Legacy Data Managers
Technical Support Guide
<table>
<thead>
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Table 1 - Document Revision History
Applicable devices

This document is applicable to the following NetComm Wireless devices:
- NTC-6908
- NTC-6908-02
- NTC-6520
- NTC-6200
- NWL-15
- NWL-25

Introduction

NetComm Wireless M2M routers equipped with a serial port and running firmware 2.0.4.2 or higher feature a Modem emulator and Packet Assembler and Disassembler Daemon (PADD). These features allow the transport of arbitrary asynchronous serial data over a packet switched (IP) cellular network or host computer. Specifically, data received on the router’s V.24 interface (serial port) can be encapsulated into TCP or UDP packets and sent to a remote host. Likewise, data contained in TCP or UDP packets received from a remote host may be forwarded to the router’s V.24 interface (serial port).

With the modem emulator feature, you can use a NetComm Wireless M2M router to replace a traditional dial-up modem for point-to-point connections while PADD is generally used in the transmission of smart metering or utilities metering data over cellular networks where multiple active sessions are required at the same time for redundancy, backup or system monitoring purposes.

The following diagram illustrates the configuration of the examples in this document. In the real world, one or more of the laptops might be replaced with legacy equipment such as a Remote Terminal Unit (RTU) but for the purpose of demonstration, laptops were used.

Note: Before performing the instructions in this guide, please ensure that you have the latest firmware version on your router. Visit [http://www.netcommwireless.com/products/m2m-wireless](http://www.netcommwireless.com/products/m2m-wireless) to find your device and download the latest firmware.
Modem emulator

Previously referred to as PAD Mode, the Modem emulator allows you to connect legacy equipment such as an RTU or PLC to the serial port of the router in place of a traditional dial-up modem. The NetComm Wireless router then emulates the dial-up modem’s behaviour and passes the serial data over the IP network.

![Modem emulator settings](image)

**Modem settings**

- **Baud Rate**
  The serial (V.24) port baud rate, the default baud rate is: 115200 bps and the serial line format are 8 data bits, no parity with 1 Stop bit. The other available baud rates are 300bps, 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps and 115200bps.

- **Inter Character Timeout**
  Modem emulator buffers any bytes received from the serial port until either 512 bytes have been received or no bytes have been received for “Inter Character Timeout” milliseconds. Any bytes in the buffer will then be sent to the remote host.
ID
When the ID field is not blank (empty) the defined ID will be sent to the remote host as follows:
- For UDP the 1st byte of each datagram sent will be set to the contents of the ID field, data follows immediately after the ID.
- For TCP the ID is transmitted once, immediately after the connection is established.

Ignore String
When the “Ignore String” field is not blank (empty) the router will strip any character sequence that matches the “Ignore String” from the data stream received from the serial port.

Connection settings

Connect to
Determines how the router behaves when it receives an “ATD” command on the serial port.
- Profile: Connect using “Data Connection Profile”.
- Circuit: Establish a circuit switched data connection.
- Packet: Connect to cellular packet network in PPP pass through mode.
- Dial String: Examine the dialled digits and connect to Profile, Circuit or Packet as appropriate.

DTR action
Determines how the router responds to change of state of the serial port (DTR) Data Terminal Ready line.
- Ignore: Take no action.
- Command: High to Low transition of DTR causes the router to enter command mode (does not end call).
- Hangup: High to Low transition of DTR causes the router to end call and enter command mode.
- High AutoDial: Low to High transition of DTR causes the router to dial the Auto Dial Number. High to Low transition of DTR causes the router to end call and enter command mode.
- Low AutoDial: High to Low transition of DTR causes the router to dial the Auto Dial Number. Low to High transition of DTR causes the router to end call and enter command mode.
- Low Pass To AT Port: When DTR is low, pass all AT commands directly to internal cellular data engine.

DCD action
Determines how the router controls the state of the serial port Data Carrier Detect (DCD) line.
- Always On: DCD is always on.
- Connect On: DCD is on when a connection is established in response to an ATD command or DTR auto dial.
- Always Off: DCD is always off.
- PPP On: DCD is on when the router has established a PPP session with the cellular network.

