Technical Bulletin, Communicating with SICK MAIHAK Ultrasonic Gas Flowmeter Model FLOWSIC600

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NOTE: User Manual Reference – This Technical Bulletin complements the information contained in the OMNI User Manual and OMNICOM help.

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Figures

Scope

Computers, for gas flow metering systems.

APPLICATION	REVISION
23.74	.20 and above
23.75	All
27.74	.19 and above
27.73	All

Abstract

The SICK FLOWSIC600 ultrasonic flowmeter determines the linear gas velocity through the meter tube by using multiple acoustic pulse paths. The flowmeter analyzes these paths employing the delta time travel measurement method. The OMNI Flow Computer either totalizes the flowmeter pulse input signal or determines the flowrate from the serial port data received from the flowmeter.

This device communicates with OMNI Flow Computers via OMNI's 'SV' process I/O combo module using a proprietary protocol. To use the scaled pulse output of the SICK FLOWSIC600, the flow computer must have at least one 'A", 'B', or 'E' combo module installed.

FLOWSIC600 Ultrasonic Flowmeter Theory of Operation

SICK's ultrasonic gas flow-metering technology incorporates multiple pairs of transducers into a smart digital inferential instrumentation device. This device is installed into a gas pipeline system to measure gas flow. Each pair of transducers emits ultrasonic (acoustic) pulses that travel bi-directionally, to and from each transducer in the pair.

Up to four pairs of transducers are positioned across the meter so that the path between each transducer has an axial component; i.e., one transducer is upstream relative to the other. Pulses emitted by the downstream transducer are slowed down by the velocity of the gas. With flow, the pulse takes longer to travel to the upstream transducer than with no flow. Pulses emitted by the upstream transducer are aided by the velocity of the gas. With flow, the pulse takes less time to travel to the downstream transducer. Ultrasonic flowmeters, such as the FLOWSIC600, that apply delta time methodology, measure these two travel times to determine both the linear gas velocity and the speed of sound in the gas. The flowmeter can measure velocity for bi-directional (forward/reverse) flow.

OMNI Flow Computer Logic

The OMNI Flow Computer can determine the actual flow rate from data received either serially from the FLOWSIC600 Flowmeter (Figure 1), or from a live pulse frequency signal input if one has been connected, assigned, and configured. In this application, Modbus serial communication can be configured as the primary measurement source with the pulse frequency configured as the backup measurement source or vice versa to determine the actual flow rate. The OMNI flow computer can also be configured to use only the Modbus serial communication link with no pulse frequency input. When Modbus communications are available, the flow computer transmits flowing temperature and pressure to the flowmeter to enable it to correct spool dimensions.

The OMNI retrieves the accumulated volume from the flowmeter. The flow computer obtains a calculated volume increment by subtracting the new accumulated volume from the previous accumulated volume it retrieved. The flowmeter updates its totalizers on a regular interval depending upon flowing conditions and configuration settings. Updating the OMNI totalizers on this same period would result in somewhat erratic totalizers and sampler pulse outputs, which could upset other equipment connected to the flow computer. The OMNI provides a smooth totalizer update by monitoring the time interval between Flowsic totalizer updates, and distributing the volume increment over a matching time-period.

