

Bulletin	JA03-UM
Revision	P02
Date	03 May 2011

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1 APPLICABILITY TABLE

Product	Part Number
GSM865CF (with GPS)	v1.1
GSM865CF (without GPS)	v2.0
CDMA864CF (Sprint Certified)	v2.0
CDMA864CF (Verizon Certified)	v3.0
UMTS864CF	v1.0

2 REFERENCES

2.1 Telit Document List

GSM865CF V1.1 (AT&T Certified)

Our terminal uses Telit module GE865, Firmware version 10.00.003

Please refer to Telit's website at www.telit.com for the latest information on the GSM GE865 module.

Telit_GE865_Hardware_User_Guide

Telit_Modules_Software_User_Guide

Telit_AT_Commands_Reference_Guide – Issue #9

Please go to www.janus-rc.com to download the AT Command Reference Guide

CDMA864CF V2.00 (Sprint Certified)

Our terminal uses Telit module CC864-DUAL

Please refer to Telit's website at www.telit.com for the latest information on the CDMA CC864-DUAL module.

Telit_CC864-DUAL_Hardware_User_Guide

Telit_CC864-DUAL_Software_User_Guide

Telit_CC864-DUAL_AT_Commands_Reference_Guide – Issue #2

Available at www.janus-rc.com

CDMA864CF V3.00 (Verizon Certified)

Our terminal uses Telit module CC864-DUAL

Please refer to Telit's website at www.telit.com for the latest information on the CDMA CC864-DUAL module.

Telit_CC864-DUAL_Hardware_User_Guide

Telit_CC864-DUAL_Software_User_Guide

Telit_CC864-DUAL_AT_Commands_Reference_Guide – Issue #4

Available at www.janus-rc.com

UMTS864CF

Our terminal uses Telit module UC864-G

Please refer to Telit's website at www.telit.com for the latest information on the UMTS UC864-G module.

Telit_UC864_Hardware_User_Guide

Telit_UC864_Software_User_Guide

Telit_UC864_AT_Commands_Reference_Guide – Issue #7

Available at www.janus-rc.com

2.2 Janus Document List

Please refer to the NavSync's website, www.navsync.com, for the latest information on the MS20.

MS20 Documentation

3 OVERVIEW

3.1 Introduction

The User Manual for the Plug-In Terminus devices is intended to illustrate how users can integrate and implement the features of each communication version of the device. The common factors are explained in detail, as well as special considerations and diagrams for each module. The module differences are highlighted in this manual for design considerations for future model placement.

3.2 Preview

The Terminus GSM865CF, CDMA864CF and UMTS864CF are self-contained, multi-band, globally capable, M2M communication devices designed to provide a comprehensive solution to application problems for our M2M customers. They utilize the proven technology of Telit's GE865, UC864-G and CC864-DUAL modules, respectively, for their core communications engines. NavSync's MS20 module adds the flexibility of GPS to the GSM865CF only.

3.2.1 Functional Description

Plug-In Module Differences

GPS Functionality

- CDMA864CF has an internal GPS solution available via Telit AT command interface
- UMTS864CF has an internal GPS solution available via Telit AT command interface
- GSM865CF has an optional stand alone NavSync MS20 12 channel GPS receiver that is not accessible via Telit AT command port.

Physical Dimensions

- Length and width of devices are equal
- Heights of different devices will vary

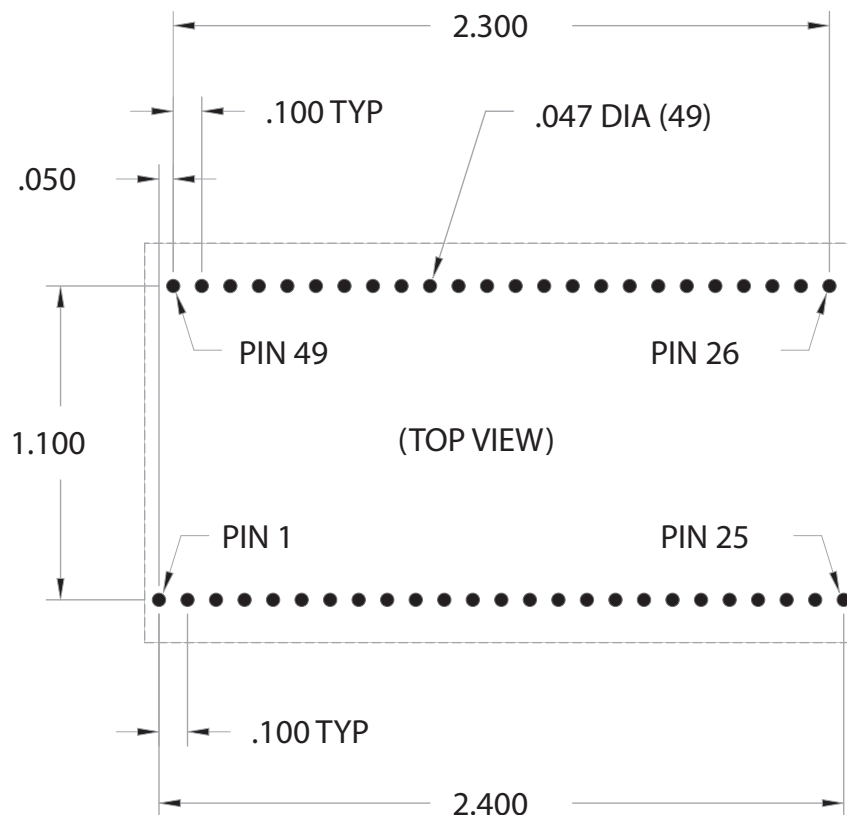
Cellular

- GSM/GPRS
- CDMA/1xRTT (Sprint and Verizon certified versions)
- UMTS/EDGE/GPRS/GSM

AT commands may vary between different cellular technologies.

USB

- CDMA & UMTS (slave USB interface)
- GSM (not available)



4 GSM OVERVIEW

4.1 GSM Features

- Quad-band EGSM 850 / 900 / 1800 / 1900 MHz
- GSM/GPRS protocol stack 3GPP Release 4 compliant
- Control via AT commands according to 3GPP 27.005, 27.007 and Telit custom
- Control via remote AT commands
- Serial port multiplexer 3GPP 27.010
- SIM application toolkit 3GPP TS 51.014
- SIM access profile
- TCP/IP stack access via AT commands
- Over-the-Air firmware management
- Voice and SMS (MO / MT)
- Output power
 - Class 4 (2W) @ 850 / 900 MHz
 - Class 1 (1W) @ 1800 / 1900 MHz
- Sensitivity:
 - -107 dBm (typ.) @ 850 / 900 MHz
 - -106 dBm (typ.) @ 1800 / 1900 MHz
- DARP/SAIC support
- Dimensions: 2.5 x 1.4 x 0.365"
- Operational temperature range (without GPS): -40°C to 80°C
Operational temperature range (GPS configured): -30°C to 65°C
- Internal LDO regulator
 - Input voltage range: 4.75 to 5.25Vdc (5.0Vdc nominal)
 - Supply disable via terminal input pin
- SIM Card
 - Standard locking SIM card socket
 - Or, optional SIM on a chip
- GSM and GPS available via Murata GSC miniature RF connector
- GPS
 - Stand alone GPS available at terminal pin interface
 - Dedicated GPS antenna connection with active antenna support

4.2 GSM Block Diagram

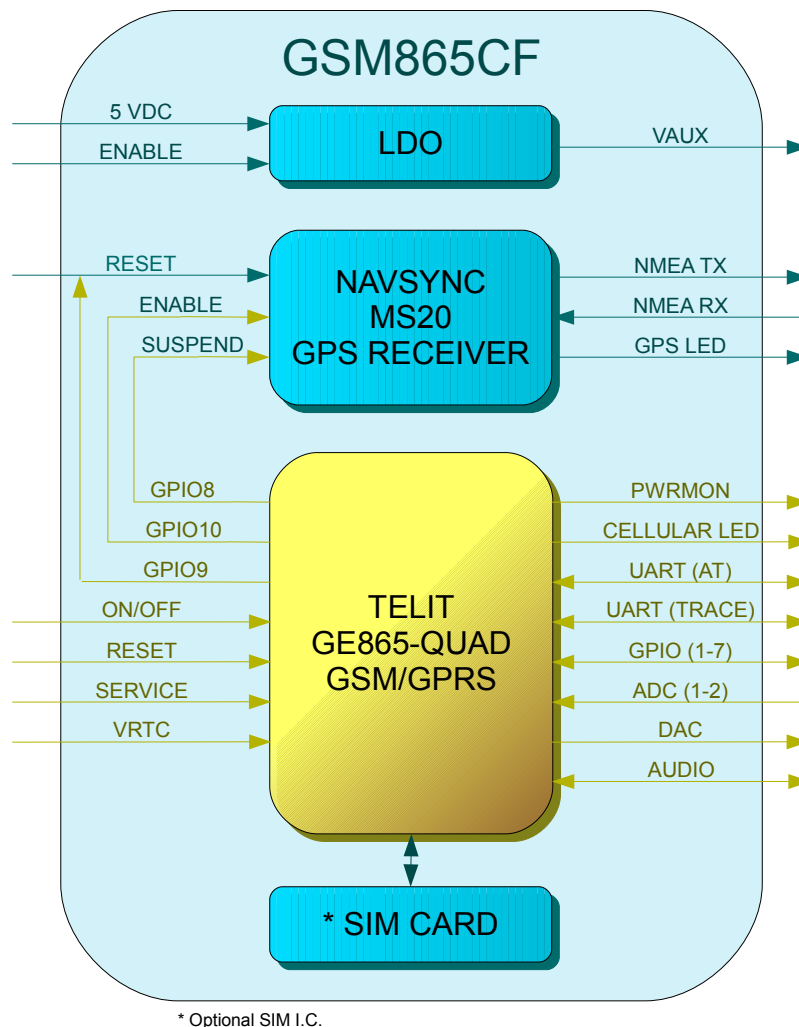


Figure 1 GSM Block Diagram

5 CDMA OVERVIEW

5.1 CDMA Features

- Dual-band CDMA 800 / 1900 MHz
- Air interface IS-95A/B and CDMA 2000
- 1xRTT data up to 153.6Kbps (full duplex)
- TCP/IP stack access via AT commands
- Over-the-Air firmware management
- Voice and SMS (MO / MT)
- Full voice support includes supplementary services
- Output power
 - 24.3 dBm (270mW)
- Sensitivity:
 - -108 dBm (typ.) @ 800 MHz
 - -108 dBm (typ.) @ 1900 MHz
- Operational temperature range: -30°C to 80°C
- Dimensions: 2.5 x 1.4 x 0.415"
- Internal LDO regulator
 - Input Voltage range: 4.75 to 5.25Vdc (5.0Vdc Nominal)
 - Supply disable via terminal input pin
- GSM and GPS available via Murata GSC miniature RF connector
- GPS
 - Stand alone GPS available at AT command interface
 - GpsOne® (user and control plane)
 - NMEA data
 - GPS fix on demand
 - Dedicated GPS antenna connection with active antenna support

