



PRT-4G-USB

Protege DIN Rail Cellular Modem

Configuration Guide



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Last Published: 15-Jun-22 3:14 PM

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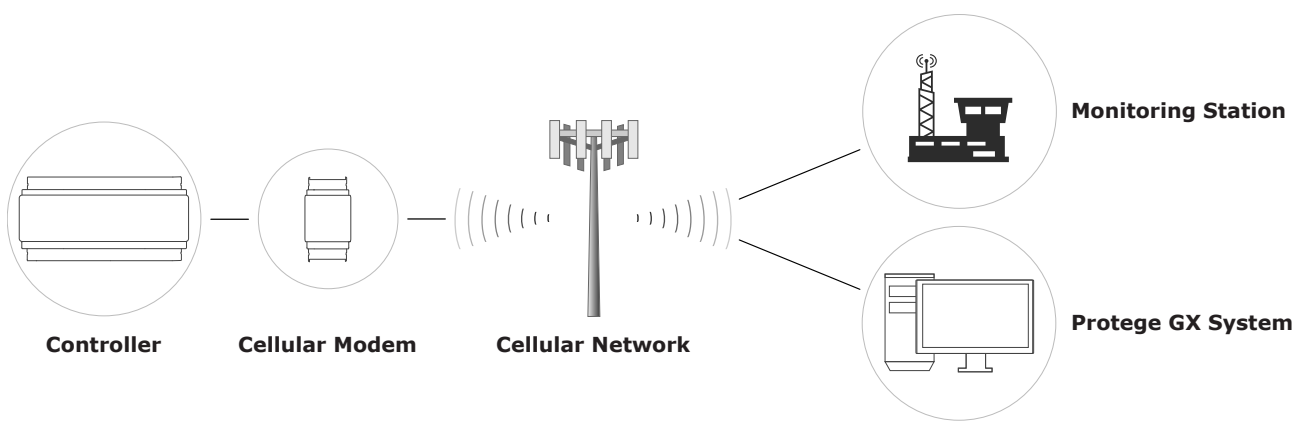
Introduction

This configuration guide provides programming instructions and operating information for the Protege DIN Rail Cellular Modem. For installation instructions and technical specifications, see the Protege DIN Rail Cellular Modem Installation Manual, available from the ICT website.

About this Module

The Protege DIN Rail Cellular Modem is a cellular communication device that provides a convenient wireless connection for a Protege controller.

For Protege WX controllers this device can provide wireless IP alarm transmission capability, allowing communication of alarms from a controller to a monitoring station via cellular network transmission for convenient, cost-effective monitored outbound reporting.



For Protege GX controllers this device can provide wireless IP alarm transmission capability, and on supported networks can also facilitate programming downloads and manual control from the Protege GX system, and event uploads to the Protege GX events database.

With no physical network required this is an ideal solution for remote sites and installations where network infrastructure may be unavailable, or difficult and expensive to install.

The current features of the DIN Rail Cellular Modem include:

- Category M-1 cellular network capability with fallback to 2G GSM
- Secure encrypted communications via the Report IP service
- Continuous connection detection and automatic fail reset
- 1 LED indicator
- 1 Micro-SIM card holder
- 1 SMA antenna connection
- 1 USB-C port
- 1 4G antenna (included)
- 1 USB-A to USB-C connector cable (included)
- Industry standard DIN rail mounting
- Convenient 1/4 DIN footprint

Prerequisites

Connection and configuration of the Protege DIN Rail Cellular Modem is only possible with compatible controller hardware, and requires the following minimum versions.

Protege GX

Component	Version
Protege GX Software	4.3.308.3 or higher
Protege GX Controller	2.08.1271 or higher

Protege WX

Component	Version
Protege WX Controller	4.00.1096 or higher

Controller Hardware

Only controllers equipped with a USB port are capable of communicating with the cellular modem. One-door controllers do not support this feature.

If it is not practical to physically check each controller for a USB port, contact ICT Technical Support with a list of the controller serial numbers.

