

EMT4100UG001

MT 4100



User Guide



General

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251 Renner Pkwy

Richardson, TX 75080 USA

Phone: (972) 633-4400

Fax: (972) 633-4444

Email: info@nvtl.com

www.novatelwireless.com

Warranty Information

This warranty applies to (a) products sold directly by Novatel Wireless M2M, unless a different warranty is specified in a written agreement between Novatel Wireless M2M and the purchaser; and (b) products sold to end users through a distributor authorized by Novatel Wireless M2M, but only where the authorized distributor does not provide a separate warranty on such products, and Novatel Wireless M2M has agreed to provide this warranty to such end users. If you purchased the product from an authorized distributor, please check whether this warranty from Novatel Wireless M2M, or a separate warranty from the distributor, applies to your purchase. This warranty does not apply to any (i) accessories or batteries for the products; or (ii) demonstration samples or prototypes of the products. Unless otherwise provided in a written agreement between Novatel Wireless M2M and the purchaser, all such accessories, batteries, samples or prototypes are provided by Novatel Wireless M2M AS IS without any warranty of any kind.

Novatel Wireless M2M warrants to the original purchaser of the product from Novatel Wireless M2M or its authorized distributor (as applicable) that, for a period of one (1) year from the date of shipment of the product from Novatel Wireless M2M, the product hardware will be substantially free from defects in material or workmanship under normal operation, and the product firmware will perform substantially in accordance with the product documentation provided by Novatel Wireless M2M. Novatel Wireless M2M does not warrant that (a) the product hardware or firmware will meet the purchaser's requirements; (b) the operation of the product hardware or firmware will be uninterrupted or error-free; or (c) the product, when integrated in, or combined with, other products or software not supplied by Novatel Wireless M2M, will continue to perform substantially in accordance with the product documentation. This limited warranty is for the benefit of the original purchaser, and is not transferable.

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Regulatory Compliance

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits pursuant to Part 15 Subpart B. FCC Part 22 & Part 24 is covered by the "modular approval" process for the embedded wireless module. This approach, described by FCC Public Notice DA 00-131407 released June 26, 2000, is intended to afford relief to equipment manufacturers by eliminating the requirement for obtaining a new equipment authorization for the same transmitter when installed in a new device.

These limits are designed to provide reasonable protection against harmful interference in an appropriate installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used in accordance with instructions, can cause harmful radiation to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

RF EXPOSURE

Your device is a radio transmitter and receiver. It is designed and manufactured not to exceed the emissions limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission (FCC) of the U.S. Government. These limits are part of comprehensive guidelines and establish permitted levels of RF energy for the general population. These guidelines are based on the safety standards previously set by the U.S. and international standards bodies. The standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.

The exposure standard for wireless RF devices, such as the device, employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6W/kg. SAR values at or below that limit are considered safe for the general public.

Before a wireless RF device is made available for sale to the Public, it must be tested and certified to the FCC that it does not exceed the SAR limits established by the FCC. Tests for SAR are conducted using the positions and locations (e.g., at the ear or worn on the body) as required by the FCC for each device model.

In order to use this device without additional FCC certification approvals, the installation must meet the following conditions:

For the transmitter to meet the MPE categorical exclusion requirements of 2.1091, the ERP must be less than 1.5 watts for personnel separation distance of at least 20 cm (7.9 in). Therefore, the maximum antenna gain cannot exceed +3.3dBi. If greater than 1.5 watts exists, then additional testing and FCC approval is required.

R&TTE

This device has been fully tested and complies with the requirements of EN301 489-1, EN301 489-3, EN301 489-7, EN60950-1, IEC60950-1, EN62311, and EN300 440-2. Compliance to EN301 511 has been demonstrated through testing performed on this device and the embedded wireless module. RF exposure levels are below the recommended levels at distances of 6.7 cm between the antenna and user.

Novatel Wireless M2M hereby declares that the MT 4100 is in compliance with the essential requirements and other provisions of the Directive 1999/5/EC.

A full copy of the declaration of conformity can be found at <http://documentation.nvtl.com>.

Industry Canada

This device complies with Industry Canada licence-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.

Cet appareil est conforme aux normes d'Industrie Canada exempts de license(s) RSS. Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas provoquer d'interférences, et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant provoquer un fonctionnement indésirable de l'appareil.

ROHS COMPLIANCE

This device has been designed to comply with the European Union Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC), effective since July 1, 2006.

DISCLAIMER

The information and instructions contained within this publication comply with all FCC, GCF, PTCRB, R&TTE, IMEI and other applicable codes that are in effect at the time of publication. Novatel Wireless M2M disclaims all responsibility for any act or omissions, or for breach of law, code or regulation, including local or state codes, performed by a third party. Novatel Wireless M2M strongly recommends that all installations, hookups, transmissions, etc., be performed by persons who are experienced in the fields of radio frequency technologies.

Novatel Wireless M2M acknowledges that the installation, setup and transmission guidelines contained within this publication are guidelines, and that each installation may have variables outside of the guidelines contained herein. Said variables must be taken into consideration when installing or using the product, and Novatel Wireless M2M shall not be responsible for installations or transmissions that fall outside of the parameters set forth in this publication.

Battery Information And Safety Requirements

NOTE: Failure to comply with all of the following precautions could:

- Cause personal injury or property damage
- Cause abnormal chemical reactions which would make the battery overheat, smoke, distort, leak, or catch on fire
- Destroy internal protections built into the battery
- Shorten battery life
- Reduce battery performance

Precautions

- Read this entire manual and the label on the exterior of the battery.
- Keep the battery away from sources of excessive heat such as fire, stoves, or direct sunlight.
- Keep the battery away from sources of high voltage or static discharge.
- Do not use or store the battery with other batteries or where it could touch metal.
- Do not put the battery into a microwave oven.
- Do not allow the battery to be crushed.
- Keep the battery away from children.
- Do not drop the battery.
- Do not allow anything to touch any of the battery contacts
- Do not connect two or more of the contacts.
- Do not disassemble, destroy, or attempt reassembly of the battery.
- Do not place or leave the battery in a damp or wet environment.
- Do not allow water to touch the battery.
- Do not wrap the battery with conductive material.
- Properly dispose of the battery.
- Do not incinerate or burn the battery.
- Do not leave or discard the battery where it could get wet or become submerged in water.
- Do not damage the battery.
- Do not weld or solder anything to the battery, the attached wires, or the connector.
- Do not use this battery in any device other than supplied.
- Use of this battery in other devices could result in unsafe conditions.
- Risk of explosion if battery is replaced by an incorrect type.
- Do not touch a leaking battery or materials that may have leaked from a battery. Do not allow it to touch your skin or clothes. If touched, immediately rinse affected areas thoroughly with water. Leaked materials may cause skin irritation. Seek medical attention if irritation persists. If it contacts your eyes, do not rub your eyes. Rinse the eyes thoroughly with water, and see a doctor immediately.

