NEW

# Radiometrix

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**SPM Eval-Kit**

# SpacePort Modem Evaluation Kit

## Supports Point to Multi Point and Broadcast Mode Test

***The SpacePort Modem Evaluation Kit enables SPM / RPM to be transformed into a complete Radio Modem with DCE type RS232 interface.***

### Range of Features

- Direct interface to RS232 serial port
- Onboard regulator can provide 5V, 1A supply to power-up DTE (e.g. barcode scanner)
- Visual indications of operation through LEDs
- Access to internal diagnostic/Test modes using HyperTerminal
- Access to each data/control pins for external interface or testing
- Set-up and configuration using HyperTerminal
- Built-in command line configuration.
- PP3 9V battery powered. DC jack and terminal block provided for external supply

### Kit Contents

The SPM Evaluation Kit comes with the following contentes:

| | |
|---|---|
| 2 | SPM Evaluation Board[1] |
| 2 | SPM/RPM modules (ordered separately) |
| 2 | 9V battery (PP3) |
| 2 | 1/4 wavelength whip antenna[2] |
| 4 | Jumpers |
| 1 | SPM data sheet |
| 1 | SPM Eval-Kit data sheet |

***Figure 1: SpacePort Modem Evaluation Kit***

### Visual Facilities

*The following status LEDs will be activated depending on the SPM operation mode.*

| LED | Indication |
|---|---|
| TX (Red) | Transmitter enabled; |
| RX (Green) | Receiver enabled; blinks in Auto standby mode |
| SIGNAL (bright Red) | Preamble detected |
| OK (bright Yellow) | Valid packet received / Test passed |
| Power (Green) | Power Supply on |

***Notes:***

1. The standard SPM evaluation kit comes with 2 Evaluation Board. In order to test the point to multipoint and broadcast modes of the SPM, at least 3 Evaluation Board would be required.
2. BNC connector can be replaced with SMB connector or terminal block to use different antenna connection

**Additional requirements**

1. DB9M – DB9F straight through serial cable
2. External power supply or DC power adaptor (optional)
3. PC/PDA with terminal program (e.g. Hilgraeve HyperTerminal)

On-board regulator (LM340TS) can supply up to 1A current at 5V. The 5V supply line is connected to the pin 9 (Ring Indicator) of DB9F connector which enables any external host to be powered from pin 9 (+5V DC) and pin 5 (GND). Certain CCD barcode scanner can make use of this feature, eliminating the need for additional external power adaptor.

**Serial Pin outs – RS232 (EIA/TIA-574) and RS232D (EIA/TIA-561)**

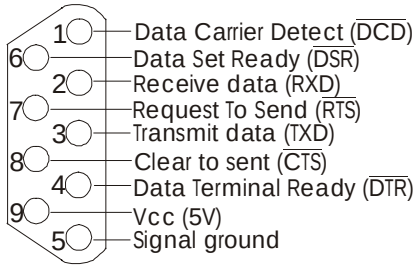


***Figure 2: DB9 Serial Port pin label***

| DB9 | DB25 | Pin Function | SPM Eval Kit (DCE) | DTE |
|---|---|---|---|---|
| 1 | 8 | Data Carrier Detect | Output | Input |
| 2 | 3 | Receive Data | Output | Input |
| 3 | 2 | Transmit Data | Input | Output |
| 4 | 20 | Data Terminal Ready | Input | Output |
| 5 | 7 | Signal Ground | - | |
| 6 | 6 | Data Set Ready | Outut | Input |
| 7 | 4 | Request To Sent | Input | Output |
| 8 | 5 | Clear To Sent | Output | Input |
| 9 | 22 | Ring Indicator | +5V DC output | Input |

In certain applications a DB9M to RJ45 adaptor cable will be required to interface SPM to Host. e.g. barcode scanners.

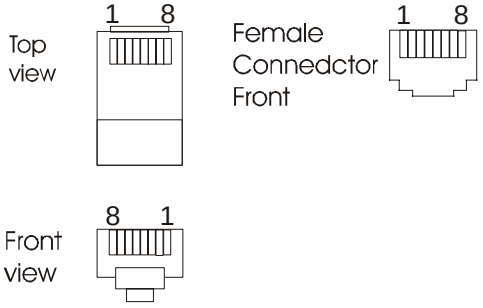


***Figure 3: RJ45 Male and Female connectors***

| Pin No. | Name | Notes/Description |
|---|---|---|
| 1 | DSR/RI | Data Set Ready/Ring Indicator |
| 2 | DCD | Data Carrier Detect |
| 3 | DTR | Data Terminal Ready |
| 4 | SGND | Signal Ground |
| 5 | RD | Receive Data |
| 6 | TD | Transmit Data |
| 7 | CTS | Clear To Send |
| 8 | RTS | Request To Send |

