Chemical Injection Technologies

Installation/Service Bulletin

SUPERIOR AutoValve Series 2000

Electronic Gas Feed Rate Control Valve

(Ver. 3.02/3.00/2.60/2.40/2.32/2.31/2.20/2.10/2.04/2.03/2.02/1.01/1.00)

Table of Contents

SUPERIOR WATER SOLUTIONS

1.0 DESCRIPTION

1.1 The SUPERIOR AutoValve Series 2000 Electronic Gas Feed Rate Control Valve is a state-of-the art, micro-processor based device for automatically controlling the feed rate of chlorine / sulphur dioxide / ammonia gas, based on process water flow rate, residual set point, or a combination of these parameters to achieve:

- **Flow Proportioning Control**
- **Residual Control (Including De-Chlorination)**
- **Compound Loop Control**

1.2 The Series 2000 is a flexible instrument, ruggedly designed, with a very user-friendly interface.

1.3 The Valve is designed to operate with virtually any brand of vacuum fed CL_2, SO_2 or NH_3 gas system.

1.4 The electronic components are housed in a rugged plastic enclosure, rated for NEMA 12/13 level protection.

1.5 The Valve components can be remotely mounted up to 20' (6 meters) from the electronics enclosure (note: a special cable may be required for remote installation).

1.6 Separate terminal compartment in the electronics enclosure allows for convenient input/output wiring connections without opening or disturbing the electronics boards.

1.7 Screen display is a 2-line, 16 character, back lighted LCD. It allows easily understood visual indication of specific application parameters.

1.8 A high-torque stepper motor positions the valve in response to input signal changes from an outside source, such as a flowmeter or residual analyzer.

1.9 Standard 4 - 20mA output signal is provided for interfacing with other process monitoring equipment.

1.10 The LCD display allows visual indication of input signal and valve position.

1.11 AutoValve Series 2000 Automatic Valve will operate with any CL_2, SO_2 or NH_3 vacuum operated gas feed system up to 2000 PPD (40 kg/hr).

1.12 Controls provide dosage ratio control, residual set point, manual operation, alarm set points and calibration.

2.0 DEFINING THE THREE CONTROL MODES:

2.1 FLOW PROPORTIONING CONTROL

Flow Proportioning Control is the simplest Control Mode. It involves few program settings, and tends to be the most reliable form of automatic control. It is referred to as "OPEN LOOP" Control Mode, because the action being controlled - the gas feed rate which creates a residual level - is not being monitored and fed back into the control system to determine if the desired action has taken place. Instead, the primary control signal is generated by a water flow meter which constantly measures the amount of water flowing through a treatment system. However, the flow meter cannot determine whether the amount of gas being fed is creating the proper residual level in the treated water.

Therefore, **Flow Proportioning Control** is best suited to treatment systems where the chlorine or sulfur dioxide "demand" of the water remains fairly constant. As the water flow level varies up or down, the control system varies the feed rate of chlorine or sulfur dioxide gas in direct proportion to the change in water flow. If the "demand" of the treated water changes, the residual will also change. This requires a simple adjustment of the "DOSAGE" setting in the controller. Adjusting the dosage setting up or down shifts the gas feed rate up or down, respectively, at any specific water flow rate. After initial AutoValve setup, the dosage is the only setting in the treatment system that needs adjusting.

When the "demand" of the water being treated varies on a frequent basis, you may wish to consider RESIDUAL CONTROL, or COMPOUND LOOP CONTROL, which are discussed below. However, you should understand that use of a water flow meter as the primary control signal source is the most reliable and maintenance-free control signal generating method. Residual analyzers, while more reliable today than just a few years ago, are still much more maintenance intensive, requiring frequent cleaning and calibrating in order to give an accurate output signal to any control device.

2.2 RESIDUAL CONTROL (Chlorination and De-Chlorination)

Residual Control, while somewhat more complicated than Flow Proportioning control, does afford the user more precise control over chlorine or sulfur dioxide (in de-chlorination) residual levels in treatment plants. This is most critical when components of the chlorine or sulfur dioxide "demand" vary, needing a higher or lower dosage rate on a continual basis. A chlorine residual analyzer is required which is capable of **continuous sampling**, rather than **batch sampling**. Amperometric analyzers are the most reliable for control systems, but ORP type analyzers may be used if the analyzer output variables, as well as any interference factors, are fully understood. Most colorimetric type analyzers are not well suited for continuous control systems. While some colorimetric analyzers have programming algorithms which allow a continuous output signal to be produced, a discussion of the AutoValve programming adjustments necessary to synchronize the variables is beyond the scope of this manual.

Because the **Residual Control** system feeds back to the controller the result of any changes made by adjusting the gas feed rate, it is considered a "CLOSED LOOP" type of control system. However, closed loop control systems require more inputs in order to achieve residual control without having a "ping pong" residual level from over-shooting the residual set point. The primary reason for this is that the analyzer "sees" the result of gas feed rate changes on a delayed basis. Time must be allowed for the gas to mix with the treated water and react with the organic constituents in the water before sampling the residual. Therefore, gas feed rate changes must be done in "steps" to allow time for the analyzer and AutoValve controller to "see" what effect each previous change had on the residual level of the treated water. But, how big should the "steps" be, and how often should they occur? Also, as the "steps" bring the residual closer to the "set point", how do we keep the last step from over-shooting the set point, and just bouncing back and forth around the set point (as in a ping pong game)?

It is important to note that when the AutoValve is used for **de-chlorination** with **Sulfur Dioxide gas**, it operates in a inverse manner to a chlorine residual control system. Since the objective in de-chlorination is to drive the chlorine residual to a zero (0) or very low chlorine residual set point by the addition of Sulfur Dioxide Gas, the valve will increase SO_2 feed when the chlorine residual is higher than the set point, and decrease the SO_2 feed rate when the chlorine residual is lower than the set point. This is exactly the opposite of a chlorine residual control system. The controller allows the user to choose the GAS TYPE for both Residual Control and Compound Loop Control Modes.

Fortunately, today's digital control systems allow us to take all of these variables into account, and automatically make the necessary adjustments after the initial parameters are entered into the controller. Let's take a look at the most important variable inputs you will need to understand:

2.2.1 RES FS [RESIDUAL ANALYZER FULL SCALE OUTPUT]

This is simply the residual reading in parts per million (PPM) or milligrams per liter (mg/L) which is represented by the maximum output of your analyzer. Normally, this is the residual level represented by a 20 milliamp analyzer signal output.

CAUTION: if your analyzer has any other type of output signal - millivolts, volts, higher or lower milliamp ranges, etc. - it is likely to be incompatible with the AutoValve, and may cause damage to the controller. It may be possible to use signal conditioners or other means to make the output signal compatible, but Chemical Injection Technologies, Inc. makes no promise or representation that this will be possible.

2.2.2 LAGFIX [LAG TIME SETTING]

"**LAG TIME**" is simply the amount of time, in seconds, that it takes for the chlorine or sulfur dioxide gas injected into the water to reach the analyzer, go through the measuring cell, and send the resulting reading back to the AutoValve controller. This time must be calculated based upon the water flow rate in the system, added to the analyzer's sampling time. Standard tables are available to determine the speed of travel of water in pipes of various diameters with a known water flow rate in gallons per minute, liters per second, etc.

2.2.3 P(GAIN)

The "**P(GAIN)**" variable allows an adjustment of the sensitivity of the controller to residual changes. This adjustment may be used to compensate for the wide variations in treatment system characteristics, which may cause very large, rapid changes in residual, or very small, slow changes in residual. One system may only experience extremely minor fluctuations in demand on a relatively infrequent basis, while another may undergo almost constant demand changes.

NOTE: The DEFAULT setting of 100% will satisfy the vast majority of installations.

We have found it useful to use the following description to explain this concept, even though it is not technically completely accurate. Think of the **P(GAIN)** as a series of concentric, electronic circles around the residual set point value. As the circles get farther away from the center set point, the distance between the circles becomes progressively larger. When the analyzer senses a residual that deviates from the center set point value, the controller checks to see how far away the actual value is from that set point. The signal value will fall within one of the series of "circles". Each of these circular areas represents an amount of change in the valve position for each time the analyzer senses a deviation from the set point; after recovering from the "**LAGFIX**" time delay. The farther away the value is from the set point, the larger the initial change in valve position. Each successive change will be progressively smaller. Thus, the valve will adjust the residual within a reasonable period, without over-shooting the set point and bouncing around it.

However, there are limitations to the controller's ability to balance between quickly adjusting the gas feed rate, but not overshooting the residual set point. For example, if a treatment system experiences frequent, very large changes in demand, and therefore residual, it may take a long time for the controller to step down through many "circles", because the initial deviation is so far away from the set point. This is how the "**P(GAIN)**" variable is used. We can adjust the **P(GAIN)** value higher to make the controller more sensitive to the residual signal and therefore making the distance between the "circles" much greater. This has the effect of reducing the number of "circles" through which the controller must step, in order to reach the set point. The trade-off is that it is more likely that the residual level will overshoot the set point, at least on the first pass.

On a system where the demand is constantly fluctuating, but only by a very small amount, if the **P(GAIN)** were set at a high value, as above, the valve would be constantly moving up and down because every little deviation in the analyzer signal will cause the controller to react. Most treatment systems can handle very minor fluctuations in residual without compliance problems, and constant movement of the AutoValve causes more frequent maintenance and wear. Therefore, setting the **P(GAIN)** to a lower value requires a larger deviation in the residual from the set point before any action is taken by the controller. In effect, the distance between the "circles" is reduced, so that the first deviation point is farther away from the set point, but each successive circle is closer to the next. The trade-off is that a larger residual deviation may take a longer time to reach the set point because the controller must step through many "circles".

The **P(GAIN)** is an error damping adjustment, used to set the controller's sensitivity to residual changes. It is different from Calibration "Damping" because while **CAL DMP** only changes the input signal sampling time, **P(GAIN)** adjusts the actual signal deviation needed to make a change.

2.3 COMPOUND LOOP CONTROL

Compound Loop Control allows the controller to accept two input signals at the same time: one from a water flow meter, and one from a residual analyzer. While it is the most complex control mode, Compound Loop Control is the most effective when not only the demand varies, but the water flow rates also fluctuate significantly.

If a Residual Analyzer signal is the only input, a rapid increase in water flow will quickly dilute the gas dosage, far more rapidly than the analyzer can react and allow the controller to adjust the valve through the residual deviation "steps" discussed above. This would cause a large decrease in residuals for a significant amount of time. Conversely, a rapid decrease in water flow would cause a big "spike" in residuals until the analyzer can react and the controller can compensate.

Likewise, if a water flow meter is the only signal input, changes in demand will cause the constant gas dosage to either over-treat, or under-treat the water. **Compound Loop Control** addresses these situations. Since water flow variations create the most immediate need for a rapid valve response, the AutoValve uses its Flow Proportioning mode as the primary control system. The residual input signal takes the place of an operator making continual residual samples and then adjusting the **DOSAGE** setting. It is like an electronic "hand" pressing the control buttons to adjust the **DOSAGE** setting.

All of the program variables discussed above for Residual Control (and de-Chlorination with SO_2 gas), also apply for Compound Loop Control, with the addition of the "**LAG TYPE**" setting. This allows the **LAG TIME** value which was set for a particular water flow rate to automatically vary as the water flow rate increases or decreases. By allowing **VARIABLE LAG TIME** the analyzer always "sees" the sample after equal mixing has taken place.

For example; if water flow in a pipeline doubles (i.e., a second well pump comes on line) the amount of time it takes for the treated water to reach the analyzer is one-half the previous amount, and the **VARIABLE** setting automatically adjusts the **LAG TIME**. However, in many "open" treatment systems, higher water flow rates do not necessarily increase the speed at which water travels through the system (at least not proportionately) and the **FIXED** setting may be used instead.

3.0 ELECTRONIC AUTOMATIC VALVE CONTROLLER

The electronics enclosure module of the Series 2000 is henceforth referred to as the *CONTROLLER.* The controller accepts the signal from a flowmeter, residual analyzer, or both, and adjusts a motorized valve, which is housed in a separate valve module.

3.1 PHYSICAL INPUTS

3.1.1 FLOW: 4-20 mA floating input through a load resistor of 250 Ohm to local ground.

3.1.2 RESIDUAL: 4-20 mA floating input through a load resistor of 250 Ohm to local ground.

3.1.3 VALVE POSITION: Potentiometer input, approximately 0.25 to 2.25 VDC.

3.2 KEYBOARD INPUTS

3.2.1 Dosage Ratio. Example: fully open = 100% @ 20mA

3.2.2 Flow Mode, Residual Mode, Compound Loop Mode.

3.2.3 Manual position override.

3.2.4 Calibration for VALVE CLOSED.

3.2.5 Calibration for VALVE 25% OPEN

3.2.6 Calibration for VALVE 50% OPEN

3.2.7 Calibration for VALVE 100% OPEN.

3.2.8 Alarm Relay for LOW FLOW, RESIDUAL DEVIATION.

3.2.9 4 - 20mA IN, 4 - 20mA OUT

3.2.10 LAG TIME adjust for Residual & Compound Loop Modes.

3.2.11 CHLORINATION/DE-CHLORINATION (SO_2) control modes.

3.2.12 GAIN sensitivity adjustment for SET POINT deviation.

3.3 OUTPUTS

3.3.1 2.5 VDC valve potentiometer excitation

3.3.2 4 - 20 mA reference to local ground- 600 Ohm drive (maximum)

3.4 ALARM RELAY

3.4.1 Alarm relay contact 10 amps at 120 VAC or 30 VDC resistive load, 5.0 amps at 240 VAC resistive load, unlatching. Adjustable settings for LOW FLOW alarm, and RESIDUAL SET POINT DEVIATION alarm.

3.5 POWER SUPPLY (VOLTAGE)

3.5.1 The operating voltage may be selected by a switch mounted on the main circuit board, located under the display panel: 110 or 220 VAC, 50 or 60 Hertz.

