Case I: ViewStation is on an internet and connects to a leaf

Remote host is default gateway should be No

Add network route should be No (default)

1.4.5.3 ViewStation Local Route Command

HDSware version 3.2 includes a local route command to let you add or delete routes from the ViewStation's route table. Use the route command in the Console Window. The route command is:

route [add|delete] [net|host] <destination gateway> [metric]

This command lets you add or delete routes or networks and hosts for the ViewStation. The "metric" argument must be included for adding a route; it is the number of hops to the final destination.

The ViewStation supports as many as four IP addresses. Its communication is limited to those IP addresses and the local subnets appropriate for them. The concept of a "route" simply tells the ViewStation how to get to a different IP address. This specified route gives a path for any packets with IP addresses not on the ViewStation's known communications paths.

For a ViewStation (IP = 128.91.6.11) follow these examples:

To add a route for a host on a different net, say 198.89.6.3:

```
route add host 198.89.6.3 128.91.2.5 2
```

This command tells the ViewStation that any packets addressed to "198.89.6.3" should be sent to address 128.91.2.5, which is the "destination gateway" computer which will then forward the packets as needed.

The command to add a route for a network is:

```
route add net 128.92.0.0 128.91.2.5 2
```

which routes all packets addressed to the 128.92 network through the 128.91.2.5 gateway.

To delete the route for a network, the command is:

```
route delete net 128.92.0.0 128.91.2.5
```

1.4.5.4 ViewStation Local Ping Command

The ViewStation has a local "ping" command included with HDSware version 3.2 or higher. The man pages for the ping command are given in Section 2.6.18.

The ping command is useful in determining if a host is reachable from the ViewStation. It is an easy way to see if the gateways and routes are working. Simply type the ping command with the host you want to reach:

```
ping <hostname>
```

The return message reports if the host is alive and reachable or not.

■ Internet - all other networks

ViewStation	**Remote Host**		
	Subnet	Internet	Leaf
Leaf	Case A*	Case D*	Case G*
Subnet	Case B*	Case E*	Case H
Internet	Case C	Case F	Case I

* indicates that the default settings on the ViewStation will work correctly unless multiple PPP interfaces are running.

Case A: the ViewStation is a leaf and connects to a subnet

ViewStation default configuration works correctly

Case B: ViewStation is on a subnet and connects to a subnet

- Standard configuration (one PPP connection):

  Remote host is default gateway should be Yes (default)

  Add network route should be No (default)

- Alternate configuration (multiple PPP connections):

  Remote host is default gateway should be No

  Add network route should be Yes

Case C: ViewStation is on an internet and connects to a subnet

Remote host is default gateway should be No

Add network route should be Yes

Case D: ViewStation is a leaf and connects to an internet

Remote host is default gateway should be Yes (default)

Add network route should be No (default)

Case E: ViewStation is on a subnet and connects to an internet

Remote host is default gateway should be Yes (default)

Add network route should be No (default)

Case F: ViewStation is on an internet and connects to an internet

You will have to add host or net routes manually using the ViewStation's local **route** command

Case G: ViewStation is a leaf and connects to a leaf

Remote host is default gateway should be No

Add network route should be No (default)

Case H: ViewStation is on a subnet and connects to a leaf

Remote host is default gateway should be No

Add network route should be No (default)

1.4.5 ViewStation IP Addresses and Route Table

The ViewStation, with HDSware versions 3.2 and higher, supports an internal user-definable route table. It supports up to four IP addresses (one for Ethernet, one for Token Ring, and one for each serial port - either an assigned address for SLIP connections or a negotiated one for PPP connections). SLIP and PPP addresses can be different. The SLIP address is entered in the Setup Mode menu (Configure Serial Port - PPP/SLIP Options); an address is needed for PPP connections if Address Negotiation is turned Off. If IP Address Negotiation is turned On for PPP, the IP address is assigned dynamically by the host when the connection is made.

1.4.5.1 PPP Configuration and Network Routes

Support for network routes is available with HDSware version 3.2 and higher. Earlier HDSware versions used the resource:

HDSsetup.remote.serial1.netmask

to establish a network route for SLIP or PPP. This has been replaced with two resources:

HDSsetup.serial1.add.network.route (default NO)

HDSsetup.serial1.add.default.gateway (default YES)

The first setting lets you add a specific network route; the default setting of No disables the feature. The second setting allows you to set the ViewStation's gateway as the remote host's IP address; this field is not available from Setup Mode.

More complicated network configurations are discussed below.