**Interfacing SPM Evaluation Kit to Data Terminal Equipment (DTE)**

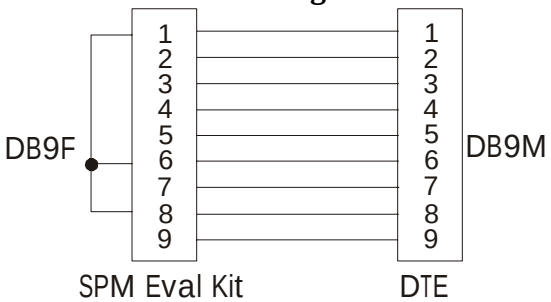


***Figure 4: DB9M-DB9F straight through modem cable***

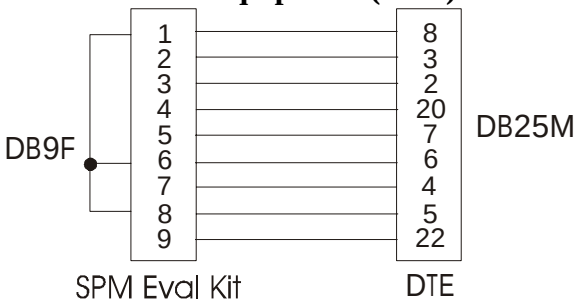


***Figure 5: DB9M-DB25F straight through modem cable***

The SPM Eval board interface is a 9 way female D type connector. The CTS, DSR and DCD are wired together eliminating the need for special RS232 cables in certain DTE interface configurations.

When using SPM Eval Kit with DTE (e.g. printer and printer driver) which uses DTR/DSR flow control instead of RTS/CTS flow control, the shut down mode should be disabled in configuration by turning SHDN to OFF.

SPM implements DTE to DCE flow control using CTS line. CTS is wired together with DSR and DCD in the Evaluation Kit to meet common DTE interface requirement. However, SPM does not implement DCE to DTE flow control using RTS line. DTR line used to wake up the module if SHDN is turned ON and put it to sleep if the Host (DTE) is detached from SPM.

Therefore, if the receiving DTE(B) [e.g. EPoS printer] cannot process [print] received data fast enough, DTE(B) will not be able to stop attached SPM(B) from sending any further data which SPM(B) received from SPM(A). SPM(A) will assume SPM(B) is ready to receive more data every time SPM(B) sends back a packet acknowledgements as SPM buffers are not filled to stop DTE. DTE(A) [PC] will continue to send more data resulting in data corruption in DTE(B). Simple solution is to reduce the baud rate (e.g. 2,400bps) between SPM(A) and DTE(A) and use maximum possible baud rate (e.g. 9,600bps) between DTE(B) and SPM(B).

**Interfacing SPM Evaluation Kit to Data Communications Equipment (DCE)**

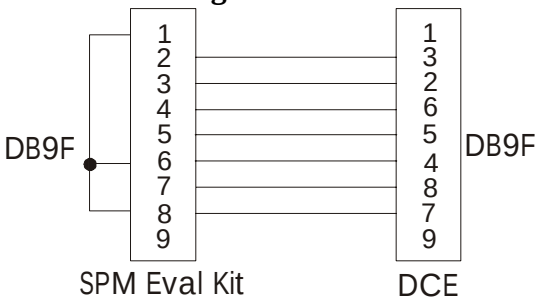


*Figure 6: DB9M-DB9M null-modem cable*

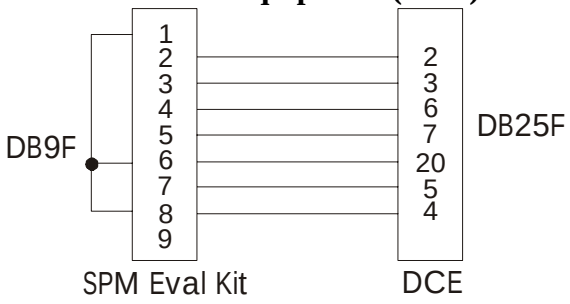


*Figure 7: DB9M-DB9M null-modem cable*

**SPM Configuration**

To configure the SPM the HyperTerminal should be set with the following settings. ASCII Setup should be left at default settings with no ticks on *Send line ends with line feeds* and *Append line feeds to incoming line ends*.