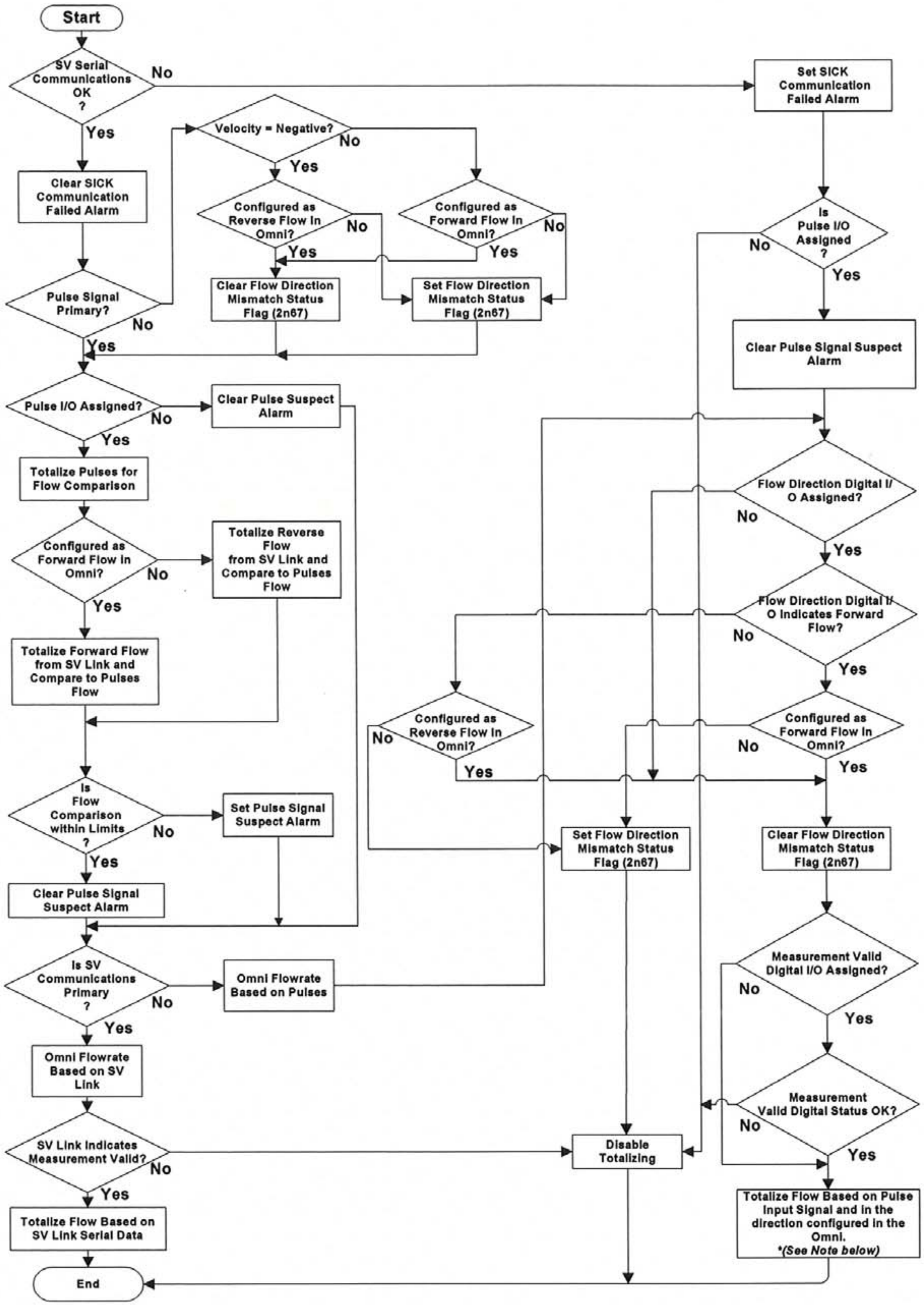

Figure 1. SICK FLOWSIC600 Ultrasonic Gas Flowmeter

***NOTE:** Totals will be applied in the Reverse or Forwarded direction depending on status of the digital channel configured for flow direction. If a flow direction digital channel is not configured, the flow will be applied in the direction specified in the OMNI configuration for each meter run.

In the event of a communication failure between the two devices, the OMNI will not receive serial data. However, the FLOWSIC600 may be fully operational and continue to accumulate volume. In this case, if a pulse signal is available from the flowmeter and the OMNI flow computer is configured to receive the flow pulse signal as a backup, the flow computer will automatically continue to accumulate flow based on this flow pulse train. When normal communications resume, the flow computer will validate and adjust its internal totalizers if necessary to match the Flowsic internal totalizer. The flow computer automatically adjusts its totalizers to account for the small amount of flow that takes place before it detects that a communication failure has occurred (i.e., the OMNI does not immediately start totalizing using the Flowsic pulse train).

If a pulse signal from the Flowsic is not available (i.e., not assigned) and the communication link fails, the flow computer immediately stops totalizing. Once communication is reestablished, the OMNI will adjust its internal totalizers to match the accumulated flow in the Flowsic since the last time it was able to read from the Flowsic. In this case, the OMNI may have to add a significant amount of flow to its totalizers, depending upon how much time the communication link was inoperative.

In some instances, adjusting the flow computer's totalizers may not be desirable (e.g., if a flowmeter has been disconnected for a long period of time, or the Flowsic electronics package has been replaced). For these cases, there are flow computer configuration settings that specify the maximum time that a Flowsic serial communication failure can exist, and still be compensated for by adjusting the flow computer totalizers. By default, this maximum time is 15 minutes.

Modbus Communication

The FLOWSIC600 connects to an external system using the Modbus ASCII protocol via a serial line. This connection is a 2-wire RS-485 serial link. Communications parameters are fixed in the OMNI (Table 1).

Table 1. OMNI Flow Computer Fixed Communications Parameters

Setting	Value
Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Protocol	Modbus ASCII

Wiring Installation

NOTE: Serial Data Communications – The serial interface between these devices is 2-wire RS-485 mode utilizing a Modbus ASCII protocol.

Setting Up and Wiring to OMNI Combo Modules – In order to communicate with SICK FLOWSIC600 ultrasonic flowmeters, the OMNI Flow Computer must be equipped with at least one SV combo module (68-6203). For instructions on jumper setting and other process I/O combination module setup information, please refer to Volume 1, Chapter 2 of the OMNI User Manual.

Getting SICK MAIHAK Technical Support – SICK MAIHAK Technical Support is available in Germany or the U.S.

Contact and technical information is available at website: www.sickmaihak.com

There are several options for wiring a SICK FLOWSIC600 ultrasonic meter to an OMNI flow computer. The option to implement depends upon requirements of the flow metering system. Contact SICK MAIHAK Technical Support (see sidebar) for assistance with software/hardware configuration of the flowmeter.

Always interconnect these devices via a 2-wire RS-485 serial interface from the FLOWSIC600 to an OMNI SV combo module serial port. The OMNI uses the Modbus ASCII protocol to determine the incremental flow from the data it retrieves from the FLOWSIC600 accumulators. The OMNI also transmits the fluid temperature and pressure to the flowmeter to allow the flowmeter to correct for dimensional changes of the measurement spool.

In addition to serial data, the OMNI can also receive live forward and/or reverse flow pulse signals from the FLOWSIC600. The Flowsic transmits pulse frequencies through wires typically connected to an OMNI combo module. Connecting two FLOWSIC600 pulse output channels to the OMNI can provide pulse fidelity and integrity checking. To perform pulse fidelity and integrity checking, the OMNI must have an E combo module installed.

OMNI Combo Module Terminal Assignments

The OMNI requires the SV combo module for serial communications plus either an A or a B combo module if also connecting the flow pulse signal(s) (Requires an E combo module instead of the A or B combo module if utilizing the Pulse Fidelity and Integrity Checking feature with dual pulse trains).

Tables 2 thru 5 specify the terminal assignments for each module type when connecting wires to the OMNI. The terminal block number (TB*n*) on the OMNI back panel for each combo module corresponds to the slot on the motherboard into which the module is plugged.

NOTE: The bolded areas indicate pinouts applicable to interfacing the OMNI to the SICK FLOWSIC600 flowmeter.

Table 2. OMNI SV Combo Module Back Panel Terminal Assignments (TB*n*)

Terminal	Signal Description
1	**Port # 1 (3): RS-485 B Wire**
2	**Port # 1 (3): RS-485 A Wire**
3	**Port # 2 (4): RS-485 B Wire**
4	**Port # 2 (4): RS+485 A Wire**
5	Signal Return for 4-20mA Analog Outputs
6	Signal Return for 4-20mA Analog Outputs
7	Analog Output # 5: 4-20mA
8	Analog Output # 6: 4-20mA
9	Analog Output # 3: 4-20mA
10	Analog Output # 4: 4-20mA
11	Analog Output # 1: 4-20mA
12	Analog Output # 2: 4-20mA
None:	Numbers in parenthesis “( )” refer to SV module 2 if installed.