1.4.5.2 Typical PPP Configurations

There are several possiblities for using the ViewStation in a PPP environment. There are three possibilities for an IP address and nine possibilities for a network, which are described below. Most cases are handled correctly with the ViewStation's default assignments.

For instance, connecting a ViewStation from your home to the subnet in your office, or connecting from your office subnet to another subnet, or connecting from your office subnet to the Internet are all handled correctly with the ViewStation's default configuration.

If you have more complicated network arrangements, look at the definitions and tables below:

- Leaf - an isolated host
- Subnet - a network completely specified by one netmask (all hosts on the subnet have IP addresses that match the netmask and all IP addresses that match the netmask are found on the subnet [including gateways])

When you open the Serial Terminal window, give the modem commands to open the connection, such as (for Hayes-compatible modems):

```
atdt 6102778300
```

You may need to do some additional modem configuration with other modem commands. Check your modem’s manuals for more details about the commands you can use. From that point, the modem will connect to the host computer and you will get a login prompt.

1.4.4.8 PPP Connection Example

This example describes starting a simple PPP session. It assumes that the PPP is correctly configured on the host system and that a serial connection can be opened to the host.

- Use the ViewStation’s Serial Terminal window to open a serial connection to the host, either directly or with a modem. When the connection to the host is complete and PPP has been started on the host computer, go on.
- Select “Start PPP” from the Serial Options pull-down menu of the ViewStation’s Serial Window. This closes the Serial Terminal window (but the modem connection remains open). You may notice a delay when the Serial Terminal window closes which is caused by the PPP negotiation with the host, but there is an interval permitted for you to open the Telnet session before the PPP connection times out. When the Serial Window disappears, open a Telnet session.
- Open a TCP/IP connection to the host with Telnet. Use the IP address of the PPP remote host. If you have HDSware 3.2, this new IP address for the PPP connection will be entered automatically for the Serial port you’re using. If you have an older HDSware version, you will have to enter the new IP address for the ViewStation and restart it (the connection will remain open).

If you have PPP address negotiation enabled (the default), the remote host will determine and set an IP address for the ViewStation. If address negotiation is disabled, you must enter the ViewStation’s PPP IP address on the PPP/SLIP Options menu.

It may be advantageous to establish a separate logon on the remote host for users making a PPP connection to a host. If your regular Ethernet login on the host is “bill”, you may want to have a separate login account on the host for “billPPP”. This would allow the billPPP logon to start a shell script that aids your PPP connection. This script might include a line to start the PPP daemon on the host (usually just starting */etc/pppd*, or whatever the configuration on your system).

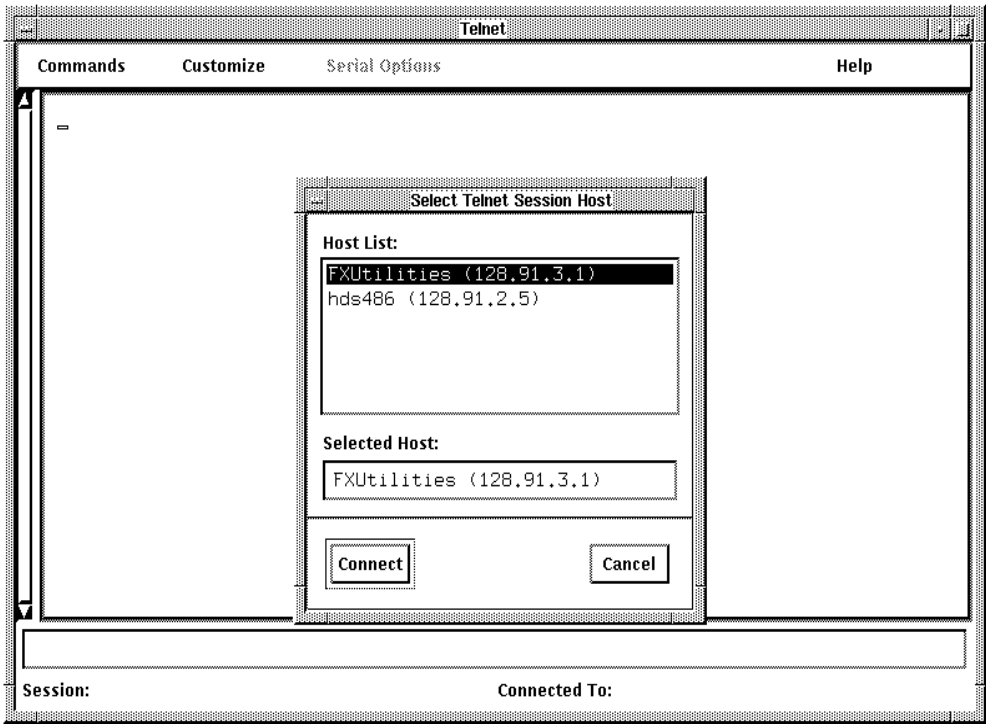
1.4.4.9 SLIP Protocol or CSLIP Protocol for Serial Communications

