



Sage Service Manual-Rev 2

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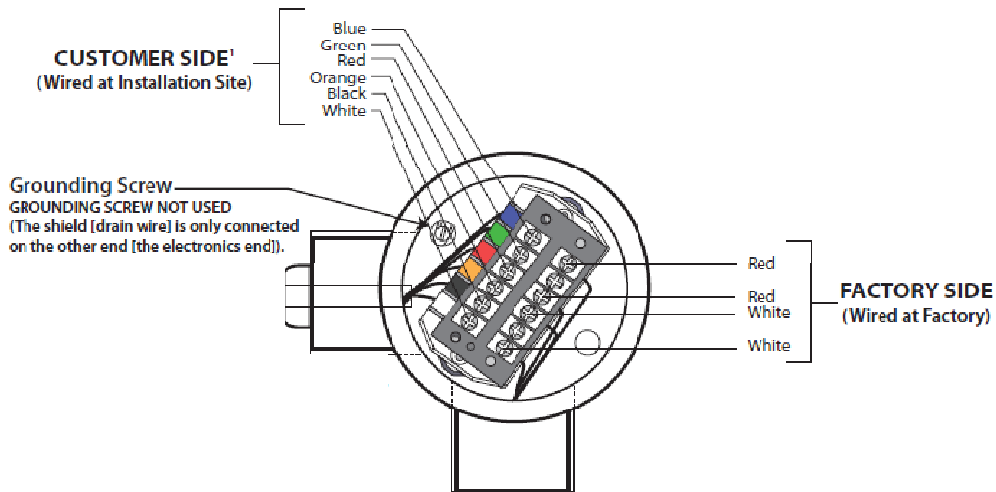


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1.0 Remote Wiring Issues

The following chart describes the symptoms that will be seen with various open wires or incorrect wiring relative to remote style meters

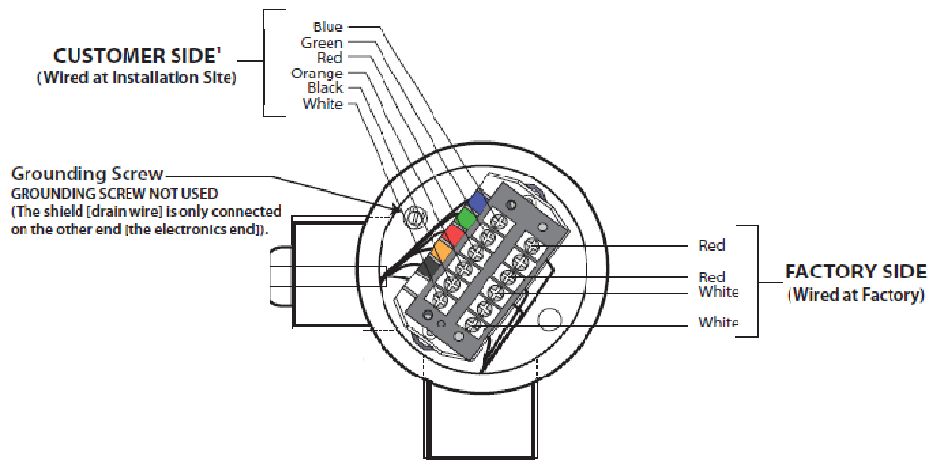
Troubleshooting Remote Wiring Issues							
				mW	Temperature	Flow	Response to flow
	Normal reading >			60	"80F" or "27C"	0	Yes
	Full Scale Reading >			700	"80F" or "27C"	6300	Yes
	Jbox Wiring	Normal	Fault				
	Short between 1 & 2 removed			60	"80F" or "27C"	0	Yes
J-Box 1&2 Internally shorted	Pin 1	Blue	Open	60	"80F" or "27C"	0	Yes
	Pin 2	Green	Open	60	"80F" or "27C"	0	Yes
	Pin 3	Red	Open	0	"80F" or "27C"	0	No
	Short between 4 & 5 removed			183 +	"-201F" or "-129C"	240 +	Yes
J-Box 4&5 Internally shorted	Pin 4	Orange	Open	1400 +	"-201F" or "-129C"	Full Scale	No
	Pin 5	Black	Open	180 +	"-201F" or "-129C"	240 +	Yes
	Pin 6	White	Open	600 +	"1434F" or "779C"	Full Scale	No
	SAB Wiring	Normal					
	Pin 1	Red	Open	0	"80F" or "27C"	0	No
	Pin 2	Green	Open	60	"80F" or "27C"	0	Yes
	Pin 3	Blue	Open	60	"80F" or "27C"	0	Yes
	Pin 4	White	Open	580	"1434F" or "779C"	Full Scale	No
	Pin 5	Black	Open	190	"-201F" or "-129C"	240 +	Yes
	Pin 6	Orange	Open	1600	"-201F" or "-129C"	0	No





