OpenWay® Riva Socket Based Router
User Guide

Technical
Communications

knowledge to shape your future

Identification

OpenWay® Riva Socket Based Router User Guide

18 April 2018 DRAFT

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Contact

- Email: support@itron.com
- Internet: support.itron.com
- Telephone Itron Technical Support North America: 1-877-487-6602

For technical support contact information by region, go to www.itron.com and select your country and language.

Contents

Chapter 1 Important Product and Compliance Information

FCC Compliance

Labeling

The following information appears on labels on the exterior of the SBR.

• FCC ID: SK9OW1

• FCC ID: SK9ITR9002

• FCC ID: SK9WF111

• FCC ID: N7NEM7455

The following information may also appear on an exterior label.

"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."

FCC Part 15, Class B

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.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

Note: Changes or modifications to this device not expressly approved by Itron, Inc. could void the user’s authority to operate the equipment.

RF Exposure

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Professional Installation

These antennas are intended for professional installation by the integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this antenna.

Modification and Repairs

To ensure FCC compliance and system performance, this device, antenna, and/or coaxial assembly shall not be changed or modified without the express written approval of Itron. Any unauthorized modification will void the user's authority to operate the equipment.

This device contains no user serviceable parts. Attempts to repair this device by unauthorized personnel may subject the person to shock hazard if removal of protected covers is attempted. Unauthorized repair will void the warranty and/or maintenance contract with your company.

Factory Repair of Meters

Itron recommends that all repairs be performed at the factory. Certain repairs may be performed by the user; however, unauthorized repairs will cause any existing warranty to be void.

Repair of Meters Under Warranty
If the meter is under warranty and has failed due to components or workmanship, then Itron, Inc. will repair the meter at no charge. A return authorization number must be obtained before the equipment can be sent back to the factory. Contact your Itron Sales Representative for assistance.

Repair of Meters Not Under Warranty
The same procedure as above applies. Itron will charge for the necessary repairs based on the failure.

Service Return Address
Itron, Inc. Customer Repair Department 313 North Highway 11 Dock C West Union, SC 29696

Battery

The OpenWay Riva CENTRON meter contains a battery that powers the clock circuit during a power outage. The battery is permanently soldered to the module and is expected to last the life of the meter.

⚠ **Caution**: The product you have purchased contains a recyclable battery. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local area solid waste officials for details about recycling options or proper disposal.

Standards

Regulatory Compliance:

- FCC Part 15.247
- FCC Part 15 Class B
- FCC Part 2.1091

Standards Compliance:

- ANSI C12.1 - 2008
- ANSI C12.20 (Class 0.5) – 2010 (socket based only)
- ANSI 62.45 - 1992
- IEC 61000-4-4-2004-07
- IEC 61000-4-2-2001-04

Chapter 2 General

Overview

The Socket Based Router (SBR) is an OpenWay networking device whose software and hardware are designed to route and forward information and to connect two or more logical subnets (which do not necessarily map one-to-one to the physical interfaces of the router). In other words, the SBR incorporates traditional router functionality in addition to relay characteristics.

The Socket Based Router combines the existing cell relay functionality with the capability to serve as an Internet Protocol (IP) network router. The SBR includes the capability to perform the wrapping and unwrapping of the different IP versions. The SBR is a high capacity OpenWay solution capable of simultaneous support of Wide Area Networks (WAN), Remote Area Networks (RAN), and Local Area Networks (LAN).

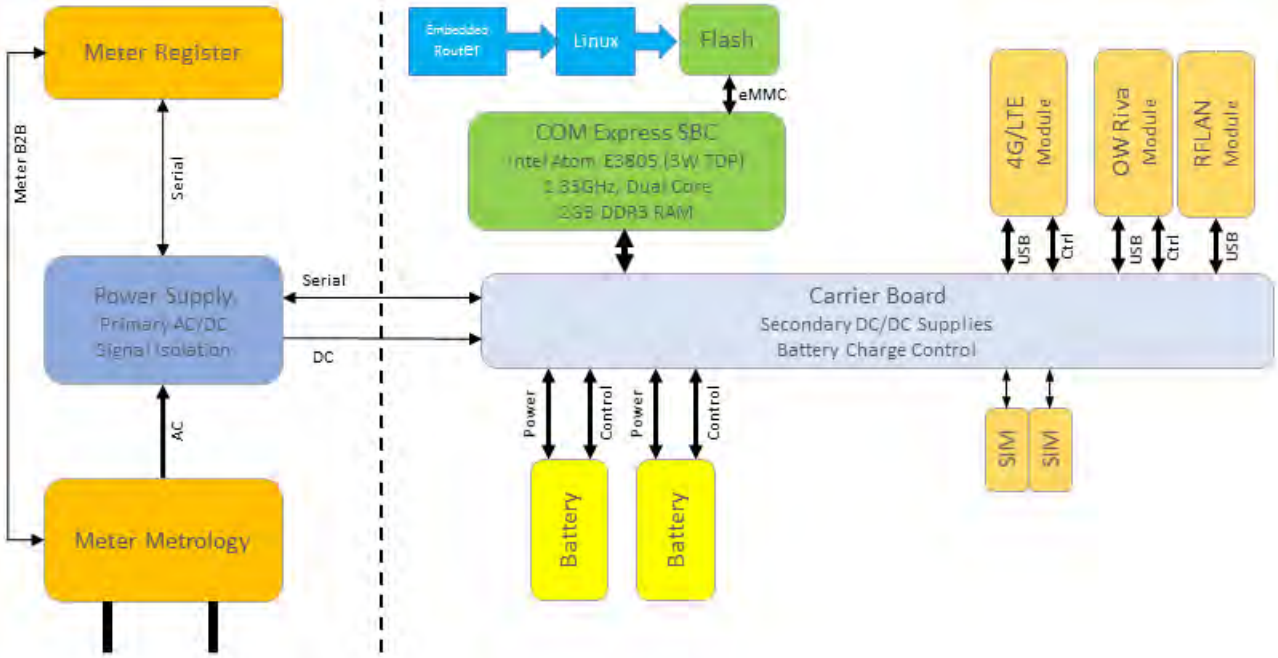
The SBR provides dual-mesh network support by supporting both RFLAN and OpenWay Riva mesh networks simultaneously while maintaining full cell relay functionality between RFLAN meters. The SBR also improves OpenWay Riva mesh network by serving as a gateway for distribution automation and adding new devices and applications such as OpenWay Riva gas and water metering, streetlights, and future active grid applications including Distributed Intelligence. Adaptive Communications Technology (ACT) for network communications and distributed intelligence applications enables the SBR to support various modulation rates with automatic selection of optimal data rates.

