MultiTrak™

670S Multi-Point Mass Flow Meter System

INSTRUCTION MANUAL
IM-Multipoint
Revision: C, July 2015

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Chapter 1: Introduction

Welcome to the MultiTrak™

Sierra's MultiTrak™ 670Sis an advanced state-of-the-art instrument for measuring mass flow rates in very large ducts or stacks that have non-uniform velocity profiles, high turn-down requirements, dirty gas streams, wide temperature ranges and fast velocity and temperature changes. The 670Sdynamically compensates for changes in the flow profile by using up to four independent mass flow sensing points to measure the instantaneous average gas mass flow velocity. The MultiTrak™ is commonly used in petrochemical refining, coal-fired electric power generation, steel manufacturing and many other industrial processes that face the challenge of accurate and repeatable gas mass flow measurement in very large pipes or ducts.

An innovative, versatile and user-friendly microprocessor-based Human Machine Interface (HMI) controls all functions of the MultiTrak™ system. The HMI collects velocity data from the 4 flow meters using Modbus communication. The HMI will collect, visualize and store flow data, as well as set up the individual sensor points, thus allowing the entire system to be easily configured in the field. The Model 670S' HMI integrates the functions of flow measurement, flow-range adjustment, field validation and diagnostics, and displays mass flow rate and totalized flow, as well as other configuration variables. All of this data is easily programmable from the HMI's easy-to-use touch screen. The processed flow data is then made available as an analog 4-20 mA. or 0-5 Volt output signal to connect to your process.

Unlike single probe insertion sensors where each sensor point is on the same insertion probe, each 670Ssensor point is completely independent of the others, allowing for easy field swap-out or cleaning of individual transmitters.

The MultiTrak™ offers a variety of features for ease of operation.

- ✓ **Averages the flow of 4 meters**
- ✓ **Convert engineering units in LCD menu**
- ✓ **Setup density of the gas for mass flow measurement**
- ✓ **Setup of the individual meters**
- ✓ **Easy setup of the HMI system**
- ✓ **Alarm setup**
- ✓ **Touch screen operated**
- ✓ **And many more…visit www.sierrainstruments.com**

SAFETY INFORMATION

Caution and warning statements are used throughout this manual to draw your attention to important information.

Warning!

This statement appears with information that is important to protect people and equipment from damage. Pay very close attention to all warnings that apply to your application.

Caution!

This statement appears with information that is important for protecting your equipment and performance. Read and follow all cautions that apply to your application.

RECEIPT OF YOUR INSTRUMENT

When receiving the instrument, carefully check the outside packing carton for damage that may have incurred during shipment. If the carton is damaged, notify the local carrier and submit a report to the factory or distributor. Remove the packing slip and check that all ordered components are present and match your specifications (as ordered). Do not return any equipment to the factory without first contacting Technical Support Center.

DEFINITIONS USED IN THIS MANUAL

The following terms are used frequently in this manual. They are presented here with their definitions for your information.

FFS = Factory full scale of the 640S meter

UFS = User full scale of the 640S meter

HMI = Human machine interface

Modbus-RTU = A standard digital communication protocol using RS485

Note: For information about the meters it is recommended to you read:

Steel-Mass™ Model 640S Insertion Mass Flow Meter Instruction Manual
http://www.sierrainstruments.com/userfiles/file/manuals/640s-instruction-manual.pdf

The 670 can also be built using 4 620S Fast Flow light industrial Thermal insertion flow meters. The 620s is electrically identical to the 640S, but uses lighter duty 3/8 inch diameter probes.

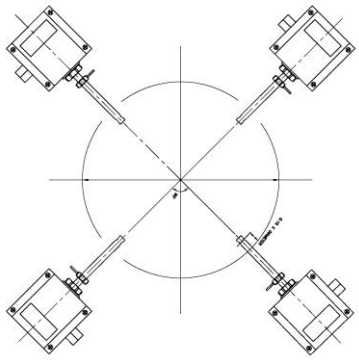
FastFlo™ Model 620S Insertion Mass Flow Meter Instruction Manual
http://www.sierrainstruments.com/userfiles/file/manuals/620s-instruction-manual.pdf

Chapter 2: Introduction to The Multipoint

The MultiTrak™ is used for bigger pipes to dynamically compensate for changes in the flow profile due to changes in flow. The basic principle is that flow is measured at several locations in the pipe, then those points are added together and divided by the number of points to get the grand-average flow rate.

MultiTrak™ consists of:

- 4 x 640S meters with Modbus. (see Sierrainstruments.com for
- information about Model 640S meters)
- 1 x Control box, with HMI and 4-20mA/0-5V output module.
- 3 x cable's (power, output 4-20mA/0-5V, cable for daisy chaining
- the 640S meters)



In the default mode the four models of the 640S are added together and divided by four, but the operator can turn units On or Off.
For example, if one unit is turned off the average is divided by three.

