Digi EX15

User Guide

Revision history 90002344

Revision	Date	Decription
A	April 2019	Initial release of the *Digi EX15 User Guide*.
B	September 2019	Firmware release 19.8.1.43. ■ Changes to passthrough mode configuration.

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Customer support

Gather support information: Before contacting Digi technical support for help, gather the following information:

- Product name and model
- Product serial number (s)
- Firmware version
- Operating system/browser (if applicable)
- Logs (from time of reported issue)
- Trace (if possible)
- Description of issue
- Steps to reproduce

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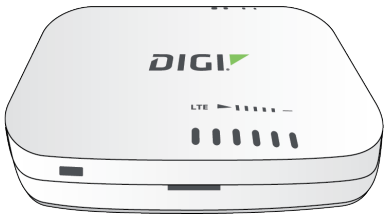
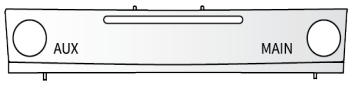
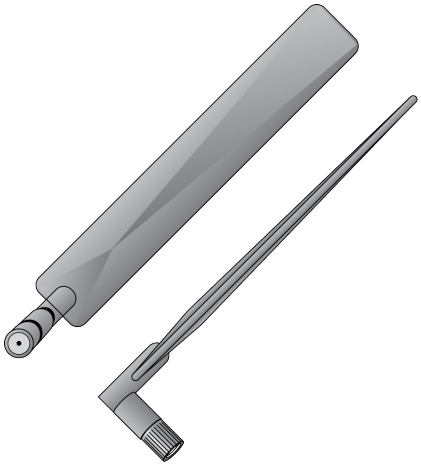
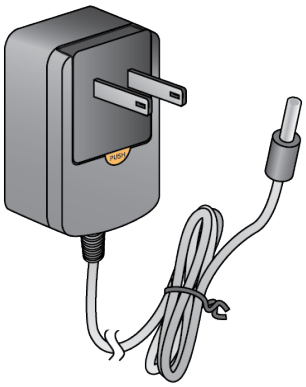
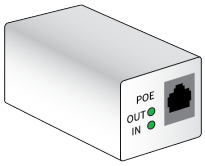
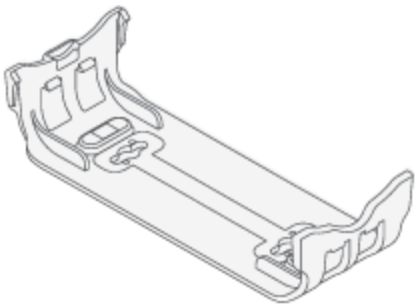
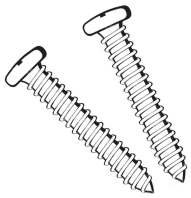
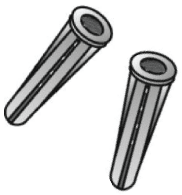
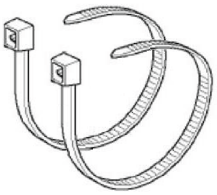
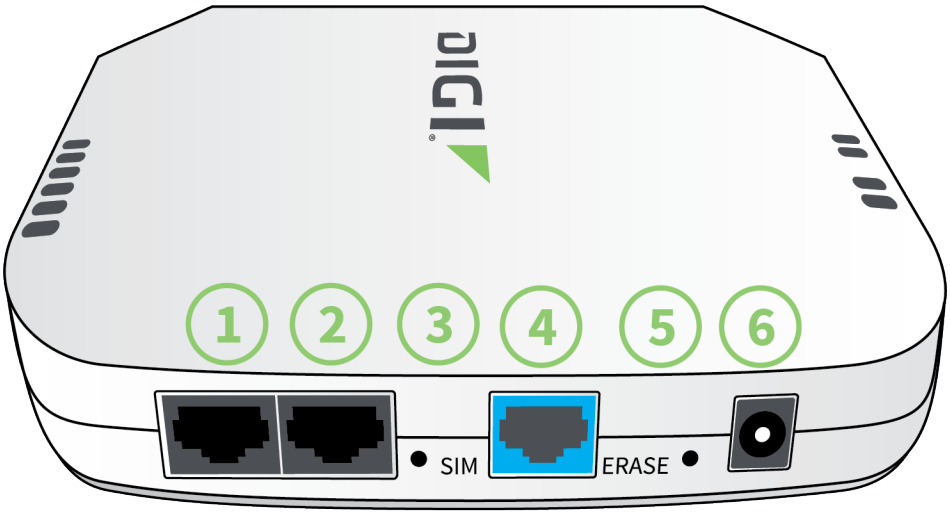
Package contents

Item	Description
	**Digi EX15 unit**
	Digi 1002-CM unit **Note** The 1002-CM unit included in your box may be branded for Digi Accelerated rather than for Digi.
	CM unit anchor screws ■ 1 Phillips head ■ 1 hex head
	**CM unit cover plate**
	**Cellular antennas (2)**

Item	Description
	**Power supply**
	Temporary battery pack
	Ethernet cables: ■ 1 x 18 inch ■ 1 x 156 inch
	**Passive power-over-Ethernet injector**

Item	Description
	**Mounting bracket**
	Ceiling rail clips, narrow (2)
	Ceiling rail clips, wide (2)
	**Screws (2)**
	**Drywall anchors (2)**
	**Zipties (2)**

Hardware features



1. **LAN/PoE** Port
2. **WAN** Port
3. **SIM** Button

   The SIM button is used to manually toggle between the two SIM slots included in the CM module.
4. **SERIAL** Port
5. **ERASE** Button

   The **ERASE** button is used to perform a device reset, and it has three modes:

   a. **Configuration reset**: Pressing the **ERASE** button one time will reset the device configurations to the factory default. It will not remove any automatically generated certificates and keys.

   b. **Full device reset**: After the device reboots from the first button press, press the **ERASE** button again before the device is connected to the internet to also remove generated certificates/keys.

   c. **Firmware reversion**: Press and hold the **ERASE** button and then power on the device to boot to the version of firmware that was used prior to the current version.
6. Power Socket

7. LTE connection indicator
8. LTE signal strength

9. LAN/WAN indicator
10. SIM 1/2 indicator

Plug-in LTE modem

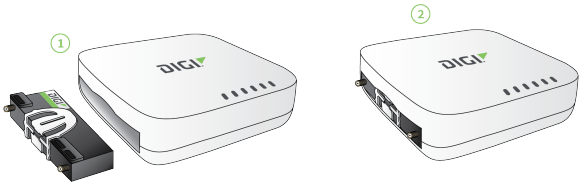
There is a label on the bottom of the Digi EX15 that indicates the plug-in modem IMEI number.

(The modem is referred to as the **Digi 1002-CM**.)

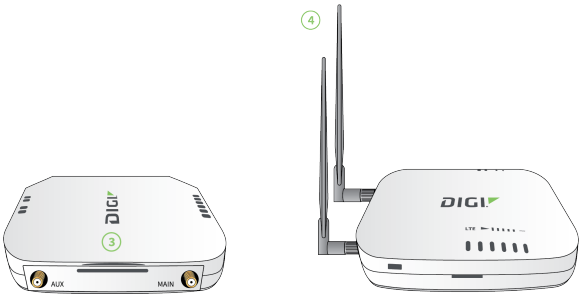
Verify the IMEI number is an exact match to that on the plug-in modem itself, as well as the label on the device's packaging.

1. Identify the SIM 1 and SIM 2 slots. If using only one SIM card, insert it into SIM 1. A second SIM may be inserted into slot SIM 2 for an alternate wireless carrier.
2. With the antennas SMA connectors pointing outward, slide the Digi 1002-CM modem into the Digi EX15

device. A clicking sound will indicate it is properly inserted.

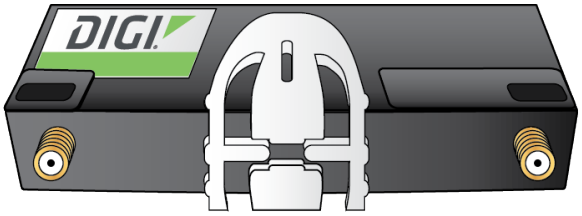


3. Slide the white plastic plate over the antenna connectors to cover the plug-in modem as shown; it will clip into place.
4. Affix the cellular antennas to the two connectors protruding from the device.



Note Be sure to use the plate with the cut outs for the antenna connectors.

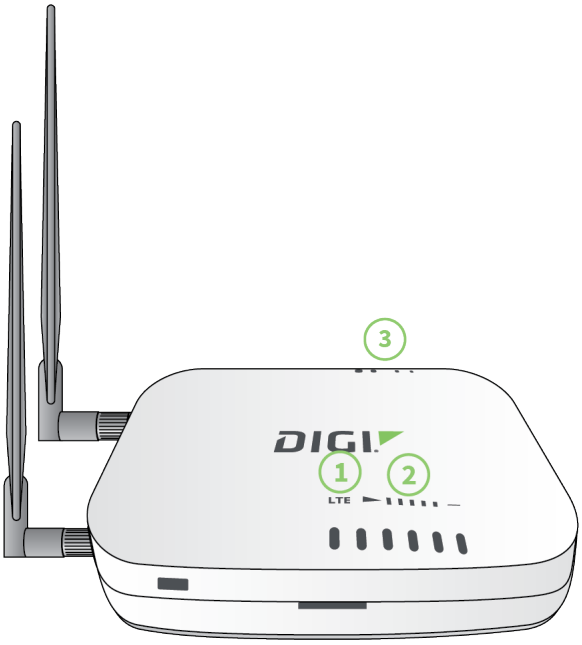
To remove the plug-in LTE modem, pinch the two vertical sides of the white clip (as shown below) and slide out the modem.



Device status LEDs

Once power has been established, your device will initialize and attempt to connect to the network. Device initialization may take 30-60 seconds. By default your Digi EX15 will attempt to use DHCP to establish an Internet connection either through its cellular modem or the ethernet port .

1. Cellular connectivity status is indicated by the color-coded LTE light.
2. Indicator lights on the Wireless Strength Indicator show you the cellular network signal strength.
3. Ethernet connections are confirmed via the light corresponding to the Digi EX15 port number.



LTE status indicators

Network Status LED

Solid Yellow
Initializing or starting up.

Flashing Yellow
In the process of connecting to the cellular network and to any device on its LAN port(s).

Flashing White
Established LAN connection(s) and is in the process of connecting to the cellular network.

Flashing Green
Connected to 2G or 3G and is in the process of connecting to any device on its LAN port(s), or nothing is connected to the port.

Solid Green
Connected to 2G or 3G and also has a device linked to a LAN port.

Flashing Blue
Connected to 4G LTE and in the process of connecting to a device on its LAN port(s).

Solid Blue
Connected to 4G LTE and also has a LAN connection.

Alternating Red/ Yellow
Upgrading firmware. **WARNING: DO NOT POWER OFF DURING FIRMWARE UPGRADE.**

Signal strength indicators

Signal Bars	Weighted dBm	Signal Strength %	Quality
	-113 to -99	0 - 23%	Bad
	-98 to -87	24 - 42%	Marginal
	-86 to -76	43 - 61%	OK
	-75 to -64	62 - 80%	Good
	-63 to -51	81 - 100%	Excellent

The ***weighted dBm*** measurements are negative numbers, meaning the smaller negative values denote a larger number. So, for example, a **-85** is a better signal than **-90**.

Note For more information regarding how signal strength is calculated and subsequently displayed via the LED indicators, refer to Signal bars explained.

Signal bars explained

The LTE signal status bars are calculated using various algorithms based on the network type it is connected to. For 4G LTE, the RSRP, SNR, and RSSI values are all factored in to determine the reported signal strength bars. For 3G networks (including HSPA+) and 2G networks, the signal strength bars are determined by the RSSI value.

