



Excellence in Compliance Testing

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## **Certification Test Report**

**Frequency Hopping Spread Spectrum Transmitter**

**FCC ID: R7PEC1R2S4**

**IC: 5294A-EC1R2S4**

**FCC Rule Part: 15.247**

**IC Radio Standards Specification: RSS-210**

**ACS Report Number: 07-0269**

Manufacturer: Cellnet Technology, Inc.

Model: L+G S4e 2G Utilinet Endpoint

## **Installation Guide**



# **Cellnet Landis + Gyr S4e 2G UtiliNet Module**

## **Technical Reference Guide**

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### *Cellnet Concentrator User and Installation Guide*

<HW-0070-GB-05.07>

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## PREFACE

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This guide includes technical information about Cellnet's UtiliNet endpoint module ("the module") for the Landis + Gyr S4e 2G 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 May 2007 edition of the *Cellnet Landis + Gyr S4e 2G UtiliNet Module 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.
- Landis + Gyr S4e 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 <b>bold</b> , initial capital letters	Refers to field names, buttons, menus, menu options, and keys. Examples: <b>Device</b> field, <b>Open</b> button, <b>File</b> menu, or <b>Ctrl</b> key.
All <b>bold</b> lower-case letters	Refers to the exact keystrokes you enter. What you type is always shown in lowercase letters. Example: Type <b>local</b> in the <b>Device</b> 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 <b>Start</b>   <b>Settings</b>   <b>Control Panel</b> or choose <b>File</b>   <b>Open</b> .
Plus sign (+) between keys	Refers to pressing the keys at the same time. Example: <b>Alt+B</b> .
Comma (,) between keys	Refers to keys which are pressed sequentially. Example: <b>Alt,F</b> .



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.

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## CONTACTING TECHNICAL SUPPORT

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.

## Ordering Publications

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

HW-0070-GB-05.07

## Publication Comments

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**

<b>Document Name</b>	<b>Document Description</b>
<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

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

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### 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.

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### REQUIRED SOFTWARE

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

- UtiliNet Solution Center
- RadioShop
- Network Configuration Manager
- L+G 1132Prog application
- Endpoint Testing Manager
- Endpoint Implementation Manager

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## MODULE OVERVIEW

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

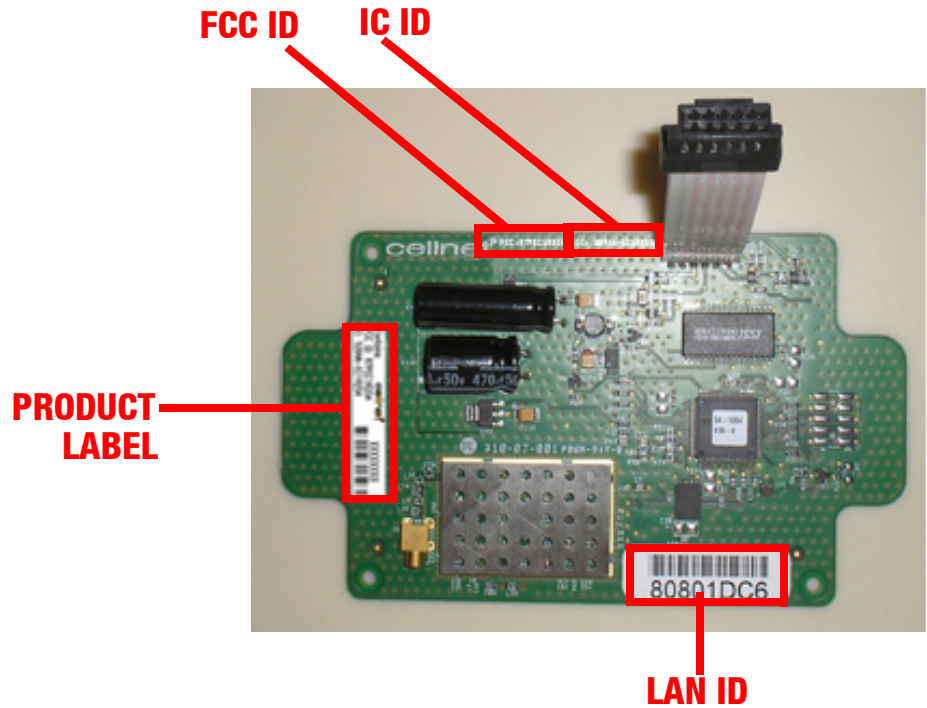


Figure 1.1 Module with labels called out

The module is not available as a stand-alone product. To order a S4e 2G module, the Cellnet kit number is 40-1083. To order directly from L+G, visit their website at <http://www.landisgyr.com>.