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1

Introduction

Introduction
Technical Specifications

Introduction

Novatel Wireless' MT 4100 keeps you connected to your assets. It is more than just a communication device, it is a full-featured telematics solution designed to optimize your mobile resources and improve your company's bottom line. MT 4100 offers two serial interfaces, 1-wire driver ID support, multiple GPIO, polygon geo-fencing, driver behavior reporting, and an optional backup battery. MT 4100 includes optional routing and optimization with Garmin® Fleet Management Interface (FMI)—a key part of today's most useful, versatile, and cost-efficient fleet management solutions.

When you add N4A™ Communications and Management platform to your MT 4100, you can provision, monitor, and reconfigure the MT 4100 remotely from almost anywhere in the world.



Figure 1-1 MT 4100

The MT 4100 has a printed label on the top side of the device. The figure below shows the information included on the label.

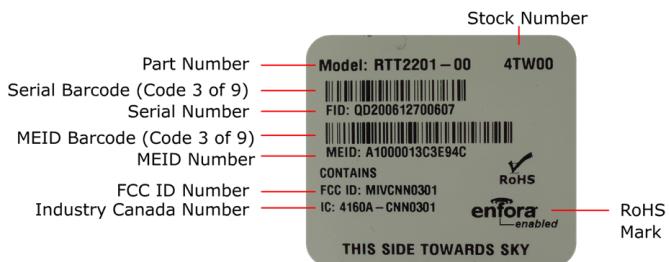


Figure 1-2 MT 4100 Label

Technical Specifications

General

Name:	MT 4100
Model:	RTT2201, UMT2202, UMT2203
Approvals:	FCC, CE, RoHS, Industry Canada
Housing:	Rugged textured plastic enclosure UL94-Vo fire
Weight:	Without Battery: 71.8 grams With Battery: 81 grams
Dimensions:	82 x 52 x 26.4 mm
Battery:	Rechargeable lithium-ion battery (230mAh)
Recharge Temperature Range	0 to +45°C
Operating Voltage:	9 - 32 V DC operational for 12 V & 24 V systems. "" on page 8

Radio Technology

Downlink/Uplink	
CDMA	153 Kbps
GPRS	80 Kbps, 40 Kbps
EDGE	237 Kbps, 118 Kbps
WCDMA Release 99	384 Kbps, 384 Kbps
HSDPA Release 5	3.6 Mbps, 3.6 Mbps
Cellular Technology:	1xRTT (CDMA2000) or HSDPA (UMTS 3G)
	1xRTT (CDMA): 850/1900
	HSDPA (UMTS) 850/1900 (Bands V, II) (NA) or 900/2100 (Bands VIII, I) (ROW)
GSM/GPRS/EDGE Fallback:	850/900/1800/1900

Packet Data

Packet Data	IS-95, IS-2000
SMS Functionality:	
- HSDPA SMS:	Text, PDU, MO/MT, Cell Broadcast
- CDMA SMS:	Text, MO/MT

Environmental

Operating Temperature:	Battery version: -20°C to 60°C Non battery version: -30°C to 85°C
Storage Temperature:	-40°C to 85°C
Humidity: (Battery version)	Up to 89% non-condensing
Humidity: (Non-battery version)	Up to 95% non-condensing
Vibration Stability:	In accordance with SAE J1211
Drop:	

Components

GPS Protocols:	NMEA, Binary "GPS" on page 8
Buffered GPS Message Feature:	Yes
Accelerometer:	3-axis digital .
SIM Access:	Internal (HSDPA models only)
Cellular Antenna:	Internal
GPS Antenna:	Internal
Serial Data I/O:	(2) RS-232 (RX, TX, CTS, RTS) (RX, TX on 2nd)
I/O Connector:	22-pin Molex (3) digital outputs (2) analog inputs (0-16V,0-32V) (5) digital inputs 1-wire interface (Driver ID) Ignition Sense
Garmin® FMI:	Optional, Version 2.6 with integrated safe mode and speed limit alerts
LEDs:	Power (green), Cellular (green), GPS (red)
Analog To Digital Converter (ADC1):	10 bit, 0-16V input range, +/- 1%, 40V max, scaling 0.0156 per bit (16vdc/1023)
Analog To Digital Converter (ADC2):	ADC2: 10 bit, 0-32V input range, +/- 1%, 40V max scaling 0.0312 per bit (32vdc/1023)

Protocols

Host Protocols:	AT commands, UDP API, FOTA
Internal Protocols:	UDP API, TCP API
API Control/Status:	AT commands, UDP API, TCP API, AT commands over SMS

Part Numbers

RTT2201-00	CDMA 1xRTT w/ Backup Battery
RTT2201-01	CDMA 1xRTT w/o Backup Battery
UMT2202-00	ROW (HSDPA Version with Battery)
UMT2202-01	ROW (HSDPA Version without Battery)
UMT2203-00	NA (HSDPA Version with Battery)
UMT2203-01	NA (HSDPA Version without Battery)
BRK4100	Mounting bracket
CAB2448-01	Power, ground, ignition cable
CAB2200-02	Power and full I/O integration/development cable

Document References

GSM2388AT001	MT 4100 AT Command Set For GPRS
RTT2201AT001	MT 4100 AT Command Set For 1xCDMA
UMT2202AT001	MT 4100 AT Command Set For UMTS
ENF0000AN003	Accelerometer Guide Application Note
ENF0000AN009	Low Power Sleep Mode Application Note
ENF0000AN002	FOTA Application Note
ENF0000CB001	API Reference
ENF0000XG001	GFMI Technical Guide
ENF0000AN014	Access the Novatel Wireless M2M Test Server
ENF0000AN010	MT Decoding NMEA Messages
ENF0000AN018	1-Wire Interface

Certifications

FCC:	Yes
CE:	Yes
RoHS Compliant:	Yes
Industry Canada:	Yes

Additional Features

FOTA (Firmware Over-the-Air)I/O control
Binary reporting
Timed reporting

2

Features And Functions

GPS
Power
LEDs
Connectors
Battery Disconnect Switch
Low-Power Sleep Mode
Accelerometer
1-Wire® Interface
Device Check-in
Optional Software Features

GPS

GPS functions:

- NMEA protocol (to update all data points)
- Novatel Wireless M2M Binary Packets
- Buffered GPS message feature
- Geo-fencing (helps secure devices within a defined location)
- Virtual odometer (uses GPS technology to track devices)

GPS Measurements

Dimension	Measurement
Time to first fix - Cold Start @ -130 dBm with 20 m accuracy:	< 60 sec
Time to first fix - Hot Start @-130 dBm with 20 m accuracy	≤ 3 sec
Time to first fix - Reacquisition @-130 dBm with 20 m accuracy	< 3 sec
Acquisition Sensitivity with 50 m accuracy	< -140 dBm
Tracking sensitivity with < 50 m accuracy	< -157 dBm
Tracking sensitivity with > 50 m accuracy	-162 dBm
Accuracy, R 95%, Clear view of the sky, 24 hours	< 15 meters

For more details on NMEA and Binary Packets, please see Novatel Wireless M2M Application note ENF0000AN010.