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	Jbox Wiring	Normal	Miss wired				
J-Box 1&2 Internally shorted	Pin 1	Blue	Red	30 91	"80F" or "27C"	Full Scale	No
	Pin 2	Green	Green				
	Pin 3	Red	Blue				
J-Box 4&5 Internally shorted	Pin 4	Orange	Orange				
	Pin 5	Blk	Black				
	Pin 6	White	White				
	SAB Wiring	Normal					
	Pin 1	Red	Red				
	Pin 2	Green	Green				
	Pin 3	Blue	Blue				
	Pin 4	White	White				
	Pin 5	Black	Black				
	Pin 6	Orange	Orange				
	Jbox Wiring	Normal					
J-Box 1&2 Internally shorted	Pin 1	Blue	Blue	18 0 +	"-201F" or "-129C"	240 +	Yes
	Pin 2	Green	Green				
	Pin 3	Red	Red				
J-Box 4&5 Internally shorted	Pin 4	Orange	White				
	Pin 5	Black	Black				
	Pin 6	White	Orange				
	SAB Wiring	Normal					
	Pin 1	Red	Red				
	Pin 2	Green	Green				
	Pin 3	Blue	Blue				
	Pin 4	White	White				
	Pin 5	Black	Black				
	Pin 6	Orange	Orange				





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2.0 Common Diagnostics

SYMPTOM: Display failure, or pixels extremely dim.

CORRECTIVE ACTION: Contact Factory. Certain types of failures are under long term warranty. Please note that the 4-20 mA will still function normally.

SYMPTOM: Display fading, or partially fading.

CORRECTIVE ACTION:

- a) Some fading, particularly with those characters that are lit up most frequently, is normal. The flow meter will continue to function properly, and flow meter accuracy and outputs will not be affected.
- b) In extreme cases, contact the factory for display replacement.
- c) Note, in late 2009, the Sage Prime was modified to incorporate a built-in photocell. The purpose of the photocell is to adjust the display brightness with ambient lighting. The brighter the surrounding lighting conditions, the brighter the display. Lower ambient lighting conditions, such as a factory environment, will dim the display. The display will be dimmest if operated in low ambient lighting, or at night. The photocell circuit is designed to extend the life of the display, and to minimize fading.
- d) Note, in early 2010, a further enhancement was added to further extend the life of the display. The above mentioned built-in photocell also senses motion which automatically switches display from Screen Saver mode to Normal mode.

SYMPTOM: Erratic Readings.

POSSIBLE CAUSES: If a large Motor or Generator or Variable Frequency Drive (VFD) is nearby the enclosure, it may be inducing sufficient analog noise into the circuitry to temporarily corrupt the data.

SUGGESTED CORRECTIVE ACTION:

- a) If a Power-Restart temporarily solves the problem, than it is likely that the source of the noise was the problem.
- b) To prevent subsequent problems, if a Remote Style Meter, move the enclosure as far away as possible from the source (the Motor or VFD).
- c) If an Integral Style Meter, mount the meter in a different location (further from the source) or move the source further from the meter.

SYMPTOM: Erratic Readings on a Remote Meter.

POSSIBLE CAUSE: In some cases, analog noise is induced into the Remote cable causing erratic, or climbing readings.

SUGGESTED CORRECTIVE ACTION:

- a) Be sure the remote cable is installed in metal conduit and grounded on one end (in some cases, grounding *both* ends may be required).
- b) Also, avoid coiled cable, especially if not in metal conduit.
- c) Also, if extra cable exists, move the extra cable as far away as possible from any source of analog noise, such as large motors or VFDs.

SYMPTOM: Meter reading zero continuously, or Full Scale continuously, or temperature reading is abnormally low (hundreds of degrees below zero).

