TOPCON

MC-i4

GNSS Receiver

Installation and Setup Guide

MC-i4
Installation and Setup Guide

Part Number 1009669-01
Rev. C

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Preface

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Manual Conventions

This manual uses the following conventions:

Convention	Description	Example
Bold	Menu, or drop-down menu selection	**File ▸ Exit** (Click the **File** menu and click **Exit**)
Bold	Name of a dialog box or screen	From the **Connection** screen...
Bold	Button or key commands	Click **Finish**.
`Mono`	User supplied text or variable	Type `guest`, and click **Enter.**
Italic	Reference to another manual or help document	Refer to the *Topcon Quick Guide.*

Further information to note about system configuration, maintenance, or setup.

Supplementary information that can have an adverse effect on system operation, system performance, data integrity, measurements, or personal safety.

Notification that an action has the potential to result in system damage, loss of data, loss of warranty, or personal injury.

MC-i4

Read this manual thoroughly while using the MC-i4.

The MC-i4 (Figure 1) is a rugged machine control receiver and communication box for 2D and 3D applications in the heavy construction market. The MC-i4 supports up to two GNSS boards, internal radio and GSM/CDMA modem. MC-i4 can also be used as an Internet gateway to connect to Sitelink3D for remote support, file transfer, text messaging and productivity reports.

Figure 1: MC-i4

System Diagram

Figure 2 shows the MC-i4 in an example of a system diagram.

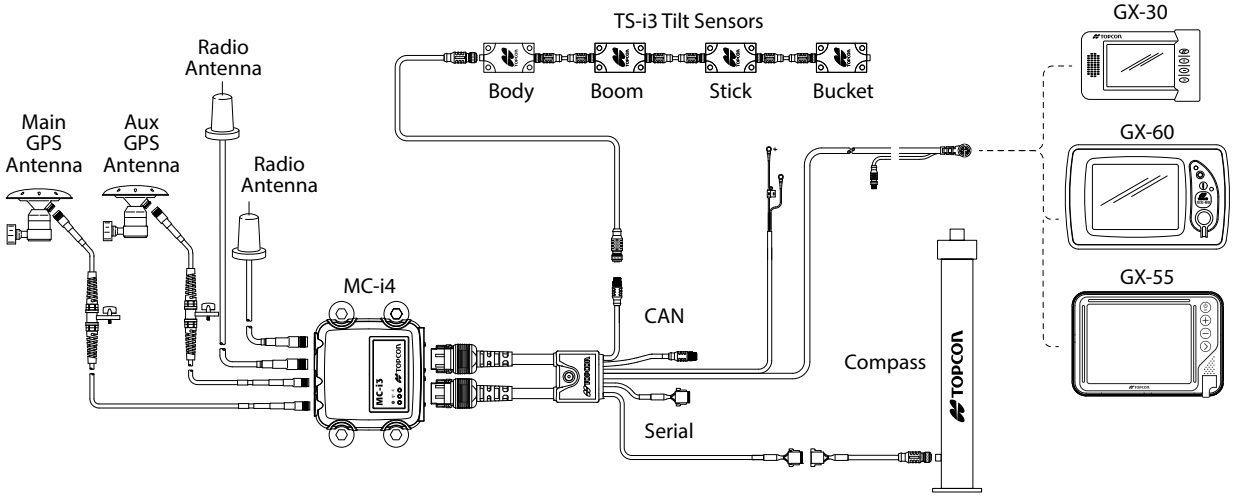

Figure 2. MC-i4 Example Excavator System Diagram

LED Status

The following describes the blink patterns of the LEDs inside the MC-i4.

POWER LED (GREEN)		
ICON	COLOR	STATUS
	Solid Green	On
	No Light	Off

TRANSMITT LED (GREEN/RED/AMBER)		
ICON	COLOR	STATUS
	No Light	Off
	Amber	Booting
	Green Flash	Not connected to sitelink3D Server (No GPRS connection information)
	Solid Green	Connected to sitelink3D Server but not receiving RTK corrections
	Solid Green w/Red Flash	Connected to sitelink3D Server and receiving GPS corrections

BLUETOOTH® LED (BLUE)		
ICON	COLOR	STATUS
	Solid Blue	Bluetooth connection enabled and operational
	No Light	Bluetooth connection unavailable

Topcon Receiver Utility (TRU)

Use TRU v3.0 or later when working with the MC-i4. TRU can be used for setting the Bluetooth configuration, and loading and configuring radio firmware. See the online Help embedded in TRU for more information.

MC-i4 SIM Card Installation

The following steps apply to all versions of the MC-i4.

1. Remove the eight (8) retaining screws from the base of the MC-i4.
2. Remove the base.

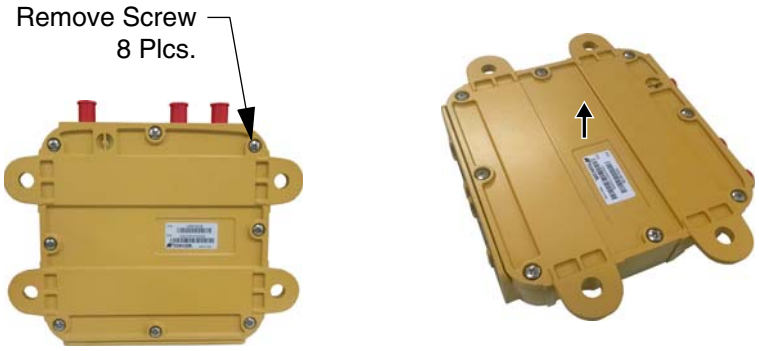

Figure 3: Remove Screws and Base

When working with multiple MC-i4s at one time, be careful not to mix bases as the unit's serial number and other important information is marked on the label affixed to the base.

3. Insert the SIM card into the SIM card slot.

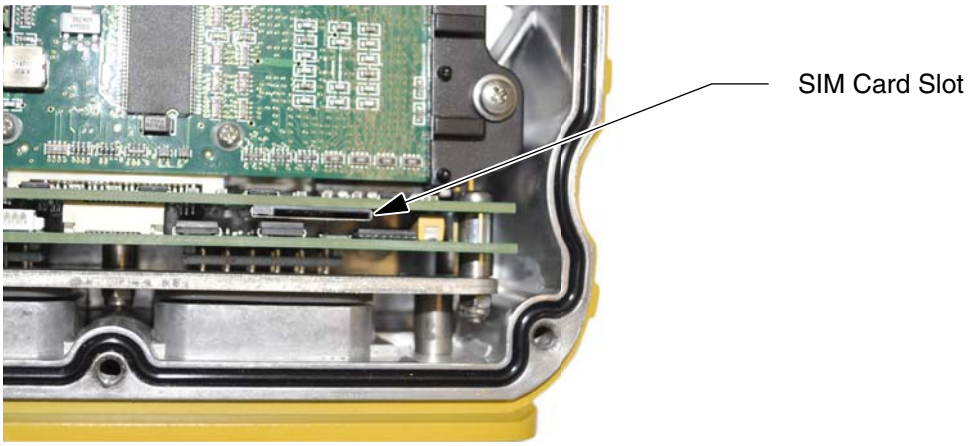

Figure 4: Insert SIM Card

4. Reinstall the base and the eight (8) retaining screws using Blue Loctite (not included), and torque to 12 in-lbs.

Failure to tighten all screws to the recommended torque may lead to moisture or dust entering the MC-i4.

If using Sitelink3D, see the *SL-100 Upgrade Kit Installation and Setup Guide* (P/N 1000226-01).

Connectivity and Configuration

Configuration of the unit can be done using the GX-60, GX-55, or GX-75 display and the cable, or with a computer using the following programing cables:

- SL-100-MC-i4 Program Cable (Power-Serial)
- SL-100-MC-i4 Program Cable (Ethernet)

It is not possible to configure the MC-i4 using the GX-30 display.

Connect to MC-i4 Web Interface

Download the MCXCONFIC installer file from myTopcon (https://www.topconpositioning.com/support).
Use the MCXCONFIG program on the desktop of the GX-55 and GX-75 displays to access the web interface.

1. Check to see that IP address settings are correctly configured.
   - On the GX-60 display: Tap **Start** ▸ **Settings** ▸ **Control Panel** ▸ **Network Connections** ▸ **Local area Connection** ▸ **Properties** ▸ **Internet Protocol (TCP/IP)** ▸ **Properties**.
     – Check that the settings are as follows:
       – **IP address** is set to **192.168.0.10**
       – **Subnet mask** is set to **255.255.255.0**
       – **Default Gateway** and **Preferred DNS** is set to **192.168.0.1**
   - On the computer: By default the computer should be set to **Obtain IP address** automatically (Figure 5), which is required. The steps to check for this will depend on the Computer operating system, but should be similar to the steps for the display.

