SINGER VALVE
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Singer Process Multi-Application Controller (SCP-TP)

Instruction, Operation, and Maintenance Manual

IOM A-9124A1
FOR USE WITH 120VAC MODEL ONLY
Revision 0.0

Table of Contents

Health and Safety: Read First

Read the health and safety information before using the SCP-TP Single Process Multi-Application Controller. Specific warning and caution statements, where they apply, will be found throughout the manual.

- "Warning" statements identify conditions and actions that pose hazard(s) to the user.
- "Caution" statements identify conditions and actions that may damage the SCP-TP.

This manual is produced to enable a competent user to install, operate, program, and calibrate the SCP-TP. The electrical installation and use of device should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

Only persons competent by virtue of their training or experience should be allowed to install, program, and/or operate the product. Work undertaken must be carried out according to the instructions in this manual. Users working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the health and safety of their workplace.

Where appropriate, the user must ensure that the SCP-TP is suitably protected against its operating environment.

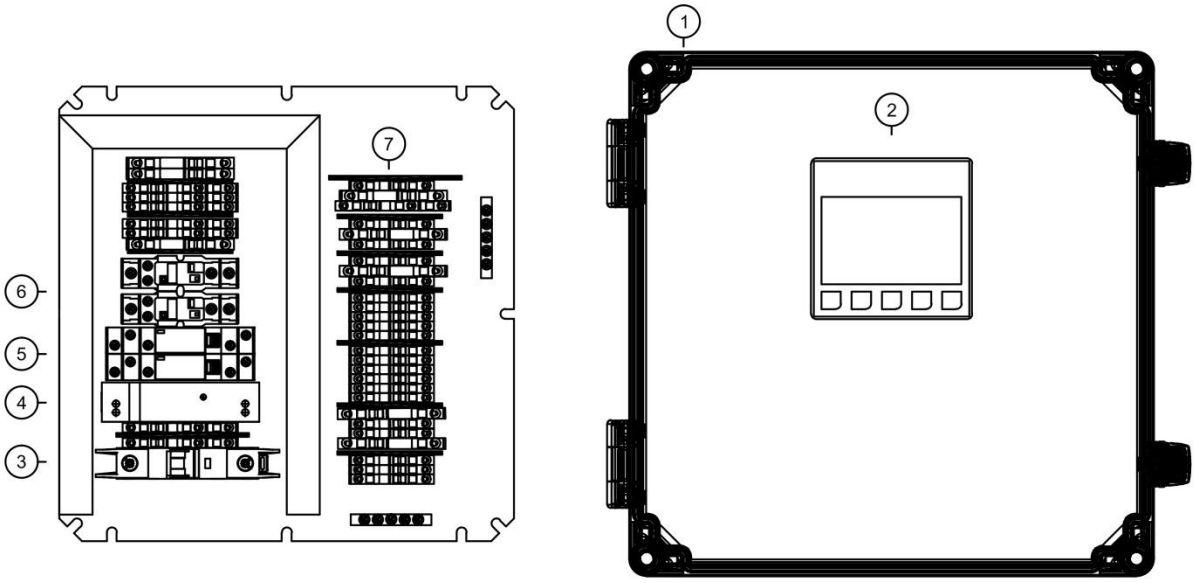
WARNING: When installing, operating, and maintaining equipment where hazards may be present, you must protect yourself by wearing Personal Protective Equipment (PPE) and be trained to enter confined spaces.

General Information:

The SCP-TP Single Process Multi-Application Controller is a single controller designed to complement the Singer Model 2SC-PCO Dual Solenoid Control Valves, PT-4SC Electronic Control Valves, valves equipped with the 420DC Motorized Pilot Actuator.

The range of the application is dependent on the process variable (feedback) transmitter used, which includes, but not limited to, common automatic control valve functions such as flow control, downstream pressure control, upstream pressure sustaining, and valve positioning. The controller can be used for open loop process indication and control of our 420DC Motorized Pilot Actuator and On-Off Control for level applications.

Standard Control Panel Layout:



1. Enclosure
2. Controller
3. Circuit Breaker
4. DC Power Supply
5. Solid State Relays
6. Mechanical Relays
7. Field Wiring Terminal Strip

Technical Specification:

Standard Equipment:

General:

Display:	Coloured Touch Screen Interface (standard)
AC Supply:	120VAC, 60 Hz
Current Consumption:	Typical: 0.6A Full Load: 5A
Sensor DC Supply:	24VDC, 2.5A
Operating Ambient:	-10 to +60ºC (14 to 140 ºF)
Storage temperature:	-10 to +60ºC
Relative Humidity:	5 to 90% RH non-condensing
Enclosure Material:	Polycarbonate (standard)
Enclosure Rating:	NEMA Type 4, 4X, 12, 13 IEC 60529, IP 66,67
Safety standards:	UL 508A Industrial Control Panel
Installation Location:	not suitable for use in hazardous locations or for use with devices that are installed in hazardous locations
Atmospheres:	not suitable for use above 2000m or in explosive or corrosive atmospheres. Electrically conductive pollution must be excluded from the cabinet in which this controller is mounted
Digital Input Rating:	24VDC, 2.4mA Max
Digital Output Rating: (Dry Contacts)	min: 24VDC, 15A max: 250VAC, 15A
Solenoid Relay Output: (Solid State Relays)	120VAC, 1A Max
Analog Inputs:	
Process Variable:	4-20mA. All configurable between limits
Remote Setpoint:	4-20mA. All configurable between limits
Analog output:	
Signal Type:	scaleable 4-20mA signal (non-isolated)
Retransmission Options:	Process variable, Setpoint, or 420DC Actuator Control Signal
Resolution:	12 bits
Clock Accuracy:	+/- 1 minute/month at 25°C
Datalogging:	Yes, adjustable sampling frequency up to 1 sample/sec
Removable Media:	MicroSD card (not included) Capacity limited to 32GB
Communication:	Modbus over Ethernet Modbus over Serial
Dimensions:	
Polycarbonate Enclosure:	11.34”(288mm) Length x 11.34” (288mm) Width x 6.81” (173mm) Height

Field Wiring Terminal Strip:

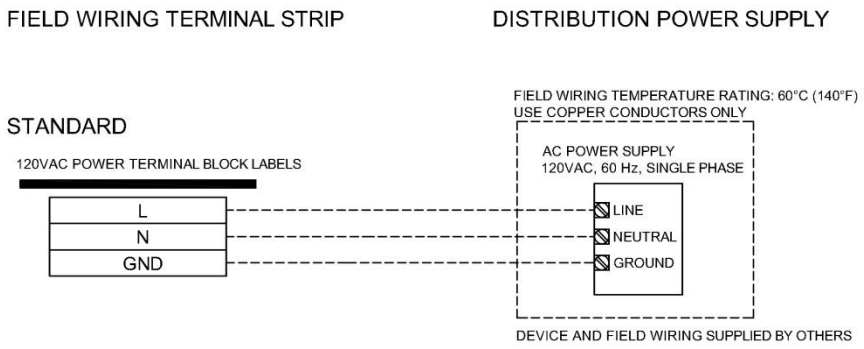
For ease of use, all field connections are to be terminated at the terminal strip. The terminal strip uses spring-cage terminal blocks to eliminate the need for torque requirements of screwed connections and guarantees a vibration-proof connection with long-term stability. The terminal blocks accept wire sizes from 0.08 to 4 mm^2 (28 – 12 AWG).

See Control Panel Wiring Schematic for full Terminal Strip details.

Power Supply Wiring Diagram:

Note: Check the control panel nameplate for power supply requirements.

Note: The electrical installation and use of the device should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

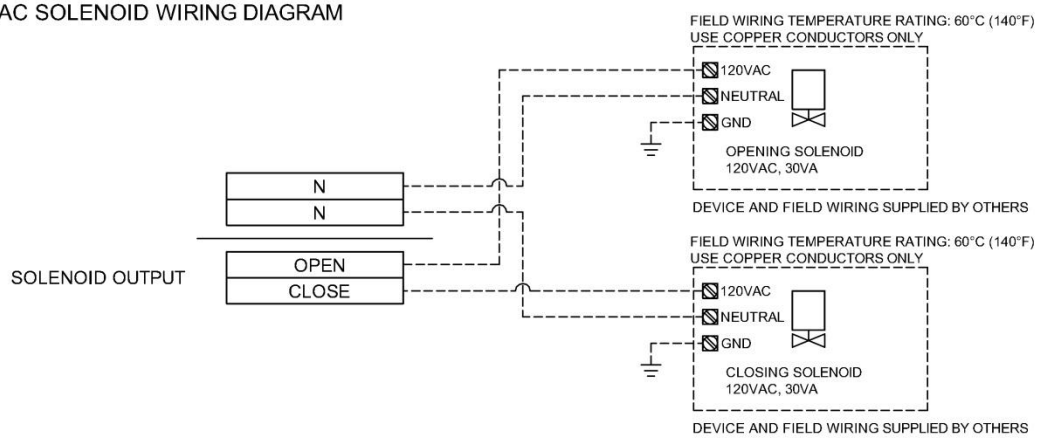


Solenoid Wiring Diagram:

WARNING: Before wiring the solenoid, confirm the solenoid voltage. The supply voltage of the control panel and the solenoid should be the same for the system to operate properly. Failure to comply will result in solenoid malfunction and/or failure.

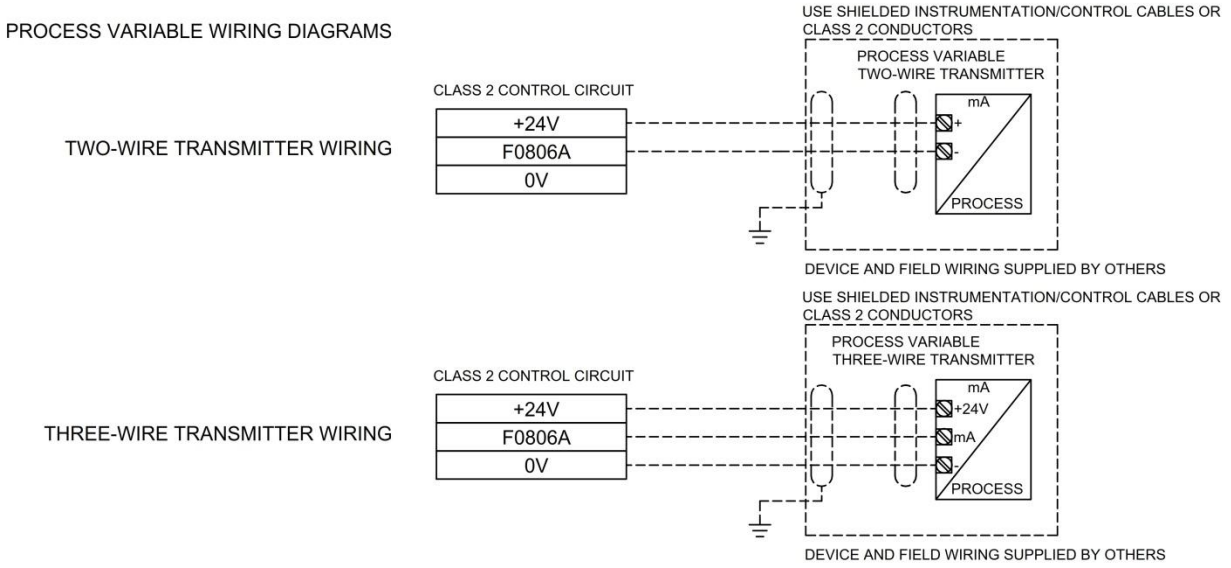
CAUTION: Do not wire solenoids that exceed the voltage, amp, or volt-amp ratings specified on the wiring diagram.

120VAC SOLENOID WIRING DIAGRAM



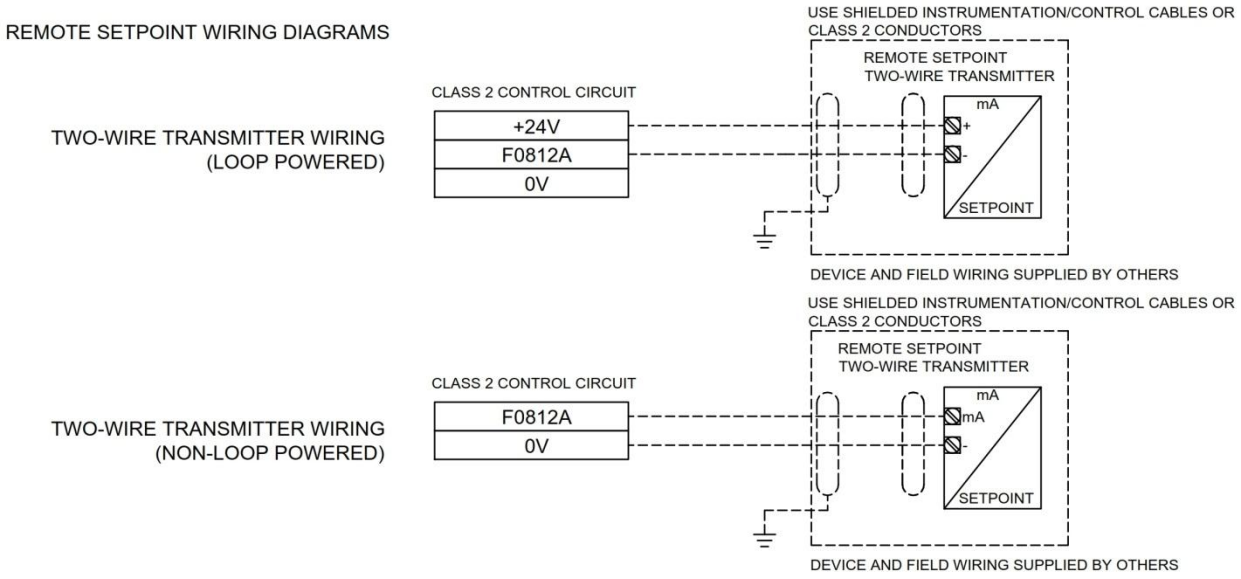
Transmitter Wiring Diagram:

The transmitter input of the SCP-TP uses a 4-20mA signal.



Remote Setpoint Wiring Diagram:

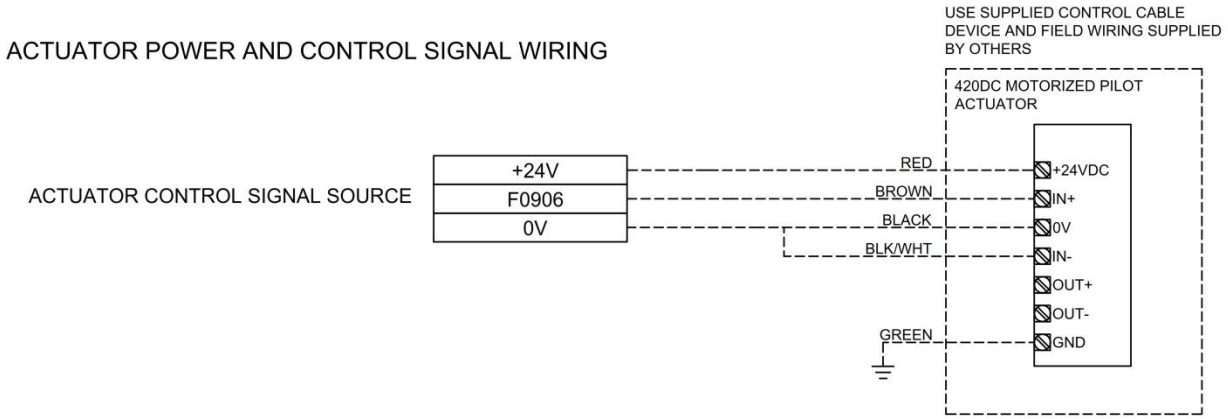
The remote setpoint input of the SCP-TP uses a 4-20mA signal.



Note: The control panel monitors the health of the control signals and its loss is indicated by an alarm. An alarm relay can be set to remotely monitor the status of the process variable and remote setpoint.

