



# Product Technical Specification

Preliminary Version

## Fastrack Xtend Battery Accessory

WA\_DEV\_FEX20\_PTS\_003

001

November 24, 2009

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Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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## >> 1. General Description

The Fastrack Xtend battery accessory consists of a slow charging circuit and a NiMH battery cell. It is designed for the Fastrack Xtend Plug & Play modem to suit M2M system requirements. The 85°C operating temperature fulfills the high power transmission condition required in GPRS class12 and WCDMA. With the ADC (Analog to Digital Converter) feature of the Fastrack Xtend, the battery accessory status can be easily monitored by AT commands.

### Overall Dimensions

- Length: 89 mm
- Width: 60 mm
- Thickness: 30 mm
- Weight: 115g



Figure 1. Fastrack Xtend Battery Accessory

## Battery Accessory Assembly

The following figures show how the battery accessory can be connected to the Fastrack Xtend.



Figure 2. Fastrack Xtend Plug & Play Modem Optional Battery Accessory

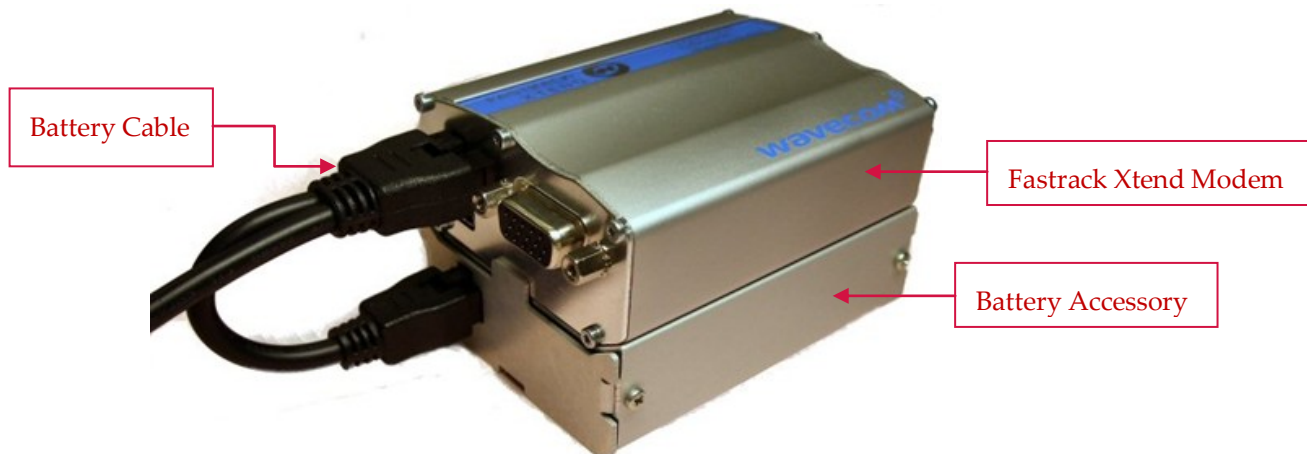


Figure 3. Fastrack Xtend Plug & Play Modem with Battery Accessory Attached



The cable used to connect the Fastrack Xtend to the battery accessory is a 6-pin Micro-Fit connector that comes packaged with the battery accessory.

