T3X Cellular Terminal
User Manual

JANUS REMOTE COMMUNICATIONS

TABLE OF CONTENTS

DISCLAIMER

T3X Description

The T3X cellular terminal is a communication control terminal with a compact, rugged enclosure that encapsulates everything needed for easy M2M and IoT integration. The multiple orderable versions allow for system deployment in different networks with little to no change in the design investment.

Powered by a Janus XF footprint device, the T3X contains all circuitry required to give your application access to cellular networks data communication technology. The unit contains both RS232 and USB communication interfaces, and has an easy to use input to control ON/OFF remotely, and accepts a wide range of supply voltage input.

T3X Connections
Power Connector

A four position 3.5 mm terminal block receptacle (On Shore Technology OSTOQ 041251) serves as the power supply input. It is also the access point for the external power disable input.

Part numbers for compatible power connector plug:

On Shore Technology	OSTTJ 0411530
Wurth	691361100004
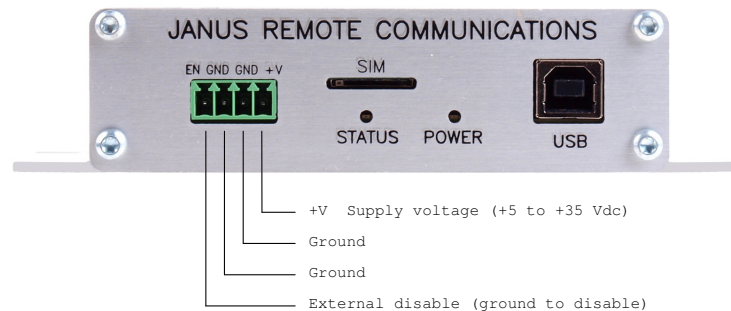
Figure 1: T3X Power Connector Plug

+V - Supply voltage

Power supply input. Accepts 5 to 35 Vdc, 12 Vdc nominal.

GND - Ground

Power and signal ground reference.

EN - External Disable

This input signal is designed to put the unit into the lowest possible power state without needing to cut power entirely. It can be used by simply grounding the signal, then released when not needed.
This signal is internally pulled up to ~ 3.3 Vdc. It should only be controlled via grounding or floating.
The modem module should be shut-down via the #SHDN command before using the External Disable.

T3X Connections continued

SERIAL DB9

The DB9 port follows the standard for RS-232 communications and gives the connections for serial interaction with hardware handshaking.

Pin	Description	Direction
1	DCD	Output
2	RXD	Output
3	TXD	Input
4	DTR	Input
5	GND	Supply
6	DSR	Output
7	RTS	Input
8	CTS	Output
9	RING	Output

USB

The USB B type port is directly connected to the modem, giving several interfaces in one connection for application ease. This port can be used for various functions, including firmware updates of the modem. This port does not provide power to the T3X , which must come from the main terminal input.

LED Indicators

The T3X contains two LEDs for feedback to the user.

POWER – Green LED

This LED indicates that the cellular modem has been turned on after applying power. When the modem is not ready, either through external disable control or the use of low power AT+CFUN modes this LED will be turned off.

There is normally about a 6 second delay after applying power to the T3X before the POWER LED illuminates.

STATUS – Yellow LED

This LED is directly connected to the modem's cellular status signal (GPIO_1). It can be user controlled through AT commands, or set to automatic control by the modem for cellular status indication.

Please consult the modem AT command guide for control commands. AT#GPIO and AT#SLED are the common

The default setting for the STATUS indicator is cellular status as follows:

STATUS LED	Device Status
Off	Cellular radio is off
On	On/Searching
Slow Blinking (0.3 sec on / 2.7 sec off)	Registered

Antenna Connections

These are SMA bulkhead antenna connections for wireless communication to cellular and GPS technology.

GPS

This is the GPS antenna connector for modems that support this feature. When the GPS receiver is active, the antenna connector will supply a 1.8v dc bias for powering active antennas.

