Technical Bulletin, Communicating with Instromet Q.Sonic Ultrasonic Gas Flowmeters

OMNI FLOW COMPUTERS, INC.
12620 West Airport Boulevard, Suite 100
Sugar Land, Texas 77478 United States of America
Phone-281.240.6161 Fax: 281.240.6162
www.omniflow.com

52-0004-0001/Rev D

NOTE: User Manual Reference - This Technical Bulletin complements the information contained in the User Manual Volume 3 Revision 23/27 Configuration and Advanced Operation.

Table of Contents

Figures

Scope

This Technical Bulletin applies to firmware revisions 23.74+ and 27.74+ of OMNI 6000/OMNI 3000 Flow Computers for gas flow metering systems.

Abstract

The Q.Sonic® ultrasonic flow meter determines the linear gas velocity through the meter tube by using multiple acoustic pulse reflection paths. The Q.Sonic® analyzes these paths employing the Absolute Digital Time Travel (ADTT) measurement method. The OMNI Flow Computer totalizes either the flow meter pulse input signal or the profile corrected gas velocity data, received from the Q.Sonic®, to calculate the actual flow rate of gas. The OMNI compensates temperature expansion effects on the flow meter tube by equaling the flow to the profile corrected gas velocity multiplied by the temperature compensated tube area. If required, it can also directly use the non-compensated flow rate value transmitted by the ultrasonic meter as the actual flow rate.

NOTE 1: Communicating With Instromet® Q.Sonic® Ultrasonic Flow Meters – The Instromet® Q.Sonic® ultrasonic flow meter measures gas flow with acoustic pulse reflection paths by using the Absolute Digital Time Travel (ADTT) method. This device communicates with OMNI Flow Computers via OMNI's 'SV' process I/O combo module using a proprietary protocol with a fixed baudrate of 4800. To use the scaled pulse output of the Instromet flow meter, the flow computer must either have one (1) 'A', 'B' or 'E' combo module installed**.**

Q.Sonic® Flow Meter Theory of Operation

Instromet's® ultrasonic gas flow metering technology incorporates multiple pairs of transducers into a smart digital inferential instrumentation device. The device is installed into a gas pipeline system to measure gas flow. Each pair of transducers emits ultrasonic (acoustic) pulses that travel bi-directionally, in either a single (axial or diagonal) or double (swirl) reflection path, to and from each transducer in the pair.

The flow meters apply the Absolute Digital Time Travel (ADTT) method of ultrasonic pulse analysis, which is based on the fact that pulses travel (between a transducer pair) faster downstream with the flow than upstream against the flow. The gas flow velocity is determined from this upstream/downstream travel time differential of the ultrasonic pulses within the multiple reflection paths. When there is no gas flow in the pipeline, the upstream and downstream travel times are the same; i.e., the time differential is zero (0).

The Q.Sonic® flow meter employs three (3) or five (5) transducer pairs with a minimum of one axial path and two swirl paths. This configuration allows for unique combinations of reflection paths to best take into account the different effects of gas flow profile variations, including swirl in the pipeline. The gas velocity can be determined for bi-directional (forward or reverse) fluid flow.

OMNI Flow Computer Logic

The OMNI Flow Computer can determine the actual flow rate from data either received serially from the Q.Sonic® flow meter or from a live pulse frequency signal input, if one has been connected and assigned.

Totalization will be based on the flow pulse frequency input when the flow transmitted by the Q.Sonic® is in the correct direction (forward/reverse) and the pulse frequency is within limits. This live signal will also be used in the event of a communications failure between the Q.Sonic® and the OMNI. However, in order for the OMNI to use the pulse frequency signal, it must be wired to the Q.Sonic® and an I/O point assigned in the flow computer configuration.

The flow computer will temperature compensate the meter tube area and calculate flow rate based on the profile corrected velocity of the gas transmitted serially by the flow meter (Figure 1). If the calculated flow rate is not within reasonable limits, the OMNI will directly use the transmitted flow rate as the actual flow rate.

