Wi-Fi Administration

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March 1, 2021

Instruction Sheet 1024-524

Introduction

Qualified Persons

> ### ⚠ WARNING
>
> Only qualified persons who are knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone who is trained and competent in:
>
> - The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
> - The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
> - The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment
>
> These instructions are intended ONLY for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

> ### NOTICE
>
> Thoroughly and carefully read this instruction sheet and all materials included in the product's S&C Instruction Handbook before installing or operating an IntelliCap 2000 Automatic Capacitor Control. Familiarize yourself with the Safety Information and Safety Precautions on pages 4 and 5. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of your IntelliCap 2000 control. Designate a location where you can easily retrieve and refer to this publication.

Proper Application

> ### ⚠ WARNING
>
> The equipment in this publication is only intended for a specific application. The application must be within the ratings furnished for the equipment. Ratings for the IntelliCap 2000 Automatic Capacitor Control are listed in the ratings table in Specification Bulletin 1024-31.

Special Warranty Provisions

The standard warranty contained in S&C's standard conditions of sale, as set forth in Price Sheets 150 and 181, applies to the IntelliCap 2000 Automatic Capacitor Control, except that the first paragraph of the said warranty is replaced by the following:

(1) General: The seller warrants to the immediate purchaser or end user for a period of 10 years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within 10 years after the date of shipment, the seller

agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with the recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at the seller's option) by shipment of necessary replacement parts. The seller's warranty does not apply to any equipment that has been disassembled, repaired, or altered by anyone other than the seller. This limited warranty is granted only to the immediate purchaser or, if the equipment is purchased by a third party for installation in third-party equipment, the end user of the equipment. The seller's duty to perform under any warranty may be delayed, at the seller's sole option, until the seller has been paid in full for all goods purchased by the immediate purchaser. No such delay shall extend the warranty period.

Replacement parts provided by the seller or repairs performed by the seller under the warranty for the original equipment will be covered by the above special warranty provision for its duration. Replacement parts purchased separately will be covered by the above special warranty provision.

For equipment/services packages, the seller warrants for a period of one year after commissioning that the Wi-Fi/GPS module will provide automatic fault isolation and system reconfiguration per agreed-upon service levels. The remedy shall be additional system analysis and reconfiguration of the IntelliTeam® SG Automatic Restoration System until the desired result is achieved.

Warranty of the Wi-Fi/GPS module is contingent upon the installation, configuration, and use of the control or software in accordance with S&C's applicable instruction sheets.

This warranty does not apply to major components not of S&C manufacture, such as batteries and communication devices. However, S&C will assign to immediate purchaser or end user all manufacturer's warranties that apply to such major components.

Warranty of equipment/services packages is contingent upon receipt of adequate information on the user's distribution system, sufficiently detailed to prepare a technical analysis. The seller is not liable if an act of nature or parties beyond S&C's control negatively impact performance of equipment/services packages; for example, new construction that impedes radio communication, or changes to the distribution system that impact protection systems, available fault currents, or system-loading characteristics.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels attached to the IntelliCap 2000 Automatic Capacitor Control. Familiarize yourself with these types of messages and the importance of these various signal words:

⚠ DANGER
"DANGER" identifies the most serious and immediate hazards that will result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING
"WARNING" identifies hazards or unsafe practices that can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION
"CAUTION" identifies hazards or unsafe practices that can result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE
"NOTICE" identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

Following Safety Instructions

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE	
Read this instruction sheet thoroughly and carefully before installing or operating an IntelliCap 2000 Automatic Capacitor Control.	

Replacement Instructions and Labels

If additional copies of this instruction sheet are required, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

⚠ DANGER

The IntelliCap 2000 Automatic Capacitor Control line voltage input range is 93 to 276 Vac. Failure to observe the precautions below will result in serious personal injury or death.

Some of these precautions may differ from your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

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1. **QUALIFIED PERSONS.** Access to an IntelliCap 2000 Automatic Capacitor Control must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.

2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.

3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.

4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels. Remove tags only if instructed to do so.

5. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

Connecting to the Wi-Fi/GPS Module

Follow these steps to open the *Wi-Fi Configuration* screens for the Wi-Fi/GPS module 005-002659-01:

STEP 1. In the Windows® 10 **Start** menu select *Start>Programs>S&C Electric> LinkStart>LinkStart V4*. The *LinkStart Main* screen will open. See Figure 1.

Figure 1. The LinkStart *Main* screen.

STEP 2. Enter the serial number of the IntelliCap 2000 Automatic Capacitor Control and click on the **Connect** button. See Figure 1.

The **Connect** button changes to the **Cancel** button, and connection progress is shown on the connection status bar. See Figure 2.
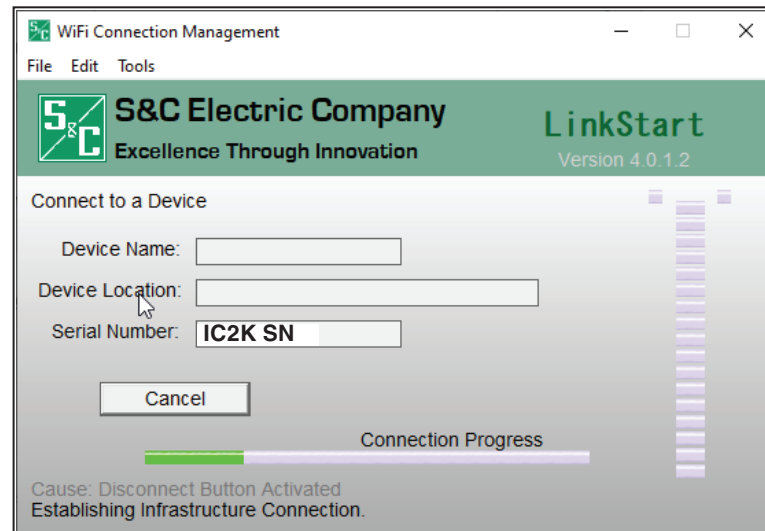

Figure 2. The connection progress status bar.

When connection is established, the status bar indicates "Connection Successful" and displays a solid green bar. The vertical bar graph indicates signal strength of the Wi-Fi connection. See Figure 3.

Figure 3. Successful connection to the Wi-Fi/GPS module.

