

# **Smart IP Router**

**RT-101**

**Single Port Internet Router**

**EMRT101**

## **FCC Statement:**

This device complies with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and,
2. This device must accept any interference received, including interference that may cause undesired operation.

## **CE Marking Warning**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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# 1 INTRODUCTION

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Thank you for purchasing PLANET RT-101—Single port IP Router. The RT-101 is designed to provide SOHO (Small Office Home Office) users an efficient and affordable Internet access solution. This sophisticated, yet easy to use device features IP spoofing, Dial-On-Demand, and PPP authentication. The RT-101 allows you to expand network functionality while minimizing system resource costs.

Set up has never been easier. Simply connect the RT-101 directly to your PC's serial port via the packaged configuration serial cable and configure using any DEC VT100 compatible terminal program.

Once configured, the PLANET RT-101 provides hassle free installation. It can be placed anywhere in your 10Base-2 or 10Base-T Ethernet LAN environment and its unique interface auto-sensing feature means there are no troublesome jumpers or software configurations required.

## **How the RT-101 Works**

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The RT-101 gives users across your network access to the vast resources available on the Internet. Once the RT-101 is installed and configured, the Internet is just a click away.

The RT-101 is assigned a unique IP addresses that allows it to communicate directly with the Internet. Activating your browser and inputting a URL (Universal Resource Locator) produces a Internet bound data package that is routed through the RT-101 to Internet. Additionally, since dial up line fees are dependent on line usage, the RT-101 supports the following cost saving functions:

### **IP Spoofing**

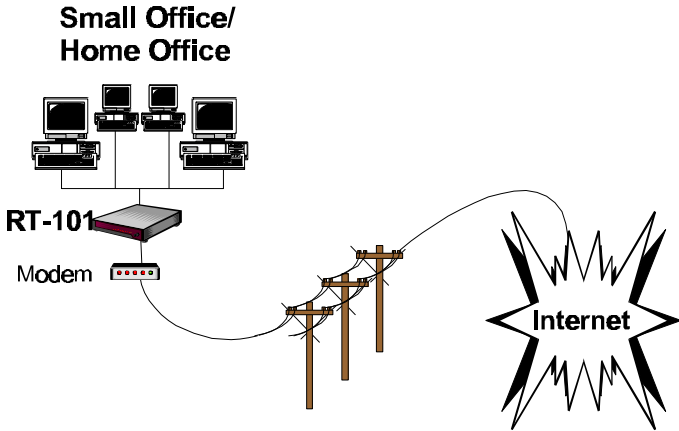
IP protocol tends to be quite talkative; that is, it is always requesting and sending RIPv (routing information packets) to detect any change in resource status-- servers, routers and other peripheral devices. Spoofing is a means of filtering the chatter (RIPv) so that when no important data is present the line can be dropped as defined by the Disconnect time-out setting. After the line is dropped, the spoofing mechanism fools the local network into thinking the line is still up and that the Internet resources are still available. Without spoofing, the line would remain up indefinitely and huge line fees would be incurred.

### **Dial On Demand**

Dial On Demand is an intelligent feature that monitors the

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dropped communication link for transmission activity. If activity is detected, a connection with the Internet will automatically be re-established. To the user, it is as if the line were never dropped.



**Figure 1-1: Office to Internet Diagram**

## Package Contents

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Please inspect your package. The following items should be included:

- The RT-101 Unit
- Power Adapter
- Configuration Serial Cable
- This User's Manual

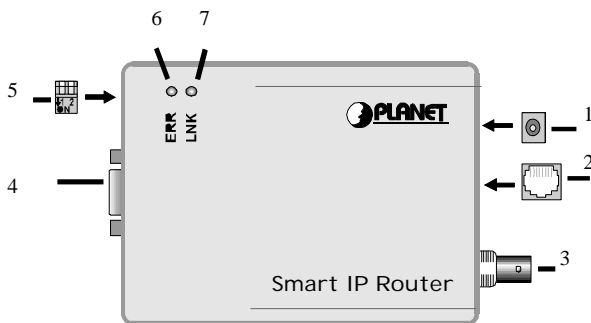
If any of the above items are damaged or missing, please contact your RT-101 dealer as soon as possible.

