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Test Report

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Manufacturer: Cellnet Technology, Inc.
Model: L+G Focus AX w/ Zigbee Utilinet Endpoint

Manual



L+G Focus AX w/Zigbee Utilinet Endpoint

Technical Reference Guide

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L+G Focus AX w/Zigbee Utilinet Endpoint Technical Reference Guide

<HW-0073-GB-07.07>

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PREFACE

This guide includes technical information about Cellnet’s UtiliNet endpoint module (“the module”) for the Focus AX meter. Any training provided directly by the utility or by the Cellnet project management team takes precedence over this guide.

ABOUT THIS GUIDE

This is the July 2007 edition of the *L+G Focus AX w/Zigbee Utilinet Endpoint Technical Reference Guide*. It provides:

- Definition and purpose of the module.
- Features, functions, and communications of the module.
- Troubleshooting.

Who Should Use This Guide

This guide is intended for use by utility or Cellnet engineers, technicians, and project managers. It does not assume an expert level of industry or computer knowledge. This guide does assume that you are familiar with basic:

- Utility operations.
- Terminology of your industry.
- Focus meter and meter operations.

How This Guide Is Organized

[Table P.1](#) illustrates how this guide is organized.

Table P.1 Description of Chapters

Chapter	Title	Description
1	Overview	About the network, module, and software
2	Features and Functions	Description of the module’s capabilities and features and configuration tables

TYPOGRAPHICAL CONVENTIONS

This section describes the conventions used in this guide to make finding and understanding information easier. Text formatting identifies special information.

<u>Convention</u>	<u>Description</u>
All bold , initial capital letters	Refers to field names, buttons, menus, menu options, and keys. Examples: Device field, Open button, File menu, or Ctrl key.
All bold lower-case letters	Refers to the exact keystrokes you enter. What you type is always shown in lowercase letters. Example: Type local in the Device field.
<i>Italicized</i> lower-case word between less-than sign (<) and greater-than sign (>)	Refers to variables that occur in item names. Example: Add Sub Network To <network name> dialog, where <network name> refers to the name of a network.
<menu> <option> <option>...	Refers to the sequence of choices you should make to access a specific dialog or menu option. Examples: choose Start Settings Control Panel or choose File Open .
Plus sign (+) between keys	Refers to pressing the keys at the same time. Example: Alt+B .
Comma (,) between keys	Refers to keys which are pressed sequentially. Example: Alt,F .



Note boxes provide essential information about the module.



Cautions provide information that you must read to avoid making relatively moderate errors when working with the module.



Warnings provide special must-read information. If you ignore a warning, you may omit essential data or make a critical error. Warnings are in the same format as notes, except they are shown in bold red text.

CONTACTING TECHNICAL SUPPORT

Within the United States, Cellnet technical support is available by telephone or email. When you contact technical support, be prepared to give exact descriptions of:

- The problem you encountered
- What happened and what you were doing when the problem occurred
- How you tried to solve the problem

- The exact text of any error messages

Telephone Access

Technical support is available Monday through Friday from 8:00 a.m. to 5:00 p.m. (EST) by calling 800-791-2567. If all support technicians are helping other customers, your call will be routed to the Cellnet Support voice mail system.

Leave a brief message that includes the following information:

- Your name
- Your company's name
- Your telephone number

A support technician will return your call as soon as possible within normal business hours. Technicians return all calls in the order that they are received.

Email Access

If you prefer, you may email a description of your problem to:

customersupport@cellnet.com

A support technician will return your email as soon as possible within normal business hours. Technicians return all emails in the order that they are received.

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You can order publications from your sales representative. To order additional copies of this manual, use order number:

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Cellnet welcomes your feedback and comments. If you have comments or suggestions for improving this publication, there is a form for reader's comments at the back of this manual. If you would like a reply, include your contact information:

- Name
- Telephone number or fax number
- Email address
- Company name and address

Be sure to include the following information along with your comment:

- Title and number of this manual
- Page number or topic related to your comment

RELATED PUBLICATIONS

The following documents provide important related information.

Table P.2 Related Publications

Document Name	Document Description
<i>Cellnet Electric Meter Installation Guide</i>	Describes electric meter installation procedures.
<i>Network Configuration Manager Users Guide</i>	Describes usage of Network Configuration Manager software application, including how to program the concentrator.
<i>Radioshop 3.4 Getting Started Guide</i>	Describes the Radioshop application, including updating firmware and working with UtiliNet radios.
<i>UtiliNet Solution Center Operators Guide</i>	Describes the UtiliNet Solution Center back end operations
<i>UtiliNet Solution Center Users Guide</i>	Describes the UtiliNet Solution Center front end applications.

