CCR
PROCESS PRODUCTS

SR5 Power Supply/Controller Manual

CCR
Process Products

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Warranty and Repair Policy

1. CCR Process Products or as hereinafter referred to as CCR, warrants that its instruments shall be free from defects in material and workmanship for one year under normal and proper use when correctly installed.

2. Any CCR product which proves defective in material or in workmanship within one year from date of shipment by CCR, will be repaired or replaced free of charge provided that (1) buyer provides CCR with satisfactory proof of the defect and that the product was properly installed, maintained, and operated within the limits of rated and normal usage; (2) buyer obtains from CCR authorization to return the product; and (3) products claimed to be defective must be returned with transportation charges prepaid. Product will be returned to Buyer with transportation charges collect unless the item is found to be defective, in which case CCR will pay the return transportation charges.

3. The remedy set forth herein does not apply to damage to or defects in any product caused by the Buyer's misuse or neglect, nor does it apply to any product which has been repaired or disassembled, which in the sole judgement of CCR affects the performance of the product.

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5. Representations and warranties made by any person, including dealers and representatives of CCR, which are inconsistent or in conflict with the terms of this warranty (including but not limited to the limitations of the liability of CCR, as set forth above), shall not be binding upon CCR unless reduced to writing and approved by an officer of CCR.

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OBTAINING SERVICE UNDER WARRANTY

Advance authorization is required before any product is returned to CCR. Prior to the return of any product, write or call the Repair Department at CCR advising them of; (1) a part number; (2) a serial number of the defective product; (3) a technical description of the defect including specific test data, written observations on the failure and specific corrective action required; (4) a no-charge purchase order number (so the product can be returned to sender correctly); and (5) ship and bill addresses. Non-verified problems or defects may be subject to an evaluation charge. Please return the original calibration data with the unit.

REPAIR WARRANTY

All repairs of CCR products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items which were found defective and repaired. It does not apply to products in which no defect was found and returned as is or merely recalibrated. Out of warranty products may not be capable of being returned to the exact original specifications.

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FIGURES

DESCRIPTION

The SR5 is a microprocessor-based digital indicator capable of interfacing directly to a mass flowmeter, a mass flow controller, pressure controller or pressure transducer. A integrated +/-15 vdc @250ma power supply is available providing a well regulated, short circuit and thermal overload protected output. It is packaged in a small 1/8 DIN, 5.5" deep extruded aluminum housing which provides excellent EMI/RFI shielding and good heat dissipation characteristics.

The SR5 is a state-of-the-art product and uses the latest surface mount

components. The internal microprocessor provides the following capabilites.

Pushbutton Zero and Full Scale Calibration
Front Panel Setup of Setpoint Control Voltage
Front Panel Setup of (2) High and (2) Low Digital Setpoints with open collector outputs.


SPECIFICATIONS

Signal Input:	0-5 vdc or 0-10 vdc
Input Resistance:	> 1 Megohm
Input Bias Current:	< 1 na
Display Type:	0.4" high efficiency red LED's
Max display range:	+/- 99,999 counts
A/D Resolution:	+/- 19,999 counts
Linearity:	+/- 0.01% FS +/- 1 count
FS Accuracy:	+/-0.01% FS +/- 1 count
FS Step Response:	500ms (typ)
Overrange Display:	Flashing digits for input > 10.5 vdc
No Sensor Indication:	Flashing digits
Setpoint Output:	0-5 vdc or 0-10 vdc (optional)
Power Supply:	+/- 15 vdc +/- 5% @ 250 ma (min)
Operating range:	-10 to +50 degC
Input Power:	100, 110, 220 and 240 VAC (solder pad jumper selectable)
Pkg dimensions:	3.78W x 1.89H x 5.13D

RS232   Optional

INSTALLATION AND WIRING

INSTALLATION

The SR5 enclosure is designated for panel mounting in a 1/8 DIN cutout. The cutout dimensions are shown below.

1.772"
(+0.024, -0.000)

45mm

92 mm

3.622"
(+0.032, -0.000)
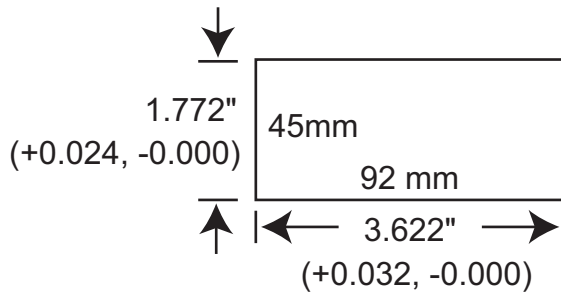
To panel mount the unit, perform the following steps.

