metrinet®

Water Quality Monitors

Q52 MetriNet Controller

Badger Meter

ATI-UM-04443-EN-08 (January 2026)

User Manual

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INTRODUCTION

General

MetriNet is an integrated water quality system designed for potable water distribution monitoring. The primary function of this system is to log water quality measurements and transmit collected information to you digitally. Data may be manually collected using an SD card built into each controller or communicated digitally over wired/wireless interfaces. Interface options are available to retrieve data from the unit via LTE-M cellular radio, Modbus RTU/RS-485, Modbus TCP or Ethernet IP. With the *Cell Modem* option, periodic transmission of data to a user-specified data storage location (cloud site) provides remote data collection using 12–24V DC or battery power.

MetriNet is a modular system consisting of a controller (Q52) and at least one sensing node (M-Node or Q32). Controllers may be connected to up to 8 M-Nodes using bus bars to consolidate communication signals. 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
Nitrite	0–2.000 ppm	0.001 ppm
Turbidity	0–40.00 NTU	0.01 NTU
pH	2–12.00 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

MetriNet systems are powered by either battery packs or local 12–24V DC power supplies. The power source must be specified when ordering. Do not use a controller designed for battery operation on an external DC power supply. Units supplied for 12–24V DC operation may be run from a battery pack but it draws more current than a unit designed strictly for battery power.

The MetriNet controller communicates with sensor nodes using the Modbus protocol. Each measuring node is a complete sensor and Modbus transmitter with submersible multi-pin connector on the back. If only one sensor is used, that sensor is connected directly to the controller.

If more than one sensor is used, sensors plug into a multi-sensor bus bar, which is then connected to the controller. Systems with more than 5 sensors require 2 bus bars. Bus bar connectors are protected by push-on vinyl protective caps. Leave caps in place for any connectors not in use.

M-Nodes are installed in modular flow chambers, secured with twist-lock pins on the front of the node. Each node requires one chamber, and chambers clamp together with locking rings on each end. Push-to-connect fittings are installed on each end but end fittings contain 1/8 in. NPT female threads to accommodate other fittings. The outlet side of the flow assembly normally contains a fixed-flow regulator to maintain a constant flow of 200 ml/min.

NOTE: A fixed and stable input sample pressure in the range of 10–50 psig (0.7–3.4 bar) is required for proper operation of the system. We recommend 20–30 psig. Some sensors, like the Q32H chlorine sensors, require very stable operating pressure for proper operation. See *"Input Sample and Drain Connections" on page 17* for more details on maintaining proper pressure input.

In operation, MetriNet controllers log measurement data at an interval you program, from a minimum of every 0.1 minute to a maximum of 99.9 minutes. Data is stored in on-board non-volatile memory, which may be written to an internal SD card. If the controller contains the optional modem, data is transmitted to a cloud-based data site.

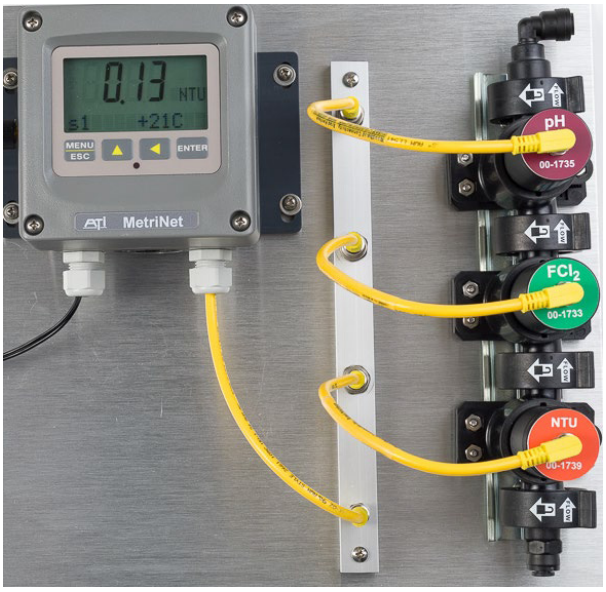


Figure 1: MetriNet system with 3 M-Nodes

System Components

MetriNet systems are supplied either as an assembled panel similar to that shown in *Figure 1 on page 6* or in individual components that can be mounted in an arrangement that better suits a specific application (*Figure 2*). Sensor nodes are normally not installed in the flow chambers when packed for shipment as many sensors require preparation and/or calibration prior to use. Each M-Node sensor has its own specific operating manual covering preparation, calibration and usage.

When unpacking the MetriNet hardware, check to verify that all items listed on the packing list have been received. Contact Badger Meter if any discrepancies are noted. Each sensor node is marked with a part number and measurement designation on a label under the connector.

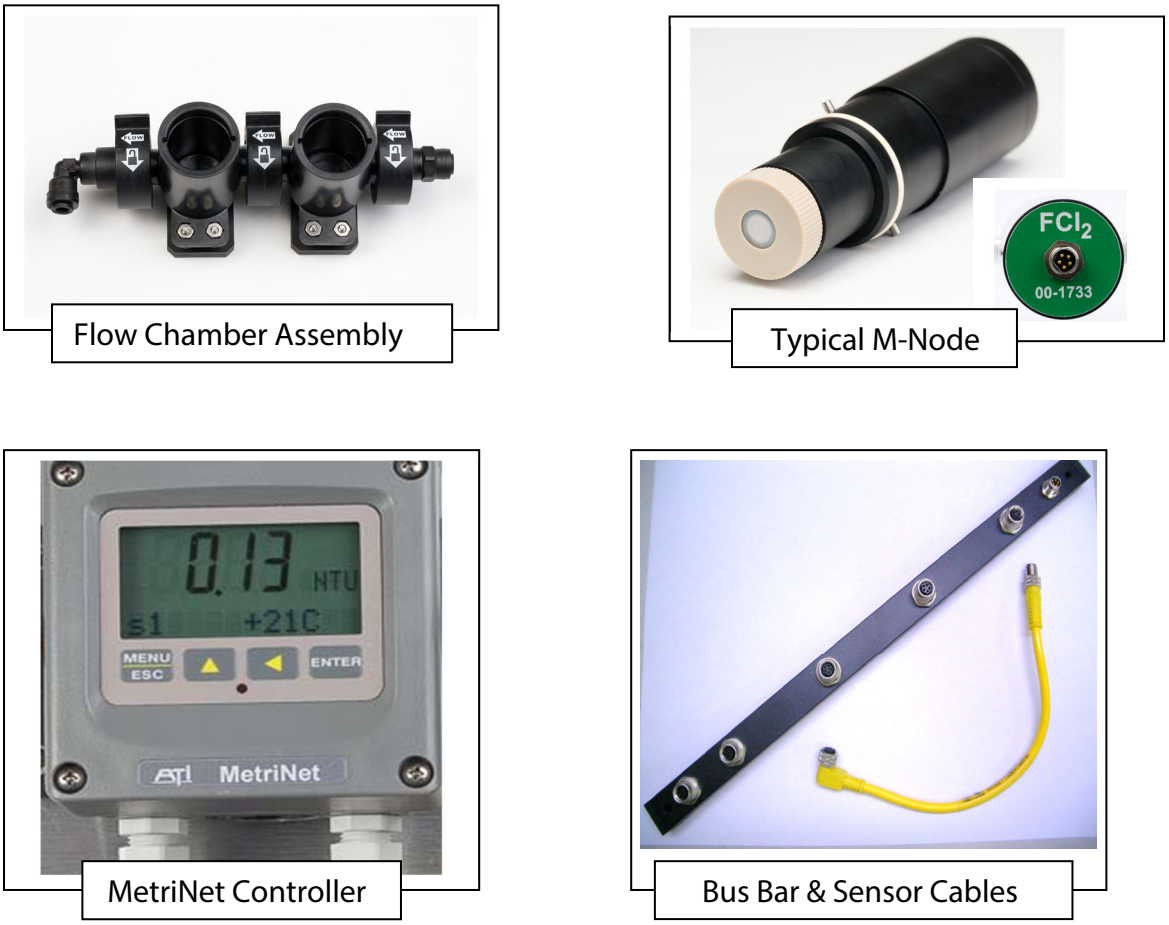


Figure 2: MetriNet system components

SPECIFICATIONS

MetriNet Controller Q52

Displayed Parameters (for each M-Node)	4-digit node measurement (ppm, NTU, mV, for example) Sensor temperature, –5 to 50° C (23–122° F) Other measurement displays on lower line dependent on specific sensor
Display	0.75 in. (19.05 mm) high 4-digit main display with sign 12-digit secondary display, 0.30 in. (7.62 mm) 5 × 7 dot matrix
Maximum Sensors	8 digital Q32 digital sensors of any measurement type
Data Logger	Internal 4 MB SPI Flash memory with removable micro SD card. Internal logger can hold 230,000 data points. Running 4 sensors and collecting data every 10 minutes is 239 days of time stamped data storage.
Controls	4-key polycarbonate keypad, UV resistant coating
Power (These values illustrate power consumption with no added communication features installed. For power information on units with communication feature, consult those user manuals.)	115V AC/60 Hz version, optional AC power supply on panel, 6W max. Continuous mode, backlight OFF, no SD, host Comms OFF DC Supply: 12–24V DC isolated version; @ 12V DC, 16 mA + 4.2 mA/Node max.* Battery: 8–16V DC non-isolated version; @ 12V DC, 2.4 mA + 4.2 mA/Node max.* Backlight add 3–4 mA @ 12V DC
Bus or Node Connection	Data cable with M8 5-pin waterproof connector, 13 ft (4 m)
Ambient Temperature	Controller Service, –20 to 60° C (–4 to 140° F) Sensor Node Sample and Service (Refer to the specific Q32 M-Node manual)
Ambient Humidity	0–95%, indoor/outdoor use, non-condensing to rated ambient temperature range
Electrical Compliance	CE/EMC to EN 61326
Environmental	RoHS Compliant, Flow path NSF61 certified
Digital Communication Output	None standard. Must be ordered as an option. Optional Modbus RTU (continuous) Optional Modbus TCP (continuous) Optional Ethernet/IP (continuous) Optional LTE-M Cellular, AT&T SIM, worldwide coverage, logger (interval upload)
Enclosure	NEMA 4X, polycarbonate, stainless steel hardware HWD: 4.40 in. (111.76 mm) × 4.40 in. (111.76 mm) × 3.50 in. (88.90 mm)
Conduit Openings	Two Pg9 cable glands, one 1/2 in. NPT 2-hole cable gland
Mounting Options	Wall or pipe mount bracket standard. Bracket suitable for either 1.50 in. or 2.00 in. I.D. U-bolts for pipe mounting
Weight	1 lb (0.45 kg)

* Q32T turbidity node consumes twice the power of other nodes, so added is 8.4 mA instead of 4.2 mA

MetriNet Flow Chambers

Sample Pressure Input	Stable/fixed, 10–50 psig (0.7–3.4 bar) 20–30 psig recommended
Material	Glass filled Ryton® (polyphenylene sulfide)
O-ring	Ethylene-propylene (EP)
Inlet	1/8 in. FNPT with 1/4 in. O.D. push-connect tube fitting
Outlet	1/8 in. FNPT with 1/4 in. O.D. push-connect right angle tube fitting
Flow Control Option	200 ml/min. flow control element installed in outlet assembly
Mounting	DIN rail adapter on bottom for 35 × 7.50 mm rail

MetriNet Bus Bar

Material	Powder coated aluminum
Connectors	Six M8 connectors, 5 female, 1 male (connections for 5 nodes and 1 controller)
Size	12 in. × 1/2 in. × 1/2 in. (30 × 12 × 12 mm)
Rating	IP67 when all connections made or capped

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.

INSTALLATION

Panel Mount Configuration

If your MetriNet system was purchased as a complete assembly mounted on a non-metallic plate, all that is needed is to mount the plate. Systems with up to 4 Nodes are supplied on a 14 in. × 14 in. plate, 1/4 in. thick. Mounting holes are located in each corner as shown in *Figure 3*. Larger systems are generally custom sizes with dimensions provided separately. For systems of 5–8 sensors, a 20 in. × 14 in. plate is available as shown in *Figure 4 on page 11*.

IMPORTANT

When operating in Cycle mode (battery powered mode,) locate the system as close as possible to the source water to be measured, as long sample feed lines to the system can result in excessive water usage and allow the sensors to quickly reach the actual source water temperature and value. If the system is located far from the source water, it is necessary to flow much more water during Cycle mode operation to essentially flush any standing water from the static input sample line.