3.5.2 Power is immediately converted to 24 Volts DC for all valve operations.

4.0 INSTALLATION PROCEDURES *(SEE FIGURES IN APPENDIX)*

WARNING

OPERATORS MUST FAMILIARIZE THEMSELVES WITH ALL GAS CYLINDER OR TON CONTAINER HANDLING AND CHANGING PROCEDURES. REFER TO THE LITERATURE SUPPLIED WITH THE GAS FEEDING EQUIPMENT. ADDITIONAL INFORMATION MAY BE SUPPLIED BY THE EQUIPMENT MANUFACTURER OR BY THE GAS DISTRIBUTOR.

Refer to **FIGURE 4.1** in the APPENDIX for a typical AutoValve setup.

4.1 MOUNTING

CAUTION

***** THE SERIES 2000 AUTOVALVE IS NOT DESIGNED FOR OUTDOOR INSTALLATION *****

If circumstances require outdoor installation, the clear controller box cover must be kept closed and the unit must be kept protected from the elements at all times.

4.1.1 The Series 2000 is supplied with a wall mounting sub-panel. The separate modules are attached to the panel by means of pre-positioned fasteners. Modules may also be remotely mounted when special considerations require separating the components.

4.1.2 The panel may be mounted on any vertical surface using the proper installation hardware.

4.1.3 The electronics enclosure, valve module and remote meter panel are shipped pre-installed on the sub-panel (see **FIGURE 4.1** in the APPENDIX). Check all components to insure they are securely fastened. Any or all components may be mounted separately, but it is suggested that the remote gas feed rate flow meter panel be located where it can be seen while adjusting the electronics module. This will make calibration and operation easier.

4.2 WIRING

CAUTION

***** THE SERIES 2000 AUTOVALVE MUST BE PROPERLY GROUNDED *****

Incorrect wiring, the use of inadequate cable, or improper grounding may result in AutoValve malfunction or damage, which will void all warranties.

It is strongly suggested that the power supply be protected from voltage spikes and drops, and especially from lightning strikes. We highly recommend installation of an uninterruptible power supply (UPS) of the type used to protect computers. These are available at electronics, office supply, or home improvement stores at relatively low cost.

DAMAGE DUE TO VOLTAGE SPIKES OR LIGHTNING IS NOT COVERED BY WARRANTY

4.2.1 Installing electrical wiring for the Series 2000 AutoValve requires connection of 4-20mA input signal(s), and 110 VAC, 60 Hz power supply (or optional 220 VAC, 50 Hz).

4.2.2 The AutoValve is shipped with the connecting cable between the electronics module and the valve module, already pre-wired. If the installation requires these components to be separated, an appropriate length and type of cable must be provided and the wiring connections must be rewired according to the WIRING CONNECTIONS diagram (see **FIGURE 4.2** in the APPENDIX for a schematic diagram).

4.2.3 The AutoValve is shipped with watertight strain reliefs installed. However, these may be removed and standard ½" conduit fittings substituted. 18-22 gauge two-conductor shielded cable is recommended for the input signal(s), and 18-20 gauge grounded two-conductor wire for the power supply.

4.2.4 Connect the power supply leads to the terminals as shown on the WIRING CONNECTIONS schematic diagram (see **FIGURE 4.2** in the APPENDIX).

CAUTION

Before wiring the input control device signal(s) to the terminal board refer to the Operator's Manual for each device to make certain that the Flow Meter or Residual Analyzer you are using does NOT generate a VOLTAGE BASED signal (ex: 0 to 5 Volts DC), or you will cause irreparable damage to the controller.

The AutoValve requires a 4 - 20 mA signal to operate in Automatic Mode. If no signal is present for either the Flow meter or Residual meter, the display characters "NoSig%" will flash on the screen when operating in the "RUN" function in any of the three Control Modes.

4.2.5 Connect the 4 - 20mA control signal(s) to the correct terminals. Also connect any necessary output signal wiring and any wiring to alarm device(s) (see **FIGURE 4.2** in APPENDIX).

4.3 VACUUM LINE PIPING

4.3.1 The Series 2000 AutoValve is designed to be installed in the vacuum gas line between the ejector and the remote metering panel or vacuum regulator (if equipped with integral flowmeter). All of the manual flow rate valves in the system must be in the **FULL OPEN** position (see **FIGURE 4.1** in the APPENDIX).

4.3.2 Attach the vacuum tubing from the ejector to the bottom fitting of the valve module, labeled "Vacuum to Ejector". Attach the vacuum tubing from the remote meter panel (or regulator) to the fitting on the side of the valve module. Tighten all vacuum fitting nuts by hand only - **DO NOT USE WRENCHES (SPANNERS) OR PLIERS.**

4.4 START-UP

4.4.1 TESTING FOR VACUUM LEAKS

4.4.1.1 With the ejector operating and the gas cylinder valve still closed, the ball in the metering tube will remain at the bottom. If the ball is not at the bottom, or bounces up and down, there is either a leak at the lead gasket at the vacuum regulator connection on the cylinder valve or a loose vacuum connection in the system. Check and correct.

4.4.1.2 The gas supply indicator on the regulator face should indicate an "out of gas" condition. Double check by attempting to RESET the indicator. It should NOT be able to be reset.

4.4.1.3 Close the ejector water supply valve or turn off booster pump to stop ejector operation.

WARNING

CHEMICAL INJECTION TECHNOLOGIES, INC. STRONGLY RECOMMENDS THAT A GAS MASK (A PRESSURE-DEMAND TYPE AIR PACK IS PREFERRED) BE AVAILABLE AND ALL OPERATING PERSONNEL SHOULD BE PROPERLY TRAINED IN ITS USE. CHLORINE GAS OR THE FUMES FROM CHLORINE SOLUTIONS CAN BE LETHAL IN LARGE ENOUGH DOSES. THEREFORE, YOU SHOULD ALWAYS HAVE A CO-WORKER OBSERVE FROM A SAFE LOCATION WHEN YOU ARE WORKING ON ANY TYPE OF CHLORINATION EQUIPMENT.

4.4.2 TESTING FOR GAS LEAKS

4.4.2.1 Open the gas cylinder valve 1/4 turn and ***close immediately***. The system should now be full of gas just below atmospheric pressure.

4.4.2.2 Using the recommended testing method for the gas being fed (see below), check all fittings and connections as well as the body seams and seal areas of the AutoValve.

4.4.3 RECOMMENDED GAS TESTING METHODS

4.4.3.1 **CHLORINE & SULFUR DIOXIDE**: Fill a small plastic squeeze bottle about 1/4 full with a strong ammonium hydroxide solution and squeeze vapor from the bottle at each fitting and seam. DO NOT POUR AMMONIA SOLUTION ON THE EQUIPMENT. Instead of a squeeze bottle, a small piece of cloth wetted with ammonia solution can be held under each connection. If chlorine or sulfur dioxide is leaking, a white smoke will appear similar to cigarette smoke.

4.4.3.2 **AMMONIA**: Fill a small plastic squeeze bottle about 1/4 full with a strong chlorine bleach solution and squeeze vapor from the bottle at each fitting and seam. DO NOT POUR BLEACH SOLUTION ON THE EQUIPMENT. Instead of a squeeze bottle, a small piece of cloth wetted with the Bleach solution can be held under each connection. If ammonia is leaking, a white smoke will appear similar to cigarette smoke.

4.4.4 POWERING UP THE CONTROLLER

NOTE

***** FACTORY DEFAULT SETTINGS ARE BUILT INTO THE AUTOVALVE UNIT *****

If you encounter any calibration or setting difficulty causing a "LOCKUP" condition, turn off the AC power to the controller, wait 15 seconds to power-down the capacitors, then hold down the F4 button while turning on the AC power again. Wait until the screen says "FACTORY DEFAULT", then release the F4 button and wait until the main menu appears. Previous AutoValve calibration will be lost. Re-calibrate per ***SECTION 5.0*** *instructions.*

If the AC power to the controller is left off for periods of up to six months, the system should return to the previous function point with no re-calibration required.

CAUTION

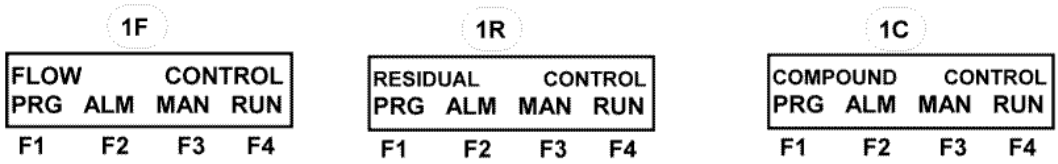
DURING A POWER OUTAGE (ONLY), THE AUTOVALVE MAY BE MANUALLY REPOSITIONED BY TURNING THE EXPOSED GEARS BY HAND. DO NOT TURN THE EXPOSED GEARS OR SHAFTS AGAINST BY HAND WHILE THE UNIT IS POWERED. THIS MAY CAUSE HARDWARE DAMAGE, WHICH IS NOT COVERED BY WARRANTY.

4.4.4.1 When all of the previous installation & startup procedures have been completed, then apply main power to the AutoValve controller.

4.4.4.2 A series of opening screens will appear with information about the firmware version, etc.

4.4.4.3 After a few seconds the main control screen will appear, if this is the first time you have powered up the controller and have not previously turned off power in the “RUN” condition.

The main control screen will show the Control Mode which was last set: either FLOW, RESIDUAL, or COMPOUND LOOP [1F, 1R or 1C] (see the screens below).



NOTE

If this is not the first time you are turning on power to the AutoValve, the opening screen will default to the last screen which was open before the power was turned off - normally FLOW CONTROL, which is set at the factory (unless requested otherwise).

4.4.4.4 Proceed to **SECTION 5.1** for instructions regarding use of the PASSWORD SYSTEM.

4.4.4.5 Set the Control Mode you wish to use: FLOW, RESIDUAL or COMPOUND, following the instructions in **SECTION 5.2**.

5.0 PROCEDURES COMMON TO ALL CONTROL MODES

*(See the Menu System Flow Diagram in the **APPENDIX** for a complete overview, and to help in navigating through the various levels of the AutoValve user interface. All menus shown in this manual are numbered to correspond with menus on the Menu System Flow Diagram).*

5.1 PASSWORDS (*READ CAREFULLY*)

5.1.1 The SUPERIOR AutoValve has a two (2) level password protection system built into the user interface menu structure. One password can be set for programming operations, and another (or the same) password can be set to allow changes in alarm set points, or residual or flow dosage set points. This allows supervisory and/or management personnel to choose whether or not to allow access to some or all operations personnel. It is designed to prevent unauthorized persons from changing the programming settings (calibration & residual settings), the alarm settings, and the dosage & residual setpoints. Either of these passwords may be independently set, or may both be the same.

5.1.2 **IMPORTANT!!!** Once a password has been set, it cannot be changed unless the old password is entered first. It is strongly suggested that a master copy of all passwords be kept in a secure place. If any password is forgotten, you will be effectively locked out of that section of the menu system. If passwords are not available and changes must be made, the controller will have to be returned to the factory to be "unlocked".

5.1.3 FACTORY DEFAULT PASSWORDS

Default AutoValve passwords, as supplied from the factory, are all set at "0000". **IMPORTANT!!!** It is strongly recommended that new passwords (different from the factory default "0000") be entered as soon as possible to prevent unauthorized setting of a password which will lock out supervisory personnel.

5.1.4 PASSWORD ENTRY SCREENS

All password entry screens are identical in appearance: see "PASSWORD" Menu [2]. When you first encounter the password entry menu, it will appear with the number "0" as the first digit, and an asterisk (✱) in place of the last three digits. You must enter each digit by using the F1 & F2 keys to scroll up & down from 0 to 9. When the proper number appears, press the NXT key (F4). The next number can now be entered in the same manner, pressing the NXT (F4) key when correct. After all four numbers are entered the screen will automatically open the next Menu.

2

PASSWORD 0 ★★★			
UP↑	DWN↓	ESC	NXT
F1	F2	F3	F4

5.1.5 PASSWORD SET/CHANGE SCREENS

5.1.5.1 The two password change screens "SET PW" [26A], are used in an identical manner to the "PASSWORD" Menu [2], above. The asterisk is replaced by a question mark (**?**). The password change menu, "SET NEW PASSWORD" [26], is always shown when exiting from the PROGRAMMING function, or from the ALARM SET function. Pressing the ESC key (F3) aborts the new password setting and exits to the Main Menu [1].

26

SET NEW PASSWORD			
		YES	NO
F1	F2	F3	F4

26A

SET PW 0 ? ? ?			
UP↑	DWN↓	ESC	NXT
F1	F2	F3	F4

5.1.5.2 After the last digit is entered, pressing the ENT key (F4) shows the "NEW PASSWORD STORED" menu [26B, or 33], and then automatically exits to the Main Menu [1].

26B

NEW PASSWORD STORED			
F1	F2	F3	F4

5.1.6 **FUNCTIONS PROTECTED BY PASSWORDS**

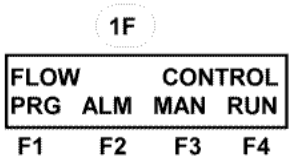
5.1.6.1 PROGRAM Password
CALIBRATION
PROGRAM PARAMETERS
SET MODE

5.1.6.2 ALARM Password
ALARM SET POINT
DOSAGE SET POINT
RESIDUAL SET POINT

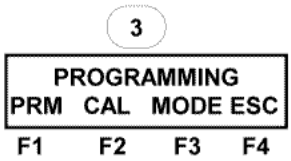
5.2 SET CONTROL MODE

When you view the opening Menu [1F, 1R, or 1C], if the Control Mode shown is not the one you wish to use, proceed as below. If the Control Mode is correct, then skip to **SECTION 5.3 CALIBRATION**.

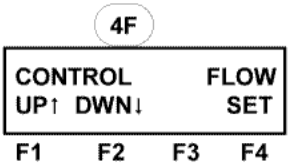
5.2.1 From the opening Menu [1F, 1R, or 1C], press the PRG key (F1).



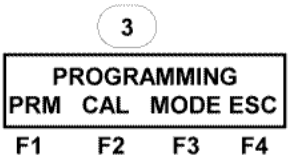
5.2.2 AFTER entering the password (see **SECTION 5.1.4 - PASSWORD ENTRY**) the "PROGRAMMING" Menu [3] opens. Press the MODE key (F3).