1. Rotate the four pawl screws (outside screws in each corner) several turns counter-clockwise to retract the pawls. Make sure the pawls retract enough to clear the back of the mounting panel. The pawls may be retracted to accomodate panel thicknesses up to 0.25 inches (6.35mm).

2. Insert the instrument into the panel cutout.

3. Position the pawls so that their elongated dimension overlaps the panel cutout, then tighten the screws. Do not over-tighten.

4. Installation complete.

WIRING

Reference Figures 3 and 4 for TRANSDUCER and INPUT/OUTPUT (I/O) wiring information. Power is applied with a 3-prong AC power cord. The instrument is protected by a 250V, 500ma, slo blo, 5mm fuse. The fuse holder is an integral part of the input power connector. A spare fuse is provided in the fuse holder. Internal solder jumpers are provided to allow 100, 110, 220 or 240VAC operation.
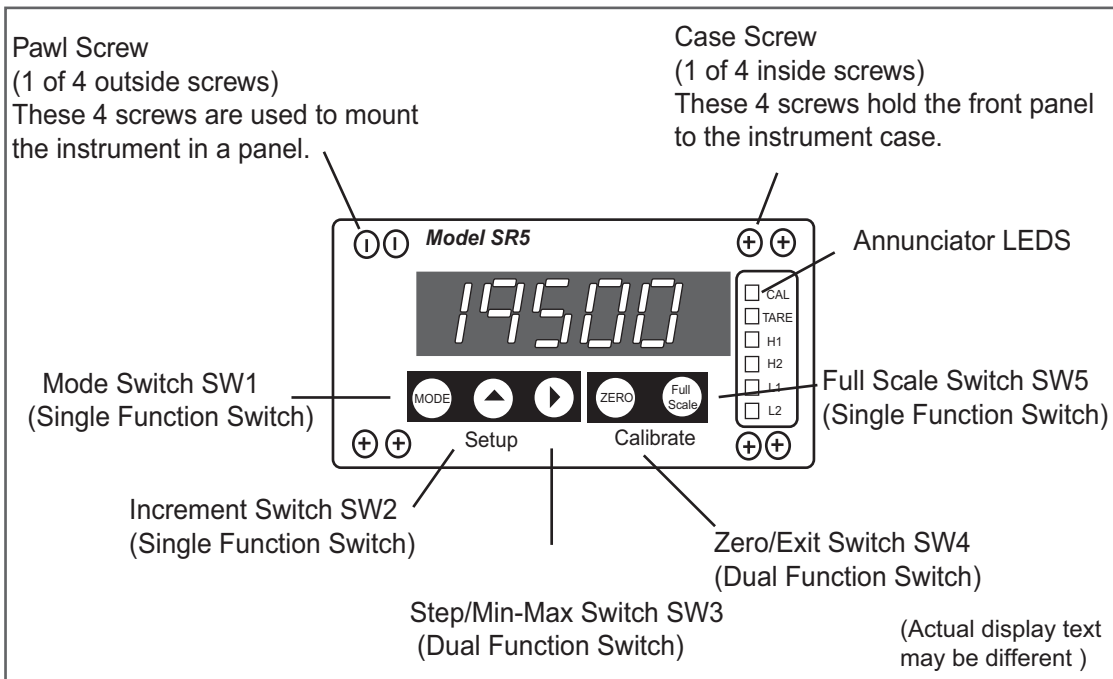
Pawl Screw
(1 of 4 outside screws)
These 4 screws are used to mount
the instrument in a panel.

Case Screw
(1 of 4 inside screws)
These 4 screws hold the front panel
to the instrument case.

Model SR5

19500

CAL
TARE
H1
H2
L1
L2

Annunciator LEDS

Mode Switch SW1
(Single Function Switch)

MODE

ZERO

Full Scale

Full Scale Switch SW5
(Single Function Switch)

Setup

Calibrate

Increment Switch SW2
(Single Function Switch)

Zero/Exit Switch SW4
(Dual Function Switch)

Step/Min-Max Switch SW3
(Dual Function Switch)

(Actual display text
may be different)

Figure 1. SR5 Front Panel View

Transducer Connector (J1)
(15-pin Standard D-Sub)

Fuse Holder
(250v, 500ma, 5mm fuse)

J1 Transducer

8   1
15   9

Line
50/60 Hz
115V .10A
230v .05A

J2

11   15
6   10
1   5

I/O

FUSE
220/240v T250v 250ma

Input/Output (I/O) Connector (J2)
(15-pin High Density
D-Sub Connector)

