

910CF Cellular Modem Evaluation Board User Guide

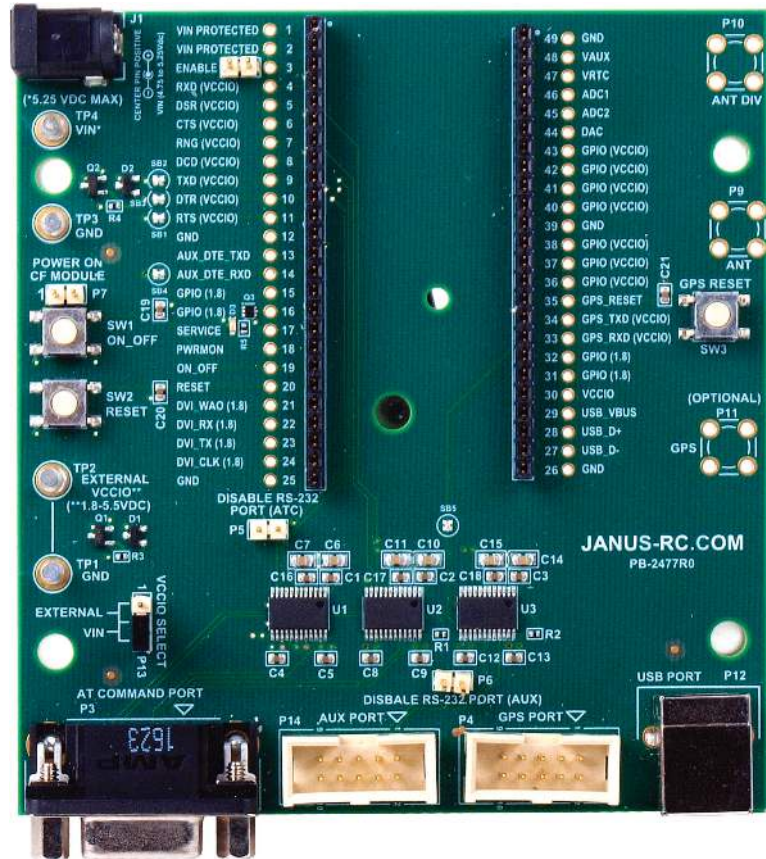


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INTRODUCTION

Scope

The aim of this document is to describe the CF Evaluation Board features used for evaluating the CF Socket Modems.

Audience

This document is intended for Janus customers who are about to implement their applications using CF Socket Modems.

Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Janus Remote Communications at:

info@janus-rc.com

Alternatively use: www.janus-rc.com/support.html for technical details and recommendations on accessories.

Text Conventions

Danger –



This information **MUST** be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning –



Alerts the user to follow the points mentioned, if the points are not followed the product may fail or malfunction.

Tip or Information –



Provides advice and suggestions that may be useful when using this product.

Related Documents

Embedded Cellular CF Socket Modems – www.janus-rc.com/terminuscf.html

Overview

In this document, all the basic functions of this product are explained and proper hardware solutions are suggested. The given information shall be considered as a starting point for properly evaluate and design products using CF Socket Modems. For further hardware details that may not be explained in this document, contact Janus technical support at info@janus-rc.com

