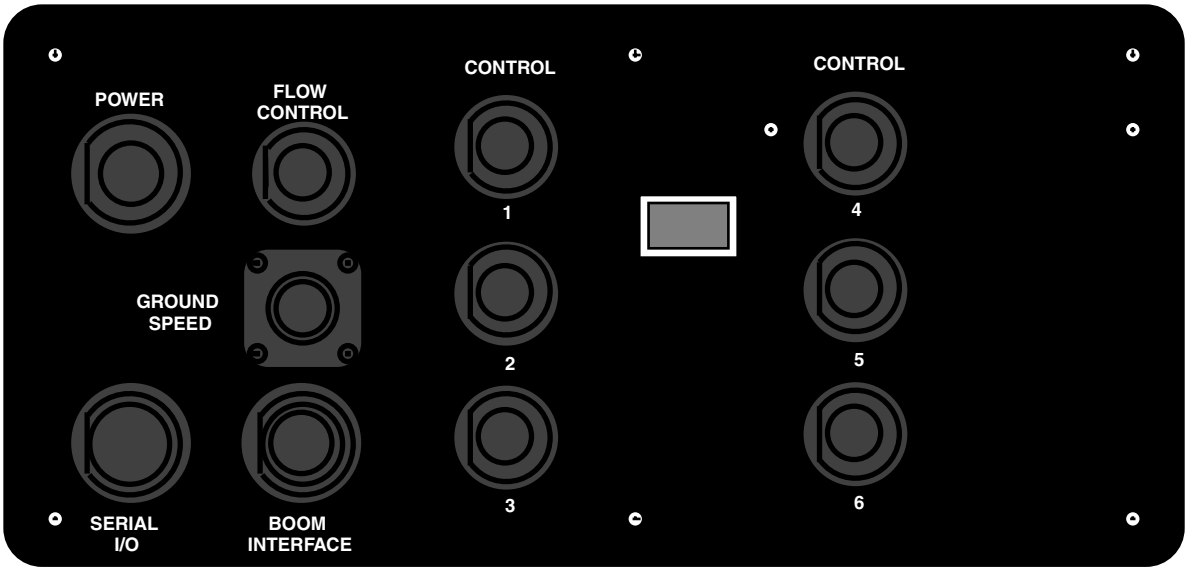
NOTE: If the control console is to be installed on a vehicle in a location which is unprotected from weather or chemicals, the following precautions must be followed.

A. Install the console so that the front panel is tilted up no more than 45 degrees and no less than 10 degrees. This will allow any water that gets inside the console to drain through the holes in the back of the case.

B. The console electronics are sealed to prevent damage from moisture, however if the console will be exposed to weather, it should be covered when not in use. The best cover is one which would protect the console from rain and yet allow for air movement from below. A plastic bag sealed tightly around the console is **NOT** recommended, as this can cause excessive moisture and heat build up inside the console.

C.1.2. CONSOLE CABLE ROUTING

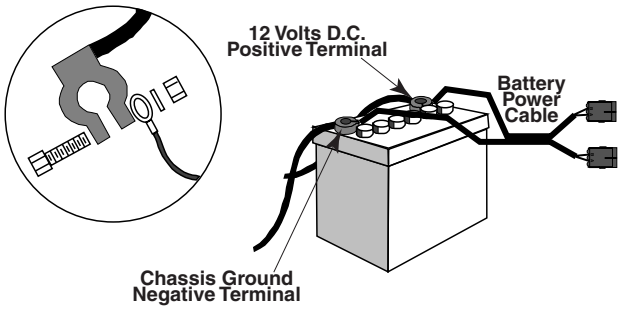
Console Cable routing is important. There are up to eleven connector positions on the back of the console; Power, Pump Controls #1 to #6, Ground Speed, Boom I/O, Flow Control, and serial I/O. Depending on the TASC model, some connector positions may not be present. The power cable is marked with a **"Connect to +12 Volts Only"** label, all other cables are labeled and connect to the corresponding position on the rear of the console (See Appendix A). The connectors are keyed so they will only mate in the proper position.



Rear view of the TASC Control Console

Determine the best location for the cables to exit the cab. If an existing exit point is not available, drill or punch a 11/4" to 11/2" dia. hole in the cab. The hole must be protected with a grommet or other material to prevent sharp edges from cutting into the cables. After all cables have been properly routed and secured, seal the entry point with foam rubber, or other appropriate material, to keep dust out of the cab.

CONNECT ALL POWER LEADS DIRECTLY TO THE VEHICLE BATTERY



CAUTION: DAMAGE TO THE TASC SYSTEM MAY OCCUR, IF POLARITY IS REVERSED!

DO NOT SUBSTITUTE HIGHER AMPERAGE FUSES

CAUTION: The Console Power Cable *MUST* be connected directly to the vehicle battery (12 VDC only). This provides electrical noise protection to the console. Be sure that the red (fused) wire is attached to the positive terminal of the battery and the black wire is attached to the negative terminal.

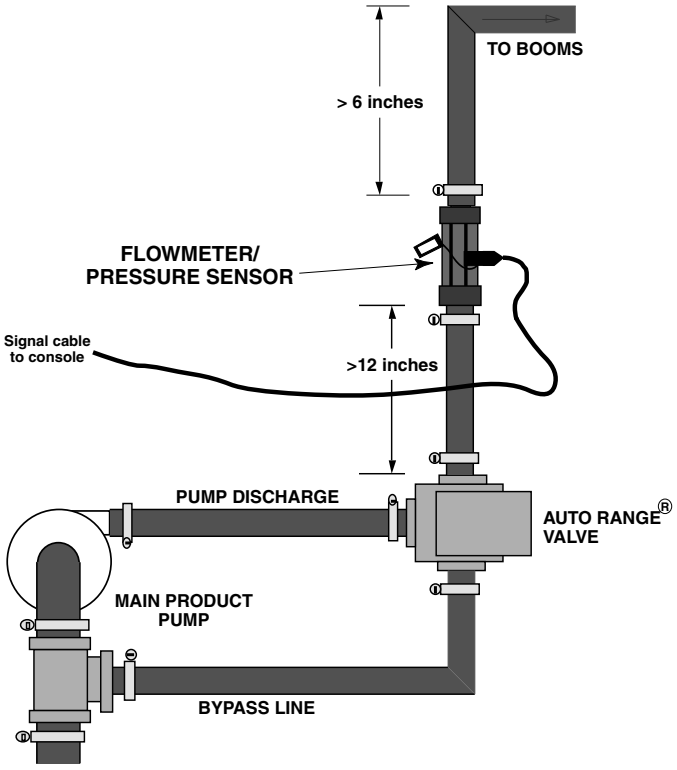
NOTE: Route all cables carefully, avoiding moving parts, excessive heat and exposure to tree limbs, stubble, or other debris. Allow enough slack at all pivot points to guard against pinching or stretching the cables. Finally, secure the cables in place with tie wraps and/or cable clamps.

