



**DT-4000**  
**MULTIPLE PROTOCOL**  
**INTER-NETWORKING DEVICE**  
**USER'S MANUAL**



Build 24

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# 1 IMPORTANT SAFETY INSTRUCTIONS



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing, operating, or maintaining this equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

- ❑ Read and understand all instructions.
- ❑ Follow all warnings and instructions marked on this product.
- ❑ For information on proper mounting instructions, consult the User's Manual provided with this product.
- ❑ The telecommunications interface should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection.
- ❑ This product should only be operated from the type of power source indicated in the User's Manual.
- ❑ This unit is intended to be powered from either –48 V DC or AC voltage sources. See User's Manual before connecting to the power source.
- ❑ The –48 V DC input terminals are only provided for installations in Restricted Access Areas locations.
- ❑ Do not use this product near water, for example, in a wet basement.
- ❑ Never touch uninsulated wiring or terminals carrying direct current or leave this wiring exposed. Protect and tape wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
- ❑ To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect re-assembly can cause electric shock when the unit is subsequently used.
- ❑ For a unit intended to be powered from –48 V DC voltage sources, read and understand the following:
  - ❑ This equipment must be provided with a readily accessible disconnect device as part of the building installation.
  - ❑ Ensure that there is no exposed wire when the input power cables are connected to the unit.
  - ❑ Installation must include an independent frame ground drop to building ground. Refer to User's Manual.



This symbol is marked on the *DT-4000*, adjacent to the ground (earth) area for the connection of the ground (earth) conductor.



- ❑ This Equipment is to be Installed Only in Restricted Access Areas on Business and Customer Premises Applications in Accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. Other Installations Exempt from the Enforcement of the National Electrical Code May Be Engineered According to the Accepted Practices of the Local Telecommunications Utility.
- ❑ For a unit equipped with an AC Wall Plug-In Unit, read and understand the following:
  - ❑ Use only the K'TRON, Model KA-52A Wall Plug-In Unit shipped with this product.
  - ❑ Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
  - ❑ Do not staple or otherwise attach the power supply cord to the building surfaces.
  - ❑ Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.
  - ❑ The socket outlet shall be installed near the equipment and shall be readily accessible.
  - ❑ The Wall Plug-In unit may be equipped with a three-wire grounding type plug, a plug having a third (grounding) pin. This plug is intended to fit only into a grounding type power outlet. Do not defeat the safety purpose of the grounding type plug.
  - ❑ Do not allow anything to rest on the power cord. Do not locate this product where the cord may be abused by persons walking on it.
  - ❑ Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    - a) When the powers supply cord or plug is damaged or frayed.
    - b) If liquid has been spilled into the product.
    - c) If the product has been exposed to rain or water.
    - d) If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by qualified technician to restore the product to normal operation.
    - e) If the product has been dropped or the cabinet has been damaged.
    - f) If the product exhibits a distinct change in performance.

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## SAVE THESE INSTRUCTIONS

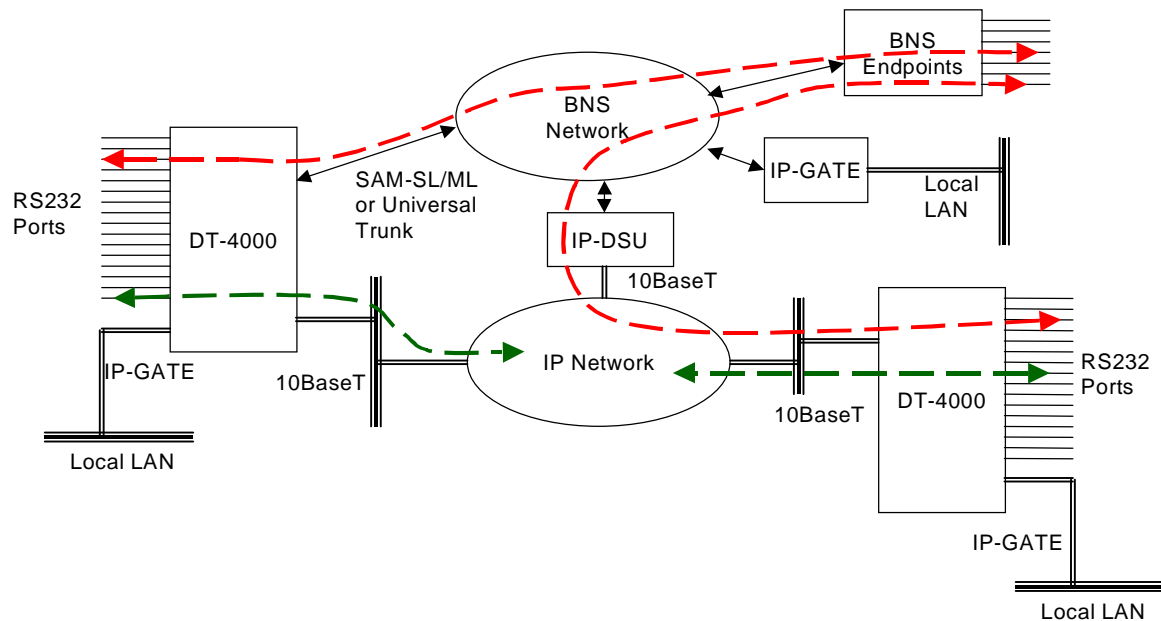


## 2 INTRODUCTION

The **DT-4000** is a Multiple Protocol Inter-Networking device, which can function as part of either a BNS<sup>1</sup> or an IP infrastructure, or access **both** infrastructures **simultaneously**. It has 16 async/sync ports supporting speeds up to 115.2 Kbps (asynchronous) or 56 Kbps (synchronous).

### 2.1 BASIC BNS AND IP NETWORKING

The **DT-4000** can be used simply as a drop-in replacement for the SAM16 in any BNS network without an IP interconnection. Conversely, it can be used in an IP network as a device interface without any BNS network connection. When the **DT-4000** is connected to **both** types of networks, **either** infrastructure may be accessed by **each** of its individual ports, since configuration is on a port-by-port basis. The following diagram demonstrates some **DT-4000** connectivity options when connected to both BNS and IP networks:



Referring to the previous diagram, the **DT-4000** on the left is connected to a node in the BNS network via a serial trunk such as the SAMSL or **Universal Trunk Module**<sup>2</sup>. This allows some of its ports (based on configuration) to communicate with endpoints in the

<sup>1</sup> Throughout this user manual the term **BNS** encompasses BNS-2000 and BNS-2000 VCS type nodes.

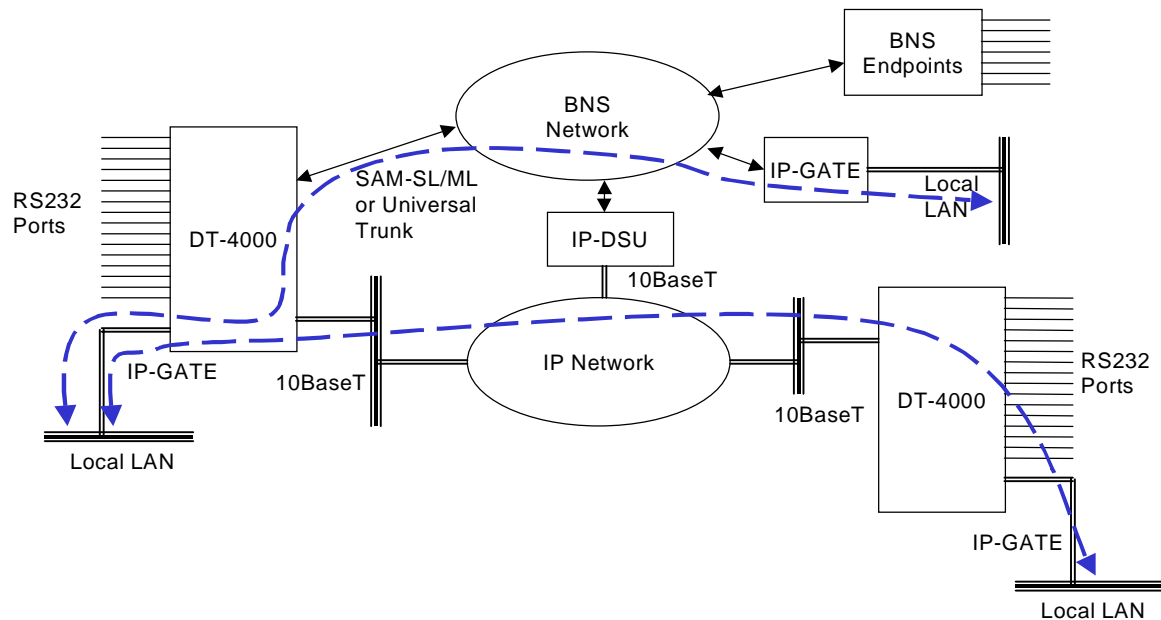
<sup>2</sup> The **Universal Trunk Module (UTM)** is a BNS module that allows the customer to employ more cost-effective interconnection facilities between nodes and other BNS product family components. Infrastructures such as IP, ATM or Frame Relay can be used rather than traditional leased-line services.



BNS network, as shown by the path indicated by the red dashed line. At the same time, other ports on the same **DT-4000** (again, based on port configuration) can communicate with IP network endpoints, via its 10BaseT interface, as shown by the green path. The **DT-4000** on the right communicates with the BNS network via emulation of a SAMSL/ML DDS trunk over the IP network, using an **IP-DSU**<sup>3</sup> co-located with a remote BNS node. This again allows some of the **DT-4000** ports to communicate with endpoints in the BNS network, as shown by the other red path. Some of these ports can also communicate with endpoints in the IP network (green path). In the case of the **DT-4000** on the right, the emulated trunk connection and standard TCP/IP communications are simultaneously taking place over the same 10BaseT interface.

## 2.2 IP-GATE PORT NETWORKING

In the next diagram, the same network is again depicted, but the use of the **IP-GATE**<sup>4</sup> port on the **DT-4000** is instead illustrated.



The **IP-GATE** port provides access to a secure and reliable virtual private network separate from the other functions of the **DT-4000**. It provides an inter-LAN networking connection over a BNS network, or over an IP network which would otherwise not be secure enough to carry this traffic. This provides complete connectivity with any remote

<sup>3</sup> The **IP-DSU** allows router networks to carry both their original traffic and BNS-2000/BNS-2000 VCS trunk traffic simultaneously. The **IP-DSU** replaces an existing, conventional DSU on each end of the circuit and eliminates the interconnecting dedicated facility.

<sup>4</sup> The **IP-GATE** is an intelligent gateway device that allows IP traffic from a LAN segment to be transported across a WAN. Its principal application is for widely-distributed high-reliability or high-security IP networking. It enables the deployment of an Ethernet segment in a remote location where there is a SAM, MPC, or node, but no IP network access.



**IP-GATE**, via a BNS network, or via an IP network where there is a **DT-2020**<sup>5</sup> + SAM + **IP-GATE** combination at the other end. Similarly, **IP-GATE** ports on two **DT-4000s** can communicate with each other over an IP network. While only one such connection is currently supported, two possible applications of the **IP-GATE** port on the left-side **DT-4000** are shown by the blue dashed lines in the above diagram.

If it is desirable to provide access to a LAN in a central site from a large number of remote sites (up to about 500), the **IP-GATE** port on the main-site **DT-4000** can be configured to interconnect with the **IP-FANOUT** application on a **DT-6061 Network Processor** located anywhere on the IP network. Please see the Datatek Solution Document *Secure and Reliable Intranet Access For Remote Sites* for a more detailed discussion of this use of the **IP-FANOUT** application on the **DT-6061**.

### 2.3 CLOSED USER GROUPS

This is an important feature for protecting sensitive endpoints in a corporate-wide network without the burden of special "security servers". **DT-4000** ports configured as BNS endpoints are affected by node administration and call control from the standpoint of Closed User Group (CUG) membership and calling security. The **DT-4000** provides a similar capability for IP networks, which restricts access between **DT-4000** ports configured for IP networking and domains or individual endpoints in the IP network. No external security systems of any kind are required. A CUG application example is presented at the end of this manual.

Closed user group security may also be applied to the **DT-4000** telnet console to prevent unauthorized access; and on the **DT-4000** SNMP interface to prevent malicious intrusion.

### 2.4 HUNT GROUPS

A Hunt Group is a set of ports arranged to receive calls to a common address. The **DT-4000** provides this capability for user ports configured to receive calls from the IP network. For BNS user ports, hunt-group membership and operation is determined by node administration and call control.

### 2.5 DNS FEATURES

The **DT-4000** can maintain a set of mnemonic host names, analogous to the */etc/hosts* file on both UNIX and Microsoft Windows platforms. This allows the **DT-4000** to perform a translation between a user-provided name and its associated IP address and TCP port number. (The use of a mnemonic name is optional, as the **DT-4000** will always accept an IP address in its numeric form.) The **DT-4000** also allows for the definition of an external Domain Name Server (DNS) to be used for mnemonic addresses not defined in the host table.

### 2.6 SIMPLEX AND DUPLEX TRUNKING

When one or more ports on a **DT-4000** are configured to be BNS endpoints, the multiplexed connection back to a BNS node is treated by the latter as a "SAM trunk". This trunk connection may utilize a dedicated TDM facility, or, when an **IP-DSU** is being

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<sup>5</sup> The **DT-2020** is a stand-alone unit, which interfaces an existing SAM to an IP network instead of a BNS network. This gives IP network access to devices connected to the SAM ports without any re-cabling.



used at the node end, it may traverse an IP network. In addition, with the use of a **UTM** in the BNS node, the trunk connection may traverse a Frame Relay or ATM network.

The **DT-4000** also has an option for fault-tolerant trunking to a BNS node with a **UTM** module, using its duplex feature. When a **DT-4000** trunk is configured as duplex, data traverses either of two different paths, depending on automatically-monitored facility status. One path uses the IP network (in this case, the **DT-4000** as well as the far-end **UTM** emulate an **IP-DSU**). The other path uses a dedicated TDM facility, Frame Relay network, or ATM network.

The **DT-4000** has an internal DSU, which can connect directly to a T1/E1 facility providing TDM, frame relay, or ATM service. It also has a serial interface, which can be configured as either RS232 or V.35 for TDM or frame relay connections. For **IP-DSU** trunking, the 10BaseT interface is used.

## 2.7 ALARM RELAY UNIT ALARM GRID INTERFACE

The **DT-4000** provides standard wiring for activation of the alarm grid should the **DT-4000** hardware encounter a fault condition. The fault conditions include a total loss of power to the **DT-4000**. The alarm grid interface may be wired for normally open or normally closed connections.

## 2.8 Peer To Peer Secure Socket Cryptography

The **DT-4000** will support peer to peer communications using secure cryptography. This is important for Internet Protocol (IP) networks where the contents of the peer session is to be protected from network *sniffer* devices. The cryptography feature is selectable on a per port basis, and both session endpoints should be set identically. The cryptography key selection is dynamic, and automatic.



### 3 PHYSICAL DESCRIPTION



#### 3.1 POWER INTERFACES

##### DC Power

Rack-mounted or operating stand-alone, the **DT-4000** accepts DC power input directly from a 48V DC power source which connects to the three position (return, -48, and ground) terminal block labeled 48V DC on the faceplate. The terminal block connectors accommodate 10 awg (American Wire Gauge) to 14 awg wire. A strain-relief clamp is available separately for DC wire stabilization.

##### AC Power

For this application, a separate AC power supply is available which plugs into a standard 115/240V AC outlet. The power supply has a six-foot cable that terminates with a barrel connector. The barrel connector plugs into the circular connector labeled 5V AC on the **DT-4000** faceplate.

#### 3.2 ALARM RELAY UNIT INTERFACE

The Alarm Relay Unit connector is a three position (Failed Open, Closed, Failed Closed) terminal block labeled ALARM on the **DT-4000** faceplate. The terminal block connectors accommodate 10-awg to 14-awg wire.

#### 3.3 CONSOLE INTERFACE

The **DT-4000** console interface is used for initial configuration, and for StarKeeper® II NMS monitoring on an on-going basis.<sup>6</sup> This interface requires a standard RJ45-terminated twisted-pair data cable. It connects as a data terminating equipment (DTE) to an asynchronous device and uses RS-232C signaling. It is configured as 9600 bps, 8 bits, no parity and one stop bit.

#### 3.4 RS-232/V.35 SERIAL TRUNK INTERFACE

Through a DB25 RS-530 connector, the **DT-4000** supports two software-selectable device interfaces (V.35 and RS232-C), used to terminate a BNS SAMSL or SAMML trunk. The male connector electrically presents a data terminal equipment (DTE) interface and supports RS-232C directly. For V.35, a standard RS-530 DB25 Female to V.35 Winchester-34 Male adapter is available.

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<sup>6</sup> The **DT-4000** also provides access to the console function through a TCP telnet connection via the standard telnet server port (port 23). This service is available only when the unit is in service.



### 3.5 10BASE-T INTERFACES

There are two 10BaseT interfaces side-by-side on the front of the unit.

#### IP WAN CONNECTION

This interface (on the right, labeled "LAN") requires a standard RJ45-terminated Category 5 twisted-pair data cable. It connects to a 10BaseT hub or router on a local LAN segment providing access to a wide-area IP-based network. This port simultaneously supports an *IP-DSU* style DDS-format trunk and TCP/IP peer -level protocols (e.g. TELNET, TCP, IP, ARP, SNMP, etc.).