Each unit and total average can have a multiplication factor (the default is 1.00):

$$Average = \left(\frac{X1 * Flow1 + X2 * Flow2 + X3 * Flow3 + X4 * Flow4}{4} \right) * Xtot$$

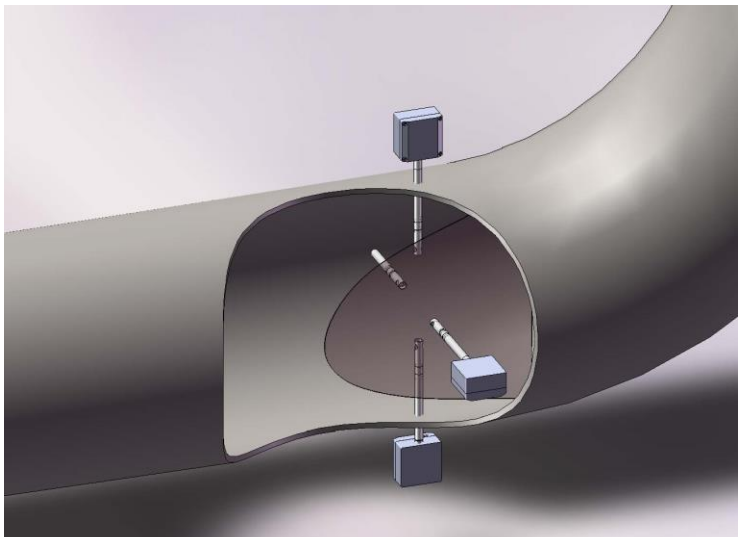


Figure 1: Sierra Instruments' MultiTrak™ Demo

Chapter 3: Installation

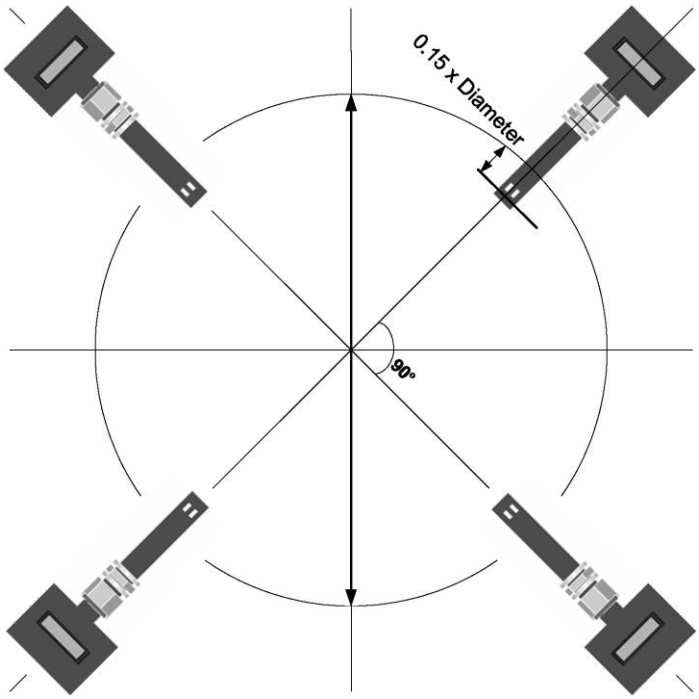
Installation Depth of the 640S in the Duct

If you don't know the flow profile or you are not familiar on how to determine the flow profile, there is a basic rule on how to set the depth of the 640S meters in the duct.

Be aware that this might not be the most accurate way for your application, knowing the flow profile and install according to that profile is preferred

Divide the duct in four equal quadrants. Insert the middle of the sensors of the probe to 0.15 x D (D=diameter of the duct) into the duct. Make sure that the probes are turned 90º from each other. See picture below.

Although a MultiTrak™ theoretically compensates for distorted flow profiles it is recommended that there be as much straight length of pipe possible before the measurement point.



Wiring of the HMI and 640S flow meters

The MultiTrak™ 670 requires 24VDC at approximately 2A that will be used to power the HMI and the 4 640S meters.

