Quicksilver QS-100 User Guide

Rev. H

March 14, 2025

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 2, Part 15, and Part 25 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. Changes or modifications not expressly approved by NAL Research could void the user's authority to operate the equipment.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. 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 necessary for successful communication.

This radio transmitters IC: 4629A-9770 and 451I-WL18DBMOD have been approved by Industry Canada to operate with the antenna types listed in this manual with a maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this manual, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

REVISION HISTORY

Revision	Date	Description
A	10/21/2021	Updated Wi-Fi & user passwords. Formally designated Rev A.
B	02/3/2022	Updated to address user interface changes due to Quicksilver firmware updates.
C	10/31/2022	• Removed Data Usage • Added SAF9704 antenna • Editorial updates • Format updates • Supports software/hardware release 1.0.0
D	06/21//2023	Updated Section 9.5: Electrical Specifications
E	04/03/2024	Changed operating temperature to -40C to +55C (-40F to +131F)
E.1	05/10/2024	• Updated reference [1] version number from v.1.0.0 to v.2.0.0 • Removed references to the Iridium Firmware Update menu – affected sections include: 3.3, 4.5.1, 4.5.2, 4.7.1 and 4.7.2
F	08/28/2024	Formal Release
F.1	09/10/2024	• Updated "LEGAL DISCLAIMER AND CONDITION OF USE" section • Deleted Appendix C: Standards Compliance
G	09/11/2024	Formal Release
G.1	03/14/2025	• Added definitions to the DB25 connector table
H	03/14/2025	Formal Release

REFERENCE DOCUMENTS

The latest revisions of the NAL documents are available by request to:

Support@nalresearch.com.

Reference	Title	Revision/Date
[1]	WebApi.yml	Version 2.0.0 May 10, 2024
[2]	AT Commands for Quicksilver QS-100	Version A August 19, 2022

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GLOSSARY

API .... Application Programming Interface

AT .... Two-letter sequence starting a string of terminal commands. The AT is
intended to get the terminal's <u>at</u>tention prior to executing a command.

DCE .... Data Communication Equipment

DHCP .... Dynamic Host Configuration Protocol

DNS .... Domain Name System

GPIO .... General-Purpose Input/Output

GPS .... Global Positioning System

ICCID .... Integrated Circuit Card Identifier

IMEI .... International Mobile Equipment Identity

IP .... Internet Protocol

IPv4 .... Internet Protocol version 4

JSON .... JavaScript Object Notation

kbps .... Kilobits per second

LAN .... Local Area Network

MAC .... Media Access Control

PPP .... Point-to-Point Protocol

RF .... Radio Frequency

RHCP .... Right-Handed Circular Polarization

RoHS .... Restriction of Hazardous Substances

RP-SMA .... Reverse-Polarity SubMiniature version A (RF connector)

RUDICS .... Router-based Unrestricted Digital Internetworking Connectivity Solution

SBD .... Short-Burst Data

SFX .... Small Form Factor Transceiver

SIM .... Subscriber Identification Module

SMA .... SubMiniature version A (RF connector)

SSID .... Service Set Identifier

TCP .... Transmission Control Protocol

TNC .... Threaded Neill–Concelman (RF connector)

UDP .... User Datagram Protocol

VAC .... Volts (Alternating Current)

VDC .... Volts (Direct Current)

VSWR .... Voltage Standing Wave Ratio

1   QUICKSILVER QS-100 INTRODUCTION

The NAL Quicksilver terminal is built on the Iridium 9770 terminal Certus transceiver that utilizes Iridium Certus 100 service to provide Internet Protocol (IP) data services with maximum uplink/downlink rates of 22/88 kbps respectively. To maximize ease of use, the Quicksilver hosts a local web-based Graphical User Interface (GUI) to allow configuration and management of the Quicksilver. The GUI web pages are available over an Ethernet 10/100 Base-T wired connection or over a Wi-Fi 802.11 b/g/n wireless connection.

The Quicksilver enclosure is compliant to IP67, including the DB-25 connector on the enclosure. For use in wet environments, ensure that the mating connectors to the Quicksilver are properly sealed to create an IP67-compliant system. The Quicksilver Data Adapter is not IP67 compliant.

1.1   FEATURES

The Quicksilver offers a variety of services including:

- **Data Transfer via Iridium —** The main function of the device is to allow users to transfer data from remote locations via an Iridium link. The device accomplishes this by putting the 9770 transceiver into data mode and routing Internet traffic between the 9770 and the user data interfaces—Ethernet and Wi-Fi.

- **Power Management —** The user can restart the device using the web API/website.

- **Configuration Management —** There are two configurations— runtime and startup. When the device is rebooted the startup settings will be applied. Save desired runtime settings to be applied at startup. Both configurations can be downloaded in JSON format. The startup configuration can be uploaded. The user can also revert to the default settings.

- **Firmware Updates —** Both the 9770 transceiver firmware and the Quicksilver terminal firmware can be updated through the web API/website.

- **DHCP —** Enables the device to assign IP addresses to client computers on the LAN. Can be disabled to only allow static IP assignment.

- **Wi-Fi —** This allows users to access Iridium using a Wi-Fi link. The user can enable and configure the security for the Wi-Fi link as well as the broadcast channel.

- **Outgoing Firewall —**The outgoing firewall defines what traffic is allowed to be sent over the Iridium link. It can be used to block or allow traffic over certain ports and to certain IP addresses. The intent is to limit Iridium traffic to preserve bandwidth. NAL strongly recommends only allowing specifically desired IP addresses and ports to prevent undesired data charges (e.g., from applications checking for and downloading software updates, etc.).

- **Graphical Interface —** The device hosts a website to provide a GUI for configuration, monitoring, and certain control operations.

- **User Web API —** The terminal provides an API available to user apps in the form of a web service. See Appendix E.

- **Serial AT Command Interface —** The serial interface provides an AT command interface for restoring admin access to the device in case of a forgotten password. It also provides a set of AT commands for compatibility with data calling apps. These apps can make and receive data calls which, under the hood, are just TCP connections. See **Appendix F: AT Commands**.

- **GPS Receiver —** The device has a built-in GPS receiver. An interface for getting the current GPS position information is provided through the web API/website.

IMPORTANT: Do not disassemble the Quicksilver for repair or services. This voids the warranty. Return it to NAL Research for service. Contact NAL Research Tech Support by dialing +1-888-SHOUT-NR (+1-888-746-8867) or emailing support@nalresearch.com.

2   USING THE QUICKSILVER TERMINAL

2.1   DEVICE DESCRIPTION

The standard Quicksilver kit comprises the Quicksilver terminal, Iridium Certus antenna, Wi-Fi antenna, GPS antenna, Data Adapter, and 115 VAC 12 VDC power adapter, as shown in the figures below.
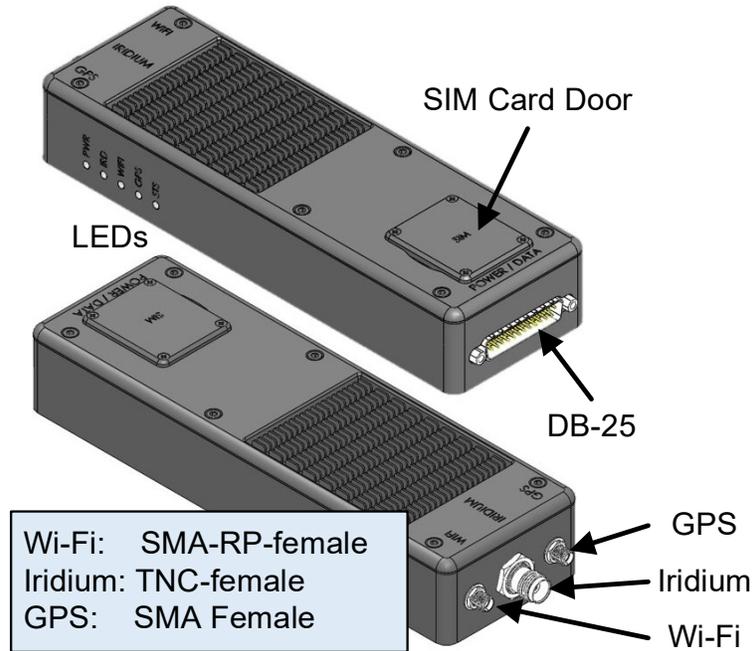
Figure 1: Quicksilver Views and Features
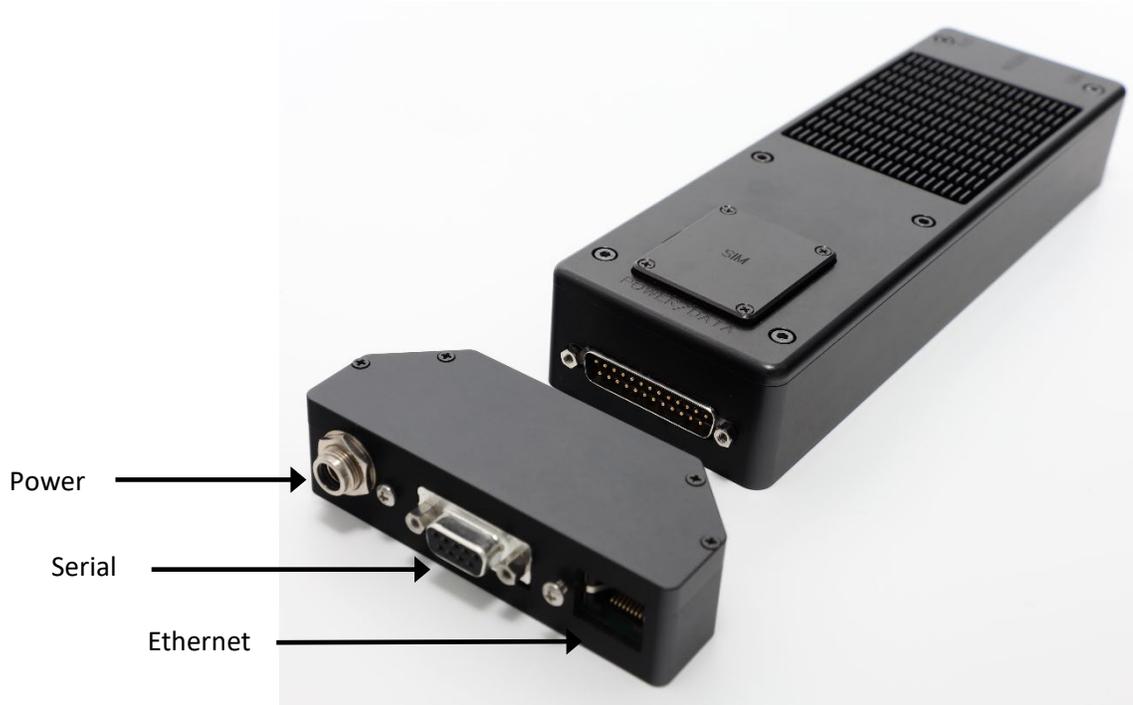
Figure 2: Quicksilver with Data Adapter

Power

Serial

Ethernet

Figure 3: Quicksilver with Antennas Connected

Figure 4: Quicksilver Wall Adapter

2.2   POWER ON/OFF & AWAKEN, REBOOT

Activate the Quicksilver by providing 10 – 32 VDC power to the power pins on the DB-25 connector or plugging in the wall adapter provided with the Quicksilver Data Adapter. Once power is applied, the Quicksilver begins the startup process. All five LEDs illuminate solid for 15 seconds and then go into the indication modes described in section **7.1 LED Indications**.

Turn off the Quicksilver by removing the 10 – 32 VDC power from the power pins on the DB-25 connector or unplugging the wall adapter provided with the Quicksilver Data Adapter.

3 USING THE WEBSITE WITH QUICKSILVER

The Quicksilver website is accessible via Wi-Fi (section **3.1**) or Ethernet (section **3.2**).

3.1 CONNECT WITH WI-FI

Follow the steps below to use the website via Wi-Fi.

1. Insert a Certus SIM card into the SIM slot before powering on the Quicksilver.

2. Power on the Quicksilver and wait for the Power LED to stop blinking.

3. On the local external device (phone/tablet/laptop), open the Wi-Fi settings and look for the default Quicksilver Wi-Fi network SSID "Quicksilver".

4. Connect to the network and enter the default password "Password!" when prompted.

5. Open a web browser and enter the URL https://192.168.60.1 to load the Quicksilver website.

6. Sign into the website with the default username "admin" and default password "Password!" when prompted, as shown in **Figure 5**.

> **NOTE: On initial hardware releases, "Quicksilver!" was the default Wi-Fi and user passwords on the units when they were shipped. If "Password!" does not work with your unit, try "Quicksilver!"**
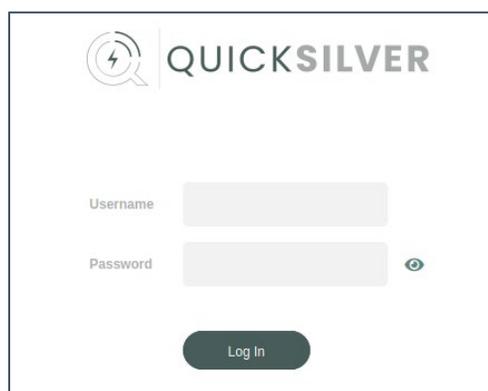
Figure 5: Quicksilver Log-in Page

After initially signing into the website, users can change the Wi-Fi settings from the defaults to user-specific parameters using the **Configuration** > **Wi-Fi** page shown in **Figure 30**.

3.2   CONNECT WITH ETHERNET CABLE

Follow the steps below to use the website via an Ethernet cable.

1. Insert a Certus SIM card into the SIM slot before turning on the Quicksilver.

2. Install the Data Adapter on the Quicksilver DB-25 connector.

3. Connect the local device to the Quicksilver Data Adapter Ethernet port.

4. Verify the local device is set to obtain an IP address automatically through DHCP.

5. Turn on the Quicksilver and wait for the power light to stop blinking.

6. Open a web browser and enter the URL https://192.168.20.1 to load the Quicksilver website on the local device.

7. Sign into the website with the default username "admin" and default password "Password!" when prompted.

3.3   VERIFY CONNECTION

The main menu on the left side of the Quicksilver website provides access to the **Device**, **Configuration**, and **Admin** features.

1. Configure the outgoing firewall.

   NOTE: Refer to *Appendix G*: Common Firewall Settings regarding common setups for the outgoing firewall, especially the need to allow the DNS server through the firewall.

2. Go to the **Configuration** > **Iridium (**see **Figure 5).**

Figure 6: Main Menu

3. From the Iridium page, select the **Data** option to activate the Quicksilver data connection.

4. Go to the **Status** page to verify the Iridium signal is detected and signal strength is displayed.

5. Enter a desired web page such as www.google.com into the browser and verify the desired web page is displayed.

3.3.1   SEND A FILE TO A SERVER

Once the Quicksilver has established a data connection, use a file transfer application such as FileZilla to connect to a desired server and transfer files.