Using an independent base meter along with a specially designed router enclosure allows the utility more flexibility with inventory management and field support. The SBR can be serviced or replaced without disrupting meter service. The base meter remains in place during field activities. The base meter uses a standard 2S form meter socket (either ring or ringless).

Local access to the Socket Based Router is through secure Wifi. The Socket Based Router is also accessible using SSH/Telnet through Port 22. Base meter local access is through either zigbee or the optical port. Backhaul communications are with 4G/LTE cellular with backward compatibility to 3G.

The Socket Based Router is designed with two field-replaceable battery packs that provide up to 8 hours of hold-up time. In addition, these dual battery packs permit automated battery health checks.

Architecture



Packaging

The SBR is designed to deliver high performance in a variety of outdoor environments. SBR packaging takes into consideration utility power meter attachment restrictions within the allowed communications space parameters.

Chapter 3 Physical Description

The Socket Based Router product is comprised of two primary hardware components: the router with its housing and the base meter. When assembled the Socket Based Router becomes one unit as shown
below.

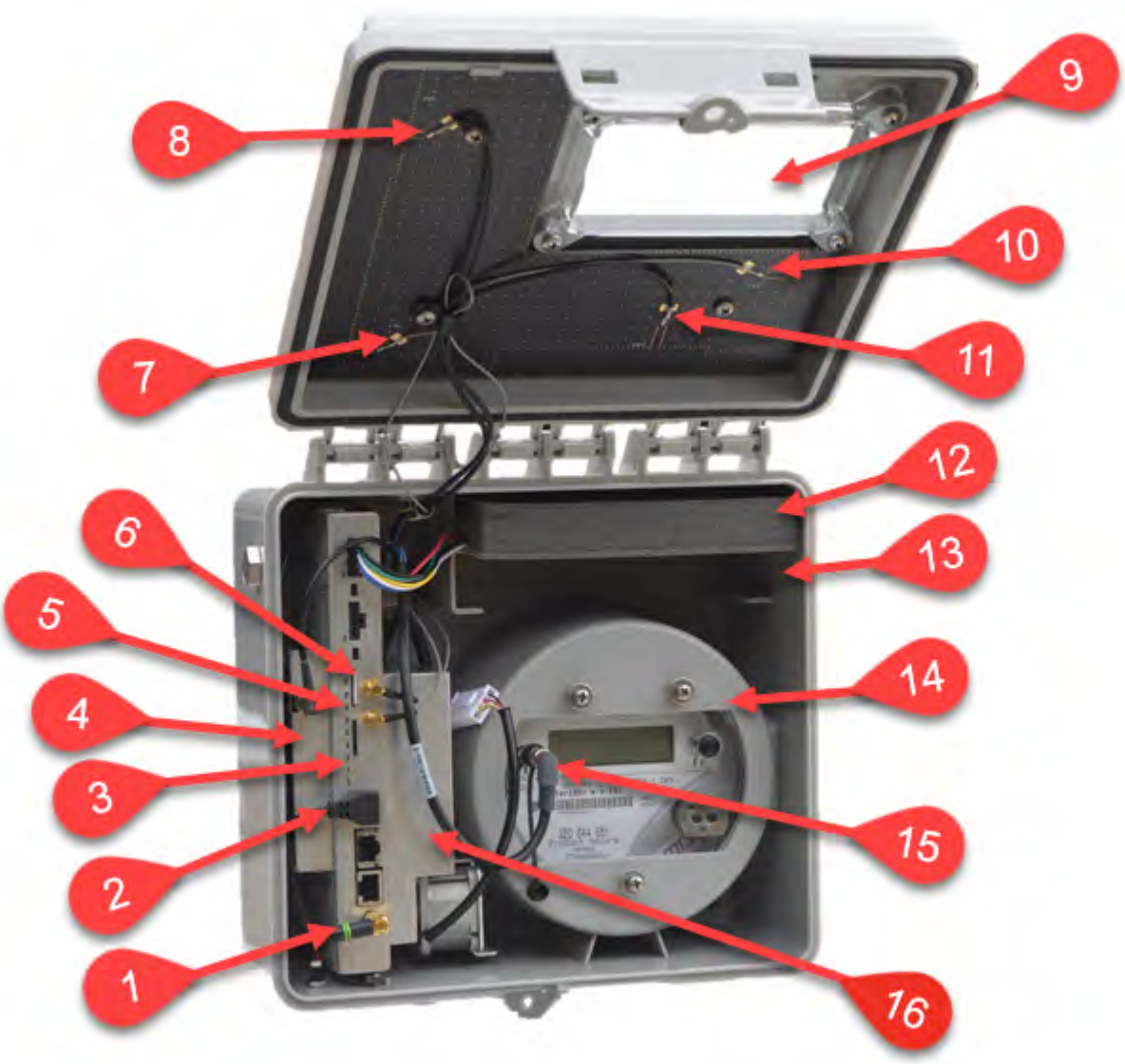
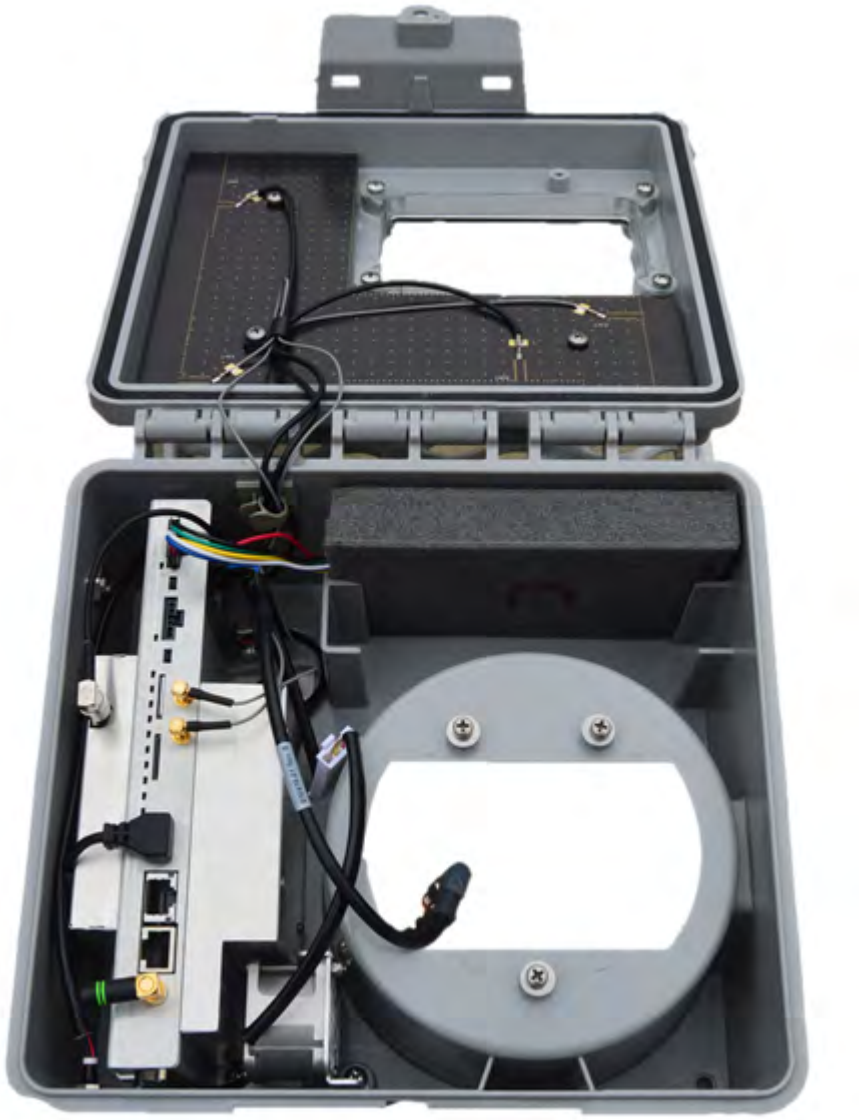


