# Technical Bulletin, Communicating with Kongsberg Metering MPU 1200 Ultrasonic Gas Flowmeters

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**NOTE:** User Manual Reference - This Technical Bulletin complements the information contained in the User Manual, applicable to Revision 23.74/27.74.

Communicating with Kongsberg Metering MPU 1200 Ultrasonic Gas Flowmeters – The Kongsberg Metering MPU 1200 ultrasonic flowmeter measures gas flow by using an upstream/downstream transit time method of acoustic pulses. This device communicates with OMNI Flow Computers via OMNI's 'SV' process I/O combo module using a proprietary Modbus® protocol. To use the scaled pulse output of the Kongsberg Metering, the flow computer must have either an 'A', 'B', or 'E' combo module installed.

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## Scope

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

## Abstract

Ultrasonic gas flowmeters determine the linear gas velocity through the meter tube by using multiple acoustic pulse reflection paths. These meters analyze the acoustic paths employing an upstream/downstream transit time measurement method. The OMNI Flow Computer totalizes either the flowmeter pulse input signal or the actual uncorrected volume data received from the MPU 1200 Series A and Series B.

## MPU 1200 Ultrasonic Flowmeter Theory of Operation

Kongsberg'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.

The MPU 1200 has six (6) pairs of transducers positioned across it so that the path between each transducer has an axial component; i.e., one transducer is upstream relative to the other. When the downstream transducer emits an ultrasonic pulse that is slowed down by the velocity of the fluid, the pulse takes longer to travel to the upstream transducer than with no flow. When the upstream transducer emits a pulse that is aided by the velocity of the fluid, the pulse takes less time to travel to the downstream transducer. Ultrasonic flowmeters that apply transit time methodology, such as the MPU 1200, measure these two (2) transit times to determine both the velocity and the speed of sound of the fluid. The flowmeter can measure gas velocity for bi-directional (forward/reverse) fluid flow.

## OMNI Flow Computer Logic

The OMNI Flow Computer can determine the actual flow rate from data received either serially from the MPU 1200 flowmeter, or from a live pulse frequency signal input, if it has been connected, assigned, and configured. In this application, Modbus serial communication is the primary measurement source. The pulse frequency signal serves as a backup flow measurement, should the Modbus serial communication link fail or be disconnected (Figure 1).

The MPU 1200 serially transmits the accumulated volume to the OMNI. The flow computer obtains a calculated volume increment by subtracting the new accumulated volume from the last accumulated volume it received. The MPU 1200 flowmeter updates its totalizers on a regular interval depending upon flowing conditions and configuration settings. Updating the OMNI totalizers on this same interval would result in somewhat erratic totalizers and sampler pulse outputs, which could upset other equipment connected to the flow computer. The OMNI therefore provides a smooth totalizer update by monitoring the time interval between MPU 1200 totalizer updates, and distributing the volume increment over a matching time interval.

