Interface Manual

ModQ Sentry Flow Totalizer

SignalFire Model: ModQ

The SignalFire ModQ Flow Totalizer has the following features:

- Input frequency range 1Hz – 4kHz (low gain), 1Hz – 2kHz (high gain)
- Input Sensitivity of 20mV or 5mV peak-to-peak (jumper selectable)
- Provides grand total, yesterday's, today's, last month and this month totals to Modbus registers
- Real time clock for daily contract hour setting
- Configurable using pushbuttons and LCD
- Configurable K factor
- Flow rate reporting
- Display showing flow rates and flow totals
- Low power operation from an internal battery back or external DC power source
- All data is available via RS485 Modbus RTU
- Configurable pulse output
- On-board logging of 32 days of flow totals
- Batch processing mode

Specifications

Overall Size	5.8″ tall × 5.9″ wide × 3.6″ deep
Power Source	6-36VDC (<1mA without Modbus) or lithium battery pack *SignalFire Part Number: 810-0030-01 (1BIS)*
Temperature Rating	-40°C to +80°C (-40°F to +176°F) LCD visible: -20°C to +70°C (-4°F to +158°F)
Compliance	Certified for use in Class I, Division 2 groups A, B, C and D areas.
Turbine Input	Sensitivity: 5mV peak-to-peak (high gain), 20mV peak-to-peak (low gain) Input Frequency: 1Hz to 2kHz (high gain), 1Hz-4kHz (low gain) Input Voltage: 6V max 1″ NPT swivel union connector. Includes standard 2-pin pickup connector
Digital Input	Dry contact, open collector (sinking ground), or push-pull voltage (30v max) pulse. 2kHz maximum frequency
Digital Output	Open collector output. 36VDC max. Maximum sinking current 250mA

Battery Life

The table below gives battery life estimates assuming a new battery and no Modbus polling. If the RS485 Modbus port is used, a DC power source is recommended.

LCD Off	**LCD Always on**
6 years	4 years

Hazardous Location Certification

The ModQ Flow Totalizer is rated Class 1 Division 2 non-incendive.

WARNING – EXPLOSION HAZARD Substitution of components may impair suitability for Class I, Division 2

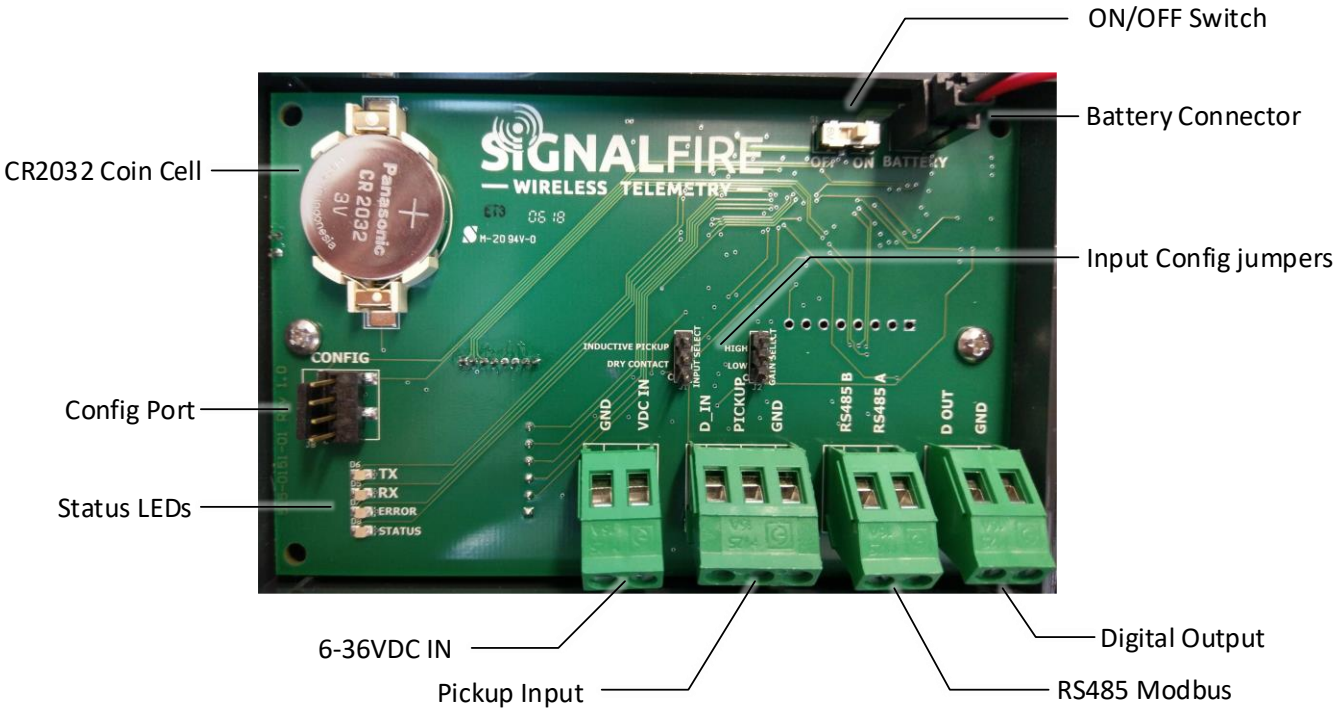
AVERTISSEMENT - RISQUE D'EXPLOSION. La substitution de composants peut rendre ce materiel inacceptable pour les emplacements de classe I, division 2