4G LTE algorithm

Determine RSRP, SNR, and RSSI values separately, using the following

```
RSRP > -85, rsrp_bars=5
-95 < RSRP <= -85, rsrp_bars=4
-105 < RSRP <= -95, rsrp_bars=3
-115 < RSRP <= -105, rsrp_bars=2
-199 < RSRP <= -115, if we're connected to the cellular network, rsrp_bars=1,
if not rsrp_bars=0
```

If RSRP <= -199, then use RSSI as the value and run it through the same algorithm described above.

```
SNR >= 13, snr_bars=5
4.5 <= SNR < 13, snr_bars=4
1 <= SNR < 4, snr_bars=3
```

```
-3 < SNR < 1, snr_bars=2
-99 < SNR <= -3, if we're connected to the cellular network, snr_bars=1, if not
snr_bars=0
```

Once the snr_bars and rsrp_bars are determined, use the lesser of the two. That is the reported signal strength bars.

3G algorithm

Determine RSSI signal strength.

```
RSSI > -80, bars=5
-90 < RSSI <= -80, bars=4
-100 < RSSI <= -90, bars=3
-106 < RSSI <= -100, bars=2
RSSI <= -106, if we're connected to the cellular network, bars=1, if not bars=0
```

bars is then reported as the signal strength bars.

2G algorithm

Determine RSSI signal strength.

```
RSSI > -80, bars=5
-89 < RSSI <= -80, bars=4
-98 < RSSI <= -89, bars=3
-104 < RSSI <= -98, bars=2
RSSI <= -104, if we're connected to the cellular network, bars=1, if not bars=0
```

bars is then reported as the signal strength bars.

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Site survey

A cellular site survey is not necessary if your anticipated installation location is known to have strong cellular signal strength. If you are unsure of available cellular signal strength or are choosing between several installation locations, follow the below instructions to perform a site survey to determine your best possible installation location. After the optimal location has been determined, set up the Digi EX15 with either the power supply unit or the PoE injector cable.

1. During a site survey it is useful to use the included battery pack instead of the power supply unit to power the Digi EX15. The battery pack will power your device for approximately two hours while you perform your site survey. The battery pack is not rechargeable and should be properly disposed of after use.
2. Move the Digi EX15 to different locations within your site to determine the best compromise between signal strength and installation constraints. Since cellular signal strength may fluctuate, it is important to wait at each location for 1 minute while observing the signal strength indicator on the front of the device. Minimum cellular signal strength for proper operation is 2 bars.
3. After the optimal location has been determined, remove the battery pack and connect either the main power supply unit or PoE injector cable (see Physical installation).

Note After the optimal location has been determined, set up the Digi EX15 with either the power supply unit or the PoE injector cable.

Site survey troubleshooting

If you are unable to verify a location with a strong cellular signal:

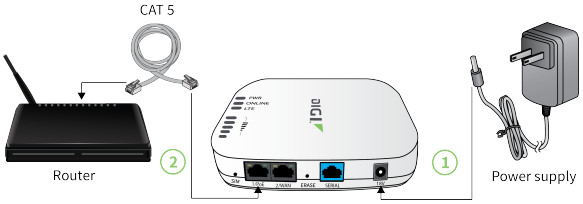
- Verify your SIM has been activated with your cellular operator.
- If you do not get a cellular signal when the Digi EX15 is located indoors, then take the device outdoors to verify that your cellular network operator has coverage in your location.
- If the outdoor cellular signal strength is less than 2 bars, it may be necessary to connect using a different cellular network operator. This requires an activated SIM from the alternate cellular network operator.
- Try the device/antennas in different orientations and away from other nearby electronic equipment at each test location.

  Note LTE requires the use of both antennas & antennas will usually give better performance when vertical.

- Refer to Device status LEDs to use the Digi EX15 indicator lights to aid in diagnosis.

Physical installation

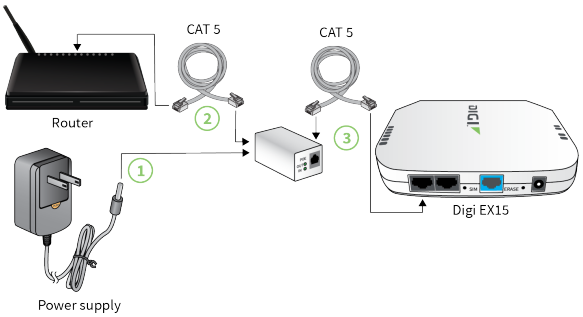
Connecting to the site network with local power



1. Plug the power supply unit into an AC power outlet
2. Connect the PSU to the Digi EX15.

Connecting to the site network with remote power

If your device needs to be positioned some distance from either the nearest AC power outlet or site network equipment, using the included passive Power-over-Ethernet (PoE) injector will simplify the installation cabling and allow for improved cellular signal strength. The POE injector cable allows the DC power and Ethernet connection to be run to the Digi EX15 via the Ethernet connection only.



1. Plug the power supply unit into an AC power outlet and connect to the PoE injector.
2. Connect the male RJ45 connector plug of the POE injector cable to the site network equipment/router.
3. Connect a standard Ethernet cable from the RJ45 socket/jack on the POE injector cable, (marked **DC OUT**), to the LAN/PoE Ethernet port of the Digi EX15.

Remote power troubleshooting

The LED marked **IN** will illuminate when the PoE injector is receiving power from the PSU. The LED marked **OUT** lights up green when an Ethernet connection is recognized by the Digi EX15.

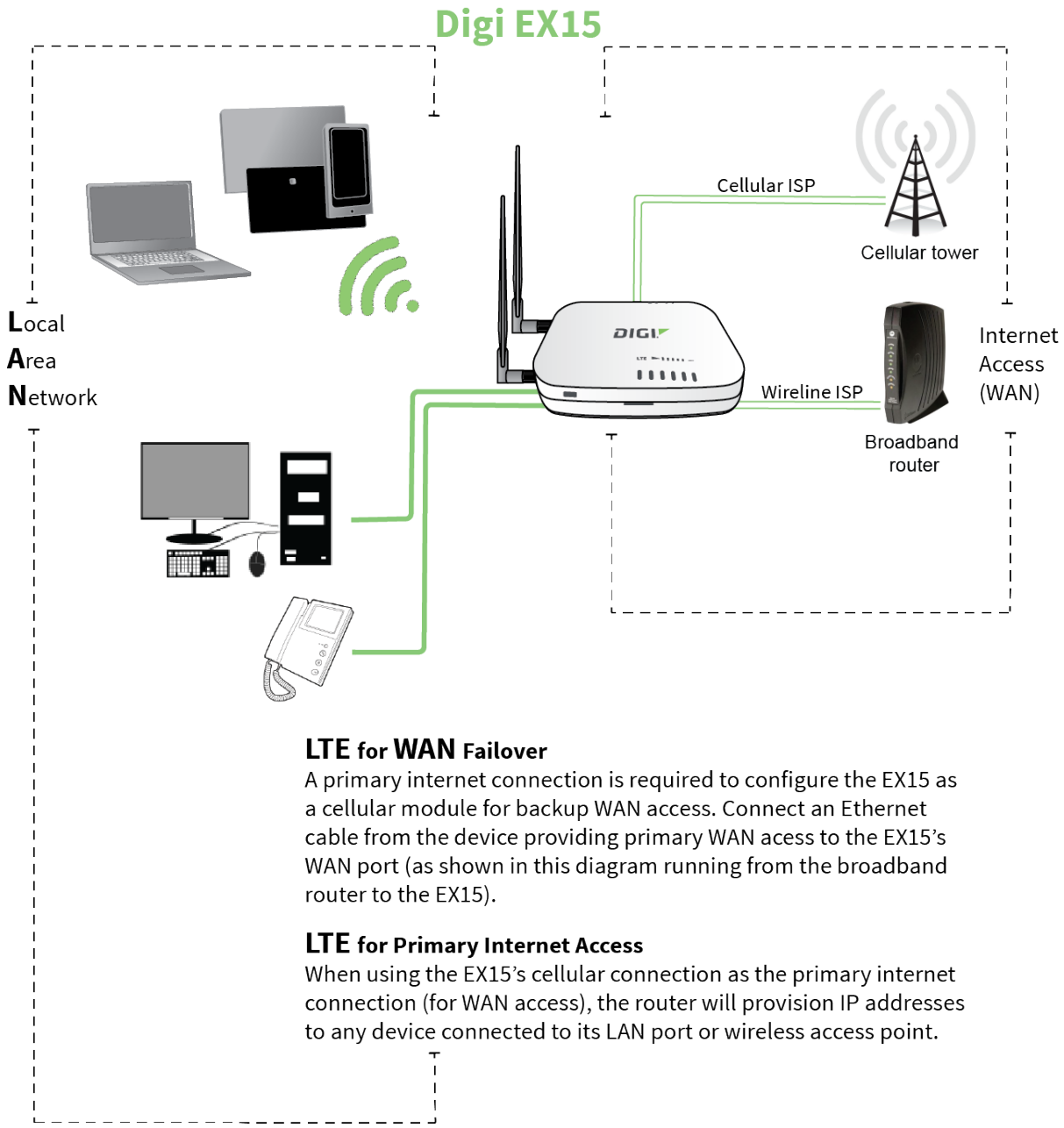
If the **IN** LED is not illuminated check the following:

- Ensure that the PSU is plugged into an AC power outlet and is receiving power.
- Ensure that the PSU power plug is correctly connected to the POE injector cable power input socket.

If the **OUT** LED is not illuminated after connecting to the Digi EX15, verify the integrity of the Ethernet cable.

Note The PoE injector must be connected to LAN port 1 on the Digi EX15 for the device to properly receive power.

Network integration



Note The Digi EX15W is WiFi-enabled. The Digi EX15 does not offer WiFi capabilities.

A second internet connection must be available for cellular failover.

When integrating a second Internet connection for cellular failover, connect the alternative ISP to the WAN port. This interface is configured for WAN access by default though ports can be reconfigured as necessary.

Default settings

Option	Default settings
Ethernet ports	■ Port 1 is configured as a LAN port in passthrough mode and will receive the passthrough IP address of the Digi EX15 cellular modem connection. ■ Port 2 is configured as a WAN port and will accept a DHCP IP address from an existing local network router.
Interface priorities	■ WAN is set at a metric of 1. **Note** This metric sets the WAN port as the Digi EX15 primary network connection. ■ Modem (cellular) is set at a metric of 3.
Modem configuration	■ SIM failover after 5 attempts. ■ Carrier Smart Select enabled.
Network settings	■ The Digi EX15 is configured to run in passthrough mode by default.
WAN failover conditions	■ Connectivity monitoring enabled for WAN. ■ HTTP and Ping test: 4 attempts set a 30s interval.
Security policies	■ Packet Filtering set to block all inbound traffic. ■ SSH, Web Admin, and Local GUI access enabled.

Configuring the device

Network managed configuration

Your Digi EX15 has the capability to automatically sync and receive all settings from a centralized cloud management tool, aView.

The aView management portal provides the following capabilities:

- Monitoring details including signal strength, network connectivity details (RSRP, CNTI, RSRQ, Ec/Io, and so on), SIM card details (IMEI, IMSI, ESN, and so on), data transmitted/received, and more.
- Email notifications based on connectivity, device firmware, and signal strength.
- Remote control.
- Out of band SMS recovery.

Devices using aView typically require no additional configuration or setup.

Local configuration

If your Digi EX15 is not provisioned in aView, it will use a default local configuration profile which will enable basic cellular connectivity (primary or backup) to your device.

To change any default settings for a Digi EX15 not provisioned in aView, refer to Local device management.

Local device management

Note Digi recommends you manage your device centrally using aView.

If you are not using the aView portal, you must manage and configure your device via the local interface.

Connect to the device using its Gateway IP address **192.168.210.1** by default.

The default user for logging into the device will vary:

- The default user is **root**:
  - If the device is at a firmware level 19.8.x or older.
  - If the device has been upgraded from 19.8.x or older to 19.11.x or newer.
- The default user is **admin**:
  - If the device is at 19.11.x or newer when manufactured.
  - If the device has been upgraded from 19.8.x or older to 19.11.x or newer and has been factory reset after the upgrade.