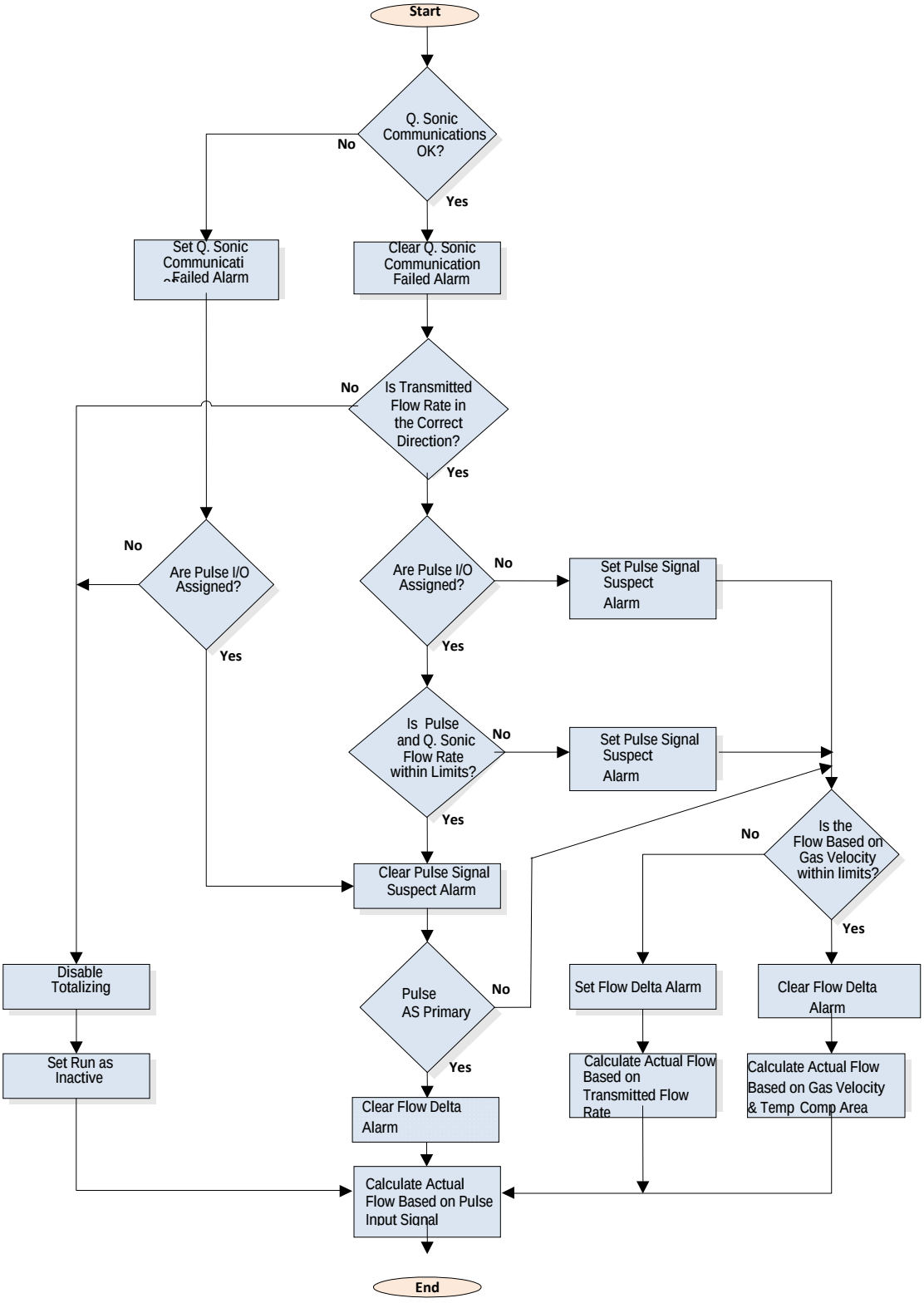

Figure 1. Flow Computer Logic Flow Diagram for the Q.Sonic® Ultrasonic Gas Flow Meter

Wiring Installation

NOTES: Serial Data Communications – The serial interface between these devices is 2-wire RS485 mode utilizing a proprietary protocol at a fixed baudrate of 4800. All versions of the meters must be set for 4800 baud to communicate properly with the flow computer.

