AutoLog® Wi-Fi Wireless Sensor Network

- AutoLog Wireless Sensor Network products are using Wi-Fi (2.4GHz)
- Distributes Analog and digital I/O without wires
- Ultra low power consumption: sensors are working up to 5 years without battery recharge.
- Standard Modbus RTU data interface in Wi-Fi master module.
- Bidirectional, allows also output controls via Wi-Fi network.
- Wi-Fi base stations form fault-tolerant Auto MESH network.
- Wi-Fi is mainstream technology allowing low cost implementations and high variety of supporting devices.
1 Introduction

1.1 FF-Automation Oy

FF-Automation Oy (established 1976) has over 30 years experience in automation development and production. Our head office is in Vantaa, Finland and production facilities are in Valkeakoski, Finland. Our customers are all over the world in many sectors including oil & gas, water, energy, municipality, machine manufacturers, transportation, etc. Our AutoLog product series gives complete solutions for wireless remote monitoring.

1.2 AutoLog® wireless sensor network

Brand new wireless technology from FF-Automation opens new ways to build high-efficient and profitable systems which are easy to install and maintain.

FF-Automation has developed low power, battery or power supply operating Wi-Fi sensor modules for wireless sensor data collection, measurement and control.

1.3 Why Wireless Sensors?

Wireless sensors are eliminating the need for expensive communication- and even power cablings. Wide areas can be covered using existing or new Wi-Fi / WLAN networks, anyway with the fraction of cost compared to traditional cabling costs.

Battery operating wireless sensors are freely movable allowing special installations like on moving machine, -vehicle or -process instrument or temporary installations etc.

Also the ergonomic needs especially in home and office environments has moved the evolution more and more towards non-cable environments.

1.4 Why Wi-Fi technology?

Wi-Fi (=WLAN 802.11b/g) access points has already became a mainstream technology and as common as PCs at the workplaces, homes or offices. Almost any new laptop has build-in Wi-Fi capability, so it can be used for configuring the sensors in the field or viewing the sensor values or making controls - possibilities are unlimited!

Analysts are predicting that Wi-Fi technology will increase also in the measurement and control applications, because the infrastructure already exists. Development has been delayed, mainly because of high battery consumption of Wi-Fi sensors and
short battery life, which is now prolonged up to 5-10 years, i.e. is in the same class as other wireless sensor technologies.

Operating distance can be grown almost infinitely by using commercial Wi-Fi MESH base stations. Wi-Fi base stations are mass market products which give variety of build-in features, such as security, logical network separations, sophisticated graphical network configuration and analysing user interfaces etc. with low cost.

In most countries the 2.4GHz Wi-Fi frequency is freely usable, without permissions or annual payments.

1.5 How data can be used?

Wi-Fi wireless sensor connects to the Wi-Fi network automatically as any other Wi-Fi network device. Wi-Fi sensors’ settings can be managed wirelessly via Wi-Fi network. Set up is very simple and flexible.

1.5.1 Direct connection to SQL database

Direct connection between wireless sensor network and SQL database

Data transmission from wireless sensors can be pointed directly to the SQL database through personal computer connected to Ethernet LAN. From database measured data can be directed to other programs, for example to MS Excel or supervision SCADA systems.
1.5.2 Connection to PLC controllers or SCADA system using Modbus RTU

Wireless sensors network connection using RS-232 Modbus.

As another option, AutoLog Wi-Fi Master (green circle on a picture) acts as transition link. External AutoLog Wi-Fi Master Module allows sensors to connect directly to supervision SCADA systems or PLC controllers using standard RS-232 Modbus RTU interface.

Wireless sensor network provides hardware independent interface that can be used to connect to any Modbus RTU compatible supervision and data collection system (SCADA). At the moment Modbus RTU is the most popular interface in automation systems all over the world.

AutoLog Wi-Fi Master Module is equipped with Ethernet connection which establishes links to wireless base station, as well as directly to the company Ethernet LAN, inside which Wi-Fi base stations could be placed quite arbitrarily.

2 Wireless sensor modules

FF-Automation Oy provides a wide range of wireless sensor network modules for different user needs. All modules are working in 2.4GHz Wi-Fi frequency range. (Module name AL WSN24 means AutoLog Wireless Sensor Network 2.4GHz.)

<table>
<thead>
<tr>
<th>Product code</th>
<th>Product name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>900528</td>
<td>AL WSN24-2</td>
<td>2 digital inputs (DI) + 2 digital outputs (DO)</td>
</tr>
<tr>
<td>900530</td>
<td>AL WSN24-4</td>
<td>4 analog inputs (AI)</td>
</tr>
<tr>
<td>900532</td>
<td>AL WSN24-6</td>
<td>2 DI + 2 DO + 2 AI</td>
</tr>
<tr>
<td>900534</td>
<td>AL WSN24-8</td>
<td>2 DI + 2 DO + 2 pulse inputs + 2 AI + 1 analog output</td>
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</tbody>
</table>

Field module models are shown in the table.
As a power source for sensor modules, a battery or 3-15VDC supply can be used. AutoLog WSN24 wireless sensor modules have ultra low power consumption. Wireless sensor is "sleeping", until it wakes up from internal clock or digital input signal. After waking up module turns on the 5VDC power voltage for the sensors, starts measurements and sends measured data to **WSN Master Module**, after that it turns off 5VDC power voltage from the sensors and goes again into “sleep mode”.

In the applications where any immediate remote commands are needed, wireless modules need to be ready to apply commands and sleep mode is not possible to use or awake time must be extended. In many applications where equipment control is needed, main power is available and can be used as power source for sensor modules.