WARNING – EXPLOSION HAZARD Do not open enclosure unless area is known to be nonhazardous

AVERTISSEMENT - RISQUE D'EXPLOSION. Ne pas ouvrir le boitier à moins que la zone n’est identifiée comme étant non-dangereuse

WARNING – All wring methods must be in accordance with the NEC

AVERTISSEMENT - Toutes les méthodes de Essorez doivent être en conformité avec la NEC



Status LEDs

- The TX LED (green) blinks each time a Modbus response is sent
- The RX LED (red) blinks each time a Modbus request is received

Status LEDs

- The STATUS LED (green) Currently not implemented – for future use.
- The ERROR LED (red) will blink to indicate an error condition.

Setup

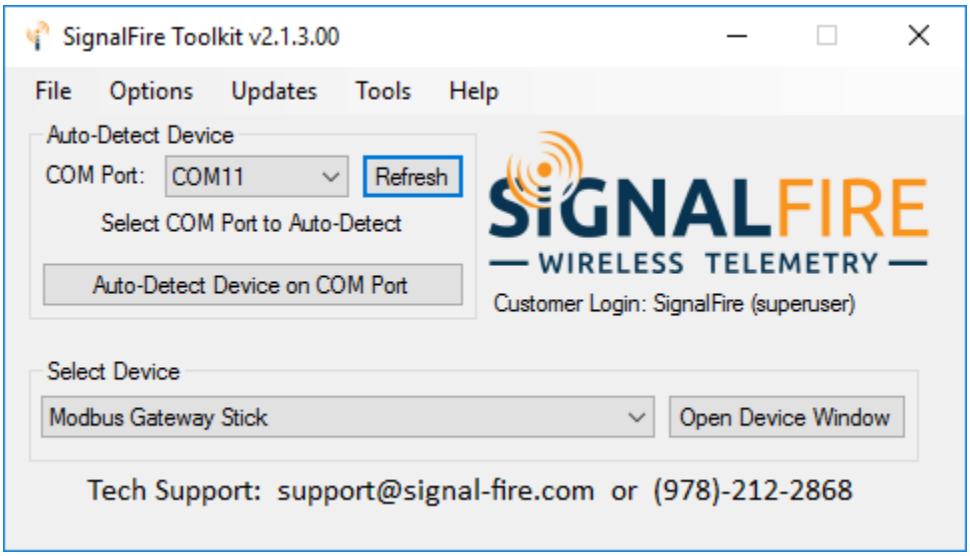
The nodes need to be set up for correct operation before being fielded. The configurable items include:

- Modbus Slave ID setting
- Modbus baud rate and UART mode
- Input k-factor
- Units and timebase setting