C.2. FLOWMETER INSTALLATION

The installer should refer to the detailed instructions shipped with the particular device being installed. MIDWEST TECHNOLOGIES recommends that these specific installation instructions be attached to this manual for future reference. There are, however, a few general mounting tips which should be considered for any flowmeter installation.

The accuracy of the flowmeter depends on a smooth, unobstructed flow through the device. Every effort should be made to mount the flowmeter in a straight section of the main boom supply line with at least twelve inches of straight flow upstream from the device and at least six inches of straight flow downstream from the device. Sharp bends in the flow stream caused by valves, kinks, elbows, tees, etc., can seriously degrade the performance of the flowmeter. Additionally, if the flowmeter being installed is sensitive to the direction of flow, it will be marked with an arrow. These devices should always be installed with the arrow pointing in the direction of normal flow.

NOTE: THE FLOW METER MUST BE MOUNTED SO THAT IT WILL DRAIN COMPLETELY WHEN THE SPRAYER IS NOT OPERATING!



The flowmeter must provide the TASC Control Console with a continuous measurement of total liquid actually discharged by the sprayer. This includes both the main carrier and the injected chemical, after the two are mixed. To accomplish the required measurement, the flowmeter must be installed in the main boom supply line, upstream from the individual boom shut off valves and downstream from the flow control valve and pump bypass line, if used (See figure above).

The flowmeter should be installed in a location that will physically protect it from damage and allow liquid to drain away when the sprayer has been flushed and secured at the end of an operating day. **Keep the flowmeter from lying in a low section of tubing.** This is particularly important in cold weather, when water could freeze in the flowmeter and damage the internal mechanism. It is also important when applying chemical suspensions which may settle and obstruct the flowmeter if they don't drain away. A straight, vertical section of the main boom supply line, is the ideal location for the flowmeter. Firmly support the main boom supply line in the vicinity of the flowmeter to protect it from deforming and vibration.

C.3. FLOW CONTROL VALVE INSTALLATION

There are a number of different types of flow control valves capable of operating with the TASC System. The installer should refer to installation instructions supplied with each device for information that applies specifically to that device. Mid-Tech recommends that these specific installation instructions be attached to this manual for future reference. There are, however, a few general mounting tips which should be considered for any flow control valve installation.

Since the valve is used to control the liquid flow to the spray boom, it must be mounted downstream from the pump bypass line and at least twelve inches upstream from the flowmeter. **The valve should not be mounted in a low spot in the line**, where water or sediment can collect and obstruct the valve by freezing or jamming. Select a location that will protect the valve from physical damage.

The cable connecting the flow control valve to the TASC Control Console should be routed carefully to afford maximum protection from abrasion or breakage. The flow control valve power cable **must be** connected directly to the vehicle battery (12 VDC only). Attach the red lead (fused) to the positive post and the black lead to the negative post of the battery.

C.4. GROUND SPEED SENSOR INSTALLATION

A variety of devices are capable of providing the actual ground speed information required by the TASC Control Console. The installer should refer to the detailed installation instructions provided with the particular device being used. Attach these specific installation instructions to this manual for future reference. There are a few general tips the installer should be aware.

Wheel Sensor: Be sure to mount the sensor on a non-driven wheel, making every effort to protect the cabling from physical damage during field operations. Make sure the sensor magnets are securely attached, and that they are mounted in the proper alternating sequence.

Radar Sensor: The most secure mounting is to use a metal bracket as described in the instructions for mounting to the frame of the vehicle. Make sure there are no moving or rotating parts of the vehicle exposed in the field of view of the radar sensor.

Speedometer Sensor: If installed on a vehicle with a two speed axle, be sure the sensor is mounted between the ratio corrector and the speedometer head.

C.5. BOOM CONTROL SWITCHES AND INTERFACE

TASC is supplied with a boom interface cable (standard) or a boom control switch box (optional).

C.5.1. BOOM CONTROL SWITCH BOX

Using the Boom Control Switch Box as a template, locate it conveniently close to the sprayer operator and close enough to the TASC Control Console for the connecting cable to reach. Drill mounting holes and firmly attach the switch box to the vehicle. (In some cabs, it may be necessary to fabricate a mounting bracket for the switch box.) (**Always check behind the surface that you are drilling to make sure that there are no wires, tubing, etc. that might be damaged!)**

The Boom Control Switch box is equipped with four cables (Boom I/O, Power, Boom Valve, and Implement Status). The Boom I/O cable plugs into the Boom I/O position on the back of the console. Carefully route the power cable to the accessory power (12 VDC only). Connect the red (fused) wire to the positive terminal and the black wire to the negative terminal. The third cable ends with up to nine pairs of wires, numbered one through nine, and supplies positive and negative power to the individual boom valves. Carefully route this cable to the boom valves and connect the wire pairs to the valves in sequence. The status cable is terminated with a 3 pin connector (used for the status switch) and a male / female spade pigtail (used for electrically activated carrier pumps). When the status or pump switch is **OFF**, the console stops the chemical injection pumps and demands a selectable response from the Flow Control Valve. **If a status or**

pump switch is not used, the shorting plug must be installed or TASC will not operate. The optional Ground Speed Override switch should be mounted conveniently for the operator's use. This switch can be either hand or foot operated.

Check to insure all cables are protected from abrasion and breakage, and secure with cable ties or clamps.

C.5.2. BOOM INTERFACE CABLE

If your sprayer already has switches for controlling the boom valves, you can continue to use those switches. Instead of a Boom Control Switch box like that described in the previous section, you would use a Boom Status Cable to monitor the status of the boom valves.

The connector on one end of the Boom Interface Cable plugs into the Boom I/O position on the back of the TASC Control Console. The other end of the cable has up to nine wires that have been terminated with a female spade terminal. These wires are individually numbered from one through nine. The installer must decide which of the booms will be designated number one. Then, each numbered wire from the boom interface cable must be connected to either, the boom on/off switch or the boom valve itself, in the appropriate sequence. Each wire must be connected to a terminal that is normally zero volts or open when the boom section valve is closed (OFF) and powered (12 V. DC) when that particular boom section valve is opened (ON).

Each Boom Interface also has an Implement Status Connector. For chemical injection to occur, the status switch must provide (+12 VDC) to the white or green wire. If a status switch is not used, the shorting plug must be installed, otherwise the TASC System will not operate properly.

The wire ends should be connected first and then routed back to the TASC Control Console. Unused wires should be taped and secured to prevent damage. Check to insure that the cable is protected from abrasion and breakage, and secure with cable ties or clamps. **Do not run the Boom I/O cable near a two way radio antenna or other source of electrical noise!** Insert the connector into the Boom I/O position on the back of the console (See Appendix A).

