TPRM Product Specification

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TeLLUS Technology, Inc.
40990 Encyclopedia Circle
Fremont, CA 94538-2470
USA

For information, please contact:

Technical Support

Tel: +1 510 498 8500
Fax: +1 510 498 8540

TeLLUS Technology Inc.

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1. Introduction

This document describes the specification of a CDPD module, which is designed for system integrators that require a CDPD modem.

Section 2 describes the hardware interface for this module. The module has a serial interface connector for the Host to communicate with. An antenna connector is also provided for connecting to an external antenna. A standard 50Ω dipole antenna is suggested.

The software specification are referenced in Section 3. For a detailed description, refer to referenced documents containing the specifications. Some operation procedures are given in Section 4. These procedures should be treated as examples for the Host firmware developer. The mechanical specification is given in Section 5. FCC Requirements are provided in Section 6.

2. Hardware Interface

In this section, we describe the external interface of the CDPD modem module. The hardware interface has two parts: the antenna connector and the baseband signal connector.

The antenna connection is a standard MMCX 50Ω connector. A 50Ω co-axial cable is required to connect to the external antenna. A standard 50Ω dipole antenna is recommended.

The baseband serial connector is an SMT ZIF Connector, 12 Pin, FH10-12S-1SH Hirose (53-152310-02TEKCON) which accepts a I mm Flex Cable.

Host Interface

An asynchronous serial interface to the Host is implemented to support the communications and data transfer between the modem and the Host. A 12-pin connector is used to implement this serial interface. The Host should set up the serial communication line control to match with the modem's communication line setup. The parameters, which must be set, include the baud rate, number of data bits, parity, and number of stop bits. The modem parameters are 38400 baud, 8 data bits, no parity, and 1 stop bit (or more concisely, 38400 8-N-1).

The pin assignment is shown in the connector pin out table below. Take extra precaution to ensure that pin 1 of the mating connector connects to pin 1 of the board connector. When looking into the connector on the TPRM unit, pin 1 is on the far right. Also ensure that the contacts on the connector cable mate to the contacts on the connector. The connector contacts for the TPRM are on the top, when looking into the connector.

Connector Pin Out Table

Pin Number	Pin Name
1	PWR
2	PWR
3	GND
4	TXD
5	RXD
6	/CTS
7	/RTS
8	GND
9	TX_IND
10	RSSI
11	RESET
12	Reserved

Pin Descriptions

The following table describes the function of each of the connector pins. In the following descriptions, a CMOS logic low or logic 0 is < 0.8V and a CMOS logic high or logic 1 is > 4.0V.

Pin Name	Pin #	I/O	Pin Description
PWR	1 and 2	I	+5VDC ± 0.15V power input. 50mV peak-to-peak ripple. The current requirement is 720mA max. The connector is rated at 0.5 A, hence the use of two pins for power.
GND	3 and 8	N/A	Ground
TXD	4	O	Serial data transmit output. This is a CMOS output.
RXD	5	I	Serial data receive input. This is a CMOS input.

/CTS	6	O	Clear to send output from the modem A logic low indicates that the modem is able to accept data. A logic high indicates that the modem is not able to accept data and therefore the host should not send any data. If data is sent while this output is high, the data will not be received correctly by the modem. This is a CMOS output.
/RTS	7	I	Ready to send input from the host A logic low indicates that the host is able to accept data. A logic high indicates that the host is not able to accept data; therefore, the modem should not send any data. If data is sent while this input is high, the data may not be received correctly by the host. This is a CMOS input.
TX_IND	9	O	Transmit indication This CMOS output goes logic high when the modem is transmitting
RSSI	10	O	Received signal strength This CMOS output must see a high impedance load. It provides an indication of received signal level. For basic indication, route to the base of a transistor through a 10K resistor with the emitter grounded. When the transistor collector sinks current, then RF signal is being received.
RESET	11	I	Reset input This is a CMOS input, providing a hardware reset to the modem. Set to a logic high to reset the modem. The pulse width must be at least 1us in duration.
Reserved	12	N/A	Reserved. This pin must be left unconnected at this time.