#### IP-GATE PORT

This interface (on the left, labeled "GATE") requires a standard RJ45-terminated Category 5 twisted-pair data cable. It connects to a 10BaseT hub or router on a co-located LAN segment separate from the above.

### 3.6 DSU

The *DT-4000* DSU interface uses an industry-standard RJ48C connector. The option of using the interface for T1 (1.544 MHz) or E1 (2.048 MHz) is software selectable.

### 3.7 RS-232/V.35/RS-530 USER PORTS

These 16 ports support both asynchronous and synchronous protocols in either DCE or DTE modes. Configuration is selectable on a per port basis. Baud rates up to 115.2kbps are supported. Synchronous ports support NRZ & NRZI. The NRZI format supports recovered clocks for isochronous (i.e. 2 wire) operation. The V.35 and RS-530 interfaces require a DT-9116 intelligent patch panel. The RS-232 physical interface may be done via the DT-9116 intelligent patch panel, or directly from the DT-4000 RJ45 user port interface. When using the RJ45 interface, a industry standard RJ45 to DB25 adapter is utilized. This is the same adapter family used by the BNS SAM64/504. The DT-9116 intelligent patch panel provides a DB25 interface.

### 3.8 LEDs

The faceplate contains light emitting diodes (LEDs) used to report *DT-4000* activity and status.

LED Function	LED Color	LED Description
PWR	Green	Unit Power Indicator
ALARM	Red	Reset Indicator & General Failure Indicator
LNK	Green	10 Base-T Link Indicator
COL	Red	10 Base-T Collision Indicator
RX	Yellow	10 Base-T Receive Packet Indicator
TX	Yellow	10 Base-T Transmit Packet Indicator
DSU	Red	LOS Indicator



## 4 INSTALLATION

This chapter contains the steps needed to install and cable the **DT-4000**. A #2 Phillips and medium-sized flathead screwdrivers are required.

### 4.1 REQUIRED EQUIPMENT

To install either a rack-mounted or stand-alone **DT-4000**, the following items are needed:

- One **DT-4000** unit
- For AC operation, AC power supply
- For DC operation, a strain-relief clamp for wire stabilization

Cables – refer to CABLING sections 4.4 through 4.7 below to determine specific requirements for this installation. **Note: Shielded cables must be used in order to maintain compliance with EMC requirements.**

For rack-mount installations only:

- An EIA standard 19-inch or 23-inch equipment rack with internal, vertical mounting rails. Hole spacing on the vertical-mounting rail must be 1.25 inches. Use the dimension specifications to calculate how high the rack needs to be to support the required number of **DT-4000** units.
- A pair of mounting brackets for each **DT-4000**.

### 4.2 INSTALLATION FOR AC-ONLY OPERATION

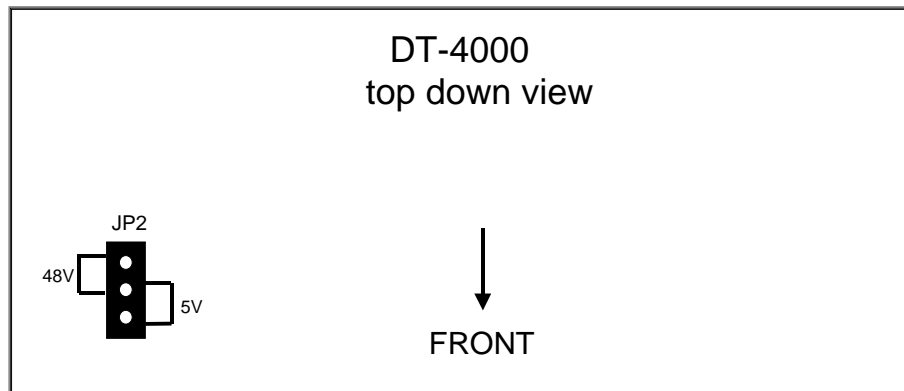
- 1) Stand-Alone: Attach the provided feet to the bottom of the unit  
Rack-Mount: Attach the mounting brackets to each side of the **DT-4000**.
- 2) Stand-Alone: Place the **DT-4000** in the desired location, such as a shelf in a data equipment rack.  
Rack-Mount: Fasten the **DT-4000** to a 19-inch equipment rack (using appropriate rack screws) or use extension ears for a 23-inch rack.
- 3) Attach data transport cables – refer to section 4.5
- 4) Attach console cable by plugging one end of an RJ45-terminated twisted-pair data cable into the **DT-4000** console interface and the other into the port of the asynchronous device that will be used to configure or manage the **DT-4000**.
- 5) Plug the power supply into a standard 115V AC outlet and the barrel connector on the power supply cable into the circular connector on the faceplate labeled 5V DC.



### 4.3 INSTALLATION FOR DC-ONLY OPERATION

The **DT-4000** is factory configured for 115V AC usage. 48V DC operation requires a different jumper setting on the **DT-4000** system board. Refer to the diagram below and perform the following steps:

1. Disconnect any power connectors from the unit.

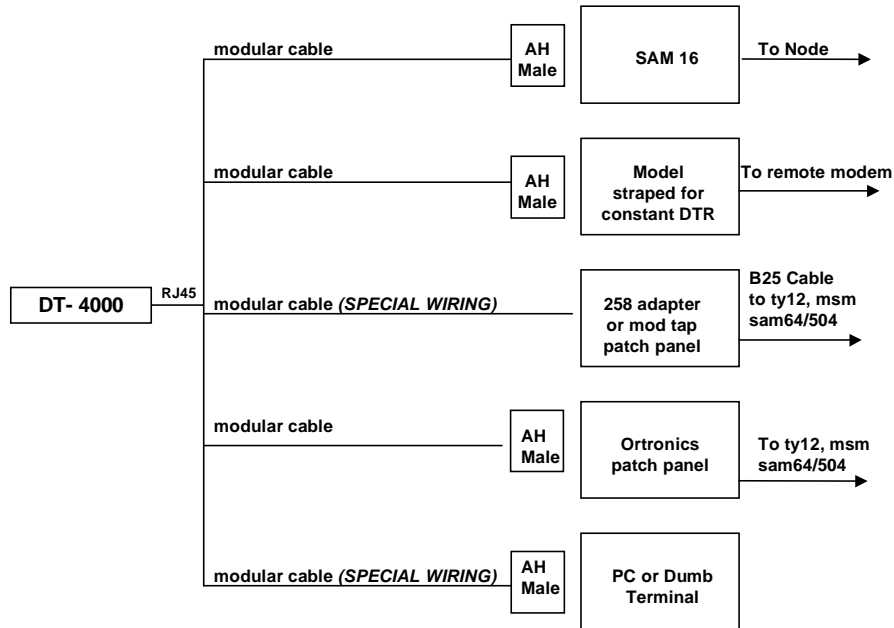


2. Remove the unit cover, exposing the top portion of the system board.
3. Locate the jumper connector (**JP2**) and move the jumper to the 48v setting
4. Replace the unit cover.
5. **Stand-Alone:** Attach the provided feet to the bottom of the unit  
**Rack-Mount:** Attach the mounting brackets to each side of the **DT-4000**.
6. **Stand-Alone:** Fasten the strain relief to the side of the **DT-4000**.  
**Rack-Mount:** Fasten the strain relief to the **DT-4000** rack-mount bracket.
7. **Stand-Alone:** Place the **DT-4000** in the desired location, such as a shelf in a data equipment rack.  
**Rack-Mount:** Fasten the **DT-4000** to a 19-inch equipment rack (using appropriate rack screws) or use extension ears for a 23-inch rack.
8. Attach data transport cables – refer to section 4.5
9. Attach console cable by plugging one end of an RJ45-terminated twisted-pair data cable into the **DT-4000** console interface and the other into the port of the asynchronous device that will be used to configure or manage the **DT-4000**.
10. Run 48V DC (return, -48, and ground) wires from a central source through the strain relief clamp for DC wire stabilization. On the **DT-4000** faceplate, attach the return, -48, and ground wires to the return, -48, and ground connections, respectively, on the terminal block labeled 48V DC.



#### 4.4 CABLING THE DT-4000 CONSOLE

This section describes the options for cabling the **DT-4000** console port, to allow the **DT-4000** to be managed by a terminal, PC, dial-up modem, or BNS asynchronous connection. The following diagram shows the connection options:



*Important!* A modular cable with “SPECIAL WIRING” can be ordered using the table below or built using the wiring diagram in Appendix I

- Configure SAM, TY12 and MSM console connections as 9600 bps with 8 bits and no parity, and use a DCE type cable.
- Configure SAM and MSM console connections as type “host” and as a “pap” (permanently active port).
- Configure TY12 console connections as type “console”.

Additional instructions for configuration of SAM, TY12 or MSM asynchronous ports may be found in the appropriate BNS module reference guide.

The following cables and adapters are available for console connections:

Cable or Adapter	Order Information (Lucent)	Order Information (Datatek Reseller)
modular cable (10')	407981646	modular cable (length)
modular cable ( <b>special wiring</b> )	408198133	modular cable ( <b>special wiring</b> )
AH male connector	ED5P055-31 G-139	AH male connector
Ortronics Patch Panel	406485755	Ortronics Patch Panel
258 Adapter	ED5P055-31 G(155)	258 Adapter



## 4.5 DATA TRANSPORT CABLING – SAM16 REPLACEMENT

This section describes the procedures for cabling a **DT-4000** being used to replace a SAM16. Existing SAM16 cabling will be reused. The new **DT-4000** will be transparent to the BNS node, so no node configuration changes will be necessary.

For a completely new **DT-4000** installation, this section should still be read first. Differences will be noted in section 4.6.

### 4.5.1 Trunking Interface

This sub-section applies to a SAM16 to **DT-4000** migration where the TDM trunk connection back to the BNS node will continue to be used. However, if IP network access is available at this SAM16 site, a better solution would be to replace the external DSU at the node end with a Datatek **IP-DSU** and use the IP network to carry the trunk traffic. This would eliminate the private-line TDM connection, and in this case the 10BaseT WAN port on the **DT-4000** would be used for trunking.

The SAM16 trunk interface was available as either an RS-232 or a V.35 interface. These interfaces were not interchangeable on the SAM16, whereas the **DT-4000** provides a single DB25 male connector that may be configured as either an RS-232 or a V.35 interface. The interface is pre-configured by the factory for RS-232 operation. Operation of the DB25 as a V.35 interface may be selected via a console command. Physical interface to the V.35 (Winchester-34) cable then requires a standard adapter (refer to the table in sec. 4.7). When using the RS-232 trunk interface these steps are needed for the SAM16 replacement:

1. From the BNS node, remove the SAM16 from service.
2. Power down the SAM16 and remove the trunk and user port cables.
3. Connect the existing RS-232 trunk cable to the serial port on the **DT-4000**.
4. Power on the **DT-4000**
5. From the BNS node, restore the "SAM16" to service.

Changing the trunk interface to V.35 is accomplished on the **DT-4000** console and can be done prior to the physical installation of the new **DT-4000** unit. When using the V.35 trunk interface these steps are needed to complete the SAM16 replacement:

1. From the BNS node, remove the SAM16 from service.
2. Power down the SAM16 and remove the trunk and user port cables.
3. Attach a **V.35 (Male)** to **DB25 (Female)** adapter (comcode 408418911) to the existing V.35 trunk cable and connect to the serial port on the **DT-4000**.
4. Power on the **DT-4000**
5. Establish a console connection to the **DT-4000** (see section 4.4)
6. Login to the **DT-4000** Console and change the physical interface option to V.35 using the **trunk** command, as follows:

```
<DT-4000> login passwd=initial ↵
<DT-4000> trunk phy=v35 ↵
<DT-4000> reboot ↵
```

7. From the BNS node, restore the "SAM16" to service.



#### 4.5.2 Asynchronous User Port Connections

The **DT-4000** has 16 RS-232C (*RJ45*) connectors presented as data terminal equipment (DTE) interfaces, in place of the DB25 connectors on the SAM16. These RJ45 connectors use the same pinouts that each port on a SAM64 or SAM504 uses. The following steps are needed for each asynchronous user port to complete the SAM16 replacement:

- **DTE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Attach a **D8AG-F** (*25-pin-F to mod socket, null modem wiring*) adapter to the DB25 cable.
  3. Connect a **D8W** (*mod plug to mod plug, straight through*) cable from the **D8AG-F** to the corresponding **DT-4000** RS-232C user port.
- **DCE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Remove the existing DCE to DCE adapter.
  3. Attach a **D8AH-F** (*25-pin-F to mod socket, straight through*) adapter to the DB25 cable.
  4. Connect a **D8W** (*mod plug to mod plug, straight through*) cable from the **D8AH-F** to the corresponding **DT-4000** RS-232C user port.

#### 4.5.3 Synchronous User Port Connections

The following steps are needed for each synchronous user port to complete the SAM16 replacement:

- **DTE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Attach a **SYNC DCE-F** (*25-pin-F to mod socket*) adapter to the DB25 cable.
  3. Connect a **D8W** (*mod plug to mod plug, straight through*) cable from the **SYNC DCE-F** adapter to the corresponding **DT-4000** RS-232C user port.
- **DCE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Remove the existing DCE to DCE adapter.
  3. Attach a **SYNC DTE-F** (*25-pin-F to mod socket*) adapter to the DB25 cable.
  4. Connect a **D8W** (*mod plug to mod plug, straight through*) cable from the **SYNC DTE-F** adapter to the corresponding **DT-4000** RS-232C user port.

### 4.6 DATA TRANSPORT CABLING – NEW INSTALLATION

#### 4.6.1 Trunking Interface

If any user ports on the new **DT-4000** will be BNS endpoints, a new SAM trunk connection to a BNS node will be required. The node will require a SAMSL, SAMML, or **UTM** to terminate this trunk. With a **UTM** in the node, the trunk may utilize a TDM, IP, Frame Relay, or ATM network for transport. With a SAMSL/SAMML-type trunk, the only options are TDM or IP (external **IP-DSU** required). In any event, the node must be administered as if a new SAM16 is being added to the network. Refer to *Data Networking Products Synchronous/Asynchronous Multiplexer Reference* for node-administration information. Cabling and any necessary configuration of the **DT-4000** will be as described in section 4.5.1.





If the new **DT-4000** is to be used exclusively for IP networking, no BNS node connectivity or configuration is required. Instead, a connection must be established between the unit's 10BaseT WAN interface and a hub or router on a local LAN segment providing access to a wide-area IP network, using a standard RJ45-terminated Category 5 twisted-pair data cable.

#### 4.6.2 User Ports

Although the **DT-4000** is configured to work like a SAM16, the pin outs on the RJ45 connectors used for the RS-232 user ports are identical to the pin outs for the SAM64 and SAM504 user ports. Thus, all adapters and cables used with these SAM types will apply to the **DT-4000**. Refer to the Cabling section of *Data Networking Products Synchronous/Asynchronous Multiplexer Reference*. In most cases, a standard RJ45-terminated Category 5 twisted-pair data cable can be used, with the appropriate adapter (depending on the gender) on the connector on the endpoint device. This applies regardless of whether ports will be used for BNS or IP service.

#### 4.7 Ordering Information

Cable or Adapter	Description	Order Information (Lucent)	Order Information (Datatek Reseller)
V.35(M) to DB25(F)	34-pin-M 25-pin-F	408418911	V.35(M) to DB25(F)
D8AG-F	25-pin-F mod socket, null modem wiring	ED5P055-31 G-138	D8AG-F
D8AH-F	25-pin-F mod socket	ED5P055-31 G-147	D8AH-F
D8W	Mod plug Mod plug, straight through, 3ft.	408421803	D8W
SYNC DCE-F	25-pin-F mod socket	ED5P055-31 G-150	SYNC DCE-F
SYNC DTE-F	25-pin-F mod socket	ED5P055-31 G-151	SYNC DTE-F



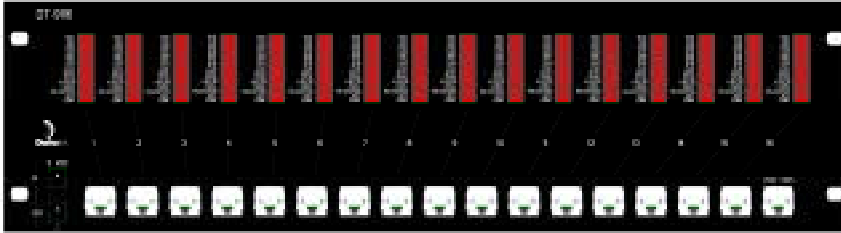


## 4.8 THE DT-9116 INTELLIGENT PATCH PANEL

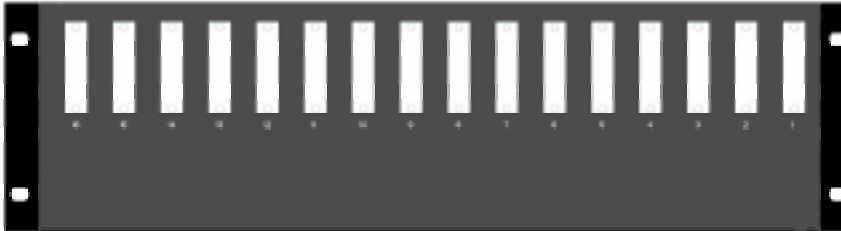
The DT-9116 Intelligent Patch Panel (IPP) is used to provide software selectable physical interfaces to the DT-4000 user ports. The DT-9116 supports RS-232, V.35, V.11, RS-530, RS-530A, X.21, RS-422, RS-449, and V.36 interfaces. The DT-9116 can operate as a DTE or a DCE on a per port basis.