For more details on Virtual Odometer, please see Novatel Wireless M2M document ENF0000CB001 - API Reference.

Power

The MT 4100 accepts 9-32 VDC, minimum 2 amps input power. This allows the device to be used on both 12 V and 24 V vehicles per SAE specifications, including protection for jump-starting 24 V vehicles.

Pins 17 and 18 on the 22-Pin IO connector are the power input and pins 6 and 7 are ground.

All power and ground pins must be connected.



Power Consumption

Mode	Current	GPS
CDMA BC0 - 800 MHz	< 66 mA @ 14.2V	GPS off; lowest current consumption while still being able to contact the device
CDMA BC1 - 1900 MHz	< 63mA @ 14.2V	GPS on
Idle (GPS on)	< 54 mA @14.2V	Registered
Idle (GPS off)	< 33mA @14.2V	Registered
Low Power Sleep Mode	<1.3 mA @14.2V	GPS off

Bench Testing / Programming



After performing a firmware upgrade the device will respond that the firmware load is complete. However, power must remain applied to the device for approximately 2 minutes after the firmware upgrade completion message is received. This allows time for the upgrade to be applied to the auxiliary processor. The user can confirm it is safe to remove power by sending the AT\$OBDVER? command. If the upgrade is still processing, the device will respond with an error. If the upgrade is complete, the device will respond with the current software version.

LEDs

The MT 4100 includes LEDs to indicate Power, GPS, and Registration status.

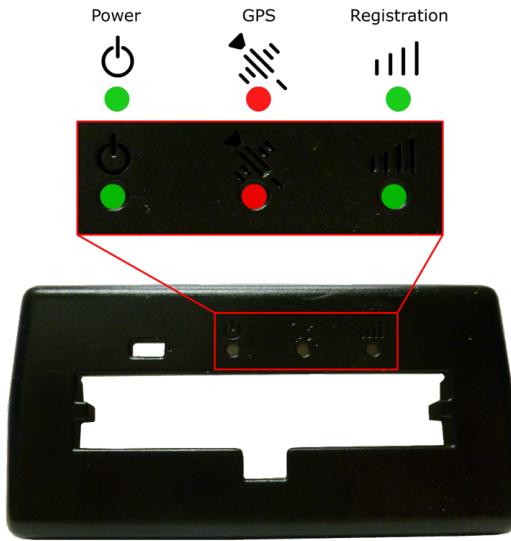


Figure 2-1 MT 4100 LEDs Behavior

The MT 4100 has three LEDs on its front panel.

MT 4100 LEDs	
PWR:	This LED indicates power to the GPS module. LED is on ~1 second after powered on and the GPS module is operational. This LED is off when powered off or when the MT 4100 enters Low-Power Sleep mode. Note: If you disable the GPS module, you must apply power for this LED to turn on. 
GPS:	You can configure this LED to display registration, GPS fix status, or other user functions. By default, this LED indicates GPS fix status. The LED remains off when it receives invalid GPS data. The LED remains on when it receives valid GPS data. 
Registration:	You can configure this LED to display registration or other user functions. By default, this LED indicates network registration status. If this LED stays off, this indicates that the device is not attempting to register to the network. If the LED blinks, it indicates that the device is trying to connect to the network. If the LED is always on, this indicates that the device has connected to the network. 

Table 2-1 MT 4100 LEDs

Connectors

22-Pin I/O Connector

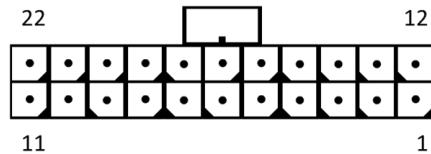


Figure 2-2 22-Pin I/O Connector

The 22-Pin I/O Connector provides the following functionality:

Pin #	User Name	Description
1	Digital Input #5	Digital Input #5 (GPI12)
2	Digital Input #4	Digital Input #4 (GPI11)
3	1-Wire	1-Wire® Interface / Note: Maximum voltage on this pin is 3.3 VDC
4	ADC In #2	Analog-to-Digital Input, 0 – 32 VDC
5	ADC In #1	Analog-to-Digital Input, 0 – 16 VDC
6	Ground	System Ground
7	Ground	System Ground; Connector has longer pin for MFBL
8	Digital Input #2	Digital Input #2 (GPI9)
9	Digital Input #1	Digital Input #1 (GPI1)
10	RS-232 CTS1	RS-232 CTS1 Out / Note: Output only. Input voltages should not be applied.
11	Ignition Sense	Vehicle Ignition Sense
12	RS-232 TX2	RS-232 TX2 In Note: -25 VDC to 25 VDC
13	RS-232 RX2	RS-232 RX Out / Note: Output only. Input voltages should not be applied.
14	Digital Output 1	Output, High-Current Sink, Low-Current Source, Latched (GPO5)
15	Digital Output 2	Output, High-Current Sink, Low-Current Source, Latched (GPO2)
16	Digital Output 3	Output, High-Current Sink, Latched (GPO3)
17	Power In	Vehicle Power from 12 or 24 V Vehicles
18	Power In	Vehicle Power from 12 or 24 V Vehicles
19	Digital Input #3	Digital Input #3 (GPI10)
20	RS-232 RTS1	RS-232 RTS1 In / Note: -25 VDC to 25 VDC
21	RS-232 TX1	RS-232 TX1 In / Note: -25 VDC to 25 VDC
22	RS-232 RX1	RS-232 RX1 Out / Note: Output only. Input voltages should not be applied.

Table 2-1 22-Pin I/O Connector

Battery Disconnect Switch

Use the MT 4100 Battery Disconnection Switch to remove battery power from the device (battery models only). Move the switch toward the dot to place the battery in the **ON** position. Move the switch away from the dot to place the battery in the **OFF** position. The figure below shows the MT 4100 Battery Disconnection Switch in the **OFF** position.