The default password is the unique password printed on the label packaged with your device.

Once logged in via the local web interface, click on the **Configuration** link. You will initially be shown a limited set of configuration options. Start by enabling local management of the device.

1. Uncheck box next to **Enable central management**.
2. (optional) If this is the first time the device has been configured, you will also need to update the default user's password, under **Users -> admin-> Password** or **Users -> root > Password**.

   Note Passwords are case sensitive.

3. Click **Save**.

   After saving the profile, the device will no longer attempt to sync with aView and a full range of available configuration options will be visible. Clicking the down arrow next to the name of a configuration option will display a pop-up providing help details about that option, including any default values.

   The local management portal offers the same configuration options as aView, although changes made here will not sync with the cloud.

Define a custom APN

If your device is unable to sync with aView because the device cannot establish a cellular connection without a custom APN, it will need to be managed locally before remote configuration will be possible.

To do so:

1. Connect to the device's local UI by navigating to its default gateway address in a web browser. See Local device management for more information.

2. From the **Configuration** tab, enter the name of the APN that should be associated with this device.
3. Optional: If the custom APN requires a specific username and password, input those into the corresponding fields.
4. Click the **Save** button to finalize any changes.

Enable router mode

This procedure assumes that the Digi EX15 device is operating under default settings, which provides passthrough connectivity to a device connected on port 1 of device. See Default settings for more information about the device's default settings. Also, refer to About aView for details on how to configure the Digi EX15 device by using aView, or Local device management if you are managing the device without aView.

1. Click to expand **Network -> Interfaces -> LAN.**
2. Select the **Enabled** checkbox.
3. For **Interface type**, select **Ethernet**.
4. Set the IP address for the device:
   a. Click to expand **IPv4**.
   b. For **Type**, select **Static IP Address**.
   c. For **Address**, type the IP address you wish to assign to the device for its LAN DHCP network (that is, the gateway IP for the DHCP network).
5. Enable the device's DHCP server:
   a. Click to expand **DHCP server**.
   b. Click **Enable**.
6. Click **Save** to apply the configuration changes.

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Connecting to the serial port

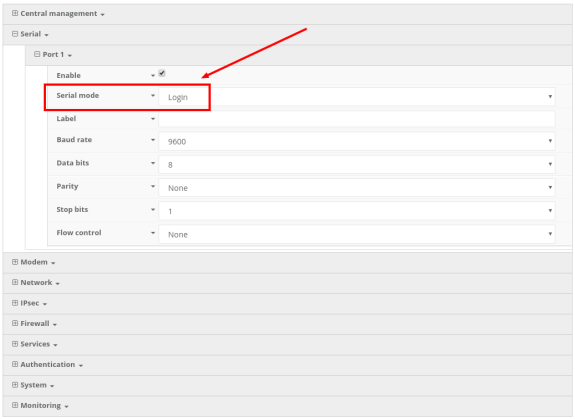
The RS232 serial port on the Digi EX15 provides two modes of functionality:

- **Login**—provides login access to device.
- **Remote access**—Remote OoB access to the console of another client device.

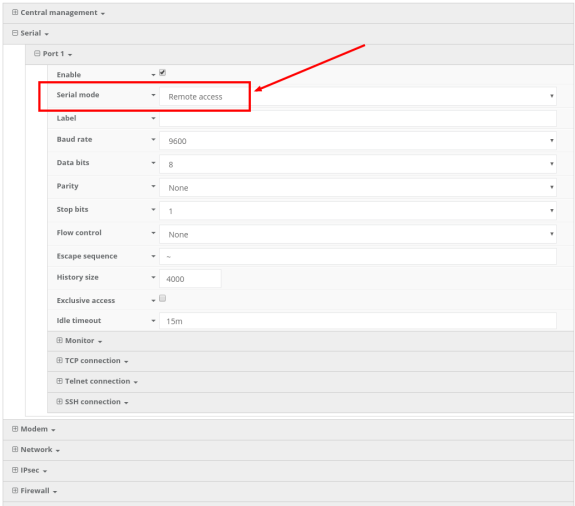
By default, the Digi EX15 serial port operates in the **Login** mode.

You must use a cable with an RJ45 connector to connect to the Digi EX15 with a RJ45, DB9F or DB9M connector, as determined by your device type, to terminate to your device. Consult the user guide for the device you are connecting to the Digi EX15 to determine the connector type, cable type, and pinout positions for your specific device.

The serial port is enabled by default.



If the Digi EX15 serial mode is set to **Remote access**, the network device connected to the Digi EX15 serial port may be accessed using the aView terminal window, the Digi EX15 local web GUI, TCP, telnet, or SSH connections. TCP, telnet and SSH connections to serial ports are disabled by default and must be enabled by a device specific configuration.



Connect the network devices to the Digi EX15 serial port using the pinout information in Serial port pinout and use.

Serial port pinout and use

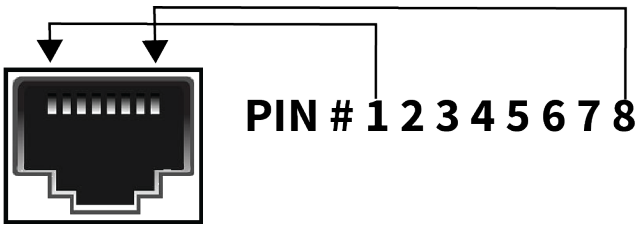
The RS232 standard requires support for baud rates up to 9600 baud on shielded multicore cable up to 50 feet (15 meters) long. For the Digi EX15, the use of standard CAT 5 cables enables serial communication at all baud rates up to 50 feet. CAT5 unshielded twisted pair cable lengths much longer than 50 feet have been verified at 9600 baud but are non-standard and are not guaranteed.

The Digi EX15 RS232 serial port is DTE and has the following pin configuration:

Pin 1	RTS	Request to send	Output from Digi EX15
Pin 2	DCD	Data carrier detect	Input to Digi EX15
Pin 3	RXD	Receive data	Input to Digi EX15
Pin 4/5	—	Ground	Signal ground
Pin 6	TXD	Transmit data	Output from Digi EX15
Pin 7	DTR	Data terminal ready	Output from Digi EX15
Pin 8	CTS	Clear to send	Input to Digi EX15

Note Ring indicate (RI) and data set ready (DSR) are not implemented.

The serial port uses a female RJ45 jack to enable connection using UTP Ethernet cabling.



Getting started with aView

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About aView

The following actions are typically performed by your network administrator.

Changes can be made either at the device or group level. Select override from any given menu item to edit its inherited value, or navigate to the Digi EX15 group configuration page to update the config profile shared between all devices belonging to this group.

It is recommended that aView centrally manages the Digi EX15 devices; only resort to local management as necessary. For any questions regarding how to access aView, please contact Digi support or your purchasing partner.

Viewing and editing group configurations

To bring up a device in the configuration portal:

1. Use the search bar to filter devices by **MAC address**.

   Note The device MAC address is on its bottom label.

2. Select the MAC address of your unit and bring up its **Details** page.
3. Navigate to the **Configuration** tab of the left-side menu.
4. Follow the **Edit Group Configuration** link.
5. Adjust the necessary settings, clicking the Update button to apply any changes.

   Devices will automatically apply configuration updates after the next daily sync (1am UTC by default). Refer to Using remote commands for details on how to apply changes sooner.

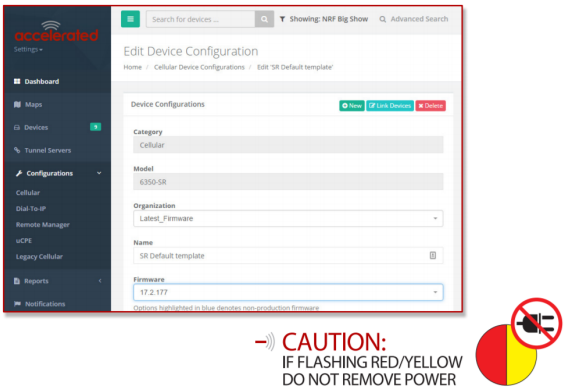
Upgrading firmware

WARNING! When the Digi EX15 is updating firmware, its LEDs will flash red and yellow. Do NOT remove power from the device during this process.

To view or select new firmware:

1. Navigate to the **Configuration** tab of the left-side menu.
2. Follow the **Edit Group Configuration** link.
3. Locate the **Firmware** pull-down menu.
4. Select the intended version and wait for the settings to finish loading.

5. Click on the **Update** button at the bottom of the page to confirm firmware selection.



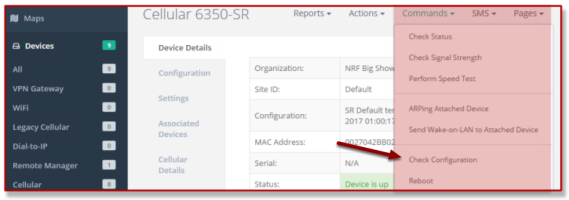
Using remote commands

aView maintains a connection to all online client devices registered with the service.

Using this tunnel, network administrators can send a specific set of remote commands that will be received immediately as opposed to waiting to check in and apply any changes propagated from the cloud. The following remote commands are available:

- Check Status
- Check Signal Strength
- Perform Speed Test
- ARPing Attached Device
- Send Wake-on-LAN to Attached Device
- Check Configuration
- Reboot

Remote commands must be sent to each device in question. To do so, browse to the **Device Details** screen and select the desired option from the **Commands** pull-down.



Note Select the **Check Configuration** menu option to update a device immediately.

Learn more

Details on using aView can be found in the aView User Guide.

Getting started with Digi Remote Manager

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About Digi Remote Manager

By default, your Digi EX15 is configured to use aView for cloud-based central management.

Alternatively, you can chose to use Digi Remote Manager (DRM). DRM is a hosted remote configuration and management system that allows you to remotely manage a large number of devices. Digi Remote Manager includes a web-based interface that you can use perform device operations, such as viewing and changing device configurations and performing firmware updates. DRM servers also provide a data storage facility.

To use Digi Remote Manager, you must setting up a DRM account. To set up a DRM account and learn more about Digi Remote Manager, go to www.digi.com/products/cloud/digi-remote-manager.

To learn more about DRM features and functions, see the Digi Remote Manager User Guide.

Configure the device to use Digi Remote Manager

Note Once you have configured the device to use Digi Remote Manager, aView will no longer be able to make configuration changes or send remote commands to the device. All further changes will need to be made in DRM or in the local interface.

To configure your Digi EX15 device to use DRM for central management:

1. From the main menu, click **Configuration**.
2. Click **Central management**.
3. Enble DRM support:
   a. Click **Enable central management**, if it central management is not already enabled.
   b. For **Service**, select **Digi Remote Manager**
   c. For **Management server**, enter **my.devicecloud.com**.
   d. (Optional) For **Retry interval**, configure how often the device should attempt to connect to DRM when disconnected.

      The default is every 30 seconds. Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*{**w**|**d**|**h**|**m**|**s**}.
   e. (Optional) For **Keep-alive interval**, configure the amount of time to wait between keep-alive messages that are sent to DRM when connected to an Ethernet interface.

      The default is every 60 seconds. Allowed values are any number of hours, minutes, or seconds, and take the format *number*{[**h**]|**m**|**s**}.
   f. (Optional) For **Cellular keep-alive interval**, configure the amount of time to wait between keep-alive messages that are sent to DRM when connected to a cellular interface.

      The default is every 290 seconds. Allowed values are any number of hours, minutes, or seconds, and take the format *number*{[**h**]|**m**|**s**}.
   g. (Optional) For **Allowed keep-alive misses**, configure the number of keep-alives that can be missed before the connection to the DRM is considered down.

      The default is three.
4. Click **Save**.