Table :

Callout	Description
1	Monopod WiFi Antenna
2	RFLAN Connector
3	4G/LTE Module
4	RFLAN Module
5	LTE1 RF Connector
6	LTE2 RF Connector
7	LTE1 Antenna
8	RFLAN 900MHz Antenna
9	Viewing Window
10	LTE2 Antenna
11	OW Riva 900MHz CAM Antenna
12	Backup Battery
13	Additional Backup Battery Slot
14	Base Meter
15	Base Meter to Router Box Connector
16	OpenWay Riva Module

Router Box

The Socket Based Router enclosure is a weathertight box specially designed to protect the router components and to attach a Base Meter. This Base Meter is a Form 2S meter that has special lugs and a connector built into the outer cover for mounting the Router Box and a connector to connect the Base Meter to the router.



Base Meter

This Base Meter is a Form 2S meter that has special lugs built into the outer cover for mounting the Router Box and a connector to connect the Base Meter to the router. The Base meter is an ITRD device based on the HW3.5 OpenWay meter.


200 240V 3W TYPE C2S0DS 30TA 1.0Kh
4G Verizon w/o ERT
CA 0.5
FM2S
60Hz
320 644 651
Product Secure
OpenWay
USA

The Base Meter also includes a custom AC-DC primary power supply board with isolated 19V outputs. This provides serial port isolation and pass-through between the register and

the Socket Based Router.

Chapter 4 Specifications

Operating Environment

Table :

Parameter	Description
Temperature, Base Meter	-40°C to +85°C (-40°F to +185°F)
Temperature, Modem	-30°C to +65°C (-22°F to +149°F)
Humidity	0% to 95% non-condensing

Electrical

Table :

Parameter	Description
Voltage Input	240 VAC (+/- 20% at 60 Hz) (+/- 10% at 50 Hz)
Frequency	60 Hz (50 Hz)
Burden (total burden for meter and router)	14.7 Watts

Dimensions

Table : Router Box

Parameter	Description
Height	10.8 inches (27.4cm)
Width	11 inches (30.0cm)
Depth	7.5 inches (19.1cm)

Table : Base Meter

Parameter	Description
Height	6.95 inches (17.66cm)
Width	6.95 inches (17.66cm)
Depth	5.5 inches (13.97cm)

Shipping Weights

Table : Router Box

Parameter	Description
15 lbs(6.8 kg)	4 units with shipping carton

Table : Base Meter

Parameter	Description
11 lbs (4.99kg)	with battery and shipping box

Chapter 5 Installation

The Base Meter used with the Socket Based Router may be installed and powered up prior to the installation of the Router Box. Base Meter installation must be compliant with the generally accepted technical rules for the installation of electrical and telecommunication equipment valid in your jurisdiction. This feature allows the Router Box to be installed, serviced or exchanged without disrupting power to the residence.

Base Meter

Safety

Meter installation must be compliant with the generally accepted technical rules for the installation of electrical and telecommunication equipment valid in your jurisdiction.

The electrical utility dictates the safety procedures for meter installations. Please check with the local electrical utility for these safety procedures.

Install the meter in accordance with the voltage and current specifications printed on the front panel and the wire and environmental specifications given in the installation information.

Do not install the meter if it is damaged.

Do not install the meter if it has been dropped or otherwise subjected to significant impact even if no damage can be seen.

Do not use the meter for primary protection purposes.

Unpacking and Inspection

Be sure you are working in a static-free environment; electrostatic discharge (ESD) can damage meter components.

Upon receipt:

- Check the condition of the packaging to ensure there was no damage during shipment.
- Verify that the packaging label matches the order.
- Inspect for obvious damage to the cover, base, and meter assembly.
- Compare the meter and register nameplates to the record card and invoice. Verify the type, class, voltage, form number, and other pertinent data.
- Verify that the Itron meter seals are in place.

As with all precision electronic instruments, the meter should be handled with care. Follow these precautions when handling the meter:

- Avoid damaging the meter base, cover, reset mechanism (if supplied), and optical connector (if supplied).
- When handling modules, grip the circuit board by its edges. Do not touch the liquid crystal display.
- Save the original packing materials.

Battery

The OpenWay Riva CENTRON meter contains a battery that powers the clock circuit during a power outage. The battery is permanently soldered to the module and is expected to last the life of the meter.

⚠ **Caution**: The product you have purchased contains a recyclable battery. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local area solid waste officials for details about recycling options or proper disposal.

Selecting a Site

The meter is designed and manufactured to be installed in an environment with an operating temperature range between -40°C and +85°C (-40°F to +185°F).

Router Box

Unpacking and Inspection

Upon receipt:

- Check the condition of the packaging to ensure there was no damage during shipment.
- Verify that the packaging label matches your order.
- Inspect for obvious damage to the device.
- Compare the nameplates to the record card and invoice. Verify the pertinent data.
- Verify that the unit seals are in place.
- Save the original packing materials.