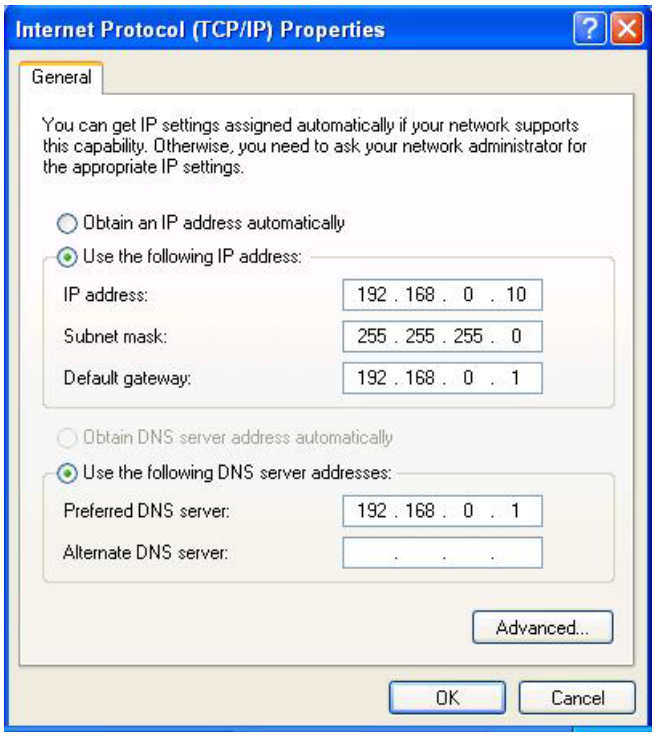

Figure 5. Confirm Internet Protocol (TCP/IP) Properties

2. Open the web browser on the display or your computer.

3. Type `192.168.0.1` into the address bar to connect to the web interface of the MC-i4 (Figure 6).

Figure 6. Access Topcon Sitelink3D Gateway Web Interface

When prompted for the user name and password, enter `admin` for both (Figure 7).

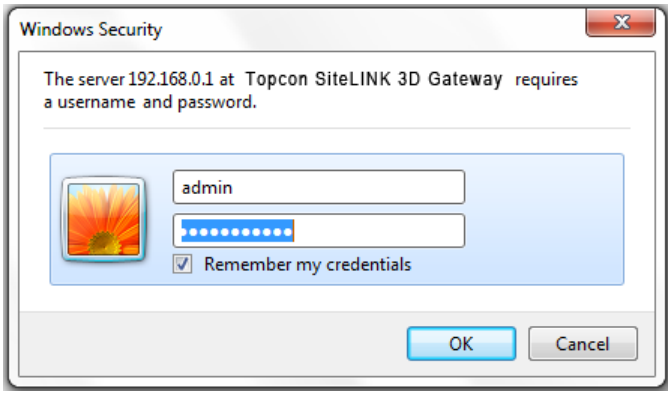

Figure 7. Enter Sitelink3D User Name and Password

MC-i4 General Information and Firmware

From the left menu on the screen, click **Settings ▸ General.** The device information is listed in the **General Device Configuration** screen (Figure 8).

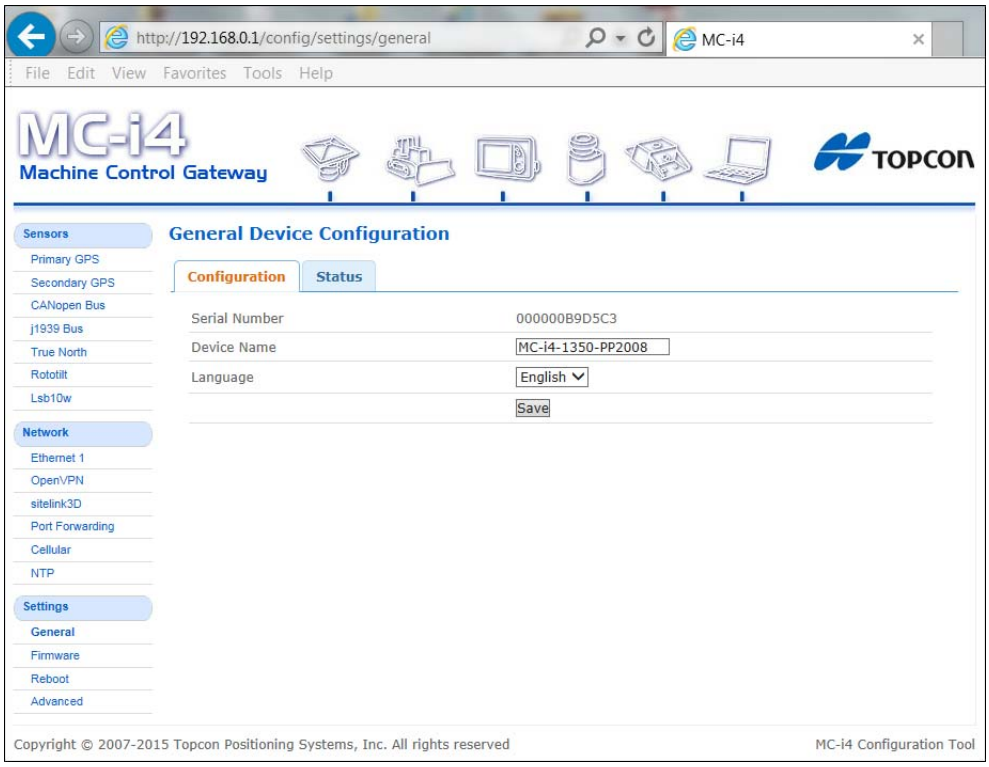

Figure 8. General Device Information

Upgrading GNSS Firmware

The MC-i4 contains two sets of GNSS firmware files (RAM and Flash), which can be recovered should a serious event occur. In such cases, load the RAM file first and then reboot. Once rebooted, load the Flash file and reboot again. Once completed, both sets of firmware will be upgraded.

1. Click **Sensors** ▸ **Primary GPS**, then click the **Firmware Upgrade** tab (Figure 9).

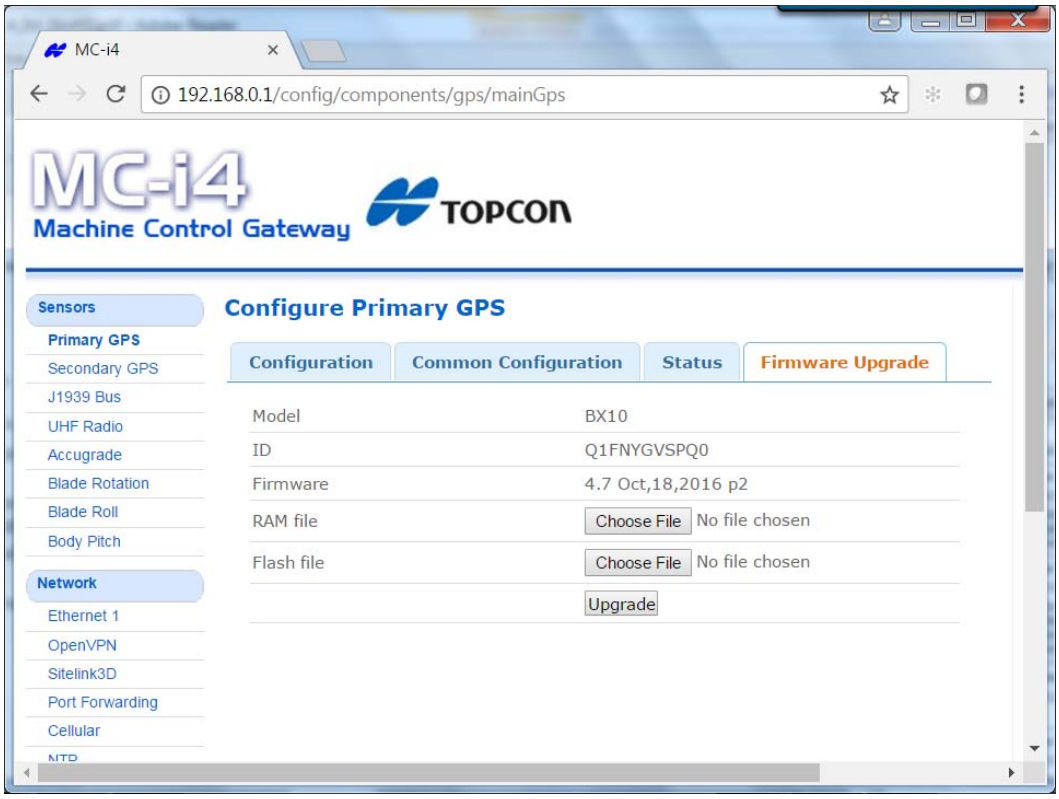

Figure 9. Upgrading the Firmware

2. Click the **Choose File** button for both **RAM file** and **Flash file**. The Windows explorer appears.
3. Locate and select the appropriate modem firmware files.
4. Click **Upgrade**.