STEP 3. Open the **Tools** menu and click on the **Wi-Fi Administration** option. See Figure 4.
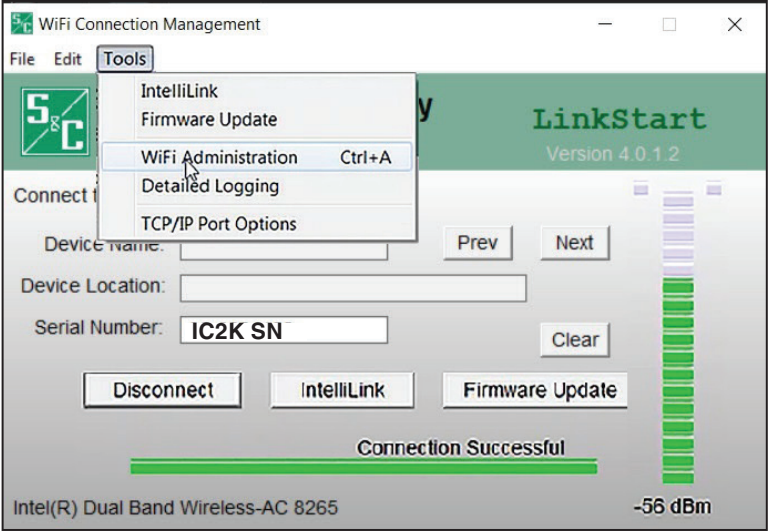

Figure 4. The Wi-Fi Administration entry on the Tools menu.

Login

The *Login* screen opens with a username and password challenge. See Figure 5. These screens are displayed in the Internet browser on the computer. The supported browser versions include Google Chrome and Microsoft Edge. The IP address is displayed at the top of the screen and is supplied by the Wi-Fi GPS module.

STEP 4. Enter your username and password and click on the **Login** button. Authentication status is displayed.

The default username and password can be requested from S&C by calling the Global Support and Monitoring Center at 888-762-1100 or by contacting S&C through the S&C Customer Portal at **sandc.com/en/support/sc-customer-portal/**.
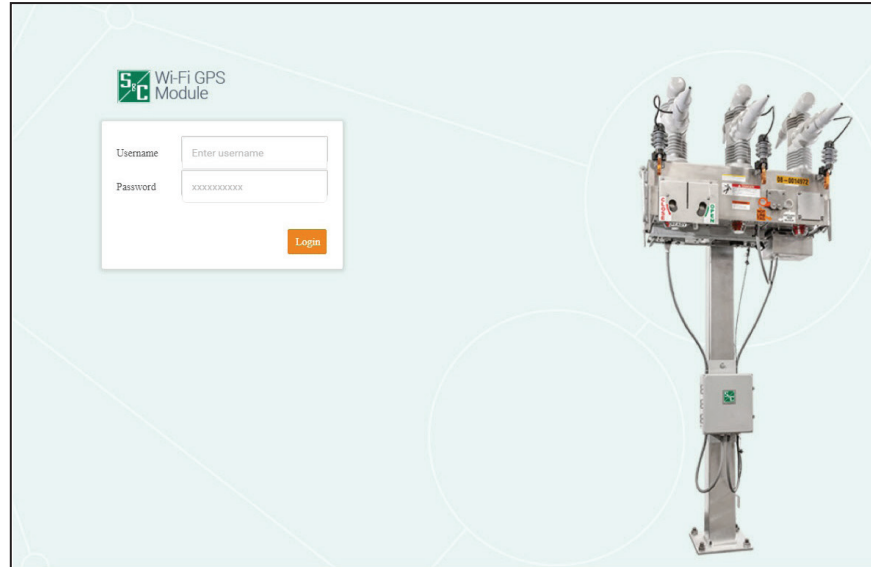

Figure 5. The *Login* screen.

When the default username and password are entered, the *Profile* screen opens and prompts assignment of a new password entry and confirmation. See Figure 6.
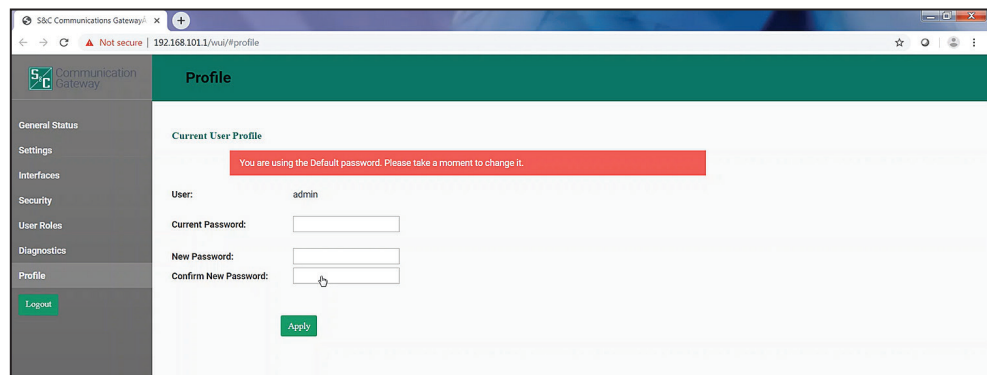

Figure 6. The *Change Password* screen.

NOTICE
In firmware versions later than 2.1, the default user password must be changed before proceeding. This step cannot be skipped because the user will be unable to navigate to any other page until the password is changed.

STEP 5. With firmware version 2.1 and earlier, to skip this screen and keep the default password setting, click on an entry in the left menu. Figures 7 and 8 show the *General Status* screen.

General Status

The *General Status* screen is informational and only displays data; no edits are allowed. Field edits are permitted in the respective menu sections where each field is defined.
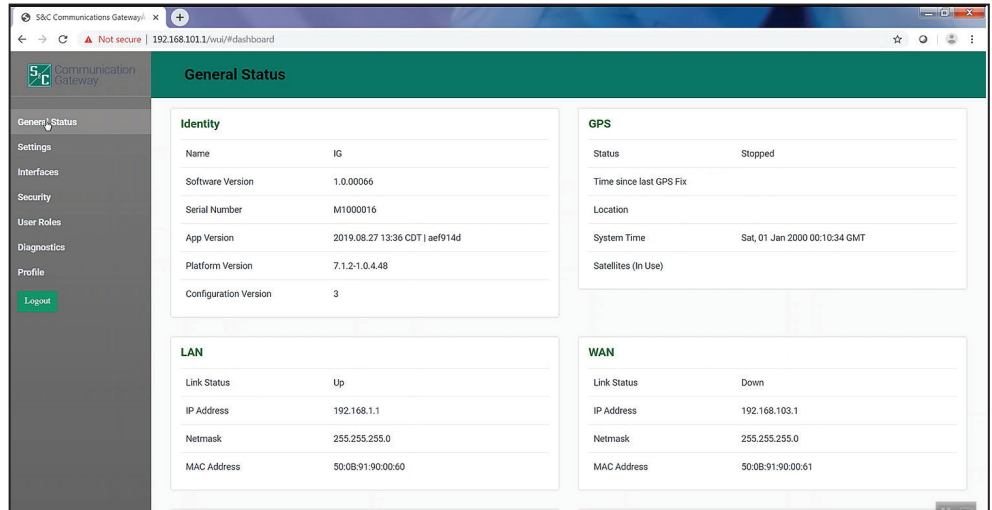