5.2 CDMA Block Diagram

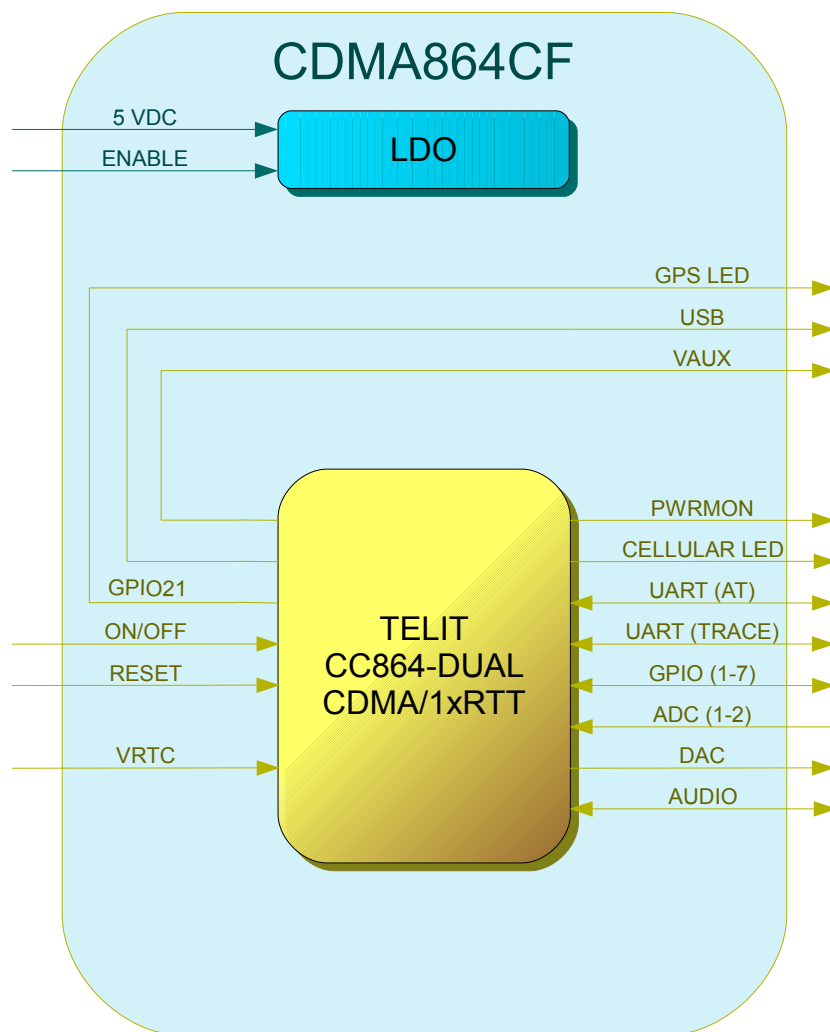


Figure 2 CDMA Block Diagram

6 UMTS OVERVIEW

6.1 UMTS Features

- HSDPA 7.2 Mbps
- Tri-band UMTS / HSDPA / (WCDMA / FDD) 850/1900/2100 MHz
- Quad-band EGSM 850 / 900 / 1800 / 1900 MHz
- GPRS/EDGE CLASS 12
- TCP/IP stack access via AT commands
- Over-the-Air firmware management
- Voice and SMS (MO / MT)
- Output power
 - Class 4 (2W, 33 dBm) @ GSM 850 / 900
 - Class 1 (1W, 30 dBm) @ GSM 1800 / 1900
 - Class 3 (0.25W, 24 dBm) @ UMTS
 - Class E2 (0.5W, 27 dBm) @ EDGE 850 / 900
 - Class E2 (0.4W, 26 dBm) @ EDGE 1800 / 1900
- Dimensions: 2.5 x 1.4 x 0.420"
- Operational temperature range: -30°C to 80°C
- Internal LDO regulator
 - Input voltage range: 4.75 to 5.25Vdc (5.0Vdc Nominal)
 - Supply disable via terminal input pin
- SIM Card
 - Standard locking SIM card socket
 - Or, optional SIM on a chip
- GSM and GPS available via Murata GSC miniature RF connector
- GPS
 - Stand alone GPS available at AT command interface
 - NMEA data
 - Dedicated GPS antenna connection with active antenna support

6.2 UMTS Block Diagram

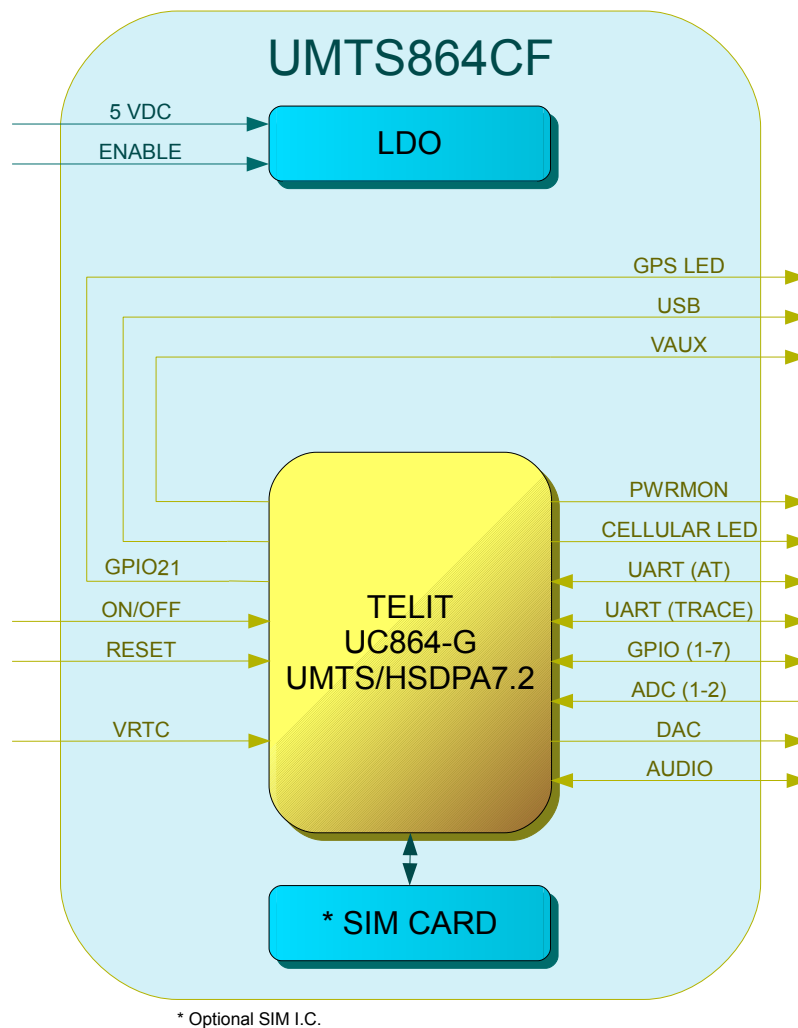


Figure 3 UMTS Block Diagram

7 INTERFACES

7.1 Serial Interface

7.1.1 UART Serial Port

The serial interface is a CMOS level UART. Communications settings for this port are as follows:

- Baud Rate: 115.2 kbps
- Bits: 8
- Stop Bits: 1
- Parity: None
- Hardware Handshaking: Yes

7.1.2 USB Port

UMTS864CF & CDMA864CF include an integrated universal serial bus (USB) transceiver, compliant with USB 2.0 specifications and supporting the USB full speed (12 Mb/s) mode. The UMTS864CF supports HSDPA (High Speed Download Packet Access) mode with downlink data speed rates up to 7.2 Mbps. High data rates available only via USB.

Note: You must implement the USB interface in order to locally update radio firmware for CDMA and UMTS applications. The GSM865CF does not have USB port available.

7.1.2.1 USB Connection Diagram

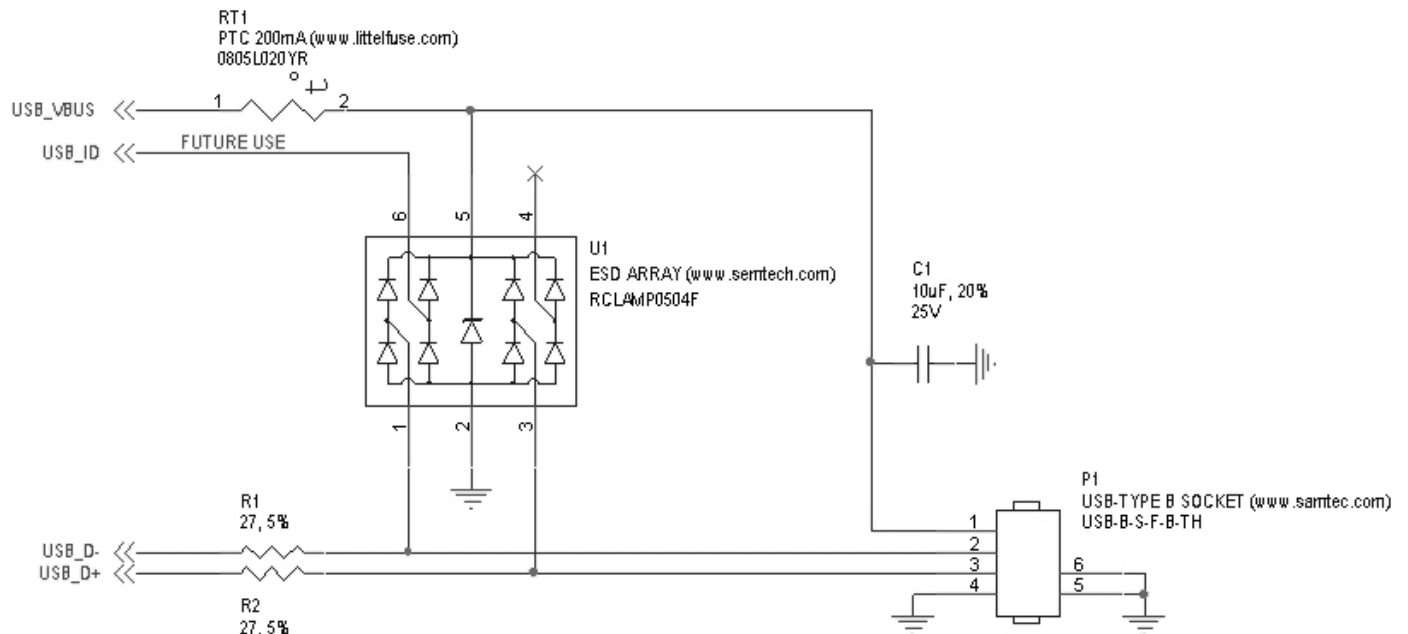


Figure 4 USB Connection Diagram

7 Interfaces continued

7.2 Power Supply

The module's power supply accepts input voltages from 4.75Vdc to 5.25Vdc and requires a nominal current sourcing capacity of 5W (maximum 10W).

Power Supply

A good understanding of the load transients is required in order to meet the power requirements of a cellular radio. Power supply design, thermal management and layout are outside the scope of this document. Please refer to power supply manufacturers for product documentation and design application notes.

Cellular Load Transients

Cellular radios use a mix of modulation schemes including, but not limited to, TDMA and CDMA. In GSM/GPRS systems the transmission and reception of data is achieved via Time Division Multiple Access (TDMA). TDMA transmission is made up of RF bursts that cause 2A current pulses at the supply input of the cellular radio. These current pulses occur at a frequency of 216 Hz and can persist for 1.2 to 2.4ms.

Plug-In Module LDO Regulator

The Terminus Plug-In modules are designed with a linear dropout (LDO) regulator to power the cellular radio. The LDO requires an input voltage of 4.75 to 5.25Vdc to maintain regulation and specified junction temperature limits. 4Vdc is supplied to the supply inputs of the cellular radio. The LDO has an efficiency of > 80%, and can source enough current to guarantee proper operation of the cellular radio.

Note: The LDO input is capable of withstanding 16Vdc. This is outside the recommended operating voltage of the plug-in modules but is helpful to know when designing input transient circuitry.

Plug-In Module Input Supply Requirements

Please refer to the power supply specification for the specific plug-in module you are designing into your circuit. The current values are given in average units due to the pulsed nature of the transmission scheme. It is recommended that your supply source the full peak current value of the transmission pulse in order to maintain proper cellular operation. The use of bulk output capacitors on your supply allows for a less powerful supply. If you are designing your PCB to accept all of the plug-in modules it is necessary to choose the highest consumption power supply requirement and design for it.

7 Interfaces continued

7.4 Plug-In Pin-Out

PIN	PIN NAME	DESCRIPTION	STANDARD I/O SIGNAL	POWER-ON STATE	PULL TYPE	TERMINAL	NOTE
1	SUPPLY	Positive Supply Input	Power	N/A	N/A	ALL	
2	SUPPLY	Positive Supply Input	Power	N/A	N/A	ALL	
3	ENABLE SUPPLY	Enable/Disable Supply	Input	N/A	PULL-UP:681k	ALL	1
4	RXD	UART - Transmit Line	CMOS Output	N/A	N/A	ALL	6
5	DSR	UART - Data Set Ready	CMOS Output	N/A	N/A	ALL	6
6	CTS	UART - Clear to Send	CMOS Output	N/A	N/A	ALL	6
7	RING	UART - Ring Indicator	CMOS Output	N/A	N/A	6	
8	DCD	UART - Data Carrier Detect	CMOS Output	N/A	N/A	ALL	6
9	TXD	UART - Receive Line	CMOS Input	N/A	N/A	ALL	6
10	DTR	UART - Data Terminal Ready	CMOS Input	N/A	N/A	ALL	6
11	RTS	UART - Request to Send	CMOS Input	N/A	N/A	ALL	5
12	GROUND	Supply Reference	Power	N/A	N/A	ALL	
13	TRACE_TX	Debug UART - Transmit Line	CMOS Output	N/A	N/A	ALL	6
14	TRACE_RX	Debug UART - Receive Line	CMOS Input	N/A	N/A	ALL	6
15	GPS_LED	GPS Status	CMOS Output	N/A	N/A	ALL	6
16	CELLULAR_LED	Cellular Status	Output	N/A	N/A	ALL	6
17	SERVICE	Enable Firmware Load	CMOS Input	N/A	PULL-DOWN	GSM865CF	6
18	PWRMON	Power Monitor Output	CMOS Output	N/A	PULL-DOWN:1M	ALL	6
19	ON_OFF	Toggle Cellular Radio On Off State	Input	N/A	PULL-UP to VTRC: 47k	ALL	1
20	RESET	Reset Cellular Radio	Input	N/A	PULL-UP: 47k	ALL	1
21	MIC+	Positive Analog Audio Input	Differential Analog Input	N/A	N/A	ALL	
22	MIC-	Negative Analog Audio Input	Differential Analog Input	N/A	N/A	ALL	
23	EAR+	Positive Analog Audio Output	Differential Analog Output	N/A	N/A	ALL	
24	EAR-	Negative Analog Audio Output	Differential Analog Output	N/A	N/A	ALL	
25	GROUND	Supply Reference	Power	N/A	N/A	ALL	
26	GROUND	Supply Reference	Power	N/A	N/A	ALL	
27	USB_D-	USB Differential Data (-)	CMOS Bi-Direction	N/A	N/A	CDMA864CF, UMTS864CF	6
28	USB_D+	USB Differential Data (+)	CMOS Bi-Direction	N/A	N/A	CDMA864CF, UMTS864CF	6
29	USB_VBUS	USB Supply	Power	N/A	N/A	CDMA864CF, UMTS864CF	
30	USB_ID	Future Use	Analog Input	N/A	N/A	NONE	2,3
31	I2C_SDA	Future Use	CMOS Bi-Direction	N/A	N/A	NONE	
32	I2C_SCL	Future Use	CMOS Bi-Direction	N/A	N/A	NONE	
33	GPS_RX	GPS NMEA UART - Receive Line	CMOS Input	N/A	N/A	GSM865CF	6
34	GPS_TX	GPS NMEA UART - Transmit Line	CMOS Output	N/A	N/A	GSM865CF	6
35	GPS_RESET	GPS Reset	Input	HIGH-Z	PULL-HIGH: 47k	GSM865CF	1
36	GPIO_7	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
37	GPIO_6	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
38	GPIO_5	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
39	GROUND	Supply Reference	Power	N/A	N/A	ALL	
40	GPIO_4	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
41	GPIO_3	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
42	GPIO_2	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
43	GPIO_1	General Purpose I/O	CMOS Bi-Direction	INPUT	N/A	ALL	6
44	DAC	Digital to Analog Converter	Analog Output	N/A	N/A	ALL	4
45	ADC2	Analog to Digital Converter	Analog Input	N/A	N/A	ALL	
46	ADC1	Analog to Digital Converter	Analog Input	N/A	N/A	ALL	
47	VRTC	Cellular Radio External RTC Supply	Power	N/A	N/A	ALL	
48	VAUX	CMOS Reference Voltage	Analog Output	N/A	N/A	ALL	
49	GROUND	Supply Reference	Power	N/A	N/A	ALL	