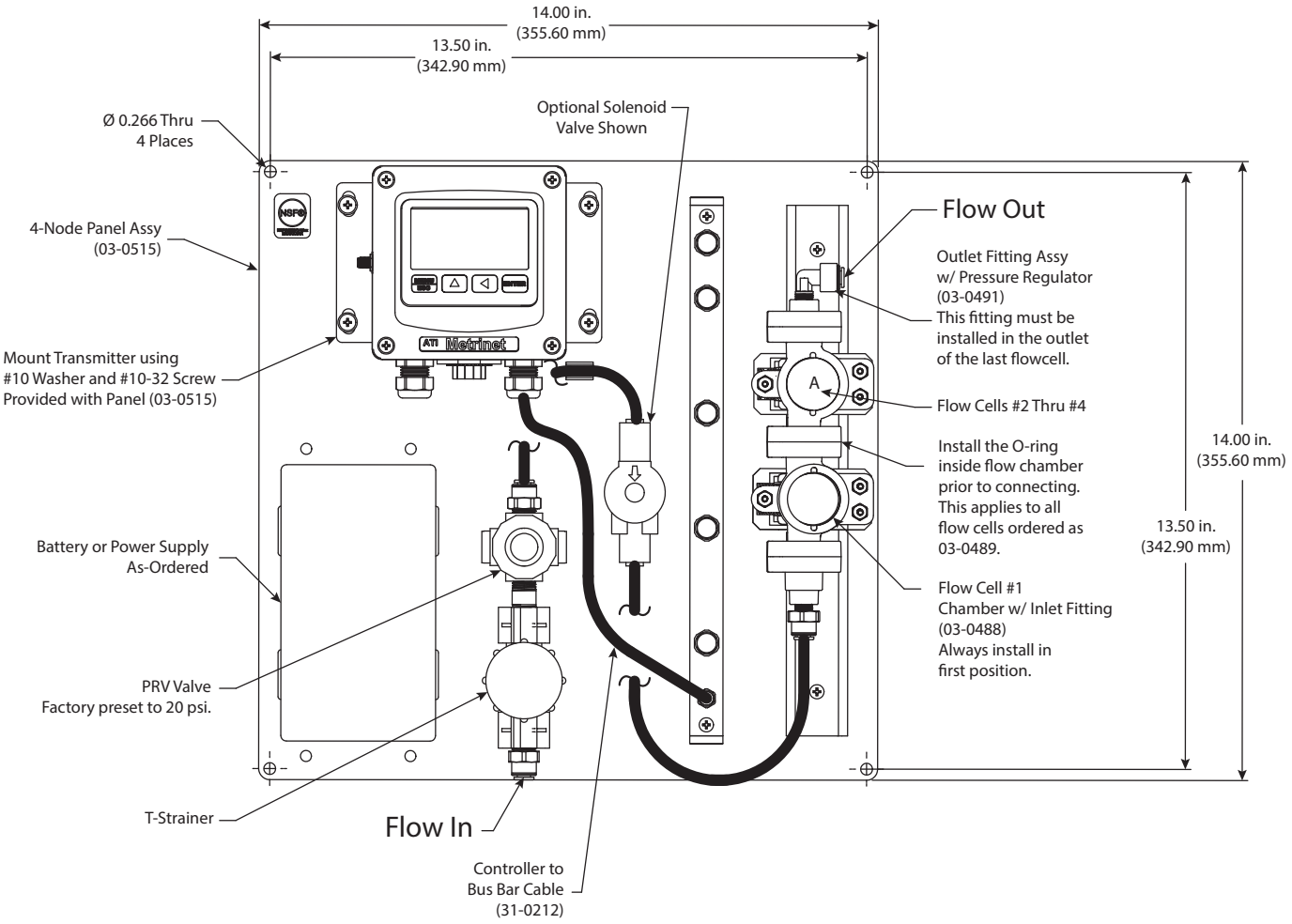


Figure 3: Up to 4 node system panel with T-strainer, PRV and optional solenoid valve

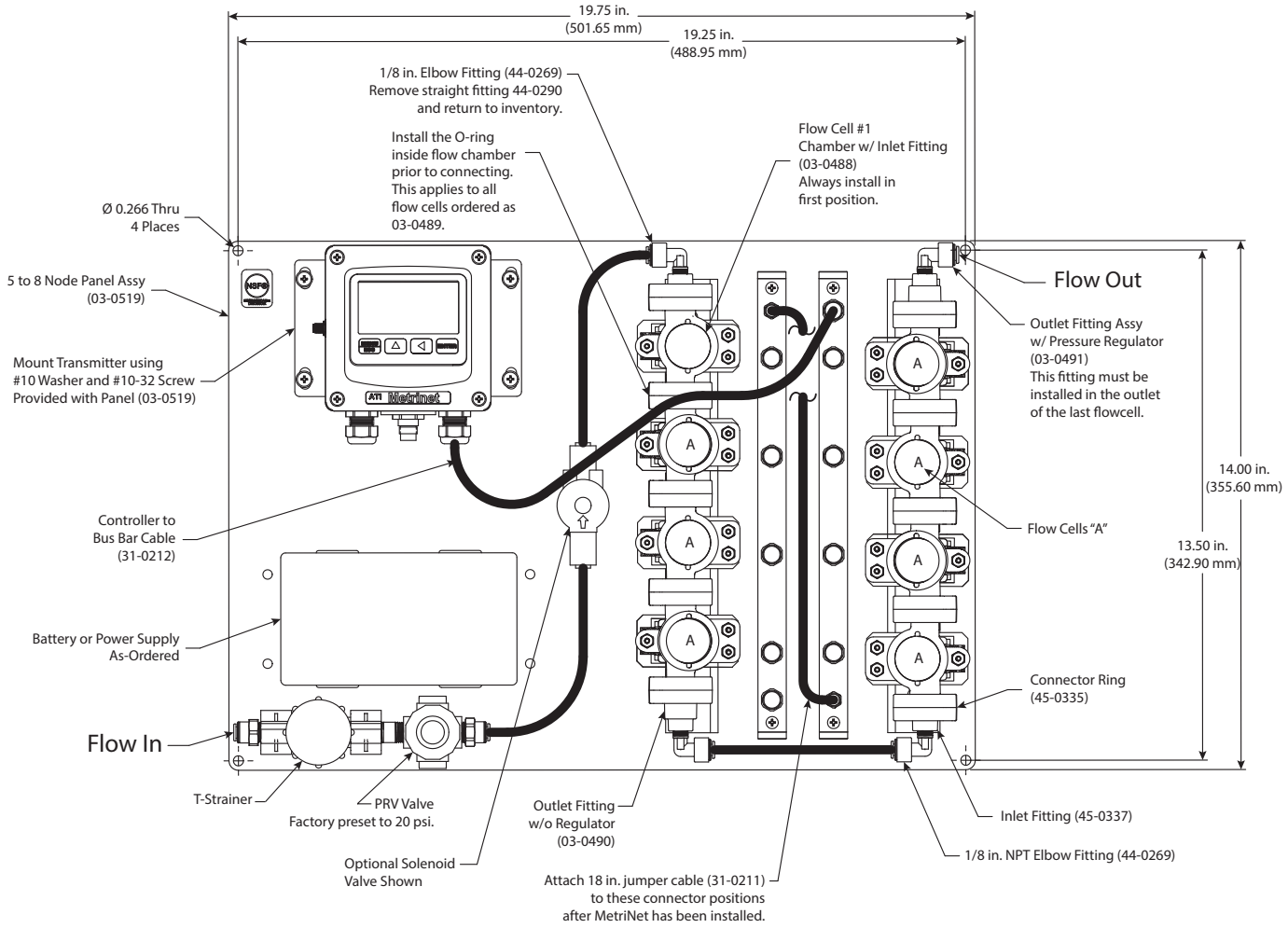


Figure 4: 5–8 Node system panel with T-strainer, PRV and optional solenoid valve

Install the mounting panel permanently and firmly on a wall or other flat vertical surface to avoid movement of the panel. Vertical mounting is critical for proper flow of bubbles through the system. Note location of drain line and feed water inputs. A PRV and mesh strainer is provided and mandatory for the feed line input as the mesh filter can catch scale or other solids, and the PRV maintains a constant pressure on the M-Node sensors. PRV valve is preset to 20 psi.

Some sensors, like the Q32H chlorine sensors, can be sensitive to pressure fluctuation or pulses, so the PRV provides contact pressure in locations where input pressure may fluctuate.

For cellular option systems, check location for general quality of cellular reception to assure the best chance of proper connectivity of systems in that location. If located in a basement, consider also ordering optional extension antennas to improve reception.

The outlet side of the assembly is supplied either with or without a flow control element installed. If the flow element is installed, flow is automatically controlled to 220 ml/min. If not, you must control the flow through the system by a method that produces a constant flow between 200–500 ml/min.

Bollard Mount Configuration

For MetriNet systems purchased with the bollard assembly, the bus bar(s), flow cells, controller and other optional additions are mounted to the internal chassis at the factory. Once sensors are prepared and installed, place the cover over the chassis and secure the chassis to the base with the included hardware.

The bollard is an ideal solution for a self-contained automated monitoring station and can be operated by 12–24V DC or battery power. We recommend 12–24V DC for more frequent sampling applications, as the battery system is optimum for sampling intervals of 15 minutes and consumes considerable amounts of power when sampling more frequently.

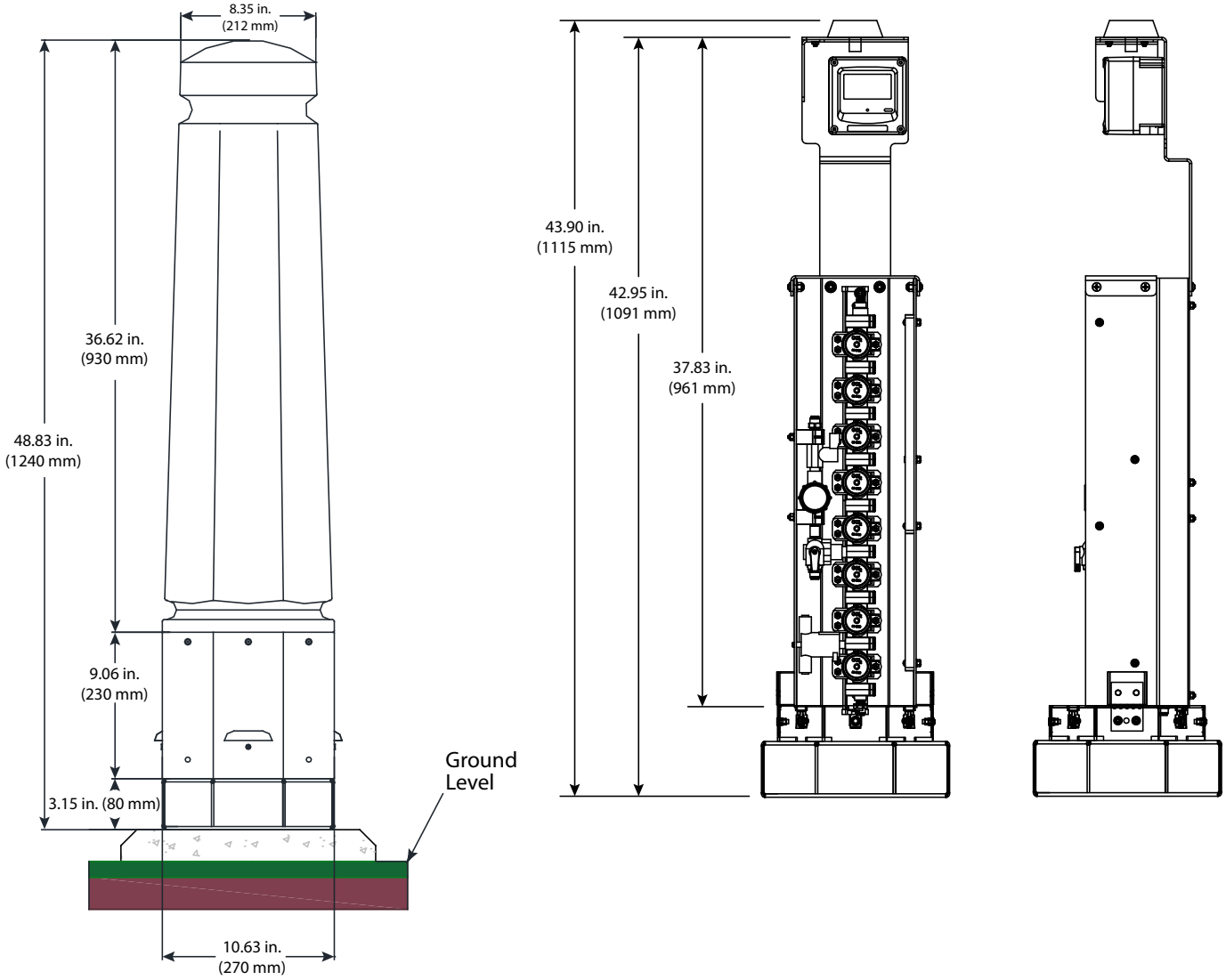


Figure 5: Bollard mount

Dimensions for mounting holes of the bollard base are shown in *Figure 6* along with a platform design option for securing the bollard.

