

MettrySense3000

WIRELESS IP DATA ACQUISITION

MS3000-XX-915 Unit description



Purpose of the device:

The purpose of the device is to acquire data from sensors via I/O terminals and send it to a server via other MS3000 devices.

Applications

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

Operating frequencies in the US:

- ⦿ 921-928 MHz

Type of modulation:

GFSK (narrowband)

Method of operation

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.

Typically, a MetrySense-3000 network includes RTU units, a single Gateway, and optionally additional router units:

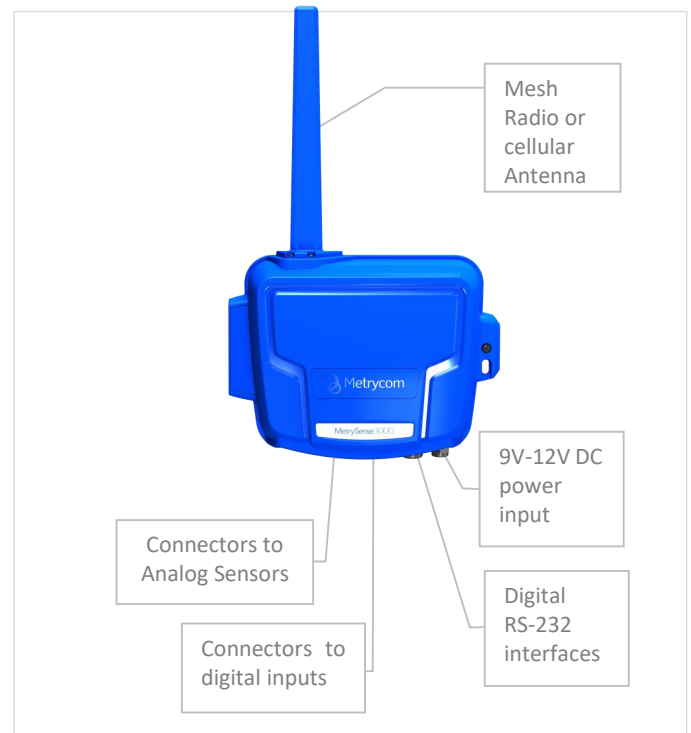
- ⦿ **RTU Remote terminal unit (MS3000-SU/HU/MT)** directly connected to many types of meters, sensors and actuators using both digital and analog ports, and supports a number of commercially used communication protocols.

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 (e.g. a PC) via a RS232 serial interface.

- ⦿ **Gateway unit (MS3000-GU)** includes serial RS232 connection to a cellular modem, and connects both to sensors in the mesh radio network via the radio and to the server via the cellular network.



Radio and Frequency Hopping

The system hops to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The following two sequences of channels are two examples of such pseudo random sequences:

{1, 24, 47, 11, 39, 38, 6, 25, 5, 17, 30, 42, 44, 29, 14, 35, 31, 18, 37, 2, 19, 22, 45, 10, 20, 12, 41, 0, 23, 43, 21, 33, 36, 48, 4, 49, 32, 9, 15, 16, 13, 3, 7, 26, 46, 40, 28, 34, 27, 8};

{46, 18, 20, 19, 16, 38, 9, 10, 3, 15, 1, 49, 44, 29, 14, 4, 27, 24, 8, 36, 34, 32, 45, 40, 47, 41, 12, 0, 23, 33, 21, 43, 2, 48, 35, 42, 22, 6, 17, 39, 7, 5, 13, 28, 30, 25, 26, 11, 31, 37};

There are a total number of 50 channels, distributed evenly in the range 921-928MHz.

The modulation is GFSK, and the baud rate is 11kps. The bit rate is also 11kbps.

The length of each time slot is 0.2 Second, and the frequency channel is changing each time slot. Each frequency is used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

The Antenna of the unit is a $\frac{1}{2}$ wavelength dipole, and the same antenna is attached on the top of the unit, or alternatively it can be connected to the unit using a coaxial cable that is supplied with the unit.