3.3.2   SEND A PING

After establishing a data connection, ping a remote server to verify connectivity.

1. Open the Windows Command Prompt by entering "cmd" in the Windows taskbar search box.

2. Enter "ping" followed by the IP address or domain name of the server.

3. Press Enter.

4. Verify that ping responses are received.

4 DEVICE MENU

The *Device* menu features include the **Status**, **Security (Admin Only)**, **Users (Admin Only)**, **Self-Test (Admin Only)**, **Firmware (Admin Only), Power (Admin Only)** and **About** pages.

4.1 STATUS

The *Status* page is updated every 30 seconds after it is loaded or at reload.

4.1.1 NOTIFICATIONS

- **User Data Backup** — When there is an archived user data backup from a previous failure, the User Data Backup notification appears with options to download or delete the user data backup. An encrypted backup of the user data is made when it is cleared during a recovery process. If clearing the user data successfully recovers the device, then the user data backup should be downloaded and sent to NAL along with other details (refer to the About page). Otherwise, the user data may be deleted. The User Data Backup is only meant to be used by NAL to diagnose failures. It is not meant to be used to restore settings. Use the options to export/import users and download/load configurations to restore settings.
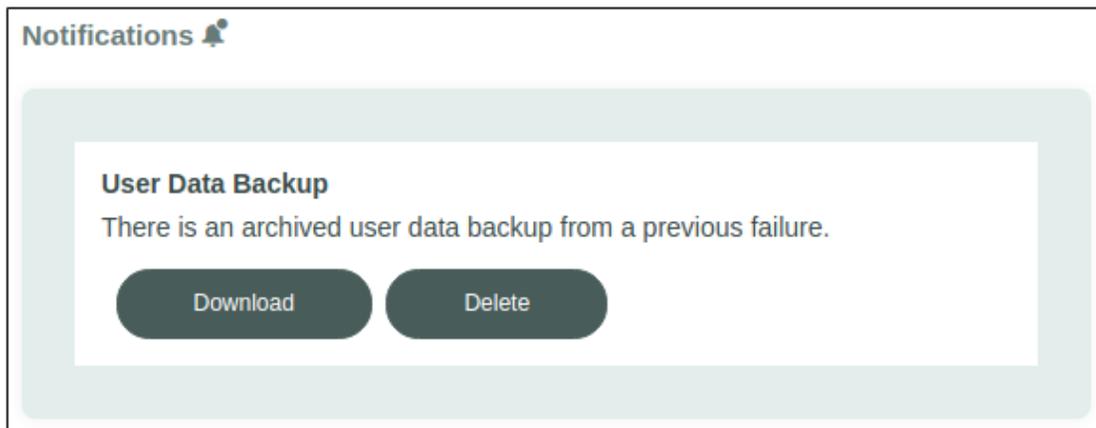
Figure 7: User Data Backup Notifications Area of Status Page

- **Startup Error** — When there are any errors that result in a failure of the startup configuration, the device will record the error as a notification and reboot into safe mode. Rebooting may fix the issue. If the device continues to operate in safe mode and

the error is due to a configuration setting, try changing the startup configuration for the setting and rebooting.

Figure 8: Startup Error Notifications Area of Status Page

- **Safe Mode** — This notification appears when the device is in safe mode. This means the device is using the default configuration, due to a startup error.
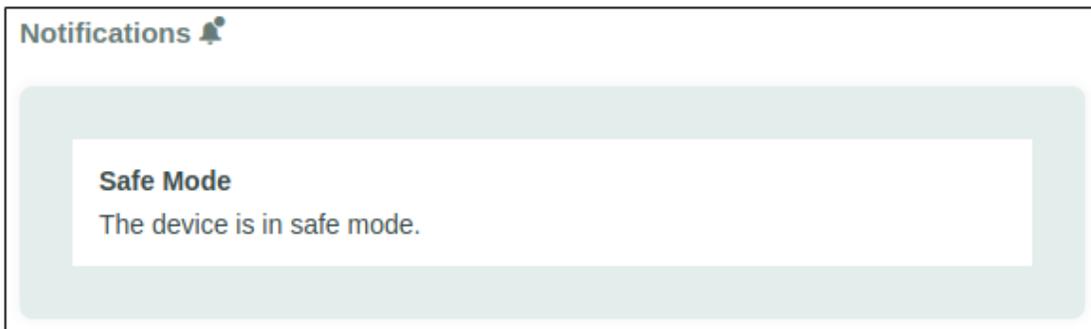
Figure 9: Safe Mode Area of Status Page

- **9770 Fault** — When there is an Iridium 9770 fault, such as hardware self-test failure, temperature fault, or RF power protection fault, the 9770 Fault notification appears.
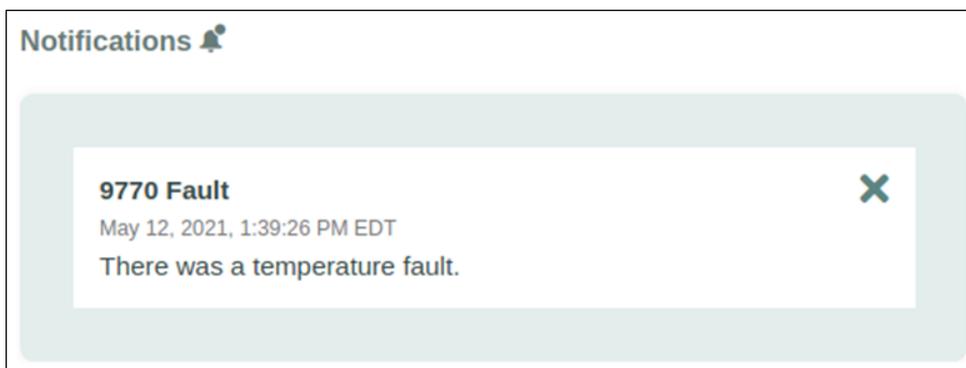
Figure 10: 9770 Fault Notifications Area of Status Page

4.1.2   HEALTH

The time since startup and the system time are updated every second and displayed in the *Health* section of the *Status* page.

- **Time Since Startup** — Shows time since the last device startup.

- **System Time** — Formatted based on the time zone preference selected by the user.

- **Power Amp Temp —** Iridium transceiver internal temperature sensor in degrees Celsius.

- **Board Temp** — Temperature near the Iridium transceiver power amplifier in degrees Celsius.

Figure 11: Health Area of Status Page

4.1.3   SERVICES

The *Services* section of the *Status* page displays the current mode / state of each available service.

Figure 12: Services Area of Status Page

4.1.4   IRIDIUM

The *Iridium* section of the *Status* page displays the following elements.

- **Signal** — Displays the Iridium signal strength bars (0-5) and level indication (dBm). If Iridium data is inactive in the configuration settings, the Signal bars are greyed out here in the Status Page.

- **Constellation Visible** — Indicates 'yes' if the unit can see the satellite constellation. If it cannot, or if the data is inactive in the configuration settings, it will indicate 'no'.

- **SIM Present** — Indicates 'yes' if a SIM is inserted and locked in the SIM slot.

- **SIM Connected** — Indicates 'yes' if the SIM is communicating with the 9770 Iridium transceiver.
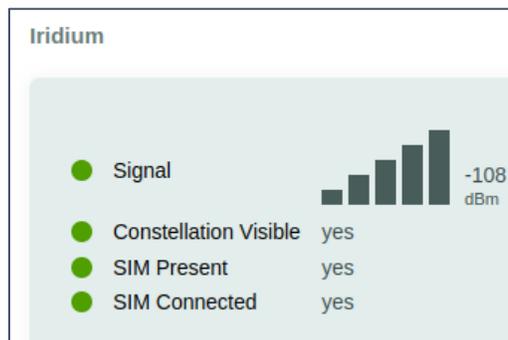
Figure 13: Iridium Area of Status Page

4.1.5   GPS

If the GPS is turned on, the GPS information will be updated as new information becomes available.

Figure 14: GPS Area of Status Page

4.1.6   LAN Clients

The *LAN Clients* section of the *Status* page shows the list of connected clients on the LAN.

Figure 15: LAN Clients Area of Status Page

4.2   Security (Admin Only)

If desired, the HTTPS certificate used for the website / API can be updated from the *Security* menu in one of two (2) ways, as shown in **Figure 16**.
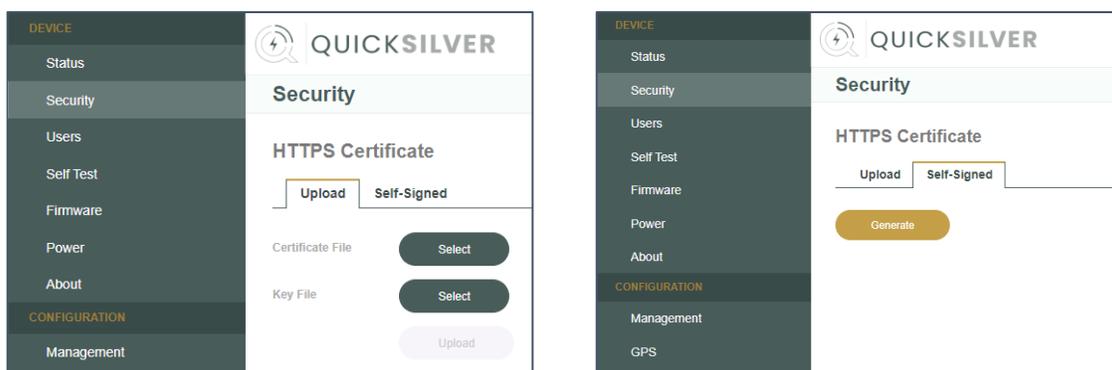
Figure 16: HTTPS Certificate Upload and Self-Signed Tabs

4.2.1   HTTPS Certificate Upload

From the *Upload* tab users may stage and upload their certificate and key files.

4.2.2   HTTPS Certificate Self-Signed

From the *Self-Signed* tab, users may instruct the Quicksilver to generate a new self-signed certificate.

4.3   Users (Admin Only)

The *Users* page displays all the users currently configured to access the configuration website and API. Click **Add** to create new users. On this page, admins can also view and terminate any

active sessions. Passwords must be 8-32 characters, not contain the username, and have three of the following characteristics: lowercase, uppercase, numeric, and a special character.
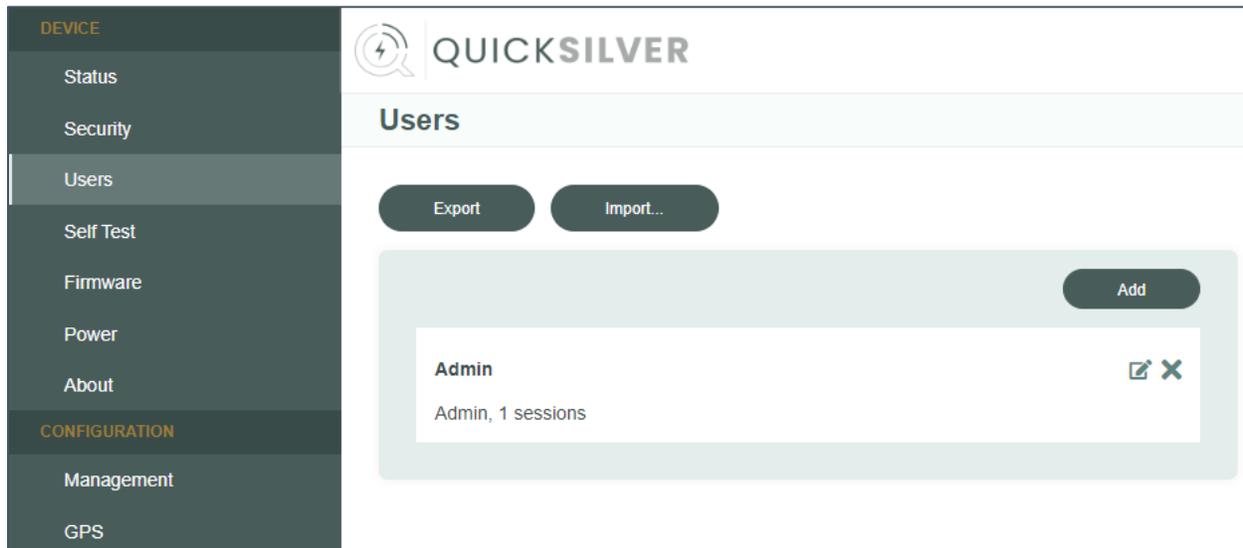
Figure 17: Users Page
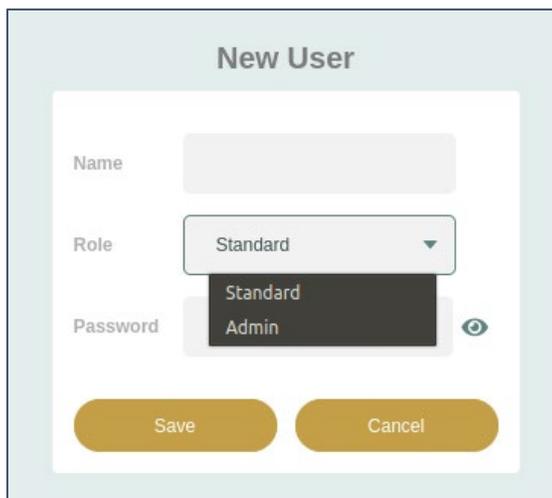
Figure 18: Add New User Menu

4.3.1   EXPORT

The *Export* button downloads the currently configured user information as a JSON formatted text file. Passwords are exported in a format recognized only by Quicksilver devices. This text file may be hand edited. However, since the passwords are encrypted, new passwords cannot be defined. Existing passwords can, however, be copied and used to create new user entries.

4.3.2   IMPORT

The *Import* button uploads and applies user information from a JSON formatted text file, which should match the format retrieved from the export option. Importing will only add and modify users. Users will not be deleted and the user performing the import will not be modified.

4.4   SELF-TEST (ADMIN ONLY)

The *Self-Test* page displays the report created by the last Iridium hardware self-test. On startup, the Iridium 9770 first performs a hardware self-test and generates a test report. Running a new hardware self-test generates a new test report overwriting the existing report.

4.4.1   RUN -

The *Run* button runs a new Iridium hardware self-test and displays a newly generated test result afterwards.

Figure 19: Iridium Hardware Self-test Results

4.5   FIRMWARE (ADMIN ONLY)

The *Firmware* page displays the current firmware version information and allows updating both the product firmware and the Iridium 9770 transceiver firmware. There are two tabs on Firmware page, one tab for the Product Firmware update, and the other tab for the 9770 transceiver firmware update.