The optional Ground Speed Override switch should be mounted conveniently for the operator's use and the excess cable coiled up and secured in a protected location. This switch can be either hand or foot operated.

C.6. INJECTION PUMP INSTALLATION

The injection pumps supplied with a TASC System are precision peristaltic pumps. If other approved pumps are installed, the installer should refer to the detailed installation instructions provided with those alternate injection pumping devices. MIDWEST TECHNOLOGIES recommends that the specific installation instructions be attached to this manual for future reference.

C.6.1. SELECTING THE CORRECT PUMP FOR THE APPLICATION

Use the following formula to determine the required pump capacity for the application. Then check to be sure the TASC System has been provided with the appropriate pump.

Pump Cap.	= Max. Boom Width	x	Max. Speed	x	Chemical Rate	x	(.00202)
(Oz./Min.)	(Ft.)		(MPH)		(Oz./Acre)		

Example: A sprayer with 35 ft. booms, traveling at a maximum speed of 7 mph and applying 1 quart of chemical per acre would require a maximum pump capacity of 15.8 Oz./Min. (i.e. 35 ft. x 7 mph x 32 oz/ac x .00202 = 15.8 Oz./ Min.). Referring to the Pump/Tube Selection Chart in Appendix A we find that a MID-TECH Model-20 pump would be sufficient for this chemical. However; if you needed to apply 64 oz./ac. of chemical, you would need the MID-TECH Model-100 pump, (i.e. 35 x 7 x 64 x .00202 = 31.7, which exceeds the capacity of the smaller 20 Oz./Min. pump). Variations in speed and boom widths will also affect the pump capacity required.

NOTE: Select the pump with a maximum capacity the next size larger than the calculated capacity required. This will insure that the TASC system will have enough capacity to provide precise control over the expected range of operating conditions.

C.6.2. INJECTION PUMP LOCATION

Injection pumps must be located as close as possible to the point where the chemicals will be injected into the main boom supply line. Consideration for the location of the chemical containers must also be given, keeping the distance from the injection pump to the chemical container to a minimum. There are two recommended locations for injecting the chemicals into the carrier fluid.

A. Preferred Location: The inlet point of the main pump is the preferred location. This allows for excellent mixing of the chemicals through the main pump. If this location is selected the sprayer must be plumbed so that no mixed material can return to the main tank (See plumbing diagram in Appendix A). If sparging is necessary, MID-TECH recommends installing a separate sparging pump. This has the added advantage of maintaining a constant sparge flow, regardless of variations in ground speed or spraying rates.

B. Alternate Location: If sparge line agitation of the main tank is required, the injection point needs to be located between the sparge line and the boom section valves. This can be accomplished by using an Auxiliary pump to inject the metered chemicals from the Peristaltic Injection pumps into the relatively high pressure main boom supply line.

NOTE: Since tank mixing is no longer required with this system, most sprayers will not need a sparge line. MIDWEST TECHNOLOGIES recommends that sprayers equipped with a sparge line (Main tank agitation return line) be plumbed as a pump recirculating only sprayer, when a TASC injection system is installed.

C.6.3. CLEARANCE AND MOUNTING OF INJECTION PUMPS

Once the best location for the injection pump has been selected, plan to orient the assembly so that the injection pump assembly cover is easily opened, allowing access for inspecting and changing the tubes. Be sure that the injection pump assembly is protected from inadvertently being stepped on or bumped. Use the pump mounting base as a template to mark the mounting hole locations. **NOTE: Secure each pump firmly to eliminate vibration and possible damage to the connecting hoses and cables.**

C.6.4. INJECTION PUMP CABLE ROUTING

Each injection pump comes with two cables, one pump control cable and one pump power cable. **NOTE: Route all cables carefully, avoiding moving parts, excessive heat and exposure to tree limbs, stubble, or other debris. Allow enough slack at all pivot points to guard against pinching or stretching the cables.** Finally, secure the cables in place with tie wraps and/or cable clamps.

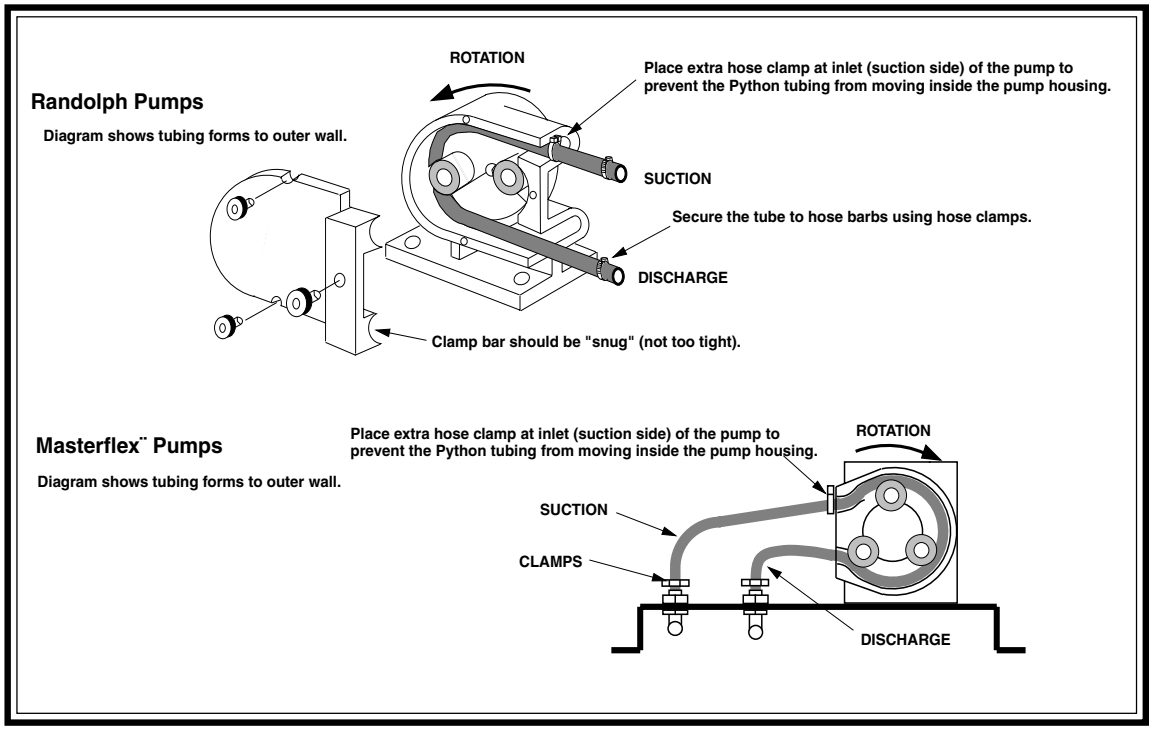
Pump Control Cables: The operator needs to decide which pumps are to be designated #1 , #2, etc., and then mark the cable tags accordingly, (use a permanent ink - water proof marker). Carefully route the cable to the console and connect to the corresponding console connector. (See Appendix A)

Pump Power Cable: Route each power cable to the **vehicle battery (12 VDC only)** and attach the red lead (fused) to the positive post and the black lead to the negative post of the battery.