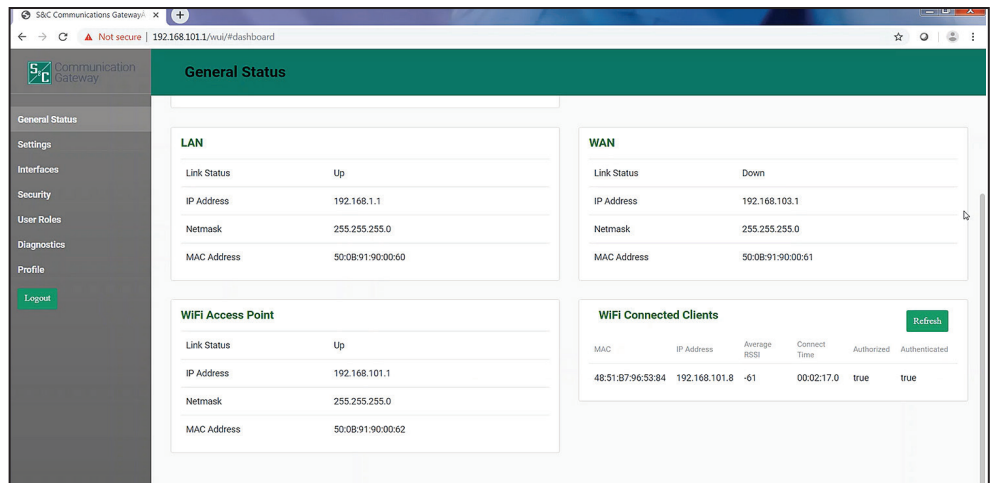**Figure 7. The top of the *General Status* screen.**

Figure 8. The bottom of the *General Status* screen.

The *General Status* screen is comprised of the Identity, GPS, LAN, WAN, Wi-Fi Access Point, and Wi-Fi Connected Clients panels. The Identity panel contains six fields: **Name**, **Software Version**, **Serial Number**, **App Version**, **Platform Version**, and **Configuration Version**. The GPS panel contains five fields: **Status**, **Time Since last GPS Fix**, **Location**, **System Time**, and **Satellites (In Use)**. The LAN and WAN panels contain four fields each: **Link Status**, **IP Address**, **Netmask**, and **MAC Address**. See Figure 7 on page 9. The Wi-Fi Access Point panel contains four fields: **Link Status**, **IP Address**, **Netmask**, and **MAC Address**. The Wi-Fi Connected Clients panel contains six fields: **MAC Address**, **IP Address**, **Average RSSI**, **Connect Time**, **Authorized**, and **Authenticated**. See Figure 8 on page 9.

Click on the **Refresh** button to update the information displayed on the *General Status* screen.

Settings

Click on the **Settings** entry in the left menu to open the *Settings* screen. See Figure 9.
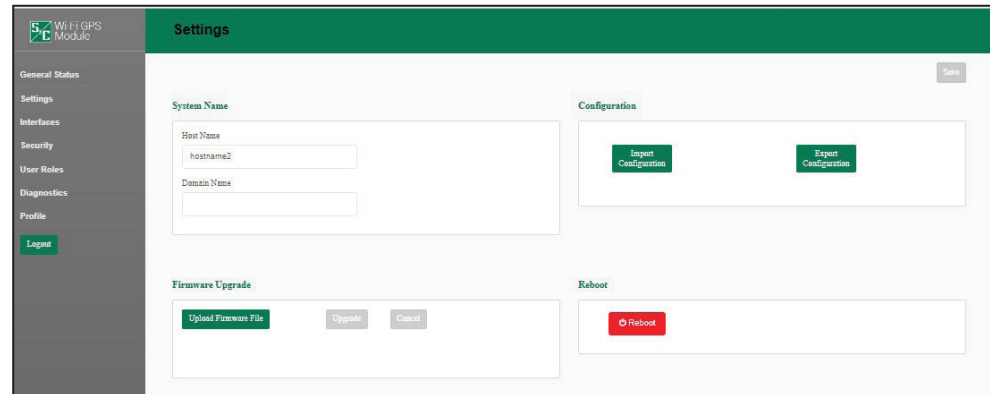
Figure 9. The System Name and Firmware Upgrade panels on the *Settings* screen.

The *Settings* screen contains the System Name, Firmware Upgrade, Configuration, and Reboot panels.

NOTICE
When a field edit is typed, the **Save** button becomes green and must be clicked for the new entry to be saved.

System Name

Enter a user-defined name for the **Host Name** setting and click on the **Save** button. The name entry is limited to 50 characters. The Host Name entry is displayed in the **Name** field on the *General Status* screen. The Domain Name entry is not used. See Figure 9.

Firmware Upgrade

This panel enables loading a firmware version onto the IntelliCap 2000 control **Wi-Fi** option.

Follow these steps to perform a firmware upgrade:

STEP 1. Download the firmware file to the computer. The firmware files are located in the S&C Customer Portal at **sandc.com/en/support/sc-customer-portal/**.

STEP 2. Click on the **Upload Firmware File** button in the Firmware Upgrade panel.

STEP 3. A Windows dialog box opens. Navigate to and select the required firmware file. The file will upload to the IntelliCap 2000 control **Wi-Fi** option. When the upload has completed, the successful upload is confirmed. Then, the communication gateway verifies the installer was securely digitally signed by S&C Electric Company.

STEP 4. After verification, a notification opens. Click on the **OK** button to dismiss the notification.

STEP 5. When the **Upgrade** button becomes active, click on it. This starts the upgrade process.

STEP 6. When the upgrade process completes, a notification opens. Click on the **OK** button. The IntelliCap 2000 control **Wi-Fi** option will be unavailable while it reboots. The reboot takes approximately 5 minutes and the *Login* screen opens when the reboot is complete.

STEP 7. Log in and confirm the new firmware has been installed successfully by checking the *General Status* screen.