Table 3. OMNI E Combo Module Back Panel Terminal Assignments (TB*n*)

Terminal	Signal Description
1	Input Channel # 1: 1-5v, 4-20mA, RTD
2	Input Channel # 1: Isolated Signal Return
3	Input Channel # 2: 1-5v, 4-20mA, RTD
4	Input Channel # 2: Isolated Signal Return
5	**Input Channel # 3: Flowmeter Pulses (independent channel or Pulse Train A for Pulse Fidelity)**
6	**Input Channel # 4: Flowmeter Pulses (independent channel or Pulse Train B for Pulse Fidelity)**
7	Double Chronometry Detector Switch Input (Active Low)
8	RTD Excitation Current Source Output #2
9	RTD Excitation Current Source Output #1
10	**Signal Return for Terminals 5, 6, 7, 8, 9, 11, & 12 (Internally connected to DC power return)**
11	Analog Output # 1: 4-20mA
12	Analog Output # 2: 4-20mA

Table 4. OMNI A Combo Module Back Panel Terminal Assignments (TB*n*)

Terminal	Signal Description
1	Input Channel # 1: 1-5v, 4-20mA, RTD
2	Input Channel # 1: Isolated Signal Return
3	Input Channel # 2: 1-5v, 4-20mA, RTD
4	Input Channel # 2: Isolated Signal Return
5	**Input Channel # 3: Flowmeter Pulses**
6	**Input Channel # 3: Isolated Signal Return**
7	**Input Channel # 4" Flowmeter Pulses**
8	**Input Channel # 4: Isolated Signal Return**
9	RTD Excitation Current Source Output #1
10	Signal Return for Terminals 9, 11 & 12 (Internally connected to DC power return
11	Analog Output # 1: 4-20mA
12	Analog Output # 2: 4-20mA or RTD Excitation Current Source Output #2 *(See JP12 Setting)*

Table 5. OMNI B Combo Module Back Panel Terminal Assignments (TB*n*)

Terminal	Signal Description
1	Input Channel # 1: 1-5v, 4-20mA, RTD
2	Input Channel # 1: Isolated Signal Return
3	Input Channel # 2: 1-5v, 4-20mA, RTD
4	Input Channel # 2: Isolated Signal Return
5	**Input Channel # 3: Flowmeter Pulses**
6	**Input Channel # 3: Isolated Signal Return**
7	Input Channel # 4: Densitometer Pulses
8	Input Channel # 4: Isolated Signal Return
9	RTD Excitation Current Source Output #1
10	Signal Return for Terminals 9, 11 & 12 (Internally connected to DC power return
11	Analog Output # 1: 4-20mA
12	RTD Excitation Current Source Output #2 *(See JP12 Setting)*

FLOWSIC600 Terminal Assignments

There are two hardware variants of the FLOWSIC600 flowmeter that can be selected using hardware jumper settings. Consult the Flowsic manual for specific details on procedures to change the related jumpers.

NOTE: The hardware "variant" is not the same as the hardware "version"referenced in the sidebar on page 1 of this bulletin (i.e., both hardware "versions" 1.0 and 2.0 have user selectable Hardware "variant" 1 or 2. Variant 2 provides a second serial port.

The hardware variant can be selected via the Jumper 2 setting on what is known as the Back Board on the flowmeter. In addition to selecting the hardware variant, the same jumper can be used to specify if the outputs are to be Open Collector (Active) or NAMUR (Passive) signals. Use the Open Collector option when connecting to the OMNI Flow Computer. DC Coupling selected on the A and E combo module and if using the NAMUR input, select AC coupling jumper on the A and E combo module.

The "variant" or specific assignments of the digital outputs DO 1 through DO 3 can be software configured with the help of the MEPAFLOW 600 PC-Based program used to configure the flowmeter.

The bolded areas in Tables 6 and 7 indicate how the flowmeter should be configured for interfacing to the OMNI when using either variant.

Table 6. Hardware Variant 1 (without current output)

Output	Terminal	Assignment
Digital Out 0	**31+, 32-**	**Actual Volume (frequency signal), inverted to Digital Output 1, constant "open" with fault**
Serial Interface	**33+, 34-**	**RS-485 2-Wire**
Digital Out 1	**51+, 52-**	**Actual Volume (frequency signal)**
Digital Out 2	**41+, 42-**	Data Invalid or Config Mode = High signal **Data Valid or Measurement Mode = Low signal**
Digital Out 3	**81+, 82-**	**Direction of Flow** Forward Flow = High signal, Reverse Flow = Low signal

Table 7. Hardware Variant 2 (with current output)

Output	Terminal	Assignment
Digital Out 0	31+, 32-	Actual Volume (frequency signal
Serial Interface	33+, 34-	RS-485 2-Wire Port 1
Digital Out 1	51+, 52-	Actual Volume (frequency signal)
Digital Out 2 Or Serial Interface	41+, 42-	Data Invalid = High signal (Config Mode) and Data Valid = Low signal (Measurement Mode) RS-485 2-Wire Port 2
Digital Out 3	81+, 82-	Direction of Flow Forward Flow = High signal, Reverse Flow = Low signal

FLOWSIC600 UFM Configuration Options Explained

Following are the software and hardware settings available in the SICK MAIHAK FLOWSIC600 UFM when connecting to the OMNI Flow Computer.

Option 1

Frequency outputs *D0, D1 (51/52-31/32)* setting = Flow (DO1) + Direction (DO0)

Either *Normally Open (D0+D1)* or *Normally Closed (D0+D1)*

Hardware jumper set to DO0 = frequency

This configuration creates the same frequency on terminals 31/32 and 51/52 but the phase shift is dependent on flow direction.

Dual pulse trains are provided simultaneously in both the forward and reverse flow directions for pulse fidelity and integrity checking. The phase shift in the forward direction is 90 degrees and 180 degrees in the reverse direction. It is possible to use this configuration with the OMNI flow computer if configuring two separate meter runs in the flow computer with each meter run representing different flow directions, and with each meter run assigned different flow pulse input channels.