4.5.1   PRODUCT

The Update Log on the Product Firmware page displays a history of the initial firmware as well as any updates applied to it. The following are the types of firmware update statuses:

- initial - Only for the first entry.
- started - The update was started but did not finish.
- success - The update was successful.
- partial - The update made changes, but was not successful.
- failed - The update was not successful and did not make any changes.
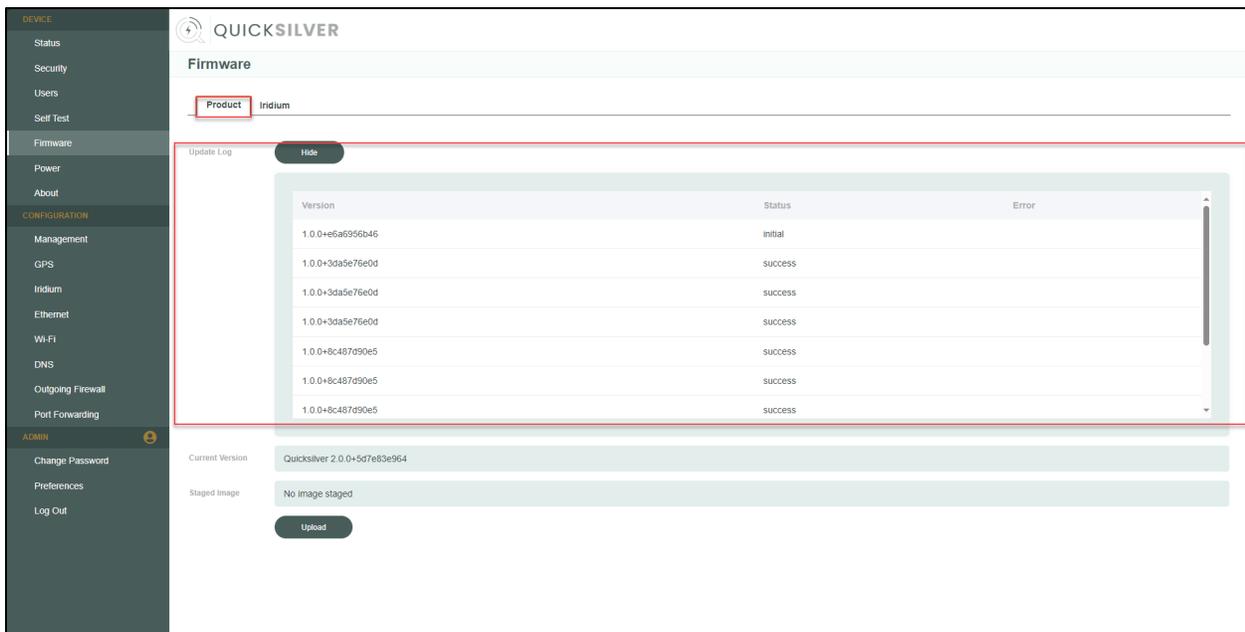
Figure 20: Product Firmware Update Page

Stage a valid Quicksilver terminal firmware image provided by NAL before updating the firmware.

1. Click **Upload**.

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2. After the image stages successfully, click **Start Update** to start the firmware update.

3. At the end of the product firmware update, the Quicksilver restarts, and the current user login session ends.

The product firmware update is always supported. If the Quicksilver fails to start normally due to any possible errors such as having a corrupted product firmware image, the device enters the recovery mode. In recovery mode, the device firmware can be updated. For information on the recovery mode, refer to section **7.1 LED Indications.**

> **NOTE: Failed and partial statuses may have an error message(s). After an update, the update log should be checked to see if the update was successful. If an update fails, apply the update again. If update failed with partial status, reapply the update. If reapplying the update is successful, this should repair any corruption to the file systems. If the device enters recovery mode, product updates can still be applied over TCP using a command line program. Please contact NAL for help with this.**

4.5.2   IRIDIUM

The Iridium firmware update is now part of the Product firmware update. The Iridium Firmware page displays information on the current Iridium Firmware version.
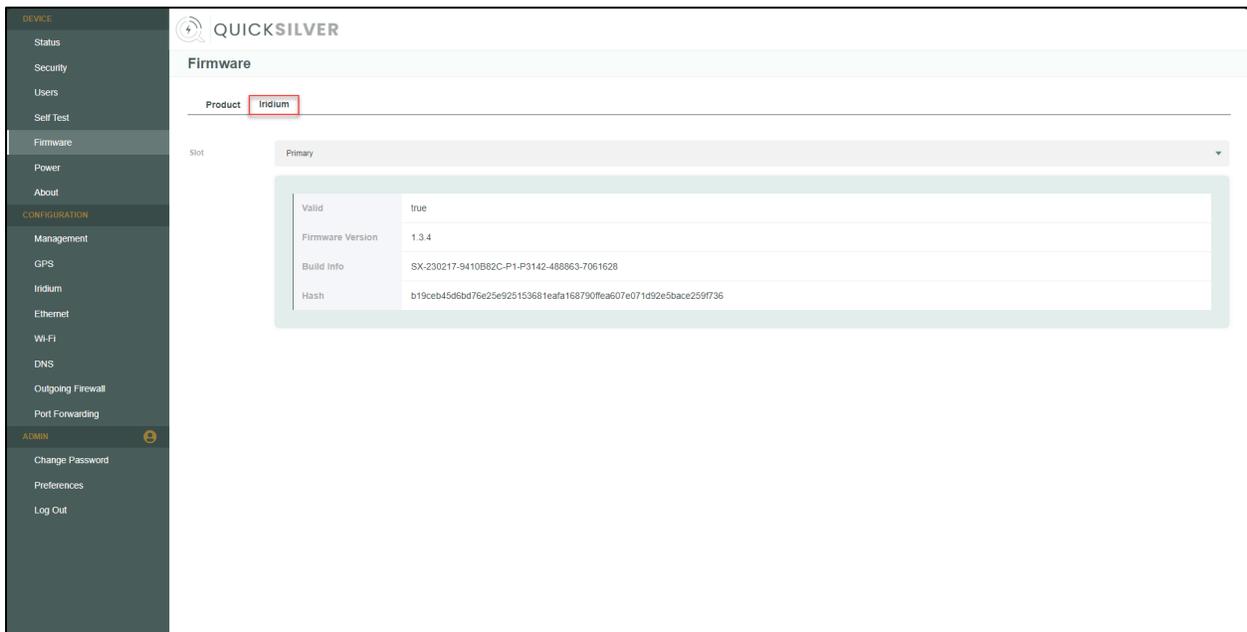
Figure 21: Iridium Firmware Page

There are two (2) Iridium image slots: primary and fallback. If the primary image is valid, the Iridium modem boots with the primary image. If the primary image is invalid or missing, it boots with the fallback image. If both images are invalid or not found, the Iridium modem enters the Iridium recovery mode. The Boot Source in the *About* page below shows the image type that the Iridium modem is booted with. The Iridium firmware update is always supported.

4.6 POWER (ADMIN ONLY)

The *Reboot* button on the *Power* page restarts the Quicksilver and ends the current user login session. Any runtime configuration changes not saved to the startup configuration file will be lost after a restart.

Use the *Reboot into Recovery Mode* button to recover the device from a bad state. When the device is in recovery mode you will not be able to access the website. Please do not put your device in recovery mode unless you have been advised to do so by an NAL customer service representative. If you unintentionally press the button, you will need to manually power off and then power on the device to bring it back to normal operation.
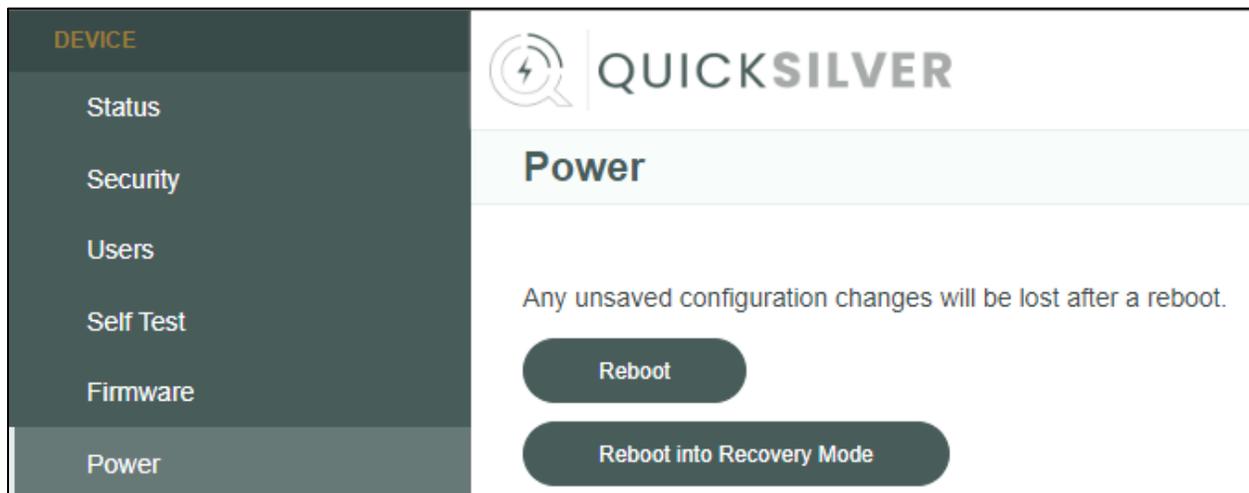
Figure 22: Reboot Buttons

4.7 ABOUT

The *About* page displays the information about the Quicksilver and the Iridium transceiver.

4.7.1   DEVICE

The *Device* section of the *About* page displays the following information about the device: firmware version, product model, serial number, hardware revision, web API version, Ethernet MAC address, and Wi-Fi MAC address.

Figure 23: Device Section of the About Page

4.7.2   IRIDIUM

The *Iridium* section of the *About* page displays the following information: boot image type, firmware version, build info, boot source, API version, hardware version, serial number, IMEI, and ICCID.

Iridium	
Boot Image Type	production
Firmware Version	1.3.4
Build Info	SX-230217-9410B82C-P1-P3142-488863-7061628
Boot Source	primary
API Version	1.2.0
Hardware Version	0x0004
Serial Number	y0005u
IMEI	300058060009240
ICCID	

Figure 24: Iridium Section of the About Page

5 CONFIGURATION MENU

The Configuration menu features include the Management (Admin Only), GPS, Iridium, Ethernet (Admin Only), Wi-Fi, DNS, Outgoing Firewall, and Port Forwarding (Admin Only) pages. The pages which are not admin only allow regular users to read certain settings but not modify them. Not all settings will display for non-admins. The following documentation only documents the admin interface.

For each configuration menu you can configure the current runtime settings as well as the settings which the device will use the next time it is rebooted. The startup settings will overwrite the runtime settings when the device is rebooted. To copy the runtime settings to startup, use the "Copy Runtime" option under the "Startup" heading on the management page."

5.1 MANAGEMENT (ADMIN ONLY)

Use the *Management* page to download and manage the configuration of a Quicksilver device.
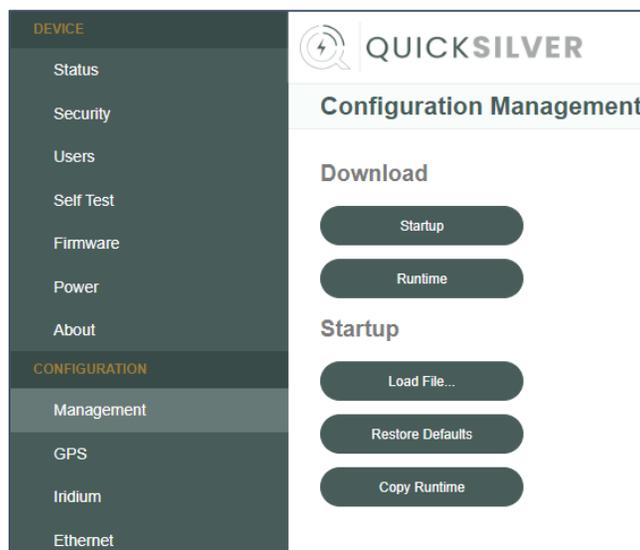
Figure 25: Management Page

5.1.1 DOWNLOAD

- **Runtime** — Downloads the configuration settings in use by the device to a text file.

- **Startup** — Downloads the configured startup settings to a text file.

5.1.2 STARTUP

- **Load File** — Loads the startup configuration with settings from an uploaded file. This file should match the format of the configuration retrieved from the *Download* options.

- **Restore Defaults** — Reverts the startup configuration to the default settings.

- **Copy Runtime** — Copies the device's current configuration settings to the startup configuration. Users should do this before restarting if they want to keep their changes.

5.2 GPS
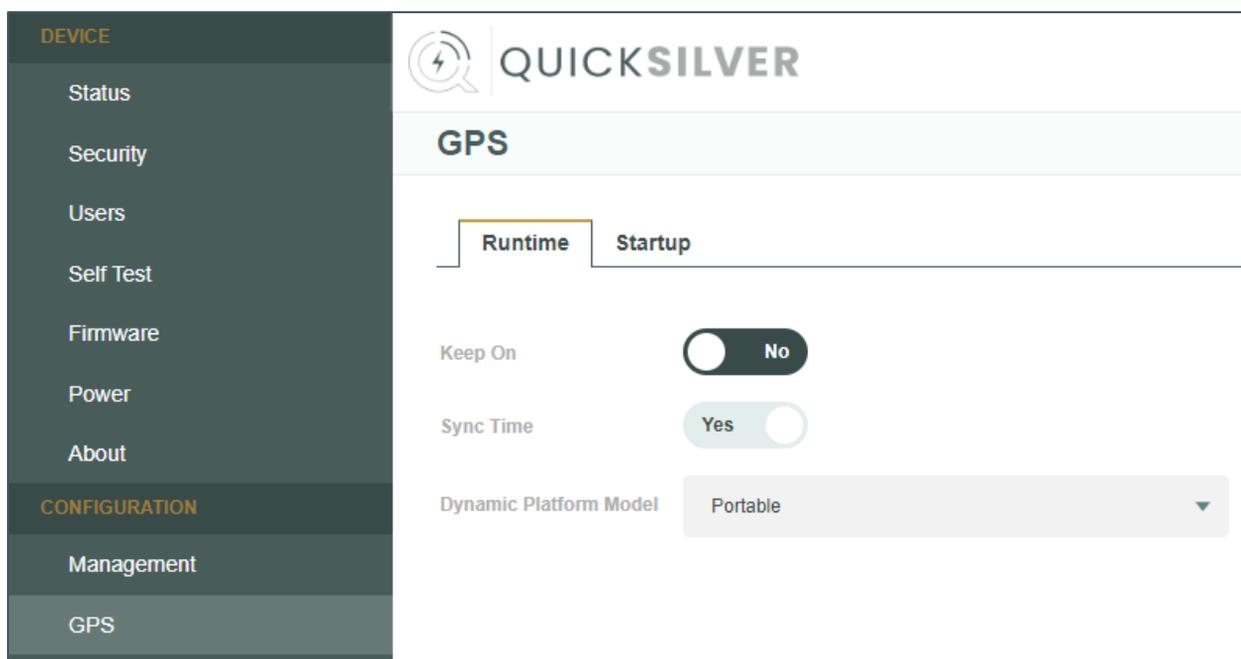
Figure 26: GPS Page

5.2.1 KEEP ON

The *Keep On* switch sets the *GPS Keep On* setting. If set to Yes, the GPS is on continuously. Otherwise, the GPS will be kept off and only turn on when needed internally, such as when synchronizing the system time from the GPS time.

