UPC·MARATHON

SAV PLUS™
User Manual

MASTERING
STRENGTH.
WORLDWIDE.

MANUAL #: 404

Revision #	Revision Date	Revision Description

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TECHNICAL ASSISTANCE

For all questions or concerns regarding the operation of the **SAV Plus™**, please consult the last page of this manual for contact information.

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1 CONTROL VALVE INTRODUCTION

Purpose of Control Valve

Control valves are used to vary the flow of fluid through a Flo-Meter. The Control Valve is microprocessor based and compares a flow control signal (4-20 mA represents zero to full scale flow) to the position signal produced by a encoder connected to the stepper motor's drive shaft. If there is no difference between the control signal and the actual valve position, the system is "satisfied" and the motor does not drive. If the valve position is different from the control signal, the system will tell the motor to drive up or down until the valve position matches the control signal. The SAV is programmed to automatically "ramp" to a set point smoothly to limit "under "and "over shoot

The unit is factory "tuned" to each flow specification to provide smooth control action. The unit's response and control is limited by the response of the customer-supplied controller, inlet pressure, flow range, gas type and downstream restrictions. If necessary, the SAV Plus may be "field tuned" for a variety of applications.

The SAV Plus control valve offers the following features:
• Error codes to aid in troubleshooting
• Shut off contacts to close the valve by opening a remote switch or contact
• Three Alarm contacts that can be programmed for various alarm types

Model Explanation

SAVP - 1M1

Series Name ——————

Valve Size

GS1: S Gas Valve
LS1: -1 SF Liquid Valve
LS2: -2 SF Liquid Valve
1M1: -1 M1-7 Gas Valve
1M3: -3 M1-7 Gas Valve
1M5: -5 M1-7 Gas Valve
M10: -10 M1-7 Gas Valve

8M1: -1 M8-11 Gas Valve
8M3: -3 M8-11 Gas Valve
8M5: -5 M8-11 Gas Valve
8M9: -9 M8-11 Gas Valve
1L1: -1 L1-3 Gas Valve
1L3: -3 L1-3 Gas Valve
1L5: -5 L1-3 Gas Valve

1L9: -9 L1-3 Gas Valve
4L2: -2 L4-6 Gas Valve
4L4: -4 L4-6 Gas Valve
4L7: -7 L4-6 Gas Valve
7L1: -1 L7 Gas Valve
7L2: -2 L7 Gas Valve
8L1: -1 L8-9 Gas Valve

Nameplate Information

Model ——————→
Serial Number ——————→
Input Specifications ——————→

SAV Plus™
MODEL: SAVP-1M1
SERIAL #:   21875SAVP
INPUT: 24VDC±10% 50mA
TEMP: 32F (0C) – 150F (65C)
Upc-Marathon.com

2 SPECIFICATIONS

General Specifications			
Operation Specification			
Power	**Operating Voltage**		24VDC +/- 10%
	Power Consumption		500mA
Inputs	**Flow Setting**	**Keypad**	Setting by <UP> or <DN> keys
		External Signal	4-20mA (Input Impedance 250Ω) Ethernet Modbus TCP
	Input Terminals	**Digital**	1 user-programmable: Input Disabled, Close Valve(N.O.), Close Valve (N.C.)
		Analog	1 - 4-20mA (Input Impedance 250Ω)
Outputs	**Output Terminals**	**Digital**	3 relay 1A@30VDC user-programmable: Output Disabled, Valve Full Open, Valve Closed, Fault
		Analog	1 - 4-20mA: Valve Position
Operator Interface	**Operator Device**		4 key, graphics LCD display
	Programming		Parameter values for setup and review, fault codes
	Status Display		%Setpoint, % Valve position
	Key Function		Dispalay, Enter, UP, DN
Control Valve	**Working Pressure**		S,SF,M1-7 = 90PSI(6.2Bar) M8-1, L1-3 = 75PSI(5.2Bar) L4-6 = 30PSI(2.1Bar) L7 = 10PSI(0.7Bar) L8-9 = 5PSI(0.3Bar)
	Max Pressure		S,SF,M,L1-6 Series = 100PSI(6.9Bar) L7-9 Series = 50PSI(3.4Bar)
Enviroment	**Enclosure Rating**		IP40
	Ambient Temp		0°C to 65°C (32°F to 150°F)
	Storage Temp		-20°C to 40°C (-4°F to 140°F)
	Ambient Humidity		20 to 90% RH (non-condensing)
	Vibration		9.8 m/s2 (1G) less than 10Hz, 5.9m/s2 (0.6G) 10 to 60 Hz
	Installation Location		Keep from corrosive gas and liquid

3 INSTALLATION AND WIRING

3.1 Flo-Meter Installation

The 904 "Installation and Operation of UPC-Marathon Flo-Meters" manual contains instructions on the proper installation of the Flo-Meter. Read all CAUTIONS and WARNINGS before proceeding.

The SAV Plus Flo-Meter is shipped as a complete unit. Before installing the Flo-Meter, carefully remove the guard assembly, to achieve this lay the unit on its side on a work bench or table. Then hold the guard with one hand, while unscrewing the union nut counter clockwise with the other hand to loosen it.

⚠️ **CAUTION: Once the guard is loose from the Flo-Meter make sure to pull the guard from the Flo-Meter straight back off the float rod assembly. Moving the guard to one side or another during removal may result in damage to the float rod assembly.**

Remove the Float Rod Assembly and store it in a safe location until Flo-Meter body is installed and mounted. Once the Flo-Meter is installed, remove the red tape from the float rod and insert the float rod assembly into the Flo-Meter body. Fill the sight glass tube with UPC-Marathon Flo-Meter Oil so that the level of oil is approximately one (1) inch from the top. Then carefully install the guard onto the Flo-Meter.

📝 *Do not put oil in the sight glass tube of meters used for **oxygen** or **methanol** service. Oxygen Flo-Meters should be run dry, or with distilled water. Flo-Meters for Methanol service will automatically fill the sight glass tube with Methanol when in service.*

⚠️ **WARNING: Do not fill the sight glass tube with Flo-Meter oil on meters used for oxygen service. Use of oil may cause fire or explosion. Serious personal injury may result from fire or explosion.**

📝 *If the SAV Plus is shipped separately to be installed onto an existing Flo-Meter, please refer to the following page.*

SAV

ADAPTER BLOCK

COUPLING

VALVE UNION NUT

VALVE ASSEMBLY

VALVE BODY FLAT GASKET

VALVE ORIFICE O-RING

FLO-METER BODY

FLOAT ROD ASSEMBLY

FLOAT STOP BODY O-RING

SIGHT GLASS TUBE O-RING

UNION NUT

GUARD ASSEMBLY
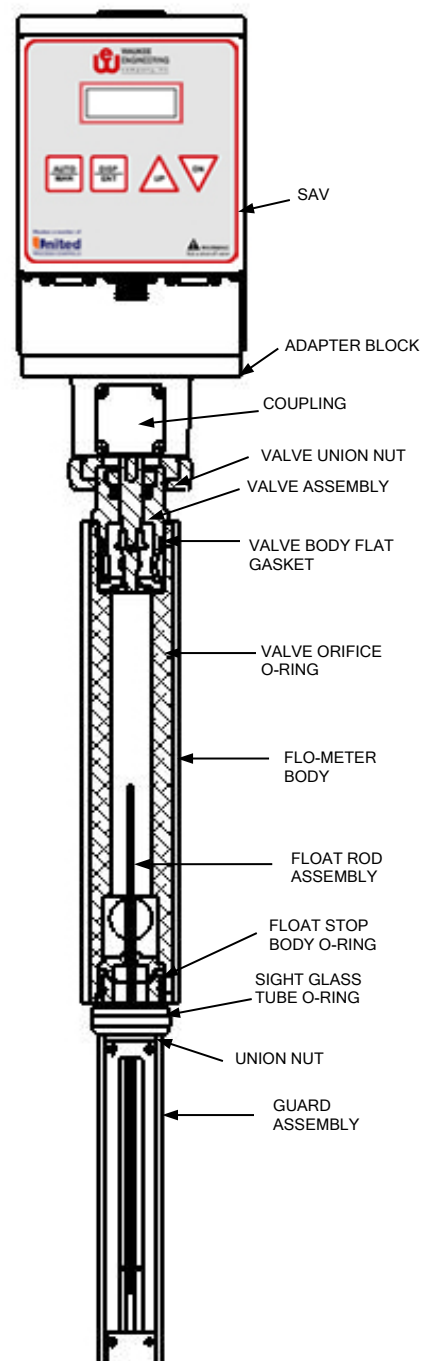
3.2 SAV Plus Control Valve Installation

The following instructions are for installing a SAV Control Valve onto an existing UPC-Marathon Flo-Meter.