Hardware flow control should be disabled. Default baud rate of the SPM is 9600bps. However if the default baud rate of the SPM is changed then the baud rate of the HyperTerminal should be matched or DEFAULT jumper should be connected to force the SPM baud rate to 9600bps.

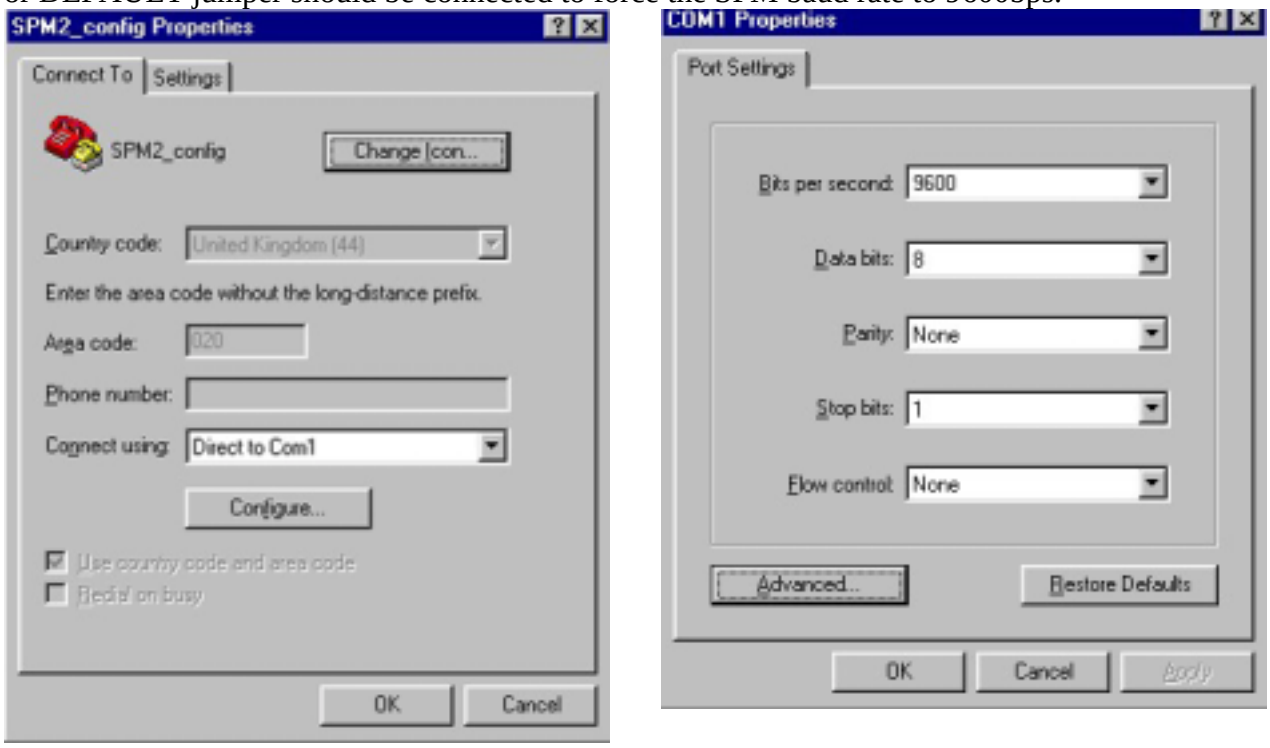


*Figure 8: Serial port setting on HyperTerminal to configure SPM*

SPM has a 2mm pitch pin-out for embedded system applications where PCB space is very limited. However, for the convenience of evaluating the module, separate rows of 0.1” pitch pin headers are provided on both sides of the SPM sockets.

Oscilloscope probes can be easily connected on these to monitor data transmission on each stage from serial RS232 type data entering SPM, FRPC transmitting packetised data, SPM on receiving end sending serial data to attached Host and sending back Packet Acknowledgements.

Oscilloscope screen capture below were taken during a large file transfer at 115,200bps using HyperTerminal with ZMODEM setting. They were captured on Laptop from Tektronix TDS2024 Digital Storage Oscilloscope fitted with TDS2CM Communications Extension Module. The wireless RS232 link was established using SPM Evaluation Kit with SPM2-433-28.