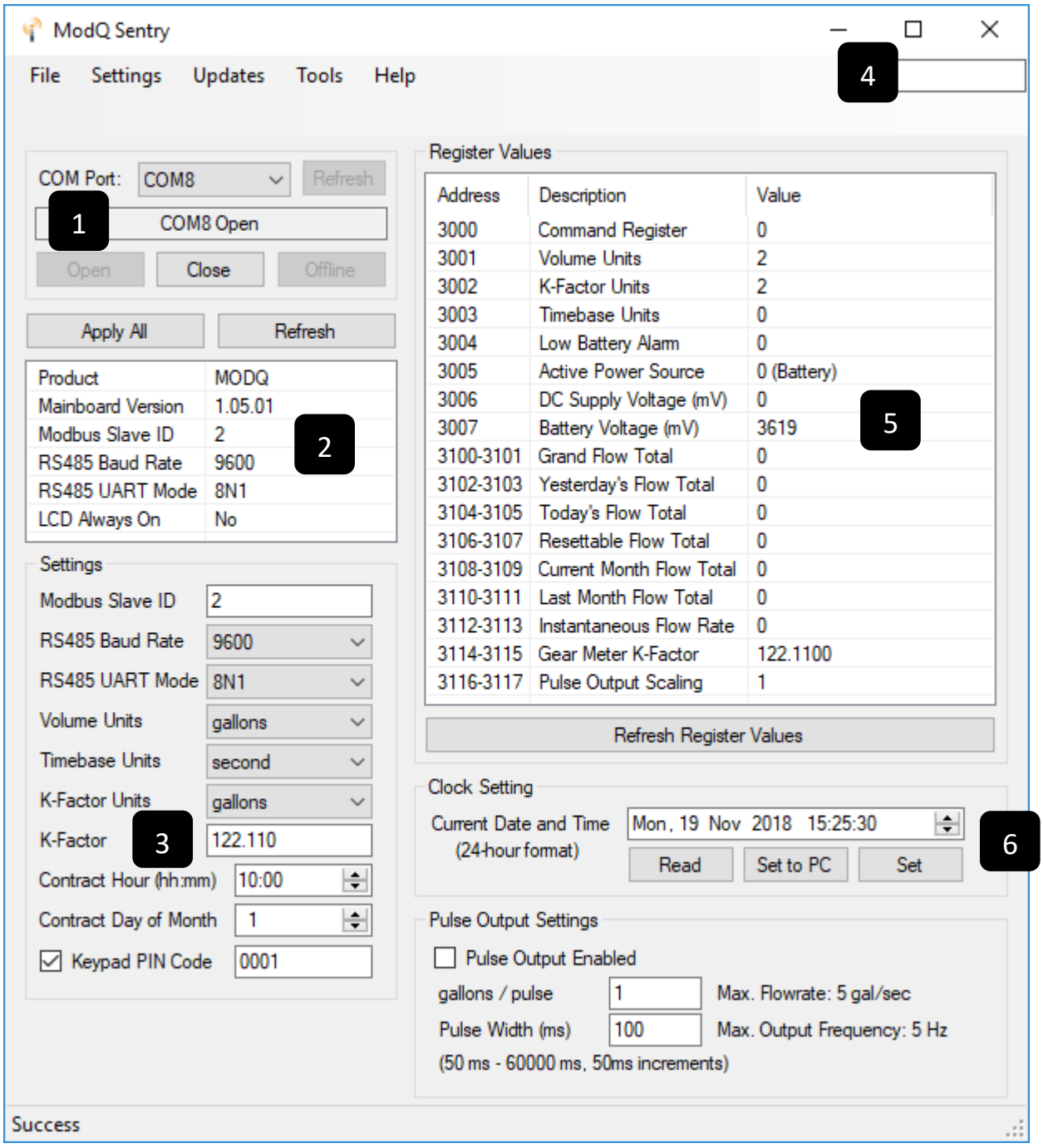
All settings are made using the SignalFire Toolkit PC application and a serial programming cable.

Using the SignalFire Toolkit

The SignalFire Toolkit application can be downloaded at www.signal-fire.com/customer. After installation, launch the software and the main toolkit window will open:



Select the COM port associated with the ModQ Flow Totalizer and click “Auto-Detect Device on COM Port.” This will open the device configuration window, where all device settings can be configured.



1 Serial Port Settings
2 Flow Totalizer Internal/Saved Information
3 Settable Parameters
4 Status of Last Operation
5 Reported Register Values
6 Clock Settings

Modbus Settings

The Modbus Slave ID must be set with the SignalFire Toolkit. All Modbus registers will be polled from the configured Slave ID. In addition, the Baud rate and UART mode must match that of the Modbus master device.