The following is a diagram of the DT-9116 IPP:

**DT-9116 IPP Front View**



**DT-9116 IPP Rear View**



Please note that the DT-9116 does not have switches of any kind. All configuration information is dynamically set by the DT-4000. The DB25 interfaces are on the rear side of the panel, and the RJ45 interfaces and LED indicators are on the front side.

The DT-9116 IPP is connected to the DT-4000 on a port by port basis using a short RJ45 to RJ45 straight cable. There is no requirement to connect all of the DT-4000 ports to the DT-9116 IPP. Each port will operate independently.

The DT-9116 requires a +5V power input, and will also cascade the power to the next device. If the DT-4000 is being operated with a -48VDC power, the +5V to the DT-9116 may be parasite power from the DT-4000 +5V connector. If the DT-4000 is being operated with +5V power from an AC source, either a separate AC adapter may be used, or the power cascaded from the existing adapter through the DT-9116 to the DT-4000.

The DT-9116 DB25 ports are configured with the physical interface selected on the DT-4000 user console. The ports may operate in DTE or DCE modes. The DB25 is a female



and is a native physical DCE. For physical DTE operation, a wiring adapter (or cable) is required. The logical DTE operation is incorporated automatically by the DT-9116 IPP.

This physical DTE-DTE wiring is as follows:

Signal	DB25 Male (J1) DT-9116 End.	DB25 Male (J2) DCE Device End.
GND	1	1
SGND	7	7
TxD	2	3
	14	16
RxD	3	2
	16	14
RTS	4	5
	19	13
CTS	5	4
	13	19
DCD	8	20
	10	23
DTR	20	8
	23	10
SCTE	24	17 (also Connect to J2 – 24)
	11	9 (also Connect to J2-11)



Each DT-9116 port has 15 LED indicators. These are described as follows:

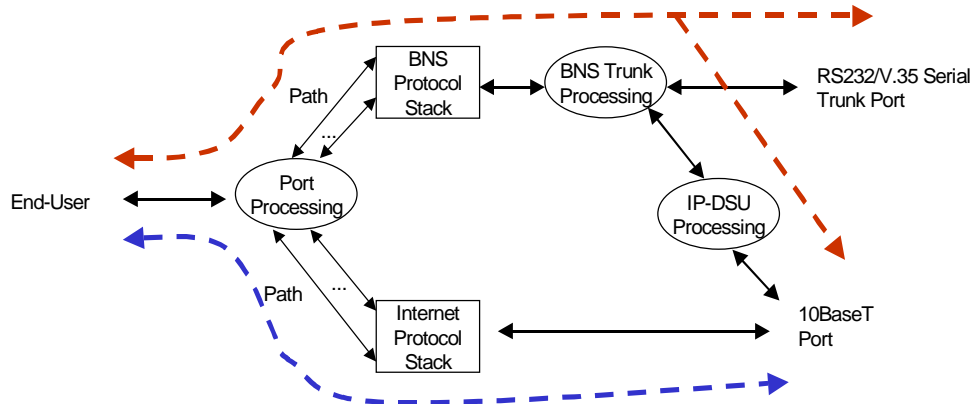
Lamp	Function
RxD	DB25 Receive Data indication.
TxD	DB25 Transmit Data indication.
DCD	DB25 Data Carrier Detect indication.
CTS	DB25 Clear to Send indication.
DSR	DB25 Data Set Ready indication.
RTS	DB25 Request to Send indication.
DTR	DB25 Data Terminal Ready indication.
CLK	DB25 RxC and TxC indication.
SCTE	DB25 External Timing indication.
SYNC	Port is operating in synchronous mode. Asynchronous mode when not illuminated.
DCE	Port is operating in logical DCE mode. Logical DTE mode selected when not illuminated.
V.11/V.35	Port is operating in V.11 or V.35 mode. RS-232 mode when both V.11/V.35 and RS-530(A) lamps are extinguished.
RS-530(A)	Port is operating in RS-530 or RS-530(A) modes. RS-232 mode when both V.11/V.35 and RS-530(A) lamps are extinguished.
Status	DT-9116 IPP port reporting status information to the DT-4000.
Configure	The DT-4000 is actively configuring the DT-9116 port.



## 5 CONFIGURATION

### 5.1 OVERVIEW

The following diagram is a functional representation of **DT-4000** operation, intended as an aid to understanding the configuration process.



In the above diagram, the red path, from “End User” through “RS232/V.35 Serial Trunk Port”, represents data flow exactly equivalent to that of a SAM, which illustrates the use of the **DT-4000** simply as a SAM16 replacement. If we now take the path through “IP-DSU Processing” to “10BaseT Port”, we have the functionality equivalent to using the SAM with an external **IP-DSU**; i.e., the private-line connection back to the BNS node has been replaced by a logical connection through the IP network.<sup>7</sup> The blue path, from “End User” to “10BaseT Port” represents a telnet over TCP/IP connection (or a transparent TCP/IP connection) from a user port on a **DT-4000** to an endpoint on the IP network, which is functionally equivalent to using a SAM with a **DT-2020**. The choice of which path user data will take is provisioned on a **per-port** basis; hence the earlier statements that the **DT-4000** can simultaneously exist in two networking infrastructures. Over time, as the entire network gradually migrates from BNS to IP, no hardware changes or reconfigurations will be required for endpoint devices; only the **DT-4000** ports would need to be re-configured.

The overall configuration process can be divided into three phases:

Base Configuration – setting up the **DT-4000** for BNS and/or IP network connectivity, console security, and other general maintenance operations such as displaying measurements and exception logs

User Port Configuration – setting up the **DT-4000** to enable connections to be established between specific user ports and endpoints on BNS and/or IP networks, performing measurements and diagnostics on user ports

**IP-GATE** port configuration, if required

<sup>7</sup> This requires that the BNS node at the other end of the connection have either a matching **IP-DSU** or **Universal Trunk Module**



Actual command sequences will be presented throughout this section to illustrate the **DT-4000** configuration process. Section 6 of this document should be used as the reference for **DT-4000** console commands.

## 5.2 BASE CONFIGURATION

This phase of the configuration process sets up the **DT-4000** for IP and/or BNS networking. These aspects of the configuration will rarely need to be changed once they are satisfactorily set up.

### 5.2.1 BNS Networking

Base configuration for BNS networking is required if any user ports will be used as BNS endpoints. The serial port or DSU port may need to be configured, depending on the type of trunk connection. Since the **DT-4000** is shipped with its serial trunk port already pre-configured for RS-232 operation, this step is only required if a different trunking option, such as serial V.35, internal DSU, **IP-DSU**, Frame Relay, or ATM, is to be used. The command sequence for setting up the serial port for use with a V.35 TDM trunk was included in sec. 4.5.1.

To set up the **DT-4000** for trunking back to a BNS node (equipped with a **UTM**) via a frame relay network, the following example command sequence could be used:

```
<DT-4000> login passwd=initial ↵
<DT-4000> trunk type=fr phy=v35 dlci=16 ↵
<DT-4000> restore mod ↵
```

In this example, the serial port is used to interface to the Frame Relay network. The access port on the **DT-4000** side of the Frame Relay network would need to be configured to use DLCI 16. (The DLCI may be different on the **UTM** side.)

To set up the **DT-4000** for trunking back to a BNS node (equipped with a **UTM**) via an ATM network, the following example command sequence could be used:

```
<DT-4000> login passwd=initial ↵
<DT-4000> dsu type=t1 prof=s0 timing=net tsrate=64 addslot=all ↵
<DT-4000> trunk type=atm phy=dsu vpi=0 vci=32 ↵
<DT-4000> restore mod ↵
```

In this example, the internal DSU is used (as required when interfacing the **DT-4000** to an ATM network), and the entire T1 bandwidth is used, as required by the ATM convergence protocol. The ATM network port connected to the **DT-4000** would have to be configured to provide a circuit with the administered VCC (VPI/VCI combination), which may be different from that presented to the **UTM**.

Note that all the above examples set up the **DT-4000** for simplex trunking. Please see the duplex trunking example.



### 5.2.2 IP Networking

For IP networking, it is necessary to configure the **DT-4000's** IP address and subnet mask, the IP address of the gateway router, the IP address of an SNMP manager (optional), and the IP address of a domain name server (optional). This will be required if at least one of the following applies:

- at least one of the 16 user ports will be used for IP
- **IP-DSU** trunking will be used to connect to a BNS node
- the **IP-GATE** port will be used
- telnet access to the console is desired

To illustrate an IP networking configuration, the following is a command sequence for a direct SAM16 replacement **DT-4000** installation using a standard **IP-DSU** connection across an IP infrastructure to a BNS node. The **DT-4000** configuration is the same regardless of whether the BNS node is using a SAMSL + external **IP-DSU** combination or a **Universal Trunk Module (UTM)**, since the same internal **IP-DSU** emulation function is used in either case. The commands used to configure the **DT-4000** would be following:

```
<DT-4000> login passwd=initial ↵
<DT-4000> trunk type=ipdsu dest=135.17.58.1 ↵
<DT-4000> local ipaddr=135.17.59.165 submask=255.255.255.0 ↵
<DT-4000> gateway ipaddr=135.17.59.1 ↵
<DT-4000> restore mod ↵
```

In addition to enabling the **IP-DSU** trunk connection, the above setup would also allow all other IP networking applications of the **DT-4000**, e.g., IP user ports, **IP-GATE** operation, telnet access to the console.

### 5.2.3 Console Security

Console-security parameters, i.e., an administrative login password and the (optional) timeout for automatic console logoff, will also be set up at this time.

## 5.3 USER PORT CONFIGURATION

### 5.3.1 BNS Networking

The **DT-4000** is shipped with all its user ports pre-configured for BNS operation, so no further configuration of the **DT-4000** is required for those user ports to be used as BNS endpoints. If the **DT-4000** is replacing a SAM16, all SAM-port configuration data on the BNS node will still be valid. Otherwise, **DT-4000** user ports must be configured via the BNS node as though they were SAM16 ports, as described in the *Data Networking Products Synchronous/Asynchronous Multiplexer Reference and Commands Reference*.

### 5.3.2 IP Originating Ports

**DT-4000** user ports designated as **originating**, using the **port** command, are used to establish connections **to** endpoints on the IP network. A predefined destination (PDD), in the form of a destination IP address and TCP port number, is required for a user port configured for a synchronous protocol. A PDD is optional for an asynchronous port.



For asynchronous ports, operation from the perspective of a user is determined by whether or not a PDD has been specified. An **originating** user port which has a PDD associated with it will have that connection automatically established when the user device goes “off hook”, i.e., signals DTR, or when the user sends the attention sequence. If no PDD has been specified, the calling user is instead greeted with a **DT-4000 Destination>** prompt. The user would then enter the destination IP address plus TCP port number desired. If no TCP port number is entered, the telnet default (23) is used. The user also has the option to enter a mnemonic host name previously administered into the **DT-4000**'s host table. The session is terminated when the calling user types the attention sequence.

If a Domain Name Server has been defined on the **DT-4000**, the calling user may also enter a fully qualified destination name (e.g. “server.ab.company.com”) to be resolved. It is also possible to override the TCP port while still resolving the IP address. For example, the dial string “server.ab.company.com 50030” selects TCP port 50030 and then asks DNS to resolve “server.ab.company.com” to an IP address.

An **originating** port optioned for one of the supported synchronous protocols should be configured as a permanently active port (PAP), and also have a PDD specified. This will cause the desired connection to be established as soon as the port is restored to service.

The following example command sequence would set up an **originating** user port that would allow the connected endpoint to “dial” other endpoints in the IP network. It will be configured for 9600 baud, 8 bits, no parity, and no PDD defined. It will default to asynchronous operation. Assume the **DT-4000** itself is already configured for IP networking, and in service.

```
<DT-4000> port 2 type=orig baud=9600 dbits=8 parity=none ↵
<DT-4000> restore port 2 ↵
```

### 5.3.3 IP Receive Ports

A **DT-4000** unit is accessible from anywhere in the IP network via a single IP address. That is the address administered on the **DT-4000** using the **local** command, as previously shown. At this address, each user port configured as **receive**, using the **port** command, “listens” on a configured TCP port for the arrival of an incoming call **from** somewhere in the IP network. Once a call is established, the telnet over TCP protocol is used for transport. A hunt group may be established, by assigning the same TCP port number to more than one **receive** user port. Ports included in a given hunt group do not need to be contiguous.

The following example command sequence would establish a hunt group of **receive** user ports to support a modem pool reachable from anywhere in the IP network. Ports #1, #9, and #13 are to be part of the hunt group, at TCP port 51000. They will be configured for 9600 baud, 8 bits, no parity, and permanently active. Assume the **DT-4000** itself is already configured for IP networking, and in service.



```
<DT-4000> port 1 type=rcv hport=51000 baud=9600 dbits=8
parity=none pap=on ↵
```

```
<DT-4000> port 9 type=rcv hport=51000 baud=9600 dbits=8
parity=none pap=on ↵
```

```
<DT-4000> port 13 type=rcv hport=51000 baud=9600 dbits=8
parity=none pap=on ↵
```

```
<DT-4000> restore port 1 ↵
```

```
<DT-4000> restore port 9 ↵
```

```
<DT-4000> restore port 13 ↵
```

### 5.3.4 IP Closed User Groups

The **DT-4000** has its own implementation of closed user groups (CUGs) to control access between its user ports and endpoints on the IP network. The **cug** command is used to create a closed user group, as a single IP address or range of addresses in a sub net. The **port** command allows up to 16 CUGs to be associated with a port. Calls being received by the DT-4000 are restricted as follows:

- A call to the TCP port number corresponding to a **receive**-type user port will be blocked unless the calling IP address belongs to at least one of the CUGs associated with the port.
- A call to the telnet console will be blocked unless the calling IP address belongs to at least one of the CUGs associated with the telnet console.
- SNMP request PDUs will be dropped unless the sending IP address belongs to at least one of the CUGs associated with the SNMP interface.

Please see the CUG example at the end of this manual for a CUG application example using the **DT-4000**.

## 5.4 IP-GATE PORT CONFIGURATION

A sequence of three commands:

```
ipgate route
ipgate path
ipgate port
```

configures the **IP-GATE** port on the **DT-4000**.

The **ipgate route** command configures the screening and routing table for the **IP-GATE** port, which specifies a set of destination IP address ranges for which packets originating on the LAN segment connected to the **IP-GATE** port should be forwarded or dropped.

The **ipgate path** command defines the physical path to be used for forwarding packets. A path can be thought of as a “private tunnel” through either a BNS network or an IP infrastructure, public or private. It is set up to either originate or receive a TCP/IP connection, specified by the combination of an IP address and TCP port number. A BNS-type path provides secure and reliable LAN inter-connection across a wide area. A path over TCP/IP is also secure, because only one TCP connection is accepted at the specified **IP-GATE** destination (unlike standard host TCP implementations), and this will be set up automatically by the **DT-4000** firmware.





The **ipgate port** command specifies the interface configuration of the **IP-GATE** port on the virtual private network formed by the interconnected LANs. It is a basic address and mask so that the interface may be pinged.



## 6 DT-4000 COMMAND REFERENCE

These commands are used to configure the operation of the *DT-4000*.

Not all commands are visible all the time. Should the unit be logged out, only the **login** command is visible. The **reboot** command places the unit in the logged-out mode.

- ❑ Commands may be entered in upper or lower case.
- ❑ Parameters of the form **name=<value>** may use upper or lower case for **name**.
- ❑ Case is preserved for values.
- ❑ Backspace erases one character.
- ❑ Changes are cumulative.

After running a configuration command (especially those with many parameters) it is always a good idea to run the corresponding **verify** command, to check for any defaulted values which may need to be overridden.

### 6.1 BASE CONFIGURATION COMMANDS

#### 6.1.1 LOGIN

**Syntax:** `login passwd=<password>` (default password is: initial)

This command is a security command required for accessing the bulk of the *DT-4000* command set. It is only available when the user is logged off the *DT-4000*. The password must contain between one and seven alphanumeric characters. The typed password is case sensitive. The login command will prompt for a password if it is not given on the command line. A password given at the prompt will not be echoed. There is a timeout of approximately 30 seconds on the password prompt.

#### 6.1.2 LOGOUT

**Syntax:** `logout`

This command returns the *DT-4000* to its logged-out mode, thus preventing unauthorized access.

#### 6.1.3 CHANGE PASSWORD

**Syntax:** `chgpass old=<password> new=<password> confirm=<password>`

This command allows the user to change a previously configured password. The old password is the one currently in effect. The new and confirm passwords should be identical. The password must contain between one and seven alphanumeric characters. Prior to build #23, the typed password is not case sensitive. In Build #23 and thereafter, the typed password is case sensitive. All arguments are required to complete the command.

