# ULTRA-RUGGED
# FIELD PC
## RTK GPS Expansion Pack

## RTK GPS Expansion Pack Overview

The RTK GPS Expansion Pack for the Carlson Surveyor+ and the Juniper Systems TK6000 handheld incorporates a high accuracy NovAtel RTK GPS receiver and an EDGE class wireless modem (GSM). This combination enables precision measurements to be made with a small, lightweight handheld device. The NovAtel RTK GPS receiver incorporates state-of-the-art positioning technology using GPS and GLONASS dual frequency receivers, which feature NovAtel's AdVance RTK and ALIGN technologies.

There is a North American model (U.S. and Canada) and an International model (European CE Marking).

## Batteries

It is strongly recommended that two battery packs be used in the handheld. This should provide approximately six hours of continuous operation.

## GPS Receiver Operation

Support for the precision GPS receiver in the RTK GPS expansion pack is provided by the application software supplier. Please consult the document provided by your application software provider for the proper operation of the GPS receiver with your specific application software.

The GPS receiver uses COM port 7 and COM port 8 with a default of 9600 baud, 8 data, no parity, 1 stop bit.

### GPS Antenna
For the GPS antenna, we recommend using the Novatel dual frequency, dual constellation antenna model 702-GG.

## Wireless Modem Operation
The following steps are required to get the GSM modem ready to use (these steps are described in this manual):

- Set up a wireless service data account for the GSM modem and receive a SIM (Subscriber Identification Module) card.
- Install the SIM card in the wireless modem, and seal the card portal.
- Install the expansion pack and antennas on the handheld.
- Run the setup program to configure the wireless modem.

**CAUTION:** Damage to the RTK GPS expansion pack can occur if it is installed or removed while the handheld in running or in suspend. Ensure the handheld has been completely powered off before installing or removing the RTK GPS Expansion Pack. This is done by holding the power button down until the power menu pops up and selecting the *Power Off* option.

## GSM Account Set Up and Activation Process

Follow these steps to set up a wireless account for the data modem:

1. Contact your wireless provider to obtain an account and SIM card. Since you already have the equipment, and all you need is to set up an account, it is best to work directly with the wireless provider, i.e.; AT&T, T-Mobile, Vodafone, etc.

2. When you contact the wireless provider, inform them that you have a wireless data modem and need to set up data service for this device. Your company may already have a business account with a provider. If so, you can add the account you need for this device to your business account.

3. Be prepared to provide the following information when setting up an account:

   • Billing Information and business ID such as your Federal Tax I.D. or VAT number.

   • The wireless services required: You need data only service. You probably want an unlimited data plan. You do not need voice or messaging services (the modem does not support them).

- The modem's 15-character IMEI number: This is shown on the Cell Modem Setup screen shown below:
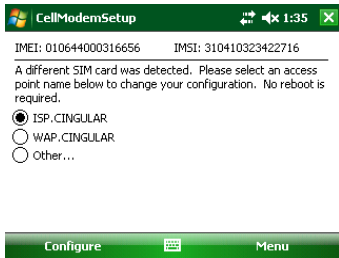


**4.** You may be asked for the modem's model number. This number allows the carrier to verify this modem has been approved for use on their network. The internal modem module is a MultiTech model MTSMC-E1.

**IMPORTANT:** Do not confuse this number with the model number of the handheld computer which is not needed by the carrier.

**Inserting the SIM Card into the Wireless Modem**

Insert the SIM Card into the RTK GPS Expansion Pack wireless modem as follows:

1. Remove the rubber cover with SIM printed on it from the RTK GPS Expansion Pack.

2. Insert the SIM card carefully, making sure that the card is inserted in the correct orientation. The beveled corner on the card lines up with the outline on the socket, with the gold electrical contacts facing towards the socket.
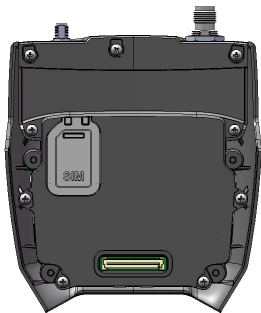
**CAUTION:** There is space between the case and the socket. When inserting the card make sure that the card is inserted into the connector and not into the space above or below the connector.

3. Replace the rubber cover. Run a finger around the outside edge to make sure the gasket is flush with the case.

**CAUTION:** If the rubber cover is not replaced the unit is no longer sealed and the warranty is void.

## Attaching the Expansion Pack to the Handheld

Follow these instructions to attach the RTK GPS Expansion Pack to the handheld:

1. Power off the handheld by holding down the power button for a few seconds and selecting Power Off from the Power Button menu.