Turbine Meter Connection

The Flow Totalizer is supplied with a 1" NPT Union to allow it to be directly mounted to a standard turbine flowmeter. The nut on the union can be loosened to allow the totalizer to be rotated to the desired orientation. Also supplied is a 2-pin connector for connection to the turbine flow meter magnetic pickup. Teflon tape should be used on the NPT connections. The turbine meter is connected to the PICKUP and GND terminals.

The Input Select jumper (J1) must be positioned on the INDUCTIVE PICKUP location for turbine meters. For most turbine flow meters, the Gain Select jumper (J2) should remain in its default "LOW GAIN" position. This provides a sensitivity of 20mV p-p. If a higher sensitivity is needed the jumper can be moved to the "HIGH GAIN" position which increases the sensitivity to 5mV p-p.

Digital Input Connection

When the digital input is used the Input Select jumper (J1) must be positioned on the DRY CONTACT location. The digital input is then connected between the D_IN and GND terminals. The Gain Select jumper (J2) can be in either LOW or HIGH GAIN setting (does not matter which).

Flow Settings / Configuration

Clock Setting

The battery backed up real-time clock must be set. To set the clock to match the PC's clock, simply click "Set to PC". Alternatively, the time/date can be manually entered.

Volume Units

The Volume units set the units that the accumulated volumes and flow rate will be presented in. Volume units available are:

- Gallons
- Barrels
- Liters
- Cubic Meters

Timebase Units

The Timebase units configure the units used for the flow rates. For example, if the volume units are set to 'gallons', and the timebase units are set to 'minute', the flow rates will be reported as gallons/minute. Timebase units available are:

- Seconds
- Minutes
- Hours
- Days

K-Factor Units / K-Factor

The K-factor units set the units that the flow meter uses for its k-factor. For example, if the turbine flow meter has a stated k-factor of 50,000 pulses/gallon, select 'gallons' for the K-Factor units, and enter 50000 for the k-factor.

Contact Hour

The contract hour setting controls when the volume accumulated for today, rolls over to yesterday's volume. The contract hour is set in hh:mm in the 24-hour format. For example, 2:30pm would be entered as 14:30.

Contact Day of Month

The contract day of month (1-28) controls when the volume from the current month rolls over to the last month total. This occurs on at the contract hour on the defined contact day of the month.

32 Day Logging

The Flow Totalizer also keeps an on-board log of the last 32 days of flow totals. This log can be accessed using the SignalFire ToolKit. From the Tools Menu, select 'Daily Log'. On the daily log window click 'Refresh' to read the log file. The log can be saved as a .csv file.

Flow Rate Reporting

The Flow totalizer reports the instantaneous flow rate, which is calculated every 2-seconds.

Local Display

The Flow Totalizer has a local LCD display (with back-light) that allows for easy viewing of the flow totals and flow rates. The display is powered on when any button under is pressed. Pressing the arrow buttons when the display is on, cycles through the various information screens. The

display and backlight will automatically turn itself off after 30 seconds.

Configuration with the Keypad/LCD

The K-Factor and Contract hour are configurable using the keypad and local display. To edit either of these values, first navigate to the value to change. Then hold down the center (enter) key for 3 seconds. The display will then change to an entry mode and each digit can be navigated to and changed with the up/down arrows. When the changes are complete, press the center (enter) key again. A prompt will be given to accept the changes, select yes and click enter to save the changes.

And optional 4 Digit PIN can be configured in the ToolKit. If this PIN is enabled, it must be entered using the keypad before changing any settings using the keypad/LCD.

LCD Always on

The default operation of the LCD is for it to time out and turn off after 30 seconds. It will come back on when the any button is pressed. If it is desired that the LCD remain on always, this can be selected from the 'Settings' menu in the TookKit. Leaving the LCD always on will impact the system battery life, see the table on page 2 for details. Note that the LCD backlight will still turn off after 30 seconds.

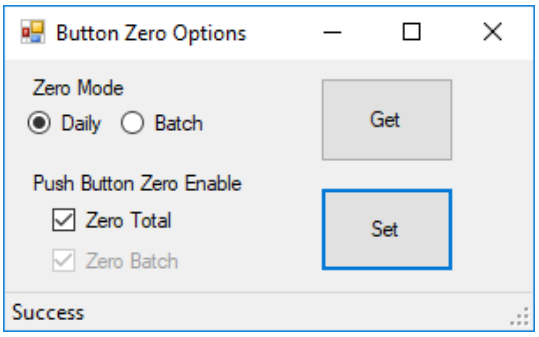
Pushbutton Zeroing and Batch Mode

The SignalFire Totalizer has two modes of operation – "Daily Mode" and "Batch Mode". By default, the Totalizer operates in "Daily Mode" which means that today's volume will be zeroed and stored into yesterday's volume at the configured contract hour.