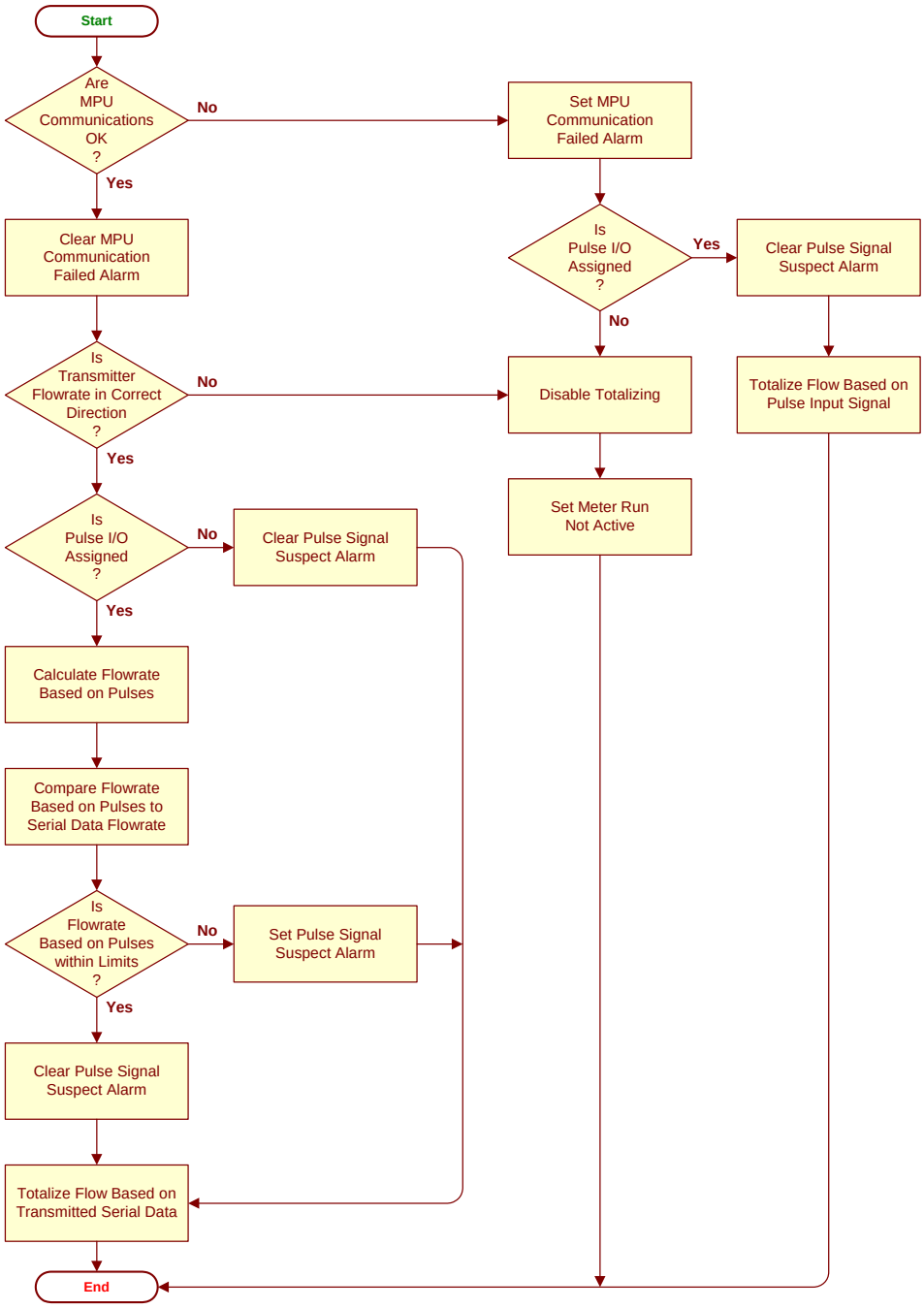


**Figure 1. Flow Computer Logic Flow Diagram for the MPU 1200 Ultrasonic Gas Flowmeter**

If there is a communication failure between the two (2) devices, the OMNI Flow Computer will not receive serial data. However, the MPU 1200 may be fully operational and continue to accumulate volume. In this case, if a pulse signal is available from the MPU 1200, the OMNI 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 volume indicated by the MPU 1200 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., when the serial link fails, the OMNI Flow Computer does not immediately start totalizing using the MPU 1200 pulse train because it takes several seconds to determine if a failure has occurred).

If a pulse signal from the MPU 1200 is not available and the communication link fails, the flow computer immediately stops totalizing. Once communication is reestablished, the OMNI Flow Computer will adjust its internal totalizers to include volume flow indicated by the MPU 1200 totalizer. In this case, the OMNI Flow Computer 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 MPU 1200 electronics package has been replaced. For these cases, there are flow computer configuration settings that specify the maximum time that an MPU 1200 serial communication failure can exist and still be compensated by adjusting the flow computer totalizers (default maximum time is 15 minutes).

## Wiring Installation

**NOTE:** Setting Up and Wiring to OMNI Combo Modules – In order to communicate with MPU 1200 ultrasonic flowmeters, 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.

Serial Data Communications – The serial interface between these devices and 2-wire RS-485 mode utilizing a modified Modbus protocol.

There are several options for wiring an MPU 1200 ultrasonic meter to an OMNI Flow Computer. The option to implement depends upon requirements of the flow metering system.

Connect these devices via the 2-wire RS-485 serial interface from the MPU 1200 to an OMNI SV combo module serial port. This connection uses the Modbus protocol to transmit the volumetric flow data that the MPU 1200 accumulates to the OMNI Flow Computer.

In addition to serial data, the OMNI Flow Computer can also receive live forward and/or reverse flow pulse signals from the MPU 1200. The MPU 1200 transmits pulse frequencies through wires typically connected to an OMNI E combo module. Connecting two (2) MPU 1200 pulse output channels to the OMNI Flow Computer can provide pulse fidelity and integrity checking. To perform pulse fidelity checking, the OMNI Flow Computer must have one (1) E combo module for each flowmeter and flow direction (forward/ reverse) requiring totalizing.

## OMNI Combo Module Terminal Assignments

Depending upon the implemented wiring option, the OMNI Flow Computer requires SV, E, and/or A combo modules. Tables 1 thru 3 specify the terminal assignments for each module type. This information is necessary when connecting wires to the OMNI Flow Computer. 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.

**Table 1. 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 |
| **Note:** | Numbers in parenthesis "( )" refer to SV module 2. |

**Table 2. 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 |
| 6 | Input Channel # 4: Flowmeter Pulses |
| 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 3. 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)* |

## MPU 1200 Terminal Assignments

Use the X8 and X5 terminal blocks in the MPU 1200 to connect to the OMNI Flow Computer. Tables 4 and 5 specify the terminal assignments for each of these terminal blocks. This information is necessary when connecting wires to the MPU 1200.

**Table 4. MPU 1200 Terminal Block X8 Assignments**

| Terminal | Signal Description |
|---|---|
| 1 | Output Channel #1A: Frwrd Flow Pulses – Open Collector (NPN) |
| 2 | Output Channel #1A: Frwrd Flow Pulses – Return |
| 3 | Output Channel #1B: Frwrd Flow Pulses – Open Collector (NPN) |
| 4 | Output Channel #1B: Frwrd Flow Pulses – Return |
| 5 | Output Channel #2A: Rvrse Flow Pulses – Open Collector (NPN) |
| 6 | Output Channel #2A: Rvrse Flow Pulses – Return |
| 7 | Output Channel #2B: Rvrse Flow Pulses – Open Collector (NPN) |
| 8 | Output Channel #2B: Rvrse Flow Pulses – Return |
| 9 | Flow Direction + |
| 10 | Flow Direction - |
| 11 | Measurement Valid + |
| 12 | Measurement Valid - |

**Table 5. MPU 1200 Terminal Block X5 Assignments**

| Terminal | Signal Description |
|---|---|
| 23 | Transmit/Receive Data (TxD/RxD–) |
| 24 | Termination (Negative) |
| 25 | Transmit/Receive Data (TxD/RxD+) |
| 26 | Termination (Positive) |
| 27 | Signal Ground |

## Forward & Reverse Flow Signals

Figure 2 shows a typical wiring installation between the MPU 1200 and an OMNI 6000 for serial data and both forward and reverse flow signals. In this example, assume that the OMNI has an A module plugged into slot TB5 and an SV module in slot TB6.

