

AMRUSB-1

900 MHz AMR Receiver
with USB Interface

PATENT PENDING



Data Sheet

Description

Grid Insight's 900 MHz AMR Receiver enables personal computers and other devices with USB host capability (such as set-top cable TV boxes) to receive and make use of household and commercial utility consumption data in near real-time. Using software, this data can be analyzed, aggregated, and shared in various scenarios to provide smart grid capabilities to consumers and utilities.

Physical

(Shown at 150% of actual size)



Features

- Receives interval data message (IDM) and standard consumption message (SCM) meter data transmissions in the 900 MHz band from Itron ERT-compatible transmitters.
- Works with high-power (FCC Type 15.247) solid-state electricity meters as well as legacy low-power (FCC Type 15.249) electromechanical meters.
- Works with all electricity, water, and gas meters configured in “bubble-up” transmission mode (the default mode on all contemporary solid-state meters and on most legacy electromechanical meters).
- Monitor multiple meters of various types simultaneously.
- Compatible with an installed base of over 73 million¹ utility meters.
- Ensures data accuracy through CRC and NMEA (two's complement) error detection.
- User-friendly bi-color LEDs indicate correct data reception, data corruption, and USB connection status.
- Supports wide range of antenna options using industry-standard 50 Ω SMA antenna jack (RP-SMA also available).
- Tiny 12mm x 55mm “thumb drive” form factor.
- No FCC license required; sends no “wake up” transmission.

Range

Using a dipole antenna, unobstructed range has been measured to be at least 500 feet when used with Itron Centron C1SR R300HP meters. Unobstructed range with low-power Itron ERT 45ER-1 modules has been observed to be at least 150 feet.

¹ Source: Itron website (http://www.itron.com/pages/products_flv_player-choiceconnect.asp)

Host Compatibility

The receiver interfaces to its host as a USB 2.0 CDC device. CDC drivers are included in most versions of Apple Macintosh OS and open source Linux operating systems, allowing the device to be recognized upon insertion and automatically configured as a virtual serial port. On Microsoft Windows, a simple installer program must be run by the user in order to identify the device to the operating system and enable the Microsoft-provided CDC driver.

Any host device capable of implementing the USB 2.0 Communications Device Class specification should be able to interface with the receiver.

Meter Compatibility

The receiver is capable of receiving and decoding signals transmitted by the following electricity meters:

Manufacturer	Model	Required option
ABB	A3 Alpha	Itron 53ESS module
	AB1	Itron ERT*
	D5S	Itron ERT*
Elster	AB1R	Itron ERT*
GE Energy	kV2c	Itron 53ESS module
	kV2c+	Itron 53ESS module
	I-210	Itron 52ESS or Hunt AirPoint module
	I-210+	Itron 54ESS, 55ESS, or 56ESS module
	I-210+n	Itron 54ESS, 55ESS, or 56ESS module
	I-70-S	Itron ERT*
Itron	I-70-S/1, I-70-S/1, I-70-S/2	Itron ERT*
	Centron C1SR R300	Itron R300 module
	Centron C1SRc	Itron R300 module
	Centron CP1SR	Itron R300 module
	Centron C1SR R300HP	Itron R300HP (high power) module
	Centron C1STI	Itron R300CD or R300CD3 module
	Centron C1STL	Itron R300CD or R300CD3 module
	Sentinel	Itron R300S, R300SD, or R300SD3 module
Landis+Gyr / Hunt	FOCUS	Hunt / Landis+Gyr AirPoint module
Landis+Gyr / Siemens	MX (OMRMX)	Itron ERT*
	MS	Itron ERT*
	MS-II	Itron ERT*
Sangamo	J4S	Itron ERT*
	J5S	Itron ERT*
Schlumberger	J5S	Itron ERT*
	Centron C1SR	Itron R300 module
Sensus / Invensys	iCon	Itron 51ESS module
Westinghouse	D4S	Itron ERT*
	D5S	Itron ERT*

* Electromechanical meters may be equipped with any of a number of Itron ERT or Hunt AirPoint electromechanical retrofit AMR modules. Compatible Itron ERT units include, but are not limited to, models 45ER-1, 45ES-1, and 45EN-1. Some ERT units, especially very early units, may require reconfiguration to operate in bubble-up mode.