CELL

This is the primary cellular antenna connector.   It must be used to facillatate cellular communications.

CELL 2

This is a connector for a second cellular antenna on those modems that support it.

JANUS REMOTE COMMUNICATIONS

T3X Connections continued

SIM Card

The SIM card used in the internal XF footprint modem is accessable via a slot in the case edge.

A 'micro' (3FF) SIM card size is required.

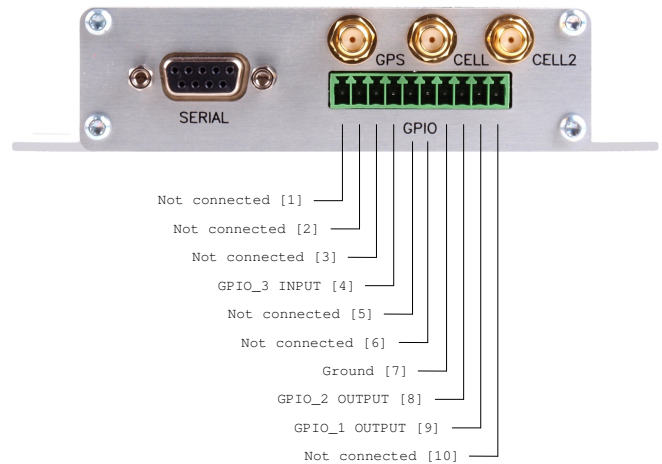The SIM card must be inserted lengthwise, chamfered end first, with the metal contact pads facing up.

The XF footprint modems use a 'push-push' type SIM card holder - push in to seat; push in again to eject.

The SIM card will seat slightly inside the outer surface of the faceplate; it is suggested to use a small coin to assist in seating the SIM card.

I/O connector

The GPIO connector on the T3X provides connections to the XF footprint modem GPIO porports.
One input and two outputs are supported,


```
Not connected [1]
Not connected [2]
Not connected [3]
GPIO_3 INPUT [4]
Not connected [5]
Not connected [6]
Ground [7]
GPIO_2 OUTPUT [8]
GPIO_1 OUTPUT [9]
Not connected [10]
```

GPIO INPUT:

- An input path to the GPIO_3 pin is provided.
- This pin must be used with an external open drain collector input to pull down to ground.
- GPIO_3 on the modem must be configured as an INPUT: #GPIO=3,0,0.
- The input is internally pulled high to 1.8v dc.
- An input protection diode provides protection of up to 100v dc input voltage.
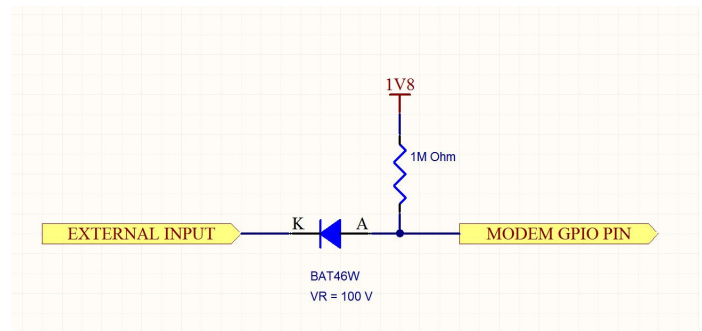
GPIO OUTPUTS:

- Output paths from the GPIO_1 and GPIO_2 GPIO pins are provided.
- The output has an internal pull-down MOSFET activated (low) when XF modem output pin is active (high)
- The output MOSFET is +40v maximum rated.
- The output is protected with a 1500W capable TVS diode with 24v dc reverse standoff capability.