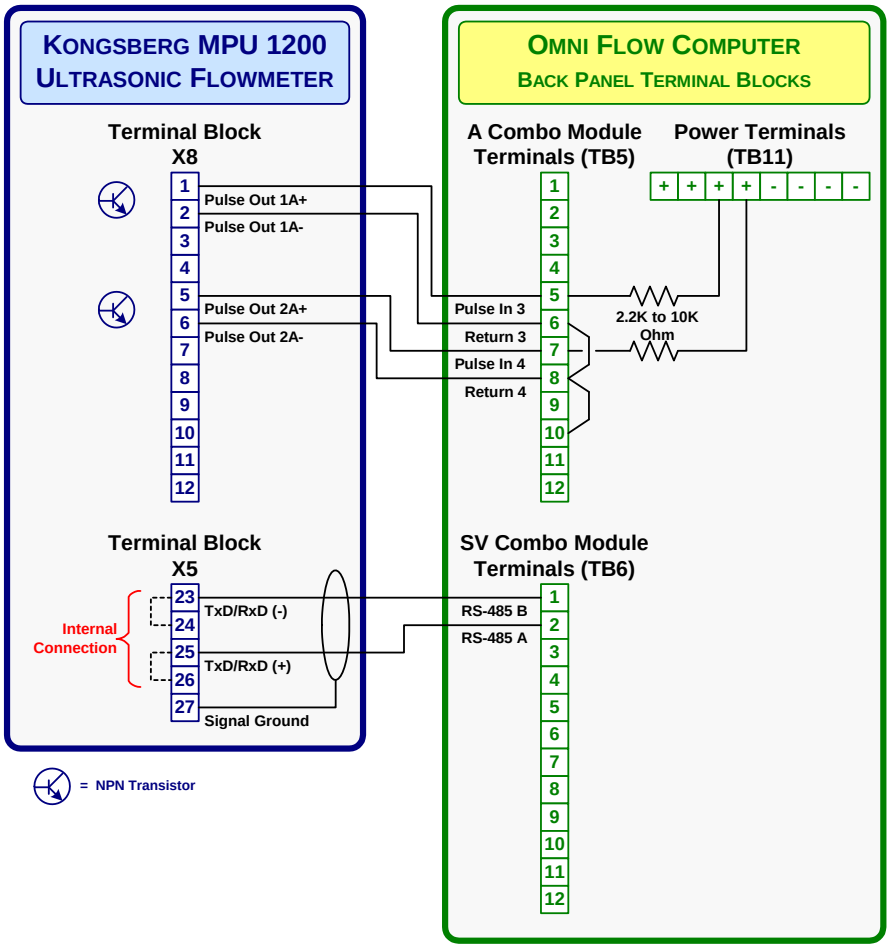


**Figure 2. Example of wiring a Kongsberg Metering MPU 1200 ultrasonic flowmeter to an OMNI 6000 Flow Computer with connections for serial data and live forward and reverse flow signals (without pulse fidelity and integrity checking)**

## Forward Flow Only with (Dual) Pulse Fidelity & Integrity Checking

Figure 3 shows a typical wiring installation between the MPU 1200 and an OMNI 6000 of serial data and forward flow signal, with connections for pulse fidelity and integrity checking. In this example, assume that the OMNI Flow Computer has an E module plugged into slot TB5, and an SV module in slot TB6.

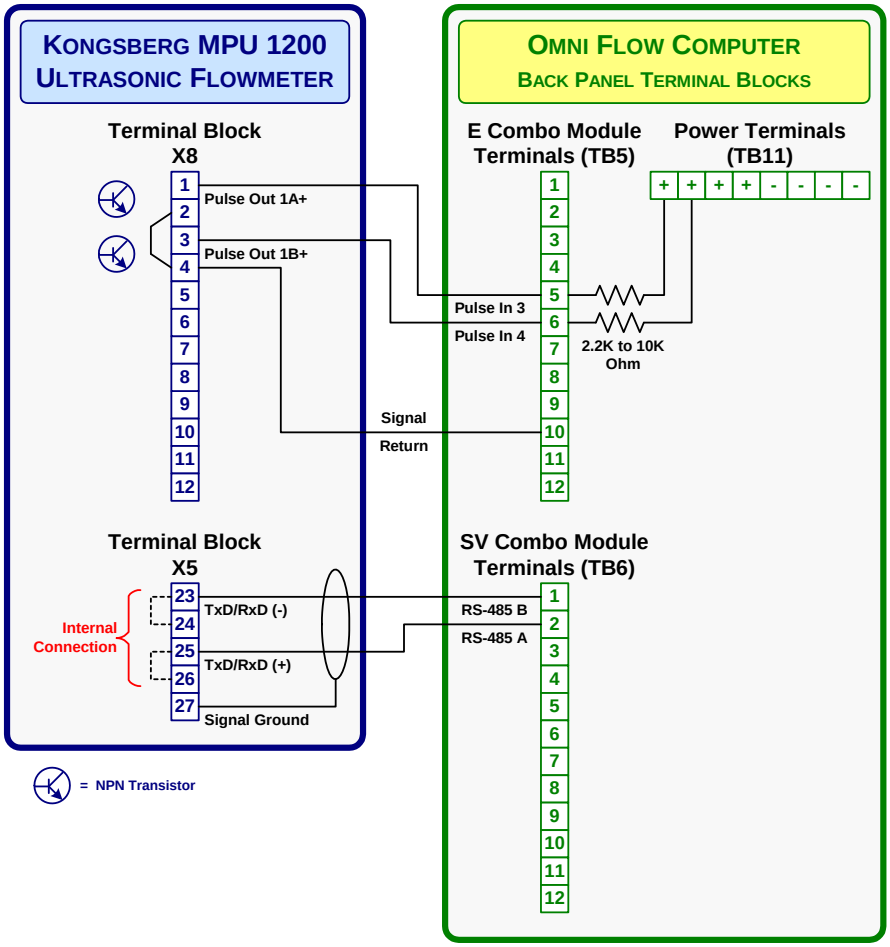


**Figure 3. Example of wiring a Kongsberg Metering MPU 1200 ultrasonic flowmeter to an OMNI 6000 Flow Computer with connections for serial data, live forward flow signal, and pulse fidelity and integrity checking**

## Forward & Reverse Flow with (Dual) Pulse Fidelity & Integrity Checking

Figure 4 shows a typical wiring installation between the MPU 1200 and an OMNI 6000 of serial data and both forward and reverse flow signals, with connections for pulse fidelity and integrity checking. In this example, the OMNI Flow Computer has E modules in slots TB5 and TB6, and an SV module in slot TB7.