2. Loosen the top four screws on the back of the handheld as shown.
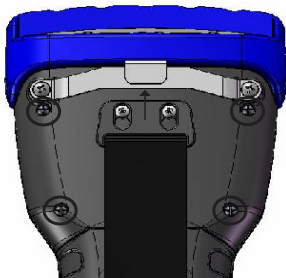
3. Remove the cover and screws from the handheld. (The cover is not used with the pack. Place the cover and screws someplace where you can find them in the future.)

4. Slide the top of the hand strap up to detach it from the back. Remove the bottom of the hand strap. (The hand strap is not used with the pack. Place the hand strap someplace where you can find it in the future.)

5. Place the RTK GPS Expansion Pack on the back of the handheld and insert the four screws included with it.

6. Tighten the screws to attach the pack.

*Attaching the Antennas to the Expansion Pack*

Follow these instructions to attach the antennas to the RTK GPS Expansion Pack:

1.  Attach the GSM modem antenna North American or International) to the RTK GPS expansion pack. The GSM modem antenna connector is the smaller of the two coaxial connectors (SMA) on the top of the pack. Use the knurled ring at the bottom of the antenna to tighten the antenna. Do not twist on the antenna rod to tighten the antenna. Do not over-tighten it—it should only be finger tight.

    **IMPORTANT:** The RTK GPS Expansion Pack should not be operated without having the cell modem antenna connected.

2.  Attach the GPS antenna cable to the GPS antenna connector. The GPS antenna connector (TNC) is the larger coaxial connector on the top of the pack.

## Running the Cell Modem Setup Utility

Run the Cell Modem Setup utility program to configure the internal wireless modem for the specific wireless network that you have an account with.

1.  The Cell Modem Setup utility should already be installed on the handheld, located in Start > Program. If the utility is not there, go to: http://www.junipersys.com/Juniper-Systems/support/Downloads/TK6000-Ultra-Rugged-Field-PC. Follow the instructions on

the screen to download the utility directly to the handheld (you need a method to connect to the internet from your handheld like Wi-Fi) or to your desktop PC (you need a USB communications cable and ActiveSync or Windows Mobile Device Center for the utility to be transferred to your handheld from the desktop PC).

2.  To start the utility, Tap Start > Programs > Cell Modem Setup.

3.  This screen is displayed. This is a reminder to close any open application programs so that you will not lose any data when the handheld resets to complete the configuration process. Tap *Yes* to continue.
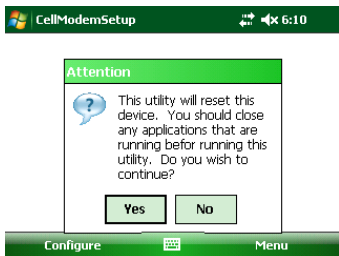


4.  A screen is displayed that allows you to select settings that are unique to every wireless provider and are required for the modem to connect to the

internet. Configure the APN (Access Point Name), username, and password.



Depending on your wireless provider, there may only be one selection. Select one of the choices presented on this screen and tap on the *Configure* button at the bottom of the screen. The handheld performs a reset to configure the modem with the settings you selected.

Wireless providers occasionally change these settings. You may need to configure the modem with one of these settings and then test the configuration by using Internet Explorer to see if you can connect to the internet and locate a website. If it does not connect as expected, then you may need to run Cell Modem Setup again, choose one of the other selections on the list, and repeat the test.

It is best to get this information (APN, username, and password) directly from your wireless provider when you subscribe and enter it manually as outlined in the next step.

5. If the only selection in the list is "Other", you must obtain that information (APN, user name, and password) from the wireless provider and manually enter this information.

Select "Other" on the list and then tap on the *Configure* button at the bottom of the screen. The following screen is shown Enter the information into each field specified and then tap *OK*. The handheld performs a reset to configure the modem.



*Note: Some wireless provider settings only specify the APN, and the username and password are blank. If so, enter the APN and leave the username, password  fields blank and then tap* OK.

