ANALYTICAL TECHNOLOGY, INC.

O & M Manual

Q51/Metrinet Calibrator/Logger

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Part 1 - Introduction

1.1 General

The Q51/MetriNet is a portable battery powered tool that supports many M-Node sensor applications. It can be used with permanently installed Q52/MetriNet systems, with any other logging system using M-Node sensors, or as a complete stand-alone data logger to run M-Node sensors directly.

Although the sensor list is always expanding, currently available M-Nodes are as follows:

Parameter	Range	Resolution
Free Chlorine	0-5.00 ppm	0.01 ppm
Combined Chlorine	0-5.00 ppm	0.01 ppm
Total Chlorine	0-5.00 ppm	0.01 ppm
Turbidity	0-40.00 NTU	0.01 NTU
pH	0-14.00 pH	0.01 pH
Conductivity	0-2000 µS	1 µS
ORP	0-1000 mV	1 mV
Dissolved Oxygen	0-20.00 ppm	0.01 ppm
Fluoride	0.1-10.00 ppm	0.01 ppm
Dissolved Ozone	0-5.00 ppm	0.01 ppm
Chlorine Dioxide	0-5.00 ppm	0.01 ppm
Peracetic Acid	0-200 ppm	1 ppm
Hydrogen Peroxide	0-20.00 ppm	0.01 ppm
Pressure	0-300 PSI	1 PSIG

The Q51/MetriNet communicates with individual sensor nodes using the Modbus RTU protocol. Each measuring node is a complete Modbus smart transmitter with a submersible multi-pin M8 connector on the back. If only one sensor is used, that sensor is connected directly to the Q51/MetriNet. If more than one sensor is used, sensors plug into a multi-sensor M-Node sensor bus bar, which is then connected to the instrument. Systems with more than 5 sensors require 2 bus bars.

M-Nodes are normally installed in modular flow chambers, secured with twist-lock pins on the front of the node. When used with the portable Q51/MetriNet, they can be used in the same flow chamber for periodic maintenance and calibration, or they can simply be placed into liquid filled beakers. Some sensors, like the Q32T turbidity sensor, may require flow-chamber mounting only, as they are required to operate under some amount of liquid pressure

Flow chambers clamp together with locking rings on each end. Push-to-connect fittings are installed on each end but end fittings contain 1/8" NPT female threads to accommodate other fittings. The outlet side of the flow assembly will normally contain a fixed-flow regulator to maintain a constant flow of 200 ml/min. when sample line pressure is 1-100 PSI (.07-6.6 bar). Maximum pressure on flow chambers should not exceed 100 PSI. Recommended inlet pressure is 15-60 PSI (1-4 bar).

In operation, the Q51/MetriNet logs measurement data at an interval programmed by the user, from a minimum of every 1 minute to a maximum of 99 minutes. Data is stored in on-board non-volatile Q51/MetriNet memory which may be offloaded with a PC using a USB cable and the ATI Data Log Utility software on a PC.

Figure 1 – Portable Q51/MetriNet with 1m Cable and One M-Node Sensor

Part 2 - Specifications

2.1 General Specifications

Displayed Parameters (for each M-Node)	Four digit node measurement (ppm, NTU, mv. etc) Sensor temperature, -10.0 to 55.0 °C (14 to 131 ºF) Other measurement displays on lower line dependent on specific sensor
Display	128 x 64 OLED graphic display, 2.2” (57mm) x 1.1” (29mm) viewable
Data Logger	Internal 4MB SPI Flash memory. Data is removed via USB cable and special ATI PC program.
Controls	4-key polycarbonate keypad, UV resistant coating
Power	Three AA batteries
Bus or Node Connection	Data cable with M8 waterproof connector, 3.28 ft. (1 m)
Ambient Temperature	Controller Service, -20 to 60 °C (-4 to 140 ºF) Sensor Node Service, -5 to 55°C (23 to 131 °F) Storage, -5 to 70 °C (23 to 158 ºF)
Ambient Humidity	0 to 95%, indoor/outdoor use, non-condensing to rated ambient temperature range
Environmental	RoHS Compliant
EMI/RFI Influence	Designed to EN 61326-1
Enclosure	ABS 94-V0 rated enclosure. Includes silicone boot HWD: 3.3” (83.8 mm) x 5.6” (142.2 mm) x 1.9” (48 mm) with boot
Weight	0.95 lb (0.43 kg) with batteries

2.2 Performance Specifications (M-Node)

Accuracy	1% of range
Repeatability	0.5% of range
Sensitivity	0.1% of range
Non-Linearity	0.1% of range
Warm-up Time	3 seconds to rated performance (electronics only)

Supply Voltage Effects +/- 0.05% of range

Power When running continuously in Service Mode with one Q32P sensor, approximately 30 mA DC @ 4.6 VDC, or 138 mW. Off-state leakage current approximately 12 uA.

When running in data logger mode, the instrument will show the same 30 mA DC @ 4.6 VDC, or 138 mW when a user is calibrating or configuring a single Q32P sensor. However, the instrument operates in ON-OFF cycles in data logger mode, and automatically drops to a "sleep" mode during non-measurement times and after display time-out occurs. During sleep, the instrument consumers only about 1.4 mA @ 4.6 VDC, or about 6.4 mW.

**Note- Other than the Q32T, all other M-Node sensors consume approximately the same of power. The Q32T consumes about 2x the power of the standard M-Node.*

Run Time/Service Mode Battery operating time is highly dependent on user settings, type and number of sensors, and how often instrument is used.
Typical 5 hours per week with one Q32P:>**3 months**
Continuous running with one Q32P:**2-3 days**

**Note- Assumes 2500 mA AA-alkaline batteries used. Other than the Q32T, all other M-Node sensors consume approximately the same of power. The Q32T consumes about 2x the power of the standard M-Node.*

Run Time/Data Log Mode - Battery operating time is highly dependent on user logging settings, and type and number of sensors. The OLED display is OFF the majority of the time in data logger mode. A sleeping Q51/MetriNet consumes about 1.4 mA @ 4.6V, or 6.4 mW. Active current, or "pulse power," then adds to that to calculate final average power over some period of time. Calculating this total power can be a little complex as the pulse of high current must be average over some period of sleep time. Batteries see average power.

Some typical power examples based on user settings:

1- One Q32P sensor, sensor delay 10 sec, **l**og interval 15 min. So the Q51/MetriNet + Q32P consumes 13 mA @ 4.6V when active for only 10 seconds per 15 min. Average active power per hour is then 0.6 mW. Add baseline sleep power of 6.4 mW for a total average power of 7 mW.
Run-time estimate of 1645 hours or about 2 months

2- One Q32P sensor, sensor delay 10 sec, **l**og interval 1 min. So the Q51/MetriNet + Q32P consumes 13 mA @ 4.6V when active for only 10 seconds per minute. Average active power per minute is then 10 mW. Add baseline sleep power of 6.4 mW for a total average power of 16.4 mW.
Run-time estimate of 701 hours or about 30 days

3- Three sensors, Q32P, Q32T, Q32H0, sensor delay 30 sec, log interval 15 min. So the Q51/MetriNet + Q32P/Q32T/Q32H0 consumes 35 mA @ 4.6V when active for only 30 seconds per 15 minutes. Average active power is then 5.4 mW. Add baseline sleep power of 6.4 mW for a total average power of 11.8 mW.
Run-time estimate of 974 hours or about 40 days

**Note- Display is off in all cases above. Assumes 2500 mA AA-alkaline batteries used. Other than the Q32T, all other M-Node sensors consume approximately the same of power. The Q32T consumes about 2x the power of the standard M-Node. The biggest influence in battery life for datalogger mode is how often samples are taken, as all sensors are powered up at that time.*

Equipment bearing this marking may not be discarded by traditional methods in the European community after August 12 2005 per EU Directive 2002/96/EC. End users must return old equipment to the manufacturer for proper disposal.