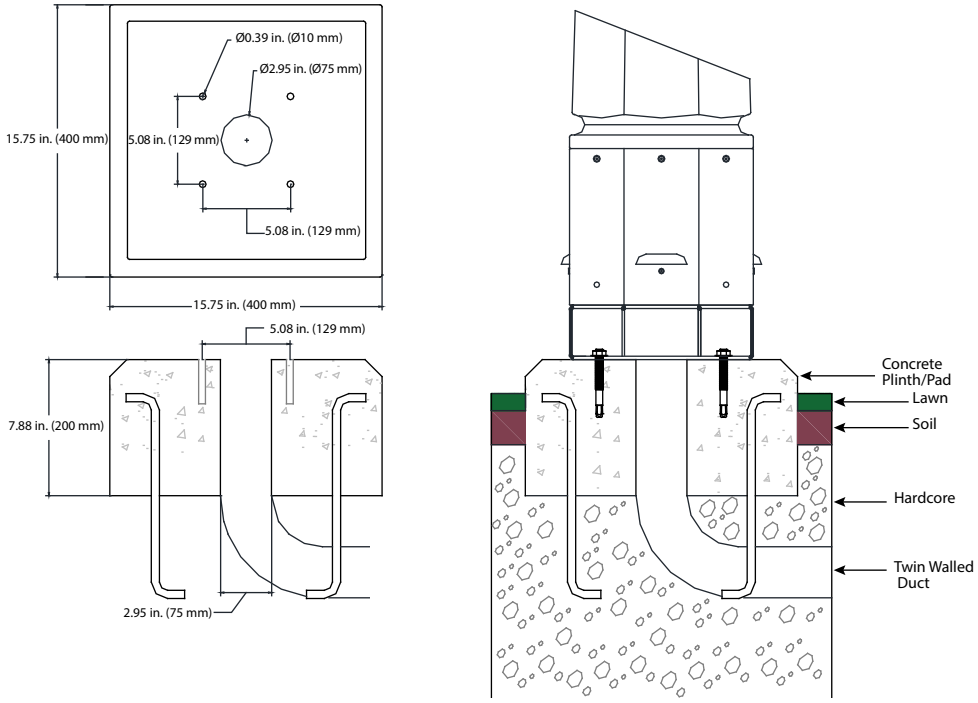


Figure 6: Bollard site preparation

NOTE: The specifications in *Figure 6* are for reference only. Always follow your local government building and electrical codes during construction and installation.

The bollard configuration is specifically suited for more temperate climates where the mounting location is not excessively hot and freezing does not occur, basically conforming to a location range of 10–50 °C (50–122 °F). Shaded locations can offset excessive solar heating, but for freezing locations the bollard would have to be removed in winter like other sampling stations in use today. Note location of drain line and feed water inputs. A required PRV and mesh strainer is part of the standard bollard configuration and the PRV is preset to 20 PSIG on the sensor and flow loop. The cap of the mesh strainer can be removed by unscrewing and manually cleaning out 80 mesh filter as required. For cellular option systems, check location for general quality of cellular reception to assure the best chance of proper connectivity of systems in that location.

Some sensors, like the Q32H chlorine sensors, can be sensitive to pressure fluctuation or pulses, so the included PRV provides contact pressure in locations where input pressure may fluctuate.

IMPORTANT

When operating in Cycle mode (battery powered mode,) locate the bollard as close as possible to the source water to be measured, as long sample feed lines to the panel can result in excessive water usage and allow the sensors to quickly reach the actual source water temperature and value. If the panel is located far from the source water, it is necessary to flow much more water during Cycle mode operation to essentially flush any standing water from the static input sample line.

MetriNet Mini Below Ground Configuration

For MetriNet Mini systems purchased with the below ground assembly, flow cells, controller and other optional additions are mounted to the case at the factory. Once sensors are prepared and installed, close and secure the lid. There are locking holes at the top of the case. You need to provide the locks.

The MetriNet Mini is an ideal solution for a self-contained automated monitoring station and can be operated by 12–24V DC or battery power. Use 12–24V DC for more frequent sampling applications, as the battery system is optimum for sampling intervals of 15 minutes and consumes considerable amounts of power when sampling more frequently.

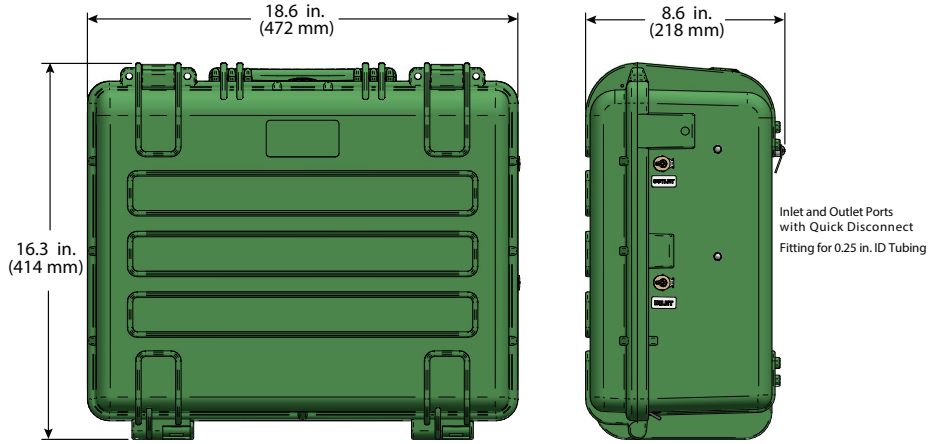


Figure 7: Mini below-ground case

NOTE: The specifications in *Figure 7* are for reference only. Always follow your local government building and electrical codes during construction and installation.

The below-ground configuration is specifically suited for more temperate climates where the mounting location is not excessively hot and freezing does not occur, basically conforming to a location range of 50–122 °F (10–50 °C). Below ground or shaded locations can offset excessive solar heating, but for freezing locations the case would have to be removed in winter like other sampling stations in use today. Note location of drain line and feed water inputs. A PRV and mesh strainer is part of the standard MetriNet Mini configuration and the PRV is preset to 20 PSIG on the sensor and flow loop. The cap of the mesh strainer can be removed by unscrewing and manually cleaning out 80 mesh filter as required. For cellular option systems, check location for general quality of cellular reception to provide the best chance of proper connectivity of systems in that location.

When mounting/hanging the case, make sure that it is upright (handle on top) and not laying down. This provides proper sample flow and optimum system performance. Sensor flow cells must always be vertical.

The case can be mounted by using the handle to hang the case from. We recommend that it be a rigid mount and that case not be allowed to swing. Or you can use the optional French cleat mounting assembly (05-0168).

Some sensors, like the Q32H chlorine sensors, can be sensitive to pressure fluctuation or pulses. The included PRV provides constant pressure in locations where input pressure may fluctuate.

IMPORTANT

When operating in Cycle mode (battery powered mode,) locate the system as close as possible to the source water to be measured, as long sample feed lines to the system can result in excessive water usage and allow the sensors to quickly reach the actual source water temperature and value. If the system is located far from the source water, it is necessary to flow much more water during Cycle mode operation to essentially flush any standing water from the static input sample line.

NOTE: A check valve is included with all MetriNet Minis. Air-gap the drain line into the pit or other receiving drain area. The drain line must always be suspended in air just above drain water level to prevent potential siphoning. For below-ground installation, a rigid mount makes sure the system is positioned upright for appropriate drainage and maintaining the air gap.

MetriNet Mini Above Ground Configuration

For MetriNet Mini systems purchased with the above ground assembly, the bus bar, flow cells, controller and other optional additions are mounted to the enclosure at the factory. Once sensors are prepared and installed, close and secure the door.

The MetriNet Mini is an ideal solution for a self-contained automated monitoring station and can be operated by 12–24V DC or battery power. Use 12–24V DC for more frequent sampling applications, as the battery system is optimum for sampling intervals of 15 minutes and consumes considerable amounts of power when sampling more frequently.

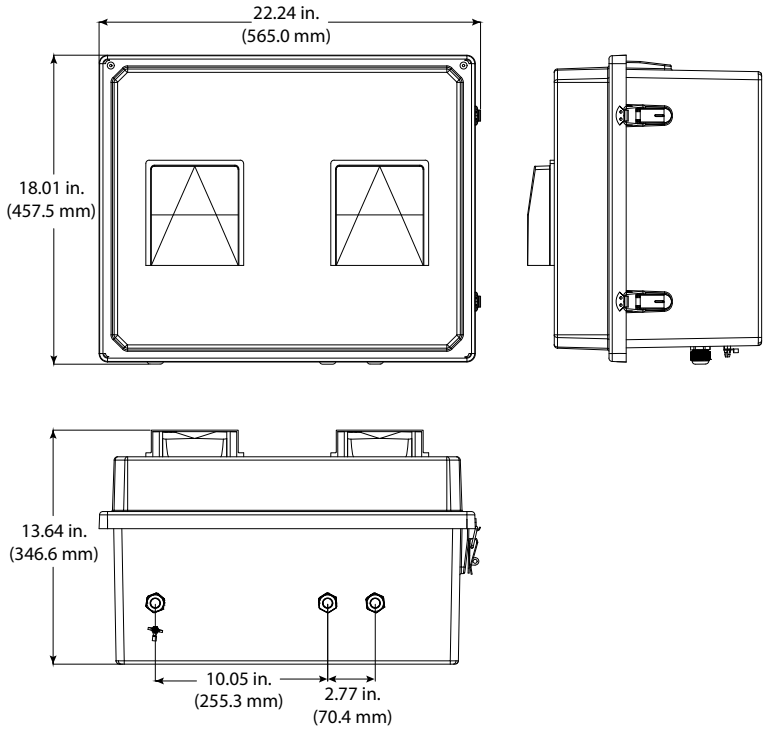


Figure 8: Mini above-ground enclosure

NOTE: The specifications in *Figure 8* are for reference only. Always follow your local government building and electrical codes during construction and installation.

The above ground configuration is specifically suited for more temperate climates where the mounting location is not excessively hot and freezing does not occur, basically conforming to a location range of 50–122 °F (10–50 °C). Shaded locations can offset excessive solar heating. In freezing locations, remove the case as is necessary with other sampling stations in use today. Note location of drain line and feed water inputs. A PRV and mesh strainer is part of the standard MetriNet Mini configuration and the PRV is preset to 20 PSIG on the sensor and flow loop. To remove the cap of the mesh strainer, unscrew it. Manually clean out the mesh filter, as required. For cellular option systems, check location for general quality of cellular reception to provide the best chance of proper connectivity of systems in that location.

Some sensors, like the Q32H chlorine sensors, can be sensitive to pressure fluctuation or pulses, so the included PRV provides constant pressure in locations where input pressure may fluctuate.

IMPORTANT

When operating in Cycle mode (battery powered mode,) locate the system as close as possible to the source water to be measured, as long sample feed lines to the system can result in excessive water usage and allow the sensors to quickly reach the actual source water temperature and value. If the system is located far from the source water, it is necessary to flow much more water during Cycle mode operation to essentially flush any standing water from the static input sample line.

NOTE: A check valve is provided with all MetriNet Minis. Air-gap the drain line into the pit or other receiving drain area. The drain line must always be suspended in air just above drain water level to prevent potential siphoning.

Electrical Connections

There are only a few electrical connections required for installation of a MetriNet system. All connections are in the controller and the main communication cable connection is made at the factory during testing. Customer connections are DC power and the external solenoid valve if that option is used.

MetriNet controllers are powered from either a local 12–24V DC power supply or from an 8–16V DC battery pack. Use controllers designed for 12–24V DC on installations powered with either an external power supply or a battery system connected to a float charger. Connect battery-powered controllers *only* to battery packs. These units are designed for minimum power consumption and some protective components have been removed.

Figure 9 below identifies DC connection terminals as well as terminals for the sensor bus and optional external solenoid. Note that controllers are supplied with only two cable glands installed. A third cable gland is supplied but not installed. The red plug on the bottom can be removed to install the additional gland. That gland accommodates two cables, one for the solenoid wiring and a second for an external trigger. If only one hole is used, put a short piece of cable in the second hole to act as a seal.

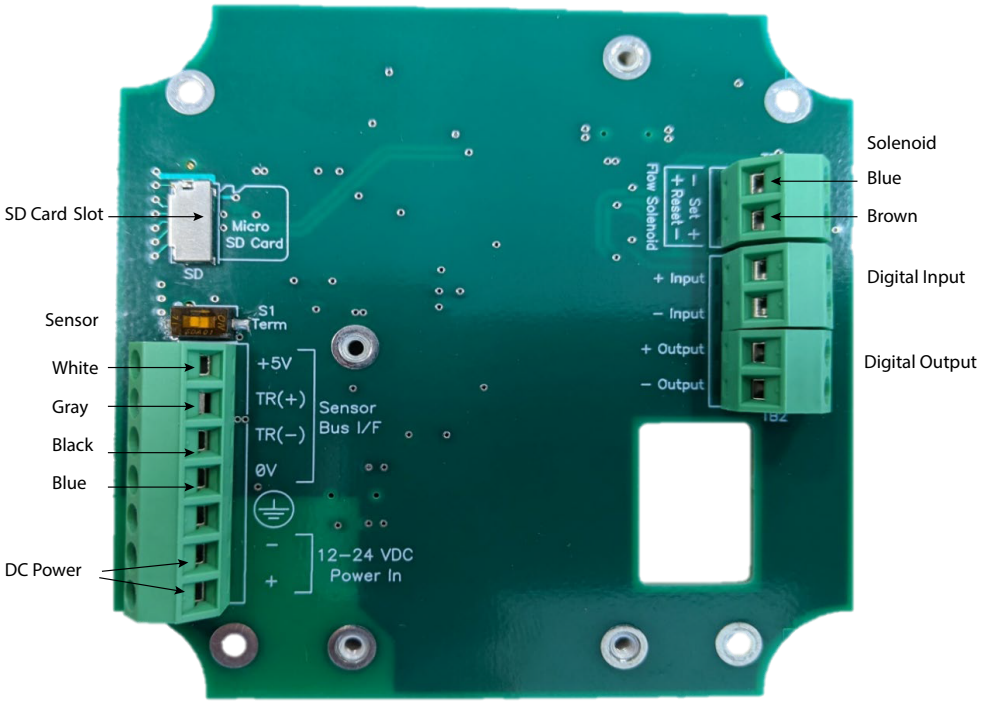


Figure 9: External connections

If the MetriNet panel or bollard is ordered with the 115/230V AC power supply, that power supply comes pre-wired with the 12V DC output wired in to the Q52 controller. If the MetriNet panel or bollard is ordered with the 8–16V DC battery power supply, that power is again tied directly into the Q52 controller.