POSSIBLE CAUSES/SUGGESTED CORRECTIVE ACTION:

- a) It is likely that a wire is loose. But in rare cases, a sensor could fail (i.e., if a standard sensor, HT01 or HT02 sensor exceeds a process temperature of 450°F.)
- b) Check for continuity to be sure the wiring is making good contact at the terminals of the Junction Box.
- c) Also, to verify that the electronics and the sensor serial number are the same, note the following: The sensor's serial number will come up upon power up, right after Initializing on the Display. If the serial number doesn't agree with the Junction Box labels, that would affect calibration (in other words, sensors and electronics are a matched pair—mixing them up will cause false readings). Also metal Serial Number Tags are fastened to both the electronics and the Junction Box. They must have identical Serial numbers.
- d) To check if a sensor has failed on a remote style meter, it is easy to use the Junction Box to do so. You must Power Down (shut off power), but you do not need to remove the probe from the pipe.

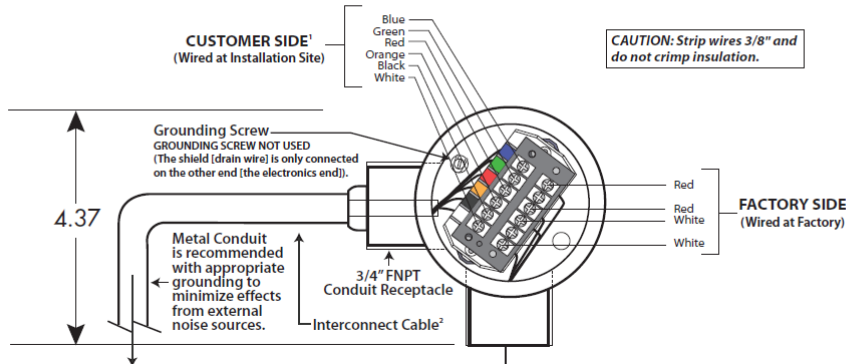


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- e) An Ohm Meter is required to check across the sensor leads of the Flow Sensor. Look at the drawing of the Junction **Junction Box Wiring Terminals for Remote Style Meters (Series SRP)**

(THERE ARE NO ELECTRONICS INSIDE JUNCTION BOX)

SEE THE PREVIOUS PAGE FOR THE OTHER END OF THE REMOTE WIRING HOOKUP (the electronics side).



Box.

Disconnect the red wires on the Factory Side to isolate and measure the resistance. If the reading is infinity or a short, it means that sensor has failed.

f) Now check the Temperature Sensor. Disconnect the white wires on the Factory Side to isolate and measure the resistance. If you have infinity or a short, it means that sensor is burned out. **Note:** *Normally the sensors will read approximately 110 ohms at 70° F. At higher temperatures they should read a higher resistance, but both sensors should have a similar value.*

g) On integral style meters (SIP), there is no Junction Box. In that case, refer to the Prime Integral Terminals on page 19 and check the sensor wires. Remove the appropriate wires first (red pair for flow, then white pair for temperature). Measure their resistance. If reading infinity or short, it means that sensor has failed.

SYMPTOM: Meter Railing (Pegging) or Reading High

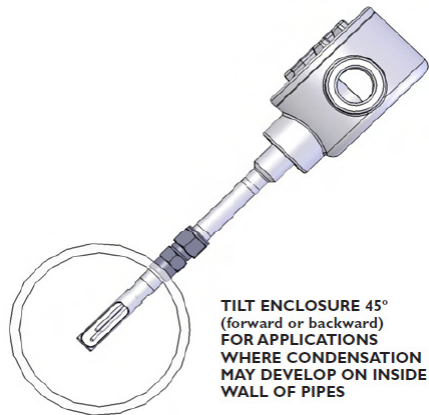
POSSIBLE CAUSES/SUGGESTED CORRECTIVE ACTION:

- Insufficient straight run (i.e. flow profile is disturbed, causing errors).
- Possible jet effect if upstream pipe is smaller than meter flow body or if valve is too close upstream to meter.
- Not following Probe Insertion Guideline.
- If sensor is inserted in reverse (“Upstream” mark is facing downstream) Meter may over-report (or under-report) by as much as 30%.
- If sensor is not aligned properly, with “Upstream” mark facing upstream, a rotation greater than ± 5 degrees may cause change in reading (greater than ± 5 degrees and less than ± 20 degrees causes meter to over-report; a greater rotation actually blocks the sensor, and causes meter to under-report).
- A downstream valve too close to the meter (flow may be reflecting back).
- Possibly caused by water droplets condensing out of gas stream (which generally causes output to spike; but if droplets are near continuous, output may rail).
- Meter is miswired, especially in Remote Style application.
- Possibly caused by water droplets condensing on inside of pipe wall, which roll down or hit sensor causing output to spike; but if droplets are near continuous, output may rail. **Note:** *Recommend installation 45° from vertical*