Storage

Store the Socket Based Router in a clean, dry environment which meets the specifications detailed in the Specifications chapter of this document. Avoid prolonged storage (more than

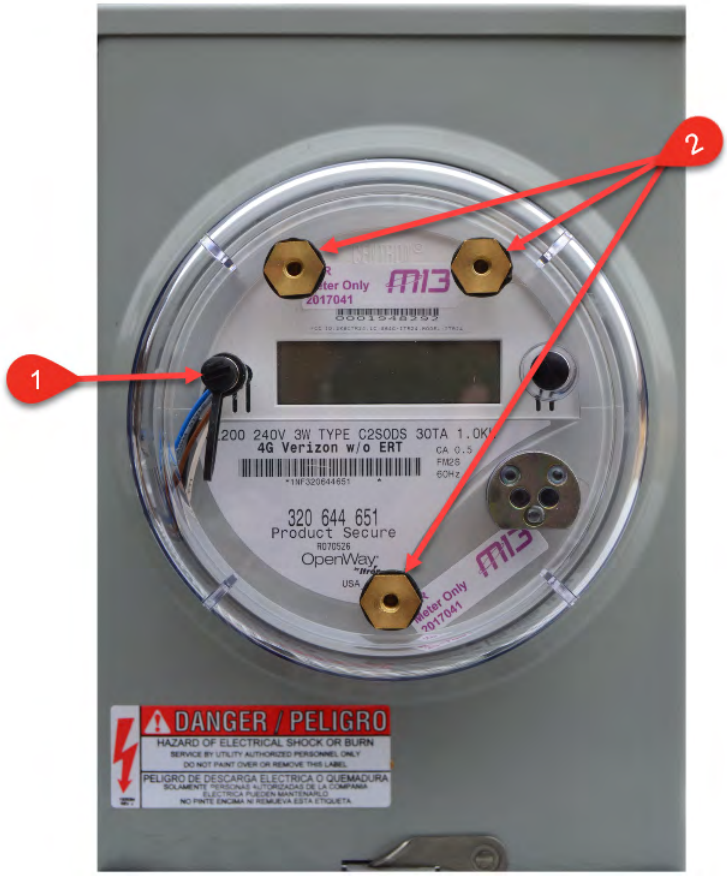
one year) at temperatures above +70°C (+158°F). Store the unit in the original packing material.

Selecting a Site

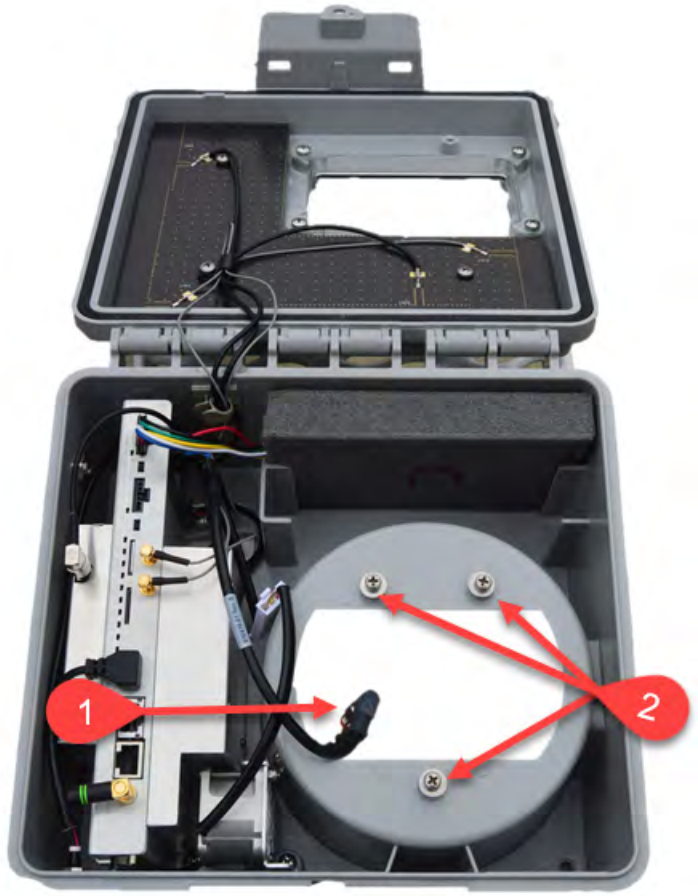
The Socket Based Router is intended for outdoor installation with an operating temperature range between -40°C and +85°C (-40°F to +185°F). Operation in moderate temperatures increases reliability and product life.

Mounting the Router Box to the Base Meter

The base meter is fitted with three threaded lugs on the outer cover to receive the three screws that are captive to the router box. The outer cover also contains one electrical connector for the router box cable.



Callout	Description
1	Electrical connector
2	Screw mounting lugs



Callout	Description
1	Router box connector cable
2	Captive mounting screws

Connecting the Router to the Base Meter

Insert the cable from the router into plug on the face of the base meter to make the electrical connection between the router box and base meter.


200 240V 3W TYPE C2S0DS 30TA 1.0Kh
4G Verizon w/o ERT
320 644 651
Product Secure
OpenWay

Chapter 6 Configuration

Initial Setup

This section assumes that the SBR Customer configuration is not loaded by the factory. This is meant for initial SBR Evaluation samples setup, only. For changes following initial setup, use the HTTP interface with Advanced REST Client (ARC) tool in the Configuration and Monitoring section.

Login

An SSH server is available for the user to connect to the SBR. To connect to the SBR using WiFi setup a hotspot using the configured SSID/Password given with customer shipment information. After which you can SSH into the SBR with the provision IP from the hotspot. ior login via serial console. A serial console (UART0) is also enabled.

Table : Example

```
Ubuntu 16.04.3 LTS sbr-0-3-8 ttyS0
sbr-0-3-8 login:_
```

On both interfaces, the username is`itron` and the password is provided on customer shipment information.

Table : Example

```
Last login: Fri Nov 10 13:18:33 EST 2017 from 172.17.212.30 on pts/1
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.10.0-37-generic x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage
48 packages can be updated.
23 updates are security updates.

itron@sbr-0-3-8:~$ _
```

SBR Configuration Script

The SBR includes a configuration script which allows the user the edit various configuration variables. By default, it is in `/home/itron/sbrconfig.sh` and can only be run as root or with sudo.

Changing Hostname

To change the hostname, run sbrconfig script:

```
sudo ./sbrconfig.sh hostname <your hostname>
```

Table : Example

itron@sbr-0-3-8:~$ sudo ./sbrconfig.sh hostname sbr-test123-0-3-8 Parameter Count 2 Set the hostname of the SBR to sbr-test123-0-3-8 Parameter Count 1 hostname is set to sbr-test123-0-3-8

Reboot the SBR for the changes to be applied.

```
sudo reboot
```

C1222 Relay

The following c1222relayConfigure variables can be changed using the sbrconfig script.

i) SBR ESN

```
sudo ./sbrconfig.sh esn <your esn here>
```

Table : Example

itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh esn your.esn.here Parameter Count 2 Set the Electronic Serial Number your.esn.here Setting ESN to your.esn.here

ii) Collection Engine IP address

```
sudo ./sbrconfig.sh master_relay_address <CE IP address>
```

