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ABB Totalflow Measurement Applications - Enhanced Mode

Overview

The ABB Totalflow AGA3, AGA7 and Linear Liquid applications have been modified to provide additional features. These features will also be beneficial in meeting the recent BLM 3174 and 3175 rulings for flow computers. This update is specific to the "Enhanced Mode" measurement applications. Totalflow has always believed in "backward compatibility" and not forcing a user to make changes that may impact their current processes and host systems. By default, the AGA3, AGA7 and Linear Liquid measurement applications will work the same as they traditionally have. The user will be required to enable the "enhanced" features. Highlights of the new features are listed below:

- Accumulator values for AGA3, AGA7 and Linear Liquid will display 5 decimals.

- There are individual rollover accumulators (such as mass, uncorrected volume, volume) for AGA3, AGA7 and Linear Liquid. In the past, if one accumulator reached 1 million, all accumulators rolled over at that time. Now, each accumulator will rollover when it reaches 1 million and will not cause any other accumulator to rollover. Example would be in the AGA7: when the volume accumulator reached 1 million it would rollover and force the uncorrected accumulator to also rollover, even though it had not yet reached 1 million. They will now each rollover independently of each other. In the liquid application, the IV, GSV, NSV and S&W rollovers will each roll over when the respective accumulator exceeds 1 million.

- AGA7 now has a "No Flow Cutoff." If the input is a pulse, the user can enter the number of pulses per flow period. Anything less is considered "No Flow." If the input is either a flow rate or accumulator difference, the user can enter the number of ACF per flow period. Any value less than that value is considered "No Flow." The flow period length is user configurable.

- The Trend application now has the capability of trending double precision values. This is NOT specific to the Enhanced mode but is a new feature.

- PCCU version 7.63 or newer is required (7.66 or newer for latest Liquid additions including shrinkage and multiple input units and units/time). An older version of PCCU will be able to enable, configure and "see" the standard applications but will not be able to view an Enhanced mode measurement application that may be enabled in the device.

- With a PCCU version that supports the Enhanced mode, under "General" is a new selection "Enhanced Mode" – Default will show "Disabled." Select "Enabled" for the new features. Once enabled, the part numbers for the Enhanced AGA3, AGA7 and Linear Liquid applications will also be changed. The goal is that these part numbers for the AGA3 and Liquid application are what are presented to the BLM, and that these numbers are listed as "approved" and not the complete flash. There are different "enhanced" tube part numbers for the G4 and G5 platforms.

AGA3 Gas Orifice Measurement Application

ABB Totalflow has had a long commitment of supporting existing customers and older versions of API standards as much as possible. The AGA3 measurement application still supports the AGA3-85 version, the AGA3-92 version, as well as the current AGA3-2012/2013 version. Older versions for Fpv calculations, such as NX-19, are still included as well. The AGA3 application fully meets the latest API 21.1 standard, as well as the latest AGA8 Part 1 (AGA8 Gross and Detailed) and Part 2 (GERG 2008) for compressibility and/or density calculations. The AGA3 measurement application performs the complete API 14.3.3 calculation and any of the AGA8 method calculations every second. No estimating or using previous values or windows within some defined limits is ever used. The complete volume calculations are performed every second, and all seconds are summed to account for the volumes logged in the log period QTRs. All input values are averaged per the current API 21.1 standard. For all QTRs that have any flow time, only the inputs during seconds of flow time are linearly averaged and logged. In the event a QTR has "no flow" the entire period, the QTRs will reflect the linear averages for the no flow in the QTR. API 21.1 allows for either an "average extension" or "summed integral value" to be logged in the QTRs. ABB Totalflow logs a true Integral Value. The Integral Value is $\sqrt{\mathrm{DP} * \mathrm{SP}/\mathrm{Temp}\,^{\circ}\mathrm{R}}$. Each 1 second IV is summed to obtain the QTR IV. Log period IVs are summed to obtain the Daily QTR IV. The ABB Totalflow custody audit data consists of a single file that contains multiple reports. For each individual AGA3 application, there is a Characteristics Report that shows the applications setup up and parameters. This includes a detailed "snapshot" of the latest 1 second calculation inputs, intermediate calculation values, and the calculated volume. This can easily be used to verify the calculations against 3rd party programs. There are also both log period (usually hourly) and daily QTRs reflecting the average values of the inputs and sums of the volumes and energy as well as an Event log reflecting all changes to parameters that affect the AGA/API calculations. In the Enhanced mode, there is an Alarm log, similar to the Event log, that can be collected as well. The user defined alarms will be reflected and indicate when any alarms became active and when they cleared. Limits for the alarms is user configurable.

Below are shown the AGA3 entry fields available in PCCU as the application is configured and maintained. Calibration is not covered in this document.

Setup/General

- **Device/APP ID** – Field for user to enter a unique identification number for the measurement location. This is a 10-character, alpha/numeric field. Usually this ID would be used to identify the specific location throughout the customers accounting system.

- **Tube Description** – Field for user to enter unique location or description for the meter location. This is a 25-character alpha/numeric field.

- **Facility Measurement Point** – (**new feature** - optional) field for the user to enter a unique measurement point identifier. This may be used to enter the BLM FMP number, for example. This is an alpha numeric field (40 + characters) and if a number is entered, it will appear in the header of every associated report.

- **Company Name** – (**new feature** - optional) field where the user can enter a company name. Either operator or buyer, etc. This value will also be shown in the header on all associated reports.

- **Enhanced Mode – Enabled**. Once this feature is enabled, it cannot be "dis-abled".

- **Contract Hour** – User entered field to determine the hour of the day that daily volumes begin.

- **Vol Calc Period** – 1 second and cannot be changed by the user. Full API 14.3.3 and AGA8 calculations are performed every second.

- **Log Period** – user can select the length of the QTRs (Quantity Transaction Records)
  - 1 minute
  - 2 minutes
  - 5 minutes
  - 10 minutes
  - 15 minutes
  - 20 minutes
  - 30 minutes
  - 60 minutes (default)

- **Calculation Type** – Allows the user to select different versions of the AGA3 orifice calculation
  - AGA3-1985 – earliest version and supports the "factored" method
  - AGA3-1992 – improved version
  - AGA3-2012 – Other vendors or 3rd party companies may refer to this as AGA3-2013. It is the same equation. API 14.3 is published in 4 parts. Part 1 is for general orifice measurement and was released in 2012. Part 3 is specific for Natural Gas applications. It was published in 2013. ABB Totalflow had the equation ready

when Part 1 was released and chose to name it "AGA3-2012". This version uses the same basic equations as the "92" version except the Expansion or Y equation has changed to provide a better Expansion factor when the DP to SP ratio is high. Also, there are additional metal types available for orifice and pipe expansion coefficients. Stainless Steel was split to provide 304SS and 316SS as well as the "92" version of 304/316SS. The Monel coefficient also changed slightly.

- **Fpv Method** – Old versions are still available selections, however, all NX19 methods are not recommended to be used with AGA3-92 or AGA3-2012.
  - NX19 fixed FtFp - Uses NX19 Gravity, Carbon Dioxide and Nitrogen method but user must manually calculate and enter Ft and Fp.
  - NX19 GCN - Uses NX19 Gravity, Carbon Dioxide and Nitrogen method.
  - NX19 Auto (GCN or GCNM) - This method automatically switches to GCNM method if Gravity exceeds .75 and/or Carbon Dioxide or Nitrogen exceed 15%.
  - AGA8 Gross 92 – there are 2 primary "Gross" methods. The Totalflow only implements Gross Method 2. This is the default method when selecting the AGA3-1992 equation. It only requires the user to enter Specific Gravity, Carbon Dioxide and Nitrogen. Full analysis may be entered but the Gross Method 2 does not use the other components.
  - AGA8 Detail 92 - This method supports total analysis and one of the better traditional methods for a wider range of analysis concentrations. This is now referred to as AGA8 Part 1 (Detailed) 2017.
  - SGERG88 - This method adheres to the international standard ISO 12213-3. For this method to be viable, one of the following base conditions must exist:
    - 0 C / 32 F and 1.01325 bar / 14.695949 psi
    - 15 C / 59 F and 1.01325 bar / 14.695949 psi
    - 15.555556 C / 60 F and 1.01592 bar / 14.734674 psi
    - 15.555556 C / 60 F and 1.01560 bar / 14.730033 psi
  - GERG 2008 – Provides one of the better methods when analysis, pressures or temperatures are at extremes. This is now also referred to as AGA8 Part 2 (2017). This method requires much greater processing time. It takes approximately 10 times the processor as AGA8 Detailed method. It will still be calculated once per second, but not as many applications may be run in a single device when this method is selected.

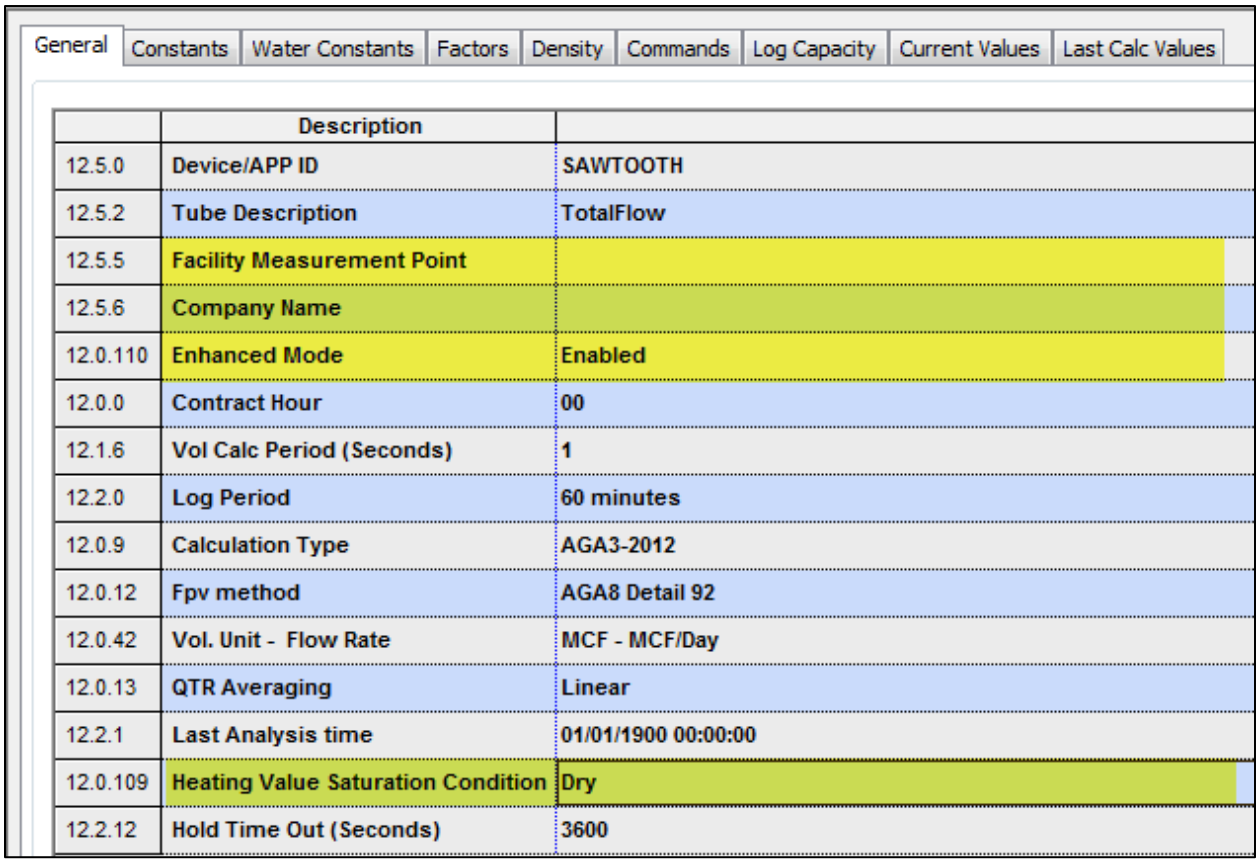
- **Vol. Unit – Flow Rate** – Select the volume unit and the associated flow rate from the list. This selection affects how the volume and rates are displayed in the Setup/Current Values tab. It does NOT affect how the volume is logged in the QTRs. The logged QTR volume is MCF.
  - MCF – SCF/Hr
  - MCF – MCF/Day
  - MMCF – MCF/Hr
  - MMCF – MMCF/Day

- **QTR Averaging**
  - Linear – This is the only option if AGA3-2012 calculation is selected. Current API 21.1 specifies that Linear averaging during flow time, is the only acceptable averaging method for QTRs. If there is any period of flow during a QTR, the result is a linear average of the DP, SP and Temperature taken only during the seconds of flow. If during the entire QTR period, the DP is less than the No Flow cutoff value, the values will be a linear average of all the seconds during the QTR.
  - Square Root – This option is only available if AGA3-92 calculation is selected. Each second when there is flow, the square root of the input is obtained and at the end of the QTR, these values are averaged and then squared. Only the seconds of flow are used in the averages. If during the entire QTR period, the DP is less than the No Flow cutoff value, the square root of the input is obtained and at the end of the QTR, these values are averaged and then squared. If there is no flow for the entire QTR, the average is for all samples. If there are any seconds of flow, the average logged is only of the samples during flow seconds.

- **Last Analysis time** – This shows the date and time the last Live Analysis was obtained. Only applicable if Live Analysis is an input.

- **Heating Value Saturation Condition** – (**new feature**) Optional field to show the saturation condition of the analysis. This is informational only and will appear on the Characteristics report as well as create an Event record when changed.
  - Not Specified – (default) This will appear if the user does not make a selection.
  - Dry
  - Saturated
  - As Delivered

- **Hold Time Out (Seconds)** – Default value is 3600. User may change the value. All measurement applications will place input values for DP, SP and Temperature (as applicable) into a "Hold" state when entering calibration. This allows the flow computer to continue calculating with "best known" or most recent values. When the calibration mode is exited, the input values used in the calculations return to "live" values. In the event an unexpected break in communications occurs during a calibration, the hold values will automatically return to "live" values when this time out value is exceeded.



General | Constants | Water Constants | Factors | Density | Commands | Log Capacity | Current Values | Last Calc Values

	Description	
12.5.0	Device/APP ID	SAWTOOTH
12.5.2	Tube Description	TotalFlow
12.5.5	Facility Measurement Point	
12.5.6	Company Name	
12.0.110	Enhanced Mode	Enabled
12.0.0	Contract Hour	00
12.1.6	Vol Calc Period (Seconds)	1
12.2.0	Log Period	60 minutes
12.0.9	Calculation Type	AGA3-2012
12.0.12	Fpv method	AGA8 Detail 92
12.0.42	Vol. Unit - Flow Rate	MCF - MCF/Day
12.0.13	QTR Averaging	Linear
12.2.1	Last Analysis time	01/01/1900 00:00:00
12.0.109	Heating Value Saturation Condition	Dry
12.2.12	Hold Time Out (Seconds)	3600

Setup/Constants

- **Barometric Pressure Type** - (**new feature**) This will be listed in the Characteristics report and create an event when changed).
  - User Entered – This is the default …. User enters the appropriate barometric pressure.
  - Calculated Per NASA-TM-X-74335 – (**new feature**) This uses the user entered Elevation (feet) to calculate the theoretical barometric pressure for that specific elevation. This is one of the BLM approved methods to obtain "Barometric Pressure."

- **Location Elevation** – (**new feature**) User entered value and is required if user chooses to "calculate" the barometric pressure.

- **Barometric Pressure** – User entered value if "User Entered" is selected or the field will be calculated if "Calculated per NASA-TM-X-74335" is selected. This value will be the default low calibration point for static pressure (absolute sensor) when in calibration mode.

- **DP Zero Cutoff** – User entered field. Any DP value less than this value will be considered “0” inches of DP and result in a no flow calculation.

- **SP Tap Location**
  - Upstream – Select this if the static pressure reading is obtained from the upstream flange tap (default selection).
  - Downstream – Select this if the static pressure reading is obtained from the downstream flange tap.

- **Orifice Diameter** – User entered field. Enter the measured internal diameter of the orifice. This value is referenced to a temperature. The default orifice reference temperature is 68°F. If the known internal diameter was measured at a temperature other than 68°F, be sure to modify the reference temperature accordingly.

- **Pipe Diameter** - User entered field. Enter the measured internal diameter of the meter run. This value is referenced to a temperature. The default meter run, or pipe reference temperature is 68°F. If the known internal diameter was measured at a temperature other than 68°F, be sure to modify the reference temperature accordingly.

- **Pressure Base (Pb)** – User entered field. The Default is 14.73. This value is defined in the contractual agreement and up to the customer to know the correct value to enter.

- **Temperature Base (Tb)** - User entered field. The Default is 60°F. This value is defined in the contractual agreement. 60°F is normally used in the US.

- **Z of Air @ Tb and Pb** – Default value is 0.99959. This is user changeable. The value is used in the AGA3 equation and used to calculate the density from the Real Relative Density (used to be referred to as Specific Gravity).

- **Auxiliary Factor** - This value is used when the Faux factor is turned on under the Factors tab. This factor is typically used as the Full Well Stream factor if applicable. It is a straight multiplier of the volume and is not “commonly” used.

- **Viscosity** - The default value of .010268 is used but can be edited by the user. This value is in centipoise units. The value is not calculated by the application.

- **Specific Heat Ratio** (Cp/Cv) - A default value of 1.3 is used but can be edited by the user. The value is not calculated by the application.

- **Orifice Plate Exp. Coef.** - Select the Orifice Plate material type from the drop-down list. A standard expansion coefficient is shown and used based on the material type.

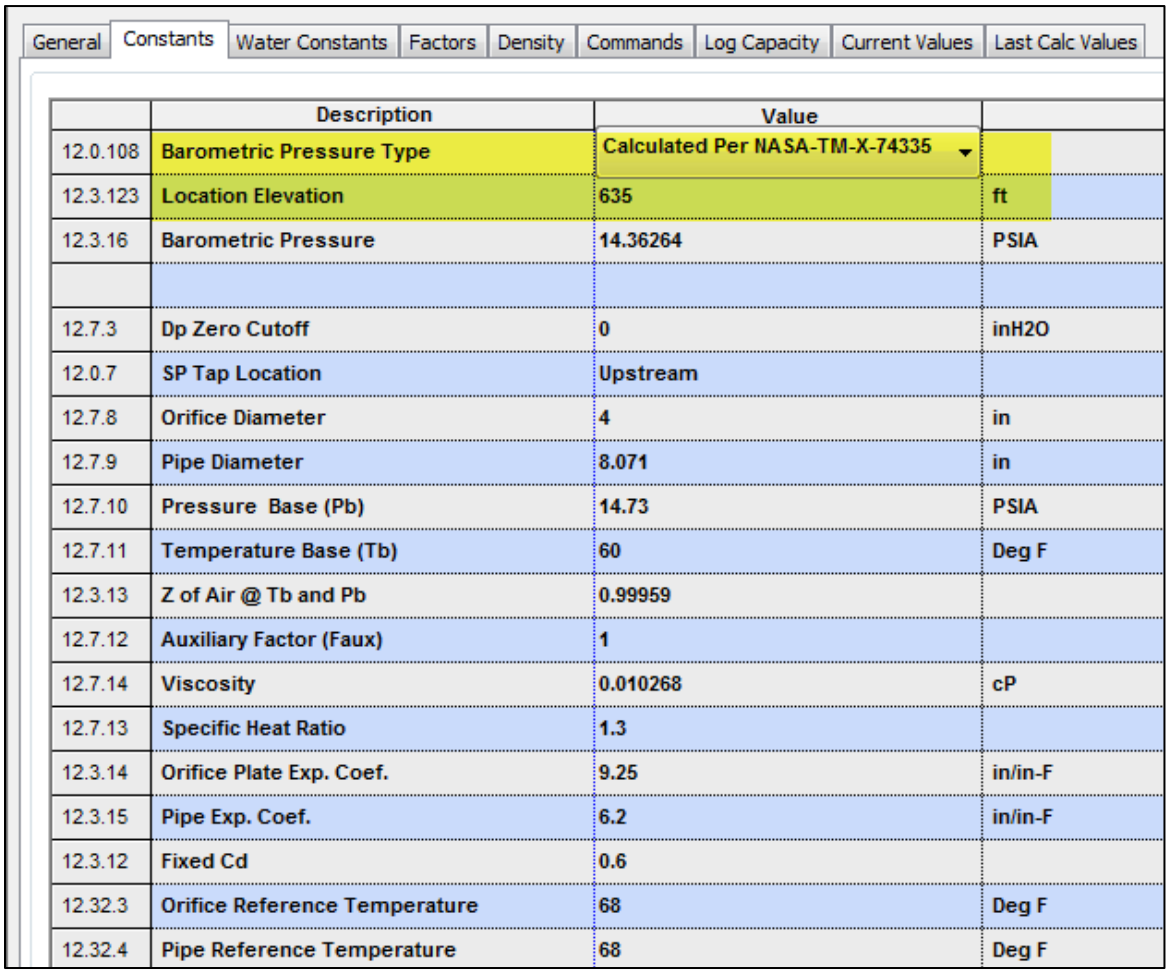
Three standard material types are provided if AGA3-92 is selected (Stainless Steel (9.25), Monel (7.95) and Carbon Steel (6.20)). Five standard material types are provided if AGA3-2012 is selected (304/316 Stainless Steel (9.25), 304 Stainless Steel (9.61), 316 Stainless Steel (8.89), Monel (7.72) and Carbon Steel (6.20)). If an orifice plate of a different type material is used, the user must select "Other", and enter an Expansion Coefficient (inches per Deg. F). Move the decimal point six places to the right and enter in the format of (x.xx) which is then scaled by the flow computer to x.xx times 10^{-6}. (Used in AGA-3 1992 and 2012 equations.)

- **Pipe Exp. Coef.** – Select the pipe (meter tube) material type from the drop-down list. The selections are the same as for the Orifice shown above.

- **Fixed Cd** - Used in AGA3-92 and AGA3-2012 equations. If “Use Calc Cd” is not selected in the “Factors” tab, this fixed value for Coefficient of Discharge is used. A default value of .6 is used. This value can be changed by the user.

- **Orifice Reference Temperature** - Enter the Orifice Reference Temperature. 68°F is the default. The user should enter the temperature at which the Orifice plate I.D. has been measured.

- **Pipe Reference Temperature** - Enter the Pipe Reference Temperature. 68°F is the default. The user should enter the temperature at which the pipe (meter tube fitting) I.D. has been measured.



General | Constants | Water Constants | Factors | Density | Commands | Log Capacity | Current Values | Last Calc Values

	Description	Value	
12.0.108	Barometric Pressure Type	Calculated Per NASA-TM-X-74335	
12.3.123	Location Elevation	635	ft
12.3.16	Barometric Pressure	14.36264	PSIA
12.7.3	Dp Zero Cutoff	0	inH2O
12.0.7	SP Tap Location	Upstream	
12.7.8	Orifice Diameter	4	in
12.7.9	Pipe Diameter	8.071	in
12.7.10	Pressure Base (Pb)	14.73	PSIA
12.7.11	Temperature Base (Tb)	60	Deg F
12.3.13	Z of Air @ Tb and Pb	0.99959	
12.7.12	Auxiliary Factor (Faux)	1	
12.7.14	Viscosity	0.010268	cP
12.7.13	Specific Heat Ratio	1.3	
12.3.14	Orifice Plate Exp. Coef.	9.25	in/in-F
12.3.15	Pipe Exp. Coef.	6.2	in/in-F
12.3.12	Fixed Cd	0.6	
12.32.3	Orifice Reference Temperature	68	Deg F
12.32.4	Pipe Reference Temperature	68	Deg F

Setup/Water Constants

The Water Constants screen allows for setup when using the Water Vapor Factor (Fw) in volume calculations. “Fw” is used to adjust the computed gas volume to account for the portion of the gas stream that is water in vapor phase. The “Use Fw” parameter must be set to “Yes” on the “Factors” tab for the “Water Vapor Factor” to be used and for any setup on this screen to apply. This should normally be left at defaults. This option is for very specific needs or requirements and if the user has any questions regarding the possible use of this feature, they should consult their company measurement manager. Standards such as GPA 2172 recommend that when water vapor is present and to be accounted for, the actual water percentage should be determined and entered in the gas analysis composition. In this manner, the water content is included in GPM, Super-compressibility, Real Relative Density, and in the heating value.

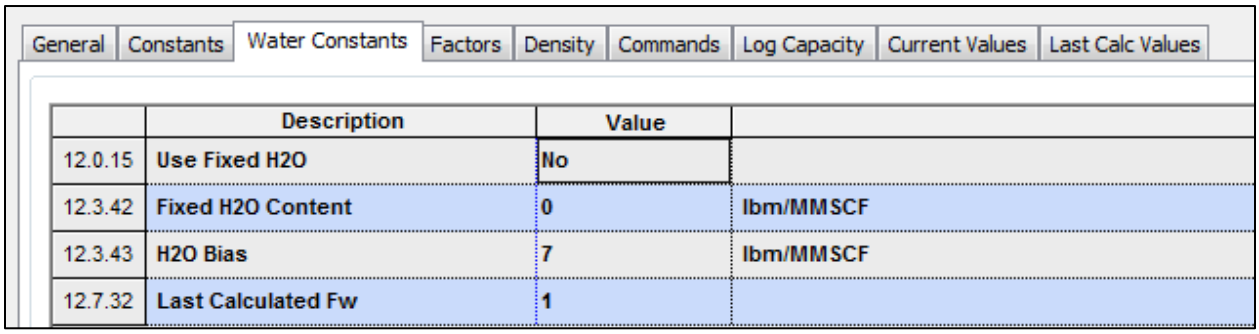
When F(w) is enabled, the application uses the results of the Institute of Gas Technology Research Bulletin 8, Equilibrium Moisture Content of Natural Gases paper from 1953.

- **Use Fixed H2O –** Yes/No. This is not a common selection to be "Yes". Select "Yes" to use the water vapor content value as specified by "Fixed H2O Content" in lieu of the flow computer calculating the water vapor content. If this is selected as "Yes", the application will reduce the volume to the water saturation level entered in "H2O Bias" field.
    - Example: The industry often considers gas to be "dry" if the moisture is at 7 lbs/MMCF or less. The default value for H2O Bias is 7 lbs/MMCF. If this field is left at 7 lbs/MMCF and the user enters a fixed H2O Content of 7 Lbs, the F(w) factor will remain at "1.000". If the user enters 100 lbs/MMCF, the application will shrink the volume to the moisture content of 7 lbs/MMCF or whatever the H2O bias is set to. If the user wants to "shrink" the volume to "0" lbs/MMCF, the H20 bias must be set to "0". Re-reading the device, will update the screen to show the user what the "Last Calculated F(w)" was.

- **Fixed H2O Content** - Enter a value in the units as shown that will be used as a fixed value for the water vapor content. The above parameter "Use Fixed H2O" will need to be set to "Yes" for the fixed value to be used.

- **H2O Bias** - Enter a bias or offset for the water vapor content. The default is 7 lbm/MMSCF, which is commonly considered "Dry" for pipeline gas. If the "H2O Bias" is the same as the calculated water vapor content or if using "Use Fixed H2O" the same as the "Fixed H2O Content", the resultant "Fw" would equal 1 and thus no effect on the volume calculation. If the calculated water vapor (or Fixed H2O Content value if using "Use Fixed H2O") is higher than the bias, the resultant "Fw" is less than 1 and since "Fw" is a direct multiplier, the resultant calculated volume goes down. This selection does NOT affect the analysis, BTU, GPM, compressibility, or real relative density. This option reduces the volume only.

- **Last Calculated Fw** - Displays the Last "Fw" value calculated by the device. The "Water Vapor Factor (Fw)" is a direct multiplier in the volume calculation. If "Use Fw" on the "Factors" tab is set to "No", this parameter is set to 1 and thus no effect to the calculations. If "Use Fw" is set to "Yes", the flow computer will calculate "Fw" based on the water vapor content. The water vapor content is either calculated by the flow computer using pressure and temperature or the user can enter a fixed water vapor content as the "Fixed H2O Content" stated above.



Setup/Factors

- **Use Calc Cd** - Coefficient of Discharge factor (Cd) - Select "Yes" (default) for the device to calculate the factor to be used in the volume calculations. Selecting "No" will cause the device to use a Fixed Cd, which by default is .6, but can be edited by the user in the Constants tab. Someone with in depth measurement knowledge should be consulted before changing this setting to "No."

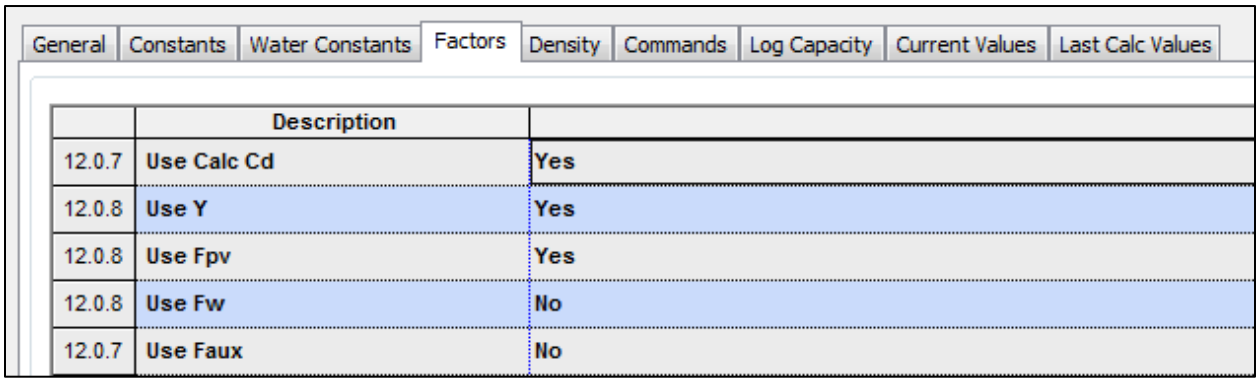
- **Use Y** - Expansion factor (Y) - Select "Yes" (default) for the device to calculate and use this factor in the volume calculations.

- **Use Fpv** – Super-compressibility factor - Select "Yes" (default) for the device to calculate, and use this factor based on the Fpv method selected in the General tab.

- **Use Fw** - Water Vapor factor – (default = No) Used to adjust the computed gas volume downward to account for the portion of the measured fluid stream that is water in vapor phase. If enabled, Fw is computed by the flow computer. If supported, see the Water Constants tab for additional setup.

- **Use Faux** – (default = No) Typically used as a Full Well Stream factor to adjust the computed gas volume downward to account for the portion of the measured fluid stream that is liquid. The user enters a value which will be used as a direct multiplier when calculating the volume. For example, a value of 0.9 would result in a volume reduction of 10%. The percentage liquids in the stream is typically determined by a Full Well Stream Test. The "Faux factor" is entered under the Constants tab. Since Faux is a direct multiplier to the volume, it can be used for any correction to the volume not accounted for in the basic equation.

NOTE: Although factors (Faux and Fw) are being used by some companies, they have not been adopted by any standards committee. To meet current API standards for measurement quality, "Use Calc Cd", "Use Y", and "Use Fpv" must be set to "Yes."



Setup/Density

Select one of the available sources for the density. It is highly recommended that the same source be used for BOTH base conditions and flowing conditions.

- **Density at Base Conditions**
  - **Density Source** (the user should select the appropriate option based on contracts or their company's policies and procedures)
    - **Calculated from Real Relative Density –** (default) In the past, this was often referred to as "Specific Gravity." This selection results in the Real Relative Density from the "Fixed" or "Live Analysis" data section to be used to calculate the density.
    - **Calculated from AGA8 Detailed** - This selection uses the AGA8 Detail Fpv method and requires that the AGA8 Detail Fpv method be used as selected on the "General" tab. Density is then calculated using AGA8 Detailed.
    - **Calculated from GERG 2008 –** (also referred to AGA8 Part 2) This selection uses the GERG 2008 Fpv method and requires that the GERG Fpv method be used as selected on the "General" tab. Density is then calculated using GERG 2008.
    - **User Entered** - Enter the value in the User Entered Density field as shown below. This selection is not recommended if any of the other methods are viable.

  - **User Entered Density** - Enter the density in "lbm/ft^3" to be used if "User Entered" was selected as the "Density Source" for base conditions.

- **Density at Flowing Conditions**

  - **Density Source** (the user should select the appropriate option based on contracts or their company's policies and procedures) It is strongly

recommended to select the same Density Source for Density at Flowing Conditions as was selected for Density at Base Conditions.

- **Calculated from Real Relative Density –** (default) In the past, this was often referred to as "Specific Gravity." This selection results in the Real Relative Density from the "Fixed" or "Live Analysis" data section to be used to calculate the density.

- **Calculated from AGA8 Detailed** - This selection uses the AGA8 Detail Fpv method and requires that the AGA8 Detail Fpv method be used as selected on the "General" tab. Density is then calculated using AGA8 Detailed.

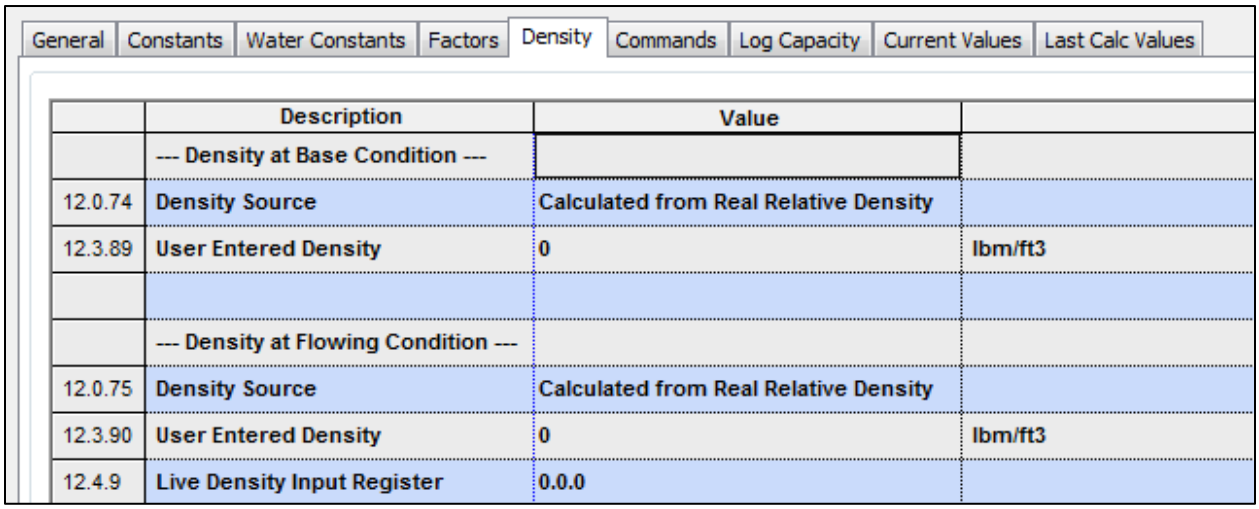
- **Calculated from GERG 2008 –** (also referred to AGA8 Part 2) This selection uses the GERG 2008 Fpv method and requires that the GERG Fpv method be used as selected on the "General" tab. Density is then calculated using GERG 2008.

- **User Entered** - Enter the value in the User Entered Density field as shown below. This selection is not recommended if any of the other methods are viable

- **Live Measured** - Live Measured - This method assumes density is acquired from an external source such as a densitometer. If used, specify the app/array/register for the "Live Density Input Register."

➢ **User Entered Density** - Enter the density in "lbm/ft^3" to be used if "User Entered" was selected as the "Density Source" for flowing conditions.

➢ **Live Density Input Register -** Specify the App/Array/Register for the source of the density value if "Live Measured" was selected as the "Density Source" for flowing conditions. If an on-board analog input or TFIO module is used for the input, the address can be found under the ***I/O Interface*** tree-view item.



General | Constants | Water Constants | Factors | Density | Commands | Log Capacity | Current Values | Last Calc Values

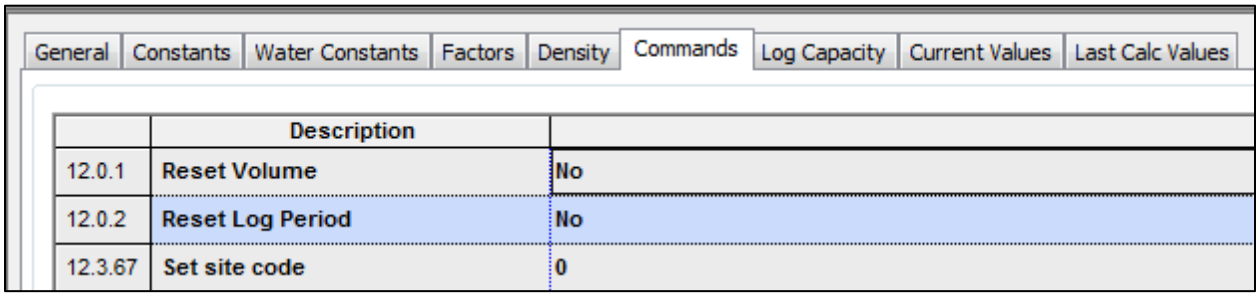
	Description	Value	
	--- Density at Base Condition ---		
12.0.74	Density Source	Calculated from Real Relative Density	
12.3.89	User Entered Density	0	lbm/ft3
	--- Density at Flowing Condition ---		
12.0.75	Density Source	Calculated from Real Relative Density	
12.3.90	User Entered Density	0	lbm/ft3
12.4.9	Live Density Input Register	0.0.0	

Setup/Commands

- **Reset Volume** – Yes/No. Selecting "Yes" and "Send", only zeros out the master accumulators. An event will be generated showing the value at the time of the reset and a new value of "0".