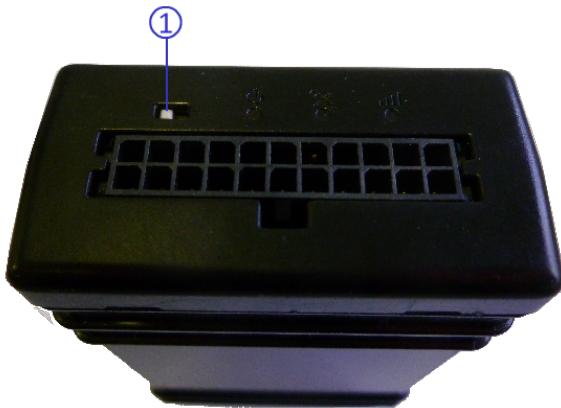


Figure 2-3 MT 4100 Battery Disconnection Switch

You must place the Battery Disconnection Switch in the **ON** position before using the optional backup battery for programming or operating the MT 4100.



If the Battery Disconnection Switch remains in the **ON** position with no external power applied for an extended period of time, then the battery may significantly lose its charging capability.



Before connecting to any auxiliary I/O device, you must apply power to the MT 4100 by moving the Battery Power Switch to the **ON** position. Failure to apply power to the MT 4100 before connecting auxiliary devices may result in damage to the attached I/O device.



Move the Battery Disconnection Switch to the **OFF** position when transporting the device by air.

Bench Testing / Programming



After performing a firmware upgrade the device will respond that the firmware load is complete. However, power must remain applied to the device for approximately 2 minutes after the firmware upgrade completion message is received. This allows time for the upgrade to be applied to the auxiliary processor. The user can confirm it is safe to remove power by sending the AT\$OBDVER? command. If the upgrade is still processing, the device will respond with an error. If the upgrade is complete, the device will respond with the current software version.

Low-Power Sleep Mode

In Low-Power Sleep Mode (LPS), all modem/GPS activity stops; this allows extreme power savings. The auxiliary processor efficiently monitors system inputs based on the configuration assigned and will exit LPS mode when needed. The current draw during LPS is:

< 1.5 mA @ 12 V

You can configure the MT 4100 to exit Low-Power Sleep Mode when:

- Ignition detected
- Motion detected
- Input triggered
- Elapsed-time expired

For more details, see Novatel Wireless M2M document ENF0000ANO15 - Power Saving Techniques Application Note.

Accelerometer

The MT 4100 has two, three-axis digital accelerometers that provide the following features:

- Motion alert (towing alert)
- Driver behavior reporting
 - Rapid acceleration
 - Harsh braking
- Configurable thresholds
 - Range settings
 - Mode (Normal, Sleep, Wakeup)
 - Wakeup pause (20 to 2560 msec)
 - Sample Rate (0-25 per second)
 - Filter Coefficient and Filter Bandwidth
 - Device Orientation Setup

For more information, please refer to Novatel Wireless M2M document ENF0000AN003 - Accelerometer Guide Application Note.

1-Wire® Interface

The MT 4100 includes a 1-Wire® interface that enables the device to communicate with the following accessories:

1. An iButton® receiver to allow for Driver ID (iButton® and receiver not included)
2. Up to two 1-wire Temperature Sensors

For more information about the functions of the iButton® and the Temperature sensor(s), refer to the 1-Wire Application Note (ENF0000AN018).

Device Check-in

The device check-in feature provides connectivity to "configuration-only" servers. The device will "check-in" to these servers periodically for configuration updates. A check-in is similar to a wake-up message. The server will configure the device using AT commands after establishing a UDP connection.

This feature has AT\$CHKIN Command available, and requires Novatel Wireless M2M CMS software version 3.1 or higher. For more details, refer to MT 4100 AT Command documents.

Optional Software Features

The following optional software features are available for separate purchase. Contact your Novatel Wireless M2M sales representative for information.

Garmin Fleet Management Interface (GFMI)

GFMI provides the MT 4100 with a Wireless Network back-end to allow the Garmin Portable Navigation Device (PND) to communicate with a server.

Garmin has defined and published the GFMI Control Specification. The GFMI defines the message protocol that the PND supports over the 9600 baud serial line. If a device has GFMI enabled, the MT 4100 will support this protocol and transmit and receive requests back to the server.

Refer to APP Note ENF0000XG001 for more information.

3

Installation

SIM Access (UMT2202 Only)

Device Installation

SIM Access (UMT2202 Only)

The MT 4100 UMT version includes an onboard SIM carrier supporting 1.8/3V SIM cards. This section applies only to version with a SIM. There is no external access to the SIM.

Opening The Device

To prevent damaging the device, use the Metal Lever (Novatel Wireless M2M part number K1T2418) when opening the MT 4100.



Use proper Electrostatic Discharge precautions when handling the open device.

To open the MT 4100, follow these steps:

1. Insert the curved foot of the Metal Lever into the gap between the lid and the body next to the retainer snaps on both sides of the device as shown below.



Figure 3-1 Retainer Snaps



Figure 3-2 Unsnapping the Lid

2. Gently apply pressure upwards on the lever until the lid unsnaps.



Figure 3-3 MT 4100 With Cover Unsnnapped

3. Carefully remove the cover from the device.



Figure 3-4 MT 4100 Opened

Inserting The SIM

Insert the SIM using the following procedure (only applicable to UMTS versions UMT2202) :



You must obtain a SIM card from your network service provider. The operator must provision the SIM card for data. Always take care to protect the SIM. Without the SIM installed, the MT 4100 modem cannot communicate with the network.

1. Carefully remove the device cover to access the internal SIM holder.
2. Insert the SIM into the SIM holder of the MT 4100.
3. Replace the cover as described in the next section.

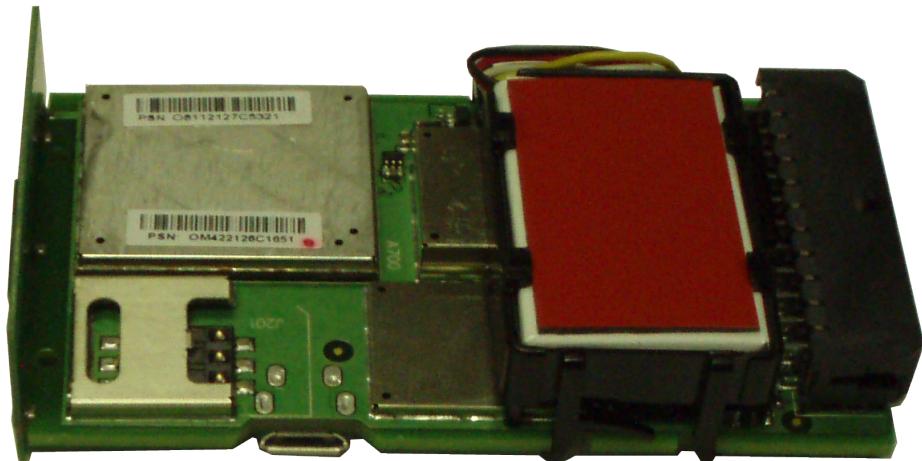


Figure 3-5 MT 4100 Board with SIM Holder (Lower Left)

Closing The Device

Replace the MT 4100 cover by using the following steps:

1. Place the MT 4100 cover onto the base as shown in the following figure. Take care not to disconnect the battery connector on devices with a backup battery.
2. Carefully slide the lid until it snaps in place.