Upgrading MC-i4 or Cinterion Modem Firmware

1. If the MC-i4 or Cinterion modem firmware requires upgrading, click **Settings** ▸ **Firmware** (Figure 10).

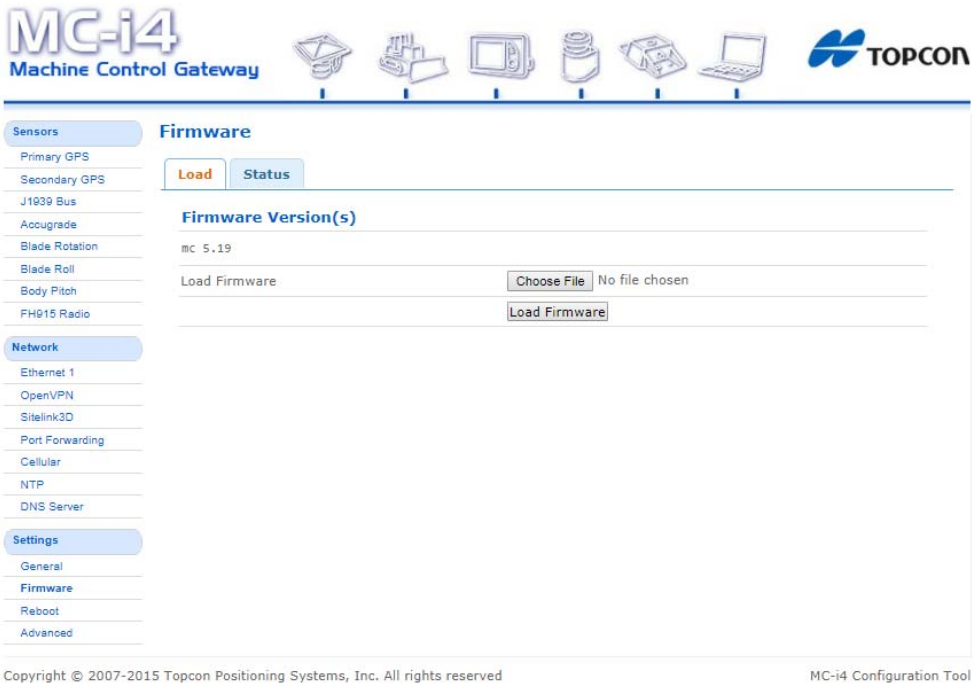

Figure 10. Firmware Upload Screen for the MC-i4

2. Click the **Choose File** button. The Windows explorer appears.
3. Locate and select the appropriate controller firmware for the MC-i4, or modem firmware for the cellular board.
4. Click **Load Firmware** to begin.

Do not close the web browser or power off the system during the firmware upload process.

5. Once firmware loading is complete, a reboot prompt appears (Figure 11).

Figure 11. Reboot the Device

6. Click **Reboot**.

Resetting the MC-i4

If the MC-i4 settings are in an unknown state, all the settings can be reset, which will remove most settings, including any user defined settings. This step is recommended if the history of the unit is unknown, or if it has been upgraded from any early beta version of the MC-i4 firmware.

1. From the menus on the left of the screen click **Settings** ▸ **Advanced**, then click the **Administration** tab.
2. In **Erase persistent data** row, select **Application** from the drop-down list (Figure 12).

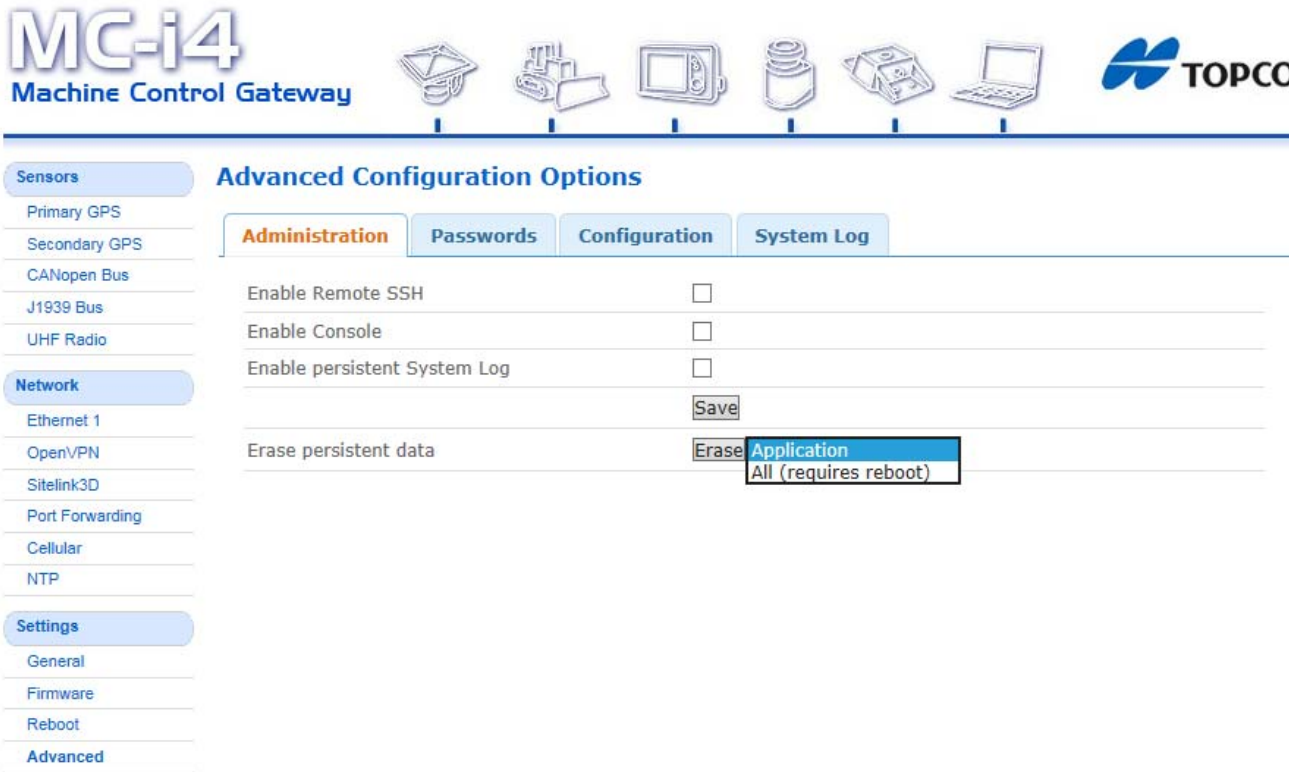

Figure 12. Erase Persistent Data

3. Click **Erase**.
4. Locate and click the **Reboot** shortcut link at the top of the screen, or click **Settings** ▸ **Reboot** on the left side of the screen.

Network provider information must be entered manually when resetting the MC-i4.

Configure MC-i4 for Cellular

Before configuring, you will need the APN, user name, and password from the cellular provider.

If using a CDMA network provider, you will need to provide the device's MEID number for activation. The MEID number may be found by clicking **Network** ▸ **Cellular** ▸ **Status** tab, and referencing the "Modem Serial Number".