1. First remove the valve assembly from the SAV Plus as follows:
i. Remove the Four (4) access window cover plate screws and the access window cover plate.
ii. Loosen the valve stem coupling lower hex head set screw.
iii. Loosen the valve body union nut.
iv. Carefully separate the valve body assembly from the adapter block.
v. Set the SAV and valve body assembly aside.
2. Remove the cap or manual valve from the existing Flo-Meter using the valve tool provided.
3. Inspect the top of the Flo-Meter and remove any of the following if present: Valve orifice, orifice gasket or valve spring.
4. Insert the "O-Ring" into the top of the UPC-Marathon Flo-Meter. Ensure that the "O-Ring" is seated flat against the "shelf" of the Flo-Meter.
5. Insert the orifice on top of the "O-Ring" and ensure that the "O-Ring" is still seated properly.
6. Screw the valve body assembly into top of the Flo-Meter using the valve tool. Tighten until the flat gasket is seated in the Flo-Meter body.

⚠️ **CAUTION: Do not over tighten as damage to the threads may occur.**

7. Install the SAV Plus onto the valve body assembly. Carefully align the valve stem coupling to the valve stem.

⚠️ **CAUTION: Do not force the SAV Plus onto the valve stem.**

8. Tighten the union nut by hand until there is little or no play between the valve body assembly and SAV Plus.
9. Tighten the valve stem coupling lower hex head set screws.
10. Replace the access window cover plate and Four (4) access window cover plate screws.

3.3 Wiring Guidelines

Your company may have guidelines for wiring installation. If so, you should check those before you begin the installation. Here are some general things to consider:
- Use the shortest wiring route whenever possible.
- Use shielded wiring for all signal wiring and ground the shield at the Field Device end. **DO NOT** ground the shield at both the SAV Plus and Field Device.
- Do not run the signal wiring next to large motors, high current switches, or transformers. This may cause noise problems.

- Route the wiring through an approved cable housing to minimize the risk of accidental damage. Check local and national codes to choose the correct method for your application.
- Be sure to leave enough slack in the cables to allow easy removal of the SAV Plus from the Flo-Meter for maintenance. If seal tight or similar conduit is used, be sure to provide an adequate loop of conduit for maintenance access.

CAUTION: To reduce the risk of electrical shock and also to prevent damage to the SAV Plus and the Field Device. It is advised to turn off the supply power to the Flo-Tronic, SAV Plus and Field Device before connecting or disconnecting any wires.

WARNING: Any electrical or mechanical modification to this equipment without prior written consent of UPC-Marathon will void all warranties, may result in a safety hazard, and may void the CE listing.

WARNING: When making cable assemblies with the included plugs, ensure none of the connections are shorted to each other before plugging into the unit. Failure to verify the cable assembly may result in damage to the unit and may void the warranty.

If you are not experienced in soldering and would prefer a cable assembly. UPC-Marathon has cable assemblies in a variety of lengths available. Contact your local sales representive or UPC-Marathon for information on cable assemblies.

Use 18-22AWG shielded wire for the control signal wiring. It is recommended to run all signal wires in a separate steel conduit. The shield wire should only be connected at the Field Device. Do not connect shield wire on both ends.

3.4 Wiring Terminals

Digital I/O   Comm Port

Analog I/O   Power   Not Used
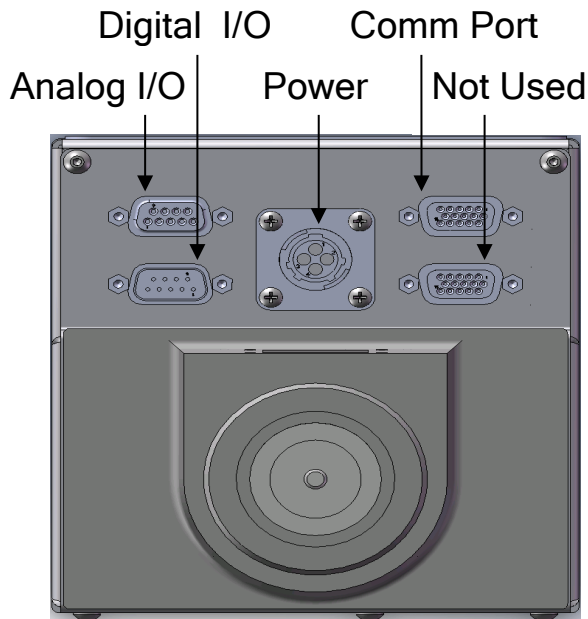
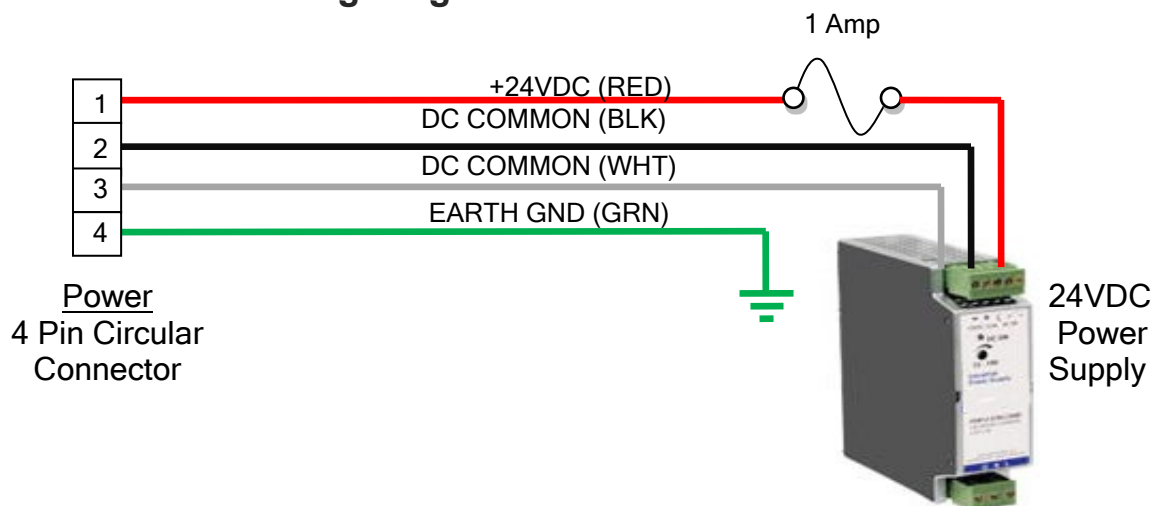| Analog I/O Wiring (9 Pin D-sub Receptacle)		
Pin #	Description	Wire Color
1	Analog In 1 + (AI1)	Red
2	Analog In 1 - (AI1C)	Black
3	N/C	
4	N/C	
5	N/C	
6	N/C	
7	Analog Out 1 + (AO1)	Green
8	Analog Out 1 - (AO1C)	White
9	N/C	

Digital I/O Wiring (9 Pin D-sub Plug)		
Pin #	Description	Wire Color
1	Digital Input + (DI1)	Red
2	N/C	
3	Digital Out 1 N.O.(DO1)	Yellow
4	Digital Out 2 N.O.(DO2)	Orange
5	Digital Out 3 N.O.(DO3)	White
6	Digital Input Com (DCM)	Brown
7	Digital Out 1 Com (DO1C)	Blue
8	Digital Out 2 Com (DO2C)	Vilot
9	Digital Out 3 Com (DO3C)	Black

Power Wiring (4 Pin Circular Receptacle)		
Pin #	Description	Wire Color
1	+24VDC	Red
2	DC Common	Black
3	DC Common	White
4	PE	Green

Comm Wiring (15 Pin D-sub Receptacle)		
Pin #	Description	Wire Color
1	Bus RTS	
2	N/C	
3	N/C	
4	ETH RX+	
5	ETH RX-	
6	N/C	
7	ETH TX+	
8	ETH TX-	
9	Bus AL	
10	Bus BL	
11	Bus +5V	
12	N/C	
13	Bus GND	
14	N/C	
15	PE	

3.5 Power Wiring Diagram

Power
4 Pin Circular
Connector

1 Amp

+24VDC (RED)
DC COMMON (BLK)
DC COMMON (WHT)
EARTH GND (GRN)

24VDC
Power
Supply

3.6 Control Wiring Diagram

Analog Inputs/Outputs
(9 Pin D-Sub Receptacle)