#### 6.1.4 LOCAL

**Syntax:** `local [ ipaddr=<IP address> ]  
[ submask=<submask> ]  
[ tcpunreach=< ICMP | RESET > ]`

This command sets up IP networking for this unit. The **mac** (address) parameter is a fixed attribute for each unit that is set at the factory. The **ipaddr** parameter is the IP address of this unit. The **submask** parameter is the subnet mask of the LAN segment on



which this unit is located, with a default value of 255.255.255.0. The **tcpunreach** option specifies the type of operation that the DT-4000 will take when a calling party attempts to make a connection to a DT-4000 TCP port that does not exist. If the **tcpunreach** option is set to ICMP, the DT-4000 will issue an **ICMP** “Port Unreachable” message to the call originator. If the **tcpunreach** option is set to **RESET**, the DT-4000 will reset the TCP connection without sending an ICMP message. The latter option is used for security purposes where necessary.

### 6.1.5 GATEWAY

**Syntax:** `gateway ipaddr=<IP address>`

This command identifies the IP address of the local gateway router, if any. The gateway router is the first hop packets travel through to reach a remote destination address residing on a different LAN segment.

### 6.1.6 DOMAIN NAME SERVER

**Syntax:** `dns [ ipaddr=<IP address> ]  
[ name1=<Domain Name> ]  
[ name2=<Domain Name> ]  
[ name3=<Domain Name> ]`

The **dns** command is only visible when the unit is logged in. The **ipaddr** parameter is the IP address of the Domain Name Server to be used for mnemonic addresses not defined in the host table. When set to 0.0.0.0, the DNS functions on the **DT-4000** are disabled. The **name1**, **name2**, and **name3** parameters are domain names. These domain names are appended to a dial string which is not fully specified for DNS purposes. For example, a name “bender.ho.lucent.com” is fully specified, so nothing is appended by the **DT-4000**. A name such as “bender” would need to have a domain appended before the DNS server could resolve it. The **DT-4000** will append the specified domain names in the order of **name1** through **name3**, and send the resulting strings to the DNS server in succession until the latter is able to perform a resolution.

### 6.1.7 HELP

**Syntax:** `help`

This command produces a display of the entire **DT-4000** command set and syntax available for the mode (logged out or logged in) the unit is currently in.

### 6.1.8 VERSION

**Syntax:** `ver`

This command displays the current software and database revisions of the unit and is only visible when the user is logged in. The command has no arguments. If new software has been downloaded to the DT-4000 and no reboot has been performed; the new software version is also displayed.

### 6.1.9 REBOOT

**Syntax:** `reboot [newip=<New IP Address>]`

This command resets the unit, which allows configured physical attributes to take effect. The command is only visible if the user is logged in. The command has an optional argument to allow the remote alteration of the DT-4000’s IP address. If a new IP address



is required, the user is prompted for the password as a verification check before the reboot is actually executed. After the reboot, the console interface returns to the logged-out mode.

#### 6.1.10 REMOVE MODULE

**Syntax:** `remove mod`

This command is only visible when the unit is logged in. The command has no additional arguments. The command takes the unit out of service. This command must be performed before any unit-level configuration changes can occur.

#### 6.1.11 RESTORE MODULE

**Syntax:** `restore mod`

This command is only visible when the unit is logged in. The command has no additional arguments. It returns the unit to service. If any physical attribute was changed on the unit, including the MAC address, the unit will be automatically rebooted by this command.

#### 6.1.12 CLEAR

**Syntax:** `clear < meas | logs | cache >`

This command is only visible when the unit is logged in. The command has a single argument. When the argument value is **meas**, the current measurements are all set to zero. When the value is **logs**, the **IP-GATE** port exception logs are cleared. When the value is **cache**, the **IP-GATE** ARP Cache is cleared.

#### 6.1.13 DISPLAY MODULE MEASUREMENTS

**Syntax:** `dm mod`

This command is only visible when the user is logged in. It displays the current, unit-level measurements in a formatted report on the console (see for an itemization of the unit-level measurements at the end of this manual). **Port** and **IP-GATE** information is not displayed on the unit-level report.

#### 6.1.14 DISPLAY LOG

**Syntax:** `dlog`

This command displays the exception logs. The exception log provides details about the last 32 errors recorded. Not all errors generate exception entries.

#### 6.1.15 VERIFY MODULE

**Syntax:** `vfy mod`

This command is only visible when the unit is logged in. The command displays the unit-level configuration in a formatted report on the console.

#### 6.1.16 DISPLAY MODULE MEASUREMENTS

**Syntax:** `dmeas mod`

This command is only visible when the unit is logged in. It displays the common measurements, including errors, or the DT-4000. The common measurements are not



related to a specific user interface. The report is formatted on the console. There are two types of measurements, base and exception. The base measurements are always displayed. The exception measurements are only displayed when non-zero.

### 6.1.17 HOST NAME ADMINISTRATION

**Syntax:** `host <host #>[name=<host name>][ipaddr=<IP address>]  
[port=<TCP port>][del]`

The **DT-4000** supports mnemonic destination name translation for non-PDD originating user ports. These mnemonic names are translated into an IP address and TCP port during call setup. The **host** command is used to configure the translation table

The **name** field is a mnemonic for a destination up to nine characters in length. The **ipaddr** (of the host) and TCP **port** (on the host) parameters specify the translation to be performed during call setup. If the parameter **del** is used, the entry is deleted.

### 6.1.18 VERIFY HOST

**Syntax:** `vfy host`

This command is only visible when the unit is logged in. It displays host-address configuration in a formatted report on the console.

### 6.1.19 SNMP

**Syntax:** `snmp [ ipaddr= < trap mgr addr > ]  
[ port= < trap mgr port > ]  
[ CUG=<<+|-> CUG Number> ]  
[ COMM="Double Quoted String" | NONE ]  
[ SYSCONTACT="Double Quoted String" | NONE ]  
[ SYSNAME="Double Quoted String" | NONE ]  
[ SYSLOC="Double Quoted String" | NONE ]`

This command is used to configure the IP address of the SNMP trap manager. Since traps are unsolicited alarms, an agent can take the initiative to inform the manager of the occurrence of a predefined condition. Typical conditions include the cold-start or warm-start of equipment and a link-down or link-up condition.

A single and multiple SNMP managers can access the **DT-4000**. However, only one SNMP manager can be defined as the trap manager. As a result of this command, all traps will be directed to the chosen trap manager.

The **ipaddr** field defines the IP address of the SNMP manager to which the traps are to be sent.

The **port** field indicates the UDP port on that SNMP manager and defaults to the standard value of 162.

If closed user groups are to be defined on the SNMP interface, the **cug** option allows the association of individual groups defined with the **cug** command. SNMP request packets that fail the closed user group validation are discarded. Measurement on packet discard due to closed user group validation is displayed on the module measurement report (dmeas mod).



The DT-4000 allows setting of an SNMP community in addition to the *public* community. When configured, the DT-4000 will respond to SNMP manager requests in that community. The DT-4000 will always respond to a request in the *public* community. The settable SNMP community is configured with the [ **COMM="Double Quoted String" | NONE** ] option. The community may be in any case. The double quote encapsulation is not part of the community string. The settable community may be cleared by setting it to the keyword **NONE**.

The MIB-II variables sysName, sysContact, and sysLocation may be initialized from the DT-4000 non-volatile database using the **SNMP** command. These variables are volatile in that they may be over-written by an SNMP manager. However, any change made by the SNMP manager will not impact the DT-4000 non-volatile database. Setting the value to **NONE** will clear the entries in the DT-4000 non-volatile database. Each field may be of 31 characters or less. The double quote encapsulation is not part of the respective variable. Any of the variables may be cleared by setting it to the keyword **NONE**.

### 6.1.20 INSTALL (Installing Software & Resetting the Password)

**Syntax:** `install [ key=<software key> ]`

The **DT-4000** has a unique software key. The installation of the key is performed by the factory, and need only be done if the software is changed in the field.

When executed without arguments, the **install** command will display the significant information needed to manufacture the software key.

The **<software key>** is an eight-character alphanumeric which is unique to this **DT-4000**. When the **install** command is entered with the **key=<software key>** option, the general user password is reset to the original value of **initial**, and the administrative passwords are cleared. If an invalid key is entered, a MINOR alarm is generated to that effect.

The **install** command is always available regardless of whether the console is logged in or not.

### 6.1.21 CONSOLE TIMEOUT

**Syntax:** `timeout [ off | < number of seconds > ]`

The **DT-4000** console uses a three-wire interface (RD, TD, GND), and the lead state of other signals is not relevant. This would imply that the only way to change the state of the console is to explicitly log in or log out or via a reboot or reset, which forces the console to be logged out.

For users who wish the console to automatically log off after a period of inactivity, there is a console timer. The console timer defaults to the disabled condition, and may be activated by the **timeout** command. This command is only visible when the console is logged in. The **<number of seconds>** value must be between 15 and 255, inclusive.



When the **DT-4000** determines a period of inactivity of the specified time, it automatically forces the console to log off. An **INFO**-level alarm is issued at that time.

### 6.1.22 Label

**Syntax:** `label [ "Double Quoted String" | none ]`

The **label** command is used to give the command console a unique prompt. The command is visible only when logged into the UMI administrative console. If the **label** command is invoked without arguments, the current configuration of the label is displayed. If the argument to the **label** command is the word 'none', any current label is set to a null value. If the argument to the **label** command is a double quoted string, the contents of the string becomes the application console prompt label. A console label may be up to thirty one characters in length, and may contain spaces. The console label string may not contain the colon character (:).

### 6.1.23 PING

**ping** `<IP address> [ Interval Seconds ]`

The **ping** command is only visible when the unit is logged in. The command has a single required argument, the IP address that is to be pinged.

The **ping** command formats an ICMP echo request packet which is then sent to the IP Address specified. The device with that address will issue an ICMP echo reply to the request. This is required of all IP implementations by RFC 791. If a reply is received, an informational alarm is issued on the UMI console. If no reply is received, there is a timeout message that will appear for that ICMP echo request.

The ping command issues a single ICMP echo request packet and awaits a response. The response is printed, and another ICMP echo request is issued. The operation continues until the user presses *any* character. The `[ Interval Seconds ]` argument specifies the amount of time to wait in seconds between the individual ICMP echo requests.

It should be noted that some host Internet Protocol implementations issue duplicate responses to a single ICMP request. The **ping** command will suppress duplicate replies.

### 6.1.24 TraceRoute

**trte** `<IP address>`

The **trte** command is only visible when the unit is logged in. The command has a single required argument, the IP address that is to be pinged.

The **trte** command formats an ICMP echo request packet that is then sent to the IP Address specified. The valid packet "time to live" is set to an initial value of "1". If the IP address is on the local subnet, the ICMP echo will respond immediately. If the IP



address is on a different subnet, the gateway router will decrement the “time to live” upon routing the packet. When the “time to live” reaches zero, the gateway sends an ICMP “time exceeded” message to the DT-4000. The DT-4000 then displays the gateway device, and increments the “time to live” on the next ICMP echo request packet. This continues until the IP address is reached. The result is a display of all the intermediary gateway devices used to reach the IP address from the DT-4000.

If no answer is received, each “time to live” value is tried 3 times before an increment. The timeout is 5 seconds for each attempt. The maximum number of “time to live” is set to 30 in this build of the DT-4000.

Since a traceroute command can be unusually long in duration, any character sent to the console will interrupt the operation of the traceroute command.

### 6.1.25 DSU CONFIGURATION

```
Syntax: DSU [type      = < e1 | t1 > ]
          [prof       = < t1 waveform > ]
          [timing     = < int | net > ]
          [tsrate    = < 56 | 64 > ]
          [addslot   = <all | slot_no> ]
          [delslot   = <all | slot_no> ]
```

This command configures the RJ48C DSU interface for connectivity to a BNS node. It does not associate a protocol with the interface, nor does it make the interface active. The DSU must first be configured using this command, before it is made active by assigning a PHY type to the DSU (**trunk** command). The DSU may be configured in one or multiple instances of the same command (changes are cumulative).

The **type** parameter indicates what basic framing is being used. A value of **T1** is used for domestic 1.544 MHz interfaces with 193 Bit Superframes. A value of **E1** is used for European interfaces at 2.048 MHz with 256 Bit Superframes.

The **prof** parameter indicates the Transmission Waveform to be used with T1 transport. There is only one E1 transport profile, which is automatically set. The following table indicates the available waveforms for T1.

Option	Description
0DB	T1 Long Haul w/ 0 DB Attenuation.
7DB	T1 Long Haul w/ 7.5 DB Attenuation.
15DB	T1 Long Haul w/ 15 DB Attenuation.
22DB	T1 Long Haul w/ 22 DB Attenuation.
S0	T1 Short Haul @ 0-110 Feet.
S110	T1 Short Haul @ 110-220 Feet.
S220	T1 Short Haul @ 220-330 Feet.
S330	T1 Short Haul @ 330-440 Feet.
S440	T1 Short Haul @ 440-550 Feet.
S550	T1 Short Haul @ 550-660 Feet.





T0	TR62411 T1 Long Haul w/ 0 DB Attenuation.
TS0	TR62411 T1 Short Haul @ 0-110 Feet.
TS110	TR62411 T1 Short Haul @ 110-220 Feet.
TS220	TR62411 T1 Short Haul @ 220-330 Feet.
TS330	TR62411 T1 Short Haul @ 330-440 Feet.
TS440	TR62411 T1 Short Haul @ 440-550 Feet.
TS550	TR62411 T1 Short Haul @ 550-660 Feet.

The TR62411 nomenclature indicates compliance to the AT&T TR62411 ACUNET T1.5 pulse template. It is to be used for situations requiring such compliance.

The **timing** parameter indicates the timing signal to be used for transmission. A value of **INT** (internal) indicates that the **DT-4000** should generate the transmit clock internally from its precision oscillator. A value of **NET** (network) indicates that the **DT-4000** should recover the transmit clock from the receive data stream and use it for transmission. It should be noted that there may only be one master clock in the DSU interface between components, and there **must** be one master clock in that interface.

The **tsrate** parameter indicates the type of timeslot to be used. This is used for DDS and Frame Relay protocols, which may be connected to a remote channel bank at 56K instead of 64K. ATM protocol **must** have 64K timeslots.

The **addslot** parameter allows the user to map a single time slot, or all time slots defined for the DSU type, in the usage map. This allows fractional T1/E1, using from one up to the maximum number of timeslots (24 for T1, 30 for E1). Note that in E1 framing, the first and 16<sup>th</sup> (17<sup>th</sup>, counting from one) timeslots are not usable, according to the standard

The **delslot** parameter allows the user to remove a timeslot from the usage map. All of the timeslots may be removed with the **all** option.

### 6.1.26 BNS TRUNK CONFIGURATION

**Syntax:** `trunk`

```
[type      = < ipdsu | hdlc | fr | atm > ]
[phy       = < v35 | 232 | dsu > ]
[dest      = < ipaddr > ]
[encrypt   = < on | off > ]
[loop      = < on | off > ]
[dlci      = < dlci num > ]
[cir       = < open | 16K | 32K | 64K | 128K | 256K | 512K | 768K > ]
[vpi       = < vpi num > ]
[vci       = < vci num > ]
[duplex    = < on | off > ]
```

The **trunk** command configures the method of interfacing to the BNS network.

The **type** parameter indicates the base protocol to be used between interfaces. A value of **IPDSU** indicates that the trunk is to communicate to a remote entity using the **IP-DSU** base protocol. The transport protocol is automatically selected as DDS. This corresponds to a **modtype of sams1** on a **Universal Trunk**, consistent with SAM implementations. A value of **HDLC** indicates that the protocol is HDLC bit encoding. This



value is available for use on either the serial PHY or the DSU PHY. A value of **FR** indicates that the Frame Relay base protocol stack is to be used. This value is available for use on either the serial PHY or the DSU PHY. A value of **ATM** indicates that the ATM AAL5 protocol stack is to be used. This value is available for use only on the DSU PHY.

The **phy** parameter indicates the physical interface. Please note that the selection of an **IPDSU type** automatically uses the 10BaseT interface; the **phy** attribute has no effect in that case. A value of **232** for the **phy** parameter selects the Serial PHY using the RS-232 physical layer. This configuration may be used at speeds up to 64K. A value of **V35** selects the Serial PHY using the V.35 physical layer. This configuration may be used at speeds up to E1. A value of **DSU** selects the DSU interface, which was configured using the DSU command.

If the connectivity is via an **IP-DSU** compatible connection across an IP infrastructure, the **dest** parameter is set to the IP address of the remote **IP-DSU** or **Universal Trunk**. The **encrypt** option enables or disables the **IP-DSU** encryption algorithm. These need to be configured the same way on both ends of the connection.

The **loop** option is only valid with an **IP-DSU** type trunk. When set to ON, the **DT-4000** will echo all data received on a trunk back to their origin. This only applies to the **IP-DSU** trunk traffic, as opposed to any other IP packets received on the 10BaseT interface.

The **dlci** parameter allows the selection of the DLCI to be used for frame-relay transport. It is only valid when the selected **type** is **FR**. It should be noted that DLCI values 0-15 and those above 1008 are reserved for LMI, and not available.

The **cir** parameter allows the selection of the administered committed data rate on the facility. It is only valid when the selected **type** is **FR**. The **cir** value administered is used as the maximum data rate at which the **DT-4000** will send data when the facility has indicated congestion via the **BECN** flag on a received frame. Every frame received from the facility will update the congestion status that is used to make the determination whether or not the **cir** threshold is applicable. The valid values are **open** which is the default, and indicates that no restriction should be made; **16k** for 16kbps, **32k** for 32Kbps, **64K** for 64Kbps, **128K** for 128Kbps, **256K** for 256Kbps, **512K** for 512Kbps, **768K** for 768Kbps, and **1024K** for 1Mbps.