SIM

A SIM is required from a validated cellular network provider in the region where the Protege DIN Rail Cellular Modem is installed. For a list of validated network providers in each region, see the Supported Cellular Network Providers table or contact ICT Technical Support.




Only validated cellular networks are supported. Others may not work correctly and will not be supported by ICT.

Insert the SIM securely and fully into the cellular modem's Micro-SIM card slot, with the metal contact facing down and the notched corner inwards.

Never insert or remove the SIM while the modem is powered up.

Supported Cellular Network Providers

The following table identifies the mobile network operators that have been tested and validated by ICT, and the functionality they support.

-  Supported
-  Supported with conditions
-  Not supported

Region	MNO	APN	APN Login	SIM Plan	Reporting	Inbound
Australia	Telstra	telstra.m2m	N/A	No specific plan required	✓	✗
Canada	Rogers	media.com	Obtain login from provider	TBC	✓	✗
	Telus	pse.telus.iot	N/A	TBC	✓	✓
Inbound service requires request for static IP.						
Denmark	3 SE	data.tre.se	TBC	TBC	✓	✓
	Supported provider, not yet physically validated.					
	Telenor	services.telenor.se	N/A	No specific plan required	✓	✓
Supported provider, inbound service not yet physically validated.						
Hong Kong	3 Mobile	mobile.lte.three.com.hk	N/A	TBC	✓	✗
	China Mobile	CMHK	N/A	TBC	✓	✗
	China Unicorn	3gnet	N/A	TBC	✓	✗
	CSL	PCCW	N/A	TBC	✓	✗
	HKT	PCCW	N/A	TBC	✓	✗
Indonesia	Indosat Ooredoo	Indosatgprs	Obtain login from provider	4G DATA SIM	✓	✗
New Zealand	Spark	m2mdirect	N/A	TBC	✓	✓
	Contact Spark to be put onto the correct SIM plan for inbound service.					
Sweden	Vodafone NZ	internet	N/A	No specific plan required	✓	✓
	3 SE	data.tre.se	TBC	TBC	✓	✓
	Supported provider, not yet physically validated.					
USA	Telenor	services.telenor.se	N/A	No specific plan required	✓	✓
	Supported provider, inbound service not yet physically validated.					
USA	Choice IoT	TBC	TBC	TBC	✓	✓
	Slow data transfer as not yet network certified.					

Programming for Protege GX

Controller configuration and monitoring of the Protege DIN Rail Cellular Modem is performed in the web interface of the controller that the modem is physically connected to. Programming must also be performed in Protege GX to configure the reporting service and, optionally, Protege GX programming downloads.

The key programming steps required are as follows:

- Configure the controller for communication with the cellular modem (see below)
- Configure the reporting service to report to the monitoring station (see next page)
- If required, configure Protege GX and the controller for downloads (see page 10)

Configuring the Protege GX Controller

Cellular modem configuration is supported in Protege GX controller firmware version 2.08.1271 or higher.

1. Log in to the controller web interface and navigate to the **System Settings** page.
2. In the **Adaptor - USB Ethernet** tab, check **Enable USB Ethernet** to configure the controller to look for an ethernet adaptor connected to its USB port.
3. If not automatically enabled, set the **Connection** to Cellular Modem to configure the controller to communicate with the cellular modem connected to its USB port.

When this option is enabled the details of the cellular connection will be displayed.

4. Configure the **Cellular Network Connection**:
 - **Cellular APN**: The APN is specified by the mobile network operator (MNO) and is unique to that network. It is important to use the correct APN for the cellular service required.
 - **Cellular Username**: The username for the cellular network account.
 - **Cellular Password**: The password for the cellular network account.
5. Click **Save**.
6. **Restart** the controller.

Establishing the Connection

After the controller restarts it will automatically detect the modem and connect to the cellular network. The connection status and details will be updated in the Cellular Information section.