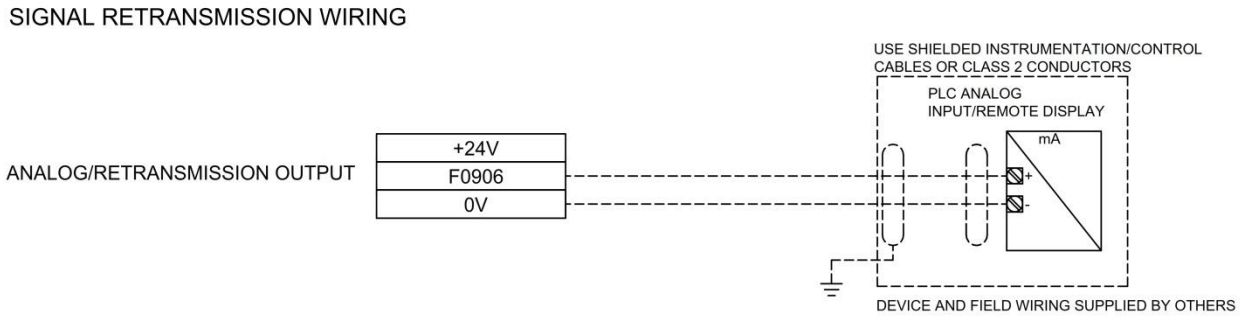
420DC Motorized Actuator Wiring Diagram:

The analog output can be used as a signal source for the 420DC Motorized Actuator.



Signal Retransmission Wiring Diagram:

The analog output can be used to retransmit the process variable to eliminate the need for a signal splitter. It can be wired to a PLC analog input or a remote display.



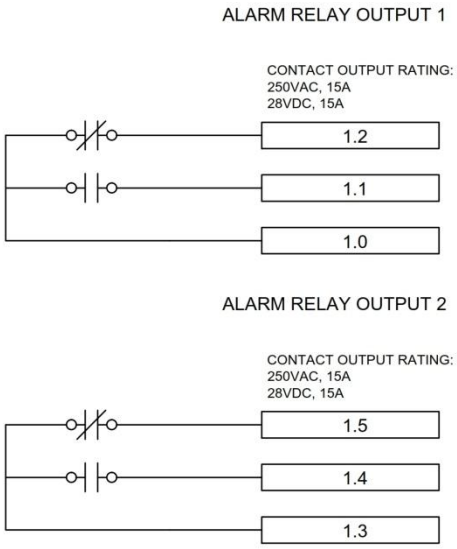
Alarm Wiring/Digital Output Wiring:

The controller is equipped with two mechanical relays for alarms, indication, or control. Device and field wiring shall be supplied by installer.

WARNING:

1. **Do not wire loads that exceed the contact ratings**
2. **For AC general use, use loads with a steady state current draw of up to 10% of the contact rating or 1.5A maximum**
3. **For DC general use, use loads with a steady state current draw of up to 10% of the contact rating or 1.5A maximum**
4. **If using a voltage source external to the control panel, use a properly-sized overcurrent protection device.**

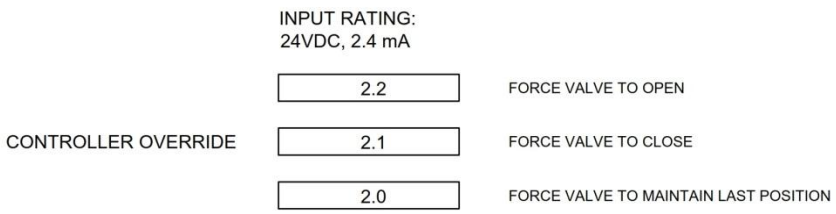
   Disconnecting means and/or branch circuit protection shall be provided by installer.



Controller Override/Digital Input Wiring:

The controller has built-in hardware overrides. Device and field wiring shall be supplied by installer.

WARNING: The digital inputs can take 24VDC ONLY. Wiring an AC voltage to the input will immediately damage the controller.



PID Control for Dual Solenoid Control Valves:

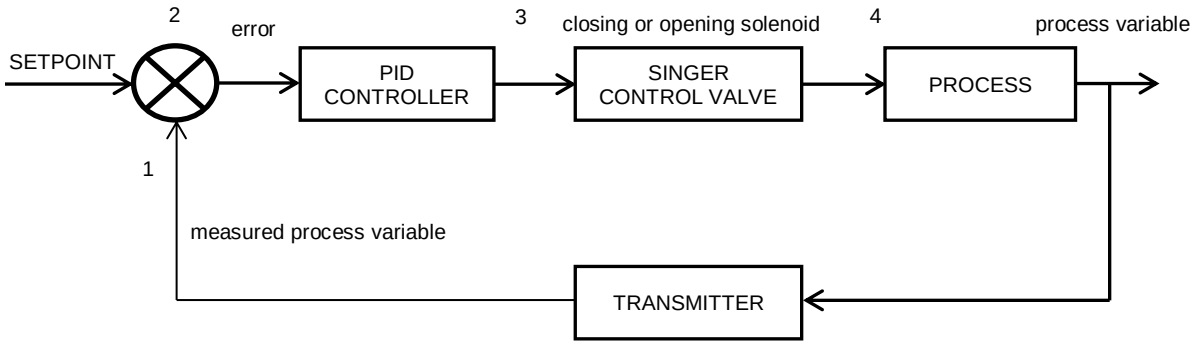
A PID Controller is a closed-loop feedback mechanism that calculates the difference between the process variable and the setpoint; otherwise known as the error. Using the measured process variable, the controller attempts to minimize the error by manipulating the process variable thru the control valve. In general, Singer Control Valves can be controlled thru the use of solenoids.

NOTE: PID Control is recommended for fast processes such as flow, pressure, and valve position.

PID Controller: How it Controls the Solenoids

The PID controller is designed to actuate two solenoids through the use of Pulse Width Modulation, and can be described by the diagram below.

Closed-Loop Feedback Control Diagram:



1. The controller receives an analog input signal (ie. 4-20mA) and converts the signal to a value within the range of the transmitter.

2. The controller compares the measured process variable with the setpoint value, and generates an error.

3. The error passes through the PID Control Algorithm where a controller output is generated.

4. If the controller output is negative, the closing solenoid will be active, and if the controller output is positive, the opening solenoid will be active. The duration of the pulse is determined by the controller output from 0% - 100% of duty cycle. For example, a 50% controller output with a duty cycle set at 2 seconds will generate a pulse that will turn on the opening solenoid ON for 1 second and OFF for 1 second.

   By pulsing the opening or closing solenoid, the control valve can be positioned from 0% to 100% open.

5. The opening or closing of the control valve manipulates the process variable and is measured by the transmitter.

On/Off Control for Dual Solenoid Control Valves:

An On/Off controller is a closed-loop feedback mechanism that only switches between two states: On or Off. An On/Off Controller does not modulate the pulse of the solenoids. For this type of control, the solenoids are either fully on or off; in turn, allows the control valve to go fully open or fully closed.

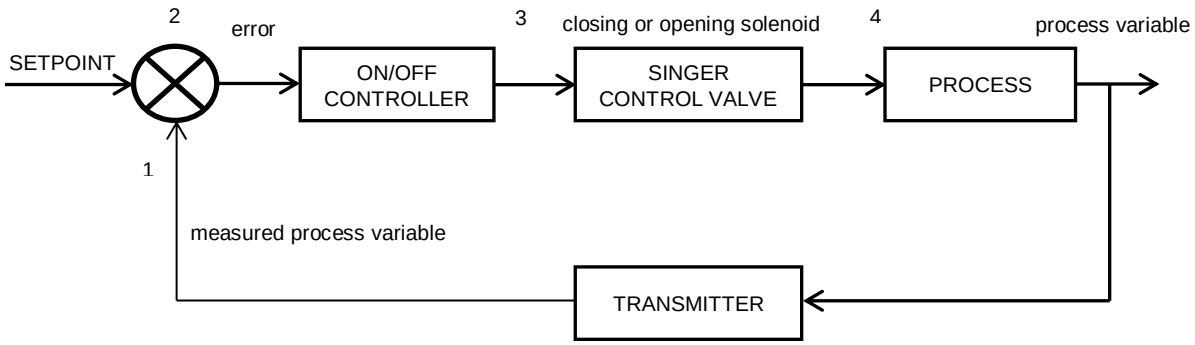
The control system is designed with hysteresis and includes an adjustable deadband. A deadband is region around the setpoint in which no control occurs.

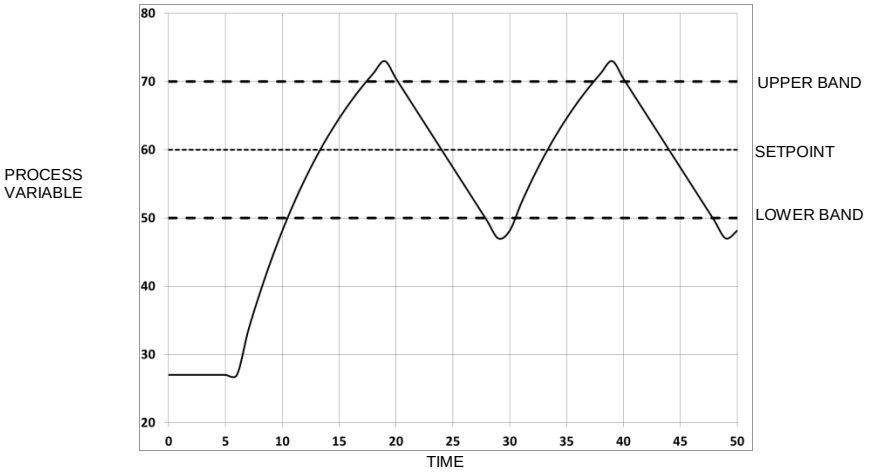
NOTE: On/Off Control is recommended for large integrating processes such as tank level.

On/Off Control: How it Controls the Solenoids

The On/Off controller is designed to actuate two solenoids when the process falls below or rises above the deadband.

Closed-Loop Feedback Control Diagram:





1. The controller receives an analog input signal (ie. 4-20mA) and converts the signal to a value within the range of the transmitter.

2. The controller compares the measured process variable with the deadband.

3. Opening Solenoid:

   If the process variable is below the Lower Band, the controller actuates the opening solenoid to open the valve. If the process variable rises above the Lower Band, the opening solenoid stops actuating, and the valve stays in its last position.

   Closing Solenoid:

   If the process variable is above the Upper Band, the controller actuates the closing solenoid to close the valve. If the process variable falls above the Upper Band, the closing solenoid stops actuating, and the valve stays in its last position.

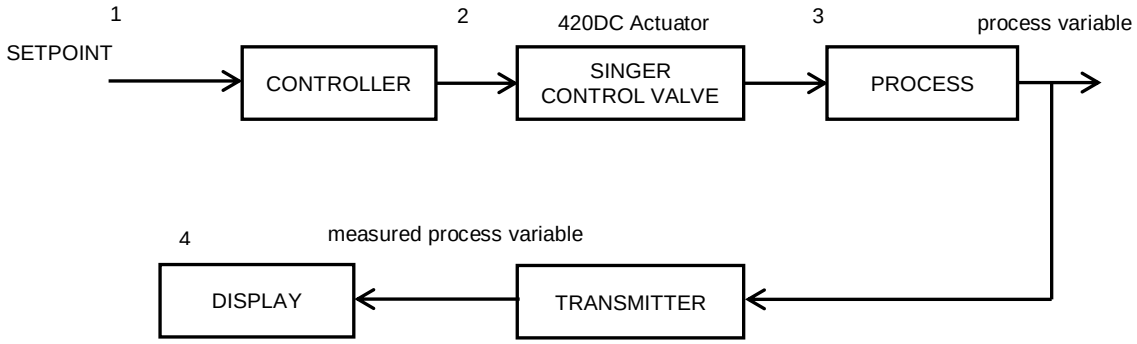
4. From the chart above, the On/Off control allows the process to modulate around the setpoint.

NOTE: **This type of control is ideal for large tanks as it allows the valve to actuate to its fully open or fully closed position. The benefit of On/Off control is less wear and tear on the components because of intermittent operation. Note that the time scale can be in hours.**

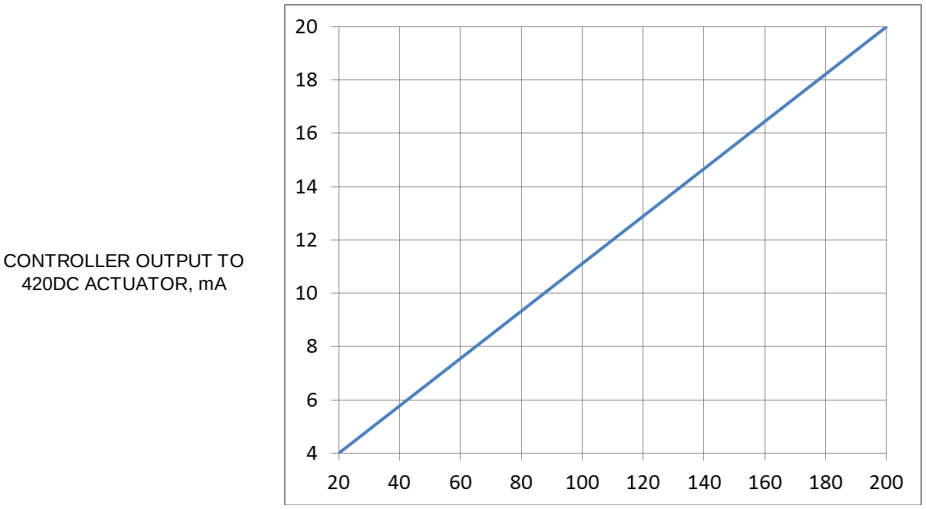
420DC Motorized Pilot Actuator: Open-Loop Control

The actuator controller is open loop controller. It is a non-feedback mechanism that calculates the output based on the input (ie. setpoint) and model of the system (ie. pilot).

Open-Loop Control Diagram:



420DC Actuator Control Model:



1. The controller receives a setpoint.
2. A control output to the actuator is generated based on the setpoint given.
3. The 420DC Motorized pilot actuator changes the setpoint of the pilot/regulator based on its calibrated range.

   Note: Setpoint range must match 420DC Actuator calibrated range

4. The measured process variable is displayed.

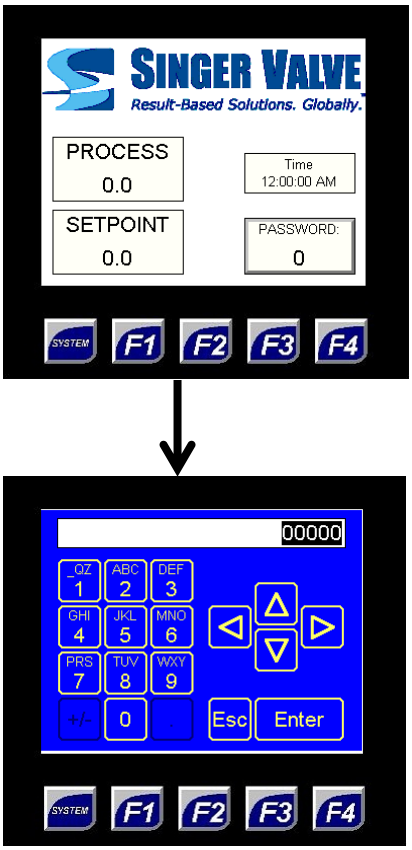
Controller Operation:

Before powering the controller…, verify the following:

- Power supply voltage must correspond to that specified on the label of the controller or electrical wiring schematic.
- Electrical wiring must be wired as shown in the wiring diagram in this manual or the supplied electrical wiring diagram (ie. if factory wired in an enclosure).
- Verify that the power supply voltage requirements of the solenoids correspond to the power supply of the controller.

Accessing the Additional Levels

Access to the configuration level is protected by a password to prevent unauthorised access.



The following screen appears on controller start-up.

Press the PASSWORD display to proceed.

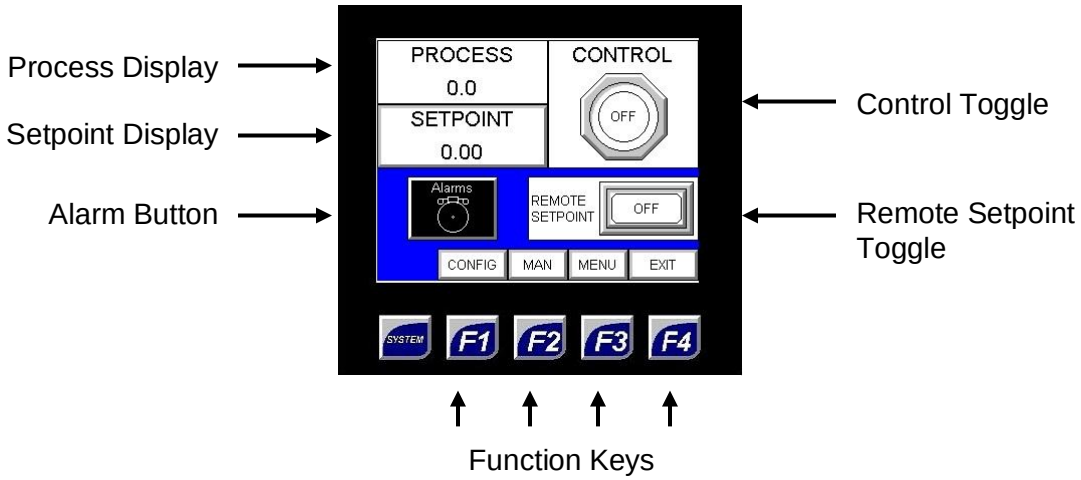
Enter the default Administrator password, 9998, for full access.