5.2.3 The "CONTROL MODE" Menu [4F, 4R, or 4C] opens (Menu 4F shown here). Press the UP (F1) or DWN (F2) key to cycle through the three Control Modes and choose FLOW, for **Flow Proportioning**, RES for **Residual Control**, or COMP for **Compound Loop Control**. When the desired Control Mode is shown, press the SET key (F4).



5.2.3 You will exit back to the "PROGRAMMING" Menu [3], for that Control Mode.



5.3 CALIBRATION

NOTE

AUTOVALVE SERIES 2000 CALIBRATION IS PERFORMED AT THE FACTORY AND IS USUALLY NOT REQUIRED AT INSTALLATION & SETUP FOR THE GREAT MAJORITY OF SYSTEMS.

If you are unsure of whether you need to calibrate your Autovalve before use, contact your dealer or Chemical Injection Technologies, Inc for further assistance.

There are two types of calibration which can be performed:

1. **VALVE LINEARITY** & **SPAN**
2. **INPUT/OUTPUT (I/O) SIGNAL**

VALVE LINEARITY & **SPAN Calibration** is performed at the factory and is generally not needed in the field for most system installations and setups - except if the motorized valve is disassembled or if the AutoValve is restarted in FACTORY DEFAULT mode (by holding the F4 key while turning on power until "FACTORY DEFAULT" appears) - then calibration is required. See instructions in **SECTION 5.3.1 - VALVE LINEARITY & SPAN CALIBRATION.**

INPUT/OUTPUT (I/O) SIGNAL Calibration is performed at the factory and is generally not needed in the field for most installations and setups - except if the milliamp signal generated by your Water Flowmeter or Residual Analyzer does not read 4.0 mA at 0% Flow or Residual, and 20.0 mA at maximum Flow or Residual - then calibration is required. See instructions in **SECTION 5.3.2 - INPUT/OUTPUT CALIBRATION**.

5.3.1 VALVE LINEARITY & SPAN CALIBRATION

Valve Calibration involves matching four (4) separate gas feed rates with their respective water flow meter and/or residual analyzer mA input signals. This automatically allows the valve to determine the linear range between the maximum gas flow desired at the maximum range of the water flow meter, and the "zero flow" point of the gas feed and water flow meter.

IT IS VERY IMPORTANT that the AutoValve system (including the valve plug and remote meter) be sized within a range that is consistent with the maximum expected water flow and gas dosage. If you are unsure of any of these items, contact your dealer or Chemical Injection Technologies, Inc.

NOTE

***** FOR VALVE CALIBRATION, THE GAS FEED SYSTEM MUST BE IN OPERATION *****

Be certain that the ejector is producing sufficient vacuum and that the vacuum ejector is connected to an open gas supply valve.

Valve calibration should only be done with the dosage level set at 100% (FACTORY DEFAULT).

*The gas feed rate (and valve position) should be measured by reading the **remote metering tube**. DO NOT attempt to read the "OPEN" / "CLOSE" markings on the clear plastic cover over the valve shaft - these markings are not calibrated and are for reference purposes only.*

CAUTION

DURING A POWER OUTAGE (ONLY), THE AUTOVALVE MAY BE MANUALLY REPOSITIONED BY TURNING THE EXPOSED GEAR WHEEL BY HAND. DO NOT TURN ANY EXPOSED GEARS OR SHAFTS BY HAND WHILE THE UNIT IS POWERED. THIS MAY CAUSE HARDWARE DAMAGE WHICH IS NOT COVERED BY WARRANTY.

5.3.1.1 From the opening Main Menu [1] press the PRG key (F1).

1F

FLOW			CONTROL
PRG	ALM	MAN	RUN
F1	F2	F3	F4

5.3.1.2 The "PASSWORD" Menu [2] opens. Enter password: see **SECTION 5.1**. After the last password digit is entered, press the ENT key (F4), which will open the "PROGRAMMING" Menu [3].

2

PASSWORD	0	★	★ ★
UP↑	DWN↓	ESC	NXT
F1	F2	F3	F4

5.3.1.3 From the "PROGRAMMING" Menu [3] press the CAL key (F2). This opens the "CALIBRATE" Menu [5].

3

PROGRAMMING			
PRM	CAL	MODE	ESC
F1	F2	F3	F4

5.3.1.4 From the "CALIBRATE" Menu [5], press VLV key (F1), which opens the "SELECT POINT" Menu [6].

5

CALIBRATE			
VLV	OUT	IN	ESC
F1	F2	F3	F4

5.3.1.5 Start by calibrating the "0%" point. This is displayed when you first enter the "SELECT POINT" Menu [6], but you may press the UP or DWN keys to change the percentage point. Press the ADJ key (F3).

6

SELECT	PNT		0%
UP↑	DWN↓	ADJ	ESC
F1	F2	F3	F4

5.3.1.5.1 The "ADJUST PNT 0%" Menu [7] opens. This Menu allows you to <u>electrically</u> adjust the valve position so that the gas flow rate corresponds to the feed rate when the input signal is at 0%.

7

ADJUST	PNT		0%
UP↑	DWN↓	POS	EXT
F1	F2	F3	F4

5.3.1.5.2 Pressing the UP, DWN or POS keys at this point will take you to a Sub-Menu [7A].

7A

ADJUST	PNT		0%
UP↑	DWN↓	SET	EXT
F1	F2	F3	F4

Holding the UP or DWN keys changes the valve position and gas feed rate continuously. Once you have positioned the valve approximately, you can press the UP or DWN keys repeatedly to make fine adjustments.

As a shortcut, pressing the POS key (POSITION) will QUICKLY MOVE the valve to the "test" position, which will normally be close to the setting being tested. However, once you press the UP or DWN keys you can no longer use this shortcut, since you are immediately taken to Sub-Menu [7A].

5.3.1.5.3 When the gas feed rate indicated on the remote meter tube is at the correct 0% feed rate, press the SET key (F3), which will take you back to the "SELECT PNT" Menu [6].

6

SELECT	PNT		0%
UP↑	DWN↓	ADJ	ESC
F1	F2	F3	F4

NOTE

YOU MUST SET AT LEAST THE 0% AND 100% VALVE POSITIONS; HOWEVER, IT IS HIGHLY RECOMMENDED THAT <u>ALL FOUR</u> VALVE POSITIONS BE SET WHENEVER CALIBRATING THE AUTOVALVE.

If you do not set at least the 0% and 100% positions, an error message: "CALIBRATION ERR: NO SPAN EST" will be displayed, followed by the message, "RESTORING LAST CALIBRATION".

Note that the "100%" feed rate position <u>does not</u> necessarily mean a reading of 100% full-scale on the gas remote meter. It refers to the gas feed you expect to be using when the water flow meter input mA signal is at 100%. This also applies for the 25% & 50% feed rate positions as well.

5.3.1.6 The procedure for calibrating the remaining valve settings is identical to that just performed for the "0%" point (see **SECTION 5.3.1.5**).

From the "SELECT PNT" Menu [6], **REPEAT** the same calibration procedure as before for the 25%, 50%, and 100% feed rate positions. Press the UP or DOWN keys to change the feed rate position ("X%"). Menus [8],[9],[10] and Sub-Menus [8A],[9A],[10A] will all open in turn.

5.3.1.7 After calibrating all four valve positions (after pressing the SET (F3) key for the last set point) you return to the "SELECT PNT" Menu [6].

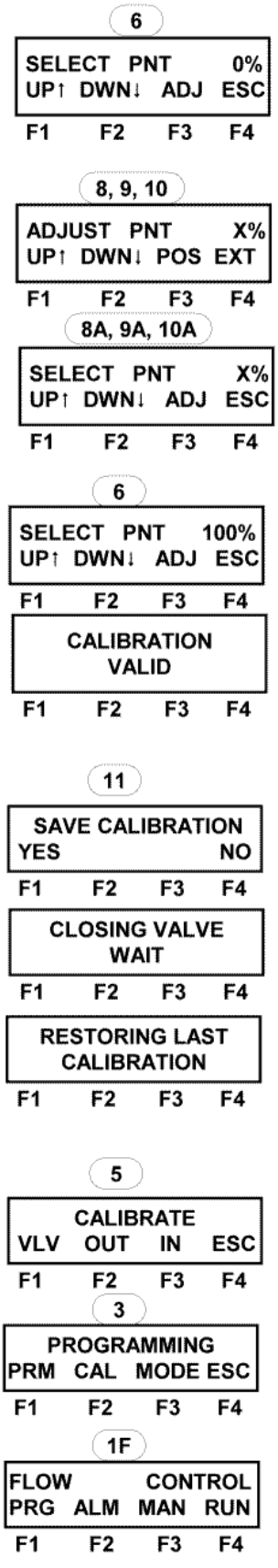
Press the ESC key (F4). The "CALIBRATION VALID" screen will show briefly, then the system goes to the "SAVE CALIBRATION" Menu [11].

5.3.1.8 From the "SAVE CALIBRATION" Menu [11], press the YES key (F1) to accept the calibration procedure. If you decide that you would like to retain the previous calibration press the NO key (F4).

5.3.1.8.1 Pressing the YES key (F1) shows the "CLOSING VALVE WAIT" Screen, the valve will run down to the 0% position, and then the system will go to the "CALIBRATE" Menu [5].

5.3.1.8.2 Pressing the NO key (F4) shows the "RESTORING LAST CALIBRATION" Screen, and the system will go to the "CALIBRATE" Menu [5].

5.3.1.9 Press the ESC key (F4) on the "CALIBRATE" Menu [5], and then press the ESC key (F4) on the "PROGRAMMING" Menu [3] to exit out to the Main Control Menu [1].



5.3.2 INPUT SIGNAL CALIBRATION

NOTE

INPUT SIGNAL CALIBRATION IS PERFORMED AT THE FACTORY AND IS NOT REQUIRED FOR MOST SYSTEM INSTALLATIONS & SETUPS.

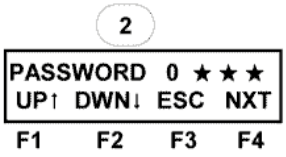
This procedure calibrates <u>both</u> Flow Signal input and Residual Analyzer Signal input, regardless of the Control Mode. If only a Flow Signal input is connected, there is no need to calibrate the Residual Signal input, and vice versa. You must calibrate both inputs only for Compound Loop Control Mode.

Calibration of Input and Output signals requires the use of accurate electronic test instruments. Calibration of Input & Output signals should only be performed by experienced electronics technicians. The following technical information is for general information only - it implies no warranty of any kind.

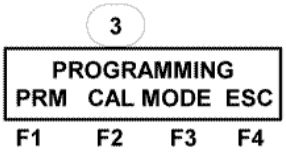
CAUTION
DO NOT APPLY ANY VOLTAGE PRODUCING ELECTRONICS TO THE INPUT TERMINALS. THEY ARE DESIGNED FOR 4-20 mA SIGNAL ONLY.

5.3.2.1 From the opening Main Menu [1] press the PRG key (F1).

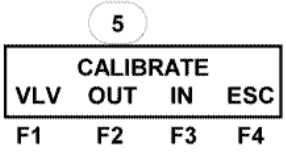
5.3.2.2 The "PASSWORD" Menu [2] opens. Enter password: see **SECTION 5.1**. After the last password digit is entered, press the ENT key (F4), which will open the "PROGRAMMING" Menu [3].



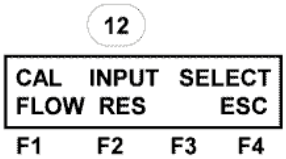
5.3.2.3 From the "PROGRAMMING" Menu [3] press the CAL key (F3).



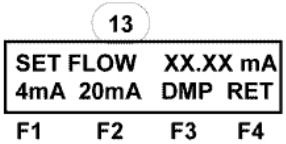
5.3.2.4 The "CALIBRATE" Menu [5] opens. Press the IN key [F3].



5.3.2.5 The "CAL INPUT SELECT" Menu [12] opens. To calibrate the **FLOW METER INPUT** signal press the FLOW key (F1).

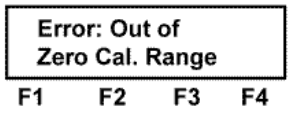


5.3.2.5.1 The "SET FLOW" Menu [13] opens. The XX.XX mAC reading will show the mA input signal from your test device source. Set the source signal at 4 mA, then press the 4mA key (F1) to store the signal into memory. Set the source signal at 20mA, then press the 20mA key (F2) to store the signal into memory.

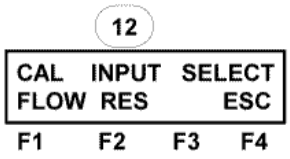


NOTE

If the test device signal differs greatly from the 4 mA setting, a "ERROR: OUT OF ZERO CAL. RANGE" message is displayed. Likewise for a "ERROR: OUT OF SPAN CAL. RANGE" message at the 20 MA setting. Check the test device to ensure the correct signals are being generated.



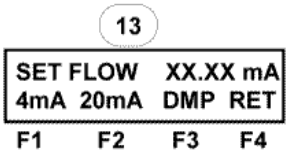
5.3.2.5.2 When the inputs are set for both 4mA and 20mA settings, press RET key (F4) to go back to the "CAL INPUT SELECT" Menu [12].



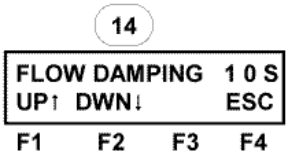
NOTE

Under normal operating conditions, there is no need to adjust the Flow Damper factory setting. Before adjusting, it is recommended that you contact Chemical Injection Technologies, Inc. for assistance.

5.3.2.5.2.1 From the "SET FLOW" Menu [13], you may adjust the input signal sensitivity "Damper", by pressing the DMP key (F3).

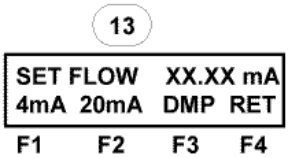


After pressing the DMP key (F3) the "FLOW DAMPING" Menu [14] opens.