The meter kit includes:

- meter
- module
- antenna.(qualified with Landis + Gyr PN 71654)

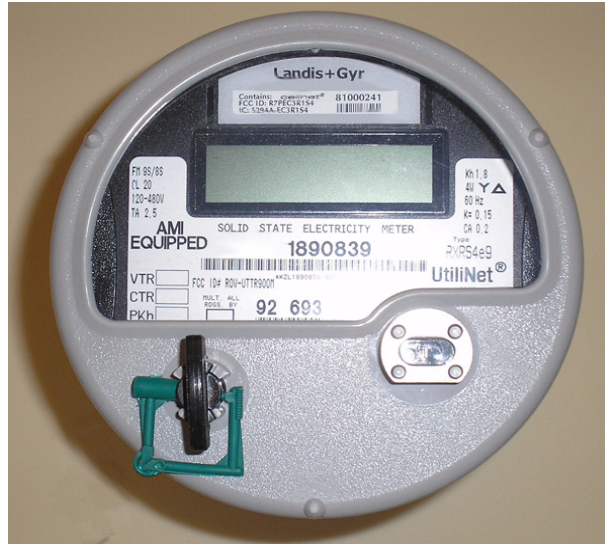


Figure 1.2 Landis + Gyr S4e 2G meter

## 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)
- Cellnet Product ID (printed and barcoded)
- FCC ID: R7PEC1R2S4 (stamped)
- ICC ID: 5294A-EC1R2S4 (stamped)

## 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

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Using the Landis + Gyr S4e with 2G module, you can:

- Integrate module into all forms, classes and voltages of the S4E 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

### Communicating via Meter to Module Connection

The serial connection is a 12-pin ribbon cable 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** Serial connection between module and meter

### Endpoint Registration

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

*Users Guide* for more information, The Host sends the endpoint registration command to the endpoint. 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
- Time Synchronization process

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, demand and TOU values
- Load Profile or Interval Data (Standard Table 64)
- Revenue Integrity Services which includes instantaneous measurements related to line voltage, current and phase angle

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, demand, TOU values and meter status
- Load Profile or Interval Data & Status Flags (Standard Tables 64 & 3) which includes interval data and meter status

## Demand Reset

When the USC Host delivers a Demand Reset command, the communication module passes the command to the meter, which performs the Demand Reset on the meter. The endpoint then passes the previous demand data captured by the meter (Standard Table 25) to the USC Host for processing.

## Time Synchronization

Time synchronization is the process of keeping the meter time synchronized with the UtiliNet network time within a configurable limit. The communication module automatically keeps its time synchronized with the UtiliNet network via periodic background process. The communication module reads the meter date/clock table (Standard Table 52) periodically, determined by its configuration. If the time drift between meter and communication module exceeds the configured threshold, it sends a time synchronization alert message to the USC Host. The Host schedules a time change event for the meter and sends it to the

communication module. The time of the change is determined such that the meter's data integrity is maintained. At the scheduled time, the communication module executes the standard procedure to change date/time on the meter.

## 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 endpoint. 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 meter firmware remotely via host or 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 S4e 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*.

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## 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.

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## **TROUBLESHOOTING**

Contact Cellnet Customer Support at [customersupport@cellnet.com](mailto: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	S4e Default Value Descr	General Descr	Notes
Packet Contents	The Config Bytes 1-5 are the only features masked out by this value. This is because the S4e 2G DCW does not capture LP data in the UtiliNet module.	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.	When the configuration is sent, all 55 bytes must be provided. Only the values that have the mask bit specified are used. maskConfigBytes = 0001h maskLPReportingInterval = 0002h maskPumpPeriodRegister = 0004h maskPumpPeriodRIS = 0008h maskPumpPeriodStatus = 0010h maskPumpSnapRead = 0020h maskUserID = 0040h maskLogonUser = 0080h maskSecurityPassword = 0100h maskSustainedOutageDuration = 0200h maskMaxMeterTimeDrift = 0400h maskMeterTimeReadPeriod = 0800h maskGMTOffset = 1000h
Config Byte 1	Not Used. Masked out by the Packet Contents field	Not used.	Current DCW version does not support this. Value is 0.
Config Byte 2	Not Used. Masked out by the Packet Contents field	Not used.	Current DCW version does not support this. Value is 0.
Config Byte 3	Not Used. Masked out by the Packet Contents field	Not used.	Current DCW version does not support this. Value is 0.
Config Byte 4	Not Used. Masked out by the Packet Contents field	Not used.	Current DCW version does not support this. Value is 0.
Config Byte 5	Not Used. Masked out by the Packet Contents field	Not used.	Current DCW version does not support this. Value is 0.
Reporting Interval LP	240 minutes (4 hours)	In Minutes. Zero disables the LP pump.	