Table : Example

itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh master_relay_address your.master.relay.address your.master.relay.address Parameter Count 2 Set Master Relay Address your.master.relay.address Setting master relay to your.master.relay.address

iii) Base Meter ESN

```
sudo ./sbrconfig.sh vcm_mac <BM ESN>
```

Table : Example

```
itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh vcm_mac 123456789
Parameter Count 2
Set the virtural comm MAC address to 123456789
VCM MAC to 123456789
```

RFLAN UID

```
sudo ./sbrconfig.sh utility_id <Utility ID>
```

Table : Example

```
itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh utility_id ff
Parameter Count 2
Set the Utility ID to ff
RFLAN COM UID set to ff
C1222 Relay Daemon PID 1611
SetUtilityID: OK
Modem Reset
Scheduled comm module reset. Takes about 1 minute to complete.
```

LTE Connection Manager

The following Connection Manager Configure variables can be changed using the sbrconfig script.

i) APN

```
sudo ./sbrconfig.sh apn <cellular provider Access Point Name>
```

Table : Example

```
itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh apn your.apn.here
Parameter Count 2
Set the APN to your.apn.here
apn your.apn.here
```

System Configuration

The following System Configure variables can be changed using the sbrconfig script.

i) NTP Server

```
sudo ./sbrconfig.sh ntp_config <NTP Server IP address>
```

Table : Example

itron@sbr-test123-0-3-8:~$ sudo ./sbrconfig.sh ntp_config your.ntp.server Parameter Count 2 NTP Configuration your.ntp.server Setting NTP Server to your.ntp.server

ii) External Syslog Server

```
sudo ./sbrconfig.sh syslog_server <Syslog server IP address>
```

Table : Example

itron@sbr-test123-0-3-8:~$sudo ./sbrconfig.sh syslog_server your.syslog.server Parameter Count 2 syslog Server Address your.syslog.server Setting Syslog Server to your.syslog.server

Enabling Itron Service(s)

Enable mctrld

```
sudo systemctl enable mctrld
```

Start mctrld

```
sudo systemctl start mctrld
```

Table : Example

itron@sbr-test123-0-3-8:~$ sudo systemctl enable mctrld mctrld.service is not a native service, redirecting to systemd-sysv-install Executing /lib/systemd/systemd-sysv-install enable mctrld itron@sbr-test123-0-3-8:~$ sudo systemctl start mctrld

The SBR will then connect to the LTE network and register to the CE. After this point, you can use the HTTP interface with ARC for monitoring and to make any additional configuration changes which are listed in the Configuration and Monitoring section.

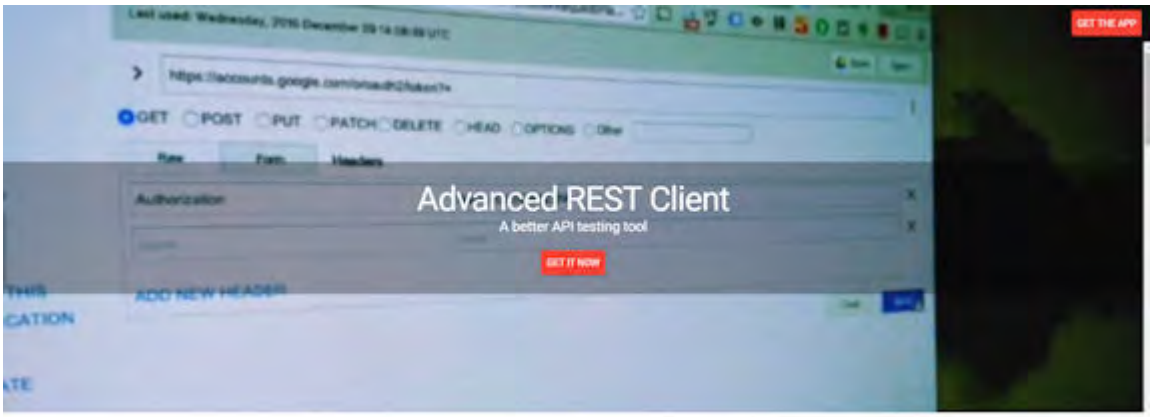
Note: For certain configuration item(s) like SBR ESN, Base Meter ESN, APN, a system reboot is required for the changes to take effect. This may be required after changing Test Environments, if not handled by runtime configuration changes in the Configuration and Monitoring section.

Configuration and Monitoring

The RESTful Web Services client, i.e. ARC, should only be used after Itron services have been enabled and started as described in the SBR Configuration Script section.

Installing Advanced REST Client Chrome Web App

a) https://advancedrestclient.com/



b) Hit the GET IT NOW or GET THE APP button the website and once redirected to the chrome web store add it to chrome.