It can take a minute or two for the modem to connect to the cellular network and obtain an IP address, and the page may display 'Not registered' while the modem is initially starting up.

Cellular Options

- **Enable Debug***: When enabled, debug events are logged to the event log to help diagnose setup issues with the cellular modem. This would generally be enabled only during initial configuration or troubleshooting and should be disabled during standard operation.
- **Enable Watchdog***: When enabled, this option will prompt an automatic restart of the controller in the event that a critical fault is detected with the cellular modem that cannot be resolved. This option would typically only be enabled during fault finding.

Cellular Information

The cellular information section displays the cellular network connection status and details.

- **External Modem Detected:** Indicates whether the controller is able to communicate with the cellular modem connected to its USB port.
- **SIM Detected:** Indicates whether the controller is able to detect the cellular modem's SIM.
- **SIM Provider:** Displays the provider of the SIM, if detected.
- **Signal Strength:** The current strength of the wireless connection.

The signal strength can only be displayed once a connection to a cell tower is established. When the cellular modem is performing initial configuration, has been automatically reset, or is initially searching for a network, Signal Not Measured will be displayed. This does not indicate a problem with the signal.

- **Network Registration Status:**
 - Registered (home): Displayed when the cellular modem is successfully connected to a network inside the SIM home region.
 - Registered (roaming): Displayed when the cellular modem is successfully connected to a network outside the SIM home region.
 - Not registered: Displayed when the cellular modem is detected but no connection has been established.
 - Not registered, seeking: Displayed when the cellular modem is actively seeking a network to connect to.
 - Denied: The network actively refused the connection attempt by the cellular modem.
 - Unknown: The cellular modem cannot currently determine network connection status.
- **Current Network Provider:** The mobile network operator that the cellular modem is currently connected to.
- **Current Technology:** The cellular technology that the cellular modem is connected with.
- **Internet Connection Status:** Identifies whether the cellular modem's internet connection is valid.
- **IP Address:** The IP address assigned to the cellular modem by the network provider.

If there is an error with the cellular connection the controller may automatically reset the modem to attempt to resolve the connection. When this occurs the controller interface will momentarily display the External Modem Detected disconnected icon. This is expected and only indicates a problem if it remains disconnected .

Configuring the Protege GX Reporting Service

A reporting service is required to manage and send the alarm data from the controller via the cellular modem.

1. Navigate to **Programming | Services**.
2. In the toolbar, select the **Controller** that the cellular modem is connected to.
3. Add a service with a suitable identifying **Name**.
4. Set the **Service type** to Report IP.
5. Set the **Service mode** to 1 - Start with controller OS.
6. In the **General** tab, enter the **Client code** to identify the site in reports to the monitoring station.
7. Set the **Reporting protocol** to match the protocol of the monitoring station receiving application.
8. In the **Primary channel settings**, enter the **IP address / Host name** of the monitoring station server.
9. Enter the **IP port number** to communicate with the monitoring station server.
10. Set the **Adaptor** to USB ethernet. This instructs the controller to transmit report data through its USB port.
11. The **Ack wait time** defaults to 5 (seconds). This is suitable for most standard connections, but may need to be increased to 10 for slow connections if events and polling are failing (see page 15).
12. In the **Options** tab, review and update the events to report, as required.

The 'Log' options can be enabled for troubleshooting, but should be disabled once the service is operational.

13. **Save** the service configuration.
14. Wait for the changes to be downloaded to the controller, then right click on the service and click **Start Service**.

For more information on reporting service configuration, see the Protege GX Operator Reference Manual.

Backup Reporting Service

Where possible, a backup reporting service should be created to provide an alternative connection to the monitoring station for alarm reporting in the event that the main reporting connection fails. The backup service would generally use an alternative IP connection or phone line.

The configuration for a backup service is essentially the same as for the main reporting service, with a couple of important additional requirements.