The **vpi** and **vci** parameters allow the selection of the VCC to be used for ATM AAL5 transport. They are only valid when the selected **type** is **ATM**. It should be noted that VCI values of 0-31 are reserved for specific functions under UNI 3.1 and UNI 4.0. Consequently, they are not available for use.

The **duplex** option selects the type of operation of the trunk. When **duplex** is **off**, the **DT-4000** trunk operates in **simplex** mode. That is, there is a single logical connection between the **DT-4000** and the far-end BNS trunk module. The connection can exist via an IP, FR, ATM, or TDM infrastructure. When **duplex** is **on**, there are two connections between the **DT-4000** and the far-end trunk module. The first must be an **IP-DSU** connection. The second is a non-IP connection, via either the serial port (V.35 or RS-232) or the internal DSU. Any network type, including Frame Relay and ATM, is allowed for the second connection.



In the duplex mode, a failure of either facility is alarmed, and the data is automatically switched over to the alternate facility if the in-use facility has failed. When the serial port is used, the carrier signal (DCD) is used to indicate a carrier failure from the external modem. When the internal DSU is used, a **loss of signal** is used to determine the carrier failure. Since the master clock end provides its own signal, the **loss of signal** is only noted on the recovered clock end of the DSU connection. Alarms are placed on the console to be monitored by Starkeeper.

The transport protocol defaults to 'DDS'. This is consistent with other SAM implementations and allows direct connection to a remote SAMSL, SAMML, or **Universal Trunk**. Any of these may be used with or without an **IP-DSU**.

### 6.1.27 VERIFY TRUNK

**Syntax:** `vfy trunk`

This command displays the BNS trunk configuration in a formatted report on the console.

### 6.1.28 DATA-BASE RESET

**Syntax:** `dbreset passwd=<password>`

This command returns the **DT-4000** to the default configuration set up by the factory. The password will return to the factory default of **initial**.

### 6.1.29 DISCONNECT CONSOLE

**Syntax:** `disc console`

The **disc** command is only visible when the unit is logged in. If a telnet console is connected to the **DT-4000**, the session is terminated. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error.

### 6.1.30 CLOSED USER GROUP (CUG) ADMINISTRATION

**Syntax:** `cug < cug num > [ ipaddr=< ip address > ]  
[ submask=< ip submask > ]`

The **cug** command is only visible when the unit is logged in. The **<CUG\_num>** parameter is the closed user group identifier used to assign the CUG to a user port (with the **port** command), or the console (with the **console** command). The **<CUG\_num>** may be a value between 1 and 16, inclusive.

A single IP address and subnet mask pair specifies each CUG. The **ipaddr** parameter is an address of an endpoint (or base address of a group of endpoints) to be allowed into the group. The **ipaddr** value **ANDed** with the **submask** value must agree with the caller's or destination's IP address **ANDed** with the same **submask** for a call to be allowed to or from a user port to which the CUG is assigned. Depending on the



**submask** value, this allows an individual (submask=255.255.255.255), intermediate, or network-wide level of authorization.

Setting the **ipaddr** value to 0.0.0.0 deletes any prior configuration for the **<CUG\_num>**. A **<CUG\_num>** may not be deleted if it is currently assigned to any user port.

A list of all configured CUGs is reported via the **vfy cug** command. The list of closed user groups associated with a given user port is presented in response to the **vfy port** command.

### 6.1.31 VERIFY CUG

**Syntax:** **vfy cug**

This command is only visible when the unit is logged in. It displays the configuration of all Closed User Groups.

### 6.1.32 ASSIGNING A CUG TO THE CONSOLE

**Syntax:** **console cug=<+|->< cug num >**

The **console** command is only visible when the unit is logged in. The **<CUG\_num>** parameter is the closed user group identifier as defined with the **cug** command. A prefix of **+** will add the **<CUG\_num>** to the list associated with the telnet console. A prefix of **-** will delete the **<CUG\_num>** from the list associated with the telnet console.

If the telnet console is connected at the time a closed user group is defined, the connection must be allowed in the closed user group. If the connection is not allowed, an error message is displayed and the association will not take place.

If it is desirable to disable the telnet console entirely, a closed user group consisting only of the **DT-4000** address may be assigned to the console. The net effect is to disallow any and all connections via the telnet console.

### 6.1.33 Configurable User Prompt

**Syntax:** **uprompt [ "User Prompt" | STD ]**

The **uprompt** command is only visible when the unit is logged in. The "User Prompt" is a double quoted string that is to be used on the RS-232 TCP originate ports to request a destination. The double quotes are not displayed. The default value is "DT-4000 Destination > ". The default user prompt may be set by using the **STD** option. The maximum length of the user prompt is 31 characters.

## 6.2 USER PORT COMMANDS

The User Port commands are used to configure the operation of the individual RS-232C ports on the **DT-4000**. By default, these are BNS endpoints controlled by the BNS node



to which the trunk interface is connected. They may be changed to operate as stand-alone IP network endpoints (and back to BNS again) by commands in this section.

### 6.2.1 PORT

```
Syntax: port < PortNum > [ type = < dk | orig | rcv > ]
[ dest = < ipaddr > ]
[ dport = <tcp port > ]
[ hport = <tcp port > ]
[ prot = < protocol > ]
[ dxr = < dce | dte > ]
[ clk = < norm | rcvd > ]
[ phy = < 232 | v35 | 530 > ]
[ baud = < baud rate > ]
[ enc = < nrz | nrzi > ]
[ ccar = < on | off > ]
[ pap = < on | off > ]
[ fill = < mark > | < flag > ]
[ dbits = < 5 | 6 | 7 | 8 > ]
[ parity = < even | odd | none > ]
[ stop = < 1 | 1.5 | 2 > ]
[ attn = < 1brk | 2brk | none | char > ]
[ flow = < xon | hw | none > ]
[ cug = [+ | - ] < cug num > ]
[ crfix = < trans | nonnull > ]
[ crlf = < trans | nolf > ]
[ PDDonCR = < on | off > ]
[ crypt = < on | off > ]
[ comment = "user comment" ]
[ moveto=<New Port Num> ]
[ copyto=<Port Number Range> ]
```

This command configures an individual user port. The **<PortNum>** parameter is a number in the range of 1 through 16 that corresponds to the RS-232C user port being configured.

The default port **type** is **DK** (i.e., a BNS port). In this case, all port parameters are configured on the BNS node, so nothing further is required as far as **DT-4000** configuration is concerned.

When a port uses TCP/IP for communications, it is either a port which waits for an incoming call (**type=rcv**), or an originator of a call (**type=orig**). The (optional) PDD for an **orig-type** port is defined by **dest=<ipaddr>** and **dport=<tcp\_port>**. A caller on an originating port without PDD information configured will be presented a **DT-4000 Destination>** prompt for "dialing".

A **rcv-type** user port is assigned a default TCP port number of 50000 + user port number, i.e., 50001 to 50016. The port may then be addressed uniquely at that address. However, when a specific TCP port number is specified via the **hport=<tcp\_port>** option, it is used in lieu of the default value. Multiple ports may share the same TCP port number, to define a **hunt group**. When a connection is directed to a TCP port number



associated with a **hunt group**, the **DT-4000** selects the next available physical port by round robin. The **hport** parameter only applies to **rcv-type** ports.

The **prot=<protocol>** option defines the protocol used by the port. It may take on the values of **Raw**, **Async**, **HDLC**, **SDLC**, **EBSC** (EBCDIC BiSync), **ABSC** (Ascii BiSync), **UNI** (Uniscope BiSync), **ALC** (ALC BiSync), **DDCMP**, **VIP** (VIP 7600 BiSync), or **VBA** (Variable Bit Asynchronous used for E-Telemetry). The default protocol is **Async**. The **Raw** protocol is asynchronous, without the benefit of Telnet RFC encapsulation. It is used for direct TCP connections to the user ports. Please send email to [angel@datatekcorp.com](mailto:angel@datatekcorp.com) with any other protocol requests.

The **dx=< DCE | DTE >** option specifies the clocking and signaling mode of the port. The default value is DCE.

When the protocol is asynchronous, a **dx** value of **DCE** implies that the port is operating as a modem device. It will assert CTS when presented with RTS. A value of **DTE** for the asynchronous protocol implies that the port is operating as a 2-wire DTE. When there is data available to send, it will assert RTS and wait for CTS before sending data. Please note that a four wire DTE interface should be configured as **DCE** even though it uses a DTE asynchronous connector.

When the protocol is synchronous (e.g. SDLC), a **dx** value of **DCE** implies that the **DT-4000** should generate the clock signals. This would require the standard synchronous DCE cable adapter. A **dx** value of **DTE** implies that the **DT-4000** should accept the clock signals presented on the port. This would require the standard synchronous DTE cable adapter. When the protocol uses a recovered clock instead of a separate clock lead (e.g. SDLC NRZI two wire), the **dx** value operates like the asynchronous protocol described above since external clocking is not necessary. The appropriate asynchronous adapters should be used.

The **clk=< NORM | RCVD >** option specifies the location of the clock signal. A value of **NORM** indicates that the clock signals are present on the TxC and RxC leads. This is the normal operating mode for synchronous protocols. A value of **RCVD** indicates that the clock signals are presently encoded in the data stream. This is valid for NRZI and FM encoding of the data stream for any protocol.

The **phy=<232 | V35 | 530>** option specifies the physical interface specification to be used by a DT-9116 connected to the user port. If a DT-9116 is not connected, the physical interface is RS-232. The DT-4000 automatically determines a DT-9116 connection and performs the dynamic configuration.

The **enc=<NRZ|NRZI>** option specifies the physical encoding of the line. The default is Non-Return to Zero (NRZ).

The **ccar=<ON|OFF>** field defines constant carrier. This is an option in which the CD (or DTR if the port is a DTE) EIA signal is maintained asserted regardless of call status.



The **pap=<ON|OFF>** field defines a permanently active port. The default value is OFF. Setting this flag ON means that the port is ready to communicate regardless of its DTR (or DCD if the port is a DTE) EIA signal.

The **fill=<mark|flag>** option indicates what kind of line fill should be applied between frames in the **HDLC** or **SDLC** protocols.

The **baud=<baud\_rate>** determines the speed of the line. It is not required for synchronous DTE ports since the clocking is derived from the line. For asynchronous ports, the allowed values are 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 48000, 57600, 67200, 76800, and 115200. For synchronous DCE ports, the same rates apply up to and including 57600 (56K) baud. The default value is 9600. A special value "dt9001" (without quotes) should be entered if the port is being used to connect to a **DT-9001**.

The **dbits=<5|6|7|8>** option specifies the number of data bits in an asynchronous word. It excludes start, stop, and parity bits.

The **parity=<even|odd|none>** option specifies the parity of an asynchronous word.

The **stop=<1|1.5|2>** option determines the number of stop bits for asynchronous ports.

The **attn=<1BRK|2BRK|NONE|char>** sets the attention character. This is a character that when typed will interrupt the local session. The **1BRK** option specifies a single break. The **2BRK** option specifies two breaks within a short period. The **NONE** option specifies that no attention character is defined. Finally, any ascii character may be used as the attention. It should be entered in decimal ASCII representation.

The **flow=<XON|HW|none>** option determines the flow control for the port. The **XON** option uses XON/XOFF in-band flow control characters. The **HW** option uses the CTS and RTS leads for flow control. Finally, flow control may be disabled by indicating **none**.

The **cug=[+|-]<CUG\_num>** option allows the inclusion or deletion of a Closed User Group in the list of CUGs assigned to the user port. The "+" will add the **<CUG\_num>** to the CUG list. The "-" is used to delete the **<CUG\_num>** from the list.

The **crfix=< TRANS | NONULL >** option accommodates an anomaly in some early variants of telnet implementation on UNIX systems, which insert a NULL character in the data stream after a carriage return. Most end devices are not affected by this NULL character. However, some devices (e.g. the BNS control computer) have erroneous operation if these characters are received. The value **TRANS** indicates transparent operation, where all data received by the **DT-4000**, including a NULL after a carriage return, is forwarded to the end device. The value of **NONULL** removes a NULL character immediately following a carriage return. No other NULL characters are affected. The default operation is transparent, and the **crfix** option may only be specified if the protocol selected is asynchronous.

The **crlf=< TRANS | NOLF >** option is used to strip LF (line-feed) after CR (carriage return) in the asynchronous protocol.





The **PDDonCR=< ON | OFF >** option is used in conjunction with the **DEST**, and **DPORT** options to define a permanent destination which is not automatically dialed. The DT-4000 will display a message that the user should enter a "carriage return". Once entered, the permanent destination is defined. This option is used for a secure connection via a network security server. Please note that making the port permanently active with the **PAP** command will over-ride this feature.

The **crypt=< ON | OFF >** option is used to select peer to peer secure cryptography of the session. Both session endpoints should be set identically. When the feature is set **OFF**, there is no cryptography on the session. When the feature is set **ON**, a peer to peer session cryptography is used. The key selection is dynamic, and automatically performed by the **DT-4000**.

The **comment="User Comment"** option allows the administrator to post a note related to the user port. The string is double quoted, and may have any length up to sixteen characters between the quotes. Per Port comments can be changed even if the user ports are "in service".

The **moveto=<New Port Number>** option allows the administrator to move this configured port to another port number without re-entering the configuration. The original port number configuration is then deleted.

The **copyto=<Port Number Range>** option allows the administrator to replicate this port exactly on other ports. The **<Port Number Range>** may cross the port being replicated.

### 6.2.2 REMOVE PORT

**Syntax: remove port < portnum > < all > < range >**

This command is only visible when the unit is logged in. The command takes a user port out of service, and must be performed before any port-level configuration changes can occur. The **<PortNum>** parameter may be a number in the range 1 through 16. The **<all>** parameter removes all 16 ports. The **<range>** parameter removes a sequential range of ports between 1 and 16.

### 6.2.3 RESTORE PORT

**Syntax: restore port < portnum > < all > < range >**

This command, only visible when the unit is logged in, returns a user port to service. The **<PortNum>** parameter may be a number in the range of 1 through 16. The **<all>** parameter restores all 16 ports. The **<range>** parameter restores a sequential range of ports between 1 and 16.

### 6.2.4 DISPLAY PORT MEASUREMENTS

**Syntax: dmeas port < portnum | all | range >**





The **dmeas (dm) port** command is only visible when the unit is logged in. It displays the current port-level measurements for the RS-232C port specified by **<portnum>**, in a formatted report on the console. The **<portnum>** parameter may be a number in the range 1 through 16. The **<all>** parameter will display the measurements on all 16 ports. The **<range>** parameter will display the port measurements on a sequential range of ports between 1 and 16.

### 6.2.5 VERIFY PORT

**Syntax:** `vfy port < portnum | all | range >`

This command is only visible when the unit is logged in. It displays the configuration of the port number specified. The **<PortNum>** parameter may be a number in the range 1 through 16. The **<all>** parameter will verify all 16 ports. The **<range>** parameter will verify a sequential range of ports between 1 and 16.

### 6.2.6 DISPLAY PORT STATUS

**Syntax:** `dstat port < < portnum > | < all > | < range > >`

This command is only visible when the unit is logged in. It displays the status of the port number specified. The **<PortNum>** parameter may be a number in the range 1 through 16. The **<all>** parameter will display the status of all 16 ports. The **<range>** parameter is in the form of "start-end", and will display the status of the ports in that sequential range inclusive.

### 6.2.7 DISPLAY CONNECTIONS

**Syntax:** `dconn`

The **dconn** command is only visible when the unit is logged in. The command displays the connections between user ports and their destinations. The service state of all ports currently 'In Service' are displayed. Ports which are under the direction of the Datakit network node control complex are displayed as "Datakit Controlled".

### 6.2.8 DIAGNOSE USER PORT

**Syntax:** `diag port < portnum > < int | ext | all >`

The **diagnose (diag)** command is only visible when the unit is logged in. The command accepts arguments to specify a user port on which to perform diagnostics. Two types of diagnostics are available. The internal port diagnostic checks the operation of the hardware exclusive of the cabling, connectors, and drivers. The external port diagnostic checks the operation of everything, including the attached cable. The port **must** be out of service to diagnose.

The **<port\_num>** parameter specifies the RS-232C user port, in the range of 1 through 16, inclusive. The diagnostic type is either **INT** for the internal test, **EXT** for the external test, or **ALL** for both the internal and external tests.

### 6.2.9 DISCONNECT USER PORT

**Syntax:** `disc port < portnum >`



The **disc** command is only visible when the unit is logged in. The value of **<Port\_num>** is between 1 and 16, inclusive. If an IP stand-alone port is in service, any existing circuit established via the port will be dropped. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error. It is essentially equivalent to the **remove port + restore port** command sequence.

### 6.3 IP-GATE PORT COMMANDS

These commands are used to configure the operation of the single **IP-GATE** port on the **DT-4000**. There are two basic objects to be configured. The first, the screening/routing table, determines which packets will be directed to the outgoing path. The second is the specification of the path across the BNS or IP infrastructure to either a stand-alone **IP-GATE**, the **IP-GATE** port on another **DT-4000**, or a **DT-6061 Network Processor** running **IP-FANOUT**. Although the command structure has been designed to accommodate multiple paths, only a single path ( i.e. **idx=0** ) is supported at the present time.