- **Reset Log Period** – Yes/No. Selecting "Yes" and "Send" ends the current log records, "hourly" and Daily QTRs, and begins a new "hourly" and Daily QTRs. This may be a company requirement or policy to perform anytime a constant that effects the calculations is changed. Changing an orifice plate size may be an example. An event will be generated.

- **Set site code** – user entered value. Up to seven numerical digits and a decimal point is allowed anywhere among the digits. A site code entry enters an event in the event file using the site code number. This number can represent anything to the user as some function performed at the site.



General | Constants | Water Constants | Factors | Density | Commands | Log Capacity | Current Values | Last Calc Values

	Description	
12.0.1	Reset Volume	No
12.0.2	Reset Log Period	No
12.3.67	Set site code	0

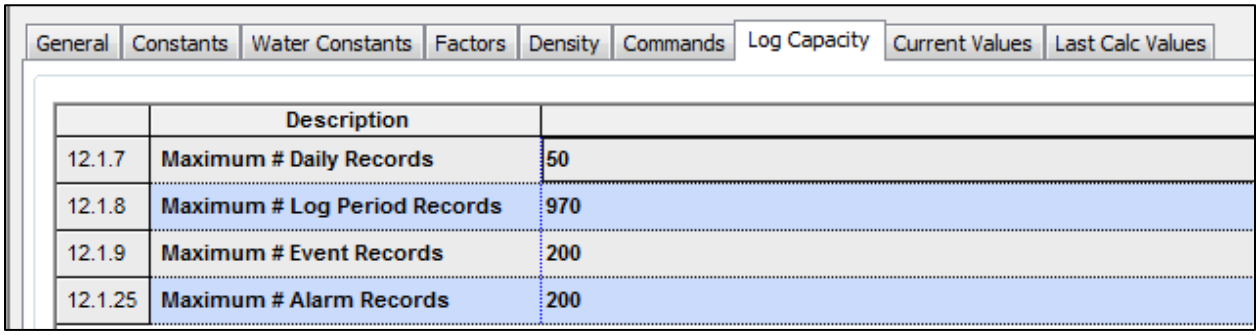
Setup/Log Capacity

- **Maximum # Daily Records** - Enter the maximum number of Daily Records that the device is to store. The default is 50. A “Reset Log Period” will end a day record and begin a new one. Each reset will use an additional “daily” record.

- **Maximum # Log Period Records** - Enter the maximum number of Log Period Records that the device is to store. The default of 970 is recommended. 970 allows for 40 days of hourly records. One Log Period Record is used no matter what the Log Period interval may be. A “Reset Log Period” will end a log record and begin a new one. Each reset will use an additional log record.

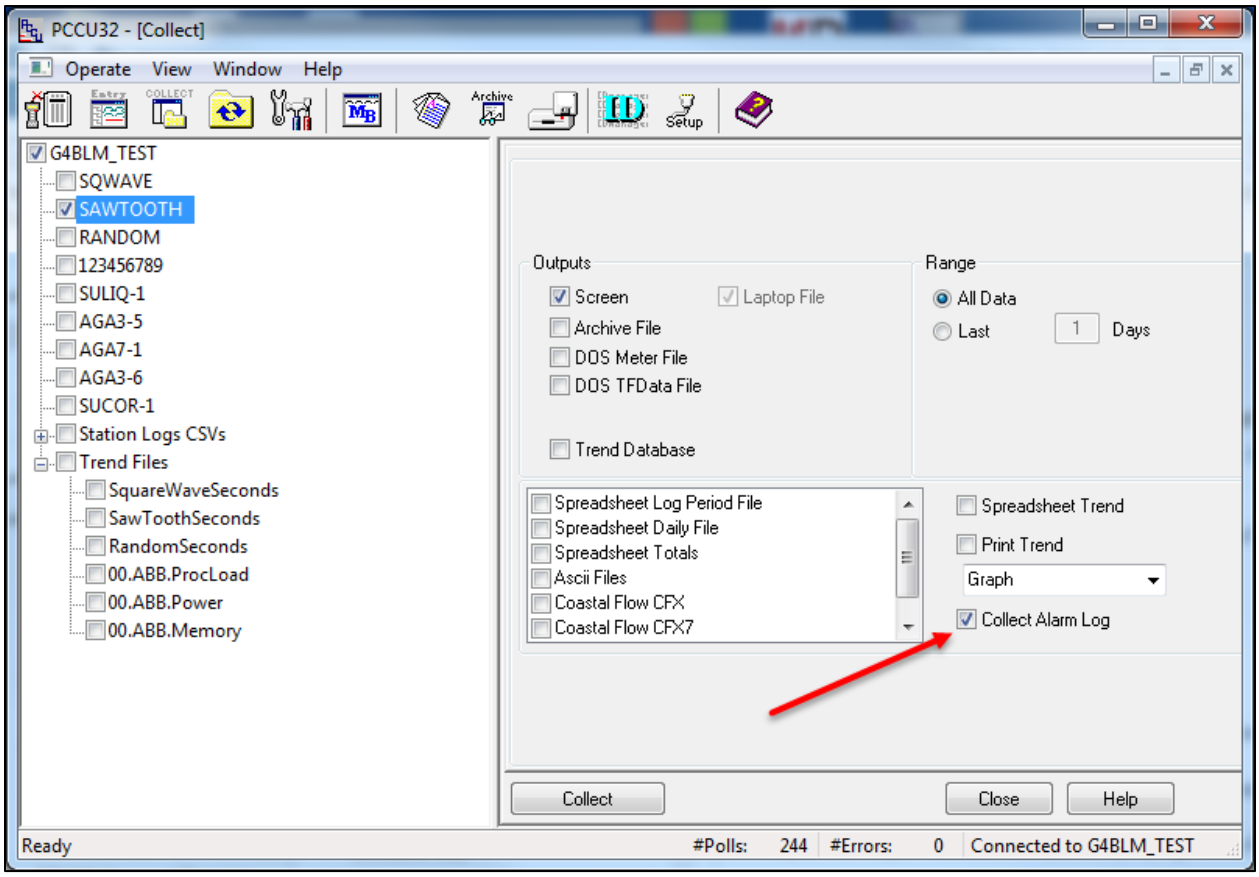
- **Maximum # Event Records** – (default is 200) Enter the maximum number of Event Records that the device is to store. Any change to the flow computer that may affect the calculations will create an event record.

- **Maximum # Alarm Logs** – (default is 200) (**new feature**) Many of the alarms can be “enabled” for logging. If an alarm is “enabled for logging” and the alarm is triggered or when the alarm clears, an alarm will be logged. This log is user selectable to be included in the standard collection or not be collected.



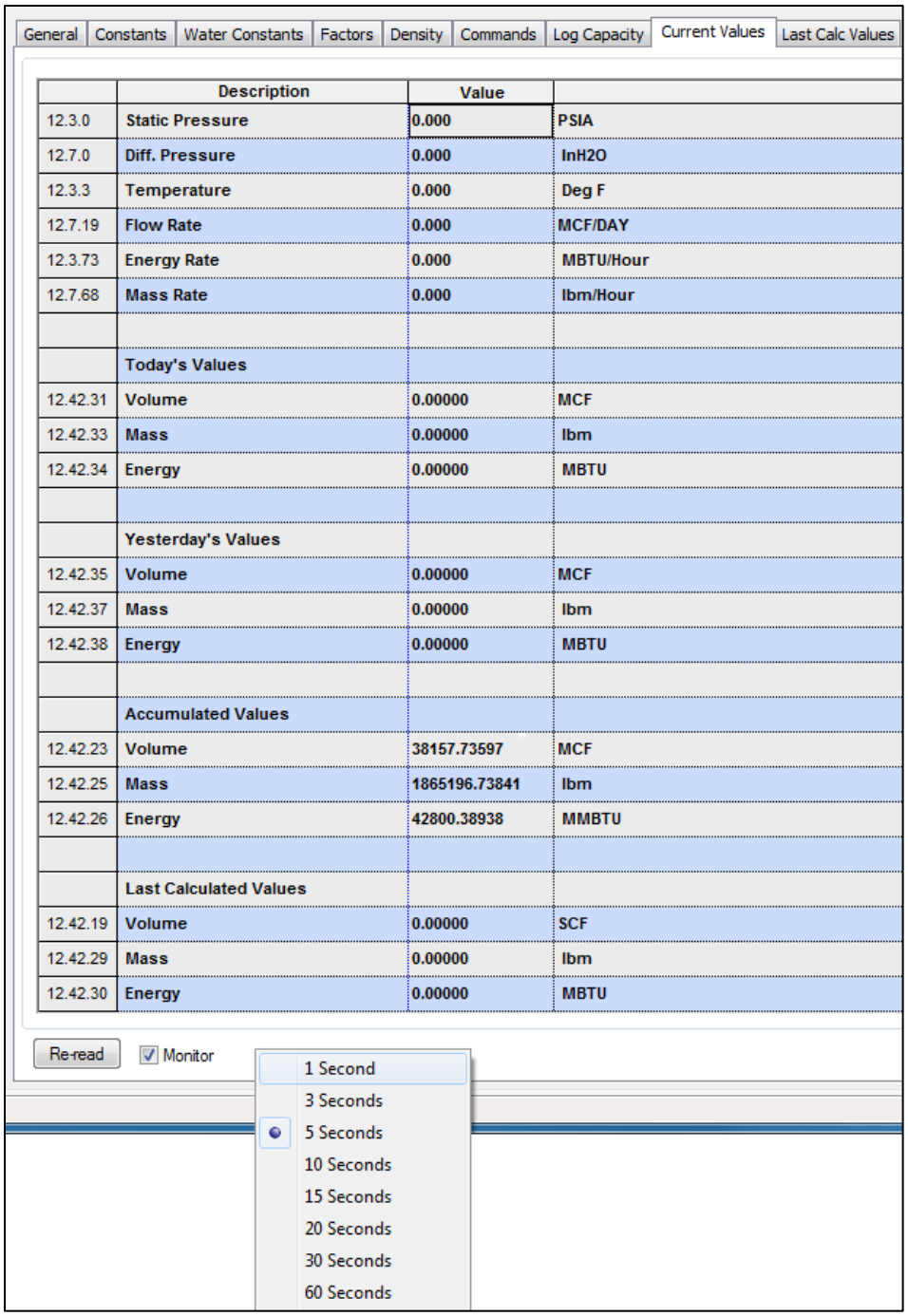
	Description	
12.1.7	Maximum # Daily Records	50
12.1.8	Maximum # Log Period Records	970
12.1.9	Maximum # Event Records	200
12.1.25	Maximum # Alarm Records	200

When collecting the flow computer data and a user wants to include the Alarm Logs in the collect, be sure to check the “Collect Alarm Log” box as shown below.



Setup/Current Values

All fields on this screen are informational (read only). When the “Monitor” box is checked, data will be updated. Hovering your mouse in the bottom bar near the “Monitor” box and right clicking, will result in a “pop up” allowing you to change the update frequency. Default is 5 seconds. This screen shows the current input values as well as calculated flow rates, today’s accumulator values, as well as yesterday’s accumulators, values of the total accumulators, and the last seconds calculated volume/mass.

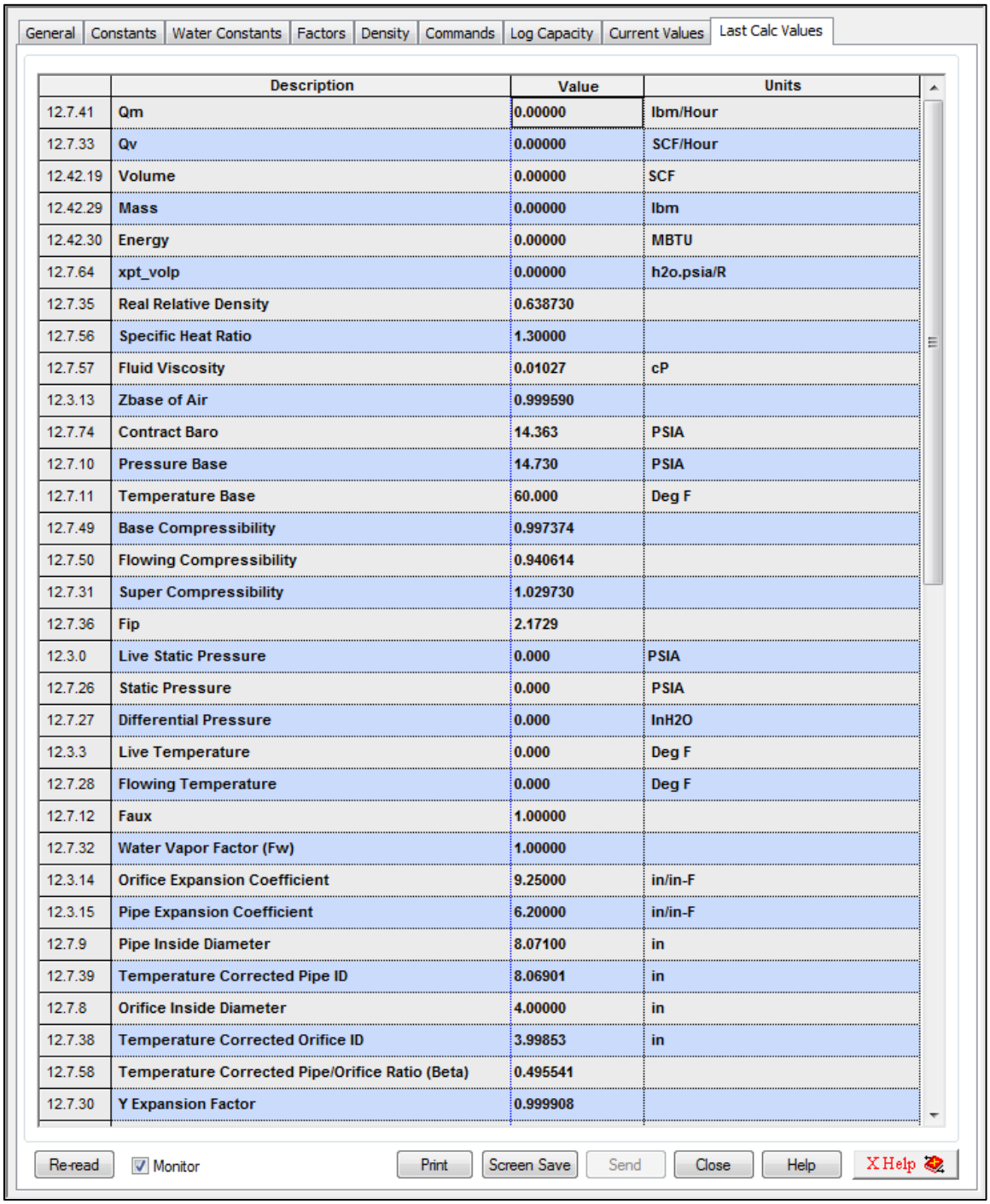


	Description	Value	
12.3.0	Static Pressure	0.000	PSIA
12.7.0	Diff. Pressure	0.000	InH2O
12.3.3	Temperature	0.000	Deg F
12.7.19	Flow Rate	0.000	MCF/DAY
12.3.73	Energy Rate	0.000	MBTU/Hour
12.7.68	Mass Rate	0.000	lbm/Hour
	Today's Values		
12.42.31	Volume	0.00000	MCF
12.42.33	Mass	0.00000	lbm
12.42.34	Energy	0.00000	MBTU
	Yesterday's Values		
12.42.35	Volume	0.00000	MCF
12.42.37	Mass	0.00000	lbm
12.42.38	Energy	0.00000	MBTU
	Accumulated Values		
12.42.23	Volume	38157.73597	MCF
12.42.25	Mass	1865196.73841	lbm
12.42.26	Energy	42800.38938	MMBTU
	Last Calculated Values		
12.42.19	Volume	0.00000	SCF
12.42.29	Mass	0.00000	lbm
12.42.30	Energy	0.00000	MBTU

Setup/Last Calc Values

The information shown on this screen is a snapshot of the last second's inputs and calculation results. This data can be used to verify that the user properly configured the flow computer as well as to verify the flow computers calculations against 3rd party

verification programs. An Example of some of the available information for the last calculation period (1 second) is shown below.



	Description	Value	Units
12.7.41	Qm	0.00000	lbm/Hour
12.7.33	Qv	0.00000	SCF/Hour
12.42.19	Volume	0.00000	SCF
12.42.29	Mass	0.00000	lbm
12.42.30	Energy	0.00000	MBTU
12.7.64	xpt_volp	0.00000	h2o.psia/R
12.7.35	Real Relative Density	0.638730	
12.7.56	Specific Heat Ratio	1.30000	
12.7.57	Fluid Viscosity	0.01027	cP
12.3.13	Zbase of Air	0.999590	
12.7.74	Contract Baro	14.363	PSIA
12.7.10	Pressure Base	14.730	PSIA
12.7.11	Temperature Base	60.000	Deg F
12.7.49	Base Compressibility	0.997374	
12.7.50	Flowing Compressibility	0.940614	
12.7.31	Super Compressibility	1.029730	
12.7.36	Fip	2.1729	
12.3.0	Live Static Pressure	0.000	PSIA
12.7.26	Static Pressure	0.000	PSIA
12.7.27	Differential Pressure	0.000	InH2O
12.3.3	Live Temperature	0.000	Deg F
12.7.28	Flowing Temperature	0.000	Deg F
12.7.12	Faux	1.00000	
12.7.32	Water Vapor Factor (Fw)	1.00000	
12.3.14	Orifice Expansion Coefficient	9.25000	in/in-F
12.3.15	Pipe Expansion Coefficient	6.20000	in/in-F
12.7.9	Pipe Inside Diameter	8.07100	in
12.7.39	Temperature Corrected Pipe ID	8.06901	in
12.7.8	Orifice Inside Diameter	4.00000	in
12.7.38	Temperature Corrected Orifice ID	3.99853	in
12.7.58	Temperature Corrected Pipe/Orifice Ratio (Beta)	0.495541	
12.7.30	Y Expansion Factor	0.999908	

Alarms/Alarm Setup

(New feature) This is a new tab and requires the user to enter set point values and "enable" alarming. The traditional "Limits" tab has been replaced with the "Alarm Setup" tab. Log reports and daily reports will still have the traditional alarm "X" s when those alarms occur. Such as backflow (BF), zero flow (ZF), low lithium (LL), remote sense (RS), Differential High (DH), etc. The traditional alarms only had a low and high alarm for DP, SP, Temp, Flow rate, etc. The new alarm setup has LoLo, Lo, Hi, and HiHi alarms. As a result, the new HiHi settings will be the alarm settings that trigger the traditional Hi "X" alarms and the new LoLo settings will be the alarm settings that trigger the traditional Lo "X" alarms.

Several fields in this section require the user to enter the appropriate information. We currently do not have the ability to automatically know the SP and DP sensor URLs (Upper Range Limits) of all the possible sensors that may be utilized. As a result, the user is required to fill in these values for the URL alarming to work correctly. The Totalflow SP and DP sensors are factory characterized to 115% of URL. If any URL value is exceeded, it will generate an alarm and another when it has "cleared". The URL and Calibrated Span alarms cannot be disabled.

Static Pressure

- **Static Pressure –** This field will reflect the current SP value (read only).

- **SP URL –** Requires the user to enter the URL of the static pressure sensor. When this value is exceeded, an alarm will be generated AND when the value exceeds 115% of the URL, the "live value" used in calculations will be clipped. Example: 1000 psia URL will not exceed 1150 psia… once the pressure exceeds 1150 psia, the calculations will continue to use and log no value higher than 1150 psia. When the pressure drops below 1150 psia, the application will again use the live value.

- **SP Calibrated Span –** This value will be the same as the user entered URL value UNTIL the sensor is calibrated. Once the sensor is calibrated, this field will reflect the highest calibration point value. If this value is exceeded, an alarm will be generated. (this is a BLM requirement)

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **SP Lo Lo Alarm –** lowest pressure where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **SP Lo Alarm** – medium low pressure where an alarm would be generated. Any value less than this value will activate the alarm.

- **SP Hi Alarm** – medium high pressure where an alarm would be generated. Any value greater than this value will activate the alarm.

- **SP Hi Hi Alarm** – highest user defined pressure alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **SP Alarm GROUP (LoLo, Lo, Hi, HiHi**) – This "group function" simply enables/disables all the SP alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **SP Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **SP Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **SP Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed set point to activate the alarm. The live value must drop below a HiHi or Hi set point by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to set point and the alarm will clear when the live value EXCEEDs the set point by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Differential Pressure

- **Differential Pressure** – This field will reflect the current DP value (read only)

- **DP URL** – Requires the user to enter the URL of the differential pressure sensor. When this value is exceeded, an alarm will be generated AND when the value exceeds 115% of the URL, the "live value" used in calculations will be clipped. Example: 800" URL will not exceed 920" … once the differential pressure exceeds exactly 920, the calculations will continue to use and log 920" DP. When the DP drops below 920" DP, the application will use the live value again.

- **DP Calibrated Span** – This value will be the same as the user entered URL value UNTIL the sensor is calibrated. Once the sensor is calibrated, this field will reflect the

highest calibration point value. If this value is exceeded, an alarm will be generated. (this is a BLM requirement)

The user has the option to enable the alarm as well as enable logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **DP Lo Lo Alarm** – lowest DP where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **DP Lo Alarm** – medium low DP where an alarm would be generated. Any value less than this value will activate the alarm.

- **DP Hi Alarm** – medium high DP where an alarm would be generated. Any value greater than this value will activate the alarm.

- **DP Hi Hi Alarm** – highest user defined DP alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **DP Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the DP alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **DP Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **DP Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **DP Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to setpoint and the alarm will clear when the live value EXCEEDs setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Temperature

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **TF Lo Lo Alarm** – lowest flowing temperature where an alarm would be generated. Any value less than this value will activate the alarm.

- **TF Lo Alarm** – medium low flowing temperature where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **TF Hi Alarm** – medium high flowing temperature where an alarm would be generated. Any value greater than this value will activate the alarm.

- **TF Hi Hi Alarm** – highest user defined temperature alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **TF Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the TF alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **TF Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **TF Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **TF Deactivate Deadband (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Flow Rate

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **FR Lo Lo Alarm** – lowest flow rate where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **FR Lo Alarm** – medium low flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **FR Hi Alarm** – medium high flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

- **FR Hi Hi Alarm** – highest user defined flow rate alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **FR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – this "group function" simply enables/disables all the FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **FR Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **FR Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **FR Deactivate Deadband (units of measure)** - user entered field. Alarm must exceed the set point to activate the alarm. The live value must drop below a HiHi or Hi set point by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the set point and the alarm will clear when the live value EXCEEDs the set point by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Alarms Setup

	Description	Threshold Value	Status	Enable Alarm	Enable Logging	Units
	----------					
14.3.0	Static Pressure	306.825				PSIA
14.3.135	SP URL	1000.000		Yes	Yes	PSIA
14.3.145	SP Calibrated Span	1014.363		Yes	Yes	PSIA
14.3.2	SP Lo Lo Alarm	200.000		Yes	Yes	PSIA
14.3.139	SP Lo Alarm	300.000		Yes	Yes	PSIA
14.3.140	SP Hi Alarm	700.000		Yes	Yes	PSIA
14.3.1	SP Hi Hi Alarm	800.000		Yes	Yes	PSIA
14.156.1000	SP Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
14.170.1000	SP Alarm Setpoint Time to Activate	3.000				Seconds
14.173.1000	SP Alarm Setpoint Time to Clear	3.000				Seconds
14.174.1000	SP Deadband Units to Clear	0.000				PSI

14.7.0	Differential Pressure	493.988				inh2o@60F
14.7.84	DP URL	800.000		Yes	Yes	inh2o@60F
14.7.89	DP Calibrated Span	800.000		Yes	Yes	inh2o@60F
14.7.2	DP Lo Lo Alarm	5.000		Yes	Yes	inh2o@60F
14.7.85	DP Lo Alarm	10.000		Yes	Yes	inh2o@60F
14.7.86	DP Hi Alarm	400.000	ACTIVE	Yes	Yes	inh2o@60F
14.7.1	DP Hi Hi Alarm	600.000		Yes	Yes	inh2o@60F
14.156.1001	DP Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
14.170.1001	DP Alarm Setpoint Time to Activate	3.000				Seconds
14.173.1001	DP Alarm Setpoint Time to Clear	3.000				Seconds
14.174.1001	DP Deadband Units to Clear	0.000				inh2o@60F

14.3.3	Temperature	50.402				Deg F
14.3.6	TF Lo Lo Alarm	0.000		No	No	Deg F
14.3.141	TF Lo Alarm	0.000		No	No	Deg F
14.3.142	TF Hi Alarm	0.000		No	No	Deg F
14.3.5	TF Hi Hi Alarm	420.000		No	No	Deg F
14.156.1002	TF Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
14.170.1002	TF Alarm Setpoint Time to Activate	3.000				Seconds
14.173.1002	TF Alarm Setpoint Time to Clear	3.000				Seconds
14.174.1002	TF Deadband Units to Clear	0.000				Deg F

14.7.19	Flow Rate	11451.767				MCF/DAY
14.7.25	FR Lo Lo Alarm	0.000		No	No	MCF/DAY
14.7.88	FR Lo Alarm	0.000		No	No	MCF/DAY
14.7.87	FR Hi Alarm	0.000		No	No	MCF/DAY
14.7.24	FR Hi Hi Alarm	24000		No	No	MCF/DAY
14.156.1003	FR Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
14.170.1003	FR Alarm Setpoint Time to Activate	3.000				Seconds
14.173.1003	FR Alarm Setpoint Time to Clear	3.000				Seconds
14.174.1003	FR Deadband Units to Clear	0.000				MCF/DAY

Analysis/Analysis Setup

This tab allows the user to select the option to have the application log the current gas quality in the standard QTRs (Quantity Transaction Records). Live or Fixed can be logged along with the standard items such as DP, SP, Temp and Volume.

- **Log Analysis in QTRs** (**new feature**)
  - Disabled (default)
  - Enabled

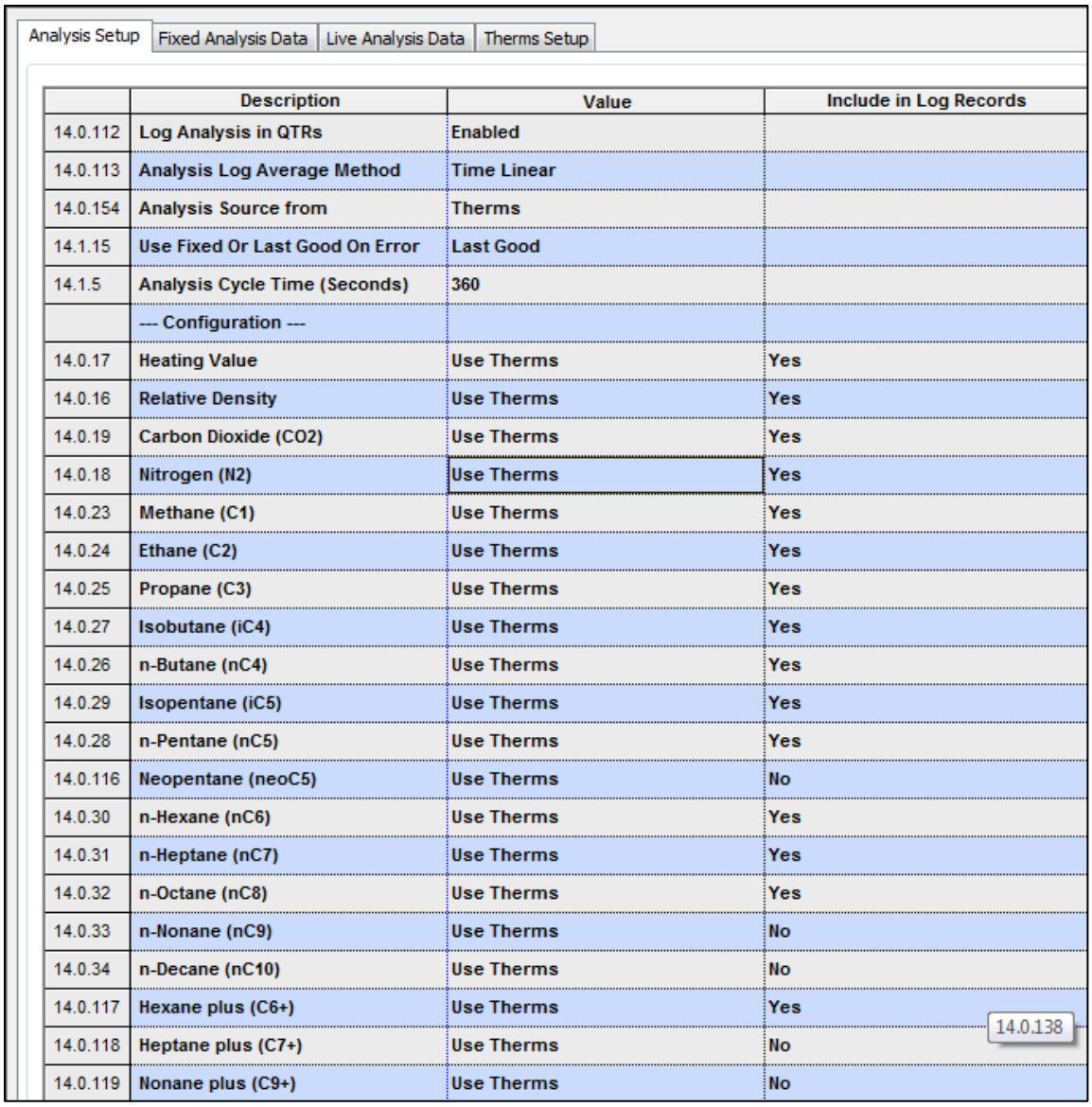
- **Analysis Log Average Method** - defines how the analysis values are averaged when logging is enabled (**new feature**)
  - Time Linear (Default)
  - Flow Volume Weighted

- **Analysis Source from** (**new feature**)
  - Fixed Analysis (default)
  - Therms (when connected to a gas chromatograph)
  - Protocol Update

- **Use Fixed or Last Good On Error**
  - Last Good (default)
  - Fixed

- **Analysis Cycle Time –** default is "0". Normally this would be set to the number of seconds that a complete GC analysis cycle time is PLUS an additional few seconds… such as 10-15.

(**New feature**) When Log Analysis in QTRs is "Enabled" a new column is shown to the right: "Include in Log Records". By default, all components in a standard C6+ analysis are set to "Yes."



Analysis Setup | Fixed Analysis Data | Live Analysis Data | Therms Setup

	Description	Value	Include in Log Records
14.0.112	Log Analysis in QTRs	Enabled	
14.0.113	Analysis Log Average Method	Time Linear	
14.0.154	Analysis Source from	Therms	
14.1.15	Use Fixed Or Last Good On Error	Last Good	
14.1.5	Analysis Cycle Time (Seconds)	360	
	--- Configuration ---		
14.0.17	Heating Value	Use Therms	Yes
14.0.16	Relative Density	Use Therms	Yes
14.0.19	Carbon Dioxide (CO2)	Use Therms	Yes
14.0.18	Nitrogen (N2)	Use Therms	Yes
14.0.23	Methane (C1)	Use Therms	Yes
14.0.24	Ethane (C2)	Use Therms	Yes
14.0.25	Propane (C3)	Use Therms	Yes
14.0.27	Isobutane (iC4)	Use Therms	Yes
14.0.26	n-Butane (nC4)	Use Therms	Yes
14.0.29	Isopentane (iC5)	Use Therms	Yes
14.0.28	n-Pentane (nC5)	Use Therms	Yes
14.0.116	Neopentane (neoC5)	Use Therms	No
14.0.30	n-Hexane (nC6)	Use Therms	Yes
14.0.31	n-Heptane (nC7)	Use Therms	Yes
14.0.32	n-Octane (nC8)	Use Therms	Yes
14.0.33	n-Nonane (nC9)	Use Therms	No
14.0.34	n-Decane (nC10)	Use Therms	No
14.0.117	Hexane plus (C6+)	Use Therms	Yes
14.0.118	Heptane plus (C7+)	Use Therms	No
14.0.119	Nonane plus (C9+)	Use Therms	No

14.0.138

IF for some reason not all components are being analyzed or the GC is a C9+ GC, the components showing “Yes” can be modified to log only the components that the GC is capable of analyzing.

All components with a “Yes” will be logged and reflected in associated reports. Verify that all required components are selected with “Yes.”

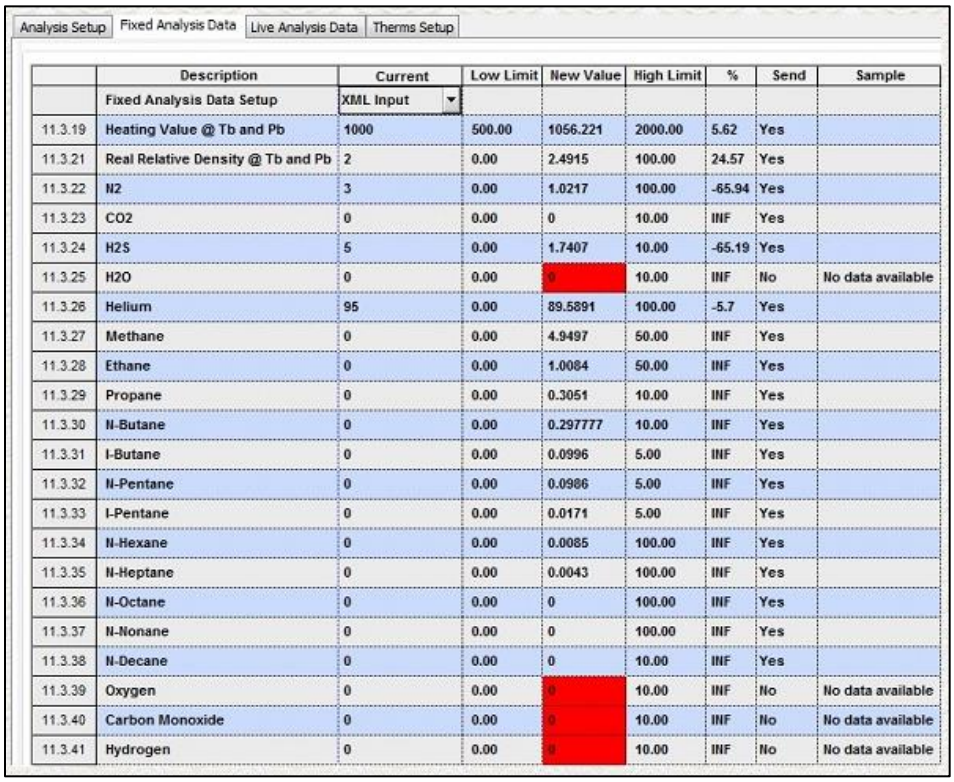
Analysis/Fixed Analysis Data

The flow computer will use the setup in this tab to calculate Energy, density and compressibility if not connected to a live analysis source such as chromatograph or analysis pushed by protocol update. If using live analysis and an error occurs, the system may “fall back” to either the last good analysis or to “Fixed Analysis”. If this occurs, the values in this

tab will then be used. If AGA8 Detailed or GERG 2008 are used for Fpv, the full analysis components must be entered and equal to 100%. The system will not accept an analysis that does not equal 100% if either of these methods are selected.

- **Fixed Analysis Data Setup** – This is the method in which the fixed analysis is updated or entered.