NOTE: Use Q52 controllers designed for 8–16V DC battery power with battery power sources in that voltage range to prevent damage. Battery power Q52 controllers are marked specially for 8–16V DC on label and near power input.

Digital Input

Under some conditions, you may wish to initiate a measurement cycle using an externally generated contact closure. As an example, you may use an alarm from another device to tell the MetriNet controller to take a reading. Digital input terminals are provided for that purpose.

Digital Output

A digital output is available to provide an external indication of an alarm condition. The output toggles on and off in parallel with the backlight flash function. This output toggles even if the backlight is programmed to OFF. This output changes state on any system alarm, so do not use it as a control output, only as a system health indicator.

General Power Overview

MetriNet components are designed to minimize power usage. The total amount of power used depends on the input power option chosen, the number of M-Nodes used, whether operation is full-power or cycle-power, if a communication option is enabled, and if cellular, the frequency of call out.

The type of communication feature, if used, greatly affects power consumption. Consult each communication feature operating manual for specific information on the version of the Q52 MetriNet controller. *"Specifications" on page 8* only covers the base logger with no communication options, which would likely only be used for logging local data to the removable SD card.

Input Sample and Drain Connections

Flow systems are designed to use 1/4 inch O.D. polyurethane or other semi-rigid tubing. Sample is normally coming from pressurized water pipe and flow systems can handle sample pressures as high as 50 psig. However, it is required and mandatory that you reduce the inlet pressure to 20–30 psig for effective operation and optimal life of the sensor.

For Panel Mount:

On panel mount systems, you must control pressure input to the panel by using either your own components or the Badger Meter PRV/Strainer assembly. Pressure reducing is required on the input side of the system (*Figure 10*). For cycled operation of the MetriNet, mount the optional pulse solenoid on the output side of this assembly, just prior to the sample connection to the panel (*Figure 11*).

Figure 10: Meter Input PRV/Strainer/Shut-off assembly

Alternatively, you may choose to supply your own pressure reducing valve to drop input sample pressure to the recommended stable 20–30 psig range.

NOTE: You can thread the Q32K pressure node into a higher pressure external line to detect higher source pressures.

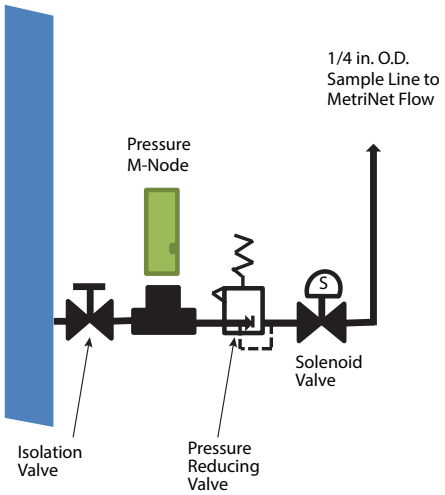


Figure 11: Possible user PRV/solenoid/shut-off assembly placement

NOTE: Air-gap the drain line into the pit or other receiving drain area. The drain line must always be suspended in air just above drain water level to prevent potential siphoning. If this is not possible, you can add a check valve capable of working with 200 ml/min flow rates.

For Bollard Configuration:

On the bollard systems, the Badger Meter PRV/Strainer/Shut-off assembly is included as a standard feature. Flow path for the MetriNet system with the Bollard accessory is shown below. See *Figure 3* and *Figure 4* for inlet and outlet references of 14 × 14 and 14 × 20 panel assemblies.

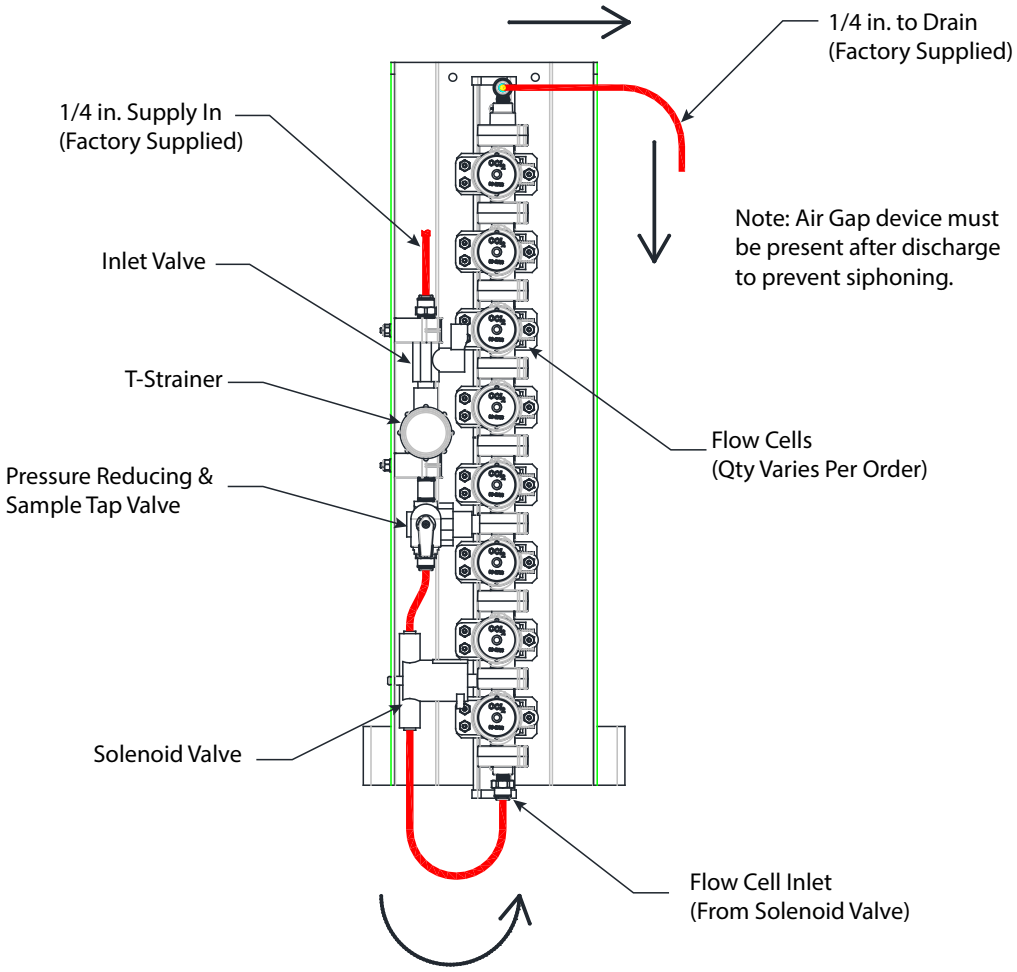


Figure 12: Bollard flow path

NOTE: If pressure and flow are not within the operating specifications, and not stable, sensor readings and age can be affected. While the bollard configuration includes a PRV and filter assembly, it is an option for the panel configuration and can also be ordered separately. Badger Meter can supply this optional one-piece PRV/Valve/Strainer assembly for applications where a stable input pressure within 10–50 psig cannot be achieved.

NOTE: Air-gap the drain line into the pit or other receiving drain area. The drain line must always be suspended in air just above drain water level to prevent potential siphoning. If this is not possible, add a check valve capable of working with 200ml/min flow rates.

For MetriNet Mini Configuration:

On the MetriNet Mini systems, the Badger Meter PRV/Strainer/Shutoff assembly is included as a standard feature. The flow path for the MetriNet Mini system is shown below. See *Figure 3* and *Figure 4* for inlet and outlet references of 14 × 14 and 14 × 20 panel assemblies.

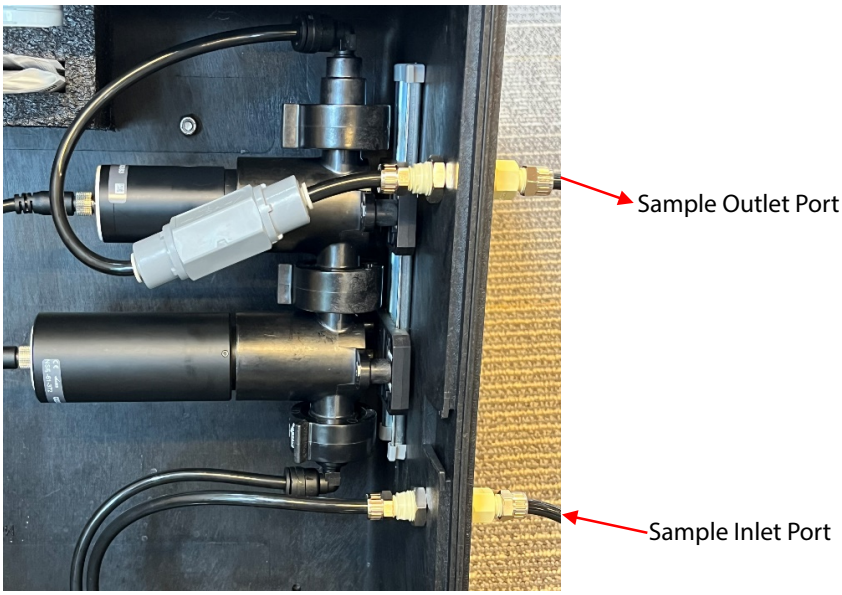


Figure 13: Mini below-ground enclosure flow path

Figure 13 does not show the sample valve. Install the sample valve before you install the sample inlet port.

NOTE: For the below-ground version of the MetriNet Mini, if there is a potential for underwater submersion you must make sure that the release valve is closed to avoid water intrusion.

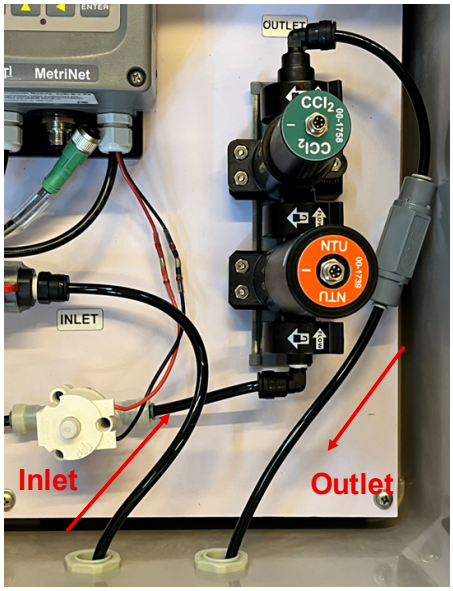


Figure 14: Mini above-ground flow path

Figure 14 shows the above-ground enclosure flow path. Please note that the sample must flow from the bottom up through the flow cells, and that the check valve must be plumbed after the outlet from the flow cells.

NOTE: If pressure and flow are not within the operating specifications, and not stable, sensor readings and sensor longevity can be affected. The MetriNet Mini configuration includes a PRV and filter assembly to maintain an effective pressure and flow for the system.

NOTE: A check valve is provided with all MetriNet Minis. Air-gap the drain line into the pit or other receiving drain area. The drain line must always be suspended in air just above drain water level to prevent potential siphoning. For below ground installation, use a rigid mount to make sure the system is positioned for appropriate drainage and maintaining the air gap.

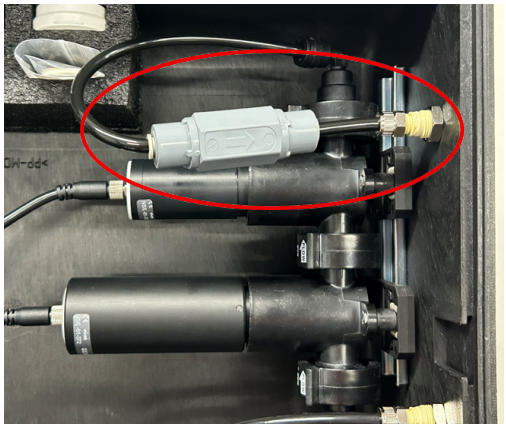


Figure 15: Mini below-ground check valve installed

Optional Solenoid Valve for Water Usage Limiting

MetriNet controllers can be operated in either "CONT" (*Continuous*) or "CYCL" (*Cycle*) power modes.