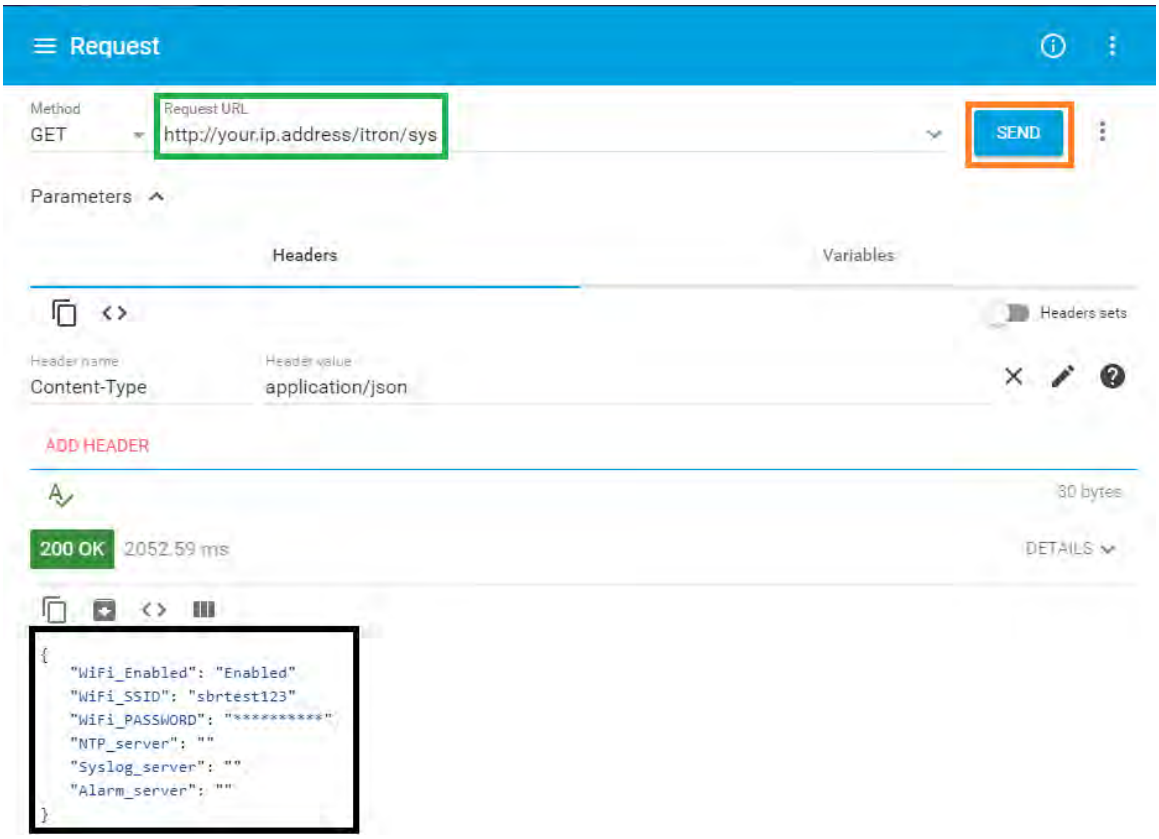
ARC Setup

Please, ensure HTTP “Content-Type” header is set to “application/json”, as shown below before continuing.

Using ARC

GET Request Using ARC

i) Enter the URL for the information you would like (green box) and hit the send button to the right (orange box). The information (black box) will then be displayed.



PUT Request Using ARC

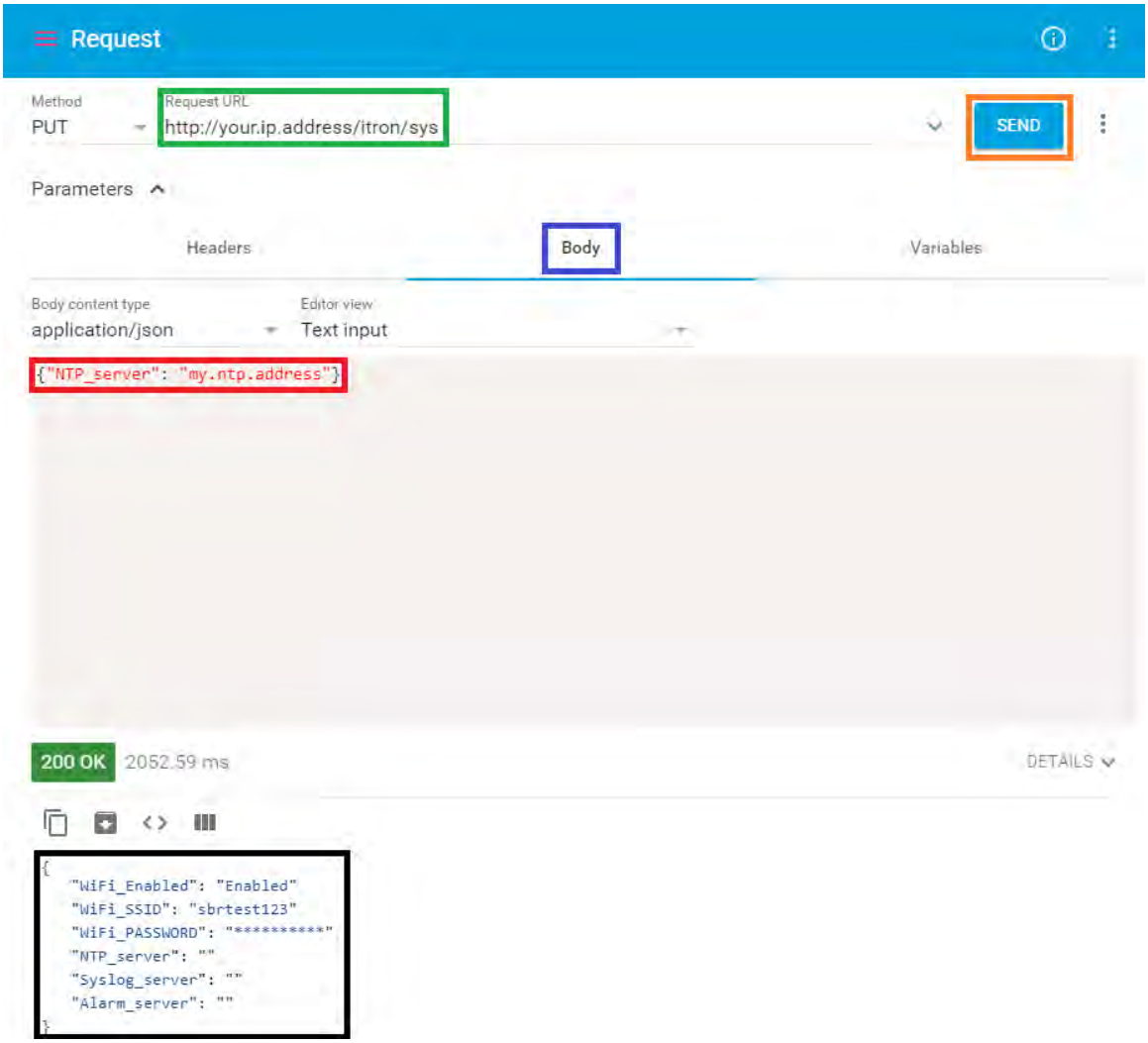
ii) Generally, you do a PUT request after a GET request this follows that logic.

iii) Enter IP address (green box).

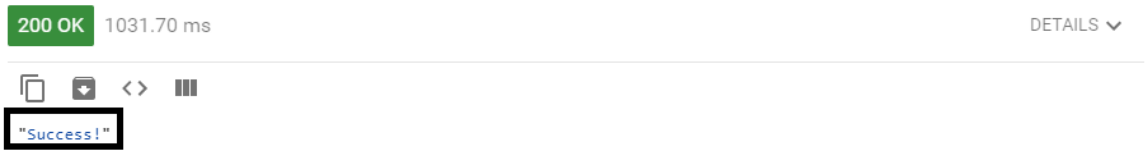
iv) Select the Body tab (blue box) then ensure that Body content type is “application/json” and Editor view is “Text input”.

v) Insert the option you wish to change (red box) using the same format as the output from the GET request (black box). Ensuring that the text in the body is in the format: {“option”:”option”}

vi) Once the change is formatted correctly you can hit send (orange box).



vii) After which point the output (black) will change to “Success!” if the put request was successfully executed.