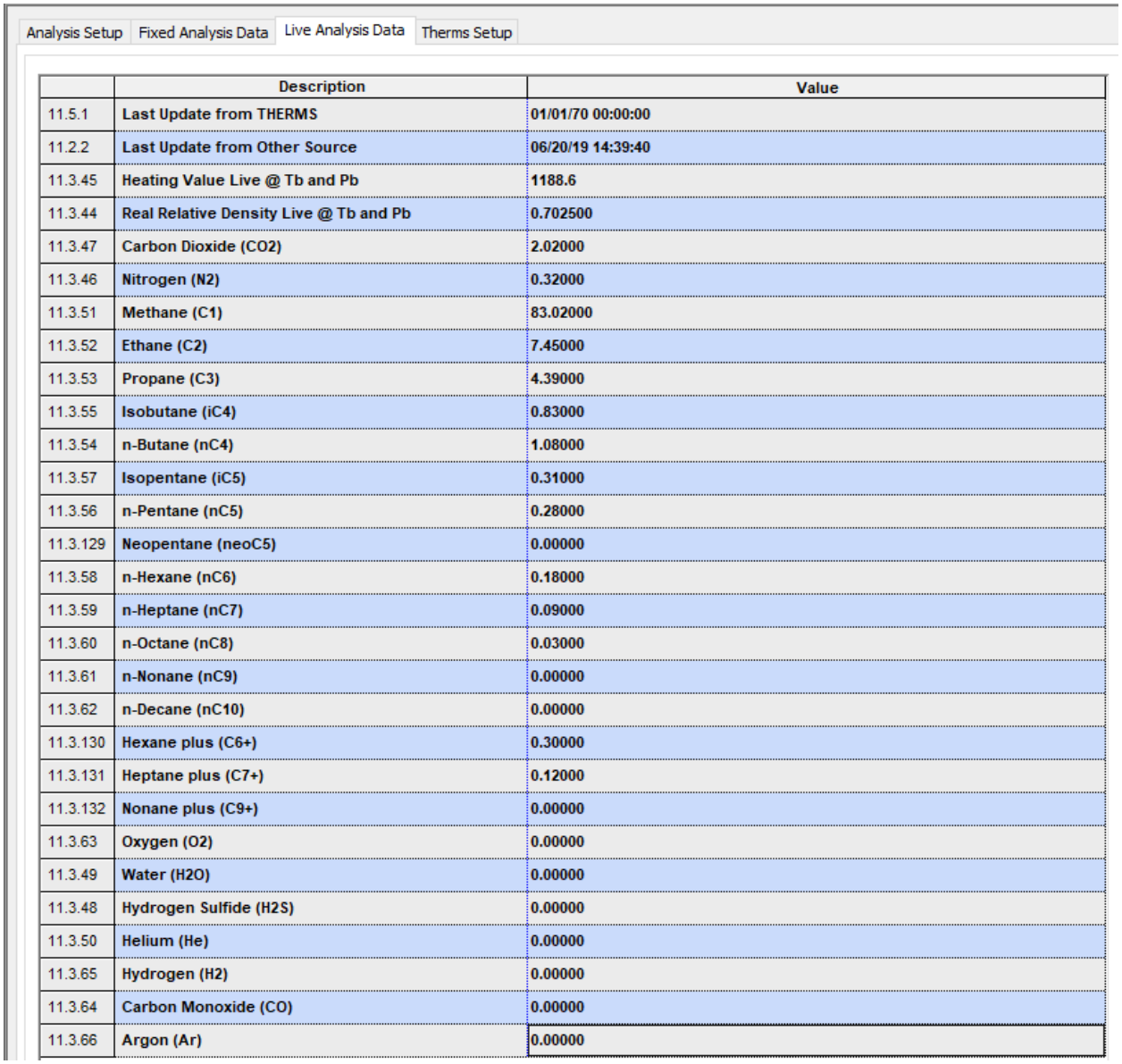
  - User Entered – user manually enters the Heating Value, the Real Relative Density, and all applicable components mole %
  - XML Import - The “XML Input” screen is an option displayed when “XML Input” is selected as the “Fixed Analysis Data Setup” option. The “XML Input” screen is used when you have an XML analysis file from an NGC such as the Totalflow Portable NGC. The file must be named "tffluidAnalysisResult.xml" and reside in the folder "xmldata" which will be a sub-folder in PCCU's main directory. If PCCU was connected to the NGC and the NGC was configured to output the XML file, the "xmldata" folder will be created automatically when PCCU receives the file. If you receive the file via other methods such as a USB drive etc., you will need to create the "xmldata" folder under the PCCU directory and copy the file there. If the XML file is available when entering the “XML Input” screen, the “New Value” column as shown below is populated with the file's component data. The “Current” column will display the measurement tube's current values.


Analysis Setup | Fixed Analysis Data | Live Analysis Data | Therms Setup

	Description	Current	Low Limit	New Value	High Limit	%	Send	Sample
	Fixed Analysis Data Setup	XML Input						
11.3.19	Heating Value @ Tb and Pb	1000	500.00	1056.221	2000.00	5.62	Yes	
11.3.21	Real Relative Density @ Tb and Pb	2	0.00	2.4915	100.00	24.57	Yes	
11.3.22	N2	3	0.00	1.0217	100.00	-65.94	Yes	
11.3.23	CO2	0	0.00	0	10.00	INF	Yes	
11.3.24	H2S	5	0.00	1.7407	10.00	-65.19	Yes	
11.3.25	H2O	0	0.00	0	10.00	INF	No	No data available
11.3.26	Helium	95	0.00	89.5891	100.00	-5.7	Yes	
11.3.27	Methane	0	0.00	4.9497	50.00	INF	Yes	
11.3.28	Ethane	0	0.00	1.0084	50.00	INF	Yes	
11.3.29	Propane	0	0.00	0.3051	10.00	INF	Yes	
11.3.30	N-Butane	0	0.00	0.297777	10.00	INF	Yes	
11.3.31	I-Butane	0	0.00	0.0996	5.00	INF	Yes	
11.3.32	N-Pentane	0	0.00	0.0986	5.00	INF	Yes	
11.3.33	I-Pentane	0	0.00	0.0171	5.00	INF	Yes	
11.3.34	N-Hexane	0	0.00	0.0085	100.00	INF	Yes	
11.3.35	N-Heptane	0	0.00	0.0043	100.00	INF	Yes	
11.3.36	N-Octane	0	0.00	0	100.00	INF	Yes	
11.3.37	N-Nonane	0	0.00	0	100.00	INF	Yes	
11.3.38	N-Decane	0	0.00	0	10.00	INF	Yes	
11.3.39	Oxygen	0	0.00	0	10.00	INF	No	No data available
11.3.40	Carbon Monoxide	0	0.00	0	10.00	INF	No	No data available
11.3.41	Hydrogen	0	0.00	0	10.00	INF	No	No data available

Analysis/Live Analysis Data

The information on this screen is read only. It will list the time of the last live analysis as well as the results of that analysis.



	Description	Value
11.5.1	Last Update from THERMS	01/01/70 00:00:00
11.2.2	Last Update from Other Source	06/20/19 14:39:40
11.3.45	Heating Value Live @ Tb and Pb	1188.6
11.3.44	Real Relative Density Live @ Tb and Pb	0.702500
11.3.47	Carbon Dioxide (CO2)	2.02000
11.3.46	Nitrogen (N2)	0.32000
11.3.51	Methane (C1)	83.02000
11.3.52	Ethane (C2)	7.45000
11.3.53	Propane (C3)	4.39000
11.3.55	Isobutane (iC4)	0.83000
11.3.54	n-Butane (nC4)	1.08000
11.3.57	Isopentane (iC5)	0.31000
11.3.56	n-Pentane (nC5)	0.28000
11.3.129	Neopentane (neoC5)	0.00000
11.3.58	n-Hexane (nC6)	0.18000
11.3.59	n-Heptane (nC7)	0.09000
11.3.60	n-Octane (nC8)	0.03000
11.3.61	n-Nonane (nC9)	0.00000
11.3.62	n-Decane (nC10)	0.00000
11.3.130	Hexane plus (C6+)	0.30000
11.3.131	Heptane plus (C7+)	0.12000
11.3.132	Nonane plus (C9+)	0.00000
11.3.63	Oxygen (O2)	0.00000
11.3.49	Water (H2O)	0.00000
11.3.48	Hydrogen Sulfide (H2S)	0.00000
11.3.50	Helium (He)	0.00000
11.3.65	Hydrogen (H2)	0.00000
11.3.64	Carbon Monoxide (CO)	0.00000
11.3.66	Argon (Ar)	0.00000

Analysis/Therms Setup

Therms setup configures the system to utilize the correct sample stream from a chromatograph and provide it to the AGA3 measurement application.

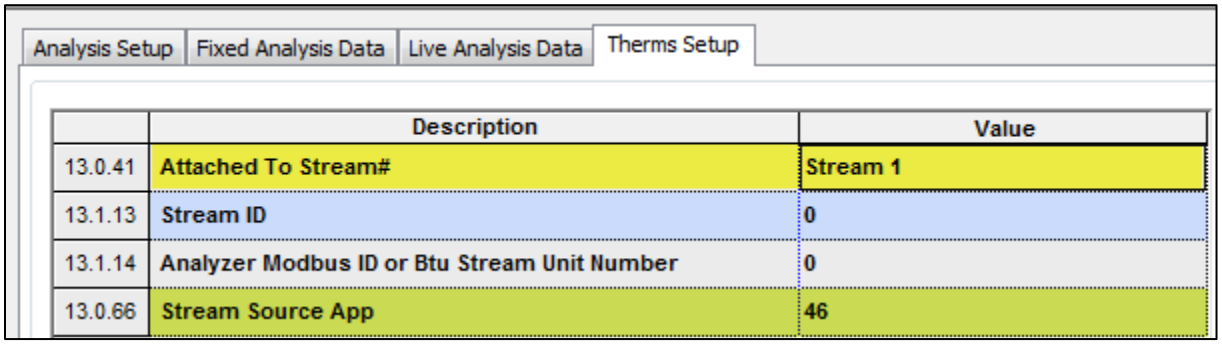
- **Attached to Stream #** - select the correct Stream number that the attached GC is analyzing.
  - None, 1, 2, 3, or 4

- **Stream ID** – this field is optional in "enhanced mode". It is a required field in the "non-enhanced" applications when the analysis QTRs were stored in a separate Analysis Trend File (in this case it was a user entered 4-digit number). Not needed when analysis is logged in the measurement applications QTRs.

- **Analyzer Modbus ID or Btu Stream Unit Number** - this field is optional in "enhanced mode". It is a required field in the "non-enhanced" applications when the analysis QTRs were stored in a separate Analysis Trend File (in this case it was the Modbus address of the GC). Not needed when analysis is logged in the measurement applications QTRs.

- **Stream Source App** - Enter the application number of the application providing the analysis information. This can be a Therms Master, Therms Slave or a Btu Stream application. A Btu Stream application only applies to a Totalflow NGC. A communications application such as a Therms Master performs the communications to the physical analyzer. This application contains the most current analysis information. It may contain multiple streams of data from an analyzer. The setup on this tab, identifies which flow computer application is the Therms or BTU application and the "Attached to Stream #" selection above, identifies which stream number and data to retrieve.

In the example below, the analysis will be obtained from a Therms/BTU app that is enabled and functional in the Flow Computers application slot # 46. The analysis will be retrieved from Stream 1. Those value will be logged and averaged as configured by the user in the "Analysis Setup" tab of the "enhanced" AGA3 or AGA7 measurement application.



Digital Outputs/Digital Output 1/Digital Output 2

Depending on the model of flow computer, the number of Digital Output tabs may vary. However, each tab has identical information.

- **Digital Output** – user must enter the Totalflow register (app.array.register) of the appropriate Digital Output

- **Volume Sampler Setpoint (MCF)** – user entered field. The DO will activate each time the volume accumulates the user enter volume. This is used to activate a composite sampler to sample the stream proportional to flowrate or could "trigger" some other device.

- **Volume Sampler 1 (MCF)** – read only. Shows the accumulated volume since previous DO action/reset. When the volume reaches the "Volume Sampler Setpoint (MCF)", the DO will trip, and the accumulator will reset.

- **Trip on Volume Sampler Setpoint** – Yes/No. If set to "Yes", the digital output will be tripped each time the Volume sampler reaches the Volume Sampler Setpoint and the volume sampler will be reset to zero.

- **Trip on DP LoLo** – Yes/No. If "Yes", the DO will trip when the differential pressure is below the LoLo alarm setpoint.

- **Trip on DP HiHi** - Yes/No. If "Yes", the DO will trip when the differential pressure is above the HiHi alarm setpoint.

- **Trip on SP LoLo** – Yes/No. If "Yes", the DO will trip when the flowing pressure is below the LoLo alarm setpoint.

- **Trip on SP HiHi** - Yes/No. If "Yes", the DO will trip when the flowing pressure is above the HiHi alarm setpoint.

- **Trip on TF LoLo** – Yes/No. If "Yes", the DO will trip when the flowing temperature is below the LoLo alarm setpoint.

- **Trip on TF HiHi** - Yes/No. If "Yes", the DO will trip when the flowing temperature is above the HiHi alarm setpoint.

- **Trip on FR LoLo** – Yes/No. If "Yes", the DO will trip when the flow rate is below the LoLo alarm setpoint.

- **Trip on FR HiHi** - Yes/No. If "Yes", the DO will trip when the flow rate is above the HiHi alarm setpoint.
- **Trip on Charger Low** - Yes/No. If "Yes", the DO will trip when the Charger voltage is below the low charger limit.

- **Trip on Digital Input** - Yes/No. If “Yes”, the DO will trip when the user assigned Digital Input is active.

- **Digital Input** – user assigned input register (app.array.register) for one of the DIs. If the assigned DI closes, it will trip the assigned Digital Output. Example: a high-level switch may activate the DI at a certain level. When the DI is active, it in turn activates the assigned DO which may cause an alarm to go off or light to flash.

- **DO Action** – Normally Open or Normally Closed. This selection determines the state of the DO when there are not ANY active conditions. User can select if the DO is normally open or normally closed.

- **Auto Reset** – Yes/No. If the selection is “Yes”, the DO will change states once the active state becomes inactive. If the selection is “No”, the DO will remain in its active state until some outside action or logic resets the state.

- **Auto Reset Delay (Secs)** – user entered field. If Auto Reset is “Yes”, the DO will remain in its active state for the number of seconds entered in this field.

- **Current State** – Read only. Shows the current state of the DO.

- **Manual Operation** – selections are Clear/Trip. This allows the user to manually activate the DO or to Clear the DO and have it return to its normal state if Auto Reset is not enabled.

RS and No Flow/Setup

This tab allows the user to configure a Digital Input to generate a “Remote Sense” alarm bit and/or cause the current measurement application to go to a “No Flow” state. An example of when this may be used: the same primary meter and sensors measure quantity from two separate parties or may be a bi-directional meter run. The flow can only be to one party and logged to one AGA3 measurement application at a time. Two measurement applications are enabled. A switch is on the valve that changes the flow from one party to the other.

Both measurement applications use the exact same inputs. Based on the configuration of this tab, if the switch on the valve is in the open position, this specific meter will show the flow. If the switch changes position, it will show “no flow”. The second measurement application would be configured similarly but require the DI action to be setup the opposite. One would have No Flow when DI is closed, the other would have No Flow when the DI is open, yet both AGA3 applications (tubes) would be sharing common DP, SP and Temperature sensors.

- **Digital Input** – user defined register (app.array.register) of the digital input to be used for logic

- **DI Action**
  - Disabled – No logic will be performed.
  - RS and No Flow on **closed** contact – If DI is in closed state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm
  - RS and No Flow on **open** contact - If DI is in open state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm
  - RS on closed contact - If DI is in closed state, the application will generate a "remote sense" alarm
  - RS on open contact - If DI is in open state, the application will generate a "remote sense" alarm

- **Flow State** – this is a read only field that will indicate the status of the measurement application based on the selections above.

Adv Setup/Setup

There are 2 new items on this tab. The user must enter the URL of the SP and DP sensor in this tab or in the **Alarms Setup Tab.** Either location will accept the entry and then reflect the value in both locations.

Static Pressure

- **Input Register** – User entered Totalflow register (app.array.register) where the flowing pressure value is located.

- **Static Pressure Type**
  - Absolute – default value. Most ABB Totalflow static pressure sensors are absolute devices. If the attached pressure sensor measures absolute pressure, select Absolute.
  - Gauge – If the attached pressure sensor measures gauge pressure, select Gauge.

- **SP URL** – This is a manually entered field and should always be entered correctly. Verify the Upper Range Limit of the attached sensor and enter that value in this field. An alarm WILL be generated when this value is exceeded, and the value shown and used in calculations will be "clipped" at 115% of this value. If 100 is entered, no values higher than 115 will be shown or used in any calculations.

Diff. Pressure

- **Input Register** – User entered Totalflow register (app.array.register) where the differential pressure value is located.

- **DP URL** – This is a manually entered field and should always be entered correctly. Verify the Upper Range Limit of the attached sensor and enter that value in this field. An alarm WILL be generated when this value is exceeded, and the value shown and used in calculations will be "clipped" at 115% of this value. If 100 is entered, no values higher than 115 will be shown or used in any calculations.

Temperature

- **Input Register** – User entered Totalflow register (app.array.register) where the flowing temperature value is located.

- **RTD Installed**
  - Yes – If selected, the temperature from the Input register above will be used in calculations and the "Use User Entered TF" will be "No."
  - No – If selected, the temperature used in calculations will be the user entered temperature and "Use User Entered TF" will be "Yes."

- **Use Fixed Temperature**
  - No – If selected, RTD installed will be "Yes" and the value from the Input register will be used in calculations.
  - Yes – If selected, RTD Installed will be "No" and User "Fixed Temperature" will be used in calculations.

- **Fixed Temperature** – User entered field for the temperature to be used if "Use Fixed Temperature" is selected. This value will also be used if the RTD or temperature reading fails when using "RTD Installed = Yes."

Speed of Sound

The Speed of Sound is calculated based on the AGA-10 specifications and is provided to the user to use as they see fit and is not used by the flow computer for any additional calculations.

- **Speed of Sound Calculation** – Disable is the default

- **Speed of Sound** – If the Speed of Sound Calculation is enabled, this field will reflect the calculated SOS in ft/sec.

AGA7 Linear Gas Measurement Application

The ABB Totalflow AGA7 application adheres to the latest AGA7 standard for calculating corrected gas volumes when obtaining inputs from a linear gas primary meter. Although the AGA7 standard, which includes much more than just volume calculations is technically for turbine meters, other linear primary meters use the same volume calculations and can be interfaced with the AGA7 gas measurement application. Ultrasonic meters and PD meters are several other types of linear gas meters that use this standard to perform gas volume calculations. AGA9 is the standard for ultrasonic primary meters, yet AGA9 states that the calculations to be used shall be the AGA7 calculations. ABB Totalflow strives to maintain backward compatibility and allow new flow computers to be utilized on sites that may have contracts that specify the use of older standards.

This application supports NX-19 as well as AGA8, GERG2008 and several others to perform the compressibility calculations. The AGA7 application will accept 3 different types of inputs. 1) Traditionally pulses have been the primary input and the flow computer has a corresponding K Factor that will convert the pulses to the proper volume at flowing conditions. 2) The AGA7 application also has the capability to accept a flow rate, either as a scaled value such as a 4-20ma signal or a digital MODBUS signal from a smart primary meter such as the ultrasonic. 3) The third option is to serially poll a smart primary meter using MODBUS and read its accumulated volume register. The ABB Totalflow can do this every second and simply take its current reading minus the previous reading to know exactly how much volume has accumulated since the previous read. With this method, even if communications are lost for some period of time, when communications are restored, the flow computer will again take its current reading minus it previous good value and accumulate the exact volume that the primary meter has accumulated.

Setup/General

- **Device/APP ID** – Field for user to enter a unique identification number for the measurement location. This is a 10-character, alpha/numeric field. Usually this ID would be used to identify the specific location throughout the customers accounting system.

- **Tube Description** – Field for user to enter unique location or description for the meter location. This is a 25-character alpha/numeric field.

- **Facility Measurement Point** – (**new feature** - optional) field for the user to enter a unique measurement point identifier. This may be used to enter the BLM FMP number, for example. This is an alpha numeric field (40 + characters) and if a number is entered, it will appear in the header of every associated report.

- **Company Name** – (**new feature** - optional) field where the user can enter a company name. Either operator or buyer, etc. This value will also be shown in the header on all associated reports.

- **Enhanced Mode – Enabled**. Once this feature is Enabled, it cannot be "dis-abled."

- **Primary Meter Type** – user selectable and informational only. This will be reflected on reports.
  - Turbine
  - Ultrasonic
  - PD
  - Other

- **Contract Hour** – user entered field to determine the hour of the day that daily volumes begin

- **Vol Calc Period (Seconds)** – 1 second and cannot be changed by the user. Full AGA7 and AGA8 calculations are performed every second.

- **Log Period** – user can select the length of the QTRs (Quantity Transaction Records)
  - 1 minute
  - 2 minutes
  - 5 minutes
  - 10 minutes
  - 15 minutes
  - 20 minutes
  - 30 minutes
  - 60 minutes (default)

- **Calculation Type** – AGA7

- **Fpv Method** – Old versions are still available selections, however, AGA8 or GERG 2008 are recommended methods.
  - NX19 fixed FtFp - Uses NX19 Gravity, Carbon Dioxide and Nitrogen method, but user must manually calculate and enter Ft and Fp.
  - NX19 GCN - Uses NX19 Gravity, Carbon Dioxide and Nitrogen method.
  - NX19 GCNM – Uses Gravity, Carbon Dioxide, Nitrogen, and Methane.
  - NX19 Auto (GCN or GCNM) - This method automatically switches to GCNM method if Gravity exceeds .75 and/or Carbon Dioxide or Nitrogen exceed 15%.
  - AGA8 Gross 92 - This is the default method when selecting the AGA3-1992 equation. It only requires the user to enter Specific Gravity, Carbon Dioxide and Nitrogen. Full analysis may be entered but the Gross Method 2 does not use the other components.
  - AGA8 Detail 92 - This method supports total analysis and one of the better traditional methods for wide range of analysis concentrations. This is now referred to as AGA8 Part 1 (Detailed) 2017.

- SGERG88 - This method adheres to the international standard ISO 12213-3. For this method to be viable, one of the following base conditions must exist:
  - 0°C / 32°F and 1.01325 bar / 14.695949 psi
  - 15°C / 59°F and 1.01325 bar / 14.695949 psi
  - 15.555556°C / 60°F and 1.01592 bar / 14.734674 psi
  - 15.555556°C / 60°F and 1.01560 bar / 14.730033 psi
- GERG 2008 – provides one of the better methods when analysis, pressures or temperatures are at extremes. This is now also referred to as AGA8 Part 2 (2017).

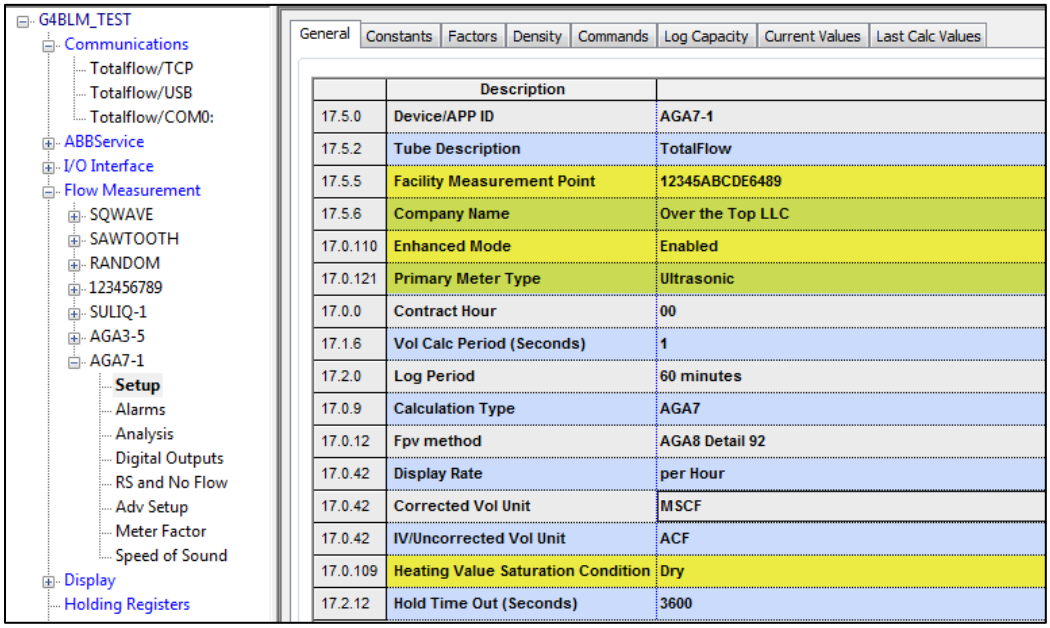
- **Display Rate** – selects the rate at which flows are displayed within the application
  - Per Hour
  - Per Day
  - Per Flow Period

- **Corrected Vol Unit** – The unit selection determines what volume unit is shown in the application for volumes at base conditions. QTRs are always logged in MSCF (standard is at base conditions).
  - SCF – standard cubic foot
  - DSCF – 10 standard cubic feet
  - CSCF – 100 standard cubic feet
  - MSCF - 1,000 standard cubic feet
  - DMSCF – 10,000 standard cubic feet
  - CMSCF – 100,000 standard cubic feet
  - MMSCF – 1,000,000 standard cubic feet

- **IV/Uncorrected Vol Unit** – The unit selection determines what volume unit is shown in the application for volume at flowing conditions. QTRs are always logged in MACF (actual is at flowing conditions).
  - ACF – actual cubic foot
  - DACF – 10 actual cubic feet
  - CACF – 100 actual cubic feet
  - MACF - 1,000 actual cubic feet
  - DMACF – 10,000 actual cubic feet
  - CMACF – 100,000 actual cubic feet
  - MMACF – 1,000,000 actual cubic feet

- **Heating Value Saturation Condition** – (**new feature**) Optional field to show the saturation condition of the analysis. This is informational only and will appear on the Characteristics report as well as create an Event record when changed.
  - Not Specified – (default) this will appear if the user does not make a selection
  - Dry
  - Saturated
  - As Delivered

- **Hold Time Out (Seconds)** – Default value is 3600. User may change the value. All measurement applications will place input values for SP and Temperature (as applicable) into a "Hold" state when entering calibration. This allows the flow computer to continue calculating with "best known" or most recent values. When the calibration mode is exited, the input values used in the calculations return to "live" values. In the event an unexpected break in communications occurs during a calibration, the hold values will automatically return to "live" values when this time out value is exceeded.



	Description	
17.5.0	Device/APP ID	AGA7-1
17.5.2	Tube Description	TotalFlow
17.5.5	Facility Measurement Point	12345ABCDE6489
17.5.6	Company Name	Over the Top LLC
17.0.110	Enhanced Mode	Enabled
17.0.121	Primary Meter Type	Ultrasonic
17.0.0	Contract Hour	00
17.1.6	Vol Calc Period (Seconds)	1
17.2.0	Log Period	60 minutes
17.0.9	Calculation Type	AGA7
17.0.12	Fpv method	AGA8 Detail 92
17.0.42	Display Rate	per Hour
17.0.42	Corrected Vol Unit	MSCF
17.0.42	IV/Uncorrected Vol Unit	ACF
17.0.109	Heating Value Saturation Condition	Dry
17.2.12	Hold Time Out (Seconds)	3600

Setup/Constants

- **Barometric Pressure Type** - **(new feature)** This will be in the Characteristics report and create an event when changed.
  - User Entered –This is the default …. User enters the appropriate barometric pressure.
  - Calculated Per NASA-TM-X-74335 – (**new feature**) This uses the user entered Elevation (feet) to calculate the theoretical barometric pressure for that specific elevation. This is one of the BLM approved methods to obtain "Barometric Pressure."

- **Location Elevation** – (**new feature**) User entered value and is required if user chooses to "calculate" the barometric pressure.

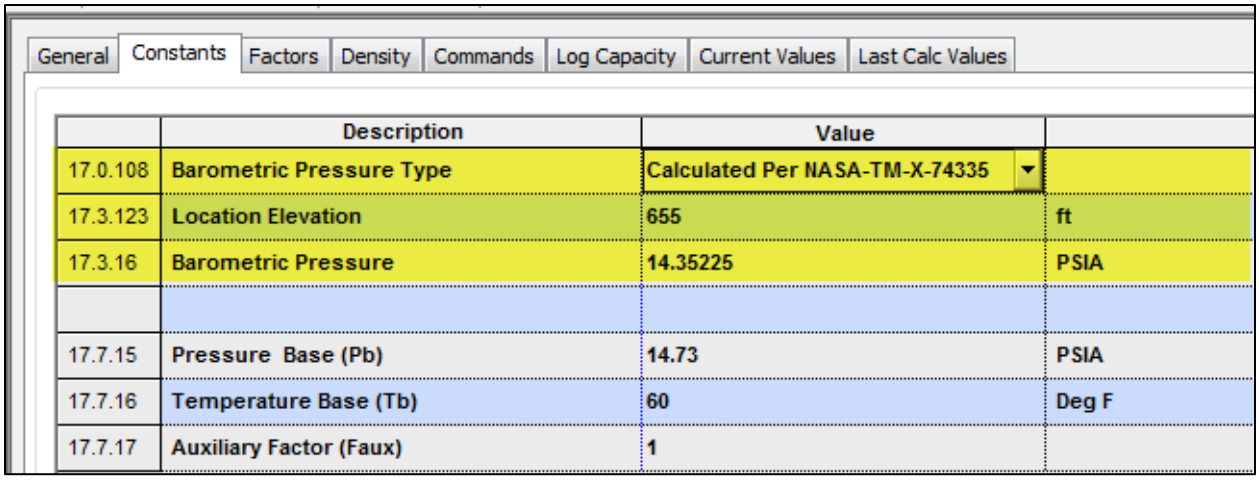
- **Barometric Pressure** – User entered value if "User Entered" is selected or the field will be calculated if "Calculated per NASA-TM-X-74335" is selected. This value will be

the default low calibration point for static pressure (absolute sensor) when in calibration mode.

- **Pressure Base (Pb)** – user entered field. The Default is 14.73. This value is defined in the contractual agreement.

- **Temperature Base (Tb)** - user entered field. The Default is 60°F. This value is defined in the contractual agreement. 60°F is normally used in the US.

- **Auxiliary Factor (Faux)** – Default value is "1" and not recommended to be changed under normal measurement conditions. The value entered here is a multiplier of the volume. If 0.95 is entered AND if the "Use Faux" under the "Factors" tab is set to "Yes", the volume will be reduced by 5%.



	Description	Value	
17.0.108	Barometric Pressure Type	Calculated Per NASA-TM-X-74335	
17.3.123	Location Elevation	655	ft
17.3.16	Barometric Pressure	14.35225	PSIA
17.7.15	Pressure Base (Pb)	14.73	PSIA
17.7.16	Temperature Base (Tb)	60	Deg F
17.7.17	Auxiliary Factor (Faux)	1	

Setup/Factors

The factors in AGA7 linear measurement are direct multipliers. Each factor enabled, adjusts the uncorrected or flowing volume for different influences.

Volume at Base Conditions = Actual volume x Fpc x Ftc x Fs x Faux

- **Use Fpc** – Yes/No. This corrects the flowing volume for pressure. The factor is obtained by dividing the flowing absolute pressure by the contract Pressure Base (Pb)
- **Use Ftc** – Yes/No. This corrects the flowing volume due to temperature. The factor is obtained by dividing the contract Temperature Base (Tb) in degrees Rankine by the flowing temperature in degrees Rankine.

- **Use Fs** – Yes/No. This corrects the flowing volume due to compressibility. The factor is obtained by squaring the super-compressibility value calculated by NX19, AGA8 or GERG. (Fpv^2).
- **Use Faux** – Additional factor that will directly modify the volume. NORMALLY this will not be used.

Setup/Density

Select one of the available sources for the density. It is highly recommended that the same source be used for BOTH base conditions and flowing conditions

- **Density at Base Conditions**
  - **Density Source** (the user should select the appropriate option based on contracts or their company's policies and procedures)
    - **Calculated from Real Relative Density** – (default) In the past, this was often referred to as "Specific Gravity." This selection results in the Real Relative Density from the "Fixed" or "Live Analysis" data section to be used to calculate the density.
    - **Calculated from AGA8 Detailed** - This selection uses the AGA8 Detail Fpv method and requires that the AGA8 Detail Fpv method be used as selected on the "General" tab. Density is then calculated using AGA8 Detailed.
    - **Calculated from GERG 2008** – (also referred to AGA8 Part 2) This selection uses the GERG 2008 Fpv method and requires that the GERG Fpv method be used as selected on the "General" tab. Density is then calculated using GERG 2008.
    - **User Entered** - Enter the value in the User Entered Density field as shown below. This selection is not recommended if any of the other methods are viable.

  - **User Entered Density** - Enter the density in "lbm/ft^3" to be used if "User Entered" was selected as the "Density Source" for base conditions.

- **Density at Flowing Conditions**

  - **Density Source** (the user should select the appropriate option based on contracts or their company's policies and procedures) It is strongly recommended to select the same Density Source for Density at Flowing Conditions as was selected for Density at Base Conditions.
    - **Calculated from Real Relative Density** – (default) In the past, this was often referred to as "Specific Gravity." This selection results in the Real

Relative Density from the “Fixed” or “Live Analysis” data section to be used to calculate the density.

- **Calculated from AGA8 Detailed** - This selection uses the AGA8 Detail Fpv method and requires that the AGA8 Detail Fpv method be used as selected on the “General” tab. Density is then calculated using AGA8 Detailed.

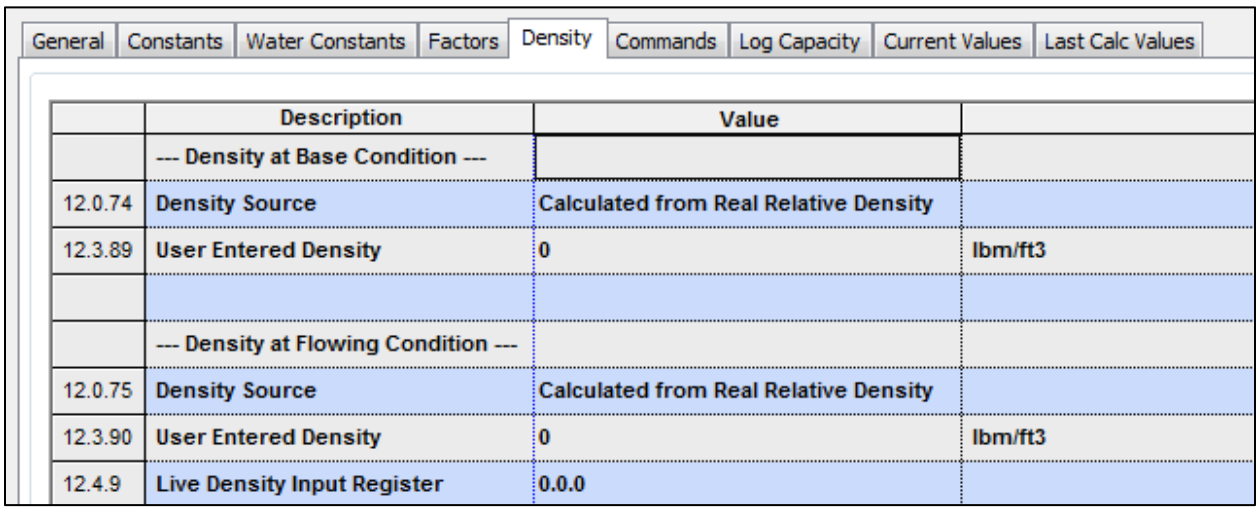
- **Calculated from GERG 2008** – (also referred to AGA8 Part 2) This selection uses the GERG 2008 Fpv method and requires that the GERG Fpv method be used as selected on the “General” tab. Density is then calculated using GERG 2008.

- **User Entered** - Enter the value in the User Entered Density field as shown below. This selection is not recommended if any of the other methods are viable

- **Live Measured** - Live Measured - This method assumes density is acquired from an external source such as a densitometer. If used, specify the app/array/register for the “Live Density Input Register.”

➢ **User Entered Density** - Enter the density in “lbm/ft^3” to be used if “User Entered” was selected as the “Density Source” for flowing conditions.

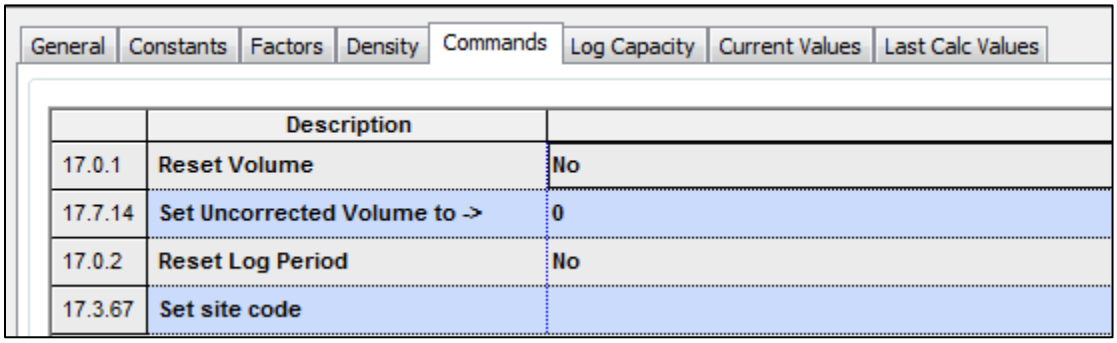
➢ **Live Density Input Register -** Specify the App/Array/Register for the source of the density value if “Live Measured” was selected as the “Density Source” for flowing conditions. If an on-board analog input or TFIO module is used for the input, the address can be found under the ***I/O Interface*** tree-view item.



	Description	Value	
	--- Density at Base Condition ---		
12.0.74	Density Source	Calculated from Real Relative Density	
12.3.89	User Entered Density	0	lbm/ft3
	--- Density at Flowing Condition ---		
12.0.75	Density Source	Calculated from Real Relative Density	
12.3.90	User Entered Density	0	lbm/ft3
12.4.9	Live Density Input Register	0.0.0	

Setup/Commands

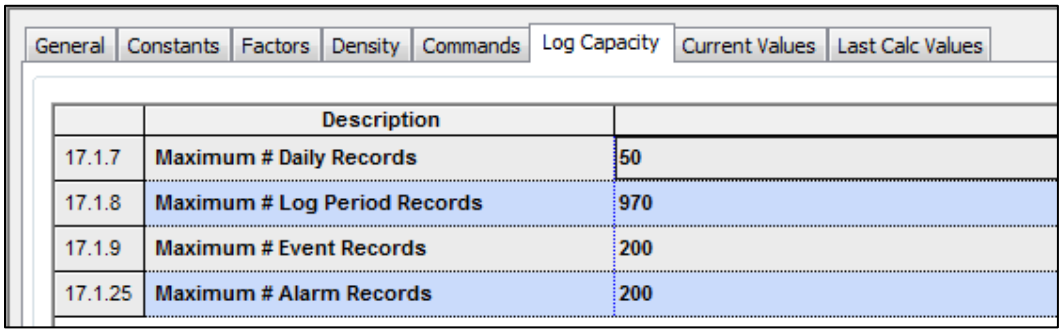
- **Reset Volume** – Yes/No. Selecting "Yes" and "Send" only zeros out the master accumulators. An event will be generated showing the value at the time of the reset and a new value of "0."
- **Set Uncorrected Volume to >** - This allows the user to "Reset Volume" to a specific value. Example may be that the user wants the flow computer accumulator to agree with dials on a PD meter.
- **Reset Log Period** – Yes/No. Selecting "Yes" and "Send" ends the current log records, "hourly" and Daily QTRs, and begins a new "hourly" and Daily QTRs. This may be a company requirement or policy to perform anytime a constant that effects the calculations is changed. An event will be generated.
- **Set site code** – user entered value. Up to seven numerical digits and a decimal point is allowed anywhere among the digits. A site code entry enters an event in the event file using the site code number. This number can represent anything to the user as some function performed at the site.