Option 2

Frequency output *D0, D1 (51/52-31/32)* setting = Flow (DO1) + Invalid (DO0)

Either *Normally Open (D0+D1)* or *Normally Closed (D0+D1)*

Hardware jumper set to DO0 = frequency

This configuration provides dual pulse trains for purposes of dual pulse fidelity and integrity checking with the signals 180 degrees out of phase. Both signals are normally active simultaneously in either the forward or reverse flow directions. If there exists a data invalid situation in the flowmeter, terminals 31/32 will not output a frequency.

NOTE: An internal Data Invalid situation or switching the meter to "Configuration" mode will cause a Data Invalid signal to be output.

Option 3

Frequency output *D0, D1 (31/32-51/52)* setting = Flow FW(DO1) + RW(DO0)

Either *Normally Open (D0+D1)* or *Normally Closed (D0+D1)*

Hardware jumper set to DO0 = frequency

This configuration also provides dual pulse trains but not for pulse fidelity and integrity checking. The signals are mutually exclusive of one another - while one signal is on, the other is off. The DO1 signal is used to indicate forward flow and the DO0 signal is used to indicate reverse flow.

Dependent on the flow direction, the meter outputs a frequency only on terminals 51/52 for forward flow or the meter outputs a frequency only on terminals 31/32 for reverse flow.

Option 4

Frequency output *D0, D1 (31/32-51/52)* setting = Flow FW (DO1) + status output (DO0)

Either *Normally Open (D0+D1)* or *Normally Closed (D0+D1)*

Hardware jumper set to DO0 = frequency

This configuration provides only one pulse train on terminals 51/52. Terminals 31/32 can be configured for status output signals (i.e. Data Invalid, Warning, Flow Direction, and Check Request).

Forward & Reverse Flow Signals

Figure 2 is a typical wiring installation between the SICK FLOWSIC600 and an OMNI 6000 for serial data and both forward and reverse flow signals, without pulse fidelity and Integrity checking. In this example, assume that the OMNI 6000 has an A or B Combo module plugged into slot TB5, and an SV module in slot TB6.

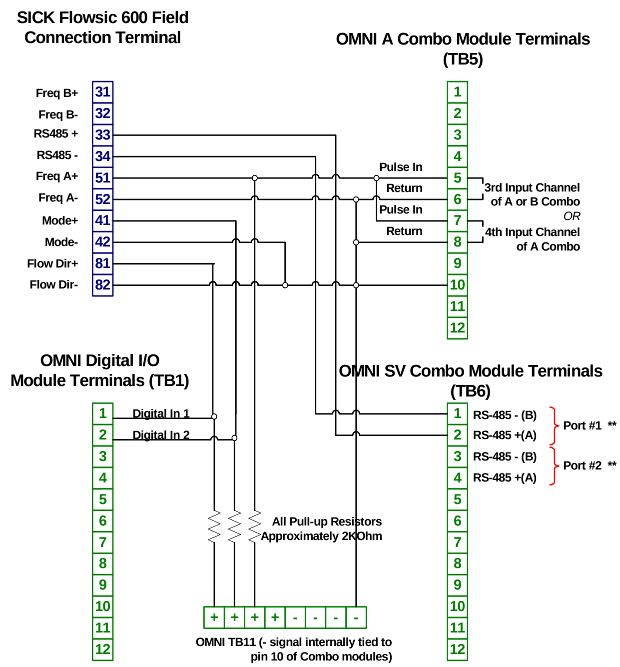

Figure 2. Wiring a FLOWSIC600 Ultrasonic Flowmeter

*Ports 1 or 2 of the SV1 combo module or ports 3 or 4 of the SV2 combo module can be utilized.

Forward & Reverse Flow with Dual Pulse Fidelity Checking

Figure 3 is a typical wiring installation between the SICK FLOWSIC600 and an OMNI 6000 for serial data and forward and/or reverse flow signals, with connections for pulse fidelity and integrity checking. In this example, assume that the OMNI 6000 has an E module plugged into slot TB5, and an SV module in slot TB6.

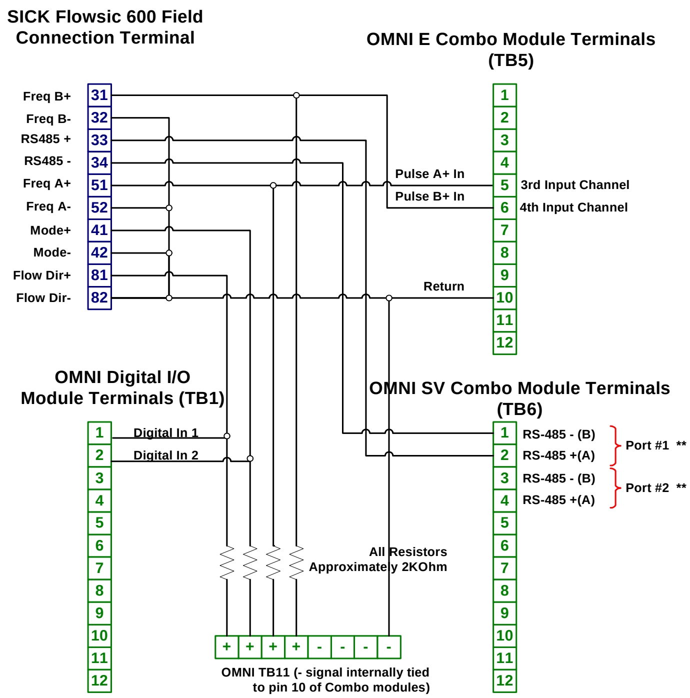

Figure 3. Wiring a FLOWSIC600 Ultrasonic Flowmeter

**Ports 1 or 2 of the SV1 Combo module or ports 3 or 4 of the SV2 Combo module can be utilized.

OMNI Flow Computer Configuration

Use either the flow computer's front panel keypad or the OmniCom for Windows PC-based software program to enter configuration settings unique to the SICK FLOWSIC600 flowmeter. The configuration settings that are specific to the FLOWSIC600 are under Miscellaneous Setup, Configure Meter Run menu and the Meter Run Setup menu if accessing the settings from the keypad.