C.6.5. PRECISION PERISTALTIC INJECTION PUMP TUBING INSTALLATION

Each injection pump comes with two appropriately sized tubes and a bottle of Tube Lube. To install the tubing, remove the retaining hardware from the pump cover and gently pry the cover off, (Do Not Force). Take one of the tubes and coat approximately 12" of its midsection with a liberal portion of the Tube Lube. Slip this lubricated section into the inner pump housing, between the rollers and the pump housing. Replace the outer pump housing and retaining hardware, (Do Not fully tighten the retaining hardware).

Connect the tubing to the two hose barb fittings on the base of the pump assembly, and tighten securely to prevent air leaks in the chemical lines. The top of the pump is the suction side and must be connected suction line, (see Tubing Installation Decal inside the pump cover). Adjust the position of the tubing, avoiding sharp bends or kinks in either the suction or discharge lines. Trim a little off of the discharge end, if the tubing appears to be too long. Tighten the retaining hardware on the outer pump housing.



WARNING: BE SURE THE CHEMICAL LINES ARE POSITIVELY SHUT OFF BEFORE REMOVING THE TUBES FROM THE PUMP HOUSINGS. THIS WILL KEEP CHEMICAL FROM SIPHONING INTO THE MAIN TANK OR WATER FROM SIPHONING INTO THE CHEMICAL TANKS THROUGH THE RELAXED TUBES.

NOTE: After use, the pump should be thoroughly flushed with clean water and have the tubing removed from the pump housing, (leave the tubing connected to the two fittings). This will prevent the tubing from deforming under the pressure of the rollers.

C.7. CHEMICAL CONTAINERS

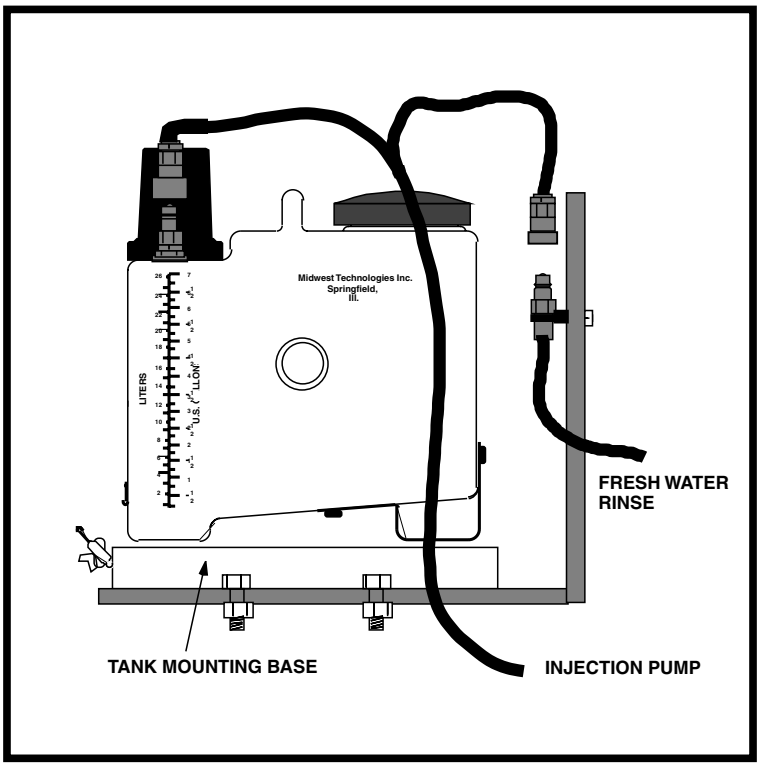
Mid-Tech tanks are ideal containers for handling raw chemicals. Alternative containers can also be used, such as permanently mounted cone bottomed tanks. Whatever chemical container will be used, it is important to select a large enough tank to cover a normal area at the expected application rates. This is particularly true with permanently mounted chemical tanks. Since Mid-Tech tanks are easily removed and exchanged in the field, spare tanks can be available to the operator.

CAUTION: Alternate chemical tanks (other than MID-TECH tanks) must be fitted with shut off valves at the bottom of the tanks.

C.7.1. MOUNTING AND PLUMBING MID-TECH TANKS

MIDWEST TECHNOLOGIES provides an optional stainless steel rack for securing Mid-Tach tanks to the spraying vehicle. The largest rack is approximately 18 inches by 19 inches and has been punched with holes for 5/16" carriage bolts. Each large rack will hold two 7.5 gallon or one 25 gallon Mid-Tach tank. A smaller rack is available for a single 7.5 gallon Mid-Tach tank. The smaller rack is approximately 18 inches by 9.5 inches. The Mid-Tech tanks fit tightly into the racks and are secured in place with a tab and clip mechanism.

The rack should be mounted to the vehicle so that it is level during normal vehicle operation. The tanks should be located as close to the injection pumps as possible to keep product lines short. The rack should be mounted in such a manner that the operator can easily lift the tanks in and out when changing. In some instances it may be necessary to fabricate additional support for the tank rack.



The Mid-Tech tanks comes complete with a chemical resistant, quick disconnect coupler. The product line between the tanks and the injection pump should be at least 1/8 inch larger than the tubing size in the pump, and it must be fitted with a mating coupler (available through MIDWEST TECHNOLOGIES). It is also recommended that a nearby fresh water source be fitted with a quick disconnect nipple similar to that on the Mid-Tech tank. The injection pump feed line can then be disconnected from the tank and quickly connected to a fresh water source for flushing the injection system.