CHAPTER 1 OVERVIEW

This chapter contains an overview of the Cellnet network and the module.

SAFETY OVERVIEW

Prior to starting the installation process, you must develop and launch an installer safety training plan for initial, refresher and ongoing safety training. Ensure that installers receive appropriate initial and refresher training to meet their specific safety-related responsibilities. You must provide safety training when

- An existing installer assumes new duties for which he or she has not previously received training
- New processes and methodologies representing new risks are introduced into the installation environment
- Previously unidentified risks are reported.

The installation supervisory team assumes responsibility for ensuring that installers are properly trained, authorized, and continually qualified to perform their work. The team must also take responsibility for the safety of their installers and to assure safe work methodologies. Installers must understand that their supervisor's responsibility does not relieve them from their individual responsibility to perform the work safely and to follow all safety rules and procedures applicable to their work.

ABOUT THE CELLNET NETWORK

The Cellnet Automated Meter Infrastructure (AMI) network transfers information from a number of endpoints, usually distributed over a large geographical area to a back-end host. The most common endpoints are from electrical, gas and water meters. The network includes a Radio Frequency (RF) Wide Area Network (WAN) and an RF Local Area Network (LAN). The WAN includes Take Out Points (TOPs), repeaters, and concentrators. The LAN is the radio frequency (RF) link between the concentrator and Cellnet endpoints.

- 1-way endpoints transmit data via RF to the concentrator, where it is stored and processed. The concentrator transmits the data via RF to the TOP.
- 2-way endpoints transmit data via RF to UtiliNet network radios, which pass data via RF to the TOP. The TOP sends data to the utility via Ethernet.

REQUIRED SOFTWARE

To work with the module, you need at least one of the following software tools:

- UtiliNet Solution Center
- RadioShop
- Network Configuration Manager
- Endpoint Testing Manager
- Endpoint Implementation Manager

MODULE OVERVIEW

The module is the Cellnet radio that communicates with the network.



Figure 1.1 Focus AX meter

The module is not available as a stand-alone product. To order a Focus AX module, the Cellnet kit number is 40-1077. To order directly from L+G, visit their website at <http://www.landisgyr.com>.

The meter kit includes:

- meter
- module
- antenna

The module is the Cellnet radio that communicates with the network.