Part 3 - Mechanical

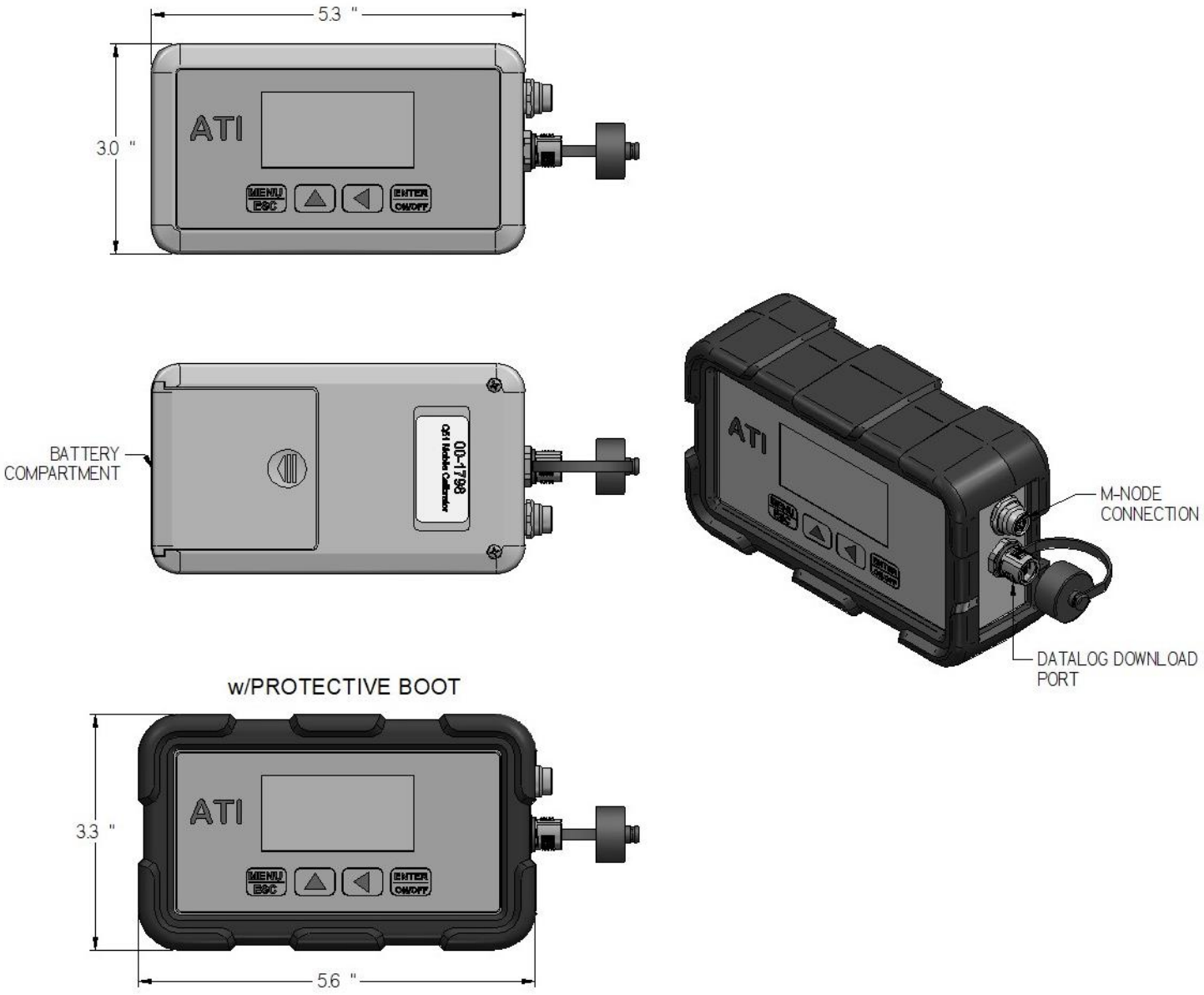


Figure 2 - Calibrator General Diagram

Part 4 – Operation

4.1 General

The Portable Q51/MetriNet operates is two distinct modes of operation, Service (Srvc) and DataLog (DLog.) These modes are selected the moment the instrument is first turned ON.

-**Service Mode** is for general calibration and configuration of M-Node sensors.
-**DataLog Mode** is selected to create a complete remote data logger system.

4.2 Power and Battery Replacement

To turn instrument ON, momentarily press and hold ON/OFF key. To turn the instrument OFF, press and hold the ON/OFF key for 7 seconds. The query “Shut Down?” will appear, with NO displayed. Change No to YES, and press ENTER.

The display has a battery ICON in the upper right corner that indicates how much battery life remains. This symbolic representation varies based upon the measured battery voltage. In addition, one of the lower INFO screens displays specific battery voltage level. The unit will operate down to about 2.7V of total battery voltage, and several battery life examples are shown in the Performance Specifications section.

If the instrument is plugged into a USB host device and is currently OFF, the display will periodically display the message “Bus Power On.” The instrument is in “sleep mode” when plugged into USB power, as the USB connection is only used for offloading data. However, the sensor bus power is turned on, so the unit can be used in this way to polarize sensors without using up battery power.

In Service Mode, the display and sensor measurement will remain active until the instrument is turned OFF, or until no key is pressed for 30 minutes. After 30 minutes of no key press, the instrument automatically shuts down.

Batteries are easily replaced by removing protective boot, and then sliding off lower battery cover.

Figure 3 – Battery Replacement

4.3 Instrument Interface

The user interface for the portable Q51/MetriNet consists of a graphical OED display and a membrane keypad. All functions are accessed from this user interface.