General Configuration

1. From the left menu on the screen, click **Network** ▸ **Cellular**.
2. In the **Configuration** tab (Figure 13) the settings should be as follows:
   - **Enabled**: this check box is selected by default
   - **Radio Technology**: choose an option:
     – **Autodetect**: chooses the strongest carrier signal
     – **GSM/UMTS**: always chooses GSM/UMTS carrier
     – **CDMA**: always chooses CDMA
   - **Allow Roaming**: this check box is not selected by default
   - **Reset On No Data Reception**: this check box is selected by default
   - **Use SIM PIN**: this check box is not selected by default
   - **SIM PIN**: as supplied by cellular provider

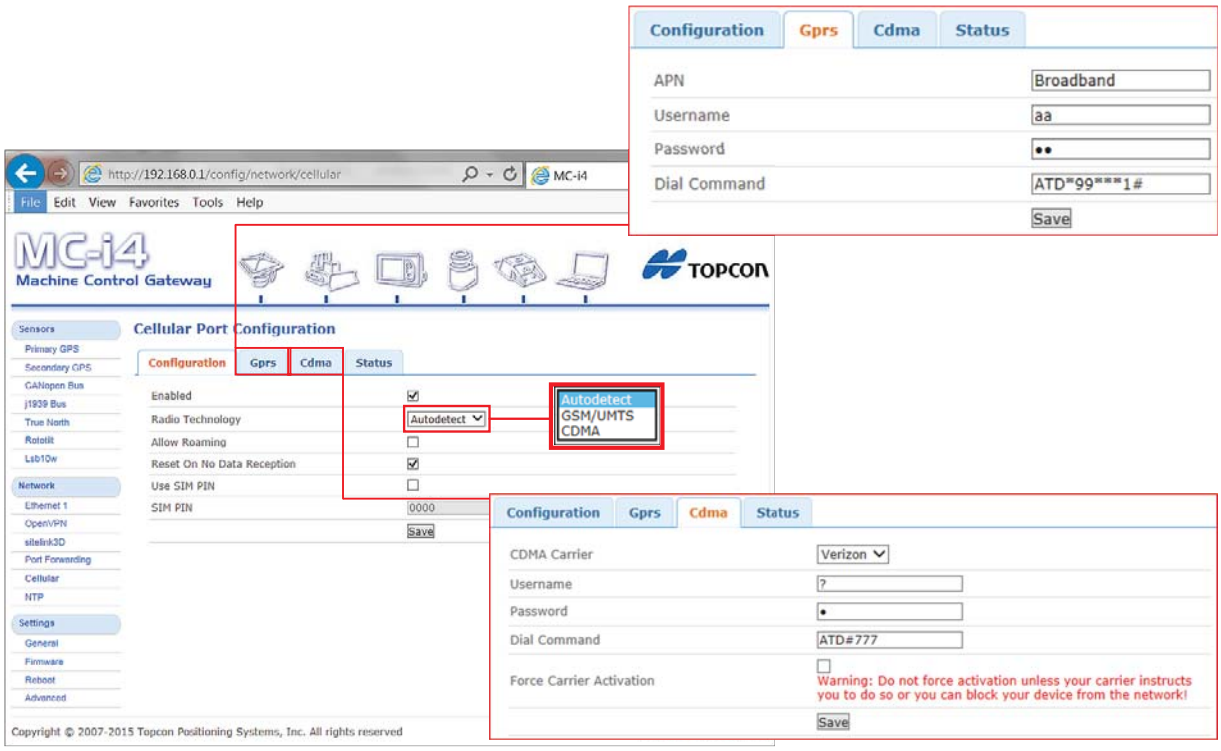

Figure 13. General, GPRS, and CDMA Configurations

GPRS Configuration

Click the **GPRS** tab (Figure 13) and enter the following information as supplied by your cellular provider.

Example:

- **APN**: *Broadband*
- **Username**: enter your user name
- **Password**: enter your password
- **Dial Command**: *ATD*99***1#*

CDMA Configuration

1. Click the **CDMA** tab (Figure 13 on page 10) and enter or select the following information as supplied by your cellular provider.

Example:

- **CDMA Carrier**: select a carrier
- **Username**: enter your user name
- **Password**: enter your password
- **Dial Command**: *ATD#777*
- **Force Carrier Activation**: select this only if your carrier instructs you to.

Connectivity Test

To test connectivity do the following:

1. Connect the cellular antenna to the MC-i4, and click **Network** ▸ **Cellular**.
2. Click the **Status** tab.
3. Check that the **SIM Status** displays **Ready**.
4. After a few minutes, confirm that the status displays **Connected**.

Configure OpenVPN

1. From the left menu of the screen, click **Network** ▸ **OpenVPN**, and click the **Remote Configuration** tab.
2. Ensure that **OpenVPN Enabled** is selected under the **Configuration** tab.
3. To enter the one-time code you received from your Sitelink3D Server administrator, click the **Remote Configuration** tab.

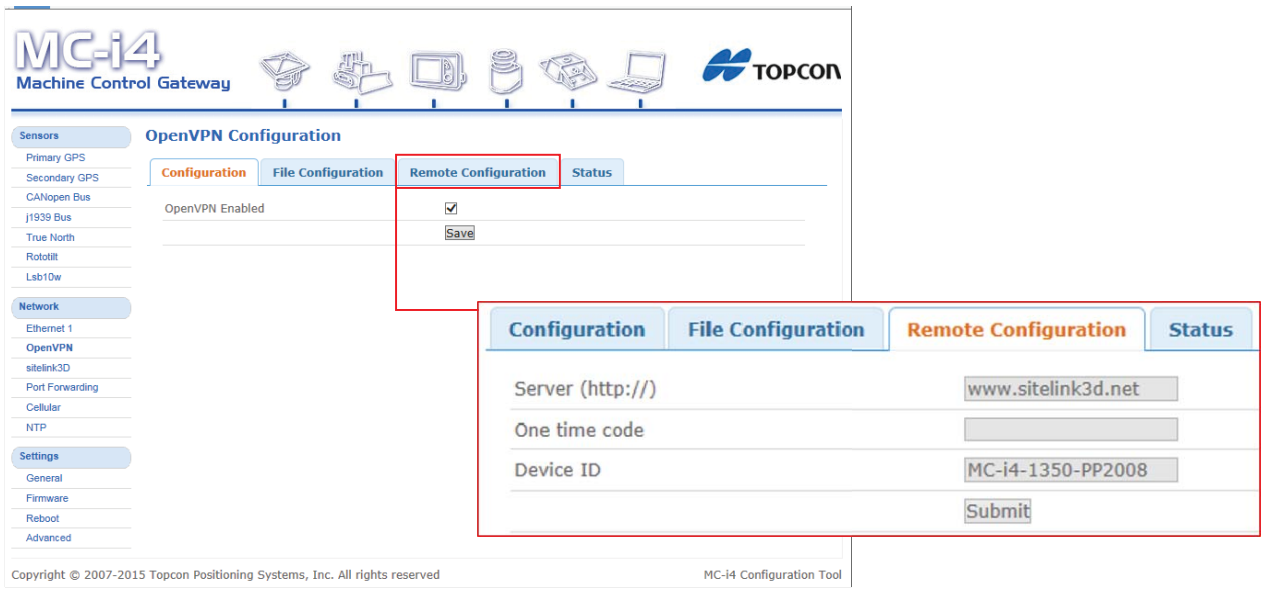

Figure 14. Configuring OpenVPN

Prior to entering a one-time code, ensure a cellular connection is running.

4. Click **Submit** at the bottom of the screen to save these settings and start the OpenVPN connection.
5. To check open VPN status, click the **Status** tab; the **OpenVPN Status** page displays.
6. Check that the **Connection Status** displays **OpenVPN tunnel is up**.

Default Settings

The following should be correctly set when the unit is received from Topcon. The steps outlined in "Resetting the MC-i4" on page 9 will also return the unit to these settings.

- **Settings ▸ General ▸ Device Mode** should be set to **Cellular**.
- **Settings ▸ Ports ▸ Serial 1 ▸ Function** should be set to **GPS**.
- **Settings ▸ Ports ▸ Serial 2 ▸ Function** should be set to **GPS**.
- **Sensors ▸ Primary GPS ▸ Configuration** tab, the **Enabled** check box should be selected.
- **Sensors ▸ Primary GPS ▸ Configuration** tab, **Mode** should be set to **TCP Access Only**.
  – To verify that the MC-i4 is properly configured to use the Main GPS, click the **Status** tab. The information line displays **Ready for TCP client connection on port 8012**.
- **Sensors ▸ Secondary GPS ▸ Configuration** tab, the **Enabled** check box should be selected.
- **Sensors ▸ Secondary GPS ▸ Configuration** tab, **Mode** should be set to **TCP Access Only**.
  – To verify that the MC-i4 is properly configured to use the Secondary GPS, click the **Status** tab. The information line displays **Ready for TCP client connection on port 8013**.