Log into Digi Remote Manager

To start Digi Remote Manager:

1. If you have not already done so, click here to sign up for a Digi Remote Manager account.
2. Check your email for Digi Remote Manager login instructions.
3. Go to remotemanager.digi.com.
4. Log into your Digi Remote Manager account.

Add a device to Digi Remote Manager

1. From the web interface, click **Manage Device** in the top right of the display.
2. Log into Digi Remote Manager. (If you created an account in Add a device to Digi Remote Manager, look for the Digi Remote Manager email that provides your login credentials.)
3. Click **Device Management**.
4. Click **Add Devices**.

Select **MAC address** and provide the Ethernet MAC address for your device.

For **Install Code**, enter the default password on the printed label packaged with your device. (The same default password is also shown on the label affixed to the bottom of the device.)

c. Click **Add**.

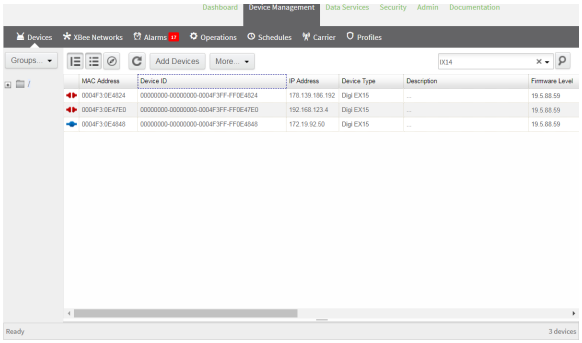
d. Click **OK**.

Digi Remote Manager adds your Digi EX15 to your account and it appears in the **Device Management** view.

View and manage a Digi EX15 device

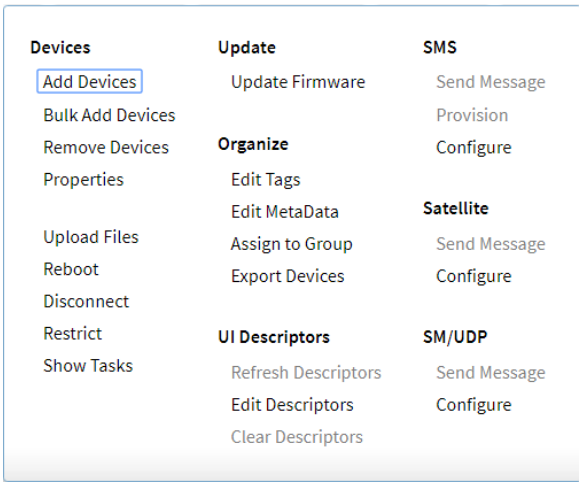
To view and manage your device:

1. If you have not already done so, connect to your Digi Remote Manager account.
2. Click **Device Management** to display a list of your devices.
3. User the Search bar to locate and select the Digi EX15 you want to manage.



4. Click **Properties** to view general information for your Digi EX15.

5. Click the **More** menu to perform a task.



Use the Digi Remote Manager mobile app

If you have a smart phone or tablet, you can use the Digi Remote Manager mobile app to automatically provision a new devices and monitor devices in your account.

To download the mobile app:

- For iPhone, go to the **App Store**
- For Android phones, go to **Google Play**

To sign up for a new Digi Remote Manager account using the mobile app:

1. From the menu, click **Log in or Sign Up**.
2. Click **Sign up** to create a new account.
3. You'll receive an email with login instructions.
4. From the **Digi Remote Manager** mobile app, click **Log in** and log into your new account.

To register a new device:

1. From the menu, select **Install a device with a QR or bar code** and scan the installation QR code on the label.
2. Follow the prompts to complete your Digi EX15 registration.

   Digi Remote Manager registers your Digi EX15 and adds it to your Digi Remote Manager device list. You can now manage the device remotely using Digi Remote Manager.

Configure multiple devices using profiles

Digi recommends you take advantage of Digi Remote Manager profiles to manage multiple Digi EX15 routers. Typically, if you want to provision multiple Digi EX15 routers:

1. Using the Digi EX15 local web UI, configure one Digi EX15 router to use as the model configuration for all subsequent Digi EX15s you need to manage.
2. Register the configured Digi EX15 in your Digi Remote Manager account.
3. In Digi Remote Manager, create a profile based on the configured Digi EX15.
4. Apply the profile to the Digi EX15 routers you need to configure.

Digi Remote Manager provides multiple methods for applying profiles to registered devices. You can also include site-specific settings with a profile to override settings on a device-by-device basis.

Learn more

- For information on using Digi Remote Manager to configure and manage Digi EX15 routers, see the Digi Remote Manager User Guide.
- For information on using Digi Remote Manager APIs to develop custom applications, see the Digi Remote Manager Programmer Guide

Custom-settings

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Network managed configuration

Digi EX15 devices will automatically synchronize with the aView cloud management platform so long as it is able to establish a network connection. This web-based configuration and monitoring portal provides:

- Remote control and configuration updates
- Email notifications for user-defined parameters (connection quality, data usage, and so on).
- Out-of-Band SMS recovery
- Real-time monitoring for:
  - Signal strength and quality
  - Network connectivity details
  - Location-based services
  - Device performance

Changes made within aView will be applied to the intended recipient(s) as soon as those devices check in with the web service for synchronization. This occurs once every 24 hours by default (though it can be rescheduled as necessary).

Note This assumes the Digi EX15 device being configured has been registered with aView.

To apply all pending changes immediately, reboot the device or refer to the step-by-step guidance for issuing remote commands.

Local configuration

If your Digi EX15 is not provisioned in aView, it will use a default local configuration profile.

Refer to Local device management to change settings for an Digi EX15-series without accessing aView.

Note Changes applied locally will be overridden should the device then sync with its configuration from aView.

Dual-WAN configurations

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Failover 38
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Load balancing 39

About dual WAN configuration

The Digi EX15 is a Dual-WAN device, meaning that by default, it has two interfaces capable of providing Internet access: its WAN Ethernet port and the plug-in cellular modem. The additional LAN port may also be reconfigured for supplemental Internet access.

Note By default, the Digi EX15 device is in cellular passthrough mode. The device must be in router mode to use the dual WAN functionality. See Enable router mode for instructions.

Failover

Active WAN connections can provide both failover and load balancing per user-defined parameters.

By default, this allows the plug-in modem to serve as a secondary (backup) WAN that becomes the active connection when the Ethernet WAN port is detected as offline. The Digi EX15 then monitors the offline connection to see when it comes back online, which prompts the backup interface to once again become inactive.

Each interface has a **Metric** value associated with its IPv4 configuration. By default, the WAN interface will take priority over all other interfaces, because its default Metric value is **1**).

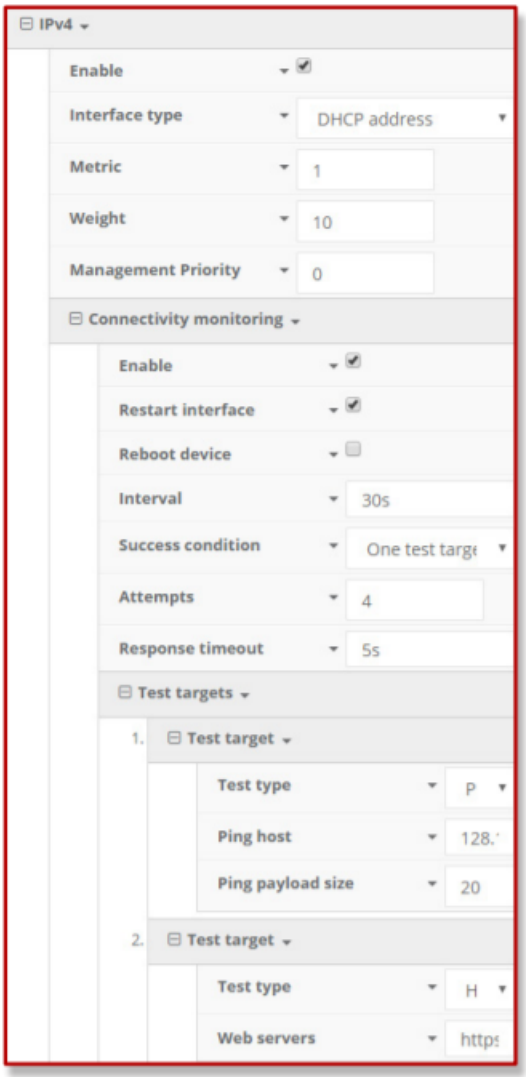
Connectivity monitoring

Note Both tests are set via the default group configuration in aView. It is not built into the firmware.

Devices that have not synced with aView will not have these tests enabled by default.

To properly trigger a failover (or failback) scenario, test parameters must be defined to monitor the primary connection. Both a Ping and HTTP test come built into the Digi EX15 WAN port configuration by default. After 4 failed attempts, the secondary connection will take over Internet access for the Digi EX15. Similarly, the monitoring tests trigger the restoration of the primary WAN connection when they detect that the interface with a higher metric has come back up.

Note Best practices dictate that redundant tests (with divergent failure conditions) will be the best way to ensure proper connectivity monitoring and active recovery. With only a single test type, false positives could be reported. Two different tests are recommended to prevent false positives.



Carrier Smart Select

Note If one of the SIM cards requires a custom or unique APN, you will need to add this APN to the Digi EX15 configuration under the **Modem > APN** option.

By default, the Digi EX15 plug-in modem is set up for automatic SIM selection. That is, if the Digi EX15 is unable to connect with the SIM in slot 1, after a specified number of failures (5 by default) the Digi EX15 will automatically switch to use the SIM in slot 2. For this setup, you will need two SIM cards enabled, provisioned, and installed in the plug-in modem's SIM slots. The two cards can be from the same carrier or from different carriers.

Load balancing

Traffic can be balanced between the Ethernet and Cellular WAN interfaces. This feature, often referred to as load balancing, uses an interface's **Weight** value, defined under the IPv4 expandable menu. The interfaces being balanced must share the same **Metric** value.

It is important to note that the two SIM slots cannot be leveraged simultaneously for load balancing; the load must be shared between the cellular modem and the Ethernet connection. The **Weight** of an interface establishes its proportional contribution relative to the weight of its complimentary interface.

For example, setting the Ethernet WAN to a weight of **20** and the Cellular WAN to a weight of **5** establishes a **4:1** ratio—the Ethernet interface will handle 4 times the amount of data with this configuration.

Interface configuration

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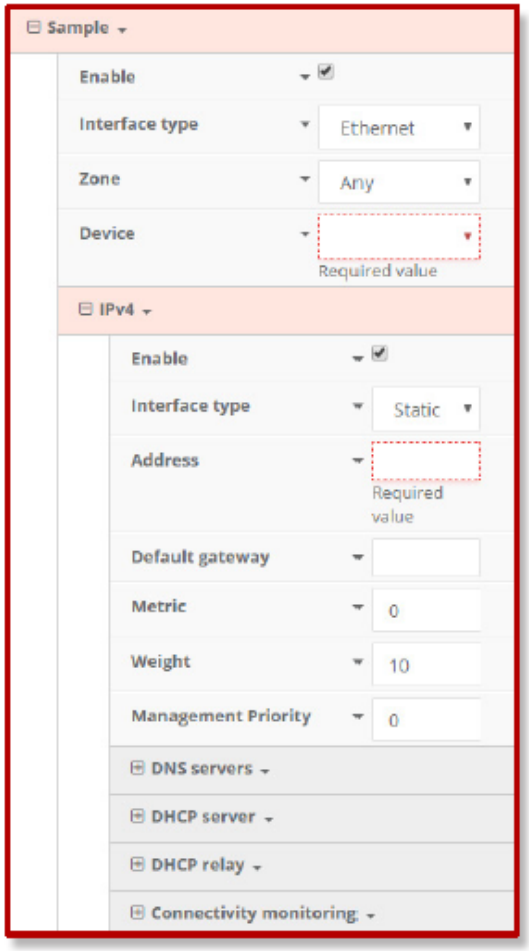
Changing the LAN subnet

The default subnet, **192.168.2.1/24**, is set in the IPv4 Address field of the LAN interface, and can be adjusted to any range of private IPs by completing the following steps:

1. Expand the configuration page to **Network > Interfaces**.
2. Select the **LAN** interface that needs to be adjusted and expand its IPv4 entry.
3. The **Address** field contains the range of IPs available for assignment.