The *Continuous* mode of operation is very simple, as it means that water flows continuously to drain through the system at a target flow rate of 200 ml/min. *Continuous* mode is primarily used with 12–24V DC systems, as the constant flow of water allows sensors to be left on and measuring continuously, so it is ideal for cases where high frequency of data is being measured. In addition, this operating mode does not need any consideration for pushing static water samples through to get to fresh source water from a longer sample line, as might be a concern in *Cycle* mode where water flow stops, and the system sleeps for a period of time. In addition, *Continuous* mode systems maintain constant source water temperature at the sensors, so there is not a need to flow extra water for sensors come up to temperature from a static sample.

The *Cycle* mode of operation is designed specifically for cellular battery powered systems where energy is very limited, water loss must be minimized, and remote measurements are only acquired about every 15 minutes. Then the system sleeps for the next 12–14 minutes, greatly reducing power. When a MetriNet controller is programmed for *Cycle* mode, operation of the measuring system is intermittent. During part of the cycle, all sensors are powered down and the controller is in *sleep mode*. The overall cycle period is defined in the *Poll Rate* setting of the *CONFIG* menu. It is possible for a *Cycle* mode unit to simply leave the water source on continuously, so that less time is required to purge old sample, and less time is needed for temperature equilibrium of sensors to be achieved. *Cycle* mode is used to either extend battery life, reduce sample water consumption, or both. The pulse solenoid, part number 00-2008, controls flow in the *Cycle* mode of operation. When used, sample flows from the pipe for a short time prior to the recording of sensor measurements. The exact amount of time depends on sample line length but can reduce water consumption from 75 gallons per day down to 5 or 10% of that value depending on the frequency of measurement.

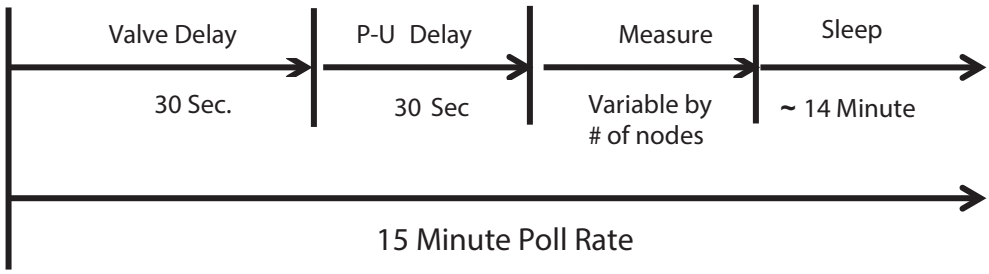


Figure 16: Cycle mode schematic

When a MetriNet controller is programmed for *Cycle* mode, operation of the measuring system is intermittent. During part of the cycle, all sensors are powered down and the controller is in sleep mode. The linear events of *Cycle* mode operation are defined as follows. These appear as menus in the CONFIG menu:

- ^Poll Rate, definition of complete cycle period length.
- ^Valve Delay, wait-time after solenoid opens. Allows for stabilization of flow.
- ^Sensor Delay, power up time of sensors prior to an actual reading

Poll Rate

During an operation cycle, the controller remains in *sleep* mode until a measurement is required at the Poll Rate period start time. At that time, if a solenoid is in the system, the solenoid opens to allow sample to flow for the time entered in Valve Delay.

Valve Delay

The purpose of the Valve Delay is to make sure that sensing nodes are exposed to fresh sample for a long enough period of time to get good measurements. For systems where flow is continuous, leave the Valve Delay setting at the lowest value.

If a system is using solenoid flow control, be sure that the Valve Delay is long enough so that fresh sample reaches sensors for at least 30 seconds. For estimating the required time, you must take into account the length of your sample line. Using standard 1/4 inch O.D. polyurethane tubing, you need approximately 1 second for every 1 foot (3 seconds per meter) of sample tubing from the source pipe to the flow assembly. Assuming you have a 20 foot sample line, you need a Valve Delay of 20 + 30 or a total of 50 seconds to make sure that sensors have seen fresh sample for at least 30 seconds prior to measurement.

Sensor Delay

The solenoid change of state happens in 200 ms by a pulse, so power is still very low when it changes state. After the value of Valve Delay expires, sensors are powered up and the Sensor Delay period begins. Sensor Delay is the power-up (P-U) delay. This is the time during which measurement nodes are energized so that a measurement may be made on the flowing sample. At the end of that period, a measured data point is stored, nodes are again powered down and the solenoid valve is closed (if used). *Figure 16 on page 21* shows a typical sequence schematically.

Individual Controller and Flow Cell Component Dimensions

MetriNet controller basic enclosure dimensions. While these are part of the panelized or bollard systems, they are included here for customer systems that use individual parts.

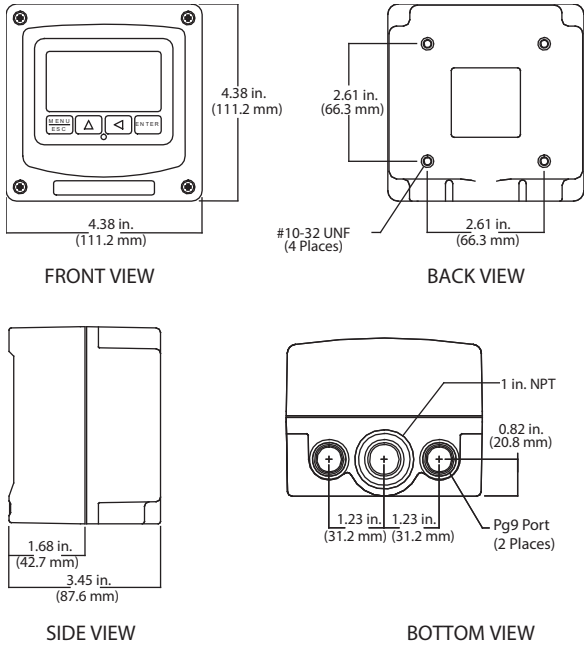


Figure 17: Q52/MetriNet enclosure dimensions

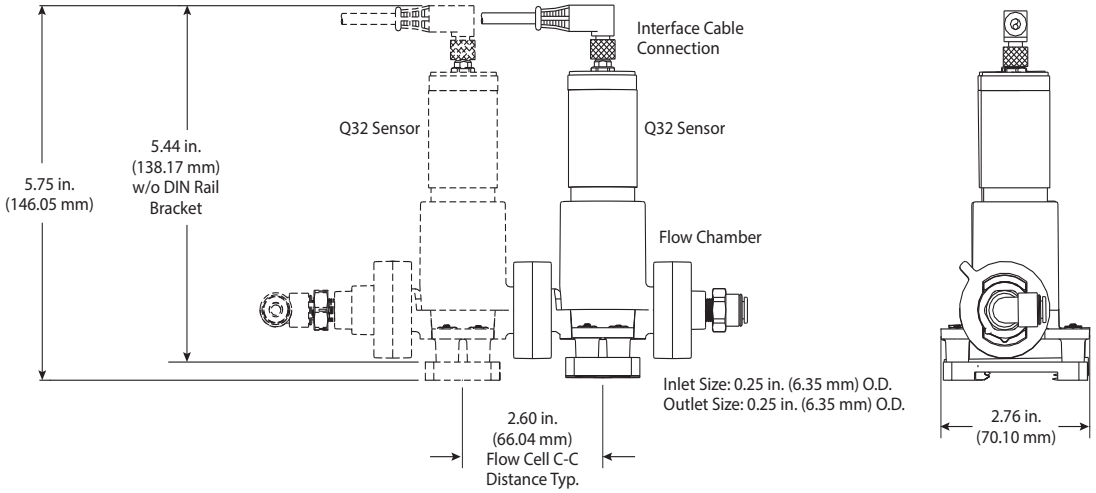


Figure 18: Q32 M-Node sensor flow cell dimensions

If the flow chambers are loose and not part of a pre-configured panel or bollard system, they may be individually mounted. Flow chambers for MetriNet systems are modular so the size varies depending on the number of M-Nodes to be used. **Always mount flow chambers vertically**, with sample entering at the bottom and exiting at the top. This arrangement makes sure that air does not collect near a sensor and cause inaccurate readings. Conductivity and turbidity sensors are extremely sensitive to trapped air.

Flow chambers are supplied with DIN rail adapters for 35 × 7.5 mm rail. The adapters are spring loaded to allow assembled flow chambers to snap onto the rail. Clamp together all chambers prior to putting them on the rail. Chambers clamp together using clamping rings. *Figure 19* shows two flow chambers disconnected. Although not shown, there is an O-ring in the inlet side of the flow chamber for sealing. When disconnecting, be sure the O-ring remains in place.

The lock rings between flow chambers and inlet/outlet fittings rotate downward by about 45 °to open and back up to close again. Opening and closing flow assemblies are not normally required except possibly for cleaning or inspection. It takes a bit of practice to reassemble the chambers.

Figure 19: Flow chamber connection

The overall size of a flow assembly depends on how many M-Nodes are to be used. *Figure 18 on page 22* shows dimensions for height and width. The overall length varies from about 6.00 in. (152.40 mm) for a single assembly to about 13.00 in. (330.20 mm) for a 4-chamber assembly. It is best to limit assemblies to no more than five M-Nodes, using a second assembly and interconnecting the two assemblies if larger systems are to be used. For example, a 6-Node system would be easier to handle with two 3-chamber flow assemblies connected by tubing. If two flow assemblies are used, run tubing from the outlet of the first back down to the bottom of the second so the flow is in the UP direction through both assemblies.

NOTE: Sensor installation is aided by an NSF61 grade lubricant that is applied to the Q32 M-Node sensor body O-ring during installation. Small packs are included with each sensor, and a larger tube is included with each MetriNet controller panel. It greatly eases removal and maintenance of sensors and can extend the life of the sensor O-ring. It is particularly important to use this O-ring lubricant at high and low temperatures. It can also be used to ease any disassembly or assembly of the O-ring seals in the flow assembly.

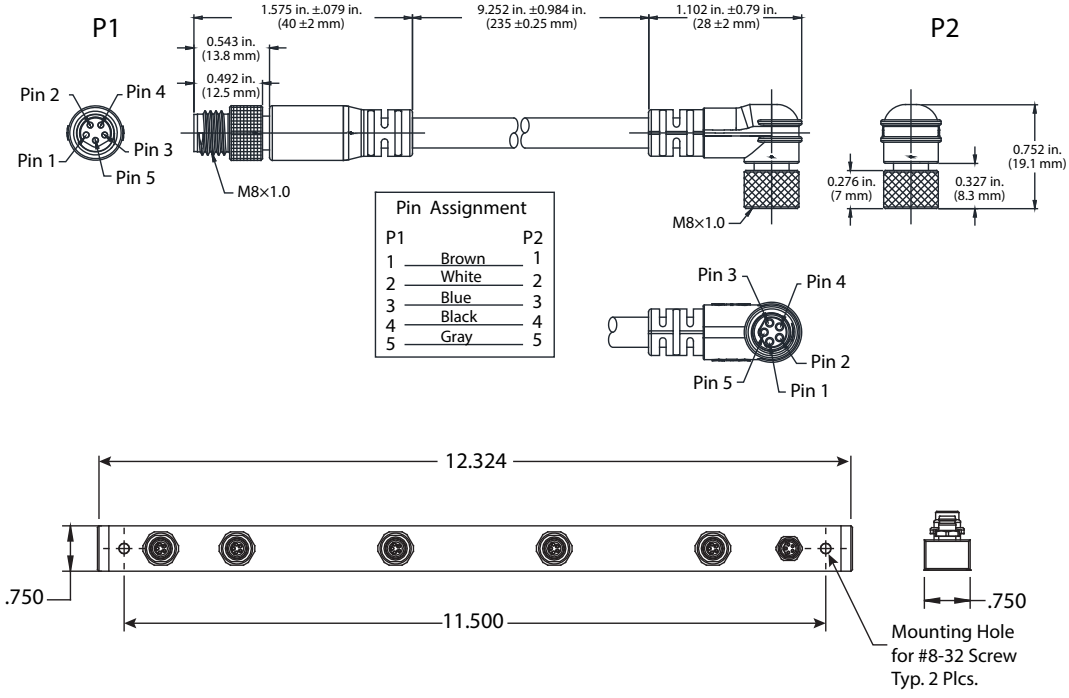


Figure 20: Sensor bus bar interface and M8 cable

MetriNet controllers connected to only one sensing node do not use a bus bar. All systems with more than one sensor need at least one bus bar. The bus bar is an assembled communication network allowing the controller to speak to any node connected to the bus bar.

There are connectors for up to 5 nodes on each bar. If more than 5 nodes are to be used, 2 bars are needed plus a jumper cable to connect the 2 bars together. The use of 2 bus bars allows a maximum of 8 nodes to be connected to a single controller. Bus bar dimensions are shown in *Figure 20*. Always mount bus bars close to and parallel to the flow assembly so that node cables can reach the connectors on the bus bar.

Loose Mounting of Controller, Wall or Pipe Mount

If the Q52 controller is to be loose and not part of a pre-configured panel or bollard system, a PVC mounting bracket with attachment screws is supplied with each controller. The bracket is attached to the rear of the enclosure. The bracket provides for either wall or pipe mounting as shown in *Figure 21* and *Figure 22*. Note that bracket slots are for U-bolts with 1/4-20 threads. The 1-1/2 inch pipe U-bolt (2 in. I.D. clearance) is available from Badger Meter in type 304 stainless steel (part number 47-0005).