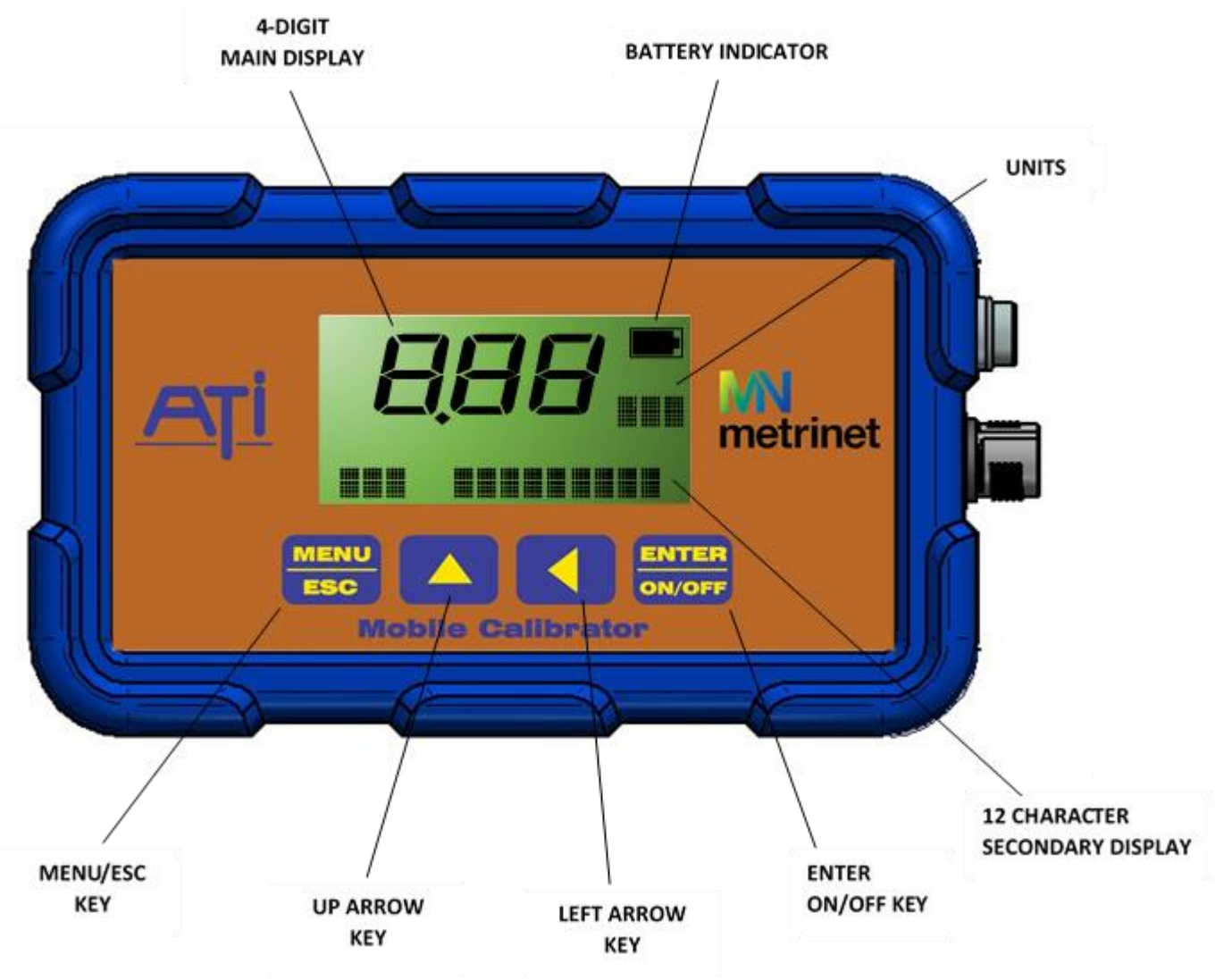


Figure 4 – Portable MetriNet Interface

The interface is organized around 4 main menu tree branches: MEASURE, INFO, SENSOR and CONFIG. The MEASURE and SENSOR menu displayed data is controlled by the individual M-Node sensor, while INFO contains display-only information about the Q51/MetriNet system. The CONFIG menu contains Q51/MetriNet setup parameters. Depending on the mode of operation, the software map will appear in two different arrangements.