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Installations Where Pipe Condensation May Develop



- j) Possibly caused by water droplets condensing out of gas stream and filling the cavity containing the sensing elements (usually due to probes mounted below horizontal in saturated pipes).
- k) Sensor may be contaminated. Remove probe, wipe off or clean with a solvent. Reinsert.
- l) Using a different gas or gas mix than the meter was specified and calibrated for.
- m) If a Remote Style Meter (SRP), be sure Serial Numbers of Junction Box and Remote Electronics are identical (if not, errors in calibration are inevitable). To confirm, verify that Junction Box Serial Number Tag has identical Serial Numbers to Tag on Remote Enclosure.
- n) Meter may appear to be reading high if user is comparing Sage flow meter readings (SCFM) to an uncorrected volumetric device (ACFM). For example, at constant volume, a decrease in gas temperature will increase the mass flow (SCFM). That is completely normal.

SYMPTOM: Reading Low

POSSIBLE CAUSES:

- a) Insufficient straight run (i.e. flow profile is disturbed, causing errors).
- b) Poor flow profile Upstream (insufficient upstream straight run).
- c) Not following Probe Insertion Guideline.
- d) If sensor is inserted in reverse ("Upstream" mark is facing downstream) Meter may over-report (or under-report) by as much as 30%.
- e) If sensor is not aligned properly, with "Upstream" mark facing upstream, a rotation greater than ± 5 degrees may cause change in reading (greater than ± 5 degrees and less than ± 20 degrees causes meter to over-report; a greater rotation actually blocks the sensor, and causes meter to under-report).
- f) Sensor may be contaminated. Remove probe, wipe off or clean with a solvent. Reinsert.
- g) Using a different gas or gas mix than the meter was specified and calibrated for.
- h) If a Remote Style Meter (SRP), be sure Serial Numbers of Junction Box and Remote Electronics are identical (if not, errors in calibration are inevitable). To confirm, verify that Junction Box Serial Number Tag has identical Serial Numbers to Tag on Remote Enclosure.
- i) Meter may appear to be reading low if user is comparing Sage flow meter readings (SCFM) to an uncorrected volumetric device (ACFM). For example, at constant volume, an increase in gas temperature will lower the mass flow (SCFM). That is completely normal.
- j) On most models, the Totalizer will not start counting for 10 seconds after power up so any flow data will not be accumulated during this time.
- k) Insufficient power supply—most products require minimum 100 ma.



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l) Excessive load on the 4-20 ma. (To check if problem is due to 4-20 ma output device, temporarily remove device, and observe if display reads as expected).

SYMPTOM: Totalizer can take up to 10 seconds to update its reading when flow meter is first powered up, or a channel is changed.

CORRECTIVE ACTION: None. This slight delay is completely normal.

SYMPTOM: Display does not have power

POSSIBLE CAUSE: Miss-wiring

SYMPTOM: 4-20 mA output not tracking the flow rate display

POSSIBLE CAUSE:

a) In normal operation (Self Powered) B4 and B5 must be jumpered to supply power to loop.

b) In Externally Powered mode, the jumper must be removed. Verify that 9 to 27 Volts DC is supplied to externally power the loop.



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3.0 Installing / using Addresser

Addresser is a convenient software kit that includes Addresser software, as well as an optically isolated ULINX RS485 to USB converter. The Addresser is a READ/WRITE Program with drop-down menus for convenient user interface between your PC or laptop and the Modbus Terminals of the Sage Prime. Contact Sage for ordering information and instructions.

3.1 SAGE ADDRESSER TECHNICAL ASSISTANCE

Visit our website at www.sagemetering.com and navigate to the Manuals/Download section (<http://www.sagemetering.com/manual.htm>). Click on the “Instructional Manuals & Technical Data” button. User name: sage; password: 7243737. Click on link “Click to View ADDRESSER Procedures” and/or “Click to View MODBUS Poll/PRIME Communications Setup Instructions”.

3.2 Sage Addresser Common Installation Difficulties

Symptom: LabVIEW error message: Unable to locate the LabVIEW Run-Time Engine

Possible Cause: If you have not installed VI Terminal software prior to installing the Addresser software, you will be missing the required Run Time Engine that is installed when installing VI Terminal.