Flow control
- Off: Serial port flow control off
- Hardware: Serial port uses RTS/CTS flow control

RI action
Determines how the router controls the state of the serial port RI (Ring Indicator) line.
- Always On: RI is always on.
- Incoming Ring: RI is on when an incoming connection request is received.
- Always Off: RI is always off.

Circuit auto answer rings
Sets the number of incoming rings after which the router will answer incoming circuit switched data calls. The default value is Off. The other available options are from 1 to 12.

Auto dial number
Sets the number the router will dial if DTR Auto Dial is enabled and the DTR setting changes state.
Important Note:
The Modem emulator parameters may be configured separately for each of the APN connection profiles, however only one single profile can be enabled at one time. Please also note that after a soft reset (reboot) of the cellular router, any active PAD and cellular packet data sessions will be terminated.

Profile-specific settings

Remote host
In client mode, this is where the cellular router connects to a local or remote host. A local or remote host IP address needs to be specified in the "Remote Host" field. In server mode, this is where a local or remote host connects to the NetComm Wireless cellular router. The cellular router will only accept incoming connections from the specified host if an IP address in the field is specified. The IP address specified can be a local or remote IP address. If you specify 0.0.0.0 the router will accept incoming connections from any host.

Port
The port field specifies the TCP/UDP port number to use for the PAD session. The range allowed is from 1 – 65535. If not supplied, the protocol from the currently selected profile is used.

Local encoding
This is normally disabled where data is sent without any encapsulation.

Mode
This is the used of TCP or UDP protocol for the Modem emulator session.

Auto answer
This radio button serves as the enable / disable switch for configuring Modem emulator server or client mode. When “Auto answer” is enabled, Modem emulator operates in server mode. This means that the router will accept incoming connections. When “Auto answer” is disabled, Modem emulator operates in client mode. This means the router connects to a remote host. By default, the NetComm Wireless router is set as a Modem emulator client where “Auto answer” is set to “Disabled”.


PAD Daemon

PAD Daemon runs as a background process whose settings can be accessed with a user controlled web configuration interface. The PADD configuration page is located under the Services menu. PAD Daemon is usually used with multiple connections or when redundant connections are needed. There are two modes: the PADD Server mode and PADD Client Mode. When PADD is enabled, both the PADD server mode and PADD client mode can be run at the same time.

The PAD Daemon web configuration page is shown in the screenshot below.

![PAD Daemon configuration page](image)
Each of the parameters are also briefly described below.

**Activate**
Enable or disable the PAD daemon locally using this setting.

**Debug Level**
Set the level of system log messages. 0 for off, 1 for basic error messages, 2 for verbose logging.

**Baud Rate**
The serial (V.24) port baud rate, the default baud rate is: 115200 bps and the serial line format are 8 data bits, no parity with 1 Stop bit. The other available baud rates are 300bps, 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps and 115200bps.

**Data Bits**
The default serial line data bits setting used is 8. Options include 5 – 8 bits.

**Stop Bits**
The default stop bit setting is set to 1. However the stop bit setting can be set to 2 bits if required.

**Parity**
Parity is the means to detect transmission errors. An extra data bit is transmitted with each data character, and is arranged in a fashion such that the number of 1 bits in each character, including the parity bit, is always odd or always even. If a byte is received with the wrong number of 1s, then this shows the data must be corrupt. Options include none, odd or even. The default setting is none for no parity checks.

**Hardware Flow Control**
Used in the hardware handshaking process this field is used to set Data Terminal Ready and Data Set Ready signalling.

**Inter-character timeout**
The default value is 1 x 100ms. This parameter is used to configure the Inter-Character timeout used by the PAD service when assembling packets for transmission. The PAD will send a packet of data every time the buffer is full (512 Bytes) or if the serial data line is idle for longer than the time specified by this command.