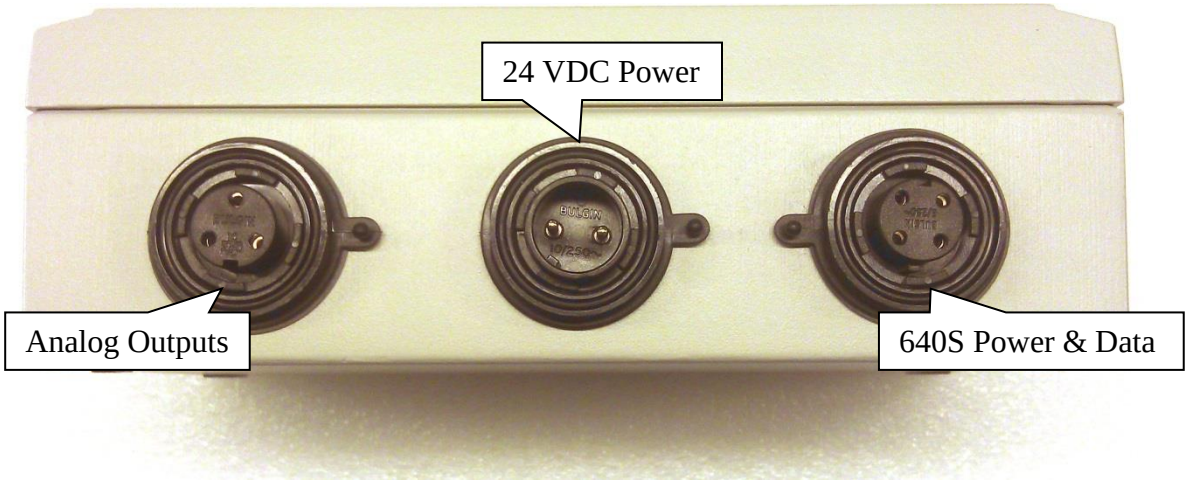


Figure 2: Wiring Ports on the HMI

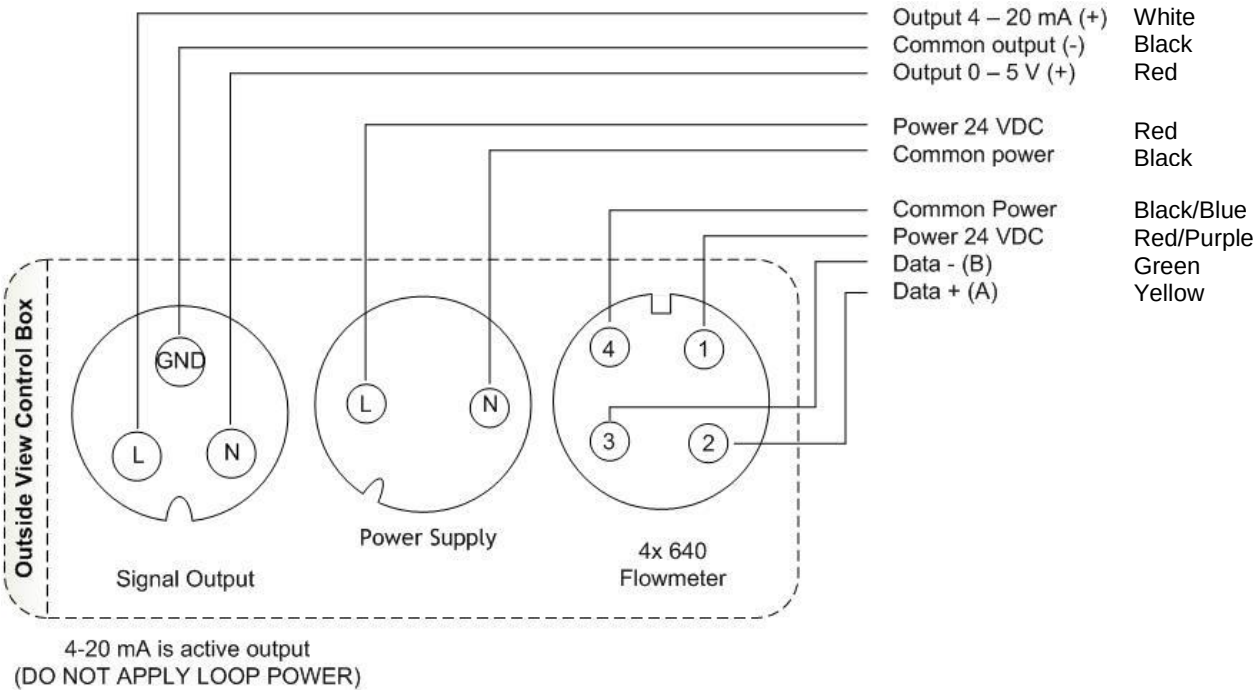


Figure 3: Pin-outs of the HMI & Wire colors

Cables

When ordering the 670 you will need to complete the "Multipoint ADS Cable Configuration" sheet so we can pre-build the cables for your application to the lengths you need.