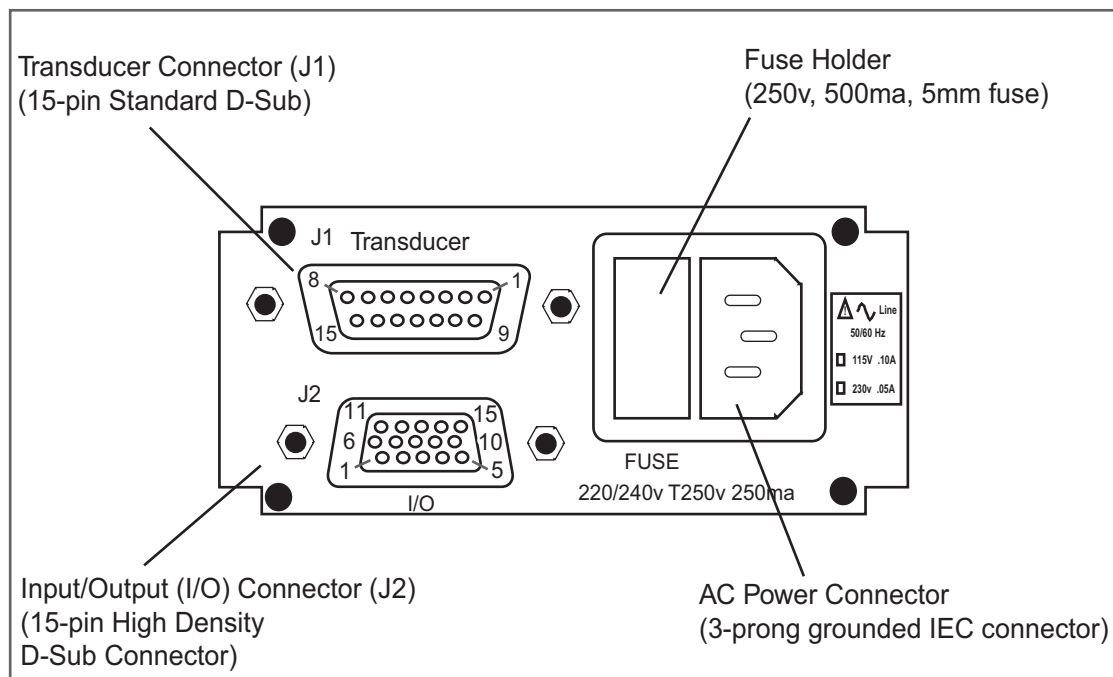AC Power Connector
(3-prong grounded IEC connector)