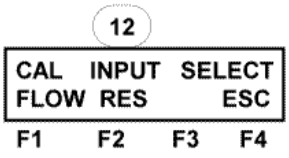


The flow damper adjusts the sensitivity of the valve electronics to changes in the input mA flow signal. The higher the number shown, the less sensitive the valve will be to small changes in the input flow signal. The lower the number shown, the more sensitive the valve will be to small changes in the input flow signal.

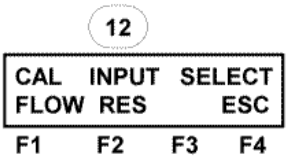
5.3.2.5.2.2 Press the SET key (F4] to return to the "SET FLOW" Menu [13].



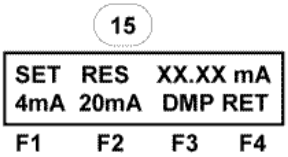
Press the RET key [F4] to go back to the "CAL INPUT SELECT Menu [12].



5.3.2.6 To calibrate the **RESIDUAL ANALYZER INPUT** signal press the RES key (F2) on the "CAL INPUT SELECT" Menu [12].



5.3.2.6.1 The Residual Analyzer procedure is identical to the Flow Meter procedure, except for the "SET RES" Menu [15] name.



Follow the same instructions in **SECTION 5.3.2.5** which were used to calibrate the Flow Meter Input signal.

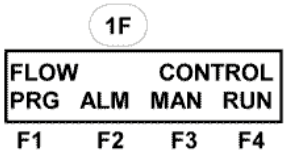
5.3.3 OUTPUT SIGNAL CALIBRATION

NOTE
OUTPUT SIGNAL CALIBRATION IS PERFORMED AT THE FACTORY AND IS NOT REQUIRED FOR MOST SYSTEM INSTALLATIONS & SETUPS.

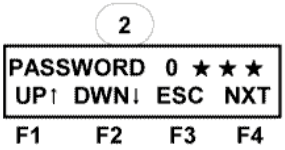
Calibration of Input and Output signals requires use of accurate electronic test instruments. Calibration of Input & Output signals should only be performed by experienced electronics technicians. The following technical information is for general information only. It implies no warranty of any kind.

CAUTION
DO NOT APPLY ANY VOLTAGE PRODUCING ELECTRONICS TO OUTPUT TERMINALS. THEY ARE DESIGNED TO SEND A 4-20 mA SIGNAL ONLY.

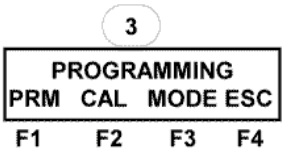
5.3.3.1 From the opening Main Menu [1] press the PRG key (F1).



5.3.3.2 The "PASSWORD" Menu [2] opens. Enter password: see **SECTION 5.1**. After the last password digit is entered, press the NXT key (F4), which will open the "PROGRAMMING" Menu [3].

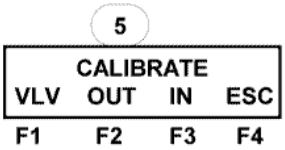


5.3.3.3 From the "PROGRAMMING" Menu [3] press the CAL key (F3).

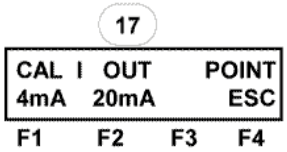


5.3.3.4 The "CALIBRATE" Menu [5] opens. Press the OUT key (F2).

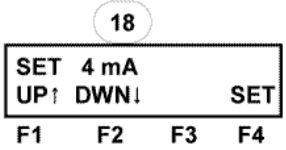
At this point you must have an accurate mA current meter connected across the "OUT 4-20mA" output terminals.



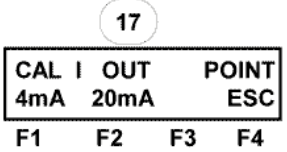
5.3.3.5 The "CAL I OUT POINT" Menu [17] opens. Press the 4mA key (F1).



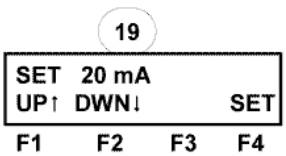
5.3.3.5.1 The "SET 4mA" Menu [18] opens. Press the UP (F1) or DOWN (F2) keys until the meter reads 4mA. Press the SET key (F4).



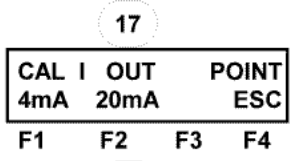
5.3.3.5.2 The "CAL I OUT POINT" Menu [17] opens. Press the 20mA key (F2).



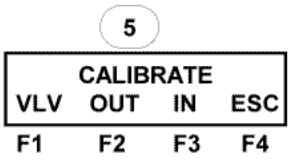
5.3.3.5.3 The "SET 20mA" Menu [19] opens. Press the UP (F1) or DOWN (F2) keys until the meter reads 20mA. Press the SET key (F4).



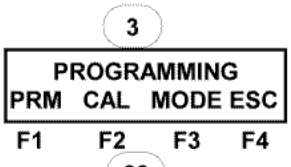
5.3.3.5.4 The “CAL I OUT POINT” Menu [17] opens.

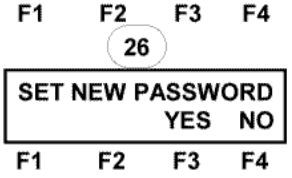


Press the ESC key (F4) to return to the “CALIBRATE” Menu [5].

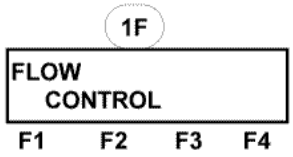


Press the ESC key (F4) again to return to the “PROGRAMMING” Menu [3].





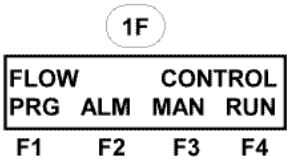
Press the ESC key (F4) and exit through the “SET NEW PASSWORD” Menu [26], back to the Main Menu [1].



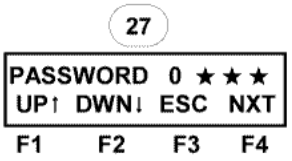
5.4 ALARM SET POINTS

The AutoValve Series 2000 is designed to allow you to set independent alarm conditions for Low Flow Signal and Residual Deviation, depending on the Control Mode. When an alarm condition, or “event”, occurs, a relay is energized which either opens or closes a set of contacts on the Terminal Board. You may choose whether you wish these contacts to be Normally Open (N/O) or Normally Closed (N/C) when the relay is *NOT* energized by an alarm “event”. These contacts can be used as a switch to turn on an external device requiring up to 240 VAC. See the **WIRING DIAGRAM (FIGURE 4.2)** in the **APPENDIX** for an example.

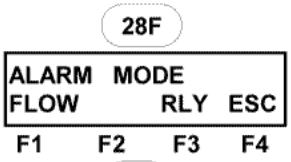
5.4.1 From the opening Main Menu [1] press the ALM key (F2).



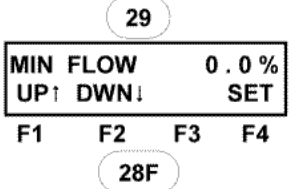
5.4.2 The “PASSWORD” Menu [27] opens. Enter password: see **SECTION 5.1.** After the last password digit is entered, press the NXT key (F4).

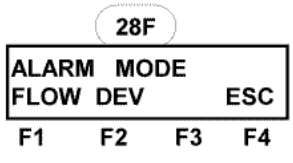


5.4.3 The “ALARM MODE” Menu [28] opens. You may choose one of two alarm set points, depending on the Control Mode, and whether you wish the alarm contacts to be Normally Open (NO) or Normally Closed (NC):



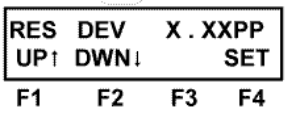
5.4.3.1 **FLOW (F1)** will open the “MIN FLOW” Menu [29], in the Flow Control and Compound Loop Control Modes. You can set the percentage (%) of maximum water flow input signal at which you wish the alarm relay to be activated, by pressing the UP (F1) or DOWN (F2) keys. When the minimum flow percentage is correct, press the SET key (F4). This will take you back to the “ALARM MODE” Menu [28].





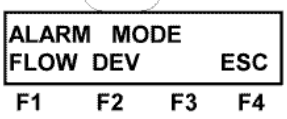
5.4.3.2 **DEV (F2)** opens the Residual Deviation "RES DEV" Menu [30], in the Residual Control and Compound Loop Control Modes. You can set the amount of deviation from the Residual Set Point, in Parts per Million (PPM or mg/L), at which you wish the alarm relay to activate by pressing the UP (F1) or DOWN (F2) keys.

30



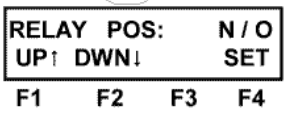
When the Residual Deviation amount is correct, press the SET key (F4) to return back to the "ALARM MODE" Menu [28]

28R

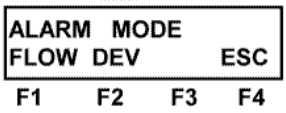


5.4.3.3 **RLY (F3)** will open the "RELAY POLARITY" Menu [39], in all Control Modes. When an alarm condition, or "event", occurs, a relay is energized which either opens or closes a set of contacts on the Terminal Board. You may choose whether you wish these contacts to be Normally Open (N/O) or Normally Closed (N/C) when the relay is *NOT* energized by an alarm "event". Press the UP (F1) or DOWN (F2) keys to change the contact status to N/O or N/C **(NOTE: The factory default setting is N/O**). When the RELAY status is correct, press the SET key (F4) to return to the "ALARM MODE" Menu [28]

39



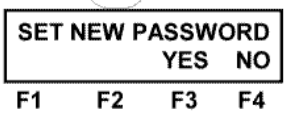
28R



5.4.4 To exit Alarm Mode, press the ESC key (F4) on "ALARM MODE" Menu [28].

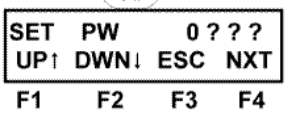
5.4.5 The "SET NEW PASSWORD" Menu [31] opens. If you do not wish to change the password for the ALARM section and the RUN section of the program, press the NO key (F4). This will exit back to the opening Main Menu [1].

31



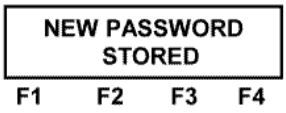
5.4.5.1 If you wish to set a new password, press the YES key (F3). This will open the "SET PW" Menu [32]. Use the UP (F1) or DWN (F2) keys to change the digits. When correct, press the NXT key (F4) to move to the next digit.

32

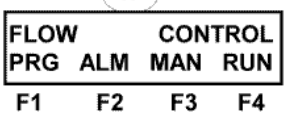


When all four digits are correct, pressing the (F4) key will show the "NEW PASSWORD STORED" screen [33] and exit back to the opening Main Menu [1].

33



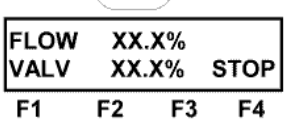
1F



5.4.6 **ALARM INDICATION**

When an alarm "event" occurs (LOW FLOW or RESIDUAL DEVIATION) and the alarm relay is activated, the screen display shows the parameter causing the alarm by "FLASHING" the value on the automatic run mode screen [38F, 38R or 38C]. A LOW FLOW Alarm screen [38F] is shown as an example at right.

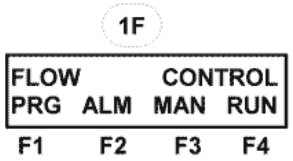
38F



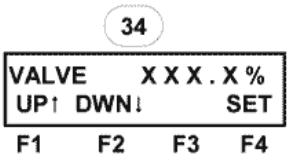
6.0 MANUAL CONTROL

6.1 The SUPERIOR AutoValve Series 2000 can also be operated in MANUAL mode. When using the Manual Control mode, all input signals are ignored.

6.2 You may enter the Manual Control mode from any of the three (3) automatic control opening Main Menus [1F, 1R, or 1C]. Press the MAN key (F3).

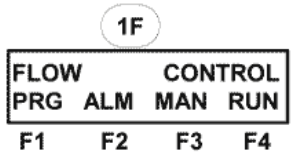


6.3 The "VALVE" Menu [34] opens. You may adjust the valve position to change the gas feed rate to any point you require by pressing the UP (F1) or DWN (F2) keys.

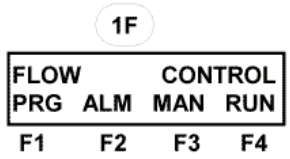


The valve position setting will move very slowly at first, then it will move much more quickly to allow you to rapidly approach the desired value. Then press the UP (F1) or DWN (F2) keys repeatedly to make fine adjustments to the value.

6.4 Pressing the SET key (F4) will exit the "VALVE" Menu [34] and take you back to the opening Main Menu [1F, 1R, or 1C]. The valve will continue to feed gas at the rate which was set in the MANUAL mode, until the RUN key (F4) is pressed to return to Automatic Control.



7.0 FLOW PROPORTIONING CONTROL



Follow the procedures in this section AFTER you have set the Control Mode to FLOW. See **SECTION 5.2 - SET CONTROL MODE**, if your opening Main Menu [1] does not indicate FLOW CONTROL [1F] as shown at right.

Read instructions for PASSWORDS, CALIBRATION, and ALARM SET POINTS - see **SECTION 5.0 - PROCEDURES COMMON TO ALL CONTROL MODES** before use.

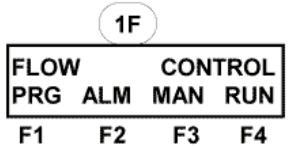
7.1 CALIBRATION

NOTE

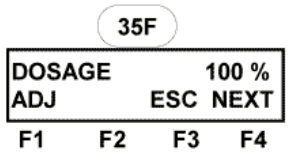
AUTOVALVE SERIES 2000 CALIBRATION IS PERFORMED AT THE FACTORY AND IS USUALLY NOT REQUIRED PRIOR TO USE, UNLESS THE 100% FEED RATE FOR YOUR SYSTEM DIFFERS FROM THE MAXIMUM FEED RATE OF THE METERING TUBE YOU ARE USING.