Cable A – From HMI averaged 4-20 mA/0-5 volt signals to your system
White – 4-20 mA. output (active)
Black – Output Common
Red – 0-5 Volt Output

Cable B – Customer supplied 24 VDC power supply to power the HMI and 640S meters
Black – 24 VDC Minus
Red – 24 VDC Plus

Cable C – From HMI to 640S #1
Cable D – From 640S #1 to #2.
Cable E – From 640S #2 to #3.
Cable F – From 640S #3 to #4, terminator resistor on Modbus wires.
These are assembled as one continuous cable.
The wire colors are:
Red/Purple +24 VDC
Black/Blue -24VDC
Green – Modbus (A)
Yellow + Modbus (B)

Daisy chain the DC Power & Modbus Wiring to the Individual 640S Meters

The provided cables C through F are used to supply power and collect the flow data from the 4 640S meters using Modbus. Connect all 4 meters as shown below. Note the last meter will have a terminator resistor across the A & B Modbus terminals supplied with the cables.

Daisy chain the C through F cable assembly to the 4 x 640S meters as shown in the picture below and tighten the cable glands:

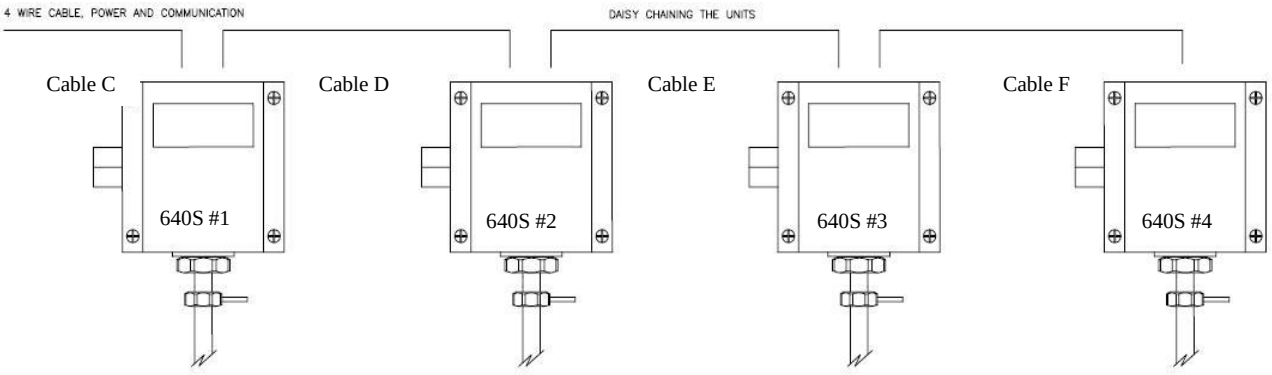
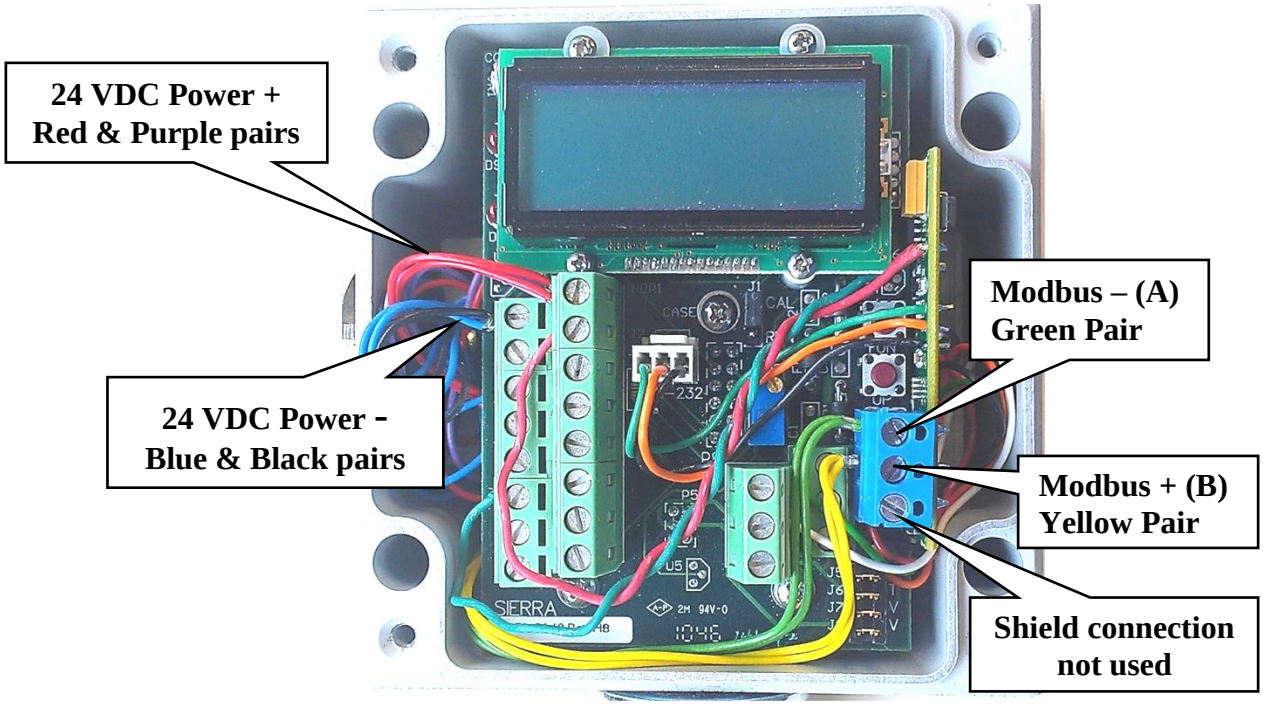
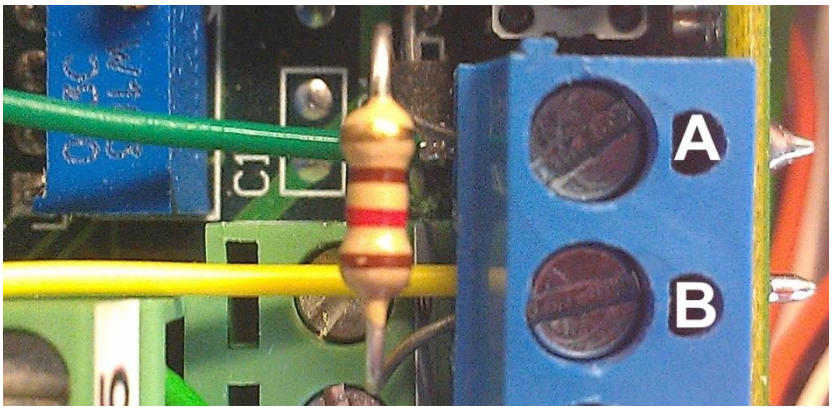