Symptom: When trying to run the Addresser program you get a LabVIEW error 8

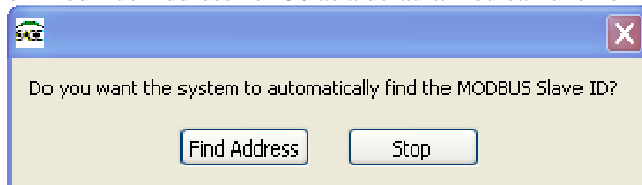
Probable Cause: This happens most often with users that are running Windows 7 and possible Vista on their computer. This is a permission error, meaning you do not have the right to write files to your computer. See your computer Network Administrator to allow this permission



Symptom: Addresser Error, Read Registers Failure:

Possible Cause:

- The Slave ID or Mod Bus address of your meter is NOT hex 30. The Addresser is broadcasting to your meter on Mod Bus Address hex 30 as a default. You can click on the Stop button and then see:

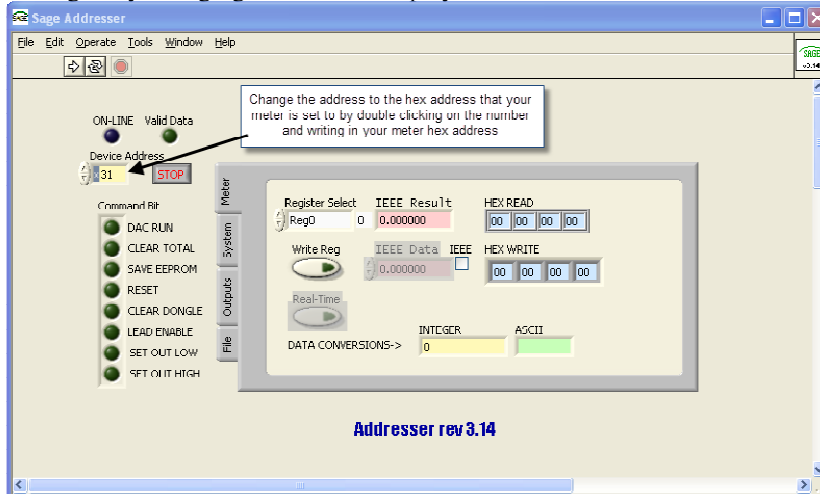


The Addresser can find the slave ID if you click on the Find Address button.

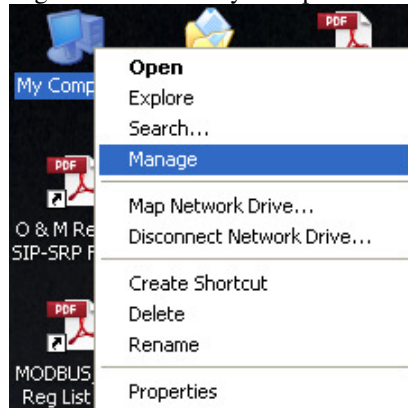


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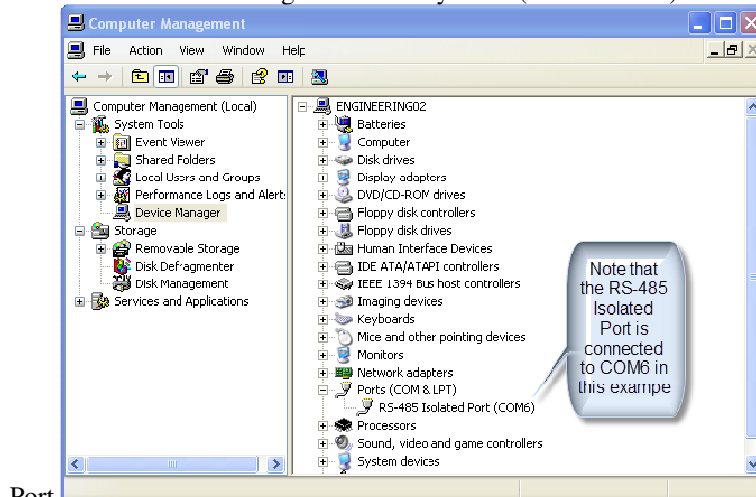
- a. If you know what address your meter is set to, you can change the address that the Addresser is talking to by changing the address displayed in the Device Address window of the Addresser.