Device Installation

The MT 4100 case includes molded anchor points for mounting as shown in the figure below (facing skyward).



Connect the ground first. Failure to connect the ground to the MT 4100 before connecting auxiliary devices may result in damage to the attached I/O device.



Figure 3-6 MT 4100 Mounting Anchors

Device Orientation

Use the orientation parameters to convert the accelerometer axes to the vehicle axes so that you can separately measure acceleration and deceleration along the vehicle centerline (front-to-back), from side-to-side, and up-and-down accelerations.



Figure 3-7 Device Orientation



For the accelerometer to operate properly, you must mount the MT 4100 securely. The accelerometer may report inaccurate results if you mount the device to cable runs or other structures that may shift the device's orientation.

Mount your device in one of the following locations:

- Above the air vents
- Above the instrument cluster
- Above the glove box

Mounting Precautions/Guidelines:

- Choose a location where metal or cable bundles will not shield the device
- Mount the device away from possible RF interference (such as radio, speaker, satellite, etc)
- Protect cabling through the vehicle chassis against spurs and nicks
- Do not mount the device in the engine bay
- Do not mount the device near or in the path of the vehicle's airbag

Mounting Methods

You may opt to use the MT 4100 Mounting Bracket Assembly (BRK4100) to secure the device. The bracket allows for mounting the device either label side up or label side down to conform to the installation location.

(To purchase accessories, contact your Novatel Wireless M2M sales associate).



While performing these steps, do not apply excessive force to the retention legs or snap feature prior to inserting the device as this may deform the mounting bracket.

Mounting Bracket

1. Secure mounting bracket to the desired mounting surface using one of the following methods:
 - Two (2) # 6 screws (preferred method)
 - Double-sided tape (see below)
2. Insert the device into the mounting bracket with the connector end at the mount opening. You can insert the device with the label side up or down. Position the device so that the label side has the best unobstructed path to the sky.
3. Connect the device to the power source.
4. The bracket contains openings in the retention tabs to support a cable tie for tamper control.



Figure 3-8 Device in Mounting Bracket

Cable Ties

To mount the device using cable ties, use the channels provided on the device to secure it to a stable structure or wire bundle. The recommended cable tie size is 0.19" wide (4.75mm).

Double-Sided Foam Tape

If securing the device using double-sided foam tape or a method not described in this manual, note the following precautions:

- Do not apply excessive force in the middle of the device as this may damage the device.
- If using rigid mounting hardware, apply pressure only to the ends of the device.
- Limit the mounting pressure only to the amount needed to secure the device.

4

Network Test Procedures

Activating The Device
Configuring the Modem
Verifying Server Connectivity

Activating The Device

Verizon Activation:

To activate with Verizon, the user must contact Verizon and provide the MEID of the device to the provider. Once Verizon has acknowledged that the device is ready to activate, the user will then be required to send an activation string to the network.

Send the activation string: AT+CDV*22899. This will initiate a call with the network. A successful call will last approximately 40 seconds. If the call is terminated within 10-15 seconds, the call was not successful. Multiple attempts might be required. If the call is not successful after a few attempts, please check the MEID of the device and compare it with the MEID provided to the provider.

To verify that the activation has successfully completed, attempt a voice call AT+CDVxxxxxx. If the call is successful, then the over-the-air provisioning was successful.

As part of the activation process, the network will download a new PRL. The device will reset after the PRL is successfully reset to allow the new PRL to take effect.

Sprint Activation:

To activate with Sprint, the user must contact Sprint and provide the MEID of the device. After the MEID is provided to Sprint, the user will need to power on the device when instructed by the carrier. The device will automatically activate when it attaches to the network. For the first attempt the user should see a series of unsolicited reports. If the device gets to +HFA: 6, the device has successfully activated. This process can take up to 60 seconds to complete. AT+HFA? can be used to query the activation state. A response of 1 means the device is successfully activated. A response of 0 means that it has not.

An unsuccessful activation attempt may take up to 5 minutes, because of the number of retries specified by the carrier.

As part of the activation process, the network will download a new PRL. The device will reset after the PRL is successfully reset to allow the new PRL to take effect.

Configuring The Modem

Use the following instructions to configure the Novatel Wireless M2M modem to communicate with the Novatel Wireless M2M test server using UDP.

First, consider the following:

- Most configurations are Mobile Originate only.
- A mobile modem initiates a conversation with a remote server before it can talk to the modem.
- IP addresses are dynamically assigned and can change.
- Some IP addresses are NAT and are non-routable.

The following configuration commands address these issues:

- Modem ID/name = "My_MT_TEST"
- Remote Server address = <http://apitest.nvtl.com/UDPAPP/>
- Remote Server IP port = 1721

Ensure the device is powered up and connected to the PC using serial connection or USB (whichever is applicable for the device you are using). You will require a serial application tool like Hyperterminal or similar to communicate with the device.

To configure the modem for test server connection follow these steps:

Step 1: Verifying Communications with the Computer:

AT	The modem should respond with OK.
ATE1	Use ATE1 if the modem doesn't respond to AT
ATI	The modem should respond with Novatel Wireless M2M Inc
AT&F	Reset the modem to factory defaults
AT&W	Write current configuration to memory. The modem is now ready to be configured using Step 2.
AT\$RESET	Reset the modem

Step 2: Configure the modem to access the GPRS network.



GPRS Registration Information which includes the APN (Access Point Name) Username, and Password (if applicable) should come from the service provider of the SIM.

Example:

APN = isp.cingular or public IP

Username (If necessary) Username = ISP@CINGULARGPRS.COM

```
Password (If necessary) Password = CINGULAR1
```

The following commands listed below are how the GPRS registration information should be programmed into the device.

AT+CGDCONT=1,"IP","<APN>"	Inform the modem of the proper APN
AT%CGPCO=1,"<user>,<pwd>",0	Inform the modem of the user and password
AT\$AREG=2	Enable auto GPRS registration
AT&W	Write current configuration to memory
AT\$RESET	Reset the modem

Step 3: Checking if the device can connect to the cellular network.