#### 6.3.1 IPGATE ROUTE

```
Syntax: ipgate route < idx = k > [ addr = < ipaddr > ]
      [ mask = < submask > ]
      [ path = < path_idx > ]
      [ act = < rte | drop | del> ]
```

The **ipgate route** command builds the screening and routing table for the **IP-GATE** port. This table may have up to 8 entries, indexed 0-7 by the **idx** parameter. Each entry is for a range of IP addresses (specified by the **addr** and **mask** parameters), and an action to perform (specified by the **act** parameter) if the packet's destination address falls into this range. These entries have **precedence**, i.e., entry 0 is evaluated before entry 1, etc., as each outgoing packet is inspected, and the indicated action is immediately performed when a match is found. If a match occurs on an entry for which **act=RTE**, the packet is routed. If **act=DROP**, the packet is explicitly dropped. If no entry in the table matches the packet's destination IP address, the packet is dropped and an exception is logged. Setting the **act** parameter to **DEL** deletes the entry.

Since only one path is available, the **path** parameter has a default value of 0, and should be left that way for correct operation.

For some example route-table configurations, please refer to the **IP-GATE User Manual**.

#### 6.3.2 IPGATE PATH

```
Syntax: ipgate path <idx=k> [type=<DK|ORIG|RCV|DIRECT|NONE>]
      [ipaddr=<ip_addr>]
      [dport=<TCP Port>]
      [hport=<TCP Port>]
```

The **ipgate path** command configures a BNS circuit, a point to point direct path, or a private tunnel through the IP infrastructure.

The **idx** parameter must take on the value of **0**.

When **type=DK**, the path traverses the BNS network. Its circuit setup information is administered on the BNS node.



When **type=DIRECT**, the path is a point to point direct pathway over the selected trunk type. This option is used to configure point-to-point networking utilizing a DT-4000 at each end. By using the internal DSU, no other equipment is required. The **DIRECT** option may also use the serial trunk connection (either RS-232 or V.35). Further, a network transport such as ATM or Frame Relay is allowed. When using Frame Relay, DLCI 1007 is utilized for this purpose. An ATM connection will share the VCC specified in the trunk command.

When **type=ORIG**, the **IP-GATE** port will be the originator of a TCP/IP circuit via the IP infrastructure. In this case, the **ipaddr** and **dport** parameters represent the remote end of the tunnel.

When **type=RCV**, the **IP-GATE** port will wait for the arrival of a TCP/IP connection request. In this case, **hport** specifies the TCP port to be used by the remote end to originate the path (using the IP address of the **DT-4000** unit).

A **type** of **NONE** indicates that the path is not usable.

### 6.3.3 IP-GATE PORT

```
Syntax: IPGATE PORT [addr=<ipaddr>]
          [mask=<submask>]
          [gateway=<ipaddr>]
          [comment="User Comment"]
```

The **ipgate port** command configures the **IP-GATE** port as an endpoint on the virtual private network formed by the path between two LAN segments. It specifies a private IP address (**addr**) and sub-net **mask** used only to allow the **IP-GATE** port to be "pinged" for diagnostic purposes.

The **gateway** parameter specifies the address of the gateway router (if any) on the LAN segment to which the **IP-GATE** port is connected.

The **comment** field may be up to sixteen characters between the quotes. The comment can be changed even if the user is "in service"

### 6.3.4 REMOVE IP-GATE

```
Syntax: remove ipgate
```

The **remove** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it takes the **IP-GATE** port out of service. This command must be performed before any **IP-GATE** port-level configuration changes can occur.

### 6.3.5 RESTORE IP-GATE

```
Syntax: restore ipgate
```

The **restore** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it returns the **IP-GATE** port to service.

### 6.3.6 VERIFY IP-GATE

```
Syntax: vfy ipgate
```



The **vfy** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it displays the configuration of the **IP-GATE** port in a formatted report on the console.

### 6.3.7 DISPLAY IP-GATE STATUS

**Syntax:** `dstat ipgate`

This command is only visible when the unit is logged in. It displays the current status of the **IP-GATE** port in a formatted report on the console.

### 6.3.8 DMEAS IP-GATE

**Syntax:** `dm ipgate`

The **dm** command is only visible when the unit is logged in. When using an argument of **ipgate**, the command displays the current **IP-GATE** port measurements in a formatted report on the console.

### 6.3.9 DISCONNECT IP-GATE

**Syntax:** `disc ipgate`

The **disc ipgate** command is only visible when the unit is logged in. If the **IP-GATE** port is in service with a TCP/IP type path, the existing connection will be dropped. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error. It is essentially equivalent to the **remove + restore** command sequence.

### 6.3.10 DISPLAY IP-GATE ARP CACHE

**Syntax:** `dcache`

The **dcache** command is only visible when the unit is logged in. The command has no arguments.

The **dcache** command formats a report of the current contents of the **IP-GATE** ARP cache. The **IP-GATE** ARP cache is dynamically assembled during the operation of the **IP-GATE** port. The **IP-GATE** ARP cache may be cleared by using the **clear cache** command. If the ARP cache is cleared, it will be re-assembled by the **IP-GATE** using traffic present on the **IP-GATE** port.

## 7 FIELD SOFTWARE UPGRADE

A Field Software upgrade of the **DT-4000** is a two-step process consisting of a software download to the unit's memory followed by a restart of the unit to activate the new software. The download can be accomplished through either of two different console interfaces on the **DT-4000**: Telnet or RS-232C.

*Specific upgrade instructions are made available with all software updates.*

### 7.1 TELNET UPGRADE

Using an industry-standard Telnet application, you can download to the **DT-4000** while it is in service and transporting data. Following the download, a **DT-4000** reboot activates the new software without affecting established calls. Until the reboot is requested, the "staged" software version is also displayed in the output of the **version** command.

### 7.2 RS-232C CONSOLE PORT UPGRADE

The **DT-4000** may also be upgraded through its RS-232C console port. This is done either remotely from a StarKeeper® II NMS, or locally from a PC. When upgrading via the RS-232C console port, the **DT-4000** needs to be taken **out of service** for the software download portion of the upgrade. Following the download, a **DT-4000** restore module performs a reboot that activates the new software. Until the reboot is requested, the "staged" software version is also displayed in the output of the **version** command.



## 8 SNMP

The **DT-4000** SNMP V1 agent supports a multitude of SNMP MIB variables, SNMP Traps, and Set and Get operations.

### 8.1 SNMP Version 1 Commands

Command	Operational Result
Get	Requests the values of one or more Management Information Base (MIB) variables.
GetNext	Enables MIB variables to be read sequentially, one variable at a time.
Set	Permits one or more MIB values to be updated.
GetResponse	Used to respond to a Get, GetNext, or Set.
Trap	Indicates the occurrence of a predefined condition.

### 8.2 DT-4000 SNMP MIB Variable Database

RO = Read-Only Variable

R/W = Read/Write Variable

SIV = Storage is Volatile

MIB Variable Number	Name	MIB	Console Equivalent	Access	Notes
1.3.6.1.2.1.1.1.0	SysDescr	MIB-II	Banner Message	RO	
1.3.6.1.2.1.1.2.0	SysObjectID	MIB-II	None	RO	
1.3.6.1.2.1.1.3.0	SysUpTime	MIB-II	None	RO	
1.3.6.1.2.1.1.4.0	SysContact	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.5.0	SysName	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.6.0	SysLocation	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.7.0	SysServices	MIB-II	None	RO	
1.3.6.1.2.1.4.1.0	IpForwarding	MIB-II	None	RO	
1.3.6.1.2.1.4.2.0	IpDefaultTTL	MIB-II	None	RO	
1.3.6.1.2.1.4.3.0	IpInReceives	MIB-II	Number of Ethernet Pkts Rcvd	RO	
1.3.6.1.2.1.4.4.0	IpInHdrErrors	MIB-II	Nbr of Packets w/Header Errs	RO	
1.3.6.1.2.1.4.5.0	IpInAddrErrors	MIB-II	Nbr Rx Packets w/Wrong Addr	RO	
1.3.6.1.2.1.4.6.0	IpForwDatagrams	MIB-II	None	RO	
1.3.6.1.2.1.4.7.0	IpInUnknownProtos	MIB-II	Nbr of Packets w/Unk Protocol	RO	
1.3.6.1.2.1.4.8.0	IpInDiscards	MIB-II	Nbr of Packets Disc due to Resource	RO	
1.3.6.1.2.1.4.9.0	IpInDelivers	MIB-II	Inferred from DMEAS counters	RO	
1.3.6.1.2.1.4.10.0	IpOutRequests	MIB-II	Number of Device Frames Transmitted	RO	
1.3.6.1.2.1.4.11.0	IpOutDiscards	MIB-II	Nbr of Port frames Disc due to Resource	RO	
1.3.6.1.2.1.4.12.0	IpOutNoRoutes	MIB-II	None	RO	
1.3.6.1.2.1.4.13.0	IpReasmTimeout	MIB-II	None	RO	



1.3.6.1.2.1.4.14.0	IpReasmReqds	MIB-II	None	RO	
1.3.6.1.2.1.4.15.0	IpReasmOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.16.0	IpReasmFails	MIB-II	None	RO	
1.3.6.1.2.1.4.17.0	IpFragOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.18.0	IpFragFails	MIB-II	None	RO	
1.3.6.1.2.1.4.19.0	IpFragCreates	MIB-II	None	RO	
1.3.6.1.2.1.4.21.0	IpRoutingDiscards	MIB-II	None	RO	
1.3.6.1.2.1.5.1.0	IcmpInMsgs	MIB-II	None	RO	
1.3.6.1.2.1.5.2.0	IcmpInErrors	MIB-II	ICMP Errors	RO	
1.3.6.1.2.1.5.3.0	IcmpInDestUnreach	MIB-II	None	RO	
1.3.6.1.2.1.5.8.0	IcmpInEchos	MIB-II	Nbr of Pings	RO	
1.3.6.1.2.1.5.9.0	IcmpInEchoReps	MIB-II	None	RO	
1.3.6.1.2.1.6.1.0	TcpRtoAlgorithm	MIB-II	None	RO	
1.3.6.1.2.1.6.2.0	TcpRtoMin	MIB-II	None	RO	
1.3.6.1.2.1.6.3.0	TcpRtoMax	MIB-II	None	RO	
1.3.6.1.2.1.6.4.0	TcpMaxConn	MIB-II	None	RO	
1.3.6.1.2.1.6.5.0	TcpActiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.6.0	TcpPassiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.7.0	TcpAttemptFails	MIB-II	None	RO	
1.3.6.1.2.1.6.8.0	TcpEstabResets	MIB-II	None	RO	
1.3.6.1.2.1.6.9.0	TcpCurrEstab	MIB-II	None	RO	
1.3.6.1.2.1.6.10.0	TcpInSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.11.0	TcpOutSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.12.0	TcpRetransSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.13.X	TcpConnTable Entries	MIB-II	None	RO	
1.3.6.1.2.1.6.14.0	TcpInErrs	MIB-II	None	RO	
1.3.6.1.2.1.6.15.0	TcpOutRsts	MIB-II	None	RO	
1.3.6.1.2.1.7.1.0	UdpInDatagrams	MIB-II	Derived from other Counts.	RO	
1.3.6.1.2.1.7.2.0	UdpNoPorts	MIB-II	Non-Peer and Spurious UDP errors	RO	
1.3.6.1.2.1.7.3.0	UdpInErrors	MIB-II	Frame Errors	RO	
1.3.6.1.2.1.7.4.0	UdpOutDatagrams	MIB-II	Frames Sent, Keep Alive Messages sent, etc.	RO	
1.3.6.1.2.1.7.5.X	udpEntry Table	MIB-II	None	RO	
1.3.6.1.2.1.11.1.0	SnmpInPkts	MIB-II	None	RO	
1.3.6.1.2.1.11.3.0	SnmpInBadVersions	MIB-II	None	RO	
1.3.6.1.2.1.11.4.0	SnmpInBadCommunityNames	MIB-II	None	RO	
1.3.6.1.2.1.11.5.0	SnmpInBadCommunityUses	MIB-II	None	RO	
1.3.6.1.2.1.11.6.0	SnmpInASNPars	MIB-II	None	RO	



	eErrs				
1.3.6.1.2.1.11.30.0	SnmpEnableAuthenTraps	MIB-II	None	R/W	SIV
1.3.6.1.2.1.11.31.0	SnmpSilentDrops	MIB-II	None	RO	
1.3.6.1.2.1.11.32.0	SnmpProxyDrops	MIB-II	None	RO	

### 8.3 Supported Traps

Alarm Text	Severity	Trap Type	Notes
None	N/A	ColdStart	Generated when the unit starts up
Lost Connectivity to Peer DT-4000	Minor	LinkDown	Generated when Peer Connectivity is lost; DCD & CTS is dropped
Peer Connectivity Established	Info	LinkUp	Generated when Peer Connectivity is established; DCD & CTS is asserted
None	N/A	AuthFail	SNMP Authorization Failure





## 9 ALARMS

The following table lists alarm types generated by the *DT-4000*. Alarms are visible at the console and via StarKeeper® II NMS.

Alarm	Severity
Tx Error on 10BaseT. Check Physical Connection.	MAJOR
Insufficient Buffers for FRAME RELAY LMI Status Report.	MAJOR
Lost Connectivity to Peer IP-DSU.	MINOR
Peer Connectivity Established.	INFO
User Requested Reboot in Progress	INFO
Invalid Login Attempt.	MINOR
Invalid Password Change Attempt.	MINOR
Gateway Connectivity Established.	INFO
SNMP Trap Manager not reachable (ICMP).	INFO
ICMP Destination Unreachable Msg Received.	MINOR
Tx Error on Serial Trunk	MAJOR
Over-Temperature Condition Detected.	MAJOR
Over-Temperature Condition Cleared.	INFO
High Temperature Condition Detected.	MINOR
High Temperature Condition Cleared.	INFO
DB contains an Invalid Datakit Trunk Configuration.	MAJOR
Port XXX received a call from XXX.XXX.XXX.XXX outside CUG list.	MINOR
Serial Number is not valid. Module defective.	MAJOR
ATM Receiver never Synchronized.	INFO
Secondary connection via DSU Failure.	MINOR
Secondary connection via DSU restored.	INFO
Secondary connection via Serial Port Failed.	MINOR
Secondary connection via Serial Port restored.	INFO
Console session in-activity timeout.	INFO
Password Reset Attempt Failed.	MINOR
User Port XX disconnected. Half Open TCP error.	INFO
Gate Path XX disconnected. Half Open TCP error.	INFO
Duplicate IP address @ MAC XXX.XXX.XXX.XXX.XXX.XXX	MAJOR

### 9.1 Major Alarms

A major alarm indicates a serious, service-degrading condition.

### 9.2 Minor Alarms

A minor alarm indicates a secondary or transient error that is not likely to affect overall service unless multiple minor alarms are issued. In this case, a serious condition exists that may affect overall system performance.

### 9.3 Info Alarms

An information alarm is a message that does not necessarily require attention. It typically is important for network administration, but does not adversely affect service.



## 10 MODULE MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **mod** option. These are unit-level measurements. The base measurements are always displayed; the error and exception counters are only displayed if nonzero.

Interface	Type	Protocol	Description
10BaseT	Base	All	Number of 10BaseT Packets Received
10BaseT	Base	All	Number of 10BaseT Packets Transmitted.
10BaseT	Except	All	Number of ICMP Echo Requests Received.
V.35, RS-232, DSU	Except	HDLC, FR	Number of Serial Trunk Frames Received.
V.35,RS-232, DSU	Except	HDLC, FR	Number of Serial Trunk Frames Transmitted.
DSU	Except	ATM	Number of ATM AAL5 Trunk Frames Received.
DSU	Except	ATM	Number of ATM AAL5 Trunk Frames Transmitted.
10BaseT	Error	All	Number of Ethernet Discards (Resource).
10BaseT	Error	All	Number of Late Collisions ( TX).
10BaseT	Error	All	Number of Under-run. ( TX).
10BaseT	Error	All	Number of packets which exceeded the Retry Limit ( TX ).
10BaseT	Error	All	Number of Carrier Sense Lost ( TX ).
10BaseT	Error	All	Number of Frame Collisions (RX).
10BaseT	Error	All	Number of Receiver Overruns (RX).
10BaseT	Error	All	Number of Receive CRC Errors. (RX).
10BaseT	Error	All	Number of Short Frame Errors. (RX).
10BaseT	Error	All	Number of Non-Aligned Frame Error. (RX).
10BaseT	Error	All	Number of Frame Length Violations. (RX).
10BaseT	Error	All	Number of Unsupported Protocol Frames. (RX).
10BaseT	Error	All	Number of Invalid UDP frames. (RX).
10BaseT	Error	All	Number of Rx Frames w/IP Header Checksum Errors. (RX).
10BaseT	Error	All	Number of Rx Frames w/ICMP Checksum Errors. (RX).
10BaseT	Error	All	Number of ICMP Unreachable Destination Messages (RX).
10BaseT	Error	IP-DSU	Number of Rx Frames from Non-Peer Entity.
10BaseT	Error	All	Number of Unknown ICMP Messages. (RX).
10BaseT	Error	IP-DSU	Number of Packets lost from TTL Network Error. (RX).
10BaseT	Error	All	Number of Packets with wrong IP Destination Address (RX).
10BaseT	Error	All	Number of Rx Packets with Unknown ARP Operations. (RX).
10BaseT	Error	All	Number of Bad ARP Reply Packets Received.
10BaseT	Error	All	Number of RFC894 Packets with an Unknown protocol type field. (RX).
10BaseT	Error	All	Number of 802.3 Frames with an Unknown protocol type field. (RX).
10BaseT	Error	SNMP	Number of SNMP Packets Received outside CUG (RX).
RS-232,V.35, DSU	Error	HDLC, FR	Number of Frames aborted by CTS lost (TX).
RS-232,V.35, DSU	Error	HDLC, FR	Number of Frames Under-Run. (TX).
RS-232,V.35, DSU	Error	HDLC, FR	Number of Rx Frames Over-Run.
RS-232,V.35, DSU	Error	HDLC, FR	Number of Rx Frames with CRC Errors.
RS-232,V.35, DSU	Error	HDLC, FR	Number of Non-Aligned Frame Errors (RX).
RS-232,V.35, DSU	Error	HDLC, FR	Number of Frame Length Violations. (RX).
DSU	Error	ATM	Number of ATM AAL5 Frames discarded due to buffer congestion.
RS-232,V.35, DSU	Except	FR	Number of Frame Relay Frames received with the discard eligible (DE) bit set.
RS-232,V.35, DSU	Except	FR	Number of Frame Relay Frames received with the Forward Explicit Congestion Notification (FECN) bit set.