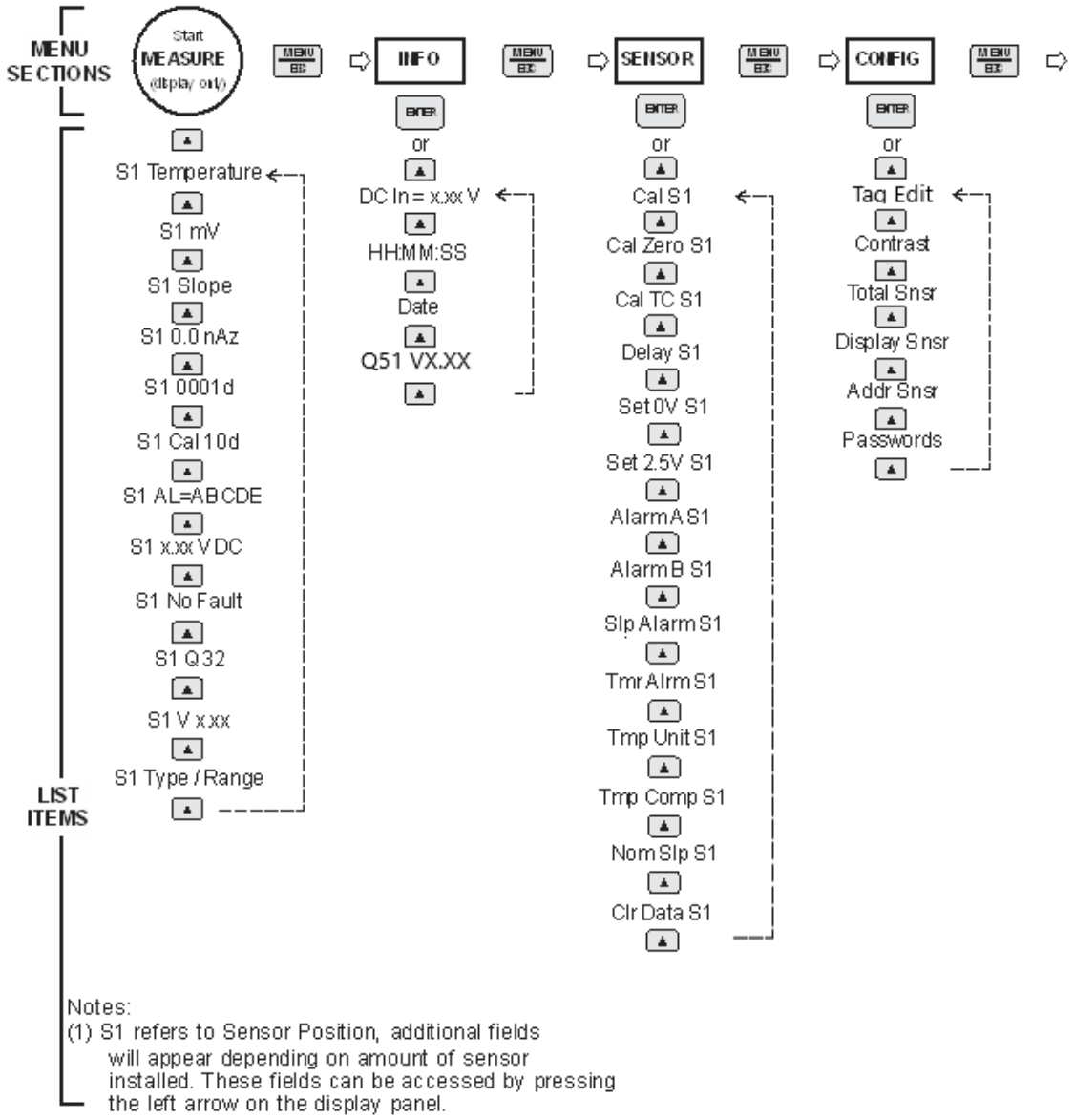


Figure 5 – Service Mode Software Map

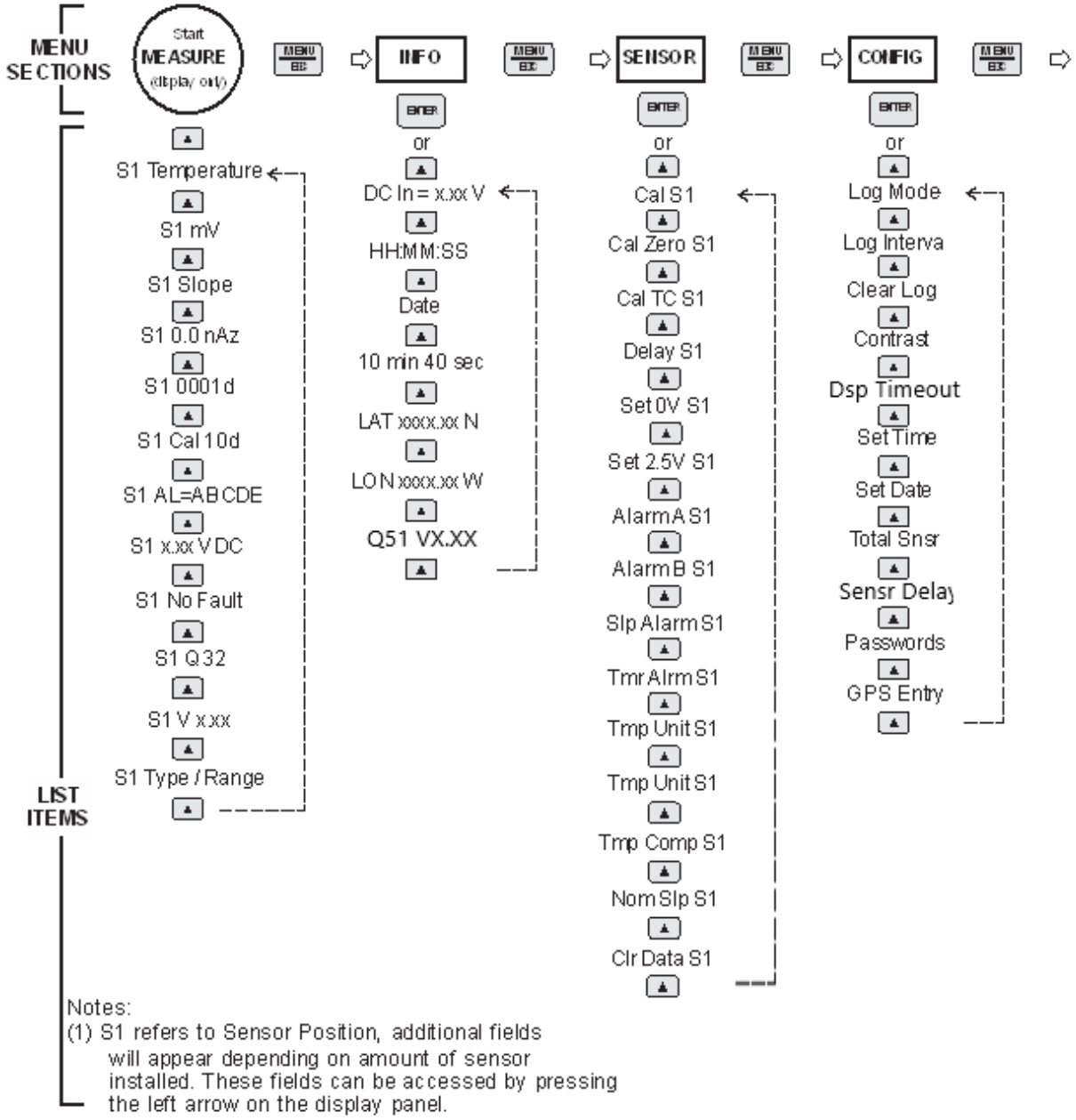


Figure 6 – Data Log Mode Software Map

4.31 MEASURE Menu

The default menu is MEASURE. This menu is display-only. When left alone, the unit will return to the MEASURE menu after 30 minutes. The lower line information applies to the node currently displayed. To look at information on an individual node, press the ◄ key. After selecting the node you wish to look at, use the ▲ key to scroll through variables on the lower display line. The information is not exactly the same for every node but includes the following.

NOTE: The S1 designation means sensor #1 and will change for each sensor.

S1 25.7°C	Temperature display. Can be displayed in °C or °F, depending on user selection.
S1 32.0 nA	Raw sensor data. Could be mA, mV., or other.
S1 100%	Sensor output response vs. ideal calibration. Also referred to as sensor "slope" and indicates sensor condition. Value updates after each calibration
S1 0.0 nAz	Sensor output current at a zero ppm input. Value updates after a zero-calibration.
S1 0001d	Sensor life run-time in days. Indicates how long the sensor has been in operation.
S1 Cal 10d	Calibration timer. Indicates number of days since last calibration.
S1 AL=ABCDE	Alarm indicator. Shows which alarms are active.
S1 2.50VDC	Sensor voltage output (only shown for Q32 sensors.)
S1 No Fault	Sensor fail message to define detected fault condition.
S1 Q32H0	Sensor model number.
s1 VX.XX	Sensor firmware version
S1 Res Clr/0-5.00	Identifies type of measurement and overall range. Display alternates between measurement type and range. This is the text TAG field, and it can be modified in some newer sensors.

To manually sequence through the M-nodes, press the ◄ key. By pressing the ◄ key repeatedly, you can cycle through all S1-S8 measurements. If no key is activated for 30 minutes, the display will revert to scan mode. When you select a specific S-# sensor using the ◄ key, you can then sequence through the information screens on the bottom line using the ▲ key.

Once you have selected a specific node, you can go to the SENSOR menu for that node by pressing Menu twice. From the SENSOR menu, you can adjust sensor zero and sensor span, calibrate temperature, set alarms, and adjust other settings.

NOTE: If passwords are enabled, you must enter your password in order to make sensor adjustments.

4.32 INFO Menu

The INFO menu provides some basic reference-only information on the Q51/MetriNet, also called the Q51. Since the portable Q51/MetriNet runs in two distinct modes, Service and DataLog, the display here changes slightly based on which mode is running.

INFO items shown in Srvc Mode:

13:59:40	Hour/Minute/Sec time. 24-hour format.
Jan 20, 2000	Current date
Q51 Ver X.XX	Q51 software version number
DC In = 4.6	Measured DC input voltage (from battery or power supply)

INFO items shown in Dlog Mode:

13:59:40	Hour/Minute/Sec time. 24-hour format.
Jan 20, 2000	Current date
10min 40sec	Time until next data point is recorded.
LAT 1234.56N	User entered latitude position
LON 1234.56W	User entered longitude position
Q51 VX.XX	Q51 software version number
DC In = 4.6	Measured DC input voltage from battery supply

4.33 SENSOR Menu

The SENSOR menu provides all M-Node sensor configuration and calibration functions. This menu information largely originates from sensor memory and there is some variation in the exact menu displays from sensor type to sensor type. The information below illustrates a free chlorine sensor as an example.