Once the device is power cycled as per the AT\$RESET in Step 2. The following commands can be used to check that the device can connect to the cellular network.

Refer to the AT command guide for the device being used for more information on the AT commands listed below.

AT+CREG?	Verify GSM status
+CREG: 0,1	-GSM registered to home network
+CREG: 0,5	-GSM registered roaming
AT%CGREG?	Verify GPRS status
%CGREG: 0,1	-GPRS registered to home network
%CGREG: 0,5	-GPRS registered roaming
AT\$NETIP?	Verify GPRS activation
	-If the response is non-zero, then everything is working.
AT\$CGEER	If AT\$NETIP returns all zeros -no PDP reject cause (Everything should be working OK) -requested service option not subscribed (APN is incorrect or SIM has not been enabled for data mode.) - user authentication failed (username/password is wrong)

Step 4: Configure the modem to talk to the Novatel Wireless M2M Test Server.

This example will use the following information:

```
--Modem ID/name = "My_MT_Test"  
--Remote Server IP address = http://apitest.nvtl.com/UDPAPP/  
--Remote Server IP port = 1721
```

The following commands listed below are how the device should be programmed to communicate with the Novatel Wireless M2M Test server.

AT\$MDMID="My_MT_Test"	Give the modem a unique name
AT\$FRIEND=1,1,"apitest.nvtl.com"	Configure the modem to talk with a specific server.

```
AT$UDPAPI=,1721          Configure the port number to be used by the modem.  
AT$WAKEUP=1,1             Enable wakeup to be sent to the server every 60 seconds  
AT&W
```



Giving the modem a unique name using AT\$MDMID and by combining with a wakeup message allows the server to associate a Public IP address with a specific modem, and can create an opportunity where the server can send commands to the modem.

Verifying Server Connectivity

For the following tests, ensure that you have Java Runtime installed on your computer. To install Java Runtime, please visit the Java website here:

<http://www.java.com/en/download/manual.jsp>

1. Start a web browser and enter the following URL:
<http://apitest.enfora.com/enforaapp/>

API Applet HTML Page

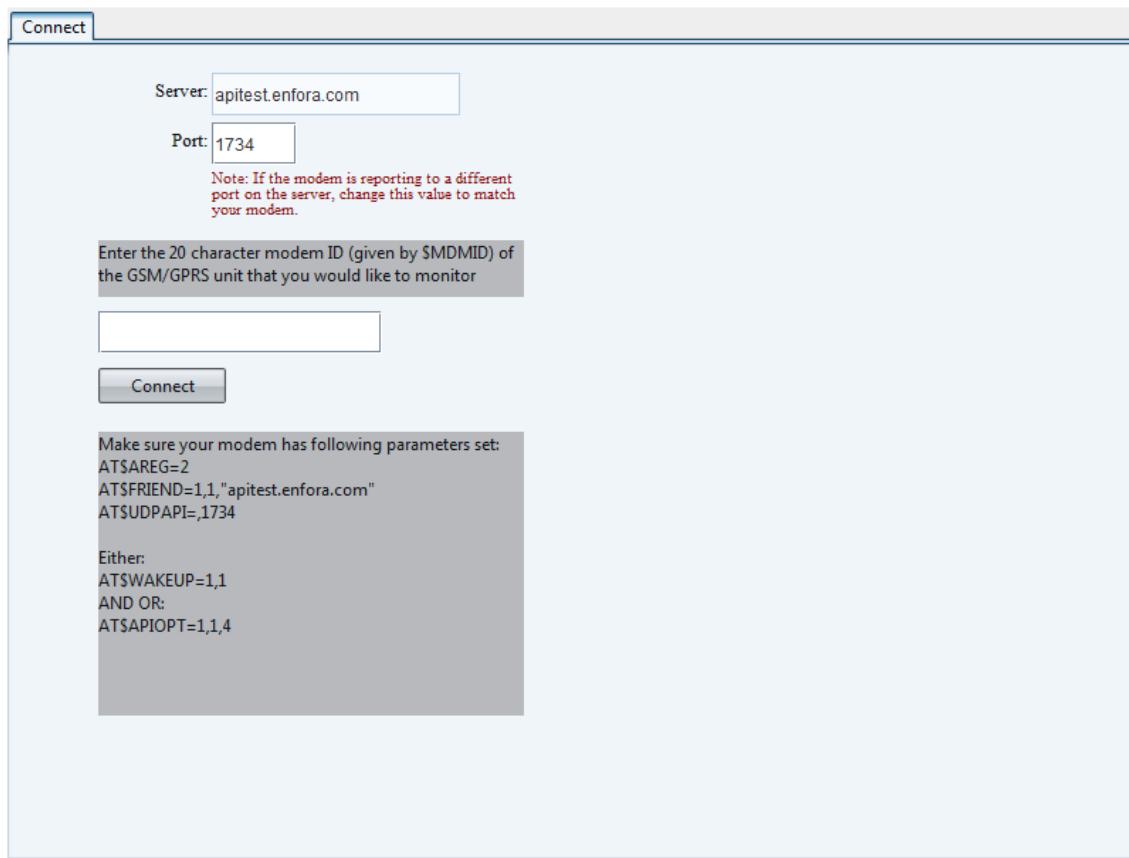


Figure 4-1 apitest.enfora.com/enforaapp/ Window

2. Enter the Server port in the port command box. In this case it is 1721 as defined in AT\$UDPAPI=1721
3. Enter the name used in the Modem ID (MDMID) command in the box.
4. Select Connect.

GSM/GPRS Applet HTML Page

The screenshot shows a web-based interface for managing a modem. At the top, there's a tab bar with 'Connect' and 'My_MT_Test'. The main area is divided into sections:

- Connection Information:** Shows 'Modem ID' as 'My_MT_Test', 'Modem IP' as 'unknown', and 'Server IP:Port' as '10.6.0.65:1721'.
- Modem Communications:** Contains fields for 'Command Type' (radio buttons for 'AT Command', 'API Read', 'API Write', 'Unsolicited MSG Request', 'Custom Header', and 'No Header'), 'Header Bytes' (hex values 00, 00, 04, 00), 'ASCII data' (a large text input field), 'Send Via' (radio buttons for 'UDP' selected, 'TCP', and 'Protocol of last received message'), and a 'Submit' button.
- Log:** A window titled 'Log' with tabs for 'Time' and 'ASCII'. It includes checkboxes for 'Show ASCII + RAW hex view', 'Compress Extended Header', 'Enable Word Wrap' (checked), 'Auto-scroll' (checked), and a 'Clear' button.