MC-i4 Configuration in 3D-MC

To configure your machine for 3D-MC, follow the steps below.

To access the 3D-MC menus, use the **Topcon Menu Button**. If you are using a GX-60 display, tap the **Topcon Menu Button** on the screen. If you are using a GX-30, GX-55, or GX-75 display, press the **Topcon Menu Button** on the device.

1. Tap the **Topcon Menu Button**, and tap **Control** ▸ **Machine setup**.
2. From the **Machine Files** screen, select **New** to create a new machine; to edit an existing machine, select the desired machine and select **Edit**.

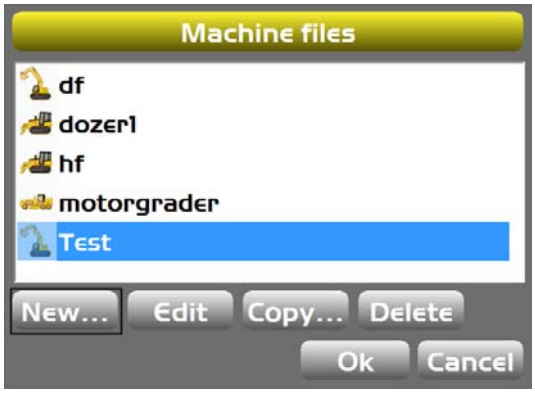

Figure 15. Create or Edit a Machine File

3D-MC Machine Setup

1. From the **Machine Setup** wizard, in the **Options** page, select the following from the **Position Input** drop-down list (Figure 16):
   - For GNSS Receiver Boards: **MC-i3**/**MC-i4**.
   - For Total Station 3D positioning: **MC-i4 (LongLink)**.

For more information on Total Station 3D positioning, refer to the *LPS Operator's Manual* (P/N:1002375-01) or the *3D LPS Excavator Indicate System Installation and Calibration Manual* (P/N 1013683-01).

2. If using a rotating tilt bucket, select **MC-i4** from the **Sensor Input** drop-down list (Figure 16).

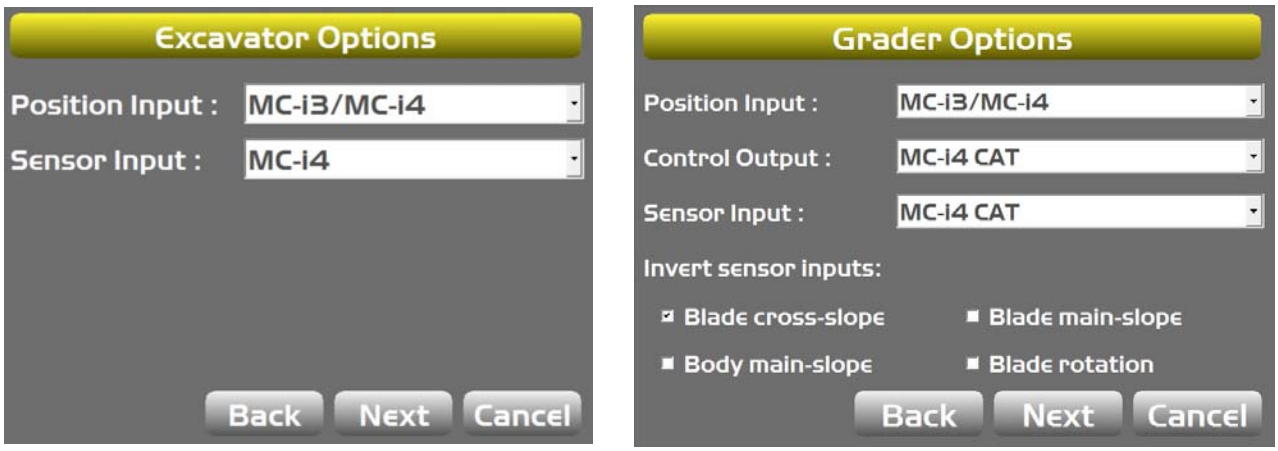

Figure 16. Setup Options

3. If using a Caterpillar M2 or M3 series machine, select **MC-i4 CAT** from the **Control Output** and **Sensor Input** drop-down lists (Figure 16).
4. If using TS-1 tilt sensors connected to a GX-60, GX-55, or GX-75 display, select **GX-Series** from the **Sensor Input** drop-down list.
5. Tap **Next** until the **GPS radio configuration** screen appears (Figure 17).

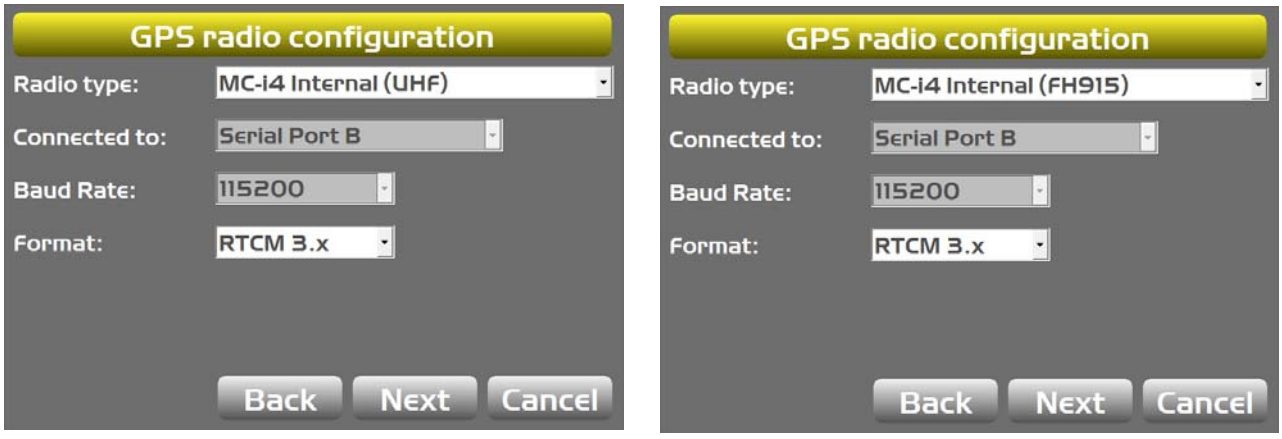

Figure 17. GPS Radio configuration

6. If using local Base Station corrections, select either **MC-i4 Internal (UHF)** or **MC-i4 Internal (FH915)**.

Connected to and **Baud Rate** options are unavailable when using internal UHF or FH915 radios.

7. If using network corrections, select **Direct Network Corrections** and enter the appropriate data, including the **Base IP/port** (Figure 18).
8. Tap **Net** to enter the **Username** and **Password**, and select the **Network type** (Figure 18).