The functions outlined below allow users to adjust various parameters and calibrate sensors. When making adjustments, pressing Enter will normally start the process. Values may be adjusted using the ▲ and ◄ keys. Pressing Enter again will accept the changes. Pressing Menu/Esc during a routine will cancel the adjustment and go back to the starting screen.

Cal Chlr S1	Calibration routine for sensor span adjustment
Cal Zero S1	Calibration routine for sensor zero adjustment
Cal TC S1	Temperature calibration routine
Delay S1	Routine for adjustment of sensor “damping” or response time
Set 0V S1	Routine to adjust zero value for 0-2.5 V output. No adjustment necessary for sensors used with MetriNet systems. Used to set up sensors for other applications. Q32 sensors only.
Set 2.5V S1	Routine to adjust full scale value for 0-2.5 V output. No adjustment necessary for sensors used with MetriNet systems. Used to set up sensors for other applications. Q32 sensors only.

Alarm A S1	Setpoint for Alarm A. User may define an alarm limit above which the A alarm will be shown in the MEASURE menu.
Alarm B S1	Setpoint for Alarm B. User may define a second alarm limit above which the B alarm will be shown in the MEASURE menu.
Slp Alrm S1	User may define a "slope" alarm limit. If the sensor slope falls below that limit after a calibration, Alarm C is shown in the MEASURE menu.
Tmr Alrm S1	User may define an alarm limit for the time between calibrations. If a calibration is not done within the defined time period, Alarm D is shown in the MEASURE menu.
Tmp Unit S1	Allows temperature reading in degrees C or degrees F.
Tmp Comp S1	Allows modification of sensor temperature compensation.
Nom Slp S1	Normalizes slope to 100%. May be done after a sensor has been serviced and calibrated for the first time.
Clr Data S1	Resets all sensor stored data to factory default values.

4.34 CONFIG Menu

The CONFIG menu provides access to the Q51/MetriNet system configuration settings. Routines defined here are not sensor specific. Since the portable Q51/MetriNet can be operated in one of two modes, Service, or DataLog, the menu listing will appear slightly different in either case, as different functions are required.

Menus shown in Srvc Mode:

Tag Edit	Editor for TAG name in M-Node sensor
Contrast	Sets OLED graphic display contrast level
Total Snsr	Sets total number of sensors, 1-8, the system will query
Disply Snsr	Displays whether sensor 1-8 is readable
Addr Snsr	Configures unique slave address of sensor
Password	Sets system user passwords

Menus shown in Dlog Mode:

Log Mode	Configures data log to either wrap or fill
Log Interval	Sets measurement time period
Clear Log	Clears old data from stored measurement memory
Contrast	Sets OLED graphic display contrast level
Dsp Timeout	Sets the amount of time display stays active after last key press
Set Time	Set current time of day
Set Date	Set current date
Total Snsr	Sets total number of sensors, 1-8, that the system will query
Sensr Delay	Set the amount of time sensor is running before measuring
Password	Set system user password
GPS Entry	Set location

Details on Individual Srvc/Dlog Menus –

***Tag Edit**

Used to edit the Tag Field in the M-Node Sensor. The tag editor function allows the user to edit the sensor tag field (two-line text string) in the M-Node sensors. The Tag Edit function is only available in the Service Mode.

1. In the CONFIG menu, select Tag Edit and press ENTER.
2. The available characters that may be entered are displayed. On the lower line of the display, the tag stored in the selected sensor is displayed. The character that is blinking is the character that will be changed or overwritten. The underlined character is the character that is selected. Use the ▲ key to select the line, and the ◄ key to move the characters on the selected line to the underlined position.
3. Press the ENTER key to select the character. The blinking character will advance to the next position.
4. When finished editing the lower line, press the MENU key.
5. The unit will prompt to Write Data? (Yes/No). Change the Yes/No prompt using the ▲ key, then press ENTER.

***Note – this feature may not yet be supported by all M-Node sensors.**

Contrast

Used to adjust display contrast. Default is 1. Range is 1-8. Lowest value consumes the least amount of power.

Total Snsr

1-8. Total sensors connected.

1. Press Menu key to access CONFIG menu.
2. Press ▲ key until lower line display shows “Total Snsr”.
3. Press Enter and the main number on the display will flash.
4. Use the ▲ key to adjust the flashing number to the total number of sensors in your system and then press Enter.

Display Snsr

Tests communication to each sensor. Press Enter and status of comms for each sensor is tested. Sensor found indicate “Yes” while sensors not found indicate “No”. Press Enter again to exit.

Addr Snsr

Each measurement node must have a unique sensor number. By default, all sensors shipped from ATI are set to sensor #1. If there is more than one sensor in your system, a new sensor number must be assigned to each additional sensor. Only one sensor can be connected to the Q51 during this address setting operation. BEFORE SETTING ADDRESS, make sure you have correctly set the total numbers of sensors being used, as that setting limits the addresses you can enter here. Also, this menu will not appear if more than one sensor is connected to sensor bus.

1. Press Menu key to access CONFIG menu.
2. Press the ▲ key 5 times to access “Addr Snsr” and then press Enter.
3. The display will flash “NO”. Press ▲ once for “YES” and press Enter.
4. The controller will show the current sensor number assigned to that node and it will be flashing. Use the ▲ key to set the required sensor number and press Enter.
5. Repeat steps 1-4 for each M-Node in the system until you have assigned a unique number to each one.

Passwords

0000. A single 4-digit password. The Q51/MetriNet is designed with a single level of password protection to prevent unauthorized adjustments. The password is numerical, consisting of 4-digit numbers. As shipped, the Q51/MetriNet is not password protected. The user must decide whether to use password protection or not.

1. Go to CONFIG Menu and press ▲ repeatedly until bottom line indicates Password.
2. Press Enter. Display will show 0000 with right digit flashing. Using the ▲ and ◄ keys, enter a 4-digit supervisor password.
3. Press Enter and that number will be recorded.

Note: Consult Factory for password reset instructions, if forgotten.

Log Mode

Continuous/Full. Data held in flash memory may be recorded until the memory is full or it may be stored in a circular file, with the oldest data overwritten by the newest data once the memory is full. The selection is made here. Choosing "Cont" selects a circular file mode of operation. Selecting "Full" stops the data logging when the memory is full.

Log Interval

1-120 minutes. Interval of measured data storage.

Clear Log

YES/NO. This routine clears all data stored in flash memory. Once cleared, it cannot be recovered. Verify that all data has been saved (or is not needed) prior to clearing the log.

Display Timeout

15 sec, 30 sec, 1 min, 2 min, 5 min, continuous. Enter the time to shut off display after no key press. This is a power saving feature used to disable display during logging mode.

Set Time

Used to program current time. After pressing Enter, use a combination of the ▲ and Enter keys to adjust hours, minutes, and AM/PM.