Note The subnet mask must also be specified.

Changes made to the IPv4 Address must also be updated in the DHCP server entry to preserve functionality.



Creating new interfaces

Additional interfaces may be configured to further differentiate port functionality:

1. Expand the configuration page to **Network > Interfaces**.
2. Name the new **Interface** using the text field at the bottom of the list, clicking the **Add** button to continue.
3. Ensure the appropriate settings are entered into the new collapsible section generated for the interface:
   - The **Enable** checkbox must remain selected.
   - **Interface Type** will stay **Ethernet**.
   - **Zone**: Select the appropriate firewall zone for the interface. Generally, this should be set to **Internal** for a LAN interface, or **External** for a WAN interface.
   - **Device** establishes which port(s) are assigned to the new interface.
   - Expand the **IPv4** category to specify the Interface type and the desired address range.
   - Additional settings for **DNS** and **DHCP** configuration can be adjusted as necessary.
   - Refer to Failover for information on **Connectivity Monitoring**.

Note This assumes a static (private) IP is desired for the interface.

Wi-Fi options

Note The following information applies only to the Digi EX15W. the Digi EX15 does not offer Wi-Fi capabilities.

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About Wi-Fi configuration

Note Wi-Fi support is available wit the Digi EX15W model. The Digi EX15 model does not include Wi-Fi support.

With the default configuration profile, there is one available SSID. WiFi-enabled Digi EX15Ws can broadcast up to a total of 8 WLAN SSIDs simultaneously. To create additional SSIDs or to change the configuration of existing ones:

1. Navigate to the device (or group) **Configuration** page.
2. Expand **Network > WiFi**.
   a. Verify that WiFI support is enabled.
   b. Select either **2.4 GHz** or **5 GHz** for the **Frequency Band**. The default is **2.4 GHz**.
   c. Adjust the **Channel** and **Beacon** interval if necessary.
3. Expand the **Access Points** menu to view existing SSIDs or create new ones.
4. Each WLAN AP is listed as its own collapsible menu featuring:
   - Enabled status box
   - SSID
   - SSID Broadcast
   - Encryption type
   - Pre-shared key
5. To create a new AP, specify its name in the corresponding text field and click the **Add** button.

Client mode

In addition to serving as an independent WLAN Access Point, the Digi EX15 Wi-Fi can broadcast in **Client Mode** to serve as a supplemental AP to relay Wi-Fi originating from another Wi-Fi-enabled router by entering that network SSID and pre-shared key.

Wi-Fi as WAN

Client Mode can also be used to leverage the Digi EX15W Wi-Fi to relay Internet access (WAN) provided by another router's wireless AP.

Before configuring the Digi EX15W for Wi-Fi-as-WAN (WaW) Client Mode, identify the SSID that the Digi EX15W should connect to, including its broadcasting channel, authentication details for the SSID, and interface prioritization for the WaW connection (that is, should it take precedence over the WAN Ethernet port).

1. Under **Network > WiFi > Client mode connections**, create a new entry named **testclient**. The name can be different if desired.
2. Enter the **Channel** and **authentication credentials** for the SSID of the secondary wireless router.
3. Under **Network > Interfaces**, create a new entry named **WiFiasWAN**.

Note For details on how to create new interfaces, see Creating new interfaces.

4. Set the **Zone** for the new interface to **External**.
5. Set the **Device** for the new interface to **WLAN Client: testclient**.
6. Under **IPv4**, set the Interface type to **DHCP address**. NOTE:

Note This will trigger the Digi EX15 to obtain a DHCP connection to the secondary wireless router's SSID network.

7. Click **Save**.

Firewall settings

The Digi EX15 can function as a stateful firewall. Firewall configuration options leverage two key security measures:

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Packet filtering 48

Port forwarding

Remote computers can access applications or services hosted on a local network with the Digi EX15 by setting up port forwarding. It provides mapping instructions that direct incomming traffic to the proper device on a LAN.

To configure port forwarding:

1. Under **Firewall > Port Forwarding**, click the **Add** button.
2. Select the external WAN interface that will accept the communications on the incoming port and forward them to the LAN client.
3. The **IP version** and **Protocol** can be left at their default values unless changes are required by the request being serviced by this port-forwarding configuration.
4. Specify the public-facing **Port** for remote access.
5. In the **To** fields, specify the **port** and **IP address** associated with the intended destination device.
6. If necessary, expand the **Access Control List** to create a white list that determines which devices are authorized to leverage this particular forwarding route.

Note Both individual IP addresses and entire zones may be white listed.

Packet filtering

Enabled by default, packet filtering will monitor traffic going to and from the Digi EX15. The predefined settings are intended to block unauthorized inbound traffic while providing an unrestricted flow of data from LAN to WAN.

Virtual Router Redundancy Protocol (VRRP)

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Configuring VRRP 50

About VRRP

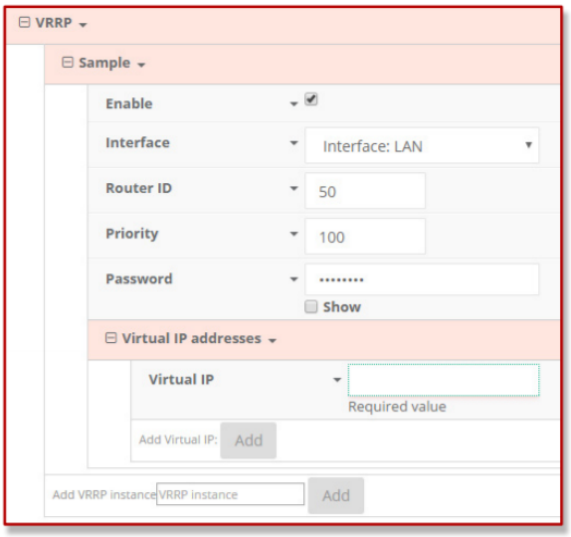
Virtual Router Redundancy Protocol (VRRP) is a networking protocol used to configure devices as a hot standby for a primary router, where a backup device will only start routing traffic after the network detects that the primary device is offline (using parameters set by VRRP).

Configuring VRRP

To link multiple devices together, each must be configured with the same Router ID within aView. Refer to the following step-by-step guidance for more information:

1. Expand **Network > VRRP**.
2. In the **Add VRRP Instance** text field, enter a name for the entry.
3. **Enable** the instance.
4. Specify an **Interface**—this will typically be set to **LAN**, meaning all four LAN ports.
5. Set the **Router ID** to match the number designated for this instance.
6. **Priority** establishes the order in which backup devices step in for offline routers.
7. The **Password** is a shared string of characters that must be entered for each device to authorize its integration into the VRRP instance.

Note A higher number establishes higher priority. Refer to the Creating new interfaces for more info on custom interfaces.



Troubleshooting

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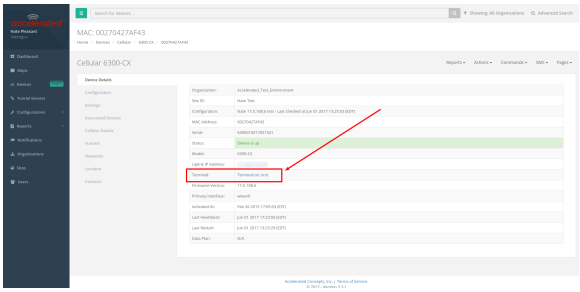
Terminal on unit

Goal

To access the console of the Digi EX15 using the **Terminal on Unit** link presented in aView for the device.

Note **Terminal on Unit** leverages the management tunnel established between the Digi EX15 and aView. For details on the monthly data usage for this access, see Data usage estimates.



Setup

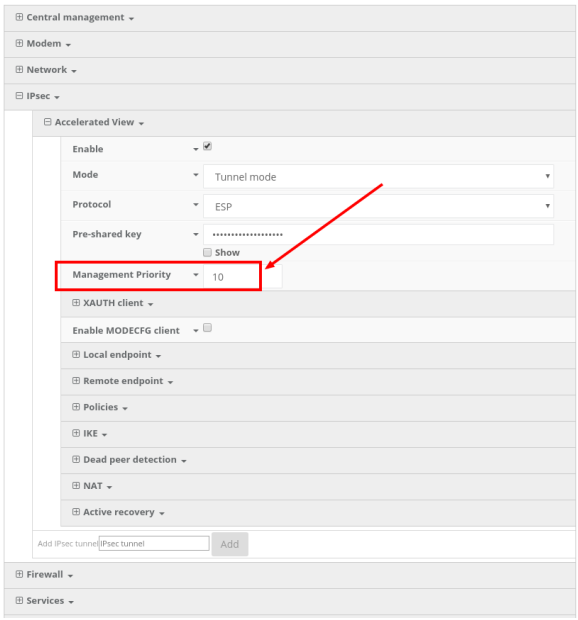
For this setup, you need access to aView and a Digi EX15 online and syncing with aView. If you see the Digi EX15 listed as up (green status) in aView, you are good to go.

Details

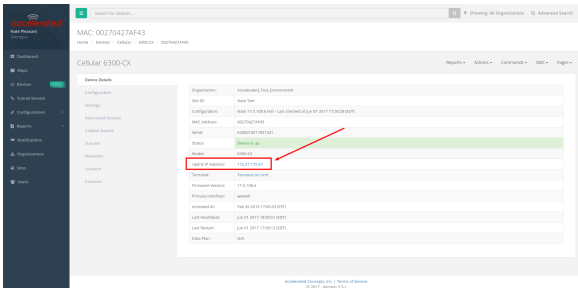
Note aView uses the IPSec tunnel the Digi EX15 establishes to **ipsec.accns.com** to provide terminal access to the console of the Digi EX15. For details on the monthly data usage for this access, see Data usage estimates.

The following configuration sets up the Digi EX15 to report its IPSec tunnel local IP address as the management IP that aView can then use to access its console.

Open the configuration profile for the Digi EX15. Under **IPSec -> Tunnels > Accelerated View**, set the **Management priority** to **10**. This gives the aView IPSec tunnel the highest priority management interface, which it then reports to aView as the IP that can be used to access its console.



Once you apply the new configuration to the Digi EX15, reboot the device so it rebuilds the IPSec tunnel and reports the new IPSec local IP address to aView. You can verify that aView is using the IPSec local IP as the management IP by looking at the **Uplink IP address** on the **Device Details** tab. This value should be set to a **172.x.x.x** IP address.



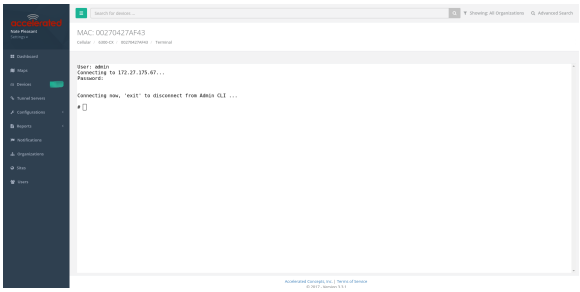
Using Terminal on Unit link

Once the correct management IP is reported from the Digi EX15 to aView, click the **Terminal on Unit** to open a page on aView that provides access to the Digi EX15 console.

The default user for logging into the device will vary:

- The default user is **root**:
  - If the device is at a firmware level 19.8.x or older.
  - If the device has been upgraded from 19.8.x or older to 19.11.x or newer.
- The default user is **admin**:
  - If the device is at 19.11.x or newer when manufactured.
  - If the device has been upgraded from 19.8.x or older to 19.11.x or newer and has been factory reset after the upgrade.

The default password is the unique password printed on the label packaged with your device.