Overview continued

CF Socket Modem Pin-Out

SIGNAL (Logic Level)	I/O	FUNCTION	PIN	NOTES
USB Serial Interface				
USB_D-	I/O	USB differential Data (-)	27	
USB_D+	I/O	USB differential Data (+)	28	
USB_VBUS	I	Power sense for the internal USB Transceiver	29	
UART Serial Interface				
TXD (VCCIO)	I	Serial data input from DTE	9	
RXD (VCCIO)	O	Serial data output to DTE	4	
DTR (VCCIO)	I	Input for (DTR) from DTE	10	
RTS (VCCIO)	I	Input for (RTS) from DTE	11	
CTS (VCCIO)	O	Output for (CTS) to DTE	6	
DCD (VCCIO)	O	Output for (DCD) to DTE	8	
DSR (VCCIO)	O	Output for (DSR) to DTE	5	
RNG (VCCIO)	O	Output for (RI)to DTE	7	
Auxiliary UART Serial Interface				
AUX_DTE_TXD	I	Auxiliary UART TX data to DTE	13	
AUX_DTE_RXD	O	Auxiliary UART RX data from DTE	14	
DVI Interface²				
DVI_WA0	I/O	Digital Audio Interface (WA0)	21	
DVI_RX	I	Digital Audio Interface (RX)	22	
DVI_TX	I/O	Digital Audio Interface (TX)	23	
DVI_CLK	I/O	Digital Audio Interface (CLK)	24	
GPIOs/Special Functions				
GPIO (1.8)	I/O	GPIO	15	GPIO_2 ¹
GPIO (1.8)	I/O	GPIO/STAT LED	16	GPIO_1 ¹
GPIO (VCCIO)	I/O	GPIO	36	
GPIO (VCCIO)	I/O	GPIO	37	GPIO_6 ¹
GPIO (VCCIO)	I/O	GPIO	38	GPIO_5 ¹
GPIO (VCCIO)	I/O	GPIO	40	GPIO_4 ¹
GPIO (VCCIO)	I/O	GPIO	41	GPIO_3 ¹
GPIO (VCCIO)	I/O	GPIO	42	
GPIO(VCCIO)	I/O	GPIO	43	
GPIO (1.8)	I/O	GPIO	31	GPIO_9 ¹
GPIO (1.8)	I/O	GPIO	32	GPIO_10 ¹
GPS Interface				
GPS_RESET	I	Resets The GPS	35	
GPS_TX (VCCIO)	I	Serial GPS data input from DTE	34	
GPS_RX (VCCIO)	O	Serial GPS data input to DTE	33	
ADC & DAC²				
ADC1	A1	Analog / Digital Converter I/P	46	
ADC2	A2	Analog / Digital Converter I/P	45	
DAC	I/O	Digital / Analog Converter	44	
Power Supply				
VIN Protected	Power	Main Positive Supply Input	1,2	
GND	Power	Supply Reference	12, 25,26,39,49	

Overview continued

CF Socket Modems Pin-Out

SIGNAL	I/O	FUNCTION	PIN	NOTES
Miscellaneous Functions				
ENABLE	I	Input to Turn On/Off CF Plug-In	3	Open collector drain drive only
ON_OFF	I	Input command for Power ON	19	Open collector drain drive only
PWRMON	O	Power ON Monitor	18	
VRTC	I	Cellular Radio External RTC supply	47	Backup for the embedded RTC supply
VAUX	O	Reference Voltage	48	
RESET	I	Main reset	20	Open collector drain drive only
SERVICE	N/A	UNUSED	17	

NOTES:

1. GPIO number on Telit based modems. Pin function on other products may vary. See CF product User Guide for specific pin functions.
2. Function not supported on all CF products. See CF product User Guide for specific pin functions.

Mechanical Dimension/weight

The CF Evaluation Board overall dimensions:

Length: 4.51" (115mm)

Width: 4.00" (102mm)

Height: 0.80" (20mm)

Weight: 2.5 oz. (70g)

Temperature Range

Operating Temperature Range: -40°C to +85°C

Storage and non- operating Temperature Range: -40°C to +85°C

RoHS compliance

As a part of Janus Remote Communication's policy of environmental protection, the CF Evaluation Board complies with RoHS.