NOTE: The GPS position information on the Status page will only auto-update while the GPS is on.

5.2.2   SYNC TIME

The *Sync Time* switch sets the *GPS Sync Time* setting. If set to *Yes* and the GPS time is valid, the system time is synchronized with the GPS time.

5.2.3   DYNAMIC PLATFORM MODEL

Table 1: Dynamic Platform Model Details

Platform	Max Altitude [m]	Max Horizontal Velocity [m/s]	Max Vertical Velocity [m/s]	Sanity Check Type	Max Position Deviation
Portable	12000	310	50	Altitude and Velocity	Medium
Stationary	9000	10	6	Altitude and Velocity	Small
Pedestrian	9000	30	20	Altitude and Velocity	Small
Automotive	6000	100	15	Altitude and Velocity	Medium
At Sea	500	25	5	Altitude and Velocity	Medium
Airborne <1g	50000	100	100	Altitude	Large
Airborne <2g	50000	250	100	Altitude	Large
Airborne <4g	50000	500	100	Altitude	Large
Wrist	9000	30	20	Altitude and Velocity	Medium

5.3   IRIDIUM

The *Iridium* page displays the current Iridium mode setting and allows changing the mode setting.

5.3.1   MODE

There are two Iridium modes: *Inactive* and *Data*. When *Data* mode is selected the Quicksilver registers on the network and acquires provisioning information. The *Status* menu page auto-updates the Iridium constellation information and the SIM information. The device then makes a PPP connection to provide data services. If signal strength is low, it may take some time before the PPP connection can be made.

NOTE: Internet connectivity will not work even while in data mode if the signal strength is not good.
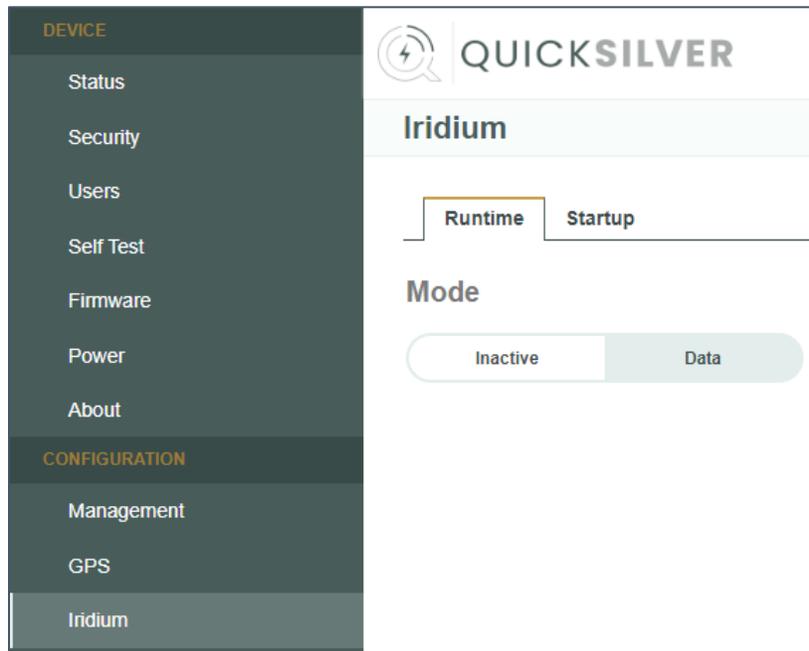
Figure 27: Iridium Page

5.4 ETHERNET (ADMIN ONLY)

The *Ethernet* page displays the current interface and DHCP configuration on the Ethernet network (see **Figure 28**).
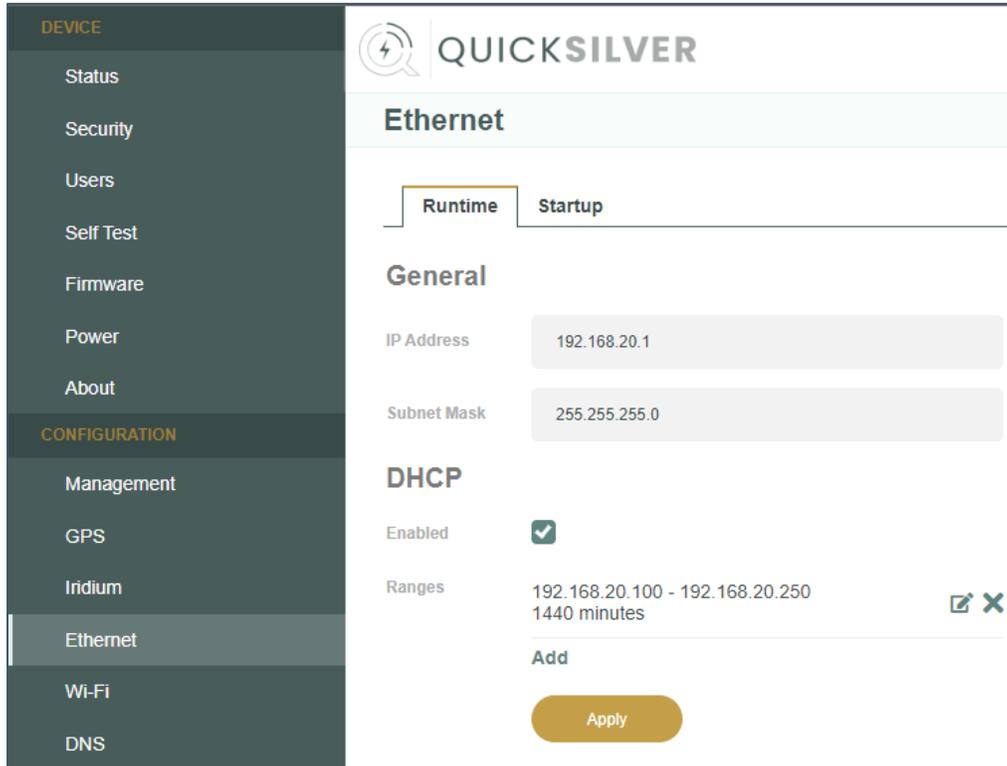
Figure 28: Ethernet Page

5.4.1 GENERAL

- **IP Address** — Configures the default gateway of this network. It must be a valid IPv4 address. It must not belong to the same network defined in the Wi-Fi menu.

  CAUTION: If the user changes the address for accessing the configuration website, the connection will be dropped and a new connection must be made to the new address.

- **Subnet Mask** — Configures the netmask. It must be a valid IPv4 netmask.

5.4.2 DHCP

The following settings configure the dynamic host configuration protocol on this network. Any changes to the general settings should be accompanied by an appropriate shift in the configured DHCP ranges. The default range allocates 150 addresses.

- **Enabled** — Turns on the Dynamic Host Configuration Protocol on this network. Without DHCP, IP addresses must be assigned manually to each device attempting to connect to the network. IP addresses can still be manually assigned when DHCP is enabled.

- **Ranges** — The list of DHCP ranges configured on this network. A DHCP range specifies a range of IP addresses to be assigned to clients on the network. Ranges should not overlap and should belong to the network defined by the address and netmask.

  o **Start** — The start address of a particular range. This address must be in valid IPv4 format and belong to the network as defined by the *IP Address* and *Subnet Mask* fields.

  o **End** — The end address of a particular range. This address must be in valid IPv4 format and belong to the network as defined by the *IP Address* and *Subnet Mask* fields.

  o **Lease** — The duration of the DHCP lease in minutes. This is the duration of time before a client must refresh their IP address or be assigned a new one. Changes made to DHCP or DNS settings will not be seen by clients until their lease expires.
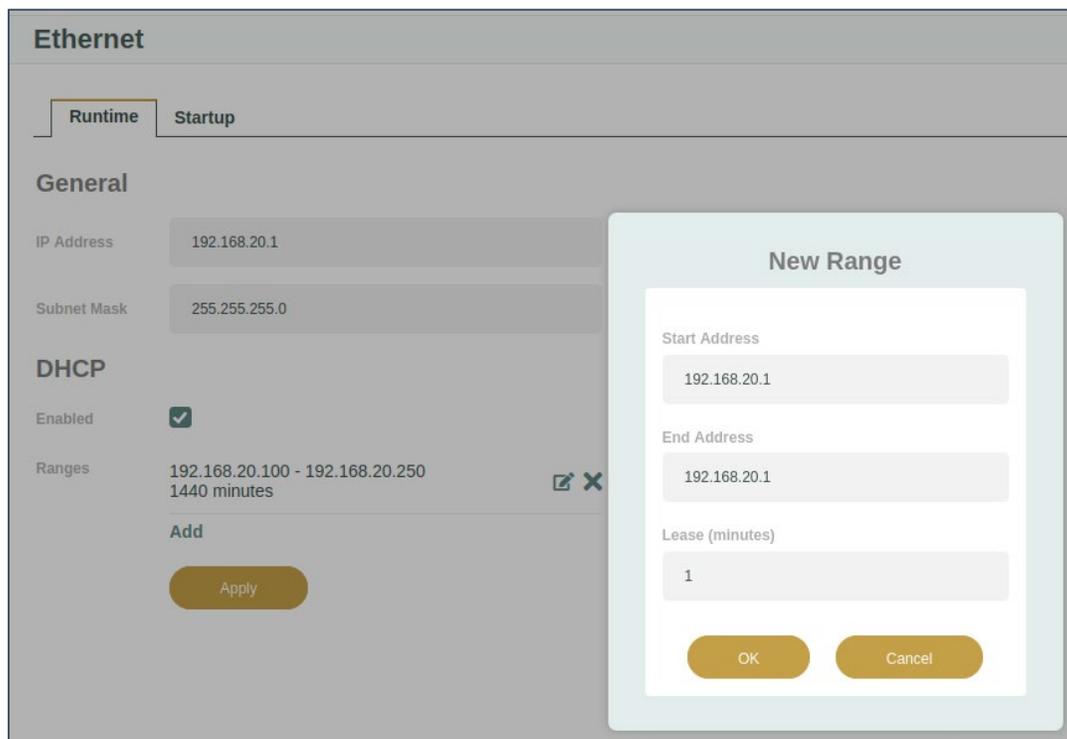
Figure 29: DHCP Section of Ethernet Page

5.5 WI-FI

The *Wi-Fi* page displays the current interface and DHCP configuration on the Wi-Fi network.
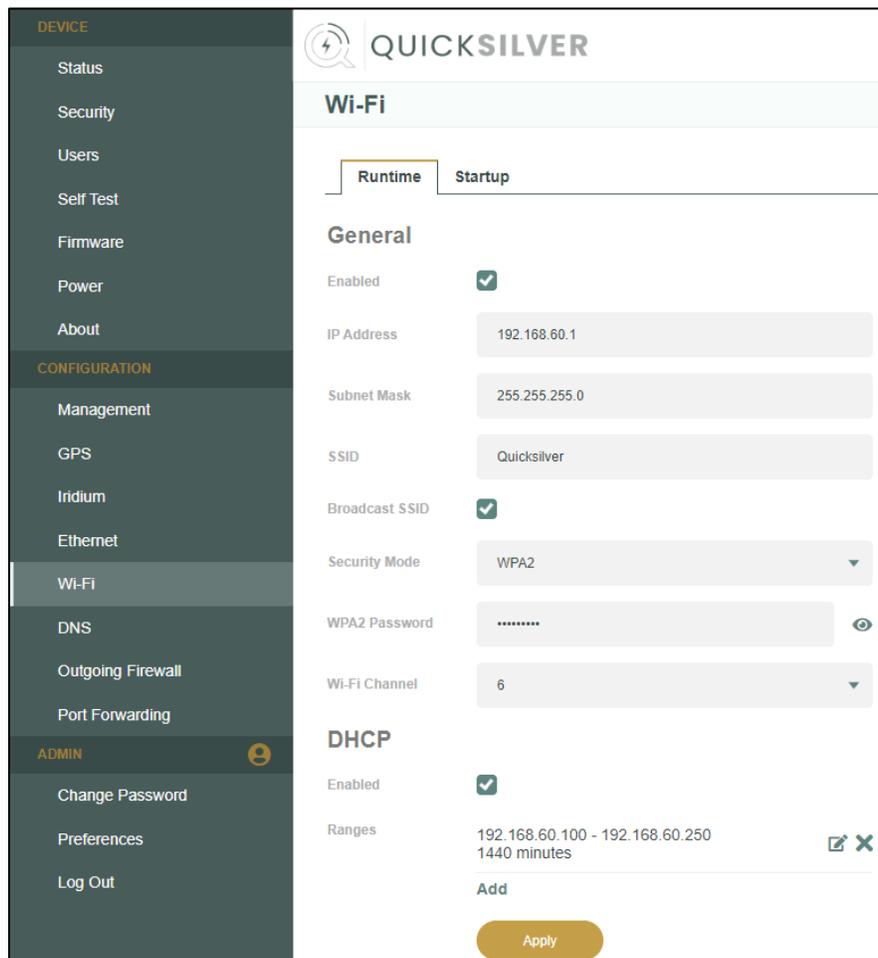
Figure 30: Wi-Fi Page

5.5.1 GENERAL

- **Enabled** — Activates the Wi-Fi link.

- **IP Address** — Configures the default gateway of the network. It must be a valid IPv4 address. It must not belong to the same network defined in the Ethernet menu. The configuration website can also be accessed at this address.

  CAUTION: If the user changes the address for accessing the configuration website, the connection will be dropped and a new connection must be made to the new address.

- **Subnet Mask** — Configures the netmask. Must be a valid IPv4 netmask.

- **SSID** — Configures the name of the Wi-Fi network. Max 30 characters.

- **Broadcast SSID** — Determines whether the user's Wi-Fi network is publicly visible.

- **Security Mode** — Configures the type of security on the user's network. Available options are: None, WPA2.

- **WPA2 Password** — Configures the WPA2 password. 8-25 characters.