Figure 6: Daisy Chaining of 640S Units



Meter Connections in all 4 meters

The white 3 pin Molex connector, the red wire on terminal 3, and the green wire on terminal 12 should have already been connected at the factor. If an orange wire jumper for non-isolated 4-20 mA (not shown) wire was installed remove it, it's not necessary.



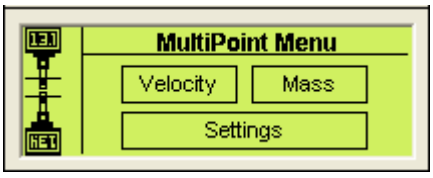
The last 640S Modbus connections

Cable F will have an EOL resistor across the yellow and green wires. (Modbus A & B)

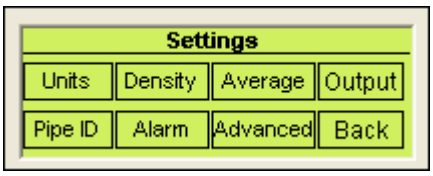
Chapter 4: Setting Up The Menu

Follow these screen shots tp set up the MultiTrak™

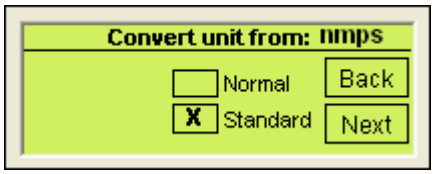
1)
After power up the HMI initialize the system, this will take about 12 seconds. No action required.

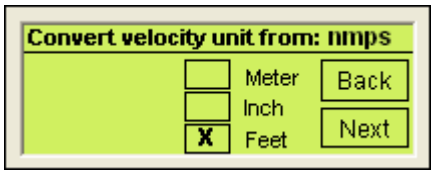


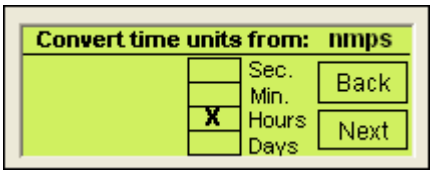
2)
After power up, the MultiPoint Menu will appear. Begin setup of the MultiTrak™. This is done by pressing the "settings" button.



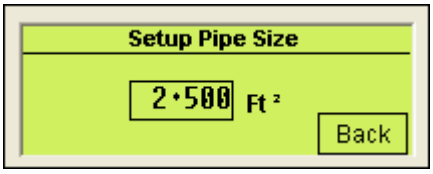
3)
First, press the "units" button to setup units. Here the user can also convert to other units.