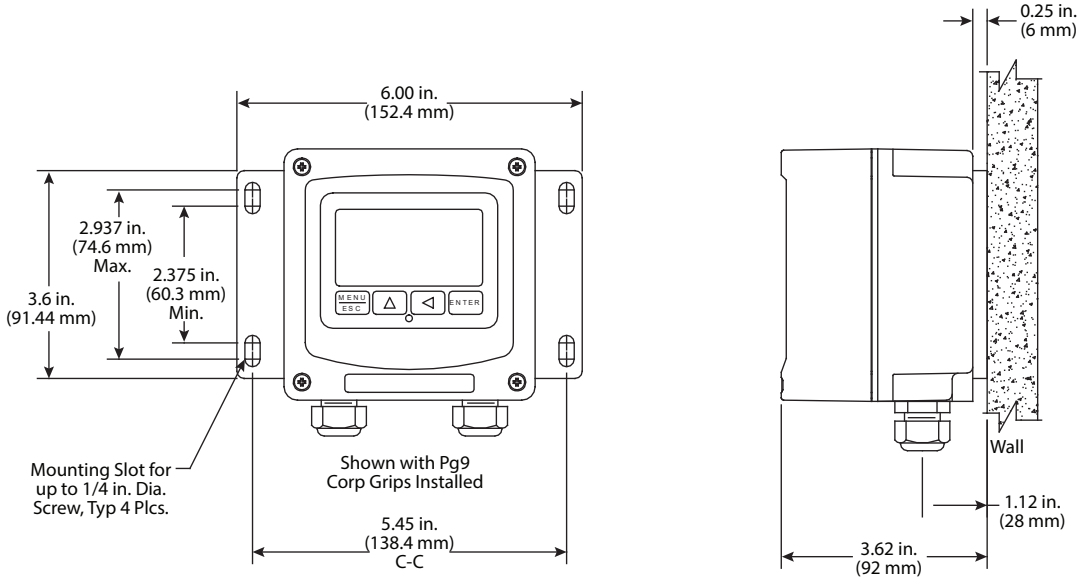


Figure 21: Wall mount

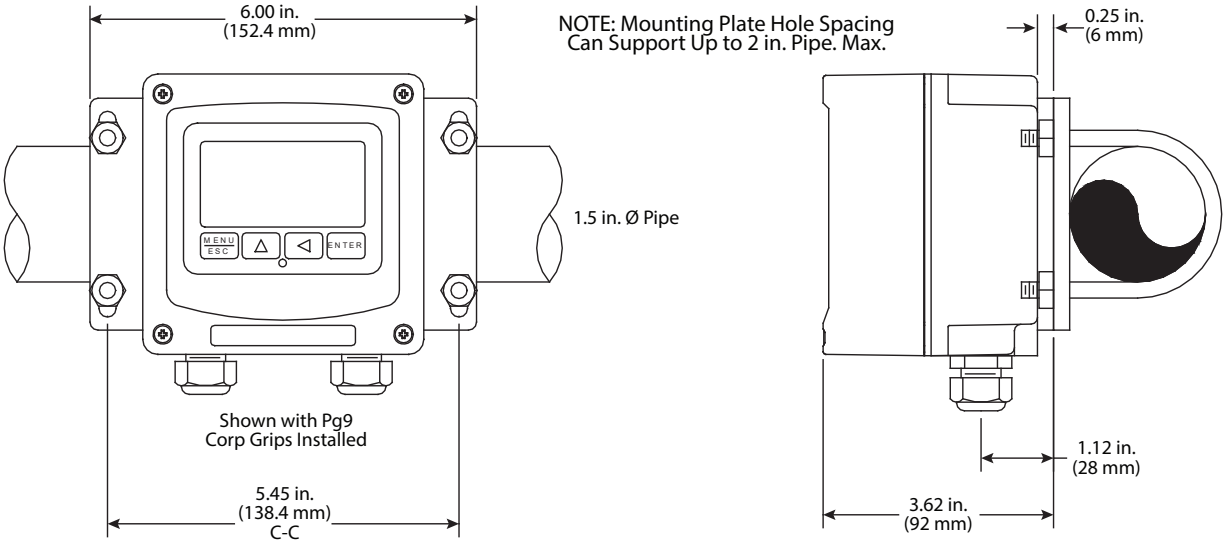


Figure 22: Pipe mount

M-Node Installation

M-Nodes are twist-lock sensors designed for use in special flow cell assemblies that regulate flow to a fixed value using a small 220 ml/min Maric flow regulator mounted to the output of the flow cell. Dimensions of the sensor are shown below. The sensor may be used in user designed flow systems for clean (very low solids) water if flow and pressure are carefully controlled. The minimum required flow is 200 ml/min. and the sensor operates at stable input pressures up to 50 psig (3.4 bar). Pressure must be stable and pressure shock in the hydraulic system must be avoided, so an input PRV (pressure reducing valve) is required, as sensor readings can be affected by pressure changes. Recommended pressure setting is 20–30 psig for maximum sensor life.

The model number and measured parameter for each M-Node sensor is labeled on the rear of the sensor.

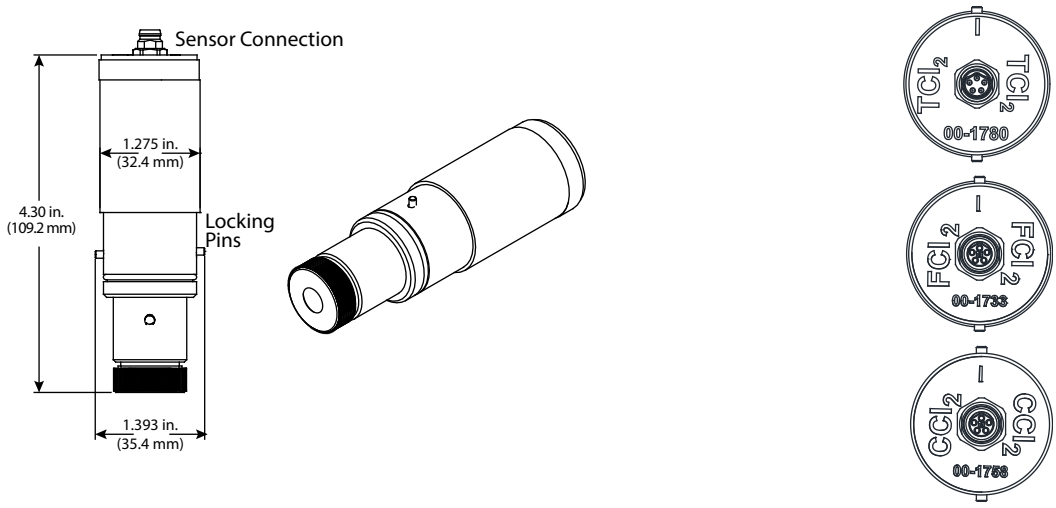


Figure 23: M-Node sensor

Sensor nodes are packaged individually, and some require preparation prior to use. Some require removal of a wetting cap and some simply require installation into the flow chamber. The table below provides guidance. Instructions for preparing individual sensor nodes are provided separately in the individual M-Node sensor manuals, as are the calibration instructions for that node.

Parameter	Preparation Required	Calibration
Free Chlorine	Membrane & Electrolyte	After startup
Combined Chlorine	Membrane & Electrolyte	After startup
Total Chlorine	Electrolyte, Calibration	After startup
Turbidity	None	Before startup
pH	Remove wetting cap	Before startup
Conductivity	None	Before startup
ORP	Remove wetting cap	Before startup
Dissolved Oxygen	Membrane & Electrolyte	Before startup
Fluoride	Remove cap	Before startup
Dissolved Ozone	Membrane & Electrolyte	After startup
Chlorine Dioxide	Membrane & Electrolyte	After startup
Peracetic Acid	Membrane & Electrolyte	After startup
Hydrogen Peroxide	Membrane & Electrolyte	After startup
Pressure	None	Not Required
Nitrite	Membrane & Electrolyte	After startup

Do not install sensors until sample has been connected to the flow chamber assembly and you are ready to turn on the sample flow. Sensor installation is aided by an NSF61 grade lubricant that is applied to the Q32 M-Node sensor body O-rings during installation. Small packs of lubricant are included with each sensor, and a larger tube is included with each MetriNet controller panel. It greatly eases installation and removal for maintenance of sensors and can extend the life the sensor O-ring.

It is particularly important to use this O-ring lubricant at high and low temperatures and can prevent the potential of a locked-out ring caused by a dried-out seal on sensors that have not been serviced very often. Apply a small amount to the entire main O-ring seal on the body of the M-Node sensor, taking care not to get any lubricant near the face of the sensor.

Found inside Node packaging

Figure 24: M-Node O-ring lubricant application

When ready, carefully install a sensor in each chamber, align the pins and press the sensor into the chamber. Once inserted fully, rotate the sensor about 90 °to lock in place. For systems that include conductivity as part of a multi-node assembly, place the conductivity sensor in the first flow chamber off the inlet so that any small amounts of electrolyte leakage from other sensors do not affect the conductivity measurement. If Turbidity has been ordered as part of the system, install it in the first chamber with conductivity in the second chamber. Address Turbidity as Sensor 1, then Conductivity as Sensor 2. You can install all remaining parameters in any order.

Node Removal

Removal of M-Node sensors is the opposite of installation—with one exception. Prior to removal, it can extend the life of the membraned sensors by making sure the drain line is open to ambient air. Once water is shut off, any vacuum developed in the flow assembly is limited as the sensor is slowly removed. In addition, if possible, remove any non-membraned sensor first, perhaps pH, conductivity, or turbidity, to further open the flow assembly to ambient air and possibly drain some of the standing water.

OPERATION

General

Check to see that sample is running through the flow assembly. Sample flow is controlled at 200 ml/min. If the system was not purchased with the flow control element, adjust the flow through the system with a valve placed on the outlet side of the flow assembly. Recheck all wiring and verify that the power supply is in the range of 12–24V DC. The controller does not contain a power switch. It operates as soon as DC power is applied. Once power is applied, the system goes through an initialization routine and then begins to operate.

NOTE: Battery powered systems run from 12V DC down to about 7V DC. The controller does not contain a power switch. It operates as soon as DC power is applied. Once power is applied, the system goes through an initialization routine and then begins to operate.

Controller Interface

The user interface for the MetriNet controller consists of a custom display and a membrane keypad. All functions are accessed from this user interface.

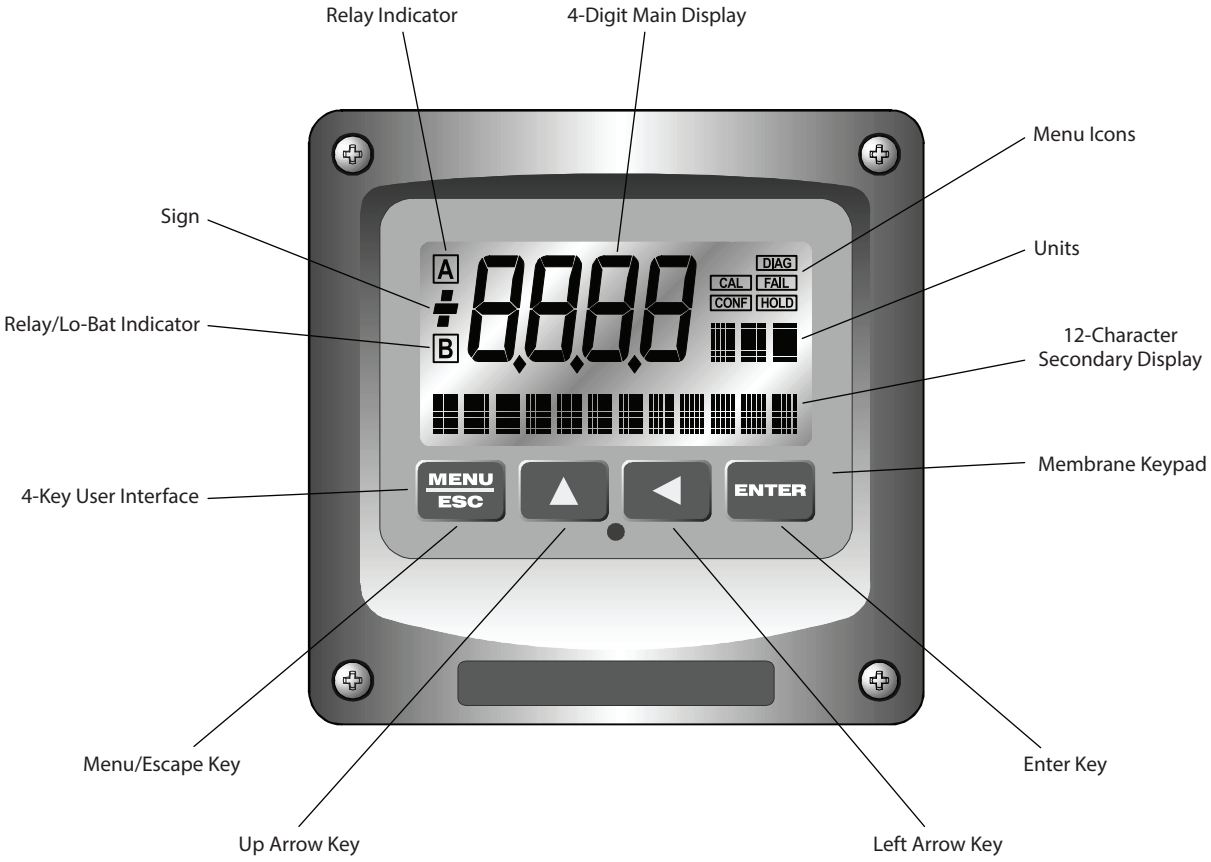


Figure 25: MetriNet controller interface

M-Node Assignment

Each measurement node must have a unique sensor number. All sensors are factory configured as sensor #1. If there is more than one sensor in your system, a new sensor number must be assigned to each additional sensor. For fully assembled systems, sensor numbers are set at the factory. For other systems, use the following procedure:

NOTE: Only one (1) node may be connected to the controller during this procedure. Connect each node separately to assign a sensor number and then disconnect it prior to connecting another.