> *If you cannot determine the correct settings, leave all the fields blank and select* OK. *In many instances this work.*

### View Current Settings

To view current settings, launch the Cell Modem Setup utility and tap on the *Menu* button at the bottom of the screen. Select the *About* menu item. A screen showing the current settings is shown.
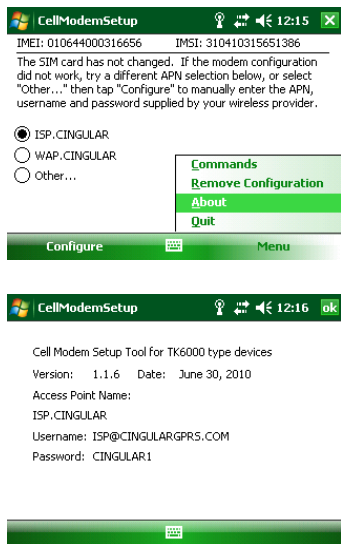
### GSM Modem Operation

The following icons may be displayed on the status bar at the top of the screen. They indicate various states related to the operation of the wireless modem in the expansion pack:

**No SIM Card**—This icon notifies the user that: a) no SIM card is installed and b) it will be impossible to create an internet connection using the cell modem until a valid SIM card is installed.

**No Internet Connection**—This icon is displayed when there is no internet connection present or if the internet connection has been dropped. Most programs automatically establish an internet connection (Internet Explorer is one example). To (re)establish an internet connection when the RTK GPS Expansion Pack is properly installed and has a valid SIM card installed, simply run the application and attempt to access the internet.

You may need to consult with your application supplier to determine the capabilities of the application.

**Internet Connection icon**—This icon is displayed when an internet connection is present.

**Signal Strength icon**—This icon is displayed when an internet connection has been established using the cell modem. It contains either the letter E or G and 0 to 4 bars. The E indicates EDGE and the G indicates GPRS.

The quality of the wireless modem signal and the data transmission speed is dependent on the signal strength displayed.

- 0 bars: There is not a reliable signal. Don't attempt to send data. If no bars are displayed it may be necessary to move to another location with better signal strength in order to send and receive data effectively.
- 1 bar: Signal strength is weak and the data transmission speed will be slow.
- 2–4 bars: Signal strength is strong and transmission speed will be faster.
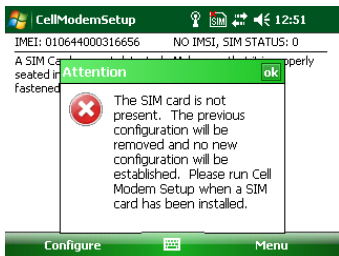
## Troubleshooting

### *SIM Card Missing or Not Working*

If there are problems with the SIM card, the main Cell Modem Setup screen indicates that it is missing:

The IMSI number is an indication from the SIM card. It is unique to each card.

Configuration is not possible if the SIM card is not detected. If a SIM card has been installed and there is still an error a new SIM card may be required. You can obtain a new SIM card from your wireless provider.



*Sending* **AT** *Commands*
This screen is used for troubleshooting by a qualified technician. There is no need to use it unless directed by a service technician.

**CAUTION:** There is no warranty for use of this dialog as it can cause the modem to become unresponsive and even potentially cause damage to your equipment.

To send *AT* commands directly to the modem, tap Menu > Commands to view this screen:
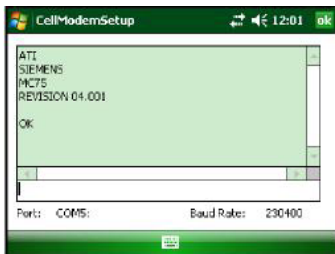


The current port is displayed along with the current baud rate. In this example, the GSM modem has not yet been configured. Port: is "COM5." When it is configured, Port: will be "VCA1."

Type commands in the command box and press Enter to send commands directly to the modem. Responses are displayed in the box above the command box. This may be useful for diagnosing problems.

## Uninstall/Deactivate RTK GPS Expansion Pack

When removing the expansion pack from the handheld, you should go through this procedure to de-activate the pack, and remove all configuration settings for the pack.

1.  To uninstall the RTK GPS Expansion Pack, launch the Cell Modem Setup utility and tap *Menu*, then *Remove Configuration*.



2.  The modem configurations will be removed from the handheld. During the process the handheld performs a reset to complete this process

3.  Power off the handheld by holding down the power button for several seconds and select Power Off from the displayed menu. Once the handheld powers off you can remove the RTK GPS Expansion Pack.

### Wireless Safety

⚠ **CAUTION:** Maintain a separation distance of at least 20 cm (8 inches) between the transmitter's antenna and the body of the user and nearby persons.

### RF Interference Issues

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

- Switch OFF your cell modem when in an aircraft. The use of cellular telephones in an aircraft may endanger the operation of the aircraft, disrupt the cellular network and is illegal.

- Switch OFF your cell modem in hospitals and any other place where medical equipment may be in use.

- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or where blasting operations are in progress.

- There may be a hazard associated with the operation of your cell modem close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.

- Operation of your cell modem close to other electronic equipment may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.