**Table A.1 Module Configuration**

Item	S4e Default Value Descr	General Descr	Notes
Pump Period Register	360 minutes (6 hours)	In Minutes. Zero disables the register pump.	
Pump Period RIS	0 minutes, which means it is disabled.	Not used.	Current DCW version does not support this. Value is 0.
Pump Period Status	0 minutes, which means it is disabled.	Not used.	Current DCW version does not support this. Value is 0.
Pump Period Snap Read	0 minutes, which means it is disabled.	Not used.	Current DCW version does not support this. Value is 0.
User ID	No conversion; the ID is just 1.	2 byte User ID used while running ANSI Logon Service	Used to log user activity. Do not change, even though not relevant to meter.
Logon User	CellnetAMR	10 byte User Name that is used while running the ANSI Logon Service	Do not change, even though not relevant to meter.
Security Password	By default the password is empty.	The full 20 bytes are required for the S4e.	For the S4e, this is a user defined password. This must match the password that is programmed in the meter or the assigned AMR password. In order to use all of the features available in the DCW, this must be the meter's highest level password.
Sustained Outage Duration	30 seconds	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	20 seconds	The number of seconds that the meter clock can drift from the radio clock, after which an alarm is triggered.	When exceeded, causes an event to be sent to the host, which responds in kind by sending a time sync command to the device.
Meter Time Read Period	30 minutes	The period at which the module checks the time in the meter. In Seconds	
GMT Offset	No offset by default. The UtiliNet module is in GMT time.	The GMT Offset in 15 minute increments. Signed. Valid values are -128 (0x80), corresponding to GMT-32hours to +127 (0x7F), corresponding to GMT+ 31hours	The UtiliNet module will still maintain time in GMT, but any times that are used by the module for metering purposes will be adjusted with this offset first. For the S4e, this includes setting the Last Programmed Time.

## APPENDIX B COMPLIANCE

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### FCC CLASS B

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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.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

This device has been designed to operate with an antenna having a maximum gain of 2 dBi. Antennas with a gain greater than 2 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Cet appareillage 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 peut ne 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.

Pour réduire le risque d'interférer avec d'autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle sorte que la Puissance Isotrope Rayonnée Equivalente (P.I.R.E) ne soit pas supérieure à celle autorisée pour une communication réussie.

Cet appareil a été conçu pour opérer avec des antenne ayant un gain maximum de 2dBi. Les antennes n'ayant pas un gain supérieur à 2 dBi sont strictement interdites pour une utilisation avec cet appareil. L'impédance d'antenne requise est de 50 ohms.

## GLOSSARY

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<b>ANSI</b>	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. <a href="http://www.ansi.org/">http://www.ansi.org/</a>
<b>C&amp;I</b>	Commercial & Industrial meters, usually solid state meters with demand notes.
<b>Concentrator</b>	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.
<b>DCW</b>	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.
<b>Demand</b>	Meter rate.
<b>EEPROM</b>	Electrically Erasable Programmable Read-Only Memory
<b>Host</b>	The UtiliNet Network reports data to UtiliNet Solution Center software, which hosts the data and the tools to communicate remotely with the radio.
<b>Init Poll</b>	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.
<b>LAN</b>	Local Area Network, consists of modules and RF link between endpoints and gathering devices such as Concentrators and TOPs
<b>Meter Forms</b>	
<b>Network Concentrator</b>	See Concentrator.
<b>NVRAM</b>	Non Volatile Random Access Memory
<b>On Request Read</b>	Operations Center DataBase. Endpoint Management system that reports to network, exchanges information with the utility.
<b>Outage</b>	Over the Air, versus a direct or indirect (router) serial cable connection.
<b>RAM</b>	Random Access Memory
<b>Restoration</b>	
<b>Time Synchronization</b>	
<b>TOP</b>	Take Out Point
<b>TOU</b>	Time of Use. Specific meter rate where the usage is captured in intervals.
<b>Utilinet IWR</b>	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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## Reader's Comment Form

**Cellnet Landis + Gyr S4e 2G UtiliNet Module Technical Reference Guide (HW-0070-GB-05.07)**

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