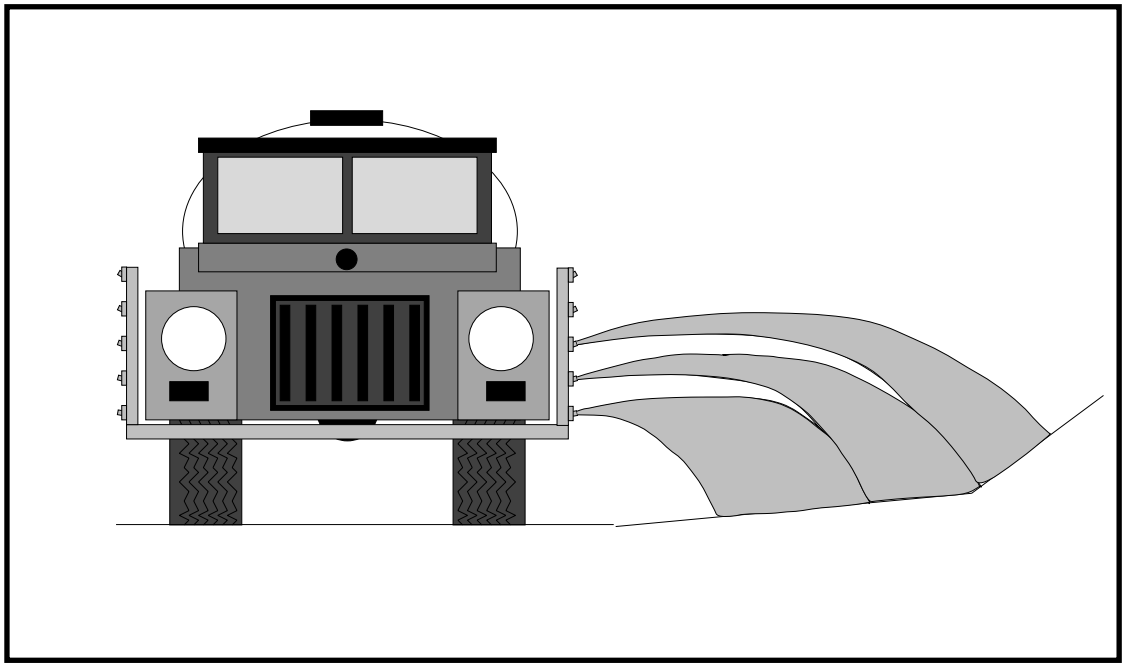
C.7.2. GENERAL SUGGESTIONS FOR PLUMBING CHEMICAL TANKS

Line sizes should be at least 1/8" larger than the tubing size for the injection pump. As a general rule keep all plumbing as short as possible, long lines will affect pump capacities and make calibration difficult. Try to keep the bottom of the tank and the injection pump on about the same level, or the tank slightly above the pump. Too great a difference in levels between the tanks and the pumps (where the pumps are mounted higher on the vehicle than the tanks) can result in reduced maximum pumping rates.

The Peristaltic Injection Pump draws chemical from the chemical container by creating a vacuum at the suction side of the pump. In some cases, this vacuum is strong enough to pull air into the suction line through fittings that appear “tight”. Air leaks adversely affect the calibration of the pump, since air bubbles take up space that should be occupied by chemical. This phenomena is most pronounced at low pumping rates and typically shows up as under application in the field. Ensure that all fittings are sealed with a good quality, liquid pipe dope and are properly tightened, especially the suction lines. Make sure that hose barbs are clamped tightly.

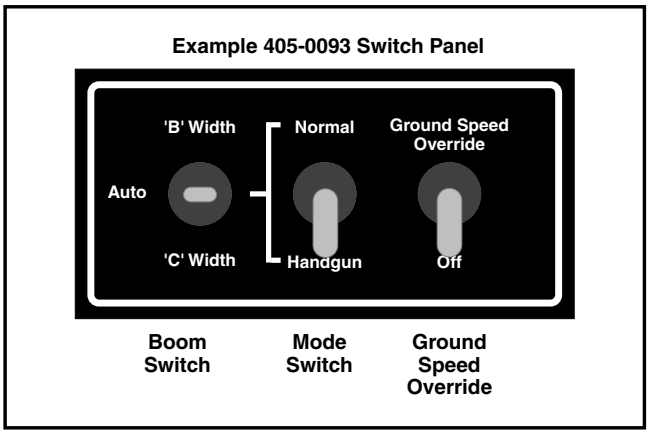
APPENDIX-D

ROADSIDE/HANDGUN OPERATION



D.0. TASC ROADSIDE/HANDGUN OPERATION

TASC roadside spraying operations require a special boom control switchbox or boom interface cable to take advantage of some of the features of the TASC console. Additionally an optional flow switch and cable is needed if a Handgun is to be used.



D.1 Modes of Operation

D.1.1 Normal

In the Normal Mode, the TASC console can control the carrier and chemical injection pumps in any one of the following manners (See Sect. D.3 for details.):

1. In Auto operation, the carrier and chemical rates are programmed to give a constant per acre (ha.) application rate regardless of speed. As a result, if you speed up the pressure goes up, and if you slow down the pressure goes down.
2. In Auto "Pressure" operation, the carrier is maintained at a constant pressure regardless of ground speed or booms On / Off. This results in the carrier rate in gal. / acre (l/ha.) decreasing with higher speeds, and increasing with lower speeds. The chemical injection pumps will continue to respond to changes in ground speed or booms On / Off, thereby maintaining a constant chemical application rate per acre (ha.)
3. In using "Special Purpose Boom Widths" (Alternate Widths “B” or “C”), the chemical injection pumps control to the programmed “B” or “C” width, ignoring the actual boom widths programmed and turned on. This is commonly used to spray very steep up and down slopes where the normal programmed boom widths may not accurately reflect the area actually being sprayed.

D.1.2 Handgun

In the Handgun Mode, the chemical injection pumps start and stop in response to the start of carrier flow sensed by a flow switch. Chemical injection will occur only when the handgun trigger is pulled and flow is established. All booms must be turned off for the Handgun mode to operate. The carrier and chemical injection pumps are controlled in any one of the following manners:

1. The carrier rate is programmed into the TASC console in gallons (liters) per minute and the console controls the carrier rate with an optional Auto-Range valve. Chemical rates are entered as "ounces per 100 gallons (liters per 1000 liters)" of carrier or as a ratio of the carrier rate, as measured through the flowmeter.
2. The carrier rate is set to 0.0 (Manual Override) and the operator controls the flow through the handgun with the Inc / Dec switch on the console, or with the Handgun trigger. The chemical rates are entered as "ounces per 100 gallons (liters per 1000 liters)" of carrier or a ratio of the carrier, as measured through the flowmeter.
3. The operator sets the nominal carrier flow rate through the Handgun as a “Test Speed” and the console controls the chemical injection pumps at the rate or ratio programmed for them, regardless of the actual flow in the handgun line.