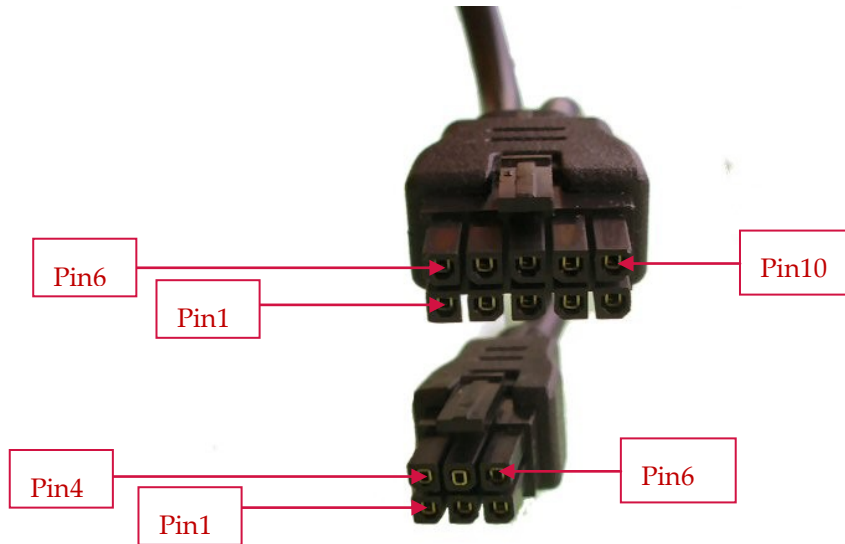


Figure 4. Battery Accessory 6-Pin Micro-Fit Connector

## Battery Accessory Interface Description

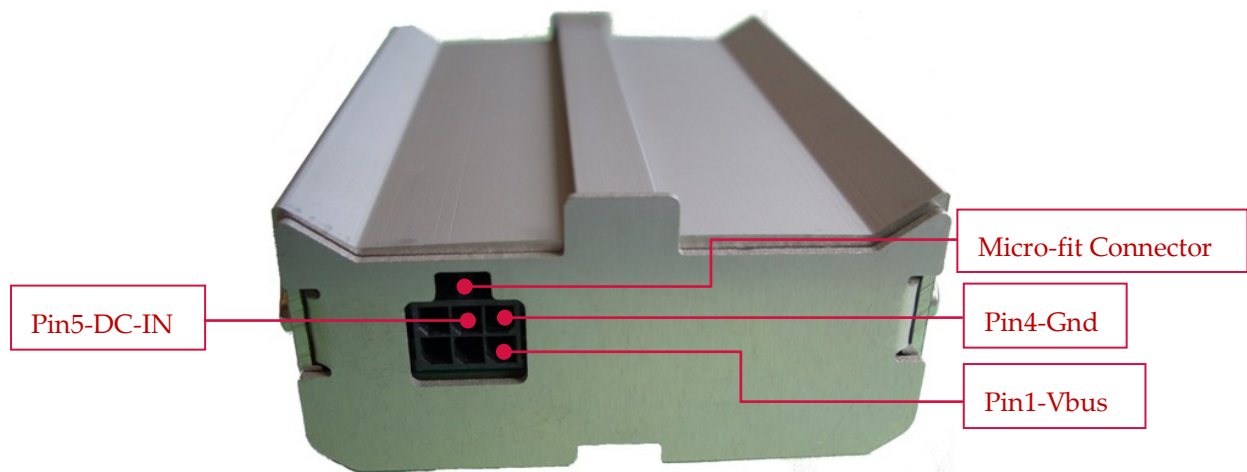


Figure 5. Battery Accessory Front Interface

There are two ways to recharge the battery accessory.

### Using DC-IN

Pin 5 of the Micro-fit connector is connected to DC-IN, which can be used to charge the battery accessory. DC-IN is the external power source of the Fastrack Xtend accessible through the battery cable.

**Using USB**

Pin 1 of the Micro-fit connector is connected to Vbus, which is used to charge the battery accessory via USB. The USB connector is located on the front interface of the Fastrack Xtend.