- **Wi-Fi Channel** – Configures the channel on which the network is broadcasted.

5.5.2   DHCP

See section **5.4.2** on page **38**.

5.6   DNS

5.6.1   DNS SERVERS

On the *DNS* page, users can specify the primary and secondary address of the DNS servers which they would like clients to use. Note that these will be sent directly to the client. Addresses must be valid IPv4.

> **NOTE**: Clients may choose to ignore these DNS addresses and use their own settings. In any case, for DNS to work the DNS server addresses need to be allowed through the outgoing firewall, by adding a rule in the Outgoing Firewall section.
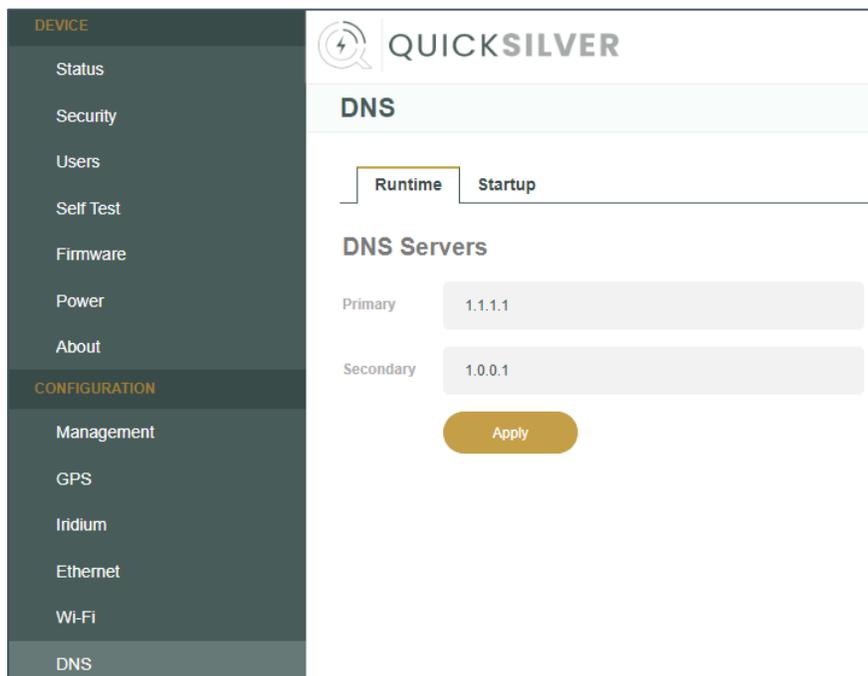
Figure 31: DNS Page

5.7 OUTGOING FIREWALL

This menu page configures the firewall for limiting data sent out over the Iridium network whether the data originates from the Wi-Fi or Ethernet LAN. This is done by configuring a list of rules against which outgoing packets will be compared until a match is found. Once a match is made the packet will not be checked against any more rules. If the packet did not match any rules, it will be dropped. Use of this firewall capability is essential to prevent inadvertent and unwanted data charges due to background process, such as applications checking for and downloading software updates. See **Appendix G: Common Firewall Settings** for more details.

Figure 32: Outgoing Firewall Page

NOTE: The Quicksilver modem has been shipped BLOCKING all IP addresses to protect users from inadvertent background processes running which will waste airtime and incur excessive overage charges.

5.7.1   NEW RULE

Use the *New Rule* window to create a new firewall rule. From the Outgoing Firewall screen (refer to Figure 32), select **ADD**. The New Rule screen displays, which will allow you to block or allow packets based on protocols, IP addresses, and ports.

Figure 33: Add New Rule Window

- **Position** — Indicates where the new rule will be inserted. If referencing another rule, the new rule will be inserted above it.
- **Name** — The name of the rule, which must be 1-15 characters and only contain alphanumeric characters, '_', '-', '.', and '~'.
- **Protocol –** Any, ICMP, TCP, or UDP.
- **Address** — A destination address to associate with this rule. Can be any address, a single address, or a subnet of addresses defined in prefix format. This address can also be negated (as in match all addresses EXCEPT what is specified). Must be a valid IPv4 address.

- **Action** — The action to take once a packet matching the rule has been processed. Options available are block or allow.

Figure 34*: Add New Rule with Protocol Selected Window*

5.8   PORT FORWARDING (ADMIN ONLY)

This menu configures port forwarding, which allows a host on the external network to connect directly to a host connected to the internal Quicksilver network.
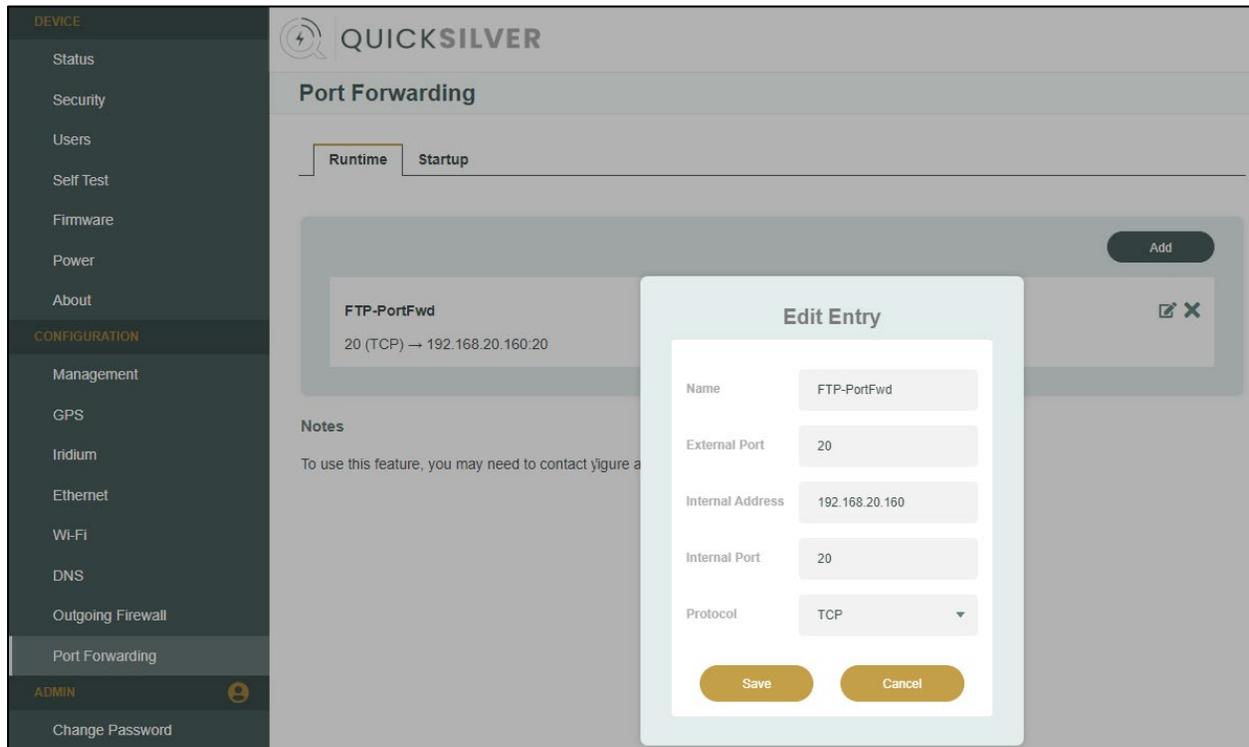
Figure 35: Edit Entry Window

NOTE: To use this feature, you may need to contact your service provider to configure a static IP address for your device.

5.8.1   GENERAL

- **Name** – Unique display name. 1-15 characters and only contain alphanumeric characters, '_', '-', '.', and '~'.
- **External** Port – The port which the external host will use to connect. 0-65535.
- **Internal Address** – The IP address of the host connected to the Quicksilver which is being exposed.
- **Internal Port** – The internal port which the exposed host is monitoring. 0-65535.
- **Protocol** – The protocol to forward (TCP, UDP, or both)**.**

6   ADMIN MENU

The *Admin* menu features include the **Change Password** and **Preferences** pages and the **Log Out** button.

6.1   CHANGE PASSWORD

Password must be 8-32 characters, not contain the username, and have three of the following characteristics: lowercase, uppercase, numeric, or special.

Figure 36: Change Password Page

6.2   PREFERENCES

From the *Preferences* menu users can set their time zone preferences when browsing the website.
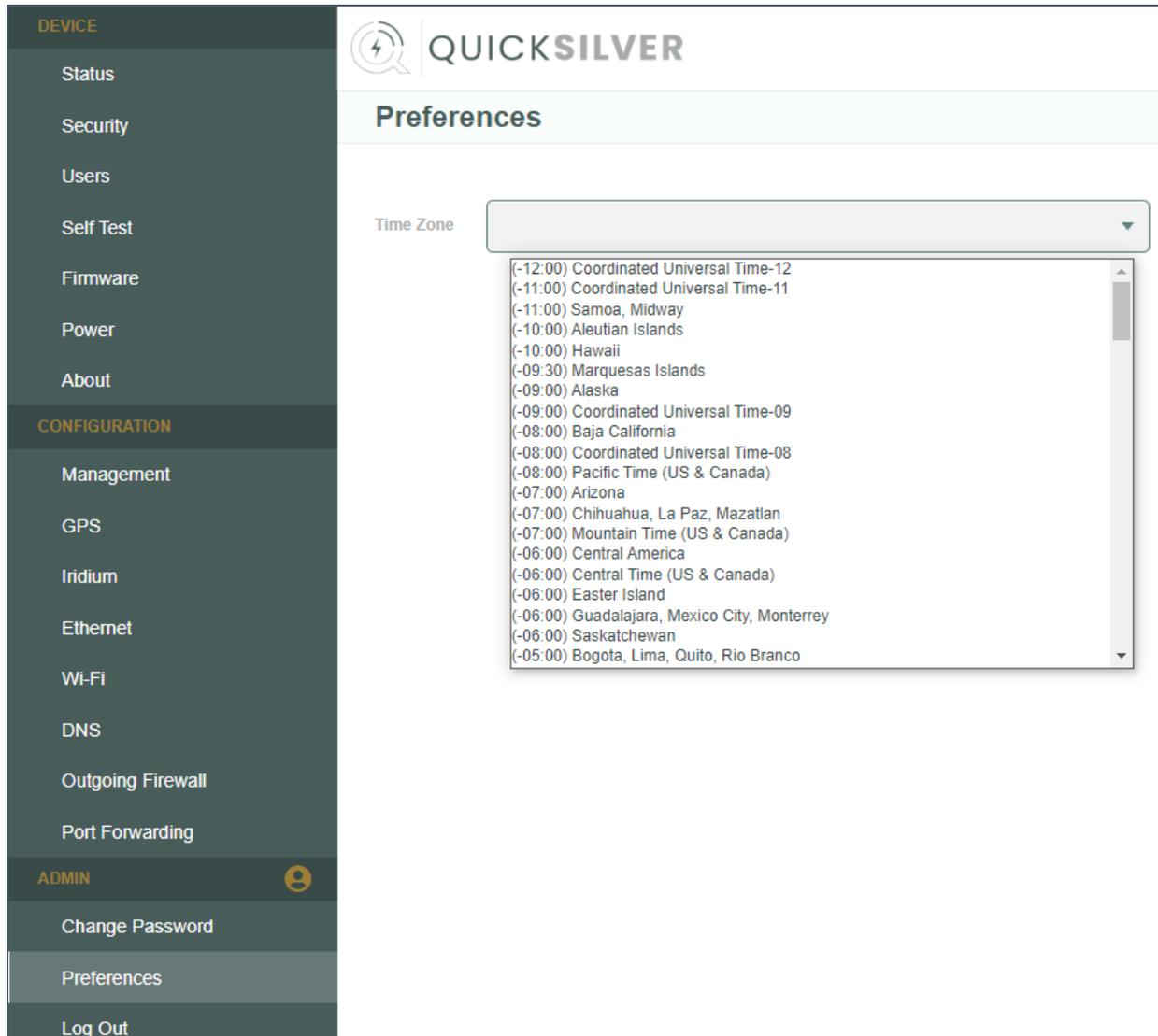
Figure 37: Preferences Page

6.3   LOG OUT

The current user session will end.

7 HARDWARE

7.1 LED INDICATIONS

Figure 38: LEDs

For the first approximately 15 seconds after power-up, all the LEDs will be solid. Then they will begin functioning according to the tables below.

> NOTE: Wait at least between 20 to 30 seconds after turning off the device before turning it back on.

Table 2: PWR and IRD LED Functions

	Power (PWR)		Iridium (IRD)
State	Description		Description
Off	Device off		Iridium disabled or signal 0
* Double Blinking	Recovery mode		N/A
Blinking	Starting up		Iridium signal 1-2
Rapid Blinking	In safe mode using default configuration due to startup error		N/A
Solid	Startup successful		Iridium signal 3-5

* To recover your device from this state, contact NAL Research Tech Support by dialing +1-888-SHOUT-NR (+1-888-746-8867) or mailing support@nalresearch.com.

Table 3: Wi-Fi, GPS, and STS LED Functions

	Wi-Fi	**GPS**	**Status (STS)**
State	**Description**	**Description**	**Description**
Off	Wi-Fi disabled	GPS off, no fix, or time-only fix	Iridium Data is not enabled
Blinking	N/A	Dead reckoning or 2D fix	N/A
Solid	Wi-Fi enabled	3D fix	Iridium Data is enabled

7.2 DB-25 CONNECTOR

The main hardware data interface for the Quicksilver is a standard DB-25 connector. The pin assignments for this connector are listed in **Table 4**.

The Quicksilver RS232 serial port is configured as Data Communication Equipment (DCE) with full hardware handshaking.

Table 4: DB-25 Pin Assignments

Pin	Name	In/Out	Type	Notes
1	EXT_ON_OFF	IN	Closure to Ground	Pull down to ground with a tolerance of <0.2V for 0.75ms to 5 seconds for software controlled graceful shutdown. Hold greater than 5 seconds for Hardware reset.
2	GPIO1	---	n/c	Reserved
3	EXT_GND	---	Power Ground	
4	EXT_PWR_IN	IN	10 – 32 VDC	Reverse polarity protection internal resettable 2.2A fuse.
5	Ethernet MX1_P	IN/OUT	IEEE 802.3, ±2.5 V	Ethernet Pair 1 Positive to pin 18. Twisted Differential Pairs. 10/100 BaseT Voltage levels ranging from ±1 to ±2.5 volts. 3.3V absolute MAX.