Setting Up and Wiring to OMNI Combo Modules – In order to communicate with Q.Sonic® ultrasonic flow meters, the OMNI flow computer must be equipped with at least one (1) SV combo module (Model 68-6203). For instructions on jumper settings and other process I/O combination module setup information, refer to Volume 1, Chapter 2 of the OMNI User Manual.

The typical wiring required for connecting a Q.Sonic® flow meter to the OMNI Flow Computer (Figure 2). A 2-wire RS-485 interface can be wired to either port (terminals 1 and 2 for port 1, or 3 and 4 for port 2) of the flow computer terminal block that corresponds to the SV combo module. You can install up to two (2) SV modules in the OMNI Flow Computer, which will give you four (4) available SV RS-485 ports.

Although not required, it is recommended that the flow meter frequency pulse signals also be wired to the flow computer's input channel #3 (forward direction) and input channel # 4 (reverse direction) of an 'A' combo module. Input channel #3 corresponds to terminals 5 and 6, and input channel #4 to terminals 7 and 8 of the back panel terminal block respective to the combo module. The actual terminal block numbers depend upon which backplane connector or slot the module is plugged. The 'E' combo module can also be used in this configuration with slight variations in wiring connections (Volume I, Chapter 2-12).

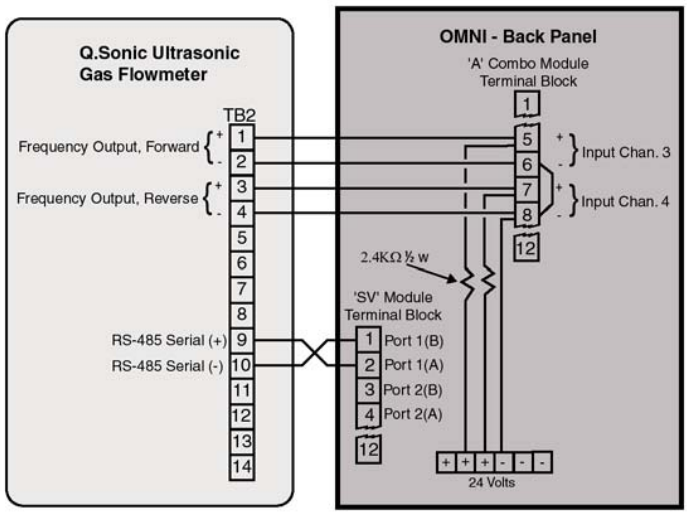

Figure 2. Example of Wiring Q.Sonic Flowmeter to OMNI Flow Computer's RS-485 Port #1 of an SV Module

Flow Meter Configuration

The OMNI Flow Computer supports the data types for the specified Q.Sonic® flow meters (Table 1):

Table 1. Data Types for Q.Sonic Flow Meters

Code	Name	Description
35	**Q_DATA**	Standard Q.Sonic-style data message used by: • Q.Sonic-3/5 Q Meter (Stand-alone SPU) • Q.Sonic-3/5 QL Meter (SPU+RU-II/III)
36	**Q_XDATA**	Extended Q.Sonic-style data message: Reserved for use in 'SupervisorMode' (a dedicated mode of operation) by: • Q.Sonic-3/5 Q Meter (Stand-alone SPU) • Q.Sonic-3/5 QL Meter (SPU+RU-II/III) AGA-9 Compliant Q-3/5 Meter (s/a SPU)
37	**U_DATA**	'Universal' data message used by 'Series-III and 'Series-IV' meters: • Q.Sonic-2/3/4/5 Q/QL Meter (Stand-alone SPU) • Q.Sonic-2/3/4/5 QL Meter (SPU+RU-II/III)

The customer is responsible for ensuring their Q.Sonic® meter is configured to use the proper data type.