Configuration Files

The Wi-Fi/GPS module can perform bulk imports and exports of specific configuration data parameters. The same XML file format is used for both import and export functions. This allows a user to configure settings in one device, export those settings into an XML file (the extension is ".json"), and import the same settings into another communication module. Clicking on the **Import Configuration** or **Export Configuration** button invokes a series of dialog boxes allowing navigation on a PC to a configuration file for import or saving a file for export. See Figure 10.
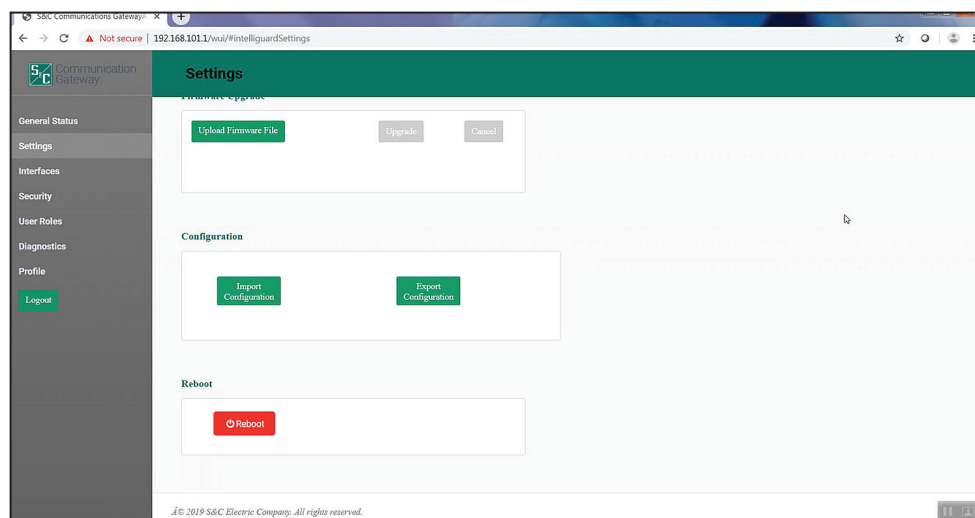

Figure 10. The Configuration and Reboot panels on the *Settings* screen.

Import Configuration

Follow these steps to complete the **Import Configuration** command:

STEP 1. In the Configuration panel, click on the **Import Configuration** button. A Web User Interface (WUI) dialog box opens.

STEP 2. Click on the **Choose File** button, which invokes a Windows file navigation box.

STEP 3. Navigate to the file.

STEP 4. Highlight the file and click on the **Open** button. The highlighted file will be identified in the WUI dialog box.

STEP 5. Click on the **Import** button.

STEP 6. Click on the **Save** button.

Export Configuration

Follow these steps to complete the **Export Configuration** command:

STEP 1. In the Configuration panel, click on the **Export Configuration** button. A WUI dialog box opens with a suggested filename for the exported configuration. The default name is "textFile" but it can be changed.

STEP 2. Click on the **Export** button.

STEP 3. Wait a few seconds for the exported file to open in your browser. The file will be stored in the Downloads folder.

Reboot

The red colored **Reboot** button enables the user to restart the communication module. See Figure 10 on page 11. When selected, a dialog box appears for confirmation of the **Reboot** command. After the **OK** button is clicked, the user interface shows an Unavailable dialog box. The entire reboot process requires approximately 5 minutes before communication to the Wi-Fi/GPS module is re-established. When the reboot is complete, the user interface will automatically load the *Login* screen.
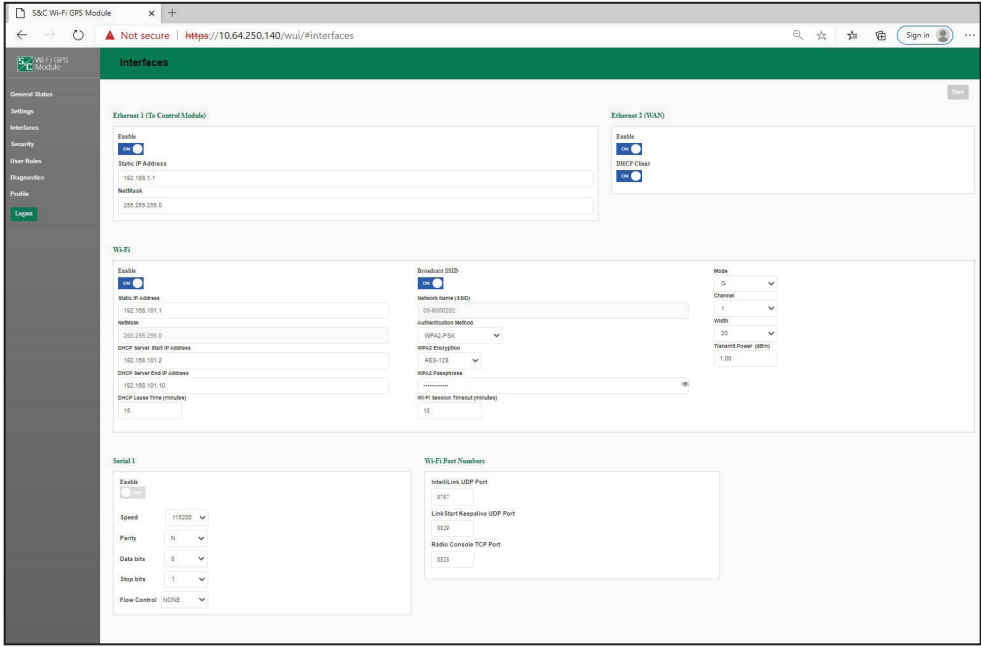
Interfaces

Figure 11. The default *Interfaces* screen.

DHCP Client State "On"

No fields require identification. A DHCP request will be initiated by the communication gateway to the WAN's DHCP server, which will assign an IP address for all data communication over the WAN.

DHCP Client State "Off:

Three fields require identification: **Static IP Address**, **Default Gateway IP Address**, and **Netmask**. The **Static IP Address** setpoint is the WAN IP address assigned to the IntelliCap 2000 control **Wi-Fi** option. The **Default Gateway IP Address** setpoint is the address of the network device up-stream of the Wi-Fi/GPS module and determines the destination of DNP3 traffic sent to the SCADA master(s). See Figure 12.