D.2. HANDGUN MODE OPERATION

D.2.1. HANDGUN MODE, SET-UP FUNCTIONS

To put the TASC in the Handgun mode:

A. Set the switches on the **Boom Control Switch Panel** as follows:

Boom Width Switch	**Auto**
Mode Switch	**Handgun**
Ground Speed Override Switch	**Off**

B. Turn the TASC power "ON" and put the mode selector switch to "SET-UP".

The following programing functions are available in the TASC console:

SPEED: An "Err" message will appear (GSO is not available in the handgun mode).
AREA: Area will not accumulate in handgun mode.
CHEMICALS, CHEM. APPLIED: This is the pump calibration number for each injection pump (see section 2.8).
CHEMICALS, CHEM. RATE: With pump switch in the "ON" position, program the rate as ounces per 100 gallons of carrier (use the INC/DEC switch to set this rate). With pump switch in the "ALT" position, the display will read as a ratio (i.e. 1:100, gal:gal, or oz:oz, chemical:carrier). The rate can be programmed with pump switch in either position.
CHEMICALS, % RATE: Use the INC/DEC switch to set the desired rate change % for chemicals or carrier.
CARRIER APPL. RATE: Use the INC/DEC switch to set the desired carrier rate in gallons per minute.
CARRIER TOTAL APPLIED: The flow meter calibration number (section 2.6).
WIDTH: The message "none" will appear (boom width is not used in the handgun mode).
DISTANCE: The distance calibration number (section 2.7).
PRIME: The prime volume for each pump (section 2.8.4).
TEST SPEED: Using the INC/DEC switch, set a test flow rate in gallons per minute (this rate is required before pumps can be accurately calibrated).
SCAN: An "Err" message will appear (there is no programming in SCAN).

D.2.2. HANDGUN MODE, OPERATE FUNCTIONS

Now put the TASC mode selector switch to "OPERATE". The following programing functions are available in the TASC console:

SPEED: This is a direct reading of ground speed.
AREA: Area will not accumulate in the handgun mode.
CHEMICALS, CHEM. APPLIED: Accumulated ounces as they are applied, switches to hundredths of gallons after 256 ounces are accumulated.
CHEMICALS, CHEM. RATE: This register will indicate the programmed standard rate (oz per 100 gallons) with the switch "ON". With pump switch in the "ALT" position, the display will read as a ratio (i.e. 1:100, gal:gal, or oz:oz, chemical:carrier).
CHEMICALS, % RATE: Allows changing chemical injection rates a preset percentage (section 3.4.2.1).
CARRIER APPL. RATE: Displays target carrier application rate. Actual carrier flow rate in gallons per minute will be displayed once flow is established. The INC/DEC switch will change the carrier rate by the percentage amount programmed in the "Chemicals, % Rate" register (injected rates will not be affected).
CARRIER TOTAL APPLIED: Accumulated gallons applied.
WIDTH: "none" (boom widths are not used in the handgun mode.)
DISTANCE: Accumulated distance in feet or miles.
PRIME: Used for priming the injection pumps (section 3.5).
TEST SPEED: The gallons per minute programmed in the "SET-UP" mode is displayed.
SCAN: Scans information in the accumulators and registers.

D.2.3. HANDGUN MODE, SPECIAL CONSIDERATIONS:

A. Pump Calibrations: The speed of the injection pumps during calibration is determined by the programmed test speed ("gallons per minute" or "liters per minute") and the programmed chemical application rate ("ounces per 100 gallons" or liters per 1000 liters") or ratio ("gallons per gallon" or liters per liter). Set these numbers to your typical operating conditions before doing the pump calibrations.

B. The injection pumps will operate at the speed necessary to apply the correct amount of chemical according to the programmed carrier application rate, regardless of small variations in the actual carrier flow rate. (Large variations in the actual flow rate lasting more than 5 seconds will cause an error shutdown of the sprayer). Thus, chemicals will always be applied correctly, even if there is variation in the carrier output. (If the carrier rate is set to 0.0, see the Manual Override of Flow Control Valve, Section D.2.5.)

C. Booms are not used in the handgun mode. If the TASC senses a boom "ON" condition it will indicate an "Err" and will stop the injection pumps and close the flow control valve.

D. The initial response of the flow control valve to the selection of the handgun mode is to open fully. Once application has started, the response of the flow control valve to the flow switch "OFF" condition is to "HOLd" the valve in the partially open condition. The CLOSE valve response is not selectable while operating in the handgun mode.

E. The values programmed into the TASC console while in either the Handgun or Normal mode will remain in console memory, even when the opposite mode is selected.

F. If operating with a flowmeter, selecting TEST SPEED on the TASC console, while in the "OPERATE" mode, will cause the flow control valve to adjust flow to the test rate selected and the injection pumps to control to the programmed test rate.

D.2.4. HANDGUN MODE, TYPICAL OPERATION:

A. Set the Normal/Handgun switch to "Handgun", the Boom switch to "Auto", and the Ground Speed Override Switch to "OFF".

B. Select "SET-UP" for the TASC console mode selector. Program the TASC console as necessary (See SET-UP Mode, Section D.2.1).

C. Zero the accumulated rates and set the desired carrier flow rate as necessary.

D. Select "OPERATE" with the TASC console mode selector switch. The initial response of the flow control valve is to drive fully open.

E. Turn "ON" the desired chemical injection pumps.

F. Close the valve leading to the spray boom.

G. Be sure the carrier pump is operating. Turn on the handgun. As soon as the flow switch senses flow, the console will begin to adjust the flow control valve (after a short delay to allow flow to stabilize) to achieve the desired flow in gallons per minute. At the same time the chemical injection pumps will be activated at the speed necessary to apply the desired rates of ounces per hundred gallons, according to the programmed target carrier rate. There is no delay to the control of the injection pumps. *(NOTE: the carrier flow rate is the sum of the carrier and the injected chemicals.)*

H. Turn off the handgun. The chemical injection pumps will stop immediately. The flow control valve will hold its position so that flow will be immediately available at the proper rate when the handgun is again activated.

I. Set the Normal/Handgun switch to "Normal" and the flow control valve will automatically go closed. Open the valve leading to the spray boom. The TASC console will then be ready for the previously programmed broadcast spraying operations.

D.2.5. HANDGUN MODE, MANUAL VALVE OVERRIDE:

The flow control valve can be set to a manual override condition, if needed. Put the TASC console in "SET-UP" mode, with the display selector on "Carrier, Application Rate". Use the INC/DEC switch to set the application rate to 0.0 gallons/minute. When the mode selector is switched back to "OPERATE", the display will show "*Flow* Contl *OFF Auto*, *Handgun*", and the flow control valve is driven fully open.

When in the Manual override condition, and with the display selector in "Carrier, Application Rate", the flow control valve responds only to operation of the INC/DEC switch on the console. Flow can be controlled, either by the INC/DEC switch setting, or by feathering the handgun trigger. When flow is established with the handgun valve, the console will display flow as GAL/MIN. Any injection pumps selected "ON" will be controlled to the proper rate per hundred gallons, based on the actual flow rates measured by the flow meter.

OPERATING WITHOUT A FLOWMETER: Manual Override Mode will also allow handgun operation without a flowmeter. Refer to a tip chart to find the pressure required by your handgun tip for the flow rate desired. After putting the console into Manual Mode, as described above, use the INC/DEC switch and a pressure gauge to set the desired pressure. Rotate to "TEST SPEED" and set the desired flow rate in gallons per minute (same flow rate used to select operating pressure) with the INC/DEC switch. Operation will be the same as above except that any active injection pumps will be controlled according to the rate set into the TEST SPEED position.