## Features Overview

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This section describes the RT-101 features and their functions. Please take a few minutes to familiarize yourself with your new Internet router.

### RT-101 Outlook



**Figure 1-2: RT-101 Internet Router**



Feature	Description
❶ Power port	Connect the power adapter to this port.
❷ 10Base-T port	Connect 10Base-T cabling to this port.
❸ 10Base2 port	Connect 10Base2 cabling to this port.
❹ Serial Port	Connect the modem to this port.
❺ DIP switches	Used to put the RT-101 in the configuration mode. For more information, refer to <i>DIP Switches</i> table below.
❻ Error LED	This LED is used to indicate an error. However, during power On it is normal for this LED to light. For more information, see the following <i>LED Status Table</i> .
❼ Link LED	This LED should be on during normal operation. For more information, see the following <i>LED Status Table</i> .

## Dip Switches

DIP Switches		
SW1	SW2	Description
OFF	OFF	Normal Operation
ON	OFF	
OFF	ON	
ON	ON	Configuration Mode

## LEDs

LED Status Table		
LINK Green LED	ERROR Red LED	Description
On	On	During power On, both LEDs should light then the Red LED should go off. If both LEDs stay on, there is a hardware problem. Consult your dealer.
On	Off	Normal Operation (Power On Self Test OK)
Flashing	Off	Normal Operation (Receiving Packets from LAN)
Flashing	Flashing	When both LEDs are flashing intermittently, there is an error. Contact your dealer for technical support.

## Pre-Installation Checklist

Before installing the Communication Server, you should:

- Remove the *Sensitive Information* page at the front of this manual and store it in safe place. It contains sensitive information on the Communication Server security features.

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- Carefully read the entire manual.
  - Ensure that you meet all hardware and software requirements.

## **Requirements**

- Any DEC VT52/VT100 compatible terminal application including Telix, Crosstalk, ProComm, SmartCom and Windows 95 Hyper Terminal.
- TCP/IP protocol enabled.
- Ethernet Network employing 10Base-T or 10Base2 cable.
- An external asynchronous modem.
- One standard serial cable to connect the modem and RT-101.
- Router account with local ISP.



# 2 CONFIGURATION

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Using the configuration software included with the RT-101, you set the parameters necessary for Office to Internet operation such as local and remote IP addresses, Net Masks and telephone numbers. Prior to starting the configuration process, ensure that you have a DEC VT52/VT100 compatible communication program.

1. With the RT-101 powered Off, connect the RT-101 serial port directly to your PC serial port using the packaged configuration serial cable.
2. Set both of the RT-101's DIP switches to their On positions. See the Dip Switches table in Chapter 1 for more information.
3. Configure your DEC VT100 or DEC VT102 compatible communications program. If needed consult the communication programs manual and ensure that the following parameters are set:
  - VT100
  - 19200bps
  - 8-bit data
  - no parity
  - 1 stop bit
  - Software (XON/XOFF) flow control
4. Power On the RT-101 by plugging in the power adapter. The configuration program will automatically initiate.
5. Configure the RT-101 as described below.

6. Once the configuration is complete, Save and reset the device.
7. Power off the RT-101 and Set the DIP switches to their OFF positions. Now you are ready to install the RT-101 in the LAN for Internet Access.

## Device Configuration

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Once the RT-101 is powered On, it will automatically initiate the configuration program. The table below describes the keystroke commands used to navigate the configuration program.