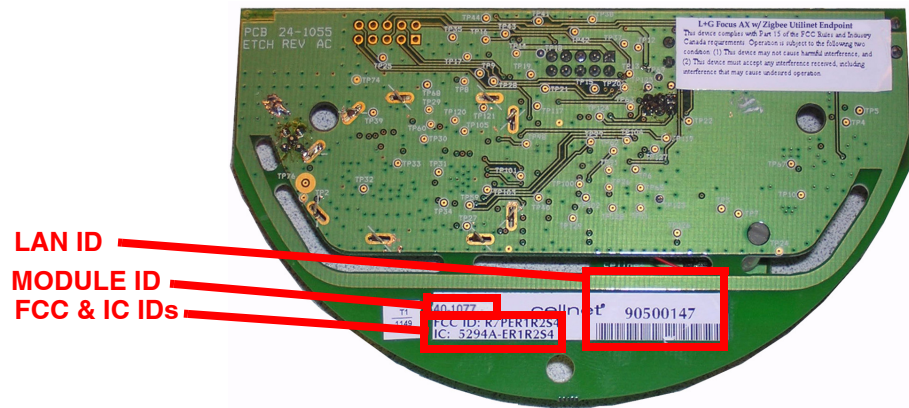


Figure 1.2 Labels on the module

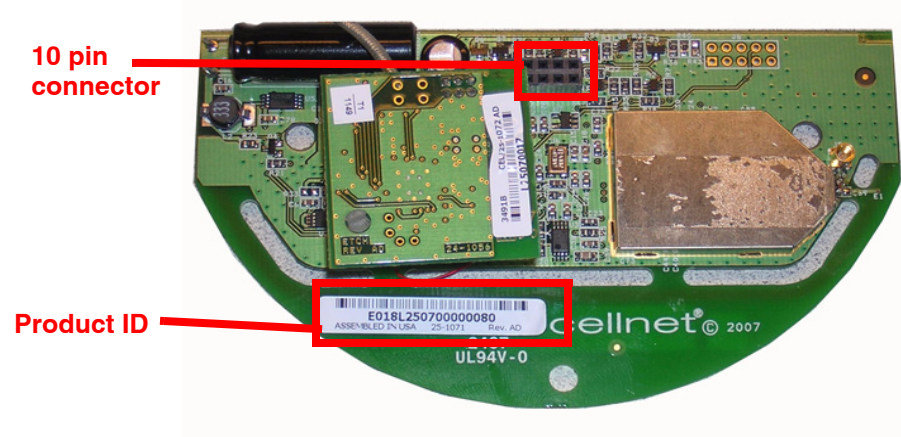


Figure 1.3 More labels on the module

About the LAN ID

The LAN ID is a unique identifier for each Cellnet module. It always displays in hex. Cellnet provides the LAN address. You cannot change the LAN ID of a radio.

Labels

The module includes the following labels:

- Cellnet LAN ID, includes programmed module part number (printed and barcoded), Module Part Number 40-1077, FCC ID R7PER1R2S4 (stamped), and IC ID 5294A-ER1R2S4 (stamped)
- Cellnet Product ID (printed and barcoded)

Shock Hazard

Beware of hazardous electrical voltages. Do not touch the board or any external connections, such as the antenna, when the meter board is powered up.

Compliance

The module meets the following standards:

- **ANSI C12.20**
American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Class
 - **ANSI C12.1**
American National Standard for electricity Meters - code for electricity metering
 - **FCC - CFR Part 15.247**
Radio Frequency Devices, Subparts A-General and B-Unintentional Radiators
- For details on FCC and Industrie Canada compliance, see [Appendix B, Compliance](#).

Environmental

Operating Temperature Range	-40° to +85° Celsius
Storage Temperature Range	-40° to +85° Celsius
Operating Vibration	IEC 68-2-6
Operating Shock IEC	68-2-27
Humidity ANSI 12.20	5.4.3.18

CHAPTER 2 FEATURES AND FUNCTIONS

Using the Focus AX with the Cellnet module, you can:

- Use module with all forms, classes and voltages of the Focus AX meter
- Communicate via serial connection between the module and the meter through the meter's provided interface
- Support all levels of meter passwords
- Download radio firmware
- Interface with ZigBee

Communicating via Meter to Module Connection

The serial connection is a 10-pin connector that contains:

- Full duplex serial connection. The baud rate is 9600, 8 bits, 1 stop bit, no hardware hand-shaking.
- Power fail indication signal from the meter that tells the module to disconnect from drawing power from the meter.
- DC power line which supplies power to the module from the meter.



Figure 2.1 Module and meter

Module Registration

After the meter/module is installed in the field, register it with the USC Host. You can register the meter/module during installation using the UtiliNet 2-Way Implementation Manager tool, or from the host. See the *UtiliNet Solution Center*

Users Guide for more information, The Host sends the registration command to the meter/module. The command configures several services provided by the communication module, including the following:

- Default Take Out Point destination
- Reporting interval for Register Data
- Reporting interval for Interval Data
- Meter's AMR-level security password
- Time Synchronization parameters
- GMT offset

This command also initializes several processes, including the following:

- Periodic Register Data reporting
- Periodic LP Data reporting

The command reads and returns key meter and module configuration data required by the Host to properly interpret data collected by the meter.

Retrieving Data

The module performs data retrieval from the meter on request (ORR) or autonomously (periodically reported).

Availability of the following features depends on meter configuration. On Request Reads (ORR) available with this module are:

- Register Data (Standard Table 23) which includes consumption values
- Load Profile (Interval Data) registered at the meter
- Revenue Integrity Services, which includes instantaneous measurements related to line voltage and wattage

Availability of the following features depends on meter configuration. Options for periodic reported data with this module include:

- Register Data & Status Flags (Standard Tables 23 & 3) which includes consumption and meter status
- Load Profile or Interval Data & Status Flags recorded by the meter, which includes interval data and meter status

Power Outage/Restoration

When an outage occurs, the meter uses an early power failure signal to alert the communication module to disconnect from the meter's power immediately. The communication module saves critical module data to non-volatile memory and creates and sends a power outage message. This message includes the following information:

- LAN ID
- Outage time
- Reboot count.