- b. If the Com Port the Addresser is connected to is different than what the Addresser thinks it is, you will need to determine what the correct Com Port is.
- i. Right click on the My Computer icon, then select Manage



- ii. Then select Device Manager followed by Ports (COM & LPT) to find the RS-485 Isolated

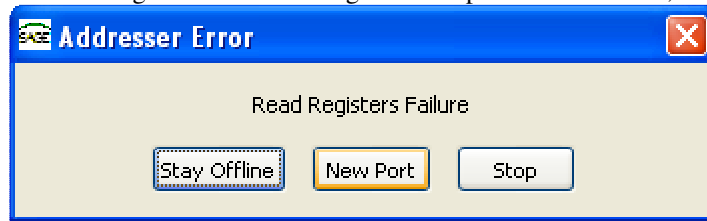


Port



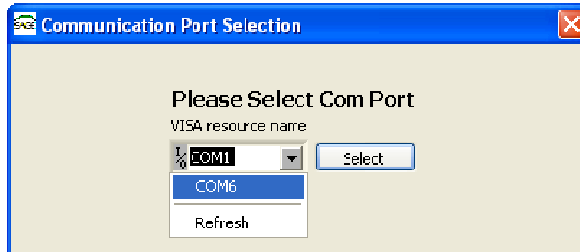
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- iii. When the Read Register Failure message comes up on the Addresser, click on the New Port



button

and then select the



port you just identified.

- iv. The Addresser should now talk to your meter.
- b) The Baud rate and/or parity of your meter has been set to other than standard of 19200 Baud with Even Parity.
- a. You will need to activate the Addresser during the initialization period of the meter during startup.
 - b. You should be able to communicate with the meter normally now.

Symptom: Windows 7 permission error

Possible Cause: Configuration settings need to be changed to allow the vi to remember what port is assigned

- a) Open the Program Files folder on your computer
 - a. Highlight Addresser.ini or Configuration settings
 - b. Right click, then select properties
 - c. Select Security, then Edit
 - d. Highlight Users, then change permissions to include Write
 - e. Click Apply



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4.0 Sage Addresser Typical Printout (Version 3.14)

SMB Printout
Serial# 73525

Units: SCFM Modbus: 0x30

11/22/2011
9:52:56 AM

Parameter	Decimal Data	Hex Format
Calib mW Val	60.00000	84700000
K-Factor	1.000000	7F000000
Lead Gain Val	1.000000	7F000000
Flow Load Res	20.10000	8320CCCD
Temp Calib[A]	34.10675	84086D51
Temp Calib[B]	0.236320	7C71FDCF
Temp Calib[C]	0.006368	7750AC4A
Temp Calib[D]	-0.00001	6F91634B
Temp Disp Null	0.000000	00000000
Temp Disp Gain	1.000000	7F000000
Amp Null Val	0.000000	00000000
Amp Gain Val	1.000000	7F000000
*Flow Coeff[A]	-511.738	87FFDE8B
*Flow Coeff[B]	24.62725	8345049E
*Flow Coeff[C]	0.428770	7D5B87AE
*Flow Coeff[D]	0.003539	7667F377
Flow Coeff[E]	0.000000	00000000
Flow Coeff[F]	0.000000	00000000
Filtering	0.070000	7B0F5C29
Min Flow/LFC	0.000000	00000000
*Full Scale	30000.00	8D6A6000
Min Temp	40.00000	84200000
Units/Pulse	200.0000	86480000
DAC1 Min	801.0000	00000321
*DAC1 Max	4000.000	00000FA0
*Serial Number	73525.00	00011F35
*Flow Units	12964504	4D464353
Total Units	11790099	46464353
Output Config	4.000000	00000004
Pulse Dur	250.0000	000000FA