The AMRUSB-1 reads all of Itron's ERT and ChoiceConnect meter modules that operate in bubble-up mode, including, but not limited to, the following water and gas modules:

Water	Itron 60W, 80W-i, 100W, 100WP, 100W-R, and 100WP-R
Gas	Itron 100G

Data Interface

Commands

The receiver understands the following commands (some of which require parameters):

Command	Description
TRGT	Focus reception on a specific target meter and/or message type.
FULL	Activate full output format, which includes receive channel and signal strength for each received data packet.
SSCN	Provide a snapshot spectrum analysis of the entire frequency band.
TUNE	Listen on a single frequency (for testing purposes).
AUTO	Toggle adaptive frequency-hopping spread spectrum tuning.
RSSI	Report background noise level at a specific frequency.
PBKT	Provide a report of spread-spectrum reception statistics.
RBKT	Reset spread-spectrum reception statistics counters.
WGHT	Adjust time spent in optimized hopping mode vs. scanning mode.
RSET	Reset receiver to start-up defaults.
VRSN	Report the firmware version number.
MYID	Report the unique, factory-assigned receiver serial number.

Data output

Following is an example of the data elements included in a consumption-type data packet:

```
-----
Serial: 18113426
ERT Type: 7
Reading: 873806
-----
```

As output on the receiver's serial interface, this data would appear like this:

```
$UMSCM,18113426,7,873806*5C
```

Error detection is handled through the use of an NMEA-style checksum. The checksum is a two-character hexadecimal number following the "*" character, located at the end of each data sentence. If the calculated checksum does not match the checksum in the sentence, the entire sentence should be discarded.

The following table describes the various elements presented in an SCM message report:

Column Name	Field Format	Max Size	Description
Serial	Long integer	10	Meter's unique identifier
ERT type	Byte	2	Identifies the type of meter (electricity, water, gas, etc.).
Reading	Long integer	10	The cumulative amount of the metered quantity that has been consumed since the meter was installed. Units will vary based on meter type and version. For electricity, 10Wh and kWh are the common units. Reading is updated at the time of transmission.

Following is an example of the data elements included in an interval-type data packet:

```

-----
Serial: 46453762
ERT Type: 23
Version: 2
Reading: 6084558
Offset: 92
IntCount: 58
Interval:
3,5,5,5,5,5,18,26,25,6,5,6,4,4,4,6,7,8,9,14,8,3,3,2,3,2,1,1,3,2,3,3,2,3,2,3,3,4,3,3,2,
3,2,3,3,2,4
-----
    
```

As output on the receiver's serial interface, this data would appear like this:

```

$UMIDM,
46453762,23,2,6084558,92,58,3,5,5,5,5,5,18,26,25,6,5,6,4,4,4,6,7,8,9,14,8,3,3,2,3,2,1,
1,3,2,3,3,2,3,2,3,3,4,3,3,2,3,2,3,3,2,4*6A
    
```

The following table describes the various elements presented in an IDM message report:

Column Name	Field Format	Max Size	Description
Serial	Long integer	10	Meter's unique identifier
ERT type	Byte	2	Identifies the type of meter (electricity, water, gas, etc.).
Version	Byte	2	Identifies the version of the meter's transmitter module. Different version may have subtle differences in data semantics. For example, one version may report using a five minute interval duration, while another version may use a ten minute duration.

Column Name	Field Format	Max Size	Description
Reading	Long integer	10	The cumulative amount of the metered quantity that has been consumed since the meter was installed. Units will vary based on meter type and version. For electricity, 10Wh and kWh are the common units. Updates at the end of each interval.
Offset	Integer	3	Number of 1/16 th seconds elapsed since the last interval ended.
IntCount	Byte	3	Incrementing interval counter. Increments at the end of each interval. Rolls over to 0 after 255.
Interval (1 to 47)	Integer	3	Amount of the metered quantity that was consumed during each of the 47 prior intervals. Units will vary based on meter type and version. For electricity, 10W is the common unit. The left-most interval is the most recent.

For more information, please visit our web site at www.gridinsight.com.

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Data subject to change. Revised 13 July 2011.

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