This product complies with FCC Part 15, and in particular with FCC part 15.247(g) and (h). It distributes the transmission over the 50 frequencies by changing the frequency for each time slot according to the pseudo random sequence. In addition, different frequency hopping systems are not synchronized.



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Country: Israel
Telephone number: 972-97792050
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Partial-configuration products of MS3000-MT-915

A. Partial configuration products

MS3000-MT-915 is a full configuration product which includes all the full assembly of electronic components on the PCB of the product targeted to support all the MetrySense-3000 functions. There are several Sub-configuration products which are targeted only to some of the functions. These sub-configuration products are identical to MS3000-MT-915 with the exception that some of the components on the PCB, which are not required in order to implement the functions of the product, are not assembled. In all these sub-configuration products the PCB itself is identical to MS3000-MT-915 and the radio circuits are also identical.

1. **MS3000-MT-915**

The full configuration product that includes these blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including battery circuits, external power circuits, and power feed to optional external cellular modem.
- 5.1 Analog inputs
- 5.2 Digital inputs
- 5.3 Outputs for valve control
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which can perform two functions: (1) connect to sensors in order to acquire data and send it to a base or router unit, and (2) route wireless data between other MetrySense-3000 units.

2. **MS3000-SU-915XHI**

A partial configuration of MS3000-MT-915 including the following blocks:

1. Network processor
2. Application processor
4. Power circuits, including only battery circuits.
- 5.1 Analog I/O
- 5.2 Digital input
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which connects to sensors in order to acquire data and send it to a base or router unit.

3. **MS3000-RU-915XHI:**

A partial configuration of MS3000-MT-915 including the following blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including only external power circuits, and power feed to optional external device.
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which routes wireless data between other MetrySense-3000 units.

4. **MS3000-GU-915XHI-X:**

A partial configuration of MS3000-MT-915 including the following blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including only external power circuits, and power feed to optional external device.



6. Connectors - includes the relevant terminal blocks
Functionality: A wireless unit which routes wireless data from other MetrySense-3000 units to a stand-alone cellular modem which is placed inside its outer enclosure via RS232 cable.

5. MS3000-GU-915XHI-I:

A partial configuration of MS3000-MT-915 including the following blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including only external power circuits, and power feed to optional external device.
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which routes wireless data from other MetrySense-3000 units to a stand-alone cellular modem which is placed outside the unit, via RS232 cable.

6. MS3000-DFM-915XHI

A partial configuration product that includes these blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including battery circuits, external power circuits, and power feed to optional external cellular modem.
- 5.1 Analog I/O
- 5.2 Digital inputs
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which can perform two functions: (1) connect to sensors in order to acquire data and send it to a base or router unit, and (2) route wireless data between other MetrySense-3000 units.

7. MS3000-WS-915XHI

A partial configuration product that includes these blocks:

1. Network processor
2. Application processor
3. RS232 ports
4. Power circuits, including battery circuits, external power circuits, and power feed to optional external cellular modem.
- 5.1 Analog I/O
- 5.2 Digital inputs
6. Connectors - includes the relevant terminal blocks

Functionality: A wireless unit which can perform two functions: (1) connect to sensors in order to acquire data and send it to a base or router unit, and (2) route wireless data between other MetrySense-3000 units.

B. Similar products with internal Antenna

The following product numbers are identical to the product numbers above, with the exception that internal antenna is used. The internal antenna is connected to the PCB internally using a coaxial cable and is connected to the product on its top side. The antenna itself is a 1/2 wavelength antenna similar to the external antenna that is used with the full configuration MS3000-MT-915 including the same plastic cover.

#	Model with internal antenna	Similar model with external antenna (see description above)
1	MS3000-MT-915-INT	MS3000-MT-915
2	MS3000-SU-915HI	MS3000-SU-915XHI
3	MS3000-RU-915HI	MS3000-RU-915XHI
4	MS3000-GU-915HI-X	MS3000-GU-915XHI-X
5	MS3000-GU-915HI-I	MS3000-GU-915XHI-I
6	MS3000-DFM-915HI	MS3000-DFM-915XHI
7	MS3000-WS-915HI	MS3000-WS-915XHI



February 28, 2016..