Table 4: DB-25 Pin Assignments

Pin	Name	In/Out	Type	Notes
6	Ethernet MX2_P	IN/OUT	IEEE 802.3, ±2.5 V	Ethernet Pair 2 Positive to pin 20. Twisted Differential Pairs. 10/100 BaseT Voltage levels ranging from ±1 to ±2.5 volts. 3.3V absolute MAX.
7	RS232 RI	OUT	EIA-232	Transmit signals can produce signal up to +/-13.2V, typical is +/-5V.
8	RS232 RTS	IN	EIA-232	Receive signals can withstand +/-25V input.
9	RS232 TX	IN	EIA-232	Receive signals can withstand +/-25V input.
10	RS232 DCD	OUT	EIA-232	Transmit signals can produce signal up to +/-13.2V, typical is +/-5V.
11	GPIO3		n/c	Reserved
12	GPIO5		n/c	Reserved
13	RS232 RX	OUT	EIA-232	Transmit signals can produce signal up to +/-13.2V, typical is +/-5V.
14	SIGNAL GND	---	Signal Ground	
15	GPIO2		n/c	Reserved
16	EXT_PWR_IN	IN	10 – 32 VDC	Reverse polarity protection internal resettable 2.2A fuse.
17	EXT_GND	---	Power Ground	
18	Ethernet MX1_N	IN/OUT	IEEE 802.3, ±2.5 V	Ethernet Pair 1 Negative to pin 5. Twisted Differential Pairs. 10/100 BaseT Voltage levels ranging from ±1 to ±2.5 volts. 3.3V absolute MAX.
19	RS232 DTR	IN	EIA-232	Receive signals can withstand +/-25V input.

Table 4: DB-25 Pin Assignments

Pin	Name	In/Out	Type	Notes
20	Ethernet MX2_N	IN/OUT	IEEE 802.3, ±2.5 V	Ethernet Pair 2 Negative to pin 6. Twisted Differential Pairs. 10/100 BaseT Voltage levels ranging from ±1 to ±2.5 volts. 3.3V absolute MAX.
21	RS232 DSR	OUT	EIA-232	Transmit signals can produce signal up to +/-13.2V, typical is +/-5V.
22	RS232 CTS	OUT	EIA-232	Transmit signals can produce signal up to +/-13.2V, typical is +/-5V.
23	SIGNAL GND	---	Signal Ground	
24	GPIO4	---	n/c	Reserved
25	SIGNAL GND	---	Signal Ground	

7.3 DATA ADAPTER

To simplify connecting power and data devices to the Quicksilver, NAL provides a Data Adapter to break out the DB-25 connector pins to an Ethernet RJ-45 connector, a DB-9 RS-232 compliant serial connector, and a Molex locking power connector.

NAL also provides a 90 – 230 VAC, 47 – 63 Hz to 12 VDC power adapter for benchtop use.

Note that GPIO is not accessible through the Data Adapter.

Power Connector Mating connector: Switchcraft 761KS12.
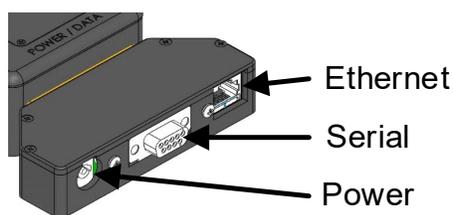
Figure 39: Quicksilver Data Adapter

As an option, NAL has designed a DB-25 to RJ-45 receptacle/DB-9 receptacle/stranded wire cable for embedded installations of the Quicksilver terminal. See Figure 46**.**

7.4 ANTENNAS

The Quicksilver has three coaxial RF antenna ports: 1) Iridium TNC female, 2) GPS SMA female, and 3) Wi-F Reverse Polarity (RP) SMA female. NAL provides Wi-Fi and GPS antennas for use with the Quicksilver terminal if these features are utilized. Due to Iridium certification requirements, customers may only use antennas that have been certified with the NAL Quicksilver terminal. Certified antennas are listed in section **7.4.3** below.

7.4.1 SAF9750 WI-FI ANTENNA

Attach the SAF9750 antenna when needed for Wi-Fi connectivity. Adjust the antenna angle as desired.

7.4.2 SAF5270-G GPS ANTENNA

Attach this antenna when needed for GPS data. Space this antenna as far away from the Iridium and Wi-Fi antennas as the user installation allows to minimize radiated interference. View the GPS data using the Quicksilver webpages (see sections **4.1.5** and **5.2**) and access the GPS data through the web API interface (see **Appendix E: Web API**).

7.4.3 IRIDIUM CERTUS ANTENNAS

The Quicksilver terminal has been certified by Iridium for use with the following antennas:

7.4.3.1 SAF9700 (CONNECTOR MOUNT, "STUB")

The SAF9700 antenna is a dielectric-loaded, decafilar-helix antenna that uses distinctive materials technology to provide the highest available efficiency in a small size. The dielectric core, together with the fly-wheeling effect of the advanced decafilar helical design, provides excellent beam width and low elevation gain, which is maintained in relatively cluttered use scenarios. The SAF9700 acts as its own filter, attenuating signals from common cellular and ISM frequencies by as much as 30 dB.
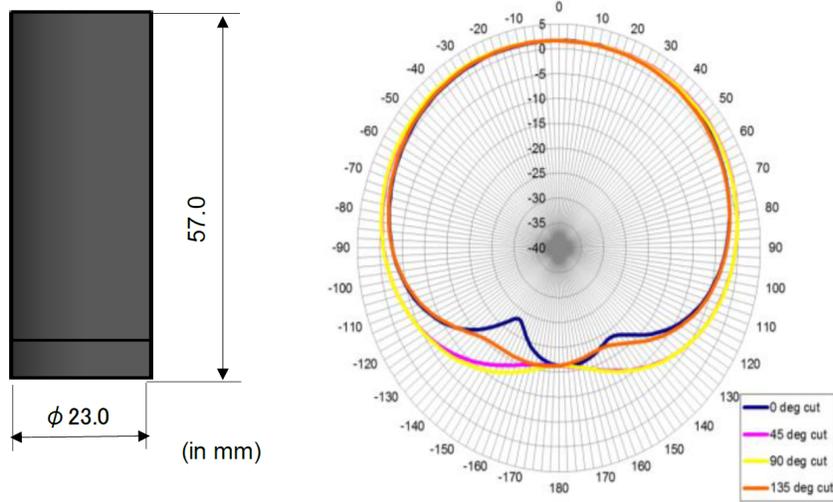
Figure 40: SAF9700

A datasheet for the SAF9700 can be requested from Support@nalresearch.com.

Table 5: SAF9700 Specifications

Parameter	Specification
Frequency	1616.0 – 1626.5 MHz
Gain (RHCP)	2.0 dBiC at zenith
Peak Efficiency	71%
Beam Width	190°
Axial Ratio	<1.5 dB at zenith
VSWR	< 2.0:1
Impedance	50Ω
Overall Dimensions	57 mm (height) x 23 mm (diameter)
Weight	34 g
Operating Temperature	–40°C to +85°C
RF Connector	SMA male

The antenna is designed to be ground-plane independent. The loss budget for the Iridium Certus link allows a maximum of 1 dB of cable losses between the Quicksilver terminal and the SAF9700 antenna. **Table 6** below provides maximum cable lengths for common LMR cable sizes meeting the certification constraints.

Table 6: Maximum Cable Lengths for SAF9700 Iridium Certus Antenna

Coaxial Cable Type	Max Cable Length (ft)	Max Cable Length (m)
LMR-195	3.3	1.0
LMR-240	4.9	1.5
LMR-400	9.4	2.9
LMR-500	11.6	3.5
LMR-600	14.4	4.4
Cable insertion loss ≤ 1.0 dB (with connectors) required. Table assumes max connector loss = 0.25 dB each; cable loss = 0.5 dB.		

7.4.3.2 SAF9701 (THROUGH HOLE / MAST MOUNT) [CERTIFICATION PENDING]

The SAF9701 is a high-performance, omnidirectional antenna designed for Iridium SFX/RUDICS/SBD services. It provides exceptional pattern control, polarization purity, and high efficiency in a very rugged and compact form factor. The omnidirectional antenna pattern allows this antenna to be easily installed in any location. This antenna is designed to work with both Iridium NAL Certus and narrowband voice and data terminals. The antenna features a TNC jack connector for easy installation. The antenna is IP66 rated and optimized for harsh environments on both land and maritime applications.
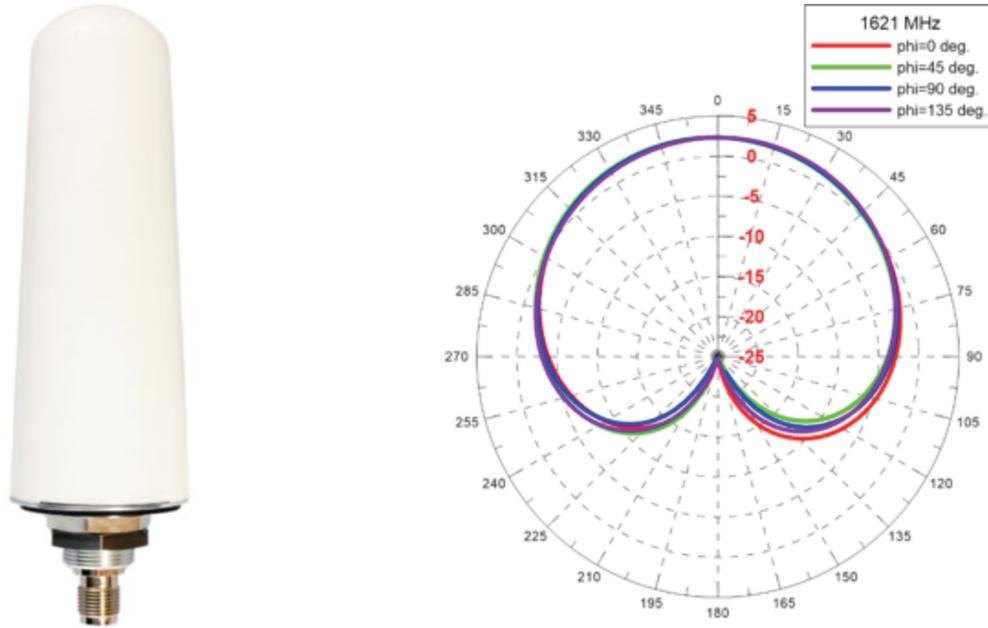
Figure 41: SAF9701

A datasheet for the SAF9701 can be requested from Support@nalresearch.com.

Table 7: SAF9701 Specifications

Parameter	Specification
Frequency	1616.0 – 1626.5 MHz
Polarization	RHCP
Antenna Element Peak Gain	2.3 dBiC
Peak Efficiency	68%
Beam Width	126°
Axial Ratio	3.8 dB (typical)
VSWR	1.6 (max)
Impedance	50Ω
Overall Dimensions	125 mm (height) x 45 mm (diameter)
Weight	100 g
Operating Temperature	–40°C to +85°C

Table 7: SAF9701 Specifications

Parameter	Specification
RF Connector	TNC Jack
Environmental	IP66 and RoHS Compliant
Attachment Method	19 mm through hole mount

The loss budget for the Iridium Certus link allows a maximum of 2 dB of cable losses between the Quicksilver terminal and the SAF9701 antenna. **Table 8** below provides maximum cable lengths for common LMR cable sizes meeting the certification constraints.

Table 8: Maximum Cable Lengths for SAF9701 Antenna

Coaxial Cable Type	Max Cable Length (ft)	Max Cable Length (m)
LMR-195	9.9	3.0
LMR-240	14.6	4.5
LMR-400	28.1	8.5
LMR-500	34.9	10.6
LMR-600	43.3	13.2
Cable insertion loss ≤ 2.0 dB (with connectors) required. Table assumes max connector loss = 0.25 dB each; cable loss = 1.5 dB.		

7.4.3.3   SAF9704 (AVIATION AUTHORIZED ANTENNA)

The SAF9704 was designed to interface with the Iridium Certus 9770 transceiver. The antenna operates in the L-band frequency spectrum. It has been designed specifically for incorporation on aviation assets and meets FAA TSO C159d, DO-160 E/G, and DO-262C specifications.
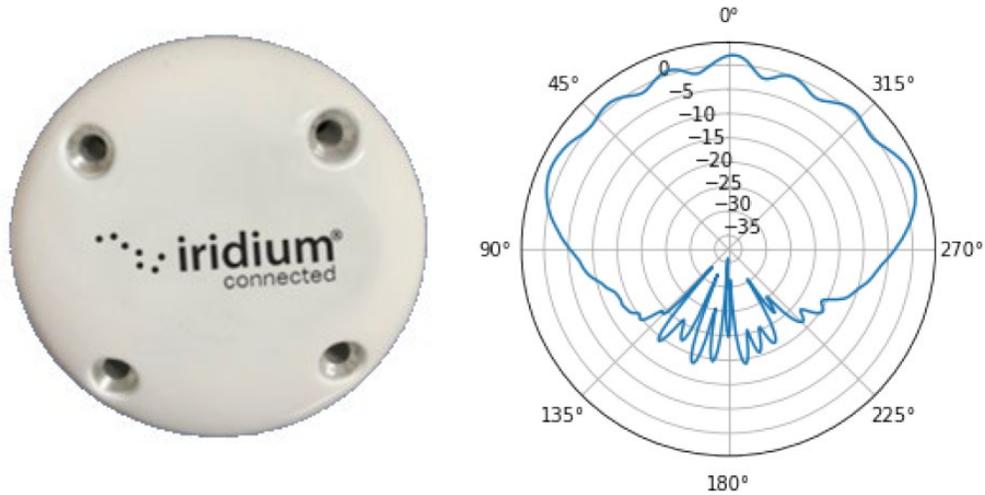
Figure 42: SAF9704

Table 9: SAF9704 Specifications

Parameter	Specification
Frequency	1616.0 – 1626.5 MHz
Polarization	RHCP
Antenna Element Peak Gain	3.0 dBiC Max
VSWR	≤ 1.8:1
Impedance	50Ω
Overall Dimensions	1.16 in (height) x 3.5 in (diameter)
Weight	13 oz.
Operating Temperature	–55°C to +70°C
Altitude	55,000 ft.
Environmental	DO-160E/G
RF Connector	TNC female connector

Table 10: Maximum Cable Lengths for SAF9704 Antenna

Coaxial Cable Type	Max Cable Length (ft)	Max Cable Length (m)
LMR-195	0.7	0.2
LMR-240	1.0	0.3
LMR-400	1.9	0.6
LMR-600	2.9	0.9
Cable insertion loss ≤ 0.6 dB (with connectors) required. Table assumes max connector loss = 0.25 dB each; cable loss = 0.1 dB.		

7.4.4   ANTENNA SIGNAL REQUIREMENTS

Although the Quicksilver's receiver can link to the Iridium satellites when the antenna is partially blocked (near buildings, in a room next to a window, etc.), the antennas must have a clear view of the sky to minimize acquisition time, provide better data throughput, and reduce power consumption.