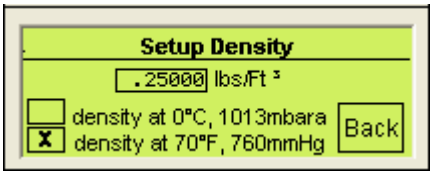




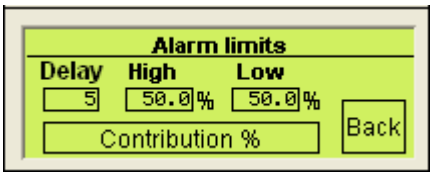
The original units of the meter are shown in the upper right corner. In this example they are normal meters per second (nmps). Press the square box before the unit which you want to convert to, or if you don't want to convert the unit press the same unit. After pressing the square box your choice will be set by a cross. Press "next" button to proceed. In our example we have changed from NMPS to SFPH. *NOTE: All MultiTrak™ meters start with a VELOCITY reading. Later steps will convert this into mass flow units like lbs/hr or SLPM if desired.*



4)
Press the "pipe ID" button in the settings menu to setup the pipe diameter. This is not required if the user only want the velocity average.

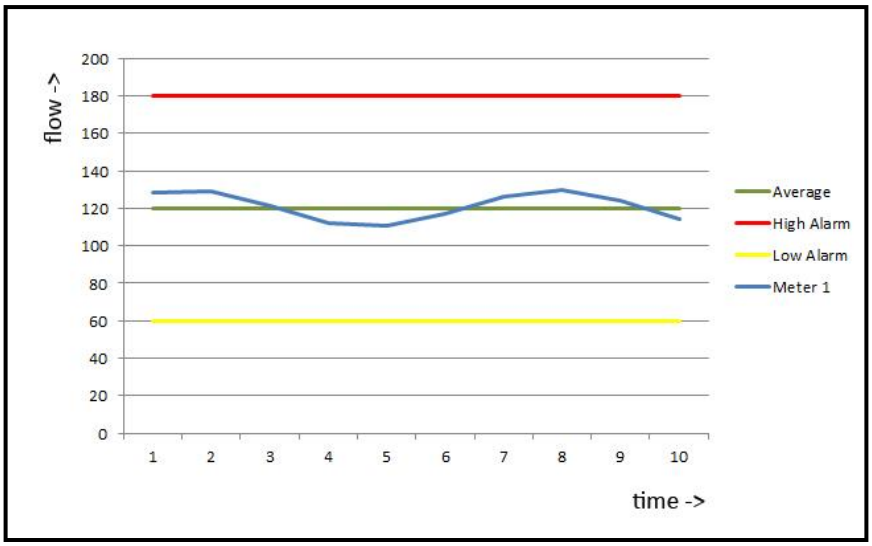


5)
Press the "Density" button in the settings menu to setup the Density of the gas. It is also required to fill in if the density is under normal or standard conditions; this is done by pressing the square box. The density is only required if you use the real mass average.

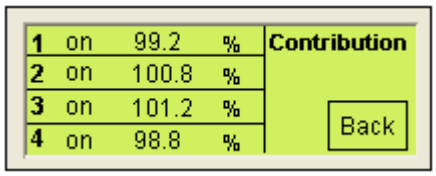


6)
By pushing the "alarm" button in the settings menu the user can setup the alarm limits. If one of the 640S meters is out of the specified limits an alarm is enabled. The user can see a LOW or HIGH alarm. AN ALARM CONDITION TAKES THE METER OUT OF THE GRAND AVERAGE. You can turn the unit on again in the average menu. Note that these additions or subtractions from the baseline. The assumed baseline is 100% of the AVERAGE FLOW. In this example for the high alarm the limit is entered as 50%. This means that the high alarm limit is set to 150% of the AVERAGE FLOW. For the low alarm it needs to be subtracted from 100%. In this example for the low alarm limit is entered 50% means that the low alarm limit is set to 50% of the AVERAGE FLOW. So you can see that if a single meter suddenly began to read less than half or more than 1.5 times the average flow (in this particular example), there is assumed to be a fault with that point and it is removed from the grand average.

There is also the possibility to set a delay, in seconds. When a meter is out of range a timer will start and if the flow recovers within this time the alarm will not go off.

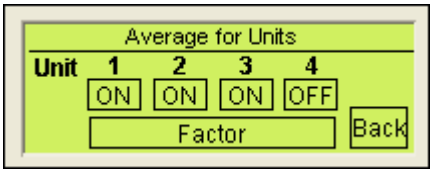


Alarms illustrated with settings: High 50% and Low 50%.

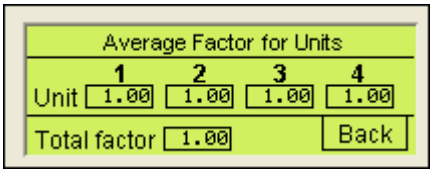


By pressing the "contribution" button in the alarm limits screen, the user can see what every meter measures in % of the average flow.

f.i: Unit 1, 2, 3 measures 10 NLPM and Unit 4 measures 9,2 NLPM. This is an average of 39.2 / 4 = 9.8 NLMP. So unit 1, 2, 3 measures 102% and unit 4 measures 94%.