Notes:

1. It is required that this input be controlled by an Open Collector/Drain Output. Do not use an external pull-up resistor; a pull-up is included internal to the module.
2. Not currently implemented
3. USB On The Go: Analog input used to sense whether a peripheral device is connected and determine the peripheral type; a host or a peripheral.
4. DAC output must be integrated (for example, with a low pass filter) in order to obtain an analog voltage.
5. RTS must be connected to GROUND if flow control is not used.
6. Refer to individual modules for standard I/O levels.

7 Interfaces continued

7.5 VRTC Details

The VRTC pin brings out the real time clock supply, which is separate from the rest of the part. This allows only the RTC to be ON when all other parts of the device are OFF. A backup capacitor can be added to this pin to increase RTC autonomy while powering the device from a battery.

No devices should be powered from this pin.

7.6 GPIO Details

Terminus GPIO are configurable as input, output, and special function. Configuration is controlled by the customer specific application via AT commands sent on the UART/USB interface. The following table describes GPIO configuration options.

GPIO	Configuration	Alternate Function	ON_OFF State
1	Input / Output		pull-up
2	Input / Output	Jamming detect output	pull-up
3	Input / Output		pull-down
4	Input / Output	RF transmission control	pull-down
5	Input / Output	RFTX monitor output	pull-down
6	Input / Output	Alarm output	pull-up
7	Input / Output	Buzzer output	pull-down

7.6.1 Using a GPIO Pad as INPUT

The GPIO pads, when used as inputs, can be connected to a digital output of another device and report its status, provided this device has interface levels compatible with the CMOS levels of the GPIO of the module.

7.6.2 Using a GPIO Pad as OUTPUT

The GPIO pads, when used as outputs, can drive CMOS digital devices or compatible hardware. When set as outputs, the pads have a push-pull output.

7.6.3 Using the Alarm Output GPIO6

When configured as alarm output, the GPIO6 pad is controlled by the module, rising when the alarm starts and falling after the issue of a dedicated AT command. This output can be used to power up the module controlling micro-controller or application at the alarm time. This enables you to program a timely system wake-up to achieve periodic actions and completely turn off the application or module during sleep periods to reduce the sleep consumption. In battery-powered devices, this feature will greatly improve the autonomy of the device.

Note: During RESET the line is set to HIGH logic level

7 Interfaces continued

7.6 GPIO Details continued

7.6.4 Using the Buzzer Output GPIO7

When the GPIO7 pad is configured as buzzer output, it is controlled by the module and will drive the buzzer driver with appropriate square waves. This allows your application to easily implement the buzzer features when needed, such as call incoming or SMS incoming.

A sample interface scheme is included below to demonstrate how to interface a buzzer to the GPIO7:

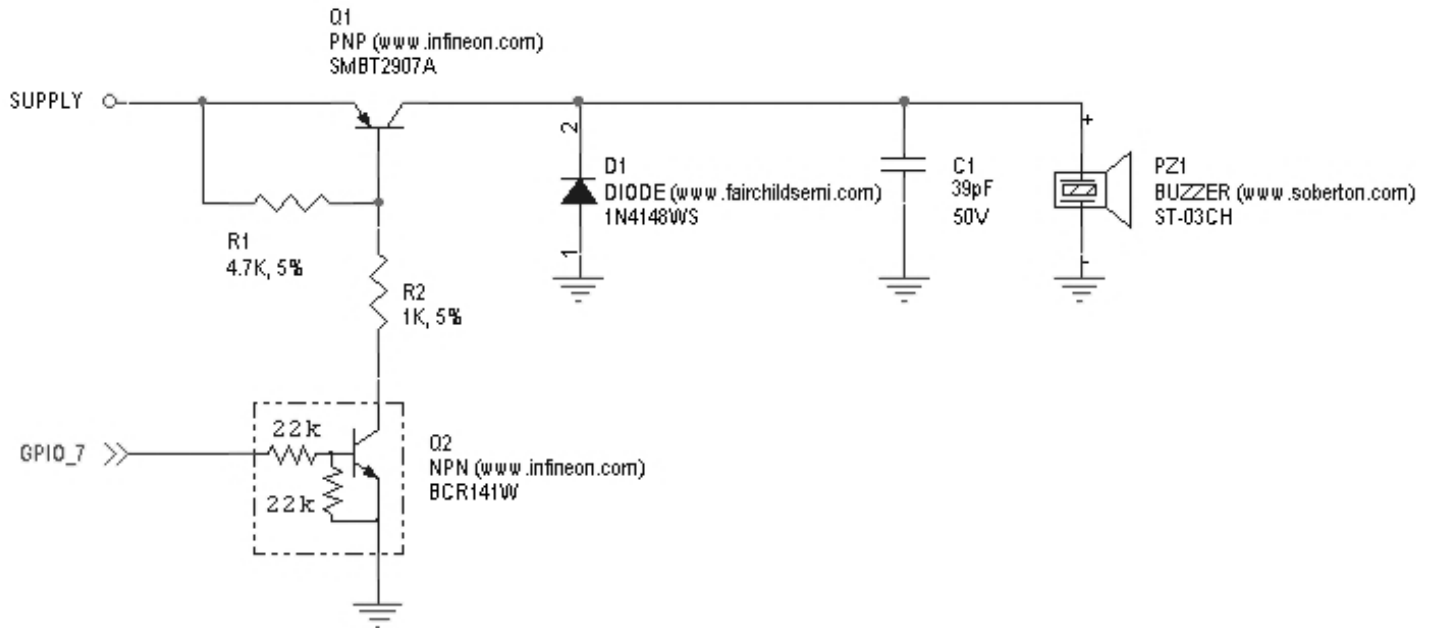


Figure 7 Sample Interface

NOTE: To correctly drive a buzzer, a driver must be provided. Its characteristics depend on the buzzer and are available from your buzzer vendor.

7.6.5 Analog to Digital Converter

ADC	Description
1	Analog to digital converter input
2	Analog to digital converter input

7 Interfaces continued

7.6 GPIO Details continued

7.6.6 RESET Pin

Input Logic State	Description
High-Z	Active state
0	Reset state

Notes:

1. It is required that this input be controlled by an open collector/drain output. Do not use an external pull-up resistor, a pull-up is included internal to the Terminus.
2. The RESET pin is offered as a means to reset the Terminus when and if the Terminus becomes unresponsive. The RESET pin is not intended to be used as a means of turning the Terminus off. Use the ON/OFF pin to turn the Terminus on or off.
3. RESET state must be held for at least 200ms before returning to active state.

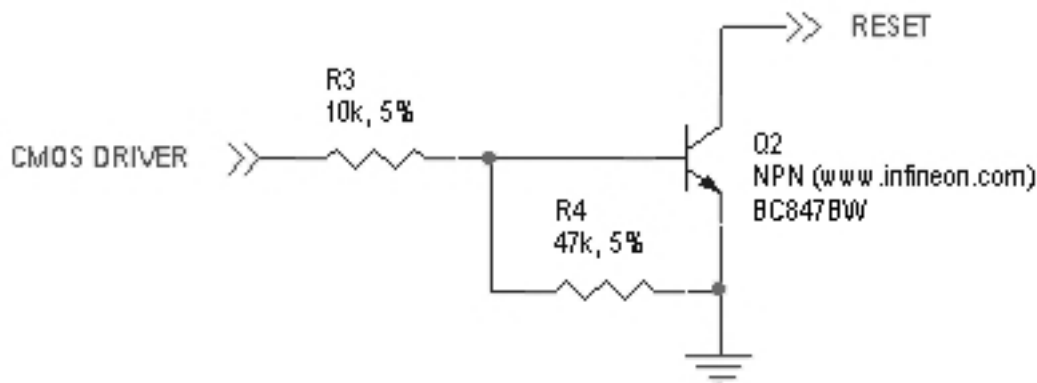


Figure 8 Reset Pin Diagram

7.6.7 ON/OFF Pin

Input Logic State	Description
High-Z	Terminus turned ON or OFF after input returns to this state.
0	Toggle Terminus ON or OFF

Notes:

1. It is required that this input be controlled by an open collector/drain output. Do not use an external pull-up resistor, a pull-up is included internal to the Terminus.
2. The ON/OFF pin is offered as a means to power-on and power-down the Terminus. When the Terminus powers-down it informs the cell tower that it is powering down and will not be communicating with the tower any more. This is considered a controlled power-down.
3. After toggling the power state of the Terminus, wait until PWRMON indicates chosen state before toggling the power state again.
4. To turn ON the plug-in module, the ON_OFF input must be tied low for at least 1 second then released.
5. To turn OFF the plug-in module, the ON_OFF input must be tied low for at least 2 seconds then released.
6. Optionally the Terminus may be powered-down with the use of AT commands.

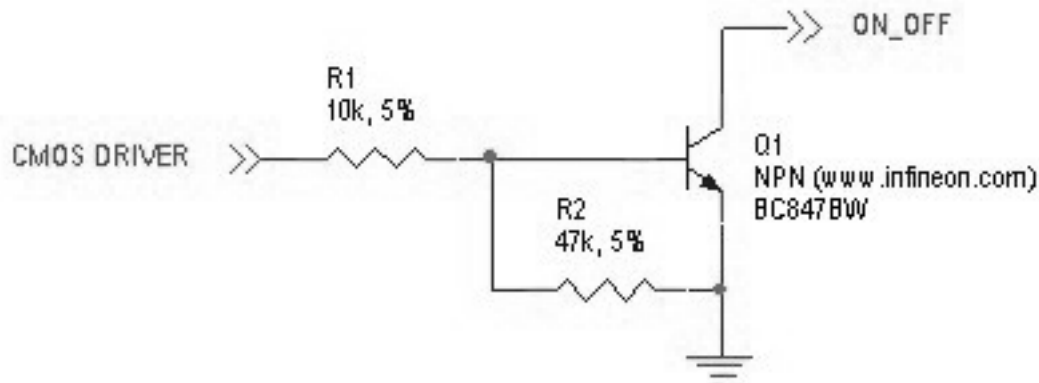


Figure 9 On / Off Pin Diagram

7 Interfaces continued

7.6 GPIO Details continued

7.6.8 PWRMON Pin

Output Logic State	Description
0	Terminus powered-down
1	Terminus powered-on

Notes:

1. Used in conjunction with ON/OFF pin to control power-on and power-down state.
2. During a power down, it is required to stop driving terminal inputs. If this is not done, the PWRMON output will not transition low. On the GSM865CF, this will cause the VAUX output to remain active.

7.7 Internal Interfaces

The following section describes all signals that are exposed internally for control of the Terminus.