The address entries are automatically verified to be sure they function with the other values entered.
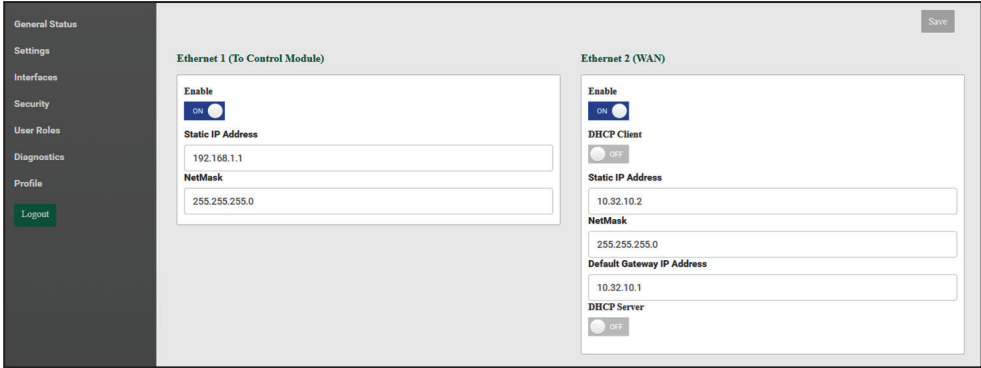

Figure 12. The *Interfaces* screen with the DHCP client disabled. Note: Ethernet is presently disabled for the Wi-Fi/control module.

DHCP Server State "On"

When the DHCP client is disabled, the DHCP server can be enabled. This allows the Wi-Fi/GPS module to automatically provide an IP address to an attached device, such as a field area network radio. See Figure 13.

Wi-Fi

The Wi-Fi panel is comprised of 15 elements: the **Enable** button, **Static IP Address**, **Netmask**, **DHCP Server Start IP Address**, **DHCP Server End IP Address**, **DHCP Lease Time (minutes)**, **Broadcast SSID** button, **Network Name (SSID)**, **Authentication Method**, **WPA2 Encryption**, **WPA2 Passphrase**, **Mode**, **Channel**, **Width**, and **Transmit Power (dBm)**. See Figure 11 on page 13.

The communication module ships with a default Static IP address of 192.168.101.1, a Netmask equal to 255.255.255.0, a DHCP server Start IP address of 192.168.101.2, a DHCP Server End IP address of 192.168.101.10. The Broadcast SSID is in the **Off** position. The **Network Name (SSID)** setting is factory configured with the Wi-Fi/GPS module serial number. The default **Authentication Method** setpoint is WPA2-PSK default. When the **Authentication Method** setpoint is in the **WPA2-PSK** setting, an additional **WPA2 Passphrase** field displays. There are no specific passphrase-style requirements. Enter the passphrase required to open a Wi-Fi connection with this Wi-Fi/GPS module serial number. The **Wi-Fi Session Timeout** field determines the time after which the session will automatically terminate from inactivity through the connections. The **Mode** setting selects the preferred Wi-Fi transmission standard (Default: N). The **Channel** setpoint can be set to a channel with less traffic. The **Width** setpoint is the channel bandwidth in MHz. This setting is only relevant when 802.11n is chosen for the **Mode** setting. If 802.11b or 802.11g is elected it will be ignored.
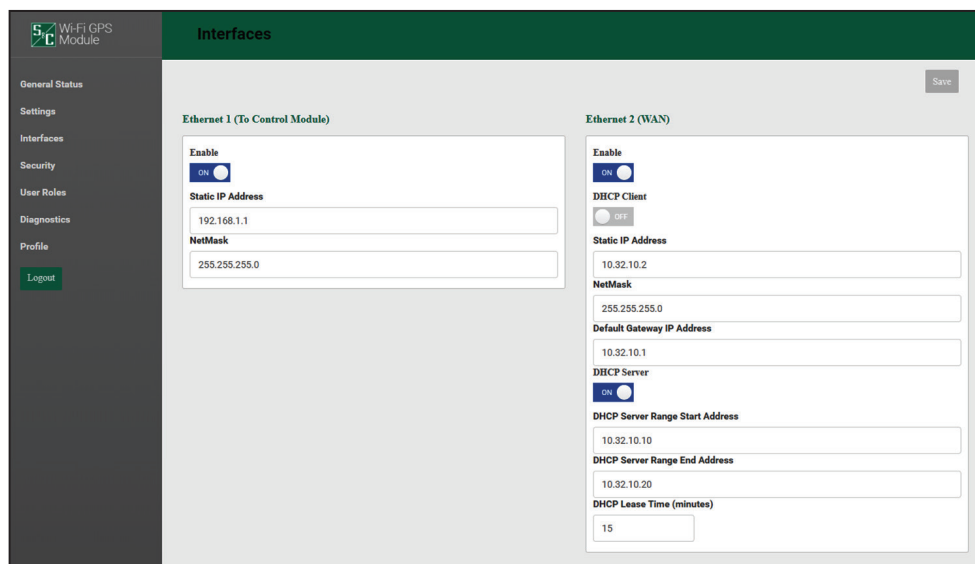

Figure 13. The *Interfaces* screen with the DHCP client disabled and the DHCP server enabled.

Serial 1 (DB9 Port)

This is the RS-232/DB9 port for connection to the radio's serial console port. If use of RTS/CTS is required, set the **Flow Control** setpoint to "NONE." See Figure 14. Use is optional. Use this port to connect to the communication devise if it has a serial configuration port, and disable the port if your IT policy requires unused ports to be disabled.

Wi-Fi Port Numbers

Enter the IntelliLink software UDP Port number and the Radio Console TCP Port number.

Wi-Fi Port Numbers

This section displays three configurable port numbers the Wi-Fi/GPS module uses to receive packets via the Wi-Fi interface.

The IntelliLink UDP port is used to receive IntelliLink local packets from a device attached via Wi-Fi. This port has a valid range of 1024-65535 and a default of 9797.

The LinkStart Keepalive UDP port is used to provide connection information to the LinkStart desktop application on the user's device. This port has a valid range of 1024-65535 and a default of 8829.

The Radio Console TCP port is used to receive packets from a Wi-Fi device intended to be redirected to the serial console interface of a field area network radio device. These packets are directed through the Wi-Fi/GPS module's DB9 port to the radio device. This port has a valid range of 1024-65535 and a default of 8828.