Enter the default Operator password, 9999, for limited access.

Menu Navigation:

To navigate through the menus and individual parameters of the controller, the following conventions are used:

Front Panel Layout (Main Display):

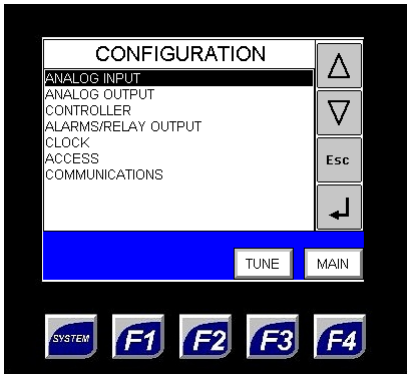


Button/Indicator:

Process Readout	Measured process value
Setpoint Readout	Setpoint
Alarm Button:	View, clear, and/or acknowledge active alarms
Control Toggle:	Turn the controller ON or OFF
Remote Setpoint Toggle:	Turn the remote setpoint ON or OFF
Function Keys:	Go to the function labelled above the key. (ex. press the F1 key to access the Configuration Menu)

Parameters and How to Access Them

Parameters are settings, within the controller, that determine how the controller will operate. The parameters are arranged in menus.



A menu header can be recognized by the fact that it always shows the name of the menu.

Some menu structures or parameters may not be available depending on access rights and control type. For example, Operators are unable to access the Configuration Menu; however, Administrators have the right.

To step through the available menus, press the appropriate Function Key .

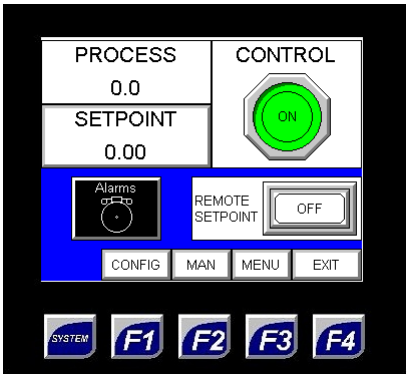
To step through the parameters within a particular list, press △ or ▽.

To change the value of a parameter or to step through a sub-menu, press ↵ .

To exit a sub-menu or parameter, press Esc .

Automatic Mode:

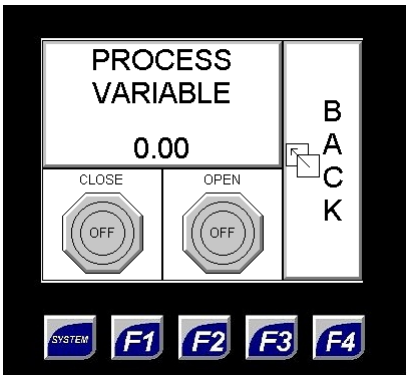
In a closed-loop control system, the controller has to be in automatic mode. If the CONTROL is OFF, press the control button to toggle the control from OFF to ON. To be in automatic mode:



- Check that CONTROL is ON
- The upper readout shows the measured process variable.
- The lower readout shows the setpoint.

Manual Mode:

In Manual Mode, the operator can manually open or close the valve via the touchscreen interface. From the Main Display (as shown above), press the F2 Key.

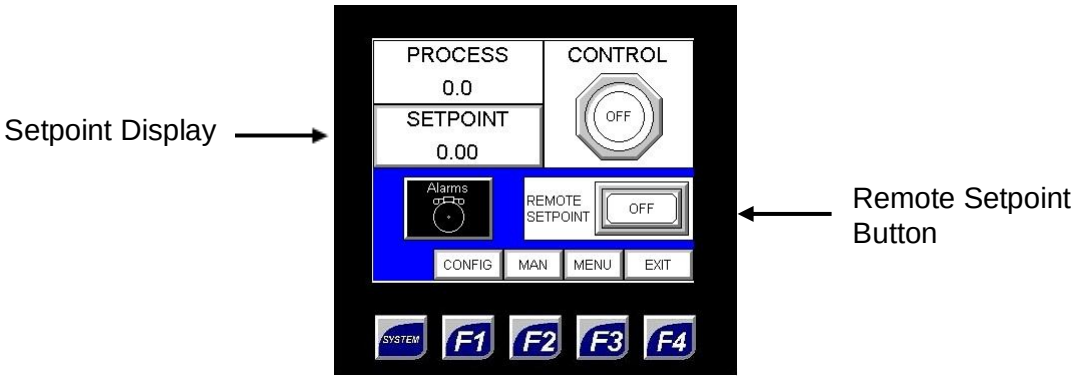


- To open the valve, press the OPEN button. The button will display ON when output that controls the open solenoid is ON.
- To open the valve, press the CLOSE button. The button will display ON when output that controls the close solenoid is ON.
- Available only if the valve is configured for dual solenoid control.

Note: When the controller is on Manual Mode screen, all automatic functions of the controller will be disabled. The controller monitors whether the screen is on Manual Mode or not, and the status can be remotely monitored using Alarm relays. See the Alarm section of this manual for more information.

Setpoint Entry:

The controller is capable of taking an input from multiple sources.



To input a setpoint locally:

a. Touch the setpoint display to enable setpoint entry
b. A keypad will pop-up
c. Enter the setpoint, press Enter

To input a remote setpoint, there are two methods: analog and digital.

Analog:
a. Wire an analog input signal, 4-20mA, to the Remote Setpoint Input.
b. Configure the Remote Setpoint Input
c. Toggle the Remote Setpoint Button on the display from Off to On.
d. Increase the analog signal to increase the setpoint. Decrease the signal the decrease the setpoint.

Note: If Remote Setpoint is On, local setpoint entry is disabled.

Digital:
a. Enable and Configure Modbus Communication
b. Toggle the Remote Setpoint Button on the display from Off to On.
c. Enter the setpoint using the Remote Setpoint register, 43002.

Note: If Modbus is enabled and Remote Setpoint is On, local and remote analog setpoint entry is disabled.

PID Controller Tuning for Dual Solenoid Control:

Before Tuning: Check the Equipment

The first best practice of controller tuning is “Don’t Tune the Loop!”. A strange message but is critically important. When the control equipment has a problem, fix the equipment first.

Check the control valve solenoids for proper wiring. The opening solenoid should be wired to the opening solenoid output of the controller. The closing solenoid should be wired to the closing solenoid output of the controller.

Check the speed controls of the dual-solenoid control valve. Speed controls regulate opening and closing speed of the valve. Manually open or close the control valve until the desired maximum opening and closing speed is set.

Instrumentation may have problems with electrical noise, calibration, or ranging. The transmitter may be too large or too small for the application.

Take the time to ensure that the equipment is in good condition. Check to see if the controller is configured for the transmitter.

Before Tuning Checklist:

Here is a checklist to complete before tuning the controller:

1. Is the transmitter configured for the controller?

   If the answer is no, see the transmitter configuration of this manual.

2. Is the input of the controller calibrated for the transmitter signal range?

   - Apply a 4 mA signal to the transmitter input. Does the controller display an acceptable value?

   - Apply a 20mA signal to the transmitter input. Does the controller display and acceptable value?

   If not, see the input calibration section of this manual.

3. Is the control valve in a closed system?

   - Can the control valve discharge to a fire hydrant or a sump?
   - Is it safe for you to make a disturbance and change setpoints?

   It is important to tune the controller with the process in a closed system as this will allow you to operate the valve in a safe manner.

   If the control valve cannot be isolated, **always** consult with the local water authority and operators regarding safe operating levels of the process.

4. Check the speed controls and isolation ball valves of the control valve.

   Can you manually open and close the valve? If no, refer to the IOM of the control valve to find the normal operating orientation of the isolation ball valves.

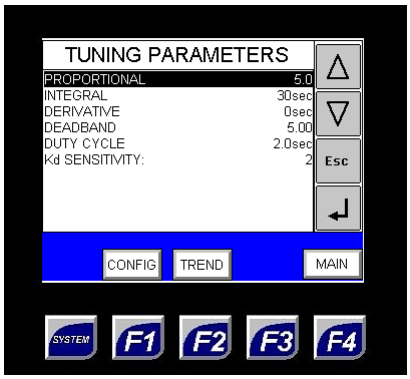
   Is the valve opening and closing at an acceptable level? If no, check the speed controls.

What is tuning?

Tuning matches the characteristics of the controller to those of the process being controlled in order to obtain good control. Good control means:

- Stable, 'straight-line' control of the process at setpoint without fluctuation
- No overshoot, or undershoot, of the process setpoint
- Quick response to deviations from the setpoint caused by external disturbances, thereby rapidly restoring the process value to the setpoint value

Tuning involves calculating and setting the value of the parameters listed in the table below. These parameters appear in the Tuning Parameters menu.



Proportional: determines the output power proportional to the error.

Integral: determines the time taken by the controller to remove steady-state error signals.

Derivative: determines how strongly the controller will react to the rate-of-change of the measured value.

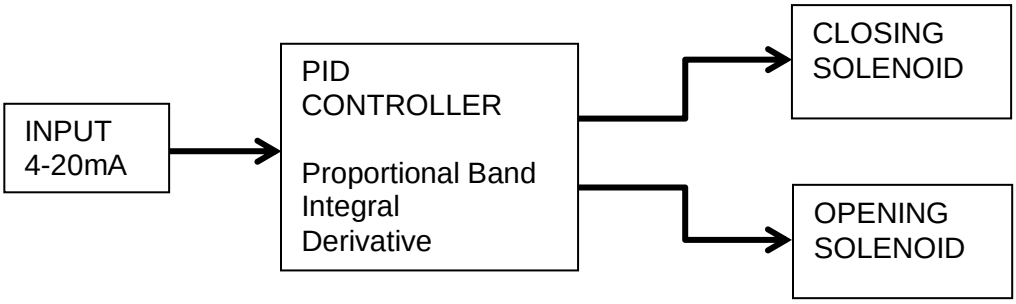
Deadband: applies a controller hysteresis.

Duty Cycle: determines the maximum solenoid ON time.

Controller: How it Controls the Solenoids

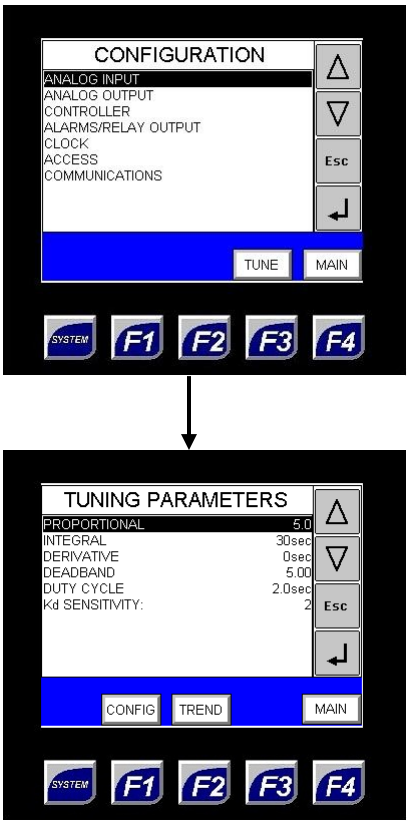
The controller is designed to actuate two dynamic states and can be described by the diagram below.

Control Diagram:



The controller receives an analog input signal (ie. 4-20mA) and converts the signal to a value proportional to the duty cycle of the output. The direction of the output is determined by the polarity of the error (ie. negative or positive). If the error is negative, the closing solenoid will be active, and if the error is positive, the opening solenoid will be active. The duration of the pulse is determined by the controller output which is limited at 100% of duty cycle.

How to access the Tuning Parameters:



From the Configuration Menu, press F3.

Alternatively, the tuning parameters can be accessed from the CONTROLLER → PID Control → Tuning Parameters

Tuning Parameters:

The controller determines the opening and closing on the valve depending on the difference between the process variable and the setpoint; otherwise known as the error. To properly control the valve, the controller has tuning parameters that determines the duration of the pulse or the ON time of the solenoids.

Proportional Gain:

Proportional is also known as controller gain, and determines the amount of change in the output proportional to the error.

$$Controller\ Output = Error * (Proportional\ Gain)$$

For example:

Process Variable:	75 unit value
Setpoint:	50 unit value
Proportional:	2
Controller Duty Cycle:	2 seconds

$$Controller\ Output = (SP - PV) * \left(\frac{100\%}{PB}\right) = (75 - 50) * (2) = -50\%$$

The closing solenoid (negative error) will be pulsed at 50% of the duty cycle; therefore, the closing solenoid will be ON for 1 second and OFF for 1 second.

How to Determine the Proportional Gain

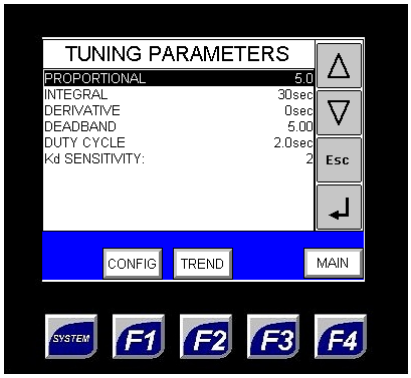
To determine the proportional gain, enter 2 as a starting value.

Using the initial proportional gain is a conservative approach to trial and error tuning.

After making a setpoint change and the controller is still sluggish, multiply the current Proportional Gain by 2.

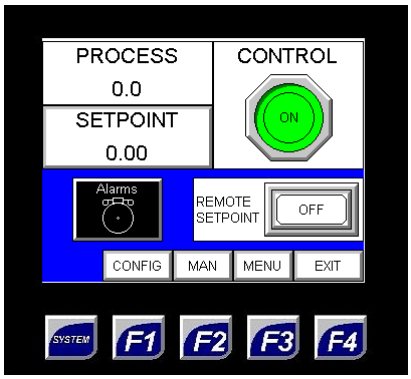
After making a setpoint change and the controller becomes unstable or the valve loses control, multiply the current Proportional Gain by 0.75.

Setting the Proportional Gain:



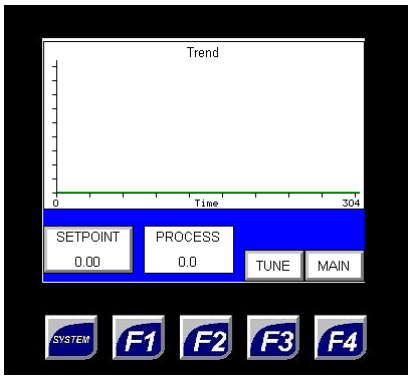
- From the Tuning Parameters, press △ or ▽ to highlight the Proportional parameter.
- Press ↵ to confirm selection. A keypad will appear. Enter the desired value. Press the ENTER key to confirm.

After setting the Proportional Gain, make a small setpoint change in the Main Display:



- Enter a setpoint by pressing the SETPOINT box
- Toggle Control from OFF to ON

Alternatively, enter use the TREND tool to see the control performance. From the Tuning Parameters page, press F2.



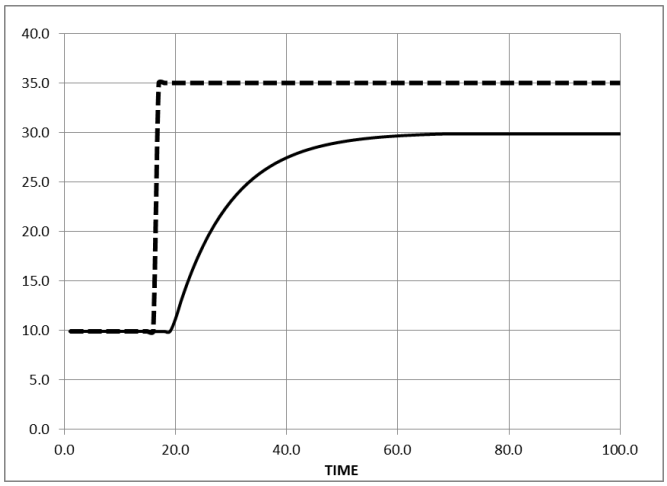
- Ensure that Control is ON
- Enter a setpoint by pressing the SETPOINT box.