Note There is a known issue where the predictive/auto-correct feature of the Google keyboard renders it incompatible with the Terminal page. If you access the above Terminal with an Android phone or tablet, you will need to use a keyboard other than the native Google keyboard.

Data usage estimates

The Digi EX15 is sensitive to the data usage on a customer's wireless data plan. Careful consideration was applied to add reporting, alerting, and remote control features through the best-of-breed aView cloud management system. Please note that even though the service was designed with standard reporting/ control intervals these values can be adjusted downward to obtain near-zero data utilization or, conversely, remote services can be tuned up for more aggressive monitoring at the expense of additional data utilization. The current aView architecture requires that all devices have a minimum of 1 publicly reachable IP address to access cloud-based features (see below).

Note These values are estimates to be used for planning purposes—the actual carrier data measurement may vary.

Data Consumption for aView Services

Service/function	Status/interval	Usage	Notes
Cloud-based Reporting/ Configuration	Standard (every 30 min)	3MB (per month)	Includes one startup sequence
Remote Control (IPSec tunnel)	Central management is enabled by default	25MB (per month)	Minimum keep-alive traffic

Note For deployments with heightened sensitivity toward data usage, the IPSec remote control tunnel can be disabled. Cloud-based reporting and configuration can still be accomplished via SMS commands that are not subject usage metering on mobile data plans. Please consult with support for more information before leveraging this approach, "Option 2" in the table below.

Note Charges for SMS messages may apply. Please consult your cellular carrier for billing details.

Service/function	Status/interval	Usage	Notes
Option 2 (Contact Digi for help)	IPSec disabled	2MB	Uses SMS on demand

Itemized Breakdown of Services via aView

Service/function	Status/interval	Usage	Notes	Protocol/port used
Syslog check-in	Every 30 minutes	1KB	Used for reporting and alerts	UDP 514 (syslog)
Configuration check-in	Once nightly -- 1am (UTC)	12KB	Recommended for remote management	TCP 443 (HTTPS)
Boot-up sequence	Each device reboot	24KB	Used for reporting and remote management	UDP 123 (NTP) UDP 514 (syslog)
Device firmware upgrade	As needed (~8 releases per year)	10MB	Updates device firmware upon new release	TCP 443 (HTTPS)
Modem firmware upgrade	As needed (less frequent than device firmware updates)	60MB	Updates firmware on the embedded cellular modem	TCP 443 (HTTPS)
Remote control tunnel	Always-on, if enabled	25MB per month	Minimum keep-alive traffic	UDP 500 and 4500 (IPSec)

AT command access

To gain AT command access through the Digi EX15, connect a PC/laptop to one of the LAN Ethernet ports of the Digi EX15. If the LAN's DHCP server is enabled, you should receive an IP address via DHCP from the Digi EX15. If the LAN's DHCP server is not enabled, you should configure a static IP on the PC/laptop of 192.168.210.2/24 with a gateway of 192.168.210.1

1. Open a SSH session to the Digi EX15.

   The default user for logging into the device will vary:

   - The default user is **root**:
     - If the device is at a firmware level 19.8.x or older.
     - If the device has been upgraded from 19.8.x or older to 19.11.x or newer.
   - The default user is **admin**:
     - If the device is at 19.11.x or newer when manufactured.
     - If the device has been upgraded from 19.8.x or older to 19.11.x or newer and has been factory reset after the upgrade.

   The default password is the unique password printed on the label packaged with your device.

2. If you are presented with an access selection menu, type **a** to access the Admin CLI.

   If no menu is presented and you have the **>** prompt, you are already in the Admin CLI.

3. At the Admin CLI prompt, type **modem at-interactive** and press **Enter**. Type **n** if you do not want exclusive access. This allows you to send AT commands to the device while still allowing the device to connect, disconnect, and/or reconnect to the cellular network.

   Example AT command access below:

```
$ ssh admin@192.168.2.1
Password:
```

```
Access selection menu:

a: Admin CLI
s: Shell
q: Quit

Select access or quit [admin] : a

Connecting now, 'exit' to disconnect from Admin CLI ...

> modem at-interactive

Do you want exclusive access to the modem? (y/n) [y]: n
Starting terminal access to modem AT commands.
Note that the modem is still in operation.

To quit enter '~.' ('~~.' if using an ssh client) and press ENTER

Connected
ati
Manufacturer: Sierra Wireless, Incorporated
Model: MC7455
Revision: SWI9X30C_02.24.03.00 r6978 CARMD-EV-FRMWR2 2017/03/02 13:36:45
MEID: 35907206045169
IMEI: 359072060451693
IMEI SV: 9
FSN: LQ650551070110
+GCAP: +CGSM
OK
```

Resetting your device

Note While the settings are reset, the device's firmware version remains the same.

To reset the device to factory default settings, press and release the **ERASE** button on the side of the device once when the device is powered on.

The **ERASE** button has three modes:

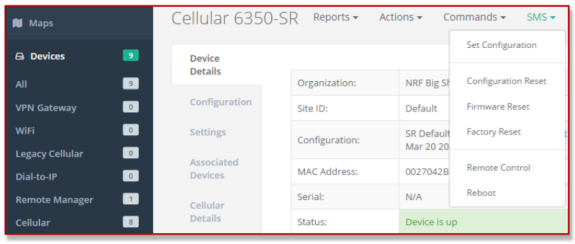
1. **Configuration reset**: Pressing the **ERASE** button one time will reset the device configurations to the factory default. It will not remove any automatically generated certificates and keys.
2. **Full device reset**: After the device reboots from the first button press, press the **ERASE** button again before the device is connected to the internet to also remove generated certificates/keys.
3. **Firmware reversion**: Press and hold the **ERASE** button and then power on the device to boot to the version of firmware that was used prior to the current version.

Out-of-band SMS commands

Note This feature is only available via aView.

A set of emergency remote commands can be sent via SMS to the device to provide Out-Of Band (OOB) recovery for the device. These SMS commands allow you to perform actions such as factory resets, reboot the device, and restore to the backup firmware partition, all without requiring the device to have an active IP (WAN) connection. Similar to the standard remote commands, these can be used to provide control over the device without any on-site interaction. To utilize this feature, SMS

must be enabled for the SIM card used by the device. The complete list of SMS commands is defined in the aView User Manual.



Support report

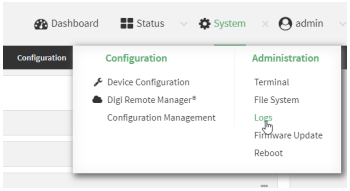
Often times, it is beneficial to download a support report from the device to provide to technical support. This report is a zipfile that contains all of the current details for the device's state and a full record of the system logs from the device.

To obtain a support report from the device, login to the device's local web UI. To access the local web UI, the user must have a PC/laptop connected to one of the LAN Ethernet ports of the Digi EX15. They should receive an IP address via DHCP from the Digi EX15 in the 192.168.2.100-250 range. If they do not receive a DHCP address, they can configure a static IP on the PC/laptop of 192.168.210.2/24 with a gateway of 192.168.210.1. Once the PC/laptop has an IP address, open the following URL in a browser on the PC:

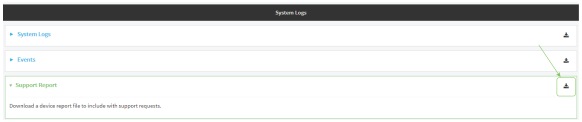
https://192.168.210.1

For firmware version 19.11.x or newer:

1. On the main menu, click **System** > **Logs**.

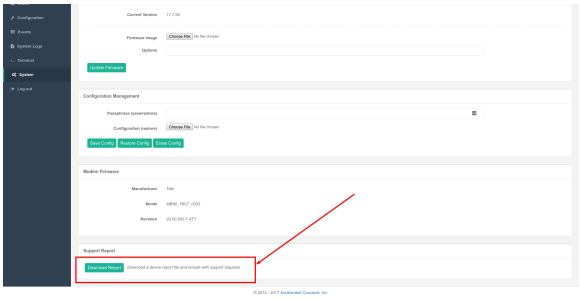


2. Collapse the system logs viewer by clicking ▼ **System Logs**, or scroll down to **Support Report**.
3. Click to expand ▶ **Support Report**.
4. Click to generate and download the support report.



For firmware version 19.8.x or older:

1. On the main menu, click **System**.
2. In the **Support Report** section at the bottom of the page, click **Download Report**.



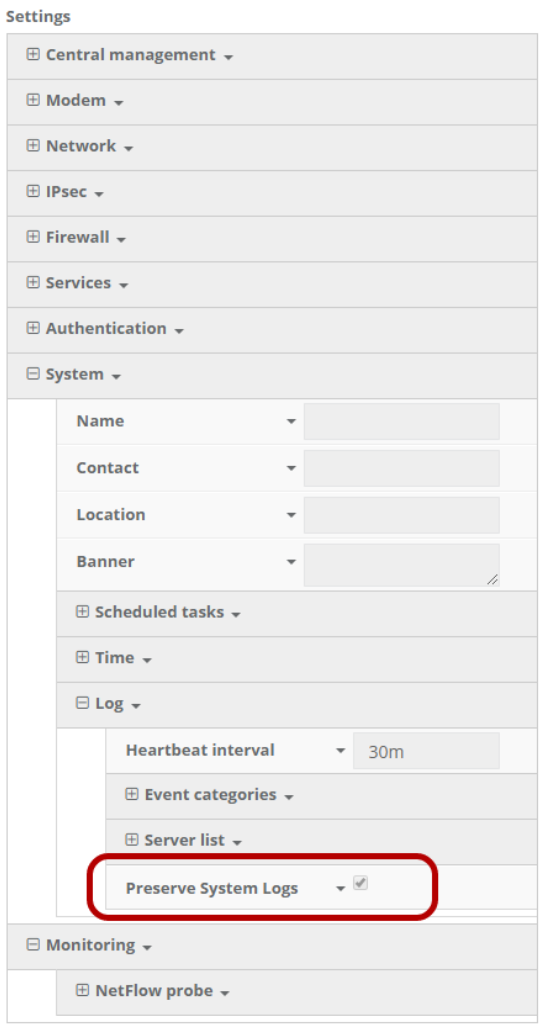
You may need to scroll down to locate the **Support Report** section .

Persistent system logs

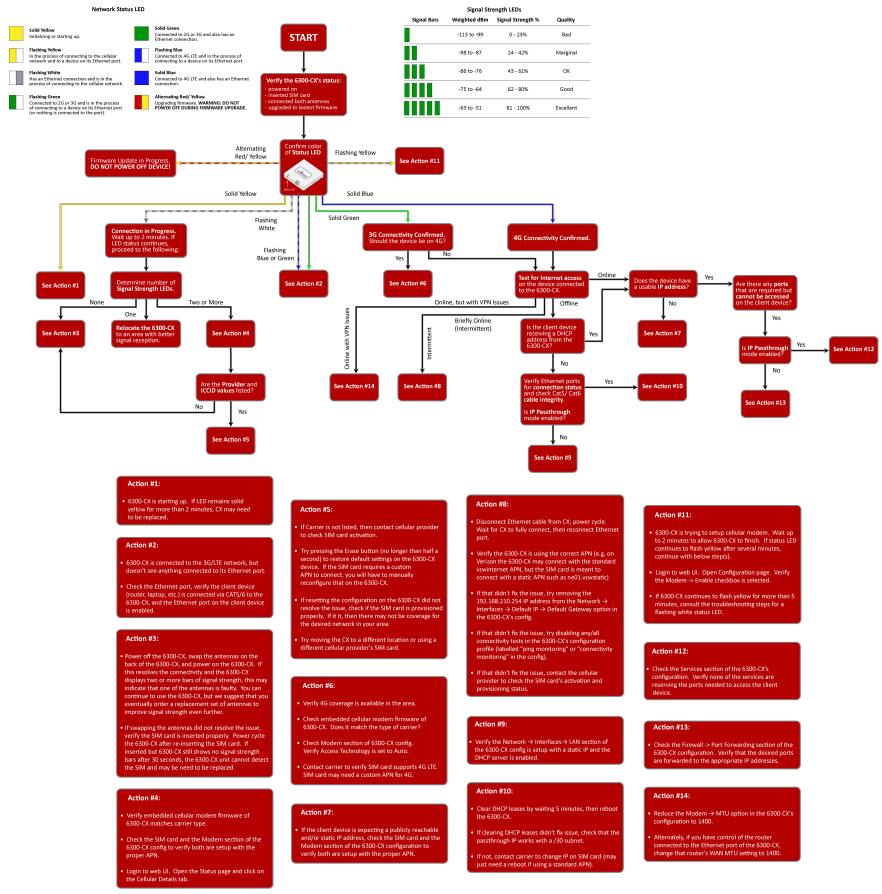
The default behavior for the Digi EX15 device is to have persistent system logs disabled. Information logged on the device will be erased when the Digi EX15 is powered off or rebooted.