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5.0 MODBUS Prime Registers

Registers		bit width	byte addr	LabView	hex word addr	IEEE word addr		
Format	store	8	0	0	256	512		
unit_id		8	1	0	256	512		
mode2		5	2	0	257	513		
pad		1	2	0	257	513		
fix_pt		2	2	0	257	513		
bRun		1	3	0	257	513		
bTotal		1	3	0	257	513		
bEEProm		1	3	0	257	513		
bReset		1	3	0	257	513		
padd		1	3	0	257	513		
bLeadEn		1	3	0	257	513		
bDAClo		1	3	0	257	513		divide by 1000
bDACHi		1	3	0	257	513		
CAL_VAL	bridge[4]	32	4	1	259	515	<- START ADDR	770
k-factor		32	8	2	261	517	w/HIGH REG FIRST!	772
VREF		32	12	3	263	519		774
LOAD_RES		32	16	4	265	521		776
COEFF A	temp[4]	32	20	5	267	523		778
COEFF B		32	24	6	269	525		780
COEFF C		32	28	7	271	527		782
COEFF D		32	32	8	273	529		784
DISP A	disp[4]	32	36	9	275	531		786
DISP B		32	40	10	277	533		788
DISP C		32	44	11	279	535		790
DISP D		32	48	12	281	537		792
COEFF A	flow[6]	32	52	13	283	539		794
COEFF B		32	56	14	285	541		796
COEFF C		32	60	15	287	543		798
COEFF D		32	64	16	289	545		800
COEFF E		32	68	17	291	547		802



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COEFF F		32	72	18	293	549	804
iir		32	76	19	295	551	806
flow_min		32	80	20	297	553	808
flow_max		32	84	21	299	555	810
temp_min		32	88	22	301	557	812
temp_max		32	92	23	303	559	814
dac1_min		16	96	24	305	561	816
dac1_max		16	98	25	306	562	818
serial		32	100	25	307	563	820
RATE	eng_units	32	104	26	309	565	822
TOTAL		32	108	27	311	567	824
totalizer		32	112	28	313	569	PLC will access registers from the High-Order address first (313) and then will take the previous (312) in addition (full data contents of the 4 byte register - 2 bytes/register
ADC0	adc[4]	32	116	29	315	571	828
ADC1		32	120	30	317	573	830
ADC2		32	124	31	319	575	832
ADC3		32	128	32	321	577	834
sil_flow		32	132	33	323	579	836
sil_temp		32	136	34	325	581	838
rtd_mWatts		32	140	35	327	583	840
rtd_res		32	144	36	329	585	842
ref_res_r		32	148	37	331	587	844
ref_res_d		32	152	38	333	589	846
dac_smooth		32	156	39	335	591	848
lead		32	160	40	337	593	850
oheat		32	164	41	339	595	852
bv		32	168	42	341	597	854
fv		32	172	43	343	599	856
tv		32	176	44	345	601	858



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lv		32	180	45		347	603		860
						using Modbus Poll - Float			
						Register minus one for value			
						i.e. Sil_flow = 579 but 578 will give value			
						Sil_temp will be in 580			



6.0 MODBUS TROUBLESHOOTING GUIDE

Baud Rate (default)	19200
Data Bits	8
Parity	Even
Stop Bits	1
RTU	Remote Terminal Unit – each 8 bit message byte contains two 4-bit hexadecimal characters.
Big Endian	Stores data big end first - i.e. first byte (lowest address) is the biggest.
Holding Register	40001 (Modicon) 4X – Read / Write
Input Register	30001 (Modicon) 3X – Read Only
Termination resistor	120 ohms – last Prime in a daisy chain
Slave ID	1 to 247 hex
Flow	Register 578 - Float
Temperature	Register 580 - Float
Serial Number	Register 306 - Long
Totalizer (total value)	Register 312 (long)



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<p>Totalizer (broken down to two 4 bit characters)</p>	<p>Register 313 * 65536 + Register 312 → Total (signed)</p>
<p>Totalizer zeroing</p>	<p>Write zero to Registers 312 & 313 (signed)</p>
<p>K-factor</p>	<p>Write K-factor to Register 516 (float) Write (K-factor*1000) to Register 772 (long)</p>
<p>Modbus Address (ID)</p>	<p>Register 256 (Hex) →305A is address 30 →write 315A to register 256 for address 31 (NOTE: 5A must not be touched!) Must use function 16 → multiple registers</p>
<p>Engineering Units (Rate String)</p>	<p>ASCII – Registers 308 & 309 – HEX SCFM would be - (308) 53-S 43-C (309) 46-F 4D-M Will be written 0x4353 (308) and 0x4D46 (309)</p>
<p>Engineering Units (Total String)</p>	<p>ASCII – Registers 310 & 311 – HEX SCF (degF) would be (310) 53S 43C (311) 46F 46F (deg) Will be written 0x4353 (310) and 0x4646 (311) SCF (degC) would be (310) 53S 43C (311) 46F 43C (deg) Will be written 0x4353 (310) and 0x4346 (311)</p>