Proportional Tuning Scenario:

By observing the process and the setpoint, the following scenarios will occur:

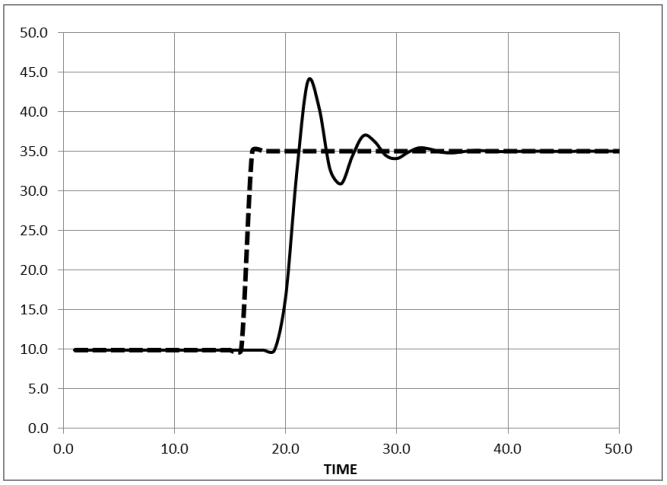
Scenario # 1: Process does not reach the setpoint

The proportional gain is too small. Either increase the proportional gain or introduce integral time to remove steady-state errors.



Scenario # 2: Process overshoots the setpoint

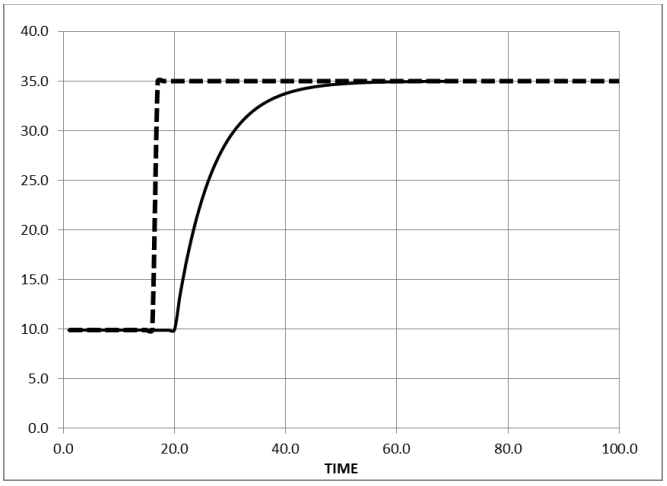
The proportional gain is too large. Decrease the proportional gain by multiplying the current value by 0.75, or throttle the valve speed controls.



Scenario # 3:

This is the ideal performance. The process should have a steep ramp at the beginning and then slowly ease up to meet the setpoint at a reasonable time.

Note: If the process meets the setpoint but the performance is sluggish, introduce integral time.



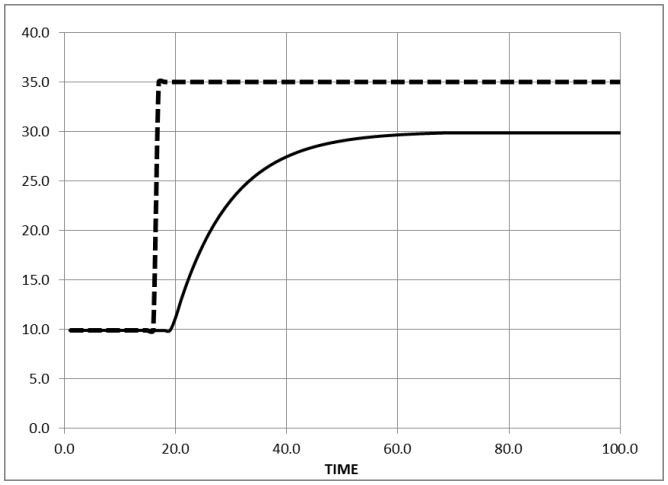
Integral Time:

The integral component sums the error term over time. The result is that even a small error term will cause the integral component to increase slowly. The integral response will continually increase over time until the error is zero, so the effect is to drive the error between the process variable and the setpoint to zero.

Use integral time to eliminate offsets between the process variable and the setpoint.

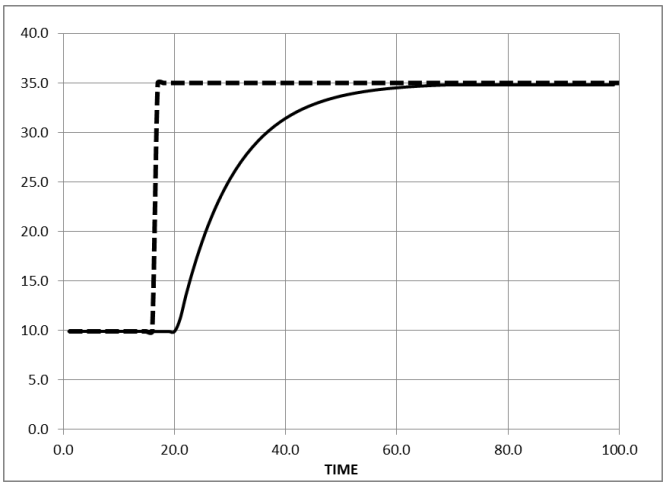
For Example:

Proportional Only:
The process variable and setpoint has an offset. This occurs if the proportional band is too small and not enough pulse is generated by the solenoid to open the valve.



Proportional and Integral Only:

As long as the error exists, the integral component will increase the output or pulse of the solenoid until the error is zero.



How to Determine Integral Time:

The integral component doubles the steady-state controller output after the integral time, and can drive the solenoid to fully turn ON. Before tuning for integral, tune the proportional component first.

Start with a value of 300 seconds. Decrease by half to make the controller more aggressive or increase by 1.5 to make the controller more sluggish.

NOTE: Decreasing the integral time causes the controller to be more aggressive; therefore, pushing it closer to instability. If the process variable is continuously cycling around the setpoint, the integral time is too low.

NOTE: The Integral component can be turned OFF by entering 9999 seconds.

Setting the Integral Time:

- From the Tuning Parameters, press  or  to highlight the Integral parameter.
- Press  to confirm selection. A keypad will appear. Enter the desired value.
- Press the ENTER key to confirm.

Derivative Time:

The derivative component causes the output to decrease if the process variable is increasing rapidly. The derivative response is proportional to the rate of change of the process variable. Increasing the *derivative time* parameter will cause the control system to react more strongly to changes in the process variable and will increase the speed of the overall control system response. Most practical control systems use very small derivative time (T_d), because the Derivative Response is highly sensitive to noise in the process variable signal. If the sensor feedback signal is noisy or if the control loop rate is too slow, the derivative response can make the control system unstable.

NOTE: For most applications of the SCP-TP, the Derivative component can be turned OFF by entering zero.

Setting the Derivative Time:

- From the Tuning Parameters, press  or  to highlight the Derivative parameter.
- Press  to confirm selection. A keypad will appear. Enter the desired value.
- Press the ENTER key to confirm.

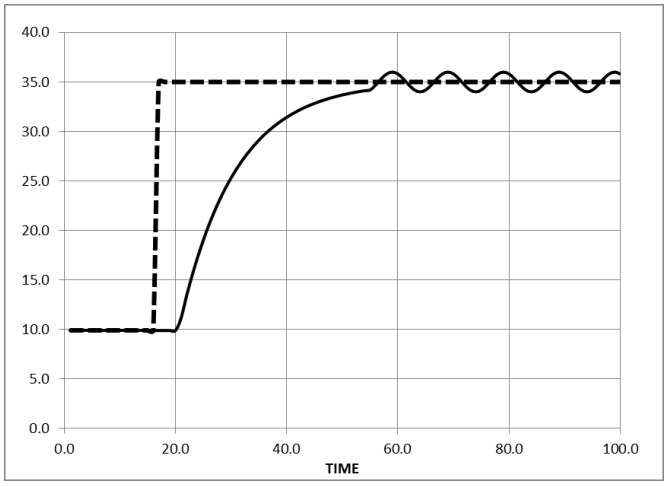
Kd Sensitivity:

Sets the sensitivity of the derivative component. Given as a value from 2 – 10. Use a value of 2 for fast processes or a value of 10 for slow processes. Default: 5.

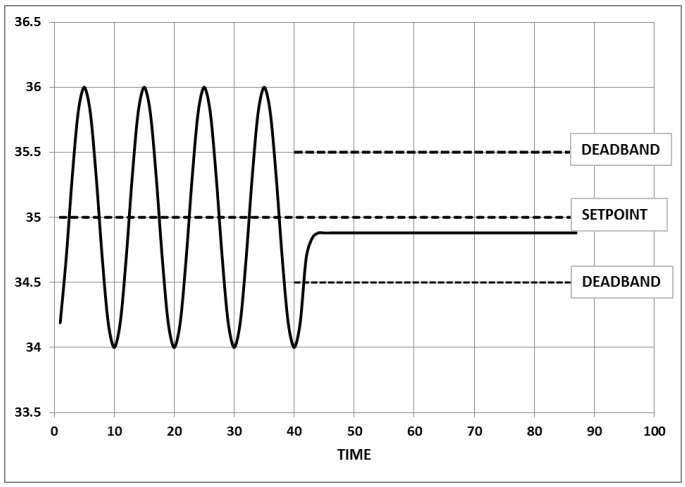
How **Deadband** Works:

Due to improper speed control settings, valve stiction, aggressive tuning parameters, or process conditions, there are times when the process variable cycles around the setpoint. The event can cause unnecessary strain on the solenoids causing premature failure and/or performance issues.

Deadband or hysteresis prevents the unnecessary cycling by increasing controller tolerance to small changes in process value.



For example:
The process cycles +/- 1 unit.
When deadband +/- 0.5 unit is introduced at Time=40, as soon as the process hits the deadband, the controller stops pulsing the solenoid allowing the process to settle.



Setting Controller Deadband:

The controller deadband or hysteresis, in display units, is a band at which the controller forces the output to zero. The deadband is active above and below the setpoint.

When setting the deadband:

- From the Tuning Parameters, press  or  to highlight the Deadband parameter.
- Press  to confirm selection. A keypad will appear. Enter the desired value.
- Press the ENTER key to confirm.

Configuration Level:

The configuration level sets the fundamental characteristics of the controller. By default, the controller is factory-set for PID dual-solenoid control. This section will allow the user to configure the following options:

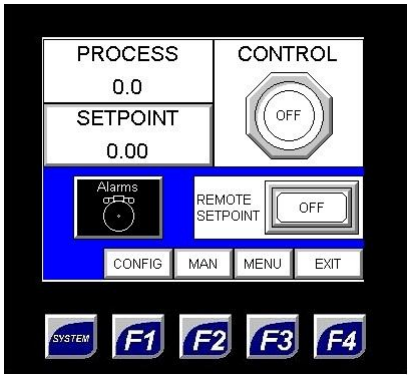
- Process value limits
- Transmitter range
- Remote setpoint range
- Controller type
- Solenoid orientation
- Digital Input configuration
- Alarm Relay configuration
- Modbus Communication
- Passwords

WARNING: Changing parameters in this manual will change characteristics of the controller and may cause it to perform outside of its intended use.

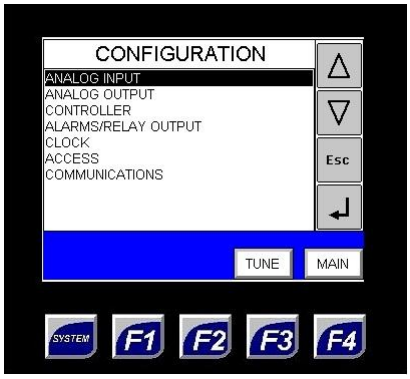
When in doubt, call the factory for assistance.

Configuration Menu Access:

To access the Configuration Menu,



- Enter the Main Display using the Administrator Password
- Press F1 for Configuration.



- To step through the list, press △ or ▽
- To change the value of a parameter or to step through a sub-menu, press ↵
- To exit a sub-menu or parameter, press Esc
- To go back to the Main Display, press F4

Configuration Menu Navigation Diagram:

Name	Value	Description
Transmitter		configure transmitter/sensor input
Minimum	0.0	displayed reading at 4 mA input
Maximum	100.0	displayed reading at 20 mA input
Calibration:		
Analog Data	0-32000	raw input value
Zero Cal.	6400	zero calibrated value
Zero?	Yes/No	write current Analog Data to Zero Cal.
Span Cal.	32000	span calibrated value, default: 32000
Span?	Yes/No	write current Analog Data to Span Cal.
Remote Setpoint		configure remote setpoint input
Minimum	0.0	displayed reading at 4 mA input
Maximum	100.0	displayed reading at 20 mA input
Calibration:		
Analog Data	0-32000	raw input value
Zero Cal.	6400	zero calibrated value, default: 6400
Zero?	Yes/No	write current Analog Data to Zero Cal.
Span Cal.	32000	span calibrated value, default: 32000
Span?	Yes/No	write current Analog Data to Span Cal.
Analog Output		configure function of analog output
Function:		
	Off	no output
	PV	retransmit process variable
	SP	retransmit setpoint
	420DC	control signal to 420DC Motorized Actuator
Minimum	6400	6400 = 4mA
Maximum	32000	32000 = 20mA

Configuration Menu Navigation Diagram (continued…):

Controller		select controller type
PID Control		pid controller
Enable?	Yes/No	enable/disable PID controller
Tuning Parameters		jump to tuning parameter menu
Open Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Close Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Mode:		controller failure mode on loss of signal or alarm
	Fail Last Pos.	fail in the last position
	Fail Close	fail in the fully closed position
	Fail Open	fail in the fully open position
Controller		select controller type
Actuator Control		open-loop actuator controller
Enable?	Yes/No	enable/disable actuator controller
Control Range:		calibrated control range of the actuator with the pilot
Minimum	20.0	pilot setpoint at 4.0mA signal
Maximum	200.0	pilot setpoint at 20.0mA signal
Integral Action		use to remove steady state errors
Enable?	Yes/No	enable/disable integral action
Integral:	300.0	integral time in seconds
Deadband:	2.0	in display units, region bet. setpoint with no control
Limit:	5+/-	anti-reset wind-up. Integral action limit
Controller		select controller type
On/Off Control		on/off controller
Enable?	Yes/No	enable/disable on/off controller
Upper Band:	5.0	control band above the setpoint
Lower Band:	5.0	control band below the setpoint
Open Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Close Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Off Delay Time:	0 sec	Delays the off time of the solenoid
Mode:		controller failure mode on loss of signal or alarm
	Fail Last Pos.	fail in the last position
	Fail Close	fail in the fully closed position
	Fail Open	fail in the fully open position

Configuration Menu Navigation Diagram (continued…):

Alarms/Relay Output		configure the function of the alarm relays
OP1/OP2		
	Sensor Break	loss of transmitter signal or remote setpoint source
	Manual Mode	controller in manual mode screen
	Remote SP Select	remote setpoint ON
	Positioning	positioning alarm ON
	Multiple Alarm	see alarm section for full description
	Modbus Toggle	use Modbus to activate the relay for remote control
	Strainer Flush	use to strainer flushing solenoid
Positioning Alarm		use to monitor controller performance
Enable?	Yes/No	enable/disable positioning alarm
Active Alarm	Yes	alarm will enable controller failure mode
	No	for monitoring/indication only
Scan Interval	5 min.	check for positioning errors at set time interval
Range:	15%	percentage of transmitter range
Strainer Flush		strainer flushing function
Day:	M/T/W/Th/Fr/Sat/Sun	select day of the week
Time:	HH:mm	time in 24 hour format
Duration:	5 sec	duration, maximum 60 seconds
Clock		configure date and time used for datalogging
Date:		configure date. DD/MM/YYYY
Time:		configure time. HH:MM:SS AM/PM
Day:		automatic calculation of day of the week
Access		
Operator Password	9999	restricted access and functions
Adminstrator Password	9998	full access and functions

Configuration Menu Navigation Diagram (continued…):

I/O Range		jump to sub-menu
Raw Value Range		set resolution of process variable and setpoints
Minimum	0	minimum raw integer value
Maximum	10000	maximum raw integer value
Setpoint Range		actual setpoint value as per Raw Value Range
Minimum	0	minimum real world value
Maximum	100	maximum real world value

Communications		communication options
MODBUS over SERIAL		
Enable?	Yes/No	enable/disable MODBUS
Slave ID:	2	Modbus slave ID
Timeout:	100	inactivity timeout in terms of 100 ms (ie 100 = 10 sec)
Status:		communication status
Port:	MJ2	Modbus communication port
Baud Rate:	9600	port baud rate
Parity:	Even	parity
Data Bits:	8 bits	data bit
Stop Bits:	1 bit	stop bit
Handshake:	none	handshake
Protocol:	Modbus RTU	modbus protocol
Mode:	RS232	communication mode

Communications		communication options
MODBUS over TCP/IP		
Enable?	Yes/No	enable/disable MODBUS
IP Address	000:000:000:000	
Subnet Mask	000:000:000:000	
Default Gateway:	000:000:000:000	
Ping Address:	000:000:000:000	ICMP Ping Function
Ping Time:	XX ms	milliseconds

Transmitter Configuration:

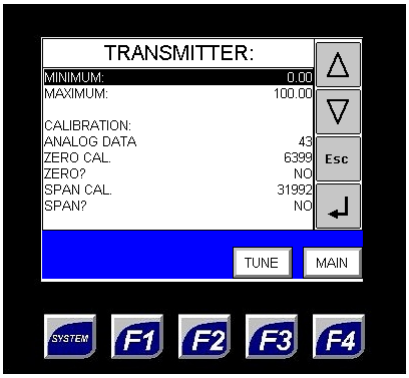
To configure the transmitter, the following steps needs to be done in order:

1. Process Value Configuration
2. Input Calibration

Analog Input 1		configure transmitter/sensor input
Minimum	0.0	displayed reading at 4 mA input
Maximum	100.0	displayed reading at 20 mA input
Calibration:		
Analog Data	0-32000	raw input value
Zero Cal.	6400	zero calibrated value
Zero?	Yes/No	write current Analog Data to Zero Cal.
Span Cal.	32000	span calibrated value, default: 32000
Span?	Yes/No	write current Analog Data to Span Cal.