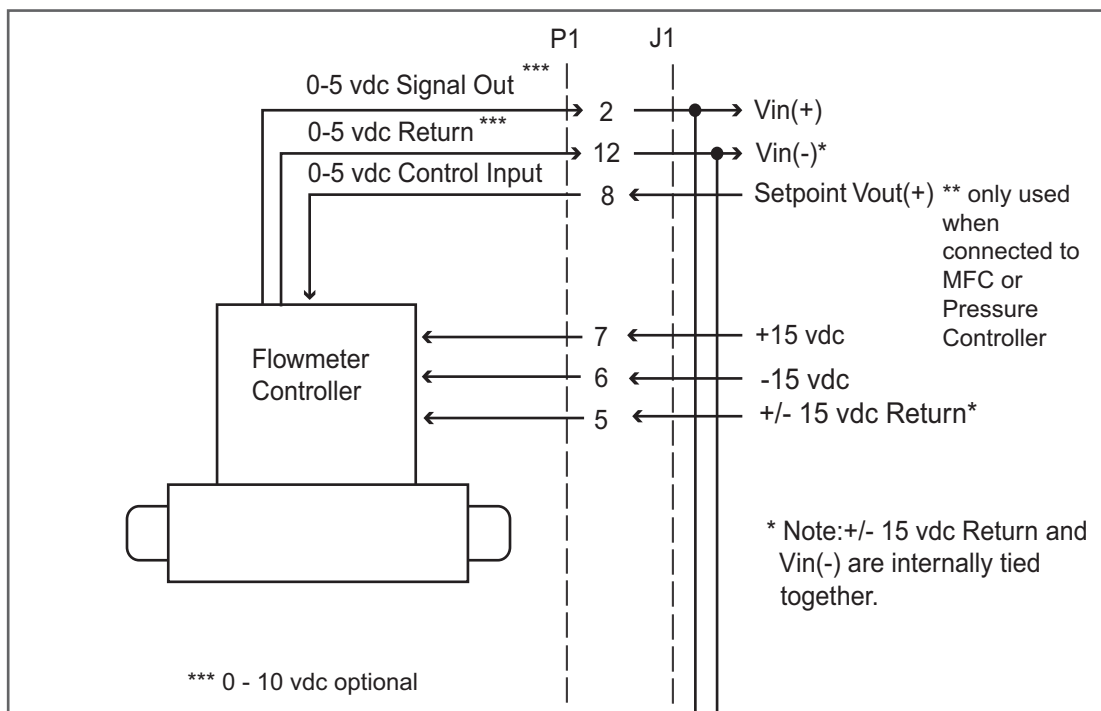*Figure 2. SR5 Model Rear Panel View*

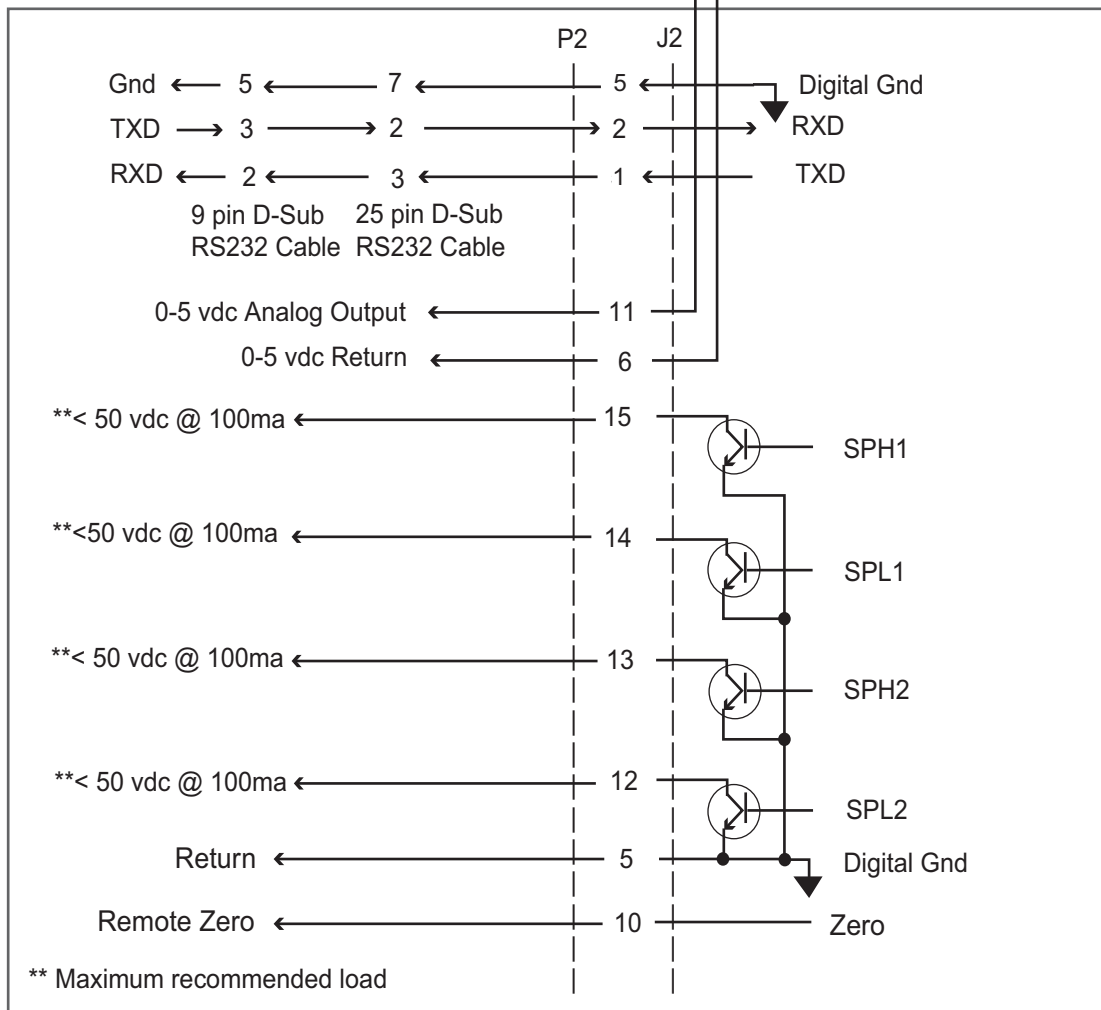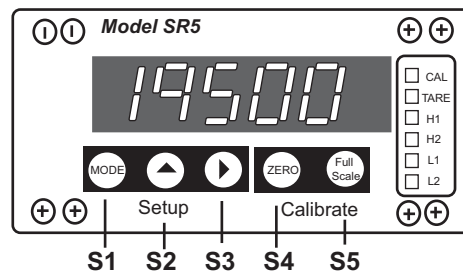Figure 3. Transducer Wiring Diagram

Figure 4. I/O Wiring Diagram

SWITCH AND FUNCTION DEFINITIONS

SWITCH DEFINITIONS

A) Mode Switch (S1)

The Mode switch (S1) is used to cycle through the various setpoints, hysteresis, calibration values and decimal point locations. The sequence is as follows. The designators, in parenthesis, identify text that will be displayed, momentarily, followed by the value.