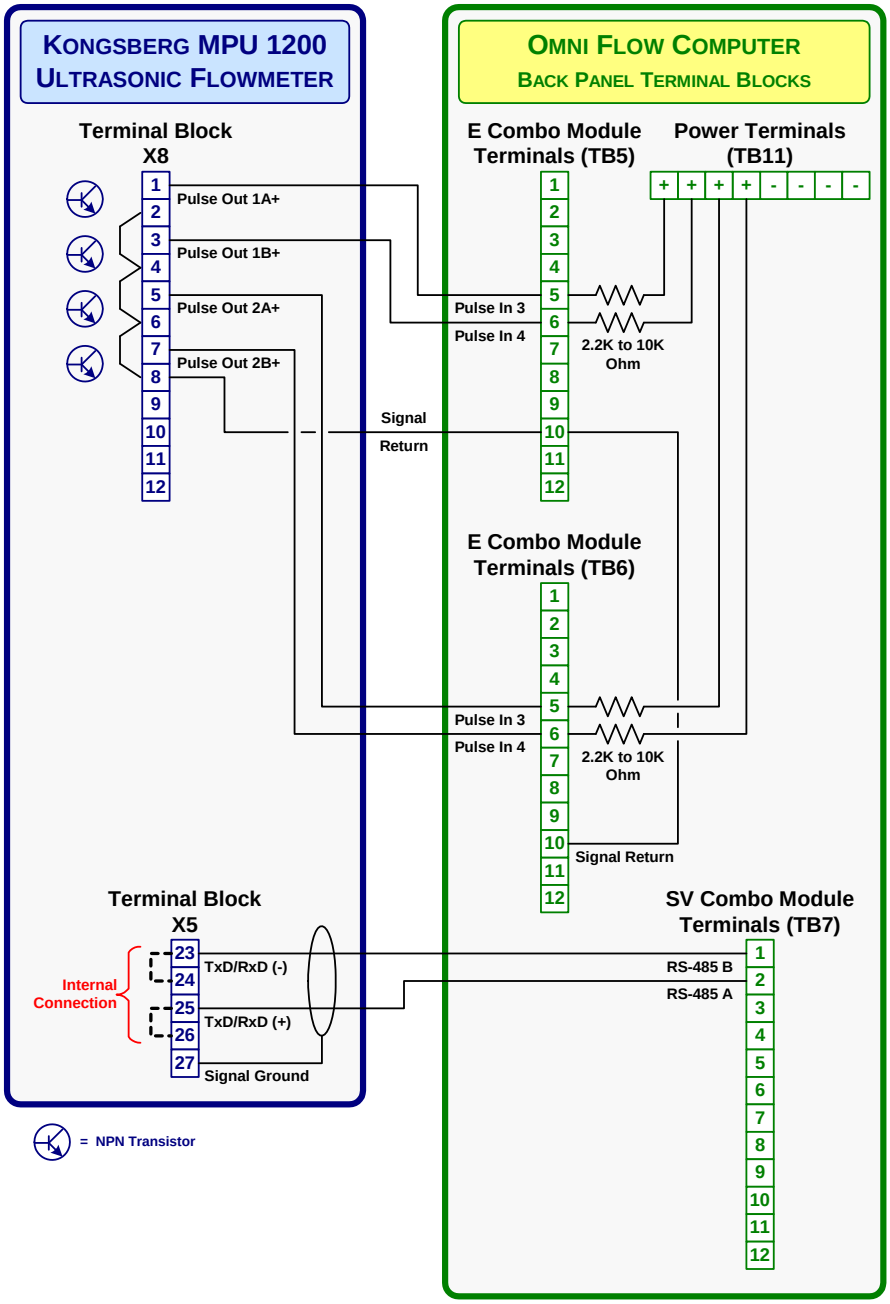


**Figure 4. Example of wiring a Kongsberg Metering MPU 1200 ultrasonic flowmeter to an OMNI 6000 Flow Computer with connections for serial data, live forward and reverse flow signals, and pulse fidelity and integrity checking**

## MPU 1200 Configuration

**NOTE:** MPU 1200 Documentation – Always refer to the official documentation supplied by FMC Kongsberg when installing, configuring, and operating the MPU 1200 ultrasonic flowmeter.

The following MPU 1200 miscellaneous configuration and serial port settings are critical in communicating with the OMNI Flow Computer.

## Miscellaneous Configuration Settings

Following are the corresponding MPU 1200 database object settings:

- **Database Type: Object Number 788** – For Series A flowmeters, always set to **1**; where **0** = 32-bit single-precision and **1** = 64-bit double-precision floating-point database. *The Series B flowmeter database is fixed at 32-bit single-precision.*
- **Units of Measure: Object Number 798** – Set to the same units of measure as OMNI 3000/6000 firmware; where **0** = metric and **1** = Imperial (US) units.

## Serial Port Settings

The MPU 1200 connects to an external system using the Modbus protocol via a serial line. This connection is a 2-wire RS-485 serial link. You must also configure the MPU 1200 serial port (Table 6).