Line of sight to satellite:

- Radio antenna must have a clear, unobstructed view of the sky.
- Nearby tall buildings or similar structures, heavy foliage, mountains, etc., can degrade performance if they block the signal between the Quicksilver and the satellite when the satellite is at low elevation angles.
- The signal may be completely lost if the operator enters a building with the Quicksilver.
- If the signal is blocked by an obstacle, the user may be able to wait a few minutes until another satellite passes overhead without relocating.

Data service disconnects:

- The most common cause of disconnects is a disruption in the line of sight between the radio antenna and the satellite.
- International Maritime Satellite (INMARSAT) terminals, Global Star (GSAT) units, radar devices, electrical substations, and broadcast stations may also cause disconnects.

8 APPENDIX A: RECOVERY MODE

Certain failures (example: partial update) will cause the Quicksilver to enter the Recovery mode. In the Recovery mode, firmware updates can be applied, user data can be cleared, the update log can be read, and the device can be rebooted over TCP with the help of a command line program. Contact NAL for help.

NOTE: The *Configuration* website is not available.

9 APPENDIX B: DESIGN SPECIFICATIONS

9.1 MECHANICAL SPECIFICATIONS

Dimensions: .... 8.4" (21.34 cm) x 2.5" (6.86 cm) x 1.5" (3.81 cm)

(see **Appendix H: Mechanical Drawings**)

Weight: .... 26.2 oz (0.74 kg)

Enclosure: .... Aluminum (black anodized)

Data/Power Connector: .... DB-25 (custom pinout)

RF Connectors: .... TNC female (Iridium), SMA female (GPS), RP-SMA

female (Wi-Fi)

Status LEDs: .... Power, Iridium, Wi-Fi, GPS, Status

Environmental Rating .... IP67, Natural Convection Cooling

9.2 IRIDIUM RF SPECIFICATIONS

Operating Frequency: .... 1616.0 to 1626.5 MHz

Duplexing Method: .... TDD

Multiplexing Method: .... TDMA/FDMA

RF TX output power (average): .... 4.8 W

9.3 GPS SPECIFICATIONS

Type of GPS Receiver: .... u-blox MAX-8MQ

Receiver Type: .... 72-Channel GPS L1 C/A, SBAS, QZSS, GLONASS

Update Rate: .... 4 Hz

Accuracy: .... Position: 8.2 feet (2.5 meters) CEP

Position SBAS: 6.6 feet (2.0 meters) CEP

Acquisition (typical): .... Hot starts: 1 second

Aided starts: 2 seconds

Cold starts: 29 seconds

Sensitivity: .... Tracking: –166 dBm

Reacquisition: –160 dBm

Cold starts: –148 dBm

Operational Limits:.......................................Altitude: 164,000 feet (50,000 meters)

Velocity: 1,640 feet/second (500 m/s)

Dynamics: ≤ 4 g

If power is provided to the device, the GPS receiver provides real-time clock functionality and stores ephemeris data in its memory before turning off (sleeping between reports). The ephemeris data are valid up to two hours and can be used in future startup to improve time-to-first-fix.

9.4 WI-FI RF SPECIFICATIONS

Operating Frequency: ....2.4 GHz

Protocol: ....802.11 b/g/n

Data Rate: ....54 Mbps (maximum)

Power Output: ....+16 dBm (maximum)

Sensitivity:...–96 dBm (maximum)

9.5 ELECTRICAL SPECIFICATIONS

Voltage Input Range:.....................................+10 VDC to +32 VDC

Power Consumption at Full Power:...............<1.75 A @ 12 VDC

Max Power Consumption at Inrush:……………6 A @ 12 VDC

Average Power Consumption: ……………………0.4 to 0.8 A @ 12 VDC

NOTE: Custom power supplies must be able to provide at least 3A at 12V during power up to ensure boot-up and correct function of the Quicksilver device. If the custom power supply does not limit current, up to 6A of current may be drawn at 12V during the initial inrush.

The average current drawn during transmission may vary depending on the field of view between the Quicksilver antenna and the Iridium satellite. The worst-case power consumption of the device using the full RF transmit power of the Iridium modem running in a continuous diagnostic mode is about 21W (1.75A at 12V).

However, this is not a typical use case. Real-world Quicksilver testing with a certified Iridium Antenna and a 6' patch cable in open sky showed average power consumption between 4.8 and

9.6W (0.4 to 0.8A at 12V). These tests used the full receive and transmit capability of the Quicksilver while sending and/or receiving data.

9.6 ENVIRONMENTAL SPECIFICATIONS

Design Operating Temperature Range: ....-40C to +55C (-40F to +131F)

Ingress Protection: IP67

Operating Humidity: ....≤ 75% RH

9.7 DATA I/O SPECIFICATIONS

Ethernet: ....10/100 Base-T

Serial (RS-232): ....EIA-232, 19.2 kbps

Wi-Fi: ....802.11 b/g/n

9.8 RELATED HARDWARE

AC Power Adapter: ....POWS010 AC/DC Supply with 12 VDC/2.0 A (max) output

Data Adapter: ....433-19004-002 DB-25 break-out with RJ45 (Ethernet), DB-9 (Serial), Power (locking connector)

Mounting Bracket: ....#433-19004-003 Aluminum with mounting hole patterns

NOTE: Refer to Figure 48 and Figure 49 for the Quicksilver Power Adapter and Data Adapter design specifications

NOTE: Refer to Figure 50 for the Mounting Bracket design specifications

10 APPENDIX D: EXPORT COMPLIANCE

The Quicksilver is controlled by the export laws and regulations of the United States of America (USA). It is the policy of NAL Research to fully comply with all U.S. export and economic sanction laws and regulations. The export of NAL Research products, services, hardware, software, and technology must be made only in accordance with the laws, regulations, and licensing requirements of the U.S. government. NAL Research customers must also comply with these laws and regulations. Failure to comply can result in the imposition of fines and penalties, the loss of export privileges, and termination of your contractual agreements with NAL Research.

The export and re-export of NAL Research products and services are subject to regulation by the Export Administration Regulations (15 CFR 730-744), as administered by the U.S. Department of Commerce, Bureau of Industry and Security (BIS).

See: https://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear for further information on BIS and the Export Administration Regulations (EAR). Additional export restrictions are administered by the U.S. Department of the Treasury's Office of Foreign Asset Controls (OFAC). See: http://www.ustreas.gov/ofac for further information on OFAC and its requirements.

11 APPENDIX E: WEB API

Details of the Quicksilver's web API for client applications can be found in the NAL document *WebApi.yml* available upon request from Support@nalresearch.com. This document is a text file documenting the API using the OpenAPI standard. For a more graphical view of the API, copy and paste the text of the document into the online Swagger Editor at https://editor.swagger.io.

12 APPENDIX F: AT COMMANDS

For details on AT commands available on the Quicksilver, refer to the NAL document *AT*

Commands for Quicksilver QS-100 available upon request from Support@nalresearch.com.

13 APPENDIX G: COMMON FIREWALL SETTINGS

NAL Research recommends only allowing the necessary traffic through the outgoing firewall to ensure background apps and services will not be using data. If you are convinced that your connected devices will not generate unnecessary traffic on the network, you may add a rule to allow all traffic.
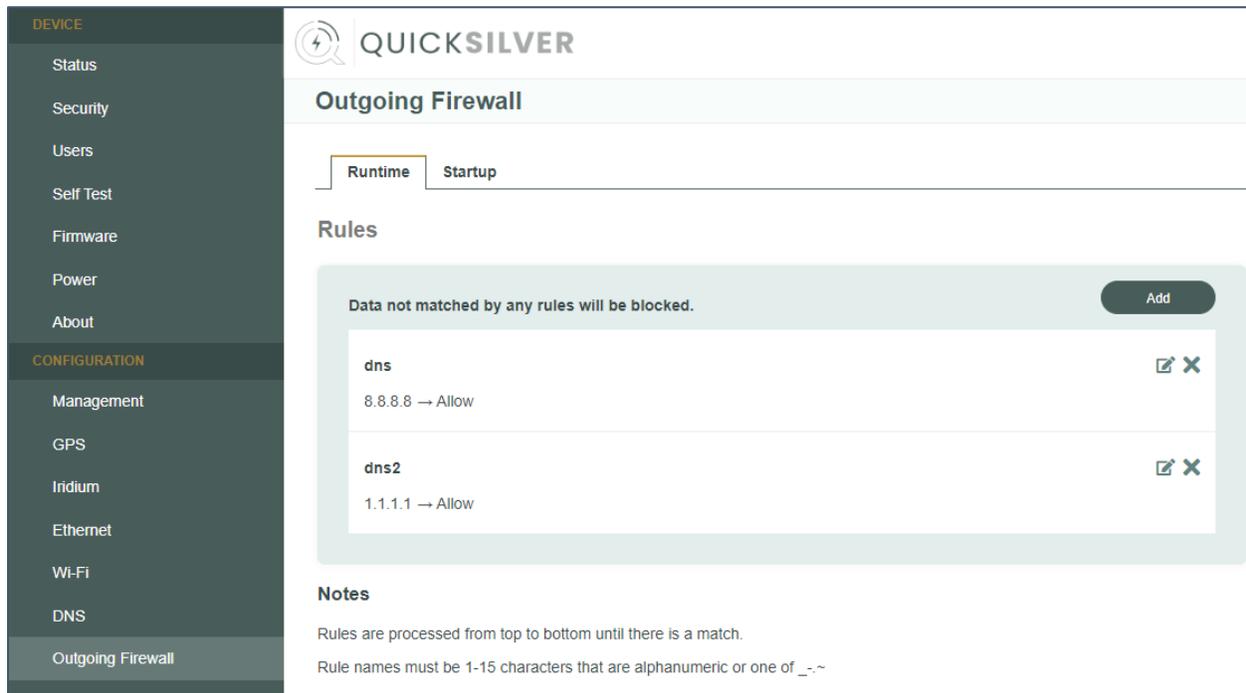
Figure 43: Outgoing Firewall Page

13.1 WEB BROWSING

- Allow ports 80 and 443 for TCP for all IP addresses

- Allow port 53 for and DNS servers (such as the ones in the DNS configuration)

13.2 NETWORK OPERATING CENTER (NOC)

Allow the single IP address of the NOC for the necessary port(s) and protocol (likely TCP).

14 APPENDIX H: MECHANICAL DRAWINGS

Figure 44: Quicksilver Specifications (1 of 2)

Figure 45: Quicksilver Specifications (2 of 2)

NOTES:

1. THIS DRAWING BUILDS PART NUMBER "CBLA080"

2. WHEN BUILDING THIS PART FOLLOW REQUIREMENTS FOR SOLDERING ELECTRICAL AND ELECTRONIC ASSEMBLIES IPC J-STD-001G.

3. FOLLOW J1, J2, J3 AND J4 PINOUTS FOR REFERENCE WHEN BUILDING CABLE.

4. CUT EACH CABLE TO APPROXIMATELY 3.00 FT BEFORE SOLDERING WIRES TO THE J1 DB25 CONNECTOR (CON0051).

5. SOLDER WIRE014 (2X) TO PINS 4 AND16 AND WIRE015 (2X) TO PINS 3 AND 17 FROM THE J1 CONNECTOR PINOUT AND SPLICE THEM TO THE TWO WIRES FROM THE J4 CONNECTOR WIRES AS SHOWN IN THE J4 PINOUT/WIRE COLOR AND J1 SOLDER PIN CONNECTION TABLE.

REVISION SYMBOL:

ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	6/2/2021	CJH

3.00 FT

J1 CONNECTOR PINOUT

PIN NO.	DESIGNATION
1	EXT ON OFF
2	GPIO1
3	EXT GND
4	EXT PWR IN
5	MX1 P
6	MX2 P
7	RS232 RI
8	RS232 RTS
9	RS232 TX
10	RS232 DCD
11	GPIO3
12	GPIO5
13	RS232 RX
14	SIGNAL GND
15	GPIO2
16	EXT PWR IN
17	EXT GND
18	MX1 N
19	RS232 DTR
20	MX2 N
21	RS232 DSR
22	RS232 CTS
23	SIGNAL GND
24	GPIO4
25	SIGNAL GND

PARTS LIST

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
7	2	WIRE015	BLACK 24 AWG WIRE
6	2	WIRE014	RED 24 AWG WIRE
5	1	CON0051	25 POSITION TWO PIECE BACKSHELL CONNECTOR SILVER 180DEG SHIELDED
4	1	CBLA089	CABLE ASSEMBLY 2.1mm ID, 5.5mm OD JACK TO WIRE LEADS FLAT 3.00' (915.00mm)
3	1	CBLA081	MODULAR CABLE PLUG TO PLUG 8P8C (RJ45, ETHERNET) 3.00' (914.4mm) UNSHIELDED
2	1	CBLA083	DELUXE MOLDED D-SUB CABLE, DB9 FEMALE / FEMALE, 10.0 FT
1	1	CON0050	25 POSITION D-SUB RECEPTACLE, FEMALE SOCKETS CONNECTOR

NAL RESEARCH CORP.

DESCRIPTION: Quicksilver DB25 Breakout Cable

SIZE C | CAGE CODE 1SZL2 | DWG. NO. CBLA080 | REV A

SCALE: 1:1.5 | SHEET 1 OF 2

Figure 46: Quicksilver DB-25 Breakout Cable

J2 CONNECTOR PINOUT/WIRE COLOR AND J1 SOLDER PIN CONNECTION

J2 PIN NO.	WIRE COLOR	J1 SOLDER PIN NO.
1	BLACK	10
2	GRAY	13
3	RED	9
4	GREEN	19
5	BROWN	14
6	BLUE	21
7	ORANGE	8
8	YELLOW	22
9	PURPLE	7

J3 CONNECTOR PINOUT/WIRE COLOR AND J1 SOLDER PIN CONNECTION

J3 PIN NO.	WIRE COLOR	J1 SOLDER PIN NO.
1	ORANGE/WHITE	5
2	ORANGE	18
3	GREEN/WHITE	6
6	GREEN	20
4	BLUE	N/A
5	BLUE/WHITE	N/A
7	BROWN/WHITE	N/A
8	BROWN	N/A

J4 CONNECTOR PINOUT/WIRE COLOR AND J1 SOLDER PIN CONNECTION

J4 JACK COMPONENT	WIRE COLOR	J1 SOLDER PIN NO.
CENTER PIN	BLACK WITH STRIPE	4, 16
SLEEVE	BLACK	3, 17

ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	6/2/2021	CJH

REVISION SYMBOL:

SIZE C | CAGE CODE 1SZL2 | DWG. NO. CBLA080 | REV A
SCALE: 4:1 | SHEET 2 OF 2

Figure 47: Quicksilver DB-25 Breakout Cable Connectors

NOTES:

1. ASSEMBLY'S CENTER OF GRAVITY LOCATION

2. DC POWER INPUT JACK

3. DB9 RECEPTACLE

4. RJ45 ETHERNET PORT

5. DATA KIT ENCLOSURE WEIGHT = 0.3 LB
   QUICKSILVER WITH DATA KIT ATTACHED WEIGHT = 1.5 LB

REVISION SYMBOL:

ZONE	REV.	DESCRIPTION	DATE	CHANGED BY
	A	INITIAL RELEASE	11/15/2021	CH
	B	ADDED WASHERS TO IMAGE AND TORQUE SPECIFICATION	1/12/2022	RLB
	C	QUICKSILVER/DATA ADAPTER ASSEMBLY CENTER OF MASS LOCATION ADDED	6/10/2022	ND

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS PROPERTY. DO NOT DISCLOSE TO OR DUPLICATE FOR OTHERS WITHOUT EXPRESS WRITTEN CONSENT.