Transmitter/Input Configuration:

These parameters are used to configure the controller to the sensor. By default, the controller is configured to receive a 4-20mA analog signal. The configuration parameters set the master limits for all settings in the controller including displayed values and setpoints.



- To start, ensure that Control is OFF from the Main Display.
- Go to the Transmitter menu.

To Configure the Transmitter/Sensor:

1. Go to Minimum. Enter the real world value that corresponds to the 4.0 milliamp signal of transmitter/sensor.
2. Go to Maximum. Enter the real world value that corresponds to the 20.0 milliamp signal of transmitter/sensor.

Transmitter Input Calibration:

Use to calibrate the analog input to the field transmitter.

To calibrate the transmitter zero or minimum value:

- Supply a 4.0mA signal to the input, or close the valve for zero flow, position, pressure, or level.
- Watch the Analog Data fall or rise within the range of the Zero Cal. value (ie. around 6400)

  If the values do not match, go to **Zero?**, select **Yes**, and press Enter.
- The Zero Cal. Value should be the same or much closer to the Analog Data value.

To calibrate the transmitter maximum value:

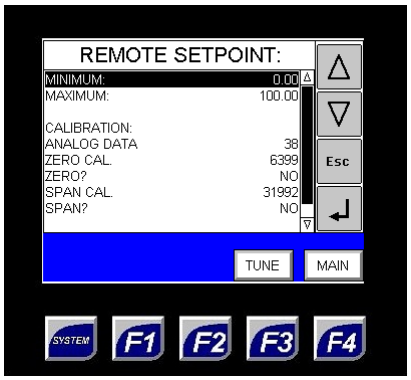
- Supply a 20.0mA signal to the input, or open the valve for maximum flow, position, pressure, or level.
- Watch the Analog Data fall or rise within the range of the Span Cal. value (ie. around 32000)

  If the values do not match, go to **Span?**, select **Yes**, and press Enter.
- The Span Cal. value should be the same or much closer to the Analog Data value.

Remote Setpoint Configuration:

These parameters are used to configure the remote setpoint input. By default, the controller is configured to receive a 4-20mA analog signal.

Analog Input 2		configure remote setpoint input
Minimum	0.0	displayed reading at 4 mA input
Maximum	100.0	displayed reading at 20 mA input
Calibration:		
Analog Data	0-32000	raw input value
Zero Cal.	6400	zero calibrated value, default: 6400
Zero?	Yes/No	write current Analog Data to Zero Cal.
Span Cal.	32000	span calibrated value, default: 32000
Span?	Yes/No	write current Analog Data to Span Cal.



- To start, ensure that Control is OFF from the Main Display.
- Go to the Analog Input 2 menu.

To Configure the Remote Setpoint:

1. Go to Minimum. Enter the real world value that corresponds to the 4.0 milliamp signal of remote setpoint.
2. Go to Maximum. Enter the real world value that corresponds to the 20.0 milliamp signal of remote setpoint.

Remote Setpoint Calibration:

Use to calibrate the remote setpoint.

To calibrate the remote setpoint zero or minimum value:

- Allow the SCADA operator to send the minimum real world setpoint.
- Watch the Analog Data fall or rise within the range of the Zero Cal. value (ie. around 6400)

  If the values do not match, go to **Zero?**, select **Yes**, and press Enter.
- The Zero Cal. Value should be the same or much closer to the Analog Data value.

To calibrate the remote setpoint maximum value:

- Allow the SCADA operator to send the maximum real world setpoint.
- Watch the Analog Data fall or rise within the range of the Span Cal. value (ie. around 32000)

  If the values do not match, go to **Span?**, select **Yes**, and press Enter.
- The Span Cal. value should be the same or much closer to the Analog Data value.

Alarm/Relay Output Configuration:

The controller continuously monitors the health of the transmitter signals, operator activity, or controller performance. Faults or actions can be remotely monitored thru the use of alarm relays.

Alarms/Relay Output		configure the function of the alarm relays
OP1/OP2		
	Sensor Break	loss of transmitter signal or remote setpoint source
	Manual Mode	controller in manual mode screen
	Remote SP Select	remote setpoint ON
	Positioning	positioning alarm ON
	Multiple Alarm	see alarm section for full description
	Modbus Toggle	use Modbus to activate the relay for remote control
	Strainer Flush	use to strainer flushing solenoid
Positioning Alarm		use to monitor controller performance
Enable?	Yes/No	enable/disable positioning alarm
Active Alarm	Yes	alarm will enable controller failure mode
	No	for monitoring/indication only
Scan Interval	5 min.	check for positioning errors at set time interval
Range:	15%	percentage of transmitter range
Strainer Flush		strainer flushing function
Day:	M/T/W/Th/Fr/Sat/Sun	select day of the week
Time:	HH:mm	time in 24 hour format
Duration:	5 sec	duration, maximum 60 seconds

Available Alarm/Relay Output Functions:

1. Sensor Break: When the controller is in automatic mode, the transmitter input is used for control. The loss of a transmitter signal means that the process is no longer measured; therefore, is no longer under control.

   If Remote Setpoint is On and a 4-20mA signal is used as a setpoint source, an alarm will trigger if the signal is lost.

2. Manual Mode: The manual mode screen is useful for manually opening or closing the valve. It also disables all automatic functions of the controller.

3. Remote SP Select: If the Remote Setpoint is On, local setpoint entry is disabled. The alarm will trigger if the Remote Setpoint is On.

4. Positioning Alarm: The primary function of the controller is to make sure the process variable is operating at the setpoint +/- a certain deadband. An alarm is triggered if the process variable and setpoint difference is out of tolerance.

5. Multiple Alarm: Includes sensor break, manual mode, remote sp select, and positioning alarm. Alarm triggers if the sensor is broken, remote setpoint is disabled, manual mode is on, or positioning alarm is on.

6. Modbus Toggle: Use MODBUS communication to actuate the relays for a customized application.

7. Strainer Flush: Use to flush the strainer equipped with a solenoid.

Strainer Flushing Function:

To enable the strainer flushing function, select Strainer Flush from one of the Relay Outputs.

Set the following:

a. Day: select the day of the week
b. Time: set the time, HH:mm, in 24-hour format
c. Duration: set the duration or On-time. Maximum: 60 seconds

NOTE: Use a Normally-Closed solenoid for proper operation

Positioning Alarm:

Once enabled, the positioning alarm monitors the deviation of the process variable from the setpoint. It is useful in monitoring the performance of the valve and controller over time.

It is possible for the strainers to clog, solenoids to fail, diaphragms to break, or isolation ball valves actuated in the wrong position. When these events happen, the valve can no longer control the process variable, and deviations will happen.

The positioning alarm can be used to monitor if the valve is in need of maintenance.

To clear the positioning alarm, an operator has to acknowledge and clear the alarm locally to allow the operator or maintenance personnel to determine the cause of the alarm.

Positioning Alarm Requirements:

Enable:	enable the alarm
Scan Interval:	set how often the controller checks for deviations
Active Alarm:	if the alarm is present, does valve need to go under failure mode status?
Range:	set the tolerance

Alarm Range Setting:

This sets the tolerance of the positioning alarm. A tight tolerance may produce nuisance alarms.

The range is a percentage of the transmitter range. For example, the alarm range is set at 15% at a 5 minute scan interval, and the controller uses valve position with a range from 0 to 100. If the difference between the process variable and the setpoint is greater than 15% after 5 minutes an alarm is triggered.

Positioning Alarm Tolerance = (Transmitter Range) * Range Percentage.

Example:

Transmitter Maximum:	75 psi
Transmitter Minimum:	0 psi
Range:	8%
Scan Interval:	10 minutes

Positioning Alarm Tolerance = (75-0) * 0.08 = +/- 6 psi

Therefore, if the process deviates from the setpoint by 6 psi after 10 minutes, an alarm is triggered.

PID Controller Configuration:

Controller		select controller type
PID Control		pid controller
Enable?	Yes/No	enable/disable PID controller
Tuning Parameters		jump to tuning parameter menu
Open Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Close Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Mode:		controller failure mode on loss of signal or alarm
	Fail Last Pos.	fail in the last position
	Fail Close	fail in the fully closed position
	Fail Open	fail in the fully open position

Control Requirements:

The following configuration parameters are required for proper dual-solenoid control:

Enable: controller must be enabled
Solenoid Orientation: physical property of the solenoid must be set
Mode: determine the safe failure mode if the transmitter signal is lost
Tune: determine tuning parameters. See tuning section.

Solenoid Orientation:

By default, the solenoid output modules of the controller are configured for a Normally Closed Solenoid. Therefore, when power is removed from the solenoid, it closes or shuts down.

In cases where a Normally Open solenoid is used, use the following procedures.

Normally-Closed Valve Operation:

A Normally-Closed valve is designed to close in the event of a power failure. To facilitate for the closing function, a Normally-Open Closing solenoid is used.

To configure the solenoid output for Normally-Open solenoid operation, select NO for the closing solenoid.

Normally-Open Valve Operation:

A Normally-Open valve is designed to open in the event of a power failure. To facilitate for the opening function, a Normally-Open Opening solenoid is used.

To configure the solenoid output for Normally-Open solenoid operation, select NO for the opening solenoid

Analog Output Retransmission:

The analog out retransmission allows for the retransmission of the process variable or setpoint into a 4-20mA signal. This is useful for remote monitoring of the process variable or setpoint.

Analog Output		configure function of analog output
Function:		
	Off	no output
	PV	retransmit process variable
	SP	retransmit setpoint
	420DC	control signal to 420DC Motorized Actuator
Minimum	6400	6400 = 4mA
Maximum	32000	32000 = 20mA

The 420DC option is reserved for actuator control.

Failure Mode Selection:

Depending on the application, the loss of a transmitter signal or a remote setpoint signal can cause the valve to fully open or close. In some situations, a fully closed or open valve can cause issues. Therefore, a failure mode is essential to allow the valve to fail in a safe manner.

Fail Last Position: this option will allow the valve to fail in its last position.
Fail Close: this option will allow the valve to fail in its fully closed position.
Fail Open: this option will allow the valve to fail in its fully open position.

Note: An alarm can be configured to indicate transmitter failure. See the Alarms section for details.

420DC Actuator Controller Configuration:

Controller		select controller type
Actuator Control		open-loop actuator controller
Enable?	Yes/No	enable/disable actuator controller
Control Range:		calibrated control range of the actuator with the pilot
Minimum	20.0	pilot setpoint at 4.0mA signal
Maximum	200.0	pilot setpoint at 20.0mA signal
Integral Action		use to remove steady state errors
Enable?	Yes/No	enable/disable integral action
Integral:	300.0	integral time in seconds
Deadband:	2.0	in display units, region bet. setpoint with no control
Limit:	5+/-	anti-reset wind-up. Integral action limit

Control Requirements:

The following configuration parameters are required for proper 420DC Motorized Actuator control:

Enable: controller must be enabled
Control Range: the minimum and maximum calibrated range of the actuator must be set
Analog Output: must be set to 420DC

Integral Action:

The integral action is an added feature to the 420DC controls to enable the controller to remove steady state errors. These errors can be due to calibration, hysteresis from the pilot, or a combination of both.

To activate the integral action:

a. Enable: enable integral action

b. Integral: set integral time. Minimum setting: 60 seconds

c. Deadband: set the deadband in display units. Deadband is a programmable controller hysteresis that will prevent the motor from running when the process is within the setpoint +/- deadband.

   Recommended setting: 2-5% of transmitter range.
   Example: Transmitter Range: 0-100 psi
   Set deadband at 2% of range; therefore, enter 2. The actuator will stop running when the pressure is +/-2 psi from the setpoint.

d. Limit: set integral action limit. This is an anti-reset wind-up feature. For example: a limit of +/- 5 will allow the controller to make a correction of up to 5% of controller output.

Analog Output Configuration:

The analog output will supply the control signal to the 420DC Motorized Actuator.

Analog Output		configure function of analog output
Function:		
	Off	no output
	PV	retransmit process variable
	SP	retransmit setpoint
	420DC	control signal to 420DC Motorized Actuator
Minimum	6400	6400 = 4mA
Maximum	32000	32000 = 20mA

Additional Information:

For installation and operation of the 420DC Motorized Pilot Actuator, refer to Singer Valve IOM A-0984E. Call your local representative or the factory for an electronic copy.

ON/OFF Controller Configuration:

Controller		select controller type
On/Off Control		on/off controller
Enable?	Yes/No	enable/disable on/off controller
Upper Band:	5.0	control band above the setpoint
Lower Band:	5.0	control band below the setpoint
Open Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Close Solenoid	NO	normally open solenoid
	NC	normally closed solenoid
Off Delay Time:	0 sec	Delays the off time of the solenoid
Mode:		controller failure mode on loss of signal or alarm
	Fail Last Pos.	fail in the last position
	Fail Close	fail in the fully closed position
	Fail Open	fail in the fully open position

Control Requirements:

The following configuration parameters are required for proper on/off control:

Enable: controller must be enabled

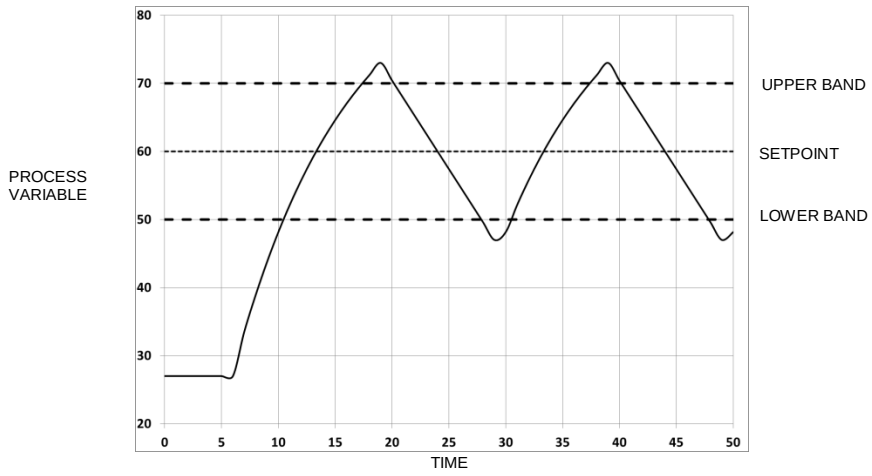
Upper Band: enter a value above the setpoint. Valve closes when the process rises above the upper band.

Lower Band: enter a value below the setpoint. Valve opens when the process falls below the lower band.

Solenoid Orientation: physical property of the solenoid must be set

Mode: determine the safe failure mode if the transmitter signal is lost

Sample Graph:



Solenoid Orientation:

By default, the solenoid output modules of the controller are configured for a Normally Closed Solenoid. Therefore, when power is removed from the solenoid, it closes or shuts down.

In cases where a Normally Open solenoid is used, use the following procedures.