Batch Mode Operation

In Batch Mode, the Daily Total screen is replaced with a "Current Batch" screen and the current batch total is not zeroed at the contract hour (the contract hour is meaningless in Batch Mode). It is only zeroed when commanded to either from the ToolKit or (if enabled) by holding down (for about 5 seconds) the center pushbutton while on the "Current Batch" screen. When the "Current Batch" is zeroed using the pushbutton, the current batch total is moved to the previous batch total.

The configuration of the Daily Mode / Batch Mode and pushbutton zeroing is set by selecting the "Button Zero Options" from the Settings menu:



Select the mode by selecting either the **Daily** or **Batch** zero mode.

Zeroing Selection

In **Daily** mode, if the **Zero Total** box is checked then all totals will be cleared by holding the center pushbutton while on the "Total Vol" screen. The total volume, today's volume, and yesterday's volume registers are zeroed. If this box is not checked, then the totals can't be zeroed and the daily total will roll over (as standard) at the contract hour time.

In Batch mode, in addition to the **Zero Total** option, the **Zero Batch** option allows the current batch to be reset and moved to the previous batch by holding down the pushbutton while on the Current Batch screen. The two zeroing features are independent of each other and (if enabled) can be zeroed by holding down the button while on the particular screen.

Resettable Zero Screen

There is a screen where the total volume (in the configured units) can be reset to zero at any time by holding down the front-panel center button for 3 seconds. Once reset to zero, the displayed value will begin to count along with the other total registers on the other screens.

Remote Modbus Register Mapping

The Flow Totalizer data is available to be read by a Modbus RTU master over a RS485 connection.

Modbus Registers

All registers are 16-bit registers and may be read using function 03 or 04.

Register Number	Register Address	Description	Data Type	Function Codes	Reg. Type
100	101	Zero ALL Totals	Coil	05, 15	read/write
101	102	Zero Yesterday's total	Coil	05, 15	read/write
102	103	Zero Today's total	Coil	05, 15	read/write
103	104	Zero resettable total	Coil	05, 15	read/write
104	105	Zero current month total	Coil	05, 15	read/write
105	106	Zero last month total	Coil	05, 15	read/write
3000	43001	Command Register (1= Zero All Totals, 2 = Zero Yesterday's Total, 3 = Zero Today's Total, 4 = Zero Resettable Total, 5 = Zero Current Month Total, 6 = Zero Last Month Total)	UINT	03, 04, 06, 16	read/write
3001	43002	Volume Units(2 = gallons; 3 = barrels; 6=liters; 7=cu m)	UINT	03, 04, 06, 16	read/write
3002	43003	K-Factor Units(2 = gallons; 3 = barrels; 6=liters; 7=cu m)	UINT	03, 04, 06, 16	read/write
3003	43004	Time Base Units(3=day, 2=hour, 1=min, 0=second)	UINT	03, 04, 06, 16	read/write
3004	43005	Low Battery Alarm (0 = battery above 3.0V, 1 = battery below 3.0V)	UINT	03, 04	read only
3005	43006	Active Power Source (0=battery, 1 = DC power)	UINT	03, 04	read only
3006	43007	DC Supply Voltage (mV)	UINT	03, 04	read only
3007	43008	Battery Voltage (mV)	UINT	03, 04	read only
3008	43009	Major firmware revision number	UINT	03, 04	read only
3009	43010	Minor firmware revision number	UINT	03, 04	read only
3010	43011	Serial Number	UINT	03, 04	read only
3100	43101	Flow Grand Total (High Word)	Float	03, 04	read only
3101	43102	Flow Grand Total (Low Word)	Float	03, 04	read only
3102	43103	Yesterday's Flow Total (High Word)	Float	03, 04	read only