VALVE LINEARITY & SPAN Calibration should be performed if the motorized valve is disassembled, or if restarting the AutoValve in FACTORY DEFAULT mode (by holding the F4 key while turning on power until "FACTORY DEFAULT" shows on screen). See **SECTION 5.3** for Calibration instructions if required.

7.2 RUN

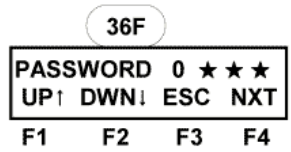


7.2.1 From the "FLOW CONTROL Menu [1F], press the RUN key (F4).



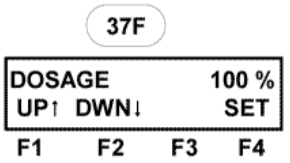
7.2.2 The "DOSAGE" Menu [35F] opens, which allows you to choose whether to change the current dosage setting, or go directly to the automatic Flow Proportioning Control operation "FLOW" Menu [38F], described below.

7.2.2.1 To change the current DOSAGE setting, press the ADJ key (F1).



7.2.2.1.1 The "PASSWORD" Menu [36F] opens. Enter the password - see **SECTION 5.1.4 - PASSWORD ENTRY SCREENS**

7.2.2.1.2 After entering the last password digit, and pressing the F4 key the "DOSAGE" Menu [37F] opens.



7.2.2.1.3 Use the UP (F1) or DWN (F2) keys to adjust the Dosage Setting to any number between 50% and 200%, covering a 4 to 1 range. See **SECTION 2.1 - FLOW PROPORTIONING CONTROL** for a full discussion of "Dosage".

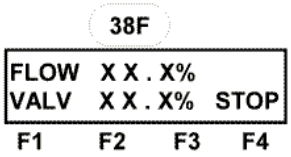
NOTE

The FACTORY DEFAULT setting is 100%, representing a 1:1 ratio.

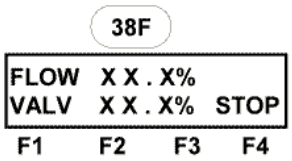
This is the setting where all initial valve adjustments should be made.

If the residual levels are either too high or too low, the dosage can be lowered or raised, respectively. The controller will automatically adjust the gas feed range to the dosage change. Keep in mind that if the water flow reaches 100% of the flow meter's capacity, and the 20 mA input signal has been calibrated to the maximum gas feed rate available for your valve, then increasing the dosage above 100% will NOT allow the valve to properly adjust the gas feeding range. This is because the valve will "top out" at the maximum feed rate of the valve plug before the feed rate required by the flow meter input signal is reached.

7.2.2.1.4 When the DOSAGE setting is correct, press the SET key (F4). This will open the FLOW Menu [38F].



7.2.3 At FLOW Menu [38F] the valve is in **Automatic Flow Proportioning Control**.



7.2.3.1 The input signal from the water flow meter will be shown next to FLOW as a percentage of the maximum flow rate measured by the flow meter.

7.2.3.2 The valve position will be shown next to VALV as a percentage of the maximum calibrated valve opening.

7.2.3.3 It is important that you understand the relationship of the FLOW and VALV values shown on Menu [38F].

At a DOSAGE setting of 100%, the two percentages shown will always be equal AFTER the valve adjusts to any change in water flow. When the water flow changes, the FLOW value will immediately increase or decrease, then the VALV value will start to increase or decrease until it matches the FLOW value.

HOWEVER, when the dosage setting is changed to some value other than 100%, then the VALV value will NOT MATCH the FLOW value, but will be offset by the dosage setting.

Examples:

At a Dosage setting of 100%, if the FLOW value is 50%, then the VALV value will also show as 50%.

At a dosage setting of 200%, the VALV value will increase to 100%.

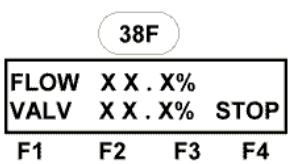
At a dosage setting of 75% the VALV value will only show 37.5%.

NOTE

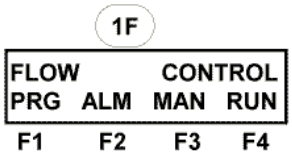
If you have previously used the Autovalve in Residual or Compound Loop Control Modes, or if you entered these Control Modes and then switched to back to Flow Proportioning Mode, it is likely that the Dosage Setting will change. This is because the other Control Modes automatically make adjustments by varying the Dosage Setting. The Dosage Setting in any one Control Mode will be carried over into all of the other Control Modes.

IF YOU EXPECT THE FLOW AND VALVE VALUES TO MATCH, BUT THEY DO NOT, CHECK THAT YOUR DOSAGE SETTING IS AT 100%.

7.3 STOP



7.3.1 To exit the Automatic Valve Control mode from the FLOW Menu [38F] press the STOP key (F4).



7.3.2 This will take you back to the main “FLOW CONTROL” Menu [1F].

8.0 RESIDUAL CONTROL (Chlorination and De-Chlorination)

Follow the procedures in this section AFTER you have set the Control Mode to RES. See **SECTION 5.2 SET CONTROL MODE**, if your opening Main Menu [1] does not indicate RESIDUAL CONTROL [1R], shown at right.

1R

RESIDUAL		CONTROL	
PRG	ALM	MAN	RUN
F1	F2	F3	F4

Read instructions for PASSWORDS, CALIBRATION, and ALARM SET POINTS - see **SECTION 5.0, PROCEDURES COMMON TO ALL CONTROL MODES**, before use.

8.1 CALIBRATE

NOTE

AUTOVALVE SERIES 2000 CALIBRATION IS PERFORMED AT THE FACTORY AND IS USUALLY NOT REQUIRED PRIOR TO USE.

VALVE LINEARITY & SPAN Calibration should be performed if the motorized valve is disassembled, or if restarting the AutoValve in FACTORY DEFAULT mode (by holding the F4 key while turning on power until "FACTORY DEFAULT" shows on screen). See **SECTION 5.3** for Calibration instructions.

8.2 PROGRAM

You must make certain settings in the PROGRAMMING section which tell the AutoValve about your specific installation.

The FACTORY DEFAULT settings SHOULD NOT always be used as an indicator of "ideal" settings, although in some instances they MAY happen to be correct for your installation. See the NOTES in each section.

The PROGRAMMING section for **Residual Control Mode** is also used for **Compound Loop Control Mode** with the use of VARIABLE LAG setting.

8.2.1 From the main "RESIDUAL CONTROL" Menu [1R] press the PRG key (F1).

1R

RESIDUAL		CONTROL	
PRG	ALM	MAN	RUN
F1	F2	F3	F4

8.2.2 The "PASSWORD" Menu [2] opens. Enter the password (see **SECTION 5.1.3 - PASSWORD ENTRY SCREENS**, for instructions).

2

PASSWORD		0 ★ ★ ★	
UP↑	DWN↓	ESC	NXT
F1	F2	F3	F4

8.2.3 After entering the last password digit, and pressing the F4 key the "PROGRAMMING" Menu [3] opens. Press the PRM key (F1).

3R

PROGRAMMING			
PRM	CAL	MODE	ESC
F1	F2	F3	F4

8.2.4 This enters you into several Settings Menus (see the **Menu Flow Diagrams** in the Appendix), which you may scroll through by using the UP (F1) and DWN (F2) keys.

Within each of these Settings Menus you can choose to enter a Sub-Menu in order to change the Setting value. Sub-Menus are similar to the Setting Menus, but instead of the ESC (F4) key, they have a SET (F4) key and do not have a ADJ (F3) key.

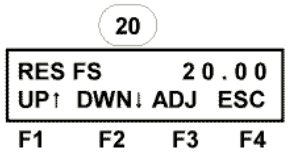
When you leave the Settings Menus, the program remembers the last Menu you exited, and returns to that Menu the next time you enter Settings. Each Settings Menu is discussed in the order in which it appears.

NOTE

The first Menu may not appear on your screen in the order shown, but the Menus will cycle back again as you scroll. Press the ESC (F4) key on any Setting Menu to exit back to the "PROGRAMMING" Menu [3]

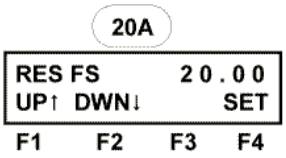
8.2.4.1 **RES FS** [20]

The "RES FS" Menu [20] refers to RESIDUAL FULL SCALE. You must set the maximum chlorine residual level which your analyzer indicates at 20 mA output. The residual level is shown as Parts Per Million (PPM), which also indicates Milligrams per Liter (mg/L).



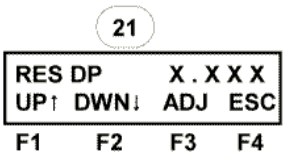
8.2.4.1.1 To change "RES FS" setting, press the ADJ (F3) key.

8.2.4.1.2 The "RES FS" Adjustment Sub-Menu [20A] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press the SET (F4) key to exit to the "RES FS" Setting Menu [20].



8.2.4.2 **RES DP** [21]

The "RES DP" Menu [21] allows you to change the number of decimal points used in setting the residual. This number can be set from ZERO decimal points up to THREE decimal points.

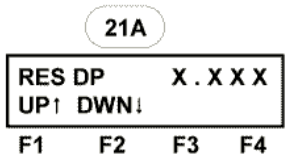


NOTE

Changing the number of decimal points affects all Residual Setpoints and readouts. If you change decimal points, you must also adjust Residual Setpoint and Residual Full Scale Setting.

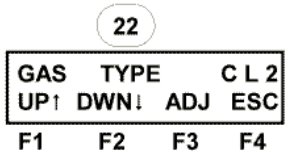
8.2.4.2.1 To change "RES DP" setting press the ADJ (F3) key.

8.2.4.2.2 The "RES DP" Adjustment Sub-Menu [21A] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press the SET (F4) key to exit to the "RES DP" Setting Menu [21].



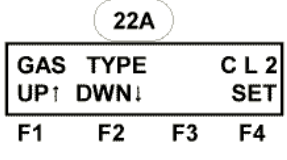
8.2.4.3 **GAS TYPE** [22]

The "GAS TYPE" Menu [22] selects if you are feeding Chlorine or Sulfur Dioxide gas. If you choose Sulfur Dioxide (SO_2), the AutoValve is automatically in DE-CHLORINATION control mode.



8.2.4.3.1 To change the "GAS TYPE" setting press ADJ (F3).

8.2.4.3.2 The "GAS TYPE" Adjustment Sub-Menu [22A] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press the SET (F4) key to exit to "GAS TYPE" Setting Menu [22].



8.2.4.4 **P(GAIN)** [23]

The "P(GAIN)" Menu [23] allows you to choose the sensitivity of the controller to residual changes. If you are unfamiliar with this concept, read **SECTION 2.3.3 P(GAIN)**, for a detailed explanation.

The P(GAIN) can be set anywhere within a range of 0% to 1000%.

23

P (GAIN)	1 0 0 %
UP↑ DWN↓ ADJ	ESC
F1 F2 F3	F4

NOTE

The FACTORY DEFAULT 100% setting is the best starting point *from which to observe the control system's response to residual variations and then make further adjustments if needed.*

Lowering this value reduces the sensitivity, while increasing the value makes the controller react more quickly, but in bigger steps.

If residual levels rise too much before the control system brings them back to the set point, try increasing the P(GAIN) setting. If residual levels are fluctuating up and down around the set point, then try decreasing the P(GAIN) setting.

8.2.4.4.1 To change the "P(GAIN)" setting press ADJ (F3).

8.2.4.4.2 The "P(GAIN)" Adjustment Sub-Menu [23A] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press the SET (F4) key to exit to the "P(GAIN)" Setting Menu [23].

23A

P (GAIN)	1 0 0 %
UP↑ DWN↓	SET
F1 F2 F3	F4

8.2.4.5 **LAGFIX** [24]

The "LAGFIX" Menu [24] allows you to set the time, in seconds, that it takes for the chlorine or sulfur dioxide gas injected into the water to reach the analyzer, go through the measuring cell, and send the resulting reading back to the AutoValve controller. This value must be calculated based upon the water flow rate in the system, added to the analyzer sampling time. Standard tables are available to determine the speed of travel of water in pipe of various diameters with known water flow rate in gallons per minute, liters per second, etc. The controller will wait this amount of time before making its next adjustment.

24

LAGFIX	1 S
UP↑ DWN↓ ADJ	ESC
F1 F2 F3	F4

NOTE

*The **LAGFIX** Setting is very important for obtaining the maximum control performance of your Series 2000 Autovalve.*

8.2.4.5.1 To change the "LAGFIX" setting press ADJ (F3).

8.2.4.5.2 The "LAGFIX" Adjustment Sub-Menu [24A] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press the SET (F4) key to exit to the "LAGFIX" Setting Menu [24].

24A

LAGFIX	1 S
UP↑ DWN↓	SET
F1 F2 F3	F4

8.2.4.6 **DEADBAND** [DB]

DB

DEADBAND			0.00
UP↑	DWN↓	ADJ	ESC
F1	F2	F3	F4

The "DEADBAND" Menu [DB] allows you to set the amount of set point deviation, in PPM, which occurs before the controller will react and start taking corrective action. If this value is set at zero (0), the valve will react to minute variations in the residual input signal and may result in constant "hunting" around the set point.

> ***NOTE***
> ***A 0.01 or 0.02 PPM setting usually gives satisfactory results.***
> *If you experience too much valve movement around the set point, set the DEADBAND at a higher number until satisfied.*

8.2.4.6.1 To change the "DEADBAND" setting, press ADJ (F3).

DB1

DEADBAND			0.00
UP↑	DWN↓		SET
F1	F2	F3	F4

8.2.4.6.2 The "DEADBAND" Adjustment Sub-Menu [DB1] opens. Use the UP (F1) or DWN (F2) keys to change the setting. When correct, press SET (F4) key to exit to "DEADBAND" Setting Menu [DB].