Setpoint for Flow (StPt)
Set Point High 1   (SPH1)
Set Point Low 1   (SPL1)
Set Point High 2   (SPH2)
Set Point Low 2   (SPL2)
Hysteresis High   (HH)
Hysteresis Low   (HL)
Cal   (CAL)
Decimal Point   (dP)
Exit

While in the Mode Selection sequence, the indicator is no longer monitoring the input signal. To exit at any time, simply depress S4 or cycle through the menu. All new data entered prior to exiting, except StPt, will be stored in non-volatile memory and recalled at power on. Depending on the position of switch SWd, the StPt value may be retained or not upon power cycling (see pg. 9 for details).

B) Increment Switch (S2)

This switch increments the flashing digit. Note that the most significant digit for StPt may be turned off (zero cannot be selected). While updating this digit the display will toggle through the following digits: 1, 2, 3, 4, 5, 6, 7, 8, 9, Blank (first digit will show blank instead of zero).

SWITCH DEFINITIONS (cont)

C) Step and Min-Max Switch (S3)

This switch has a dual function. When in the MODE sequence, it steps the
digit to be incremented, one position to the right. Using S3 in conjunction
with S2 allows rapid updating of all parameter values.

When not in the MODE sequence, depressing S3 displays the HI (Max) and LO (Min)
readings, momentarily. These values are stored in static RAM and are reset when
power is applied. When power is applied, the maximum value is initialized to -99,999
and the minimum value to 99.999.

The HI and LO values are the maximum and minimum values, respectively, of the
displayed readings. Sign and magnitude are constantly compared with the displayed
readings at the instrument update rate of 2.5 times per second.

D) Zero and Exit Switch (S4)

This switch has a dual function. When *not* in the MODE sequence, this switch must
be depressed and held for approximately 3 seconds before it zeroes the reading on
the display. The ZERO annunciator on the front panel should be illuminated. ZEROing
is accomplished by storing the reading just prior to ZEROing and subtracting this value
from all subsequent readings. This value is retained in non-volatile memory and
recalled when power is applied. It is also used to compensate the StPt control voltage
output so that the input equals the setpoint even though display is zeroed.

When in the MODE sequence, this switch is used to exit. All values entered
prior to exiting, except for the StPt value (see **NOTE), will be retained in non-volatile
memory and recalled when power is applied.

E) Cal Switch (S5)

Note, user must understand cal process fully prior to activating this process.This
switch must be depressed and held for approximately 3 seconds to auto-calibrate the
readout. When initially held and depressed for 3 seconds the CAL annunciator will
extinquish and the display will read the raw data generated by the analog-to-digital
converter. When depressed and held again for 3 seconds the CAL annunciator will
illuminate and the raw data will automatically be scaled to the CAL value entered
previously. (Reference the FS CAL pg 10 and the CALIBRATION INSTRUCTIONS on
pg 15 for more information).

FUNCTION DEFINITIONS (cont)

The Mode switch (S1) cycles through the following functions.

a) Setpoint (StPt)

The Setpoint (0-5 vdc or optional 0-10vdc) command signal is used to control the
flow through a mass flow controller or pressure controller.
The setpoint output is defined as (for 0-5 vdc):

Setpoint Output = StPt / CAL x 5.000 vdc +/- Voffset

where Voffset = Output Offset voltage (Zero)

Example: If the CAL value was programmed to be 7500 sccm and the
desired flow rate is 5000 sccm, enter 5000 for the StPt value. Depress
the ZERO switch to exit the MODE sequence and the Setpoint Output
voltage will be 3.333 vdc. This is assuming the Flowmeter output had no
offset voltage.