You can use the SLIP (Serial Line Internet Protocol) or CSLIP (Compressed SLIP) protocol just as with PPP. If you use the Compressed SLIP protocol, you must have the ability to handle compressed packets on the remote host computer (Van Jacobsen compression, RFC 1144).

You must set your SLIP IP address for the appropriate serial line on the PPP/SLIP Options menu.

Pause key creates a short BREAK (drops the data line for 300 ms.), the *Shift-Pause* key creates a long BREAK (drops DTR and the data line for 3.0 secs.).

This HDSterm window can be used as a permanent, character-based terminal. Most frequently it is used to open a modem connection, or some other terminal function, and then convert the connection to PPP, SLIP, or CSLIP communications which could then run an X-based IP connection over the serial line.



Host List:

FXUtilities (128.91.3.1)
hds486 (128.91.2.5)

Selected Host: FXUtilities (128.91.3.1)

Session:

Connected To:

1.4.4.7 Serial Connection Example

This section describes an example of making a direct serial connection. It is only an example; some settings or methods may be different on your host system.

For a host connection:

Make sure your communications parameters on both the host and the ViewStation's serial port are correct. This includes the cable pin assignments and connection, the baud rate, data/parity bits, etc.

When you open the Serial Terminal window, you will get a login prompt from your host automatically. On some systems, you may have to hit a carriage return once or more.

For a Modem connection:

Make sure your communications parameters on both the modem and the ViewStation's serial port are correct. This includes the cable pin assignments and connection, the baud rate, data/parity bits, etc.

The **Maximum Receive Unit** field allows setting the maximum PPP receive unit size. It can range from 128 to 1500. The default setting is 1500.

The **PAP Authentication Allowed** permits a remote host to ask for or provide PAP authentication when establishing a link. PAP authentication involves the transmission of cleartext passwords and can be a security problem. The default setting is Disabled.

The **Local Authorization Name** and **Local Authorization Password** fields give the hostname and host password which the ViewStation will use for PAP authentication if requested by the remote host.

1.4.4.6 Direct Serial Connections

The ViewStation uses the Serial Terminal Window as its serial interface. This window can use either Serial Port 1 or 2 (RJ11 or DB25) with an HDSterm window to simulate a VT320 character-based terminal connected directly to a host. This serial connection behaves as if it were a VT320 terminal connected to the remote host computer. This terminal emulation window allows you to do VT320 terminal commands from the ViewStation. If the host is not running the X Window system, the HDSterm window is a simple VT320 port.

The HDSterm window is a DEC VT320 terminal emulation client running on the ViewStation, so you can use it (starting from Setup Mode) anytime you want to open a serial terminal window.

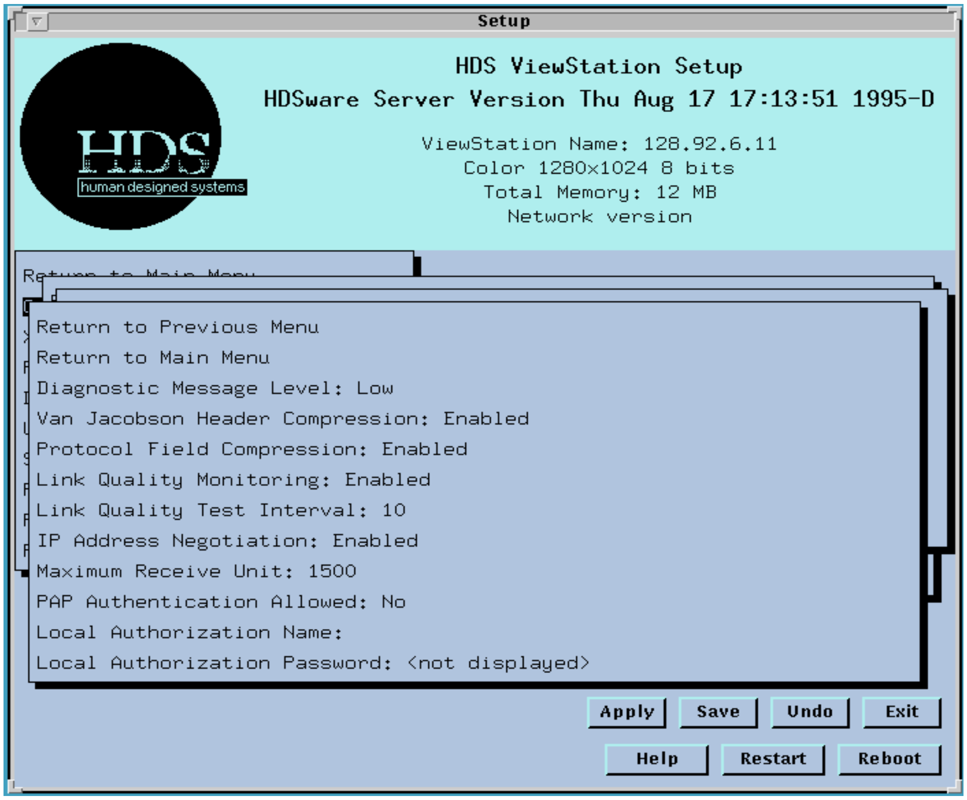
Similarly, other HDS ViewStation terminal emulation local clients have the same type of connection, a direct serial line to the host and the appropriate emulation, whether IBM 3270 or Tandem 6530, and so on, running on the ViewStation.