NOTE: The Q.Sonic-4 must be configured for Code 37 to communicate with the OMNI Flow Computer. If set to Code 35 or 36, communications will fail.

Flow Computer Configuration

The flow configuration settings that are specific to the Q.Sonic® flow meter are entered in the miscellaneous configuration meter run menu and the meter run setup menu. You must enter the miscellaneous configuration meter run settings first and then proceed to the meter run setup entries. These configuration settings can be entered either via the OMNI Flow Computer's front panel keypad or using OMNICOM configuration PC software (Chapter 2 'Flow Computer Configuration' in Volume 3 of the OMNI User Manual, and the Technical Bulletin TB-960701 (52-0000-0001) 'Overview of OMNICOM Configuration PC Software').

Miscellaneous Configuration Meter Run Settings

The following miscellaneous configuration meter run settings correspond to the Q.Sonic® ultrasonic gas flow meter:

- **Select Flow meter Device Type -** Enter **[4]** for each meter run that you want to select the Instromet Q.Sonic® flow meter as the device type.
- **Select SV Module Port -** The OMNI Flow Computer can accept two (2) SV combo modules. With one (1) SV module you have two (2) SV ports available, and with two (2) SV modules four (4) ports are available. For each ultrasonic meter run, enter the SV port number (1 to 4) to which the RS-485 serial interface input from the Q.Sonic® flow meter is wired to the flow computer.
- **Dual Pulse? (Y/N) -** Enter **[Y]** for each meter run that will be providing dual pulse trains for Pulse Fidelity checking.
- **NOTE:** This feature became available in the flow computer for the Instromet® UFM in 23.74.20 and 27.74.20 firmware.
- **Select Flow Direction -** Q.Sonic® flow meters allow for bi-directional fluid flow measurement. You can setup the flow computer to totalize either forward or reverse flow on any meter run with an ultrasonic flow meter.

- **Primary Flow -** This setting instructs the flow computer to use either the pulse input channel or the SV serial communications data as the primary means of calculating flow. Options are:
  - **0 =** Select Serial Data as primary flow. This means the SV serial communications data will be the primary and the pulse input channel, if assigned, will be used as a backup means of flow calculations by the flow computer.
  - **1** = Select Pulse Input as primary flow. This means the flow pulses received from the flow meter will be the primary and the SV serial communications data will be used as a backup means of flow calculations by the flow computer.

    NOTE: This feature became available in the flow computer for the Instromet® UFM in 23.74.20 and 27.74.20 firmware.
  - **Assign Flow Pulse Frequency I/O Point -** Flow meter pulse signals can only be assigned to Input Channels #3 and #4 of A and E combo modules, and input channel #3 of a B combo module. Enter the input channel number, which will be used to input the ultrasonic flow meter pulse signal.

    NOTE: An E-Combo module is required for Pulse Fidelity checking. Assign the flow computer input channel number that corresponds to the 3rd input channel on the Combo module where the A pulse train from the flow meter will be wired to. The flow computer will automatically assume the B pulse train will be wired to the next input channel.

Meter Run Setup Entries

The following meter run setup entries are available for the Q.Sonic® ultrasonic gas flow meter:

- **Tube Diameter -** Enter the diameter of the ultrasonic flow meter tube, in inches (firmware 23) or millimeters (firmware 27). This diameter is subsequently corrected for expansion due to temperature, and used together with the 'corrected gas velocity' through the meter to calculate flow rate.
- **Tube Reference Temperature -** Enter the temperature, as degrees Fahrenheit (firmware 23) or degrees Celsius (firmware 27), at which the ultrasonic meter tube was measured (Table 2).
- **Tube Expansion Coefficient -** The ultrasonic meter tube will expand and contract with temperature. The flow computer requires the linear coefficient of thermal expansion for the meter tube material in order to correct the meter tube area.