Hours	**1-12.**
Minutes	**0-59.**
AM/PM	**AM/PM.**

Set Date

Used to program current date. After pressing Enter, use a combination of the ▲ and Enter keys to adjust year, month, and day.

Year	**00-99.** Enter current year
Month	**1-12.** Enter current month
Day	**1-31.** Enter current day

Sensor Delay

0-99 seconds. A delay time before sensor is read, after sensor has been powered up. This is used in datalogging mode when instrument is cycling on and off. NOTE – The Q32T requires a sensor delay of at least 25 seconds after power up.

GPS Entry Manual entry of GPS Latitude and Longitude Data.

Lat Degrees Range is 0 – 90. Enter the first two digits (DD) of the Latitude. Format for Latitude is DDMM.MM N/S.

Lat Minutes Range is 00.00 – 99.00. Enter the next four digits (MM.MM) of the Latitude.

Lat N-S Enter N for North, enter S for South.

Lon Degrees Range is 0 – 90. Enter the first three digits (DD) of the Longitude. Format for Longitude is DDDMM.MM E/W.

Lon Minutes Range is 00.00 – 99.00. Enter the next four digits (MM.MM) of the Longitude.

Lon E-W Enter E for East, enter U for West.

Part 5 – Service Mode Operation Details

5.1 General

As the Q51/MetriNet instrument operates in one of two distinct modes of operation on start-up, Service or DataLog, this section gives specific information on the use of the instrument in the Service Mode using an example.

5.2 Individual M-Node Service

The primary usage of the Portable MetriNet is to simply service or configure a single M-Node sensor. Only one sensor is connected, and it will appear on the instrument at address 1-8 if the instrument is set to 8 total sensors. Once the sensor is connected to the instrument, the user simply scrolls through S1 to S8 on the front MEASURE display until they see a valid sensor at a valid S address. From there, they can then access all the internal menus of the sensor and configure or calibrate that single sensor.

Figure 7 – Single M-Node Calibration in Beaker

An example of operation –

1- Make sure the Q51/MetriNet is set to 8 total sensors. Connect one sensor.
3- Turn Q51/MetriNet ON, and select SRVC mode operation.
4- Once the Q51/MetriNet display comes up, it will show sensor S1 data, or “Err” as no sensor is detected at S1.
5- If this S1 is not the same as the sensor address connected, simply press the ◄ key to move from S1 to S2, S3, etc. When valid data appears, this is the address of the connected sensor.
6- You may now operate all the sensor menus in the SENSOR menu listing to fully configure the sensor.

***NOTE -** The Q51/MetriNet will only allow you to scan the number of sensors configured in the menu ^Total Sensors.

5.3 Multi-Sensor M-Node Service

The Q51/MetriNet operates like the main Q52/MetriNet controllers in that a full bus of up to 8 sensors can be scanned. All sensors must have their own unique address setting, 1-8. In this mode of operation, the user can simply disconnect the master cable from a Q52/MetriNet system and plugs in the master cable from the Q51/MetriNet portable system. Now, they can configure any sensor in the group. You must not attempt to change addresses in this mode, or errors can be created if there is already a sensor on the bus at the same address. Address changes should only be made with one sensor connected at a time.

Figure 8 – Bus Operation of Several M-Node Sensors

Part 6 – DataLog Mode Operation Details

6.1 General

As the instrument operates in one of two distinct modes of operation on start-up, Service or DataLog, this section gives specific information on the use of the instrument in the Data Log Mode using several examples.

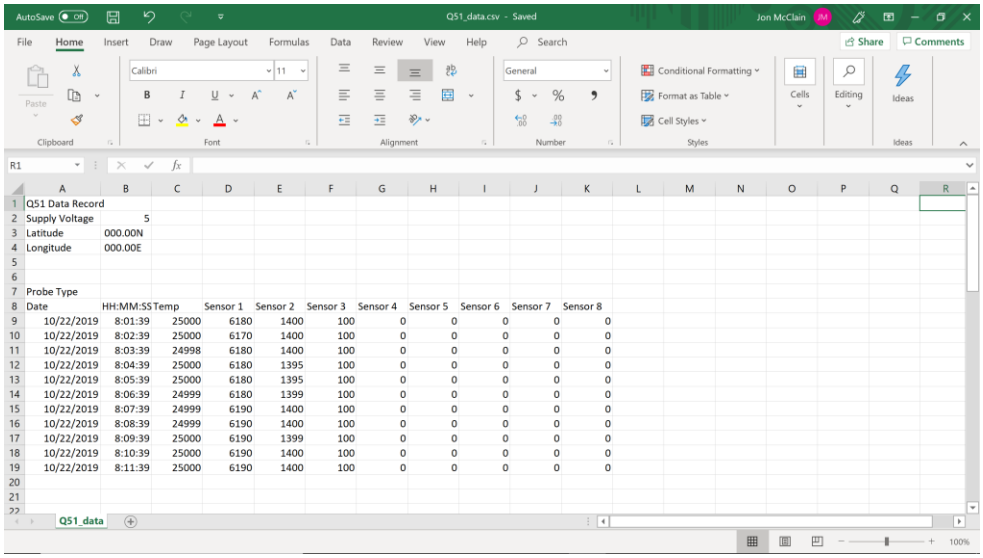
Data Log Mode would be used in cases where the Q51/Metrinet might be deployed for a period of time to gather data from 1-8 sensors. It can run for up to 30 days in cycle mode operation, cycling and collecting data much like the Q52/MetriNet.

Note that the instrument is always in “cycle mode” of operation during Data Logging. So, the instrument only has an active display when a key is touched. The display is shut down and the unit goes to sleep in between measurement interval times to save power.

The display will remain active for the Display Timeout time, and then shut down to conserve power. The instrument is still operating during this display-off time. The timer will restart any time a key is pressed. Once the display is active again, the sensors will be powered up and read continuously, so that the user can scroll through them. Once the timer times out, the display will turn off and the sensor power will also turn off – waiting for the next cycled measurement time. The cycle mode will now begin to wake up and poll the sensors at the selected Log Interval. Each time the sensor(s) are read, the data will be written to the data log flash memory.

6.2 Data File Format

Data stored inside the Q51/MetriNet in a standard *.CSV format. Data can be easily displayed and analyzed using Excel or other spreadsheet programs. Shown below is part of a typical data file that has uploaded to the ATI Q51 Data Utility.