Hardware Guide

Layout Details

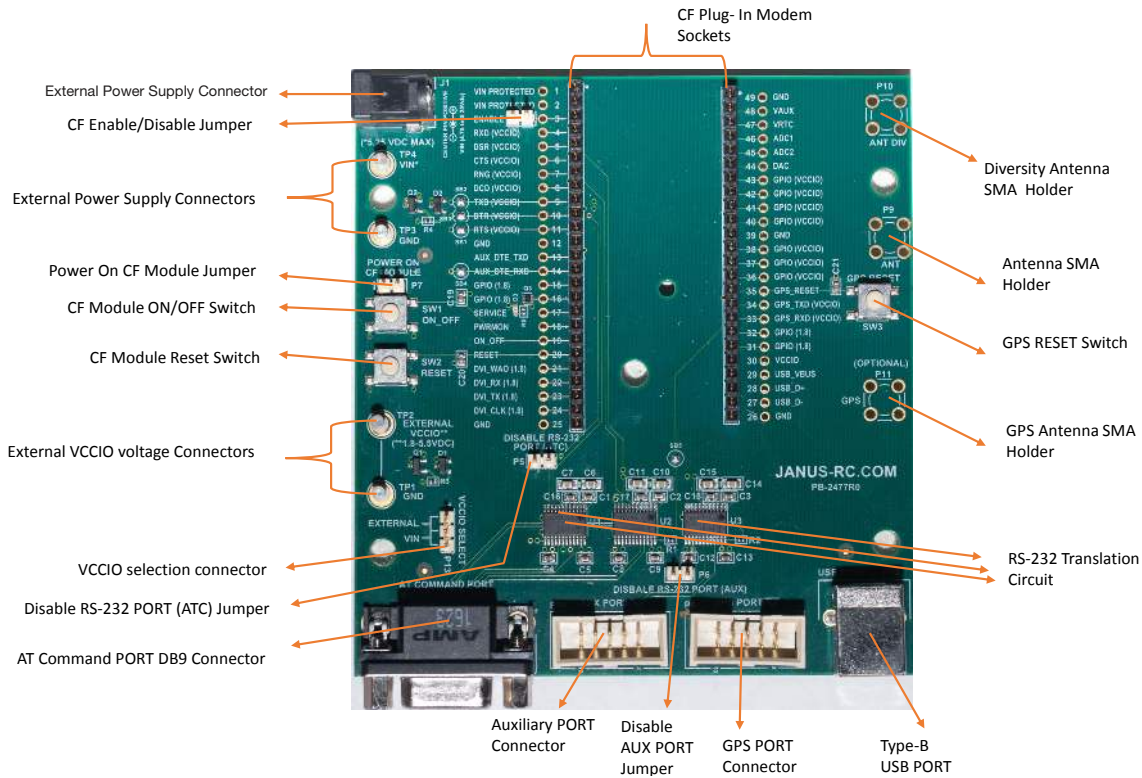


Figure 1: CF Evaluation Board Layout Details

User can connect any carrier and generation's CF Socket Modem to this Evaluation Board. For more details on various CF Socket Modems, check this link: <http://www.janus-rc.com/carrier-gen-nb.html>

Power Supply

The CF Evaluation Board requires 5VDC to power the on-board circuitry and the CF module. This product has two main power supply connection options:

- Center positive Barrel Connector (J1)

- External Power Supply Direct Wire Connectors. (TP4, TP3)

These two options are internally connected and simply offer alternative connection methods. The evaluation board is equipped with protection circuit to prevent reverse voltage as well as help with protection from transients.

The Voltage input range is 4.75V - 5.25V.



Don't Hot Plug Vin.

Hardware Guide continued

Turning ON the CF Evaluation Board

Before connecting power to the CF Evaluation Board, plug a CF Socket Modem into the sockets on the board.



One edge has 25 Pins and other has 24 Pins, make sure the alignment of the modem is correct, before placing it into the sockets.

- If you prefer Barrel Connection, connect the 5V wall transformer power plug to the power jack (J1) on the CF Evaluation Board.
- If you prefer External Power Supply, connect the Positive 5V to TP4 and GND to TP3 on the CF Evaluation Board.
- Make sure CF ENABLE/DISABLE Jumper (P8) is not shorted.
- Press and Hold the ON_OFF Switch (SW1) push-button for 5 seconds to enable the CF Socket Modem^{1,2}.
- Within a few seconds the yellow LED should turn on³. The CF Socket Modem should be able to accept AT commands through the serial AT COMMAND PORT within ten seconds after releasing the ON_OFF push-button (SW1).
- AT commands are not available during the Initialization state and different generations may take multiple seconds for modem initialization. Refer to the specific modem hardware guide for more details.

NOTES:

1. The ON_OFF Switch is used for Telit based modems; for other products (e.g. Wi-Fi) refer to the specific CF product User Guide.
2. On Telit based cellular modems you can have the CF Socket Modem turn-on automatically by shorting the POWER ON CF MODULE jumper P7. With this method the module can't be turned off using ON_OFF switch. Refer to the AT Commands Guide for how to turn off the module using AT commands.
3. The cellular status function is enabled on the LED output on cellular modems by Janus during production.

RS-232 Serial Ports (Serial Interfaces)

The CF Evaluation Board has three RS-232 serial ports.

- AT Command Port – Main UART port.
- AUX (Auxiliary) Port - Trace Port
- GPS Port – For products with an independent GPS receiver.

The AT command port is available to send AT Commands to the CF Socket Modem from any terminal software, such as Janus Explorer. Please refer to the CF Socket Modems User Guide for serial port details for the specific modem you are evaluating.

Typical AT Command Port Settings

Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Hardware Handshaking ¹	CTS/RTS

NOTES:

1. Hardware handshaking is recommended to prevent loss of data during data transfer operations. If not used, the RTS pin should be connected to GND.
2. The AT Command Port requires that the DTR signal be present in order to activate the RS232 translators. Contact Janus for a simple workaround for this requirement.

The AUX (Auxiliary) Port is a secondary serial port that can be configured as an additional AT command port, a debug output for software scripts (Python, C) or other functions depending on the specific module. Not all CF Socket Modems support this feature.

The GPS Port connects to the UART of the GPS receiver on those modems that support an independent GPS receiver module. Typically used for receiving NMEA messages from the GPS receiver.