SAV Plus
Control Valve
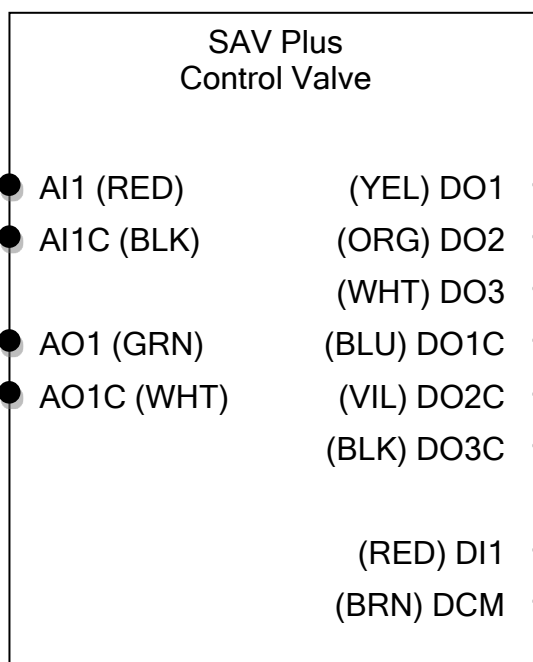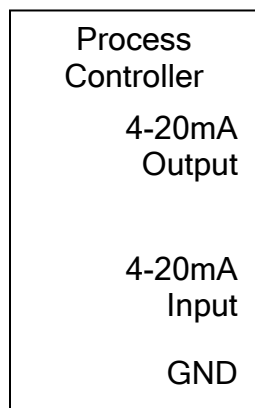
Digital Inputs/Outputs
(9 Pin D-Sub plug)

Process
Controller

4-20mA
Output

4-20mA
Input

GND

AI1 (RED)
AI1C (BLK)

AO1 (GRN)
AO1C (WHT)

(YEL) DO1
(ORG) DO2
(WHT) DO3
(BLU) DO1C
(VIL) DO2C
(BLK) DO3C

(RED) DI1
(BRN) DCM

24VDC @ 0.5A
24VDC @ 0.5A
24VDC @ 0.5A

12-24VDC

12-24VDC
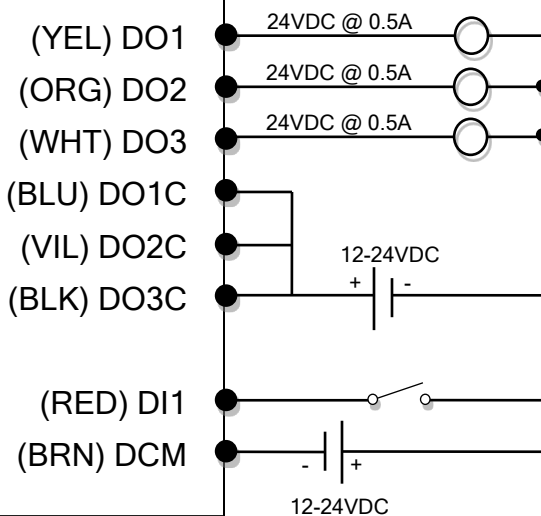
4 POSITIVE SHUT-OFF

The control valve provided with the SAV Plus is a needle valve designed specifically to precisely control the rate of flow. This valve is not intended to be used as a means of positive shut-off. Even when the valve is fully closed a small amount of leakage may be noted.

⚠️ **WARNING: The control valve on the SAV Plus is not designed as a positive shut-off valve, a ball valve or similar type valve should be installed up stream of the Flo-Meter before servicing equipment that the Flo-Meter is servicing.**

If the process is sensitive to this leakage flow or if positive shut-off is desired, a solenoid valve may be added.

4.1 Solenoid Valve Sizing and Location

When selecting a solenoid valve make sure it is capable of flowing the flow required at the operating pressure. UPC-Marathon Flo-Meter's require a constant Inlet supply pressure and if the solenoid valve does not have a large enough orifice or CV factor it may have an effect on the supply pressure at the inlet of the flo-meter which may affect its accuracy. For this reason among others, UPC-Marathon recommends installation of the solenoid valve at the outlet of the flo-meter.

4.2 Controlling the Solenoid Valve

There are many combinations of wiring and ways of controlling the solenoid valve. When closing the solenoid valve you want to ensure that the SAV Plus Control Valve drives closed. This can be achieved many ways, some of which are:

1. Configure the process controller that is controlling both the SAV Plus and solenoid valve, so that when the solenoid valve is closed that it sends a control signal of 4.5mA or less to the Analog inputs (AI1, AI1C). This will tell the SAV Plus to drive the valve closed regardless of feedback signal from the flow sensor.

2. Configure the SAV's Digital Input (DI1, DCM) via the programming parameter P3.00 = "01: Closed Valve N.O.". Then, wire these contacts to a dry N.O. contact on the process controller. Setup the process controller to close these contacts when the solenoid valve is closed. When the process controller closes these contacts the Valve will drive closed regardless of what the control or feedback signal is.

These are just two examples of how to properly use a solenoid valve with a SAV Plus Flo-Meter. The main objective is that the control valve must drive closed whenever the solenoid valve is closed.

⚠ **CAUTION: Failure to configure and wire a solenoid valve as mentioned above may result in over gassing of equipment or may cause damage to the float rod assembly within the Flo-Meter due to a sudden in-rush of flow spiking the flo-meter.**

⚠ **WARNING: When using a solenoid valve be sure to select the proper solenoid configuration for fail safety (N.O. or N.C.)**

5 KEYPAD OPERATION AND DISPLAY OVERVIEW

5.1 Keypad

The digital keypad includes a graphics LCD display and 4 function keys. The diagram below shows all the features of the digital keypad and an overview of their functions.
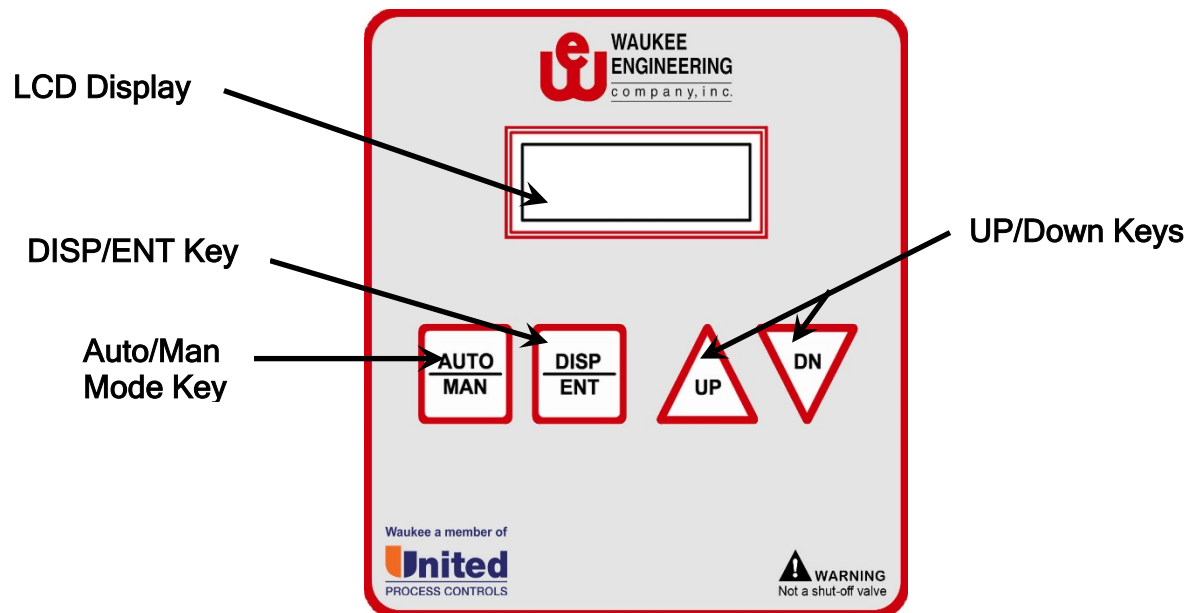
5.2 LCD Display

The LCD Display shows the operation values, parameters and faults

Mode

Displays the mode of operation as follow:
> A – Automatic Mode
> M – Manual Mode

Drive Indicator
Indicates direction of valve travel and relative speed related to how fast the indicator is flashing.

Status
Displays status of unit, for a complete list of status screens refer to pg. 17 "Displaying the status of the SAV Plus"

5.3 Function Keys

AUTO/MAN Key
Pressing the AUTO/MAN key will change the mode of operation.

DISP/ENT Key
Pressing the DISP/ENT key on the keypad repeatedly will cycle through the status messages of the Control Valve. It is also used in the programming mode to select and view parameters as well as store parameter settings.

UP/DN Key
When the control valve is in the manual mode the UP key will drive the valve open and the DN key will drive the valve closed. The UP/DN keys are also used to scroll through the parameter groups, the various parameters in each group and also changes the parameter settings in single-unit increments. To quickly run through the range of settings, press and hold the UP or DN key.