Enter the miscellaneous configuration meter run settings first and then proceed to the meter run setup entries (Chapter 2 'Flow Computer Configuration' in Volume 3 of the OMNI User Manual, and the Technical Bulletin 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 FLOWSIC600 ultrasonic gas flowmeter:

- **Select Flowmeter Device Type –** For each meter run, enter **[10]** to select the SICK Ultrasonic flowmeter as the device type.
- **Select SV Module Port –** The OMNI Flow Computer can accept two SV combo modules (*these are not the same as regular serial modules*). With one SV module, two SV ports are available, and with two SV modules, four ports are available. For each ultrasonic meter run, enter the SV port number (1 to 4) to which the SV module's RS-485 2-wire serial interface input from the FLOWSIC600 flowmeter is wired to the OMNI.
- **SICK Address** – This is the address ID of the SICK ultrasonic flowmeter communications port.
- **SICK Retry #** – This is the number of SV serial port communications consecutive retries the OMNI will attempt with the flowmeter when the flowmeter does not respond before the OMNI raises a communications fail alarm.

- **Delay Seconds** – This is the number of seconds the OMNI should wait for a response from the flowmeter before the OMNI attempts a communications retry. The flowmeter response time can vary depending on the tasks being performed at the time data is requested. If the specified number of retries has been exhausted without a response from the flowmeter, the flow computer will raise a communications failure alarm. (*Recommended value is 2 seconds*)
- **Flow I/O Point –** Enter the flow pulse input channel number of the flow computer where the ultrasonic flowmeter pulse signal is wired to. Assign flowmeter pulse signals only to Input Channels #3 and #4 of A or E combo modules, or input channel #3 of a B combo module.
- **Dual Pulse? (Y/N)** – A **"Y"** indicates to the flow computer there are two pulse trains coming from the flowmeter and they should be compared using the Pulse Fidelity and Integrity Checking feature. The channel assigned in the previous setting will be considered the "A" pulse train and the channel immediately following will be considered the "B" pulse train. Ensure the pulse train signals are wired accordingly.

  NOTE: Use of this feature requires an E-Combo module.
- **Select Flow Direction (F/R)** – FLOWSIC600 flowmeters allow for bi-directional flow measurement. Set up the flow computer to totalize either the forward or the reverse flow on any meter run with an ultrasonic flowmeter.

  NOTE: If you would like the OMNI flow computer to measure flow in both directions, you should set up two meter runs in the OMNI, one configured for forward flow and the other configured for reverse flow.
- **Flow Direction Digital Input #** – Specify which digital input channel in the OMNI will be receiving the signal indicative of the flow direction. This input signal is used for purposes of flow pulses totalizing only and not for totalizing with respect to the serial port data.
- The OMNI will use this status signal if there is a failover from the serial communications link to the pulses OR if the pulses are specified as the primary means of measurement.
- A high output digital signal from the flowmeter indicates the flow is in the forward direction whereas a low signal indicates the flow is in the reverse direction.
- If the signal indicates a direction that is different than what is configured for the Select Flow Direction setting, the OMNI will not totalize flow for the respective meter run and will set flag 2n67 to indicate a flow direction mismatch.
- **Measurement Status Digital Input #** – This input signal is used for purposes of flow pulses totalizing only and not for totalizing with respect to the serial port data. The OMNI will use this status signal if there is a failover from the serial communications link to the pulses OR if the pulses are specified as the primary means of measurement.
- A high output digital signal from the flowmeter indicates the flowmeter is in the "configuration" mode whereas a low signal indicates the flowmeter is in the "measurement" mode. Specify which digital input channel in the OMNI will be receiving the signal indicative of the measurement status.

  NOTE: When the flowmeter indicates it is in the configuration mode, the OMNI will not totalize.
- **Primary Flow** – This setting instructs the OMNI 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 that 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 that the flow pulses received from the flowmeter will be the primary and the SV serial communications data will be used as a backup means of flow calculations by the flow computer.

Meter Run Setup Entries

The following meter run setup entries in the OMNI Flow Computer are available for the FLOWSIC600 ultrasonic flowmeter:

- **Velocity of Sound (VOS) Deviation Percent from Average –** In instances where the serial data is being used as the means of totalizing, the flow computer can verify that the average VOS calculated for all paths conforms to 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. The flow computer will raise an alarm if this percentage limit is exceeded.
- **AGA 10 Velocity of Sound (VOS) Deviation Percent from Average –** Only valid if AGA 10 is enabled in the OMNI flow computer. The flow computer can verify that the average VOS calculated for all FLOWSIC600 paths conforms to the AGA 10 VOS calculated by the OMNI flow computer. The flow computer will raise an alarm if this percentage limit is exceeded.
- **Flow Minutes** – Only valid if a flow pulses I/O point is assigned. The time interval can be set for comparing the flow pulses input flow with the SV communications serial link flow. If the flow deviation exceeds the Flow Deviation Percent setting (see next setting) when this comparison is made, the OMNI will switch from the primary (flow pulses) to the backup source (SV serial link) for calculating flow.

  NOTE: It is recommended a minimum of 60 minutes be specified for this setting due to the fluctuating flow pulse frequency.)

- **Maximum Flow Deviation Percent** — Only valid if a flow pulses I/O point is assigned - this is the allowable percent of deviation between the calculated flow from the pulse input channel compared to the FLOWSIC600 flow data received via the OMNI SV serial port. The OMNI raises the pulse suspect alarm if the flow deviation percentage exceeds this limit and switches to the SV serial port as the primary means of totalizing.

  NOTE: See the previous setting relating to Flow Minutes.