Backup Service

1. In the **Options** tab for the backup service, you need to enable the **Service operates as a backup** option.
2. In the **General** tab, you should also select the **Enable offline polling** option, so that if the service loses connection the Reporting Failure trouble input will open and a report will be sent to the monitoring station. This ensures that any issues with the backup service are detected before the backup service is needed.

Main Service

1. In the **General** tab for the main reporting service, select the service that will operate as the **Backup service**.
2. Set the **Time before backup**. This defines the length of time (in seconds) that the connection must be lost before the main service will activate the backup.

Using this configuration, you can assign any other valid connection to the monitoring station as the backup for the cellular modem reporting service. You can also use exactly the same process to assign the cellular modem connection as the backup service for another connection path.

Assigning Reporting Services to Areas

The reporting service sends alerts to the monitoring station based on alarms triggered in areas. For a reporting service to send an alarm to the monitoring station, the service must be assigned to monitor the area in which the alarm occurs.

1. Navigate to **Programming | Areas** and select the area(s) that will be monitored by the service.
2. In the **Configuration** tab, scroll down to the **Reporting services** section and click **Add**.
3. Select the reporting service(s) that will monitor the selected area(s) and click **Ok**.
4. **Save** your changes.

Configuring Protege GX Downloads

There is a significant difference between a controller reporting out via the cellular modem to a monitoring station and the controller receiving programming downloads and manual control commands from Protege GX.

For downloads to the controller the TCP connection is initiated by the Protege GX software, and many cellular network providers will not allow a remote device (i.e. the Protege GX server) to initiate a connection to a cellular device, or will have a particular APN that the cellular device must connect to.

Additionally, the cellular network inherently uses DHCP and it is expensive to request a static IP address, so the controller's cellular IP address may change frequently.

The Solution

To resolve these issues, Protege GX can be configured to record the IP address from status updates it receives from the controller, and maintain this as the controller's cellular IP address which it uses for downloads.

- The Protege GX controller connects to the cellular network and obtains an IP address.
- The controller sends event and status updates to the Protege GX server.
- The Protege GX software records the IP address that the messages came from.
- When manual commands or updated programming need to be sent to the controller, Protege GX downloads them to the recorded IP address.
- If the cellular network dynamically changes the controller's IP address, the controller will send an event to Protege GX so that it can record the new IP address.

Protege GX Download Configuration

1. Your Protege GX server must be exposed to the internet with a publicly available IP address.
2. In Protege GX, navigate to **Sites | Controllers** and select the controller connected to the cellular modem.
3. In the **Communications** section, enable the **Dynamic IP address update** option.
4. Click **Save**.
5. Log in to the controller's web interface and navigate to **Settings**.
6. Program the Protege GX server's publicly available IP address as an **Event Server**.
7. Set that event server's **Primary Adaptor** to USB Ethernet so event messages are sent via the USB port.
8. Optionally, if you have an ethernet connection plugged in to the controller you could set the event server's **Secondary Adaptor** to Onboard. The controller would first attempt to connect using the cellular modem via USB, and if the event message fails would then try its onboard physical ethernet connection as a backup.
9. **Save** the settings and **Restart** the controller.

Protege GX Download Testing

In Protege GX, navigate to **Monitoring | Events** and confirm that events are being received from the controller. Note the source IP address of the received events.

Navigate to **Sites | Controllers** and check that the controller's IP address has been updated to reflect the source IP address of the events received from the controller.

Log in to the controller web interface and navigate to **Settings**. Go to the **Adaptor - USB Ethernet** tab and compare the **IP Address** to the controller's updated IP address in Protege GX. They should be the same.

If they are not the same, NAT (Network Address Translation) is being used which could cause problems with the downstream connection. An alternative network provider may be necessary to support download functionality.

In Protege GX, initiate a manual command and check that the controller responds appropriately. This can be any manual command appropriate to your controller configuration, or you could simply right click the controller record and **Set controller date time**.

Navigate to **Sites | Controllers**, and in the **Diagnostic windows** section for the controller with the modem connected click **Open download server diagnostic window**. Then right click on the controller record and **Force download**. Confirm that the download is successfully sent to the controller and that it completes correctly.