You open the serial terminal window on the ViewStation screen by clicking on the **Serial Terminal Window** button in the Main Menu of Setup Mode. This opens an HDSterm window with VT320 terminal emulation. You are first asked to specify the Serial Port 1 or 2 (RJ11 or DB25) you want to use. If you haven’t selected terminal mode for that port (in the Communications Options menu), you are prompted to do so.

An HDSterm window, labeled "Terminal" opens for your terminal mode connection. At this point, you can log into your host computer, or initiate a command sequence to your modem, or whatever you do on the serial connection.

If you want to open a TCP connection after your serial connection is established, go to the the Serial Options pull-down menu. This menu has five entries, Start PPP, Start SLIP, Start CSLIP, Short Break, and Hangup. You can use the appropriate commands to open your connection to the modem or computer. Note that PPP, or other protocol, must be running on your host. Other TCP settings, such as gateways and routing information, should be in place on your host. If you want to hangup the modem, click on the Hangup button. Use the Commands pull-down menu to close the window.

If you are using a server code version without HDSterm, you can generate Break and Hangup signals from the keyboard. With focus in the Terminal window, the



HDS ViewStation Setup
HDSware Server Version Thu Aug 17 17:13:51 1995-D
ViewStation Name: 128.92.6.11
Color 1280x1024 8 bits
Total Memory: 12 MB
Network version

```
Return to Previous Menu
Return to Main Menu
Diagnostic Message Level: Low
Van Jacobson Header Compression: Enabled
Protocol Field Compression: Enabled
Link Quality Monitoring: Enabled
Link Quality Test Interval: 10
IP Address Negotiation: Enabled
Maximum Receive Unit: 1500
PAP Authentication Allowed: No
Local Authorization Name:
Local Authorization Password: <not displayed>
```

The **Diagnostic Message Level** field selects the level of message reporting for PPP. The values are Low, Medium, and High with the default setting of Low. These messages can help you in PPP negotiations and Medium is a useful setting for getting set up for the first time.

The **Van Jacobson Header Compression** field, when Enabled, allows the ViewStation to use TCP header compression (also known as CSLIP compression) if supported by the remote host. When Disabled, the ViewStation will not attempt or allow TCP header compression. The default setting is Enabled.

The **Protocol Field Compression** field enables or disables the compression of PPP protocol fields. The default value is Enabled.

The fields **Link Quality Monitoring** and **Link Quality Test Interval** control the generation of Link Quality packets. Link Quality Monitoring, when enabled, requests that the remote host send Link Quality Report packets periodically, at a rate determined by the Link Quality Test Interval field. When Monitoring is disabled, the ViewStation will not require or participate in link quality monitoring. The default setting is Enabled with 10 sec interval.

The **IP Address Negotiation** field will disable IP address negotiation. This requires that both PPP participants know the address of their peer before connecting. The default setting is Enabled.

The **Remote host address** field lets you set the IP address of the host for your PPP or SLIP connection. This is not needed if your PPP host does address negotiation.

The **Remote Netmask** field sets the netmask appropriate for that host.

The **Local IP address** field lets you set the ViewStation's IP address for this serial port connection. This is required for SLIP connections and for PPP if Address Negotiation is not used. If PPP Address Negotiation is used, this IP address is assigned by the PPP host.