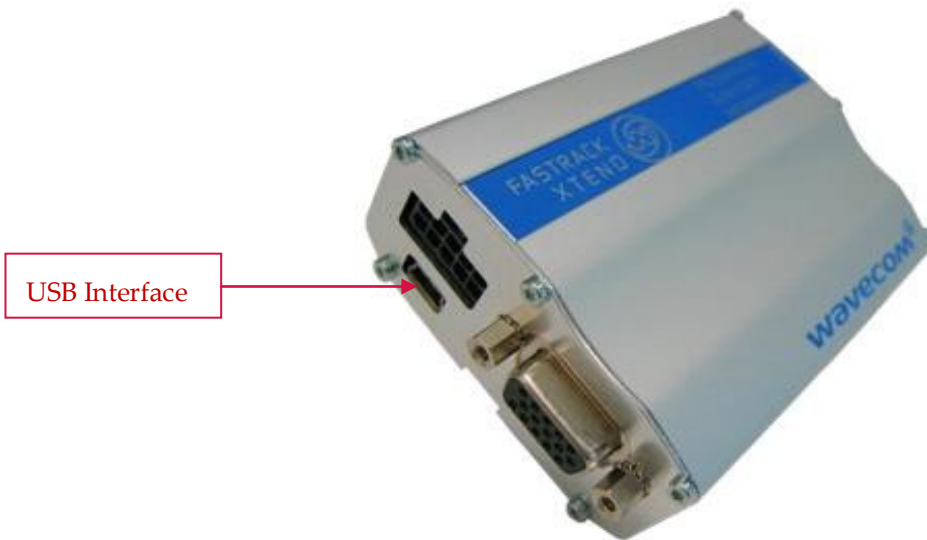


Figure 6. USB Connection from the Fastrack Xtend

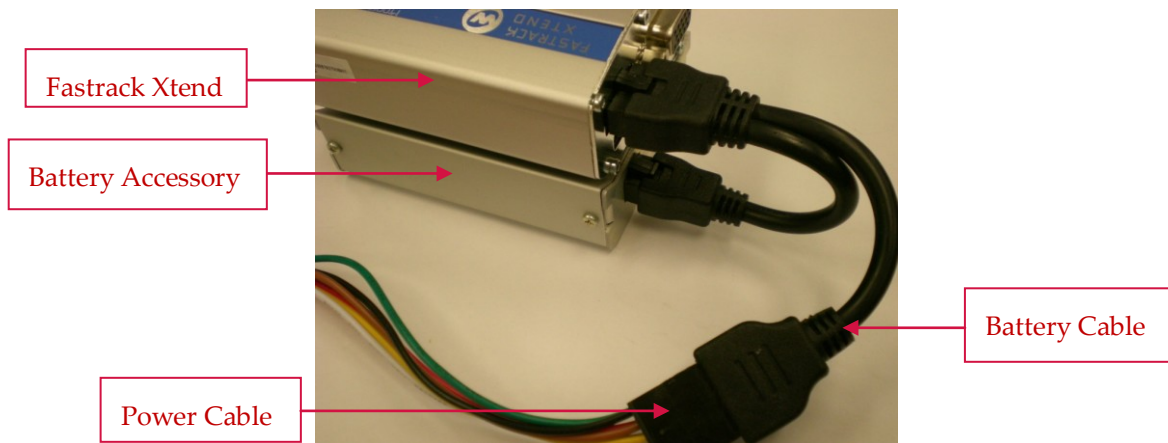


Figure 7. DC-IN Connection Through the Battery Cable

The input operating voltages for DC-IN and USB are as follows:

- DC-IN 7.5V to 32V
- USB 5.0V

And the output voltage is as follows:

- Battery 4.2V(typical, at the end of charge)

*Note:* DC-IN is the power supply input of the Fastrack Xtend ranging from 4.75V to 32V. In case the battery accessory is used, the DC-IN voltage range should be restricted to 7.5V to 32V to ensure proper battery accessory charging (charging is not effective below 7.5V). For more details about the Fastrack Xtend operating voltage and current consumption, refer to document [2] FASTRACK Xtend User Guide.

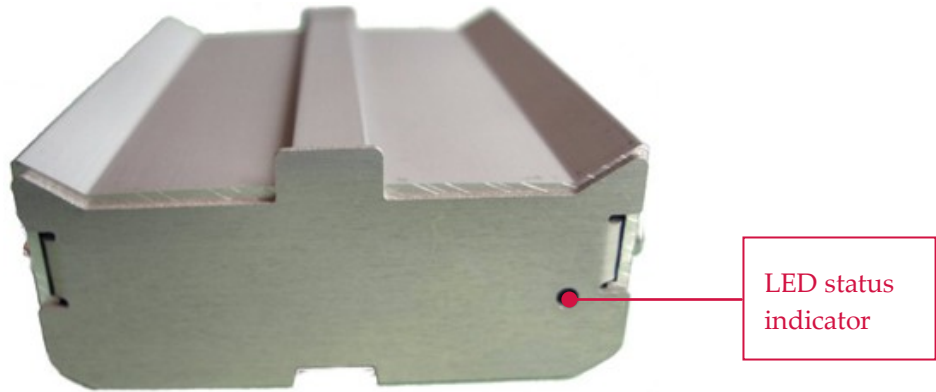


Figure 8. Battery Accessory Back Interface

The LED Status indicator is a bi-color LED that is located at the back of the battery accessory.