Note: If it is desired to modify any of these port values, the similar configuration settings in the LinkStart desktop application must also be modified. In LinkStart, click on the **Tools** tab, and then select "TCP/IP Port Options." Three similar settings must be set to the same values as the port numbers in the Wi-Fi/GPS module. In LinkStart, the IntelliCap 2000 control IntelliLink UDP port corresponds to the communication module's IntelliLink UDP port, the IntelliCap 2000 control Keepalive UDP port corresponds to the LinkStart Keepalive UDP port, and the IntelliCap 2000 control VCOM TCP port corresponds to the Radio Console TCP port.
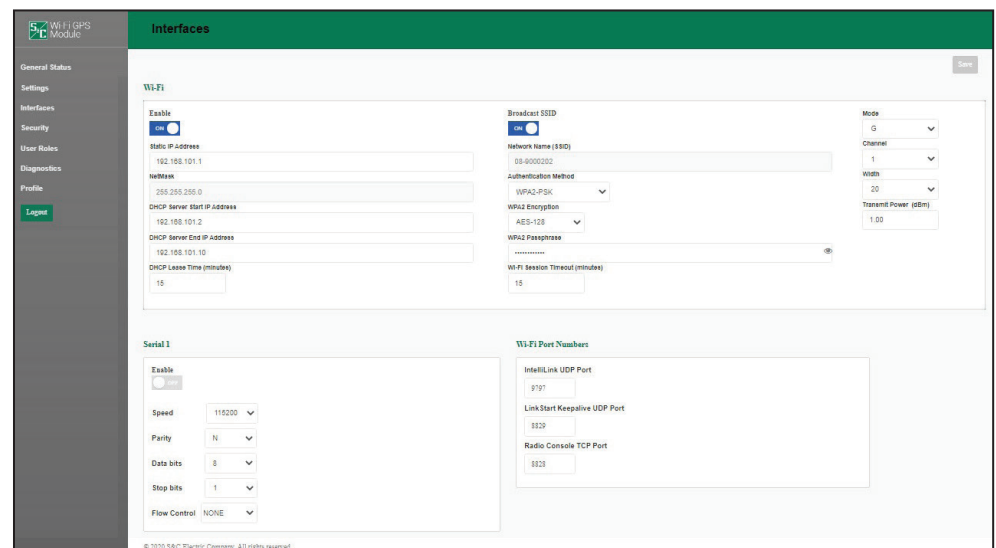

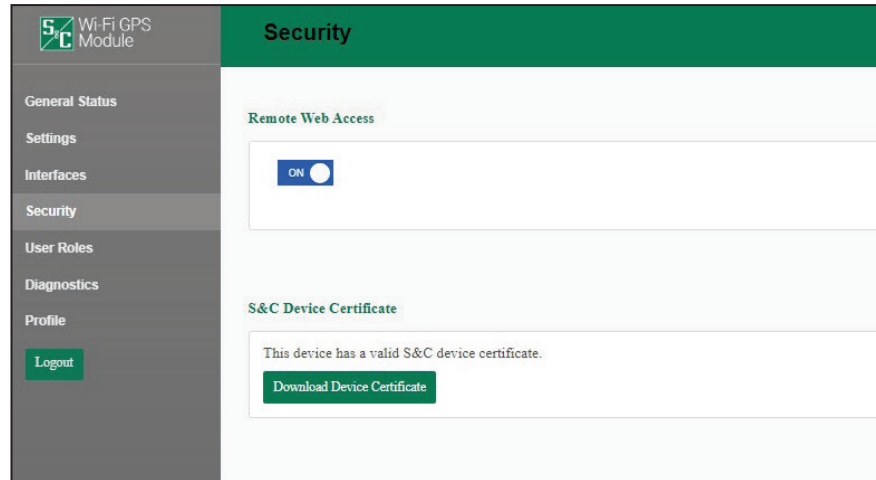**Figure 14. The default *Interfaces* screen Serial and Wi-Fi ports.**

Security

Figure 15. The *Security* screen.

Remote Web Access

To access the user interface for Wi-Fi Administration through the field area network, set the **Remote Web Access** setpoint to "on."

Note: The **Remote Web Access** setpoint is not available until the default admin password is changed and remote access requires the field area network to be routed through the Wi-Fi/GPS module.

The **Remote Web Access** toggle button enables Web-user interface access via Ethernet Port 2. This configuration setting can only be updated by the admin user, and only after the admin user has changed the default password. Web access via Ethernet Port 2 is also controlled by a DNP3 binary output setpoint, which must also be enabled to allow this traffic. See Figure 15.

NOTICE
When a SpeedNet™ Radio is the field area network radio, the remote Web user's computer will require an additional setting to be updated to enable Web access. The user must reduce the MTU (maximum transmission unit) size to a value of 500 or lower. S&C recommends using an MTU size of 500 for optimal performance. To change the MTU size, use the following command on a Windows 10 machine: **netsh interface ipv4 set subinterface "Local Area Connection" mtu=500 store=persistent**.

S&C Device Certificate

Under "S&C Device Certificate," the web page will display a message indicating whether this Wi-Fi/GPS module device has a valid factory-assigned S&C Device Certificate. A valid certificate is required to allow this Wi-Fi/GPS module to securely pair with an IntelliCap 2000 control and enable faster IntelliLink local traffic. If the Wi-Fi/GPS module does have a valid certificate, click on the **Download Device Certificate** button to retrieve and view the details of the certificate. If the Wi-Fi/GPS module does not have a valid certificate, call S&C's Global Support and Monitoring Center for additional instructions.

User Roles

The *User Roles* screen permits adding and editing users and their access privileges. The types of user roles include Admin, Engineer 1, Technician 1, and Viewer. The addition of a user is initiated by clicking on the **Add User** button. A dialog box opens with the required **User**, **Password**, and **Confirm Password** fields, and a drop-down box to select the user **Role** setpoint. Clicking on a user entry in the list opens the dialog box to edit information for that user. See Figure 16. Table 1 displays user privileges.

The Admin Role column is assigned to the system administrator, who is not included in this list, and therefore cannot be removed. The **User Roles** entry in the left menu is only available for use by the system administrator (Admin Role) and Additional Admin Role users.
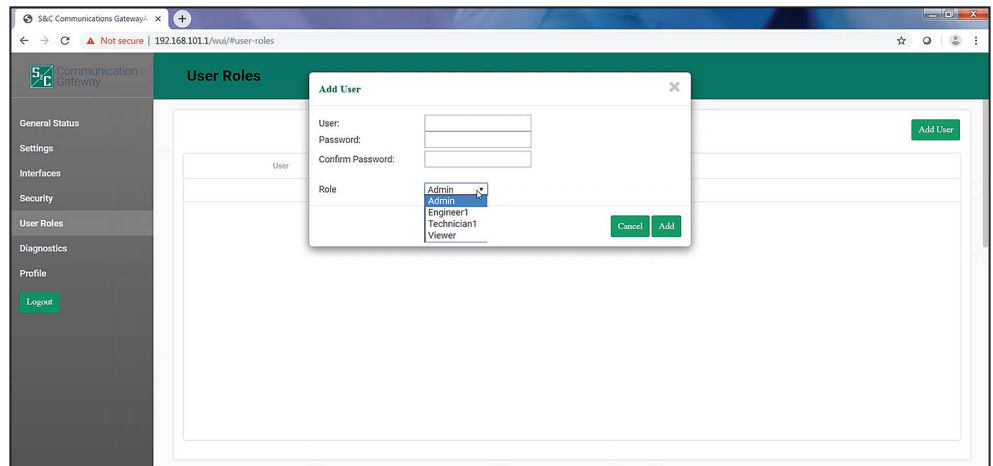

Figure 16. The *User Roles* screen.