Figure 4-2 Figure 5-2 GSM/GPRS Applet HTML Page

5. Select the tab with the modem name (My_MT_Test).
Within approximately 60 seconds you should see a wakeup message in the window.



Selecting the **Clear** button will erase the contents from the (ASCII Data) window.

6. Enter the following command in the Command/Data text box: ATI
7. Click on the **Submit** button.
8. Verify that you see the modem response: Novatel Wireless, Inc. If so, you have successfully configured the modem to talk with the server.

5

Accessories

Mounting Bracket
Cables

The following accessories are available for the MT 4100:

Part Name	Part Number
Mounting Bracket	BRK4100
Power and Full I/O Integration/Development Cable	CAB2200-02
Power, Ground, Ignition Cable	CAB2448-01

Mounting Bracket

Use the Mounting Bracket to securely mount the device.

For more information on mounting, see the Device Installation section in this User Guide.



Figure 5-1 Mounting Bracket (BRK4100)

Cables



The I/O connector on this MT product is not hot-pluggable. To ensure proper operation apply power to the MT product before you connect to any auxiliary I/O device, otherwise your target I/O device could be damaged.

The cable accessories for the MT 4100 are: CAB2448-01 and CAB2200-02. Both cables interface to the MT 4100 using the serial connector as shown below.

For more information, see the Connectors section under Features and Functions in this User Guide

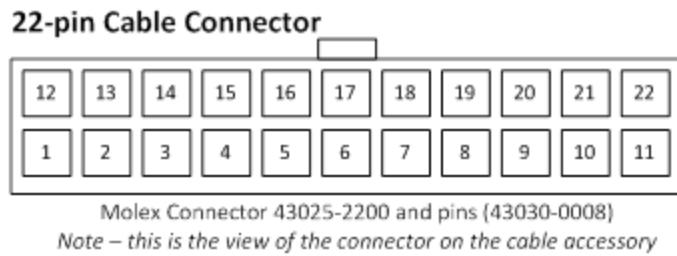


Figure 5-2 22-pin Connector

Power Cable

The power cable for the MT 4100 (CAB2448-01) includes a fuse and ignition sense.

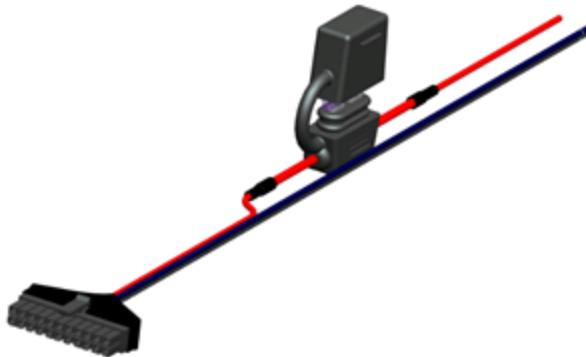


Figure 5-3 Power Cable

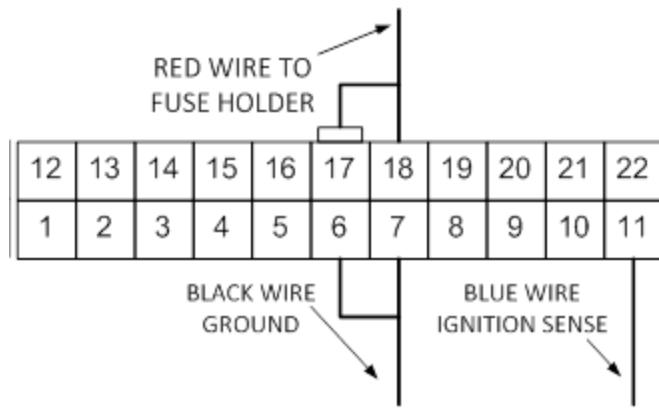


Figure 5-4 Cable Connector Pin-out

Integration And Development Cable

The MT 4100 uses the Integration and Development Cable (CAB2200-02) to program and test the device. It contains an RS232 interface, I/O header, and audio leads.