Keystroke	Description
ESC	Used to escape the input fields or return to the previous menu. Pressing ESC while at the first panel will refresh the first panel.
TAB or → or ↓	Moves the cursor to the next option in descending order. If the selected option is the last option, pressing any of these keys will return you to the first option.
← or ↑	Moves the cursor to the next option in ascending order. If the selected option is the first option, pressing either of these keys will return you to the last option.
ENTER	Used to select the current option for configuration.

### Basic Configuration Menu

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Once the RT-101 is powered On, it will automatically initiate the configuration program. Simply navigate to the desired option as described in the previous table and press enter. The configuration program will either move the cursor to the input field, where you input configuration settings directly from the keyboard, or display a predefined list of values for you to choose from. Note that those options contained in brackets [ ] have submenus.

[ Basic configuration ]

Local IP address: 203.70.212.5  
Local network mask: 255.255.255.0  
Remote IP address: 0.0.0.0  
Remote network mask: 255.255.255.0  
>IP broadcast address: 203.70.212.255  
Default gateway IP address: 139.175.50.252  
Local ID:  
Local password:  
Line type: Leased line (Null modem)  
Baud rate: 38400 bps  
Phone number: 3571058  
Disconnect link if inactive for more than 0 minutes.  
[Modem settings]  
[Networking settings]  
Save and reset device

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ESC - Back to Main Menu, TAB - Change field, ENTER - Select

Option	Description
<b>Local IP Address</b>	Enter the IP address of the RT-101
<b>Local Network Mask</b>	Enter the Net Mask
<b>Remote IP Address</b>	Enter the ISP provided IP address
<b>Remote Network Mask</b>	Enter the ISP provided Net Mask
<b>IP Broadcast Address</b>	Enter the broadcast address for your sub-network segment
<b>Default Gateway IP Address</b>	The correct IP addresses for this option varies depending on implementation. If you will using the RT-101 to connect directly with the ISP, then enter the Remote IP Address
<b>Local ID</b>	Enter the account name provided by your ISP. This name will be used to negotiate a connection with the ISP router using PPP (Point to Point Protocol) when the ISP router sends an user name authentication request
<b>Local Password</b>	Enter ISP provided password. This password will be used to negotiate a connection with the ISP's router using PPP (Point to Point Protocol) when the remote router sends a password authentication request.



Option	Description
<b>Line Type</b>	<p>Select <b>Lease Line(Null modem)</b> if you are using a lease line. When this option is enabled, the Initial String, Answer On String, Answer Off String, Hang-Up String and Dial Prefix String are disabled and RTS/CTS flow control is set. Otherwise select <b>Dial up line</b>.</p> <div data-bbox="438 489 730 568" style="border: 1px dashed black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>Dial Up Line &gt;Leased Line (Null Modem)</p> </div>
<b>Baud rate</b>	<p>This option determines the data transmission speed on the serial line. Ensure that the selected speed is supported by your modem. Below is a list of the available speeds</p> <div data-bbox="490 749 678 949" style="border: 1px dashed black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>4800 bps 9600 bps 19200 bps &gt;38400 bps 57600 bps 115.2k bps 230.4k bps</p> </div>
<b>Phone No</b>	<p>Enter the ISP provided telephone number following the conventions described in your modem user's manual.</p>

Option	Description
<b>Disconnect Link if inactive for more than N mutes:</b>	This option sets the time that a connection must remain inactive before the connection is terminated. Acceptable "N" values are 0-255 minutes with 0 having the special meaning of no time-out. If using a lease line set this value to zero.