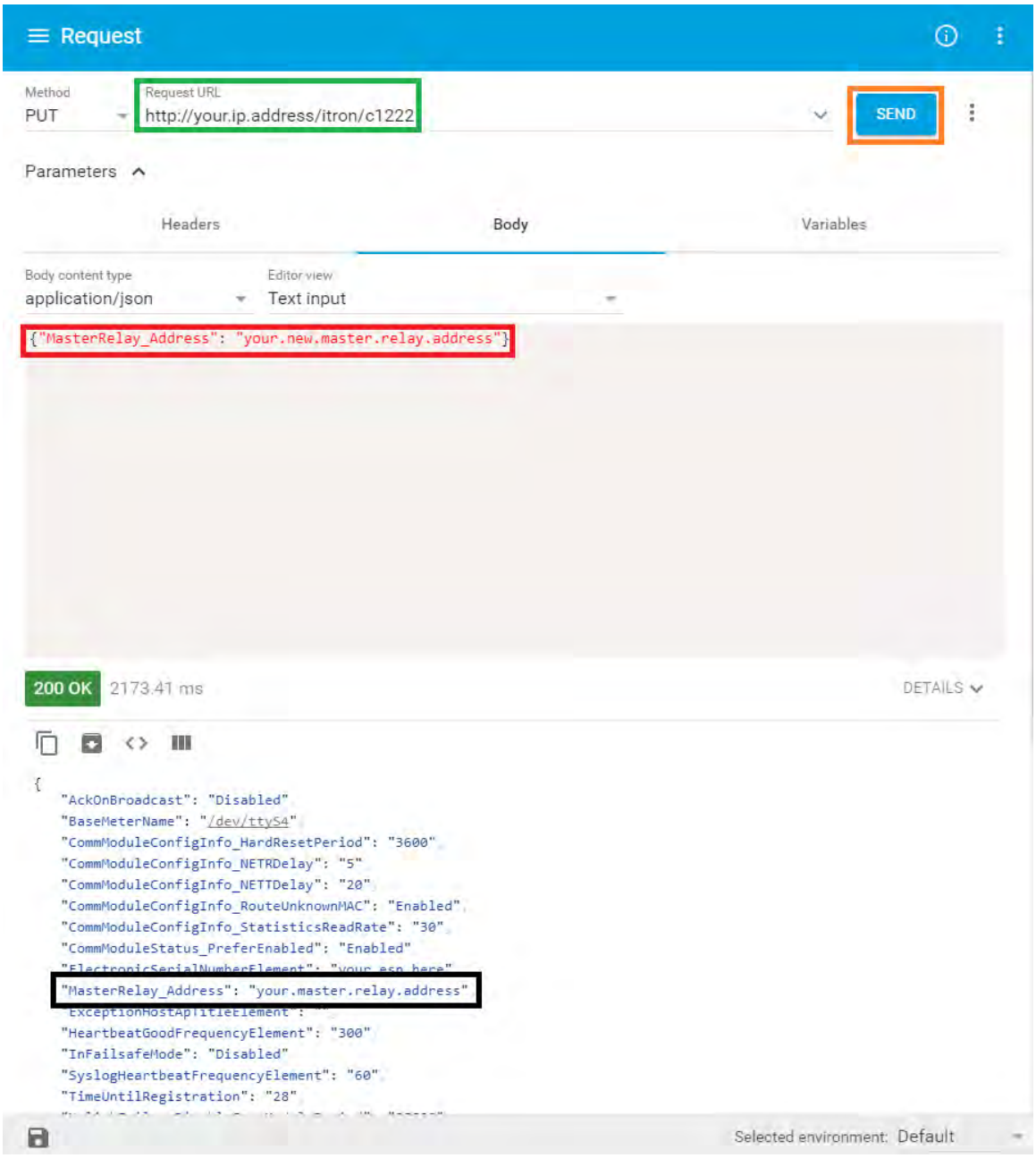
Changing Master Relay Address

i) Run a get request on http://your.ip.address/itron/c1222 to get current information on C1222 Relay.

ii) To change the Master Relay Address, follow the same procedure as the used in the PUT request example in the previous paragraph.

iii) Enter the information (red box) in the same layout as received by the GET request (black box).

iv) After submitting the PUT request, you should see the "Success!" message if put request was successfully executed.



Changing APN

You must use the Wifi interface to change the APN using ARC, as the cellular connection drops when the APN is changed.

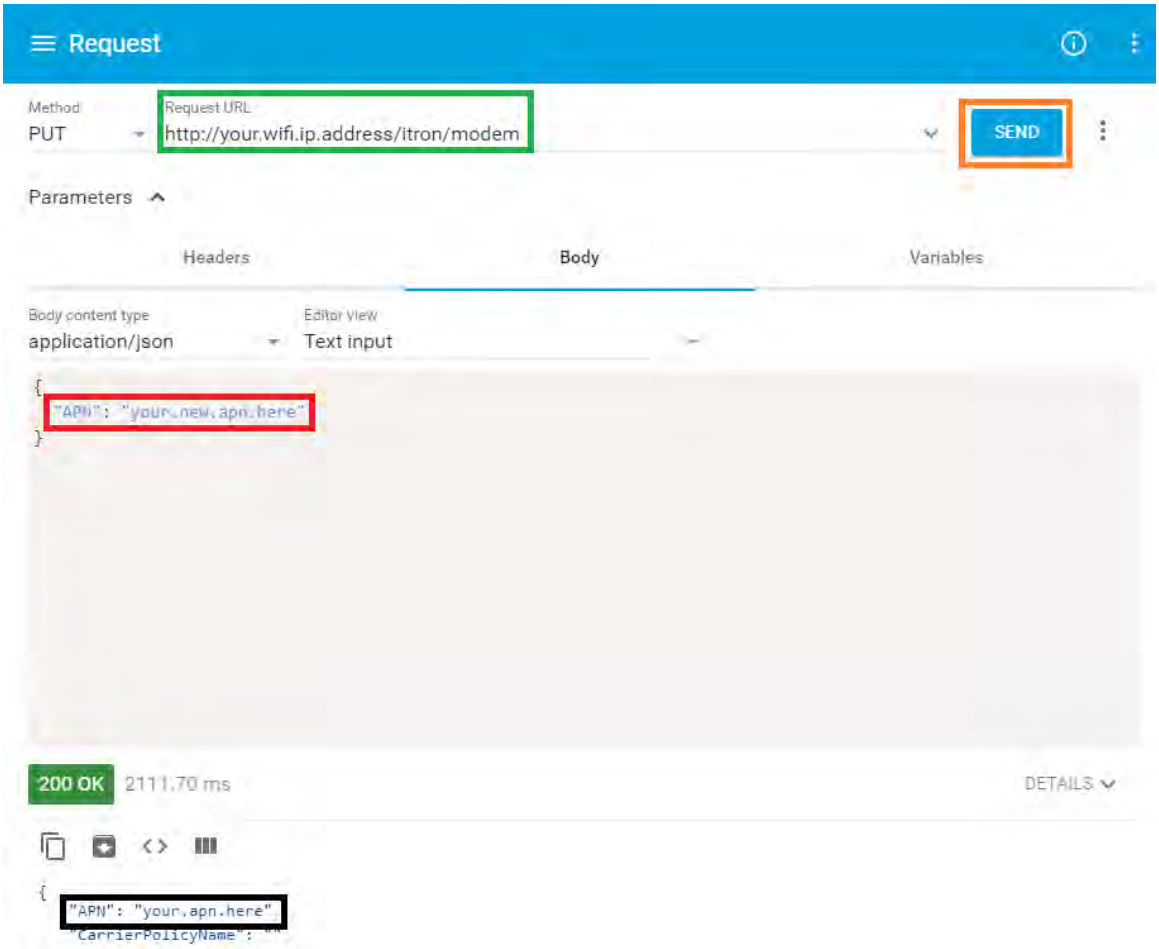
i) Run a GET request on http://your.wifi.ip.address/itron/modem to get current information about the modem interface.