Table 2. Tube Reference Temperature

	US Customary Units	Metric Units
Mild Carbon Steel Plate	**-100 to 300 °F = 6.20 x e^{-6}**	**-73.3 to 148.9 °C = 1.12 x e^{-5}**
304/316 Stainless Steel	**-100 to 300 °F = 9.25 x e^{-6}**	**-73.3 to 148.9 °C = 1.67 x e^{-5}**

- **Q.Sonic® Maximum Flow Rate Deviation Percent -** The actual user-entered flow used by the flow computer to totalize depends upon the following factors:
  - If a pulse signal is available and set as primary source, the flow computer will use it for calculations as long as the calculated flow rate is within this 'flow rate deviation percentage' of the flow transmitted serially by the Q.Sonic®.
  - If a pulse signal is not set as primary source or has failed, the flow computer will use the 'corrected linear gas velocity' transmitted by the Q.Sonic® and calculate flow based on the 'temperature compensated area' of the meter tube. The flow rate calculated by this method must also be within this 'flow rate deviation percentage' of the flow transmitted serially by the Q.Sonic®. Summarizing, the flow computer first tries to use the pulse signal, then the transmitted gas velocity value and finally the transmitted flow rate.
  - **Minimum Automatic Gain Control (AGC) Ratio -** The flow computer calculates the AGC ratio for each ultrasonic path in both path directions. An alarm will occur if the AGC ration of any path drops below this ratio. Nominal entries are 1.5 to 2.

- **Minimum Percent Sample Ratio -** This entry checks the ratio of good received data pulses verses total transmitted pulses for each ultrasonic path in both directions. A ratio below this setting will cause an alarm. Nominal entries are 50% to 70%.

  NOTE: Difference Between 'Gas Velocity' and 'Velocity of Sound' – The 'gas velocity' through the meter tube is directly proportional to the actual flow rate of the gas in the pipeline. The 'velocity of sound' (VOS) refers to the amount of time it takes a transmitted acoustic pulse to travel through the gas ultrasonic paths. The VOS will vary depending upon gas quality and flowing conditions.

- **Velocity of Sound (VOS) in Gas Deviation Percent** - In some configurations, the flow computer can verify that the average VOS calculated for all paths agrees with the VOS of each individual path. This entry is the maximum percent that any one path VOS varies from the average VOS of all the paths.
- **Gas Velocity Low Cutoff** - Some gas movement can occur even when an ultrasonic meter is blocked-in. This is caused by convection currents within the meter tube. Enter a minimum gas velocity, in feet per second (Revision 23) or meters per second (Revision 27), below which you do not want to totalize. Consult with Instromet to determine this value.

Flow Computer Database Addresses and Index Numbers

Tables 3 thru 9 list the Modbus database addresses within the OMNI have been assigned to the Q.Sonic® ultrasonic metering feature. These tables are categorized per data type.

Table 3. Meter Run Alarm Status Points – Real Time Date

Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Loss of Communication	2154	2254	2354	2454	Path 1 - sample error alarm	2167	2267	2367	2467
Loss of pulse impulse	2155	2255	2355	2455	Path 2 - sample error alarm	2168	2268	2368	2468
Flow rate delta alarm	2156	2256	2356	2456	Path 3 - sample error alarm	2169	2269	2369	2469
Path 1a - AGC ratio alarm	2157	2257	2357	2457	Path 4 - sample error alarm	2170	2270	2370	2470
Path 1b - AGC ratio alarm	2158	2258	2358	2458	Path 5 - sample error alarm	2171	2271	2371	2471
Path 2a - AGC ratio alarm	2159	2259	2359	2459	Overall sample error alarm	2172	2272	2372	2472
Path 2b - AGC ratio alarm	2160	2260	2360	2460	Path 1 - gas VOS alarm	2173	2273	2373	2473
Path 3a - AGC ratio alarm	2161	2261	2361	2461	Path 2 - gas VOS alarm	2174	2274	2374	2474
Path 3b - AGC ratio alarm	2162	2262	2362	2462	Path 3 - gas VOS alarm	2175	2275	2375	2475
Path 4a - AGC ratio alarm	2163	2263	2363	2463	Path 4 - gas VOS alarm	2176	2276	2376	2476
Path 4b - AGC ratio alarm	2164	2264	2364	2464	Path 5 - gas VOS alarm	2177	2277	2377	2477
Path 5a - AGC ratio alarm	2165	2265	2365	2465	**Notes:**	**AGC =** Automatic Gain Control			
Path 5b - AGC ratio alarm	2166	2266	2366	2466		**VOS =** Velocity of Sound			