### [Modem Settings]

Selecting the Modem Settings option will cause the following menu to appear.

```

[ Modem Settings ]

Modem AT commands:
>Initial string: AT&F&C1&D3&K3S7=60
Answer on string: ATS0=1
Answer off string: ATS0=0
Hang-Up string: ~~~~~ATH0
Dial prefix string: ATDT
    
```

Option	Description
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<b>Initial String</b>	<p>You <b>must</b> specify the following in your Initial String:</p> <ul style="list-style-type: none"> <li>• Fixed baud rate setting (disable serial data rate adjustment)</li> <li>• RTS/CTS flow control</li> <li>• DCD to track the presence of a carrier</li> <li>• DTR off to hang-up modem</li> <li>• DSR always on while modem is on (Recommended)</li> </ul> <div style="border: 2px solid black; padding: 10px; margin-top: 10px;"> <p><b>Note:</b>  <i>For a modem whose AT command set is the same as represented in Appendix D, the Initial String would look like the following:</i></p> <p style="text-align: center;"><b>AT&amp;F&amp;B1&amp;H3&amp;C1&amp;D2&amp;S0</b></p> <p><i>Consult your modem AT command set for more information on the Initial String parameters described above.</i></p> </div>
<b>Answer On String</b>	This option is reserved for future implementations.
<b>Answer Off String</b>	The Answer Off string tells the modem not to answer
<b>Hang-Up String</b>	Tells the modem to break the connection when PPP negotiation fails or when an invalid user name or password is entered
<b>Dial Prefix String</b>	Determines the dial tones and dial options to be used. For more information, refer to the ATD command in Appendix D.

## [Network Settings]

Selecting the Network Setting option will cause the following menu to appear.

```
[ Network configuration ]
Serial Port:
  >UDP checksum: Yes
  Periodic RIP: Yes
  Generate zero fill (BSD 4.2) broadcast address: No
  Use ethernet IP address and network mask: No
  IP address: 139.175.50.93
  Network mask: 255.255.255.0
Local MTU: 1500
Remotw MTU: 1500
PPP Link:
  Connect-tries: 3    Tries
  Delay between two tries: 1    Minutes
```

---

Serial Port:

>UDP checksum: Yes

Periodic RIP: Yes

Generate zero fill (BSD 4.2) broadcast address: No

Use ethernet IP address and network mask: No

IP address: 139.175.50.93

Network mask: 255.255.255.0

Local MTU: 1500

Remotw MTU: 1500

PPP Link:

Connect-tries: 3      Tries

Delay between two tries: 1      Minutes

<b>Option</b>	<b>Description</b>
---------------	--------------------

**Serial Port**

The following options allow you to set the parameters that define how the serial interface is configured for data transmission.

**UDP Checksum:**

Set this option to Yes to enable UDP Checksum. UDP Checksum provides a check on all transmission data to ensure data reliability. When the UDP Checksum function is set to No, the device ignores UDP checksum on incoming packets and uses zero checksum on out going packets.

**Periodic RIP:**

Select this option to allow the RT-101 to pass periodic RIP (routing information) packets across the WAN interface. The default setting is Yes; however, when unnecessary this increases the traffic on the WAN link. Before changing this setting ensure that the ISP router does not RIP updates.

**Generate Zero Fill (BSD 4.2)****Broadcast Address:**

This option is provided for compatibility with those networks which have early implementations based on UNIX BSD4.2. Setting this option to Yes will cause all outgoing broadcast IP addresses to be translated into Zero Fill type addresses.

**Use Ethernet IP Address and Network Mask:**

Set this option to Yes to use the

<b>Local MTU</b>	Local Maximum Transmission Unit defines the largest IP packet to be transmitted to the network by the device. The MTU affects transmission efficiency and may need to be adjusted. Valid values range from 8 to 1500 with 1500 being the default value
<b>Remote MTU</b>	Remote Maximum Transmission Unit defines the largest IP packet to be transmitted to the network by the device. The MTU affects transmission efficiency and may need to be adjusted. Valid values range from 8 to 1500 with 576 being the default value
<b>PPP Link</b>	<p>The following parameters define how often the RT-101 will attempt to establish a connection with the ISP when the first attempt fails.</p> <p><b>Connect Tries:</b>          Defines how many times the RT-101 will try to establish a connection with the ISP router. Valid entries are 0-255 with 0 having the special meaning of try until successful.</p> <p><b>Delay Between Two Tries:</b>          Specifies how much time to wait between tries to establish a connection with the ISP router. Valid entries are 0-1440 minutes(24 hours) with 0 having the special meaning of try again immediately</p>

**Save and Reset Device:**

Select this option to save the new configuration settings to the device.