7.7.1 GPS Reset (GSM865CF)

When using a GPS enabled Terminus GSM865CF terminal, GPIO 9 is internally connected to the RESET input of the MS20 GPS module. This allows the application to reset the GPS receiver to a power-on state. The terminal pin GPS RESET can also reset the MS20, but must be controlled via an open-drain output. The MS20 has an internal pull-up resistor thus GPS RESET must not implement an external pull-up resistor.

Input Logic State	Description
0	GPS module in reset state
1	GPS module in run state

7.7.2 GPS Suspend (GSM865CF)

When using a GPS enabled Terminus GSM865CF terminal, GPIO 8 is internally connected to the SUSPEND input of the MS20 GPS module. This allows the application to set the GPS receiver into a suspended mode of operation to reduce current draw when the GPS receiver is not needed.

Input Logic State	Description
0	GPS module in suspended state
1	GPS module in run state

7.7.3 GPS Enable (GSM865CF)

When using a GPS enabled Terminus GSM865CF terminal, GPIO 10 is internally connected to the LDO_EN input of the MS20 GPS module. This allows the application to set the GPS receiver into the lowest possible current draw when the GPS receiver is not needed.

Input Logic State	Description
0	GPS module is disabled
1	GPS module in run state

7 Interfaces continued

7.7 Internal Interfaces continued

7.7.4 GPS LED (GSM865CF)

When using a GPS enabled Terminus GSM865CF terminal, the MS20 GPS receiver controls the GPS_LED output. See Figure 10 for recommended connection of LED.

7.7.5 GPS LED (CDMA864CF & UMTS864CF)

The CDMA864CF & UMTS864CF terminals come equipped with GPS functionality that is built into the cellular radios. The cellular radios have no LED status output for driving an LED. These modules have GPIO21 connected to the GPS LED pin of the Terminus terminal. The user application can use this to control an LED or act as an additional GPIO. See Figure 10 for recommended connection of LED.

7.8 LED Status Indicators

The LED Status outputs are used to drive external LEDs and there status is defined below. See Figure 10 for recommended connection of LED.

7.8.1 Cellular LED Status

LED Status	Device Status
Permanently Off	Cellular radio is off
Fast Blinking (0.5 sec on / 0.5 sec off)	Net search/ not registered/turning off
Slow Blinking (0.3 sec on / 2.7 sec off)	Registered, full service
Permanently On	A call is active

7.8.2 GPS (GSM865CF)

LED Status	Device Status
Permanently Off	No power to unit, GPS not installed
Fast Blinking (1.0 sec on / 1.0 sec off)	No fix, searching
Slow Blinking (1.0 sec on / 4.0 sec off)	Location fix

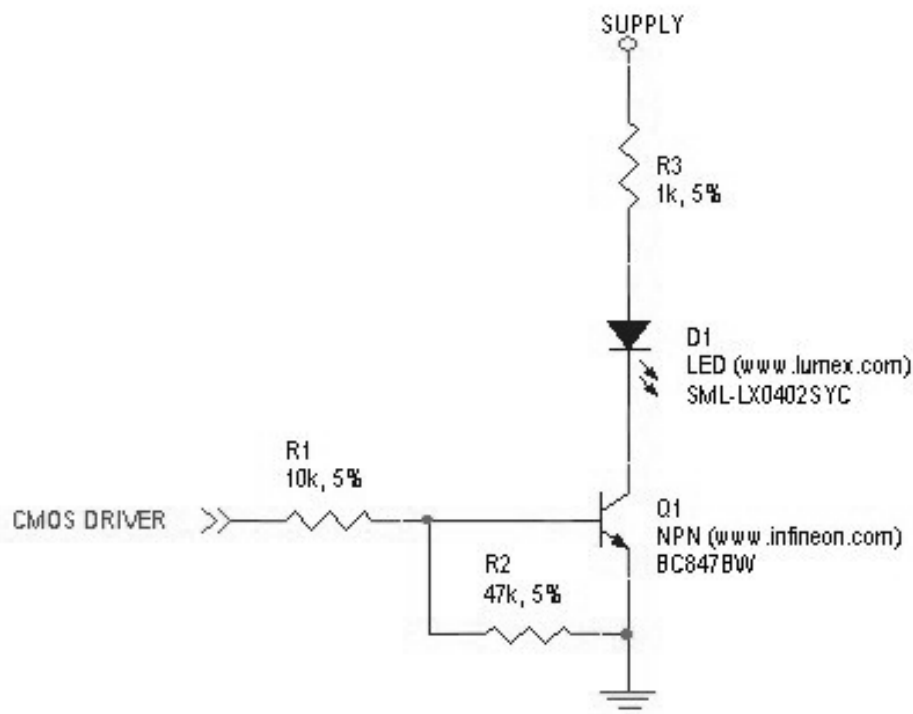


Figure 10 LED Indicators Diagram

7 Interfaces continued

7.9 RF Interface

There are two RF interfaces on the Terminus – the GSM antenna jack and the GPS antenna jack (the non-GPS version has only one). The specifications and requirements for these are as follows:

7.9.1 Cellular Antenna

7.9.1.1 GSM865CF Antenna Interface:

Type: Murata GSC - MALE (Murata Part #MM9329-2700RA1)

Pin	Description
Center Pin	RF signal
Outer Conductor	Signal ground

7.9.1.2 Certified GSM Antenna

TBD

7.9.1.3 CDMA864CF Antenna Interface

This module includes coax GSC to SMA (F) bulkhead connector that is mounted to the plug-in module.

Type: GSC to SMA (F), 200mm Cable (Janus Part #MC-0168)

Pin	Description
Center Pin	RF signal
Outer Conductor	Signal ground

7.9.1.4 Certified CDMA Antenna

(Janus Part number ANT-0073-G)

Frequency:	824-894 MHz, 1850-1990 MHz
Gain:	3 dBi
VSWR:	2:1 max
Impedance:	50 Ω nominal
Power:	5W max
Operating Temperature:	-40°C to 85°C
Length:	6.75" with 90° angle; 7.75" when straight

7.9.1.5 UMTS864CF Antenna Interface

This module includes coax GSC to SMA (F) bulkhead connector that is mounted to the plug-in module.

Type: GSC to SMA (F), 200mm Cable (Janus Part #MC-0168)

Pin	Description
Center Pin	RF signal
Outer Conductor	Signal ground

7.9.1.6 Certified UMTS Antenna

TBD

7.9.1.7 Cellular Antenna Installation Guidelines

- Install the antenna in a place covered by the cellular provider of your choice.
- The antenna must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.
- Antenna must not be installed inside metal cases
- Antenna must be installed also according to antenna manufacturer instructions.

7 Interfaces continued

7.9.2 GPS Antenna Specifications:

7.9.2.1 GPS Antenna Interface

Type: Murata GSC - MALE (Murata Part #MM9329-2700RA1)

Pin	Description
Center Pin	Supplies voltage to power active antenna
Outer Conductor	Signal ground

7.9.2.2 GPS Antenna Installation Guidelines:

- Install the antenna with a clear sky view.
- Antenna must not be installed inside metal cases
- Antenna must be installed also according to antenna manufacturer instructions.

7.10 SIM Card Interface

GSM865CF & UMTS864CF

The SIM Card Interface allows the Terminus to accept the subscriber card provided by the cellular telephone provider. It can accommodate a 1.8V or 3.0V SIM card and complies with the Phase 2 GSM 11.14 standard. Optional SIM IC. Consult factory representative.

8 GSM865CF TECHNICAL SPECIFICATIONS

8.1 Electrical Specifications

8.1.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Note
VIN (DIGITAL INPUTS 2.8V CMOS)	-0.3	-	3.1	Volt	
VIN (DIGITAL INPUTS 1.8V CMOS)	-0.3	-	2.1	Volt	
VIN (ANALOG INPUT)	-0.3	-	3.0	Volt	
Storage Temperature	-40	-	85	°C	
Supply (+) referenced to Supply(-)	0	-	16	Volt	

Operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Rating conditions for extended periods of time may affect device reliability.

8.1.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit	Note
Temperature without GPS	-40	-	80	°C	
Temperature with GPS	-30		65	°C	
Supply (+) referenced to Supply (-)	4.75	-	5.25	Volt	
VAUX Output	-	2.8	-	Volt	
VAUX Current	-	-	100	mA	

8.1.3 Power Supply

Mode	Average (mA)	Mode Description
POWERED DOWN		
Terminal Disabled	≤ 0.015 *	Terminal disabled (ENABLE SUPPLY = 0)
Cellular Radio Off	1.4 *	Cellular module powered but switched off via ON_OFF pin (PWRMON=0)
IDLE MODE		
AT+CFUN=1	25 *	Normal mode: full functionality of the module
AT+CFUN=4	24 *	Disabled TX and RX; module is not registered on the network
AT+CFUN=0 or =5	5.3 *	Power saving: module registered on the network and can receive voice call or SMS.
GSD TX and RX mode		
GSM900 CSD PL5	313.0	GSM voice call
DCS1800 PL0	214.0	
GPRS (class 10) 1TX		
GSM900 PL5	271.0	GPRS sending data mode
DCS1800 PL0	181.0	
GPRS (class 10) 2TX		
GSM900 PL5	486	GPRS sending data mode
DCS1800 PL0	316	
MS20 GPS Power		
During acquisition (fully active)	TBD	
While tracking (fully active)	TBD	

* Advanced Data

8 GSM865CF TECHNICAL SPECIFICATIONS continued

8.1.4 I/O Levels

8.1.4.1 Standard Interface Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	2.1	-	3.0	Volt	
Input Voltage Low - Vil	0	-	0.5	Volt	
Output Voltage High - Voh	2.2	-	3.0	Volt	
Output Voltage Low - Vol	0	-	0.35	Volt	
Typical Current Source/Sink capability = 1mA/1uA					

8.1.4.2 Cellular LED Output Levels

Parameter	Min	Typ	Max	Unit	Note
Output Voltage High - Voh	1.65	-	2.0	Volt	
Output Voltage Low - Vol	0	-	0.35	Volt	
Typical Current Source = 1mA					

8.1.4.3 Reset Pin Input Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	1.8	-	2.1	Volt	
Input Voltage Low - Vil	0	-	0.2	Volt	

It is required that this input be controlled by an Open Collector/Drain Output. Do not use an external pull-up resistor, a pull-up is included internal to the Terminus.

8.1.4.4 ADC Levels - ADC1 & ADC2

Parameter	Min	Typ	Max	Unit	Note
Voltage Range	0	-	2.0	Volt	
AD Conversion	-	-	11	Bits	
Resolution	-	-	< 1	mV	

8.1.4.5 DAC Levels - DAC

Parameter	Min	Typ	Max	Unit	Note
Output Voltage Range	0	-	2.6	Volt	
DAC Conversion	-	-	10	Bits	
Step Range	0	-	1023	mV	

Notes

1. DAC output must be integrated (for example with a low band pass filter) in order to obtain an analog voltage. The precision is 1023 steps. If we consider that the maximum voltage as 2.6V, the integrated voltage could be calculated with the following formula: Integrated output voltage = (2.6 x step)/1023
2. See Figure 11 for recommended low pass filter

8.1.4.6 GPS Interface Levels (NavSync MS20)

Parameter	Min	Typ	Max	Unit
Input Voltage High - Vih	2.5	-	-	Volt
Input Voltage Low - Vil	-	0.8	1.0	Volt
Output Voltage High - Voh	2.9	-	-	Volt
Output Voltage Low - Vol	-	-	0.1	Volt
Typical Current Source/Sink Capability = 4mA/1uA				

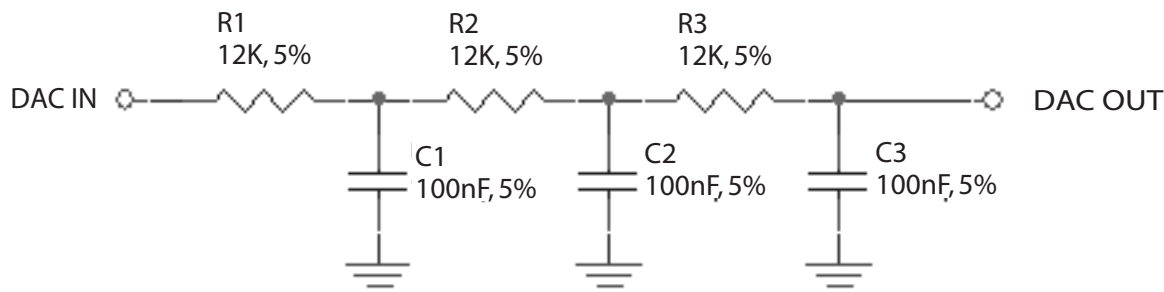


Figure 11 Required DAC Filter

8 GSM865CF TECHNICAL SPECIFICATIONS continued

8.1 Electrical Specification continued

8.1.5 GSM Cellular Antenna Interfaces

8.1.5.1 Antenna Specifications:

Frequency Range	GSM850: TX: 824.2 - 850.0Mhz GSM900 Primary: TX: 890.2 - 914.8Mhz GSM900 Extended: TX: 880.2 - 889.8Mhz PCS1900: TX: 1850.2 - 1909.8Mhz	RX: 869.2 - 895.0Mhz RX: 935.2 - 959.8Mhz RX: 925.2 - 934.8Mhz RX: 1930.2 - 1989.8Mhz
Bandwidth	70MHz in GSM850, 80 MHz in GSM900, 170 MHz in DCS, 140 MHz in PCS band	
Gain	1.4 dBi @ 900 MHz, 3dBi @ 1800 MHz, 1.4 dBi @ 850 MHz, 3dBi @ 1900 MHz	
Impedance	50 Ω	
Input Power	>2 W peak power	
VSWR absolute max	$\leq 10:1$	
VSWR recommended	$\leq 2:1$	