The module sends the message, then assists with routing other packets until the back-up energy source can no longer keep the radio alive. The time that this energy source is available varies with several factors, including amount of data packets being routed, environmental conditions and age of meter/module. Generally, a hold-up time of ~45 seconds is typical.

At restoration, the communication module first acquires network connectivity. With network communications restored, the module sends a power restoration message that includes details such as:

- LAN ID
- Outage time
- Restoration time
- Reboot count.

The communications module stores a history of up to the last five power outage and restoration event pairs. The USC Host can request this data.

Supporting Passwords

The meter/module supports passwords provided by the utility.

Downloading Firmware

Enable module firmware remotely via RadioShop. The module can remotely initiate a self-restart with communications enabled, if the downloaded firmware causes a catastrophic functional failure. Once the module completely receives the new code, it operates with the new code.

Encrypting Data

The UtiliNet Network currently supports use of one encryption key per network. If you enable the Focus AX with encryption, the host must have a matching encryption key. For more information about encryption in the UtiliNet Solution Center host, see the *UtiliNet Solution Center Operators Guide*.

Interfacing with ZigBee

ZigBee is a wireless standard based on IEEE 802.15.4 specifications for low data rate wireless personal area networks. It incorporates network, security and application layers. It operates in the ISM 2.4 GHz~2.485 GHz frequency band. The key features include low data rate, mesh networking and interoperability. Some Zigbee applications are in home automation, energy management and Industrial sensing and control.

The Focus Ax with ZigBee UtiliNet module consists of a main board with the UtiliNet circuitry and a daughter board with the ZigBee circuitry. The ZigBee board is powered from the UtiliNet main board and is interfaced with the Main board processor through a LPP (LAN packet protocol) UART Port.

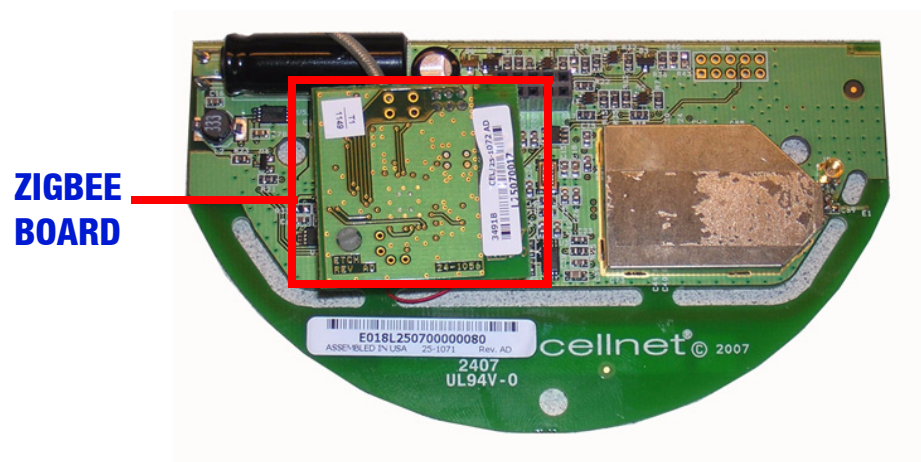


Figure 2.2 ZigBee board

UtiliNet acts as a pipeline to pass in and out the ZigBee information. The ZigBee messages conform with UtiliNet's messaging structure, and appear as UtiliNet messages. A DCW (device control word) running on the UtiliNet-ZigBee gateway module identifies the ZigBee message, strips the UtiliNet packetization, and sends the right message to the ZigBee module. The ZigBee module acts as a gateway to access various ZigBee end devices installed in the home.

CONFIGURATION TABLES

The UtiliNet Module Configuration structure passes the data to configure the module. It is used for both C&I and Residential applications. Detailed information about the configuration tables is available in [Appendix A, Configuration Tables](#).

This table is currently 55 bytes long. It contains information necessary to configure several services on the module, such as firmware reads, autonomous data return configuration.

The module receives the packet, and using the data, configures its own operation. The host maintains a record of the module's configuration.

TROUBLESHOOTING

Contact Cellnet Customer Support at customersupport@cellnet.com or call 800-791-2567 with any questions or problems, and they will guide you through the troubleshooting process.