The RT-101 is now configured. Proceed to *Chapter 3 for LAN Installation*.



# 3 LAN INSTALLATION

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Installing your new RT-101 in your existing Ethernet LAN is quick and easy. To install your RT-101, follow the instructions below:

**1. Choose an Installation Site**

Select a place on the network to install the Communication Server unit. Remember that you need phone jacks and power outlets near your chosen location.

**2. Connect Network Cable**

The RT-101 supports two types of network cables: Thin Ethernet (10Base-2, BNC connector) and Twisted Pair Ethernet (10Base-T, RJ-45 connector). During power up, the unit automatically detects the type of network cable and adjusts to that environment.

**10Base-2 Cabling:**

If your network uses 10Base-2 cable, insert a BNC T-connector into the RT-101's BNC port. Connect the cable to one end of the T-connector and connect the outgoing cable to the other end. If the RT-101 is at the end of the network, then cap off the other end of T-connector with a 50-ohm terminator. Also, keep in mind that the maximum effective length between the ends of a 10Base-2 network is 185 meters.

**10Base-T Cabling:**

If your network uses 10Base-T cable, insert one end of a 10Base-T cable into the RT-101's RJ-45 phone jack and the other end into the 10Base-T hub. Keep in mind that the maximum effective length from the hub to the device is 100 meters.

**Warning:** Do not attempt to connect more than one type of cable at the same time or change the network cable while the RT-101 is powered On.

### 3. Connect Modem & Phone Line

Connect the modem, using a standard serial cable, to the RT-101's serial port. Next, connect a telephone line from an RJ-11 style phone jack to the modem.

### 4. Connect Power Adapter

Connect the modem power adapter to the modem and the RT-101's power adapter to the RT-101. Power both devices On.

**Warning:** Only use the power adapter provided with the RT-101. Using a different one may cause hardware damage.

### 5. Check the LEDs

When the RT-101 is powered On, both LEDs should light, then the Error LED should go off. If the Error LED stays on, there is a hardware problem. Consult your dealer. For more information on the LEDs, refer to the *LED Status Table* in Chapter 1.

# 4 OPERATION

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Once the RT-101 has been configured and installed in your network, it is ready for use. To access the Internet, follow the steps below:

1. Consult the ISP data sheet and configure the following IP parameters on your workstation:
  - IP Address
  - Default Gateway
  - DNS (Domain Name Server)
2. Activate your Browser.
3. Enter the appropriate destination URL or IP address.



# A TROUBLESHOOTING

---

This chapter covers some common problems that may be encountered while using the RT-101 and some possible solutions to them. If you follow the suggested steps and the RT-101 still does not function properly, contact your dealer for further advice.

**Problem 1:** I configured and installed the RT-101 in the network, but I can't get it to respond.

**Solution 1:** If the configuration settings are correct, then you probably forgot to set the dip switches back to their Off positions after configuration. Power Off the RT-101 and ensure that the dip switches are in their Off positions.

**Problem 2:** Data Transmissions are very slow.

**Solution 2:** Check and ensure that the Initial String is configured to **RTS/CTS flow control**.

**Problem 3:** When I enter a URL or IP address I get a time out error.

**Solution 3:** Any number of things could be causing this. Try the following troubleshooting steps.

1. If this is first time you have used

- your browser, ensure that your workstations IP settings, including IP address, Default Gateway, and DNS are correct.
2. Ping the RT-101. Go to the DOS prompt and enter the following command:  
**Ping xxx.xxx.xxx.xxx**  
where xxx.xxx.xxx.xxx is the RT-101 IP address.
  3. If the ping command fails, consult your network administrator. The RT-101 may be powered Off.
  4. If the ping command is successful, the to ping the remote router.
  5. If the remoter router ping command fails, it may mean one of the following:
    - The ISP is overloaded
    - You have entered the wrong IP address
    - The ISP system is down.