**End of Line Character**
This field can be used to set an ASCII character as an end of line character.

**Start of Line Timestamps**
This option is disabled by default (0). Set to 1 for a timestamp with the format of YYYYMMDDHHMMSS.

**TCP/IP Server Mode - Port**
Enter the port number to use for the TCP/IP server connection.

**TCP/IP Server Mode – Incoming connection**
‘Exclusive’ mode allows only one single active PAD Server connection only, with further connection attempts refused. ‘Shared’ Mode means multiple connections to the router (PAD Server) are allowed but it will drop the previous active session when a second session connects to the cellular router PADD server.

**TCP/IP Client Mode - Mode**
Set the TCP/IP Client mode to connect to the first available server or all servers that are available.

**TCP/IP Client Mode - Protocol**
Select the protocol to use to connect to the remote server or servers

**TCP/IP Client Mode - Remote Servers**
Enter the IP address and port number used by the remote servers you wish to connect to.
Network Settings – Remote Server Retry Period
Enter the time in seconds before an attempt is made to reconnect to a remote server if the connection is lost.

Network Settings – TCP Keepalive Probes
Enter the time in seconds when a TCP keepalive ping probe should be sent to the remote address to ascertain whether there is a current connection.

Network Settings – Number of Probe Failures Before Disconnect
Enter the number of ping attempts that will be made before a remote connection is deemed to be disconnected.
Modem emulator configuration examples

Modem emulator - Server mode

When configuring Modem emulator settings under a particular APN profile, you must disable and save the changes then enable the profile with PAD settings. In the following example, the NetComm Wireless Router is configured as a Modem emulator server with TCP port number 3000 where it will accept client connection from any host IP address.

Note: Ensure that the selected profile is using a publicly routable IP address.

Figure 3 - NetComm Wireless Router configured as a Modem emulator server

Figure 4 - NetComm Wireless Router LAN IP address for Modem emulator server mode test

Figure 5 - NetComm Wireless Router WAN IP address for Modem emulator mode test
Verifying the NetComm Wireless Router Modem emulator server connection

The NetComm Wireless Router Modem emulator is now running in server mode and is listening on TCP port 3000. Verification of the Modem emulator server connection to the NetComm Wireless Router Cellular Router, can be made locally or remotely.

Verifying NetComm Wireless Router Modem emulator server connection locally

Connect an RS232 serial cable from the NetComm Wireless Router local serial port, and connect a crossover Ethernet cable from the test laptop to the LAN port of the NetComm Wireless Router Cellular Router.

Open a Hyper Terminal with the following baud rate settings: 115200bps, 8, None, 1, None. Verify the serial connection by typing in the following AT commands: ati (see Figure 6)

Open a telnet client from the test laptop and telnet to the LAN IP address of the NetComm Wireless Router Cellular Router: telnet 192.168.20.1 3000 once the PAD Server session is connected to the router, the terminal window shows “Connect 115200”. (See Figure 7)

When the Modem emulator server connection is up, anything that you type in the telnet session will be printed on the terminal window and vice versa. This action simulates an RTU/data logger connected to the NetComm Wireless cellular router. This behaves like a transparent connection to the serial interface of the NetComm Wireless cellular router where any data pass through will be forwarded to the serial port and vice versa. (see Figure 8)

The NetComm Wireless Router Modem emulator server session is now up and running.
Verifying the NetComm Wireless Router Modem emulator server connection remotely

To verify Modem emulator server connection remotely, you will need two test laptops and an accessible WAN IP address on the NetComm Wireless cellular router. ‘An accessible WAN IP of the router’ means a public IP address or a WAN IP that you can access from your network (Example: an IP WAN address).

Repeat steps ‘1’ and ‘2’ in mentioned above: open a telnet client from the test laptop at the remote site, telnet to the WAN IP address of the NetComm Wireless cellular router; telnet 123.209.52.150: 3000. Once the Modem emulator server session is connected to the router, the terminal window shows “Connect 115200”.

