

Wireless Equipment Monitoring Solution

The Escherlogic Wireless Equipment Monitoring System was designed as a modular three component system to provide a monitoring, notification and downtime prediction solution for commercial/industrial facilities. The system can be applied to monitor everything from refrigeration components to bearings and motors. Timely alerts and comprehensive reporting allow plant maintenance personnel to identify and anticipate equipment problems. Maintenance service can be coordinated and unscheduled downtime averted.

Quick Installation & Economical Cost

Although sensing equipment exists that can be integrated to provide a similar solution, it is very expensive, requiring conduit to be installed, the use of special wiring and components, and, of course the labor. Escherlogic's Wireless Equipment Monitoring Solution can be installed in a fraction of the time and at a fraction of the cost when compared to wired systems.

The system consists of:

- ◆ Wireless battery powered sensors, one for each point to be monitored;
- ◆ One or more PoE powered RF Access Point (RFAP) to bridge data from the wireless sensors to a network; and
- ◆ A Micro Server to collect, process and monitor sensor data, generate alerts and reports.

Wireless Explosion-proof Temperature Sensor

Escherlogic has a wide variety of sensor types that can be used within the Wireless Equipment Monitoring Solution. The most common of these is the Wireless Explosion-proof Temperature Sensor. This sensor is the ideal solution for temperature monitoring retrofit of existing equipment. Temperature is measured with a thermocouple sensing washer which is bolted to the equipment with no costly wiring and conduit needed, making installation easy.

Virtually no system configuration is required with features like auto RF channel selection and adaptive RF power control to relay the sensor's data to the closest available RFAP. The sensor is powered by a single AA battery and provide a very long battery life to ensure very low maintenance. As well as accurate temperature measurement from the bolt-on thermocouple, and the internal cold junction temperature for ambient temperature, battery voltage is also included as part of the data payload to provide long-term scheduling for battery replacement.



RFAP (RF Access Point)

Temperature measurement intervals can be adjusted remotely from 10sec. up to 4+min. and up to four different temperature trip points can be configured on-board the sensor. In the unlikely situation where the sensor fails to exchange its data with an RFAP, (e.g. RF interference) the sensor will automatically spool data to internal RAM and then automatically off-load it when the RFAP data exchange re-establishes.

Motor Tag	Sensor Serial#	Current Temp	Last hour Trend	24 hour Max	24 hour Average	7 day Max	7 day Average
170C	2553	59.2°C		60.0°C	55.2°C	61.3°C	54.5°C
25G	2434	54.7°C		54.7°C	49.2°C	57.6°C	48.9°C
143A	2719	53.7°C		63.6°C	51.1°C	65.8°C	50.1°C
D87	2594	53.3°C		53.6°C	50.7°C	55.1°C	50.1°C
142A	2640	52.1°C		56.9°C	49.7°C	61.8°C	50.5°C
37E	2447	50.3°C		50.3°C	46.0°C	50.8°C	44.8°C
5E	2774	49.7°C		50.4°C	45.0°C	51.3°C	43.7°C
144A	2557	48.7°C		51.7°C	46.1°C	53.1°C	45.8°C
69A	2683	48.7°C		50.5°C	46.8°C	51.9°C	46.7°C
N03	2575	46.8°C		52.9°C	41.9°C	54.7°C	40.5°C
137A	2727	46.7°C		49.9°C	46.1°C	54.9°C	46.0°C
39E	2408	46.6°C		51.7°C	42.5°C	52.0°C	41.6°C

The RFAP is an 802.3af compliant Power over Ethernet (PoE) device, making RFAP placement very simple as a single network cable is all that is required. The RFAP can be mounted on ceilings, walls, etc. in the vicinity of the RF sensors. Sensor to RFAP distance will vary with environment, but can achieve distances of 1000 feet or more. In applications with high RF sensor density, high levels of interference, or large coverage areas, more RFAPs can be added with no additional configuration required. RFAPs will automatically arbitrate and balance their channel settings and sensor data traffic loading.