8.1.6 GSM GPS Antenna Interfaces

8.1.6.1 Antenna Specifications

Input Voltage Range	2.9V $\pm 5\%$
Frequency Range	1575.42 ± 3 MHz
Gain	Depends on cable type and length
Impedance	50 Ω
VSWR	$\leq 1.5:1$
Current Consumption	30 mA (MAX), 20 mA TYP

Note: GSM865CF GPS antenna interface only available by option, otherwise not populated

8.1.7 Input / Output Lines

Input Lines (MIC + & MIC-)

Parameter	GSM865CF
Line Coupling	AC (*)
Line Type	Balanced
Coupling Capacitor	≥ 100 nF
Differential Input Impedance	50 k Ω
Differential Input Voltage	≤ 1.03 Vpp @ HSMicG = 0 dB
Volume Steps	7
Volume Level Step	6 dB/Step

**Warning: The line coupling definition "AC" means that the signals from the microphone must be connected to the input lines of the module through capacitors, not less than 100 nF. By not respecting this constraint, the input stage may be damaged.*

Output Lines (EAR+ & EAR-)

Parameter	GSM865CF
Line Coupling	DC
Output Load Impedance	≥ 14 Ω
Differential Output Impedance	4 Ω
Signal Bandwidth	150-4000 Hz @ -3 dB
Differential Output Voltage (max)	1.31 Vrms (open circuit)
Volume Steps	10
Volume Level Step	2 dB/Step

8.2 Mechanical Specifications



8 GSM865CF TECHNICAL SPECIFICATIONS continued

8.3 MS20 GPS Specifications

8.3.1 Features:

- High sensitivity of -159 dBm in tracking & -144 dBm in acquisition
- Assisted/Autonomous operation
- 12 channels
- SBAS (WASS/EGNOS/MSAS)

8.3.2 Specifications:

Specifications	Description		Notes
GPS Channels	12 tracking (48 acquisition)		
Frequency	1575.42 MHz – L1 C/A Code		
TTFF Cold Start	34 seconds		1,7
TTFF Warm Start	32 seconds		1,7
TTFF Hot Start	1.5 seconds		1,7
Re-Acquisition Time	<1 second		2
Acquisition Sensitivity (fix not available)	TTFF (Hot) with all signals at –138 dBm: 30 s		3
Acquisition Sensitivity (dBm)	-144 dBm		4
Tracking Sensitivity (dBm)	-159 dBm		5
Acquisition Sensitivity SBAS Satellites (dBm)	TBD		6
Tracking Sensitivity SBAS Satellites (dBm)	TBD		6
Static Accuracy (without SBAS)	50% confidence (CEP)	1.7 m	7
	95% confidence	2.9 m	
Static Accuracy (with SBAS)	50% confidence (CEP)	1.2 m	8
	95% confidence	2.4 m	
Maximum Horizontal Speed	515 m/s (1000 Knots)		9
Maximum Altitude	18 Km (60000 feet)		9
Maximum Acceleration, Jerk	4 g, 7 g/s		

Notes:

1. These are RMS values
2. Maximum sensitivity -147 dBm
3. Simulator test, all signals at specified power level
4. Estimated
5. Simulator test, continuous fix with all signals at specified power level
6. Simulator test with signal at specified power level
7. Open-sky, 24 hrs statistic, active antenna (signal range between 30 and 49 dB/Hz)
8. Open sky, 24 hrs statistic, active antenna (WAAS signal used)
9. Limited by International Traffic in Arms Regulation (ITAR)

8 GSM865CF TECHNICAL SPECIFICATIONS continued

8.4 GSM865CF GETTING STARTED

This will take you through the initial steps required that will allow AT commands to be sent to the GSM865CF Plug-In Module.

Step 1

Please confirm that you have the following items, and that your evaluation board is correctly set:

- Evaluation board
- Power supply with 2.1mm barrel connector termination
- 6' RS232 cable
- USB to serial adapter cable
- Jumper shunt
- Cellular antenna

Make sure that the DIP switches on the evaluation board are all set to OFF.

Step 2

If not done already, plug the GSM865CF into the connectors at the center of the evaluation board, being sure to align the pins properly. Take note that to make the alignment easier, the two connectors are of different lengths.

Step 3

Connect the RS232 cable to the AT command port, labeled P8. Connect the other end to an available serial port on your PC, or an available USB port by use of the serial to USB adapter.

Step 4

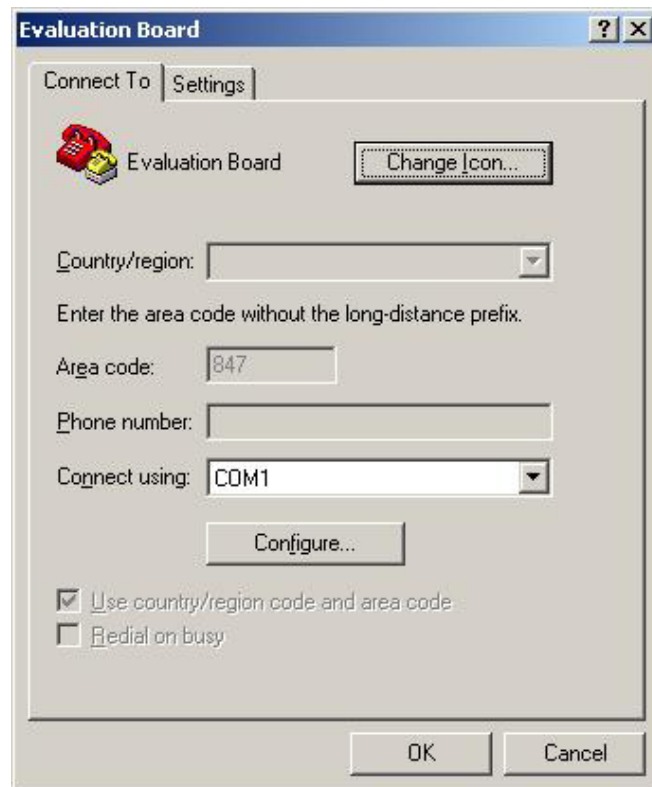
Place jumper shunt across Pin 1 and Pin 2 of Jumper J1.

Step 5

Plug in your power supply to the 2.1mm barrel connector on the board, labeled P1. After roughly 2 seconds you should see the Status LED, labeled D7, start blinking, which lets you know that the plug-in module is powered and functioning.

Step 6

Open HyperTerminal and start a new session. Use the drop down box to select the COM port that your serial cable is plugged into.



8.4 GSM865CF GETTING STARTED continued

Step 6 continued

Select “Configure,” and select these settings:

Bits per second: 115200

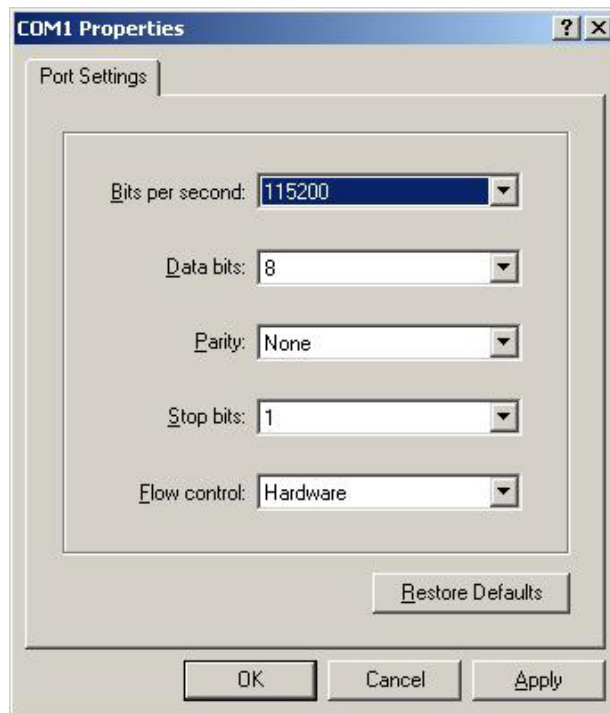
Data bits: 8

Parity: None

Stop bits: 1

Flow control: Hardware

Press “OK.”



Step 7

Click on the “Call” button in HyperTerminal to make the connection. In the window you should now be able to send AT commands. To make sure you have a proper connection, type “AT” into the window, and press Enter. You should receive a response of “OK”.

If you do not receive that response, go back and check to make sure you have selected the correct COM port, as well as the settings.

If you receive an OK, your connection is successful and you are now able to communicate with the module.

Please refer to www.janus-rc.com for a link to the proper Telit documentation.

The “Telit Module Software User Guide” will give step by step instructions on setting up voice and data calls, SMS messages, and socket connections.

The “Telit AT Reference Guide” is a full list of supported AT commands and their functions.

9 CDMA864CF TECHNICAL SPECIFICATIONS

9.1 Electrical Specifications

9.1.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Note
VIN (DIGITAL INPUTS 2.6V CMOS)	-0.3	-	3.0	Volt	
VIN (DIGITAL INPUTS 1.8V CMOS)	-0.3	-	2.1	Volt	
VIN (ANALOG INPUT)	-0.3	-	3.0	Volt	
Storage Temperature	-40	-	85	°C	
Supply (+) referenced to Supply (-)	0	-	16	Volt	

Operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Rating conditions for extended periods of time may affect device reliability.

9.1.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit	Note
Temperature	-30	-	80	°C	
Supply (+) referenced to Supply (-)	4.75	-	5.25	Volt	
VAUX Output	-	2.65	-	Volt	
VAUX Current	-	-	100	mA	

9.1.3 Power Supply

Mode	Average (mA)	Mode Description
POWERED DOWN		
Terminal Disabled	≤ 15μA	Terminal disabled (ENABLE SUPPLY = 0)
Cellular Radio Off	TBD	Cellular module powered but switched off via ON_OFF pin (PWRMON=0)
Cellular	513	Transmission at max level (23 - 24Bm)
PCS	595	Transmission at max level (23 - 24 dBm)
Cellular	134	Transmission at min level (-50 dBm)
PCS	144	Transmission at min level (-50 dBm)
Idle	103	Receiver circuit on. Transmission circuit off.
Sleep	TBD	Receiver/transmitter circuits off. RTC operational.
Hibernation	TBD	All circuits off except alarm

Notes: The average current consumption during transmissions depends on the power level at which the device is requested to transmit by the network. The thermal design for the application and its power supply needs to take the following parameters into account

9 CDMA864CF TECHNICAL SPECIFICATIONS continued

9.1 Electrical Specifications continued

9.1.4 I/O Levels

9.1.4.1 Standard Interface Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	1.69	-	2.9	Volt	
Input Voltage Low - Vil	-0.3	-	0.91	Volt	
Output Voltage High - Voh	2.15	-	2.6	Volt	
Output Voltage Low - Vol	0	-	0.45	Volt	
Typical Current Source/Sink capability = 1mA/1uA					

9.1.4.2 Cellular LED Output Levels

Parameter	Min	Typ	Max	Unit	Note
Output Voltage High - Voh	1.35	-	1.8	Volt	
Output Voltage Low - Vol	0	-	0.45	Volt	
Typical Current Source = 1mA					

9.1.4.3 Reset Pin Input Levels

Parameter	Min	Typ	Max	Unit
Input Voltage High - Vih	2.0	-	2.6	Volt
Input Voltage Low - Vil	0	-	0.2	Volt

It is required that this input be controlled by an Open Collector/Drain Output. Do not use an external pull-up resistor, a pull-up is included internal to the Terminus.