Hardware Guide continued

RS-232 Serial Ports (Serial Interfaces) continued

Typical Auxiliary Port and GPS Port Settings

Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Hardware Handshaking	N/A

The Auxiliary and GPS Ports are not normally populated with connectors. The footprint on the board accepts an IDC cable header that can connect directly to an IDC type DB9 connector.



When connecting UART ports directly to a host system that doesn't require RS232 level signals, the user can disable the RS232 translators on the CF Evaluation Board.

Disable AT Command Port RS232 driver: Add jumper at P5; Remove solder bridges at SB1, SB2, and SB3.

Disable AUX and GPS Port drivers: Add jumper at P6; Remove solder bridges at, SB4 and SB5.

Failure to remove solder bridges will cause I/O contention and might damage the CF Evaluation Board and CF Socket Modem.

USB Ports

The CF Evaluation Board allows access to virtual COM ports and modem ports via the USB on those products that support it. A Type B USB cable must be connected between the CF Evaluation Board and a PC USB host. To use this interface during the development you may need USB drivers. You can obtain USB driver information on our website (www.janus-rc.com)

CF Socket Modems may instantiate up to 6 COM ports when connected to a host. These ports serve various functions depending on the product, and some products allow re-configuring of the USB port functions. See the applicable CF product User Guide for more information.



For proper power on sequencing, the CF Socket Modem must be turned on first. The USB VCC line must be disconnected until the device is ON, otherwise it may not power up correctly or properly install USB drivers.

Hardware Guide continued

GPIO and UART Level Translation Interface

CF products offer user selectable voltage level translation on some GPIO and UART I/O lines. A reference voltage applied to VCCIO (pin 30 of the CF module) will set the interface voltage level for these signals.

This allows for connecting these signals directly to a user's host system at its I/O voltage operating level. See the product User Guide for information on which pins are translated.

The user can use a translation level between 1.8V – 5.5V by selecting P13 VCCIO SELECT position and applying an external translation voltage if required.

- If P13 is in 1-2 position: External VCCIO is used for level translation. The external VCCIO voltage must be 1.8V- 5.5V and should be connected between TP2 (External VCCIO) and TP1 (GND).
- If P13 is in 2-3 position: The 5V VIN supply is used for level translation.

Absolute Maximum Ratings

Parameters	Min	Max
Supply Voltage	-0.5V	5.25V
Input Voltage	-0.5V	5.25V
Continuous Output Current	-	+/- 50mA



Some older products only offer a fixed 2.85V interface on selected GPIO and UART I/O lines. These products are indicated in the ordering information with an 'F' (Fixed) in the Voltage designation position. See the specific Product Brief for more information.

To operate these modems, leave the P13 VCCIO SELECT jumper unpopulated and connect a jumper wire between pin 47 VAUX and pin 30 VCCIO to provide the modems 2.85V to the RS232 translators.

LED Indicator

The board is equipped with an LED (yellow) driven by pin 16 of the CF footprint. On cellular modems it can be used to indicate cellular status. Cellular Modems are factory configured with the following settings:

LED STATUS	DEVICE STATUS
Permanently Off	Cellular Radio is Off
Permanently On	On/Searching
Slow Blinking (1 sec on/ 2 sec off)	Registered

Hardware Guide continued

Jumper Connectors

The CF Evaluation Board five jumper connectors.

- ENABLE jumper used to disable the power supply to the CF Socket Modem. If you short this jumper, CF Socket Modem's on-board power supply will be disabled.
- P7: POWER ON CF MODULE jumper can be used to ground the ON_OFF pin of Telit based cellular modules which will cause the unit to power on automatically.



Using the P7 jumper precludes the ability to shut down the modem using the ON_OFF pushbutton, requiring that the modem be shut down using a software command. Turning off a cellular modem without first unregistering from the network is not a recommended operating procedure.

- P5: DISABLE RS-232 PORT (ATC) jumper disables power to the AT command port RS232 line driver circuit (P3). This is required when connecting UART I/O lines to an external logic level interface. Make sure to remove the corresponding solder bridge connections (SB1, SB2, SB3) to avoid contention on the I/O lines.
- P6: DISBALE RS-232 PORT (AUX) jumper disables power to the AT AUX port and GPS port RS232 line driver circuits (P14 and P4). Make sure to remove the corresponding solder bridge connections (SB4 and SB5) to avoid to avoid contention on the I/O lines.
- P13: VCCIO SELECT jumper selects either an external voltage or the input voltage (5v) as a reference logic voltage for I/O translation circuit. If not using an external VCCIO power supply, select P13 in 2-3 position.