	A	B	C	D	E	F	G	H	I	J	K
1	Q51 Data Record										
2	Supply Voltage	5									
3	Latitude	000.00N									
4	Longitude	000.00E									
5											
6											
7	Probe Type										
8	Date	HH:MM:SS	Temp	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8
9	10/22/2019	8:01:39	25000	6180	1400	100	0	0	0	0	0
10	10/22/2019	8:02:39	25000	6170	1400	100	0	0	0	0	0
11	10/22/2019	8:03:39	24998	6180	1400	100	0	0	0	0	0
12	10/22/2019	8:04:39	25000	6180	1395	100	0	0	0	0	0
13	10/22/2019	8:05:39	25000	6180	1395	100	0	0	0	0	0
14	10/22/2019	8:06:39	24999	6180	1399	100	0	0	0	0	0
15	10/22/2019	8:07:39	24999	6190	1400	100	0	0	0	0	0
16	10/22/2019	8:08:39	24999	6190	1400	100	0	0	0	0	0
17	10/22/2019	8:09:39	25000	6190	1399	100	0	0	0	0	0
18	10/22/2019	8:10:39	25000	6190	1400	100	0	0	0	0	0
19	10/22/2019	8:11:39	25000	6190	1400	100	0	0	0	0	0

Figure 9 – Raw Data Format

All data is stored as 16-bit data with 4 decimal resolution. In order to convert raw data to actual engineering units, simply divide each value by 1000. So, 7140 would represent 7.140 pH for a Q32P sensor. Since each instrument can accommodate up to 8 nodes, zero values are stored for each unused sensor input. Data manipulation such as appending files and generating graphical reports is left to the user.

The time period required to fill the memory depends on how many nodes are connected and how often data is stored. A controller with a maximum of 8 nodes logging data every 6 seconds can store 48 hours of data. That's about 230,000 data points. A more typical application with 4 M-Nodes taking data once every 10 minutes will hold about 239 days of data.

Data held in flash memory may be recorded until the memory is full or it may be stored in a circular file, with the oldest data overwritten by the newest data once the memory is full. The selection is made in the "Log Mode" routine of the CONFIG menu. Choosing "Cont" selects a circular file mode of operation. Selecting "Full" stops the data logging when the memory is full.

6.2 Data Logging Example

As an example of a logging set up, consider a 3-sensor example, Q23H, Q32P, Q32T. This example assumes time and date are already correct, and GPS entered location is correct - if even required.

1- **Turn on Q51/MetriNet and enter Dlog mode.**
2- **In CONFIG, set ^Log Mode to Cont.**
   This means our storage log will be in continuous mode.
3- **In CONFIG, set ^Log Intrval to 15 Min.**
   This is how often we will power up the sensors and take a measurement. Battery power is consumed much faster at a lower interval rate.
4- **In CONFIG, set ^Dsp Timeout to 15 seconds.**
   This is how long the display will stay active after the last key is pressed. Battery power is consumed much faster at a higher timeout value.
5- **In CONFIG, set ^Sensr Delay to 25 seconds.**
   This is how long the sensors will stay powered up before a reading is recorded. Most sensors only require about 5-10 seconds for a valid reading after power up. However, the Q32T sensor needs at least 25 seconds before a reading can be produced, so we have to account for that requirement. Battery power is consumed much faster at a higher delay value.

Once set up, simply leave the Q51/MetriNet in a safe location connected to the sensors and it will continually record data, cycling ON and OFF. The sensors are not active all the time, they are powered ON and OFF as required to save maximum power. Our 3 sensor example above will run for roughly 30 days on a fresh set of AA alkaline batteries. Quality rechargeable AA batteries like Panasonic Eneloop may also be used and are highly recommended. The run-time of the unit is highly dependent on the user settings above, and also on the number and type of sensors being used.

6.3 ATI Data Utility

First, the ATI free data management software must be installed. Install the Windows program to any Windows PC prior to connecting the Q51 Portable MetriNet. The free software utility is located for download here –
https://www.analyticaltechnology.com/analyticaltechnology/gas-water-monitors/water_software.aspx

NOTE: When installing the software onto your PC, make sure you have internet access as the installation utility may look for drivers needed for the program to run that may not be on your PC during the installation. Also, when you connect your PC to the Q51/MetriNet for the first time, your PC may need to install the driver for the virtual com port needed to communicate with the Q51/MetriNet. Once all drivers are installed, everything will work even if your PC is not connected to the internet.

6.4 Data Offload

To remove data, first turn OFF the Q51/MetriNet. Next, make a connection via any USB cable to the ATI Q51 instrument. Any USB cable along with the ATI Q51 DataLog Utility is used to remove data stored on the Q51/MetriNet instrument.

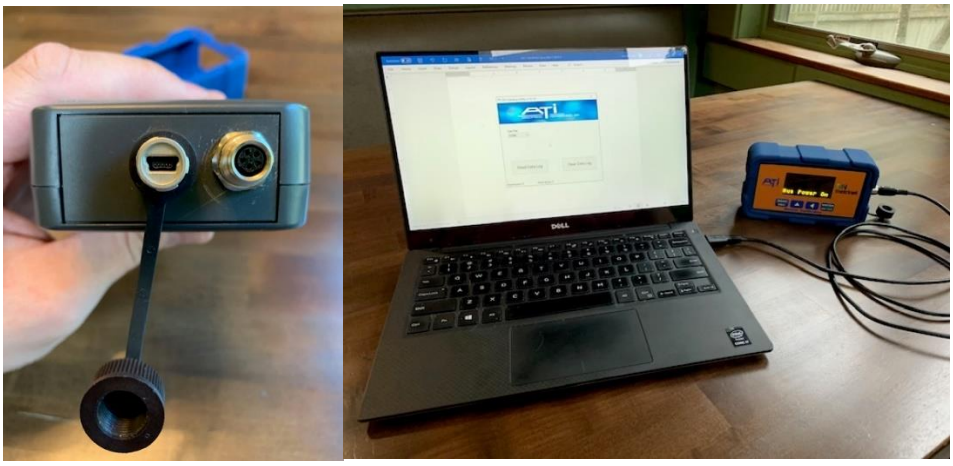


Figure 10 – Connecting Q51/MetriNet to Windows PC via USB

Once software is installed and Q51/MetriNet is connected to that PC, launch the Q51 Datalog utility. The screen below will be displayed. Click on Read Data Log.

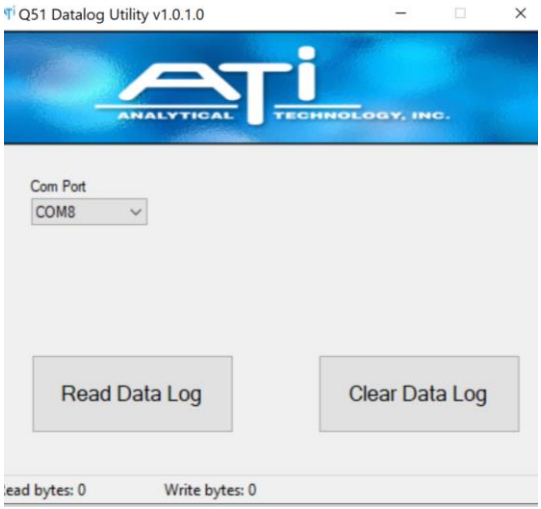


Figure 11 – ATI Q51 Datalog Utility

Clinking on Clear Data Log permanently removes all data memory from the Q51/MetriNet, like the Clear log function on the instrument. Next, a window will be displayed for the location of data storage. Enter a name for the file and press Ave. The default location for data is ***C:/This PC/Documents/Analytical Technologies/Q51 Datalog Files/***