Programming for Protege WX

Controller configuration and monitoring of the Protege DIN Rail Cellular Modem is performed in the Protege WX web interface. Programming must also be performed in Protege WX to configure the reporting service that will report to the monitoring station.

The key programming steps required are as follows:

- Configure the controller for communication with the cellular modem (see below)
- Configure the reporting service to report to the monitoring station (see next page)

Configuring the Protege WX Controller

Cellular modem configuration is supported in Protege WX controller firmware version 4.00.1096 or higher.

1. Log in to the controller web interface and navigate to the **System Settings** page.
2. In the **Adaptor - USB Ethernet** tab, check **Enable USB Ethernet** to configure the controller to look for an ethernet adaptor connected to its USB port.
3. If not automatically enabled, set the **Connection** to Cellular Modem to configure the controller to communicate with the cellular modem connected to its USB port.

When this option is enabled the details of the cellular connection will be displayed.

4. Configure the **Cellular Network Connection**:
 - **Cellular APN**: The APN is specified by the mobile network operator (MNO) and is unique to that network. It is important to use the correct APN for the cellular service required.
 - **Cellular Username**: The username for the cellular network account.
 - **Cellular Password**: The password for the cellular network account.
5. Click **Save**.
6. **Restart** the controller.

Establishing the Connection

After the controller restarts it will automatically detect the modem and connect to the cellular network. The connection status and details will be updated in the Cellular Information section.

It can take a minute or two for the modem to connect to the cellular network and obtain an IP address, and the page may display 'Not registered' while the modem is initially starting up.

Cellular Options

- **Enable Debug***: When enabled, debug events are logged to the event log to help diagnose setup issues with the cellular modem. This would generally be enabled only during initial configuration or troubleshooting and should be disabled during standard operation.
- **Enable Watchdog***: When enabled, this option will prompt an automatic restart of the controller in the event that a critical fault is detected with the cellular modem that cannot be resolved. This option would typically only be enabled during fault finding.

Cellular Information

The cellular information section displays the cellular network connection status and details.

- **External Modem Detected:** Indicates whether the controller is able to communicate with the cellular modem connected to its USB port.
- **SIM Detected:** Indicates whether the controller is able to detect the cellular modem's SIM.
- **SIM Provider:** Displays the provider of the SIM, if detected.
- **Signal Strength:** The current strength of the wireless connection.

The signal strength can only be displayed once a connection to a cell tower is established. When the cellular modem is performing initial configuration, has been automatically reset, or is initially searching for a network, Signal Not Measured will be displayed. This does not indicate a problem with the signal.

- **Network Registration Status:**
 - Registered (home): Displayed when the cellular modem is successfully connected to a network inside the SIM home region.
 - Registered (roaming): Displayed when the cellular modem is successfully connected to a network outside the SIM home region.
 - Not registered: Displayed when the cellular modem is detected but no connection has been established.
 - Not registered, seeking: Displayed when the cellular modem is actively seeking a network to connect to.
 - Denied: The network actively refused the connection attempt by the cellular modem.
 - Unknown: The cellular modem cannot currently determine network connection status.
- **Current Network Provider:** The mobile network operator that the cellular modem is currently connected to.
- **Current Technology:** The cellular technology that the cellular modem is connected with.
- **Internet Connection Status:** Identifies whether the cellular modem's internet connection is valid.
- **IP Address:** The IP address assigned to the cellular modem by the network provider.

If there is an error with the cellular connection the controller may automatically reset the modem to attempt to resolve the connection. When this occurs the controller interface will momentarily display the External Modem Detected disconnected icon. This is expected and only indicates a problem if it remains disconnected .

Configuring the Protege WX Reporting Service

A reporting service is required to manage and send the alarm data from the controller via the cellular modem.