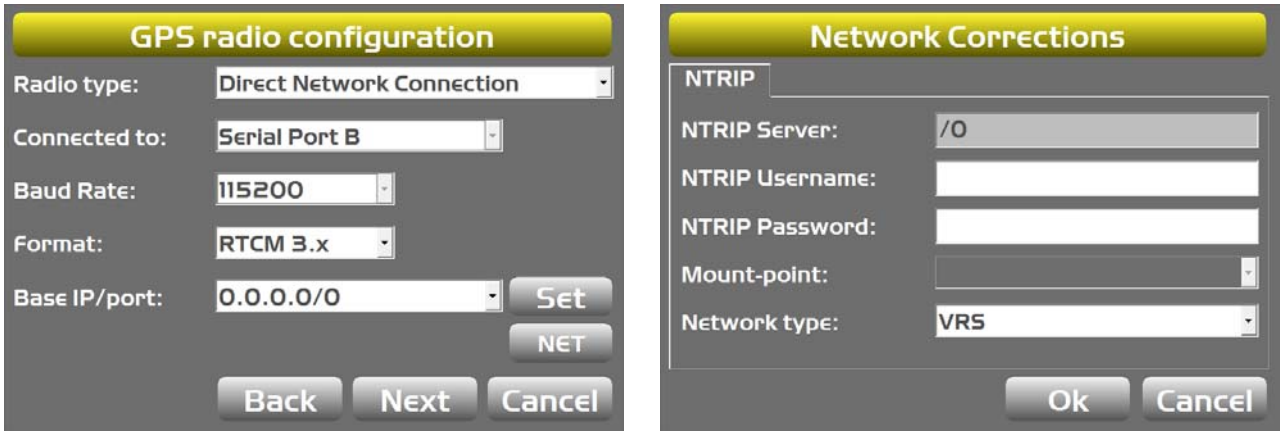

Figure 18. Direct Network Corrections

9. If using LPS with Longlink, the **LPS Connection** screen will appear (Figure 19).

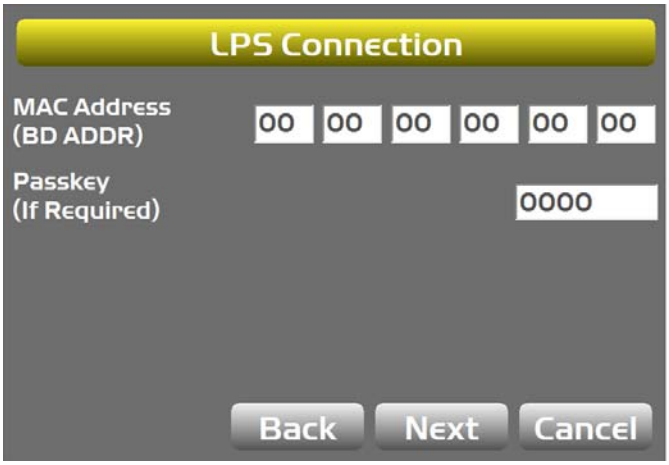

Figure 19. LPS Connection

10. From the **LPS Connection** screen enter the following:
    - **MAC Address:** enter the Bluetooth MAC address of the LPS device (i.e. Total Station)
    - **Passkey:** corresponding passkey (only if set on the Total Station)

PS Total Station parameters can be found in the program mode (PRG button): **Configuration** ▸ **Comms** ▸ **Bluetooth Tab** ▸ **Info Button**

MC-i4 Longlink Configuration

There is no configuration required on the MC-i4. For debugging purposes, a connection status screen can be viewed on the MC-i4 web interface.

1. Log in to the MC-i4 web interface: *http://192.168.0.1*
2. Select **Sensors** ▸ **Longlink** to view the connection status and current MAC address (Figure 20).

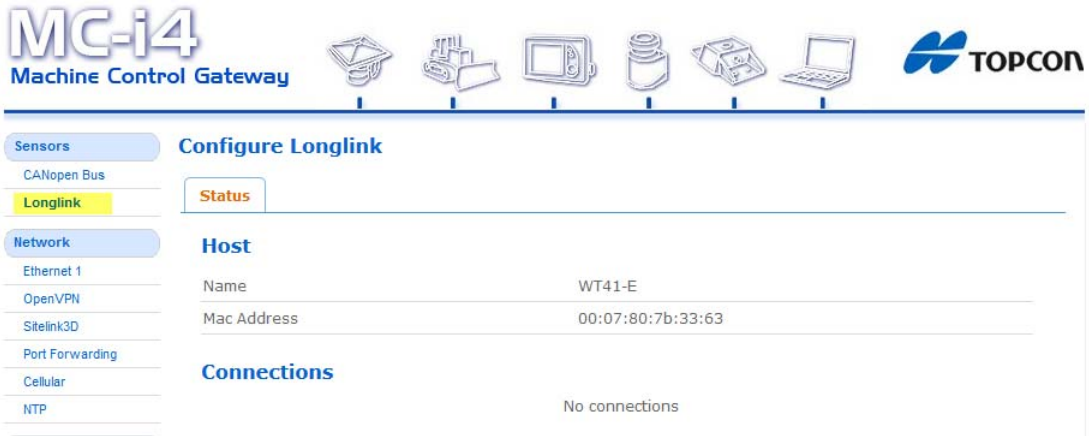

Figure 20. MC-i4 Configure Longlink

Configure MC-i4 for Digital UHF

MC-i4 Digital UHF Configuration

The MC-i4 web interface enables radio configuration, channel management and status display.

1. After an appropriate machine has been configured, log in to the MC-i4 web interface: *http://192.168.0.1*
2. Select **Sensors ▸ UHF Radio**.
3. Configuration options provided by 3D-MC are available under the **Config** tab.

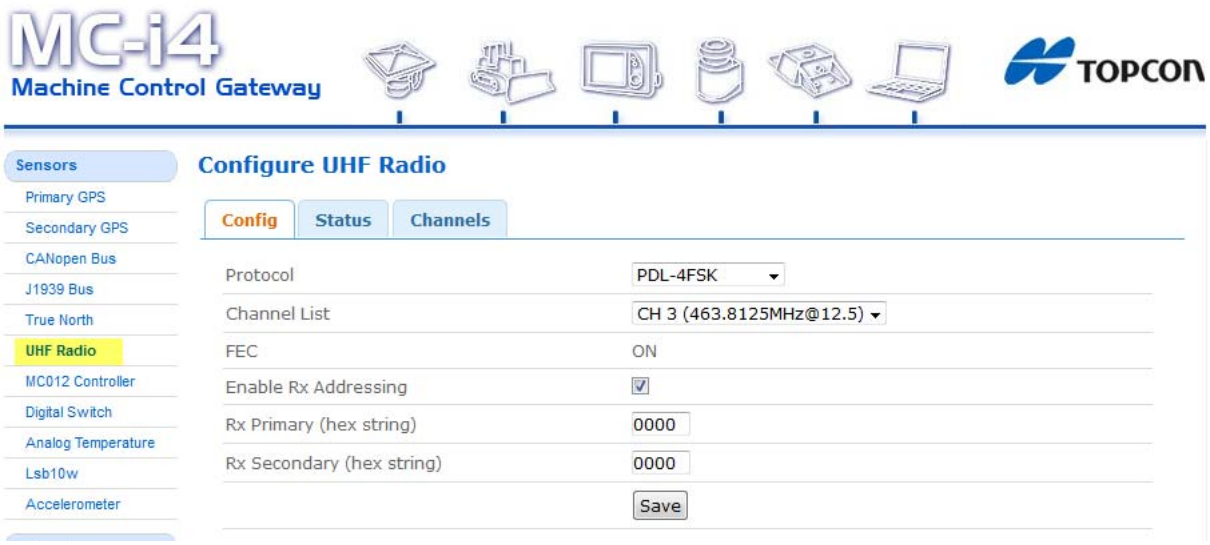

Figure 21. MC-i4 Configure UHF Radio

Digital UHF Channel Management

1. Channel presets are displayed under the **Channels** tab.
2. To add a channel enter:
   - **Channel #:** unique channel number (larger than 0)
   - **Frequency (MHz):** valid frequency (between 403-473Mhz)
   - **Spacing (kHz):** spacing
3. To delete a channel, select the desired channel and hit delete.
4. To edit a channel, select the desired channel and hit edit.

If the channel is currently used in the configuration, it is not possible to edit a channel number or delete a channel. Switch to another channel prior to editing or deleting a channel.

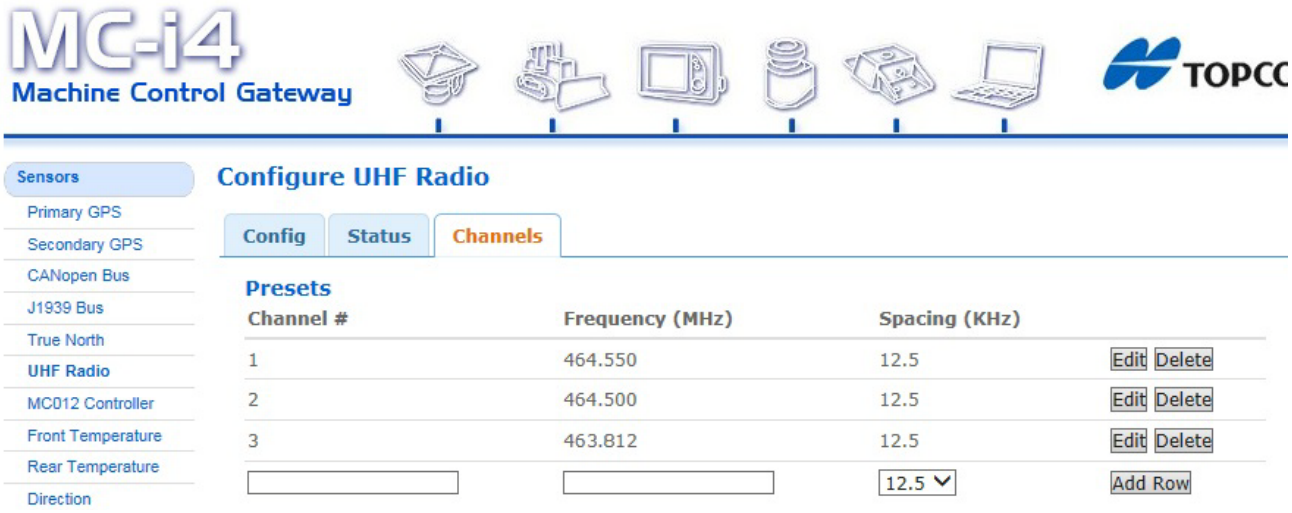

Figure 22. Configure UHF Radio Channels

5. Once modifications have been made, channel management changes are visible in the **Channel List** combo box, under the **Config** tab and **3DMC**.