Setup/Log Capacity

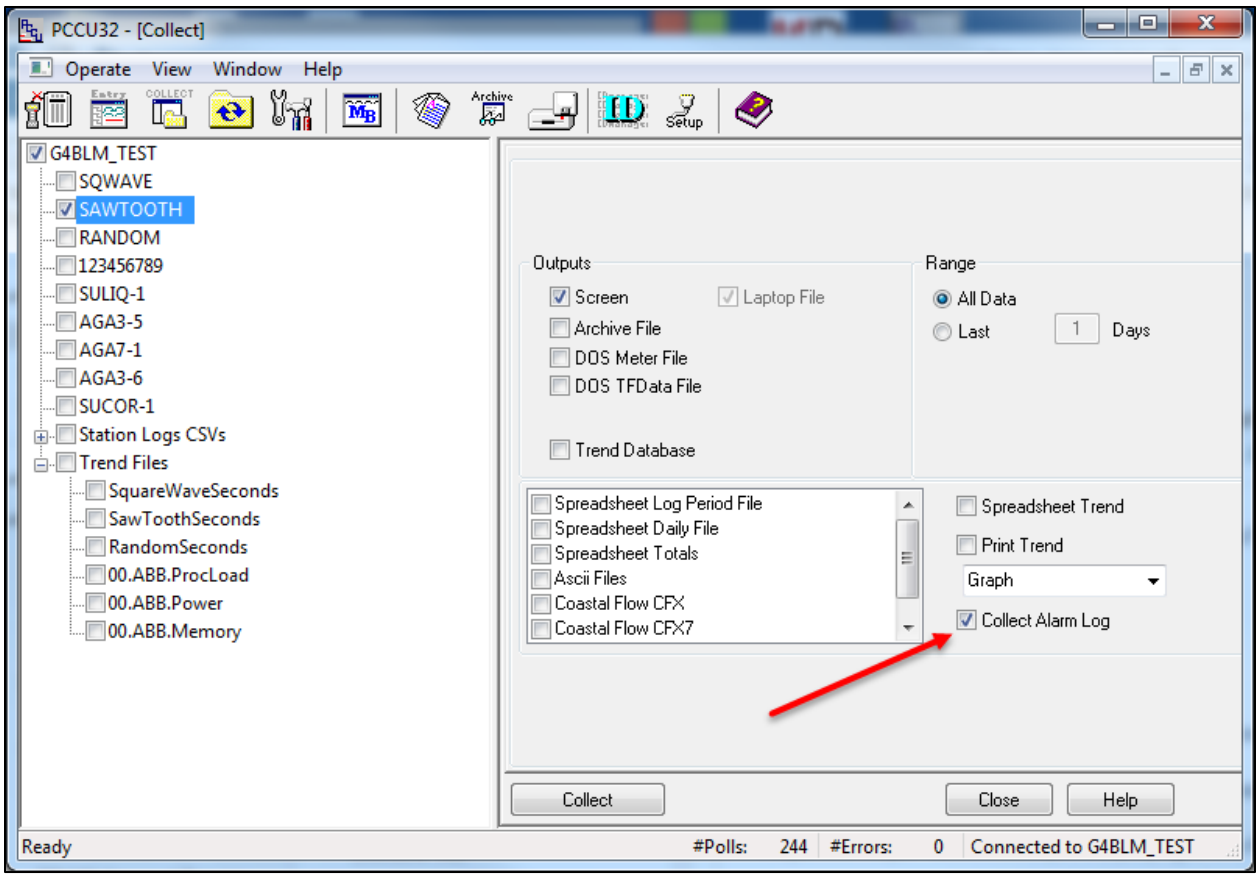
- **Maximum # Daily Records** - Enter the maximum number of Daily Records that the device is to store. The default is 50. A "Reset Log Period" will end a day record and begin a new one. Each reset will use an additional "daily" record.
- **Maximum # Log Period Records** - Enter the maximum number of Log Period Records that the device is to store. The default of 970 is recommended. 970 allows for 40 days of hourly records. One Log Period Record is used no matter what the Log Period time. A "Reset Log Period" will end a log record and begin a new one. Each reset will use an additional log record.
- **Maximum # Event Records** – (default is 200) Enter the maximum number of Event Records that the device is to store. Any change to the flow computer that may affect the calculations will create an event record.
- **Maximum # Alarm Logs** – (default is 200) (**new feature**) Many of the alarms can be "enabled" for logging. If an alarm is "enabled for logging" and the alarm is triggered

or when the alarm clears, an alarm will be logged. This log is user selectable to be included in the standard collection or not be collected.



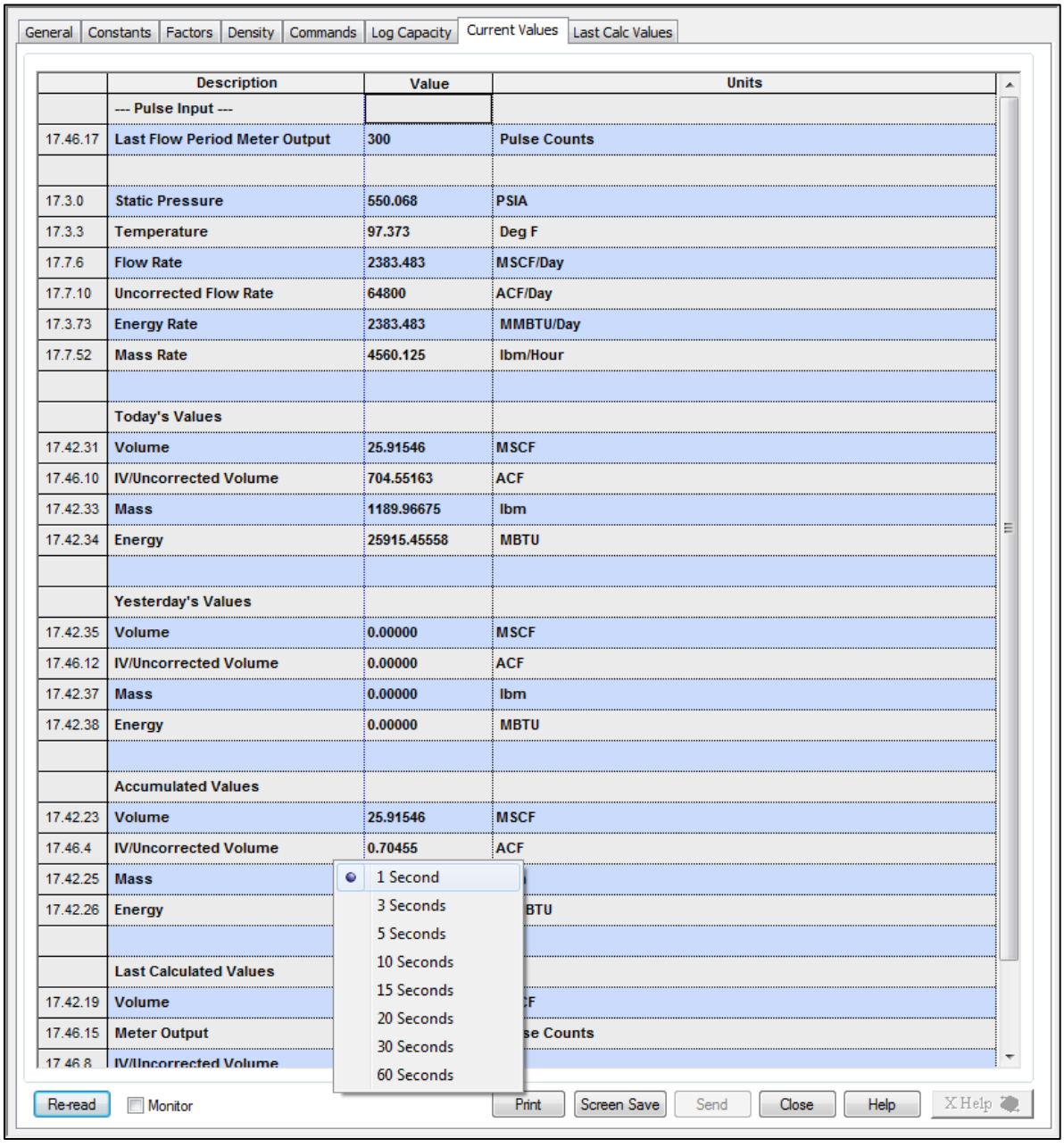
	Description	
17.1.7	Maximum # Daily Records	50
17.1.8	Maximum # Log Period Records	970
17.1.9	Maximum # Event Records	200
17.1.25	Maximum # Alarm Records	200

When collecting the flow computer data and a user wants to include the Alarm Logs in the collect, be sure to check the “Collect Alarm Log” box as shown below.



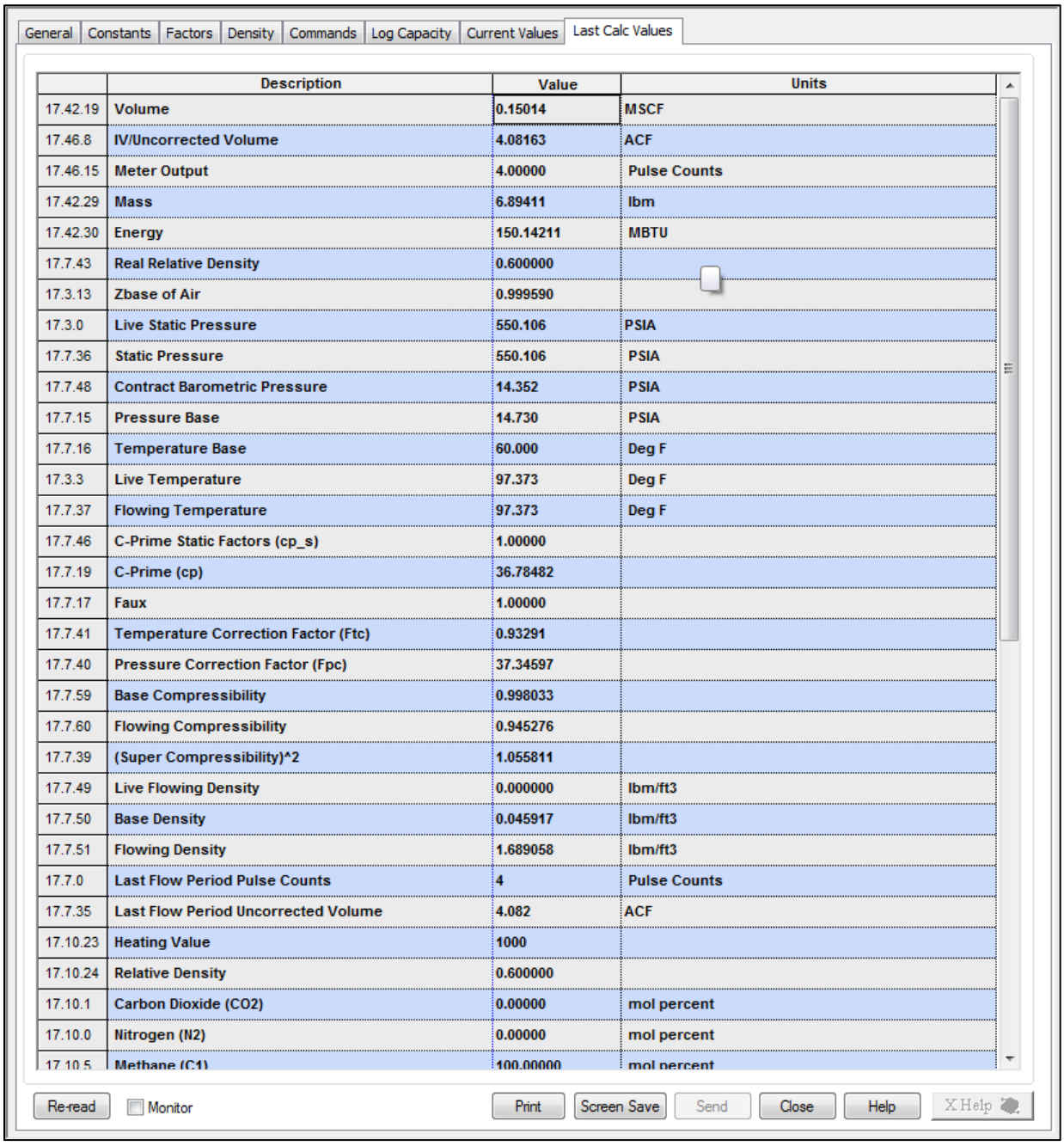
Setup/Current Values

All fields on this screen are informational (read only). When the “Monitor” box is checked, data will be updated. Hovering your mouse in the bottom bar near the “Monitor” box and right clicking, will result in a “pop up” allowing you to change the update frequency. Default is 5 seconds. This screen shows the current input values as well as calculated flow rates, today’s accumulator values, as well as Yesterday’s accumulators, values of the total accumulators, and the last seconds calculated volume/mass.



Setup/Last Calc Values

The information shown on this screen is a snapshot of the last second's inputs and calculation results. This data can be used to verify that the user properly configured the flow computer as well as to verify the flow computers calculations against 3rd party verification programs. An example of some of the available information for the last calculation period (1 second) is shown below.



	Description	Value	Units
17.42.19	Volume	0.15014	MSCF
17.46.8	IV/Uncorrected Volume	4.08163	ACF
17.46.15	Meter Output	4.00000	Pulse Counts
17.42.29	Mass	6.89411	lbm
17.42.30	Energy	150.14211	MBTU
17.7.43	Real Relative Density	0.600000	
17.3.13	Zbase of Air	0.999590	
17.3.0	Live Static Pressure	550.106	PSIA
17.7.36	Static Pressure	550.106	PSIA
17.7.48	Contract Barometric Pressure	14.352	PSIA
17.7.15	Pressure Base	14.730	PSIA
17.7.16	Temperature Base	60.000	Deg F
17.3.3	Live Temperature	97.373	Deg F
17.7.37	Flowing Temperature	97.373	Deg F
17.7.46	C-Prime Static Factors (cp_s)	1.00000	
17.7.19	C-Prime (cp)	36.78482	
17.7.17	Faux	1.00000	
17.7.41	Temperature Correction Factor (Ftc)	0.93291	
17.7.40	Pressure Correction Factor (Fpc)	37.34597	
17.7.59	Base Compressibility	0.998033	
17.7.60	Flowing Compressibility	0.945276	
17.7.39	(Super Compressibility)^2	1.055811	
17.7.49	Live Flowing Density	0.000000	lbm/ft3
17.7.50	Base Density	0.045917	lbm/ft3
17.7.51	Flowing Density	1.689058	lbm/ft3
17.7.0	Last Flow Period Pulse Counts	4	Pulse Counts
17.7.35	Last Flow Period Uncorrected Volume	4.082	ACF
17.10.23	Heating Value	1000	
17.10.24	Relative Density	0.600000	
17.10.1	Carbon Dioxide (CO2)	0.00000	mol percent
17.10.0	Nitrogen (N2)	0.00000	mol percent
17.10.5	Methane (C1)	100.00000	mol percent

Alarms/Alarm Setup

(New feature) This is a new tab and requires the user to enter set point values and "enable" alarming. The traditional "Limits" tab has been replaced with the "Alarm Setup" tab. Log reports and daily reports will still have the traditional alarm "X" s when those alarms occur. Such as zero flow (ZF), low lithium (LL), remote sense (RS), etc. The traditional alarms have only had a low and high alarm for SP, Temp, Flow rate, etc. The new alarm setup has LoLo, Lo, Hi, and HiHi alarms. As a result, the new HiHi settings will be the alarm settings that trigger the traditional Hi "X" alarms and the new LoLo settings will be the alarm settings that trigger the traditional Lo "X" alarms.

Several fields in this section require the user to enter the appropriate information. We currently do not have the ability to automatically know the SP sensor URLs (Upper Range Limits) of the possible sensors that may be utilized. As a result, the user is required to fill in these values for the URL alarming to work correctly. The Totalflow SP sensors are factory characterized to 115% of URL. If any URL value is exceeded, it will generate an alarm and another when it has "cleared." The URL and Calibrated Span alarms cannot be disabled.

Static Pressure

- **Static Pressure** – This field will reflect the current SP value (read only)

- **SP URL** – requires the user to enter the URL of the static pressure sensor. When this value is exceeded, an alarm will be generated AND when the value exceeds 115% of the URL, the "live value" used in calculations will be clipped. Example: 1000 psia URL will not exceed 1150 psia… once the pressure exceeds 1150 psia, the calculations will continue to use and log no value higher than 1150 psia. When the pressure drops below 1150 psia, the application will again use the live value.

- **SP Calibrated Span** – This value will be the same as the user entered URL value UNTIL the sensor is calibrated. Once the sensor is calibrated, this field will reflect the highest calibration point value. If this value is exceeded, an alarm will be generated. (this is a BLM requirement)

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **SP Lo Lo Alarm** – lowest pressure where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **SP Lo Alarm** – medium low pressure where an alarm would be generated. Any value less than this value will activate the alarm.

- **SP Hi Alarm** – medium high pressure where an alarm would be generated. Any value greater than this value will activate the alarm.

- **SP Hi Hi Alarm** – highest user defined pressure alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **SP Alarm GROUP (LoLo, Lo, Hi, HiHi)** – this "group function" simply enables/disables all the SP alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **SP Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **SP Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **SP Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Temperature
The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **TF Lo Lo Alarm** – lowest flowing temperature where an alarm would be generated. Any value less than this value will activate the alarm.

- **TF Lo Alarm** – medium low flowing temperature where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **TF Hi Alarm** – medium high flowing temperature where an alarm would be generated. Any value greater than this value will activate the alarm.

- **TF Hi Hi Alarm** – highest user defined temperature alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **TF Alarm GROUP (LoLo, Lo, Hi, HiHi)** – this "group function" simply enables/disables all the TF alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **TF Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **TF Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears

- **TF Deactivate Deadband (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Uncorrected Flow Rate
This is the flow rate at flowing or uncorrected conditions. The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **uFR Lo Lo Alarm** – lowest flow rate where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **uFR Lo Alarm** – medium low flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **uFR Hi Alarm** – medium high flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

- **uFR Hi Hi Alarm** – highest user defined flow rate alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **uFR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – this "group function" simply enables/disables all the FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **uFR Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **uFR Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **uFR Deactivate Deadband (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Flow Rate
This is the flow rate at base conditions. The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition.

- **FR Lo Lo Alarm** – lowest flow rate where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **FR Lo Alarm** – medium low flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **FR Hi Alarm** – medium high flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

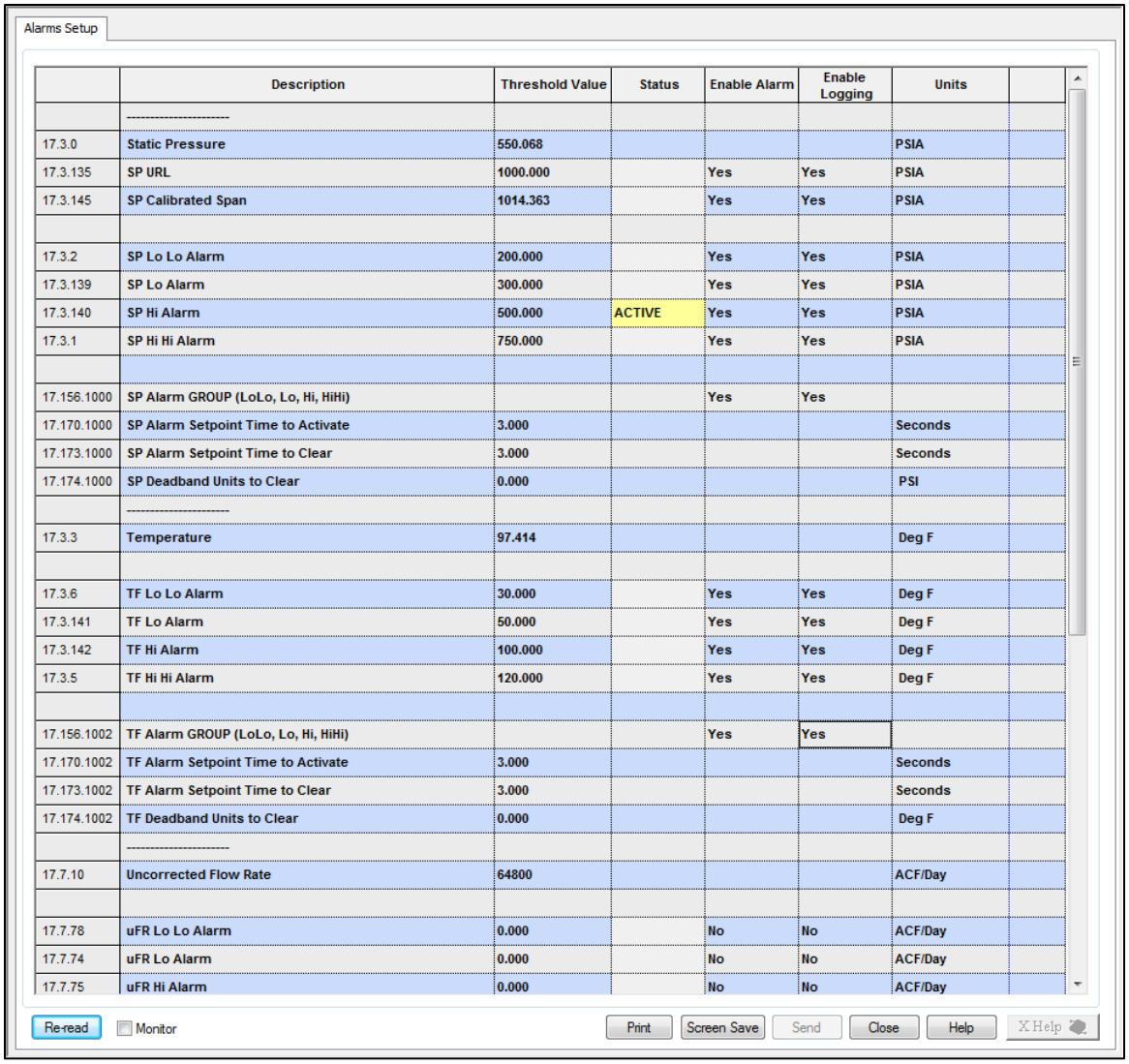
- **FR Hi Hi Alarm** – highest user defined flow rate alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **FR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – this "group function" simply enables/disables all the FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **FR Alarm Setpoint Activate Time (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **FR Alarm Setpoint Deactivate Time (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.
- **FR Deactivate Deadband (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".



	Description	Threshold Value	Status	Enable Alarm	Enable Logging	Units
	----------					
17.3.0	Static Pressure	550.068				PSIA
17.3.135	SP URL	1000.000		Yes	Yes	PSIA
17.3.145	SP Calibrated Span	1014.363		Yes	Yes	PSIA
17.3.2	SP Lo Lo Alarm	200.000		Yes	Yes	PSIA
17.3.139	SP Lo Alarm	300.000		Yes	Yes	PSIA
17.3.140	SP Hi Alarm	500.000	ACTIVE	Yes	Yes	PSIA
17.3.1	SP Hi Hi Alarm	750.000		Yes	Yes	PSIA
17.156.1000	SP Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
17.170.1000	SP Alarm Setpoint Time to Activate	3.000				Seconds
17.173.1000	SP Alarm Setpoint Time to Clear	3.000				Seconds
17.174.1000	SP Deadband Units to Clear	0.000				PSI

17.3.3	Temperature	97.414				Deg F
17.3.6	TF Lo Lo Alarm	30.000		Yes	Yes	Deg F
17.3.141	TF Lo Alarm	50.000		Yes	Yes	Deg F
17.3.142	TF Hi Alarm	100.000		Yes	Yes	Deg F
17.3.5	TF Hi Hi Alarm	120.000		Yes	Yes	Deg F
17.156.1002	TF Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
17.170.1002	TF Alarm Setpoint Time to Activate	3.000				Seconds
17.173.1002	TF Alarm Setpoint Time to Clear	3.000				Seconds
17.174.1002	TF Deadband Units to Clear	0.000				Deg F

17.7.10	Uncorrected Flow Rate	64800				ACF/Day
17.7.78	uFR Lo Lo Alarm	0.000		No	No	ACF/Day
17.7.74	uFR Lo Alarm	0.000		No	No	ACF/Day
17.7.75	uFR Hi Alarm	0.000		No	No	ACF/Day

Analysis/Analysis Setup

This tab allows the user to select the option to have the application log the current gas quality in the standard QTRs (Quantity Transaction Records). Live or Fixed can be logged along with the standard items such as SP, Temp and Volume.

- **Log Analysis in QTRs** (**new feature**)
  - Disabled (default)
  - Enabled

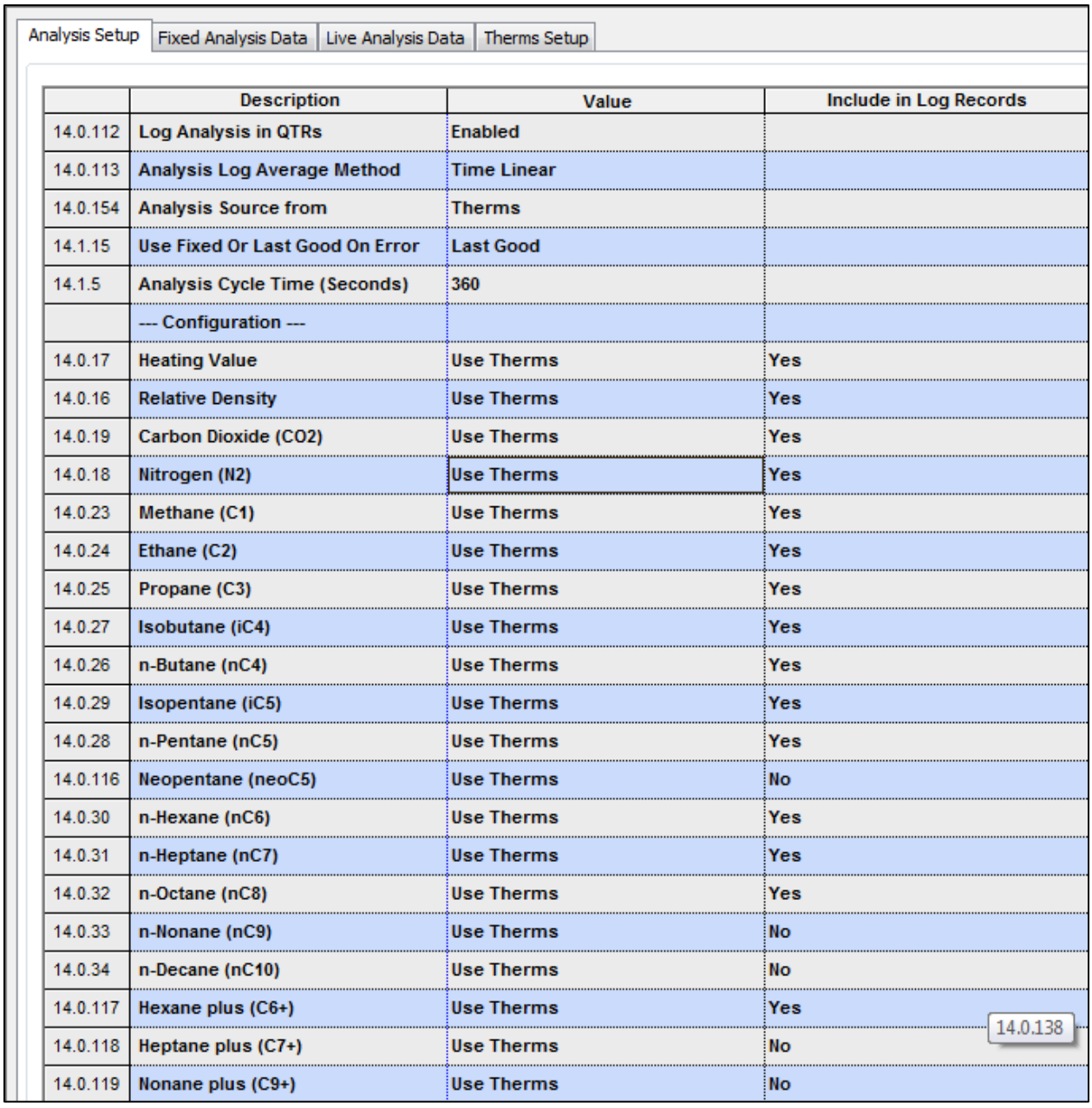
- **Analysis Log Average Method** - (defines how the analysis values are averaged when logging is enabled) (**new feature**)
  - Time Linear (Default)
  - Flow Volume Weighted

- **Analysis Source from** (**new feature**)
  - Fixed Analysis (default)
  - Therms (when connected to a gas chromatograph)
  - Protocol Update

- **Use Fixed or Last Good On Error**
  - Last Good (default)
  - Fixed

- **Analysis Cycle Time** – default is "0". Normally this would be set to the number of seconds that a complete GC analysis cycle time is PLUS an additional few seconds… such as 10-15.

(**New feature**) When Log Analysis in QTRs is "Enabled" a new column is shown to the right: "Include in Log Records". By default, all components in a standard C6+ analysis are set to "Yes". IF for some reason not all components are being analyzed or the GC is a C9+ GC, the components showing "Yes" can be modified to log only the components that the GC can analyze. All components with a "Yes", will be logged and reflected in associated reports. Verify that all required components are selected with "Yes."



Analysis Setup | Fixed Analysis Data | Live Analysis Data | Therms Setup

	Description	Value	Include in Log Records
14.0.112	Log Analysis in QTRs	Enabled	
14.0.113	Analysis Log Average Method	Time Linear	
14.0.154	Analysis Source from	Therms	
14.1.15	Use Fixed Or Last Good On Error	Last Good	
14.1.5	Analysis Cycle Time (Seconds)	360	
	--- Configuration ---		
14.0.17	Heating Value	Use Therms	Yes
14.0.16	Relative Density	Use Therms	Yes
14.0.19	Carbon Dioxide (CO2)	Use Therms	Yes
14.0.18	Nitrogen (N2)	Use Therms	Yes
14.0.23	Methane (C1)	Use Therms	Yes
14.0.24	Ethane (C2)	Use Therms	Yes
14.0.25	Propane (C3)	Use Therms	Yes
14.0.27	Isobutane (iC4)	Use Therms	Yes
14.0.26	n-Butane (nC4)	Use Therms	Yes
14.0.29	Isopentane (iC5)	Use Therms	Yes
14.0.28	n-Pentane (nC5)	Use Therms	Yes
14.0.116	Neopentane (neoC5)	Use Therms	No
14.0.30	n-Hexane (nC6)	Use Therms	Yes
14.0.31	n-Heptane (nC7)	Use Therms	Yes
14.0.32	n-Octane (nC8)	Use Therms	Yes
14.0.33	n-Nonane (nC9)	Use Therms	No
14.0.34	n-Decane (nC10)	Use Therms	No
14.0.117	Hexane plus (C6+)	Use Therms	Yes
14.0.118	Heptane plus (C7+)	Use Therms	No
14.0.119	Nonane plus (C9+)	Use Therms	No

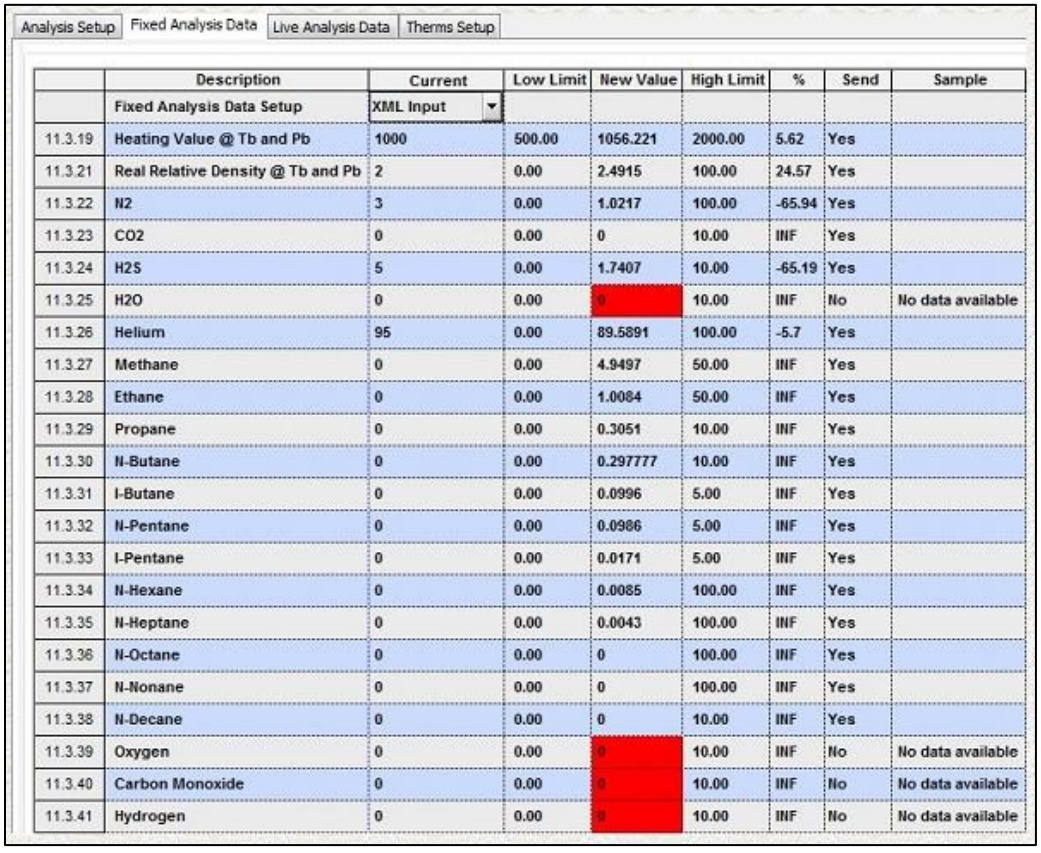
14.0.138

Analysis/Fixed Analysis Data

The flow computer will use the setup in this tab to calculate Energy, density and compressibility if not connected to a live analysis source such as chromatograph or analysis pushed by protocol update. If using live analysis and an error occurs, the system may “fall back” to either the last good analysis or to “Fixed Analysis”. If this occurs, the values in this tab will then be used. If AGA8 Detailed or GERG 2008 are used for Fpv, the full analysis

components must be entered and equal to 100%. The system will not accept an analysis that does not equal 100% if either of these methods are selected.