After a one (1) minute key inactivity, the keypad LCD display will automatically revert to the main display.

5.4 Displaying the status of the SAV Plus

Press the DISP/ENT key on the keypad repeatedly to cycle though the status messages on the control valve. The diagram below shows the order of the status messages as you cycle through them and shows the definition of the status messages.

Valve Position
This is the main display that shows the % position of the control valve, alarms and mode.

Set point
Displays the set point.

Access Level
Displays the current level of accessibility to the SAV Plus. Visable only when the default access level P2.07 is set to "01:User" See "Access Levels of the SAV Plus" on page 18.

Program Mode
Used to program parameters within the unit. For programming, see "Programming the SAV Plus on page 18.

5.5 Alarm Status of the SAV Plus

When Alarms are programmed to trigger "P3.01 and P3.03 set to 01 thru 06 the status screen will cycle through the alarms triggered and the main screen. The diagram below shows the

Alarm Message
 Displays what the alarm is programmed to trigger for. Refer to "Digital I/O Parameters" P3.01 thru P3.03 for alarm programming. Alarm messages are as follow:

- Valve Full Open
- Valve Full Closed
- Fault
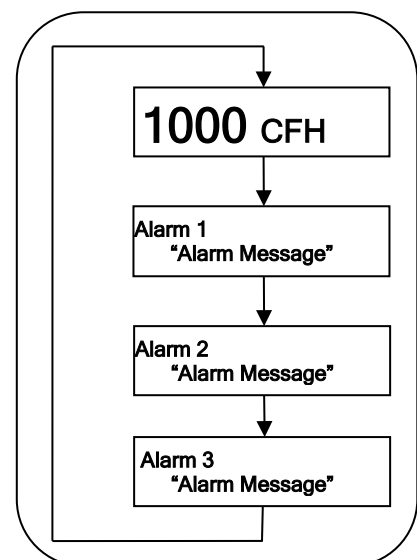
order of the alarm status messages. The display will continue to cycle until all alarms are cleared.

5.6 Access Levels of the SAV Plus

The SAV Plus has the capability to lock out parameter settings and data entry screens, requiring a pass code to change values. By Default the SAV Plus is setup with an Access Level of "Admin" which provides the operator full access to all parameter settings and data entry. If desired the default Access Level can be changed to "User". The "User" Access Level can view but not change any parameter settings (Read Only) and data entry screens have the option to be "Ready Only" or "Read/Write". For information regarding setting up Access Levels refer to the programming section of the manual.
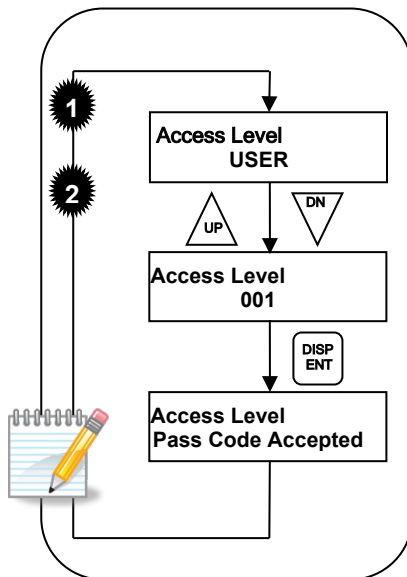
Entering Pass Code

Press the ▲or ▼ key to change the pass code in increments or decrements of 1.
Once the correct pass code is entered press the DISP/ENT Key.
If the pass code is correct the display will show "Pass Code Accepted" otherwise it will show "Pass Code Denied", then show the current Access Level.

Once the correct pass code is entered you will have access to that level of access until 5 minutes of keypad inactivity. After 5 minutes of keypad inactivity the access level reverts back to the default Access Level. If the default Access level is "ADMIN" then there is no need to enter a pass code.

5.7 Programming the SAV Plus

The SAV Plus Control Valve parameters are organized into seven (5) different groups according to their functions. The illustration below shows you how to navigate through the parameter groups and parameter settings. For a complete list of parameters, see Pgs. 18 thru 22.

(1) Press the DISP/ENT to cycle through the status display until it reads "Program" then use the UP/DN keys to cycle through the parameter groups.

(2)(3) Press the DISP/ENT key to display the various parameters for the selected group and use the UP/DN keys to view each one.

(4) When the desired parameter is shown, press the DISP/ENT key to select.

(5) Use the UP/DN keys to cycle through the available settings.

(6) Press the DISP/ENT key to select the setting. The phrase "Value Accepted" will be displayed for a moment to show that the parameter value been changed.

(7) After the parameter value has been set, the LCD display will cycle to the next parameter in the selected group.

6 CONTROL VALVE PARAMETERS

Parameter Summary				
Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Control Valve Parameters				
P0.00	Setpoint Source	00: Analog Input 01: Communications	0	
P0.01	Dead Band	0.1 to 5.0	0.1	
P0.02	Control Mode	00: Direct 00: Reverse	00	
P0.03	Control Range	00: 4-20mA 01: 4-12mA 02: 12-20mA	00	
Display Parameters				
P1.00	Language	00: English 01: Spainsh 02: German 03: Chinese	00	
P1.01	Default Access Level	00: Admin 01: User	00	
***P1.02**	Admin Pass Code	0-999	462	
Digital I/O Parameters				
P2.00	Multi-function Input Terminal (DI1)	00: Input Disabled 01: Close Valve (N.O.) 02: Close Valve (N.C.)	00	
P2.01	Multi-function Output Terminal (DO1)	00: Output Disabled 01: Valve Full Open 02: Valve Closed 03: Fault	00	
P2.02	Multi-function Output Terminal (DO2)		00	
P2.03	Multi-function Output Terminal (DO3)		00	
P2.04	Output Logic	00: N.O. 01: N.C.	01	
Analog I/O Parameters				
P3.00	Loss of Control Signal	00: Continue Operation 01: Close Valve 02: Maintain Current	02	
P3.01	100% Valve Position	Press DISP/ENT to calibrate	Factory Calibrated	
Communications Parameters				
P4.00	IP Address	0.0.0.0 thru 254.254.254.254	0.0.0.0	
P4.01	Subnet Mask	0.0.0.0 thru 255.255.255.255	0.0.0.0	
P4.02	Gateway	0.0.0.0 thru 254.254.254.254	0.0.0.0	
P4.03	MAC Address	Set at Factory		
P4.04	Module ID	1 thru 63	1	
P4.05	Comm Time-Out	0-600	10	
* Parameter only visable when P1.01 = 01 User				

7 DETAILED PARAMETER LISTINGS

**Parameter
Number**

**Parameter
Name**

| P0.00 | Setpoint Source | Default Setting: 00: Analog Input |

Settings: 00: Analog Input
        01: Communications

This parameter sets the source of command signal

**Parameter Setting
Range**

**Parameter
Description**

**Parameter Default
Setting**

Control Valve Parameters

| P0.00 | Setpoint Source | Default Setting: 00: Analog Input |

Settings: 00: Analog Input
        01: Communications
This parameter sets the source of command signal

| P0.01 | Dead Band | Default Setting: 0.1 |

Range: 0.1 to 5.00%

To avoid continual correction of valve position, a deadband is added. This deadband is a percentage of valve position. When control valve is within deadband, no correction will be made, unit PV is out of the deadband.

| P0.02 | Control Mode | Default Setting: 00: Direct |

Settings: 00: Direct
         01: Reverse

This parameter selects the action of the control valve in relation to the Control Signal.

Setting 00: Direct Acting Mode – a 4mA control signal corresponds to"0" flow and a 20mA control signal corresponds to full flow.

Setting 01: Reverse Acting Mode – a 20mA control signal corresponds to"0" flow or closed valve and a 4mA control signal corresponds to 100% flow or full flow.

P0.03	**Control Range**	Default Setting: 00: 4-20mA

Settings: 00: 4-20mA

01: 4-12mA

02: 12-20mA

This parameter selects the control signal range that the valve responds to.

(Ex. When the parameter is set to "01", 4mA will correspond to "0" flow and 12mA will correspond to full flow.)

Display Parameters

P1.00	**Language**	Default Setting: 00: English

Settings: 00: English

01: Spanish

02: German

03: Chinese.

P1.01	**Default Access Level**	Default Setting: 00: Admin

Settings: 00: Admin

01: User

Sets the Default Access level for the SAV Plus where:

Admin = Full Access

User = Read Only Access

P1.02	**Admin Pass Code**	Default Setting: 462

Range: 0 to 999

Sets the Admin Pass Code

Digital I/O Parameters

P2.00	**Multi-function Input Terminal (DI1)**	Default Setting: 00: None

Settings: 00: None
01: Closed Valve (N.O.)
02: Closed Valve (N.C.)