9.1.4.4 ADC Levels - ADC1 & ADC2

Parameter	Min	Typ	Max	Unit
Input Voltage Range	0	-	2.5	Volt
AD Conversion	-	-	8	Bits

9.1.4.5 DAC Levels - DAC

Parameter	Min	Typ	Max	Unit
Output Voltage Range	0	-	2.6	Volt
DAC Conversion	-	-	8	Bits
Step Range	0	-	255	Steps

Notes

1. DAC output must be integrated (for example with a low band pass filter) in order to obtain an analog voltage. The precision is 1023 steps. If we consider that the maximum voltage as 2.6V, the integrated voltage could be calculated with the following formula: Integrated output voltage = (2.6 x step)/1023
2. See Figure 11 for recommended low pass filter

9 CDMA864CF TECHNICAL SPECIFICATIONS continued

9.1 Electrical Specifications continued

9.1.5 CDMA Cellular Antenna

9.1.5.1 Antenna Specifications

Parameter	Descriptions
Frequency Range (CDMA)	TX: 824MHz – 849 MHz RX: 869MHz – 894 MHz
Frequency Range (PCS)	TX 1850MHz – 1910 MHz RX: 1930MHz – 1990MHz
Impedance	50 Ω
Recommended VSWR	< 2
Radiation Pattern	Omni-Directional
Polarization	Vertical

9.1.6 CDMA GPS Antenna Interfaces

9.1.6.1 Antenna Specifications

Parameter	Description
Input Voltage Range	4.0Vdc \pm 0.4Vdc
Frequency Range	1575.42 \pm 3 MHz
Gain	Depends on cable type and length
Impedance	50 Ω
VSWR	\leq 1.5:1
Current Consumption	30mA (MAX), 20 mA TYP

9.1.7 Input / Output Lines

Input Lines (MIC + & MIC-)

Parameter	CDMA864CF
Line Coupling	AC (*)
Line Type	Balanced
Coupling Capacitor	\geq 100 nF
Differential Input Impedance	20 k Ω
Differential Input Voltage	\leq 1,03 Vpp @ HSMicG = 0 dB
Volume Steps	7
Volume Level Step	TBD

**Warning: The line coupling definition “AC” means that the signals from the microphone must be connected to the input lines of the module through capacitors, not less than 100 nF. By not respecting this constraint, the input stage may be damaged.*

Output Lines (EAR+ & EAR-)

Parameter	CDMA864CF
Line Coupling	TBD
Output Load Impedance	TBD
Differential Output Impedance	TBD
Signal Bandwidth	TBD
Differential Output Voltage (max)	TBD
Volume Steps	TBD
Volume Level Step	TBD

9 CDMA864CF TECHNICAL SPECIFICATIONS continued

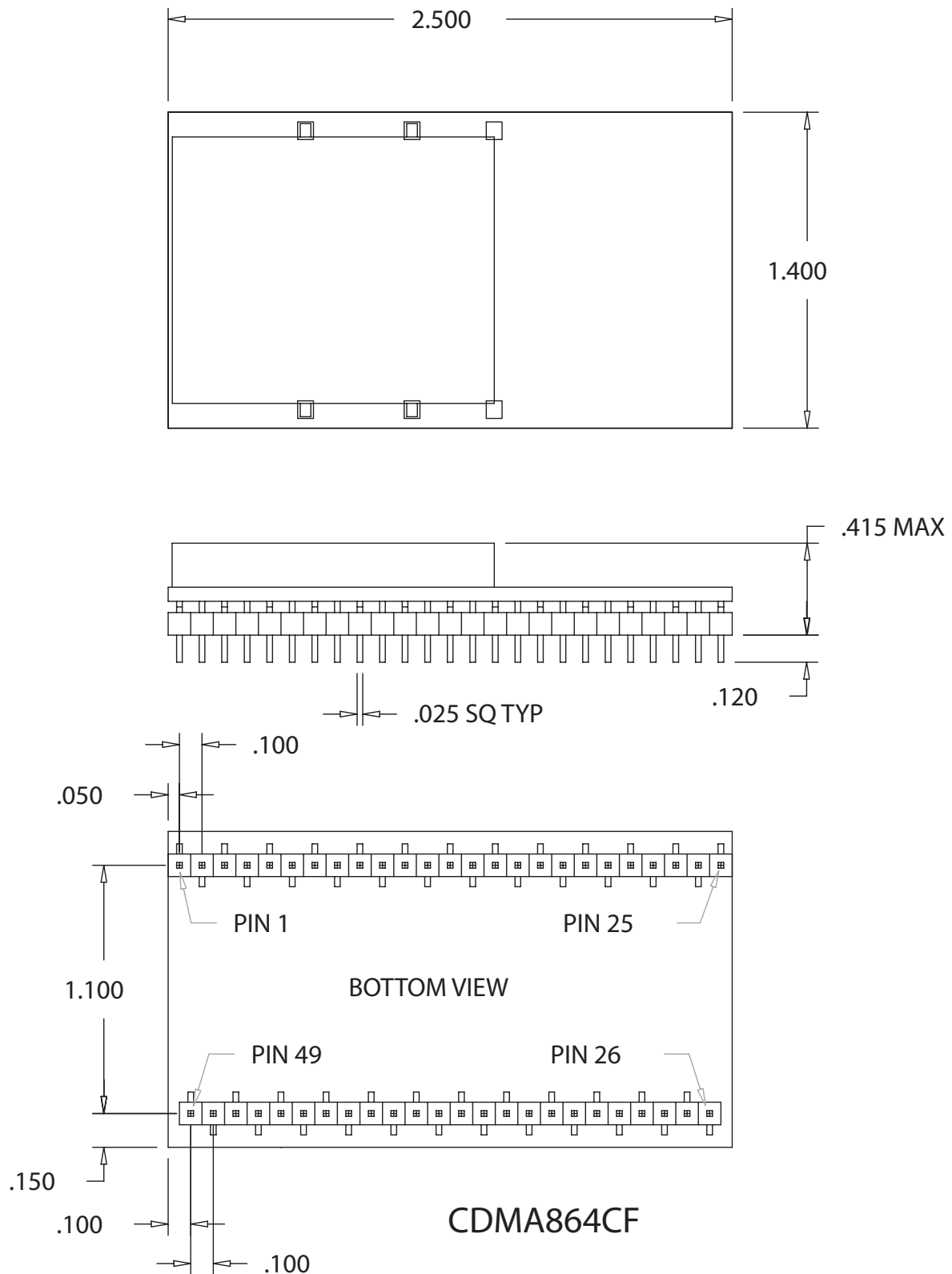
9.1 Electrical Specifications continued

9.1.8 USB Transceiver Specifications

Parameter	Comments	Min	Typ	Max	Unit
VBUS					
Supply voltage		4.4	5.0	5.6	Volt
Supply current				25	mA
Input levels for low-/full speed					
Input sensitivity (differential)	ID+ -D-I, Vin = 0.8 to 2.5 V	0.2	-	-	Volt
Common-mode range (diff)	Includes VDI	0.8	-	2.5	Volt
Receiver threshold	Single-ended	0.8	-	2.0	Volt
Receiver hysteresis	Single-ended	-	200	-	mV
Output Levels for low speed and full speed					
Logic low	RL= 1.5k to 3.6V	-	-	0.3	Volt
Logic high	RL = 15k to GND, IO = 1 mA	2.8	-	3.6	Volt
Output signal crossover voltage		1.30	-	2.00	Volt
Terminations					
High-Z state output impedance	0V < VDD<3.6V; measured at D+ and D- pins to GND	300	-	-	kΩ
Transceiver output impedance	Active high or active low	6	-	18	Ω
Series output resistance	D+, D-	28	33	44	Ω
Internal pull-up resistor	VTRM to D+, VTRM to D-	1.425	1.500	1.575	kΩ
Internal pull-down resistor	D+ to GND, D- to GND	14.3	15.0	24.8	kΩ
Transceiver input capacitance	D+ and D- pins to GND	-	-	20	pF
Driver characteristics – full speed					
Transition time					
Rise time (tR)	CL = 50 to 125 pF	4	-	20	ns
Fall time (tF)	CL = 50 to 125 pF	4	-	20	ns
Rise/fall time matching		90	-	111	%
Series output resistance	D+, D-	28	33	44	Ω
Driver characteristics – low speed					
Transition time					
Rise time (tR)	CL = 50 to 600 pF	75	-	300	ns
Fall time (tF)	CL = 50 to 600 pF	75	-	300	ns
Rise/fall time matching		80	-	125	%
ID detection					
ID pin pull-up resistance		108	140	182	kΩ
A-device detection threshold	tdelay < 1 μs, V _{hys} = 50 mV	-	0.15* VTRM	-	Volt
B-device detection threshold	tdelay < 1 μs, V _{hys} = 50 mV	-	0.85* VTRM	-	Volt

9 CDMA864CF TECHNICAL SPECIFICATIONS continued

9.2 Mechanical Specifications



CDMA864CF Mechanical Dimensions

9 CDMA864CF TECHNICAL SPECIFICATIONS continued

9.3 CDMA864CF GETTING STARTED

This will take you through the initial steps required that will allow AT commands to be sent to the CDMA864CF Plug-In Module.

Step 1

Please confirm that you have these items, and that your evaluation board is correctly set:

- Evaluation board
- Power supply with 2.1mm barrel connector termination
- 3' USB cable
- Jumper shunt
- Cellular antenna

Make sure that the DIP switches on the evaluation board are all set to OFF.

Step 2

If not done already, plug the CDMA864CF into the connectors at the center of the evaluation board, being sure to align the pins properly. Take note that to make the alignment easier, the two connectors are of different lengths.

Step 3

Connect the USB cable to the USB port on the evaluation board. Connect the other end to an available USB port on your PC.

Step 4

Place jumper shunt across Pin 1 and Pin 2 of Jumper J1.

Step 5

Plug in your power supply to the 2.1mm barrel connector on the board, labeled P1. After roughly 2 seconds you should see the status LED, labeled D7, start blinking, which lets you know that the Plug-In Module is powered and functioning.

Step 6

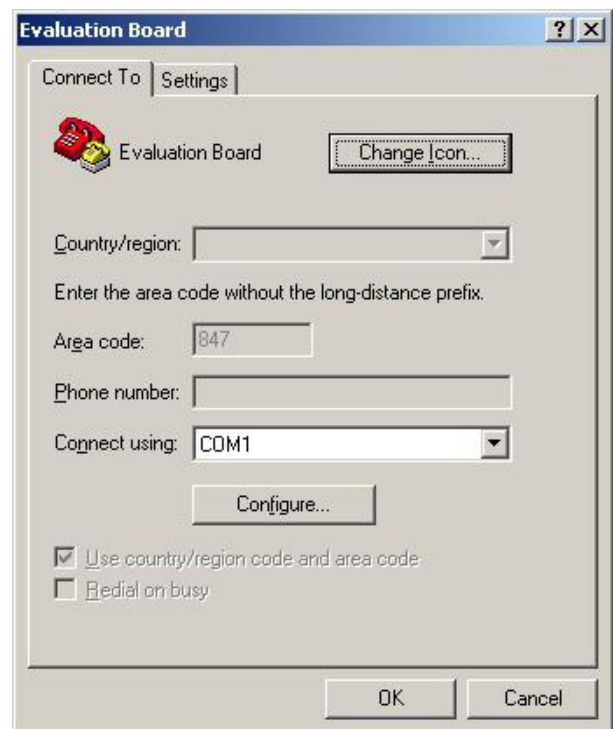
You should see the following ports in the Windows™ Device Manager:

- Telit Auxiliary Port
- Telit Diagnostics Interface
- Telit NMEA Port

If these do not become available, or you see an error message, this means you need to install the USB drivers for the CDMA864CF. Please refer to www.janus-rc.com for the proper drivers before continuing.

Step 7

Open HyperTerminal and start a new session. Use the drop down box to select the COM port that corresponds to the Telit Auxiliary Port.



9.3 CDMA864CF GETTING STARTED continued

Step 7 continued

Select “Configure,” and select these settings:

Bits per second: 115200

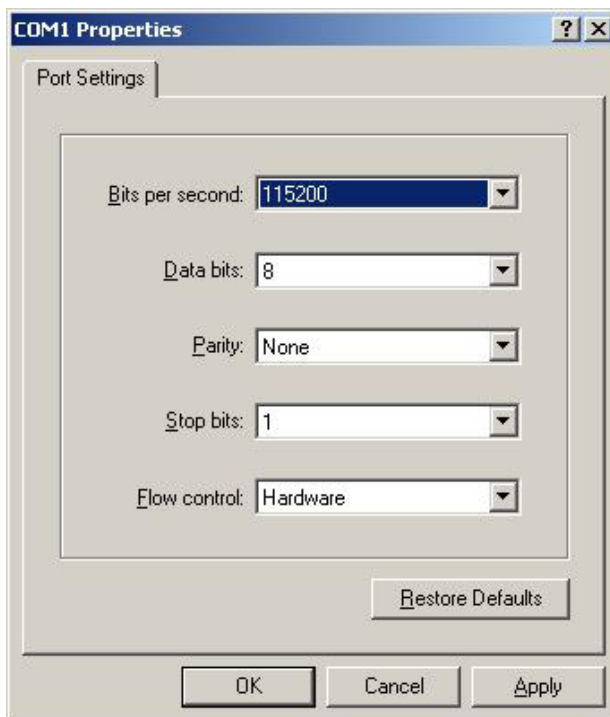
Data bits: 8

Parity: None

Stop bits: 1

Flow control: Hardware

Press “OK.”