## 2. Charger Information

The battery accessory charges the battery cell in slow charging mode by either DC-IN or USB power source. The charging current is controlled by the battery accessory to avoid DC-IN or USB current surges and protects the internal battery cell against over voltage. The output voltage of the battery accessory ranges from 3Vmin to 4.3Vmax at room temperature.

To use DC-IN charging, the power cable with DC-IN (7.5V to 32V) is plugged to the battery cable and attached to the battery accessory as shown in the figure below.

*Note: If both DC-IN and the USB power source are connected, charging through DC-IN takes precedence.*

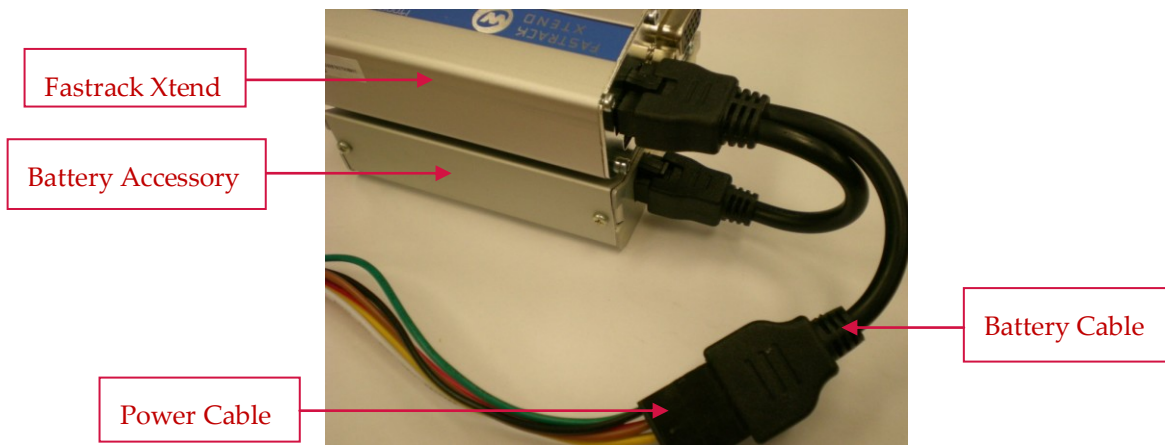


Figure 9. DC-IN Charging

For USB charging, a USB cable is connected to the Fastrack Xtend while it is connected to the battery accessory via the battery cable as shown in the figure below.

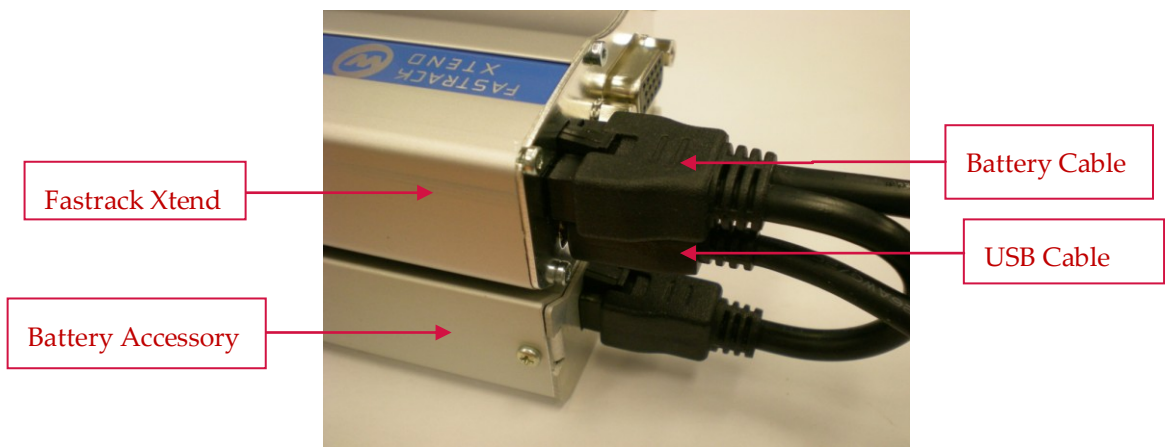


Figure 10. USB Charging

For more information about these connections, refer to document [2] FASTRACK Xtend User Guide.