Normally-Closed Valve Operation:

A Normally-Closed valve is designed to close in the event of a power failure. To facilitate for the closing function, a Normally-Open Closing solenoid is used.

To configure the solenoid output for Normally-Open solenoid operation, select NO for the closing solenoid.

Normally-Open Valve Operation:

A Normally-Open valve is designed to open in the event of a power failure. To facilitate for the opening function, a Normally-Open Opening solenoid is used.

To configure the solenoid output for Normally-Open solenoid operation, select NO for the opening solenoid

Failure Mode Selection:

Depending on the application, the loss of a transmitter signal or a remote setpoint signal can cause the valve to fully open or close. In some situations, a fully closed or open valve can cause issues. Therefore, a failure mode is essential to allow the valve to fail in a safe manner.

Fail Last Position:	this option will allow the valve to fail in its last position.
Fail Close:	this option will allow the valve to fail in its fully closed position.
Fail Open:	this option will allow the valve to fail in its fully open position.

Note: An alarm can be configured to indicate transmitter failure. See the Alarms section for details.

Communication Configuration:

The SCP-TP is capable of MODBUS communication as a slave device.

MODBUS over Serial Configuration:

Communications		communication options
MODBUS over SERIAL		
Enable?	Yes/No	enable/disable MODBUS
Slave ID:	2	Modbus slave ID
Timeout:	100	inactivity timeout in terms of 100 ms (ie 100 = 10 sec)
Status:		communication status
Port:	MJ2	Modbus communication port
Baud Rate:	9600	port baud rate
Parity:	Even	parity
Data Bits:	8 bits	data bit
Stop Bits:	1 bit	stop bit
Handshake:	none	handshake
Protocol:	Modbus RTU	modbus protocol
Mode:	RS232	communication mode

Serial Communication Requirements:

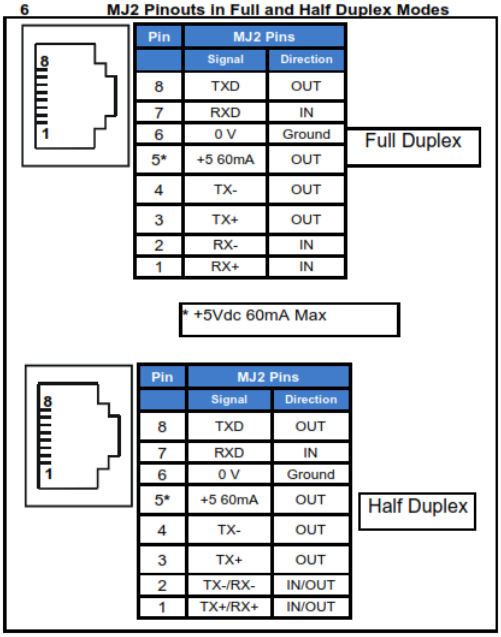
Enable: enable MODBUS
Slave ID: set slave ID
Timeout: set inactivity timeout

Baud Rate: set baud rate
Parity: set parity
Data Bits: set data bits
Stop Bits: set stop bit

Cable: The standard SCP-TP is set to communicate via RS-232 or RS-485 using the MJ2 Port. The port is an RJ45 jack. See pin connections.

Cable supplied by Installer.

6 MJ2 Pinouts in Full and Half Duplex Modes



Pin	MJ2 Pins	
	Signal	Direction
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5*	+5 60mA	OUT
4	TX-	OUT
3	TX+	OUT
2	RX-	IN
1	RX+	IN

Pin	MJ2 Pins	
	Signal	Direction
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5*	+5 60mA	OUT
4	TX-	OUT
3	TX+	OUT
2	TX-/RX-	IN/OUT
1	TX+/RX+	IN/OUT

MODBUS over TCP/IP Configuration:

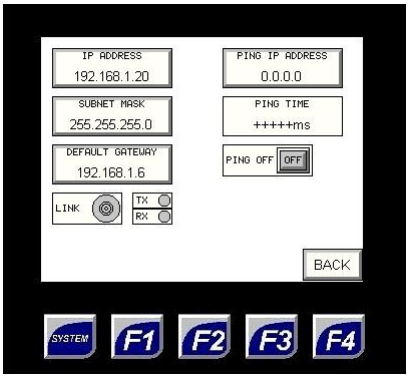
Communications		communication options
MODBUS over TCP/IP		
Enable?	Yes/No	enable/disable MODBUS
IP Address	000:000:000:000	
Subnet Mask	000:000:000:000	
Default Gateway:	000:000:000:000	
Ping Address:	000:000:000:000	ICMP Ping Function
Ping Time:	XX ms	milliseconds

TCP/IP Communication Requirements:

Enable: enable Modbus
IP Address: enter the IP address of the SCP-TP
Subnet Mask: enter the subnet mask
Default Gateway: enter the default gateway or server address

Using ICMP Ping:

The ICMP Ping to quickly determine if the host computer or router can be reached. If not, make sure the subnet mask and gateway is correct. The Ping Time will show the response time.



If the SCP-TP is connected with a host computer or router, the LINK indicator will be green. When there is transfer of information, the TX (transmit) and RX (receive) indicators will blink.

Setting Raw Value Range:

I/O Range		jump to sub-menu
Raw Value Range		set resolution of process variable and setpoints
Minimum	0	minimum raw integer value
Maximum	10000	maximum raw integer value
Setpoint Range		actual setpoint value as per Raw Value Range
Minimum	0	minimum real world value
Maximum	100	maximum real world value

For compatibility with older SCADA networks, the device is configured to receive integer values. The raw value range is the resolution of the digital information sent to the SCADA system.

For example:

12-bit 2^{12} = Raw Value Range from 0 – 4096
16-bit 2^{16} = Raw Value Range from 0 – 65536

Therefore, if the SCP-TP is set to a send a 12-bit value of valve position from 0-100%, the resolution of the valve position is 100/4096 or 0.024% per bit.

Setting Setpoint Range:

The controller is configured to receive a remote setpoint via MODBUS.

Set the actual setpoint range as represented by the raw value range. The setpoint range units should correspond with the transmitter units. The setpoint range should be equal or less than the transmitter range.

For example:

If the pressure transmitter has a range from 0-70 psi, set the setpoint range minimum to 0 and the maximum to 70.

MODBUS Address Map:

MODBUS Address Map		
Address	Values	Description
Analog Read		**integer value, 16-bit max**
43000	raw value range	Analog Input 1, Transmitter Input
43001	raw value range	Analog Input 2
Analog Write		**interger value, 16-bit max**
43002	raw value range	Remote Setpoint
43003		Unused
Digital Write		**given as integer 1 or 0**
43004	1 - enable, 0 - disable	Force Valve to Last Position
43005	1 - enable, 0 - disable	Force Valve to Close
43006	1 - enable, 0 - disable	Force Valve to Open
43007	1 - enable, 0 - disable	Control On/Off Remote Toggle
43008	1 - enable, 0 - disable	Remote Setpoint Toggle
43009	1 - enable, 0 - disable	Relay Toggle 1
43010	1 - enable, 0 - disable	Relay Toggle 2
Digital Read		**given as integer 1 or 0**
43011	1 - active, 0 - inactive	Alarm - Analog Input 1 Lost
43012	1 - active, 0 - inactive	Alarm - Analog Input 2 Lost
43013	1 - active, 0 - inactive	Alarm - General
43014	1 - active, 0 - inactive	Alarm - Positioning Error
43015	1 - active, 0 - inactive	Indicator - Remote Setpoint On
43016	1 - active, 0 - inactive	Indicator - Control On
43017	1 - active, 0 - inactive	Indicator - Manual Model On
43018	1 - active, 0 - inactive	Indicator - Overrides Active
43019	1 - active, 0 - inactive	Indicator - Close Solenoid On
43020	1 - active, 0 - inactive	Indicator - Open Solenoid On
Controller Input/Display - Read Only		**32-bit value**
43024	actual value	Process Variable, Transmitter
43026	actual value	Setpoint
43028	actual value	Analog Input 2

Controller Input Feedback

Holding registers 43024 and 43026 shows the actual real value display on the controller touchscreen. This is useful for confirming the remote setpoint sent to the controller is actually received by the controller.

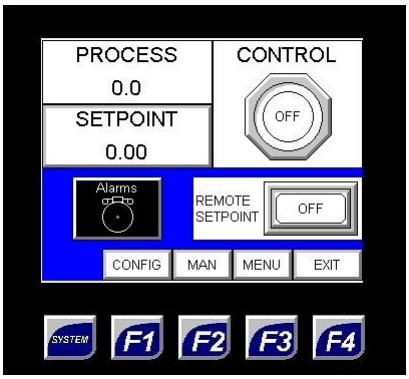
Holding register 43028 shows Analog Input 2/Remote Setpoint Input. If MODBUS is enabled, the Remote Setpoint Input is unused. The spare input can be used to monitor another process variable.

NOTE: The values are 32-bit floating point. Some devices may need to use the floating point inverse function to display the values properly.

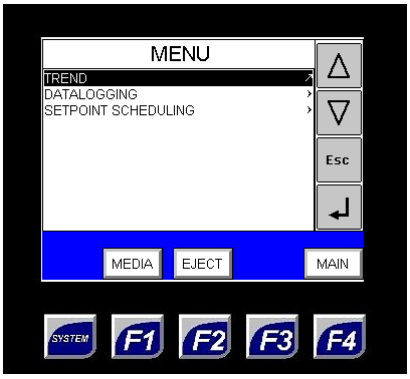
Datalogging:

The SCP-TP is equipped with a datalogger that can record process variable and setpoint data over time. The data is saved in a MicroSD card as a .CSV file that can be opened using applications such as Microsoft Excel.

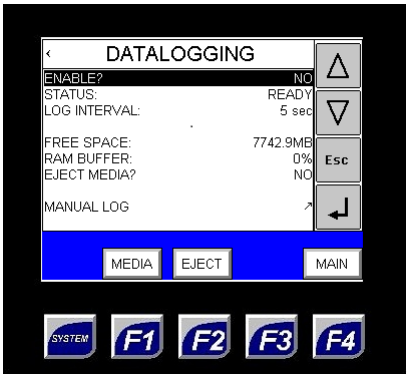
How to Access the Datalogger:



- From the Main Display, press F3



- Select DATALOGGING using △ or ▽ buttons
- Press ↵ to view the available data logging configuration options
- Press F4 to go back to the Main Display



- Press Esc to return to Menu Display

Removable Media Card Slot:

The memory card slot is located on the back of the controller. Insert the card in the orientation shown in the back of the controller.

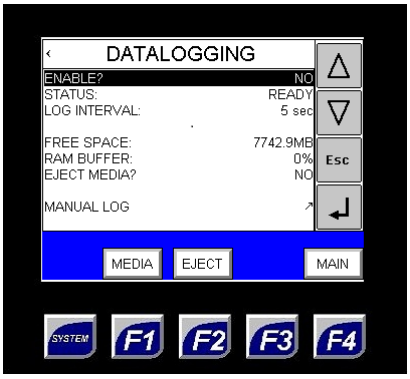
To remove the card, push on the card to pop it out.

How to use the Internal Format Function:

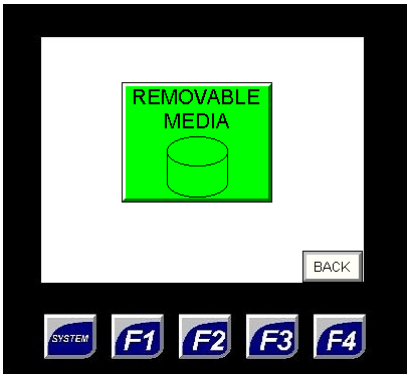
NOTE: The internal format function will limit the maximum capacity of the MicroSD card to 1 GB.

To maximize SD card space, format using the FAT32 file system using a Windows PC or SD card format software. The SCP-TP can support cards up to 32GB.

To format the new MicroSD card:



- Press F1 to open the Removable Media Object



- Press the Removable Media Object to access its available functions

- Press **FORMAT,** a confirmation screen will pop-up
- Press, Cancel, to exit
- Press, Ok, to continue
- After formatting is complete, press Esc to exit

Datalogging Menu:

Datalogging		
Name	**Value**	**Description**
Enable?	Yes/No	enable/disable datalogging function
Status		
	Ready	media ready for data logging
	Not Fomatted	media not formatted
	Not Found	media inserted but not yet ready
	Error	media critical error
	Protected	media protected, ok to remove
Log Interval	5 seconds	sampling time
Free Space	0	available free space
Ram Buffer	0-100%	temporary internal data storage
Eject Media?	Yes/No	Select, Yes, to safely remove media
Manual Log		jump manual log screen

Datalogging Requirements:

In order for the datalogger to operate properly, the following parameters need to be configured:

Clock: set the Clock in Configuration menu for proper data time stamps
Enable: enable to start datalogging
Log Interval: set time, in seconds, on how often the data are sampled.
Media: MicroSD card. See format procedure.

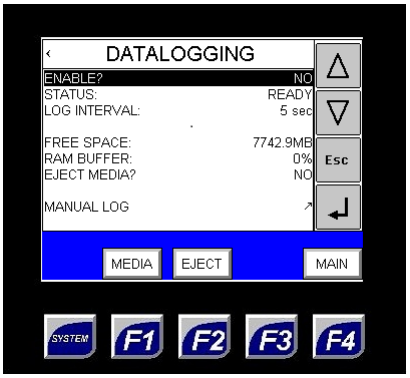
NOTE: Log Interval minimum sampling time is 1 seconds.

Data loss Prevention:

In order to prevent data loss while the media is removed, the data is temporarily stored in a Ram Buffer. If the buffer is full, data will be lost. The media should be replaced before the Ram Buffer reaches 100%. If data loss occurs, reconfigure the logging interval to a longer sampling time.

After the media is replaced and the datalogger is ready, the data stored in the Ram Buffer will be downloaded to the media. When the download is complete, the Ram Buffer will show 0%.

How to remove the media to prevent data loss:



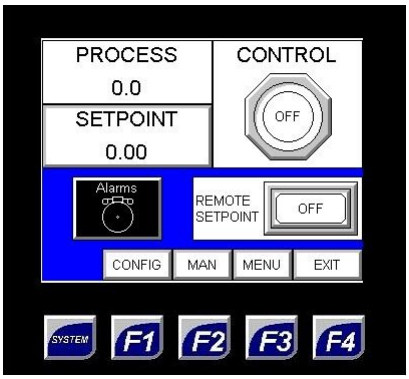
- Press F2 to write-protect the media
- Wait for the status to show, “Protected”
- Remove the card
- Replace the card before the Ram Buffer reaches 100%

Setpoint Scheduling

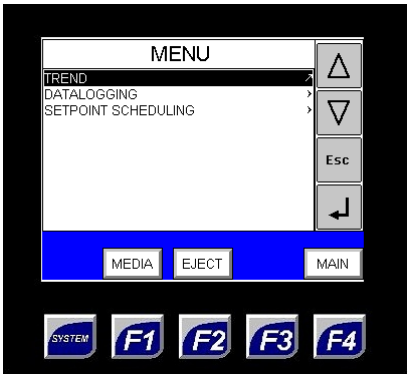
The SCP-TP is pre-programmed with a setpoint scheduling function that allows up to ten time-based setpoints per day.

Note: Setpoint scheduling does not work when Remote Setpoint is enabled.