## Maintenance of Your RTK GPS Expansion Pack

Your expansion pack is the product of advanced engineering, design, and craftsmanship and should be treated with care. The suggestions below will help you to enjoy this product for many years.

- Do not attempt to disassemble the expansion pack. There are no user serviceable parts inside.
- Do not place the expansion pack alongside computer discs, credit or travel cards, or other magnetic media. The modem may affect the information contained on discs or cards.

## Compliance and Regulatory Information

### United States and Canada

In compliance with the FCC rules, 47 CFR 15.19(a)(3), and the Industry Canada rules, the following statement must appear on the device or in the user documentation.

This Class B digital apparatus complies with Canadian ICES-003. This device also complies with Part 15 of the

FCC Rules. Operation of this equipment is subject to the following two conditions:

1. The device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

In compliance with the FCC rules, 47 CFR 15.105(b), the user must be notified that this equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In compliance with the FCC rules, 47 CFR 15.21, the user must be notified that changes or modifications to the Field PC that are not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Only approved accessories may be used with this equipment. In general, all cables must be high quality, shielded, correctly terminated, and normally restricted to two meters in length. Wall chargers approved for this product employ special provisions to avoid radio interference and should not be altered or substituted.

This device is approved for co-location with the P700 Wi-Fi transceiver and BC04 Bluetooth transceiver radios integrated in the main units. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

This device operates in compliance with the FCC radio frequency exposure limits for an uncontrolled environment. Users must follow instructions provided in the user documentation to satisfy compliance with FCC radio frequency exposure requirements.

There cannot be any alteration to the authorized antenna system. The antenna shipped with the GSM modem is the only one authorized for use. An antenna must be used when the pack is on the device. Using the wrong antenna or using the pack without an antenna voids the warranty.

This wireless modem is compliant with FCC regulations when operated within the temperature range of -20°C to +54°C. Do not operate the wireless modem outside of this temperature range.

## European Union (CE Marking)

Products bearing the CE marking comply with the 2004/108/EC (EMC Directive), 1999/5/EC (R&TTE Directive), 2006/95/EC (Low Voltage Directive) issued by the Commission of the European Community.

CE compliance of this device is valid only if powered with/by a CE-marked wall charger provided by the manufacturer. Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

EN 55022 (CISPR 22) Electromagnetic Interference

EN 55024 (IEC 61000-4-2, 3, 4, 5, 6, 8, 11) Electromagnetic Immunity

EN 60950 (IEC 60950) Product Safety

ETSI EN 300 328 Radio

ETSI EN 301 489-1, -7, EMC for Radio Equipment

ETSI EN 301 511 GSM

ETSI EN 300 440 GPS

The telecommunication functions of this device may be used in the following EU and EFTA countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Romania, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.

# Specifications

## GPS Receiver

**Manfacturer:**   Novatel

**Channel Configuration**
14 GPS L1,
14 GPS L2
12 GLONASS L1,
12 GLONASS L2
2 SBAS

**Horizontal Position Accuracy (RMS)**

| | |
|---|---|
| Single Point L1 | 1.5 m |
| Single Point L1/L2 | 1.2 m |
| SBAS2 | 0.6 m |
| DGPS | 0.4 m |
| RT-203 | 0.2 m |
| RT-2 | 1 cm+1 ppm |

**Measurement Precision (RMS)**

| | GPS | GLO |
|---|---|---|
| L1 C/A Code | 4 cm | 15 cm |
| L1 Carrier Phase | 0.5 mm | 1.5 mm |
| L2 P(Y) Code | 8 cm | |
| L2 Carrier Phase | 1 mm | 1.5 mm |

**Data Rate**

| | |
|---|---|
| Measurements | 20 Hz |
| Position | 20 Hz |

**Time to First Fix**

| | |
|---|---|
| Cold Start[4] | 60 s |
| Hot Start[5] | 35 s |

**Signal Reacquisition**

| | |
|---|---|
| L1 | 0.5 s (typical) |
| L2 | 1.0 s (typical) |
| Time Accuracy[6] | 20 ns RMS |
| Velocity Accuracy | 0.03 m/s RMS |
| Velocity[7] | 515 m/s |

## GSM Modem

MultiTech   MTSMC-E1

GPRS and EDGE Modes

| Quad Band GPRS, EDGE | 850, 900, 1800, 1900 MHz |
|---|---|

Dual Band Antenna

| - North America: | 850, 1900 MHz |
|---|---|
| - International: | 900, 1800 MHz |

Data only

Does not support voice or messaging

Automatically reconnects after a suspend/resume