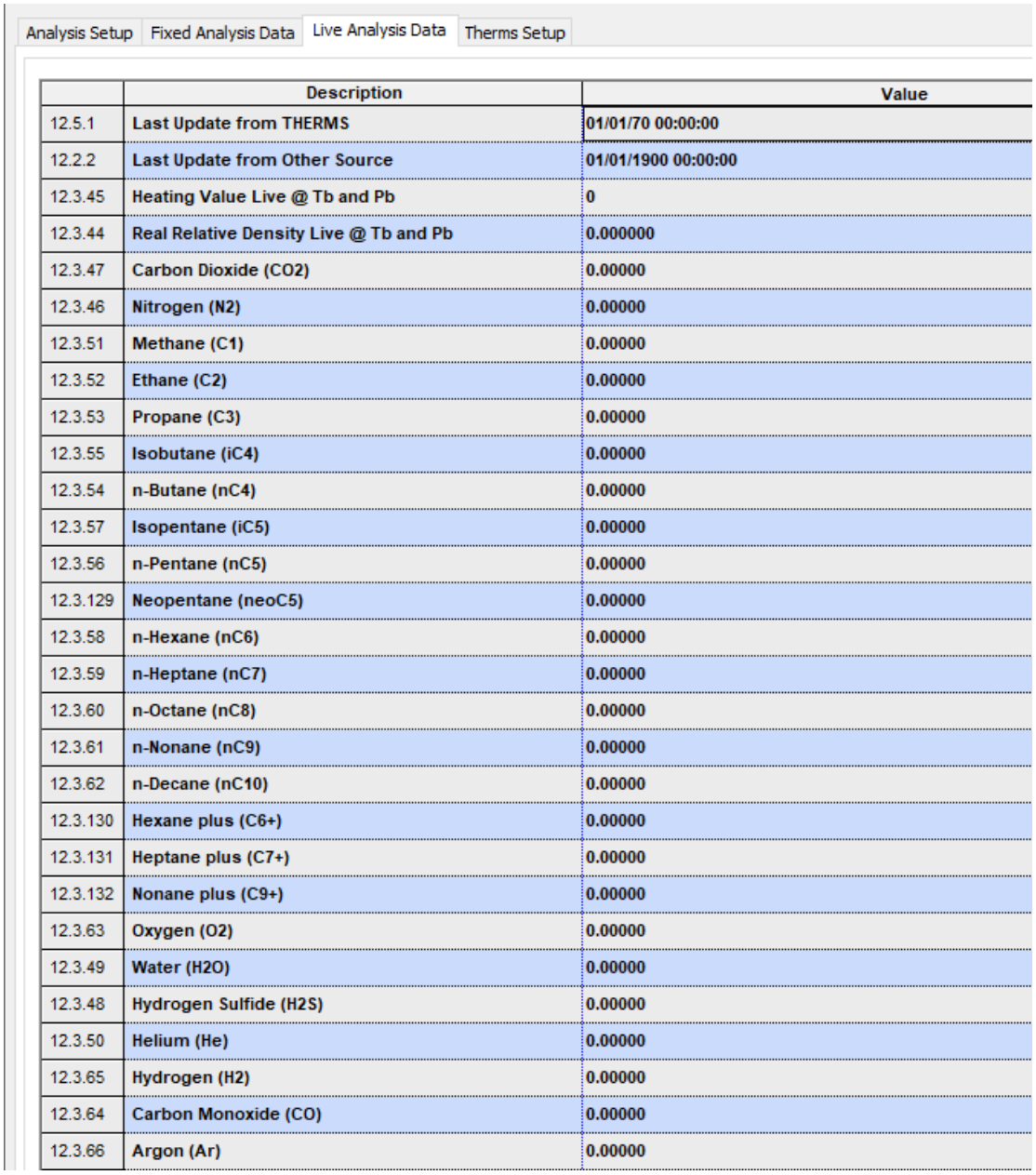
- **Fixed Analysis Data Setup** – This is the method in which the fixed analysis is updated or entered.
  - User Entered – User manually enters the Heating Value, the Real Relative Density, and all applicable components mole %.
  - XML Import - The "XML Input" screen is an option displayed when "XML Input" is selected as the "Fixed Analysis Data Setup" option. The "XML Input" screen is used when you have an XML analysis file from an NGC such as the Totalflow Portable NGC. The file must be named "tffluidAnalysisResult.xml" and reside in the folder "xmldata" which will be a sub-folder in PCCU's main directory. If PCCU was connected to the NGC and the NGC was configured to output the XML file, the "xmldata" folder will be created automatically when PCCU receives the file. If you receive the file via other methods such as a USB drive etc., you will need to create the "xmldata" folder under the PCCU directory and copy the file there. If the XML file is available when entering the "XML Input" screen, the "New Value" column as shown below is populated with the file's component data. The "Current" column will display the measurement tube's current values.



	Description	Current	Low Limit	New Value	High Limit	%	Send	Sample
	Fixed Analysis Data Setup	XML Input						
11.3.19	Heating Value @ Tb and Pb	1000	500.00	1056.221	2000.00	5.62	Yes	
11.3.21	Real Relative Density @ Tb and Pb	2	0.00	2.4915	100.00	24.57	Yes	
11.3.22	N2	3	0.00	1.0217	100.00	-65.94	Yes	
11.3.23	CO2	0	0.00	0	10.00	INF	Yes	
11.3.24	H2S	5	0.00	1.7407	10.00	-65.19	Yes	
11.3.25	H2O	0	0.00	0	10.00	INF	No	No data available
11.3.26	Helium	95	0.00	89.5891	100.00	-5.7	Yes	
11.3.27	Methane	0	0.00	4.9497	50.00	INF	Yes	
11.3.28	Ethane	0	0.00	1.0084	50.00	INF	Yes	
11.3.29	Propane	0	0.00	0.3051	10.00	INF	Yes	
11.3.30	N-Butane	0	0.00	0.297777	10.00	INF	Yes	
11.3.31	I-Butane	0	0.00	0.0996	5.00	INF	Yes	
11.3.32	N-Pentane	0	0.00	0.0986	5.00	INF	Yes	
11.3.33	I-Pentane	0	0.00	0.0171	5.00	INF	Yes	
11.3.34	N-Hexane	0	0.00	0.0085	100.00	INF	Yes	
11.3.35	N-Heptane	0	0.00	0.0043	100.00	INF	Yes	
11.3.36	N-Octane	0	0.00	0	100.00	INF	Yes	
11.3.37	N-Nonane	0	0.00	0	100.00	INF	Yes	
11.3.38	N-Decane	0	0.00	0	10.00	INF	Yes	
11.3.39	Oxygen	0	0.00	0	10.00	INF	No	No data available
11.3.40	Carbon Monoxide	0	0.00	0	10.00	INF	No	No data available
11.3.41	Hydrogen	0	0.00	0	10.00	INF	No	No data available

Analysis/Live Analysis Data

The information on this screen is read only. It will list the time of the last live analysis as well as the results of that analysis.



	Description	Value
12.5.1	Last Update from THERMS	01/01/70 00:00:00
12.2.2	Last Update from Other Source	01/01/1900 00:00:00
12.3.45	Heating Value Live @ Tb and Pb	0
12.3.44	Real Relative Density Live @ Tb and Pb	0.000000
12.3.47	Carbon Dioxide (CO2)	0.00000
12.3.46	Nitrogen (N2)	0.00000
12.3.51	Methane (C1)	0.00000
12.3.52	Ethane (C2)	0.00000
12.3.53	Propane (C3)	0.00000
12.3.55	Isobutane (iC4)	0.00000
12.3.54	n-Butane (nC4)	0.00000
12.3.57	Isopentane (iC5)	0.00000
12.3.56	n-Pentane (nC5)	0.00000
12.3.129	Neopentane (neoC5)	0.00000
12.3.58	n-Hexane (nC6)	0.00000
12.3.59	n-Heptane (nC7)	0.00000
12.3.60	n-Octane (nC8)	0.00000
12.3.61	n-Nonane (nC9)	0.00000
12.3.62	n-Decane (nC10)	0.00000
12.3.130	Hexane plus (C6+)	0.00000
12.3.131	Heptane plus (C7+)	0.00000
12.3.132	Nonane plus (C9+)	0.00000
12.3.63	Oxygen (O2)	0.00000
12.3.49	Water (H2O)	0.00000
12.3.48	Hydrogen Sulfide (H2S)	0.00000
12.3.50	Helium (He)	0.00000
12.3.65	Hydrogen (H2)	0.00000
12.3.64	Carbon Monoxide (CO)	0.00000
12.3.66	Argon (Ar)	0.00000

Analysis/Therms Setup

Therms setup configures the system to utilize the correct sample stream from a chromatograph and provide it to the AGA3 measurement application.

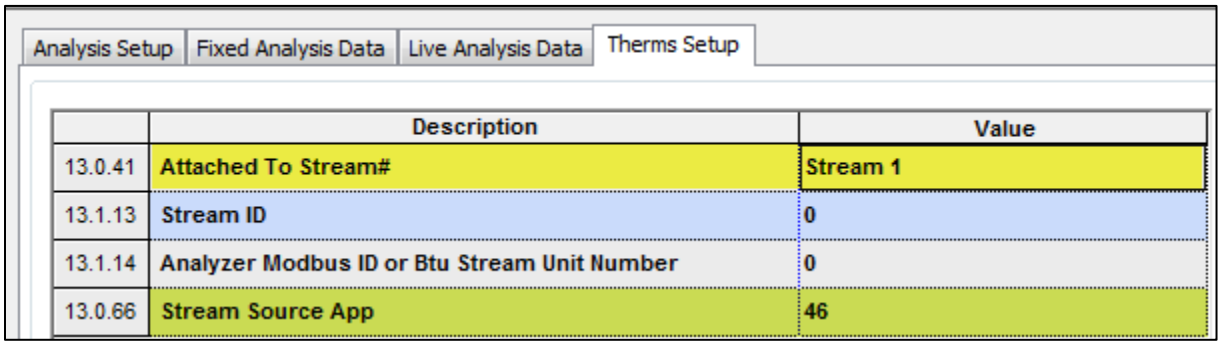
- **Attached to Stream #** - Select the correct Stream number that the attached GC is analyzing.
  - None, 1, 2, 3, or 4

- **Stream ID** –This field is optional in “enhanced mode”. It is a required field in the “non-enhanced” applications when the analysis QTRs were stored in a separate Analysis Trend File (in this case it was a user entered 4-digit number). Not needed when analysis is logged in the measurement applications QTRs.

- **Analyzer Modbus ID or Btu Stream Unit Number** - This field is optional in “enhanced mode”. It is a required field in the “non-enhanced” applications when the analysis QTRs were stored in a separate Analysis Trend File (in this case it was the Modbus address of the GC). Not needed when analysis is logged in the measurement applications QTRs.

- **Stream Source App** - Enter the application number of the application providing the analysis information. This can be a Therms Master, Therms Slave or a Btu Stream application. A Btu Stream application only applies to a Totalflow NGC. A communications application such as a Therms Master performs the communications to the physical analyzer. This application contains the most current analysis information. It may contain multiple streams of data from an analyzer. The setup on this tab, identifies which flow computer application is the Therms or BTU application and the “Attached to Stream #” selection above, identifies which stream number and data to retrieve.

  In the example below, the analysis will be obtained from a Therms/BTU app that is enabled and functional in the Flow Computers application slot # 46. The analysis will be retrieved from Stream 1. Those value will be logged and averaged as configured by the user in the “Analysis Setup” tab of the “enhanced” AGA3 or AGA7 measurement application.



Digital Outputs/Digital Output 1/Digital Output 2

Depending on the model of flow computer, the number of Digital Output tabs may vary. However, each tab has identical information.

- **Digital Output** – User must enter the Totalflow register (app.array.register) of the appropriate Digital Output.

- **Volume Sampler Setpoint (MCF)** – user entered field. The DO will activate each time the volume accumulates the user enter volume. This is used to activate a composite sampler to sample the stream proportional to flowrate.

- **Volume Sampler 1 (MCF)** – read only. Shows the accumulated volume since previous DO action/reset. When the volume reaches the "Volume Sampler Setpoint (MCF)," the DO will trip, and the accumulator will reset.

- **Trip on Volume Sampler Setpoint** – Yes/No. If set to "Yes," the digital output will be tripped each time the Volume sampler reaches the Volume Sampler Setpoint and the volume sampler will be reset to zero.

- **Trip on DP LoLo** – Yes/No. If "Yes," the DO will trip when the differential pressure is below the LoLo alarm setpoint.

- **Trip on DP HiHi** - Yes/No. If "Yes," the DO will trip when the differential pressure is above the HiHi alarm setpoint.

- **Trip on SP LoLo** – Yes/No. If "Yes," the DO will trip when the flowing pressure is below the LoLo alarm setpoint.

- **Trip on SP HiHi** - Yes/No. If "Yes," the DO will trip when the flowing pressure is above the HiHi alarm setpoint.

- **Trip on TF LoLo** – Yes/No. If "Yes," the DO will trip when the flowing temperature is below the LoLo alarm setpoint.

- **Trip on TF HiHi** - Yes/No. If "Yes," the DO will trip when the flowing temperature is above the HiHi alarm setpoint.

- **Trip on FR LoLo** – Yes/No. If "Yes," the DO will trip when the flow rate is below the LoLo alarm setpoint.

- **Trip on FR HiHi** - Yes/No. If "Yes," the DO will trip when the flow rate is above the HiHi alarm setpoint.

- **Trip on Charger Low** - Yes/No. If "Yes," the DO will trip when the Charger voltage is below the low charger limit.

- **Trip on Digital Input** - Yes/No. If "Yes," the DO will trip when the user assigned Digital Input is active.

- **Digital Input** – User assigned input register (app.array.register) for one of the DIs. If the assigned DI closes, it will trip the assigned Digital Output. Example: a high-level switch may activate the DI at a certain level. When the DI is active, it in turn activates the assigned DO which may cause an alarm to go off or light to flash.

- **DO Action** – Normally Open or Normally Closed. This selection determines the state of the DO when there are not ANY active conditions. User can select if the DO is normally open or normally closed.

- **Auto Reset** – Yes/No. If the selection is "Yes," the DO will change states once the active state becomes inactive. If the selection is "No," the DO will remain in its active state until some outside action or logic resets the state.

- **Auto Reset Delay (Secs)** – user entered field. If Auto Reset is "Yes," the DO will remain in its active state for the number of seconds entered in this field.

- **Current State** – Read only. Shows the current state of the DO.

- **Manual Operation** – Selections are Clear/Trip. This allows the user to manually activate the DO or to Clear the DO and have it return to its normal state if Auto Reset is not enabled.

RS and No Flow/Setup

This tab allows the user to configure a Digital Input to generate a "Remote Sense" alarm bit and/or cause the current measurement application to go to a "No Flow" state. An example of when this may be used: the same primary meter and sensors measure quantity from two separate parties or may be a bi-directional meter run. The flow can only be to one party and logged to one AGA7 measurement application at a time. Two measurement applications are enabled. A switch is on the valve that changes the flow from one party to the other. Both measurement applications use the exact same inputs. Based on the configuration of this tab, if the switch on the valve is in the open position, this specific meter will show the flow. If the switch changes position, it will show "no flow". The second measurement application would be configured similarly but require the DI action to be setup the opposite. One would have No Flow when DI is closed, the other would have No Flow when the DI is open, yet both AGA7 applications (tubes) would be sharing common SP and Temperature sensors.

- **Digital Input** – user defined register (app.array.register) of the digital input to be used for logic
- **DI Action**
  - Disabled – no logic will be performed

- RS and No Flow on **closed** contact – If DI is in closed state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm.
- RS and No Flow on **open** contact - If DI is in open state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm.
- RS on closed contact - If DI is in closed state, the application will generate a "remote sense" alarm.
- RS on open contact - If DI is in open state, the application will generate a "remote sense" alarm.

- **Flow State** – This is a read only field that will indicate the status of the measurement application based on the selections above.

Adv Setup

- **Input Type** – The selection chosen will be reflected in characteristics reports as well as modifying the wording for the pulse/flow rate register input. Options specific to the Input Type will be shown after selecting the applicable Input Type.
  - **Synchronous Pulse** – selection when the input is a pulse from a mechanical primary such as turbine or PD meter
  - **Manufactured Pulse** – Works the same as Synchronous but will reflect "Manufactured Pulse" in the characteristics. An example of this is an ultrasonic meter when it provides a pulse output.

    When either of the Pulse Input Types is selected, 3 fields will be shown below the topic "Pulse Input:
    - Input Register – User enters the Totalflow register (app.array.register) where the Pulse input (DI/PI) is obtained
    - No Flow Cutoff (per Flow Period) – user enters the number of pulses that if accumulated during the user defined Flow Period, are considered as "No Flow"
    - Flow Period – user entered value in seconds. If during this period, the number of pulses accumulate is equal to or less than the user entered value for "No Flow Cutoff", the pulses will not be counted and considered as "no flow"
  - **Flow rate** – This is a **new feature**. When selected, any reference to K-factor(s) will not be seen. The setup screen changes and provides the following:
    - Input register – User enters the Totalflow register (app.array.register) where the input flow rate is. May be a register from an MRB using Modbus.

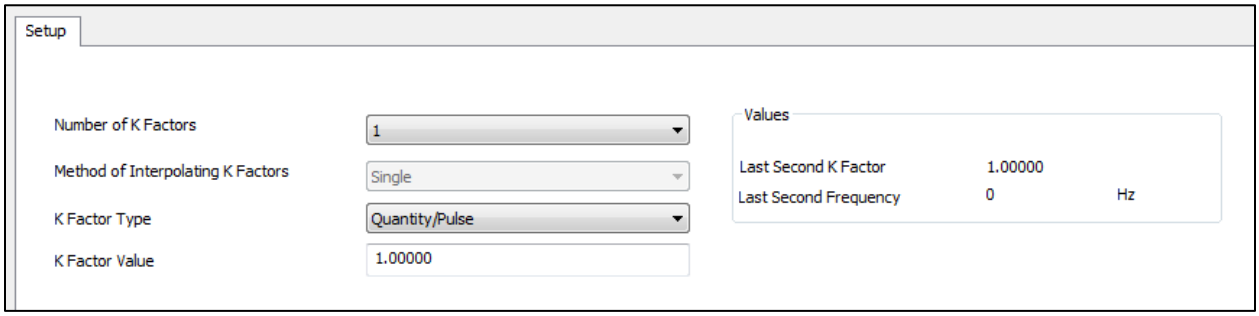
- Volume Unit – User selects what unit of measure the input register represents. It is expected to be the uncorrected flowrate or “actual” flow rate.
- Rate Unit – User selects if the flow rate represents volume per hour, per day or per second.
- No Flow Cutoff (per flow period) – User entered value in ACF… If volume is less than the user entered value over the user selected Flow Period, the application will consider it as “no flow.”
- Flow Period – User entered period in seconds. The time period is used to determine if the value accumulated over this period is true flow or should be considered “no flow”. Works with the No Flow Cutoff value.

➢ **Accumulator** – this is a **new feature**. When selected, any reference to K-factor(s) will not be shown. The flow computer will check the value in the “Input Register” (app.array.register) and subtract the previous value from the current value to determine the accumulated volume. An example for this use is a serial connection to a smart primary meter such as an Ultrasonic meter. The Modbus connection can read the meter’s accumulator value and store it in the Input Register. The EFM then reads the primary meter on a regular 1 second interval and will calculate the difference between the current value and the previous. Communications could be down for a lengthy time period and when the next good value is obtained, no actual or uncorrected volume would be missing. The hourly log may be much larger than normal, but this may be a better option to the user than losing a flow rate or pulses for an extended period.

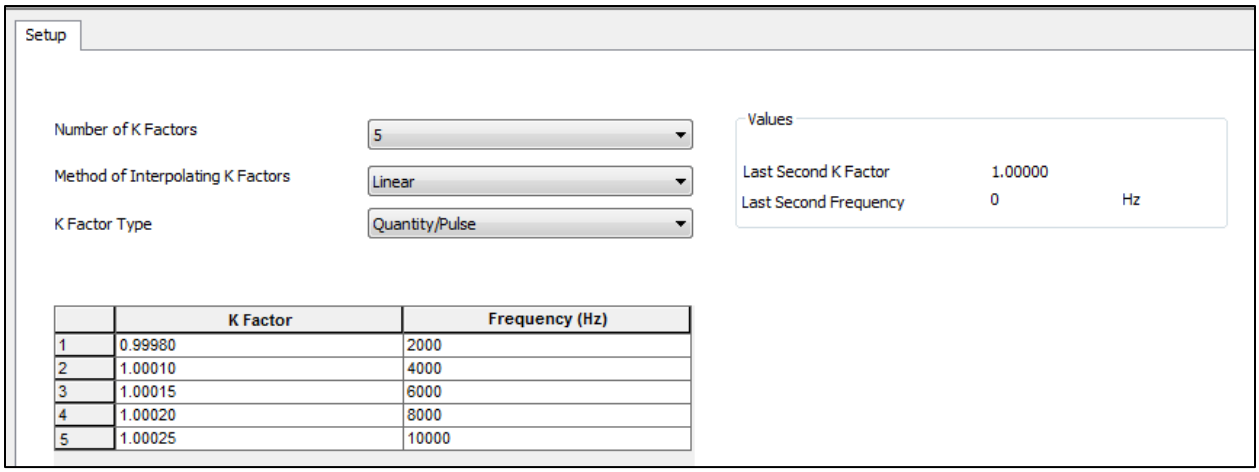
- Input Register - user enters the Totalflow register (app.array.register) where the accumulator value is. May be a register from an MRB using Modbus.
- Volume unit – is expected to be an uncorrected or actual volume unit. This must match the units that the primary meter accumulator is configured to.
- No Flow Cutoff (per flow period) – user entered value in ACF… if volume is less than the user entered value over the user selected Flow Period, the application will consider it as “no flow.”
- Flow Period – user entered period in seconds. The time period is used to determine if the value accumulated over this period is true flow or should be considered “no flow”. Works with the No Flow Cutoff value.

K Factor/Setup

This selection is ONLY available (**new feature**) IF the user selected the Input Type to be either Synchronous or Manufactured Pulse in the Adv Setup. The default will show one K Factor.



- **Number of K Factors** – user selectable from 1 to 12. When more than 1 K Factor is selected, the user will enter the appropriate K Factor for the various frequencies as applicable.



	K Factor	Frequency (Hz)
1	0.99980	2000
2	1.00010	4000
3	1.00015	6000
4	1.00020	8000
5	1.00025	10000

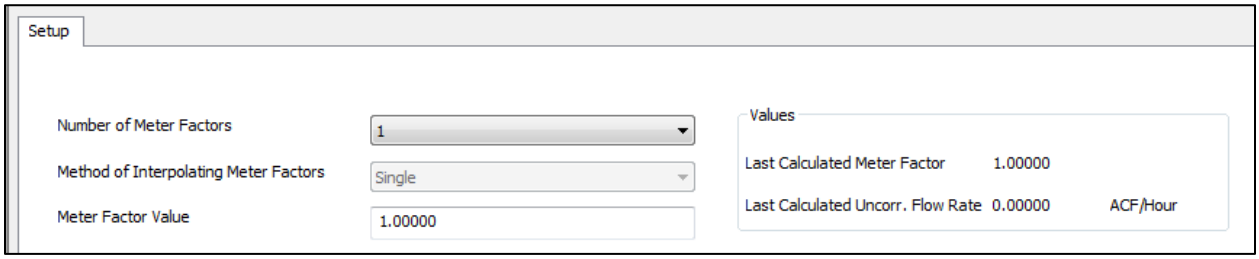
- **Method of Interpolating K Factors** – This only applies when multiple K Factors are implemented. It determines what value is used for K Factor when the pulse frequency is between 2 of the entered values.
  - Linear – default method. It will linearly extrapolate what the appropriate K Factor would be between any of the entered frequency points. In the example above, a frequency of 5000 would have a calculated K Factor of 1.000125. If you were to plot the K Factors, there would be straight lines between the K Factor points, and depending on the frequency, the K Factor would be interpolated and "fit on the plot" between the 2 K Factors.
  - Step/Range – With this method the K Factor used in calculation will always be one of the user entered K Factors. There will be no Interpolation. From 0 to half way between the 1st and 2nd K Factor, the 1st K Factor will be used. From half way between the 2nd K Factor to half way between the 2nd and 3rd K Factor, the 2nd K Factor will be used and so on…… If you were to plot the K Factors, the plot would look like steps.

- **K Factor Type**
  - Quantity/Pulse – how much volume does each pulse represent
  - Pulse/Quantity – how many pulses for each volume unit

The PCCU screen will also show to the user what the last seconds K Factor was that was used in calculations as well as the last second's frequency or number of counts in last second. This can be helpful when multiple K Factors are used to verify that the K Factor is changing as expected based on the multiple points and flow rates.

Meter Factor/Setup

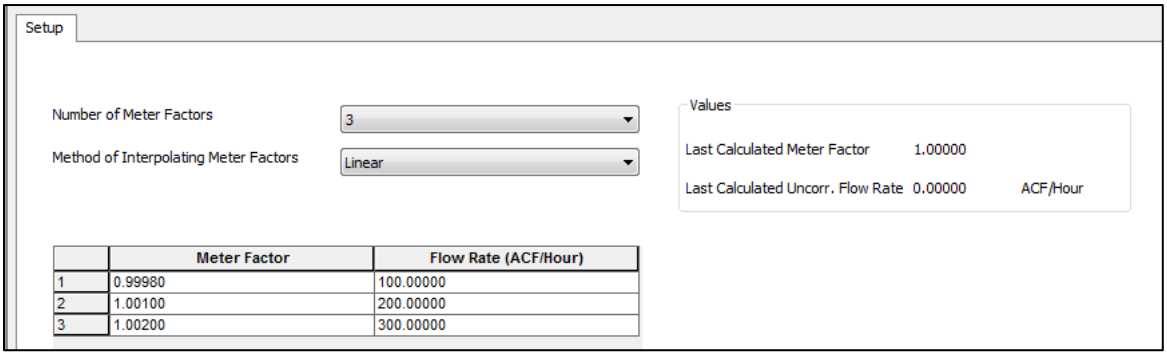
(**New feature**) By default the Meter Factor will always be "1". This section works almost identically as to how the K Factor section functions. The main difference is that K Factors are always (only) used to convert a pulse to a volume or mass. The meter factors are designed to "adjust or correct" a volume to a corrected volume as a result of comparison to a "certified" standard or flow test.



- **Number of Meter Factors** – user selectable from 1 to 12. When more than 1 Meter Factor is selected, the user will enter the appropriate Meter Factor for the various flow rates as applicable.

- **Method of Interpolating Meter Factors** – This only applies when multiple Meter Factors are implemented. It determines what value is used for Meter Factor when the uncorrected flow rate is between 2 of the entered values.
  - Linear – default method. It will linearly extrapolate what the appropriate Meter Factor would be between any of the entered flow rate points. In the example below, an **acf/Hour** flow rate of 250 **acf/Hour** would have a calculated Meter Factor of 1.0015. If you were to plot the Meter Factors, there would be straight lines between the Meter Factor points, and depending on the flow rate, the Meter Factor would be interpolated and "fit on the plot" between the 2 Meter Factors.
  - Step/Range – With this method the Meter Factor used in calculation will always be one of the user entered Meter Factors. No Interpolation will be performed. From 0 to half way between the 1st and 2nd Meter Factor, the 1st

Meter Factor will be used. From half way between the 1st and 2nd Meter Factor to half way between the 2nd and 3rd Meter Factor, the 2nd Meter Factor will be used and so on…… If you were to plot the Meter Factors, the plot would look like steps.



	Meter Factor	Flow Rate (ACF/Hour)
1	0.99980	100.00000
2	1.00100	200.00000
3	1.00200	300.00000

It is important to note that the Meter Factor is always multiplied against the uncorrected flowrate or volume. In the example above, the flow rate is in **ACF/Hour**. This is selectable, and the Meter Factor setup will change based on the user's selection for flow rate under the Adv Setup section.

Setup

	Description	Value	
17.6.7	Input Type	Flow Rate	
	--- Static Pressure ---		
17.4.0	Input Register	7.4.1	
17.0.55	Static Pressure Type	Absolute	
17.6.1	Use Fixed Static	No	
17.7.5	Fixed Static	14.73	PSIA
17.3.135	SP URL	1000.000	PSIA
	--- Temperature ---		
17.4.2	Input Register	7.4.2	
17.6.1	RTD Installed	Yes	
17.6.1	Use Fixed Temperature	No	
17.3.4	Fixed Temperature	60	Deg F
	--- Flow Rate Input ---		
17.4.11	Input Register	0.0.0	
17.6.9	Volume Unit	ACF	
17.6.10	Rate Unit	per Hour	
17.7.70	No Flow Cutoff (per Flow Period)	0.000	ACF
17.7.4	Flow Period	1	Seconds

Linear Liquid Measurement Application

The linear liquid measurement application uses the calculations from API Chapter 11 to calculate liquid volume. The application uses API 11 Physical Properties Data, Section 1 – for Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils. When Light Hydrocarbons is the selected product, the application uses API 11.2.4 for temperature correction and API 11.2.2 for pressure correction. Equilibrium vapor pressure is calculated in the application using API 11.2.5 (TP-15) when Light Hydrocarbons is selected. The application also supports water calculations using API 11.4.1 for pressure and temperature correction factors. There is a wide selection of units of volume or mass if the input is proportional to a pulse as well as a wide selection of units (volume or mass) and time intervals if the input is a flowrate. Examples are: lbs/sec, tons/day, gal/hr, bbl/day, etc.

The application is versatile and can support inputs from linear pulse meters or a digital MODBUS flowrate input from a smart primary meter if desired. The application supports either a mass input or an indicated volume input and will calculate mass if a volume input and calculate volumes if a mass input. The application supports multiple K Factors as well as multiple Meter Factors. Density can either be a live input from an analog input or a digital MODBUS input or a user entered fixed value at base conditions. Multiple units are available for Density inputs and logging. The application does not support type 3 calculations which are required when the Observed conditions are different than the Flowing conditions. As a result, the live Observed Density and Flowing density must be at the same conditions of pressure and temperature. The application is ideal for Coriolis liquid measurement, although other primary meters such as turbines, Ultrasonics, or PD meters can also be used if the observed and flowing conditions are considered the same. The application does not support user defined “batching tickets”, however a full audit trail is supported which includes user defined log period or QTRs (default is hourly) as well as daily QTRs, event records, alarm logs, and characteristics report which identifies the applications parameters. The QTRs will log opening and closing date/time, pulses or primary meter output if volume/mass, flowing pressure, flowing temperature, Indicated Volume, Gross Standard Volume, Net Standard Volume, Opening IV, Closing IV, Mass, Ctl, Cpl, Base Density, Line Density, Average Frequency, S&W Correction factor, S&W Volume, Shrinkage factor, Stock Tank Volume, Drive Gain (if a Coriolis), Observed Density, Observed Pressure, Observed Temperature, Average Meter Factor, flow time in seconds, and analysis as optional.

All averages in the QTRs are flow weighted averages, not only the pressure and temperature. (if the primary is a Coriolis and the user has selected to log Drive Gain, the log value is selectable as linear averaged, or flow weighted averaged)

Setup/General

- **Device/APP ID** – Field for user to enter a unique identification number for the measurement location. This is a 10-character, alpha/numeric field. Usually this ID would be used to identify the specific location throughout the customers accounting system.

- **Tube Description** – Field for user to enter unique location or description for the meter location. This is a 25-character alpha/numeric field.

- **Facility Measurement Point** – (**new feature** - optional) field for the user to enter a unique measurement point identifier. This may be used to enter the BLM FMP number, for example. This is an alpha numeric field (40 + characters) and if a number is entered, it will appear in the header of every associated report.

- **Company Name** – (**new feature** - optional) Field where the user can enter a company name. Either operator or buyer, etc. This value will also be shown in the header on all associated reports.

- **Enhanced Mode** – Enabled. (**new feature**) Once this feature is Enabled, it cannot be "disabled." To "disable" the user is required to delete the measurement application and re-enable the application.

- **Primary Meter Type** – (**new feature**) User selectable and informational only. This will be reflected on reports.
  - Turbine
  - Ultrasonic
  - Coriolis – When Coriolis is selected, the user is given the option of including Drive Gain in the application's QTRs. The user will need to enter the "app.array.register" where the value can be obtained. The user can also select the averaging method.
    - Drive Gain Monitor/Log in QTRs (Disabled/Enabled)
    - If Enabled
      - Drive Gain Source Register (0.0.0) – user will need to enter the register where the Drive Gain value may be obtained
      - Drive Gain Average Method – Flow Weighted or Linear. This defines how the Drive Gain values are logged.
  - PD
  - Other

- **Contract Hour** – User entered field to determine the hour of the day that daily volumes begin.

- **Vol Calc Period** – 1 second and cannot be changed by the user. Full API 11 calculations are performed every second.

- **Log Period** – User can select the length of the QTRs (Quantity Transaction Records)
  - 1 minute
  - 2 minutes
  - 5 minutes
  - 10 minutes
  - 20 minutes
  - 30 minutes
  - 60 minutes (default)

- **Flow Period (Seconds)** – For this application, it is always 1 second and not user changeable.

- **Calculation Type** – This is a calculation type identifier and this application is strictly for linear liquid measurement (mass or volume) and is identified as "API Liquid". The application uses the calculations in API 11.

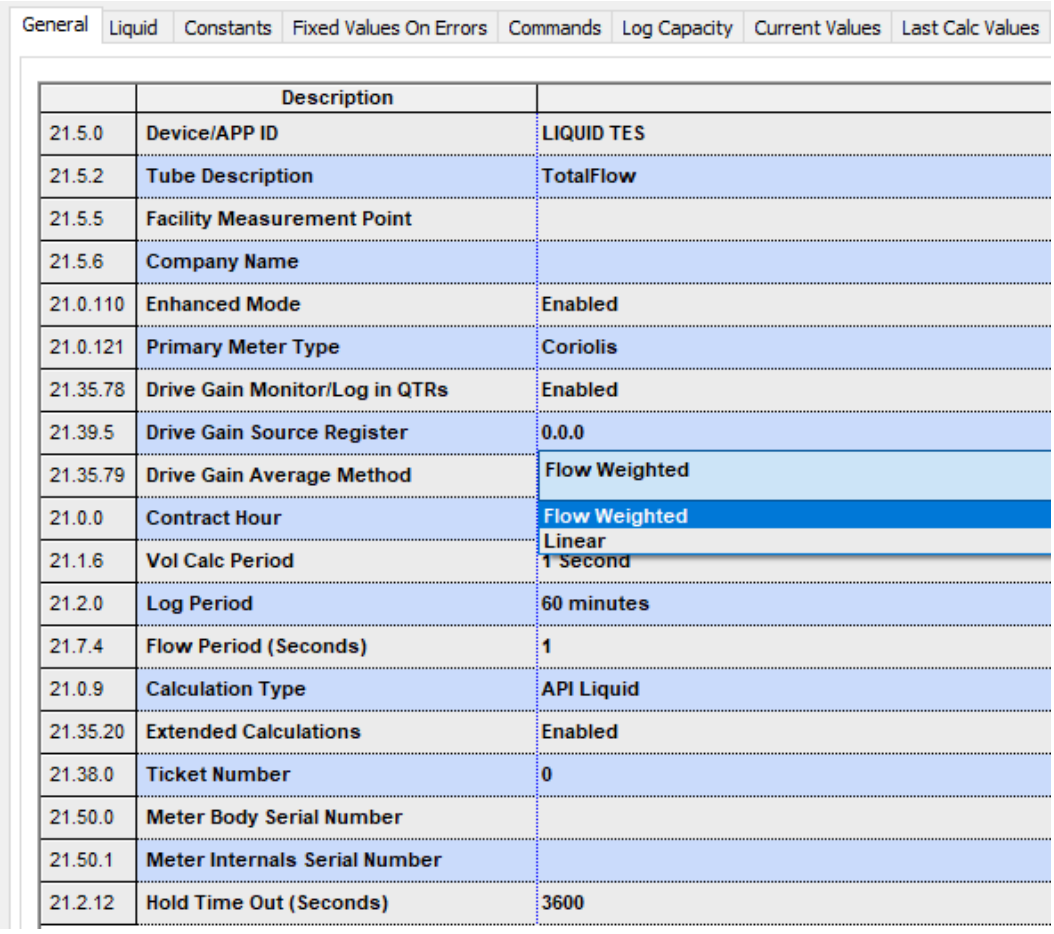
- **Extended Calculations** – Each liquid product type has specific boundaries (pressure, temperature and density) in which the calculations perform as specified within the API 11.1 standard. The options specify how the application should calculate if the boundaries are exceeded.
  - Enabled – If pressure, temperature or density limits are exceeded, the application will continue using the live values and using the constants for the applicable liquid and calculate as best the equations can. An event or alarm will be generated.
  - Disabled – If pressure, temperature or density limits are exceeded, the application will continue to use the last value as a fixed value (this could be pressure, temperature or density) until the variable returns to limits of the product and application. Example: Crude Oil boundaries for density are from 100.0 to -10.0 API Gravity (610.6 to 1163.5 kg/m^3) at base conditions. If the density drops to 605 kg/m3, the application will stop at 610.6 and continue to use 610.6 until the density increases back above 610.6 where the application will again use the "live density" if it remains within the Crude Oil boundaries. The same happens if pressure or temperature boundaries are exceeded. An event or alarm will be generated.

- **Ticket Number** – User enterable field (optional)

- **Meter Body Serial Number** – User enterable field (optional). Primary meter serial number may be entered and will be reflected on Characteristics reports.

- **Meter Internals Serial Number** - User enterable field (optional). Primary meter internal parts such as turbine assembly serial number may be entered and will be reflected on Characteristics reports.

- **Hold Time Out (Seconds)** – Default value is 3600. User may change the value. All measurement applications will place input values for SP and Temperature (as applicable) into a "Hold" state when entering calibration. This allows the flow computer to continue calculating with "best known" or most recent values. When calibration mode is exited, the input values used in the calculations return to "live" values. In the event an unexpected break in communications occurs during a calibration, the hold values will automatically return to "live" values when this time out value is exceeded.



	Description	
21.5.0	Device/APP ID	LIQUID TES
21.5.2	Tube Description	TotalFlow
21.5.5	Facility Measurement Point	
21.5.6	Company Name	
21.0.110	Enhanced Mode	Enabled
21.0.121	Primary Meter Type	Coriolis
21.35.78	Drive Gain Monitor/Log in QTRs	Enabled
21.39.5	Drive Gain Source Register	0.0.0
21.35.79	Drive Gain Average Method	Flow Weighted
21.0.0	Contract Hour	Flow Weighted / Linear
21.1.6	Vol Calc Period	1 Second
21.2.0	Log Period	60 minutes
21.7.4	Flow Period (Seconds)	1
21.0.9	Calculation Type	API Liquid
21.35.20	Extended Calculations	Enabled
21.38.0	Ticket Number	0
21.50.0	Meter Body Serial Number	
21.50.1	Meter Internals Serial Number	
21.2.12	Hold Time Out (Seconds)	3600

Setup/Liquid

- **Liquid Type** – User selectable product type. User must select the appropriate Liquid type for correct calculations
  - Crude Oil (density limits of 610.6 kg/m^3 (.61120 RD or 100.0 API) to 1163.5 kg/m^3 (1.16464 RD or -10.0 API)

- Fuel Oil (density limits of 838.3127 kg/m^3 (.83914 RD or 37.1 API) to 1163.5 kg/m^3 (1.16464 RD or -10.0 API)
- Jet Fuel (density limits of 787.5195 kg/m^3 (.798830 RD or 48.0 API) to less than 838.3127 kg/m^3 (.83914 RD or 37.1 API)
- Transition/Diesel (density limits of 770.3520 kg/m^3 (.77111 RD or 52.0 API) to less than 787.5195 kg/m^3 (.78830 RD or 48.0 API)
- Gasoline (density limits of 610.6 kg/m^3 (.61120 RD or 100.0 API) to less than 770.3520 kg/m^3 (.77111 RD or 52.0 API)
- Lube Oil (density limits of 800.9 kg/m^3 (.80169 RD or 45.0 API) to 1163.5 kg/m^3 (1.16464 RD or -10.0 API)
- Special Applications – user entered alpha 60 is required and NOT calculated
- Water – uses API 11.4.1 for Cpl and Ctl
- Light Hydros – Equilibrium vapor pressure will be calculated. API 11.2.4 is used for Ctl and API 11.2.2 for Cpl. EVP is calculated using API 11.2.5 (TP-15)

- **User Entered EVP** – currently this is not applicable for any of the products. EVP (Equilibrium vapor pressure) for Light Hydrocarbons will be automatically calculated. This field is not utilized when shown.