Setting 00: No action

Setting 01 and 02: When a signal is received, the control valve will drive closed and the words "Closed Valve" will display on the LCD display and inhibit operation. To resume normal operation, these contacts must be cleared.

P2.01	**Multi-function Output Terminal (DO1)**	Default Setting: 00:None

P2.02	**Multi-function Output Terminal (DO2)**	Default Setting: 00:None

P2.03	**Multi-function Output Terminal (DO3)**	Default Setting: 00: None

Settings for P3.01 thru P3.03
00: None
01: Valve Full Open
02: Valve Closed
03: Fault

Setting 00: No action

Setting 01: Valve Full Open – The terminals will be activated when the valve is fully open.

Setting 02: Valve Closed – The terminals will be activated when the valve is fully closed.

Setting 03: Fault – The terminals will be activated when the Control Valve has a error or problem.

P2.04	**Output Logic**	Default Setting: 01: N.C.

Settings: 00: N.O.
01: N.C.

This parameter selects the Logic of the output contacts.

Setting 00: N.O. – Contact closure when alarm condition exists

Setting 01: N.C. – Contact opens when alarm condition exists

Analog I/O Parameters

| P4.00 | **Loss of Control Signal (AI1)**   Default Setting: 00: Cont. oper. by last command |

Settings: 00: Continue operation by last command
            01: Drive valve closed
            02: Maintain current valve position
 Action control valve should take in the event that the control signal is lost.

| P4.04 | **100% Valve Position**   Default Setting: Factory Calibrated |

This parameter is used to set the 100% valve position for Automatic Mode.

Communications Parameters

| P6.00 | **IP Address**   Default Setting: 0.0.0.0 |

Range: 0.0.0.0 to 254.254.254.254

If the Control Valve is controlled by communications, the IP address must be set via this parameter. Every component connected to the same network must have a unique IP address. Normally a network administrator will assign an IP address to each device on the network

WARNING: It is extremely important not to have duplicate IP Addresses on your network. If you are using the IP Address to link the Control Valve to any network devices (PCs or PLCs), the Control valve must have a unique number.

| P6.01 | **Subnet Mask**   Default Setting: 0.0.0.0 |

Range: 0.0.0.0 to 255.255.255.255

If the Control Valve is controlled by communications, the Subnet Mask must be set to the correct network class. If you do not know your Subnet Mask, ask your network administrator.

| P6.02 | **Gateway**   Default Setting: 0.0.0.0 |

Range: 0.0.0.0 to 254.254.254.254

If the Control Valve is controlled by communications, the Gateway must be set to the IP address of the Router. If you do not know your Gateway address, ask you network administrator.

| P6.03 | **MAC Address** | Default Setting: Set at Factory |

A unique Ethernet (MAC) Address is assigned to each module at the factory and will not change. The Ethernet (MAC) Address is a twelve-digit number with no deliberate relationship to your network or functional areas of your plant. It does not usually serve as a convenient and easily remembered identifier.

| P6.04 | **Module ID** | Default Setting: 1 |

Range: 1 to 64

If the Control Valve is controlled by communications, the Module ID must be set. The Module IDs must be unique for each Control Valve, but they do not have to be in sequence.

| P6.05 | **Comm Time-Out** | Default Setting: 10 |

Range: 0 to 600 Seconds

8 WEB INTERFACE MANAGEMENT & CONFIGURATION

All SAV Plus Control Valves include a build in Web Interface. Besides being easy to use, the Web Interface includes the following features:

- Easy viewing and setup of parameter settings

- Viewing and exporting of Event Log

- Firmware upgrade capability

- Backing up and restoring of configuration

- Remotely view status of unit

8.1 System Requirments
- PC with Network Interface Card (NIC)
- Windows operating system with Internet Explore 6.0 or higher

8.2 Establish Communication Link to PC

Setup the Communication Link

Connect Tronic Valve Plus Cross Over Cable P/N: TVP-EX015 to Communication Port of SAV Plus and Network interface card (NIC) on the PC.
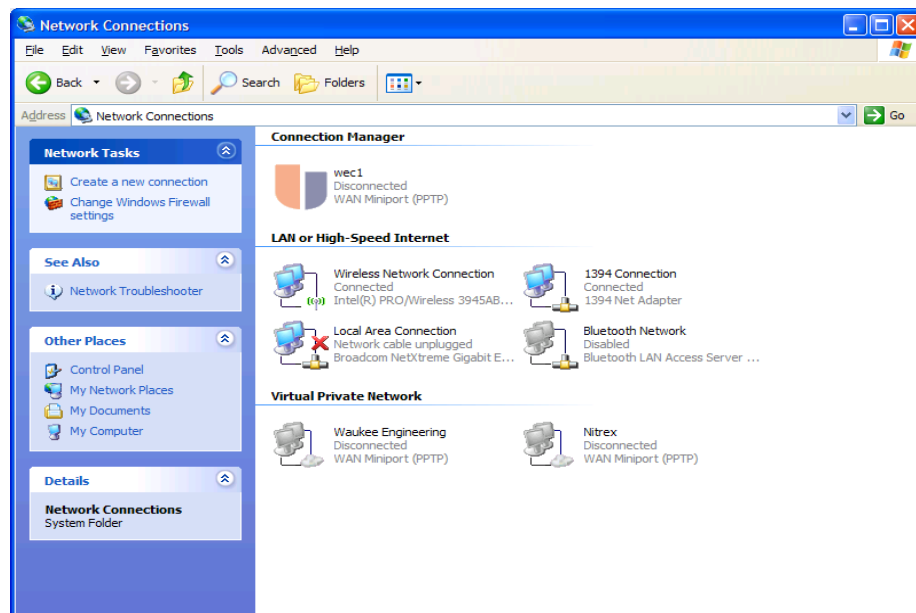
**Step 1:
Get IP Address
of Unit**

On the SAV Plus go to PROGRAM>COMMS GROUP>IP ADDRESS to get IP Address and go to the next parameter GATEWAY to get the gateway.
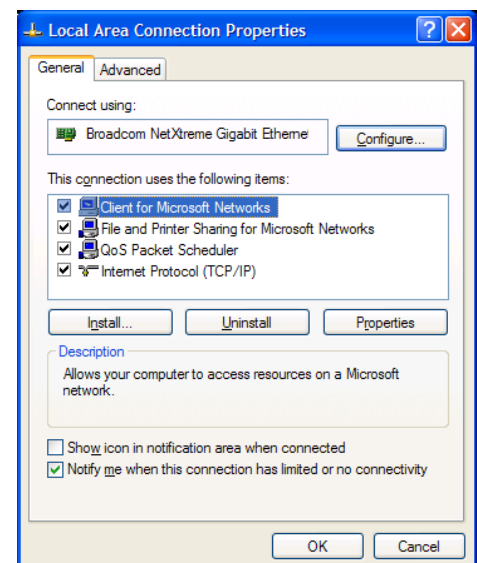
**Step 2:
Open
Connection
Manager on PC**

On the PC goto START>CONTROL PANEL> NETWORK CONNECTIONS to bring up the connection manager.

**Step 3:
Open Network
Properties**

Double-click on the connection that the SAV Plus is connected to. This will bring up the Network Properties for that connection

**Step 4:
Open Internet
Protocol
(TCP/IP)
Properties**

Double-click on "Internet Protocol (TCP/IP)" to bring up the Internet Protocol (TCP/IP) Properties.