Digital UHF Status

Under the **Status** tab, current radio status is shown including the active channel frequency, active spacing and number of packets received.

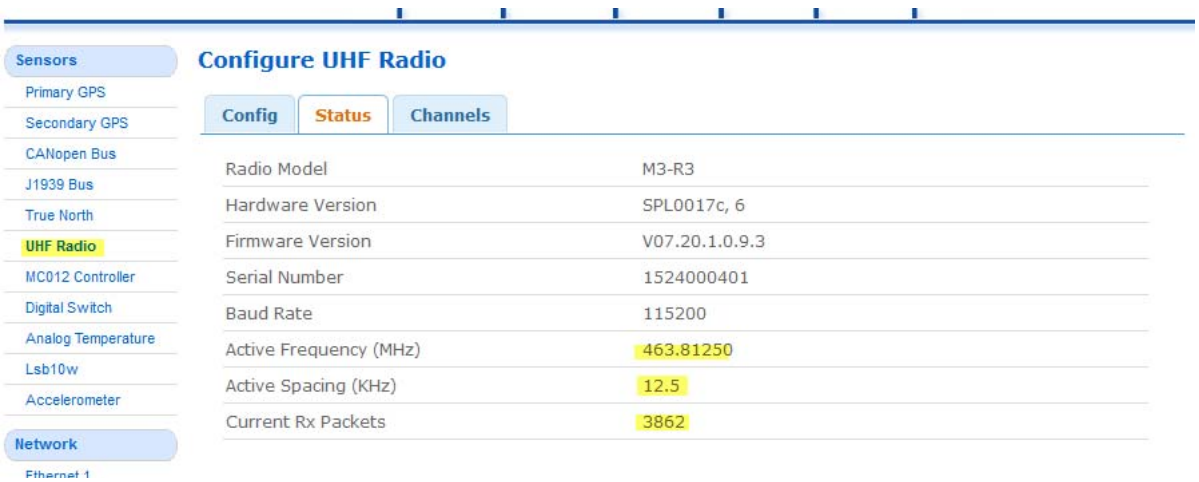

Figure 23. UHF Radio Status

Configure MC-i4 for FH915

MC-i4 FH915 Configuration

The MC-i4 web interface enables radio configuration, channel management and status display.

1. After an appropriate machine has been configured, log in to the MC-i4 web interface: *http://192.168.0.1*
2. Select **Sensors ▸ FH915 Radio**. The **Configure FH915 Radio** screen appears with the **Configuration** tab active (Figure 24).

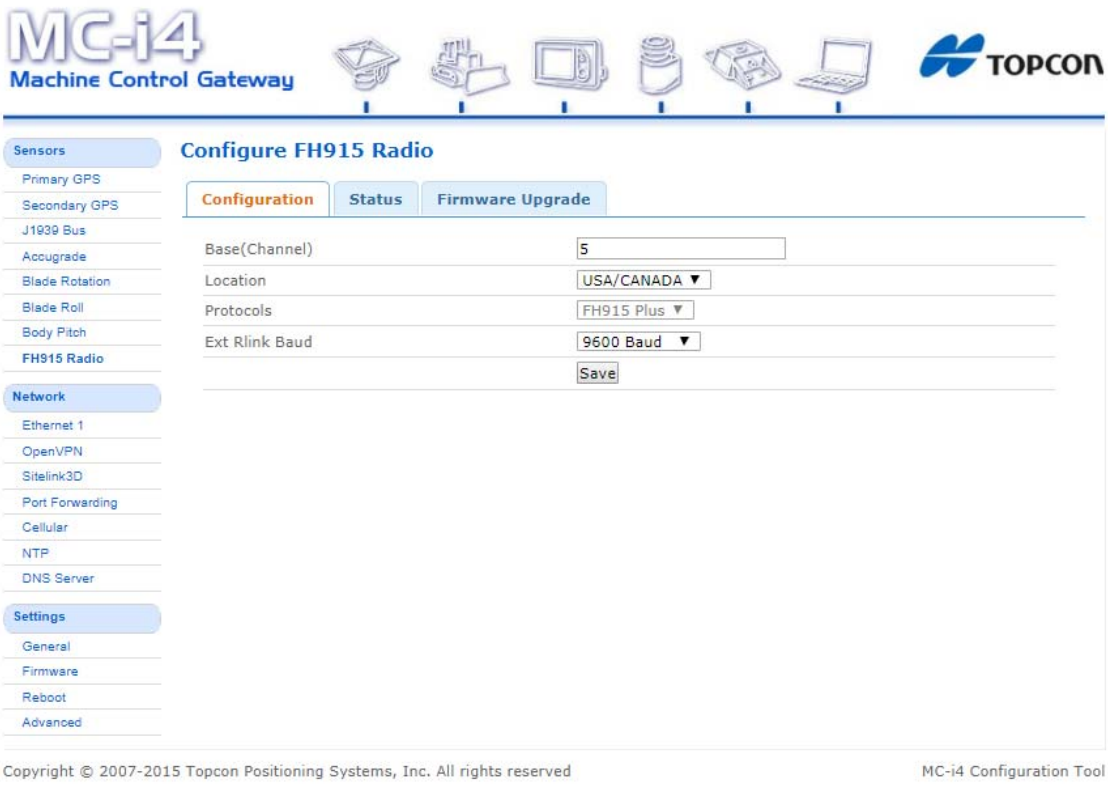

Figure 24. FH915 Configuration

3. Set the **Base(Channel)** to match the Base.
4. Select other options as needed, and click **Save**.

FH915 Status

Under the **Status** tab, current modem status is shown including Board and Firmware versions, and number of packets received.

Figure 25. FH915 Status

Digital UHF Radio Configuration

1. Tap **Topcon Logo** ▸ **Tools** ▸ **Configure radios**. The **GNSS Radio Setup** screen appears.
2. Tap **Configure**. The **MC-i4 Radio Configuration** screen appears (Figure 26).

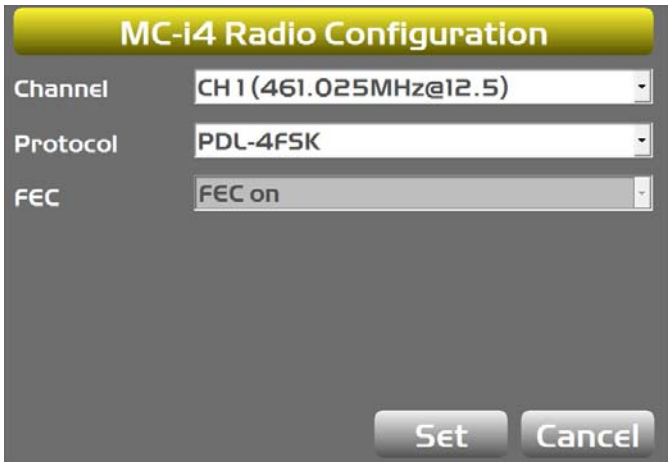

Figure 26. MC-i4 Radio Configuration

Presets are managed via the MC-i4 web interface. See "Configure MC-i4 for Digital UHF" on page 17 for details.

3. Select the appropriate **Channel** and Base Station **Protocol**.
4. Tap **Set** to save the parameters. The **GNSS Radio Setup** screen appears.
5. Tap **OK**. The main screen appears.

FH915 Radio Configuration

1. Tap **Topcon Logo** ▸ **Tools** ▸ **Configure radios**. The GNSS Radio Setup screen appears.
2. Tap **Configure**. The **FH915 Configuration** screen appears (Figure 27).