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RS-232,V.35, DSU	Except	FR	Number of Frame Relay Frames received with the Backward Explicit Congestion Notification (BECN) bit set.
RS-232,V.35, DSU	Except	FR	Number of Frame Relay Frames received with an Incorrect DLCI. These frames were therefore subsequently discarded.



## 11 USER PORT MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **port** option. These are user-port-level measurements.

<b>Interface</b>	<b>Description</b>
URP, TCP	Number of Intervals with Ingress Data.
URP, TCP	Number of Intervals with Egress Data.
URP, TCP	Number of Intervals with Port errors.
URP Only.	Number of Intervals with URP Receiver Errors.
URP Only.	Number of Intervals with URP Re-transmissions.

Note: In the measurements above, an interval is defined as 3.2 seconds.



## 12 IP-GATE PORT MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **ipgate** option. These are path-level measurements.

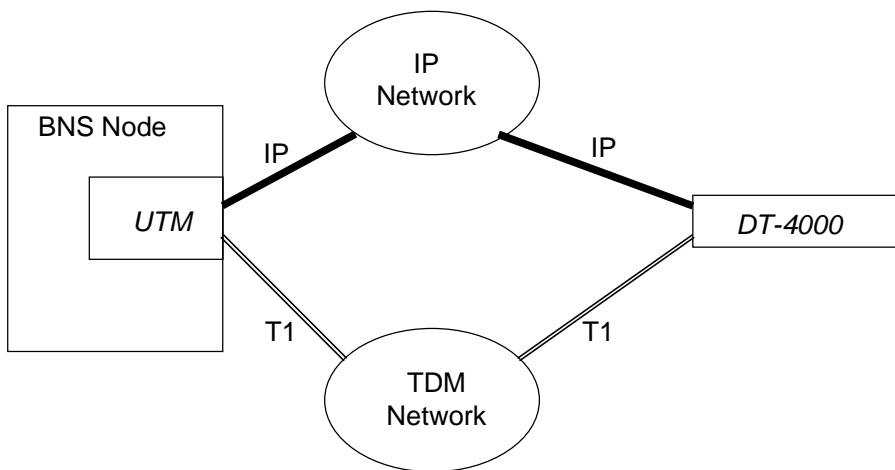
<b>Interface</b>	<b>Description</b>
URP, TCP	Number of Intervals with Ingress Data.
URP, TCP	Number of Intervals with Egress Data.
URP, TCP	Number of Intervals with Port errors.
URP Only.	Number of Intervals with URP Receiver Errors.
URP Only.	Number of Intervals with URP Re-transmissions.

Note: In the measurements above, an interval is defined as 3.2 seconds.



## 13 FAULT-TOLERANT DUPLEX TRUNKING

With the **duplex** feature, the **DT-4000** provides fault-tolerant trunking to a **Universal Trunk Module (UTM)** in a BNS node. When the trunk interface is configured for duplex operation, it has access to two different networks over which user data may be sent. The first is an IP network, using the **IP-DSU** protocol and the 10BaseT port. The second may be a direct TDM facility, Frame Relay network, or an ATM network. Either the internal DSU or the serial port may be used as the interface to the second network (only the DSU may be used for ATM). Consider the following duplex networking scenario:



Configuration of the **DT-4000** would be as follows:

```

<DT-4000> login passwd=initial ↵
<DT-4000> local ipaddr=135.17.59.165 submask=255.255.255.0 ↵
<DT-4000> gateway ipaddr=135.17.59.1 ↵
<DT-4000> dsu type=t1 prof=s0 timing=net tsrate=64 addslot=all ↵
<DT-4000> trunk type=hdlc phy=dsu ↵
<DT-4000> trunk duplex=on dest=135.17.58.1 ↵
<DT-4000> restore mod ↵
  
```

In the above example configuration, the **duplex** parameter used with the **trunk** command enables fault-tolerant trunking, with the connection over the IP network as the default initial active path. The **dest** parameter specifies the IP address of the remote **UTM**. For the backup path, the internal DSU is used to interface to a T1 line using all 24 timeslots, with a relatively short line-equalization value (**prof** parameter). HDLC is used as the data-link layer for the backup trunk facility (i.e., a direct TDM connection). Any of these parameters might have other settings in an actual installation.

At the remote end, the **UTM** would have an almost identical configuration, using the IP address of the **DT-4000** (from the **local** command above) as its **dest** value.



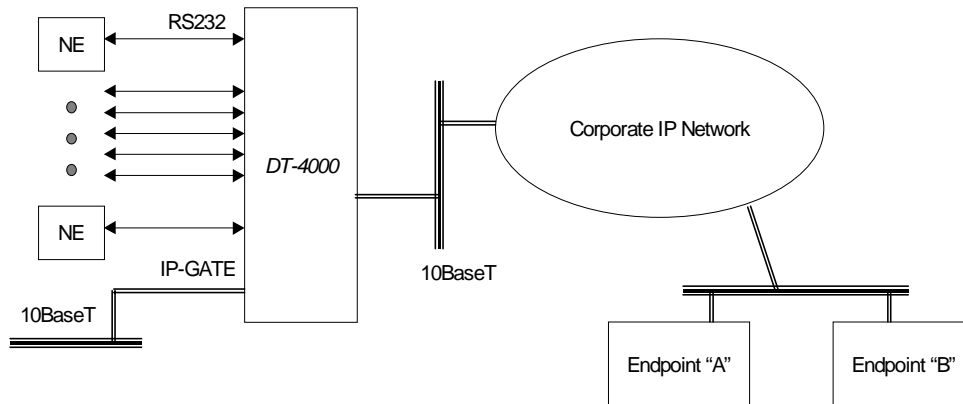
A failure of either facility will be alarmed. When the failed facility is the one currently active, the trunk path is automatically switched over to the alternate facility, where it remains until that facility fails.



## 14 CLOSED USER GROUP DEMO

The **DT-4000** supports the notion of **Closed User Groups (CUGs)** for IP networking applications. Within a BNS network, CUGs would be administered on the affected nodes, in order to restrict BNS-type user ports on a **DT-4000** to specific BNS endpoints, and vice versa. CUGs may also be fully extended from IP-type user ports on a **DT-4000** into the IP network. This can apply in either call direction (IP network to **DT-4000** user port, or vice versa). This is an important feature for protecting sensitive endpoints in a corporate-wide network without the burden of special “security servers”.

The following diagram depicts a corporate IP network infrastructure which may be accessed by endpoints throughout the network. Some endpoints require access to the Network Elements (NEs) reachable via IP-type ports on the **DT-4000**, and some endpoints are not to be allowed such access. IP network endpoints, which are allowed to access the NEs, are placed in a CUG to be associated with the appropriate user ports. (The same CUG may be associated with any number of user ports. Any one-user port may belong to up to 16 CUGs.)



Referring to the previous diagram, Endpoint **A** must be allowed access to all the NEs, but Endpoint **B** is not allowed such access. The **DT-4000** is configured with CUG 1 with the address of Endpoint **A**, as follows:

```
cug 1 ipaddr=135.17.59.5 submask=255.255.255.255
```

Each **protected** user port (i.e., those connected to the NEs) is set up with CUG 1 assigned to it, as follows:

```
port 1 type=rcv hport=26 cug=+1
```

When Endpoint **A** calls the **DT-4000** and TCP port number 26, access to the NE connected to port 1 on the **DT-4000** is granted, and everything proceeds transparently. If



an endpoint outside CUG 1 (e.g., Endpoint **B**) attempts to call the same TCP port, however, the following happens:

1. The call is terminated during authentication without any data being transported in either direction.
2. An **authentication alarm** is generated and sent to an attached Starkeeper, an attached Telnet Console (if any) and the SNMP Trap Manager (if any). The Alarm contains the IP address of the remote endpoint that attempted the unauthorized access.



## 15 CABLING

### 15.1 DT-4000's and the UDS 202T Modem

The UDS 202T modem has an RTS lead that must be either driven, or optioned to be enabled permanently. The DT-4000 Synchronous DTE adapter (depicted in this section) will drive RTS whenever a call is present and therefore DTR is also driven. However, the obsolete AT&T SAM Synchronous DTE adapters had a race condition between RTS and CTS. If the AT&T Synchronous DTE adapters are to be used, the UDS 202T modem must be configured as **permanent** when operating with a SAM or DT-4000.

In either situation, the "cable type" configured in the DT-4000 or SAM connection is DTE. The adapter presents a 25 pin male connection to the UDS modem.

It should be noted that a UDS 202T in operation with a standard DCN most likely does not have the RTS option configured as permanent. It is recommended that the Synchronous DTE adapter depicted in this section be used for such connections.

### 15.2 DT-4000s and AT&T/Paradyne 2024 Modems

The AT&T Paradyne 2024 modem is a 2400 baud synchronous or asynchronous modem used for leased facilities. These modems are used on a great deal of Network Element connections. The AT&T Paradyne 2024 modem is optioned by commands on a front panel via three levers and an "execute" button. The AT&T Paradyne 2024 modem does not provide proper clocking for a SAM or DT-4000 in its default configuration.

There are two methods to provide proper clocking from the AT&T Paradyne 2024 modem. Both methods will work properly with the DT-4000 Synchronous DTE adapter depicted in this section. Only one method will work with the obsolete AT&T synchronous DTE adapter.

The first method, which will operate correctly with the DT-4000 Synchronous DTE adapter, involves setting the modem such that the Tx Clock (Pin 15) is derived from the external clock (Pin 24). This option is configured by setting option **B3** on the AT&T Paradyne 2024 modem from the front panel.

The second method, which will operate correctly with both the DT-4000 Synchronous DTE adapter and the obsolete AT&T Synchronous DTE adapter, involves setting the modem such that the Tx Clock (Pin 15) is a slave of the internal DDS timing. This option is configured by setting option **B2** on the AT&T Paradyne 2024 modem from the front panel.

The default configuration for the AT&T Paradyne 2024 modem is **B1** which is "internal" timing. In this default configuration, the clocks are not properly phased.

The AT&T Paradyne Modem does not have an RTS issue with either the DT-4000 Synchronous DTE adapter or the obsolete AT&T Synchronous DTE adapter.

The configuration of the AT&T Paradyne 2024 is described on pages 28 and 40 of its Operations manual. A synopsis of those instructions are as follows:

The modem is placed into command mode by setting the CMD/Test switch to CMD. The MDCK will display. Press EXEC twice to enable command input. The operating mode will change from MD/O to MD/I.

Using the FWD/BCK key, select the CHOP option, execute, and then enable **B3** (or **B2**) using the EXEC key.



The modem must be taken out of command mode by returning the MDCK display and setting the operating mode from MD/I to MD/O.

### **15.3 DT-4000s and General DataComm 201-7 Modems**

The General DataComm 201-7 Modem is a 1200 or 2400 baud synchronous or asynchronous modem used for leased facilities. It is present on some Network Element connections. The modem is optioned by DIP switches, and berg jumpers. The 201-7 modem does not provide proper clocking for a SAM or DT-4000 in its default configuration.

In order to provide proper clocking, the DT-4000 Synchronous DTE adapter depicted in this section must be used. The obsolete AT&T synchronous DTE adapter will not function properly with the General DataComm 201-7 modem.

The modem is properly configured by setting DIP Switch #9, position #1, to the "external" position. The default is the "internal" position. All other configuration is not altered.

This option will instruct the General DataComm 201-7 to use clock provided on Pin 24 of the interface as its Tx (or Pin 15) clock. This clock is bridged from the Rx Clock (Pin 17) by the DT-4000 Synchronous DTE adapter depicted below. The result is that both clocks are then properly phased.

The General DataComm 201-7 requires RTS asserted before proper operation can proceed. This modem does not allow a permanent enable of that lead. The DT-4000 Synchronous DTE adapter depicted in this section properly asserts RTS when the DT-4000 or SAM port has a call active.

### **15.4 Cabling to a Modem Set**

The Cabling to a Modem Set requires the use of a Synchronous DTE adapter. This is not the same as an asynchronous DTE adapter and has a different order code. However, the same Synchronous DTE adapter may be used on SAM64, SAM128, SAM504, and DT-4000 ports. The DT-4000 port would be configured with a cable type of DTE.

### **15.5 Cabling Directly to the Network Element**

The Network Element is a physical synchronous DTE. It requires a clock source that is usually provided by a modem set. When cabling a DT-4000 directly to the Network Element; it requires the use of a Synchronous DCE adapter. This is not the same as an asynchronous DCE adapter and has a different order code. However, the same Synchronous DCE adapter may be used on the SAM64, SAM128, SAM504, and DT-4000 user ports. The DT-4000 port would be assigned a baud rate appropriate for the Network Element (e.g. 2400 baud), and a cable type of DCE.

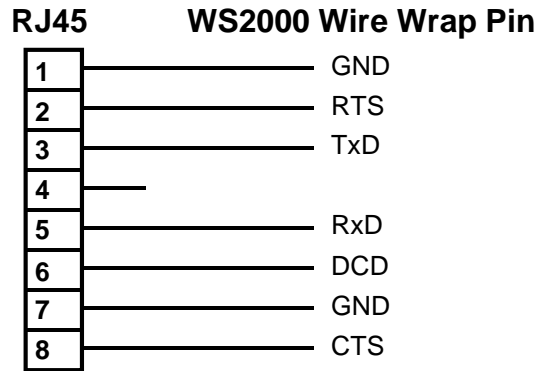
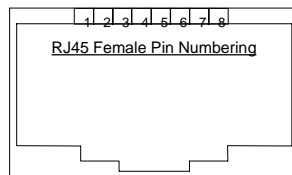


### 15.6 Cabling to a Westronic WS2000 E2A Remote

The DT-4xxx series is able to accept the E2A protocol on any of its ports. The Westronic WS2000 is an E2A remote interface for discrete scan points.

The Westronic WS2000 presents wire wrap pins and not an actual connector. The cabling is depicted in the diagram below. The port is configured prot=VBA , DXE=DCE, and PAP=ON. The originate and receive options for the port are dependent on the deployment.

### DT-4xxx to Westronic WS2000

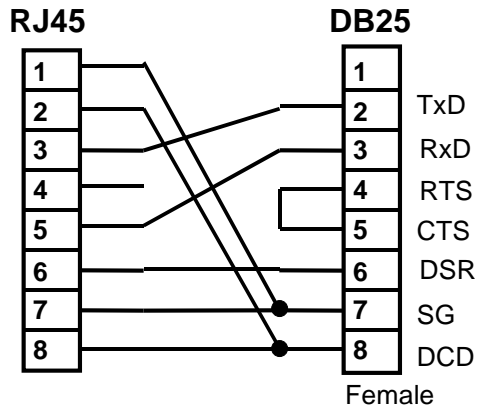
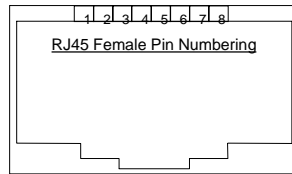


### 15.7 Cabling to an AT&T SAC E2A Remote

The DT-4xxx series is able to accept the E2A protocol on any of its ports. The AT&T SAC is an E2A remote interface for discrete scan points.

The AT&T SAC presents a DB25 Male connector. A special adapter depicted below must be used to interface to the AT&T SAC. In addition, the port is configured as prot=VBA, DXE=DTE, and PAP=ON. The originate and receive options for the port are dependent on the deployment.