Step 8

Click on the “Call” button in HyperTerminal to make the connection. In the window you should now be able to send AT commands. To make sure you have a proper connection, type “AT” into the window, and press Enter. You should receive a response of “OK”.

If you do not receive that response, go back and check to make sure you have selected the correct COM port, as well as the settings.

If you receive an OK, your connection is successful and you are now able to communicate with the module. Please refer to www.janus-rc.com for a link to the proper Telit documentation.

The “Telit Module Software User Guide” will give step by step instructions on setting up voice and data calls, SMS messages, and socket connections.

The “Telit AT Reference Guide” is a full list of supported AT commands and their functions.

Note that autobaud is not supported on the CDMA864CF. While utilizing the RS-232 port, if you wish to change the baud rate on the module you must use AT+IPR. You must also change the rate in the host UART (i.e. HyperTerminal) to match the new baud rate. If these do not match you will not be able to send AT commands to the module through the serial port.

10 UMTS864CF TECHNICAL SPECIFICATIONS

10.1 Electrical Specification

10.1.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Note
VIN (DIGITAL INPUTS 2.6V CMOS)	-0.3	-	3.0	Volt	
VIN (DIGITAL INPUTS 1.8V CMOS)	-0.3	-	2.1	Volt	
VIN (ANALOG INPUT)	-0.3	-	3.0	Volt	
Storage Temperature	-40	-	85	°C	
Supply (+) referenced to Supply (-)	0	-	16	Volt	

Operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Rating conditions for extended periods of time may affect device reliability.

10.1.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit	Note
Temperature	-30	-	80	°C	
Supply (+) referenced to Supply (-)	4.75	-	5.25	Volt	
VAUX Output	-	2.65	-	Volt	
VAUX Current	-	-	100	mA	

10.1.3 Power Supply

Mode	Average (mA)		Mode Description
POWERED DOWN			
Terminal Disabled	≤ 15µA		Terminal disabled (ENABLE SUPPLY = 0)
Cellular Radio Off	TBD		Cellular module powered but switched off via ON_OFF pin (PWRMON=0)
IDLE MODE			
Mode	Average (mA)		Mode Description
IDLE mode with GPS OFF			Standby mode; no call in progress: GPS OFF
AT+CFUN=1	WCDMA	TBD	Normal mode: full functionality of the module
	GSM	TBD	
AT+CFUN=4	WCDMA	TBD	Disabled TX and RX; module is not registered on the network
	GSM	TBD	
AT_CFUN=0 or =5	WCDMA	TBD*	Power saving; CFUN=0 module registered on the network and can receive voice call or an SMS; but it is not possible to send AT commands; module wakes up with an unsolicited code (call or SMS) or rising RTS line.
	GSM	TBD*	
			CFN=5 full functionality with power saving; Module registered on the network can receive incoming call sand SMS
WCDMA TX and RX mode with GPS OFF			GPS OFF in UC864-G
WCDMA Voice		708	WCDMA voice channel
WCDMA data		697	WCDMA data channel
HSDPA		749	HSDPA data channel (HSDPA for UC864-E/G only)
GSM TX and RX mode with GPS OFF			GPS off in UC864-G
GSM Voice		328	GSM voice channel
GPRS Class 12		810	GPRS data channel
EDGE Class 12		574	EDGE data channel
UC864-G only			
IDLE mode with GPS ON full power mode*			
AT+CFUN=1	WCDMA	117	Standby mode; no call in progress: GPS ON
	GSM	113	
AT+CFUN=4	WCDMA	109	Disabled TX and RX; module is not registered on the network
	GSM	109	
WCDMA TX and RX mode with GPS ON full power mode*			
WCDMA Voice		785	WCDMA voice channel
WCDMA		775	WCDMA data channel
HSDPA		825	HSDPA data channel
GSM TX and RX mode with GPS ON full power mode*			
GSM Voice		410	GSM voice channel
GPRS Class 12		880	GPRS data channel
EDGE Class 12		650	EDGE data channel

* except external active GPS antenna

10 UMTS864CF TECHNICAL SPECIFICATIONS continued

10.1 Electrical Specification continued

10.1.4 I/O Levels

10.1.4.1 Standard Interface Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	2.0	-	2.9	Volt	
Input Voltage Low - Vil	-0.3	-	0.6	Volt	
Output Voltage High - Voh	2.2	-	2.6	Volt	
Output Voltage Low - Vol	0	-	0.35	Volt	
Typical Current Source = 1mA					

10.1.4.2 Cellular LED Output Levels

Parameter	Min	Typ	Max	Unit	Note
Output Voltage High - Voh	1.4	-	1.8	Volt	
Output Voltage Low - Vol	0	-	0.35	Volt	
Typical Current Source = 1mA					

10.1.4.3 Reset Pin Input Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	2.0	-	2.6	Volt	
Input Voltage Low - Vil	0	-	0.2	Volt	

It is required that this input be controlled by an Open Collector/Drain Output. Do not use an external pull-up resistor, a pull-up is included internal to the Terminus.

10.1.4.4 ADC Levels - ADC1 & ADC2

Parameter	Min	Typ	Max	Unit	Note
Input Voltage Range	0	-	2	Volt	
AD Conversion	-	-	8	Bits	
Resolution	-	-	< 10.2	mV	

10.1.4.5 DAC Levels - DAC

Parameter	Min	Typ	Max	Unit	Note
Output Voltage Range	0	-	2.6	Volt	
DAC Conversion	-	-	10	Bits	
Step range	0	-	1023	Steps	

Notes

1. DAC output must be integrated (for example with a low band pass filter) in order to obtain an analog voltage. The precision is 1023 steps. If we consider that the maximum voltage as 2.6V, the integrated voltage could be calculated with the following formula: Integrated output voltage = (2.6 x step)/1023
2. See Figure 11 for recommended low pass filter

10 UMTS864CF TECHNICAL SPECIFICATIONS continued

10.1 Electrical Specification continued

10.1.5 UMTS Cellular Antenna Specifications:

10.1.5.1 Antenna Specifications

Parameter	Description
Frequency Range	Depending on frequency bands provided by the network operator, the customer should use the most suitable antenna for those frequencies.
Bandwidth	70MHz in GSM850 80 MHz in GSM900 170 MHz in DCS & 140 MHz PCS 70 MHz in WCDMA850 140 MHz in WCDMA1900 250 MHz in WCDMA2100 band
Gain	Gain < 3dBi
Impedance	50Ω
Input Power	>33 dBm (2W) peak power in GSM >24 dBm Average power in WCDMA
VSWR Absolute Max	≤ 10:1
VSWR Recommended	≤ 2:1

10.1.6 UMTS GPS Antenna Specifications:

10.1.6.1 Antenna Specifications

Parameter	Description
Input Voltage Range	3.0Vdc ±0.3Vdc
Frequency Range	1575.42± 2 MHz
Gain	Depends on cable type and length
Impedance	50 ohm
VSWR	≤ 1.5:1
Current Consumption	30mA (MAX), 20 mA TYP

10.1.7 Input / Output Lines

Input Lines (MIC + & MIC-)

Parameter	UMT864CF
Line Coupling	AC (*)
Line Type	Balanced
Coupling Capacitor	≥ 100 nF
Differential Input Impedance	20 k Ω
Differential Input Voltage	≤ 1290mVrms @ HSMicG=0dB
Volume Steps	7
Volume Level Step	6 dB/Step

**Warning: The line coupling definition "AC" means that the signals from the microphone must be connected to the input lines of the module through capacitors, not less than 100 nF. By not respecting this constraint, the input stage may be damaged.*

Output Lines (EAR+ & EAR-)

Parameter	UMT864CF
Line Coupling	DC
Output Load Impedance	≤ 26 Ω
Differential Output Impedance	≤ 01 @ 1.02 kHz
Signal Bandwidth	150-4000 Hz @ -3dB
Differential Output Voltage (max)	1.06 Vrms/32
Volume Steps	10
Volume Level Step	2 dB/Step

10 UMTS864CF TECHNICAL SPECIFICATIONS continued

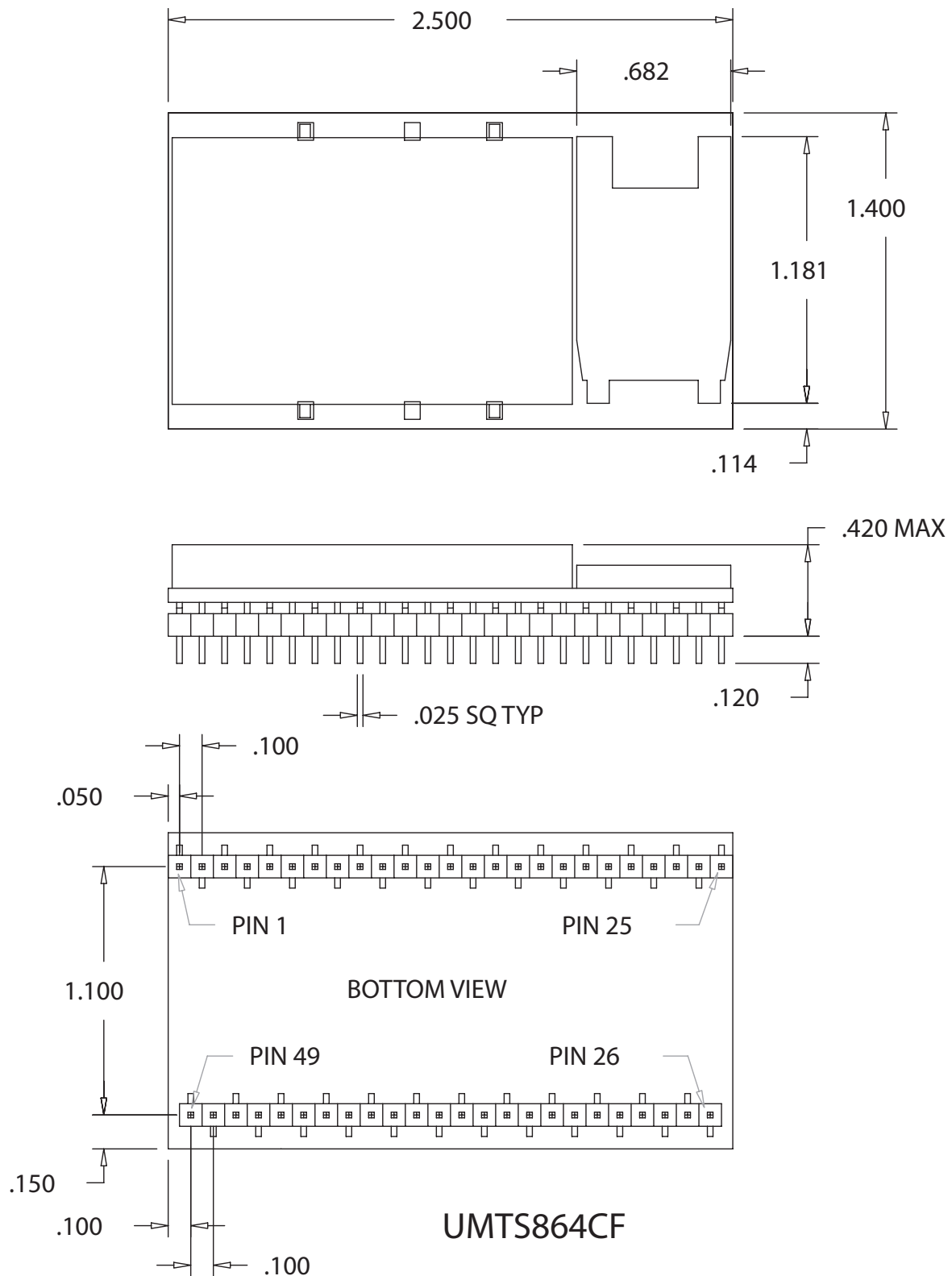
10.1 Electrical Specification continued

10.1.8 USB Transceiver Specifications

Parameter	Comments	Min	Typ	Max	Unit
USB_VBUS					
Supply voltage		4.5	5.0	5.25	Volt
Supply current				25	mA
Input levels for low-/full speed					
Receiver threshold (single-end)		0.8	-	2.0	Volt
Differential input sensitivity	ID+ - D-I, Vin = 0.8V to 2.5V	0.2	-	-	Volt
Differential common-mode range	Includes VDI	0.8	-	2.5	Volt
Output levels for low-/full speed					
Low	RL = 1.5 kΩ to 3.6 V	-	-	0.3	Volt
High	RL – 15 kΩ to GND	2.8	-	3.6	Volt
Output signal crossover voltage		1.3	-	2.0	Volt
Terminations					
Internal pull-up resistor	VTRM to D+, VTRM to D-	1.425	1.5	1.575	kΩ
Internal pull-down resistor	D= to GND, D- to GND	14.3	15	24.8	kΩ
High-Z state output impedance	0 V < VDD < 3.6 V; measured at D+ and D- pins to GND	300	-	-	kΩ
Termination voltage	An internal supply voltage, VTRM	3.0	3.3	3.6	Volt
Driver characteristics – full speed					
Transition time:					
Rise time	CL = 50 to 125 pF	4	-	20	ns
Fall time	CL – 50 to 125 pF	4	-	20	ns
Rise/fall time matching		90	-	111	%
Series output resistance	D+, D-	28	33	44	Ω
Driver characteristics – low speed					
Transition time:					
Rise time	CL = 50 to 600 pF	75	-	300	ns
Fall time	CL – 50 to 600 F	75	-	30	ns
Rise/fall time matching		80	-	125	%
USB_ID (for future use only)					
ID pin pull-up resistance		108	140	182	kΩ
A-device detection threshold	tdelay < 1 μs, V _{hys} = 50 mV	-	0.15* VTRM	-	Volt
B-device detection threshold	tdelay < 1 μs, V _{hys} = 50 mV		0.8* VTRM	-	Volt

10 UMTS864CF TECHNICAL SPECIFICATIONS continued

10.2 Mechanical Specification



UMTS864CF Mechanical Dimensions

10 UMTS864CF TECHNICAL SPECIFICATIONS continued

10.3 UMTS864CF GETTING STARTED

This will take you through the initial steps required that will allow AT commands to be sent to the UMTS864CF.