3103	43104	Yesterday's Flow Total (Low Word)	Float	03, 04	read only
3104	43105	Today's Flow Total (High Word)	Float	03, 05	read only
3105	43106	Today's Flow Total (Low Word)	Float	03, 06	read only
3106	43107	Resettable Flow Total (High Word)	Float	03, 05	read only
3107	43108	Resettable Flow Total (High Word)	Float	03, 06	read only
3108	43109	Current Month Total (High Word)	Float	03, 04	read only
3109	43110	Current Month Total (Low Word)	Float	03, 04	read only
3110	43111	Last Month Total (High Word)	Float	03, 04	read only
3111	43112	Last Month Total (Low Word)	Float	03, 04	read only
3112	43113	Instantaneous Flow Rate (High Word)	Float	03, 04	read only
3113	43114	Instantaneous Flow Rate (Low Word)	Float	03, 04	read only
3114	43115	Gear Meter K Factor (High Word)	Float	03, 04, 06, 16	read/write
3115	43116	Gear Meter K Factor (Low Word)	Float	03, 04, 06, 16	read/write
3116	43117	Pulse Output Scaling (High Word)	Float	03, 04, 06, 16	read/write
3117	43118	Pulse Output Scaling (low Word)	Float	03, 04, 06, 16	read/write
3300	43301	Modbus Slave ID (1 - 240)	UINT	03, 04, 06, 16	read/write
3301	43302	RS485 Baud Rate (1200,2400,4800,9600,19200,38400,57600)	UINT	03, 04, 06, 16	read/write
3302	43303	RS485 UART Mode (see manual for values, 0x00 = 8N1)	UINT	03, 04, 06, 16	read/write
3303	43304	Current Month (1 - 12)	UINT	03, 04, 06, 16	read/write
3304	43305	Current Day (1 - 31)	UINT	03, 04, 06, 16	read/write
3305	43306	Current Year (0 - 99, 0 = 2000)	UINT	03, 04, 06, 16	read/write
3306	43307	Current Day of Week (0 - 6, 0 = Sunday)	UINT	03, 04, 06, 16	read/write
3307	43308	Current Hour (0 - 23)	UINT	03, 04, 06, 16	read/write
3308	43309	Current Minute (0 - 59)	UINT	03, 04, 06, 16	read/write
3309	43310	Current Second (0 - 59)	UINT	03, 04, 06, 16	read/write
3310	43311	Contract Hour (0 - 23)	UINT	03, 04, 06, 16	read/write
3311	43312	Contract Hour Minute (0 - 59)	UINT	03, 04, 06, 16	read/write
3312	43313	Contract Day for Monthly Total	UINT	03, 04, 06, 16	read/write
3500	43501	Day 1: Flow Total (High Word)	Float	03, 04	read only
3501	43502	Day 1: Flow Total (Low Word)	Float	03, 04	read only
3502	43503	Day 2: Flow Total	Float	03, 04	read only
3503	43504	Day 2: Flow Total	Float	03, 04	read only
3504	43505	Day 3: Flow Total	Float	03, 04	read only
3505	43506	Day 3: Flow Total	Float	03, 04	read only
3506	43507	Day 4: Flow Total	Float	03, 04	read only
3507	43508	Day 4: Flow Total	Float	03, 04	read only
3508	43509	Day 5: Flow Total	Float	03, 04	read only
3509	43510	Day 5: Flow Total	Float	03, 04	read only

3510	43511	Day 6: Flow Total	Float	03, 04	read only
3511	43512	Day 6: Flow Total	Float	03, 04	read only
3512	43513	Day 7: Flow Total	Float	03, 04	read only
3513	43514	Day 7: Flow Total	Float	03, 04	read only
3514	43515	Day 8: Flow Total	Float	03, 04	read only
3515	43516	Day 8: Flow Total	Float	03, 04	read only