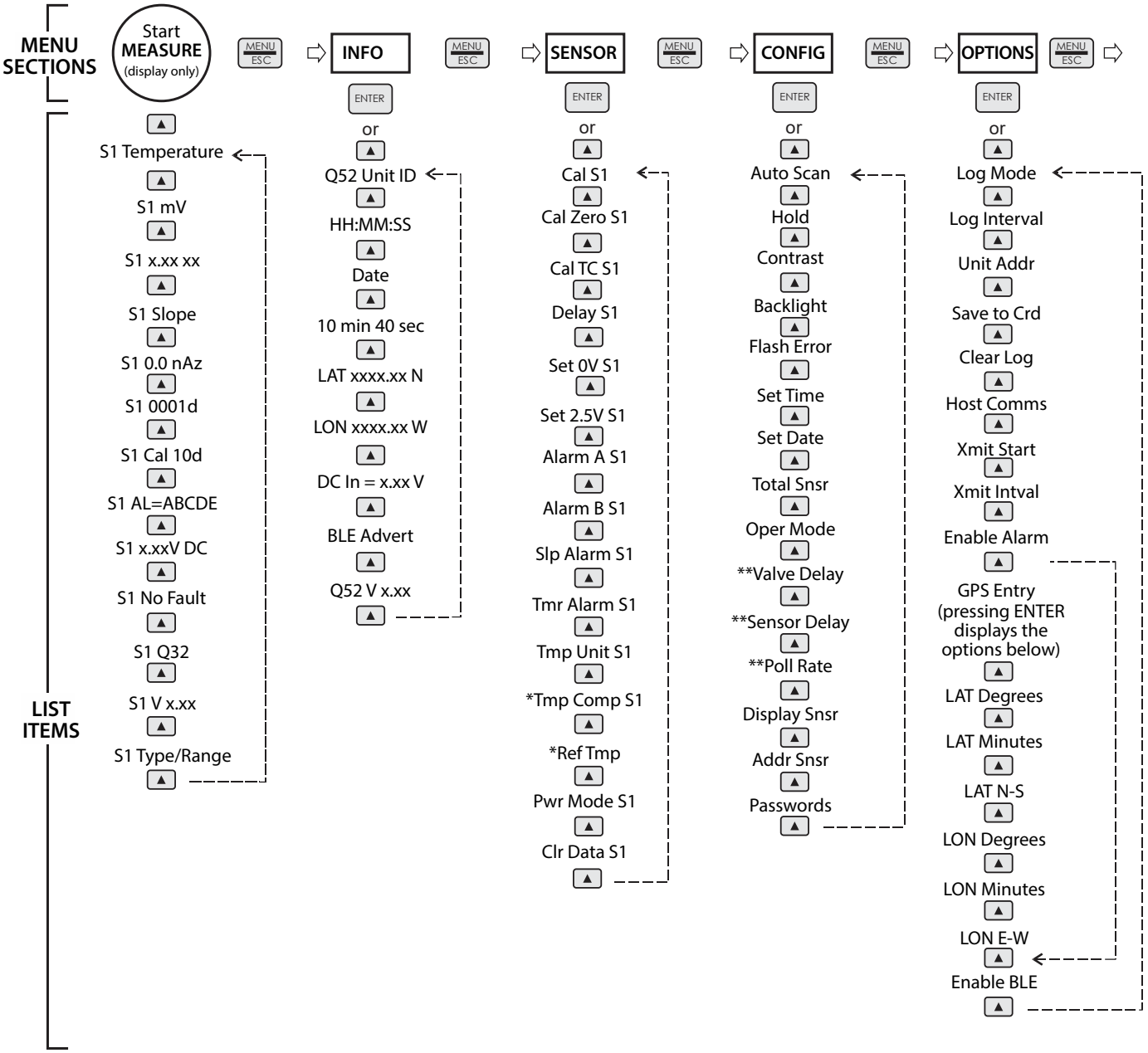
1. Press **Menu** key to access the *CONFIG* menu.
2. Press **UP** arrow key until lower line display shows "Total Snsr."
3. Press **Enter** and the main number on the display flashes.
4. Use the **UP** arrow key to adjust the flashing number to the total number of sensors in your system and then press **Enter**.
5. Press the **UP** arrow key 3 times to access "Addr Snsr" and then press **Enter**.
6. The display flashes "NO." Press **UP** arrow key once for "YES" and press **Enter**.
7. The controller shows the current sensor number assigned to that node and it flashes. Use the **UP** arrow key to set the required sensor number and press **Enter**.
8. Repeat steps 1–7 for each M-Node in the system until you have assigned a unique number to each one.

After each sensor has been assigned a unique number, connect all nodes to the bus bar. The controller is now be able to communicate with all nodes.

Controller Programming

The MetriNet controller is used to calibrate the measurement nodes, to store data supplied by the nodes and to communicate the stored data to the outside world. The nodes are really independent analyzers, measuring a water quality parameter and feeding the data back to the controller. Data is stored in non-volatile flash memory and written to an SD card located in the controller. Data can also be transmitted by cellular modem to cloud storage sites or communicate via Modbus RTU, Modbus TCP or Ethernet IP with local PLCs or other devices.

The controller program is organized into *MEASURE*, *INFO*, *SENSOR*, *CONFIG* and *OPTIONS* menus. *Figure 26 on page 29* lists those menus and the sub-menus below each of them.



NOTE: S1 refers to Sensor Position. Additional fields appear depending on the number of sensors installed. These fields can be accessed by pressing the **LEFT** arrow on the display panel.

* Item is used for select node parameters only.

** Menu options if Oper Mode is set to *CYCL*.

Figure 26: Controller software map

MEASURE Menu

The default controller menu is *MEASURE*. This menu is display-only. When left alone, the unit returns to the *MEASURE* menu after 30 minutes.

NOTE: The main display variable scans through each node automatically.

The lower line information applies to the node currently displayed. To stop the scan and look at information on an individual node, press the **LEFT** arrow key. The scan stops for 30 minutes but you can advance through each node using the **LEFT** arrow key.

After selecting the node you wish to look at, use the **UP** arrow 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 changes 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 nA, 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 zero ppm input. Sensor specific.
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 2.50V DC	Sensor voltage output.
S1 No Fault	Sensor fail message to define detected fault condition.
S1 Q32H0	Sensor type code. Sensor specific.
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.

INFO Menu

The *INFO* menu provides some basic information on the MetriNet controller, also called the Q52. These menu items are for reference only.

Q52 UNIT 10	Specific ID of this Q52. User set.
13:59:40	Hour/Minute/Sec time. 24-hour format.
Dec 31, 2016	Current date.
10min 40sec	Time until next data point is recorded. Useful if you wish to perform service before next logged data point.
LAT 1234.56N	User entered latitude position.
LON 1234.56W	User entered longitude position.
DC In = 12.1	Measured DC input voltage (from battery or power supply).
Q52 Ver X.XX	Q52 software version number.
BLE	Bluetooth Low Energy mode, used for wireless communication with the MetriNet Controller.

SENSOR Menu

The SENSOR menu provides all sensor-specific M-Node information and calibration controls. This menu information originates from the actual sensor memory and there is some variation from sensor type to sensor type. See the Q32 sensor operating manual for the specific settings that appear for that sensor.

CONFIG Menu

The *CONFIG* menu provides access to Q52 controller configuration settings. Routines defined here are not sensor specific. They define the overall function of the controller.

Auto Scan	Turns sensor scanning on and off. When ON, each sensor value is displayed for 4 seconds.
Hold	Freezes data being written to the data logger. Useful when sensor calibration or service is needed.
Contrast	Used to adjust LCD contrast. Default is 7. Range is 1–8.
Backlight	Turns LCD backlight on and off. Turn OFF when operating from battery power.
Flash Error	Programs LCD backlight to flash if an error is detected. Select **All** to flash on any sensor error. Select **Sn9l** (single) to flash display only when the sensor causing the error is displayed.
Set Time	Used to program current time. After pressing **Enter**, use a combination of the **UP** arrow and **Enter** keys to adjust hours, minutes and AM/PM.
Set Date	Used to program current date. After pressing **Enter**, use a combination of the **UP** arrow and **Enter** keys to adjust year, month and day.
Total Snsr	Defines how many sensor nodes are connected to the controller.
Oper Mode	Defines whether the controller runs continuously (*CONT*) or intermittently (*CYCL*). When operating from battery power, cyclic operation greatly reduces power consumption. In addition, an external solenoid may be controlled in *CYCL* mode in order to conserve water.
Valve Delay (CYCL)	**Displayed only when ^Oper Mode is in CYCL mode.** If the optional solenoid is used to turn flow on and off, the *Valve Delay* value defines the delay time, starting from when the solenoid is opened, before sensor nodes are powered up to make measurements. Delay time depends on length of sample lines. Delay may be set from 1–99 seconds.
Sensor Delay (CYCL)	**Displayed only when ^Oper Mode is in CYCL mode**. Sensor delay defines the time period after the nodes are energized until the controller polls the nodes for data. Range is 1–99 seconds.
Poll Rate (CYCL)	**Displayed only when ^Oper Mode is in CYCL mode**. Poll rate defines the rate at which data is recorded. In other words, this is the cycle rate. Range is 1–99 minutes.
Display Snsr	Tests communication to each sensor. Press **Enter** and status of comms for each sensor tested. Sensor found indicate "Yes," while sensors not found indicate "No." Press **Enter** again to exit.
Addr Snsr	Routine used to add sensors to a controller network. Use of this routine is described in *"M-Node Assignment" on page 28*.
Passwords	Sets a user specified supervisor password. The default is 0000, which means the password is disabled. Once a supervisor password is set, only those with that code may change the overall system configuration items and option items. After 5 unsuccessful attempts, the unit locks for 30 minutes. An additional 5 "User" passwords may be assigned by the supervisor. Those assigned a user password may make adjustments to items in the *SENSOR* menu, such as sensor calibrations. Detailed instructions on setting passwords are found in *"Set Passwords" on page 34*.

OPTIONS Menu

The *OPTIONS* menu contains settings related to the data logging function and the internal cell modem, *Modbus* option or *Ethernet Module* option, if installed.

Log Mode	Turns the data logger on or off and defines whether logging is continuous or stops when memory is full. If the data logger is shut off, the modem is disabled.
Log Interval	Sets the data storage interval. Range is 0.1–99.9 minutes.
Unit Addr	Defines the Q52 Modbus address. If you have multiple MetriNet systems operating, it is best to have a unique address for each. This number is part of the data log and is used to identify the controller that supplied the data. It is also used as the Modbus address if the unit is connected to an external Modbus network. Range is 1–247.
Save to Crd	This routine allows data stored in flash memory to be written to an SD memory card. The SD card is removable for data transfer to a laptop or PC.
Clear Log	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.
Host Comms	Enables "CELL" for internal modem, "Modb" for Modbus RTU, "Ethr" for Ethernet/IP or Modbus TCP, "OFF" for no communication options. Requires optional communications interface to be installed.
Xmit Start (CELL)	**Displayed only when ^Host Comms is in CELL mode.** Defines when the first data transmission by modem occurs. Range is 00–23, 00=midnight, 23=11 PM.
Xmit Intval (CELL)	**Displayed only when ^Host Comms is in CELL mode.** Sets the interval between modem data transmission.
Enable Alarm (CELL)	**Displayed only when ^Host Comms is in CELL mode.** Enables sending the Alarm Record when the Cell Modem option is installed.
Baud Rate (Modb)	**Displayed only when ^Host Comms is in Modb mode.** Sets the Baud Rate for the Modbus Interface. 9600 or 19.2K Baud.
Parity (Modb)	**Displayed only when ^Host Comms is in Modb mode.** Sets parity for Modbus interface. None, even or odd.
Stop Bits (Modb)	**Displayed only when ^Host Comms is in Modb mode.** Sets number of stop bits for Modbus interface. 1 or 2.
Wr LockCode (Modb)	**Displayed only when ^Host Comms is in Modb mode.** Range is 0–9999. Host must write unlock code when calibrating or changing any settings via Modbus interface.
GPS Entry	Allows auto capture or 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 DD.MM.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 (DDD) 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 **W** for West.