Table 4. 16-Bit Integer Registers — Real Time Data

Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Flow Dir (0=fwd,1=rev)	3155	3255	3355	3455	Path 1a – AGC level	3180	3280	3380	3480
Path 1 – performance (%)*	3158	3258	3358	3458	Path 1b – AGC level	3181	3281	3381	3481
Path 2 – performance (%)*	3159	3259	3359	3459	Path 2a – AGC level	3182	3282	3382	3482
Path 3 – performance (%)*	3160	3260	3360	3460	Path 2b – AGC level	3183	3283	3383	3483
Path 4 – performance (%)*	3161	3261	3361	3461	Path 3a – AGC level	3184	3284	3384	3484
Path 5 – performance (%)*	3162	3262	3362	3462	Path 3b – AGC level	3185	3285	3385	3485
Path 1a - AGC ratio*	3163	3263	3363	3463	Path 4a – AGC level	3186	3286	3386	3486
Path 1b - AGC ratio*	3164	3264	3364	3464	Path 4b – AGC level	3187	3287	3387	3487
Path 2a - AGC ratio*	3165	3265	3365	3465	Path 5a – AGC level	3188	3288	3388	3488
Path 2b - AGC ratio*	3166	3266	3366	3466	Path 5b – AGC level	3189	3289	3389	3489
Path 3a - AGC ratio*	3167	3267	3367	3467	Path 1a – AGC limit	3190	3290	3390	3490
Path 3b - AGC ratio*	3168	3268	3368	3468	Path 1b – AGC limit	3191	3291	3391	3491
Path 4a - AGC ratio*	3169	3269	3369	3469	Path 2a – AGC limit	3192	3292	3392	3492
Path 4b - AGC ratio*	3170	3270	3370	3470	Path 2b – AGC limit	3193	3293	3393	3493
Path 5a - AGC ratio*	3171	3271	3371	3471	Path 3a – AGC limit	3194	3294	3394	3494
Path 5b - AGC ratio*	3172	3272	3372	3472	Path 3b – AGC limit	3195	3295	3395	3495
Number of paths	3173	3273	3373	3473	Path 4a – AGC limit	3196	3296	3396	3496
Number of samples taken	3174	3274	3374	3474	Path 4b – AGC limit	3197	3297	3397	3497
Path 1 – valid sample	3175	3275	3375	3475	Path 5a – AGC limit	3198	3298	3398	3498
Path 2 – valid sample	3176	3276	3376	3476	Path 5b – AGC limit	3199	3299	3399	3499
Path 3 – valid sample	3177	3277	3377	3477					
Path 4 – valid sample	3178	3278	3378	3478	**Notes:**	**AGC =** Automatic Gain Control			
Path 5 – valid sample	3179	3279	3379	3479					

*Integer with two (2) implied decimal places.

Table 5. 32-bit IEEE Floating Points — Real Time Data

Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Max flow deviation (%)	17513	17613	17713	17813	Path 1 – velocity of sound	17527	17627	17727	17827
Min AGC ration (1 to 10)	17514	17614	17714	17814	Path 2 - velocity of sound	17527	17627	17727	17827
Min sample ratio (%)	17515	17615	17715	17815	Path 3 - velocity of sound	17527	17627	17727	17827
Max. VOS deviation (%)	17516	17616	17716	17816	Path 4 - velocity of sound	17530	17630	17730	17830
Gas velocity low cutoff	17517	17617	17717	17817	Path 5 - velocity of sound	17531	17631	17731	17831
Avg. path performance (%)	17520	17620	17720	17820	Path 1 - gas velocity	17532	17632	17732	17832
Velocity of sound (VOS)	17521	17621	17721	17821	Path 2 - gas velocity	17533	17633	17733	17833
Gas velocity	17522	17622	17722	17822	Path 3 - gas velocity	17534	17634	17734	17834
Pressure	17523	17623	17723	17823	Path 4 - gas velocity	17535	17635	17735	17835
Temperature	17524	17624	17724	17824	Path 5 - gas velocity	17536	17636	17736	17836
Gas flow rate	17525	17625	17725	17825	**Notes:**	**AGC =** Automatic Gain Control			
Net flow rate	17526	17626	17726	17826		**VOS =** Velocity of Sound			