- **Sediment and Water Type**
  - User Entered – Default selection
  - Measured – Select this option IF a live S&W input is available and to be used to calculate the Net Standard Volume and S&W volume. If "measured" is selected, another field will appear where the user can enter the Totalflow register (app.array.register) where the value may be obtained. This value MUST be in percent.

- **Sediment and Water Percentage** – User enterable field. Example: ½% should be entered as 0.5.

- **Use Shrinkage Factor/Stock Tank Volume –** No/Yes. The default value is No. If the user selects "Yes", additional options are available and the Shrinkage factor and resulting Stock Tank Volume will be logged in the QTRs.
  - Shrinkage Factor Type
    - User Entered
      - User Entered Shrinkage Percentage – if the user wants a 9% shrinkage, they would enter "9.0". The NSV will be reduced by this percentage and the resulting volume will be logged as "Stock Tank Volume"
    - Measured
      - Shrinkage Input Register (%) (0.0.0) – the user would enter the "app.array.register" where a measured value might be located. The value in this register is assumed to be reflected in percentage. A value of "9.0" would shrink the NSV by 9 percent.

  The order of calculations and factors is:
  IV * Ctl * Cpl = ISV

ISV * MF = GSV
GSV * S&W factor = NSV
NSV * Shrinkage factor = Stock Tank Volume

- **Thermal Expansion Factor Type (Alpha60)**
  - Calculated – Default setting. This should be left at default unless the user knows a "better value" or the product is "Special Applications."
  - User Entered – Meant to be used if the product type is "Special Applications," the user will need to know what the Alpha 60 value should be.

- **User Entered Thermal Expansion Factor (Alpha60)** – User will have to know the value and enter it in this field if the Product Type is "Special Applications."

- **Density Type**
  - User Entered – User should use this option IF they do not have a live density input and they know the Density of the Product at BASE CONDITIONS. The "Flowing Density" option is not recommended. The application will work, but a user entered density is normally obtained from a sample and calculated at Base Conditions, not flowing. When this option is selected, a field is available to manually enter the density in the correct units.
    - Raw User Entered Density/Gravity – The user must manually enter the density value. Verify the units shown are appropriate or change in Selectable Units Setup.
  - Measured – This option will also show a TotalFlow register (app.array.register) field. The user will need to enter in the correct Totalflow register (app.array.register) value where the live density may be obtained. Verify that it is in the same units as reflected in the application.
    - Liquid Density Input – The user will need to know the Totalflow register (app.array.register) where this value may be obtained.

- **Density Meter Factor** – IF the measured Density has been "proven" and found that the measured density is to be corrected, a Density Meter Factor may be calculated.
  - That factor would be entered in this field IF applicable. If not, leave at the default value of "1."

- **Use Temp Correction Factor (Ctl)** – Normally this would be left at "Yes" so that the volume would be corrected due to temperature effect.

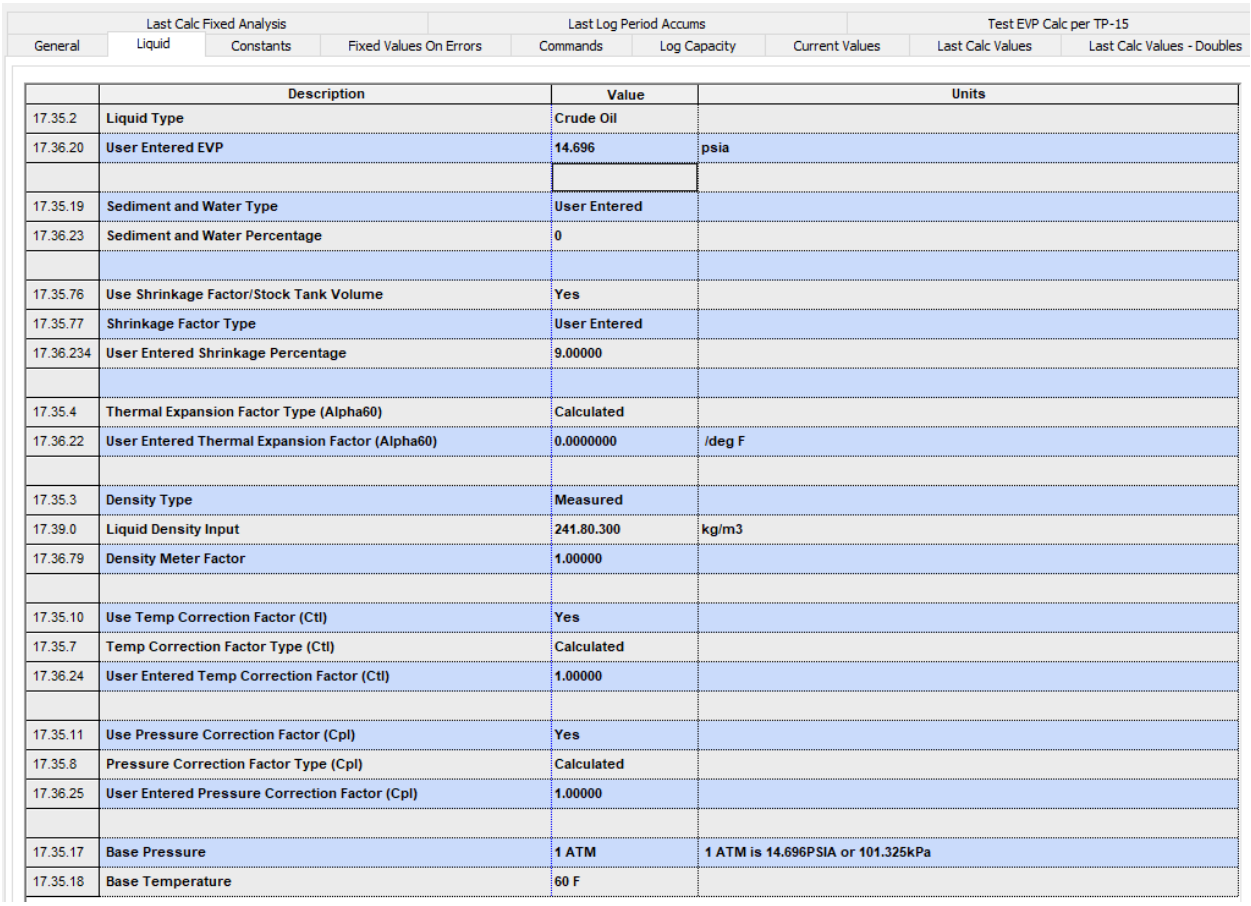
- **Temp Correction Factor Type (Ctl)** – Calculated (default) or User Entered
  - Calculated - any value in the User Entered Temp Correction Factor field will be ignored. For Crude oils, API 11.1 is used. For Light Hydrocarbons, API 11.2.4 is used.
  - User Entered Temp Correction Factor (Ctl) – If selection above is "User Entered," the user must enter the appropriate factor in this field.

- **Use Pressure Correction Factor (Cpl)** – Normally this would be left at “Yes” so that the volume would be corrected due to pressure effect.

- **Pressure Correction Factor Type (Cpl)** – Calculated (default) or User Entered
  - Calculated - any value in the User Entered Pressure Correction Factor field will be ignored. For Crude oils, API 11.1 is used. For Light Hydrocarbons, API 11.2.2 is used.
  - User Entered Pressure Correction Factor (Cpl) – If selection above is “User Entered,” the user must enter the appropriate factor in this field.

- **Base Pressure** – 1 ATM (14.696 psia) or 0 psig. Liquid is calculated at “0” psig. This field is not user changeable.

- **Base Temperature** – This field is not user changeable. 60°F



Last Calc Fixed Analysis | Last Log Period Accums | Test EVP Calc per TP-15

General | Liquid | Constants | Fixed Values On Errors | Commands | Log Capacity | Current Values | Last Calc Values | Last Calc Values - Doubles

	Description	Value	Units
17.35.2	Liquid Type	Crude Oil	
17.36.20	User Entered EVP	14.696	psia
17.35.19	Sediment and Water Type	User Entered	
17.36.23	Sediment and Water Percentage	0	
17.35.76	Use Shrinkage Factor/Stock Tank Volume	Yes	
17.35.77	Shrinkage Factor Type	User Entered	
17.36.234	User Entered Shrinkage Percentage	9.00000	
17.35.4	Thermal Expansion Factor Type (Alpha60)	Calculated	
17.36.22	User Entered Thermal Expansion Factor (Alpha60)	0.0000000	/deg F
17.35.3	Density Type	Measured	
17.39.0	Liquid Density Input	241.80.300	kg/m3
17.36.79	Density Meter Factor	1.00000	
17.35.10	Use Temp Correction Factor (Ctl)	Yes	
17.35.7	Temp Correction Factor Type (Ctl)	Calculated	
17.36.24	User Entered Temp Correction Factor (Ctl)	1.00000	
17.35.11	Use Pressure Correction Factor (Cpl)	Yes	
17.35.8	Pressure Correction Factor Type (Cpl)	Calculated	
17.36.25	User Entered Pressure Correction Factor (Cpl)	1.00000	
17.35.17	Base Pressure	1 ATM	1 ATM is 14.696PSIA or 101.325kPa
17.35.18	Base Temperature	60 F	

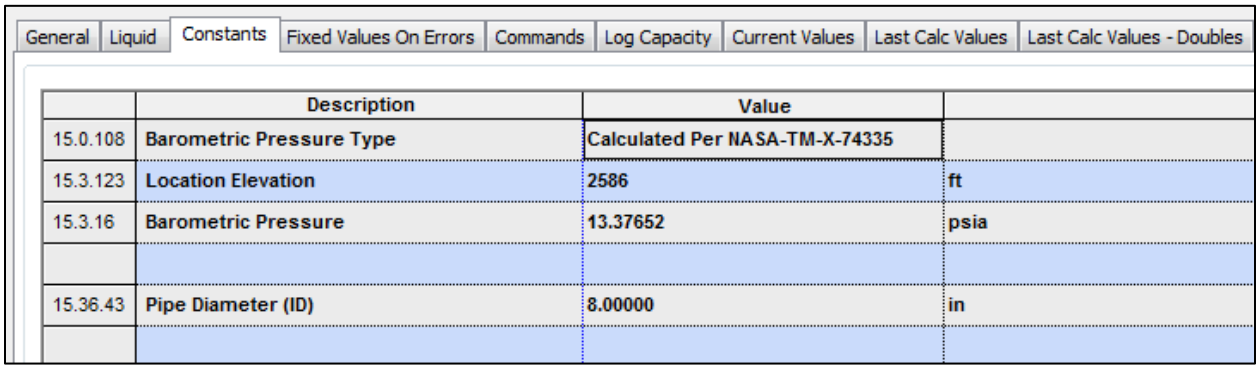
Setup/Constants

- **Barometric Pressure Type – new feature** (will be in Characteristics report and log an event when changed)
  - User Entered – This is the default …. User enters the barometric pressure.
  - Calculated Per NASA-TM-X-74335 – This uses the user entered Elevation (feet) to calculate the theoretical barometric pressure for that specific elevation. This is one of the BLM approved methods to obtain "Barometric Pressure."

- **Location Elevation** – (**new feature**) User entered value and is required if user chooses to "calculate" the barometric pressure.

- **Barometric Pressure** – User entered value if "User Entered" is selected or the field will be calculated if "Calculated per NASA-TM-X-74335" is selected.

- **Pipe Diameter (ID)** – inside pipe diameter in inches. Informational only and may be entered to show the size of meter or upstream piping.



	Description	Value	
15.0.108	Barometric Pressure Type	Calculated Per NASA-TM-X-74335	
15.3.123	Location Elevation	2586	ft
15.3.16	Barometric Pressure	13.37652	psia
15.36.43	Pipe Diameter (ID)	8.00000	in

Setup/Fixed Values on Errors

- **Use User Entered Flowing Pressure on Error** – default is "No"

- **User Entered Flowing Pressure Value** – This is a user entered field. IF the user selects "Yes" above, this value will be used in calculations IF either the High or Low-pressure values shown below are exceeded.

- **Flowing Pressure High Error** – If the user selects "Yes" above, and this value is exceeded, the calculations will use the "User Entered Flowing Pressure Value" until the pressure drops below the High Error value.

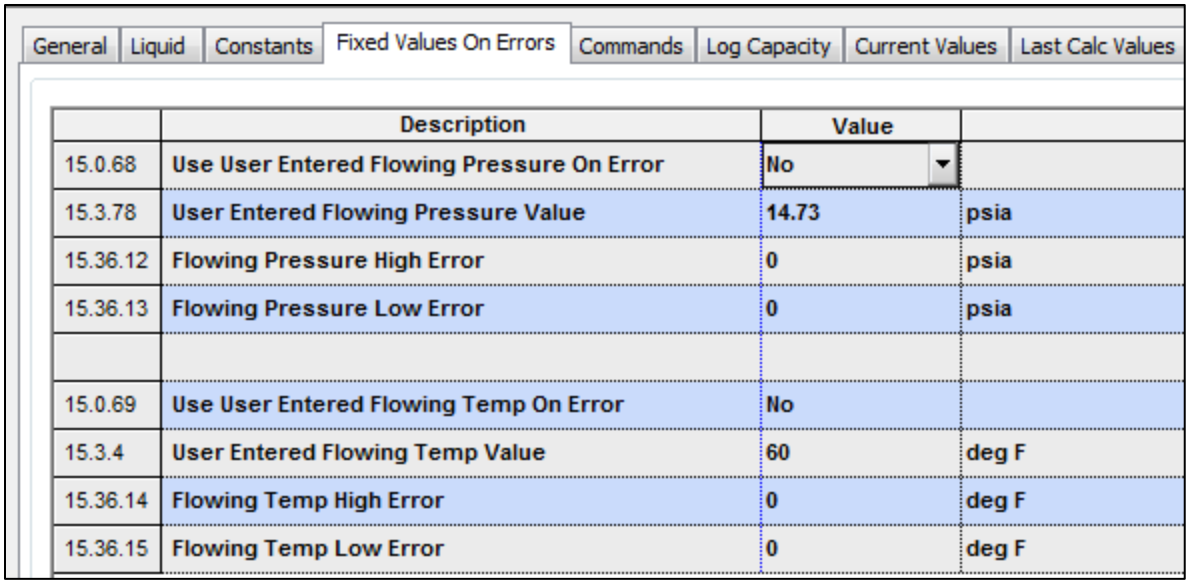
- **Flowing Pressure Low Error –** If the user selects "Yes" above, and pressure drops below this value, the calculations will use the "User Entered Flowing Pressure Value" until the pressure goes above the Low Error value.

- **Use User Entered Flowing Temp on Error –** Default is "No"

- **User Entered Flowing Temp Value –** This is a user entered field. IF the user selects "Yes" above, this value will be used in calculations IF either the High or Low temperature values shown below are exceeded.

- **Flowing Temp High Error –** If the user selects "Yes" above, and this value is exceeded, the calculations will use the "User Entered Flowing Temp Value" until the temperature drops below the High Error value.

- **Flowing Temp Low Error –** If the user selects "Yes" above, and temperature drops below this value, the calculations will use the "User Entered Flowing Temp Value" until the temperature goes above the Low Error value.



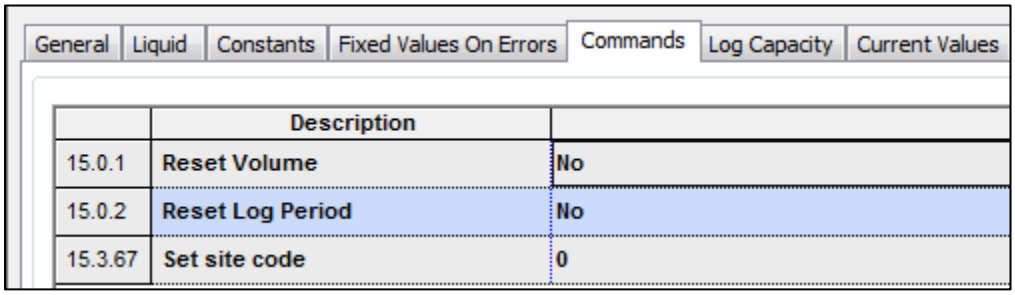
	Description	Value	
15.0.68	Use User Entered Flowing Pressure On Error	No	
15.3.78	User Entered Flowing Pressure Value	14.73	psia
15.36.12	Flowing Pressure High Error	0	psia
15.36.13	Flowing Pressure Low Error	0	psia
15.0.69	Use User Entered Flowing Temp On Error	No	
15.3.4	User Entered Flowing Temp Value	60	deg F
15.36.14	Flowing Temp High Error	0	deg F
15.36.15	Flowing Temp Low Error	0	deg F

Setup/Commands

- **Reset Volume –** Selecting "Yes" will result in resetting of the volume accumulators to "0".

- **Reset Log Period –** Selecting "Yes" will result in the ending of the current log period and day period and starting a new log period and day period.

- **Set site code** – User enterable field which will result in the value entered, being logged in the Events log. May be used to indicate some user defined action occurred at the location. Informational only.



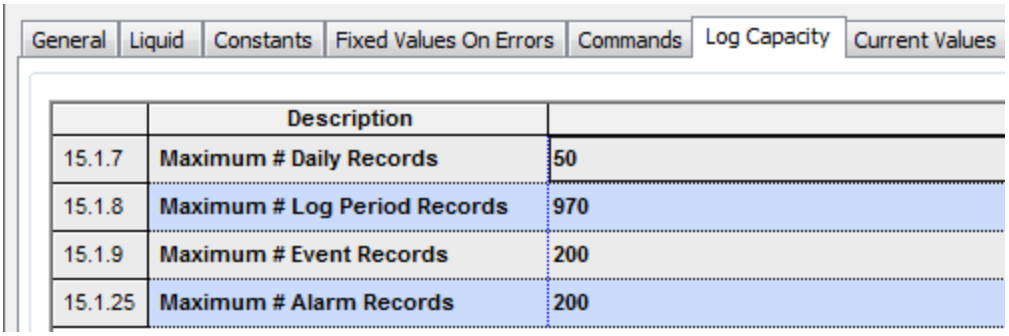
Setup/Log Capacity

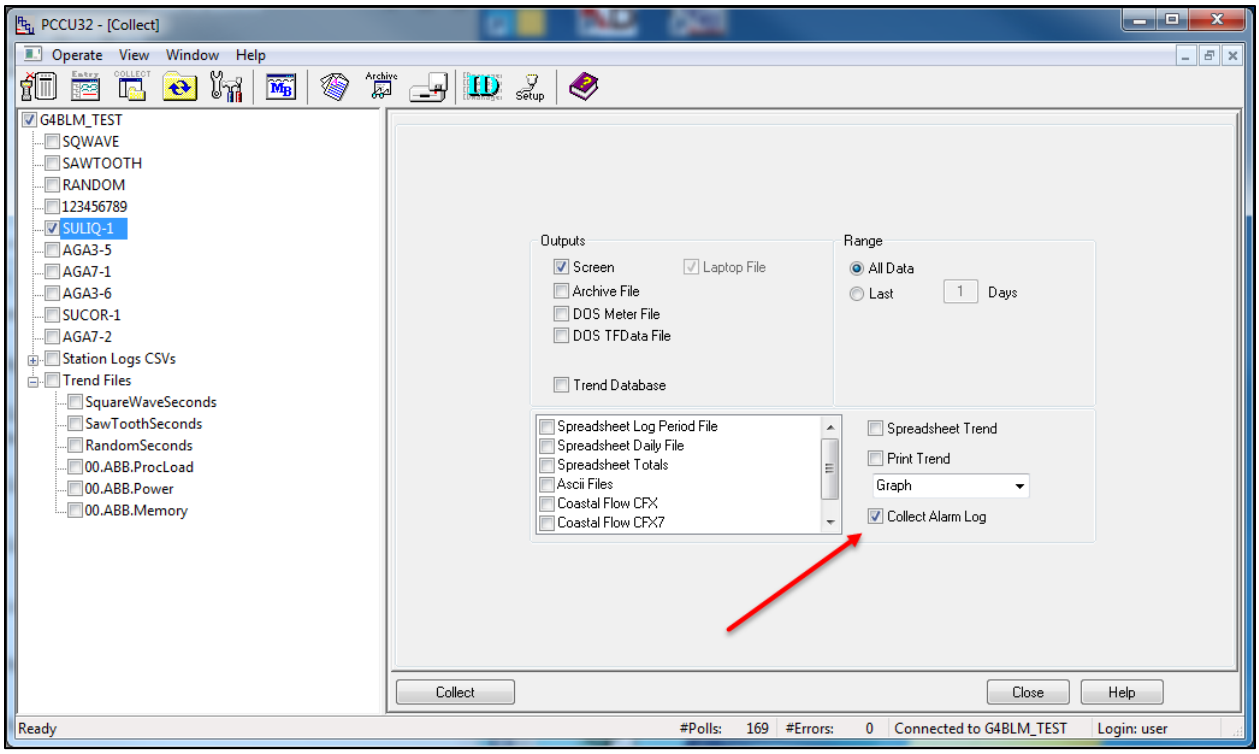
- **Maximum # Daily Records** - Enter the maximum number of Daily Records that the device is to store. The default is 50. A "Reset Log Period" will end a day record and begin a new one. Each reset will use an additional "daily" record.

- **Maximum # Log Period Records** - Enter the maximum number of Log Period Records that the device is to store. The default of 970 is recommended. 970 allows for 40 days of hourly records. One Log Period Record is used no matter what the Log Period time. A "Reset Log Period" will end a log record and begin a new one. Each reset will use an additional log record.

- **Maximum # Event Records** – (default is 200) Enter the maximum number of Event Records that the device is to store. Any change to the flow computer that may affect the calculations will create an event record.

- **Maximum # Alarm Logs** – (default is 200) (**new feature**) many of the alarms can be "enabled" for logging. If an alarm is "enabled for logging" and the alarm is triggered or when the alarm clears, an alarm will be logged. This log is user selectable to be included in the standard collection or not be collected.





Setup/Current Values

This tab allows the user to see current input values as well as various accumulators for Today, Yesterday, total accumulators and a few Last Calculated Values.

General | Liquid | Constants | Fixed Values On Errors | Commands | Log Capacity | Current Values | Last Calc Values | Last Calc Values - Doubles

	Description	Value	
	--- Current Values ---		
17.36.78	Flowing Pressure	515.000	psig
17.3.3	Flowing Temp	88.000	deg F
17.36.242	Frequency	127	Hz
	--- Today's Values ---		
17.36.52	Indicated Volume	3840.17065	Abbl
17.36.53	Indicated Standard Volume	3821.03735	bbl
17.36.54	Gross Standard Volume	3821.03735	bbl
17.36.55	Net Standard Volume	3821.03735	bbl
17.51.48	Stock Tank Volume	3818.00853	bbl
17.36.56	Sediment & Water Volume	0.00000	bbl
17.36.7	Mass	537.98834	USton
	--- Yesterday's Values ---		
17.36.57	Indicated Volume	5805.71387	Abbl
17.36.58	Indicated Standard Volume	5761.73682	bbl
17.36.59	Gross Standard Volume	5761.73682	bbl
17.36.60	Net Standard Volume	5761.73682	bbl
17.51.49	Stock Tank Volume	5211.81957	bbl
17.36.61	Sediment & Water Volume	0.00000	bbl
17.36.8	Mass	812.81256	USton
	--- Accumulated Values ---		
17.36.47	Indicated Volume	597439.625	Abbl
17.36.48	Indicated Standard Volume	593005.5	bbl
17.36.49	Gross Standard Volume	593005.5	bbl
17.36.50	Net Standard Volume	593005.5	bbl
17.51.47	Stock Tank Volume	353840.67894	bbl
17.36.51	Sediment & Water Volume	0.00000	bbl
17.36.9	Mass	83697.17188	USton
	--- Last Calculated Values ---		

Setup/Last Calc Values and Last Calc Values – Doubles

The two tabs provide basically the same information. The Doubles tab provides the user the values at a much higher resolution (more decimals that are significant) and may be used to verify more precisely the flow computers calculations.

Both tabs provide information and calculated results from the last second's calculations. They also show if the calculations had an error or if multiple iterations during calculations did not converge. This may occur if the product properties of pressure, temperature or density exceed parameters of the applications calculations.

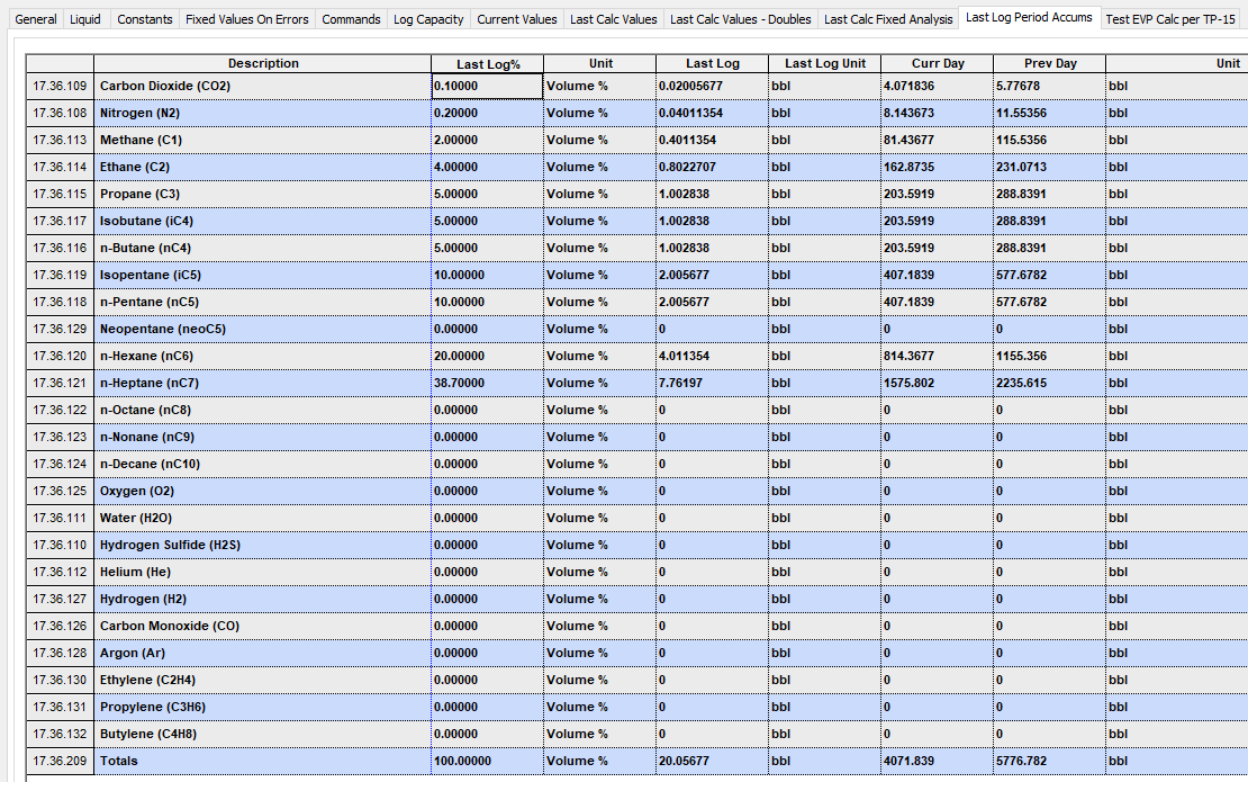
The screenshot below is of a Light Hydrocarbon. Notice that the Equilibrium Vapor pressure is calculated and reflected near the bottom of the screenshot.

General | Liquid | Constants | Fixed Values On Errors | Commands | Log Capacity | Current Values | Last Calc Values | Last Calc Values - Doubles

	Description	Value	
18.51.34	Indicated Flow Rate	419.99995859	Abbl/dy
18.51.35	Indicated Standard Flow Rate	548.31437839	bbl/dy
18.51.36	Gross Standard Flow Rate	480.61948809	bbl/dy
18.51.37	Net Standard Flow Rate	480.61948809	bbl/dy
18.51.38	Sediment and Water Flow Rate	0.00000000	bbl/dy
18.36.6	Mass Flow Rate	32.228	USton/dy
18.51.9	Indicated Volume	0.20416660	AUSgal
18.51.10	Indicated Standard Volume	0.26654165	USgal
18.51.11	Gross Standard Volume	0.23363442	USgal
18.51.12	Net Standard Volume	0.23363442	USgal
18.51.13	Sediment and Water Volume	0.00000000	USgal
18.51.0	Mass	0.74601282	lbm
18.51.15	Temperature Correction Factor (Ctl)	1.2924772181	
18.51.16	Pressure Correction Factor (Cpl)	1.0100839962	
18.51.17	Combined T and P Factor (Ctpl)	1.3055105534	
18.51.18	Compressibility Factor (Fp)	0.0000268118	/psig
18.51.19	Thermal Expansion Factor (Alpha60)	0.0000000000	/deg F
18.51.41	Temperature at 1968 Standard (Tf68)	-49.0160339867	deg F
18.51.42	Temperature at 1990 Standard (Tf90)	-49.0000000000	deg F
18.51.39	Base Density	0.3829919289	RelDen
18.51.40	Flowing Density	0.5000000000	RelDen
18.51.44	Observed Density	0.5000000000	RelDen
18.36.69	Pipe Diameter (ID)	8.00000	in
18.51.14	Sediment and Water Correction Factor	1.00000000	
18.36.67	Equilibrium Vapor Pressure	99.652	psia
18.35.15	Density Iteration	Converged	
18.35.16	Volume Correction Error Code	No Error	

Setup/Last Log Period Accums **(new feature)**

This tab is provided IF the user chose to log fixed analysis information. The application has the ability to use either the Volume % or the Mass % of each component and using a FIXED analysis, calculate either the volume % or the mass % of each component for the current day and previous day and reflect those values on this tab.



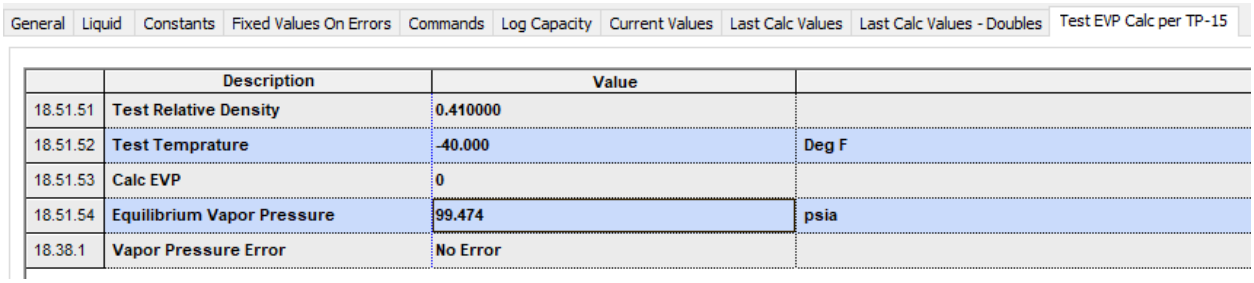
General | Liquid | Constants | Fixed Values On Errors | Commands | Log Capacity | Current Values | Last Calc Values | Last Calc Values - Doubles | Last Calc Fixed Analysis | Last Log Period Accums | Test EVP Calc per TP-15

	Description	Last Log%	Unit	Last Log	Last Log Unit	Curr Day	Prev Day	Unit
17.36.109	Carbon Dioxide (CO2)	0.10000	Volume %	0.02005677	bbl	4.071836	5.77678	bbl
17.36.108	Nitrogen (N2)	0.20000	Volume %	0.04011354	bbl	8.143673	11.55356	bbl
17.36.113	Methane (C1)	2.00000	Volume %	0.4011354	bbl	81.43677	115.5356	bbl
17.36.114	Ethane (C2)	4.00000	Volume %	0.8022707	bbl	162.8735	231.0713	bbl
17.36.115	Propane (C3)	5.00000	Volume %	1.002838	bbl	203.5919	288.8391	bbl
17.36.117	Isobutane (iC4)	5.00000	Volume %	1.002838	bbl	203.5919	288.8391	bbl
17.36.116	n-Butane (nC4)	5.00000	Volume %	1.002838	bbl	203.5919	288.8391	bbl
17.36.119	Isopentane (iC5)	10.00000	Volume %	2.005677	bbl	407.1839	577.6782	bbl
17.36.118	n-Pentane (nC5)	10.00000	Volume %	2.005677	bbl	407.1839	577.6782	bbl
17.36.129	Neopentane (neoC5)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.120	n-Hexane (nC6)	20.00000	Volume %	4.011354	bbl	814.3677	1155.356	bbl
17.36.121	n-Heptane (nC7)	38.70000	Volume %	7.76197	bbl	1575.802	2235.615	bbl
17.36.122	n-Octane (nC8)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.123	n-Nonane (nC9)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.124	n-Decane (nC10)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.125	Oxygen (O2)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.111	Water (H2O)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.110	Hydrogen Sulfide (H2S)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.112	Helium (He)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.127	Hydrogen (H2)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.126	Carbon Monoxide (CO)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.128	Argon (Ar)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.130	Ethylene (C2H4)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.131	Propylene (C3H6)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.132	Butylene (C4H8)	0.00000	Volume %	0	bbl	0	0	bbl
17.36.209	Totals	100.00000	Volume %	20.05677	bbl	4071.839	5776.782	bbl

Setup/Test EVP Calc per TP-15 **(new feature)**

This tab is provided so the user can enter fixed parameters to verify that the ABB EFM is calculating the EVP correctly for Light Hydrocarbons. The only density unit supported on this tab is Relative Density.

- Test Relative Density – user enterable field to enter a “test” density. Value must be in Relative Density units
- Test Temperature – user enterable field to enter a “test” flowing temperature value.
- Calc EVP – the user must enter a “1” and click the Send button to force the application to perform a single point EVP calculation using the Relative Density and Temperature that the user entered.
- Equilibrium Vapor Pressure – this field will show the calculated EVP with the user entered inputs.
- Vapor Pressure Error – if the user entered values above or below the limits of TP 15, and error will be shown in this field. A description of the error will be shown.



Alarms/Alarm Setup

(New feature) This is a new tab and requires the user to enter set point values and "enable" alarming. The older "Limits" tab has been replaced with the "Alarm Setup" tab. Log reports and daily reports still have the traditional alarm "X" s when those alarms occur. Such as Temperature Error (TE), zero flow (ZF), low lithium (LL), remote sense (RS), Pressure High (AH), etc. The traditional alarms have only had a low and high alarm for SP, Temp, Flow rate, etc. The new alarm setup has LoLo, Lo, Hi, and HiHi alarms. As a result, the new HiHi settings will be the alarm settings that trigger the traditional Hi "X" alarms and the new LoLo settings will be the alarm settings that trigger the traditional Lo "X" alarms.

Several fields in this section **require** the user to enter the appropriate information. We currently do not have the ability to automatically know the SP sensor URL (Upper Range Limit) of all the possible sensors that may be utilized. As a result, the user is required to fill in these values for the URL alarming to work correctly. The Totalflow SP sensors are factory characterized to 115% of URL. If any URL value is exceeded, it will generate an alarm and another when it has "cleared". The URL and Calibrated Span alarms cannot be disabled.

Static Pressure

- **Flowing Pressure (PF) –** This field will reflect the current PF value (Read only)

- **PF URL –** Requires the user to enter the URL of the static pressure sensor. When this value is exceeded, an alarm will be generated AND when the value exceeds 115% of the URL, the "live value" used in calculations will be clipped. Example: 1000 psia URL will not exceed 1150 psia… Once the pressure exceeds exactly 1150 psia, the calculations will continue to use and log no value higher than 1150 psia. When the pressure drops below 1150 psia, the application will again use the live value.

- **PF Calibrated Span –** This value will be the same as the user entered URL value UNTIL the sensor is calibrated. Once the sensor is calibrated, this field will reflect the highest calibration point value. If this value is exceeded, an alarm will be generated. (this is a BLM requirement)

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **PF Lo Lo Alarm** – lowest pressure where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **PF Lo Alarm** – medium low pressure where an alarm would be generated. Any value less than this value will activate the alarm.

- **PF Hi Alarm** – medium high pressure where an alarm would be generated. Any value greater than this value will activate the alarm.