RFAP Protocols and Purposes

The RFAP utilizes many different protocols for various purposes:

- ◆ DHCP for automatic network configuration. (devices can be statically configured as well)
- ◆ SNTP time syncing. All data is timestamped to allow correlation between events and equipment state.
- ◆ HTTP based web front access.
- ◆ Escherlogic's (BEACON) HTTP client to provide over-the-firewall secure data exchange.
- ◆ Telnet server for system monitoring.
- ◆ FTP server for file transfer.



Escherlogic BEACON System



Escherlogic's BEACON system allows RFAPs to be physically located within range of the RF sensors but on the protected side of a firewall and still be able to move sensor data securely to a server out on the web.

Integration of other types of environmental data is as simple as selecting the appropriate sensor type. The RFAP is compatible with Escherlogic's complete line of RF devices including:

- ◆ VI Sensor for isolated interfacing to analog current and voltage signals (e.g. 4-20mA, 0-20mA, 0-5V, 0-10V, etc.)
- ◆ Relative Humidity / Temperature combination sensor.

All Escherlogic temperature sensors are available as N.I.S.T. traceable devices where necessary.

Escherlogic Micro Server

The Escherlogic Micro Server is a low-cost, small, efficient, fan-less, full featured server whose primary purpose is to collect and log all sensor data from RFAPs, provide access to live data, generate alarms, warnings, and reports in PDF and CSV formats. A mounting bracket allows the server to be top, back, or bottom mounted for walls, shelves or inside cabinets, and a 2U mounting plate provides a 19" rack-mount solution. It can operate as a headless server or with monitor and keyboard to provide a direct interface.

The flexibility and power of the Micro Server means that it can be easily used to support all functions required by RFAPs such as DHCP server, SNTP server, databases, data bridging, SNMP as a managed device, mail services, messaging services, web services, etc. to allow the system to be completely stand-alone data island or as part of an integrated network. As a gateway connected to an existing network, or, adding an optional cellular modem and enabling the VPN software is the ideal solution to bridging data from remote sites.

The RFAP's collected data can be pushed when available and/or be polled on regular intervals by the Micro Server. All aspects of how data is moved to and from the Micro Server can be locally or remotely administered with network security paramount.

Warning Alerts and Emergency Alerts

Warning alerts and emergency alerts are sent out to configured email and/or SMS recipients when a monitored point exceeds the nominal operating range and remains there for a preset period of time, with the ability to individually configure every point.

Reports aggregate accumulated data and provide trends regarding how each piece of monitored equipment is performing day by day and week by week. The statistics in the daily report are a rolling day and 7 day average. By comparing daily reports it will be easy to detect emerging equipment failures. The report will display temperatures outside of the nominal range in 'orange' text and temperatures outside of the warning range in 'red' text. This allows the recipients to spot trouble conditions at a glance.

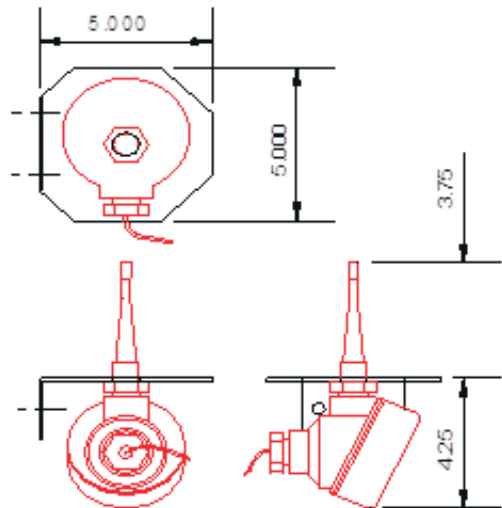
Using the Micro Server in conjunction with a monitor will provide a active display of all monitored points indicating 'all is well', 'warning' or 'emergency' for each monitored point. The 'at-a-glance' presentation is one more mode of delivery that operators and maintenance personnel can use to maintain awareness of the conditions within the facility.