## Charging Time

| Battery Type | Battery Capacity | Power Source | Charging Time |
|--------------|------------------|--------------|---------------|
| NiMH         | 500mAH           | DC-IN        | ~14Hrs        |
|              |                  | USB          | ~16Hrs        |

## Specification

| Power Source | Input Voltage | Maximum Charging Voltage | Charging Current |          |
|--------------|---------------|--------------------------|------------------|----------|
|              |               |                          | Maximum          | Continue |
| DC-IN        | DC 7.5-32V    | 4.9V                     | 128mA            | 20mA     |
| USB          | DC 5V         | 4.8V                     | 118mA            | 14mA     |

*Note: There is a discrepancy between the input voltage of the Fastrack Xtend and the input voltage of the battery accessory to ensure proper battery accessory charging. For more information, refer to document [2] FASTRACK Xtend User Guide.*

## LED Indicator

The charger status of operation can be interpreted by the bi-color LED indicator.

| LED Light Activity | Charger Status                |
|--------------------|-------------------------------|
| Red LED ON         | Battery level is below 3.6V   |
| Green LED On       | Battery level is above 3.7V   |
| LED OFF            | DC-IN or USB is NOT connected |

## Micro-Fit Connector

The 6-pin Micro-fit connector is available for power connection with the Fastrack Xtend.

| Pin Number | Signal Name | I/O Type | Voltage |         |      | Description  |
|------------|-------------|----------|---------|---------|------|--|
|            |             |          | Min     | Typical | Max  |  |
| 1          | Vbus        | I        | 4.75    | 5V      |      | USB power input  |
| 2          | Vbatt       | I        |         | 4V      |      | External power input (Power coming in from the Fastrack Xtend) |
| 3          | Bat         | O        |         | 4.2V    | 4.8V | Rechargeable Battery output                                    |
| 4          | GND         | -        |         | GND     |      | Power Ground   |
| 5          | DC-IN       | I        | 7.5V    | 13.2V   | 32V  | DC input power for battery charging                            |
| 6          | BAT-ID      | O        |         | TBD     |      | Battery ID with a resistor connected to GND                    |



## 3. Battery Cell Information

- Type of Battery Cell: NiMH
- Nominal Voltage: 3.6V
- Typical Capacity: 500mAh
- Temperature Range:
  - Storage: -40°C to 85°C
  - Discharge: -20°C to 85°C
  - Charge: 0°C to 85°C
- Maximum Discharge Current (cont): 1500mA
- Life Expectancy (typical): At least 1 year
- IEC Cycle: 1000 Cycles (IEC61951-2)

## 4. AT Commands for the Battery Accessory

There are three different methods for monitoring the battery status. The user can:

- check the presence of DC-IN charging
- check the presence of USB charging
- check how much charge is available in the battery accessory

### DC-IN Status

GPIO1 is an internal signal of the Fastrack Xtend and is dedicated for DC-IN status monitoring. GPIO1 can be controlled by Fastrack Xtend users using AT Commands.

When the power is applied on DC-IN, GPIO1 is pulled down to logic 0, and when the power is disconnected on DC-IN, it is pulled up to logic 1.

To monitor the GPIO1 level, use a communication software such as HyperTerminal and enter the following AT Commands:

- To set GPIO1 as input, enter `AT+WIOM=1,"GPIO1",0`

---

*Note:* GPIO1 needs to be set as an input initially.

---

- To read GPIO1 status, enter `AT+WIOR="GPIO1"`

### USB Power Status

The standard USB interface provides a +5V power supply signal, which can be used to charge the battery accessory. This source is limited since the default mode of the USB power cannot provide more than 100mA. Consequently, the Fastrack Xtend cannot be used in Communication mode with the USB source unless a charged battery is connected. Likewise, the USB power input has the capability to charge the battery with a maximum current of 100mA.

---

*Note:* The USB power may provide more than 100mA provided the mode of the USB power is changed to something other than the default mode.