****Note: If switch SWd (Reference drawing on pg 17) is ON , the last StPt
value will be recalled at power-up, although the StPt display will
always display to 0000 at power-up and may not correspond to the
actual StPt value.
If Switch SWd is OFF, the StPt output will be zero at power-up.**

b) Set Point High 1 (SPH1)

SPH1 is a digital setpoint being constantly compared with the displayed
reading. If the magnitude and sign of the reading *exceeds* the SPH1
value, the SPH1 open collector output will activate and pull its respective
D-Sub connector pin to ground (Ref Figure 4 on pg 4). The front
panel LED (H1) will also illuminate. If SPH1 is exceeded, the reading
must then drop below SPH1 less the Hysteresis High (HH) value before
the open collector output opens and the H1 LED turns off.

c) Set Point Low 1 (SPL1)

SPL1 is another digital setpoint being constantly compared with the
displayed reading. If the magnitude and sign of the displayed reading *is
less* than the SPL1 value, the SPL1 open collector output will activate
and LED (L1) will illuminate. If the displayed reading drops below SPL1,
it must then exceed SPL1 plus the Hysteresis Low (HL) value before the

FUNCTION DEFINITIONS (cont)

d) Set Point High 2 (SPH2)

SPH2 is independent and functions identically to SPH1. SPH2 has its own open collector outputs and front panel LED (H2).

e) Set Point Low 2 (SPL2)

SPL2 is independent and functions identically to SPL1. SPL2 has its own open collector outputs and front panel LED (L2).

f) Hysteresis High (HH)

HH is the hysteresis value for SPH1 and SPH2. The hysteresis value determines the number of counts the displayed reading must fall below SPH1 and SPH2 values before deactivating their respective open collector outputs and LEDs. The maximum value of hysteresis is 99 counts while the minimum is 00 counts.

g) Hysteresis Low (HL)

HL is the hysteresis value for SPL1 and SPL2. The hysteresis value determines the number of counts the displayed reading must exceed the SPL1 and SPL2 values before deactivating their respective open collector outputs and LEDs. The maximum value of hysteresis is 99 counts while the minimum is 00 counts.

h) FS Cal (CAL)

This input allows the user to calibrate the full scale readout to any desired engineering units. This input must be entered prior to performing the calibration.   For best resolution and stability, choose a CAL number between 0500 and 20,000 counts.

Example: If the Flowmeter is to be calibrated at a full scale flowrate of 500 sccm, the FS Cal value could be 500.00, 500.0 or 0500. If the FS Cal value of 500.00 is used, the unit will automatically count by 3 when full scale calibration is completed since the analog-to-digital converter resolution is only 19,999 counts. Choosing a FS Cal value of 500.0 or 0500 assures the best resolution and stability in this particular case.

When changing this CAL number, calibration must subsequently be completed for the SR5 to use this new setting .

FUNCTION DEFINITIONS (CONT)

i) Decimal Point (dP)

dP allows selection of decimal point locations for display. The locations selectable are x.xxxx, xx.xxx, xxx.xx, xxxx.x and xxxxx.

OPERATING INSTRUCTIONS

TURN-ON INSTRUCTIONS

Reference Figures 3 and 4 for proper input and output signal wiring.

1. Apply power to the instrument.
2. Verify the instrument readout blanks momentarily, then displays the value of the input signal.
3. To clear the StPt register, depress the MODE(S1), then the ZERO (S4) switch prior to using the instrument.

PROGRAM INSTRUCTIONS

Five front panel switches (S1, S2, S3, S4 and S5) allow the user to program Flowmeter Setpoint Output Voltage (StPt), Digital Setpoints (SPH1, SPL1, SPH2 and SPL2), Hysteresis (HH and HL), Calibration Number (CAL) and Decimal Points (dP) and monitor minimum, maximum or real time values.

S1 S2 S3 S4 S5
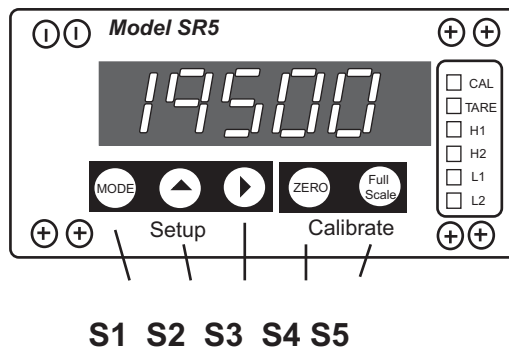
1. Depress MODE (S1) switch once.

The text *StPt* will be displayed momentarily followed by the current value for the Flowmeter Setpoint. Use switches S2 and S3 to set the StPt value. Proceed to Step 2 to set Set Point H1 (SPH1) or depress S4 to exit the MODE sequence. If S4 is depressed the latest StPt value is used to generate a new Flowmeter Setpoint output voltage.

Note StPt setting only applies to mass flow controller or pressure controller and not with a pressure transducer or other type of meter with no valve.

PROGRAM INSTRUCTIONS (cont)

2. Depress MODE (S1) switch once.

   The text **SPH1** followed by the current value of Set Point High 1 (SPH1) will be displayed. Use S2 and S3 to set Set Point High 1 to the desired value. Proceed to Step 3 to set Setpoint Low 1 (SPL1) or depress S4 to exit MODE sequence. If S4 is depressed, the new value for SPH1 will be saved in non-volatile NOVRAM memory.