Logging can be configured to persist between power cycles by enabling the **Preserve System Logs** checkbox nested under the **System > Log** menu option.

Note Logging across reboots should be enabled only to debug issues and then disabled ASAP to avoid unnecessary wear to the flash memory.


Settings
Central management
Modem
Network
IPsec
Firewall
Services
Authentication
System
Name
Contact
Location
Banner
Scheduled tasks
Time
Log
Heartbeat interval
30m
Event categories
Server list
Preserve System Logs
Monitoring
NetFlow probe

LTE troubleshooting tree



Network Status LED

Solid Yellow
Initializing or starting up.

Flashing Yellow
In the process of connecting to the cellular network and to any device on its LAN port(s).

Flashing White
Established LAN connection(s) and is in the process of connecting to the cellular network.

Flashing Green
Connected to 2G or 3G and is in the process of connecting to any device on its LAN port(s), or nothing is connected to the port.

Solid Green
Connected to 2G or 3G and also has a device linked to a LAN port.

Flashing Blue
Connected to 4G LTE and in the process of connecting to a device on its LAN port(s).

Solid Blue
Connected to 4G LTE and also has a LAN connection.

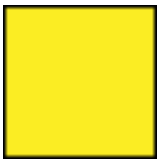
Alternating Red/ Yellow
Upgrading firmware. **WARNING: DO NOT POWER OFF DURING FIRMWARE UPGRADE.**

Signal Strength LEDs

Signal Bars	Weighted dBm	Signal Strength %	Quality
	-113 to -99	0 - 23%	Bad
	-98 to -87	24 - 42%	Marginal
	-86 to -76	43 - 61%	OK
	-75 to -64	62 - 80%	Good
	-63 to -51	81 - 100%	Excellent

Alternating Red/Yellow

Firmware Update in Progress: **DO NOT POWER OFF DEVICE!**



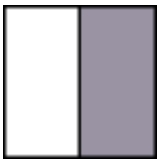
Solid Yellow

Digi EX15 is starting up.

Flashing Yellow

Digi EX15 is trying to setup cellular modem. Wait up to 2 minutes to allow the process to finish. If status LED continues to flash yellow after several minutes, continue with below step(s):

1. Login to web UI. Open Configuration page. Verify the **Modem -> Enable** check box is selected.
2. If the Digi EX15 continues to flash yellow for more than 5 minutes, consult the troubleshooting steps for a flashing white status LED.



Flashing White

Ethernet link detected, connection is in progress.
Wait up to 2 minutes. If LED status continues, determine the number of Signal Strength LEDs:
None

- Power off the Digi EX15, swap the antennas on the back of the Digi EX15, and power on the Digi EX15. If this resolves the connectivity and there are two or more bars of signal strength, this may indicate that one of the antennas is faulty. You can continue to use the Digi EX15, but we suggest that you eventually order a replacement set of antennas to improve signal strength even further.
- If swapping the antennas did not resolve the issue, verify the SIM card is inserted properly. Power cycle the Digi EX15 after re-insterting the SIM card. Wait 30 to 60 seconds. If the problem persists, the unit cannot detect the SIM and the Digi EX15 may need to be replaced.

One
Relocate the Digi EX15 to an area with better signal reception.
Two or more
Verify that the embedded cellular modem firmware matches the carrier type.
Check the SIM card and the Modem section of the config to verify both are set up with the proper APN.
Login to the web UI. Open the Status page and click on the Cellular Details Tab. Are the **Provider** and **ICCID** values listed?
No

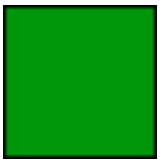
- If the proper Carrier is not listed, contact the cellular provider to verify SIM card activation.
- Try pressing the **Erase** button (no longer than half a second) to restore default settings. If the SIM card requires a custom APN to connect, you will have to manually reconfigure that on the Digi EX15
- If resetting the configuration did not resolve the issue, check if the SIM card is provisioned properly. If it is, then there may not be coverage for the desired network in your area.
- Try moving the Digi EX15 to a different location or try using a different cellular provider's SIM card.

Yes

- Power off the Digi EX15, swap the antennas on the back of the Digi EX15, and power on the Digi EX15. If this resolves the connectivity and there are two or more bars of signal strength, this may indicate that one of the antennas is faulty. You can continue to use the Digi EX15, but we suggest that you eventually order a replacement set of antennas to improve signal strength even further.
- If swapping the antennas did not resolve the issue, verify the SIM card is inserted properly. Power cycle the Digi EX15 after re-insterting the SIM card. Wait 30 to 60 seconds. If the problem persists, the unit cannot detect the SIM and the Digi EX15 may need to be replaced.

Flashing Blue or Green

Digi EX15 is connected to the 3G/LTE network, but doesn't see anything connected to its Ethernet port. Check the Ethernet port, verify the client device (router, laptop, etc.) is connected via CAT5/6 to the Digi EX15, and the Ethernet port on the client device is enabled



Solid Green

3G connectivity confirmed Should the device be on 4G?
Yes

- Verify 4G coverage is available in the area.
- Check embedded cellular modem firmware. Does it match the type of carrier?
- Check Modem section of Digi EX15 config. Verify Access Technology is set to Auto.
- Contact carrier to verify SIM card supports 4G LTE. SIM card may need a custom APN for 4G.

No
Test for Internet access on the device connected to the Digi EX15.
Online
Does the device has a usable IP Address?

- **If no**, see if the client device is expecting a publicly reachable and/or static IP address, check the SIM card and the Modem section of the Digi EX15 configuration to verify both are set up with the proper APN.

Are there any ports that are required but cannot be accessed on the client device? Also check if the IP Passthrough has been enabled.

- **If yes**, check the Services section of the configuration. Verify none of the services are reserving the ports needed to access the client device.
- **If no**, check the **Firewall -> Port Forwarding** section of the configuration. Verify that the desired ports are forwarded to the appropriate IP addresses.

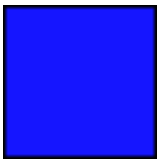
Offline
Is the client device receiving a DHCP address from the Digi EX15?

- **If yes**, check if the IP Passthrough has been enabled.
  - If yes, are there any ports that are required but cannot be accessed on the client device? Also check if the IP Passthrough has been enabled.
    - If yes, check the Services section of the configuration. Verify none of the services are reserving the ports needed to access the client device.
    - If no, check the **Firewall -> Port Forwarding** section of the configuration. Verify that the desired ports are forwarded to the appropriate IP addresses.
  - If no, see if the client device is expecting a publicly reachable and/or static IP address, check the SIM card and the **Modem** section of the configuration to verify both are set up with the proper APN.

- **If no**, verify Ethernet ports for connection status and check Cat5/ Cat6 cable integrity. Is IP Passthrough mode enabled?
  - If yes, clear DHCP leases by waiting 5 minutes, then reboot the Digi EX15. If clearing DHCP leases didn't fix issue, check that the passthrough IP works with a /30 subnet. If not, contact carrier to change IP on SIM card (may just need a reboot if using a standard APN).
  - If no, verify the **Network > Interfaces > LAN** section of the config is setup with a static IP and the DHCP server is enabled.

Online, but with VPN issues
Reduce the **Modem > MTU** option in the configuration to 1400. Alternately, if you have control of the router connected to the Ethernet port of the Digi EX15, change that router's WAN MTU seting to 1400.
Briefly online

1. Disconnect Ethernet cable from the Digi EX15; power cycle. Wait for the Digi EX15 to fully connect, then reconnect Ethernet port.
2. Verify the Digi EX15 is using the correct APN (e.g. on Verizon you can connect with the standard vzwinternet APN, but the SIM card is meant to connect with a static APN such as ne01.vzwstatic)
3. If that didn't fix the issue, try removing the 192.168.210.254 IP address from the **Network > Interfaces > Default IP > Default Gateway** option in the config.
4. If that didn't fix the issue, try disabling any/all connectivity tests in the configuration profile (labelled "ping monitoring" or "connectivity monitoring" in the config).
5. If that didn't fix the issue, contact the cellular provider to check the SIM card's activation and provisioning status.



Solid Blue

4G connectivity confirmed
Test for Internet access on the device connected to the Digi EX15.
Online
Does the device has a usable IP Address?

- **If no**, see if the client device is expecting a publicly reachable and/or static IP address, check the SIM card and the Modem section of the configuration to verify both are set up with the proper APN.

Are there any ports that are required but cannot be accessed on the client device? Also check if the IP Passthrough has been enabled.

- **If yes**, check the Services section of the configuration. Verify none of the services are reserving the ports needed to access the client device.
- **If no**, check the **Firewall -> Port Forwarding** section of the configuration. Verify that the desired ports are forwarded to the appropriate IP addresses.

Offline
Is the client device receiving a DHCP address from the Digi EX15?

- **If yes**, check if the IP Passthrough has been enabled.
  - **If yes,** are there any ports that are required but cannot be accessed on the client device? Also check if the IP Passthrough has been enabled.
    - If yes, check the **Services** section of the configuration. Verify none of the services are reserving the ports needed to access the client device.
    - If no, check the **Firewall -> Port Forwarding** section of the configuration. Verify that the desired ports are forwarded to the appropriate IP addresses.
  - **If no**, see if the client device is expecting a publicly reachable and/or static IP address, check the SIM card and the Modem section of the configuration to verify both are set up with the proper APN.
- **If no**, verify Ethernet ports for connection status and check Cat5/ Cat6 cable integrity. Is IP Passthrough mode enabled?
  - **If yes**, clear DHCP leases by waiting 5 minutes, then reboot the unit. If clearing DHCP leases didn't fix issue, check that the passthrough IP works with a /30 subnet. If not, contact carrier to change IP on SIM card (may just need a reboot if using a standard APN).
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Online but with VPN issues
Reduce the **Modem > MTU** option in the configuration to 1400. Alternately, if you have control of the router connected to the Ethernet port of the Digi EX15, change that router's WAN MTU seting to 1400.
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1. Disconnect Ethernet cable from the Digi EX15; power cycle. Wait for the Digi EX15 to fully connect, then reconnect Ethernet port.
2. Verify the Digi EX15 is using the correct APN (e.g. on Verizon you can connect with the standard vzwinternet APN, but the SIM card is meant to connect with a static APN such as ne01.vzwstatic).
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4. If that didn't fix the issue, try disabling any/all connectivity tests in the configuration profile (labelled "ping monitoring" or "connectivity monitoring" in the config).
5. If that didn't fix the issue, contact the cellular provider to check the SIM card's activation and provisioning status.

FAQs

How do I factory reset the Digi EX15?

1. Ensure that the device has been powered on for at least 30 seconds.
2. Briefly press the Erase button located on the back of the device.

What subnet does the Digi EX15 use?

By default, port 1 is configured as a LAN port in romode and will issue a single passthrough IP address based on the IP received from the cellular connection. See Enable router mode for more information about configuring the device to use router mode rather than passthrough mode.

What size SIM card does the Digi EX15 use?

Standard mini-SIMs (2FF).