RESET Buttons

The CF Evaluation Board has two RESET switches.

SW2 RESET is used to recover the operation of the CF Socket Modem's terminal in case of unexpected error resulting from the inability of the application to communicate with the terminal.

SW3 GPS RESET is used to reset the GPS module on those modems that support an independent GPS receiver.

Getting Started

This will take you through the initial steps required that will allow AT commands to be sent to a Telit based cellular CF Socket Modem. Some of the following components typically provided with CF Evaluation Kits will be required:

CF Evaluation Board	1
CF Socket Modem	1
Wall transformer, 5V	1
Type-B USB cable	1
Antenna(s)	1-2
U.FL to SMA Cable	1-2
Serial DB9 cable	1

Additionally, a Serial to USB adapter may be required when connecting to the RS232 port with computers that don't support a DB9 serial connector.

- Plug the CF Socket Modem into the Evaluation Kit Sockets.
- Connect a cellular antenna cable to the CF Socket Modem (label CELL) and connect a cellular antenna to the other end of the antenna cable (SMA Connector).
- Insert the SIM card if the CF Socket Modem has a SIM holder.



A SIM card will be required for connecting to a cellular network with most cellular modems. Even without a SIM card, many operational features of the cellular modem will still be available.

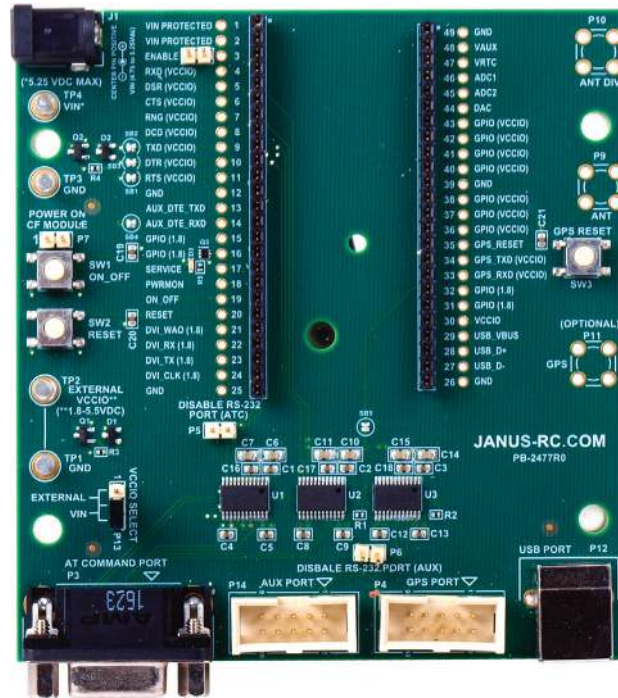
RS232 Communications

- Connect the DB9 serial cable from the AT COMMAND PORT connector to the serial port of a computer terminal or to a Serial to USB adapter. Configure the terminal as described in the RS-232 Serial Ports section.
- To turn on the board, follow the steps in the "Turning On the CF Evaluation Board" section.
- The Yellow LED should turn on to indicate that the unit is active.
- You should now be able to send 'AT' commands to the modem. To confirm a proper connection, send the command "AT" followed by a line terminator (Enter key) on the terminal and you should see "OK" as the response.

USB Communications

- To turn on the board, follow the steps in the "Turning On the CF Evaluation Board" section.
- The Yellow LED should turn on to indicate that the unit is active.
- Connect the USB cable to the evaluation Kit and to your PC.
- If you are using Windows Operating System, you can go to Device Manager and check the MODEM and COM ports that are instantiated. Depending on the specific module, the COM port designated USB3 usually supports AT commands. The MODEM ports support AT commands; look at the port properties to determine the proper COM port number to use.
- You should now be able to send 'AT' commands to the modem. To confirm a proper connection, send the command "AT" followed by a line terminator (Enter key) on the terminal and you should see "OK" as the response.

910CF Cellular Modems Evaluation Board User Guide



LTE 910CF Eval Kits Ordering Information

LTE910CF MODELS	DESCRIPTION
LTE910CF Eval Kit v20.00 TDH3S	Global CAT-M1/NB2 Embedded Cellular Modem Eval Kits
LTE910CFX Eval Kit v1.00 TAH3S	Global CAT1 Embedded Cellular Modem Eval Kits
LTE910CF Eval Kit v15.00 TDUVN	CAT1 Embedded 4G Embedded Cellular Modem

Revision	Revision Date	Note
00	12/06/17	Preliminary Release
01	02/18/20	Updated Ordering Information
02	11/09/22	Updated Models and Eval Board



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