> ***NOTE***
>
> *The following two Settings Menus, "**DROPOUT**" and "**LQD CLR**", are very rarely used. They will appear while scrolling through the Settings Menus for Series 2000 AutoValves with firmware version 3.02A/B or later.*
>
> ***Their pre-set FACTORY DEFAULT values should never be changed,** UNLESS specifically recommended for your system installation. If you have any questions, please contact Chemical Injection Technologies.*

8.2.4.7 **DROPOUT**

DROPOUT			0.00
UP↑	DWN↓	ADJ	ESC
F1	F2	F3	F4

The "DROPOUT" Menu allows you to set a minimum signal input (in PPM) below which the controller sees a "Null Input" for the measurement variable. This causes the controller to revert to its default programmed Control Mode for that event; i.e., FLOW PROPORTIONAL or MANUAL Control.

The FACTORY DEFAULT setting of 0.00 is recommended unless specifically advised otherwise for your system installation.

8.2.4.8 **LQD CLR**

LIQ CLR			0hr
UP↑	DWN↓	ADJ	ESC
F1	F2	F3	F4

The "LQD CLR" Menu allows users of a SUPERIOR VacuFeed™ Liquid Chemical Feed System to set parameters for their system.

The FACTORY DEFAULT setting of 0hr should be used for all systems other than a LIQUID FEED system. Refer to Chemical Injection Technologies Installation/Service Bulletin 4006, Appendix C - Special AutoValve Programming, for more information.

3

PROGRAMMING			
PRM	CAL	MODE	ESC
F1	F2	F3	F4

8.2.5 After all PROGRAM Settings have been completed, press the ESC key (F4) on any Settings Menu to exit the Settings Menu and return to the "PROGRAMMING" Menu [3].

1R

RESIDUAL		CONTROL	
PRG	ALM	MAN	RUN
F1	F2	F3	F4

8.2.6 Press ESC (F4) again to exit through the "SET NEW PASSWORD" Menus (**SECTION 5.1.5**) to return to the main "RESIDUAL CONTROL" Menu [1R].

8.3 RUN

8.3.1 From the "RESIDUAL CONTROL Menu [1R], press the RUN key (F4).

1R
RESIDUAL CONTROL
PRG ALM MAN RUN
F1 F2 F3 F4

8.3.2 The "RES SP" Menu [35R] (Residual Set Point) opens. This Menu allows you to choose whether to change the current Residual Set Point, or go directly to the **Automatic Residual Control** operation "FLOW" Menu [38R], described below.

35R
RES SP X.XXX PPM
ADJ ESC NEXT
F1 F2 F3 F4

8.3.2.1 To change the current **Residual Set Point**, press the ADJ key (F1).

36R
PASSWORD 0 ★★★
UP↑ DWN↓ ESC NXT
F1 F2 F3 F4

8.3.2.1.1 The "PASSWORD" Menu [36R] opens. Enter the password (see **Section 5.1.3 PASSWORD ENTRY SCREENS**, for instructions).

8.3.2.1.2 After entering the last password digit and pressing the F4 key the "RES SP" Menu [37R] opens.

37R
RES SP X.XXX PPM
UP↑ DWN↓ SET
F1 F2 F3 F4

8.3.2.1.3 Use the UP (F1) or DWN (F2) keys to adjust the Residual Set Point. The setting can be any number between 0 and the Residual Full Scale setting (RES FS).

8.3.2.1.4 When the Residual Set Point value is correct, press the SET (F4) key. This will open the RES Menu [38R].

38R
RES X.XX SP X.XX
FLOW X.XX% STOP
F1 F2 F3 F4

8.3.3 At the RES Menu [38R] the valve will be in **Automatic Residual Control**.

38R
RES X.XX SP X.XX
FLOW X.XX% STOP
F1 F2 F3 F4

8.3.3.1 The Residual analyzer input signal (RES) is shown in Parts per Million (PPM). The **Residual Set Point** (SP) is shown in Parts per Million (PPM). When there is a difference between these two values, the AutoValve will change the gas feed rate to compensate.

8.3.3.2 The valve position is shown next to VALV as a percentage of the maximum calibrated valve opening.

8.4 STOP

8.4.1 To exit the Automatic Valve Control Mode from the RES Menu [38R] press the STOP key (F4).

38R
RES X.XX SP X.XX
FLOW X.XX% STOP
F1 F2 F3 F4

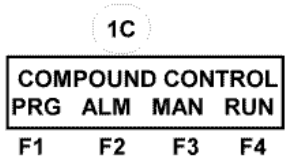
8.4.2 This will take you back to the main "RESIDUAL CONTROL" Menu [1R].

1R
RESIDUAL CONTROL
PRG ALM MAN RUN
F1 F2 F3 F4

9.0 COMPOUND LOOP CONTROL (Chlorination and De-Chlorination)

Compound Loop Control differs only slightly from RESIDUAL CONTROL, in terms of the operator interface. The "behind the scenes" algorithms and other programming (firmware) will not be apparent. Therefore, this section only deals with the few added procedures which are not already covered in **SECTION 8.0 - RESIDUAL CONTROL**. Every topic already discussed in **SECTION 8.0 - RESIDUAL CONTROL** applies equally to COMPOUND LOOP CONTROL.

Follow the procedures in this section after you have set the Control Mode to COMP. See **SECTION 5.2 SET CONTROL MODE**, if your opening Main Menu [1] does not indicate COMPOUND CONTROL [1C] (shown at right).



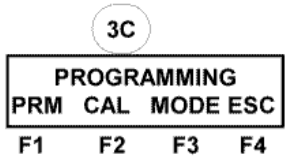
Read the instructions for PASSWORDS, CALIBRATION, and ALARM SET POINTS - see **SECTION 5.0, PROCEDURES COMMON TO ALL CONTROL MODES**, before use.

9.1 PROGRAM

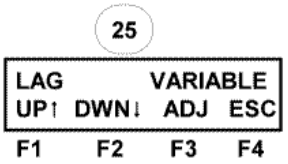
All of the program variables discussed above for Residual Control, including the discussion on De-Chlorination with SO_2 gas, also apply for **Compound Loop Control**, except for the addition of the "**LAG**" type setting. This allows the **LAG TIME** value which was set for a particular water flow rate, to be automatically varied as the water flow rate increases or decreases. By allowing **VARIABLE** LAG TIME the analyzer always "sees" the sample after equal mixing times have taken place.

For example; if the water flow in a pipeline doubles (i.e., a second well pump comes on line) the amount of time it takes for the treated water to reach the analyzer is one-half the previous amount, and the **VARIABLE** setting will automatically adjust the **LAG TIME**. However, in many "open" treatment systems, higher water flow rates do not necessarily increase the speed at which water travels through the system (at least not proportionately) and the **FIXED** setting may also be chosen.

9.1.1 Follow **SECTION 8.2.4 - RESIDUAL CONTROL PROGRAMMING**, starting from the PROGRAMMING Menu [3].



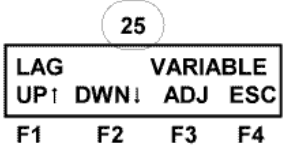
9.1.1.1 After pressing the PRM key (F1) and making any adjustments to the settings shown in RESIDUAL CONTROL, you will see the "LAG" Menu [25]. You may choose a FIXED LAG TIME, or a VARIABLE LAG TIME as mentioned above. To change the method of setting LAG TIME, press the ADJ key (F3).



9.1.1.2 The "LAG" Adjustment Sub-Menu [25A] opens. Use the UP (F1) or DWN (F2) keys to change setting between VARIABLE and FIXED. When the setting is correct, press the SET (F4) key to exit to the "LAG" Setting Menu [25].

9.1.2 If you choose a FIXED LAG TIME , then the LAG Menu [25] will appear as LAG FIXED and no other settings need to be made.

9.1.3 If you choose a VARIABLE LAG TIME, then the LAG Menu [25] appears as LAG VARIABLE.

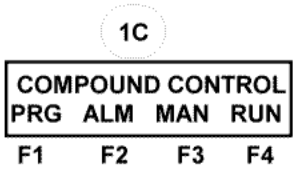


When choosing settings for **VARIABLE LAG TIME**, you must know what the lag time ("LAGVAR") will be at a given water flow rate ("FLOW@VAR"), so that the analyzer always "sees" the sample after equal mixing times have taken place.

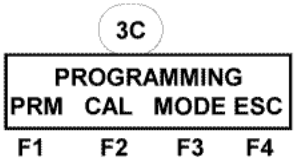
For example; if you set the variable lag time for a percentage of maximum water flow, you must know (or calculate) the lag time (in seconds), at that flow rate.

Let's assume for your system that it requires a lag time of 10 seconds for the treated water sample to reach the analyzer at 50% of the maximum flow rate.

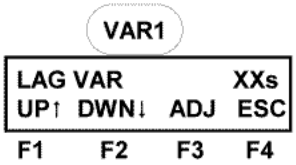
T**wo (2) new Menus** are added to the Settings Menus to allow these values to be set. Start from the opening Main Menu [1C] (in COMPOUND CONTROL).



Press the PRG key (F1) to enter the "PROGRAMMING" Menu [3C], then press the PRM key (F1) to enter into the Settings Menus. Use the UP (F1) and DWN (F2) keys to scroll through the Menus until you reach the following two Menus.

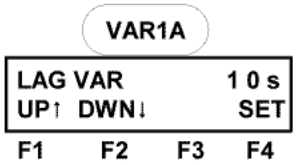


9.1.3.1 **LAG VAR** [VAR1]



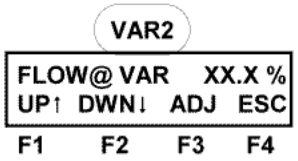
9.3.1.1.1 The "LAG VAR" Menu [VAR1] allows you to choose the Lag Time you use to set the Variable Lag. Press the ADJ (F3) key.

9.3.1.1.2 The "LAGVAR" Adjustment Sub-Menu [VAR1A] opens.



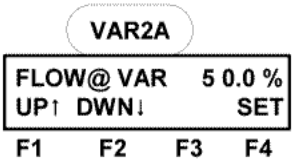
Use the UP (F1) or DWN (F2) keys to change the Lag Time, in seconds, at the water flow you choose for this setting. When the setting is correct (10 sec), press the SET (F4) key to exit to the "LAG VAR" Setting Menu [VAR1].

9.1.3.2 **FLOW@VAR** [VAR2]



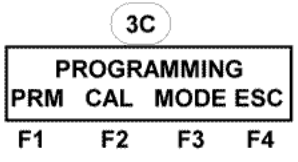
9.1.3.2.1 The "FLOW@VAR" Menu [VAR2] allows you to choose the water flow, in percentage of maximum, which corresponds to the LAG VAR [VAR1] time which you set above. To change this setting press the ADJ (F3) key.

9.1.3.2.1 The "FLOW@VAR" Adjustment Sub-Menu [VAR2A] opens.

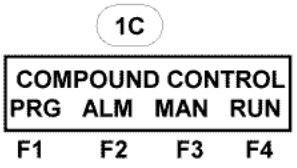


Use the UP (F1) or DWN (F2) keys to change the Water Flow Rate, in percentage of maximum, at the Lag Time you chose (50.0%). When the setting is correct, press the SET (F4) key to exit to the "FLOW@VAR" Setting Menu [VAR2].

9.1.4 After all PROGRAM Settings are complete, press the ESC key (F4) on any of the Settings Menus. This will exit the Settings section and return to the "PROGRAMMING" Menu [3].

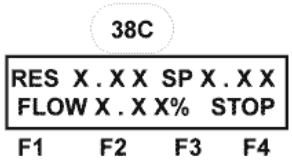


9.1.5 Press ESC (F4) to exit through the "SET NEW PASSWORD" Menus (see **SECTION 5.1.5**) to reach the main "COMPOUND CONTROL" Menu [1C].



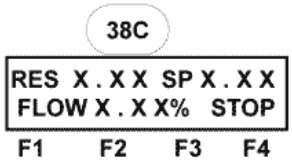
9.2 RUN

All RUN functions are the same in COMPOUND LOOP MODE as in RESIDUAL CONTROL MODE. Follow the procedures in **SECTION 8.3**. When you view the RES Menu [38C], you will also see a FLOW indication, which shows the percentage of the maximum gas feed rate as the flow meter input signal varies.

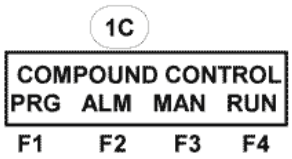


9.3 STOP

9.3.1 To exit the Automatic Valve Control Mode from the RES Menu [38C] press the STOP key (F4).



9.3.2 This will take you back to the main "COMPOUND CONTROL" Menu [1C].



NOTE

If you have specific questions regarding Compound Loop Control programming for your system, please contact your local distributor or Chemical Injection Technologies for further assistance.