1. Navigate to **Programming | Services**.
2. Add a service with a suitable identifying **Name**.
3. Set the **Service Type** to Report IP.
4. Set the **Service Mode** to Start with Controller OS.
5. In the **General** tab, enter the **Client Code** to identify the site in reports to the monitoring station.
6. Set the **Reporting Protocol** to match the protocol of the monitoring station receiving application.
7. In the **Primary channel settings**, enter the **IP Address / Host Name** of the monitoring station server.
8. Enter the **IP Port Number** to communicate with the monitoring station server.
9. Set the **Network Adaptor** to USB Ethernet. This instructs the controller to transmit report data through its USB port.
10. In the **Options** tab, review and update the events to report, as required.
 - The 'Log' options can be enabled for troubleshooting, but should be disabled once the service is operational.
11. **Save** the service configuration.

12. Navigate to **Monitoring | Services**.
13. Click on the **Controls** button beside the service record and click **Start Service**.

For more information on reporting service configuration, see the [Protege WX Programming Reference Manual](#).

Backup Reporting Service

Where possible, a backup reporting service should be created to provide an alternative connection to the monitoring station for alarm reporting in the event that the main reporting connection fails. The backup service would generally use an alternative IP connection or phone line.

The configuration for a backup service is essentially the same as for the main reporting service, with a couple of important additional requirements.

Backup Service

1. In the **Options** tab for the backup service, you need to enable the **Service Operates as Backup** option.
2. In the **General** tab, you should also select the **Enable Offline Polling** option, so that if the service loses connection the Reporting Failure trouble input will open and a report will be sent to the monitoring station. This ensures that any issues with the backup service are detected before the backup service is needed.

Main Service

1. In the **General** tab for the main reporting service, select the service that will operate as the **Backup Service**.
2. Set the **Time Before Switching To Backup**. This defines the length of time (in seconds) that the connection must be lost before the main service will activate the backup.

Using this configuration, you can assign any other valid connection to the monitoring station as the backup for the cellular modem reporting service. You can also use exactly the same process to assign the cellular modem connection as the backup service for another connection path.

Assigning Reporting Services to Areas

The reporting service sends alerts to the monitoring station based on alarms triggered in areas. For a reporting service to send an alarm to the monitoring station, the service must be assigned to monitor the area in which the alarm occurs.

1. Navigate to **Programming | Areas** and select the area(s) that will be monitored by the service.
2. In the **Reporting Services** tab, click **Add**, select the reporting service(s) that will monitor the selected area(s), then click **OK**.
3. **Save** your changes.

Troubleshooting

Force Reset

If there is an error with the cellular connection the controller may automatically reset the modem to attempt to resolve the connection. When this occurs the controller interface will momentarily display the External Modem Connected disconnected icon. This is expected and only indicates a problem if it remains disconnected for more than a minute or two. If it does not reconnect, the cellular modem can be force reset by removing power until the LED goes off, then reapplying power.

Failed Events & Polling

To help troubleshoot failed events and polling, the 'Log' options can be enabled for the reporting service (**Programming | Services | Options**). This will log message activity and help identify failed responses.

Protege GX Ack wait time

The reporting service's **Ack wait time** setting (**Programming | Services | General**) determines how long the controller will wait to receive acknowledge messages before failing. In Protege GX this defaults to 5, which is suitable for most standard connections. However, for slower connections this may be insufficient. If events and polling are failing, particularly acknowledge responses, it may be necessary to increase this setting to 10.

To prevent excess events, the logging options should be disabled once the service is operational.

Frequently Asked Questions (FAQs)

Can I use the modem to connect to a Protege WX controller's web interface for programming, manual commands and viewing events?

No. Programming downloads, event uploads and manual control are currently not supported in Protege WX controllers. This functionality may be available in the future. Speak to the ICT sales team to register your interest.

Can I use the modem to download programming to a Protege GX controller?

Yes. Programming downloads, event uploads and manual control can be facilitated with Protege GX controllers on supported cellular networks. Due to the speed of cellular networks, programming downloads work best in conjunction with the Protege GX single record download service.