To access Setpoint Scheduling:



- From the Main Display, press F3



- Select SETPOINT SCHEDULING using ▲ or ▼ buttons
- Press ↵
-
- Press F4 to go back to the Main Display

Setpoint Scheduling Menu

Setpoint Scheduling		
Name	Value	Description
Operating Days		set the operating days
Sunday - Saturday	Yes/No	
Setpoint 1-10		
Enable	Yes/No	enable setpoint schedule
Time	HH:MM	time in 24-hour format
Setpoint	0	setpoint

Setpoint Scheduling Requirements:

In order for the function to operate properly, the following parameters need to be configured:

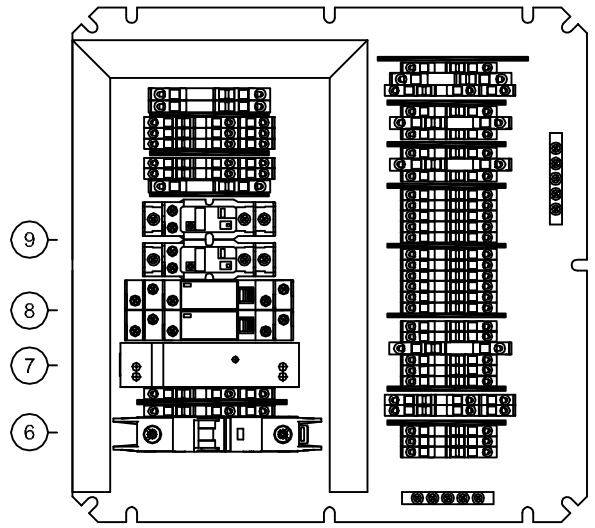
Clock: set the Clock in Configuration menu for proper data time stamps
Days: enable the Operating Days – Sunday to Saturday
Setpoint: enable the setpoint, set time – 24 hour format, and setpoint

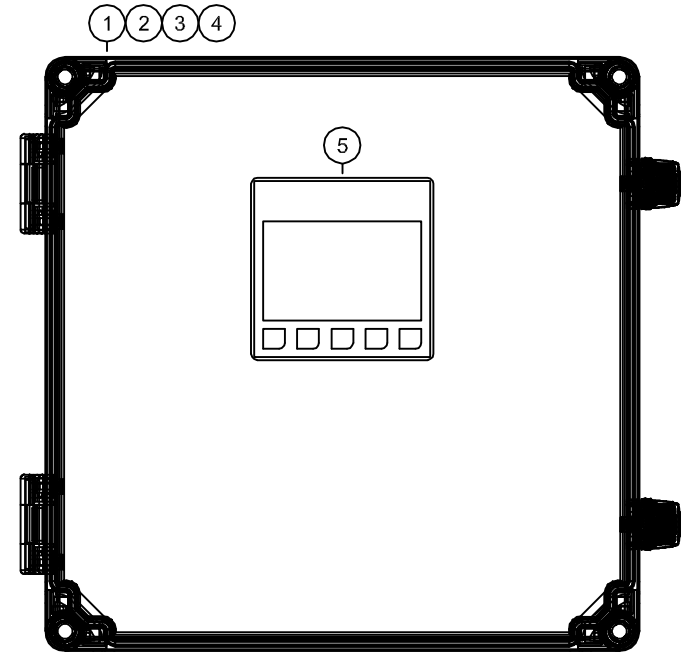
CONTROL PANEL ELECTRICAL WIRING SCHEMATICS

CONTROL PANEL ELECTRICAL WIRING SCHEMATIC- 120VAC MODEL

ITEM	DESCRIPTION	TAG	TORQUE RATING
1	ENCLOSURE - POLYCARBONATE, NEMA4X		
2	SWING PANEL		
3	BACK PANEL		
4	MOUNTING KIT		
5	MAIN CONTROLLER	A0535	2.4 Nm (21 in.lbs)
6	CIRCUIT BREAKER	Q0505	0.74 Nm (6.6 in.lbs)
7	POWER SUPPLY 24VDC	G0508	0.8 Nm (7.1 in.lbs)
8	SOLID STATE RELAYS	K0638 K0640	0.8 Nm (7.1 in.lbs)
9	MECHANICAL RELAYS	K0642 K0644	1 Nm (8.85 in.lbs)
10	WIRE DUCTS		

FUSE TABLE			
ITEM	TAG	SIZE	RATING
1	F0509	5X20 GLASS	2A, 125V
2	F0518	5X20 GLASS	4A, 125V
3	F0533	5X20 GLASS	2A, 125V
4	F0806A	5X20 GLASS	0.80A,125V
5	F0812A	5X20 GLASS	0.80A, 125V
6	F0906	5X20 GLASS	0.080A, 125V





ENVIROMENTAL RATING: IP65, TYPE 4X
NOTICE: USE HUBS OR FITTINGS WITH SAME ENVIROMENTAL RATING AS ENCLOSURE

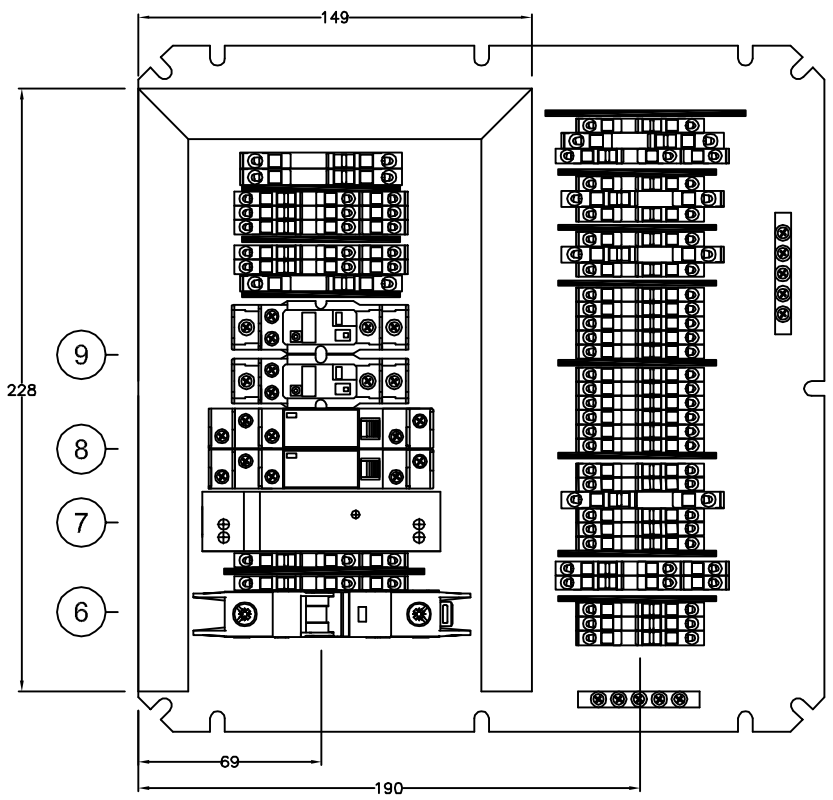
REV	DESCRIPTION	DATE

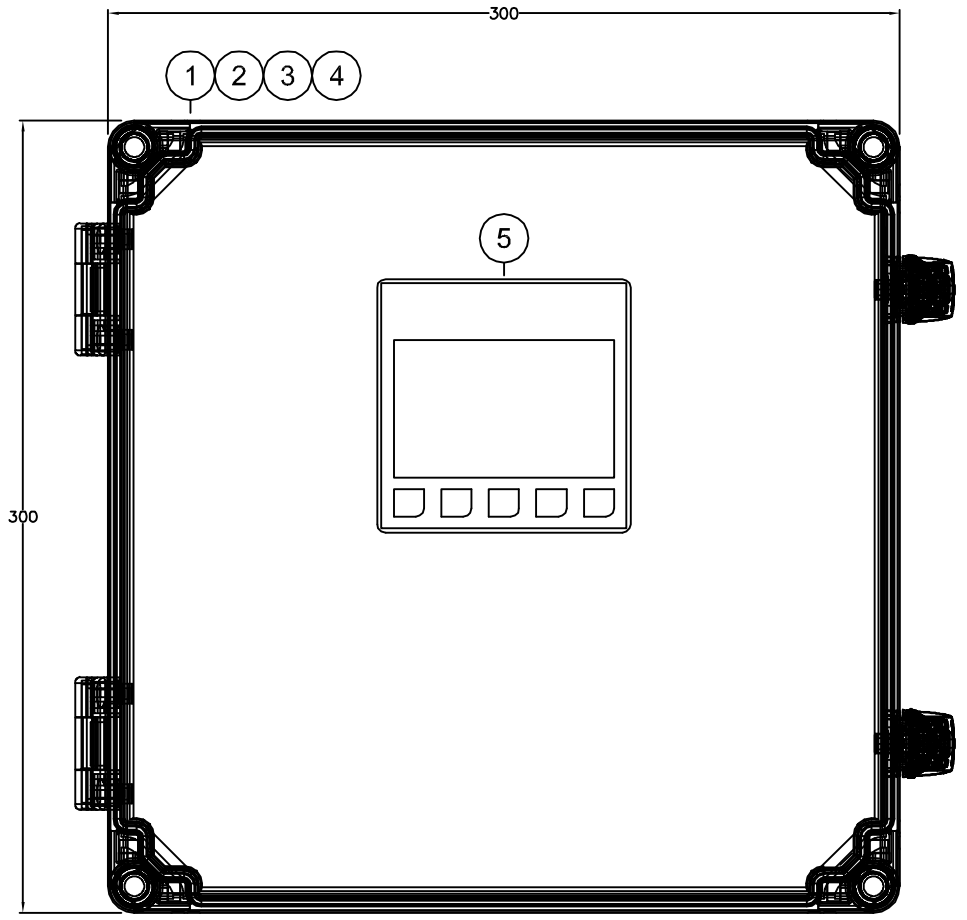
SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue. Surrey, B.C. V3W 3H9

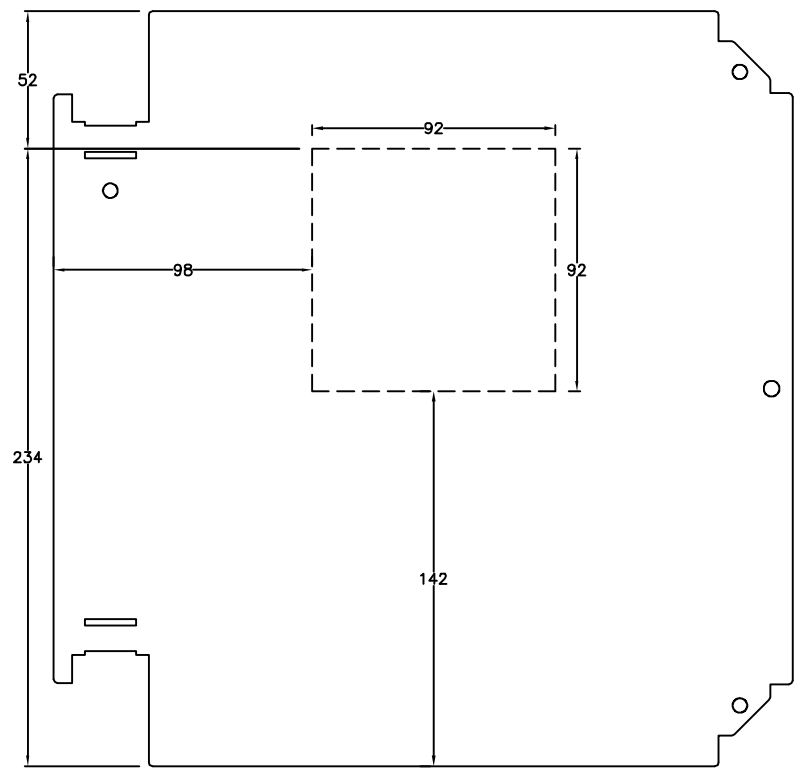
TITLE
COMPONENT LAYOUT
SPC-TP

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 1 OF 10
REVISION







ALL DIMENSIONS IN MILLIMETERS

REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE
PANEL CUT-OUT DIMENSIONS

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 2 OF 10
REVISION

REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE

INTENTIONAL BLANK PAGE

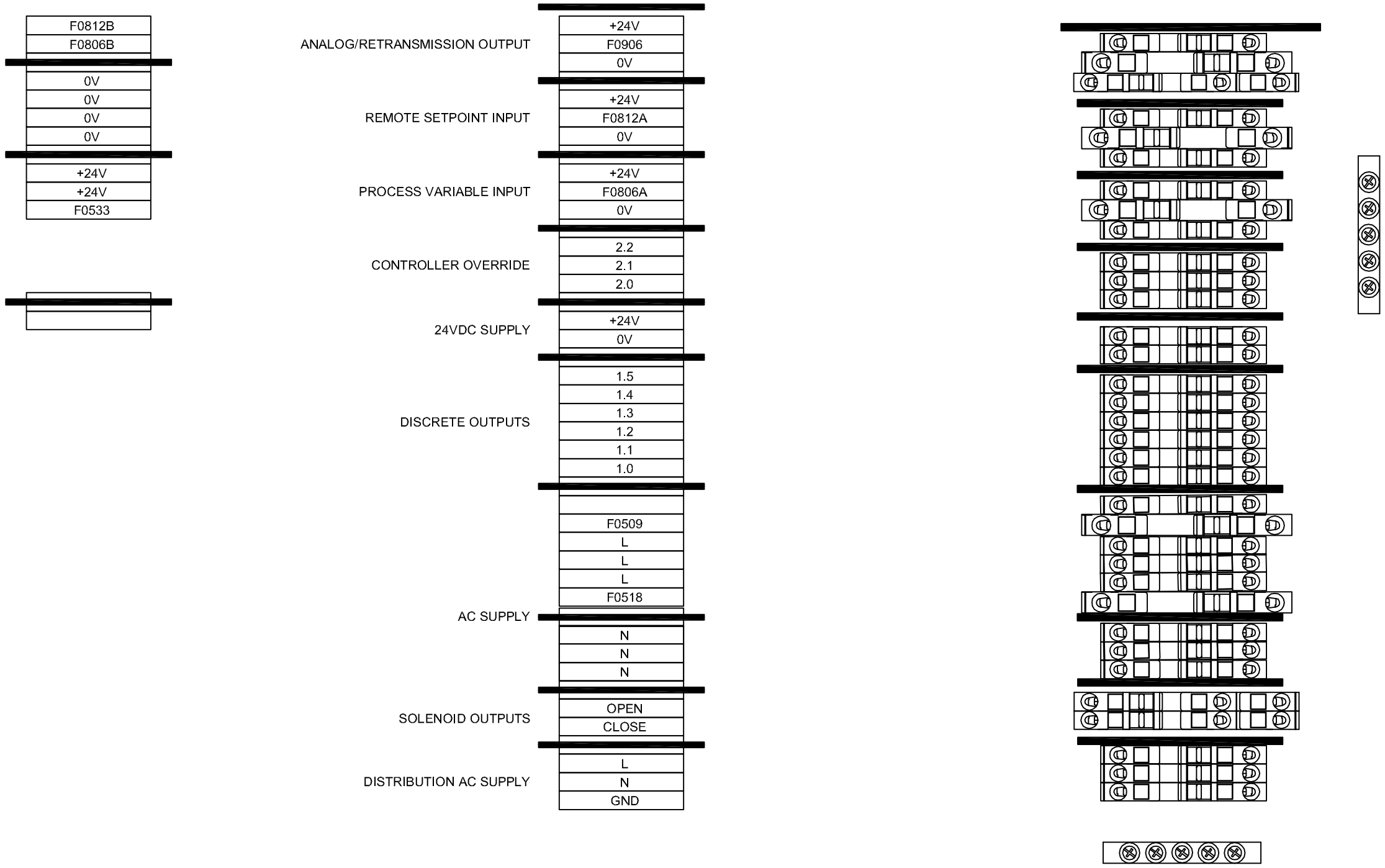
DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER

SHEET COUNT: 3 OF 10

REVISION

FIELD WIRING TERMINAL STRIP
USE COPPER CONDUCTORS ONLY



REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE
TERMINAL BLOCK LAYOUT
SPC-TP

DRAWN BY	MP
APPROVED BY	
DATE	DEC 2014
DRAWING NO.	A-9124A1
DRAWING NO.	SERIAL NUMBER
SHEET COUNT	4 OF 10
REVISION	

120VAC SUPPLY
DISCONNECTING MEANS PROVIDED BY INSTALLER

120VAC POWER DISTRIBUTION

120 VAC SUPPLY

L

Q0505
6A

NEUTRAL

N

EARTH GROUND

GND

G0508
24VDC POWER SUPPLY

F0509
2A

L

N

XN

ELECTRONIC PROCESS CONTROLLER DC SUPPLY

24VDC 0VDC

24VDC (06/31)

0VDC (06/31)

F0518
4A

120VAC (07/04)

NEUTRAL (07/04)

CLOSING SOLENOIDS AC SUPPLY

120VAC (07/16)

NEUTRAL (07/16)

OPENING SOLENOID AC SUPPLY

L

N

AC SUPPLY

24VDC (05/14)

F0533
2A

24VDC POWER DISTRIBUTION

A0535
HE-XE105
POWER CONNECTOR
(0.50-0.78 N-m)

+24VDC 0V

GND

0VDC (05/14)

(06/01)