3. Depress MODE (S1) switch once.

   The text **SPL1** followed by the current value of Set Point Low 1 will be displayed. Use S2 and S3 to set Set Point Low 1 to the desired value. Proceed to Step 4 or depress S4 to exit.

4. Depress MODE (S1) switch once.

   The text **SPH2** followed by the current value of Set Point High 2 will be displayed. Use S2 and S3 to set Set Point High 2 to the desired value. Proceed to Step 5 or depress S4 to exit.

5. Depress MODE (S1) switch once.

   The text **SPL2** followed by the current value of Set Point Low 2 will be displayed. Use S2 and S3 to set Set Point Low 2 to the desired value. Proceed to Step 6 or depress S4 to exit.

6. Depress MODE (S1) switch once.

   The text **HH** followed by the current value of Hysteresis High will be displayed. Use S2 and S3 to set Hysteresis High to the desired value. The maximum value for HH is 99 counts. Proceed to Step 7 or depress S4 to exit.

PROGRAM INSTRUCTIONS (cont)

7. Depress MODE (S1) switch once.

   The text **HL** followed by the current value of Hysteresis Low will be displayed. Use S2 and S3 to set Hysteresis Low to the desired value. The maximum value for HL is 99 counts. Proceed to Step 8 or depress S4 to exit.

8. Depress MODE (S1) switch once.

   The text **CAL** followed by the current CAL number will be displayed. Use S2 and S3 to set the CAL number. Proceed to Step 9 or depress S4 to exit.

9. Depress MODE (S1) switch once.

   The text **dP** followed by the current decimal position will be shown flashing. Use S2 to set the decimal point to the desired location.

10. Depress MODE (S1) switch once.

    The instrument will exit the Mode Selection Sequence and enter the normal operating mode (i.e. monitoring the input signal) This is the end of the PROGRAM INSTRUCTIONS.

CALIBRATION INSTRUCTIONS

Prior to connecting the SR5 to the Mass Flow Controller or other instrument, verify that the controller's +/-15 vdc requirement is no more than 250 ma. The SR5 is capable of supplying up to 500ma for short periods of time (in 1/2 or 1 hour increments). Consult the factory if the current requirement is > 250ma for prolonged periods of time.

Connect the SR5 to a voltage source with an accuracy of 0.01% or better per Figure 3. The voltage source should be connected between J1-2 and J1-12. Apply AC power to the SR5. Verify that the SR5 lights up and the instrument is displaying a stable reading. If no display appears after 1 or 2 seconds has elapsed, remove the ac power and check the fuse contained in the AC Power Connector at the rear of the SR5 (Reference Figure 2 on pg 5).

If a stable display appears, (allow 15-30 minutes power-up for the SR5 to stabilize,) then perform the calibration procedure shown below.

1. The FS Cal (CAL) value must be entered prior to performing this calibration procedure. Reference pg 8 to enter the FS Cal (CAL) value.

2. Apply zero vdc to the SR5.

3. Depress and hold the ZERO (S4) switch for approximately 3 seconds (Reference Figure 1 on pg 5). Verify ZERO annunciator LED is illuminated and the display reads 0000 +/- 0001 counts. Ignore the decimal point. The SR5 is now zeroed.

4. Apply full scale signal, for example 5.000 vdc +/- 0.0005 vdc to the SR5 (use the same voltage as the maximum signal of the transducer).

5. Depress and hold CAL(S5) switch for approximately 3 seconds. Verify FS CAL annunciator LED is extinguished.

CALIBRATION INSTRUCTIONS (cont)

6. Depress and hold CAL (S5) again for approximately 3 seconds. The
   FS CAL LED should illuminate and the readout should display
   the FS Cal value within +/- 1 digit which will correspond to the voltage
   being input.

7. The CALIBRATION sequence is now complete.

   NOTE: Calibration information (zero and scale factor values) are
          stored in non-volatile memory and are updated every time
          calibration step 6 above is performed. ZEROing the
          display changes and stores a new zero value but does
          not affect the scale factor value.