ii) To change APN, follow the same procedure as the used in the PUT request example.

iii) Enter the information (red box) in the same layout as received by the GET request (black box).

iv) Submit Put request on the APN (orange box).

v) After submitting the PUT request, you should see the "Success!" message if put request was successfully executed.



Reboot the SBR for the changes to be applied, doing so by SSHing into the SBR using the wifi interface.

i) sudo reboot

Chapter 7 Operation

LEDs

The socket based router provides several LEDs to indicate the status of key elements in the router.

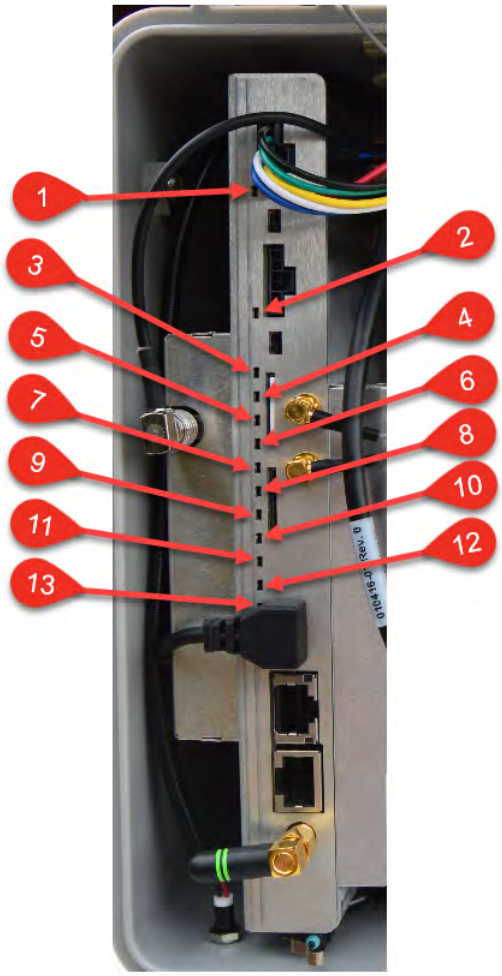


Table : Router LED

Callout	Description
1	Battery 1
2	Battery 2
3	DC In
4	System LED
5	Key E1

Proprietary and Confidential

Callout	Description
6	Key E2
7	LTE
8	WiFi
9	Vcc USB
10	ACT Ready
11	HDD
12	Vcc 3.3V
13	Vcc 5V

System LED

The Socket Based Router contains two System LEDs: one internal to the router and one located externally on the bottom left corner of the router box. The external LED provides a view of the router status without the need to open the router box. The states of the external LED mirror the states of the internal LED. The possible SYSLED states are

- Blink Red: C12.22 relay started, trying to establish a TCP connection to the CE
- Blink Green: TCP communication OK, registration with CE in progress
- Green: Registered with CE
- Red: Error (No CE communication, no backhaul, no RFLAN module…

Battery LED

The Socket Based Router contains two battery LEDs; one for each battery. If the Socket Based Router is configured with either one or two batteries, the LED states are:

- Green: OK
- Alternate Green/Red (blink): Battery below warning capacity threshold
- Red: Battery below critical capacity threshold

If the Socket Based Router is configured with:

- only one battery the LED for the second battery LED will be in the off state.
- two batteries and one is missing, the corresponding LED will be in the red state

Events

All generated events are managed by the local syslog. This behavior cannot be changed. A configuration item allows the events to duplicated and sent to a remote server: `syslog_server`

Alarms

Alarms are generated by Itron services. Itron Services monitor several parameters to ensure the proper operation of the SBR. When an alarm is asserted, the services call a shell script: sbr-alarm with an "`alarm_on`" parameter to signal the alarm. When an alarm is turned off, the alarm script is also called with “alarm_off”. Every minute, if an alarm is still present, the alarm script is called as a redundancy measure.

Discrimination of new alarms and redundancies is performed using an alarm counter that is only incremented when an alarm is new. There is one alarm counter per alarm type. Counters can be reset through the HTTPS API. The default behavior of the alarm script is the following.

1. Log a generic message in the local syslog.

2. Perform one or several action(s) related to the specific alarm, if necessary.

Furthermore, a configuration item allows the generic events to be duplicated and sent to a remote syslog server: alarm_server. This default behavior can be changed by modifying the sbr-alarm script, without the need to rebuild the Itron binaries.

The alarm script syntax is the following:

```
sbr-alarm <alarm_name> <alarm_on|alarm_off> <value_or_state> <counter>
```

The generated events have the following characteristics:

• Priority:

o Alarm ON: daemon.warning

o Alarm OFF: daemon.notice

• Tag: sbr-alarm

• Value: Alarm: ON/OFF - Condition: <alarm_name> - Value: <value_or_state> - Count: <counter>

Examples:

• sbr-alarm: Alarm: ON - Condition: battery_removed - Value: 2 - Count: 12

• sbr-alarm: Alarm: ON - Condition: door - Value: opened - Count: 25

• sbr-alarm: Alarm: OFF - Condition: door - Value: opened - Count: 25

List of Alarms

The following is a list of the alarms provided by the Socket Based Router.

• CPU Temp High

• CPU Temp Low

• Board Temp High

- Board Temp Low
- Battery1 Capacity Critical (Charge %)
- Battery1 Capacity Warning (Charge %)
- Battery2 Capacity Critical (Charge %)
- Battery2 Capacity Warning (Charge %)
- Battery1 Temp High
- Battery1 Temp Low
- Battery2 Temp High
- Battery2 Temp Low
- AC Power (Present/ Absent)
- Door Status (Open/ Closed)
- Fan Speed Low
- Battery1 Removed (Inserted/ Removed)
- Battery2 Removed (Inserted/ Removed)
- LTE Connection (Lost/ Connected)
- LTE Signal Low
- Time Sync error