Change Radio button to "Use the following IP address"

For the **IP address:** use the first three numbers that you noted from Step 1, the last number of the address can be anything between 0 and 255 as long as it is not the same as the SAV Plus. For example if the IP address of the SAV Plus is "192.168.5.23" you would type in the address as shown to the right. Notice the last number in the address is "10" but this could be any number other then "23"
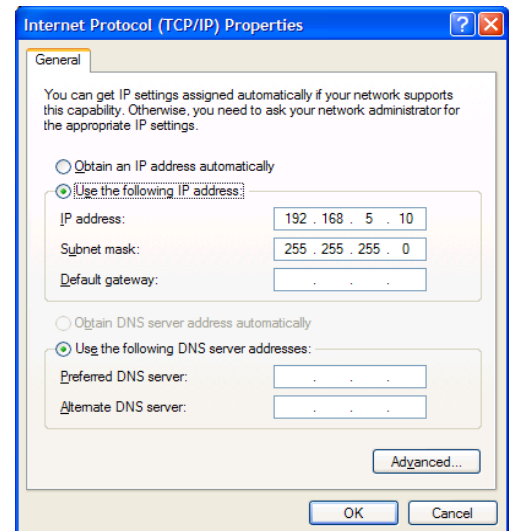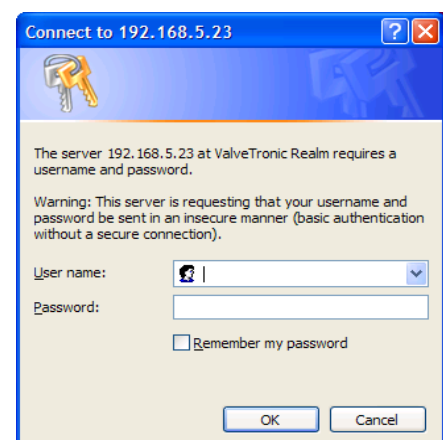
For the **Subnet mask** uses the same as noted in step 1 in this example it is 255.255.255.0

Leave all other fields blank and click on **OK**

**Step 5:
Open Internet
Explore**

Type the address of the SAV Plus as noted in step 1 into the address bar of Internet Explore and press **Enter**
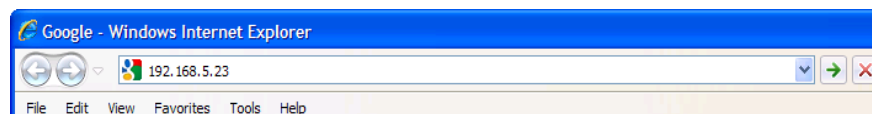
**Step 6:
Enter
credentials**

Enter **User name:** of "savadmin"

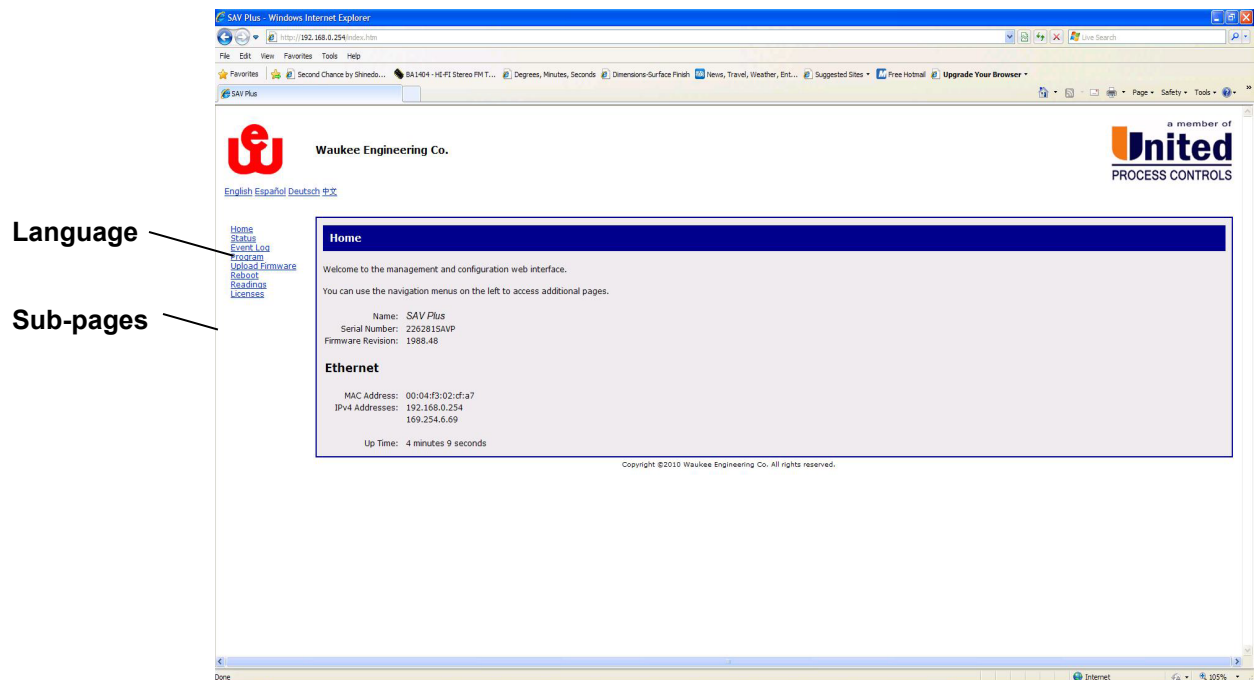Enter **Password:** of "savapw"

Then Click on **OK**

8.3   Exploring the Interface

Now that your PC and SAV Plus are linked together you will be able to perform any tasks via the web interface. The Web interface works just like any website which makes it very easy to navigate.

Home Page

Language: Select desired language

Sub-pages: Click on the text to goto the desired sub-page.

Name: Shows the Product Name
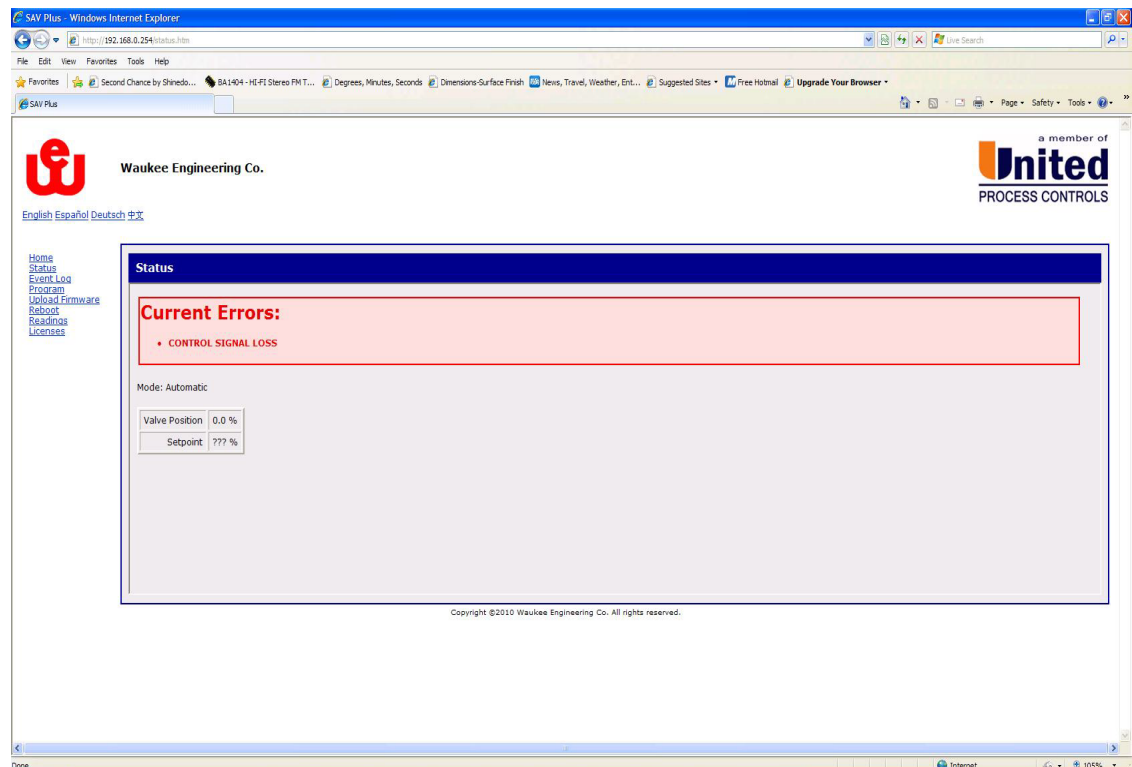
Serial Number: Shows Serial Number of Unit