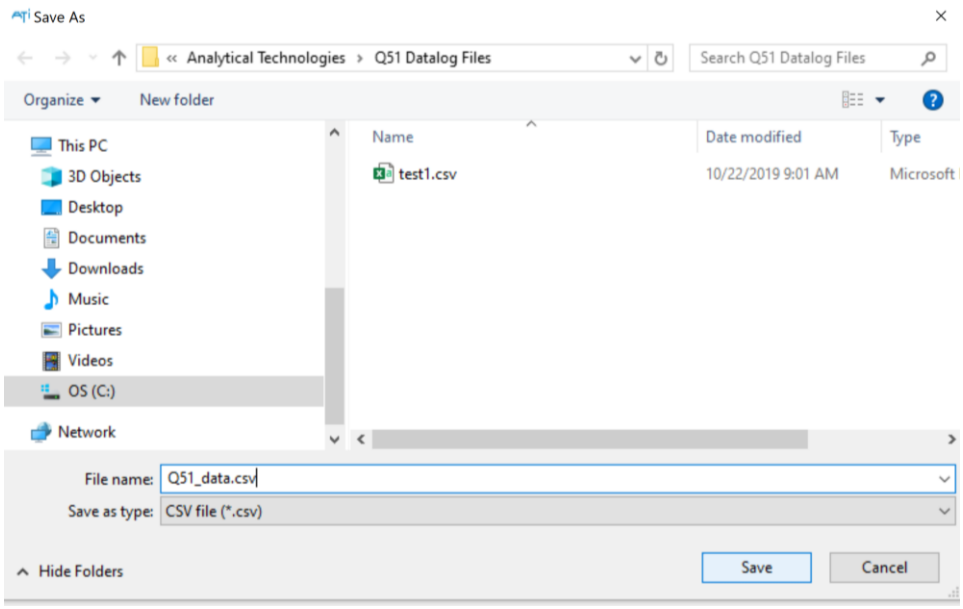


Figure 12 – Storing Q51 Datalog File

A confirmation will appear stating the file has been saved. Close window to finish program.

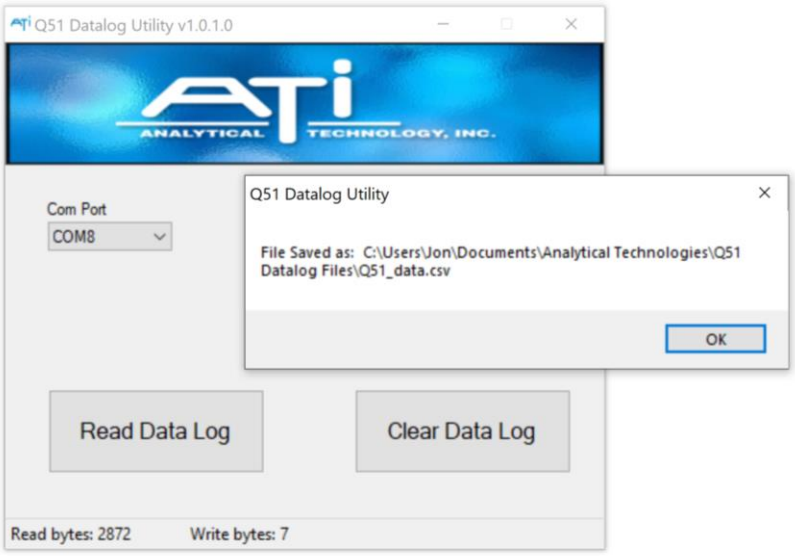


Figure 13 – Confirmation of Q51 Datalog File Storage

Spare Parts

Part No.	Description
Electronics	
00-1798	M-Node Calibrator
Spare Sensors	
Refer to Metrinet Manual	
Spare Sensor Components	
Refer to Metrinet Manual	
Flow System	
Refer to Metrinet Manual	
Cable Assemblies	
31-0216	USB, 2.0, A/B (mini)
31-0219	Node Cable, 3.25 ft. (1m)

PRODUCT WARRANTY

Analytical Technology, Inc. (Manufacturer) warrants to the Customer that if any part(s) of the Manufacturer's equipment proves to be defective in materials or workmanship within the earlier of 18 months of the date of shipment or 12 months of the date of start-up, such defective parts will be repaired or replaced free of charge. Inspection and repairs to products thought to be defective within the warranty period will be completed at the Manufacturer's facilities in Collegeville, PA. Products on which warranty repairs are required shall be shipped freight prepaid to the Manufacturer. The product(s) will be returned freight prepaid if it is determined by the manufacturer that the part(s) failed due to defective materials or workmanship.

This warranty does not cover consumable items, batteries, or wear items subject to periodic replacement including lamps and fuses.

Gas sensors carry a 12 months from date of shipment warranty and are subject to inspection for evidence of misuse, abuse, alteration, improper storage, or extended exposure to excessive gas concentrations. Should inspection indicate that sensors have failed due to any of the above, the warranty shall not apply.

The Manufacturer assumes no liability for consequential damages of any kind, and the buyer by acceptance of this equipment will assume all liability for the consequences of its use or misuse by the Customer, his employees, or others. A defect within the meaning of this warranty is any part of any piece of a Manufacturer's product which shall, when such part is capable of being renewed, repaired, or replaced, operate to condemn such piece of equipment.

This warranty is in lieu of all other warranties (including without limiting the generality of the foregoing warranties of merchantability and fitness for a particular purpose), guarantees, obligations or liabilities expressed or implied by the Manufacturer or its representatives and by statute or rule of law.

This warranty is void if the Manufacturer's product(s) has been subject to misuse or abuse, or has not been operated or stored in accordance with instructions, or if the serial number has been removed.

Analytical Technology, Inc. makes no other warranty expressed or implied except as stated above.

WATER QUALITY MONITORS

Dissolved Oxygen
Free Chlorine
Combined Chlorine
Total Chlorine
Residual Chlorine Dioxide
Potassium Permanganate
Dissolved Ozone
pH/ORP
Conductivity
Hydrogen Peroxide
Peracetic Acid
Dissolved Sulfide
Residual Sulfite
Fluoride
Dissolved Ammonia
Turbidity
Suspended Solids
Sludge Blanket Level
MetriNet Distribution Monitor

GAS DETECTION PRODUCTS

NH_3	Ammonia
CO	Carbon Monoxide
H_2	Hydrogen
NO	Nitric Oxide
O_2	Oxygen
CO	Cl2 Phosgene
Br_2	Bromine
Cl_2	Chlorine
ClO_2	Chlorine Dioxide
F_2	Fluorine
I_2	Iodine
H_X	Acid Gases
C_2H_4O	Ethylene Oxide
C_2H_6O	Alcohol
O_3	Ozone
CH_4	Methane (Combustible Gas)
H_2O_2	Hydrogen Peroxide
HCl	Hydrogen Chloride
HCN	Hydrogen Cyanide
HF	Hydrogen Fluoride
H_2S	Hydrogen Sulfide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
SO_2	Sulfur Dioxide
H_2Se	Hydrogen Selenide
B_2H_6	Diborane
GeH_4	Germane
AsH_3	Arsine
PH_3	Phosphine
SiH_4	Silane
HCHO	Formaldehyde
$C_2H_4O_3$	Peracetic Acid
DMA	Dimethylamine