RS232 SERIAL COMMUNICATIONS

The Parity(Even or None) and the Baud Rate (2400 or 9600) are selectable by setting DIP switches *SWa* and *SWb*, accessible from the right side of the instrument case. *SWc* is utilized for Pressure Controller applications only (0-10 vdc selection). *SWd* turns StPt memory ON or OFF (Reference StPt Function Definition on pg 9).
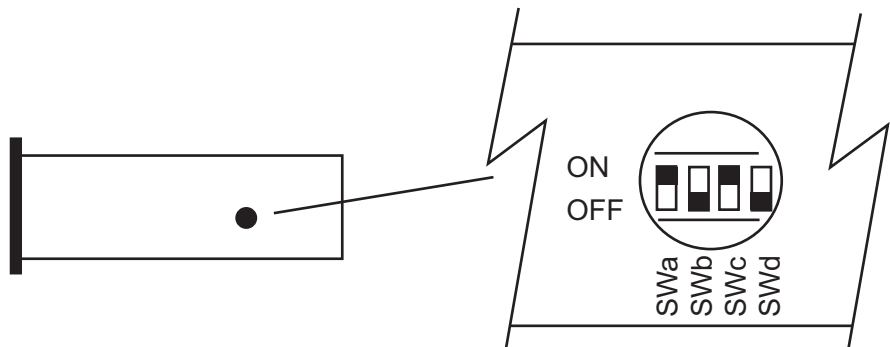
Parity (SWa)	Baud Rate (SWb)	Stpt Voltage (SWc)	Stpt Memory (SWd)
ON = Even	ON = 2400	On = 5 V	On= Memory On
OFF = None	OFF = 9600	Off = 10V	Off= Memory Off

Baud Rate: Programmable for 2400 or 9600 Baud

Parity: Programmable for Even or None

Data Bits: For Even Parity (7 data bits)
For Odd Parity (8 data bits)

Stop Bits: One

Delimeter: CrLf (Carriage Return-Line Feed)

Command Syntax

Notes: In the following tables, each command or request element separated with square brackets [ ] is for clarity only.

Unless Otherwise Specified

[value] is indicated as % of full scale and takes the following form: signxxx.xx

When entering commands, unless a minus sign is included, value will be accepted as positive.

When responding to a request, value will contain a +/- sign followed by a number complete to two decimal places.
[counts] will represent an actual number within a defined range.

RS232 SERIAL COMMUNICATIONS

SET COMMAND PROTOCOL	FUNCTION
SET COMMAND PROTOCOL	*FUNCTION*
[Z] [CR] [LF]	Zero the displayed reading
[F] [CR] [LF]	Calibrate Full Scale (Input voltage signal is scaled to display Full Scale)
[S] [counts] [CR] [LF]	Set Full Scale display value. (counts range = 0 .... 99999)
[D] [value] [CR] [LF]	Set decimal position 1 = x.xxxx 2 = xx.xxx 3 = xxx.xx 4 = xxxx.x 5 = xxxxx
[P1] [value] [CR] [LF]	Set level of Lo Alarm #1
[P2] [value] [CR] [LF]	Set level of Lo Alarm #2
[P3] [value] [CR] [LF]	Set level of Lo Alarm #3
[P4] [value] [CR] [LF]	Set level of Lo Alarm #4
[H1] [counts] [CR] [LF]	Set Lo Alarms #1&2 hysteresis
[H2] [counts] [CR] [LF]	Set Hi Alarms #1&2 hysteresis
[X] [counts] [CR] [LF]	Set analog setpoint (range 00000 to 99999)

READ COMMAND PROTOCOL	FUNCTION	RETURN MESSAGE
READ COMMAND PROTOCOL	*FUNCTION*	*RETURN MESSAGE*
[R5] [CR] [LF]	Signal Input value	[P] [value] [CR] [LF]
[R8] [CR] [LF]	Full Scale display	[S] [counts] [CR] [LF]
[R9] [CR] [LF]	Decimal location 1 = x.xxxx 2 = xx.xxx 3 = xxx.xx 4 = xxxx.x 5 = xxxxx	[D] [value] [CR] [LF]
[R1] [CR] [LF]	Lo Alarm #1 level	[P1] [value] [CR] [LF]
[R2] [CR] [LF]	Hi Alarm #1 level	[P2] [value] [CR] [LF]
[R3] [CR] [LF]	Lo Alarm #2 level	[P3] [value] [CR] [LF]
[R4] [CR] [LF]	Hi Alarm #2 level	[P4] [value] [CR] [LF]
[R6] [CR] [LF]	Lo Alarm #1&2 hysteresis	[H1] [counts] [CR] [LF]
[R7] [CR] [LF]	Hi Alarm #1&2 hysteresis	[H2] [counts] [CR] [LF]
[RX] [CR] [LF]	Setpoint value	[X] [counts] [CR] [LF]

SERIAL LOCKOUT:

The SR5 will respond to RS-232 commands and queries while it is in the normal display mode. When it is in the menu entry or calibration modes it will not respond to RS-232 commands or queries.