Does the Digi EX15 fail back to 3G?

Yes, if the Digi EX15 doesn't recognize a 4G/LTE network available, the device will automatically fallback to the highest available 3G network. Supported networks include DC-HSPA+, HSPA+, HSPA, EDGE, GPRS, GSM and CDMA.

Does the Digi EX15 support IPv6?

Yes. In passthrough mode, when the Digi EX15 receives an IPv6 prefix from the cellular network, it uses SLAAC to pass the prefix to the client device connected to its Ethernet port. The Digi EX15 will also pass the IPv6 DNS server using the SLAAC RDNSS option and stateless DHCPv6.

Regulatory guide

FCC

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE. INDUSTRY CANADA - CAN ICES-3(A)/NMB-3(A) THIS PRODUCT IS INTENDED FOR OPERATION IN A COMMERCIAL OR INDUSTRIAL ENVIRONMENT AND SHOULD NOT BE USED IN A RESIDENTIAL ENVIRONMENT. THIS PRODUCT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE REQUIREMENTS OF: ICES-003 - INFORMATION TECHNOLOGY EQUIPMENT - LIMITS AND METHODS OF MEASUREMENT ISSUE 5, AUGUST 2012.

European Union

THIS PRODUCT MAY CAUSE INTERFERENCE IF USED IN RESIDENTIAL AREAS. SUCH USE MUST BE AVOIDED UNLESS THE USER TAKES SPECIAL MEASURES TO REDUCE ELECTROMAGNETIC EMISSIONS TO PREVENT INTERFERENCE TO THE RECEPTION OF RADIO AND TELEVISION BROADCASTS.

Supported Countries

FOR A FULL LIST OF CERTIFIED COUNTRIES GO VISIT: www.digi.com/legal/terms

End user license agreement

To view the end user license agreement, visit: www.digi.com/legal/terms

Accessing Admin CLI

Goal

To show how to access Admin CLI using Terminal on Unit or SSH.

Setup

For Terminal on Unit, you will need either:

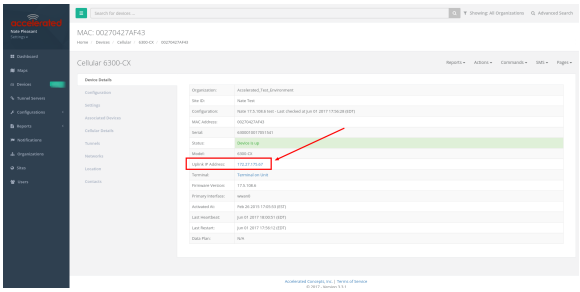
- Direct SSH access to the device
- Access to aView, and a Digi cellular extender online and syncing with aView. If you see the cellular extender listed as up (green status) in aView, you are good to go.

Details

aView utilizes the IPSec tunnel the cellular extender establishes to ipsec.accns.com (or remote.accns.com) to provide terminal access to the console of the device.

Note For details on the monthly data usage for this access, refer to the following article: Data usage estimates.

If a new configuration is applied to a cellular extender, reboot the cellular device so it rebuilds the IPSec tunnel and reports the new IPSec local IP address to aView. You can verify that aView is using the IPSec local IP as the management IP by looking at the Uplink IP address on the Device Details tab. This value should be set to a 192.x.x.x IP address (when using ipsec.accns.com or 172.x.x.x for remote.accns.com).



Using the Terminal on a Unit link

1. Once the correct management IP is reported from the cellular extender to aView, clicking **Terminal on Unit** will open a page on aView to provide the user access to the console of the device.
2. Type in the username and password for the device and press **Enter**.
3. If you are presented with an access selection menu, type **a** to access the Admin CLI.

   If no menu is presented and you have the **>** prompt, you are already in the Admin CLI.
4. At the **>** prompt, display available commands by pressing the **Tab** key. You can also display additional help information for commands by typing the commands followed by a space then pressing **Tab**. This will show the available options within that command. (See Command breakdown.)

Direct ssh access

SSH access can be gained through a local connection to the device. You can access the cellular extender on its LAN IP address. The default LAN IP address is 192.168.2.1).

1. SSH to the device at its LAN IP address.
2. Type in the username and password for the device and press **Enter**.
3. If you are presented with an access selection menu, type **a** to access the Admin CLI.

   If no menu is presented and you have the **>** prompt, you are already in the Admin CLI.
4. At the **>** prompt, display available commands by pressing the **Tab** key. You can also display additional help information for commands by typing the commands followed by a space then pressing **Tab**. This will show the available options within that command. (See Command breakdown.)

```
$ ssh root@192.168.210.1
$ password
Access selection menu:

a: Admin CLI
s: Shell
q: Quit

Select access or quit [admin] : a

Connecting now, 'exit' to disconnect from Admin CLI ...
>
```

Command breakdown

Command	Description
config	Used to view and modify the configuration.

Command	Description
exit	Exits the CLI.
cli-legacy	Changes to legacy CLI mode.
cp	Copies a file or directory.
help	Displays: ■ CLI editing and navigation commands, when executed from the root command prompt. ■ Available commands, syntax diagram, and parameter information, when executed in conjunction with another command.
ls	Lists the contents of a directory.
mkdir	Creates a directory.
modem	Executes modem commands.
more	Displays the contents of a file.
mv	Moves a file or directory.
ping	Pings a remote host using Internet Control Message Protocol (ICMP) Echo Request messages.
reboot	Reboots the Digi EX15 device.
rm	Removes a file.
scp	Uses the secure copy protocol (SCP) to transfer files between the Digi EX15 device and a remote host.
show	Displays information about the device and the device's configuration.
system	Issues commands related to system functionality.
traceroute	Sends and tracks route packets to a destination host.
update	Updates the device firmware.

Antenna notes and solutions

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Antenna terminology

Electronics require antennas to convert data into RF signals (and vice versa). They are coupled with radio transmitters and/or receivers to process the information that is carried over cellular bands. Antenna design and functionality has evolved over time:

- **Internal antennas**: An antenna can be concealed within the casing of a device, as seen with most smart phones. Internal antennas are potentially more prone to interference due to the close grouping of electrical components.
- **External antennas**: Situating antennas further away from the rest of the circuit board can help alleviate interference due to electrical components by maximizing a device's natural reach. Instead of sitting inside the device directly next to the modem or transceiver, they screw into place using SMA connectors and protrude from the equipment (think "rabbit ears").
- **MIMO**: Multiple-Input and Multiple-Output (MIMO) technology expands the throughput capacity of a transceiver by leveraging multiple antennas to simultaneously convert RF signals into data (or vice versa), providing faster transfer speeds as a result. Think of it (loosely) as Carrier Aggregation for antennas—once again combining individual lanes into a single, coordinated superhighway. Networks must leverage MIMO antenna transmission to be technically considered 4G.

Physical specifications

Many Digi devoces use industry-standard, female SMA connectors to affix antennas to the internal cellular radio. External antennas improve clarity when compared to internal antennas, which are prone to electromagnetic interference.

An extension coaxial cable can also enhance the reach of a device; however, that cabling causes attenuation—or a degradation in signal quality—due to the distance the signal travels. Significant attenuation typically begins at 30 feet of cabling.

Certain Digi products, for example, the Digi 6300-CX and Digi 6330-MX, are designed to provide the ability to place the unit where reception is best (moving the radio is always preferred). This allows the device to capture optimal Radio Frequency (RF) before converting it to IP packets and transmit data via Ethernet cabling, an approach that yields increased performance and cost savings over coax cabling.

Digi can also provide a battery pack for site surveys, creative mounting options, and a (passive) Power-over-Ethernet (PoE) injector to provide an efficient, flexible deployment at the lowest possible cost. Most Digi clients will not require third-party antennas unless deploying without PoE. It is always preferred to mount a PoE unit on an external wall via Ethernet and use the shortest coax cable required to run the external antenna to the outside of a building.

CRITICAL NOTE: Test the signal strength outside of the building to ensure you have cellular coverage in the area prior to any cabling work. **Tip**: Use the site survey battery to do this.

Antennas tested by Digi

Note Antenna information has been compiled by Digi to assist clients in finding and sourcing an antenna solution to best meet their application and business needs. The information on availability and pricing is for planning purposes only and may vary. Clients should test and validate their own applications prior to selecting an antenna for their project.

These antennas are omni-directional—that is, they offer the ability to send/receive signals from any direction. Directional antennas may improve RF sensitivity, but they will require an expert knowledge to find a specific cellular tower and maintain the ongoing fine-tuning that may be required to keep the antenna positioned properly. Due to the challenges of directional antennas, Digi typically focuses on MIMO omni-directional models.

Extra-small IoT paddle antennas

Manufacturer: Taoglas Antennas Solutions

Product: TG.08.0113 and the Product Datasheet

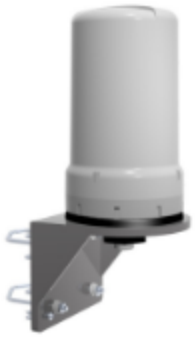
MSRP: $12 per antenna ($24 for a pair)

Note Use two antennas for full MIMO Operation.

Deployment notes

This antenna is recommended for consideration when a project requires antennas with a small form factor (for example, digital signage, small enclosures, rack mounted, in-vehicle, and so on). The performance of these antennas is surprisingly good considering the size. Although testing has shown they may slightly under perform compared to the antennas included with your unit, these smaller antennas may provide the perfect balance between form factor and performance in your IoT application.

Large external MIMO antenna (outdoor rated)



Manufacturer: EAD

Product: LMO7270 and the Product Datasheet

MSRP: $129 with dual 5M coax cabling

Deployment notes

This is a hardened antenna designed to be mounted outdoors. This is a MIMO antenna with two short pig tail connectors and the overall dimensions are 187 mm in height and 106 mm at the base. Digi typically provides this antenna with a kit including dual coax cables at 5M in length. If you are using this antenna with a Digi PoE (for example, the Digi 6300-CX) we typically recommend you mount the unit on the inside and run the 5M cables to the outside. In this way, you save costs and eliminate attenuation (signal loss) by running Ethernet as far as possible and minimize the coax cable length. Digi testing of this antenna reveals performance gain.

Flat MIMO antenna #1

Manufacturer: Taoglas Antennas Solutions

Product: Gemini LMA100 and the Product Datasheet

MSRP: $99 with dual 5M cables

Deployment notes

This is an easy-to-use MIMO antenna. It offers a low-profile form factor that accommodates simple mounting. This model is manufactured by Taoglas and showed solid RF performance in our testing. The antenna has a square shape, sized at 164 mm x 164 mm x 36.5 mm. The antenna cabling is built into the antenna, and typically reaches only one meter, but it can be built (sized) to order (lead time can take up to 8 weeks). This antenna typically includes a stand that can be used instead of mounting. The pricing above is based on 5M cables (~15 feet) and the antenna is rated for indoor and outdoor use.

Flat MIMO antenna #2

Manufacturer: Mobile Mark

Product: PNM2-LTE and the Product Datasheet

MSRP: PNM2-LTE-1C1C-WHT-180 (includes Cabling @ 15 feet) $176.40

Deployment notes

This is an additional easy-to-use MIMO antenna with a low-profile form factor and simple mounting. This model is manufactured by Mobile Mark and showed solid RF performance in our testing. With a square form factor of 146 mm x 146 mm x 18 mm, the antenna cabling is built into the antenna and can be sized to order (typically lead time from the manufacturer is 2 weeks).

Paddle extender

Deployment notes

This unique product (termed *the paddle extender*) is designed to move the standard LTE antennas to a more optimal spot to obtain better RF connectivity. A typical use can may be where the unit is installed in a metal enclosure or rack (think of a data center or digital signage enclosure). The paddle antennas can be mounted to the top SMA connector, escaping the limitations of having to stay affixed to the device's chassis. Remote mounting is then simplified thanks to the paddle extender's magnetic base (diameter of 48mm [1.9 inches]). The length of the cable 50cm (19.7 inches).