- **PF Hi Hi Alarm** – highest user defined pressure alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **PF Alarm GROUP (LoLo, Lo, Hi, HiHi**) – This "group function" simply enables/disables all the SP alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **PF Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **PF Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **PF Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Temperature

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **TF Lo Lo Alarm** – lowest flowing temperature where an alarm would be generated (also triggers the Lo "X" alarm included in QTR reports). Any value less than this value will activate the alarm.

- **TF Lo Alarm** – medium low flowing temperature where an alarm would be generated. Any value less than this value will activate the alarm.

- **TF Hi Alarm** – medium high flowing temperature where an alarm would be generated. Any value greater than this value will activate the alarm.

- **TF Hi Hi Alarm** – highest user defined temperature alarm which would be generated (also triggers the Hi "X" alarm included in QTR reports). Any value greater than this value will activate the alarm.

- **TF Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the TF alarms with a single selection.
    - Enable Alarm – Yes/No
    - Enable Logging – Yes/No

- **TF Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **TF Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **TF Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Indicated Volume Flow Rate

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **IV FR Lo Lo Alarm** – lowest IV flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **IV FR Lo Alarm** – medium low IV flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **IV FR Hi Alarm** – medium high IV flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

- **IV FR Hi Hi Alarm** – highest user defined IV flow rate alarm which would be generated. Any value greater than this value will activate the alarm.

- **IV FR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the IV FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **IV FR Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **IV FR Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **IV FR Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Mass Flow Rate

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **Mass FR Lo Lo Alarm** – lowest mass flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **Mass FR Lo Alarm** – medium low mass flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **Mass FR Hi Alarm** – medium high mass flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

- **Mass FR Hi Hi Alarm** – highest user defined mass flow rate alarm which would be generated. Any value greater than this value will activate the alarm.

- **Mass FR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the Mass FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **Mass FR Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **Mass FR Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **Mass FR Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

GSV Flow Rate (Gross Standard Volume)

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **GSV FR Lo Lo Alarm** – lowest GSV flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **GSV FR Lo Alarm** – medium low GSV flow rate where an alarm would be generated. Any value less than this value will activate the alarm.

- **GSV FR Hi Alarm** – medium high GSV flow rate where an alarm would be generated. Any value greater than this value will activate the alarm.

- **GSV FR Hi Hi Alarm** – highest user defined GSV flow rate alarm which would be generated. Any value greater than this value will activate the alarm.

- **GSV FR Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the GSV FR alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **GSV FR Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **GSV FR Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **GSV FR Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above "deadbands" may be used. "0" basically disables the "deadband" or "deadbands".

Observed Density

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can "see" the alarm condition by accessing the applicable register.

- **Obs Density Lo Lo Alarm** – lowest observed density where an alarm would be generated. Any value less than this value will activate the alarm.
- **Obs Density Lo Alarm** – medium low observed density where an alarm would be generated. Any value less than this value will activate the alarm.

- **Obs Density Hi Alarm** – medium high observed density where an alarm would be generated. Any value greater than this value will activate the alarm.

- **Obs Density Hi Hi Alarm** – highest user defined observed density alarm which would be generated. Any value greater than this value will activate the alarm.

- **Obs Density Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This "group function" simply enables/disables all the observed density alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **Obs Density Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **Obs Density Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **Obs Density Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a "clear" alarm. LoLo

and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above “deadbands” may be used. “0” basically disables the “deadband” or “deadbands”.

Base Density

The user has the option to Enable the Alarm as well as Enable Logging of these alarms. If Logging is not enabled, the alarms will still activate, and a SCADA system can “see” the alarm condition by accessing the applicable register.

- **Base Density Lo Lo Alarm** – lowest base density where an alarm would be generated. Any value less than this value will activate the alarm.

- **Base Density Lo Alarm** – medium low base density where an alarm would be generated. Any value less than this value will activate the alarm.

- **Base Density Hi Alarm** – medium high base density where an alarm would be generated. Any value greater than this value will activate the alarm.

- **Base Density Hi Hi Alarm** – highest user defined base density alarm which would be generated. Any value greater than this value will activate the alarm.
- **Base Density Alarm GROUP (LoLo, Lo, Hi, HiHi)** – This “group function” simply enables/disables all the observed density alarms with a single selection.
  - Enable Alarm – Yes/No
  - Enable Logging – Yes/No

- **Base Density Alarm Setpoint Time to Activate (seconds)** – user entered field. Alarm must be active for this number of seconds before generating an alarm.

- **Base Density Alarm Setpoint Time to Clear (seconds)** – user entered field. Alarm must be inactive for this number of seconds before the alarm clears.

- **Base Density Deadband Units to Clear (units of measure)** - user entered field. Alarm must exceed the setpoint to activate the alarm. The live value must drop below a HiHi or Hi setpoint by this number of units before generating a “clear” alarm. LoLo and Lo alarms will activate when the live values drop to the setpoint and the alarm will clear when the live value EXCEEDs the setpoint by this value.

One or both above “deadbands” may be used. “0” basically disables the “deadband” or “deadbands”.

Alarms Setup

	Description	Threshold Value	Status	Enable Alarm	Enable Logging	Units
	----------					
15.3.0	Flowing Pressure	550.083				psia
15.3.135	PF URL	1000.000		Yes	Yes	psia
15.3.145	PF Calibrated Span	1014.363		Yes	Yes	psia
15.3.2	PF Lo Lo Alarm	100.000		Yes	Yes	psia
15.3.139	PF Lo Alarm	200.000		Yes	Yes	psia
15.3.140	PF Hi Alarm	500.000	ACTIVE	Yes	Yes	psia
15.3.1	PF Hi Hi Alarm	750.000		Yes	Yes	psia
15.156.1000	PF Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
15.170.1000	PF Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1000	PF Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1000	PF Deadband Units to Clear	0.000				psia

15.3.3	Flowing Temperature	97.373				deg F
15.3.6	TF Lo Lo Alarm	0.000		Yes	Yes	deg F
15.3.141	TF Lo Alarm	50.000		Yes	Yes	deg F
15.3.142	TF Hi Alarm	150.000		Yes	Yes	deg F
15.3.5	TF Hi Hi Alarm	420.000		Yes	Yes	deg F
15.156.1002	TF Alarm GROUP (LoLo, Lo, Hi, HiHi)			Yes	Yes	
15.170.1002	TF Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1002	TF Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1002	TF Deadband Units to Clear	0.000				deg F

Alarms Setup

	Description	Threshold Value	Status	Enable Alarm	Enable Logging	Units
	----------					
15.36.62	Indicated Volume Flow Rate	75.129				Abbl/hr
15.36.222	IV FR Lo Lo Alarm	0.000		No	No	Abbl/hr
15.36.224	IV FR Lo Alarm	Undefined		No	No	Abbl/hr
15.36.225	IV FR Hi Alarm	Undefined		No	No	Abbl/hr
15.36.223	IV FR Hi Hi Alarm	175457.141		No	No	Abbl/hr
15.156.1001	IV FR Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
15.170.1001	IV FR Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1001	IV FR Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1001	IV FR Deadband Units to Clear	0.000				Abbl/hr

15.36.6	Mass Flow Rate	294.450				USton/dy
15.36.226	Mass FR Lo Lo Alarm	Undefined		No	No	USton/dy
15.36.228	Mass FR Lo Alarm	Undefined		No	No	USton/dy
15.36.229	Mass FR Hi Alarm	Undefined		No	No	USton/dy
15.36.227	Mass FR Hi Hi Alarm	Undefined		No	No	USton/dy
15.156.1004	Mass FR Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
15.170.1004	Mass FR Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1004	Mass FR Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1004	Mass FR Deadband Units to Clear	0.000				USton/dy

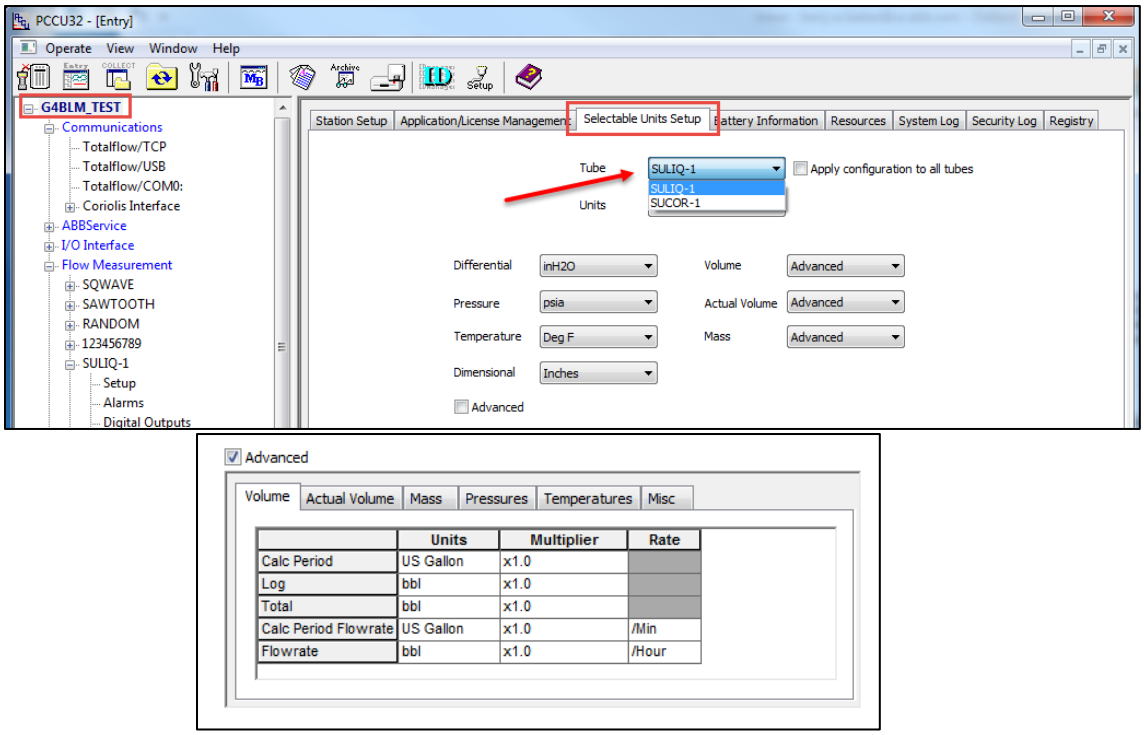
Alarms Setup

	Description	Threshold Value	Status	Enable Alarm	Enable Logging	Units
	----------					
15.36.64	GSV Flow Rate	74.205				bbl/hr
15.36.71	GSV FR Lo Lo Alarm	0.000		No	No	bbl/hr
15.3.143	GSV FR Lo Alarm	0.000		No	No	bbl/hr
15.3.144	GSV FR Hi Alarm	0.000		No	No	bbl/hr
15.36.70	GSV FR Hi Hi Alarm	24000		No	No	bbl/hr
15.156.1003	GSV FR Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
15.170.1003	GSV FR Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1003	GSV FR Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1003	GSV FR Deadband Units to Clear	0.000				bbl/hr

15.36.80	Observed Density	932.000				kg/m3
15.36.218	Obs Density Lo Lo Alarm	Undefined		No	No	kg/m3
15.36.220	Obs Density Lo Alarm	Undefined		No	No	kg/m3
15.36.221	Obs Density Hi Alarm	Undefined		No	No	kg/m3
15.36.219	Obs Density Hi Hi Alarm	Undefined		No	No	kg/m3
15.156.1005	Obs Density Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
15.170.1005	Obs Density Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1005	Obs Density Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1005	Obs Density Deadband Units to Clear	0.000				kg/m3

15.36.4	Base Density	943.406				kg/m3
15.36.230	Base Density Lo Lo Alarm	Undefined		No	No	kg/m3
15.36.232	Base Density Lo Alarm	Undefined		No	No	kg/m3
15.36.233	Base Density Hi Alarm	Undefined		No	No	kg/m3
15.36.231	Base Density Hi Hi Alarm	Undefined		No	No	kg/m3
15.156.1006	Base Density Alarm GROUP (LoLo, Lo, Hi, HiHi)			No	No	
15.170.1006	Base Density Alarm Setpoint Time to Activate	3.000				Seconds
15.173.1006	Base Density Alarm Setpoint Time to Clear	3.000				Seconds
15.174.1006	Base Density Deadband Units to Clear	0.000				kg/m3
15.174.1006	Base Density Deadband Units to Clear	0.000				kg/m3

Units for Liquid application and alarms– changing of any units must be done at the "Selectable Units Setup" tab. This is shown when the highest level of the view tree at the left of the main PCCU screen is highlighted.



Digital Outputs

Depending on the model of flow computer, the number of Digital Output tabs may vary. However, each tab has identical information.

- **Digital Output** – user must enter the Totalflow register (app.array.register) of the appropriate Digital Output

- **Gross Volume Sampler Setpoint** – user entered field. The DO will activate each time the GSV accumulates the user enter volume. This may be used to activate a composite sampler to sample the stream proportional to flowrate.

- **Gross Volume Sampler 1** – read only. Shows the accumulated volume since previous DO action/reset. When volume reaches the "Gross Volume Sampler Setpoint," the DO will trip, and the accumulator will reset.

- **Trip on Gross Volume Sampler** – Yes/No. Used to enable the sampler feature.

- **Trip on IV FR/Mass FR LoLo** – Yes/No. If "Yes," the DO will trip when the IV/Mass FR is below the LoLo alarm setpoint.

- **Trip on IV FR/Mass FR HiHi** - Yes/No. If "Yes," the DO will trip when the IV/Mass FR is above the HiHi alarm setpoint.

- **Trip on PF LoLo** – Yes/No. If “Yes,” the DO will trip when the flowing pressure is below the LoLo alarm setpoint.

- **Trip on PF HiHi** - Yes/No. If “Yes,” the DO will trip when the flowing pressure is above the HiHi alarm setpoint.

- **Trip on TF LoLo** – Yes/No. If “Yes,” the DO will trip when the flowing temperature is below the LoLo alarm setpoint.

- **Trip on TF HiHi** - Yes/No. If “Yes,” the DO will trip when the flowing temperature is above the HiHi alarm setpoint.

- **Trip on GSV FR LoLo** – Yes/No. If “Yes,” the DO will trip when the GSV FR is below the LoLo alarm setpoint.

- **Trip on GSV FR HiHi** - Yes/No. If “Yes,” the DO will trip when the GSV FR is above the HiHi alarm setpoint.

- **Trip on Charger Low** - Yes/No. If “Yes,” the DO will trip when the Charger voltage is below the low charger limit.

- **Trip on Digital Input** - Yes/No. If “Yes,” the DO will trip when the user assigned Digital Input is active.

- **Digital Input** – user assigned input register for one of the DIs. If the assigned DI closes, it will trip the assigned Digital Output. Example: a high-level switch may activate the DI at a certain level. When the DI is active, it in turn activates the assigned DO which may cause an alarm to go off or light to flash.

- **DO Action** – Normally Open or Normally Closed. This selection determines the state of the DO when there are not ANY active conditions. User can select if the DO is normally open or normally closed.

- **Auto Reset** – Yes/No. If the selection is “Yes,” the DO will change states once the active state becomes inactive. If the selection is “No,” the DO will remain in its active state until some outside action or logic resets the state.

- **Auto Reset Delay (Secs)** – user entered field. If Auto Reset is “Yes,” the DO will remain in its active state for the number of seconds entered in this field.

- **Current State** – Read only. Shows the current state of the DO. Open or Closed.

- **Manual Operation** – Selections are Clear/Trip. This allows the user to manually activate the DO or to Clear the DO and have it return to its normal state if Auto Reset is not enabled.

RS and No Flow/Setup

This tab allows the user to configure a Digital Input to generate a "Remote Sense" alarm bit and/or cause the current measurement application to go to a "No Flow" state. An example of when this may be used: the same primary meter and sensors measures quantity from two separate parties or may be a bi-directional meter run. The flow can only be to one party and logged to one Liquid measurement application at a time. Two measurement applications are enabled. A switch is on the valve that changes the flow from one party to the other. Both measurement applications use the exact same inputs. Based on the configuration of this tab, if the switch is in open position, this specific meter will show the flow. If the switch changes position, it will show "no flow". The second measurement application would be configured similarly but require the DI action to be setup the opposite. One would have No Flow when DI is closed, the other would have No Flow when the DI is open.

- **Digital Input** – user defined register of the digital input to be used for logic

- **DI Action**
  - Disabled – no logic will be performed
  - RS and No Flow on **closed** contact – If DI is in closed state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm
  - RS and No Flow on **open** contact - If DI is in open state, the application will go to a "no flow" state, even if the flow inputs indicate flow and generate a "remote sense" and a "no flow" alarm
  - RS on closed contact - If DI is in closed state, the application will generate a "remote sense" alarm
  - RS on open contact - If DI is in open state, the application will generate a "remote sense" alarm

- **Flow State** – This is a read only field that will indicate the status of the measurement application based on the selections above.

Adv Setup/Setup

Flowing Pressure

- **Input Register** – User entered Totalflow register (app.array.register) where the flowing pressure value is located.

- **Pressure Type**
  - Absolute – default value. Most ABB Totalflow static pressure sensors are absolute pressure devices. If the attached pressure sensor measures absolute pressure, select Absolute. This application will subtract the barometric pressure from the absolute pressure and show and log gauge pressure where pressure is applicable. Gauge pressure is much more commonly used in liquid measurement
  - Gauge – If the attached pressure sensor measures gauge pressure, select Gauge

- **Use User Entered PF** – default is No. If a pressure sensor is NOT used and a fixed pressure is desired, select Yes.

- **User Entered PF** – If not using live pressure and "Use User Entered PF" is selected, enter the pressure that should be used in the measurement applications calculations.

- **PF URL** – This is a manually entered field and should always be entered correctly. Verify the Upper Range Limit of the attached sensor and enter that value in this field. An alarm WILL be generated when this value is exceeded, and the value shown when exceeded and used in calculations will be "clipped" at 115% of this value. If 100 is entered, no values higher than 115 will be shown or used in any calculations.

Flowing Temperature

- **Input Register** – User entered Totalflow register (app.array.register) where the flowing temperature value is located.

- **RTD Installed**
  - Yes – If selected, the temperature from the Input register above will be used in calculations and the "Use User Entered TF" will be "No."
  - No – If selected, the temperature used in calculations will be the user entered temperature and "Use User Entered TF" will be "Yes."

- **Use User Entered TF**
  - No – If selected, RTD installed will be "Yes," and the value from the Input register will be used in calculations.
  - Yes – If selected, RTD Installed will be "No," and User Entered TF will be used in calculations.

- **User Entered TF** – User entered field for the temperature to be used if RTD Installed or Use User Entered TF is selected. This value will also be used if the RTD or temperature reading fails when using "RTD Installed = Yes."

Flow Input

- **Flow Input Type** – This determines what the input type is and how the calculations will function. The field below this selection will change, depending on the input type.
  - Pulse Input Vol – Use this selection if the input is a Pulse and is proportional to **volume**.
    - Pulse Input Register – Enter the correct register (app.array.register) from which the pulse can be obtained
    - (Pulse/K Factor) Volume Unit – the K Factor is proportional to some specific units. The user should select the applicable volume unit to match the output of the primary meter. Choices are: US Gallon, bbl, ft^3, CN Gallon, UK Gallon, m^3, cm^3, liter, kL.
    - MF Volume Unit – this only applies if a meter factor is used. There may be multiple MF in use. MF does not get applied to a pulse like a K Factor but to the GSV. The application needs to know what units the GSV is in. The available choices are the same as those available for the K Factor above.
    - MF Rate Unit – this works with the MF Volume Unit mentioned above, the MF is applied to the volume calculated each second. That volume has a rate that may be proved to "bbls/day". In this example, the rate unit entered would be "day". The choices are: second, minute, hour, day. This only applies if a Meter Factor is used.
  - Pulse Input Mass – Use this selection if the input is a Pulse and is proportional to **mass**.
    - Pulse Input Register – Enter the correct register (app.array.register) from which the pulse can be obtained.
    - (Pulse/K Factor) Mass Unit – the K Factor is proportional to some specific units. The user should select the applicable mass unit to match the output of the primary meter. Choices are: lbm, US Ton, klbm, kg, UK Ton, Metric Ton.
    - MF Mass Unit – this only applies if a meter factor is used. There may be multiple MF in use. MF does not get applied to a pulse like a K Factor but to the mass. The application needs to know what units the mass is in. The available choices are the same as those available for the K Factor above.
    - MF Rate Unit – this works with the MF Mass Unit mentioned above, the MF is applied to the mass calculated each second. That mass has a rate that may be proved to "lbs/sec". In this example, the rate unit entered would be "sec". The choices are: second, minute, hour, day. This only applies if a Meter Factor is used.

  - Volume Flow Rate – Use this selection if the input is uncorrected volume (IV) flow rate. It is possible in some scenarios that the input is GSV instead of IV.
    - Volume Flow Rate Input Register - Enter the correct register (app.array.register) from which the volume flow rate can be obtained.

- Input/MF Volume Unit – select the appropriate volume unit to match the flow rate unit of the primary meter. This may be a different unit that what the IV is logged in the QTRs. If the flow rate from the primary meter is in bbl/day, this selection should be "bbl". This is also the unit of volume that the MF (if used) will be relevant to. Choices are: US Gallon, bbl, ft^3, CN Gallon, UK Gallon, m^3, cm^3, liter, kL.
- Input/MF Rate Unit – this works with the "Input/MF Volume Unit" mentioned above. This applies to both the input flowrate "time" and to the MF which is applied to the volume calculated each second. That volume has a rate that may be proved in "bbls/day". In this example, the rate unit entered would be "day". The choices are: second, minute, hour, day.

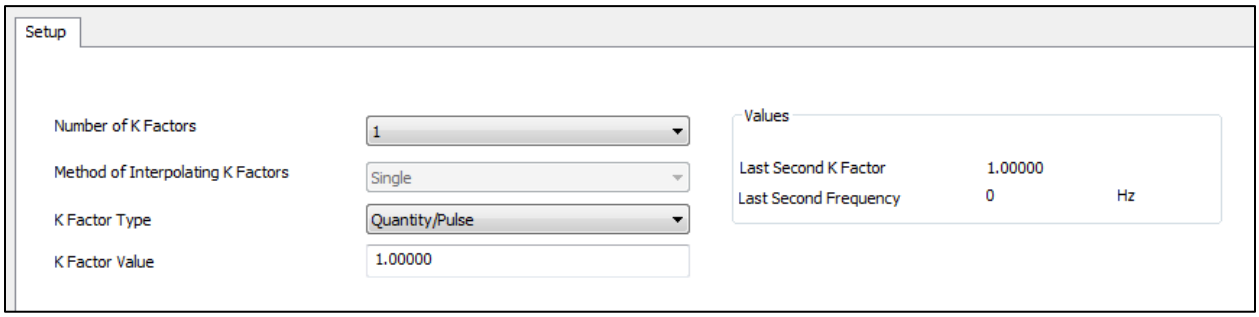
➢ Mass Flow Rate – Use this selection if the input is mass flow rate.
- Mass Flow Rate Input Register - Enter the correct register (app.array.register) from which the mass flow rate can be obtained.
- Input/MF Mass Unit – select the appropriate mass unit to match the mass flow rate unit of the primary meter. This may be a different unit that what the Mass is logged in the QTRs. If the mass flow rate from the primary meter is in lbm/hour, this selection should be "lbm". This is also the unit of mass that the MF (if used) will be relevant to. Choices are: lbm, US Ton, klbm, kg, UK Ton, Metric Ton.
- Input/MF Rate Unit – this works with the "Input/MF Mass Unit" mentioned above. This applies to both the input mass flowrate "time" and to the MF (if used) which is applied to the mass calculated each second. That mass has a rate that may be proved in "lbs/hour". In this example, the rate unit entered would be "hour". The choices are: second, minute, hour, day.

Setup

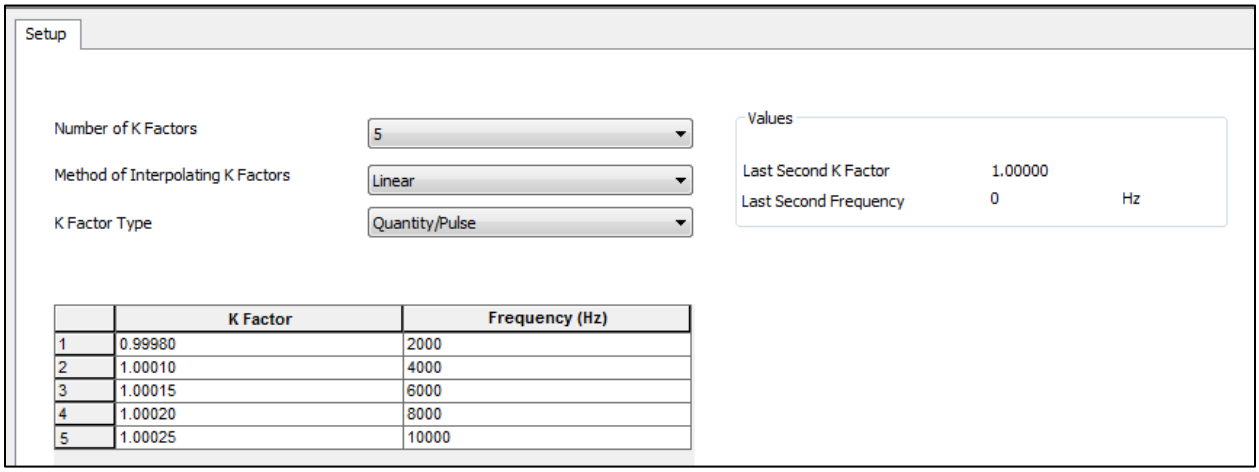
	Description	Value	
	--- Flowing Pressure ---		
21.4.0	Input Register	7.4.1	
21.0.55	Pressure Type	Absolute	
21.6.1	Use User Entered PF	No	
21.7.5	User Entered PF	255.7	psia
21.3.135	PF URL	1000.000	psia
	--- Flowing Temperature ---		
21.4.2	Input Register	7.4.2	
21.6.1	RTD Installed	No	
21.6.1	Use User Entered TF	Yes	
21.3.4	User Entered TF	-57.97	deg F
	--- Flow Input ---		
21.35.12	Flow Input Type	Mass Flow Rate	
21.39.2	Mass Flow Rate Input Register	80.1.0	
21.35.84	Input/MF Mass Unit	kg	
21.35.85	Input/MF Rate Unit	/sec	

K Factor/Setup

This selection is ONLY available (viewable) IF the user selected the Input Type to be a “Pulse Input Vol” or “Pulse Input Mass” in the Adv Setup. The default will show one K Factor.



- **Number of K Factors** – user selectable from 1 to 12. When more than 1 K Factor is selected, the user will enter the appropriate K Factor for the various frequencies (number of pulses/sec) as applicable.



	K Factor	Frequency (Hz)
1	0.99980	2000
2	1.00010	4000
3	1.00015	6000
4	1.00020	8000
5	1.00025	10000

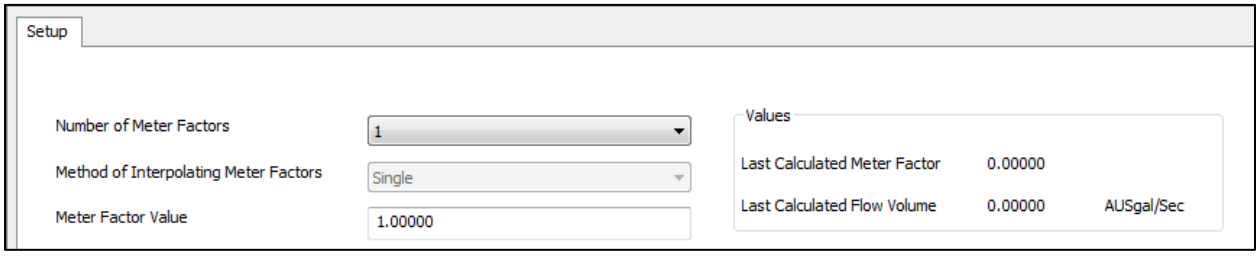
- **Method of Interpolating K Factors** – This only applies when multiple K Factors are implemented. It determines what value is used for K Factor when the pulse frequency is between any 2 of the entered points.
  - Linear – default method. It will linearly extrapolate what the appropriate K Factor would be between any of the entered frequency points. In the example above, a frequency of 5000 would have a calculated K Factor of 1.000125. If you were to plot the K Factors, there would be straight lines between the K Factor points, and depending on the frequency, the K Factor would be interpolated and "fit on the plot" between the 2 K Factors. A frequency less than the lowest entered frequency would use the lowest corresponding K Factor. A frequency greater than the highest entered frequency would use the highest corresponding K Factor. In the example shown above, frequencies < 2,000 Hz would use a K Factor of .9998. Frequencies > 10,000 Hz would use a K Factor of 1.00025
  - Step/Range – With this method, the K Factor used in calculation will always be one of the users entered K Factors. There will be no Interpolation. From 0 to half way between the 1st and 2nd K Factor, the 1st K Factor will be used. From half way between the 2nd K Factor to half way between the 2nd and 3rd K Factor, the 2nd K Factor will be used and so on…… If you were to plot the K Factors, the plot would look like steps.

- **K Factor Type**
  - Quantity/Pulse – How much volume does each pulse represent (example: 0.025 gal per pulse).
  - Pulse/Quantity – How many pulses for each volume unit (example: 40 pulses per gallon).

The PCCU screen will also show to the user what the last second K Factor was that was used in calculations as well as the last second's frequency or number of counts in last second. This can be helpful when multiple K Factors are used to verify that the K Factor is changing as expected based on the multiple points and flow rates.

Meter Factor/Setup

This is a **new feature**. By default, the Meter Factor will always be "1". This section works similarly to how the K Factor section functions. The main difference is that K Factors are always (only) used to convert a pulse to a volume or mass. The meter factors are designed to "adjust or correct" a volume to a corrected volume as a result of comparison/proving to a "certified" standard or flow test.

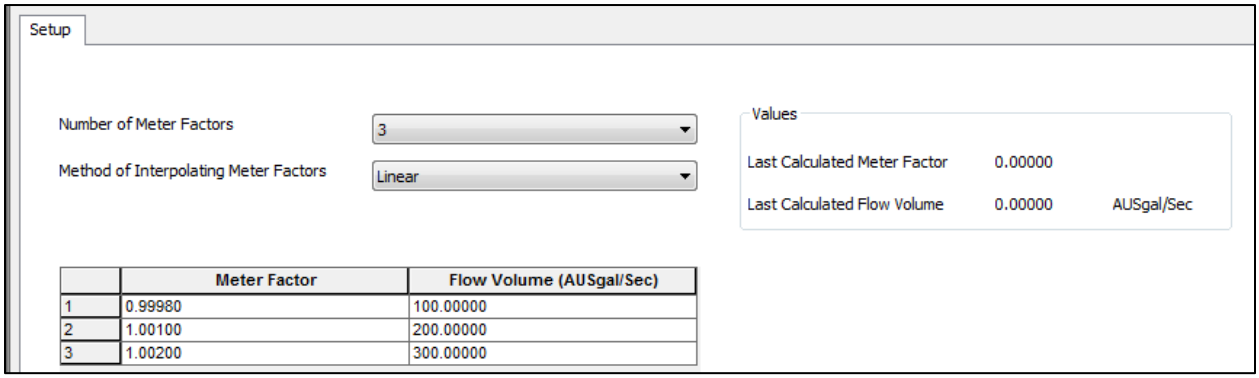


- **Number of Meter Factors** – user selectable from 1 to 12. When more than 1 Meter Factor is selected, the user will enter the appropriate Meter Factor for the various flow rates as applicable.

- **Method of Interpolating Meter Factors** – This only applies when multiple Meter Factors are implemented. It determines what value is used for Meter Factor when the uncorrected flow rate is between 2 of the entered values.
  - Linear – default method. It will linearly extrapolate what the appropriate Meter Factor would be between any of the entered flow rate points. In the example below, a **US gal/Sec** flow rate of 250 **US gal/Sec** would have a calculated Meter Factor of 1.0015. If you were to plot the Meter Factors, there would be straight lines between the Meter Factor points, and depending on the flow rate, the Meter Factor would be interpolated and "fit on the plot" between the 2 Meter Factors. A flow rate < 100 would use .9998 as a Meter Factor and a flow rate > 300 would use a Meter Factor of 1.002.

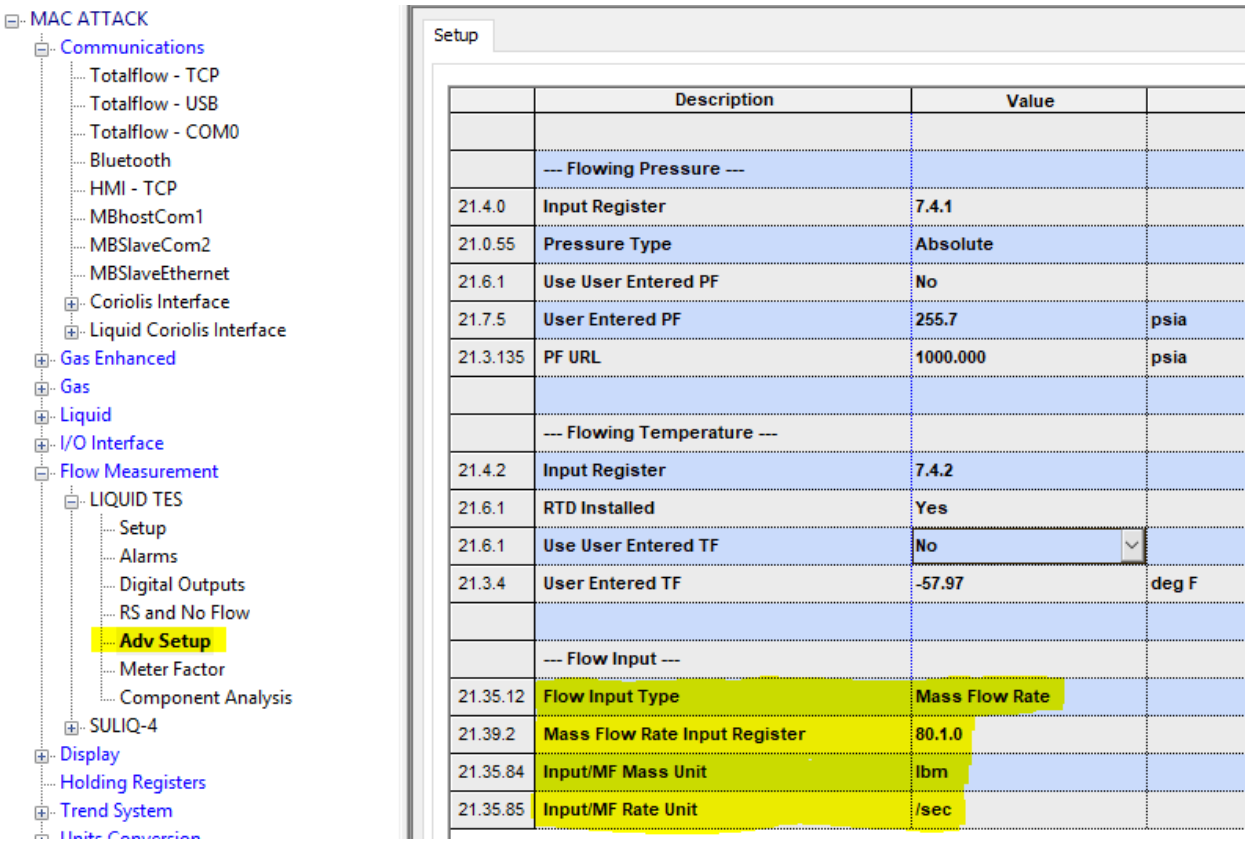
  - Step/Range – with this method the Meter Factor used in calculation will always be one of the user entered Meter Factors. There will be no Interpolation. From 0 to half way between the 1st and 2nd Meter Factor, the 1st Meter Factor will be used (0.9998). From half way between the 2nd Meter Factor to half way between the 2nd and 3rd Meter Factor, the 2nd Meter Factor

will be used (1.001) and so on…… If you were to plot the Meter Factors, the plot would look like steps.