- **Maximum Meter Downtime** — Enter the maximum allowable flowmeter downtime in minutes. If communication downtime between the OMNI and the FLOWSIC600 is greater than this value, the OMNI ***will not*** adjust its internal totalizers to match the FLOWSIC600 totalizer increment when serial communications is reestablished. Depending upon how much time the communication link and pulses were inoperative and the amount of flow that occurred during this downtime, when communications is reestablished within the time specified in this setting, the OMNI may have to add a significant amount of flow to its totalizers. (Default = 15 minutes).

  NOTE: If you do not wish the OMNI to compensate for any flowmeter downtime, specify a value of 0 for this setting.

OMNI Flow Computer Database Addresses & Index Numbers

Tables 8 thru 14 list the Modbus database addresses assigned within OMNI firmware to the FLOWSIC600 ultrasonic metering feature. These tables categorize data type.

Table 8. Meter Run Alarm Status Points – Real Time Dates

Description	Database Address for Meter Run Number			
	1	2	3	4
Loss of communication Alarm	2154	2254	2354	2454
Pulse Suspect Alarm	2155	2255	2355	2455
Flow rate deviation Alarm	2156	2256	2356	2456
Meter in Configuration mode	2157	2257	2357	2457
Meter in Reduced Accuracy mode	2158	2258	2358	2458
Path 1 Error	2159	2259	2359	2459
Path 2 Error	2160	2260	2360	2460
Path 3 Error	2161	2261	2361	2461
Path 4 Error	2162	2262	2362	2462
SICK EPROM Error	2163	2263	2363	2463
I/O Parameter Error	2164	2264	2364	2464
Warn I/O Range	2165	2265	2365	2465
DSP – fault	2166	2266	2366	2466
Flow Direction Mismatch	2167	2267	2367	2467
DSP Parameter Error	2168	2268	2368	2468
Path 1 AGC Deviation Alarm	2169	2269	2369	2469
Path 2 AGC Deviation Alarm	2170	2270	2370	2470
Path 3 AGC Deviation Alarm	2171	2271	2371	2471
Path 4 AGC Deviation Alarm	2172	2272	2372	2472
Path 1 SOS Deviation Warning	2173	2273	2373	2473
Path 2 SOS Deviation Warning	2174	2274	2374	2474
Path 3 SOS Deviation Warning	2175	2275	2375	2475
Path 4 SOS Deviation Warning	2176	2276	2376	2476
Path 1 - VOS Deviation Alarm	2181	2281	2381	2481
Path 2 - VOS Deviation Alarm	2182	2282	2382	2482
Path 3 - VOS Deviation Alarm	2183	2283	2383	2483
Path 3 SOS Deviation Warning	2175	2275	2375	2475

Table 9. 16-Bit Integer Registers – Real Time Data

Description	Database Address for Meter Run Number			
	1	2	3	4
Flow Direction Configuration (0=forward,1=reverse)	3155	3255	3355	3455
System Control Register	3171	3271	3371	3471
System Status	3172	3272	3372	3472
Numbers of Paths	3173	3273	3373	3473
Flow Meter Type	3174	3274	3374	3474
Valid Samples Path 1	3175	3275	3375	3475
Valid Samples Path 2	3176	3276	3376	3476
Valid Samples Path 3	3177	3277	3377	3477
Valid Samples Path 4	3178	3278	3378	3478
AGC Level Receiver 1A	3180	3280	3380	3480
AGC Level Receiver 1B	3181	3281	3381	3481
AGC Level Receiver 2A	3182	3282	3382	3482
AGC Level Receiver 2B	3183	3283	3383	3483
AGC Level Receiver 3A	3184	3284	3384	3484
AGC Level Receiver 3B	3185	3285	3385	3485
AGC Level Receiver 4A	3186	3286	3386	3486
AGC Level Receiver 4B	3187	3287	3387	3487
VBatt Level	3188	3288	3388	3488
Frequency Current	3189	3289	3389	3489

Table 10. 32-Bit Integer Register – Real Time Data

Description	Database Address for Meter Run Number			
	1	2	3	4
Flowsic SN Device	15524	15624	15724	15824
Flowsic Software Version	15525	15625	15725	15825
Flowsic SN Analog	15526	15626	15726	15826
Flowsic Constants CRC	15527	15627	15727	15827
Flowsic Program CRC	15528	15628	15728	15828
Flowsic Parameter CRC	15529	15629	15729	15829
Flowsic Forward Volume	15530	15630	15730	15830
Flowsic Fwd Volume Error	15531	15631	15731	15831
Flowsic Reverse Volume	15532	15632	15732	15832
Flowsic Rev Volume Error	15533	15633	15733	15833
Flowsic Counter Resolution	15534	15634	15734	15834
Flowsic Response Delay	15535	15635	15735	15835

Table 11. 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
Serial Gross flow during Flow Minutes period	17141	17151	17161	17171	Path 1 Velocity of Sound	17527	17627	17727	17827
Pulses Gross flow during Flow Minutes period	17142	17152	17162	17172	Path 2 Velocity of Sound	17528	17628	17728	17828
Calculated Flow Dev %	17143	17153	17163	17173	Path 3 Velocity of Sound	17529	17629	17729	17829
Max flow dev (%) allowed	17513	17613	17713	17813	Path 4 Velocity of Sound	17530	17630	17730	17830
Total increment from serial link (2nd to last read)	17213	17217	17221	17225	Path 1 Gas Velocity	17533	17633	17733	17833
Total increment from serial link (last read)	17214	17218	17222	17226	Path 2 Gas Velocity	17534	17634	17734	17834
Total from pulse input	17215	17219	17223	17227	Path 3 Gas Velocity	17535	17635	17735	17835
Dev % between serial & pulse	17216	17220	17224	17228	Path 4 Gas Velocity	17536	17636	17736	17836
*****Max VOS dev (%) allowed	17516	17616	17716	17816	Volume Flowrate – Line	17525	17625	17725	17825
Avg VOS – All Paths	17521	17621	17721	17821	Volume Flowrate - Base	17526	17626	17726	17826
Avg Gas Velocity – All Paths	17522	17622	17722	17822	******Max Allowed VOS Dev % *(OMNI v23 firmware)*	17518	17618	17718	17818
SICK Press – Absolute BarA	17523	17623	17723	17823	******Max Allowed VOS Dev % *(OMNI v27 firmware)*	17599	17699	17799	17899
SICK Temperature - Kelvin	17524	17624	17724	17824	***OMNI Calculated AGA10 VOS in m/s *(OMNI v23 & 27 firmware)*	18524	18624	18724	18824
SICK K-Factor	17538	17638	17738	17838	***OMNI Calculated AGA10 VOS in ft/s *(OMNI v23 & 27 firmware)*	18532	18632	18732	18832
Temperature	7105	7205	7305	7405					
Pressure	7106	7206	7306	7406					

***** The VOS of each individual path is compared against the composite VOS in the SICK FLOWSIC600 and an alarm is raised by the OMNI if this percentage limit is exceeded.