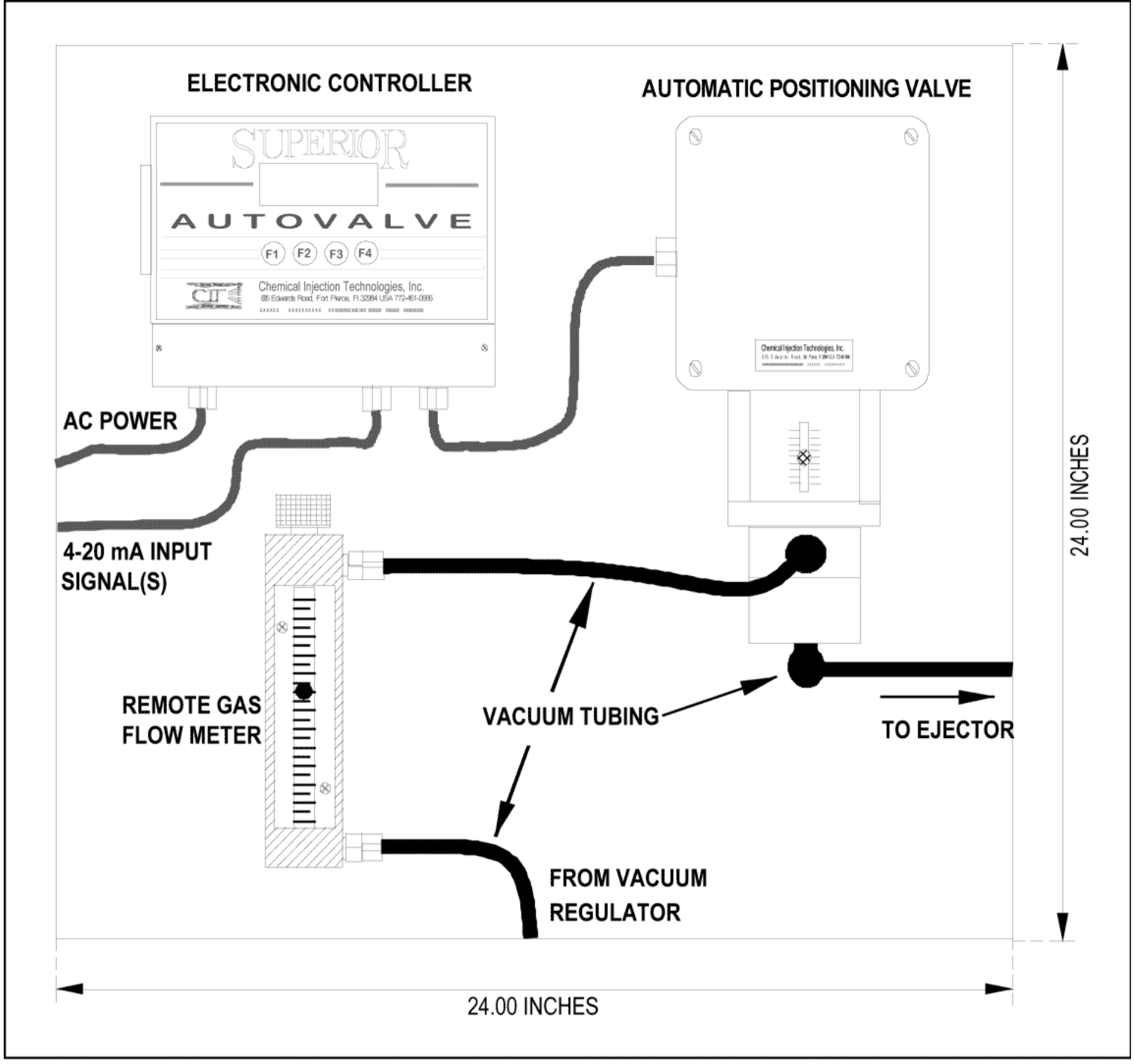


FIGURE 4.1

SUPERIOR
AutoValve Assy

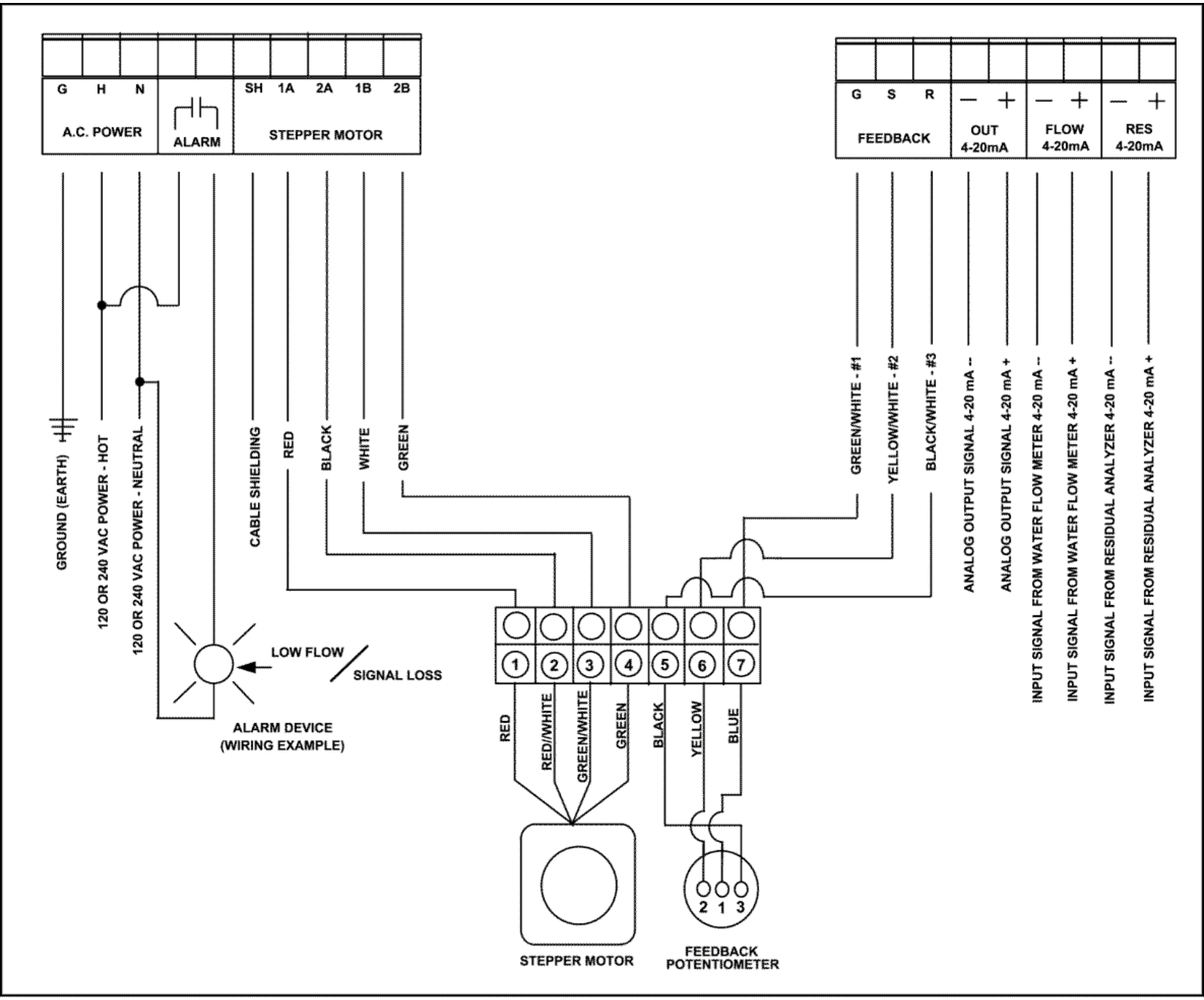
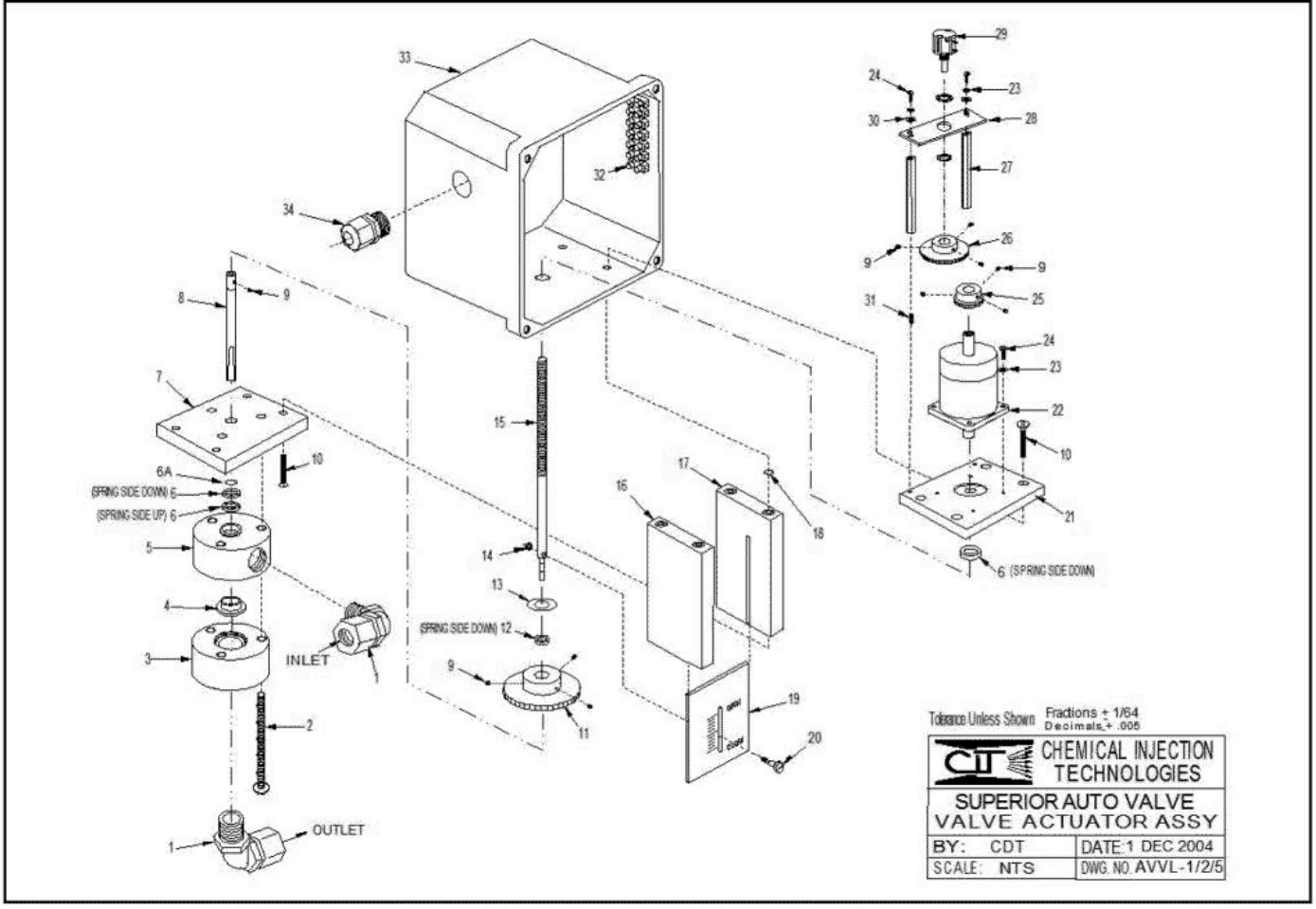


FIGURE 4.2

Simplified Wiring Schematic for AutoValve Assy



Key	QTY	DESCRIPTION	PART NO
1	2	1/4" TUBE X ½" NPT ELL TO 100PPD (2	TU-157
	2	½" TUBE X ½" NPT ELL TO 200 PPD (5 KG/HR)	TU-256
	2	5/8" TUBE X ½" NPT ELL TO 500 PPD (10	TU-556
2	3	1/4-20 UNC X 3 ½" SS RND HEAD MACH	AV-105
3	1	VALVE COVER	AV-001
4	1	VALVE ORIFICE	AV-003
5	1	VALVE BODY	AV-002
6	2	SPRING-ACTIVATED PTFE SEAL (3/8" I.D.)	AV-030
6A	1	VALVE BODY O-RING SEAL	OR-115
7	1	VALVE BODY MOUNTING PLATE	AV-014
8	1	VALVE PLUG ASSEMBLY TO 10PPD(200	AV-200-10
	1	VALVE PLUG ASSEMBLY TO 25PPD(500	AV-200-25
	1	VALVE PLUG ASSEMBLY TO 50PPD(1000	AV-200-50
	1	VALVE PLUG ASSEMBLY TO 100PPD (2	AV-200-100
	1	VALVE PLUG ASSEMBLY TO 200PPD (5	AV-200-200
	1	VALVE PLUG ASSEMBLY TO 500PPD (10	AV-200-500
9	9	4-40 UNC X 3/16" SS SET SCREW	AV-104
9A	1	4-40 UNC X 3/16" TITANIUM SET SCREW	SV-104T
10	8	10-24 UNC X 1 1/4" SS FLAT HD MACH SCREW	AV-101
11	1	HAND WHEEL	AV-008
12	1	SPRING-ACTIVATED PTFE SEAT (1/4" ID)	AV-031
13	1	PTFE FRICTION WASHER	SP-160
14	1	6-32 UNC SS HEX NUT	AV-120
15	1	LEAD SCREW	AV-007
16	1	VALVE SUPPORT PLATE, RIGHT SIDE	AV-016
17	1	VALVE SUPPORT PLATE, LEFT SIDE	AV-017
18	4	SEAL, SUPPORT PLATE TO HOUSING BOX	OR-114
19	1	GUIDE PLATE	AV-009
20	1	INDICATOR SHOULDER SCREW (6-32 UNC)	AV-010
21	1	MOTOR MOUNTING PLATE	AV-015
22	1	LINEAR ACTUATOR MOTOR	AV-100
23	6	SS LOCK WASHER	AV-130