D.2.6. HANDGUN MODE, ERROR MESSAGES

(See also section 8.0 in the TASC Manual)

Error-1: "Error - 1, Pump #" The indicated pump is running at its maximum rate. An Error-1 condition lasting more than 5 seconds will cause all the injection pumps to stop and the flow control valve to close, stopping all spraying operations. Check power connections and programming. Verify that the pump is large enough for the desired flow rate. Once the problem is corrected, Error-1, Pump # is cleared by first selecting Normal and then returning to the Handgun mode on the switch panel.

Error-3: "Error - 3, Pump #" No sensor pulses are being received from the indicated pump. An Error-3 condition lasting more than 5 seconds will cause all the injection pumps to stop and the flow control valve to close, stopping all spraying operations. Check power, ground and fuses on the pump power cable. Check the programming. Check if the pumps runs before the error condition occurs. Once the problem is corrected, Error-3, Pump # is cleared by first selecting Normal and then returning to the Handgun mode on the switch panel.

Error-4: "Error - 4, Pump #" The indicated injection pump is running when it should be off. An Error-4 condition will immediately cause all the injection pumps to stop and the flow control valve to close, stopping all spraying operations. Check for normal operation of the injection pump, the pump driver module may need to be replaced. Once the problem is corrected, Error-4, Pump # is cleared by first selecting Normal and then returning to the Handgun mode on the switch panel.

Error-5: "Error -5. Pump F" The carrier flow rate is exceeding the target rate and the flow control valve is not responding to the consoles commands. An Error-5 condition lasting more than 5 seconds will cause all the injection pumps to stop and the flow control valve to close, stopping all spraying operations. Check the fuse and power and ground to the flow control valve. Check for a stuck valve. Once the problem is corrected, Error-5 is cleared by first selecting Normal and then returning to the Handgun mode on the switch panel.

D.2.7. HANDGUN MODE, PRINTER OUTPUT SAMPLES

The following two sample printouts show the typical printouts in the HANDGUN MODE. The one on the left shows metric units and the one on the right shows english units.

```
MIDWEST TECHNOLOGIES, INC.
TASC- 6300 SPRAY CONTROL

APPLICATION RATES:

      CHEM.1 =  39.92  L/100L
      CHEM.2 =   4.99 L/1000L
      CHEM.3 =   4.99 L/1000L

      CARRIER =    . 0  L/MIN

VOLUME APPLIED:
      CHEM.1 =   38.46 LITERS
      CHEM.2 =   38.25 LITERS
      CHEM.3 =   37.87 LITERS

      CARRIER =  3038 LITERS

AREA COVERED:

      FIELD =  10.04 HA
      TOTAL =    1.8 HA

CHEM. DESCRIPTION

      CHEM.1 = .....
      CHEM.2 = .....
      CHEM.3 = .....

WEATHER DATA:

      TEMP..... %-HUMD.....
      WND.....DIR. .....

FIELD# .....
REF. # .....
DATE...../...../.....  TIME: ..... : .....
OPER.  .....
```

```
MIDWEST TECHNOLOGIES, INC.
TASC- 6300 SPRAY CONTROL

APPLICATION RATES:

      CHEM.1 =  511.1 OZ/100 GAL
      CHEM.2 =   64.0 OZ/100 GAL
      CHEM.3 =   64.0 OZ/100 GAL

      CARRIER =    . 0  GAL/MIN

VOLUME APPLIED:
      CHEM.1 =   10.16 GAL
      CHEM.2 =   10.11 GAL
      CHEM.3 =   10.01 GAL

      CARRIER =  803 GAL

AREA COVERED:

      FIELD =  27.50 ACRES
      TOTAL =    7.2 ACRES

CHEM. DESCRIPTION

      CHEM.1 = .....
      CHEM.2 = .....
      CHEM.3 = .....

WEATHER DATA:

      TEMP..... %-HUMD.....
      WND.....DIR.....

FIELD# .....
REF. # .....
DATE...../...../.....  TIME: ..... : .....
OPER.  .....
```

D.3. NORMAL MODE OPERATION

D.3.1. NORMAL MODE, AUTOMATIC "PRESSURE" OPERATION

The TASC console can be setup to control to a desired pressure. As boom sections of a balanced sprayer are turned on and off, the control valve will open and close to maintain a flow rate that will give a constant pressure. The control valve will adjust according to boom width only. SPEED will not adjust the carrier flow rate.

A. To enter this mode do the following:

MODE SELECTOR SWITCH	CARRIER APPL. RATE
MODE SWITCH	SETUP.
Use INC/DEC SWITCH to set rate to 0.0	
MODE SWITCH	OPERATE.

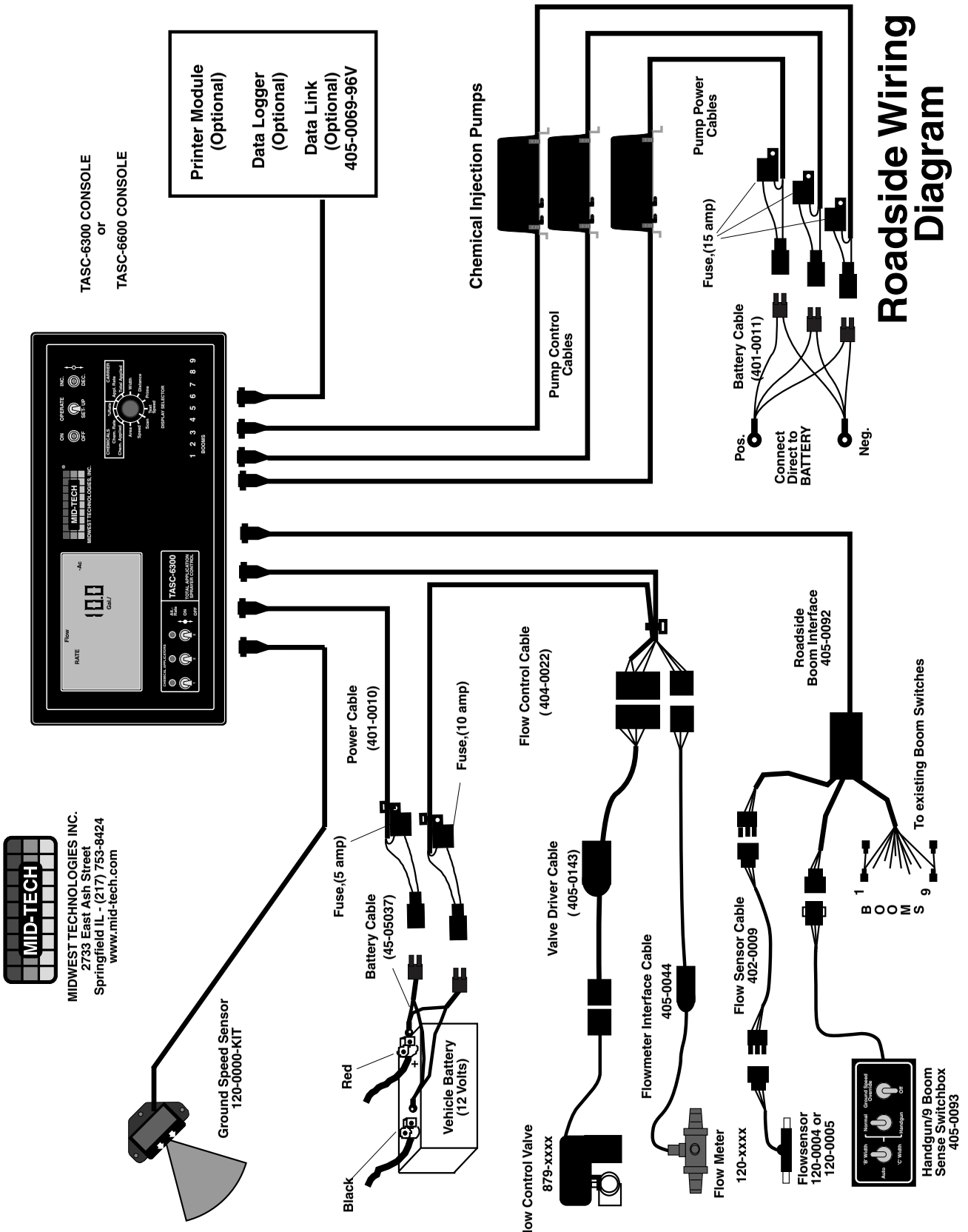
B. Console will read "**Flow Contl OFF Auto**".