Table 6. 32-bit IEEE Floating Points Previous Hour's Average Data

Description	Database Address for Meter Run Number			
	1	2	3	4
Number of samples taken	17537	17637	17737	17837
Path 1 – valid sample	17538	17638	17738	17838
Path 2 – valid sample	17539	17639	17739	17839
Path 3 – valid sample	17540	17640	17740	17840
Path 4 – valid sample	17541	17641	17741	17841
Path 5 – valid sample	17542	17642	17742	17842
Path 1a – AGC level	17543	17643	17743	17843
Path 1b – AGC level	17544	17644	17744	17844
Path 2a – AGC level	17545	17645	17745	17845
Path 2b – AGC level	17546	17646	17746	17846
Path 3a – AGC level	17547	17647	17747	17847
Path 3b – AGC level	17548	17648	17748	17848
Path 4a – AGC level	17549	17649	17749	17849
Path 4b – AGC level	17550	17650	17750	17850
Path 5a – AGC level	17551	17651	17751	17851
Path 5b – AGC level	17552	17652	17752	17852
Path 1a – AGC limit	17553	17653	17753	17853
Path 1b – AGC limit	17554	17654	17754	17854
Path 2a – AGC limit	17555	17655	17755	17855
Path 2b – AGC limit	17556	17656	17756	17856
Path 3a – AGC limit	17557	17657	17757	17857
Path 3b – AGC limit	17558	17658	17758	17858
Path 4a – AGC limit	17559	17659	17759	17859
Path 4b – AGC limit	17560	17660	17760	17860
Path 5a – AGC limit	17561	17661	17761	17861
Path 5b – AGC limit	17562	17662	17762	17862
Path 1 – gas velocity	17563	17663	17763	17863
Path 2 – gas velocity	17564	17664	17764	17864
Path 3 – gas velocity	17565	17665	17765	17865
Path 4 – gas velocity	17566	17666	17766	17866
Path 5 – gas velocity	17567	17667	17767	17867

Table 7. 32-bit IEEE Floating Points Previous Day's Average Data

Description	Database Address for Meter Run Number			
	1	2	3	4
Number of samples taken	17568	17668	17768	17868
Path 1 – valid sample	17569	17669	17769	17869
Path 2 – valid sample	17570	17670	17770	17870
Path 3 – valid sample	17571	17671	17771	17871
Path 4 – valid sample	17572	17672	17772	17872
Path 5 – valid sample	17573	17673	17773	17873
Path 1a – AGC level	17574	17674	17774	17874
Path 1b – AGC level	17575	17675	17775	17875
Path 2a – AGC level	17576	17676	17776	17876
Path 2b – AGC level	17577	17677	17777	17877
Path 3a – AGC level	17578	17678	17778	17878
Path 3b – AGC level	17579	17679	17779	17879
Path 4a – AGC level	17580	17680	17780	17880
Path 4b – AGC level	17581	17681	17781	17881
Path 5a – AGC level	17582	17682	17782	17882
Path 5b – AGC level	17583	17683	17783	17883
Path 1a – AGC limit	17584	17684	17784	17884
Path 1b – AGC limit	17585	17685	17785	17885
Path 2a – AGC limit	17586	17686	17786	17886
Path 2b – AGC limit	17587	17687	17787	17887
Path 3a – AGC limit	17588	17688	17788	17888
Path 3b – AGC limit	17589	17689	17789	17889
Path 4a – AGC limit	17590	17690	17790	17890
Path 4b – AGC limit	17591	17691	17791	17891
Path 5a – AGC limit	17592	17692	17792	17892
Path 5b – AGC limit	17593	17693	17793	17893
Path 1 – gas velocity	17594	17694	17794	17894
Path 2 – gas velocity	17595	17695	17795	17895
Path 3 – gas velocity	17596	17696	17796	17896
Path 4 – gas velocity	17597	17697	17797	17897
Path 5 – gas velocity	17598	17698	17798	17898

