Metrycom

MetrySense3000

WIRELESS IP DATA ACQUISITION

Modular Wireless IPv6 Connectivity and Control System

Features

Multiple interfaces

- **RS232/RS485** interfaces to digital meters and sensors
- **Generic analog outputs** to sensors including pressure, temperature, humidity, moisture, Inclinometers and others
- **"Dry contact" inputs**, also supporting meters with pulse output
- **Digital output** - direct control of electric valves and actuators

Extremely low power:

- 5 years of RTU operation using internal batteries
- Low power router and gateway

Robust design:

- IP67 rating
- Temperature range of -30 to 60°C

Keeps log of measurements

- Measurements can be retrieved from the log after communication failure

Supports cellular 2G/3G/4G

Supports IPv6 mesh Radio (6LoWPAN), and combined cellular & mesh

Reliable radio:

- **10km** with internal antenna (with line of sight, depending on local regulations)
- **Tens of km** with external directional antenna (with line of sight)
- Frequency hopping - for reliable operation with radio interferers
- Frequency range 240MHz to 920MHz depending on the local regulations, licensed/unlicensed bands
- Link level retransmission
- FCC compliant (MS3000-MT/SU/RU-450)
- CE compliant (MS3000-XX-865).

Scalable and flexible Radio Network

- Network size: **Hundreds of kilometers**
- Number of sensors: from one to hundreds of sensors
- Connects via gateway communication infrastructure or to cellular network
- MetrySense-5000 routers and fault detection sensors can be seamlessly added to the network

Applications

- **Industrial control**
- **Smart grid - data acquisition and control**
- **Irrigation control**
- **Meter reading - optimized to large rural areas**

Benefits

- ***Provides online sensor and Meter visibility***
- ***Complete solution from sensor interface to customer's server***
- ***Reliable and scalable IPv6 mesh radio or cellular communications***
- ***5 years operation with internal batteries***
- ***Up to 20 years operation with miniature solar panel***
- ***"plug and play" installation***
- ***Generic interfaces to multiple sensors***
- ***Direct interface to valves and actuators***

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Introduction

MetrySense-3000 is a modular low-power outdoor connectivity system that interfaces digital and analog sensors, meters and actuators and connects them via a low power wireless mesh-network to IP gateways and remote monitoring centers.

Modern industries continuously expand their dependence on real-time data acquired from a growing number of sensors of multiple types, which are installed in an increasing number of machines both locally and remotely, thus expanding the area coverage of sensor networks. This trend affects power utilities, infrastructure projects, agricultural crop management and more. Such environments requires a reliable and secure control over large geographical areas, which often do not feature convenient power supply and/or communication lines in the zones where sensors are required. As a consequence, data must be collected using a flexible and scalable wireless network, independent of any external power sources, robust and that can seamlessly connect with the many types of data protocols typically used by industry. Customers for such networks also demand rapid, simple and non-intrusive deployment, easy remote monitoring, self-healing and secure communication in order to ensure a highly reliable connectivity between their monitoring and control centers as well as between the remote sensor and actuators.

In order to address this growing trend, MetrySense-3000 has been uniquely designed to provide a robust wireless network with industrial strength connectivity that meets the stringent customer requirements. The low power units can operate up to 20 years using power feeding from miniature solar panels, or alternatively can use internal primary batteries for 5 years and beyond. They are simple to install in the field, have a small physical form and housed in a IP67 waterproof casing. This reliable wireless communication technology is based on IPv6/6Lowpan and RPL routing, which is self-configuring, self-healing and secure.

Types of MS-3000 units

Typically, a MetrySense-3000 network includes RTU units, a single Gatway or base unit, and optionally additional router units:

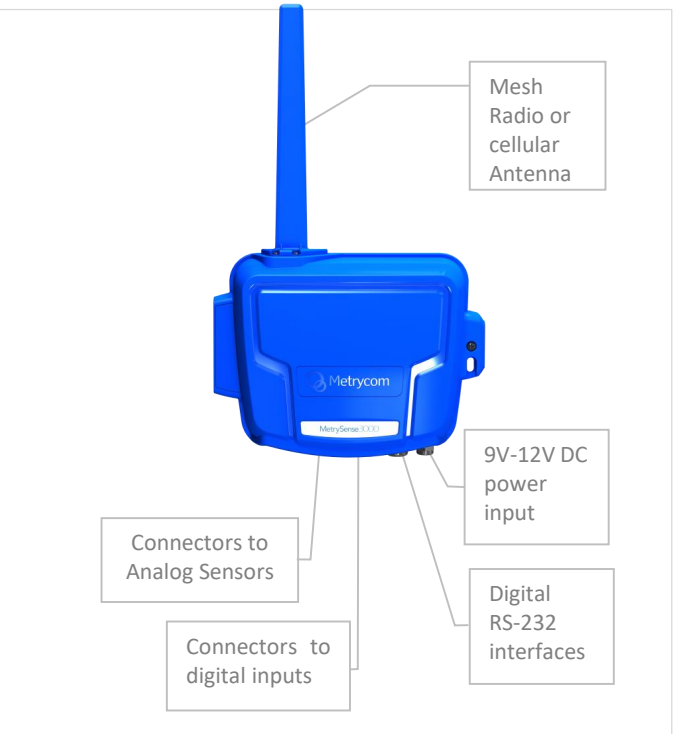
- **RTU Remote terminal unit** (MS3000-SU/HU/MT) directly connected to many types of meters, sensors and actuators using both digital and analog ports, and supports a number of commercially used communication protocols.

  Types of RTUs:

  - **MS3000-SU** – Sensor unit
  - **MS3000-HU** – Hydraulic unit
  - **MS3000-MT** – Extended sensor unit

- **Router/Base unit** (MS3000-RU) is an IPv6 router which is generally located in the field. The RU connects wirelessly to the GU or to other RUs or RTUs which are located further out in the field. All the units are collectively creating an IPv6 mesh radio network where two way information can be sent from one unit to another until it reaches the GU and then the server. Each router includes an IPv6 software stack and runs a RPL routing algorithm for creating an automatic IPv6 network structure which performs mesh-radio routing operations in order to extend the communication range to remote sensors. Note that MS5000-RU can also perform the same routing operation – see the MetrySense-5000 datasheet. MS3000-RU can also function as a base-station and connect to the communication infrastructure via a RS232 serial interface.

- **Gateway unit (MS3000-GU/GW)** which connects both to sensors in the mesh radio network via the radio and to the server via the cellular network. MS3000-GW includes an internal cellular module while MS3000-GU connects to a stand-alone cellular modem via RS232.



RTU Type		Analog Inputs	Digital Inputs	Valve Out-puts	serial com. RS232	Ext. Power supply
RTUs	Sensor (SU)	3	1	-	-	Opt(*)
	Hydraulic (HU)	-	2	2	-	Opt(*)
	Extended sensor (MT)	3	2	-	2	1
Router/Base (RU)		-	-	-	2	1
Gateway(*) (GU/GW)		-	-	-	2	1

Unit interfaces

Notes:

- The gateway unit (GU) is similar to router/base unit (RU) with the exception that it connects to a cellular modem located inside or outside the unit.
- Sensor and hydraulic units use a primary battery module as a default. These units can support external power supply input or a miniature external solar panel only when used with a special power supply module instead of the battery module.

Optional operation without cellular coverage

The Mesh radio network can extend the communication range to hundreds of km, and thus reach remote sensors which are not covered by cellular networks and located far away from the nearest access point of the utilities' communication infrastructure.

The gateway can access a single sensor, a small group of sensors (e.g. 3 – one for each phase), or up to hundreds of sensors over a range of hundreds of km when there is a requirement to reach remote rural areas.

Specifications

Digital and analog I/O:

Analog inputs	Up to 3 analog inputs. In voltage mode: 0-5V (programmable). In current mode: 0-20mA (programmable). Accuracy: +/-2%
Digital inputs	Up to 2 dry contact inputs. Can be programmed to interface meters with pulse output.
Valve/actuator outputs	Up to 2 valve/actuator outputs. Initial volt level: 15V. Pulse produced by discharge of internal 4700uF cap in positive or negative polarity.