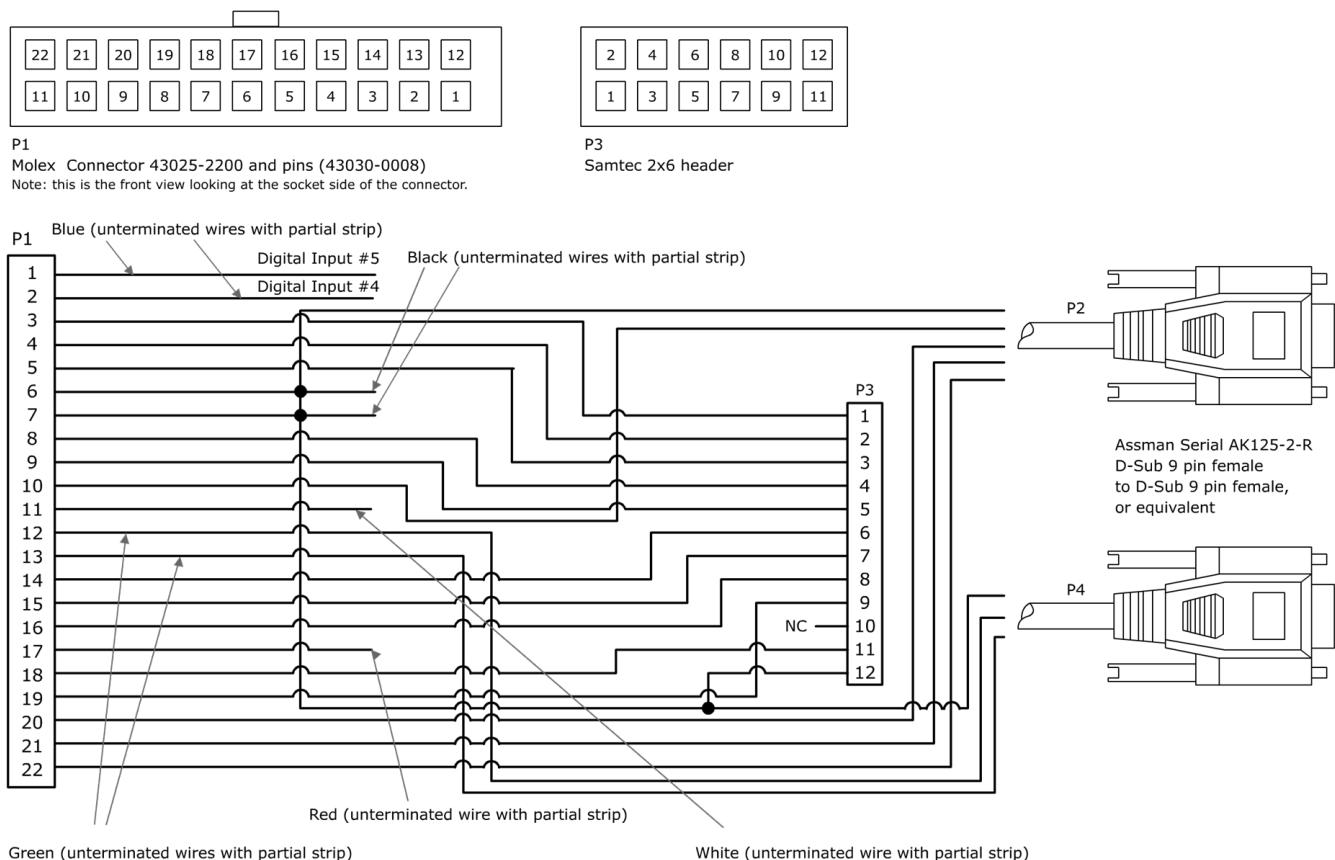


Figure 5-5 Cable Schematic

The Serial To P2 DB9 Wiring Guide

Connector	DB9	Wire Color
6/7 Ground	5 Ground	Yellow
22 Rx	2 RXD	Brown
10 CTS	8 CTS	Purple
20 RTS	7 RTS	Blue
21 Tx	3 TXD	Red

The Serial To P4 DB9 Wiring Guide

Connector	DB9	Wire Color
6/7 Ground	5 Ground	Yellow
13 RX2DOUT	2 RXD2	Brown
12 TX2DIN	3 TXD2	Red

Pin To I/O Header Wiring Guide

Connector	I/O Header	Function
3	1	1- Wire I/F
4	2	ADC In #2
5	3	ADC In #1
8	4	Digital Input #2
9	5	Digital Input #1
14	6	Digital Output #2
15	7	Digital Output #1
16	8	Digital Output #3
19	9	Digital Input #3
NC	10	No Connect
18	11	Power
6,7	12	Ground

Appendix A - 22-Pin I/O Connector Parameters

Pin #	User Name	Parameter Condition	Variable	Min	No-m	Max	Units
1	Digital Input #5	Pull-up/Pull-down (Ref. 3.3 V/GND)			47		kΩ
		Minimum-Maximum High input threshold	V_{IH}	3.0		7.0	Vdc
		Maximum Low input threshold	V_{IL}			0.39	Vdc
		Input range	V_{IN}	0.0		32.0	Vdc
		Absolute Max Input without damage	V_{MAX}			36	Vdc
2	Digital Input #4	Pull-up/Pull-down (Ref. 3.3 V/GND)			47		kΩ
		Minimum-Maximum High input threshold	V_{IH}	3.0		7.0	Vdc
		Maximum Low input threshold	V_{IL}			0.39	Vdc
		Input range	V_{IN}	0.0		32.0	Vdc
		Absolute Max Input without damage	V_{MAX}			36	Vdc
3	1-Wire	1-Wire Input High	V_{IH}	1.9			Vdc
		1-Wire Input Low	V_{IL}			0.9	Vdc
		1-Wire Weak Pull-Up R	R_{WPU}	100-0		167-5	Ω
		1-Wire Output Low @ 4 mA load	V_{OL}			0.4	Vdc
4	ADC In #2	Measurement range, 10 bit (0 to 1023) VREF Tolerance ±6% VREF Load Reg ±2 LSB	V_{IN}	0.0		32.0	Vdc
		Absolute Max Input	V_{MAX}			36.0	Vdc
5	ADC In #1	Measurement range, 10 bit (0 to 1023) VREF Tolerance ±6% VREF Load Reg ±2 LSB	V_{IN}	0.0		16.0	Vdc
		Absolute Max Input	V_{MAX}			36	
6	Ground						
7	Ground						
8	Digital Input #2	Pull-up/Pull-down (Ref. 3.3 V/GND)			47		kΩ
		Minimum-Maximum High input threshold	V_{IH}	3.0		7.0	Vdc
		Maximum Low input threshold	V_{IL}			0.39	Vdc
		Input range	V_{IN}	0.0		32.0	Vdc
		Absolute Max Input without damage	V_{MAX}			36	Vdc
9	Digital Input #1	Pull-up/Pull-down (Ref. 3.3 V/GND)			47		kΩ
		Minimum-Maximum High input threshold	V_{IH}	3.0		7.0	Vdc
		Maximum Low input threshold	V_{IL}			0.39	Vdc
		Input range	V_{IN}	0.0		32.0	Vdc
		Absolute Max Input without damage	V_{MAX}			36	Vdc

Pin #	User Name	Parameter Condition	Variable	Min	No-m	Max	Units
10	RS-232 CTS1	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc
11	Ignition Sense						
12	RS-232 TX2	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc
13	RS-232 RX2	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc
14	Digital Output 1	High Output (no sourcing capability)	V_{OH}			32.0	V
		Low Output, max ISINK = -1.1 A	V_{OL}	0.0		0.55	V
		Absolute Max Voltage without damage	V_{MAX}			36	Vdc
15	Digital Output 2	High Output, no load	V_{OHNL}			4.2	V
		High Output, ISOURCE = 10 mA	V_{OH}		3.0		V
		Low Output, max ISINK = -1.1 A	V_{OL}	0.0		0.55	V
		Sink Resistance	R_{DSON}		250	500	mΩ
		Output state during system reset			3.0	4.2	V
		Absolute Max Voltage without damage	V_{MAX}			36	Vdc
16	Digital Output 3	High Output, no load	V_{OHNL}			4.2	V
		High Output, ISOURCE = 10 mA	V_{OH}		3.0		V
		Low Output, max ISINK = -1.1 A	V_{OL}	0.0		0.55	V
		Sink Resistance	R_{DSON}		250	500	mΩ
		Output state during system reset			3.0	4.2	V
		Absolute Max Voltage without damage	V_{MAX}			36	Vdc
17	Power In						
18	Power In						
19	Digital Input #3	Pull-up/Pull-down (Ref. 3.3 V/GND)			47		kΩ
		Minimum-Maximum High input threshold	V_{IH}	3.0		7.0	Vdc
		Maximum Low input threshold	V_{IL}			0.39	Vdc
		Input range	V_{IN}	0.0		32.0	Vdc
20	RS-232 CTS1	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc
21	RS-232 CTS1	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc
22	RS-232 CTS1	Input RangeOut / Note: Output only. Input voltages should not be applied.		-25		25	Vdc

Table A-1 22-Pin I/O Connector Interface Parameters