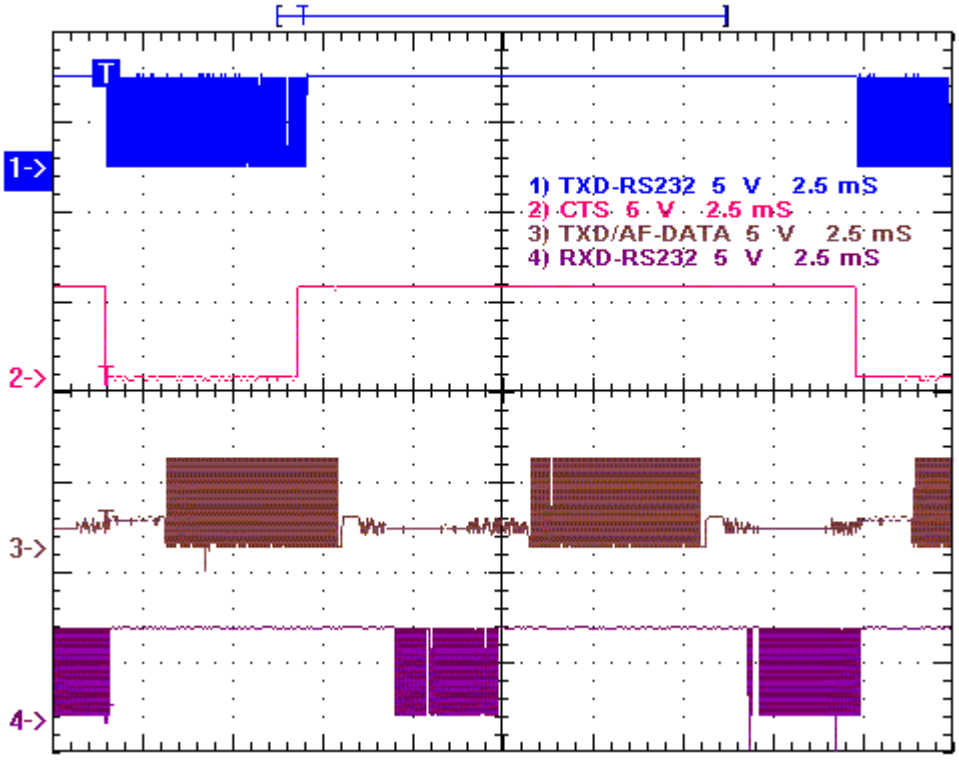


***Figure 9: Serial RS232 data transmission and reception with hardware flow control***

TXD-RS232 is the inverted RS232 data at TTL level entering the SPM module at 115,200bps.

RPM sends the collected data bytes with necessary site, unit and other control information bytes to FRPC. CTS flow control is set high when the SPM buffer reaches about 66% full, to prevent attached PC from sending further data bytes.

FRPC packetises all the bytes from RPM with preamble, synch byte, check sum and encodes each 8-bit byte into a 12-bit code for reliable transmission over the radio. TXD/AF trace is the packetised data transmission from FRPC to TXD pin of radio transceiver within the SPM module.

RXD-RS232 is the received inverted RS232 data at TTL level sent by SPM to attached host PC. It can be seen from the trace that the RS232 data stream coming into SPM is broken into two parts and transmitted as two packets.

SPM will not transmit the next packet until an acknowledgement for the previously transmitted packet is received if the ACKMODE is turned ON as shown in the following oscilloscope screen capture.