![Figure 9 - Remote telnet to the NetComm Wireless Router configured as Modem emulator server mode](image)

Once the Modem emulator server connection is up, this means that the input into the telnet session will become the output in the NetComm Wireless router’s local terminal window and vice versa. This action simulates an RTU/data logger connected to the NetComm Wireless cellular router, behaving like a transparent connection to the serial interface of the NetComm Wireless cellular router where any data passing through will be forwarded to the serial port and vice versa. (see Figure 11)

![Figure 10 - NetComm Wireless Router Modem emulator server mode working.](image)

The NetComm Wireless Router Modem emulator server session is now up and running.

NetComm Wireless Router Modem emulator client

When configuring the Modem emulator settings under a particular APN profile, you will need to disable the APN profile that is currently enabled and save these changes before the profile with Modem emulator settings can be enabled. In the following example, the NetComm Wireless Router is configured as a Modem emulator in client mode. The router will connect to a remote host with IP address: 120.157.10.212 listening on TCP port number 3000. In this scenario, a Telnet Server is used at the remote host and is listening on TCP port 3000.

![Figure 11 - WWAN connection status](image)

Note: Ensure that the selected profile is using a publicly routable IP address.
The following table summarises the Modem emulator settings:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to</td>
<td>Dial string</td>
</tr>
<tr>
<td>DTR action</td>
<td>High AutoDial</td>
</tr>
<tr>
<td>DCD action</td>
<td>Connect On</td>
</tr>
<tr>
<td>Auto dial number</td>
<td>1</td>
</tr>
<tr>
<td>Profile</td>
<td>Profile 1</td>
</tr>
<tr>
<td>Remote Host</td>
<td>120.157.10.212</td>
</tr>
<tr>
<td>Port</td>
<td>3000</td>
</tr>
<tr>
<td>Auto answer</td>
<td>OFF</td>
</tr>
</tbody>
</table>
These settings tell the router to automatically dial the connection to 120.157.10.212 on port 3000 using Profile 1 whenever it is not connected. When Auto answer is set to OFF, the Modem emulator operates in client mode.

Verifying the NetComm Wireless Router Modem emulator client mode connection
The NetComm Wireless Router Modem emulator is now running in client mode. To verify its connection, use a terminal emulator application such as PuTTY. Connect to the NetComm router on its COM port at baud 115200. The terminal window shows “CONNECT 115200” indicating that the connection has been established.

![Figure 12 - Modem emulator client terminal window](image)

Any text entered in this window is replicated on the remote host’s TCP server window using netcat.

![Figure 13 - Modem emulator remote server window](image)

The NetComm Wireless Router Modem emulator client mode session is now up and running.
NetComm Wireless Router

PADD Configuration Examples

The NetComm Wireless Router PAD Daemon - PAD Server & PAD Clients

The PADD configuration page is located under Services > Legacy data managers > PADD. The NetComm Wireless Router PADD has two modes: the PADD server mode and PADD client mode. When PADD is enabled, both the PADD server mode and PADD client mode process are running at the same time.

In the following test scenario, the NetComm Wireless Router PADD is configured to accept inbound PAD sessions on TCP port 1516 and the router runs a simultaneous PAD client session to the remote host 123.209.112.140 on TCP port 1516.

![Figure 14 - PAD Daemon Server configuration](image)
Figure 15 - PAD Daemon Client Configuration
Verifying the NetComm Wireless Router PAD Daemon – Server Connection

i. Connect an RS232 serial cable to the NetComm Wireless Router local serial port.

ii. Open a terminal connection to the local router using a terminal emulator such as PuTTY with the following Baud Rate settings: 115200bps, 8, None, 1, None.

iii. When the PAD Server session is connected to the router, the terminal emulator window shows “Connect 115200”. When the connection is up, the data typed into the telnet session will be the output on the remote server’s terminal session.

The PAD Daemon session is now up and running.

You can also run the server and client concurrently on both units. Simply enter the IP address of the other side in the Remote Host 1 field on each unit. To run multiple concurrent sessions, enter the server IP and port into the Remote Host 2, Remote Host 3 and Remote Host 4 fields on each router. Ideally you should set a different port number for each connection.