Inputs: RXD, /RTS, RESET

These are Schmitt Trigger inputs.

$Vt^+ = 3.0$ V (typical)

$Vt^- = 2.0$ V (typical)

$Vt^+ - Vt^- = 0.5$ V (min)

Outputs: TXD, /CTS, TX_IND

$V_{oh} = 0.7$ VDD (min), $I_{oh} = -2.5$ mA

$= V_{dd} - 0.5$ (min), $I_{oh} = -100$ A

$V_{ol} = 0.45$ V (max), $I_{oh} = 2.5$ mA

RSSI:

The RSSI has a gain of +19.6 mV/dBm
The RSSI is set at an RF Input = -100 dBm 1.35 V. This value is calibrated at the factory and the offset value of 1.35 V at –100 dBm is not specified, nor guaranteed.

The output should be terminated into a high impedance input > 50K .

3. Software Interface

The signaling between the module and the Host is provided in the following documents:

- AT Commands ref DOC ATC
- Tellus Binary Interface Protocol ref DOC TBIP

4. Operation Procedures

This section describes a number of procedures that the Host should follow to inter-operate properly with the modem. The procedures defined in this section are not the only approaches for the implementation. It is prepared to help the system integrator get some insights into the modem operations.

1.1 Protocol Synchronization

Upon power up, the Host processor should try to synchronize with the CDPD modem so that data and commands can be exchanged reliably. The following procedure needs to be followed to ensure the synchronization:

Initialize the parameters in the Host control processor after the overall system initialization. Send the NULL packet (0xA3,01,A3) until receiving a response (0xA3,41,A3) from the modem.

1.2 Modem Configuration

Before the modem can interconnect with the network, some system parameters need to be programmed into the modem.

First of all, the Host needs to set the correct IP address in the modem. Optional settings like SPNI, and Side Preference can also be set before connecting the modem to the network.

1.3 Modem Connection Procedure

After the synchronization, a connection command should be issued. When the modem is connected to the network, the Host can start sending and receiving data. Since CDPD is a packet data system, the modem does not need to be disconnected when not in use.

The following is a description of the steps to go through to establish the modem connection:

1. Send the connection command packet to the modem. Wait until the response from the modem is received to confirm that the modem has been connected to the network.

2. Establish a socket connection for TCP, or a virtual socket connection for UDP.

3. The modem is now ready to transmit and receive data. The Host can send data to the modem using the User Data Command (0x00) for transmission to the CDPD network.

1.4 Status Monitor and System Configuration Procedure

For status monitoring, the Host can get a snapshot of the various modem status whenever issuing a status get command.

1.5 Protocol Re-Synchronization Procedure

The modem shall stop responding to the Host when it loses the synchronization. When the Host does not get any response from the modem, the Host should:

1. Stop sending any further commands to the modem

2. Send the NULL command continuously to the modem until a NULL packet is received

3. After receiving the first NULL packet, the Host can resume the communication with the modem.

5. Mechanical Specification

The TPRM OEM module is a die cast aluminum alloy housing

Dimensions: 5.24” L by 2.25” W by 0.465” H

Weight: approx. 3.5 oz.

Finish: Chromate Coating to ASTM B449-93, 150 to 250 micro inches thick.

The mounting hole dimensions, are shown in figure 1.

6. FCC Requirements

The TPRM meets the SAR (Specific Absorption Rate) of RF radiation requirements provided the unit is integrated into products that can maintain a minimum separation of

20 cm from all persons during operation. Per FCC Regulations, a warning label must be attached to the outside of the product that states:

Warning

While operating this device, radio frequency radiation exposure limits (47 CFR 1.1310) may be exceeded at distances closer than 20 centimeters (8 inches) from the device antenna(s).