APPENDIX A CONFIGURATION TABLES

MODULE CONFIGURATION TABLE

Table A.1 Module Configuration

Item	Size	Service	Other
Packet Contents	2	All	Identifies which elements in this packet are set. Elements that are not set are ignored. There still must be a place in the packet for it, though.
Config Byte 1	1	Res	
Config Byte 2	1	Res	
Config Byte 3	1	Res	
Config Byte 4	1	Res	
Config Byte 5	1	Res	
LP Read Push Start Time	2	All	Number of minutes after midnight the LP read has to be transmitted.
LP Pump Period	2	All	Number of minutes between successive LP reads for the day, after the first LP read has been transmitted.
Register Read Push Start Time	2	All	Number of minutes after midnight that the register read has to be transmitted.
Register Pump period	2	All	Number of minutes between successive register reads for the day after the first one has been transmitted.
Status Read Push Start Time	2	All	Number of minutes after midnight that the status read has to be transmitted.
Status Pump Period	2	All	Number of minutes between successive status reads for the day after the first one has been transmitted.
Snap Read Push Start Time	2	All	Number of minutes after midnight that the snap read has to be transmitted.

Table A.1 Module Configuration

Item	Size	Service	Other
Snap Read Pump Period	1	All	Number of minutes between successive snap reads for the day after the first one has been transmitted.
Unused	4	All	Unused bytes
Number of LP and Snap Read Blocks	1	C&I and Adv. Res.	Number of LP blocks (upper 4 bits) and number of snap reads (lower 4 bits) to include in each LP push and each snap read push.
Security Password	20	All	the full 20 bytes are required for the Focus AX.
Sustained Outage Duration	2	All	Defines the number of seconds after which an outage will be classified as sustained. If less than this amount, the outage is momentary. A value of zero will cause all outages to be considered "sustained".
Max Meter Time Drift	2	C&I and Adv. Res.	The number of seconds that the meter clock can drift from the radio clock, after which an alarm is triggered.
Meter Time Read Period	2	C&I and Adv. Res.	The period at which the module checks the time in the meter, in seconds.
GMT Offset	1	All	The GMT Offset in 15 minute increments. Signed.
	55	Total size	

APPENDIX B COMPLIANCE

FCC CLASS B

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.

This equipment has been tested and found to comply with the limits for a Class B 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.
- Consult Cellnet or an experienced radio technician for help.



Changes or modifications to this device not expressly approved by Cellnet Technology, Inc. could void the user's authority to operate the equipment.

RF Exposure

In accordance with FCC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of 20 centimeters will be maintained.

INDUSTRY CANADA

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. 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.

Cet appareil numérique de la classe B répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif ne peut pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

GLOSSARY

ANSI	The American National Standards Institute (ANSI) coordinates the development and use of voluntary consensus standards in the United States and represents the needs and views of U.S. stakeholders in standardization forums around the globe. http://www.ansi.org/
C&I	Commercial & Industrial meters, usually solid state meters with demand notes.
Concentrator	Device that collects data and events from radio frequency local area network (RF LAN) devices for storage in the object database; communicates with the TOP to forward the metering data.
DCW	A Device Control Word (DCW) is not actually a word, but a program written in the UtiliNet programming language. DCWs execute within UtiliNet devices and provide the ability to control the device. The DCW sits on top of the firmware and directs the radio to do things such as reboot or perform advanced functions.
Demand	Meter rate.
EEPROM	Electrically Erasable Programmable Read-Only Memory
Host	The UtiliNet Network reports data to UtiliNet Solution Center software, which hosts the data and the tools to communicate remotely with the radio.
Init Poll	The first time the host requests data from an module, it is the Initialization Poll (Init Poll). Configurable options, such as enhanced Restoration verification, may be set at this time.
LAN	Local Area Network, consists of modules and RF link between endpoints and gathering devices such as Concentrators and TOPs
Meter Forms	
Network Concentrator	See Concentrator.
NVRAM	Non Volatile Random Access Memory
On Request Read	Operations Center DataBase. Endpoint Management system that reports to network, exchanges information with the utility.
Outage	Over the Air, versus a direct or indirect (router) serial cable connection.
RAM	Random Access Memory
Restoration	
Time Synchronization	
TOP	Take Out Point
TOU	Time of Use. Specific meter rate where the usage is captured in intervals.
Utilinet IWR	Integrated WAN Radio. Used to communicate remotely to network.

WAN

Wide Area Network, consists of data gathering devices like Concentrators and endpoints

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Fax	(678) 258-1550

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