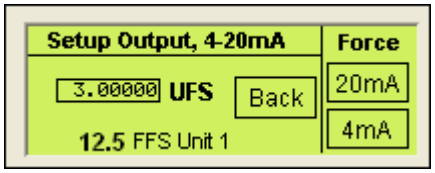


7)
By pushing the "average" button in the settings menu the user can setup which meters will count for the averaging. The user can turn meters on and off for the averaging by toggling the On/Off button below the corresponding number. By pushing the "factor" button you can give every meter a multiplication factor. Also you can give the whole average a multiplication factor. Default for every multiplication factor is 1.00



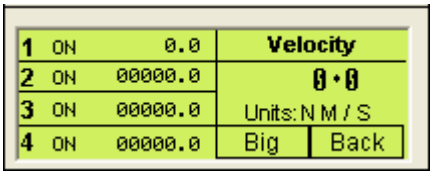
$$Average = \left(\frac{X1 * Flow1 + X2 * Flow2 + X3 * Flow3 + X4 * Flow4}{4} \right) * Xtot$$

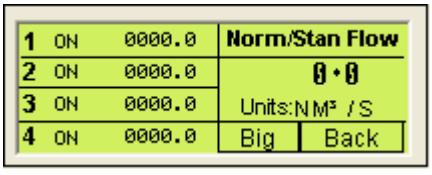
X stands for the multiplication factor.

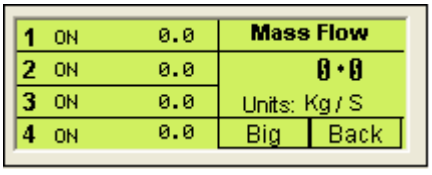


8)
By pushing the "output" button in the settings menu the user can setup the 4-20mA output (the grand-average output). The output can be forced to 4 or 20 ma for testing by pressing 4 or 20 mA below Force. By pressing 4 or 20mA the output is forced to go to 4 or 20mA. The user is free to setup the output within the FFS of unit 1. In this screenshot the FFS of unit 1 is 12.5, but for UFS is 3.00 entered. Now at a flow of 3.00 the output is 20mA. The output is always 4mA if there is no flow. *The output is the average flow.*

9) Once the user has setup the MultiTrak™ to his requirements he can go back to the MultiPoint menu and choose velocity or Mass, with mass you can choose normalized/standardized or real mass flow.

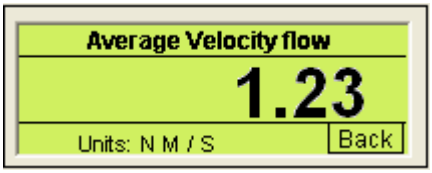






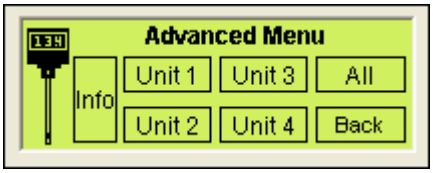
Information on the screen:
1, 2, 3, 4 stands for the corresponding Model 640S Flow Meter. You can see the individual flow for each point Flow and the grand average flow with units.

By pressing the Big button the user can see the average flow on one screen.

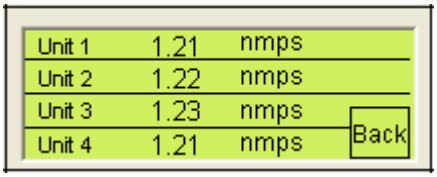


Advanced Menu

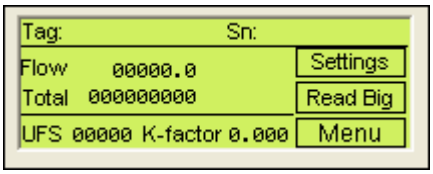
With the advanced menu, here the user can see all the parameters for the individual 640S meters. The user can enter this menu by pressing the "advanced" button in the settings menu.



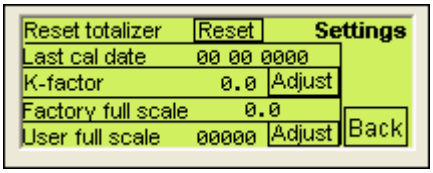
10)
In the advanced menu the user can choose the unit he wants to see. By pressing the "All" button the user can see all four 640S meters.