Is the download speed the same as ethernet?

No. Cellular network transmissions are not as fast as ethernet. The speed for the cellular modem is limited to a maximum uplink of 1Mbps and maximum downlink of 588Kbps.

Can I use the modem for Protege GX cross-controller communication?

No. This is not supported or possible.

Can I obtain my system controller time from the cellular network?

No. This is currently not supported, but may be available in the future.

Can I use the modem to update controller firmware?

No. Firmware updates are not supported and will cause unexpected results if attempted.

Can I update the modem firmware?

No. Modem firmware updates are currently not supported. This may be available in the future.

What networks is the modem compatible with?

The modem is compatible with supported cellular networks only.
It is not a WiFi-enabled device and does not support connection to a wireless LAN.

Can I use the modem on a private APN (Access Point Name)?

Yes. However, some private APNs have specific account configuration requirements which have not been validated and may present connection limitations. Connection should be validated prior to deployment.

Can the modem directly replace my dial-up reporting service?

Yes. You will need to change the reporting service from ContactID to a supported IP protocol which the monitoring station is capable of receiving.

Can I use the modem as a primary and/or secondary backup reporting path?

Yes. The cellular modem can be used in any combination of primary, secondary and/or backup IP reporting services.

When Dynamic IP address update is enabled, why does the USB Ethernet IP address in the controller's user interface not match the controller's updated IP address in Protege GX?

If using NAT (Network Address Translation) the IP address displayed in the user interface may be different.

Can I receive push notifications on my Protege Mobile App via the modem?

Yes. Push notifications are supported for both Protege GX and Protege WX controllers.
For Protege WX controllers the push notification service must first be activated using a wired connection.

Can I receive SMS alerts or other messages directly to my mobile phone?

No. SMS messaging is not supported.

Can the modem be used to make/receive voice calls?

No. Voice functionality is not supported.

Can I connect a third-party panel to the modem?

No. Third-party panels are not supported. The modem supports Protege GX and Protege WX controllers only.

Can I connect multiple controllers to the modem?

No. The modem does not support multiple connections. Only one controller can be connected to each modem.
Do not connect a USB hub or multi-USB adaptor to the modem, as unexpected results may occur.

Can multiple Protege GX controllers report through a single modem, using cross-controller communications?

Yes. With a single cellular modem connected to a single controller, and that controller connected to other controllers through a wired ethernet network using cross-controller communications, any controller in the group can use the single reporting service running on the first controller to report to a monitoring station via the modem.

Other functionality such as downloading programming to all controllers or sending events to Protege GX from all controllers will not work via that cellular connection.

Does GSM fallback include 3G?

No. GSM is often used as a generic term for mobile communication, but is strictly related to 2G networks. The modem does not support any 3G operation.

Can the cellular modem connect to any mobile network provider?

Yes. The modem is compatible with any valid cellular network provider. You may obtain a SIM from any suitable provider in your region, however there are some minimum requirements to ensure reliable operation.

- The selected provider should have good coverage across your region.
- For installations with alarm reporting only, a minimum data plan of 500MB/month is recommended.
- For installations with alarm reporting and programming downloads/event uploads, a minimum data plan of 1GB/month is recommended.

Note: The frequency and type of data transmissions will affect data consumption, so care must be taken to select a data plan which meets the requirements of your installation.

Are there recommended network providers?

Yes. ICT has tested and validated providers in each region, and continues to do so. SIMs with suitable data plans can be purchased from ICT, or sourced directly from the provider or its agents.

For a list of validated network providers in each region, see the Supported Cellular Network Providers table.

Disclaimer and Warranty

Disclaimer: Whilst every effort has been made to ensure accuracy in the representation of this product, neither Integrated Control Technology Ltd nor its employees shall be liable under any circumstances to any party in respect of decisions or actions they may make as a result of using this information. In accordance with the ICT policy of enhanced development, design and specifications are subject to change without notice.

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