In addition, this product has been certified for MPE (Maximum Power Emitted) conformance using a 4.7dBi (max.) gain, half-wave antenna, terminated with a TNC or SMA male connector. The antenna must be connected to the female MMCX connector, on the TPRM, via 10 inches (typ.) of RG178 or RG316 shielded coaxial cable.

Products that fail to meet this criteria must file for separate FCC approval.

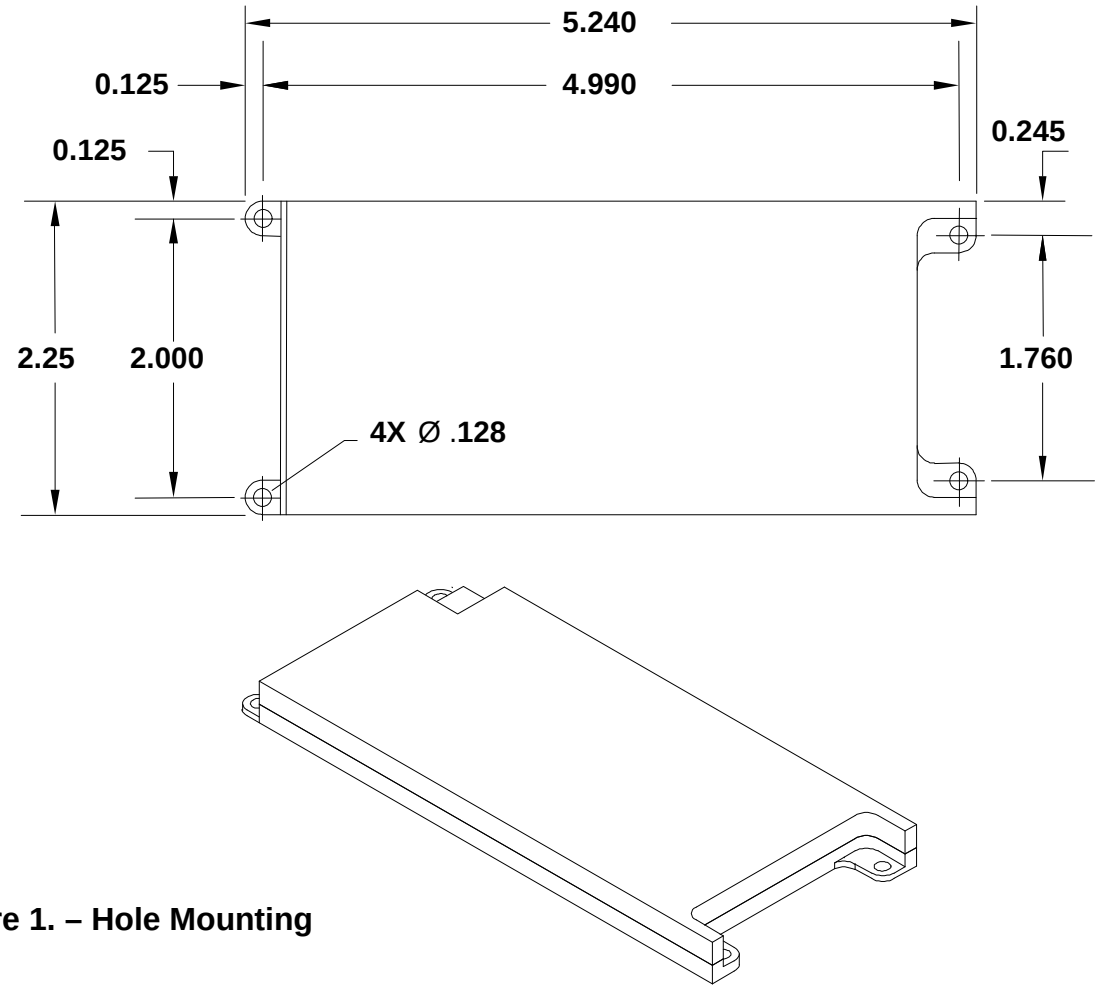

Figure 1. – Hole Mounting