****** Applicable only if AGA 10 is enabled in the OMNI. This is the result of the comparison between the SICK FLOWSIC600 composite VOS versus the OMNI calculated AGA 10 VOS. The OMNI raises an alarm if this percentage limit is exceeded.

******* Applicable only if AGA 10 is enabled in the OMNI.

Table 12. 32-Bit IEEE Floating Pints Previous Hour's Average Data
32-Bit IEEEE Floating Points Previous Day's Average Data

32-bit IEEE Floating Points Previous Hour's Average Data					32-bit IEEE Floating Points Previous Day's Average Data				
Description	Database Address for Meter Run Number				Description	Database Address for Meter Run Number			
	1	2	3	4		1	2	3	4
Valid Sample Path 1	17539	17639	17739	17839	Valid Sample Path 1	17569	17669	17769	17869
Valid Sample Path 2	17540	17640	17740	17840	Valid Sample Path 2	17570	17670	17770	17870
Valid Sample Path 3	17541	17641	17741	17841	Valid Sample Path 3	17571	17671	17771	17871
Valid Sample Path 4	17542	17642	17742	17842	Valid Sample Path 4	17572	17672	17772	17872
AGC Level Receiver 1A	17543	17643	17743	17843	AGC Level Receiver 1A	17574	17674	17774	17874
AGC Level Receiver 1B	17544	17644	17744	17844	AGC Level Receiver 1B	17575	17675	17775	17875
AGC Level Receiver 2A	17545	17645	17745	17845	AGC Level Receiver 2A	17576	17676	17776	17876
AGC Level Receiver 2B	17546	17646	17746	17846	AGC Level Receiver 2B	17577	17677	17777	17877
AGC Level Receiver 3A	17547	17647	17747	17847	AGC Level Receiver 3A	17578	17678	17778	17878
AGC Level Receiver 3B	17548	17648	17748	17848	AGC Level Receiver 3B	17579	17679	17779	17879
AGC Level Receiver 4A	17549	17649	17749	17849	AGC Level Receiver 4A	17580	17680	17780	17880
AGC Level Receiver 4B	17550	17650	17750	17850	AGC Level Receiver 4B	17581	17681	17781	17881
Path 1 Gas velocity	17553	17653	17753	17853	Path 1 Gas velocity	17584	17684	17784	17884
Path 2 Gas velocity	17554	17654	17754	17854	Path 2 Gas velocity	17585	17685	17785	17885
Path 3 Gas velocity	17555	17655	17755	17855	Path 3 Gas velocity	17586	17686	17786	17886
Path 4 Gas velocity	17556	17656	17756	17856	Path 4 Gas velocity	17587	17687	17787	17887
Path 1 Velocity of Sound	17561	17661	17761	17861	Path 1 Velocity of Sound	17592	17692	17792	17892
Path 2 Velocity of Sound	17562	17662	17762	17862	Path 2 Velocity of Sound	17593	17693	17793	17893
Path 3 Velocity of Sound	17563	17663	17763	17863	Path 3 Velocity of Sound	17594	17694	17794	17894
Path 4 Velocity of Sound	17564	17664	17764	17864	Path 4 Velocity of Sound	17595	17695	17795	17895

Table 13. 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 pulse I/O point #	13001	13014	13027	13040	Flow Direction Digital Input #	3162	3262	3362	3462
Flowmeter device type	3108	3208	3308	3408	Meter Mode Digital Input # 0=Measurement 1=Config	3163	3263	3363	3463
SV module port # assigned	3153	3253	3353	3453					
FLOWSIC600 Modbus ID	3154	3254	3354	3454	Delay Retry Seconds	13445	13446	13447	13448
Flow direction (0=frwd,1=rvrs)	3155	3255	3355	3455					
SICK Retry #	3156	3256	3356	3456					
Primary Flow (0=Serial, 1=Pulses)	3157	3257	3357	3457					

Table 14. 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
Meter maximum downtime (minutes)	3116	3216	3316	3416	*VOS deviation (%)	17516	17616	17716	17816
					**Max Allowed VOS Dev % *(OMNI v23 firmware)*	17518	17618	17718	17818
Flow Compare Interval Time – (minutes) Serial to Pulses flow compared	3135	3235	3335	3435	**Max Allowed VOS Dev % *(OMNI v27 firmware)*	17599	17699	17799	17899
Maximum flow deviation (%)	17513	17613	17713	17813	K-factor from SICK UFM	17538	17638	17738	17838

***** The VOS of each individual path is compared against the composite VOS in the SICK FLOWSIC600 and an alarm is raised by the OMNI if this percentage limit is exceeded.

******Applicable only if AGA10 is enabled in the OMNI. This is the result of the comparison between the SICK FLOWSIC600 Composite VOS versus the OMNI calculated AGA10 VOS. The OMNI raises an alarm if this percentage limit is exceeded.

OMNI 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 FLOWSIC600 flowmeter. 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.