The **Add Network Route** field lets you specify whether the network route should be added to your route table. This can also be done manually, refer to Section 1.4.5.3.

The **Set Default Gateway** field lets you set a default gateway host for this connection.

The **PPP Options** menu gives you settings for your PPP configuration. This is discussed in detail below.

1.4.4.5 PPP Protocol for Serial Communications

You can use the PPP Protocol (otherwise called Internet standard Point to Point Protocol) to run IP connections to X on a host computer. PPP is defined by RFCs 1171 and 1172. The PPP protocol is more than a superset of SLIP and CSLIP. The PPP protocol will not use or recognize SLIP or CSLIP packets.

PPP provides link-level error detection, IP address negotiation and assignment, Address/Control fields and Protocol field compression, Link-level authentication (defined by PAP in RFC 1172 and CHAP in RFC October 1991 Draft), Link-status monitoring by LQM (LCP Draft August 1991), as well as support for SLIP (RFC 1055) and CSLIP (RFC 1144). PPP corrects many of the deficiencies of SLIP and permits more features and adjustments in the serial communications interface.

PPP must be installed on your host computer; it is frequently included with commercial operating systems. There are many commercial programs which offer PPP connections for communications or you can obtain PPP from the Internet. It is included with all HDS ViewStation terminals.

To select the PPP Protocol, go to the Communications Options menu and click on **Configure Serial Port** line (for the line you want). Select the PPP option on the **Serial Port Use** line if your ViewStation uses only the PPP connection. Then click on the **PPP/SLIP Options** menu and then the **PPP Options** line. CAUTION: Select PPP, or SLIP options only if that is your only connection. If you have other connections to the host or Ethernet and use PPP only occasionally, you should select "Unspecified" as your serial port use and use the "Start PPP" option on the pull-down menu ("Serial Options" in the Serial Terminal window). The reason for this "Unspecified" selection is that if "PPP" is your Serial Port Use selection, the ViewStation will send repeated requests to the host to start the PPP daemon, even if you aren't currently using a PPP session.

The **PPP Options** menu contains a lot of PPP settings, which are explained briefly below. More detailed explanations are provided with the PPP products.

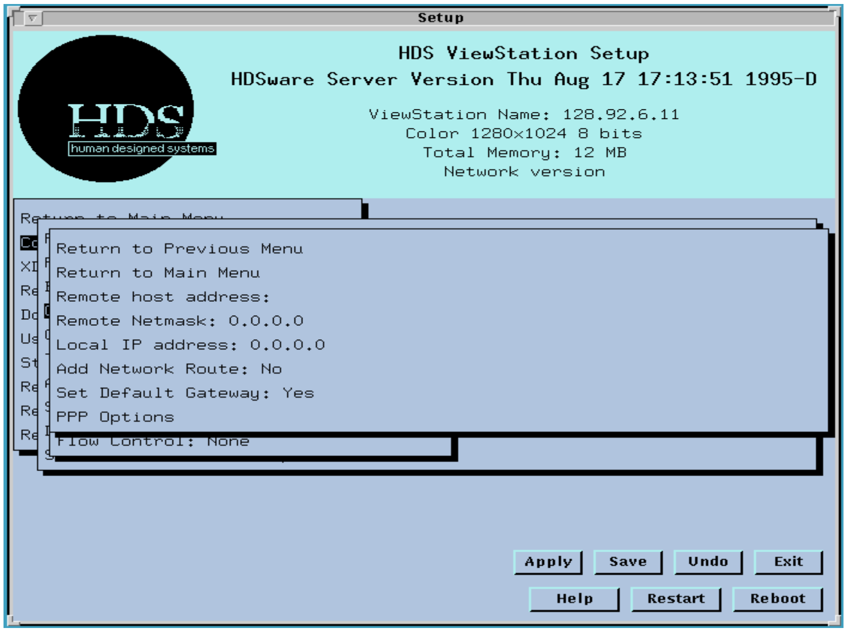
matically sets its serial ports to 8 data bits, and no XON/XOFF when the SLIP or CSLIP mode is active. The previous communications setting is restored when the SLIP mode is terminated. You shouldn't save settings in NVM while the SLIP interface is active unless you want these SLIP communication values saved for that port.)

You can log onto another host, using either Serial Port or Ethernet, with another Telnet session if you wish. The ViewStation looks at the host address you use in your Telnet session and then selects the appropriate interface as its connection, either the Serial Port 1 or Port 2 remote host, or some other host on your Ethernet network. The Default Telnet host field in Setup Mode lets you select one host as your Default connection.