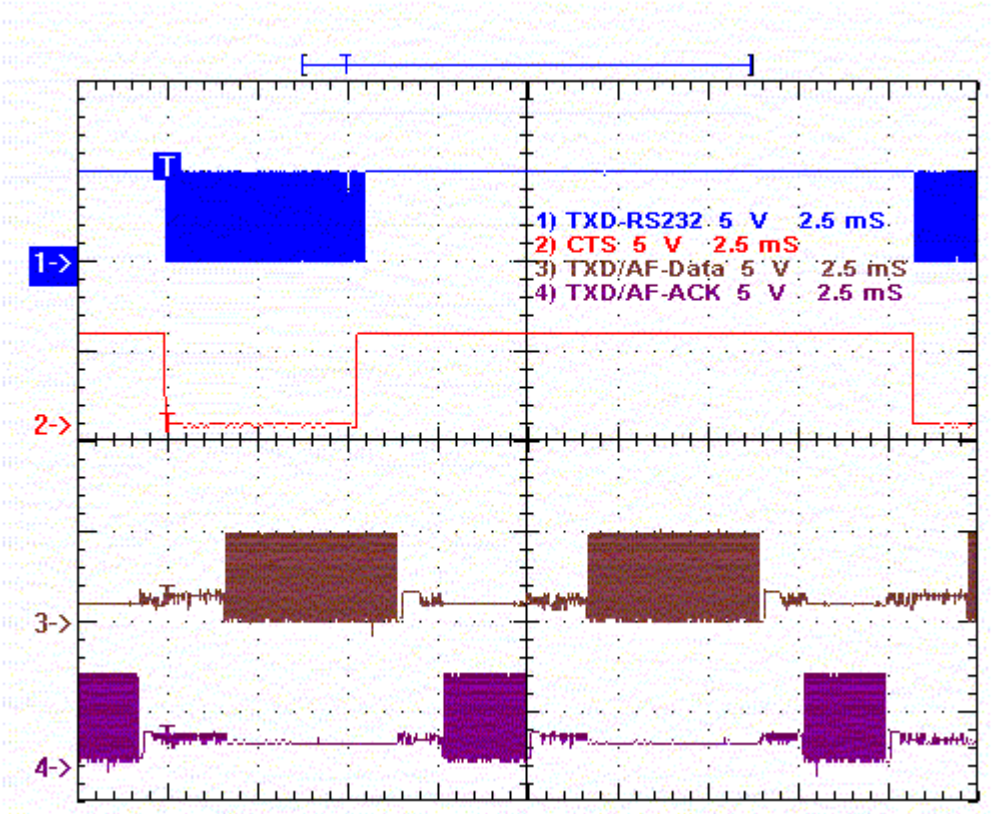


***Figure 10: Serial RS232 data transmission with packet acknowledgement***

By turning the ACKMODE OFF, the overall data throughput can be increased up to 55kbps with SPM2-433-28. In this fast mode, SPM(A) will not wait for a packet acknowledgement from SPM(B).


***Figure 11: File transfer with ACKMODE ON***

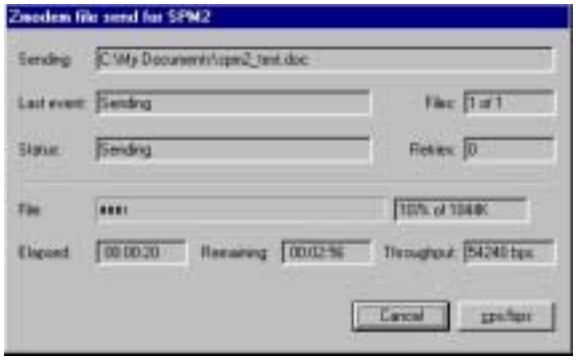


***Figure 12: File transfer with ACKMODE OFF***

In broadcast mode, same data/file can be transferred to several hosts attached to SPM Eval Kits at the same time. ACKMODE is should also be turned OFF in broadcast mode otherwise the acknowledgements from multiple slave SPMs will cause master SPM hang up.

Usually point-to-multipoint communication is used by a host (e.g. microcontroller) which can pull the SETUP line low and send the command ADDR [new unit address] to change address dynamically to communicate with several other hosts by addressing them individually. This can be simulated in Evaluation Kit by inserting SETUP jumper and typing the new dynamic unit address using HyperTerminal with its flow control disabled.

The SETUP jumper should be removed before pressing the Carriage Return (0Dhex) key. SPM will echo back with dot (2Ehex) to confirm address change. If SETUP jumper is not removed, SPM will remain in configuration mode. Flow control in HyperTerminal should be set to HARDWARE for higher baud rate data transfer.