Firmware Revision: Shows the current firmware version

MAC Address: Shows the MAC address of the Unit

IPv4 Address: Shows the IP Address of the Unit

Status Page

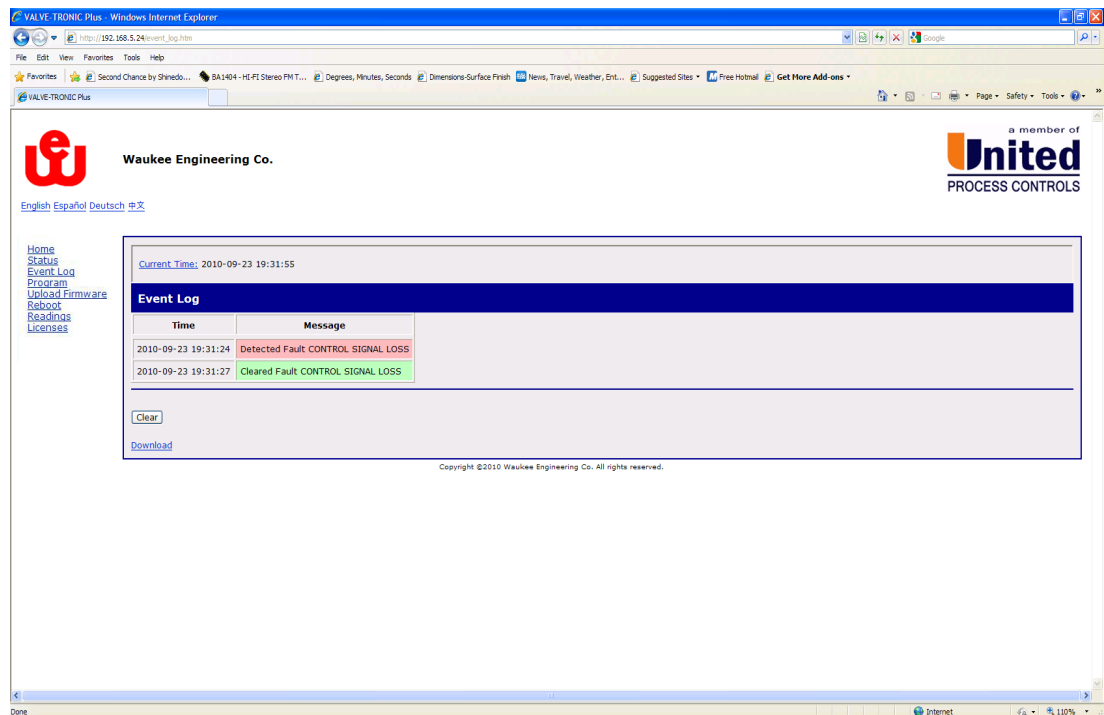**Current Errors:** Shows a list of current errors

Mode: Shows the current mode of operation (Auto or Manual)

Valve Position: Show the current valve position in % open

Setpoint: Shows the current setpoint in %

**Event Log
Page**

Current Time: Shows the current date and time set in the unit. To change the date and time, click on **_Current Time_**.

The time and date set in "Current Time" is used for the time stamp in the event log

Event Log: Shows the last 200 events

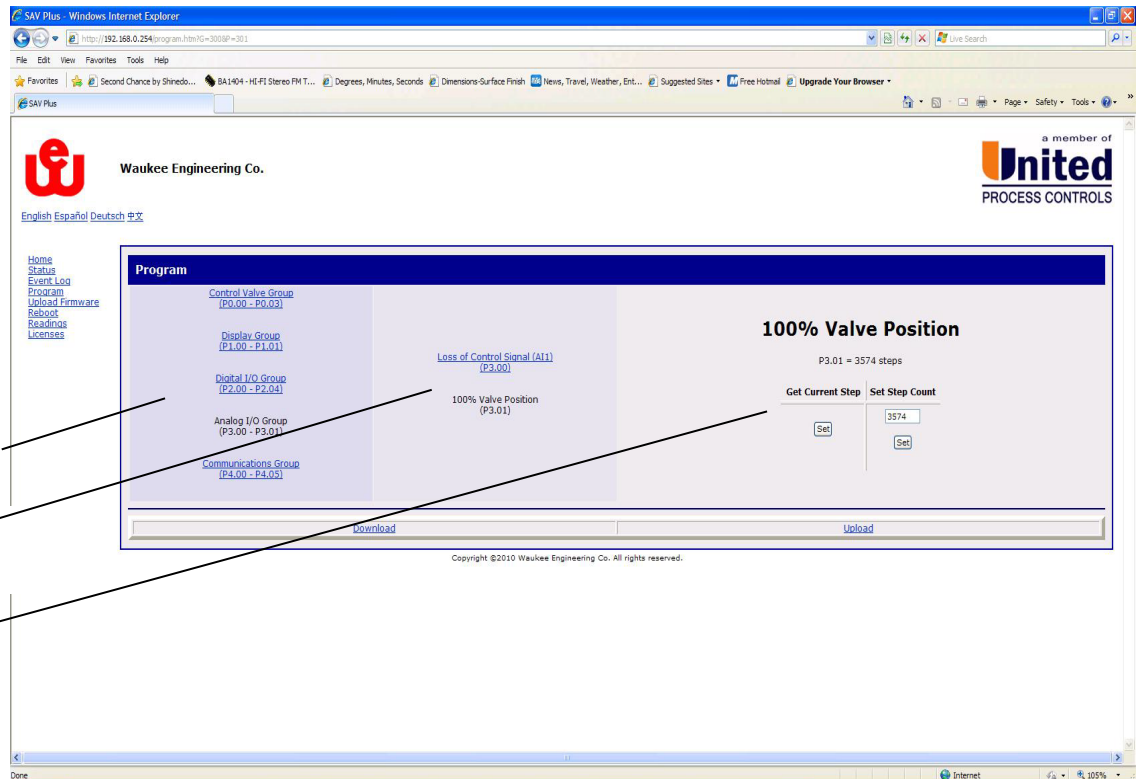**Clear: C**lears the event log when clicked

Download: Downloads the Event log in text format when clicked. This allows the event log to be sent to the factory or technincian if requested during troubleshooting.

Program
Page

Parameter
Group

Parameter
Sub Group

Parameter
Setting

Parameter Group: Shows a list of parameter groups

Parameter Sub-Group: Shows a list of parameters within a group

Paramater Setting: Shows the currently selected paramter value.
Selecting the data entry field will allow a new value to
be entered. Once desired value is entered click *Set.*

Download: Downloads the configuration file to you PC.

Upload: Allows you to upload a configuration file into the Valve-Tronic.
Click *Browse* to find a configuration file and then click
Upload to send the configuration file to the SAV Plus.
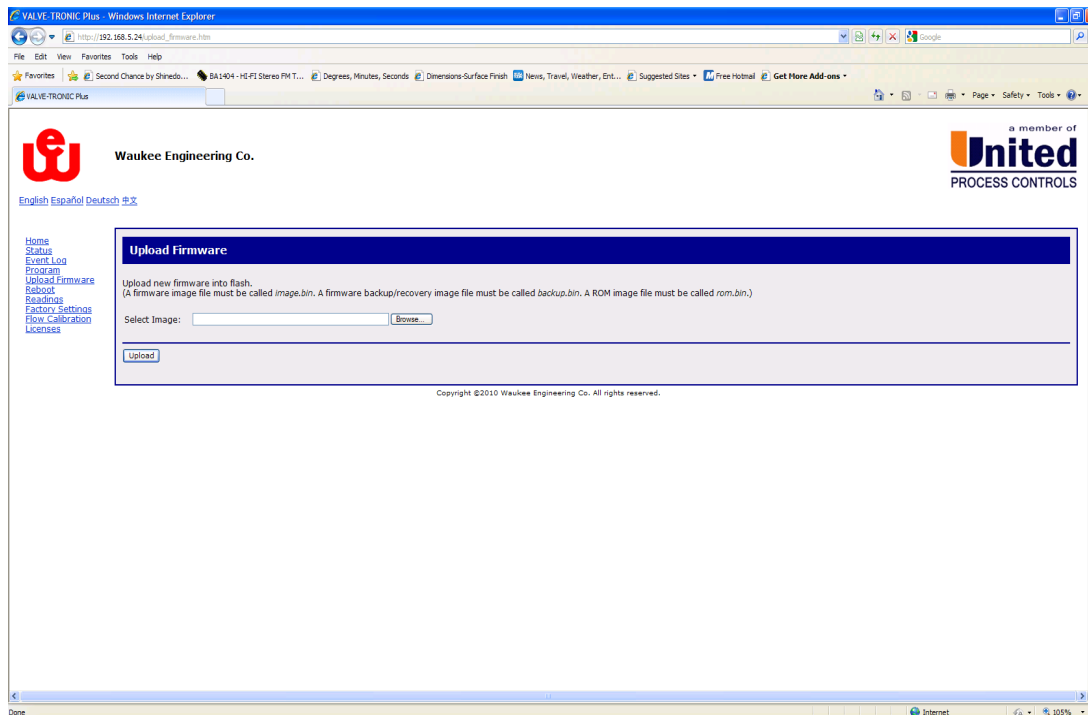
To upload a new firmware into the SAV Plus. Click on *Browse* to locate
the image file and then click on *Upload* to upload the firmware to the
SAV Plus.

WARNING: DO NOT remove power from the SAV Plus or PC during
firmware update. Failure to maintain power during update may result in
the unit becoming inoperatable and require sending it back to the factory
for repair.