3516	43517	Day 9: Flow Total	Float	03, 04	read only
3517	43518	Day 9: Flow Total	Float	03, 04	read only
3518	43519	Day 10: Flow Total	Float	03, 04	read only
3519	43520	Day 10: Flow Total	Float	03, 04	read only
3520	43521	Day 11: Flow Total	Float	03, 04	read only
3521	43522	Day 11: Flow Total	Float	03, 04	read only
3522	43523	Day 12: Flow Total	Float	03, 04	read only
3523	43524	Day 12: Flow Total	Float	03, 04	read only
3524	43525	Day 13: Flow Total	Float	03, 04	read only
3525	43526	Day 13: Flow Total	Float	03, 04	read only
3526	43527	Day 14: Flow Total	Float	03, 04	read only
3527	43528	Day 14: Flow Total	Float	03, 04	read only
3528	43529	Day 15: Flow Total	Float	03, 04	read only
3529	43530	Day 15: Flow Total	Float	03, 04	read only
3530	43531	Day 16: Flow Total	Float	03, 04	read only
3531	43532	Day 16: Flow Total	Float	03, 04	read only
3532	43533	Day 17: Flow Total	Float	03, 04	read only
3533	43534	Day 17: Flow Total	Float	03, 04	read only
3534	43535	Day 18: Flow Total	Float	03, 04	read only
3535	43536	Day 18: Flow Total	Float	03, 04	read only
3536	43537	Day 19: Flow Total	Float	03, 04	read only
3537	43538	Day 19: Flow Total	Float	03, 04	read only
3538	43539	Day 20: Flow Total	Float	03, 04	read only
3539	43540	Day 20: Flow Total	Float	03, 04	read only
3540	43541	Day 21: Flow Total	Float	03, 04	read only
3541	43542	Day 21: Flow Total	Float	03, 04	read only
3542	43543	Day 22: Flow Total	Float	03, 04	read only
3543	43544	Day 22: Flow Total	Float	03, 04	read only
3544	43545	Day 23: Flow Total	Float	03, 04	read only
3545	43546	Day 23: Flow Total	Float	03, 04	read only
3546	43547	Day 24: Flow Total	Float	03, 04	read only
3547	43548	Day 24: Flow Total	Float	03, 04	read only

3548	43549	Day 25: Flow Total	Float	03, 04	read only
3549	43550	Day 25: Flow Total	Float	03, 04	read only
3550	43551	Day 26: Flow Total	Float	03, 04	read only
3551	43552	Day 26: Flow Total	Float	03, 04	read only
3552	43553	Day 27: Flow Total	Float	03, 04	read only
3553	43554	Day 27: Flow Total	Float	03, 04	read only
3554	43555	Day 28: Flow Total	Float	03, 04	read only
3555	43556	Day 28: Flow Total	Float	03, 04	read only

3556	43557	Day 29: Flow Total	Float	03, 04	read only
3557	43558	Day 29: Flow Total	Float	03, 04	read only
3558	43559	Day 30: Flow Total	Float	03, 04	read only
3559	43560	Day 30: Flow Total	Float	03, 04	read only
3560	43561	Day 31: Flow Total	Float	03, 04	read only
3561	43562	Day 31: Flow Total	Float	03, 04	read only
3562	43563	Day 32: Flow Total	Float	03, 04	read only
3563	43564	Day 32: Flow Total	Float	03, 04	read only

Internal Lithium Battery Replacement

Battery Packs can be changed with the node in place.

1. Open the cover.
2. Slide the power switch to the off position
3. Unplug the battery from the PCB, by depressing the locking clip on the connector.
4. Remove the battery from the clip and replace with new battery.
5. Connect the battery to the main PCB battery connector.
6. Slide the power switch to the on position.
7. Close and snap shut the enclosure cover.

Coin Cell Battery Replacement

The coin cell is used to backup the real time clock in the event that the main battery pack is unplugged. The battery is a CR2032 coin cell battery

Mounting Instructions

WARNING: The ModQ Flow Totalizer must be mounted in a location free of high vibrations. Over time vibrations can damage the ModQ Flow Totalizer or battery pack, which could impair its safety ratings. Do not mount directly to continuous vibrating equipment such as pumps or compressors.

Configuration / Debug

Debug and configuration information is available if a connection is made via the debug port on the main board. A USB converter cable (available from SignalFire) must be used for this interface.

Debug and configuration is done using the SignalFire Toolkit PC application.

Technical Support and Contact Information

SignalFire Telemetry
140 Locke Dr, Suite B
Marlborough, MA 01752
(978) 212-2868
support@signal-fire.com

Revision History

Revision	Date	Changes/Updates
0.1	4/20/18	Initial engineering release
1.0	5/21/18	Various updates
1.1	7/3/18	Added electrical specs for digital output
1.2	7/10/18	Small changes (SK) for clarification on some points
1.4	8/23/18	Updated certification details
1.5	11/19/18	Added info about PIN code setting for keypad