Monitoring a pressure gauge, use the INC/DEC switch to set the desired pressure. You are now set to operate at a predetermined pressure. Injection pumps will track boom width changes and speed changes to keep chemical rate per acre constant. The console will display flow as GAL/ACRE (LITERS/HECTARE) at speeds above 1 mph. Below 1 mph the console will display flow as GAL/MIN (LITERS/MIN).

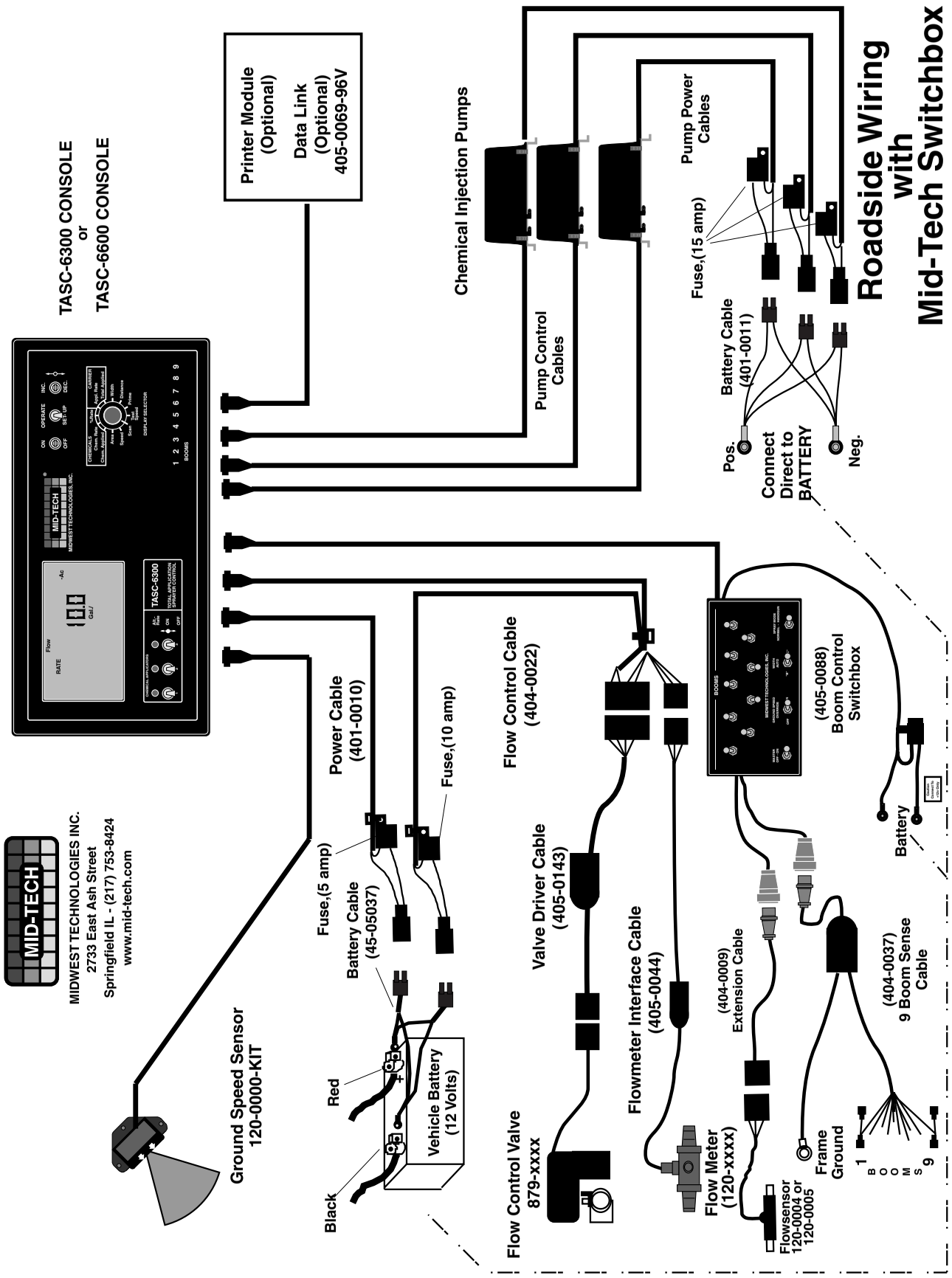
D.3.2. NORMAL MODE, SPECIAL PURPOSE BOOM WIDTHS

For broadcast spraying operations on slopes, separate widths can be programmed into the 'B' or 'C' widths on the TASC console. Select the "Normal" mode and 'B' Width or 'C' Width on the Boom Switch Panel. Select the Width display function and the "SET-UP" mode on the TASC console. Enter the desired width in inches.

Now, whenever boom width 'B' or 'C' is selected on the switch panel, the TASC console will automatically adjust its flow rate for the programmed width, regardless of the position of the individual boom valves



D4 - ROADSIDE SYSTEM DIAGRAM



D5 - ROADSIDE SYSTEM DIAGRAM W/MID-TECH SWITCHBOX

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