**Reboot
Page**

Some parameter changes my require a reboot to take effect, but clicking
on *Reboot* it will force the unit to reboot.
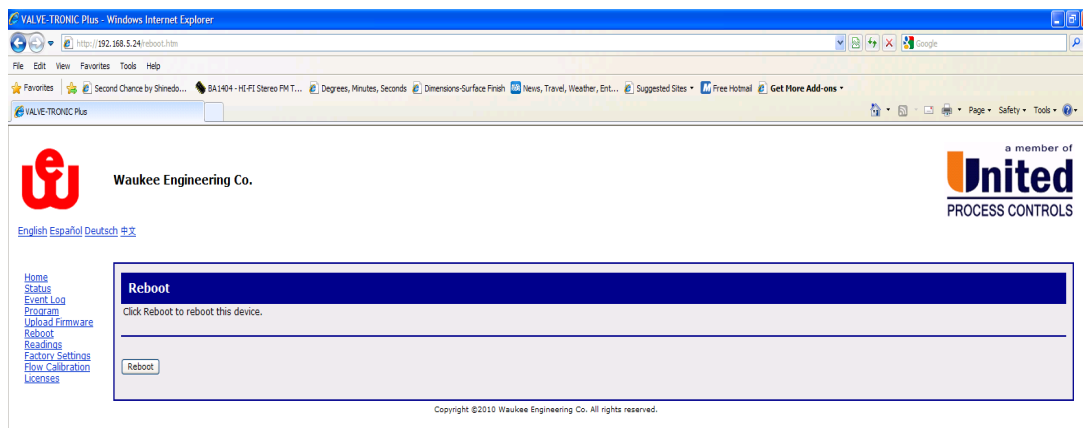
9 MODBUS COMMUNICATIONS

9.1 MODBUS TCP

MODBUS TCP is essentially the serial MODBUS RTU protocol encapsulated in a TCP/IP wrapper. MODBUS RTU is used for serial communications between a master and slave(s) devices. MODBUS TCP is used for TCP/IP communications between client and server devices on an Ethernet network. The TCP version of MODBUS follows the OSI Network Reference Model. For more information on MODBUS communication visit www.modbus.org

Supported MODBUS Function Codes
The following MODBUS function codes are supported by the SAV Plus.

MODBUS Function Code	Function
02	Read Input Discretes
03	Read Multiple Registers
04	Read Input Registers
06	Write Single Register
16	Write Multiple Registers

Determining the MODBUD Address
There are typically two ways that most MODBUS addressing conventions allow you to specify a memory location. These are:
- By specifying the MODBUS data type and address
- By specifying a MODBUS address only

If your Server Requires the Data Type and Address
Many MODBUS TCP clients allow you to specify the MODBUS data type and the MODBUS address that corresponds to the units memory location. This is the easiest method, but not all packages allow you to do it this way. From the tables on the following pages you would use the Hexadecimal and MODBUS Data Type.

If your Server Requires an Address ONLY
Some MODBUS TCP clients do not allow you to specify the MODBUS data type and address. Instead, you specify an address only. From the tables on the following pages you would use the MODBUS Decimal.

10 CONTROL VALVE MEMORY ADDRESSES

10.1 Parameter Memory Addresses

The parameters in the following list must not be written to on a continous basis as to do so will damage the EEPROM greatly reducing its useful life.

Parameter Addresses					
Parameter	Description	MODBUS Decimal	Hexadecimal	MODBUS Data Type	MODBUS Data Type
Control Parameters					
P0.00	Setpoint Source	40006	0x0006	Holding Register	UNIT16
P0.01	Dead Band	40011	0x000B	Holding Register	UINT16*10
P0.02	Control Mode	40040	0X0028	Holding Register	UINT16
P0.03	Control Range	40041	0X0029	Holding Register	UINT16
Digital I/O Parameters					
P2.00	Multi-function Input Terminal (DI1)	40021	0X0015	Holding Register	UINT16
P2.01	Multi-function Output Terminal (DO	40022	0X0016	Holding Register	UINT16
P2.02	Multi-function Output Terminal (DO	40023	0X0017	Holding Register	UINT16
P2.03	Multi-function Output Terminal (DO	40024	0X0018	Holding Register	UINT16
P2.04	Digital Output Logic	40052	0X0034	Holding Register	UINT16
Analog I/O Parameters					
P3.00	Loss of Control Signal	40031	0X001F	Holding Register	UINT16

10.2 Status Addresses

Status Addresses				
Description	MODBUS Decimal	Hexadecimal	MODBUS Data Type	Data Type
Status Monitor 1 (Read Only)	30001	0x0001	Input Register	UINT16
Setpoint	40001	0x0001	Holding Register	INT16*10
Valve Position (Read Only)	30021	0X0015	Input Register	INT16*10
Digital Input (Read Only)	10001	0x0001	Discrete Input	Binary
Home Switch (Read Only)	10002	0x0002	Discrete Input	Binary
Alarm 1 (Read Only)	10003	0X0003	Discrete Input	Binary
Alarm 2 (Read Only)	10004	0x0004	Discrete Input	Binary
Alarm 3 (Read Only	10005	0x0005	Discrete Input	Binary

10.3 Status Monitor 1 Error Codes

Status Monitor 1 Error Codes (30001)	
Error	**Bit Number**
Control Signal Loss	4
Control Signal Over Range	5
Motor Failure	8
Closed Valve	9
Home Cal OK?	10
Home Switch Failure	11
Comm Time-Out	12
Overheat	13

10.4 Memory Location and Data Types

Generally you have many different types of information to process. This includes input device status, output device status,etc. It is important to understand how the system represents and stores the various types of data. For example, you need to know how the system identifies input points, output points and data words. The following paragraphs discuss the various memory types used in SAV Plus's.

Data Type Check
If you are unsure of the format of a data type you can read the registers as shown in the below table and they should report the values as shown.

Data Type Check Registers				
Description	**MODBUS Decimal**	**Hexadecimal**	**MODBUS Data Type**	**Register Value**
INT32 Check	30100, 30101	0x0064, 0x0065	Input Register	0x12345678 = 305419896
Float32 Check	30103, 30104	0x0067, 0x0068	Input Register	123.321
INT16 Check	30106	0x006A	Input Register	0X1234 = 4660

Discrete and Word Locations
As you examine the different memory types,you'll notice two types of memory in the SAV Plus, discrete and word memory. Discrete memory is one bit that can be either a 1 or a 0. Word memory is referred to as V-memory (variable)and is a 16-bit location normally used to manipulate data/numbers, store data/numbers, etc.

Word Memory
The word memory area is for data. The SAV Plus utilizes a couple of different data types. Some types of words are shown with a multiplier, the value has been multiplied before put into its regester. To interpret the value correctly, the value that is read from the register must be divided by this same amount. See Example 1 below.

Example 1: If you would like to know the "Valve Position" , which is MODBUS Address 30021 and has a data type of UINT16*10. So if this register contains the value 523 the valve position would be 52.3% (523÷10)

Status Monitor 1
The Status Monitor 1 is a 16 bit word located at MODBUS address 30001 and it is a bit field, so when a bit is set to a logic 1 it indicates that error condition exists.

Example 2: If you look at the table below you will see the value contained in the register is 000010000010000 which shows bit # 4 and #11 are active so the SAV is reporting an error of "Home Switch Failure" and "Control Signal Loss" if the register contained all zero's that would indicate that no error conditions exist.

Value	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	N/A	N/A	Overheat	Comm Time-Out	Home Switch Failure	Home Cal OK?	Closed Valve	Motor Failure	N/A	N/A	Control Signal Over Range	Control Signal Loss	N/A	N/A	N/A	N/A

11 TROUBLESHOOTING

11.1 Error Messages

The Control Valve has a comprehensive diagnostic system that includes several different error messages. The error messages are displayed on the digital keypad LCD display.

Error Messages	
Error Name/Description	**Corrective Actions**
MOTOR FAILURE Internal Stepper Motor Failure	1. Try to free up motor using Manual overide valve located on top of unit. 2. Contact Waukee Engineering for assistance
CLOSED VALVE Closed Valve contacts open	1. If Digital Input (DI1) is not being used set P3.0 to "00: None" 2. Check and verify all connections to controller
HOME CAL OK? zero valve position	1. Press DISP/ENTER key to OK calibration.
HOME SW FAILURE Home Switch Failure	1. Home Switch out of adjustment, contact Waukee Engineering for assistance
CONT SIGNAL LOSS Loss of Control Signal	1. Check all conections to Controller 2. Check if control signal is within 4-20mA range
CONT SIGNAL OVER Control Signal above 21mA	1. Check all conections to Controller 2. Check if control signal is within 4-20mA range
OVER HEAT Unit is too Hot	1. Shield Unit from any Heat Sources

12   CUSTOMER SUPPORT

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