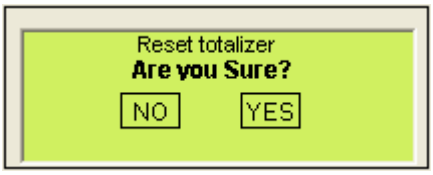


If the "All" button is pressed the user will see the flow and the original units for all four 640S meters.
NOTE: The units (example nmps) are the units in which the meters are original calibrated. This has nothing to do with the unit conversion in the Settings menu of the MultiTrak™

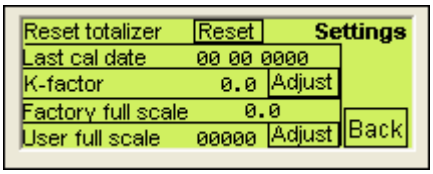


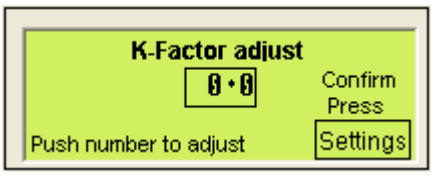
By pressing a unit in the advanced menu the user will see all the parameters of the individual meter. The parameters are Tag and Serial number, flow, totalizer, UFS and K-factor. By pressing the "Settings" button the user can change some settings.





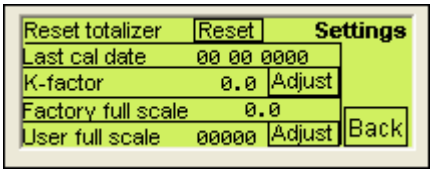
The user can reset the totalizer by pressing the "Reset" button and confirm with the "Yes" button.

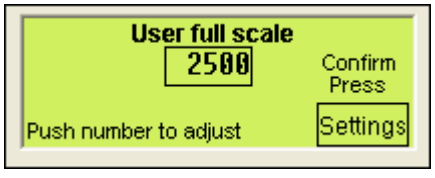




The user can change the k-factor by pressing the "Adjust" button behind the k-factor number. A screen will appear where the user can change the k-factor and confirm.

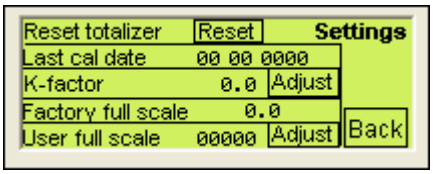
NOTE: Entering a k-factor adjusts the meters output signal without affecting the factory calibration curve. Use the k-factor calibration offset for additional flow profile compensation (the factory includes an initial flow profile correction in the calibration curve of the unit). If in doubt, read the manual "Sierra Series 640S Flow Meter".





The user can change the UFS by pressing the "Adjust" button behind the User full scale number. A screen will appear where the user can change the User full scale and confirm.

NOTE: User Full Scale Flow Rate may be Field-configured from 50% to 100% of the factory full scale setting (factory full scale is normally set to 125% of the user-specified maximum flow rate). This adjustment can be made for each flow range. If in doubt read the manual "Sierra Series 640 Flow Meter".



The settings screen also shows the last calibration date and the Factory Full Scale. Those are not changeable.

Chapter 5: Technical Support & Service

Technical Support

If you encounter any problem with your instrument, review the configuration information for each step of the installation, operation, and set up procedures as explained in this manual. Verify that your settings and adjustments are consistent with factory recommendations.

If the problem persists, Sierra Instruments is eager to help you. You may contact us at the following Technical Support Center. It may also help to call your Sierra Instruments Sales Agent, who is also well trained in the operation of the product.

IMPORTANT: When contacting Technical Support, make sure you have included the following information*:*

- The type of MultiTrak™, serial number (all marked on the instrument data label).
- The problem you are encountering and any corrective action taken.

Customer Service and Support Information

Email Technical Support: service@sierrainstruments.com
Email Sales: sales@sierrainstruments.com

FACTORY USA:
TOLL FREE: 800-866-0200
PHONE: 831-373-0200
FAX: 831-373-4402
EMAIL: service@sierrainstruments.com

European Sales & Service Center:
PHONE: +31 72 5071400
FAX: +31 72 5071401
EMAIL: service@sierra-instruments.nl

Asia Sales & Service Center:
PHONE: + 8221 5879 8521
FAX: +8621 5879 8586
EMAIL: www.sierra-asia.com

Appendix A: Warranty Policy

Limited Warranty Policy- Register Online

All Sierra products are warranted to be free from defects in material and workmanship and will be repaired or replaced at no charge to Buyer, provided return or rejection of product is made within a reasonable period but no longer than one (1) year for calibration and non-calibration defects, from date of delivery. To assure warranty service, customers must register their products online on Sierra's website. Online registration of all of your Sierra products is required for our warranty process. Register now at www.sierrainstruments.com/register.

Lifetime Limited Warranty On Patented Drysense Sensor Technology

In addition to Sierra's standard one (1) year manufacturing warranty on all instruments produced, Sierra also offers a lifetime warranty on all DrySense™ sensors standard with Sierra models 640S, 670S, 780S, 640i, and 780i instruments sold after January 1, 2010. This warranty does not extend to the Model 620S, the BoilerTrak™, the HT (High Temperature) 640S/780S sensor or the 780S UHP (Ultra High Purity) sensors. Learn more about Sierra's warranty policy at www.sierrainstruments.com/warranty.