Your remote host addresses for the serial ports should be different; if you use the same remote host address, the last one you set (with Apply settings) will be used. Note also that some things, like Domain Nameservice, rely on the flexibility and free access to many machines found on a network. If your font host, or name daemon, are running on a host that is not your SLIP host, they will work correctly if the physical connection to that host is present and active. You should realize that transferring font files over the SLIP serial lines will be slow, so most of these network processes (daemons and servers) should typically be on an Ethernet connection host.

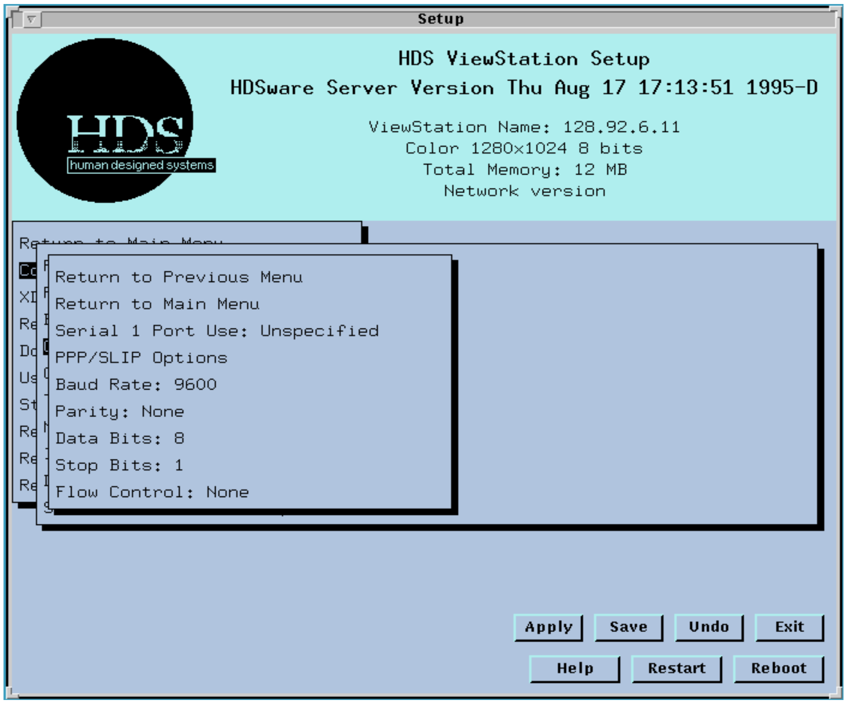
The selection of the physical port should consider that CTS/RTS is the only flow control available, and this is only available on Serial Port 2, the DB25 port. The XON/XOFF flow control can't be used with CSLIP or SLIP. Note also that CSLIP and SLIP protocols must run with 8 data bits and no parity.

1.4.4.4 PPP/SLIP Options Menu



HDS ViewStation Setup
HDSware Server Version Thu Aug 17 17:13:51 1995-D
ViewStation Name: 128.92.6.11
Color 1280x1024 8 bits
Total Memory: 12 MB
Network version

Return to Previous Menu
Return to Main Menu
Remote host address:
Remote Netmask: 0.0.0.0
Local IP address: 0.0.0.0
Add Network Route: No
Set Default Gateway: Yes
PPP Options
Flow Control: None



HDS ViewStation Setup
HDSware Server Version Thu Aug 17 17:13:51 1995-D

ViewStation Name: 128.92.6.11
Color 1280x1024 8 bits
Total Memory: 12 MB
Network version

Return to Previous Menu
Return to Main Menu
Serial 1 Port Use: Unspecified
PPP/SLIP Options
Baud Rate: 9600
Parity: None
Data Bits: 8
Stop Bits: 1
Flow Control: None

The field **Serial 1 Port Use** (or **Serial 2 Port Use**) determines how the particular serial port is used; it has options Unspecified, Normal SLIP, Compressed SLIP, PPP, or Console (the Console entry is discussed in Section 1.2.1). This is the assignment of the logical port to a connector.

Choose one of these configuration options, such as PPP or CSLIP (this compressed format uses "Van Jacobsen compression", RFC 1144; the remote host must also use this technique to decompress the data it receives). CAUTION: Select PPP, or SLIP options only if that is your only connection. If you have other connections to the host or Ethernet and use PPP only occasionally, you should select “Unspecified” as your serial port use and use the “Start PPP” option on the pull-down menu. The reason for this “Unspecified” selection is that if “PPP” is your Serial Port Use selection, the ViewStation will send repeated requests to the host to start the PPP daemon, even if you aren’t currently using a PPP session.