Step 1

Please confirm that you have these items, and that your evaluation board is correctly set:

- Evaluation board
- Power supply with 2.1mm barrel connector termination
- 3' USB cable
- Jumper shunt
- Cellular antenna

Make sure that the DIP switches on the evaluation board are all set to OFF.

Step 2

If not done already, plug the UMTS864CF into the connectors at the center of the evaluation board, being sure to align the pins properly. Take note that to make the alignment easier, the two connectors are of different lengths.

Step 3

Connect the USB cable to the USB port on the evaluation board. Connect the other end to an available USB port on your PC.

Step 4

Place jumper shunt across Pin 1 and Pin 2 of Jumper J1.

Step 5

Plug in your power supply to the 2.1mm barrel connector on the board, labeled P1. After roughly 2 seconds you should see the status LED, labeled D7, start blinking, which lets you know that the plug-in module is powered and functioning.

Step 6

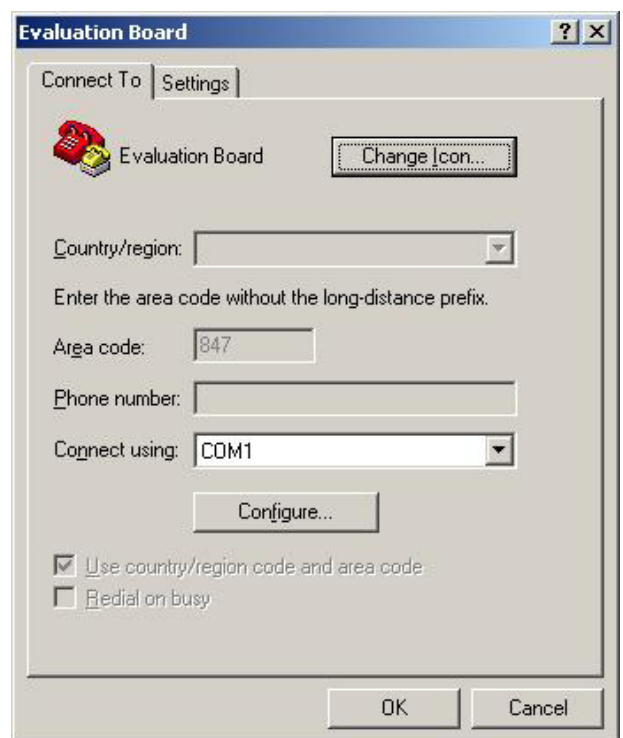
You should see the following ports in the Windows™ Device Manager:

- Telit Auxiliary Port
- Telit Diagnostics Interface
- Telit NMEA Port

If these do not become available, or you see an error message, this means you need to install the USB drivers for the UMTS864CF. Please refer to www.janus-rc.com for the proper drivers before continuing.

Step 7

Open HyperTerminal and start a new session. Use the drop down box to select the COM port that corresponds to the Telit Auxiliary Port.



10.3 UMTS864CF GETTING STARTED continued

Step 7 continued

Select “Configure,” and select these settings:

Bits per second: 115200

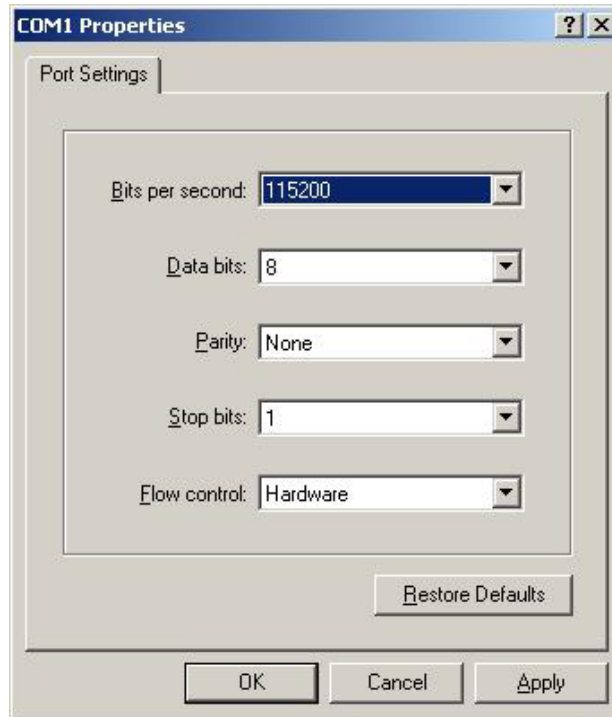
Data bits: 8

Parity: None

Stop bits: 1

Flow control: Hardware

Press “OK.”



Step 8

Click on the “Call” button in HyperTerminal to make the connection. In the window you should now be able to send AT commands. To make sure you have a proper connection, type “AT” into the window, and press Enter. You should receive a response of “OK”.

If you do not receive that response, go back and check to make sure you have selected the correct COM port, as well as the settings.

If you receive an OK, your connection is successful and you are now able to communicate with the module.

Please refer to www.janus-rc.com a link to the proper Telit documentation.

The “Telit Module Software User Guide” will give step by step instructions on setting up voice and data calls, SMS messages, and socket connections.

The “Telit AT Reference Guide” is a full list of supported AT commands and their functions.

11 DESIGN CONSIDERATIONS

11.1 GSM, CDMA & UMTS Minimum Required Module Pin Connects

GSM Pin Functions

Pin	Signal	Function	Note
1	VBATT	Main power supply	
2	VBATT	Main power supply	
12	GND	Ground	
25	GND	Ground	
26	GND	Ground	
39	GND	Ground	
49	GND	Ground	
19	ON/OFF	Input command for switching power ON or OFF (toggle command)	
9	TXD	Serial data input (TXD) from DTE	
20	RESET	Reset input	
4	RXD	Serial data output to DTE	
11	RTS	Input for request to send signal (RTS) from DTE	2
13	TXD_AUX		
14	RXD_AUX		
17	SERVICE		

CDMA and UMTS Pin Functions

Pin	Signal	Function	Note
1	VBATT	Main power supply	
2	VBATT	Main power supply	
12	GND	Ground	
25	GND	Ground	
26	GND	Ground	
39	GND	Ground	
49	GND	Ground	
9	TXD	Serial data input (TXD) from DTE	
4	RXD	Serial data output to DTE	
11	RTS	Input for request to send signal (RTS) from DTE	2
19	ON/OFF	Input command for switching power ON or OFF (toggle command)	
20	RESET	Reset input	

Note:

1. If the application uses USB as the main interface to the module, this is sufficient to capture any debug or trace data, provided the application can export the diagnostic port externally.
2. RTS must be connected to ground if flow control is not used.
3. USB interface required for local firmware upgrade of Telit radio.

11.2 Debug:

Debug of the GSM865CF, CDMA864CF and UMTS864CF in production

To test and debug the mounting of the module, we strongly recommend test pads on the host PCB. This will allow verification of the connection between the module itself and the application and to test the performance of the module connecting it with an external computer.

Depending on the customer application, these pads include, but are not limited to the following signals:

- TXD
- RXD
- ON/OFF
- RESET
- GND
- VBATT
- TX_TRACE
- RX_TRACE
- PWRMON
- USB D+
- USB D-
- USB V_BUS
- USB_ID

APPENDICES

Approvals

AT&T Certification – GSM865CF (4/11)
PTCRB Certification – GSM865CF (2/11)
Sprint - CDMA864CF (7/10)
FCC - TBD
CE - TBD

Safety Recommendations (for Information only)

Antenna Care and Replacement

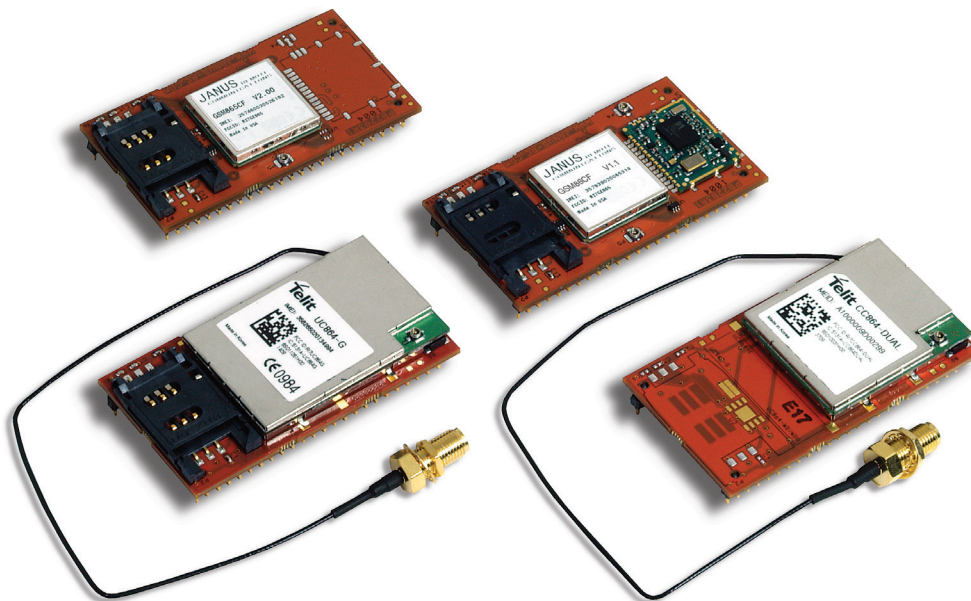
Do not use the Terminus with a damaged antenna.

Buy the antenna from an approved suppliers list. Using unauthorized antennas, modifications, or attachments could damage the Terminus and may violate local RF emission regulations or invalidate type approval.

Abbreviations

3GPP	3rd Generation Partnership Project	ITAR	International Traffic In Arm Regulation
AC	Alternating Current	LED	Light Emitting Diode
ADC	Analog To Digital Converter	M2M	Machine To Machine
BER	Bit Error Rate	PBCCH	Packet Broadcast Control Channel
CD	Carrier Detect	PDU	Protocol Data Unit
CDMA	Code Division Multiple Access	RF	Radio Frequency
CSD	Circuit Switched Data	RI	Ring Indicator
CTS	Clear To Send	RSSI	Received Signal Strength Indication
DB	Decibel	RTS	Request To Send
DBFS	Decibels Full Scale	RxD	Received Data
DC	Direct Current	SMS	Short Message Service
DCE	Data Communications Equipment	TTFF	Time To First Fix
DSR	Data Set Ready	TxD	Transmitted Data
DTMF	Dual-tone multi-frequency	UICC	Universal Integrated Circuit Card
DTR	DTE Ready	UMTS	Universal Mobile Telecommunications System
FDN	Fixed Dialing Number	USIM	Universal Subscriber Identity Module
GPIO	General Purpose Input Output	USSD	Unstructured Supplementary Service Data
GPRS	General Packet Radio Service	VSWR	Voltage Standing Wave Ratio
GSM	Global System Mobile	WAAS	Wide Area Augmentation System

Terminus Plug-In Products User Manual



Ordering Information

Ordering Information	Description
GSM865CF V1.1	Terminus GSM Plug-In Module - GPS enabled
GSM865CF V2.00	Terminus GSM Plug-In Module - without GPS
CDMA864CF V2.00	Terminus CDMA Plug-In Module - Sprint Certified
CDMA864CF V3.00	Terminus CDMA Plug-In Module - Verizon Certified
UMTS864CF V1.00	Terminus UMTS Plug-In Module

Revision History

Revision	Revision Date	Note
A00	12/10/09	Advanced Plug-In User Manual
A01	03/31/10	Interfaces Power Supply Update
A02	05/24/10	I/O Level Specifications Chart Updates
P00	05/27/10	Release for publication
P01	03/17/11	Part Number Change, Getting Started Sec, Antenna Info
P02	05/02/11	GSM865CF Version Updated; V1.1

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