Set Passwords

MetriNet systems are designed with two levels of password protection to prevent unauthorized adjustments. There is one Administrator password and up to five separate User passwords. All passwords are numerical, consisting of 4-digit numbers.

As shipped, controllers are not password protected. All passwords are disabled and you must decide whether to use password protection or not. Some of the events recorded in the Event Log are tied to the password entered in order to perform the recorded function.

The Administrator sets the administrator password and programs all user passwords. The following steps are needed to set passwords:

1. Go to *OPTIONS* menu and press the **UP** arrow repeatedly until bottom line indicates Passwords.
2. Press **Enter**. Display shows 0000 with right digit flashing. Using the **UP** arrow and **LEFT** arrow keys, enter a 4-digit supervisor password.
3. Press **Enter** and that number is recorded.

Sensor Display

Controller units can display measurements from up to 8 M-Nodes. The display operates either in *Auto-Scan* or *Manual* modes. The first routine in the *CONFIG* menu turns the *Auto-Scan* function on or off. The default mode is ON. With *Auto-Scan* on, the display shows the measured value of each node for 4 seconds and then switch to the next one. All measurements may be observed by simply watching the display.

To manually sequence through the nodes, press the **LEFT** arrow key. The first time the key is pressed, the scanning mode stops. By pressing the **LEFT** arrow key repeatedly, you can cycle through all measurements. If no key is activated for 30 minutes, the display reverts to scan mode.

Interrupting the scan mode allows you to look at specific sensor data and do calibrations or other adjustments. When you select a specific sensor using the **LEFT** arrow key, you can then sequence through the information screens on the bottom line using the **UP** arrow key. The contents of each information screen are summarized in *"MEASURE Menu" on page 30*.

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 as outlined in *"SENSOR Menu" on page 31*.

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

DATA, ALARM & EVENT LOG

General

The primary purpose of a MetriNet system is to monitor water quality parameters and log the data. The data may then be either transmitted to a remote data storage cloud site by modem or collected manually by writing data to the SD RAM card located in the controller. The amount of data depends on the number of sensors used and the logging frequency.

Data File Format

Data stored and transmitted is 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 been sent by modem to a storage site. When copied to the SD card the file name is Q52DLnnn where nnn is the unit address number.

Data Record - Raw Data Format

Date	HH:MM:SS	Temp	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8
12/8/2016	13:01:47	13760	467800	1726	1684	7150	0	0	0	0
12/8/2016	13:06:47	13760	467800	1727	1679	7150	0	0	0	0
12/8/2016	13:11:47	13760	467400	1729	1694	7150	0	0	0	0
12/8/2016	13:16:47	13760	467800	1726	1679	7150	0	0	0	0
12/8/2016	13:21:47	13760	467800	1726	1702	7150	0	0	0	0
12/8/2016	13:26:47	13750	468000	1728	1696	7150	0	0	0	0
12/8/2016	13:31:47	13750	467600	1729	1664	7150	0	0	0	0
12/8/2016	13:36:47	13750	467600	1725	1676	7150	0	0	0	0
12/8/2016	13:41:47	13750	467600	1727	1672	7150	0	0	0	0
12/8/2016	13:46:47	13750	468000	1723	1690	7150	0	0	0	0
12/8/2016	13:51:47	13750	468000	1730	1677	7150	0	0	0	0
12/8/2016	13:56:47	13740	468100	1722	1661	7150	0	0	0	0
12/8/2016	14:01:47	13740	468100	1725	1694	7150	0	0	0	0
12/8/2016	14:06:47	13730	467800	1725	1694	7150	0	0	0	0
12/8/2016	14:11:47	13740	467700	1722	1659	7150	0	0	0	0
12/8/2016	14:16:47	13730	467800	1725	1694	7150	0	0	0	0
12/8/2016	14:21:47	13740	467700	1722	1664	7150	0	0	0	0
12/8/2016	14:26:47	13730	468200	1725	1691	7150	0	0	0	0
12/8/2016	14:31:47	13730	468200	1720	1672	7150	0	0	0	0
12/8/2016	14:36:47	13720	468300	1722	1679	7150	0	0	0	0
12/8/2016	14:41:47	13720	467900	1720	1672	7150	0	0	0	0
12/8/2016	14:46:47	13720	467900	1718	1665	7150	0	0	0	0

All data is stored as 16-bit data with 4 decimal resolution. In order to convert raw data to actual engineering units, divide each value by 1000. Since each controller 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 you.

Alarm File Format

In addition to the data log file, the controller also generates an alarm log file. The alarm file format is similar to the data file format. When copied to the SD card, the file name is Q52ALnnn where nnn is the unit address number. The alarm file logs an alarm event any time one of the sensor setpoints A or B changes state. If communications is lost to a sensor, "Error" is shown. The time stamp shows when the alarm occurred. Up to 200 alarm events may be stored.

Q52 Alarm Record

Date	HH:MM:SS	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8
8/22/2018	1:28:43	OK	OK	OK	OK	0	0	0	0
8/22/2018	21:18:36	A	OK	OK	OK	0	0	0	0
8/22/2018	21:20:58	OK	B	OK	OK	0	0	0	0
8/22/2018	23:09:22	OK	OK	A B	OK	0	0	0	0
8/22/2018	23:23:10	OK	B	A B	OK	0	0	0	0
8/22/2018	23:26:20	OK	OK	A B	OK	0	0	0	0
8/25/2018	20:26:48	OK	OK	OK	OK	0	0	0	0
8/25/2018	20:28:24	OK	OK	OK	Error	0	0	0	0
8/25/2018	21:02:06	OK	OK	OK	OK	0	0	0	0

Event File Format

In addition to the data log file, the controller also generates an event log file. The event file format is similar to the data file format. When copied to the SD card, the file name is Q52ELnnn where nnn is the unit address number. The event file does not contain a lot of information and many times has nothing at all. However, it is intended to record certain changes as they occur. The following are the events currently stored. Up to 100 events may be stored.

Stored Event Data Format

Q52 Event Record			
Supply Voltage	12.1		
Latitude	GPS Off		
Longitude	GPS Off		
Date	**HH:MM:SS**	**Sensor**	**Event**
9/10/2018	10:57:45	0	EventLog Cleared
9/10/2018	14:33:43	0	Sup Passwd Entry
9/10/2018	14:40:25	0	User1 Passwd Entry

SD RAM Card

MetriNet controllers contain a micro-SD card slot on the terminal block circuit board just above the bus connections (see *Figure 17 on page 22*). As previously mentioned, data is stored in flash memory in the controller. Data can be manually removed by writing the data to a micro-SD card and then removing the card from the controller.

Controllers are supplied with 2 GB SD cards. To retrieve data manually, simply write stored data to the SD card using the "Save to Crd" routine in the *OPTIONS* menu. Many new computers have micro-SD slots while others only accept the larger format SD card. An adapter is supplied so that micro-SD cards can be inserted into standard SD card slots.

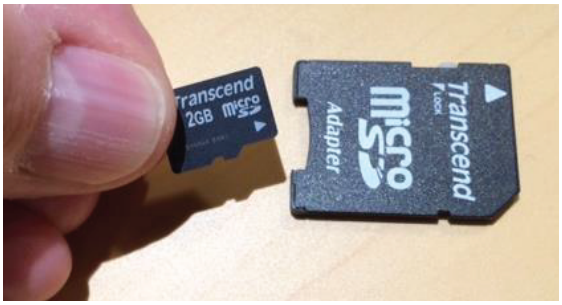


Figure 27: Micro-SD card with adapter

Data Storage Capacity

MetriNet controllers can store large amounts of data. 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—about 230,000 data points. A more typical application with 4 M-Nodes taking data once every 10 minutes holds 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 *OPTIONS* menu. Choosing "Cont" selects a circular file mode of operation. Selecting "Full" stops the data logging when the memory is full.

GPS Function

MetriNet controllers contain a GPS chip that allows the controller to transmit its position to the data site. This function is mainly useful if you plan to move the system around to different locations. However, it can also be useful if the location of the installation is to be displayed on a mapping program.

The GPS function is accessed using the "GPS Entry" routine in the *OPTIONS* menu. The GPS data is only acquired when "Search? YES" is selected. The GPS Status displays on the lower line of the display. It can take up to five minutes to acquire GPS location data.

If a location is found, the lower display shows the Latitude for a few seconds, then display the Longitude for a few seconds, then exit the function. Once the position is acquired, the data is stored in flash memory and need not be updated unless the system is moved to another location.

If a location is not found, current Latitude and Longitude data is preserved, and the display advances to the "Manual Entry?" prompt. If YES is selected, the unit advances to manual entry of Latitude and Longitude data.

The antenna for the GPS chip is internal to the controller and is not a strong receiver. It may be necessary to temporarily activate the controller outdoors at the installation site to get valid data.

SPARE PARTS

Part No.	Description
Electronics	
*	MetriNet controller, 12–24V DC with SD card
*	MetriNet controller, 12V battery with SD card
*	MetriNet controller, 12–24V DC with SD card & modem
*	MetriNet controller, 12V battery with SD card & modem
*	MetriNet controller, 12–24V DC with SD card & modbus RTU
*	MetriNet controller, 12–24V DC with ethernet/IP
*	Metrinet Controller, Lithium Battery with SD Card & LTE Modem
Spare Sensors	
00-1733	Free chlorine M-Node, 0–5.00 ppm
00-1734	Conductivity M-Node, 0–2000 µS
00-1735	pH M-Node, 2.00–12.00 pH
00-1736	ORP M-Node, 0–1000 mv
00-1737	Dissolved oxygen M-Node, 0–20.00 ppm
00-1738	Dissolved ozone M-Node, 0–5.00 ppm
00-1739	Turbidity M-Node, 0.05–40.00
00-1758	Combined chlorine M-Node, 0–5.00 ppm
00-1780	Total chlorine M-Node, 0–5.00 ppm
00-1781	Fluoride M-Node, 0.1–10.00 ppm
00-1782	Chlorine dioxide M-Node, 0–5.00 ppm
00-1783	Peracetic acid, M-Node, 0–200 ppm
00-1784	Dissolved H_2O_2 M-Node, 0–20.00 ppm
00-1786	Nitrite M-Node, 0–2.000 ppm
00-1806	Pressure M-Node, 0–300 psi

* Consult factory for item numbers of electronics assemblies

Part No.	Description
Spare Sensor Components	
02-0245	pH/ORP/Fl- reference junction
03-0511	Electrolyte chamber, Q32 Sensors
05-0120	Free chlorine membranes, pkg. of 10
05-0121	Q32 Electrolyte Chamber O-ring kit (3 each 42-0029 and 42-0061)
05-0122	Total chlorine membrane cap, pkg. of 2
05-0128	Combined chlorine membranes, pkg. of 10
05-0135	D.O. membrane, 2-mil, pkg. of 10
05-0136	Dissolved ozone membrane, pkg. of 10
05-0149	H_2O_2 membrane, pkg. of 10
05-0150	Nitrite membranes, pkg. of 10
05-0165	Q32P/R/F- sensing element O-ring kit
09-0087	Free chlorine electrolyte, 60 ml
09-0088	Combined chlorine electrolyte, 60 ml
09-0089	Total chlorine electrolyte, 60 ml
09-0090	D.O. electrolyte, 60 ml
09-0091	pH/ORP/Fl- reference gel
09-0092	Dissolved ozone electrolyte, 60 ml
09-0097	H2O2 electrolyte, 2 oz.
09-0098	Nitrite electrolyte, 60 ml
45-0354	Membrane cap
48-0197	Membrane holder, titanium (for DO_2 and DO_3 sensors)
Flow System	
00-2008	Latching solenoid valve, 6V DC
03-0490	Flow assembly outlet fitting, no flow regulator, 90 °fitting
03-0491	Flow assembly outlet with flow regulator, 90 °fitting
05-0130	MetriNet O-ring kit (5 each of flow cell O-ring and M-Node O-ring)
44-0290	Inlet fitting, 1/8 in. MNPT x 1/4 in. O.D. tube
44-0269	Outlet fitting, 1/8 in. MNPT x 1/4 in. O.D. tube elbow
45-0332	Flow chamber only
45-0335	Flow chamber connector ring

Part No.	Description
Cable Assemblies	
31-0202	Node to bus bar cable, 12 in. (30 cm)
31-0204	Q52 to bus bar cable, 155 in. (4 m)
31-0208	Q52 power supply cable, 12 in. (30 cm)
31-0212	Bus bar jumper cable, 18 in. (46 cm)
05-0163	Q52 cell antenna extension, 30 ft (9.14 m)
05-0164	Surge protection kit, 30 ft (9.14 m) for (05-0163 extension antenna)
Misc Components	
00-1798	Q51 Portable M-Node Calibrator
05-0168	French Cleat system (Mounting hardware for MetriNet Mini below-ground version)
44-0260	Pg9 cord grip (each)
47-0147	Pole Mounting Kit, S.S. (for MetriNet Mini above-ground enclosure)
55-0083	Silicone compound, 150 g tube