Communication interfaces

Sensor (SU)	USB
Extended Sensor (MT)	USB, RS232 x 2 for digital sensors
Router/Base (RU)	USB, RS232 x 2 or 1x RS485
Gateway (GU)	USB, RS232 x 1 (second RS232 used for modem)
Gateway (GW)	USB, RS232 x 2 or 1x RS485

Power options

Power Feeding modules	BATx4: 4xAA L91 internal primary batteries. BATx6: 6xAA L91 internal primary batteries. EXT: For external DC supplier with CE mark.
Default Power feeding module	for MS3000-450-SU BATx6 for other MS3000-XXX-SU: BATx4 for MS3000-HU: BATx6 for MS3000-RU: EXT, 5.5V-14V DC for MS3000-GU: EXT, 9V-14V DC
Internal Primary battery	Energizer L91 Lithium
Internal Battery life	Primary : 5 Years typical. Rechargeable: Up to 20 years [2]

Physical and environmental

Chassis body dimensions without antenna	24.0 x 8.0 x 17.7 cm
Antenna length	915MHz: 9.1 cm Other: 22.1 cm
Weight	1.0 kg
Casing	Nylon fiber glass reinforced
Water and dust resistance	Electronics compartment: IP67 Battery compartment: IP67 Terminal compartment: IP55
Operating Temperature	-30ºC to +60ºC
Storage Temperature	-30ºC to +60ºC

Regulation

CE	EN 60950-1 (Safety) EN 301489-1/3 (EMC) EN 300220-1/2 (Radio)
FCC	MS3000-XX-450:47CFR pt.90, FCCID:2AG7UMS3000-450 MS3000-XX-915:47CFR, pt.15 [2]

Cellular communications

3G option	850/900/1900/2100 MHz
4G option[2]	700 (B13) / AWS100 (B4) (Verizon)

IPv6 Mesh Radio communications

Protocols	6LoWPAN, RPL Routing
Radio data rate	6.7kbps – 1Mbps
Modulation Type	GFSK, Frequency hopping

315/325 MHz Radio Option

Frequency	315IL: 315, 325 MHz
Data Rate	11 Kbps
Bandwidth	360 kHz
Range	4 km [1]
Carrier Power	20 dBm (100mW) Max

865 MHz Radio Option

Frequency	865EU: 865.1-867.95 MHz 865RU: 868.7-869.2 MHz
Range	3 km [1]
Carrier Power	14 dBm (25mW) Max

915 MHz 100W or 1W Radio Option

Frequency	915HI: 921-928 MHz
Range	4 km [1]
Carrier Power	20dBm Max - 100mW option

450 MHz 0.5W Radio Option

Frequency	450-470 MHz, see details in last page
Range	10km (6.3 miles)
Channel BW	12.5kHz (default) or 25 kHz
Antenna's Gain	External antenna: max 9dBi
Carrier power	27 dBm

Notes:
(1) Range is specified for high installation and direct line of sight
(2) Features marked with [2] were not commercially released yet

Order Information

Product part number format: **MS3000-XX-XXXXX-X**

Unit Type

- **SU** Sensor unit
- **HU** Hydraulic unit [2]
- **MT** Extended sensor unit
- **RU** Router/Base unit
- **GU** Gateway unit used with standalone cell. modem
- **GW** Gateway unit with int. cellular module [2]

Radio Frequency option

- **315IL** Israel. **315XIL** for external antenna
- **865EU** Europe. **865XEU** for external antenna
- **865RU** Russia. **865XRU** for external antenna
- **450** US, 450-470MHz, ext. ant., up to 500mW
- **915HI** US/Australia/Brazil 100mW. **915XHI** – ext. antenna, 100mW.

Optional configuration

- **B** RU unit is configured as a base
- **R** RU unit is configured as a router
- **X** Cellular modem is located outside the GU's enclosure
- **I** Cellular modem is located inside the GU's enclosure

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 Address: 20 Galgali haplada Street Herzelia, 4673306, Israel, Tel: +972 9 779 2050, Fax: +972 9 779 2065, Website: www.metrycom.com , Mail: info@metrycom.com

Using this equipment under FCC regulations:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Metrycom Communications Ltd.) could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Exposure limits:
This unit complies with FCC exposure limits for an uncontrolled environment. This equipment must be installed and operated with a minimum distance of 36cm between the radiator and any person's body.

The operating frequencies in the US are between:

921-928 MHz

This is a FCC Class A device, and it requires professional installation by a trained technician. Only the original antenna and cable which come with the device must be used. The antenna should be connected to the cable via the RF connector of the antenna, and the cable must be connected to the device via the RF connector of the device.