JANUS REMOTE COMMUNICATIONS
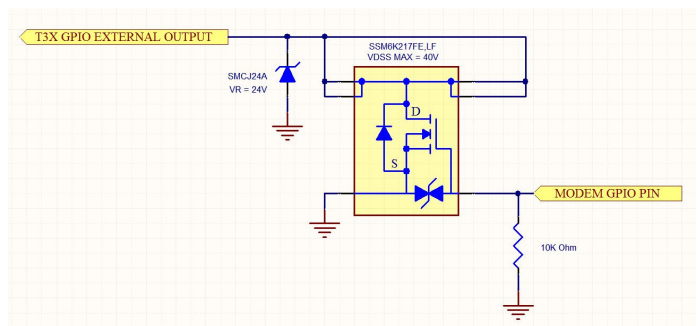
Electrical Specifications:
Absolute Maximum Ratings:

Parameter	Minimum	Nominal	Maximum	Unit	Note
Storage Temperature	-40	-	85	°C	1
Supply (Supply & Enable Input)	0	-	60	Volt	1,2
VIN (RS-232 Inputs)	-25	-	25	Volt	1
GPIO INPUT	-	-	100	Volt	1
GPIO OUTPUT pull-up	-	-	40	Volt	1

Notes:

1) *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.
2) *The supply inputs are protected from transients beyond the Recommended Operating Conditions.*
   If transients persist the supply will be latched in a disable state until the input is lowered.

Recommended Operating Conditions:

| Parameter	Minimum	Nominal	Maximum	Unit	Note
Operational Temperature:	-40	25	85	°C	
Supply	5	12	35	Volt	
Peak Supply Current	2.0	-	-	Amp	1

Note:

1) *Peak Supply Current is specified for a 12v nominal supply voltage. Peak Supply Current specification is stated as the minimum amount of current the external power supply must be able to supply during the TX burst of the embedded cellular radio. Please refer to the Plug-In User Manual for power supply characteristics of the embedded Plug-In Module in the T3X. Plug-In User Manual can be downloaded at http://www.janus-rc.com.l*

GPS Antenna Specifications:

Parameter	Description
GPS Enabled Units	
Input Voltage Range	1.8V
Frequency Range	1575.42± 2 MHz
Gain	=< 15dB overall at the connector (Antenna and LNA included)
Impedance	50Ω
VSWR	TBD
Current Consumption	30mA Max, 20mA Typ

Mechanical Specifications:

0.435

0.230

2.35

1.06

0.325

5.21

4.11

1.18

0.079

GPS   CELL   CELL2

SERIAL

GPIO
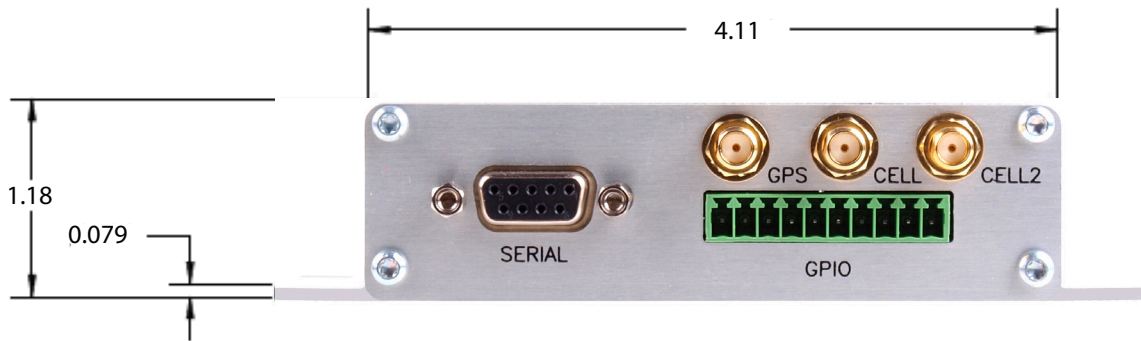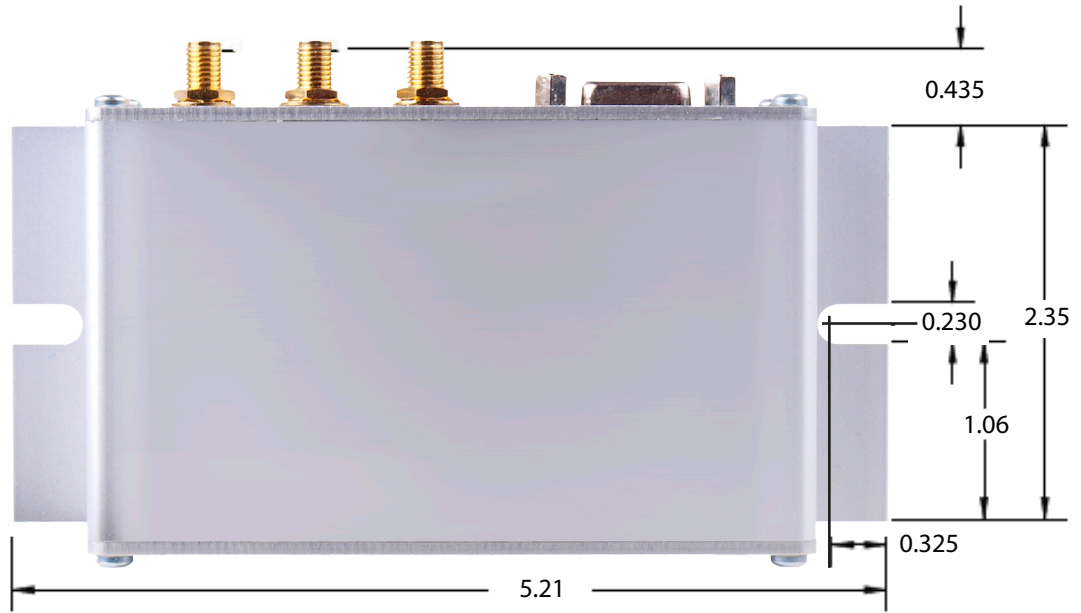
All measurements in inches unless otherwise noted.

JANUS REMOTE
COMMUNICATIONS

Getting started with the T3X

This will take you through the basic steps required to power the T3X and communicate with the modem.

Please confirm that you have these items before continuing.

- SIM card installed.
- Power Supply with the terminal block mating connection.
- RS232 DB9 ended cable or USB B to A cable.
- Host computer running a terminal emulator (e.g. Putty, Teraterm, Minicom)
- SMA cellular antennas and GPS/GNSS antenna (optional).

Starting a Terminal Session

Step 1
- Attach the cellular antennas to the SMA bulkhead connectors.
- Connect a host device using an RS232 cable to the DB9 SERIAL connector or a USB cable to the USB connector.

Step 2
Apply power to the T3X via the terminal block connector. The T3X will start the modem, and you will see the POWER LED illuminate. When GPIO_1 is set to be the SLED status indicator (default), the STATUS LED will illuminate when the modem is ready to accept commands.

Step 3 – Using RS232
Open a terminal emulator application and connect using the following default communication parameters:
Baud: 115200 bps
Data Bits: 8
Parity: None
Stop Bits: 1
Flow control: Hardware

Step 3 – Using USB
The USB connection requires drivers that support multiple port instantiations. USB driver files and instructions can be found at the Telit website: www.telit.com/evkevb-drivers/

When the drivers are installed you can open an AT command terminal session to one of the instantiated modem ports.

Step 4
Once connected to the modem you should be able to send AT commands. To make sure you have a proper connection, type "AT" into the terminal (without quotes), and press Enter. You should receive a response of "OK".

Step 5
Insure that the proper carrier firmware and APN are set. See the specific modem User Manual for details.
- Modems generally support multiple firmware loads depending on the carrier, e.g. AT&T centric or Verizon.
- Default APN's are usually set, but if using another carrier, an MVNO, or a specilised account (e.g. static IP) you would need to change the APN.