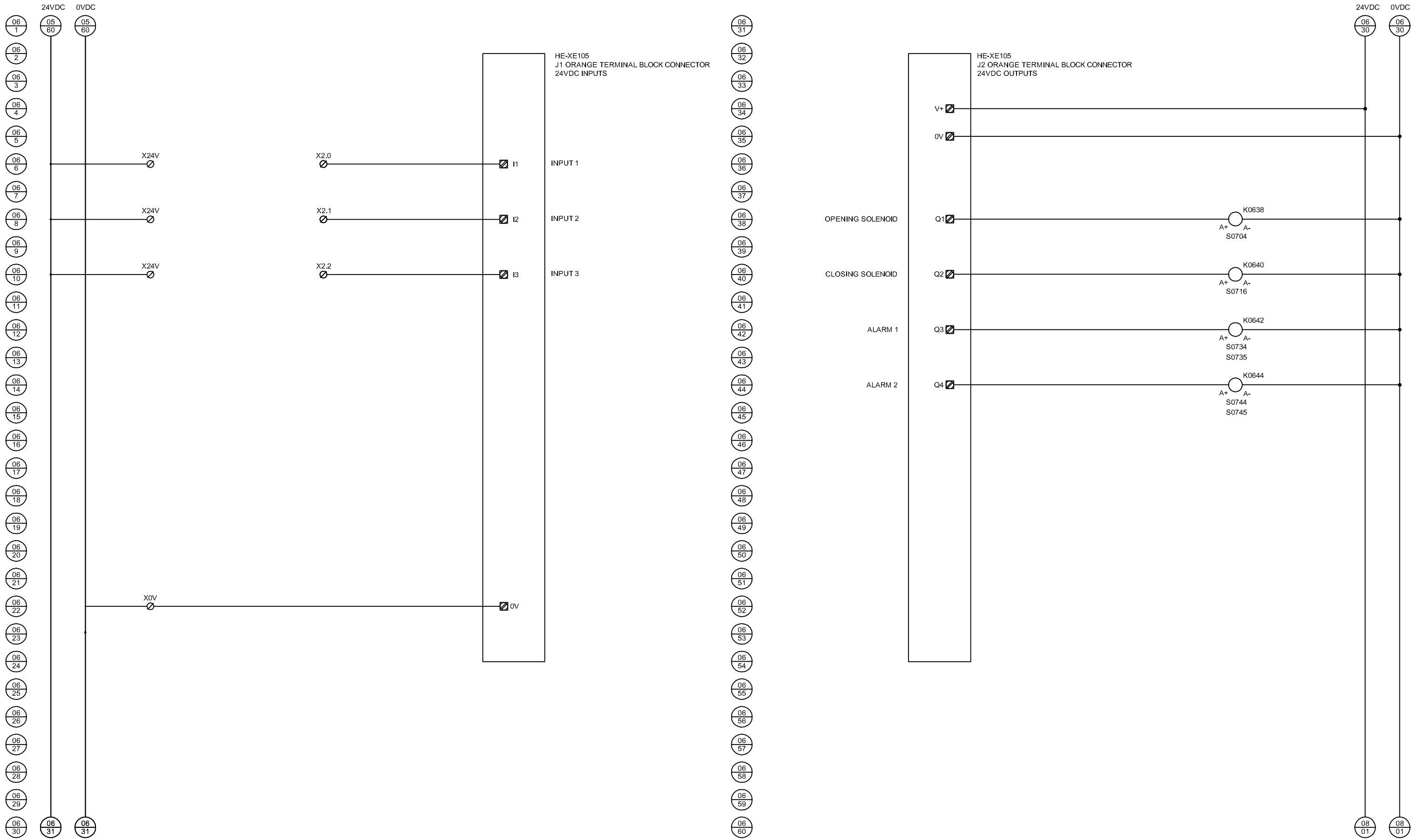
REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE
POWER DISTRIBUTION ELECTRICAL SCHEMATIC

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 5 OF 10
REVISION



REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE

DIGITAL I/O ELECTRICAL SCHEMATIC

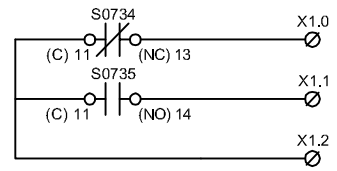
DRAWN BY	MP
APPROVED BY	
DATE	DEC 2014
DRAWING NO.	A-9124A1
SHEET COUNT	6 OF 10
REVISION	

120VAC POWER DISTRIBUTION

OUTPUT TERMINAL RATING
120VAC, 1PH 60Hz, 30VA

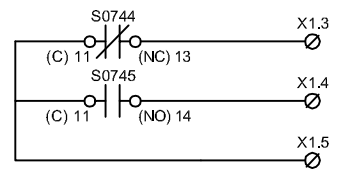
OUTPUT TERMINAL RATING
120VAC, 1PH 60Hz, 30VA

CONTACT OUTPUT RATING
28VDC, 15A
250VAC, 15A



ALARM 1

CONTACT OUTPUT RATING
28VDC, 15A
250VAC, 15A



ALARM 2

REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

TITLE
SOLENOID AND ALARM WIRING
ELECTRICAL SCHEMATIC

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
SERIAL NUMBER:
SHEET COUNT: 07 OF 10
REVISION:

08/01
08/02
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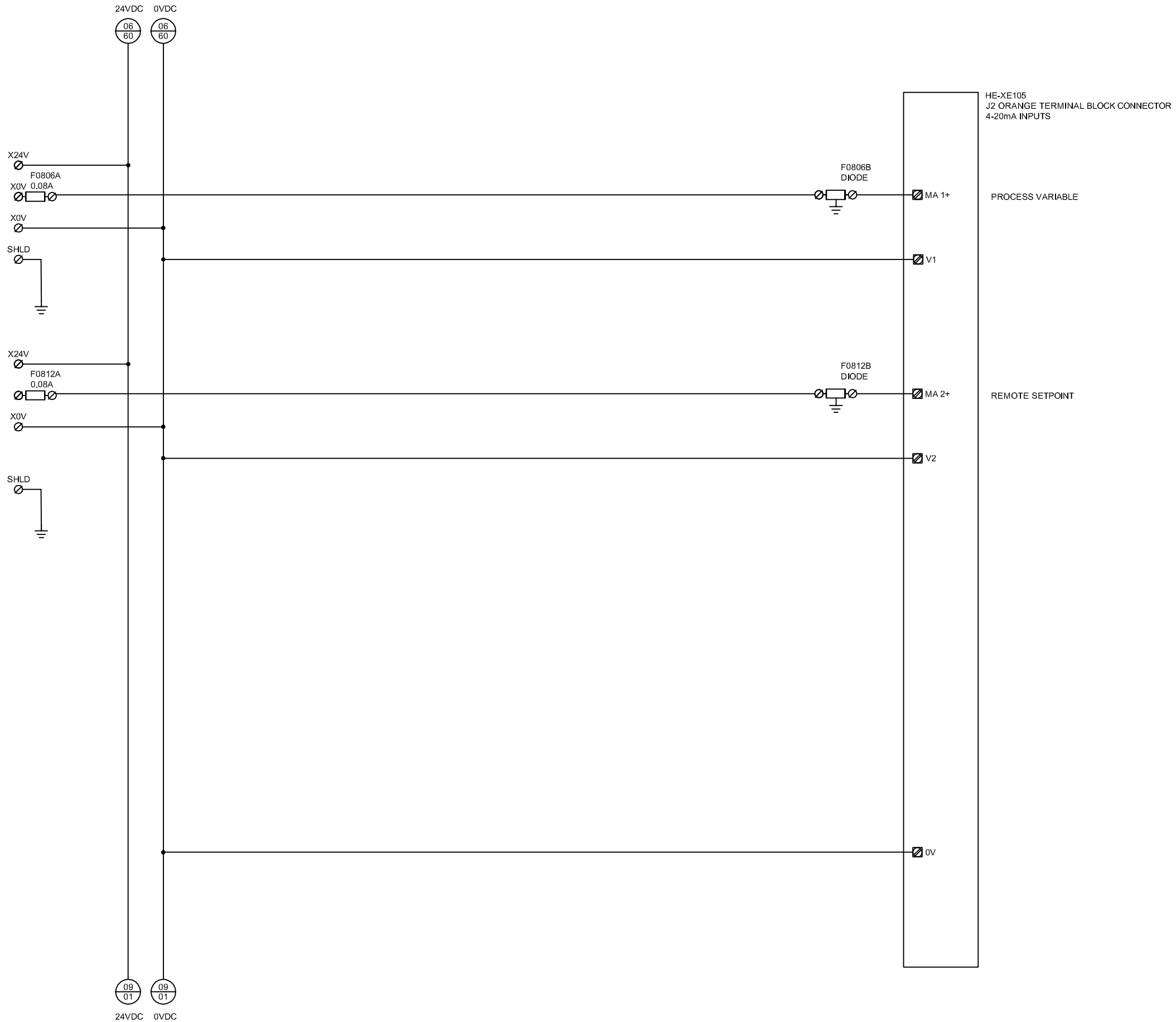


REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

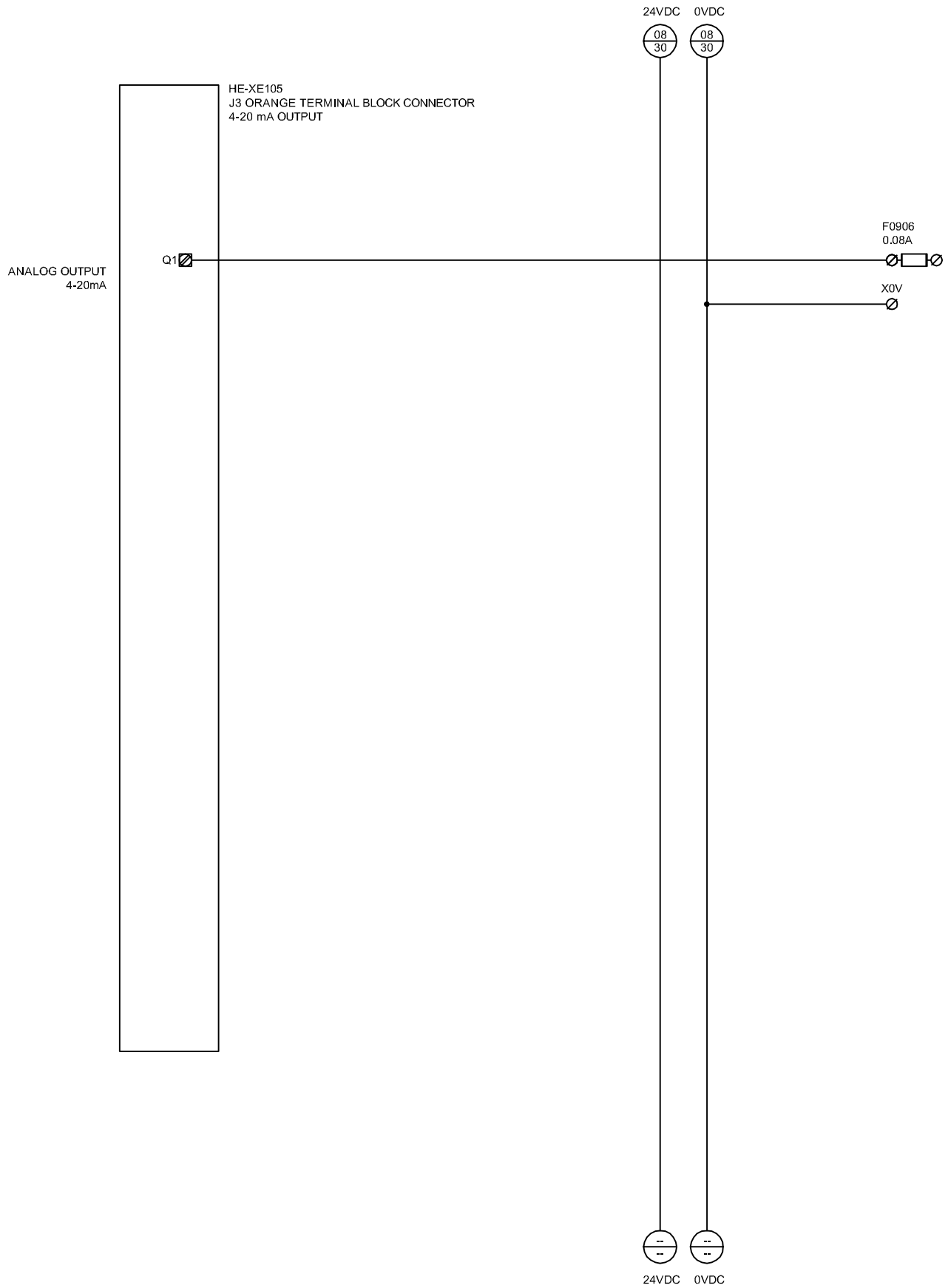
TITLE

ANALOG INPUT ELECTRICAL SCHEMATIC

DRAWN BY: MP
APPROVED BY:
DATE:

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 08 OF 10
REVISION

09/01 09/02 09/03 09/04 09/05 09/06 09/07 09/08 09/09 09/10 09/11 09/12 09/13 09/14 09/15 09/16 09/17 09/18 09/19 09/20 09/21 09/22 09/23 09/24 09/25 09/26 09/27 09/28 09/29 09/30



REV	DESCRIPTION	DATE

SINGER VALVE
Result-Based Solutions Globally
www.singervalve.com 12850-87th Avenue, Surrey, B.C. V3W 3H9

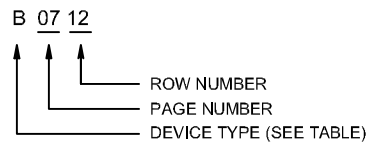
TITLE
ANALOG OUTPUT ELECTRICAL SCHEMATIC

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

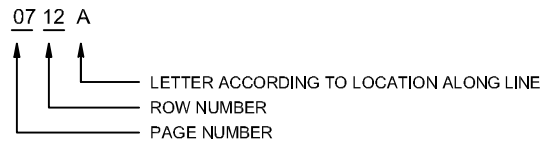
DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 09 OF 10
REVISION:

LETTER CODES FOR DEVICE TYPE	
CODE	DESCRIPTION
A	ASSEMBLIES, SUBASSEMBLIES
B	TRANSDUCERS
C	CAPACITORS
D	BINARY ELEMENTS, DELAY DEVICES
E	MISCELLANEOUS
F	PROTECTIVE DEVICES
G	POWER SUPPLIES
H	SIGNALLING DEVICES
I	
J	PROTECTION RELAYS
K	RELAYS, CONTACTORS, SWITCH CONTACT BLOCKS
L	INDUCTORS, REACTORS
M	MOTORS
N	ANALOG ELEMENTS
O	
P	MEASURING EQUIPMENT
Q	SWITCHING DEVICES FOR POWER CIRCUITS
R	RESISTORS
S	SWITCHING DEVICES FOR CONTROL CIRCUITS, SELECTOR SWITCH AND PUSHBUTTON OPERATORS
T	TRANSFORMERS, VOLTAGE REGULATORS
U	MODULATORS
V	SEMICONDUCTORS
W	TRANSMISSION PATHS, ANTENNAS
X	TERMINALS, PLUGS, SOCKETS
Y	ELECTRICALLY OPERATED MECHANICAL DEVICES
Z	NETWORKS, FILTERS

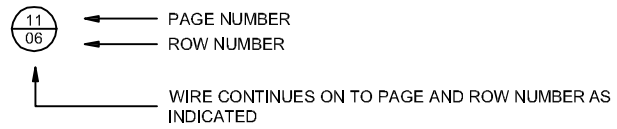
A. DEVICE REFERENCE NUMBERS



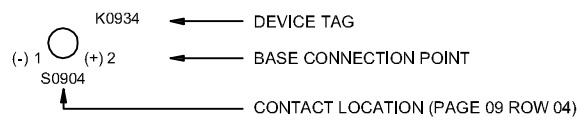
B. WIRE NUMBERS



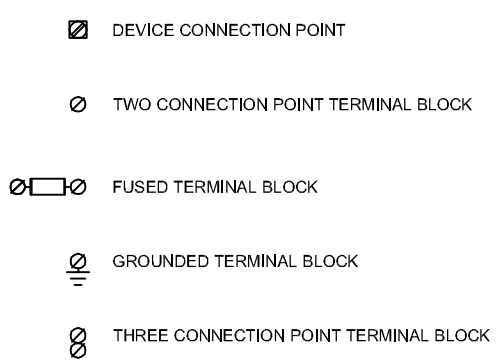
C. WIRE MARKER DEFINITION



D. RELAY IDENTIFICATION



E. TERMINAL BLOCK IDENTIFICATION



REV	DESCRIPTION	DATE

SINGER VALVE
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TITLE
DRAWING CONVENTION

DRAWN BY: MP
APPROVED BY:
DATE: DEC 2014

DRAWING NO.: A-9124A1
DRAWING NO. SERIAL NUMBER
SHEET COUNT: 10 OF 10
REVISION