Consult your system administrator for help.

6. If the remoter router ping is successful, then try to ping the DNS. If successful, then you should be able to access the Internet.

**Problem 4** How do I configure the RT-101 to work with the ISP (Internet Service Provider)?

---

**Solution 4:** The ISP must provide the customer with basic information concerning security and parameter settings. The data sheet below is from an ISP to a customer who has a router account and is using a dial-up line.

**Basic Information:**

User Name: Stymme  
Password: Keepquite  
Phone Number: 4567890

**Setting Parameters:**

IP address range: 202.73.93.0-255  
Router LAN IP address: 202.73.93.190  
Remote Gateway IP address: 167.94.214.254  
Remote Name: Charlie  
DNS IP address: 167.94.197.1  
Local Netmask: 255.255.255.0  
Local DNS IP address: 202.73.93.161  
Remote Netmask: 255.255.248.0

**Note:** *The information received from the ISP will vary according to the type service you buy and the type of routers used by the ISP. ISPs that use traditional routers will include an additional parameter, Router WAN IP address.*

Given the data sheet above, the RT-101 main configuration screen would look like the following:

```
>Local IP address: 202.73.93.190
Local network mask: 255.255.255.0
Remote IP address: 167.94.214.254
Remote network mask: 255.255.255.248
IP broadcast address: 203.70.212.255
Default gateway IP address: 167.94.214.254
Local ID: Stymme
Local password: *****(*)
Line type: Dial up line
Baud rate: 38400 bps
Phone number: 4567890
Disconnect link if inactive for more than 5 minutes.
[Modem settings]
[Networking settings]
Save and reset device
```

Notice that the Remote IP address and the Default Gateway IP address are the same.



# B AT COMMAND SET

## Basic AT Command Set

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Command		Description
<any key>		Terminate current connection attempt
+++		Escape sequence code, entered in data state, wait for modem to return to command state
ATA		Force answer mode on-line
ATBn		Handshake operation
	B0	Select ITU-T V.22 for 1200 bps communication
	B1	Select Bell 212A for 1200 bps communication
ATD		Dial number and options that follow
	P	Pulse dial
	T	Tone dial
	,	Pause for a specified time
	;	Return to command state after dialing
	!	Hook flash, call transfer
	W	Wait for second dial tone
	@	Wait for 5-second silence before proceeding, otherwise return O ANSWER"
	R	Reverse Dial (Originate a call in answer mode)

<b>Command</b>		<b>Description</b>
<b>ATDL</b>		Dial last number
<b>ATDSn</b>		Dial number stored in NVRAM at position <i>n</i> . n=0-9
<b>ATEn</b>		Command mode local echo of keyboard commands
	E0	Echo off
	E1	Echo on
<b>ATHn</b>		On/Off hook control
	H0	Hang up (on hook), same as ATH
	H1	Get off hook
<b>ATIn</b>		Display inquired information
	I0	Display product code
	I1	Display product information and ROM checksum
	I2	Link status report
<b>ATLn</b>		Speaker volume control. n=0-7
<b>ATMn</b>		Speaker control
	M0	Speaker always off
	M1	Speaker on until carrier is detected
	M2	Speaker always on
	M3	Speaker on after last digit dialed, off at carrier detect
<b>ATNn</b>		Ring volume control, <i>n</i> =0 disables ring function. n=0-7
<b>ATO</b>		Return to on-line state
<b>ATP</b>		Pulse dial