The screenshot displays a 'WEEKLY MOTOR REPORT by Motor TAG' for '2012 Week 17'. The report is organized into two columns of data, each with a header row: 'Description', 'Tag', 'Current Temp', '24 Hour Avg', '36 Hour Avg', '7 Day Avg', and '7 Day Avg'. The data rows list various motor tags and their corresponding temperature readings. A red oval highlights a specific section of the report, containing the following data points:

Current Temp	24 Hour Avg	36 Hour Avg	7 Day Avg
41.7C	23.2C	56.3C	36.3C
39.6C	21.2C	59.6C	32.1C
42.3C	22.4C	61.7C	35.4C
30.2C	19.9C	50.0C	27.9C
47.4C	38.1C	58.1C	45.1C

Explosion-proof Wireless Temperature Sensor Specifications:

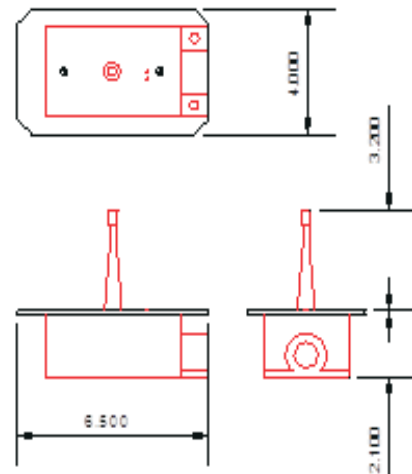
Dimensions: 8.0" x 5.0" x 5.0" (H x W x D)
Sensor: Type- K thermocouple 1/4" I.D. Washer, 55" lead 20 AWG glass-on-glass insulated, rated to 480 deg. C (900 deg. F). (1)
Environment: -30 deg. C. to +70 deg. C
Enclosure: Cast Aluminium, Buna 'N' O-ring & SS Ball chain to cover
Rating: FM/CSA Class 1, Div. 1 Groups B,C,D Class 2 Div. 1 Groups E,F,G
Frequency: 915MHz-919MHz ISM Band.
Antenna: ¼ wave whip
Recommended battery: Energizer L91 AA Lithium
Mounting: Anodized Aluminium bracket/ground plane and plated nut supplied
Sampling Interval: 10 seconds - 250 seconds
Notes:
1) Optional thermocouples and lead lengths available.



RF Access Point Specifications:

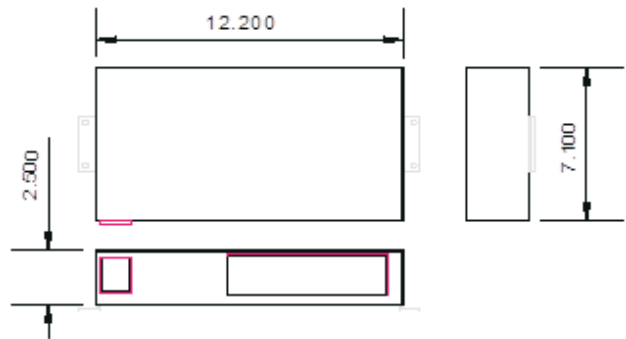
Dimensions: 4.7" x 2.5" x 2" (H x W x D)
Single Gang Cast Box with ½" NPT Hub & ground plane cover plate. (1)
Antenna: replaceable ¼ wave whip (RPSMA)
Network: 10/100M Ethernet (PoE) (2)
Power: PoE 802.3af Class 1
Frequency: 915MHz-919MHz ISM Band

Notes:
1) Optional Explosion proof enclosure available.
2) Optional relay I/O board available with 4 configurable Form-A/B contacts and isolated AC or DC inputs.



Micro Server Specifications:

Dimensions: 12.2" x 2.5" x 7.1" (W x H x D)
Mounting: 2U plate and wall/shelf bracket supplied.
Finish: Textured black powder-coated.
Power: 120VAC, 25W typ. 100W rated internal supply.
Network: 10/100/1000M Ethernet
CPU: Atom D2700
•Storage: 320G / 500G / 750G / 1T
(specify at time of order)



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