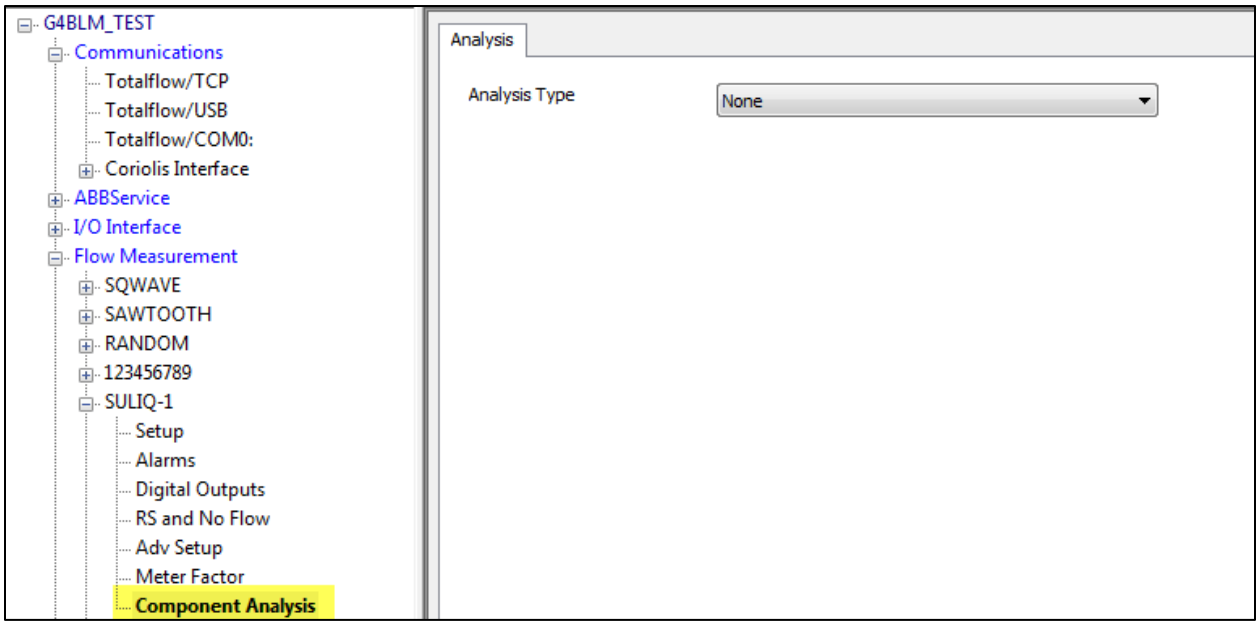
	Meter Factor	Flow Volume (AUSgal/Sec)
1	0.99980	100.00000
2	1.00100	200.00000
3	1.00200	300.00000

It is important to note that the Meter Factor is always multiplied against the Indicated Volume x Ctl x Cpl to equal the Gross Standard Volume if the input is volume or against the incoming mass if the input is mass. In the example above, the flow rate is in **US gal/Sec**. This is dependent on the Input Type and the Meter Factor setup will change based on the user's selection for Volume Flow Rate or Mass Flow Rate (lbm/Sec) under the Adv Setup section.



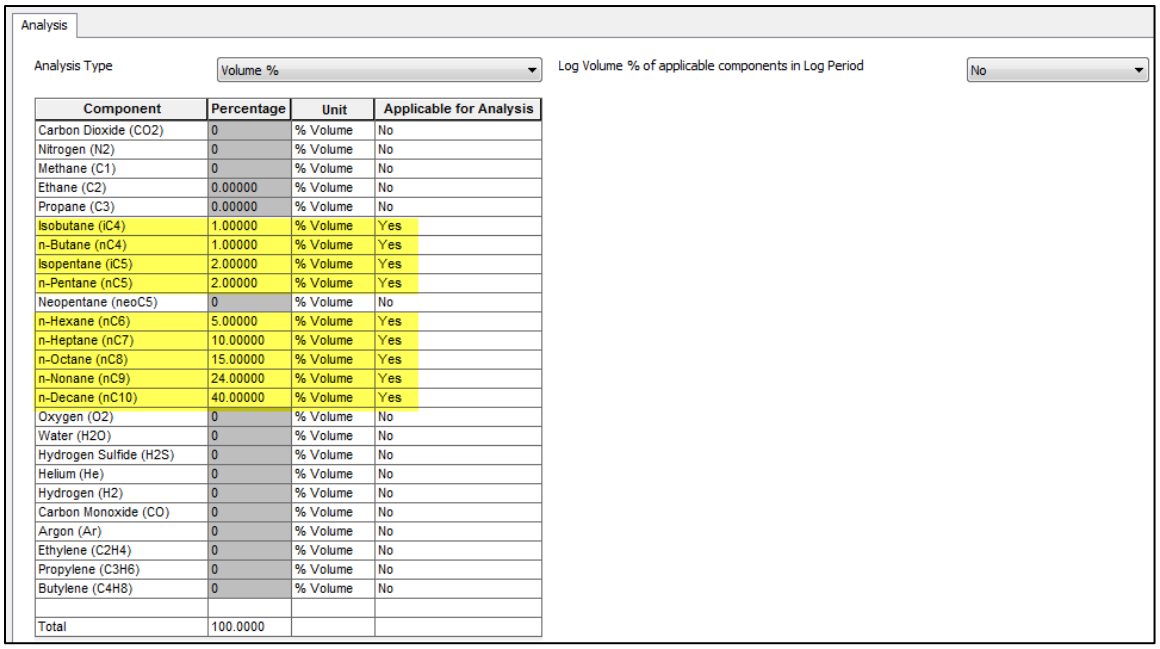
Component Analysis/Analysis

This selection defaults to “None.” The purpose of this is to allow a user to log individual analysis components Volume or Mass percentage IF they choose to. This is simply what the Liquid analysis reflects in Volume % or Mass % and performs no calculations. Another option allows the user to select if they also want to log individual component’s calculated Mass or Volume in each log. This is the total QTR Volume/Mass multiplied by each components Volume % or Mass % and each are logged in the QTR. The sum of each of the individual components Volume or Mass will equal the total Volume or Mass logged in each QTR. It does NOT do any additional calculations related to a liquid analysis.



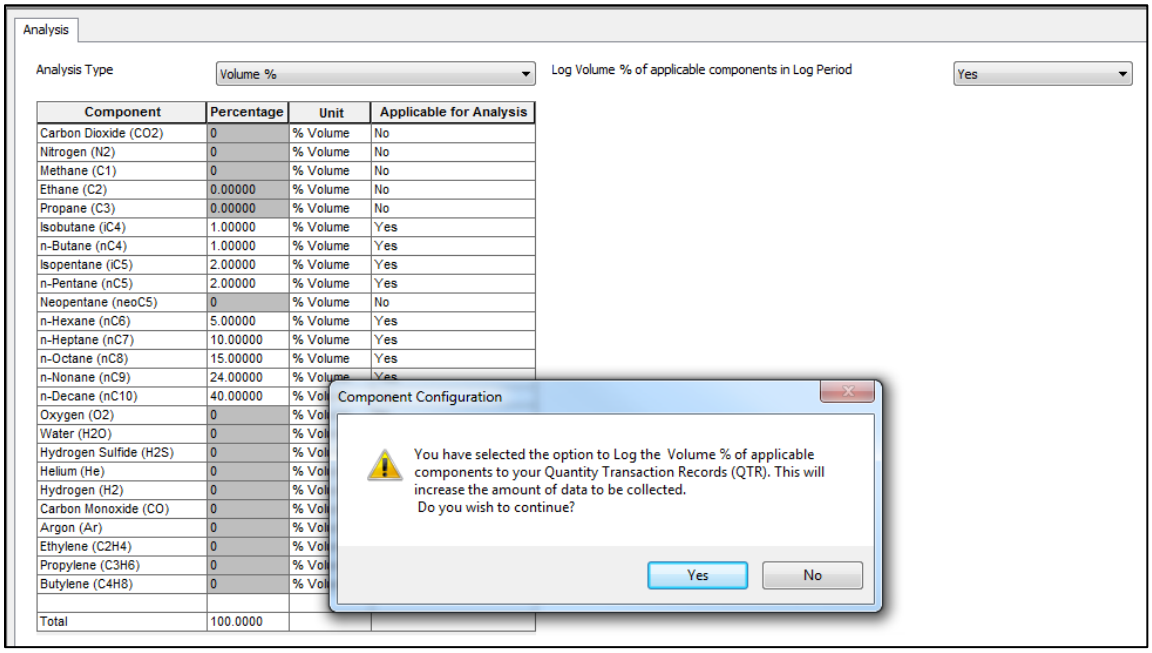
- **Analysis Type**
  - None – Default. With this selection, no analysis components are logged in the QTRs
  - Volume % - If selected, the analysis as entered in Volume % on the screen will be reflected on the characteristics report. The values will not be logged unless selected in an additional selection.
  - Mass % - If selected, the analysis as entered in Mass % on the screen will be reflected on the characteristics report. The values will not be logged unless selected in an additional selection.

  The user must select “Yes” for each component that they want to enter a value for and the appropriate Percentage



Component	Percentage	Unit	Applicable for Analysis
Carbon Dioxide (CO2)	0	% Volume	No
Nitrogen (N2)	0	% Volume	No
Methane (C1)	0	% Volume	No
Ethane (C2)	0.00000	% Volume	No
Propane (C3)	0.00000	% Volume	No
Isobutane (iC4)	1.00000	% Volume	Yes
n-Butane (nC4)	1.00000	% Volume	Yes
Isopentane (iC5)	2.00000	% Volume	Yes
n-Pentane (nC5)	2.00000	% Volume	Yes
Neopentane (neoC5)	0	% Volume	No
n-Hexane (nC6)	5.00000	% Volume	Yes
n-Heptane (nC7)	10.00000	% Volume	Yes
n-Octane (nC8)	15.00000	% Volume	Yes
n-Nonane (nC9)	24.00000	% Volume	Yes
n-Decane (nC10)	40.00000	% Volume	Yes
Oxygen (O2)	0	% Volume	No
Water (H2O)	0	% Volume	No
Hydrogen Sulfide (H2S)	0	% Volume	No
Helium (He)	0	% Volume	No
Hydrogen (H2)	0	% Volume	No
Carbon Monoxide (CO)	0	% Volume	No
Argon (Ar)	0	% Volume	No
Ethylene (C2H4)	0	% Volume	No
Propylene (C3H6)	0	% Volume	No
Butylene (C4H8)	0	% Volume	No
Total	100.0000		

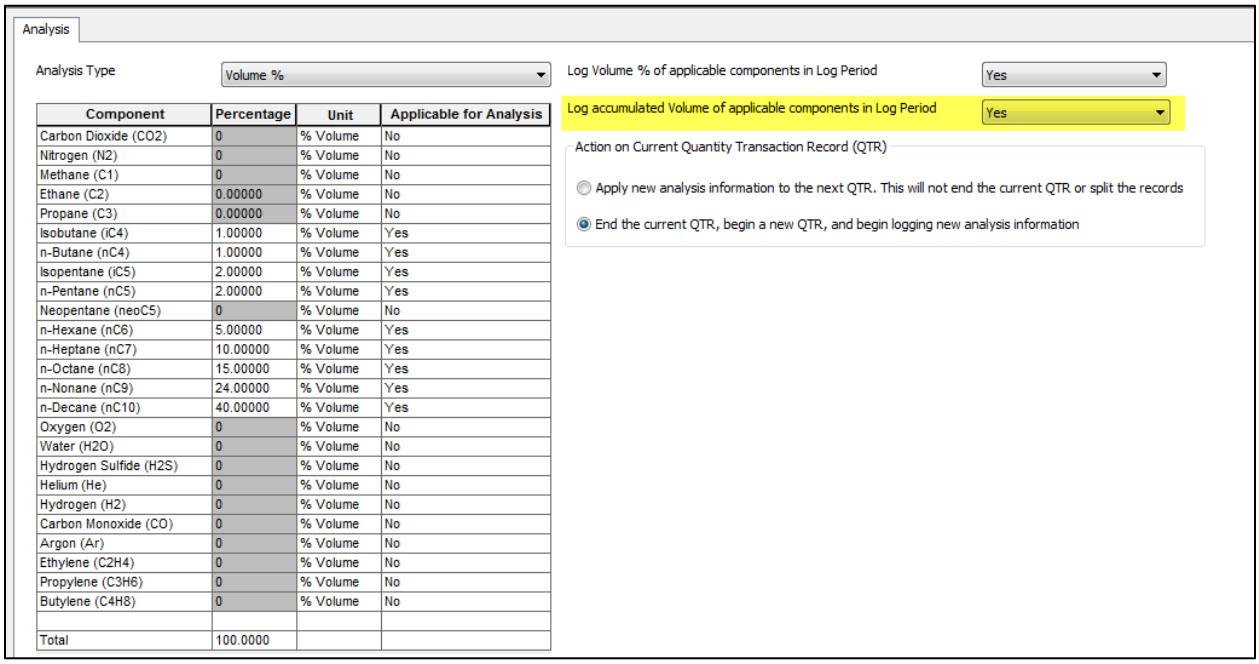
- **Log Volume % of applicable components in Log Period**
  - No – This is the default
  - Yes – Selecting “Yes” result in the analysis of individual component’s Mass or Volume being logged in every log record. This is strictly the analysis %, not the actual accumulated volume or mass



Component	Percentage	Unit	Applicable for Analysis
Carbon Dioxide (CO2)	0	% Volume	No
Nitrogen (N2)	0	% Volume	No
Methane (C1)	0	% Volume	No
Ethane (C2)	0.00000	% Volume	No
Propane (C3)	0.00000	% Volume	No
Isobutane (iC4)	1.00000	% Volume	Yes
n-Butane (nC4)	1.00000	% Volume	Yes
Isopentane (iC5)	2.00000	% Volume	Yes
n-Pentane (nC5)	2.00000	% Volume	Yes
Neopentane (neoC5)	0	% Volume	No
n-Hexane (nC6)	5.00000	% Volume	Yes
n-Heptane (nC7)	10.00000	% Volume	Yes
n-Octane (nC8)	15.00000	% Volume	Yes
n-Nonane (nC9)	24.00000	% Volume	Yes
n-Decane (nC10)	40.00000	% Vol	
Oxygen (O2)	0	% Vol	
Water (H2O)	0	% Vol	
Hydrogen Sulfide (H2S)	0	% Vol	
Helium (He)	0	% Vol	
Hydrogen (H2)	0	% Vol	
Carbon Monoxide (CO)	0	% Vol	
Argon (Ar)	0	% Vol	
Ethylene (C2H4)	0	% Vol	
Propylene (C3H6)	0	% Vol	
Butylene (C4H8)	0	% Vol	
Total	100.0000		

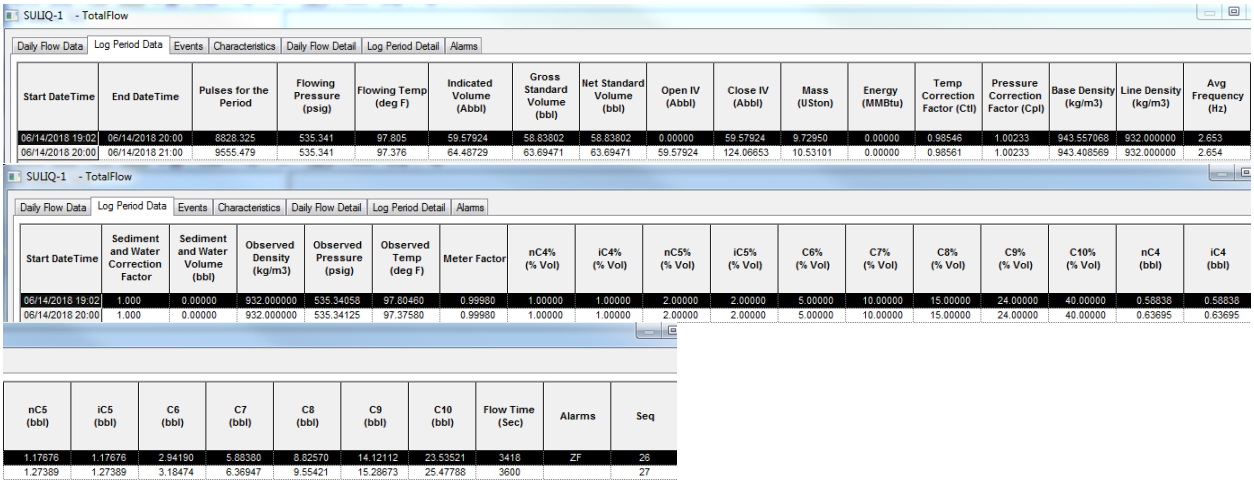
- The user will also be given the option of waiting till the following record to begin logging the new data OR ending the current QTR, begin a new QTR and begin logging analysis information.

- The user also has the option to have the application calculate the individual component's accumulated volume or mass. Default is No.



Component	Percentage	Unit	Applicable for Analysis
Carbon Dioxide (CO2)	0	% Volume	No
Nitrogen (N2)	0	% Volume	No
Methane (C1)	0	% Volume	No
Ethane (C2)	0.00000	% Volume	No
Propane (C3)	0.00000	% Volume	No
Isobutane (iC4)	1.00000	% Volume	Yes
n-Butane (nC4)	1.00000	% Volume	Yes
Isopentane (iC5)	2.00000	% Volume	Yes
n-Pentane (nC5)	2.00000	% Volume	Yes
Neopentane (neoC5)	0	% Volume	No
n-Hexane (nC6)	5.00000	% Volume	Yes
n-Heptane (nC7)	10.00000	% Volume	Yes
n-Octane (nC8)	15.00000	% Volume	Yes
n-Nonane (nC9)	24.00000	% Volume	Yes
n-Decane (nC10)	40.00000	% Volume	Yes
Oxygen (O2)	0	% Volume	No
Water (H2O)	0	% Volume	No
Hydrogen Sulfide (H2S)	0	% Volume	No
Helium (He)	0	% Volume	No
Hydrogen (H2)	0	% Volume	No
Carbon Monoxide (CO)	0	% Volume	No
Argon (Ar)	0	% Volume	No
Ethylene (C2H4)	0	% Volume	No
Propylene (C3H6)	0	% Volume	No
Butylene (C4H8)	0	% Volume	No
Total	100.0000		

Liquid QTR with ALL Analysis Options Enabled



Displays

The display setup allows a user to determine which items they may choose to show on the flow computer's LCD. Items highlighted in Yellow are either required display items OR items that must be on site for a BLM Inspector. A previous hour or daily average for SP, DP, Temp, and Volume must be displayed. There is wide latitude as to if this is a previous log record or daily record. Must be one day ago but not more than 30 days ago.

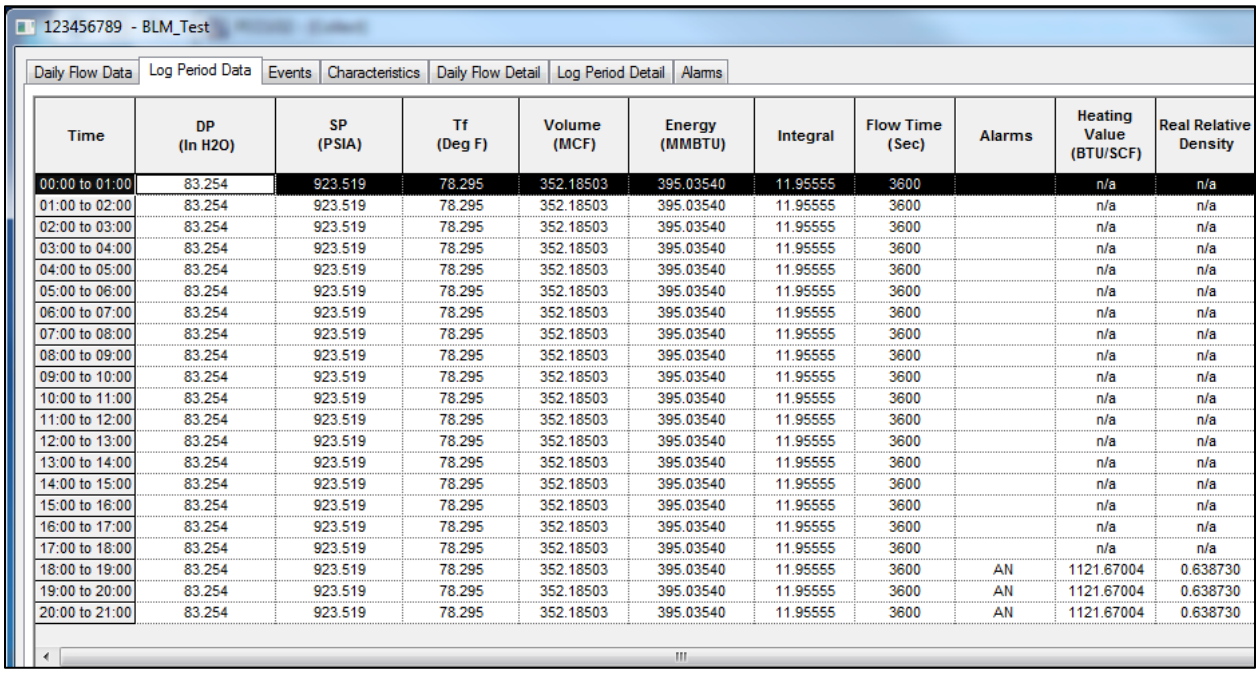
Setup | Annunciators | Displays | Plots | Groups | Enumerations | Key Log

	Group	Name	#	X	Y	Per	Scl	Ent	Val	Units	X	Y	Data	X	Y	W	D	Scale	Low	High	Enum
	BLM SAWTOOTH Tube		3.0				No	No													
8.255.768		Meter ID	3.1	0	0	3	Yes	No	No		10	1	12.5.0	0	1	0	20	0	0	0	0.0.0
8.255.769		FMP Number	3.2	0	0	3	Yes	No	No		10	1	12.5.5	0	1	0	20	0	0	0	0.0.0
8.255.770		Company Name	3.3	0	0	3	Yes	No	No		10	1	12.5.6	0	1	0	20	0	0	0	0.0.0
8.255.771		AGA3/BLM App Number	3.4	0	0	3	Yes	No	No		10	1	0.5.13	0	1	0	20	0	0	0	0.0.0
8.255.772		FMP Elevation	3.5	0	0	3	Yes	No	No	Feet	10	1	12.3.123	0	1	9	1	0	0	0	0.0.0
8.255.773		Orifice Diam	3.6	0	0	3	Yes	No	No	Inches	10	1	12.7.8	0	1	9	4	0	0	0	0.0.0
8.255.774		Beta Ratio	3.7	0	0	3	Yes	No	No		10	1	12.7.58	0	1	9	6	0	0	0	0.0.0
8.255.775		SAW.Rel Density	3.8	0	0	3	Yes	No	No		10	1	12.7.35	0	1	9	6	0	0	0	0.0.0
8.255.776		Current SP	3.9	0	0	3	Yes	No	No	PSIA	10	1	12.3.0	0	1	9	3	0	0	0	0.0.0
8.255.777		Current DP	3.10	0	0	3	Yes	No	No	in H2O	10	1	12.7.0	0	1	9	3	0	0	0	0.0.0
8.255.778		Current Temp	3.11	0	0	3	Yes	No	No	Deg F	10	1	12.3.3	0	1	9	3	0	0	0	0.0.0
8.255.779		Current Flowrate	3.12	0	0	3	Yes	No	No	MCF/Day	10	1	12.7.19	0	1	9	3	0	0	0	0.0.0
8.255.780		Yest Avg SP	3.13	0	0	3	Yes	No	No	PSIA	10	1	12.200.1	0	1	9	3	0	0	0	0.0.0
8.255.781		Yest Avg DP	3.14	0	0	3	Yes	No	No	in H2O	10	1	12.221.1	0	1	9	3	0	0	0	0.0.0
8.255.782		Yest Avg Temp	3.15	0	0	3	Yes	No	No	Deg F	10	1	12.222.1	0	1	9	3	0	0	0	0.0.0
8.255.783		Yest Volume	3.16	0	0	3	Yes	No	No	MCF	10	1	12.225.1	0	1	9	3	0	0	0	0.0.0
8.255.784		Spare	3.17	0	0	0	No	No	No		10	1	0.0.4	0	1	9	3	0	0	0	0.0.0
8.255.785		Spare	3.18	0	0	0	No	No	No		10	1	0.0.4	0	1	9	3	0	0	0	0.0.0

Miscellaneous Reports

AGA 3 Log Period Report

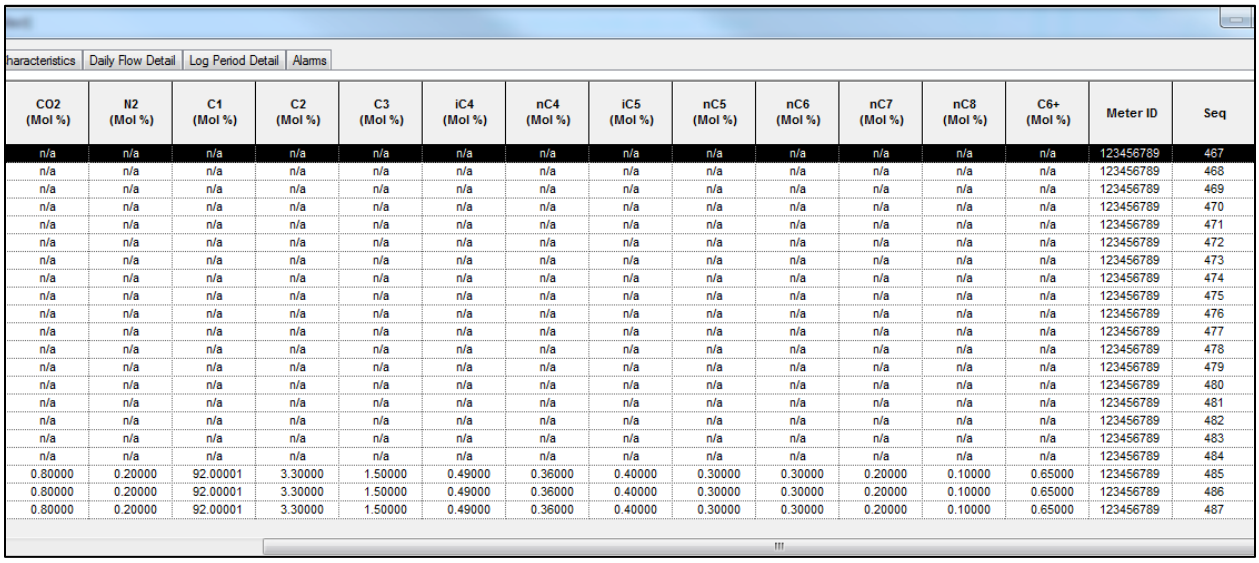
The analysis was selected to be logged beginning at 18:00 hours



123456789 - BLM_Test

Daily Flow Data | Log Period Data | Events | Characteristics | Daily Flow Detail | Log Period Detail | Alarms

Time	DP (In H2O)	SP (PSIA)	Tf (Deg F)	Volume (MCF)	Energy (MMBTU)	Integral	Flow Time (Sec)	Alarms	Heating Value (BTU/SCF)	Real Relative Density
00:00 to 01:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
01:00 to 02:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
02:00 to 03:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
03:00 to 04:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
04:00 to 05:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
05:00 to 06:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
06:00 to 07:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
07:00 to 08:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
08:00 to 09:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
09:00 to 10:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
10:00 to 11:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
11:00 to 12:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
12:00 to 13:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
13:00 to 14:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
14:00 to 15:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
15:00 to 16:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
16:00 to 17:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
17:00 to 18:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600		n/a	n/a
18:00 to 19:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600	AN	1121.67004	0.638730
19:00 to 20:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600	AN	1121.67004	0.638730
20:00 to 21:00	83.254	923.519	78.295	352.18503	395.03540	11.95555	3600	AN	1121.67004	0.638730



haracteristics | Daily Flow Detail | Log Period Detail | Alarms

CO2 (Mol %)	N2 (Mol %)	C1 (Mol %)	C2 (Mol %)	C3 (Mol %)	iC4 (Mol %)	nC4 (Mol %)	iC5 (Mol %)	nC5 (Mol %)	nC6 (Mol %)	nC7 (Mol %)	nC8 (Mol %)	C6+ (Mol %)	Meter ID	Seq
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	467
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	468
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	469
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	470
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	471
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	472
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	473
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	474
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	475
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	476
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	477
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	478
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	479
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	480
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	481
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	482
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	483
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	123456789	484
0.80000	0.20000	92.00001	3.30000	1.50000	0.49000	0.36000	0.40000	0.30000	0.30000	0.20000	0.10000	0.65000	123456789	485
0.80000	0.20000	92.00001	3.30000	1.50000	0.49000	0.36000	0.40000	0.30000	0.30000	0.20000	0.10000	0.65000	123456789	486
0.80000	0.20000	92.00001	3.30000	1.50000	0.49000	0.36000	0.40000	0.30000	0.30000	0.20000	0.10000	0.65000	123456789	487

Events Report

123456789 - BLM_Test

Daily Flow Data | Log Period Data | Events | Characteristics | Daily Flow Detail | Log Period Detail | Alarms

Date/Time	Event Description	Old Value	New Value	Seq
05/10/2018 16:20:53	Temperature Register	0.0.0	9.0.2	25
05/10/2018 16:21:28	Local database collection		-3.00000	26
05/10/2018 16:23:24	Local database collection		-3.00000	27
05/11/2018 15:25:53	Enhanced Mode	Disabled	Enabled	28
05/11/2018 15:25:54	Max alarm log records	0	200	29
05/11/2018 15:25:54	Reset log			30
05/11/2018 15:26:46	Heating Value Saturation Condition	Not Specified	Dry	31
05/11/2018 15:27:05	Barometric Pressure Calculation Type	User Entered	NASA-TM-X-743	32
05/11/2018 15:27:05	Barometric pressure (PSIA)	14.73000	14.69600	33
05/11/2018 15:27:05	Location Elevation	0.00000	635.00000	34
05/11/2018 15:27:05	Barometric pressure (PSIA)	14.69600	14.36264	35
05/11/2018 15:39:46	SP URL Change	0.000	1000.000	36
05/11/2018 15:39:46	DP URL Change	0.000	800.000	37
05/11/2018 15:45:04	Sp Location: Upstream	Yes	No	38
05/11/2018 15:45:22	Sp Location: Upstream	No	Yes	39
05/17/2018 14:32:51	Reset time and date	05/17/2018	23:59:50	40
05/18/2018 01:15:14	Reset time and date	05/18/2018	23:59:50	41
05/19/2018 01:02:54	Reset time and date	05/19/2018	23:59:50	42
05/22/2018 11:05:16	Power Fail Warm Start	05/22/2018	11:04:46	43
05/22/2018 11:05:16	System Down, (Stopped)	05/22/2018	11:04:46	44
05/22/2018 11:05:16	System Up, (Run)	05/22/2018	11:05:16	45
05/22/2018 11:05:24	Battery aging	01/05/30	04/11/22	46
05/22/2018 11:05:26	Security Switch Position	Off	Off	47
06/01/2018 18:26:23	Log Analysis in QTRs	Disabled	Enabled	48
06/01/2018 18:26:34	Attached to stream?	No	Yes	49
06/01/2018 18:26:34	Analysis Source from	Fixed	Therms	50
06/01/2018 21:39:21	Local database collection		-3.00000	51
06/01/2018 22:46:25	Static Pressure Register	9.0.1	7.4.1	52
06/01/2018 22:46:25	Diff. Pressure Register	9.0.0	7.4.0	53
06/01/2018 22:46:25	Temperature Register	9.0.2	7.4.2	54
06/01/2018 22:53:48	Local database collection		-3.00000	55

<< Previous Meter | Next Meter >>

Characteristics Report (only an example and is a small portion of the report)

123456789 - BLM_Test

Daily Flow Data | Log Period Data | Events | Characteristics | Daily Flow Detail | Log Period Detail | Alarms

Description	Value	Last Changed
Device ID	123456789	
Tube Description	BLM_Test	
Facility Measurement Point	ABCDEF54321	
Company Name	Somewhere LLC	
App Part Number	2105934-007	
Contract start hour	0	
Collection date/time	06/01/2018 22:53:48	
Firmware Part Number	2105151-012	
Record Time Stamp Method	Leading	
------- Basic Characteristic Data ------		
Flow Rate (MCF/Day)	2217.52368	
Battery (Volts)	12.27575	
Current Measured Static Pressure (PSIA	85.85751	
Current Diff Pressure (In H2O)	67.71689	
Current Flowing Temp (Deg F)	50.44251	
Pressure base (PSIA)	14.73000	
Temperature base (Deg F)	60.00000	
Fixed temperature (Deg F)	60.00000	
RTD installed	Yes	
Check security	No	
Password Mode	No	
Last Operator		
Temperature used in Calculations	Live	
Attached to stream?	Yes	06/01/2018 18:26
AIU Stream ID	n/a	
Initial analysis accepted	No	
Fpv method	AGA8 Detail	05/10/2018 16:16
Tap type	Flange Taps	
Tap location	Upstream	
Volume calculation type	AGA3 2012	05/10/2018 16:16
Volume log period	60 minutes	
Volume calc period	1 second	
Primary Meter Type	Orifice	

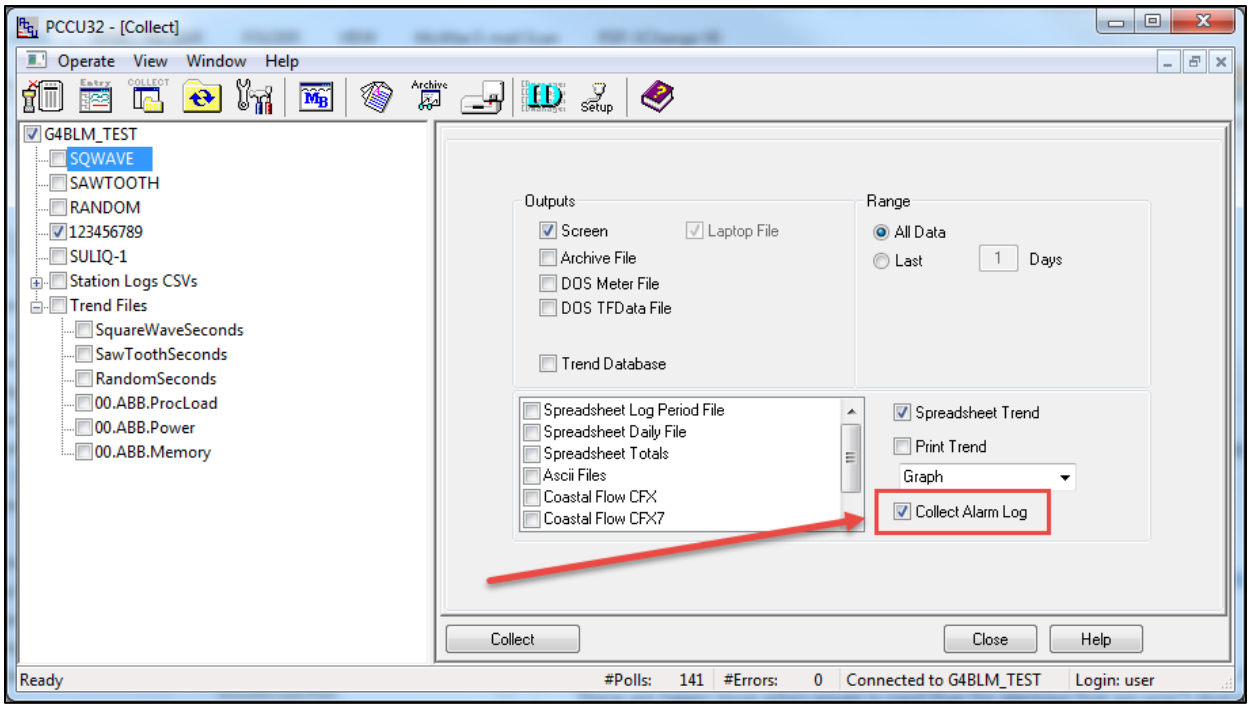
Alarms Report

Current | Log Period Data | Daily | Events | Alarms | Chart

Date/Time	Description	Setpoint Value	Status	Seq
06/01/2018 22:53:35	Differential Pressure High	75.000	Clear	19
06/01/2018 22:53:28	Differential Pressure HiHi	90.000	Clear	18
06/01/2018 22:53:25	Input DP Exceeded Max User Calibrated Span		Clear	17
06/01/2018 22:53:07	Input DP Exceeded Max User Calibrated Span		Active	16
06/01/2018 22:53:01	Differential Pressure HiHi	90.000	Active	15
06/01/2018 22:52:57	Differential Pressure High	75.000	Active	14
06/01/2018 22:52:23	PF Static Pressure High	80.000	Active	13
06/01/2018 22:51:40	Differential Pressure Low	10.000	Clear	12
06/01/2018 22:51:34	PF Static Pressure Low	40.000	Clear	11
06/01/2018 22:51:20	Differential Pressure LoLo	5.000	Clear	10
06/01/2018 22:51:18	BF Alarm Flag Bit		Clear	9
06/01/2018 22:50:55	Differential Pressure Low	10.000	Active	8
06/01/2018 22:50:55	Differential Pressure LoLo	5.000	Active	7
06/01/2018 22:50:52	PF Static Pressure Low	40.000	Active	6
06/01/2018 22:50:19	BF Alarm Flag Bit		Active	5
06/01/2018 22:50:07	BF Alarm Flag Bit		Clear	4
06/01/2018 22:49:52	BF Alarm Flag Bit		Active	3
06/01/2018 22:49:49	Input DP Exceeded Max User Calibrated Span		Clear	2
06/01/2018 22:47:12	Input DP Exceeded Max User Calibrated Span		Active	1
06/01/2018 18:26:35	Analyzer Update Error		Active	0

Collection of Logs

The collection of the Alarm Log is optional. The PCCU does not require the user to collect this log. It is highly recommended to be included in collections. To Collect the Alarm log (only available with “enhanced” option) with PCCU, the user must check the “Collect Alarm Log” box.



Summary

The “Enhanced” measurement application is an option that the user must select. It requires the appropriate Flash as well as the appropriate PCCU. It will also require that the user has host systems capable of collecting the new data and the ability to export the new data to other editing or reporting software applications, such as FlowCal.

When a user selects the “enhanced” option, they will be prompted that if selected, they will not be able to go back or unselect “enhanced”. It will require deleting the application and re-enabling the “non-enhanced” mode in the default settings if necessary. When AGA3/AGA7/Liquid is “enhanced”, it adds more data to the data records. We do not allow the user to then reduce the records if they decide they do not want “enhanced”. That measurement application will require deletion and re-enabling.

BTN/Totalflow_Measurement_Applications_Enhanced-EN 07.2019