Command		Description
<b>ATQn</b>		Result code displayed
	Q0	Modem returns result code
	Q1	Modem does not return result code
	Q2	Return result code but quiet in answer mode (will not show in AT&Vn)
<b>ATS0=n</b>		Number of rings required before modem answers. n=0 disables auto-answer.
<b>ATSr.b=n</b>		Set bit <i>b</i> of S-register <i>r</i> to <i>n</i> . (0 or 1)
<b>ATSr.b?</b>		Inquiry bit <i>b</i> of S-register <i>r</i>
<b>ATSr=n</b>		Set S-register <i>r</i> to value <i>n</i> , where <i>n</i> is a decimal number between 0-255
<b>ATSr?</b>		Display value stored in S-register <i>r</i>
<b>ATT</b>		Tone dial
<b>ATVn</b>		Verbal/Numeric result codes
	V0	Display result codes in numeric form
	V1	Display result codes in verbose form
<b>ATXn</b>		Result code options. n=0-7
<b>ATZn</b>		Reset the modem and set power-on profile. n=0-4
	Zn	Reset modem and load user profile <i>n</i> (0-3)
	Z4	Reset modem and load factory settings
<b>AT\$</b>		Help, Basic command summary
<b>AT&amp;\$</b>		Help, Extended AT& command summary
<b>AT*\$</b>		Help, Extended AT* command summary

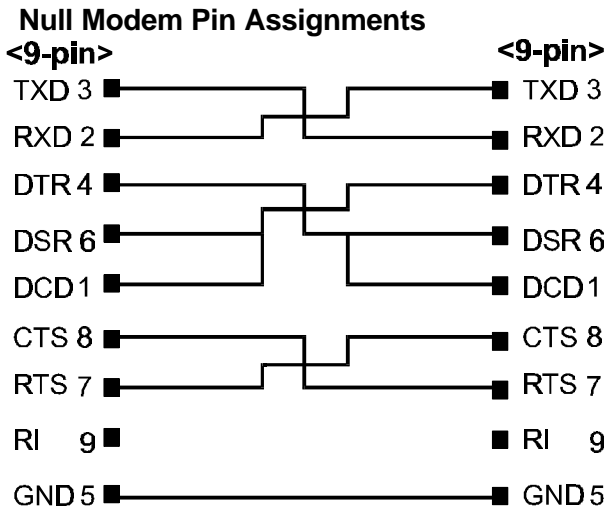
## Extended "AT&" Command Set

(Includes RTS/CTS Flow Control Commands)

Command		Description
<b>&amp;Bn</b>		Data rate, terminal-to-modem
	&B1	DTE/DCE rate fixed at DTE setting
<b>&amp;Cn</b>		Carrier Detect operations
	&C1	Carrier Detect tracks presence of carrier
<b>&amp;Dn</b>		Data Terminal Ready (DTR) operations
	&D2	DTR off causes modem to hang up
<b>&amp;F</b>		Load the default factory settings,
<b>&amp;Hn</b>		Data flow control, DTE/DCE
	&H0	Flow control disabled
	&H3	Hardware (RTS/CTS) flow control
	&H4	Software (XON/XOFF) flow control
<b>&amp;Sn</b>		Data Set Ready (DSR)
	&S0	DSR overridden, DSR always on

# C SPECIFICATIONS

<b>Model No.:</b>	RT-101
<b>CPU</b>	80186, 25MHz
<b>Dial-Out Protocol:</b>	TCP/IP
<b>Frame Type:</b>	IEEE 802.2/802.3, Ethernet II, SNAP
<b>Network Interface:</b>	Ethernet 10Base-2(BNC) and 10Base-T (UTP)
<b>Serial Port:</b>	One male DB-9 connector
<b>Max. Asyn. Speed</b>	230.4 Kbps
<b>UART</b>	16550
<b>LEDS</b>	2
<b>External Power Adapter</b>	9VDC
<b>Dimension(mm)</b>	120 x 86 x 30 (LxWxH)



**Figure C-1: Null Modem Pin Out**