**Table 6. MPU 1200 Serial Port Settings**

| Setting | Assignment |
|---|---|
| Baud Rate | 19.2K bps |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity | None |
| Modbus ID | 1 |

## OMNI 3000/6000 Configuration

**NOTE:** OMNI 3000/6000 Documentation Reference – For instructions on configuring the OMNI Flow Computer, refer to Chapter 2 Flow Computer Configuration in Volume 3 of the OMNI User Manual, and the Technicla Bulletin 960701 (52-0000-0001). 'Overview of OMMICOM® Configuration PC Software'.

Use either the flow computer's front panel keypad or OMNICOM® configuration PC software to enter configuration settings. The configuration settings specific to the MPU 1200 flowmeter are under the Miscellaneous Configuration Meter Run menu and the Meter Run Setup menu. Enter the miscellaneous meter run settings first and then proceed to the meter run setup entries.

## Miscellaneous Meter Run Configuration Settings

The following miscellaneous configuration meter run settings correspond to the MPU 1200 ultrasonic gas flowmeter:

- **Flowmeter Device Type –** For each meter run, enter **[6]** to select the Kongsberg Metering MPU 1200 flowmeter as the device type.
- **Flow I/O Point** – Enter the input channel number that is used to input the ultrasonic flowmeter pulse signal. Assign flowmeter pulse signals only to Input Channels #3 and #4 of A and E combo modules, and input channel #3 of a B combo module.
- **(Dual) Pulse Fidelity & Integrity Checking –** Enter **[Y]** to enable pulse fidelity and security checking for each meter run. Enter **[N]** to disable dual pulse fidelity checking.
- **SV Module Port –** The OMNI Flow Computer can accept two SV combo 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 serial interface input from the MPU 1200 flowmeter is wired to the OMNI Flow Computer.

- **MPU Series B? (Y/N) –** The OMNI Flow Computer can communicate with the Series A flowmeter and beginning with v23.74.30 and v27.74.20 firmware, can also communicate with the Series B flowmeter. Specify N for Series A or Y for Series B.
- **Flow Direction –** MPU 1200 flowmeters allow for bi-directional fluid flow measurement. For pulse frequency signals, setup the flow computer to totalize either forward or reverse flow on any meter run with an ultrasonic flowmeter.

## Meter Run Setup Entries

**NOTE:** Velocity of Sound – The velocity of sound (VOS) refers to the amount of time it takes an acoustic pulse to travel along the gas ultrasonic paths. The VOS will vary depending upon gas type and line conditions.

The following meter run setup entries are available for the MPU 1200 ultrasonic flowmeter when using pulse frequency signals:

- **Maximum Required Gain Value –** The flow computer monitors the maximum gain value for each ultrasonic path in both directions. An alarm occurs if the gain of any path rises above this value.
- **Minimum Burst Percent Used –** This entry checks the ratio of valid ultrasonic pulses received versus total pulses transmitted for each ultrasonic path in both directions. A ratio below this setting will cause an alarm.
- **Velocity of Sound (VOS) in Gas, Deviation Percent from Average –** This entry is the maximum percent that the VOS of any individual path can vary from the average VOS of all the paths. An alarm occurs if the percent of deviation of one or more paths exceeds this value.
- **AGA-10 VOS Deviation** (available with Firmware v23.74.11 and v27.74.11+) **–** The maximum percent that the VOS of any individual path can vary from the AGA-10 calculated VOS of all the paths. An alarm occurs if the percent of deviation of one or more paths exceeds this value.
- **Maximum Flow Deviation Percent —** If there is a valid flow I/O point assigned this is the percent of deviation between the calculated flow from the pulse input channel compared to the MPU 1200 flow data received via the OMNI SV serial port. The OMNI Flow Computer raises the pulse suspect alarm if the flow deviation percentage exceeds this limit.
- **Maximum Meter Downtime —** Enter the maximum allowable MPU downtime in minutes. If communication downtime between the OMNI Flow Computer and the MPU is less than this value, the OMNI Flow Computer will adjust its internal totalizers to match the most recent MPU 1200 totalizer value.

## OMNI 3000/6000 Database Addresses & Index Numbers

Tables 7 thru 13 list the Modbus database addresses assigned within OMNI Flow Computer firmware to the MPU 1200 ultrasonic metering feature. These tables categorize data types.

**Table 7. Meter Run Alarm Status 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 |
| Loss of communication | 2154 | 2254 | 2354 | 2454 | T03 – Burst alarm | 2172 | 2272 | 2372 | 2472 |
| Loss of pulse impulse | 2155 | 2255 | 2355 | 2455 | T04 – Burst alarm | 2173 | 2273 | 2373 | 2473 |
| Flow rate delta alarm | 2156 | 2256 | 2356 | 2456 | T05 – Burst alarm | 2174 | 2274 | 2374 | 2474 |
| T00 - Gain high alarm | 2157 | 2257 | 2357 | 2457 | T07 – Burst alarm | 2176 | 2276 | 2376 | 2476 |
| T01 - Gain high alarm | 2158 | 2258 | 2358 | 2458 | T08 – Burst alarm | 2177 | 2277 | 2377 | 2477 |
| T02 – Gain high alarm | 2159 | 2259 | 2359 | 2459 | T09 – Burst alarm | 2178 | 2278 | 2378 | 2478 |
| T03 - Gain high alarm | 2160 | 2260 | 2360 | 2460 | T10 – Burst alarm | 2179 | 2279 | 2379 | 2479 |
| T04 - Gain high alarm | 2161 | 2261 | 2361 | 2461 | T11 – Burst alarm | 2180 | 2280 | 2380 | 2480 |
| T05 - Gain high alarm | 2162 | 2262 | 2362 | 2462 | Path 0 - Gas VOS alarm | 2181 | 2281 | 2381 | 2481 |
| T06 - Gain high alarm | 2163 | 2263 | 2363 | 2463 | Path 1 - Gas VOS alarm | 2182 | 2282 | 2382 | 2482 |
| T07 - Gain high alarm | 2164 | 2264 | 2364 | 2464 | Path 2 - Gas VOS alarm | 2183 | 2283 | 2383 | 2483 |
| T08 - Gain high alarm | 2165 | 2265 | 2365 | 2465 | Path 3 - Gas VOS alarm | 2184 | 2284 | 2384 | 2484 |
| T09 - Gain high alarm | 2166 | 2266 | 2366 | 2466 | Path 4 - Gas VOS alarm | 2185 | 2285 | 2385 | 2485 |
| T10 - Gain high alarm | 2167 | 2267 | 2367 | 2467 | Path 5 - Gas VOS alarm | 2186 | 2286 | 2386 | 2486 |
| T11 - Gain high alarm | 2168 | 2268 | 2368 | 2468 | MPU 1200 status alarm(1) | 2187 | 2287 | 2387 | 2487 |
| T00 – Burst alarm | 2169 | 2269 | 2369 | 2469 | MPU 1200 config. Alarm(2) | 2188 | 2288 | 2388 | 2488 |
| T01 – Burst alarm | 2170 | 2270 | 2370 | 2470 | **Notes:** | **VOS** ➔ Velocity of Sound | | | |
| T02 – Burst alarm | 2171 | 2271 | 2371 | 2471 | | **T***nn* ➔ Transducer *nn* | | | |