---

USB detection is done via modem software. To enable USB communications between the Fastrack Xtend and the application, use a communication software such as HyperTerminal and enter the AT Command `AT+WMFM=0,1,3`.



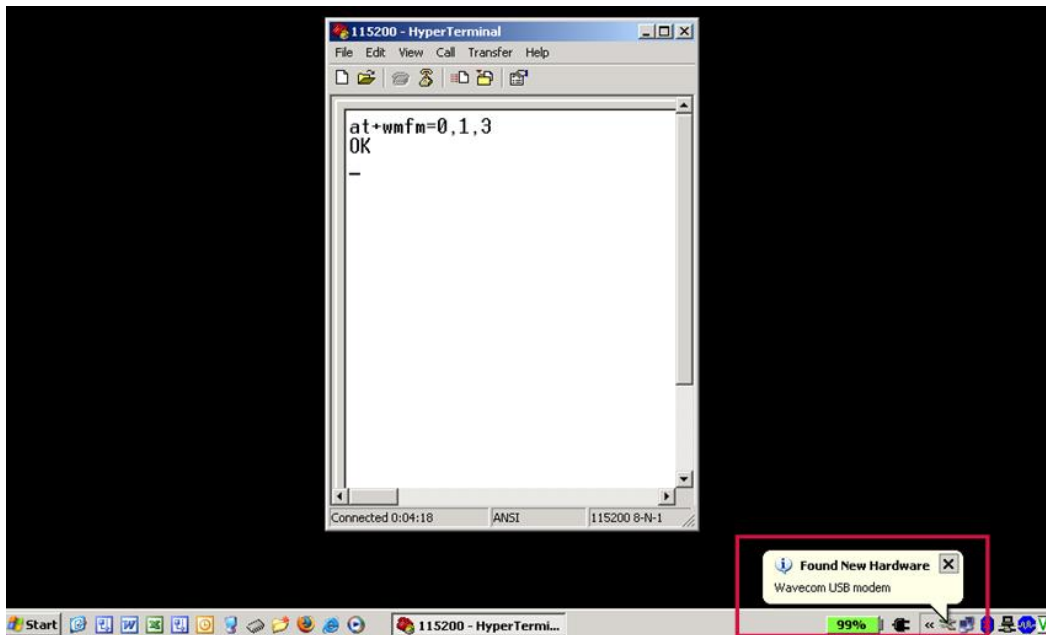


Figure 11. USB Detection by Modem Software

After USB connection has been detected and the USB driver has been installed, additional options – *Wavecom USB Wireless CPU* and an extra COM port are made available in the COM port selection list.

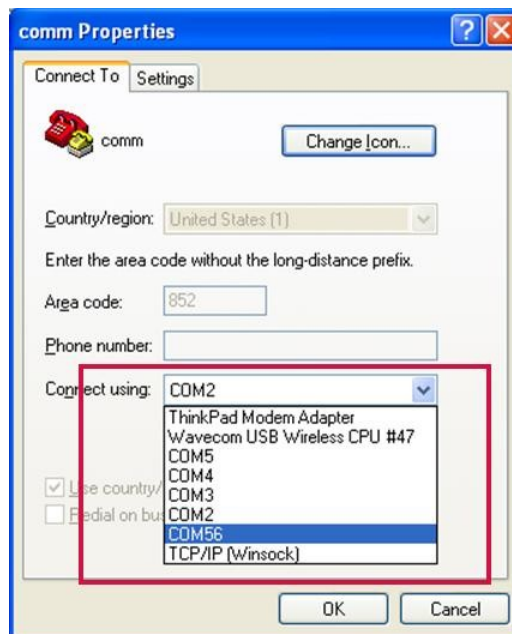


Figure 12. Setting Up USB Communications

For more information about USB communications between the Fastrack Xtend and applications, refer to document [3] Fastrack Xtend Development Kit User Guide.

For more details regarding enhanced power mode, refer to document [4] USB Power Distribution.

## Battery Level Status

ADC1 is an internal signal of the Fastrack Xtend and is dedicated for measuring the battery accessory voltage. From the ADC1 value, a specific conversion is necessary to get the battery voltage.