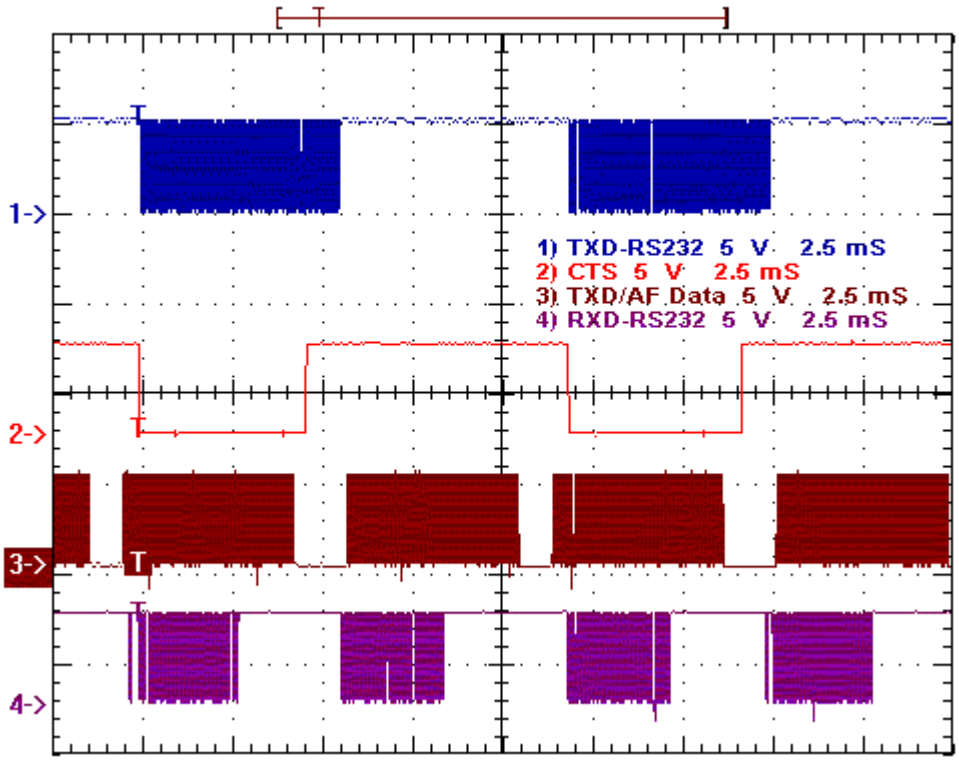


***Figure 13: Near continuous streaming of data packets with ACKMODE OFF***

SPM2-433-28 implements a very efficient data buffer management algorithm. In most cases at low or default baud rates (e.g. 9600bps), it is capable of transmitting continuous stream of serial data without asserting CTS line (no flow control) as shown below and transmit the data packets in short bursts with long gaps between RF transmission minimising the air-time usage.

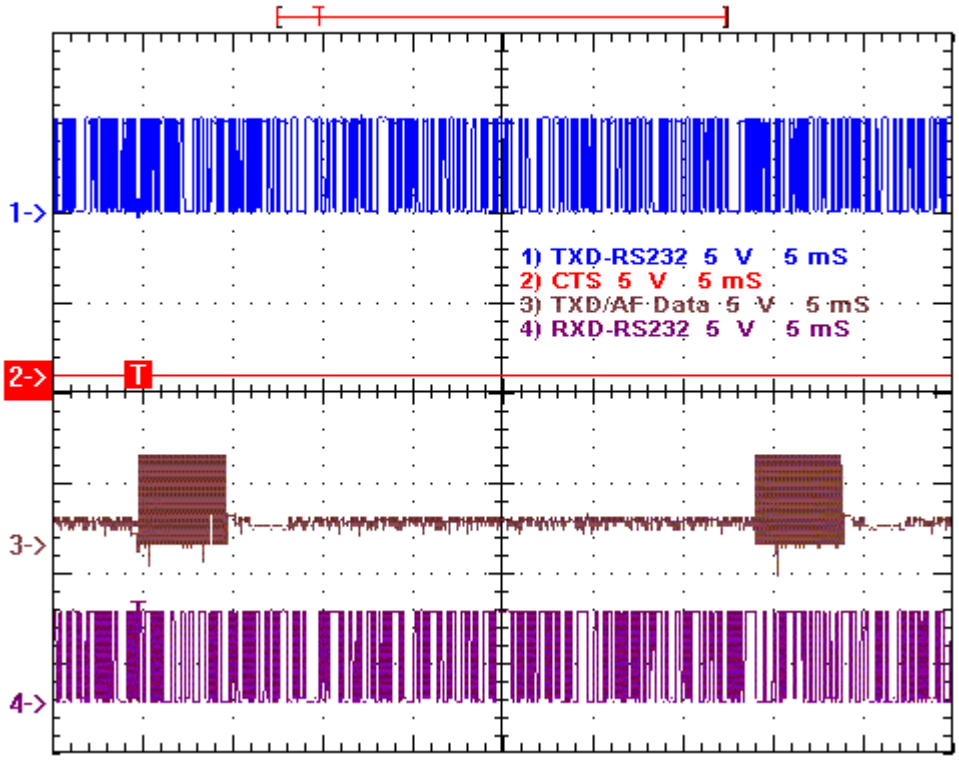


***Figure 14: SPM2-433-28 receiving from DTE continuously without asserting CTS at 9600bps***

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