### 3  WSN Master Modules

WSN Master Module has 2 variants. One can be integrated inside AutoLog PLC controllers; another is made as separate device which provides RS232 / Modbus RTU interfaces for equipment connection.

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<td>981340</td>
<td>AL-WSN24-PiM-MM</td>
<td>WSN Master Module integrated in AutoLog.</td>
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</table>

**WSN Master Module** variants are shown in the table.

### 4  Compatible sensors

Analog inputs types and ranges can be programmed. Almost any sensor types available on the markets can be connected to analog inputs. Sensor module can provide 5VDC power voltage as power source for connected measuring sensors. Ask more about compatible sensor types!

### 5  Wi-Fi network features

Wireless Wi-Fi network is mainstream technology providing reasonable pricing and lot of features.

Using wireless sensors from FF-Automation it is possible to get excellent communication range and wide coverage area. Distance between sensor and base station could be up to 200 m. Thus the ranges of common Wi-Fi networks are surely exceeded.
<table>
<thead>
<tr>
<th>Image</th>
<th>Text</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Base stations" /></td>
<td>Base stations are produced to be installed and used in extreme conditions. You can choose between internal or external mounting models. Wide range of operation temperatures allows it to work successfully in a frozen Finland and in a hot Sahara. Water- and dustproof design gives you opportunity to install modules at off-shore platforms or areas with frequent sandstorms.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Auto Mesh" /></td>
<td>Base stations are compliant with Auto Mesh function which provides automatic rerouting and network redundancy features, leading to excellent fail-tolerance. Auto Mesh feature is fully compliant with the same features from third-party vendors, like Cisco, Trobos and others.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Network identifications" /></td>
<td>Base stations are supporting up to 4 network identifications (SSID), so in one physical network it is possible to have up to 4 completely independent logical networks with separate security functions.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Configuration parameters" /></td>
<td>Base station’s configuration and parameters can be remotely controlled and changed using Web based program.</td>
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</table>
6 Complete solutions

Here's some variants of complete solution just to give the picture of wide range of possibilities.

- Web Browser (Web thin client, anywhere within the network. AutoLog ControlMan and Indusoft Web Studio can be used with Web Browser)
  ↔ NETWORK3 (Intranet, Internet, WLAN/Wi-Fi, Ethernet, TCP/IP, can be same as network 1)

- SCADA system (AutoLog ControlMan, Indusoft Web Studio or Any other SCADA. IWS and ControlMan provides also GSM (SMS and GPRS) connection.
  ↔ NETWORK2 (RS232, RS485, Ethernet, GSM, Radio, TETRA etc.)

- PLC (AutoLog RTU / GSM-PLC / TETRA-PLC or any PLC with Modbus RTU protocol) (Also direct database connection)

- Wireless Sensor Master Module (Integrated AutoLog model or External model with RS-232 Modbus RTU interface)
  ↔ NETWORK1 (Wi-Fi = WLAN, FF-Automation can supply Wi-Fi base stations or any existing Wi-Fi / WLAN Base Stations can be used)

- AutoLog Wireless Sensor Modules (Battery or 3-15VDC supply, Optional ATEX enclosure)

- Sensors (5VDC power supply from Wireless sensor, Ask more for suitable sensors! Optional Cathodic protection voltage measurement)

FF-Automation can offer complete AutoLog solution from Wireless sensors to PLC to SCADA to Internet Web Browser. Depending on the application we can offer remote communication capabilities like GSM, GPRS, Radio, TETRA, Ethernet, Internet.

FF-Automation provides full range of project works: from documentation to “turnkey”. We can design PLC application programs, communication and SCADA interfaces give training and maintenance support etc. 10 years spare parts shipment is guaranteed for all FF-Automation products. Partners companies and distributors in a field of wireless sensors and networks are very welcome!

AutoLog WSN24 products provides open and standard Modbus interface for connecting it with any PLC or SCADA system which provides Modbus RTU slave protocol.

Please contact us for more detailed information!
7 Applications

Application field for wireless sensor networks is almost unlimited. Battery-powered, cable-independent sensors allow creating very inexpensive, fail tolerant, and easy to maintain measurement network. Wi-Fi sensors are able, for example, transmit and collected data through accessible city WLAN networks.

WSN802G sensor networks are well suited to applications where IEEE 802.11b/g router compatibility, industrial temperature range operation and long battery life are important. Many applications match these criteria, including:

- Environmental monitoring
- Real estate supervision and control
- Depot and machinery zones (for example, heating system control in a bus depot).
- Seaports, Off-shore platforms (optional cathodic protection monitoring–ask more!)
- Airports
- Energy monitoring and management
- Oil and gas wells and areas
- Construction zones and production premises
- Tank farms (level measurements, valve controls)
- Agricultural measurements and controls
- Factories, warehouses
- Cold chain data logging and food safety, temperature controlling
- Move sensors, street light control
- Moving vehicles and machines like forklifts, airport trucks etc.
- Special type of moving process instruments.
- Security, Access control and customer counting applications
- Roof conditions monitoring, snow coverage control
- Explosive gases condition supervision and control. If needed, FF-Automation is able to produce ATEX compatible sensors.
8 FEATURES / SPECIFICATIONS:

- Compatibility with commercial and industrial 802.11b/g routers
- Low power consumption for long life battery operation including sleep mode
- Full -40 to +85 °C industrial temperature range operation
- Analog and digital I/O plus data and diagnostic UART ports
- Separate data and diagnostic ports
- System/application set up using just two Management Information Blocks (MIBs)
- Full 14 channel 802.11b/g coverage for world wide operation
- FCC, Canadian IC and European ETSI certifications
- Automatic (without polling) or manual (polling) I/O data reporting

We appreciate your interest in our products!

Please, contact us for more detailed information!

With best regards,

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