The **PPP/SLIP Options** menu is discussed in the next section.

Now set the communications settings as required by the remote host connection, things like baud rate, parity, etc. When you have made all your selections, click on Apply Settings, (Save in NVM if you wish) and exit Setup Mode.

When you try to log onto the remote host you specified for CSLIP (using Telnet), the ViewStation opens the CSLIP communications port using the settings you specified. (Note that the communications interface is forced to 8 data bits and no XON/XOFF when using SLIP or CSLIP. Most Unix systems use 7 data bits and Even parity with their serial connections; the parity bit is required but ignored on input. SLIP and CSLIP require 8 data bits to communicate. The ViewStation auto-

1.4.4 ViewStation Serial Connection

The ViewStation has two serial ports, Serial 1 (RJ11) with all ViewStations and Serial 2 (DB25) with the optional Communications board. These ports are configured from the Setup Mode Communications menu. The serial ports are designated */dev/tty1* and */dev/tty2* respectively.

1.4.4.1 ViewStation Serial Port Physical Connection

Using the ViewStation's serial ports for a connection involves selecting the physical port (RJ11, called Serial Port 1, or DB25, called Serial Port 2) and its communication configuration (baud rate, etc.). Available options are shown by toggling through the Setup Mode options. These choices are simple and can be made in Setup Mode on the Communications Options menu. Pin settings for the serial ports are found in Section 1.1.10.3 and 1.1.10.9.

The mode of serial communication can be direct, using the ViewStation's local terminal emulators, or it can use the TCP level interface with PPP, CSLIP, or SLIP protocols.

1.4.4.2 Serial Port Troubleshooting

Most problems with serial communications are cable problems. If you have no communication at all (no characters on the screen, or no activity), it is most likely a cable problem. Use a breakout box to analyze the transmission on each line or use another cable.

If you have characters on the screen, but they are garbled or nonsense, you can generally conclude that the cable is OK but some setting is wrong - the two devices have mismatched data settings, or baud rates, or parity checking. Check the recommended and selected settings for both devices and try other settings.

Other problems, like a print job losing characters or stopping before completion, can be a flow control problem. Verify the hardware or software flow control mechanism and try other settings.

Problems with SLIP, CSLIP, and PPP are generally configuration issues. Look at the man pages for these protocols to see the options and expected behavior. Sometimes routers and their settings need to be part of your configuration, since they may have to pass the PPP packets (if needed in your network environment).

1.4.4.3 ViewStation Serial Port Menu

The Communications Options menu contains fields for the serial port settings and is described in detail in Section 1.5.6.1. Click on the **Configure Serial 1 Port** line and you'll see this screen:

1.4.3.2 Token Ring Specifications

ViewStation Hardware Interface

The HDS ViewStation uses “tr1” to designate the token ring interface to the PC Card internal slot and “tr2” to designate the PC Card external slot.

Token Ring communications can use either shielded twisted pair connectors (called Type 1 cabling) or unshielded twisted pair connectors (called Type 3 cabling). Cable adapters (DB9 or RJ45) are supplied with the Adapter card.

Network cable quality often determines whether 4 or 16 Mb ring speed is appropriate. Token Ring speed is jumper selectable for either 4 Mbps or 16 Mbps. This is controlled by jumpers on the JP9 block for the ViewStation FX and on the JP11 block on the ViewStation Ultra. Jumper pins 5-6 select the ring speed for the internal PC Card slot and jumper pins 7-8 select the ring speed for the external PC Card slot. Ring speed 4 Mbps is selected when the jumper is in place, and ring speed 16 Mbps is selected when the jumper is off. This configuration should be selected with the initial ViewStation order so the correct configuration is installed, tested, and shipped.

ViewStation Software Interface

The hardware interface is used in the boot monitor to set the Token Ring IP address and netmask as follows (tr1 designates the internal PC Card slot and tr2 designates the external slot). You can make these settings in the Setup Mode menu above, or in Monitor Mode at boot time, or in the configuration file:

```
ip trx nnn.nnn.nnn.nnn

nm trx nnn.nnn.nnn.nnn
```

ViewStation Token Ring communications supports source routing, so it will work on bridged networks. BOOTP and XDMCP are supported on the Token Ring network for both direct and broadcast access.