UNLESS OTHERWISE SPECIFIED INTERPRET DIMENSIONS AND TOLERANCES IN ACCORDANCE WITH ASME Y 14.5-2009. INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.100.

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES

NAL RESEARCH CORP.

DESCRIPTION:
QUICKSILVER WITH DATAKIT SPECIFICATIONS

| | | TOLERANCES | APPROVALS | DATE |
FRACTIONAL± 1/4"
ANGULAR: ± 0.5
ONE PLACE DECIMAL   ± .03
TWO PLACE DECIMAL   ± .012
THREE PLACE DECIMAL ± .005

ENGINEER N. DOZIER 6/8/2022
CHECKED R. BAUGHMAN 6/13/2022
APPROVAL R. BAUGHMAN 6/13/2022

FINAL — QUICKSILVER
NEXT ASSY — PROJECT
APPLICATION

THIRD ANGLE PROJECTION
DO NOT SCALE DRAWING

SIZE B
CAGE CODE 1SZL2
DWG. NO. 433-19004-002-SPEC
REV C
SCALE: 1:1
SHEET 1 OF 2

Figure 48: Quicksilver Data and Power Adapter (1 of 2)

ZONE	REV.	DESCRIPTION	DATE	CHANGED BY
	A	INITIAL RELEASE	11/15/2021	CH
	B	ADDED WASHERS TO IMAGE AND TORQUE SPECIFICATION	1/12/2022	RLB
	C	QUICKSILVER/DATA ADAPTER ASSEMBLY CENTER OF MASS LOCATION ADDED	6/10/2022	ND

REVISION SYMBOL:

QUICKSILVER SHOWN FOR REFERENCE ONLY. QUICKSILVER IS NOT INCLUDED WITH THE DATA ADAPTER KIT AND WILL BE PURCHASED SEPARATELY.

DATA ADAPTER

MAXIMUM TORQUE FOR INSTALLATION IS 3.0 IN-LBS.

6X Ø .11 ▽ .25
6-32 UNC ▽ .15

SIZE B | CAGE CODE 1SZL2 | DWG. NO. 433-19004-002-SPEC | REV C
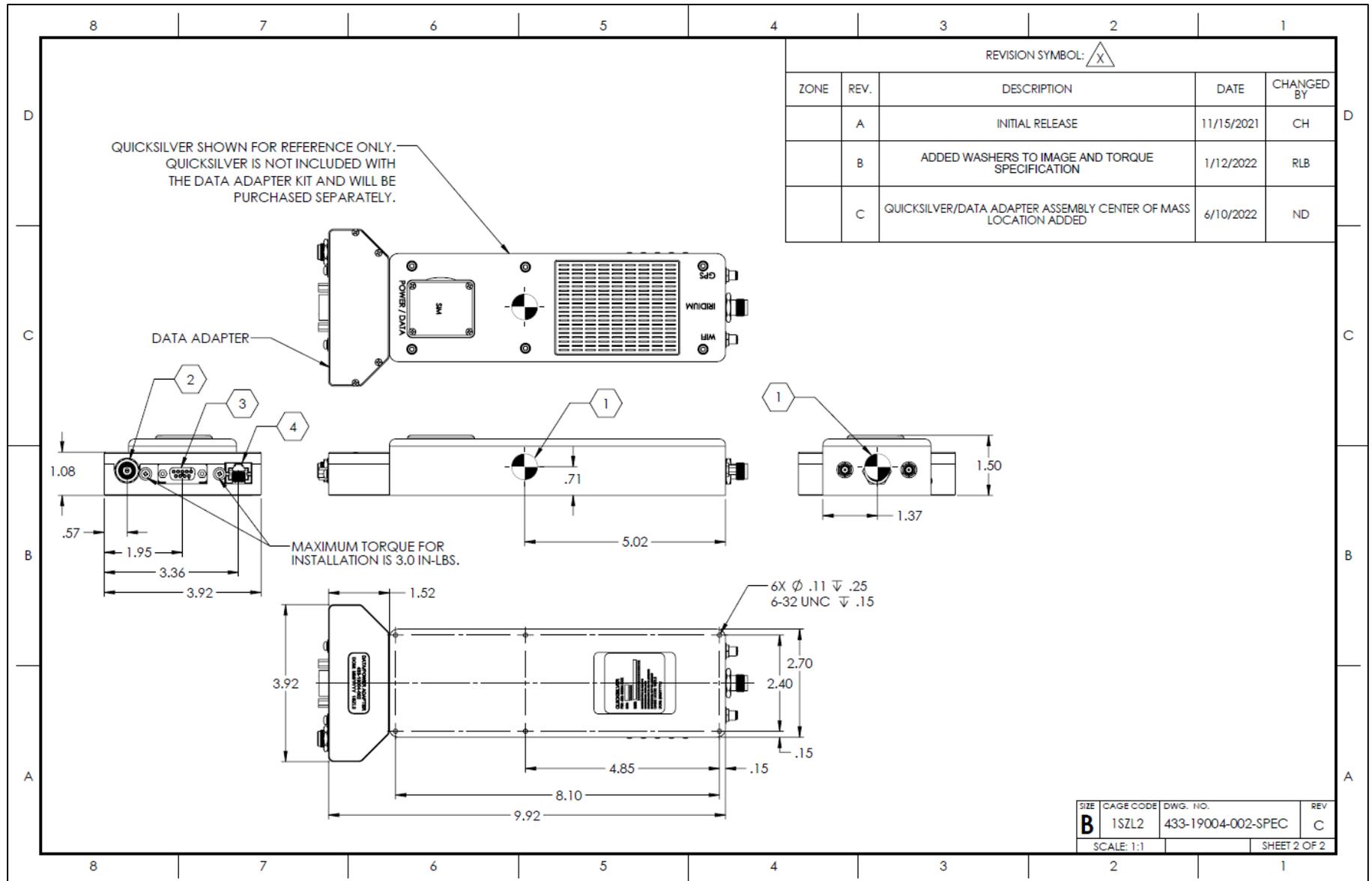SCALE: 1:1 | SHEET 2 OF 2

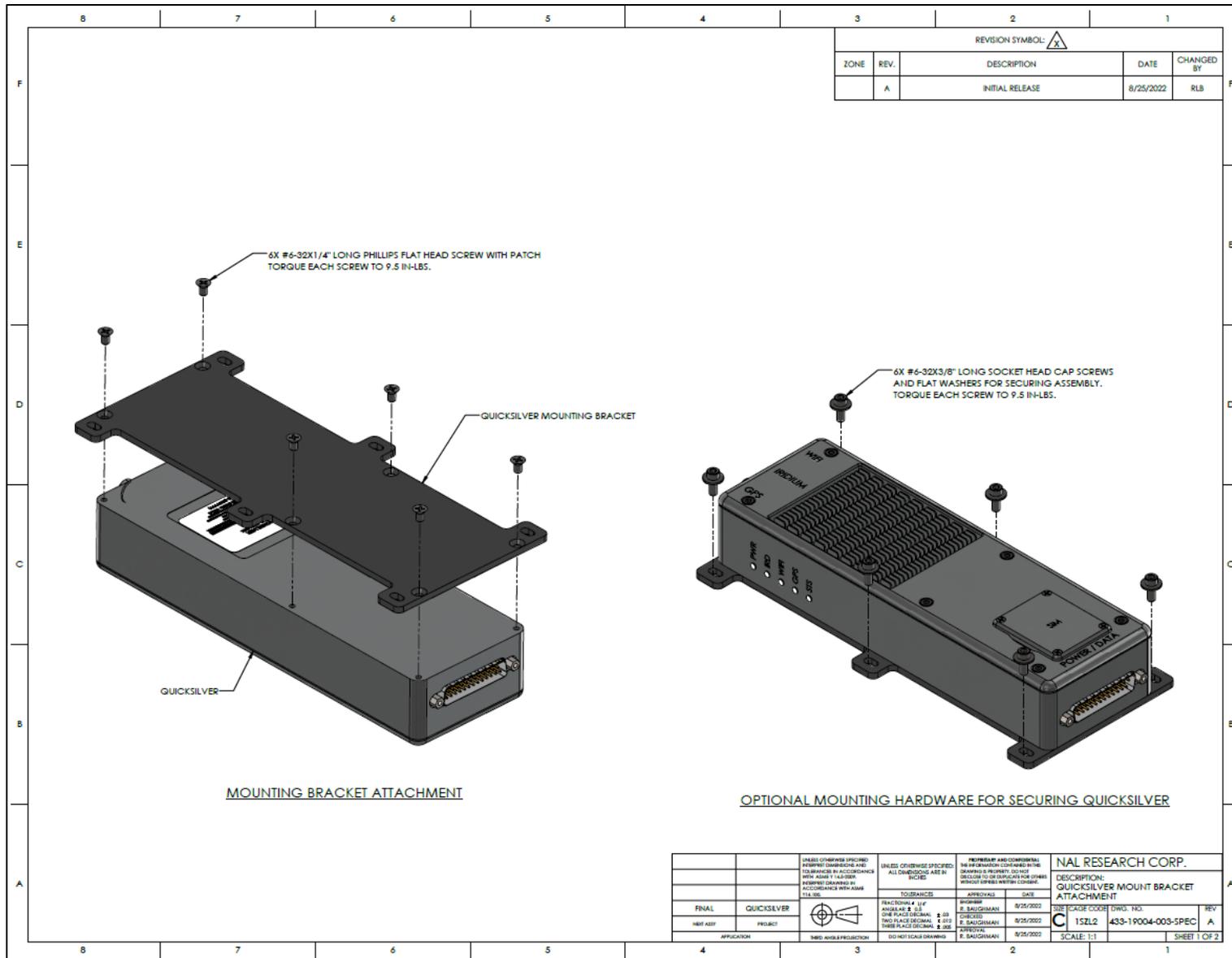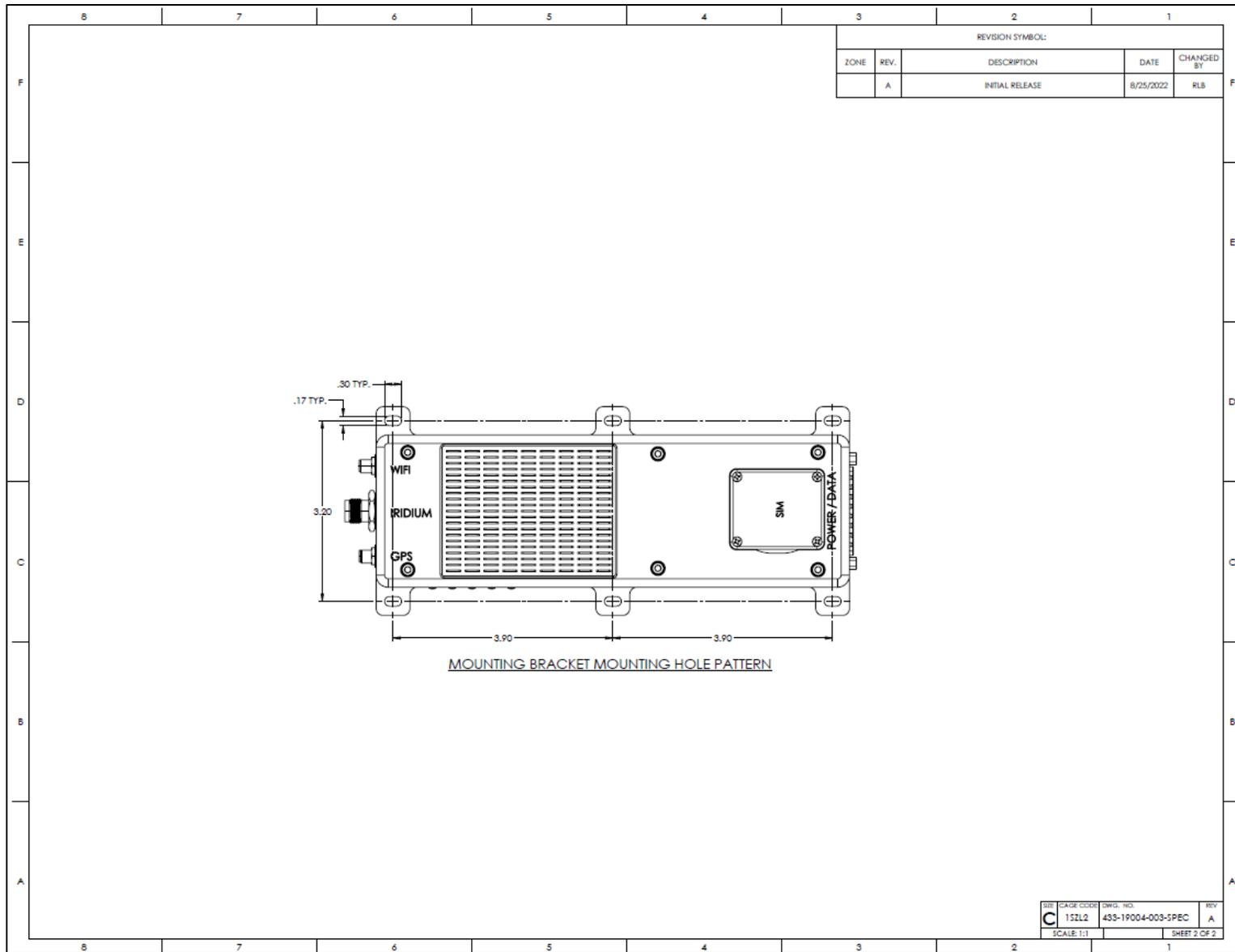*Figure 49: Quicksilver Data and Power Adapter (2 of 2)*

Figure 50: Mounting Bracket (1 of 2)

Figure 51: Mounting Bracket (2 of 2)