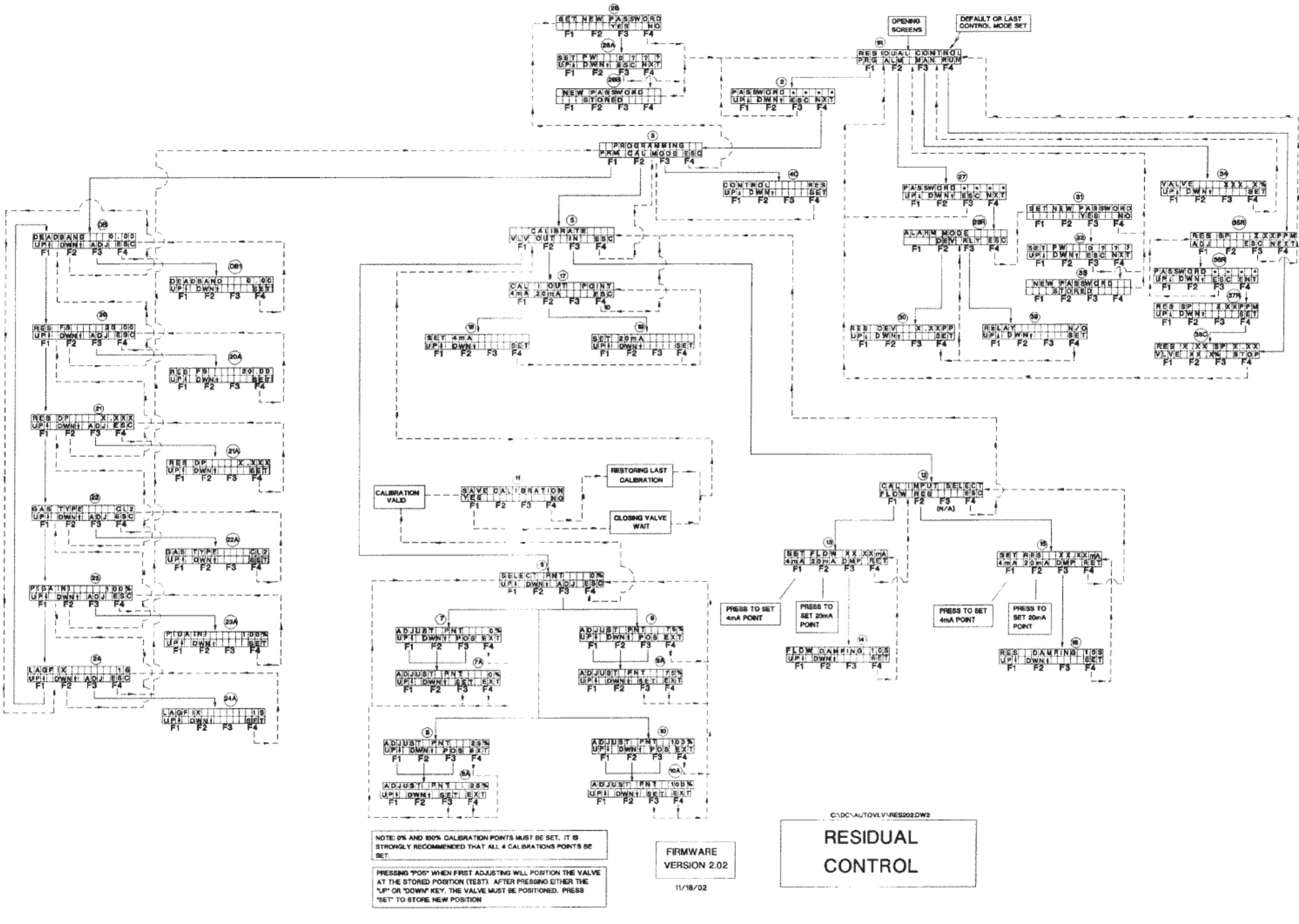
Key	QTY	DESCRIPTION	PART NO
24	6	SS PAN HEAD MACHINE SCREW	AV-102
25	1	FEEDBACK PINION GEAR	AV-012
26	1	FEEDBACK SPUR GEAR	AV-013
27	2	HEX STANDOFF	AV-060
28	1	FEEDBACK POTENTIOMETER MNTNG PLATE	AV-011
29	1	FEEDBACK POTENTIOMETER	AV-050
30	2	SS FLAT WASHER	AV-131
31	2	SS SET SCREW	AV-103
32	1	TERMINAL STRIP (7-POSITION)	AV-045
33	1	MOTOR HOUSING BOX	AV-040
34	1	½" STRAIN RELIEF LIQUID-TIGHT	STC-EL-112

***NOTE: KEY NO.s 4 & 8 (AV-003 & AV-200) *MUST* BE ORDERED AS A MATCHED SET TO ASSURE PROPER TOLERANCE.**

CHEMICAL INJECTION TECHNOLOGIES

SUPERIOR AUTOVALVE VALVE ACTUATOR ASSEMBLY

BY: CDT	DATE: 1 DEC '04
SCALE: NTS	DWG NO: AVVL-1/2/5



NOTE: 0% AND 100% CALIBRATION POINTS MUST BE SET. IT IS STRONGLY RECOMMENDED THAT ALL 4 CALIBRATIONS POINTS BE SET.

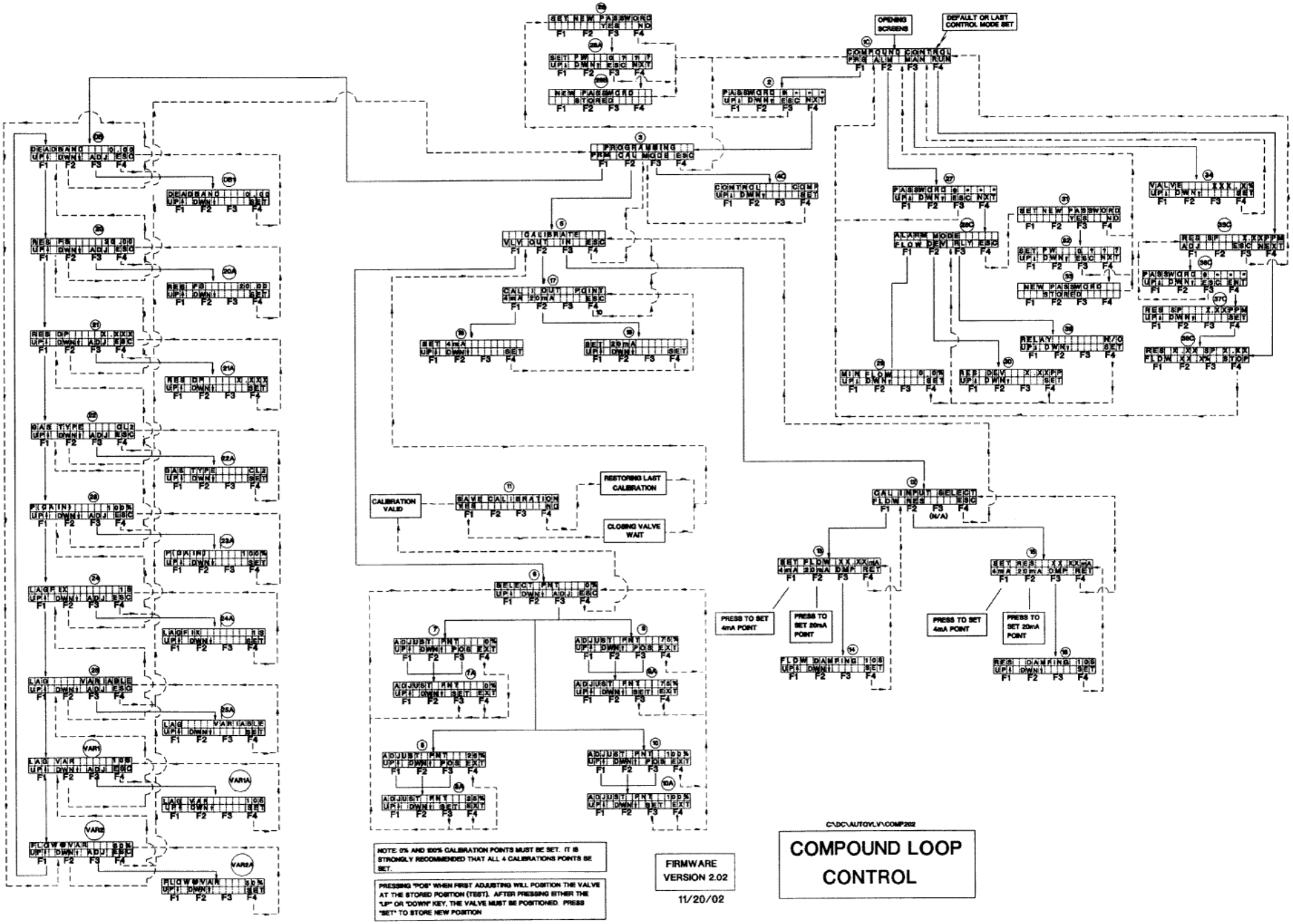
PRESSING "POS" WHEN FIRST ADJUSTING WILL POSITION THE VALVE AT THE STORED POSITION (TEST). AFTER PRESSING EITHER THE "UP" OR "DOWN" KEY, THE VALVE MUST BE POSITIONED. PRESS "SET" TO STORE NEW POSITION

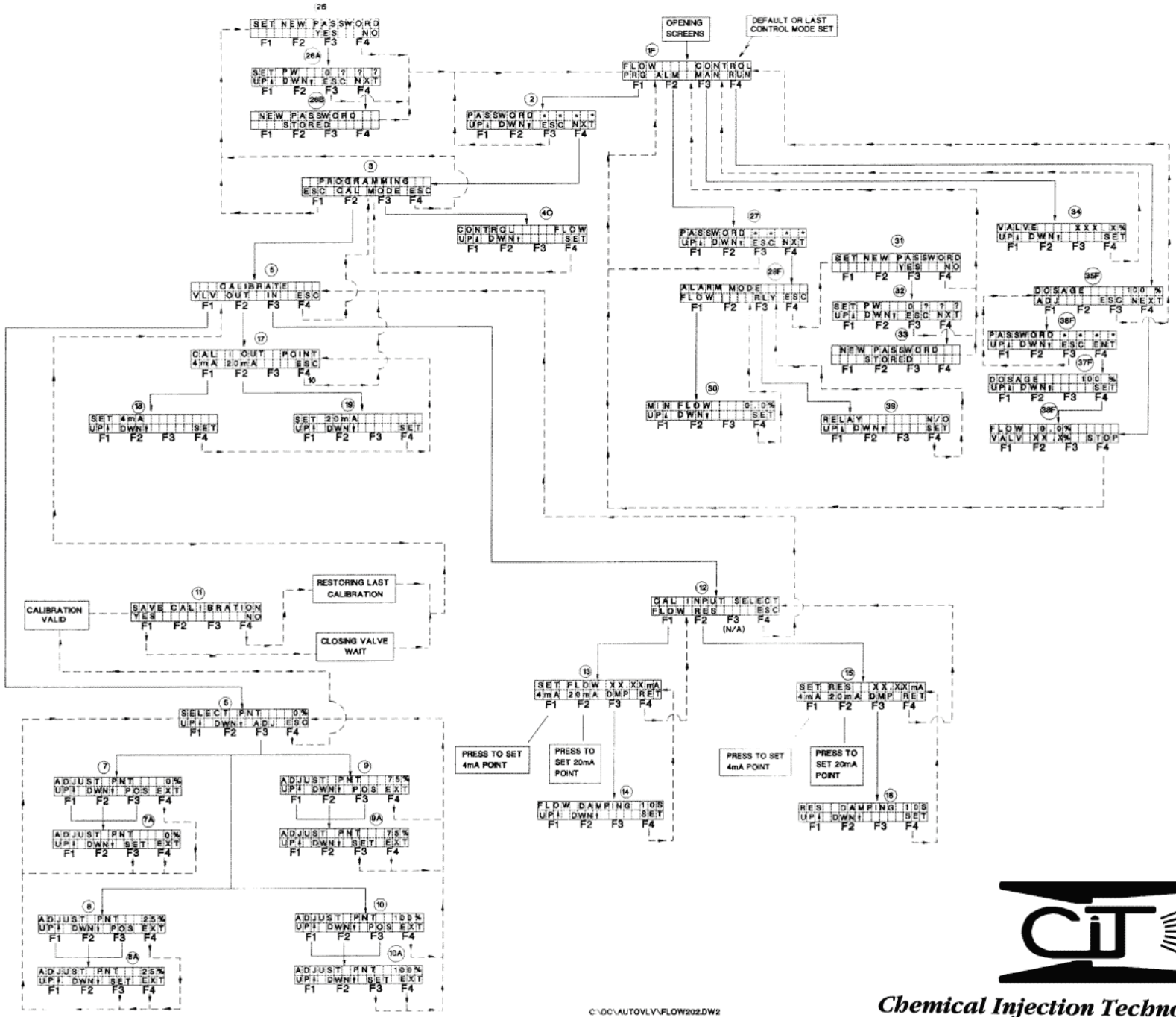
FIRMWARE VERSION 2.02

11/18/02

C:\DC\AUTOVLV\RES202.DW2

RESIDUAL CONTROL


OPENING SCREENS
DEFAULT OR LAST CONTROL MODE SET
COMPOUND CONTROL
PROGRAMMING
CALIBRATE
SELECT PNT
ADJUST PNT
CAL INPUT SELECT
SET FLOW XX.XXmA
SET RES XX.XXmA
PRESS TO SET 4mA POINT
PRESS TO SET 20mA POINT
FLOW DAMPING
RES DAMPING
CALIBRATION VALID
SAVE CALIBRATION
RESTORING LAST CALIBRATION
CLOSING VALVE WAIT
ALARM MODE
RELAY
MIN FLOW
RES DEV
VALVE
RES SP
PASSWORD
SET NEW PASSWORD
NEW PASSWORD STORED
CONTROL COMP
DEADBAND
RES FB
RES DP
GAS TYPE
GAIN
LAG FIX
LAG VARIABLE
FLOW@VAR
NOTE: 0% AND 100% CALIBRATION POINTS MUST BE SET. IT IS STRONGLY RECOMMENDED THAT ALL 4 CALIBRATIONS POINTS BE SET.
PRESSING "POS" WHEN FIRST ADJUSTING WILL POSITION THE VALVE AT THE STORED POSITION (TEST). AFTER PRESSING EITHER THE "UP" OR "DOWN" KEY, THE VALVE MUST BE POSITIONED. PRESS "SET" TO STORE NEW POSITION
FIRMWARE VERSION 2.02
11/20/02
C:\DC\AUTOVLV\COMP202
COMPOUND LOOP CONTROL



NOTE: 0% AND 100% CALIBRATION POINTS MUST BE SET. IT IS STRONGLY RECOMMENDED THAT ALL 4 CALIBRATIONS POINTS BE SET.

PRESSING "POS" WHEN FIRST ADJUSTING WILL POSITION THE VALVE AT THE STORED POSITION (TEST). AFTER PRESSING EITHER THE "UP" OR "DOWN" KEY, THE VALVE MUST BE POSITIONED. PRESS "SET" TO STORE NEW POSITION

FIRMWARE VERSION 2.02

11/20/02

C:\DC\AUTOVLV\FLOW202.DW2

FLOW PROPORTIONING CONTROL

Chemical Injection Technologies, Inc.
835 Edwards Road, Ft. Pierce, FL 34982 USA
Tel.: (772) 461-0666 Fax: (772) 460-1847
Email: Superior@chlorinators.com
www.chlorinators.com