Notes: **AGC =** Automatic Gain Control

Table 8. Flow Computer Configuration Data — Miscellaneous Meter Run Configuration

Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Flow meter device type	3108	3208	3308	3408	Primary Measurement Source (0=Serial, 1=Pulses)	3157	3257	3357	3457
SV module port #	3153	3253	3353	3453	Flow pulse freq. I/O point #	13001	13014	13027	13040
Flow Direction (0=Fwd, 1=Rev)	3155	3255	3355	3455					

Table 9. Flow Computer Configuration Data — Meter Run Setup

Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Tube diameter	7145	7245	7345	7445	Minimum AGC ratio (1-10)	17514	17614	17714	17814
Tube coefficient	7146	7246	7346	7446	Minimum sample ratio (%)	17515	17615	17715	17815
Tube reference temperature	7147	7247	7347	7447	Max. VOS deviation (%)	17516	17616	17716	17816
Maximum flow deviation (%)	17513	17613	17713	17813	Gas velocity low cutoff	17517	17617	17717	17817

Flow Computer User Displays

SV Module Serial Communications Port

You can view live data received via RS-485 communications on the flow computer front panel LCD display only if a SV port is used to input the RS-485 interface from the Q.Sonic® flow meter. To view this data, press **[Setup] [*n*] [Display]** on the OMNI front panel keypad (where "n" equals the SV port number, 1 to 4, you want to display) when in the Display Mode. The following data will display:

```
SV PORT 1 Q-SONIC
Transaction    12345
V-Status           0
C/R Status         0
# of Paths         3
# of Samples      20
#1 ValSample      19
#2 ValSample      19
#3 ValSample      18
1a(Sw)AgcLevel 35123
1b(Sw)AgcLevel 27566
2a(Ax)AgcLevel 37521
2b(Ax)AgcLevel 29912
3a(Sw)AgcLevel 35976
3b(Sw)AgcLevel 26133
1a(Sw)AgcLimit 65535
1b(Sw)AgcLimit 65535
2a(Ax)AgcLimit 65535
2b(Ax)AgcLimit 65535
3a(Sw)AgcLimit 65535
3b(Sw)AgcLimit 65535
V-Sound       351.13
Gas Vel        2.175
Pres kPa  9.9990E+09
T Deg.K   9.9990E+09
am3/Hr        1.6725
nm3/Hr    9.9990E+09
Stability          3
#1V-Sound     320.45
#2V-Sound     352.56
#3V-Sound     352.17
#1GasVel        2.13
#2GasVel        2.21
#3GasVel        2.15
```

Meter Run Data

To view the meter run data on the flow computer LCD display, press **[Meter] [*n*] [Display]** on the OMNI front panel keypad (where “n” equals the meter run number, 1 to 4, you want to display) when in the Display Mode. The following data will display:

```
METER #1 Q-SONIC
Performance%  100.00
VOSm/s       352.137
Gas Vel        2.135
Flow m3/hr     1.625
Systematic swirl
#1 Perform %  100.00
#2 Perform %  100.00
#3 Perform %  100.00
#1a Ratio        1.5
#1b Ratio        1.6
#2a Ratio        1.7
#2b Ratio        1.8
#3a Ratio        1.5
#3b Ratio        1.7
```

DOCUMENT REVISION HISTORY

DOCUMENT INITIAL RELEASE DATE.....02-June-2003

REVISION	DATE	PURPOSE / CHANGE REQUEST
A	02-June-2003	Maintained on the Web - Initial release
B	09-April-2009	DCR 090102
C	12-November-2009	DCR 090311
D	04-April-2012	DCR 120012