The permissions provided to each of the user roles is summarized in Table 1.

Table 1. User Role Permissions

Page	Element Within Page	Admin Role	Additional Admin Role	Engineer 1 Role	Technician 1 Role	Viewer Role
General Status	All●	Allowed	Allowed	Allowed	Allowed	Allowed
Settings	Update Gateway Names, Import/Export Configurations	Allowed	Allowed	Allowed	Allowed	Blocked
	Install Firmware	Allowed	Allowed	Allowed	Allowed	Blocked
Interfaces	All	Allowed	Allowed	Allowed	Blocked	Blocked
Security	Install Web Server Certificate	Allowed	Allowed	Blocked	Blocked	Blocked
	Enable Remote Web Access	Allowed	Blocked	Blocked	Blocked	Blocked
User Roles	All	Allowed	Allowed	Blocked	Blocked	Blocked
Diagnostics	All	Allowed	Allowed	Allowed	Allowed	Allowed
Profile	All	Allowed	Allowed	Allowed	Allowed	Allowed

● Without a selected permission role, access is read-only.

Diagnostics

The *Diagnostics* screen initiates the retrieval of the Diagnostic and Event Log files. See Figures 17 and 18.
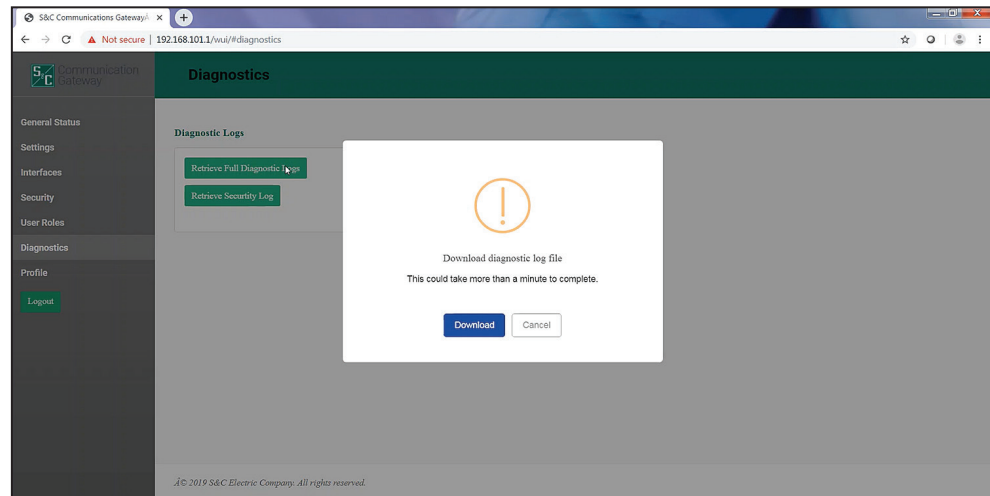

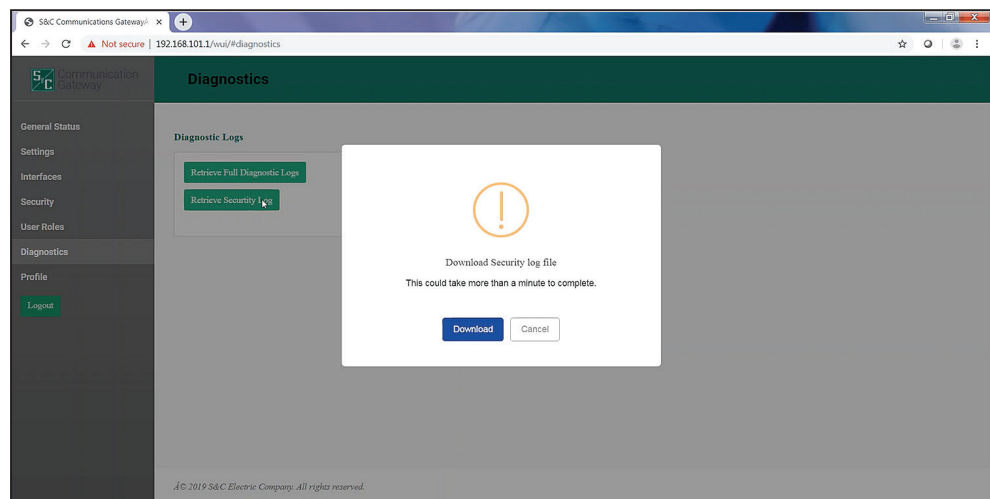**Figure 17. The Retrieve Full Diagnostics Logs button on the *Diagnostics* screen.**

Figure 18. The Retrieve Security Log button on the *Diagnostics* screen.

Profile

The *Profile* screen enables the present user logged in to the Wi-Fi/GPS module to change password credentials. See Figure 19.
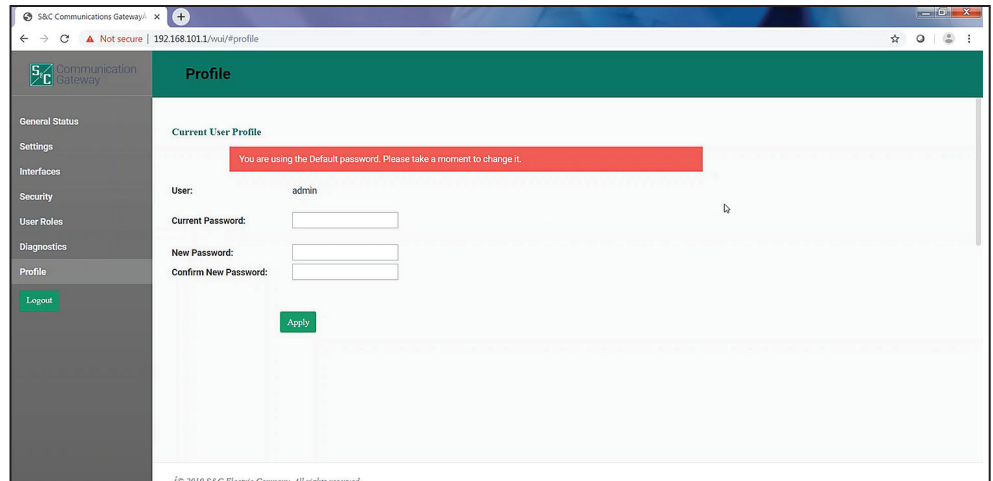

Figure 19. The *Profile* screen.