Figure 4 data displays assume that when you have a version 23 firmware OMNI, the FLOWSIC600 flowmeter will be configured for Imperial Units and when you have a version 27 firmware OMNI, the FLOWSIC600 flowmeter will be configured for Metric Units:

OMNI Version 23 Firmware

```
SV Portn FLOWSIC600
Meter Type      xxx
System Reg     xxxx
SystemStatus   xxxx
Path1 Status      x
Path2 Status      x
Path3 Status      x
Path4 Status      x
Path1 Sample      x
Path2 Sample      x
Path3 Sample      x
Path4 Sample      x
Path 1A AGC      xx
Path 1B AGC      xx
Path 2A AGC      xx
Path 2B AGC      xx
Path 3A AGC      xx
Path 3B AGC      xx
Path 4A AGC      xx
Path 4B AGC      xx
VBatt Level   xxxxx
Freq Current  xxxxx
SN Device       xxx
```

OMNI Version 27 Firmware

```
SV Portn FLOWSIC600
Meter Type      xxx
System Reg     xxxx
SystemStatus  xxxxx
Path1 Status      x
Path2 Status      x
Path3 Status      x
Path4 Status      x
Path1 Sample      x
Path2 Sample      x
Path3 Sample      x
Path4 Sample      x
Path 1A AGC      xx
Path 1B AGC      xx
Path 2A AGC      xx
Path 2B AGC      xx
Path 3A AGC      xx
Path 3B AGC      xx
Path 4A AGC      xx
Path 4B AGC      xx
VBatt Level   xxxxx
Freq Current   xxxx
SN Device       xxx
```

```
SW Version     xxxx
SN Analog       xxx
Constants CRC  xxxx
Program CRC    xxxx
Parameter CRC  xxxx
Fwd Vol    xxxxxx.x
F.VolErr     xxxx.x
Rev Vol       xxx.x
R.VolErr         .x
CtResolution    xxx
ResponseDely      x

Continued (version 23)

FwRateLn   xxxx.xxx
FwRateBs       .xxx
Avg.VOS  xxxx.xxxxx
Avg Vel    xx.xxxxx
VOS P1   xxxx.xxxxx
VOS P2    xxx.xxxxx
VOS P3    xxx.xxxxx
VOS P4     xx.xxxxx
Vel P1     xx.xxxxx
Vel P2     xx.xxxxx
Vel P3     xx.xxxxx
Vel P4     xx.xxxxx
SNR 1A       xx.xxx
SNR 1B       xx.xxx
SNR 2A       xx.xxx
SNR 2B       xx.xxx
SNR 3A       xx.xxx
SNR 3B       xx.xxx
SNR 4A       xx.xxx
SNR 4B       xx.xxx
Temp K       xxx.xx
P. (abs)    xxx.xxx
RealGasFcx  .xxxxxx
Temp Base K xxx.xxx
P.Base     xx.xxxxx
RealFcBas  x.xxxxxx
MFp/unit    xxx.xxx
LowCutOff    xx.xxx
AdjFcFwd   x.xxxxxx
AdjFcRev   x.xxxxxx
ZeroOffset    .xxxx
Temp Fix    xxx.xxx
PressureFix  xx.xxx
CompressFix  x.xxxx
```

```
SW Version     xxxx
SN Analog       xxx
Constants CRC  xxxx
Program CRC    xxxx
Parameter CRC  xxxx
Fwd Vol     xxxxx.x
F.VolErr     xxxx.x
Rev Vol       xxx.x
R.VolErr         .x
CtResolution    xxx
ResponseDely      x

Continued (version 27)

FwRateLn   xxxx.xxx
FwRateBs       .xxx
Avg.VOS  xxxx.xxxxx
Avg Vel    xx.xxxxx
VOS P1   xxxx.xxxxx
VOS P2   xxxx.xxxxx
VOS P3   xxxx.xxxxx
VOS P4   xxxx.xxxxx
Vel P1     xx.xxxxx
Vel P2     xx.xxxxx
Vel P3     xx.xxxxx
Vel P4     xx.xxxxx
SNR 1A       xx.xxx
SNR 1B       xx.xxx
SNR 2A       xx.xxx
SNR 2B       xx.xxx
SNR 3A       xx.xxx
SNR 3B       xx.xxx
SNR 4A       xx.xxx
SNR 4B       xx.xxx
Temp K       xxx.xx
P. (abs)    xxx.xxx
RealGasFc  x.xxxxxx
Temp Base K xxx.xxx
P.Base     xx.xxxxx
RealFcBas  x.xxxxxx
MFp/unit    xxx.xxx
LowCutOff    xx.xxx
AdjFcFwd   x.xxxxxx
AdjFcRev   x.xxxxxx
ZeroOffset    .xxxx
Temp Fix     xx.xxx
PressureFix  xx.xxx
CompressFix  x.xxxx
```

Figure 4. OMNI Versions 23 and 27 Firmware

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. Figure 5 data will display:

OMNI Version 23 Firmware

```
METER #n FLOWSIC600
VEL ft/s   xx.xxxxx
KF P/ft3    xxx.xxx
Flowft3h    xxxx.xx
VOS ft/s xxxx.xxxxx
Fwd Vol    xxxxxx.x
Rev Vol       xxx.x
P. psia      xxx.xx
T. Deg.K     xxx.xx
GasVelP1   xx.xxxxx
GasVelP2   xx.xxxxx
GasVelP3   xx.xxxxx
GasVelP4   xx.xxxxx
VOS P1   xxxx.xxxxx
VOS P2   xxxx.xxxxx
VOS P3   xxxx.xxxxx
VOS P4   xxxx.xxxxx
```

OMNI Version 27 Firmware

```
METER #n FLOWSIC600
VEL m/s    xx.xxxxx
KF P/m3     xxx.xxx
FlowM3/h    xxxx.xx
VOS m/s    xx.xxxxx
Fwd Vol    xxxxxx.x
Rev Vol       xxx.x
P. bara      xxx.xx
T. Deg.K     xxx.xx
GasVelP1   xx.xxxxx
GasVelP2   xx.xxxxx
GasVelP3   xx.xxxxx
GasVelP4   xx.xxxxx
VOS P1   xxxx.xxxxx
VOS P2   xxxx.xxxxx
VOS P3   xxxx.xxxxx
VOS P4   xxxx.xxxxx
```

Figure 5. Meter Run OMNI Versions 23 and 27 Firmware

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DOCUMENT REVISION HISTORY

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