Step 6

Network registration on 4G (LTE) networks can be checked by issuing the AT command:

`AT+CEREG?`

Modems may also support 2G or 3G fallback; registration on these networks can be checked by issuing the AT command:

`AT+CREG?`

A response of `+CREG: 0,1` or `+CREG: 0,5` indicates the device is registered on the home network or roaming, respectively. If the response is different than this please refer to the AT Command guide as well as verify the account on the SIM card is active.

Step 7

Check the signal quality by entering AT command:

`AT+CSQ`

The response will be `+CSQ: <rssi>,<ber>` where `<rssi>` indicates signal strength.

An `<rssi>` value of >=10 in typical applications is acceptable and you will usually see about 12-20 in normal to good signal, but note that worst case it can be lower but still register and perform normal functions.

Sending an SMS

SMS (Short Message Service) mode allows you to send a text message to an SMS capable subscriber unit.

• Set the SMS mode to text by entering the AT command:

`AT+CMGF=1`

This must be entered every power cycle.

• Enter the receiving subscriber unit phone number and message enter the AT command:

`AT+CMGS=<da>`

where <da> is the destination address (phone number) of the SMS message recipient in a quoted string.

Example:

`AT+CMGS="8885551234"`

• Wait for response ">" then enter the message text. Carriage returns (the 'Enter' key) will be embedded in the message text.

Enter a <Ctrl-z> character to end the message text and send the SMS message.

Data connections can be made using an external host using a protocol such as PPP, NCM, MBIM or QMI. These implementations are beyond the scope of this document.

You can also send and receive data using AT commands that utilize the modem's internal TCP/IP stack.

A summary of this procedure is below.

- In all cases, the proper APN must be set. To set a new APN use the AT command:

  `AT+CGDCONT=<cid>, "IPV4V6",<apn>`

  where

  `<cid>` is the context ID, generally 1 for all but Verizon which uses 3.

  `<apn>` is the APN string (quoted).

- After registering on a network you activate the context using the AT command

  `AT#SGACT=<cid>,1`

  again where

  `<cid>` is the context ID

  The modem will return IP addresse(s) assigned by the carrier.

- Open a socket connection using the AT command:

  `AT#SD=1,0,<rPort>,<IPaddr>`

  where

  `<rPort>` is the destination port

  `<IPaddr>` is a string (quoted) with a dotted IP address or a host name to be resolved via DNS.

- At this point a data session is active and data can be sent to the remote device and visa versa.
- To exit the data session and return to command mode, send the escape character sequence "+++" and wait for the OK response.
- Enter the command:

  `AT#SH=1`

  to close the socket.

GPS

On modems that support GPS/GNSS, location data can be returned to the AT command port.

- Send command:

  `AT$GPSP=1`

  to power the GPS receiver. This will also provide a 1.8 volt DC bias to the GPS antenna connector to power active antennas.

GPS data can be accessed by two mentods.

- Send command

  `AT$GPSACP`

  This will report GPS time, location, and a few other parameters.

- Send a command to enable a NMEA message stream. As an example, send the command:

  `AT$GPSNMUN=1,1,1,1,1,1,1`

  to enable a number of NMEA messages to stream to the AT command port.

  You can terminate the NMEA stram by entering:

  `AT$GPSNMUN=0`

  at any time.

There are many options available, please see the AT Command Guide for the module used on the modem for more details.

T3X Cellular Terminal
User Manual

T3X Models & Ordering

Ordering	Description
LTE910T3X v1.00	(Cat.1 AT&T / Verizon / Worldwide)
LTE910T3X v20.00	(Cat.M1 AT&T / Verizon / Worldwide))

Revision History

Revision	Revision Date	Note
P00	11/01/23	Preliminary Release
P01	12/12/23	Updated Mechanical Dimensions
02	12/19/23	Updated Voltage Control information