The password entry must be at least 8 characters in length and with one lowercase and one uppercase character. When entries are complete, click on the **Apply** button to save the new password.

Logout Button

Clicking on the **Logout** button in the left menu closes the Wi-Fi Administration program and returns to the *LinkStart Main* screen. See Figure 1 on page 6.

1. RJ45 - Ethernet1 Not Used
2. RJ45 - Ethernet2 Not Used
3. USB (Only used for production purposes)
4. J6 - DB9 Connector
5. J11 - WiFi antenna – RP SMA
6. J12 - GPS antenna – SMA
7. J2 - Power
8. LED's
 a. Blue – Power on indicator
 b. Amber – uP pulse indicator
 c. Yellow – Bootup pulse indicator
9. J15 – Serial
10. J16 – WiFi Serial
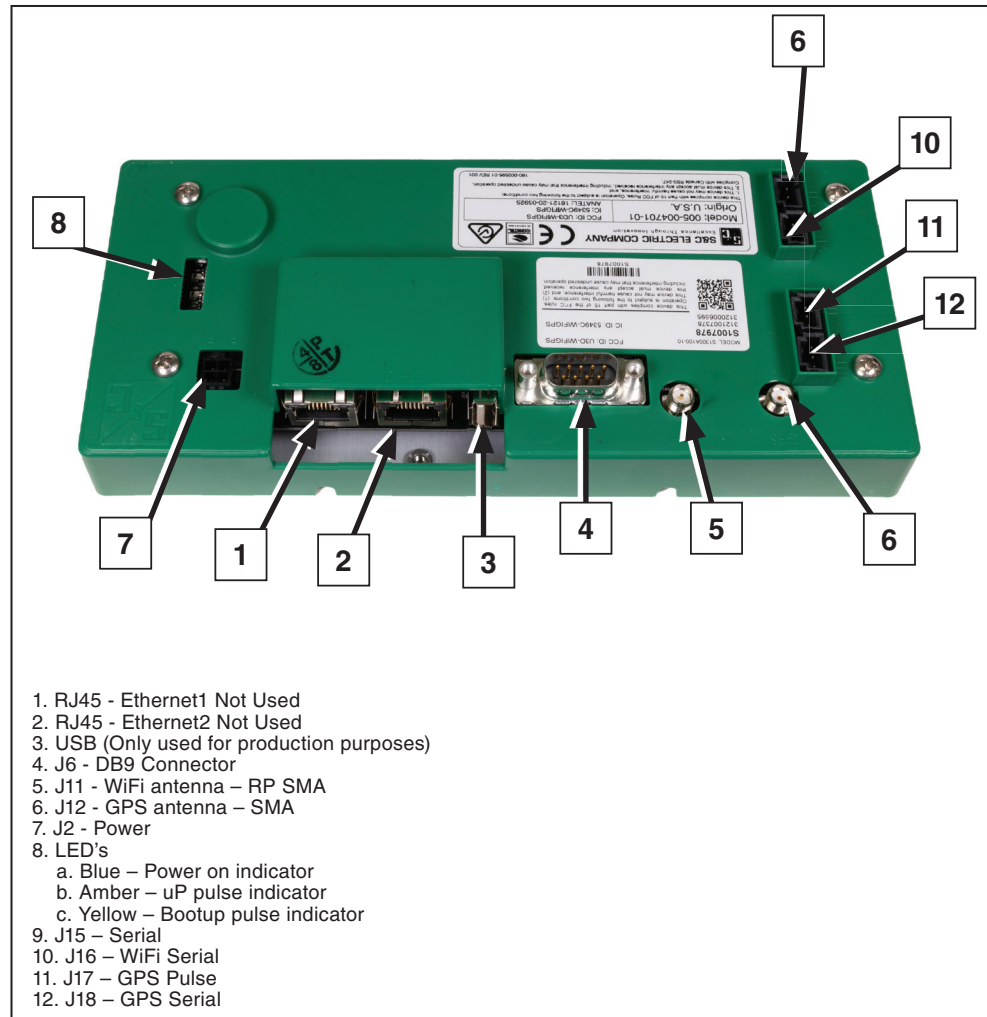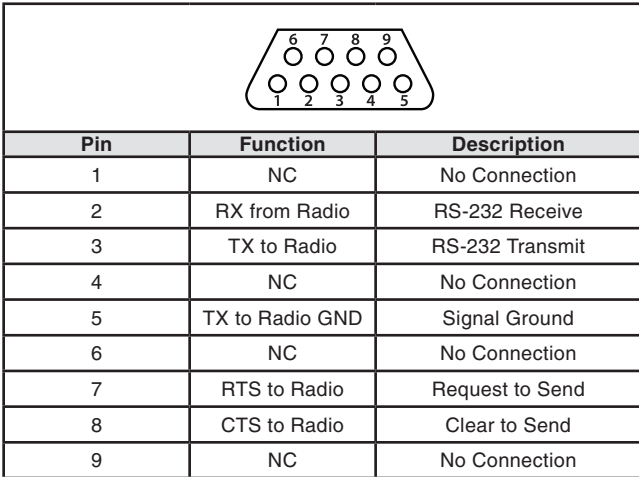11. J17 – GPS Pulse
12. J18 – GPS Serial

Figure 20. The Wi-Fi/GPS module connectors.

Interface Pinouts

The RS-232 Radio Maintenance Port of the Wi-Fi/GPS module is configured as data-terminal equipment. See Figure 21.

Pin	Function	Description
1	NC	No Connection
2	RX from Radio	RS-232 Receive
3	TX to Radio	RS-232 Transmit
4	NC	No Connection
5	TX to Radio GND	Signal Ground
6	NC	No Connection
7	RTS to Radio	Request to Send
8	CTS to Radio	Clear to Send
9	NC	No Connection

Figure 21. The Wi-Fi/GPS module RS-232 interface pinout.