(date)

A handwritten signature in black ink that reads "Liron Frenkel".

(signature)

Liron Frenkel

(printed name)

CEO

(position)



.....
(company stamp)

Declaration of Identity

We, the undersigned,

Company: Mettrycom Communications Ltd.
 Address: 20 Galgalei Haplada St., Herzeliya
 Country: Israel
 Telephone number: 972-97792050
 Fax number: 972-97792065

The reason for names changes is: The equipment is distributed by our OEM customer, Netafim Ltd., using different names.

A. External Antenna:

(1) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-MT-915	A wireless unit which can perform two functions: (1) connect to sensors in order to acquire data and send it to a base or router unit and to valves (2) route wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-FULL-CONF-US-915 EXT ANT	Identical

(2) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-SU-915XHI	A wireless unit which connects to sensors in order to acquire data and send it to a base or router unit

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-SENSE US 915MHz FOR EXTERNAL ANTENNA	Identical

(3) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-RU-915XHI	A wireless unit which routes wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK-ROUTER-US-915-EXTERNAL ANTENNA	Identical

(4) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-GU-915XHI-I	A wireless unit which routes wireless data from other MettrySense-3000 units to a stand alone cellular modem which is placed inside its outer enclosure via RS232 cable.

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK BASE-CEL-US-915-EXT-ANT-W.MODEM	Identical

(5) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-GU-915XHI-X	A wireless unit which routes wireless data from other MettrySense-3000 units to a stand alone cellular modem which is placed outside the unit, via RS232 cable.

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK BASE-CEL-US-915-EXT.ANT-W/O MODEM	Identical

(6) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-WS-915XHI	A wireless unit which can perform two functions: (3) connect to sensors in order to acquire data and send it to a base or router unit (4) route wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-METEO-US-915 EXT ANT	Identical



(7) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-DFM-915XHI	A wireless unit which can perform two functions: (1) connects to sensors in order to acquire data and send it to a base or router unit (2) route wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-SENSE DFM-US-915 FOR EXTERNAL ANTENNA	Identical

B. Internal Antenna:

The following models are identical to the models in section A above with the exception that the antenna of the UHF radio is internal.

(1) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-MT-915INT	A wireless unit which can perform two functions: (1) connect to sensors in order to acquire data and send it to a base or router unit and to valves (2) route wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-FULL-CONF-US-915 INT ANT	Identical

(2) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-SU-915HI	A wireless unit which connects to sensors in order to acquire data and send it to a base or router unit

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-SENSE US 915MHz FOR INTERNAL ANTENNA	Identical

(3) declare under our sole responsibility that the following equipment:



Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-RU-915HI	A wireless unit which routes wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK-ROUTER-US-915-INTERNAL ANTENNA	Identical

(4) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-GU-915HI-I	A wireless unit which routes wireless data from other MettrySense-3000 units to a stand alone cellular modem which is placed inside its outer enclosure via RS232 cable.

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK BASE-CEL-US-915-INT-ANT-W.MODEM	Identical

(5) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-GU-915HI-X	A wireless unit which routes wireless data from other MettrySense-3000 units to a stand alone cellular modem which is placed outside the unit, via RS232 cable.

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-LINK BASE-CEL-US-915-INT.ANT-W/O MODEM	Identical

(6) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-WS-915HI	A wireless unit which can perform two functions: (3) connect to sensors in order to acquire data and send it to a base or router unit (4) route wireless data between other

		MettrySense-3000 units
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is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-METEO-US-915 INTERANL ANT	Identical

(7) declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
MettrySense-3000	MS3000-DFM-915HI	A wireless unit which can perform two functions: (3) connects to sensors in order to acquire data and send it to a base or router unit (4) route wireless data between other MettrySense-3000 units

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
rSense	R-SENSE DFM-US-915 FOR INTERNAL ANTENNA	Identical

February 18, 2016..

(date)



(signature)

Liron Frenkel

(printed name)

CEO

(position)



(company stamp)