**(1)** This status alarm is active and logged in the OMNI 3000/6000 when Object No. 5 of the MPU 1200 Modbus database is a non-zero value.

**(2)** This configuration alarm is active when Object No. 788 of the MPU 1200 Series A Modbus database is set to 0 (zero), enabling the 32-bit single-precision floating-point database. For the Series A flowmeter to communicate with the OMNI 3000/6000, this object must always be set to 1, enabling the 64-bit double-precision floating-point database. The Series B flowmeter is fixed at 32-bit single-precision floating point database (see "MPU 1200 Configuration: Miscellaneous Configuration Settings" in this Technical Bulletin).

**Table 8. 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 direct. (0=frwd,1=rvrs) | 3155 | 3255 | 3355 | 3455 | T00 - Burst % used | 3158 | 3258 | 3358 | 3458 |
| T00 - Gain | 3180 | 3280 | 3380 | 3480 | T01 - Burst % used | 3159 | 3259 | 3359 | 3459 |
| T01 - Gain | 3181 | 3281 | 3381 | 3481 | T02 - Burst % used | 3160 | 3260 | 3360 | 3460 |
| T02 - Gain | 3182 | 3282 | 3382 | 3482 | T03 - Burst % used | 3161 | 3261 | 3361 | 3461 |
| T03 - Gain | 3183 | 3283 | 3383 | 3483 | T04 - Burst % used | 3162 | 3262 | 3362 | 3462 |
| T04 - Gain | 3184 | 3284 | 3384 | 3484 | T05 - Burst % used | 3163 | 3263 | 3363 | 3463 |
| T05 - Gain | 3185 | 3285 | 3385 | 3485 | T06 - Burst % used | 3164 | 3264 | 3364 | 3464 |
| T06 - Gain | 3186 | 3286 | 3386 | 3486 | T07 - Burst % used | 3165 | 3265 | 3365 | 3465 |
| T07 - Gain | 3187 | 3287 | 3387 | 3487 | T08 - Burst % used | 3166 | 3266 | 3366 | 3466 |
| T08 - Gain | 3188 | 3288 | 3388 | 3488 | T09 - Burst % used | 3167 | 3267 | 3367 | 3467 |
| T09 - Gain | 3189 | 3289 | 3389 | 3489 | T10 - Burst % used | 3168 | 3268 | 3368 | 3468 |
| T10 - Gain | 3190 | 3290 | 3390 | 3490 | T11 - Burst % used | 3169 | 3269 | 3369 | 3469 |
| T11 - Gain | 3191 | 3291 | 3391 | 3491 | **Notes:** | **T***nn* ➔ Transducer *nn* | | | |

**Table 9. 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 |
| Maximum % flow deviation | 17513 | 17613 | 17713 | 17813 | Path 2 - Velocity of sound | 17529 | 17629 | 17729 | 17829 |
| Maximum % VOS deviation | 17516 | 17616 | 17716 | 17816 | Path 3 - Velocity of sound | 17530 | 17630 | 17730 | 17830 |
| Velocity of sound (VOS) | 17521 | 17621 | 17721 | 17821 | Path 4 - Velocity of sound | 17531 | 17631 | 17731 | 17831 |
| Gas velocity | 17522 | 17622 | 17722 | 17822 | Path 5 - Velocity of sound | 17532 | 17632 | 17732 | 17832 |
| Gas flow rate | 7101 | 7201 | 7301 | 7401 | Path 0 - Gas velocity | 17533 | 17633 | 17733 | 17833 |
| Net flow rate | 7102 | 7202 | 7302 | 7402 | Path 1 - Gas velocity | 17534 | 17634 | 17734 | 17834 |
| Temperature | 7105 | 7205 | 7305 | 7405 | Path 2 - Gas velocity | 17535 | 17635 | 17735 | 17835 |
| Pressure | 7106 | 7206 | 7306 | 7406 | Path 3 - Gas velocity | 17536 | 17636 | 17736 | 17836 |
| Path 0 - Velocity of sound | 17527 | 17627 | 17727 | 17827 | Path 4 - Gas velocity | 17537 | 17637 | 17737 | 17837 |
| Path 1 - Velocity of sound | 17528 | 17628 | 17728 | 17828 | Path 5 - Gas velocity | 17538 | 17638 | 17738 | 17838 |