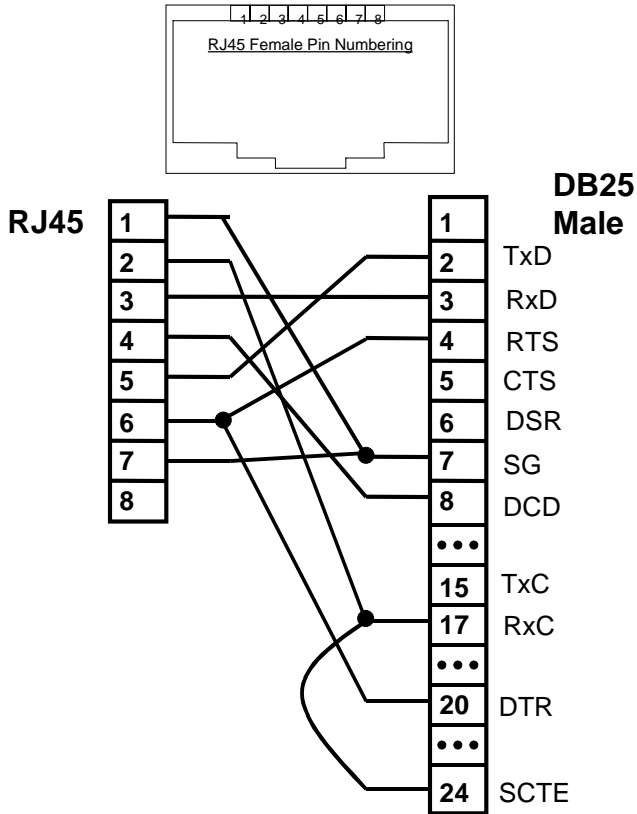
### DT-4xxx to SAC Adapter



### 15.8 The Synchronous DTE Adapter

Depicted below is the cabling description for the Synchronous DTE adapter to be used with DT-4000 ports configured as a cable type of synchronous DTE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. This adapter is applicable when the DT-4000 is receiving the clocking to the interface between itself and a device. Generally, this interface adapter is used with Modem connections.

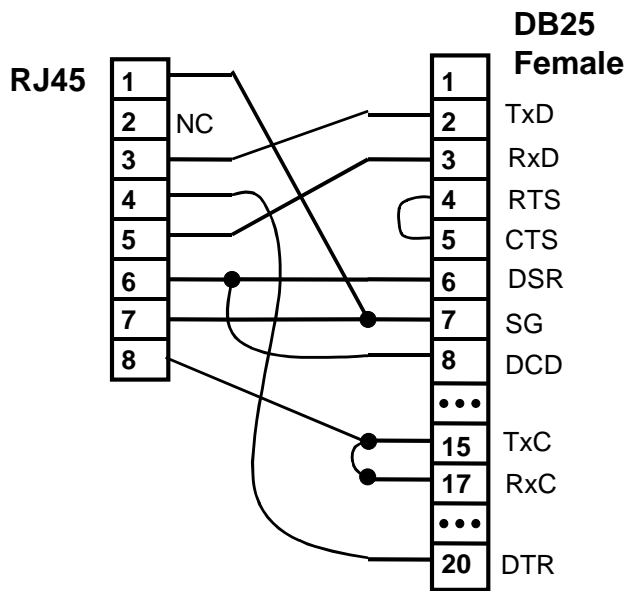
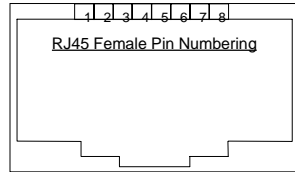
### DT-4000 Sync DTE Adapter



### 15.9 The Synchronous DCE Adapter

Depicted below is the cabling description for the Synchronous DCE adapter to be used with DT-4000 ports configured as a cable type of synchronous DCE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. This adapter is applicable when the DT-4000 is providing the clocking to the interface between itself and a device.

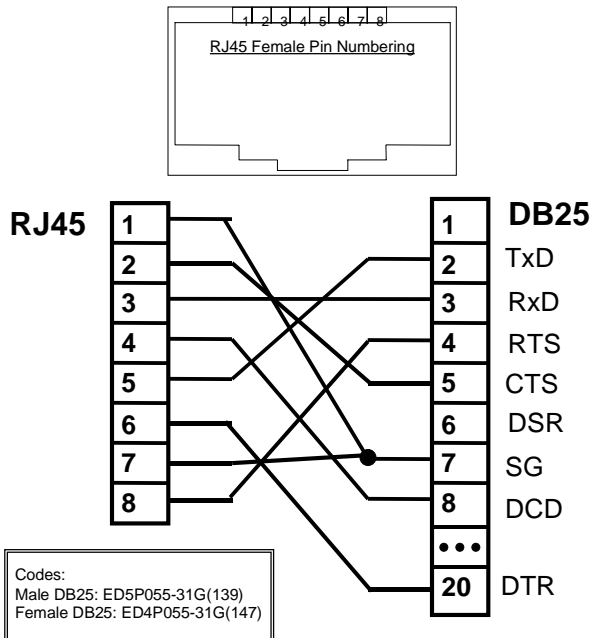
#### DT-4000 Sync DCE Adapter



### 15.10 The Asynchronous DTE Adapter

Depicted below is the cabling description for the asynchronous DTE adapter to be used with DT-4000 ports configured with a protocol of asynchronous (or raw), and a cable type of DTE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. This adapter is applicable when the DT-4000 is receiving the clocking to the interface between itself and a device. Generally, this interface adapter is used with Modem connections.

#### DT-4000 Async DTE Adapter (AH)

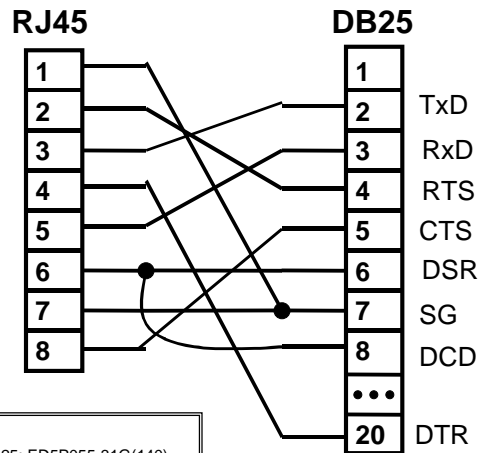
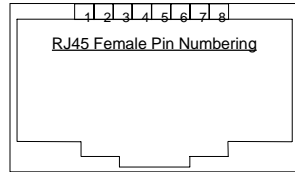




### 15.11 The Asynchronous DCE Adapter

Depicted below is the cabling description for the asynchronous DCE adapter to be used with DT-4000 ports configured with a protocol of asynchronous (or raw) and a cable type of DCE. The adapter may also be used with SAM64, SAM128, and SAM504 devices.

#### DT-4000 Async DCE Adapter (AG)



Codes:  
 Male DB25: ED5P055-31G(140)  
 Female DB25: ED4P055-31G(138)

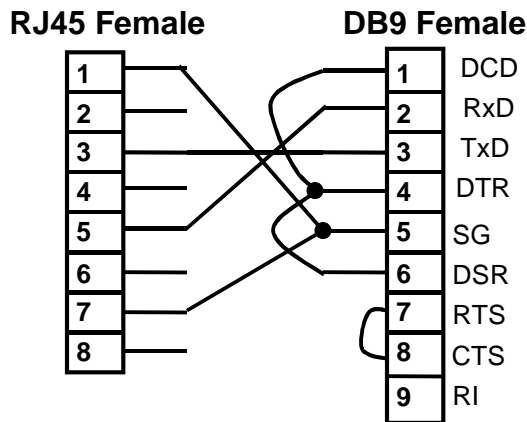
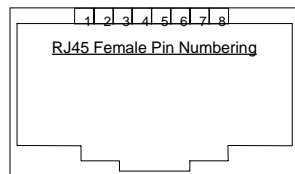


### 15.12 The DB9 Console Adapter

Some Personal Computers use a 9 pin DB9 interface for serial communications. The terminal emulation programs may require certain lead status. Since console connections are generally implemented as three wire interfaces (i.e. RxD, TxD, and SG); this may pose a problem for the terminal emulation programs.

Below is depicted the wiring of a DB9 adapter which eliminates the problems associated with these terminal emulation programs. It is used with a standard **straight** category 5 RJ45 cable.

### DB9 Async DCE Console Adapter



Note: This cable for use on console ports only.

Use with a straight CAT-5 RJ45 cable.

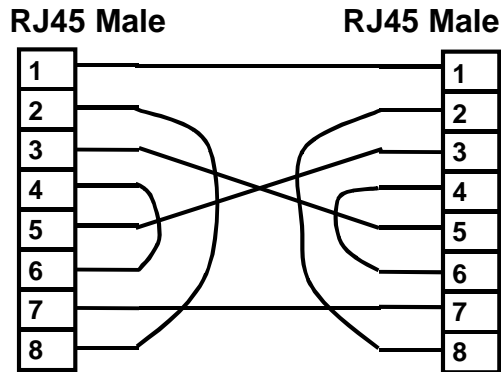
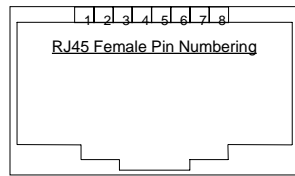


**15.13 The RJ45 to RJ45 Crossover Console Cable**

The RJ45 to RJ45 console cable implements the three wire interface for consoles with signal looping at either end. It is used to connect a serial console directly to a DT-4000 port, a SAM port, or a Datakit TY port. No adapter is required. It may also be used in conjunction with an Asynchronous DCE or DTE adapter to provide console interfaces for personal computers or terminals where looped signals are required.

The diagram for the console cable is as follows:

**RJ45 to RJ45 Console Cable**



Note: This cable for use on console ports only.

Comcode: 408198133

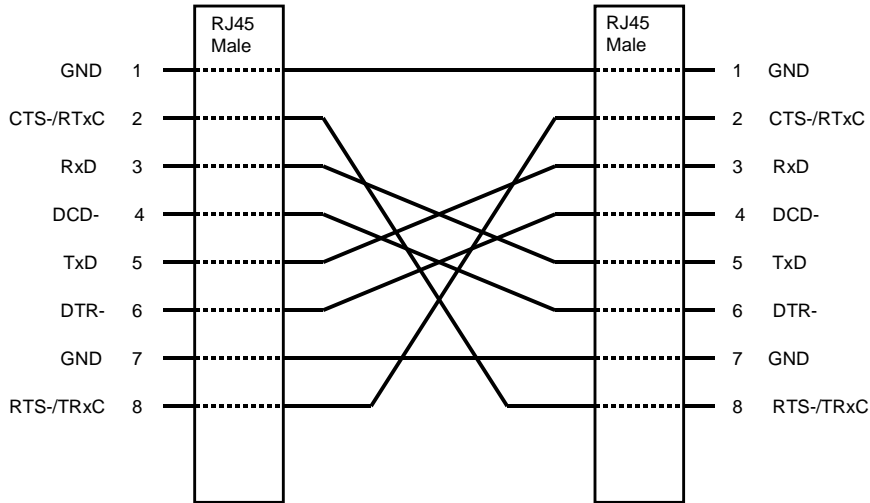


**15.14 The RJ45 to RJ45 Full Crossover Cable**

It is sometimes useful to interconnect two devices without adapters. The full cross-over cable will accomplish that function and preserve all of the lead functions. It is a generic cable that will work with any DT series, any Datakit/BNS series interface, and many other popular device interfaces.

A diagram of that cable is as follows:

**RJ45 Full Cross-Over Cable**



## 16 SYNCHRONOUS PROTOCOLS WITH RECOVERED CLOCKS

The ports on a DT-4000 support the option of recovering clocks from the data lines for synchronous protocols. When this occurs, the encoding for these protocols must be either NRZI or a Biphase frequency modulation. The NRZI option is reliable for bit stuffed protocols such as SDLC, but is subject to failure in a BiSync due to the potential for insufficient bit cell transitions. This is not a limitation on the DT-4000 hardware, but rather a fact of the encoding itself. The NRZI encoding on SDLC data streams is by far, the most common variant of these protocols. It is this NRZI encoding which is used on the isochronous LTS connections.

In order to use a DT-4000 port with recovered clocks, it should be programmed with the protocol, the line encoding, the operation on the data, the baud rate, and the recovered clock. Consider the following command:

```
port 1 prot=sdlc baud=1200 enc=nrzi dx=dce clk=rcvd fill=flag
```

This command instructs the DT-4000 that the port is SDLC NRZI with recovered clocks. The baud rate is required in order to properly recover the clocks from the data, and must match the peer. The **dx=dce** instructs the DT-4000 that it should control CTS from the peer DTEs RTS, and not wait to send data. The **clk=rcvd** instructs the DT-4000 that the clocks are to be recovered from the data rather than on a separate EIA lead. Please note that this configuration would use the asynchronous DCE adapter (i.e. the **AG** adapter). The **fill=flag** option is the default for an SDLC port and specification of the option is not required unless the port had been previously configured otherwise.

Suppose that the port is to be connected to a modem device operating in 2-wire (half duplex) mode, and the port is to be the DTE in that configuration. The DT-4000 port would need to assert RTS and wait for CTS before sending data to avoid corruption on the half duplex interface. The following command would issue that configuration.

```
Port 1 prot=sdlc baud=1200 enc=nrzi dx=dte clk=rcvd fill=mark
```

Note that the only difference is the **dx=dte** option. This instructs the DT-4000 to assert RTS when there is data to send, and then wait for CTS to be asserted by the DCE before actually sending the data. The **fill=mark** idles the line between frames in the mark state as opposed to flags. Some modem devices do not handle flag idled lines well. If that is the case, then this option should be used. It doesn't hurt to mark fill on DTE ports. Please note that this configuration would use the asynchronous DTE adapter (i.e. the **AH** adapter).



## 17 SPECIFICATIONS

### 17.1 CONSOLE PORT

A standard RS-232C interface that uses binary data interchange between DTE and DCE. This interface uses an RJ45 connector and operates at 9600 bits per second (bps), 8 bits per character, no parity, and one stop bit.

### 17.2 RS-232/V.35 SERIAL PORT

The serial port uses a 25-pin (DB25) connector and interfaces to a trunk connected to a BNS node. It is configurable to provide either an RS-232C or V.35 interface.

#### 17.2.1 RS-232C

The RS232-C interface uses up to 21 signal leads, and operates at data rates from 75 to 19200 bits per second (bps).

#### 17.2.2 V.35

The V.35 interface operates at data rates up to 2.048Mbps. A DB25 female to Winchester-34 male adapter is required between the DB25 connector and the 34-pin V.35 cable.

### 17.3 10-BASE-T PORTS (GATE & WAN)

There are two 8-pin, 10BaseT modular connectors for interfacing to 10 Mbps baseband CSMA/CD local area networks. One is for the LAN segment providing access to the IP WAN. The other is for the LAN connected to the **IP-GATE** port.

### 17.4 DSU PORT

This interface uses an industry-standard RJ48C connector. The interface may be used for T1 (1.544 MHz) or E1 (2.048 MHz)

### 17.5 PHYSICAL DIMENSIONS

L= 16.9 x W=8.77 x D=1.72

### 17.6 ENVIRONMENTAL OPERATING RANGE

Operating Temperature: 5° to 40°C (41°F to 124°F) per GR-63-CORE.

Operating Humidity: 5% to 90% non-condensing per GR-63-CORE.

Altitude: From 60 m (197 ft.) below sea level to 1800 m (5905 ft.) above sea level and less than 4000 m (13122 ft) derated by 2° C per 300 m per GR-63-CORE.

### 17.7 POWER REQUIREMENTS

<b>DT-4000</b> Operating Voltage:	5V @ 800 mA Nominal
Stand-alone AC to DC power supply:	115V @ 48 mA Nominal 115V @ 90 mA Maximum
Stand-alone DC power supply:	48V @ 104 mA Nominal 48V @ 195 mA Maximum





### 17.8.3 Industry Canada CS03 Certification Information

NOTICE: The *Industry Canada* label identifies certified equipment. This certification means that the equipment meets the telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s), but does not guarantee that the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect to the facilities of the local telecommunications company. The customer should be aware that compliance with the above conditions may not rule out degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment may give the telecommunications company cause to request the user to disconnect the equipment.

For their own protection, users should ensure that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution is particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

### 17.8.4 NEBS COMPLIANCE

- **GR-1089-CORE NEBS**
  - Section 6 DC Potential Difference
  - Section 8 Corrosion Requirements
- **GR-1089-CORE NEBS Level 3**
  - Section 2 ESD
  - Section 3.1, 3.2 EMI Emissions
  - Section 3.3 Immunity
  - Section 4 Lightning and AC Power Fault
  - Section 5 Steady State Power Induction
  - Section 7 Electrical Safety Analysis
  - Section 9 Bonding and Grounding
- **GR-63-CORE NEBS**
  - Section 2 Spatial Requirements
  - Section 4.1.3 Altitude
  - Section 4.6 Acoustic Noise
  - Section 4.7 Illumination Requirements
- **GR-63-CORE NEBS Level 3**
  - Section 4.1.1 Transportation and Storage
  - Section 4.1.2 Operating Temperature and Humidity Criteria
  - Section 4.2.3 Equipment Assembly Fire Test
  - Section 4.3.1 Packaged Equipment Shock Criteria
  - Section 4.3.2 Unpackaged Equipment Shock Criteria
  - Section 4.4.1 Earthquake Environment and Criteria
  - Section 4.4.3 Office Vibration Environment and Criteria





Section 4.4.4 Transportation Vibration Criteria



## 18 HARDWARE WARRANTY

The warranty period for hardware shall be 90 days from the date of delivery. Replacements and repairs are guaranteed for 90 days.

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has resulted from accident, abuse, or misapplication. Any replacement SOFTWARE will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

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