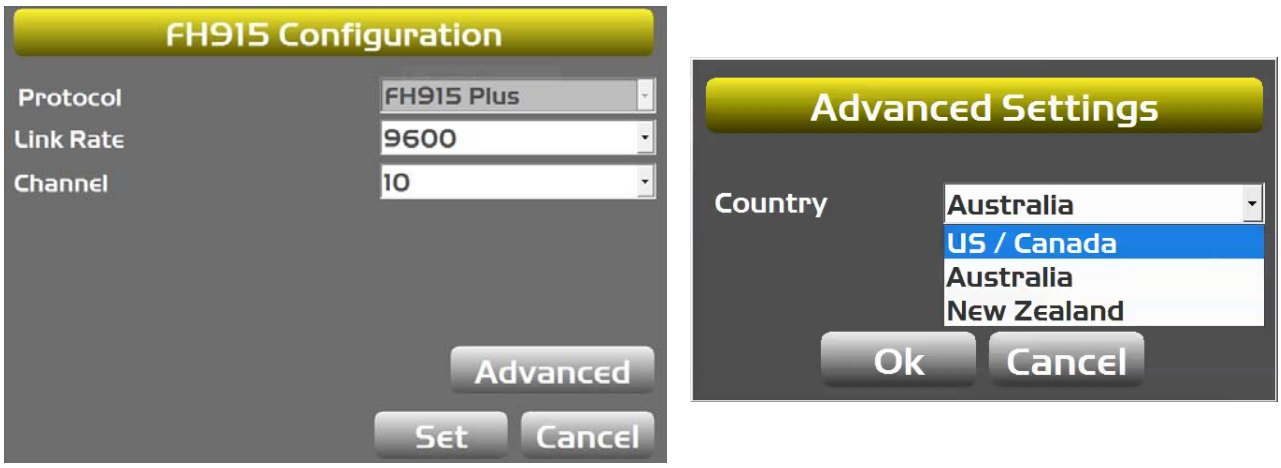

Figure 27. MC-i4 FH915 Configuration

3. If needed, select a different **Link Rate** and **Channel**.
4. Tap **Advanced**. The **Advanced Settings** screen appears (Figure 27).
5. Select the desired **Country**.
6. Tap **OK**. The **FH915 Configuration** screen appears.
7. Tap **Set** to save the parameters. The **GNSS Radio Setup** screen appears.
8. Tap **OK**. The main screen appears.

Direct Network Connection Configuration

1. Tap **Topcon Logo** ▸ **Tools** ▸ **Configure radios**. The **GNSS Radio Setup** screen appears (Figure 28).

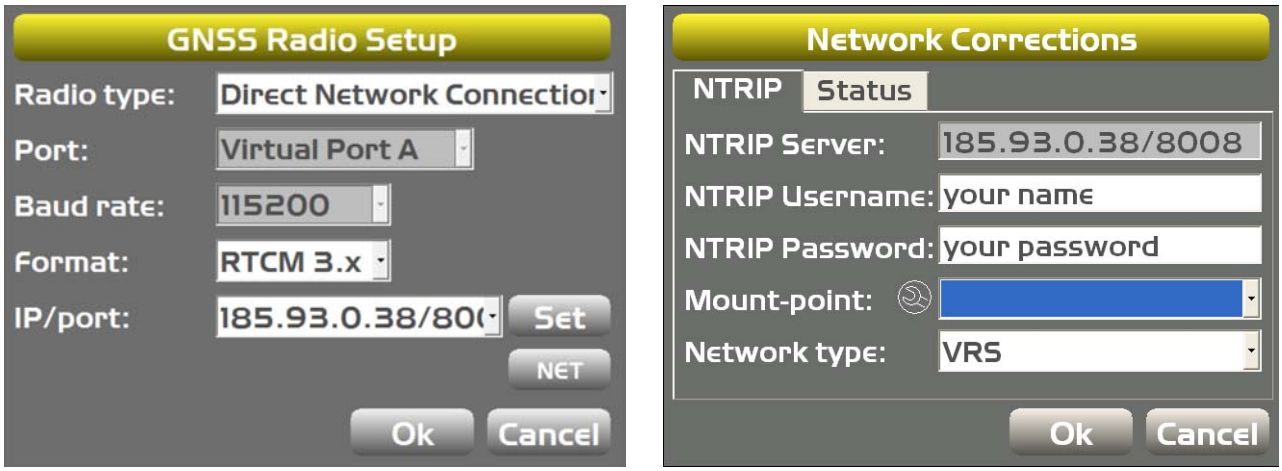

Figure 28. GNSS Radio Setup and Network Corrections

2. Tap **Net**. The **Network Corrections** screen appears (Figure 28).
3. Tap the wrench icon next to **Mount-point**. a pop-up window appears (Figure 29).

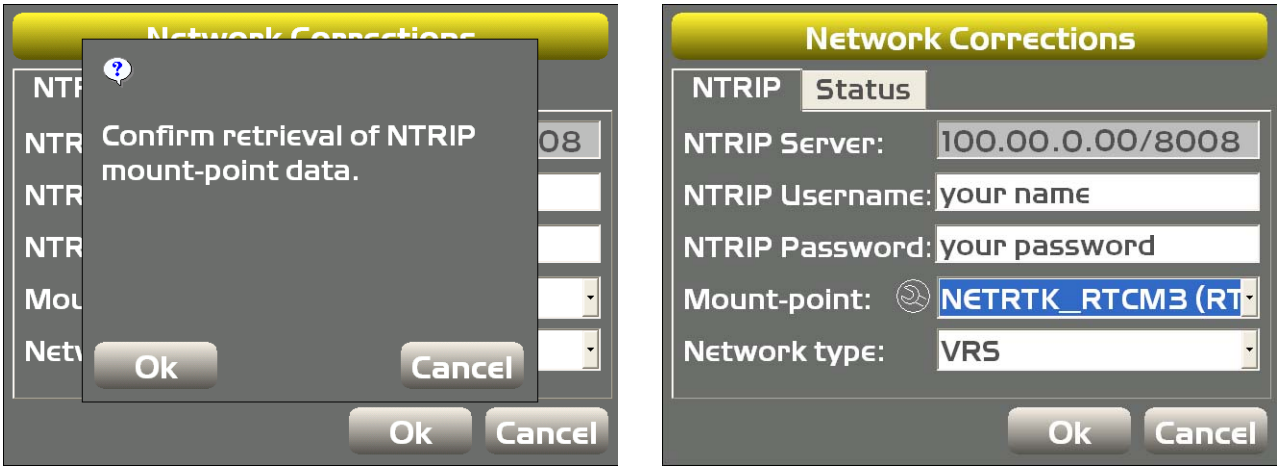

Figure 29. Retrieve Mount-point Data

4. Tap **OK** to download the mount points.
5. Select the appropriate **Mount-point** (Figure 29).
6. Tap **OK**. The **GNSS Radio Setup** screen appears.
7. Tap **OK**. The main screen appears.

Safety Warning and Regulatory Information

Safety Warning

RF Radiation Hazard Warning

To ensure compliance with FCC and Industry Canada RF exposure requirements, this device must be installed in a location where the antennas of the device will have a minimum distance of at least 20 cm from all persons. Using higher gain antennas and types of antennas not certified for use with this product is not allowed. The device shall not be located with another transmitter.

Installez l'appareil en veillant à conserver une distance d'au moins 20 cm entre les éléments rayonnants et les personnes. Cet avertissement de sécurité est conforme aux limites d'exposition définies par la norme CNR102 at relative aux fréquences radio.

Regulatory Information

IC Statements

This Class (A or B) digital apparatus complies with Canadian ICE-S003.

The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication. This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication.

Déclaration de conformité IC

Cet appareil numérique de la classe (A or B) est conforme à la norme NMB-003 du Canada.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Ce matériel respecte les standards RSS exempt de licence d'Industrie Canada. Son utilisation est soumise aux deux conditions suivantes: (1) l'appareil ne doit causer aucune interférence, et (2) l'appareil doit accepter toute interférence, quelle qu'elle soit, y compris les interférences susceptibles d'entraîner un fonctionnement non requis de l'appareil. Selon la réglementation d'Industrie Canada, ce radio transmetteur ne peut utiliser qu'un seul type d'antenne et ne doit pas dépasser la limite de gain autorisée par Industrie Canada pour les transmetteurs. Afin de réduire les interférences potentielles avec d'autres utilisateurs, le type d'antenne et son gain devront être définis de telle façon que la puissance isotrope rayonnante équivalente (PIRE) soit juste suffisante pour permettre une bonne communication.

Open Source Support

The Topcon TotalCare website contains the licenses and notices for open source software used in this product.

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www.topconpositioning.com

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