**Table 10. 32-Bit IEEE Floating Pints Previous Hour's Average Data**

| Description | Database Address for Meter Run Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| T00 - Gain | 17543 | 17643 | 17743 | 17843 |
| T01 - Gain | 17544 | 17644 | 17744 | 17844 |
| T02 - Gain | 17545 | 17645 | 17745 | 17845 |
| T03 - Gain | 17546 | 17646 | 17746 | 17846 |
| T04 - Gain | 17547 | 17647 | 17747 | 17847 |
| T05 - Gain | 17548 | 17648 | 17748 | 17848 |
| T06 - Gain | 17549 | 17649 | 17749 | 17849 |
| T07 - Gain | 17550 | 17650 | 17750 | 17850 |
| T08 - Gain | 17551 | 17651 | 17751 | 17851 |
| T09 - Gain | 17552 | 17652 | 17752 | 17852 |
| T10 - Gain | 17553 | 17653 | 17753 | 17853 |
| T11 - Gain | 17554 | 17654 | 17754 | 17854 |
| Path 0 - Gas velocity | 17555 | 17655 | 17755 | 17855 |
| Path 1 - Gas velocity | 17556 | 17656 | 17756 | 17856 |
| Path 2 - Gas velocity | 17557 | 17657 | 17757 | 17857 |
| Path 3 - Gas velocity | 17558 | 17658 | 17758 | 17858 |
| Path 4 - Gas velocity | 17559 | 17659 | 17759 | 17859 |
| Path 5 - Gas velocity | 17560 | 17660 | 17760 | 17860 |

**Table 11. 32-Bit IEEE Floating Points Previous Day's Average Data**

| Description | Database Address for Meter Run Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| T00 - Gain | 17574 | 17674 | 17774 | 17874 |
| T01 - Gain | 17575 | 17675 | 17775 | 17875 |
| T02 - Gain | 17576 | 17676 | 17776 | 17876 |
| T03 - Gain | 17577 | 17677 | 17777 | 17877 |
| T04 - Gain | 17578 | 17678 | 17778 | 17878 |
| T05 - Gain | 17579 | 17679 | 17779 | 17879 |
| T06 - Gain | 17580 | 17680 | 17780 | 17880 |
| T07 - Gain | 17581 | 17681 | 17781 | 17881 |
| T08 - Gain | 17582 | 17682 | 17782 | 17882 |
| T09 - Gain | 17583 | 17683 | 17783 | 17883 |
| T10 - Gain | 17584 | 17684 | 17784 | 17884 |
| T11 - Gain | 17585 | 17685 | 17785 | 17885 |
| Path 0 - Gas velocity | 17586 | 17686 | 17786 | 17886 |
| Path 1 - Gas velocity | 17587 | 17687 | 17787 | 17887 |
| Path 2 - Gas velocity | 17588 | 17688 | 17788 | 17888 |
| Path 3 - Gas velocity | 17589 | 17689 | 17789 | 17889 |
| Path 4 - Gas velocity | 17590 | 17690 | 17790 | 17890 |
| Path 5 - Gas velocity | 17591 | 17691 | 17791 | 17891 |
| **Notes:** | **T***nn* ➔ Transducer *nn* | | | |

**Table 12. 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 |
| Flowmeter device type | 3108 | 3208 | 3308 | 3408 | Flow direct. (0=frwd,1=rvrs) | 3155 | 3255 | 3355 | 3455 |
| Maximum downtime (min) | 3116 | 3216 | 3316 | 3416 | Flow pulse freq. I/O pnt. # | 13001 | 13014 | 13027 | 13040 |
| SV module port # | 3153 | 3253 | 3353 | 3453 | MPU 1200 Series A or B (0 = Series A, 1 = Series B) | 3154 | 3254 | 3354 | 3454 |

**Table 13. 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 |
| Max. gain value (0 to 11) | 17513 | 17613 | 17713 | 17813 | Minimum burst % used | 17515 | 17615 | 17715 | 17815 |
| Maximum % flow deviation | 17514 | 17614 | 17714 | 17814 | Maximum % VOS deviation | 17516 | 17616 | 17716 | 17816 |

## OMNI 3000/6000 User Displays

**NOTE:** Meter Run Data Display – The meter run data that is displayed on OMNI screens corresponds to the SV port number the user assigned to each meter run during OMNI Flow Computer configuration (refer to Section OMNI 3000/6000 Configuration : Miscellaneous Meter Run Configuration Settings.)

Units of Measure Displayed on OMNI 3000/6000 Screens – Both the MPU 1200 and the OMNI 3000/6000 must have firmware that supports the same units of measure; i.e., both devices either have metric firmware or U.S. firmware. The types of unites are:

| Variable | US | Metric |
|---|---|---|
| Temperature | °F | °C |
| Pressure(abs.) | PSIa | Bara |
| Totals | $ft^3$ | $m^3$ |
| Flow Rate | $ft^3/h$ | $m^3/h$ |
| Velocity | ft/s | m/s |

## 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 when in the Display Mode ("n" equals the meter run number: 1 to 4). The following data will display:

| **METER #*n*** | |
|---|---|
| Log Data Count | |
| Software Revision | yymmdd |
| Flow Velocity | m/s |
| Actual Volume Flowrate | $m^3/h$ |
| Velocity of Sound | m/s |
| Forward Flow | $m^3$ |
| Reverse Flow | $m^3$ |
| Line Pressure | Bar |
| Line Temperature | °C |
| Internal Pipe Diamter | mm |
| Rate Corr. Factor A (Neg Dir.) | XX |
| Rate Corr. Factor B (Neg Dir.) | XX |
| Rate Corr. Factor A (Pos Dir.) | XX |
| Rate Corr. Factor B (Pos Dir.) | XX |
| Flow Velocity Cut-off Limit | m/s |
| Alarm Status | X |
| FlowV P0 | m/s |
| FlowV P1 | m/s |
| FlowV P2 | m/s |
| FlowV P3 | m/s |
| FlowV P4 | m/s |
| FlowV P5 | m/s |
| VOS P0 | m/s |
| VOS P1 | m/s |
| VOS P2 | m/s |
| VOS P3 | m/s |
| VOS P4 | m/s |
| VOS P5 | m/s |
| Burst% P0-11 | XXX-XXX |
| Burst% P1-10 | XXX-XXX |
| Burst% P2-9 | XXX-XXX |
| Burst% P3-8 | XXX-XXX |
| Burst% P4-7 | XXX-XXX |
| Burst% P5-6 | XXX-XXX |
| Burst% P6-5 | XXX-XXX |
| Burst% P7-4 | XXX-XXX |
| Burst% P8-3 | XXX-XXX |
| Burst% P9-2 | XXX-XXX |
| Burst% P10-1 | XXX-XXX |
| Burst% P11-0 | XXX-XXX |
| Gain P0-11 | XXXX-XXXX |
| Gain P1-10 | XXXX-XXXX |
| Gain P2-9 | XXXX-XXXX |
| Gain P3-8 | XXXX-XXXX |
| Gain P4-7 | XXXX-XXXX |
| Gain P5-6 | XXXX-XXXX |
| Gain P6-5 | XXXX-XXXX |
| Gain P7-4 | XXXX-XXXX |
| Gain P8-3 | XXXX-XXXX |
| Gain P9-2 | XXXX-XXXX |
| Gain P10-1 | XXXX-XXXX |
| Gain P11-0 | XXXX-XXXX |

## SV Module Serial Port

**NOTE:** SV Port Data Display – The SV port data that is displayed on OMNI screens is specific to each SV port only, as acquired from the MPU 1200.

MPU 1200 Serial Port Settings – To communicate with the OMNI 3000/6000, set the MPU 1200 as follows:

| Setting | Assign |
|---|---|
| **Baud Rate** | **19.2K bps** |
| **Data Bits** | **8** |
| **Stop Bits** | **1** |
| **Parity** | **None** |
| **Modbus ID** | **1** |

Units of Measure Displayed on OMNI 3000/6000 must have firmware that supports the same units of measure; i.e., both devices either have metric firmware or U.S. firmware. The types of units are:

| Variable | US | Metric |
|---|---|---|
| **Temperature** | **°F** | **°C** |
| **Presssure(abs.)** | **PSIa** | **Bara** |
| **Totals** | **$ft^3$** | **$m^3$** |
| **Flow Rate** | **$ft^3/h$** | **$m^3/h$** |
| **Velocity** | **ft/s** | **m/s** |

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 MPU 1200 flowmeter. To view this raw data, press **[Setup] [*n*] [Display]** on the OMNI front panel keypad when in the Display Mode ("n" equals the SV port number: 1 to 4). The following data displays:

| **SV Port *n* MPU 1200** | |
|---|---|
| Software Revision | yymmdd |
| Log Data Count | ...X... |
| Flow Velocity | m/s |
| Actual Volume Flowrate | $m^3/h$ |
| Forward Flow | $m^3$ |
| Reverse Flow | $m^3$ |
| Line Pressure (Absolute) | Bara |
| Line Temperature | °C |
| Internal Pipe Diamter | mm |
| Rate Corr. Factor A (Neg Dir.) | $m^3$ |
| Rate Corr. Factor B (Neg Dir.) | $m^3$ |
| Rate Corr. Factor A (Pos Dir.) | $m^3$ |
| Rate Corr. Factor B (Pos Dir.) | $m^3$ |
| Flow Velocity Cutoff Limit | m/s |
| Alarm Status | X |
| Flow Velocity - Path 0 | m/s |
| Flow Velocity - Path 1 | m/s |
| Flow Velocity - Path 2 | m/s |
| Flow Velocity - Path 3 | m/s |
| Flow Velocity - Path 4 | m/s |
| Flow Velocity - Path 5 | m/s |
| Velocity of Sound - Path 0 | m/s |
| Velocity of Sound - Path 1 | m/s |
| Velocity of Sound - Path 2 | m/s |
| Velocity of Sound - Path 3 | m/s |
| Velocity of Sound - Path 4 | m/s |
| Velocity of Sound - Path 5 | m/s |
| Burst % - T00→T11 | XXX-XXX |
| Burst % - T01→T10 | XXX-XXX |
| Burst % - T02→T09 | XXX-XXX |
| Burst % - T03→T08 | XXX-XXX |
| Burst % - T04→T07 | XXX-XXX |
| Burst % - T05→T06 | XXX-XXX |
| Burst % - T06→T05 | XXX-XXX |
| Burst % - T07→T04 | XXX-XXX |
| Burst % - T08→T03 | XXX-XXX |
| Burst % - T09→T02 | XXX-XXX |
| Burst % - T10→T01 | XXX-XXX |
| Burst % - T11→T00 | XXX-XXX |
| Gain - T00→T11 | XXXX-XXXX |
| Gain - T01→T10 | XXXX-XXXX |
| Gain - T02→T09 | XXXX-XXXX |
| Gain - T03→T08 | XXXX-XXXX |
| Gain - T04→T07 | XXXX-XXXX |
| Gain - T05→T06 | XXXX-XXXX |
| Gain - T06→T05 | XXXX-XXXX |
| Gain - T07→T04 | XXXX-XXXX |
| Gain - T08→T03 | XXXX-XXXX |
| Gain - T09→T02 | XXXX-XXXX |
| Gain - T10→T01 | XXXX-XXXX |
| Gain - T11→T00 | XXXX-XXXX |

# DOCUMENT REVISION HISTORY

DOCUMENT INITIAL RELEASE DATE.....30-January-2002

| REVISION | DATE | PURPOSE / CHANGE REQUEST |
|---|---|---|
| A | 30-January-2002 | Maintained on the web - Initial release |
| B | 26-February-2003 | Maintained on the web |
| C | 10-March-2009 | DCR 090080 |