The formula of the battery level to ADC1 reading (expressed in mV) is detailed below:

$$\text{Battery voltage (Vbat)} = 3.212 \times \text{ADC1 reading}$$

For example, if ADC1 reading by AT command is 1218, then Vbat level =  $3.212 \times 1218 = 3912\text{mV}$ .

To monitor the battery level status, use a communication software such as HyperTerminal and enter the following AT Command:

- AT+ADC?

```
Read command
AT+ADC?
+ADC: <ADC0Value> [,<ADC1Value>] [,<ADC2Value>] [...]
OK
```



## Battery Cell Connection Anomaly

It is possible to detect if the battery cell is not properly connected inside the battery accessory.

There are two different readings to identify this anomaly as described below.

- If DC-IN is used, ADC1 reads 5V steady on the battery terminal.
- If USB is used, ADC1 reads a pulse-shaped voltage waveform on the battery terminal (due to the USB current limitation which is 100mA). Consequently, the voltage measured is not stable. Refer to the following figure.

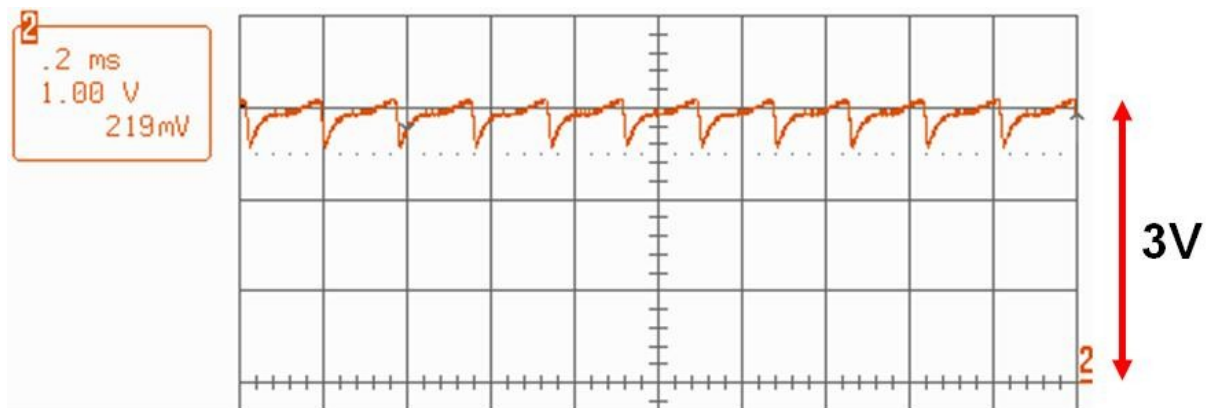


Figure 13. ADC1 Reading Using USB



## 5. Recommendations and Other Information

- When used for the first time, or after a long time (more than a month) of storage, 2 to 3 times of charging and discharging cycles are required to optimize the battery performance (capacity).
- When the battery has not been used for a long period of time, recharge it before use.
- Disconnect the DC-IN or the USB cable from the Fastrack Xtend modem if the device is not to be used for a long time.
- It is normal for the battery accessory to increase in temperature by up to 10°C during charging.
- The charging temperature of the battery accessory is from 0°C to 85°C.
- Do not open or modify the battery accessory. The battery accessory is designed using NiMH and modifying the product by using other types of battery cells (e.g. NiCd, Alkaline etc.) with different capacities may lead to a burst, causing personal injury.
- Battery storage temperature is from -40°C to 85°C.
- Do not wet, incinerate or disassemble the battery accessory.
- Do not short circuit the battery accessory.
- For indoor and dry location use only. Do not expose the battery accessory to rain, snow or extreme conditions.

## >> | 6. References

For more details, several reference documents can be consulted. The Sierra Wireless documents referenced herein are provided in the Sierra Wireless documentation package; however, the general reference documents which are not Sierra Wireless owned are not provided in the documentation package.

- [1] AT Commands Interface Guide  
Reference: WM\_DEV\_OAT\_UGD\_079
- [2] FASTRACK Xtend User Guide  
Reference: WA\_DEV\_FEX20\_UGD\_002
- [3] Fastrack Xtend Development Kit User Guide  
Reference: WA\_DEV\_FEX20\_UGD\_003
- [4] USB Power Distribution  
Reference: Universal Serial Bus Specification Revision 2.0

