Optimizing Signature® Flowmeter Performance

TELEDYNE ISCO
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Application Note
W-AN16

A properly configured Signature Meter will enhance performance and will result in satisfied customers. Often, however, technical support cases arise in which the root cause of the problem is found to be improper configuration. To reduce the number of cases in this category, this document will describe the known best practices for ensuring the maximum performance from a Signature meter through more accurate configuration. The more complex the system is—that is, the greater the number of sensors attached to the meter—the more important it is to study and implement these recommendations.

FIRMWARE/SOFTWARE VERSIONS

As with any code-driven product, periodic updates are released to fix bugs, add functionality, and enhance existing features. Therefore, whenever diagnosing an issue with a Signature meter, the first and most important step is to identify the firmware and/or software versions running on the Signature meter and on any associated TIENet® devices. Many issues can be very quickly resolved simply by updating every device to the latest version. The same is true when checking on a unit during routine maintenance and/or calibration. Always determine first whether the unit is operating with current code; if not, update it before taking any other steps. Being proactive in this manner will prevent various problems before they occur.

SITE NAMES

The default name for any Signature unit is "Signature Meter Site". If you do not give the unit a unique and meaningful site name, any connection or downloaded data from that unit is at grave risk as it could undesirably be merged in with any other site/data that was also left with that default name, and that would in essence corrupt the value of data from two (or more) sites as a result.

CONFIGURE MEASUREMENTS

Another commonly encountered area of trouble relates to the CONFIGURE MEASUREMENTS screen found in the HARDWARE – TIENet SETUP menu path. For each attached device, there are multiple parameters that can be activated for that device. It is not uncommon to find parameters activated but unused by the Signature meter, as they are of no interest. However, since these parameters have been turned on, the Signature meter must use system resources to read them, resources that should instead be focused only on what is truly desired from the unit.

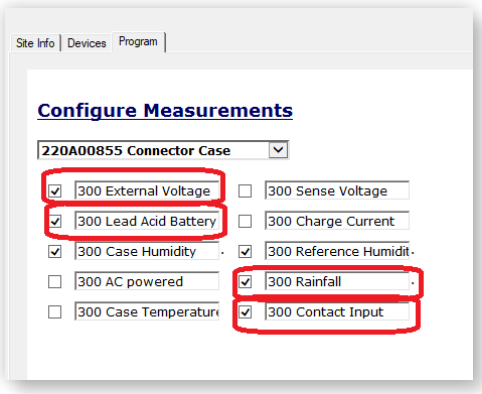
Common examples:

- Connector Case—300 RAIN GAUGE selected and active, but with no rain gauge attached.
- 308 Analog outputs—Using Channel 1 only, but Channel 2 is activated as well.

There are many other common examples of this.

Never activate parameters that are not in use and deactivate them when found.

There is a limit to the maximum number of active parameters the Signature can support. Exceeding this limit will negatively impact performance. The primary performance penalty is sluggish response. This could also result in undesirable results ranging from failed measurements to a completely unresponsive unit. The greater the number of TIENet devices connected to a system, the more critical these steps become. For example, the image below shows a 300 Connector Case configuration where unnecessary parameters have been activated.



Of the six parameters selected in this example, four are not in use, as follows:

- There is no external power connected
- There is no lead acid battery connected
- There is no rain gauge attached
- The contact input is not in use.

However, since the Signature meter has been configured to monitor these variables, it is spending time to process them. All four boxes should be unchecked to take the extra load off the system.

Check each TIENet device and ensure that only the parameters truly needed are checked. Ensure unused parameters or parameters deemed to be of little or no importance are unchecked. In certain cases where multiple TIENet devices are in use, it will be necessary to consider deactivating lower priority parameters that we might otherwise desire to be active. For example, in the case illustrated above, we could sacrifice (deactivate) one or both humidity variables as well. Parameters such as level, flow, pH, and so on will always be far more important than the humidity values.

DATA STORAGE

There are substantial gains to be made in determining which storage configuration settings are selected and HOW one goes about configuring them.

The two areas of concern here:

1) Storage rate configurations that are based upon priority

2) Configuration method

Storage Rates:

There is no improvement in data accuracy with intensive storage rates. There is no increase in accuracy when we choose to log at one-minute intervals verses a more relaxed rate of 5 or 15 minutes. More intense data is rarely better than less intense data; it is just more data to process. The reason: the Signature meter is storing the average of all measurements made over that interval. A flow rate value stored at a single 15-minute interval is essentially as accurate as the 15 individual 1-minute value. Changing to a 15-minute interval greatly reduces the amount of memory required, and results in 15x less data to process.

Consider the following:

- A 1-minute interval generates roughly 86,000 values per month for a single parameter.
- A 15-minute interval generates roughly 5,700 values in a month for that same parameter.
- There could be multiple parameters uniformly configured to log at a 1-minute interval, in which case the ramifications are that much more significant.
- There is a TIME reading logged at the same rate as the most intense parameter.
- Signature memory fills up and rolls over at a faster rate.
- With shorter logging intervals, downloads take much longer, the database is needlessly inflated, and processing data reports in Flowlink becomes slower.

EXAMPLE: Consider a situation with 10 active parameters at 1-minute rate:

- 310 Level 1 minute
- 310 Distance 1 minute
- 310 Air Temp 1 minute
- 310 Signal Strength 1 minute
- Flow Rate 1 minute
- Total Flow 1 minute
- Input Voltage 1 minute
- 300 Case Humidity 1 minute
- 300 Reference Humidity 1 minute
- 300 Rainfall 1 minute

On some level, this implies that humidity is every bit as important as flow rate, which is almost never the case. Furthermore, the 300 Reference Humidity setting isn't even applicable. An 310 Ultrasonic is attached, but it does not use pressure to take measurements. Therefore, nothing is using the reference line, and we would be getting the humidity reading of a sealed piece of tubing. That measurement would have no value.

Always program the unit to focus on what is important and reduce focus on what isn't.

Here is the impact of these configuration selections—remember the TIME variable is being logged as well: With a 1-minute interval for a 30-day month, the result is 475,200 readings per month, or 5,781,600 readings per year. In terms of memory size, that is 2,376,000 bytes of data per month and 28,908,000 bytes per year.

If these settings were to be customized instead, based strictly upon importance and need, with a 5-minute interval on the most important parameters, and a 24-hour interval on the less important parameters, the configuration would be as shown below:

- 310 Level 5 minutes
- 310 Distance 5 minutes
- 310 Air Temp 5 minutes
- 310 Signal Strength 5 minutes
- Flow Rate 5 minutes
- Total Flow 24 hours is normal
- Input Voltage 24 hours is more than sufficient
- 300 Case Humidity 24 hours is more than sufficient
- 300 Reference Humidity Turn OFF. Nothing attached uses the Reference Line
- 300 Rainfall Turn OFF; not even used

Our database storage results would then become:

- 43,290 readings per month (vs. 475,200)
- 519,480 readings per year (vs. 5,781,600)
- 216,450 bytes per month (vs. 2,376,000)
- 2,597,400 bytes per year (vs. 29,908,000)

These are substantial savings that are known to result in a better performing unit all around.

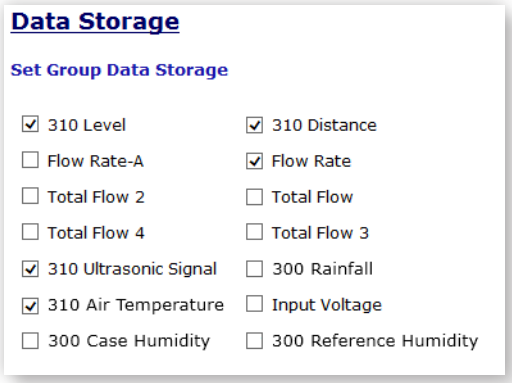
Storage Configuration Procedure:

Group Storage configuration has a significant impact on device performance. A common misconception of the Group Storage option is that it is a one-time-only event. This is incorrect. You can pass through the Group Storage Rate menu option multiple times, selecting ONLY those parameters you want to change.

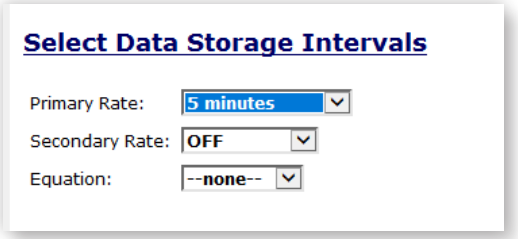
NOTE: De-selecting a parameter does not turn it OFF in the GROUP STORAGE MENU. It will merely result in no change to a deselected parameter's current storage rate.

Using the example above, there would need to be three passes through the GROUP STORAGE menu for proper configuration.

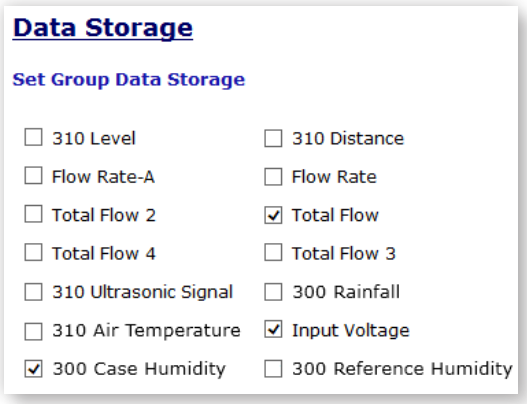
1. On the first pass, select only those parameters that require a more intensive storage rate and de-select all others:



2. Then select NEXT and enter 5 minutes as the desired PRIMARY storage rate:



3. Re-enter the GROUP STORAGE RATE menu. This time de-select the variables that were just now set for 5 minutes. Select instead only those requiring a 24-hour interval. Everything else should be de-selected:



4. Then select NEXT and enter 24 Hours as the desired PRIMARY storage rate:

5. Next we need to turn OFF "300 Rainfall and 300 Reference Humidity". To accomplish this, you could pass through the GROUP STORAGE menu, deselecting everything except 300 RAINFALL, and 300 REFERENCE HUMIDITY to turn their storage OFF. Or, you could use the INDIVIDUAL DATA STORAGE settings and turn the rate OFF for each measurement in that menu. Either route will produce the same result since in this case we are dealing with just a couple of parameters rather than a group.

The above configuration places the device focus on only the most important parameters, freeing up data storage resources.

If there is need to capture an event with a higher degree of resolution, the SECONDARY RATE function is another way to achieve that goal. A trigger can be used to switch from a more relaxed rate to a more intense rate whenever the event of interest is underway.

For example, if we have an overflow channel that is dry for several weeks at a time, but there is desire to capture an overflow event in higher resolution, the unit could be configured with a 1-minute logging interval, but this would result in weeks of running on "0" readings that are of little value. The goal is to see the higher resolution data only during the EVENT of interest.

Therefore, the unit should be set to log flow data at a 1-hour interval EXCEPT when a depth of 0.5 inches or higher is measured for a period of 5 minutes (this duration is user selectable), which means the event of interest has begun. The system will then log data at the higher rate until the flow rate goes back down below the event trigger, at which point it will revert to the less-intensive logging interval. This approach saves memory and provides the other benefits mentioned earlier while still ensuring we obtain the high-resolution data during the event.

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October 6, 2023