1.4.3.3 ViewStation Token Ring Controls

From the ViewStation’s Console window, the “srt” shell command displays, adds, and deletes source route entries for token ring communications.

```
srt         displays all source route entries

srt –s      add/modify a source route entry

srt –d      delete a source route entry
```

If the Token Ring adapter becomes unplugged from the Token Ring network, the user can issue a command to re-insert the adapter onto the network:

```
ifconfig trX up
```

(where trX = tr1 for the internal slot and tr2 for the external slot)

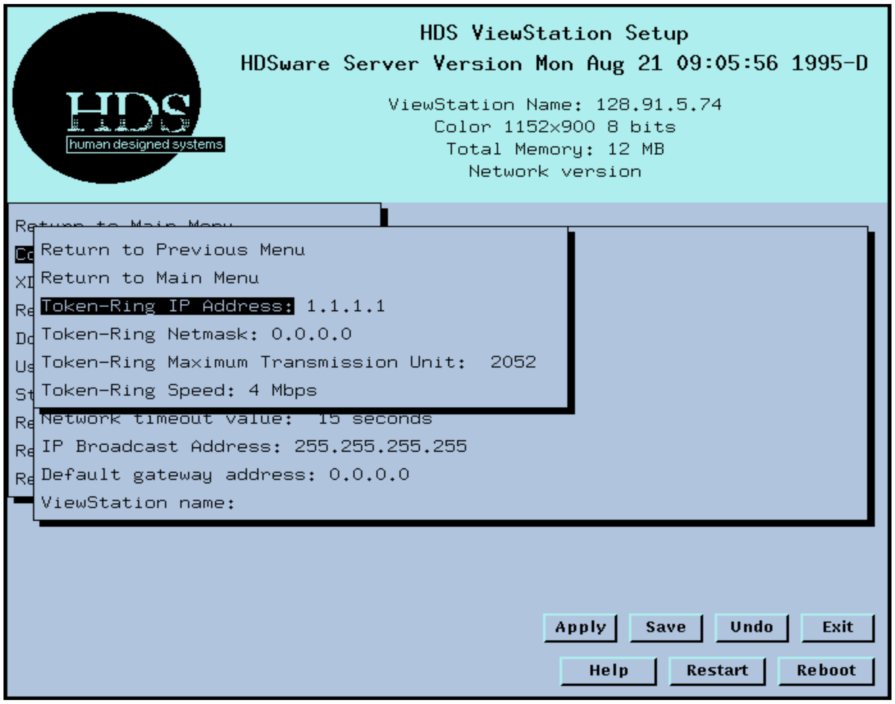
This reconnects the token ring adapter.

The “token” shell command displays token ring interface statistics.

ViewStation local clients, such as the IBM 3270 terminal emulator, add powerful capabilities to the Token Ring communications feature. This terminal emulation permits direct connection to IBM mainframe systems on Token Ring networks (at the same time keeping other ViewStation connections and emulations open).

An additional ViewStation feature, the HDS Developer’s Kit, allows ViewStation customers to write and compile their own application programs to run on the ViewStation. This includes OSF/Motif applications which could be used on IBM mainframe computers without having either X or Motif running on the mainframe.

1.4.3.1 Token Ring Communications Menu



```
HDS ViewStation Setup
HDSware Server Version Mon Aug 21 09:05:56 1995-D

ViewStation Name: 128.91.5.74
Color 1152x900 8 bits
Total Memory: 12 MB
Network version

Return to Previous Menu
Return to Main Menu
Token-Ring IP Address: 1.1.1.1
Token-Ring Netmask: 0.0.0.0
Token-Ring Maximum Transmission Unit:  2052
Token-Ring Speed: 4 Mbps
Network timeout value:  15 seconds
IP Broadcast Address: 255.255.255.255
Default gateway address: 0.0.0.0
ViewStation name:
```

The Token Ring Communications menu offers a number of settings:

The **Token Ring IP Address** is the ViewStation’s IP address on the Token Ring network.

The **Token Ring Netmask** is the netmask appropriate for the Token Ring network. For a discussion of netmask operation, refer to the Ethernet netmask section above.

The **Token Ring Maximum Transmission Unit** field lets you set the MTU for your Token Ring network. The default MTU is 2052.

The **Token Ring Speed** field reports the ring speed. You can select either 4 or 16 Mbps by means of a jumper on the ViewStation’s circuit board described below.

The Console Window, described in Section 1.2.1, can be used to display the ViewStation's routing table. This shows the current settings for various communications connections, such as the serial or network connections, the netmasks, etc. This routing table shows the Ethernet connection (shown as ec0) and the serial connection (shown as sl0). The netmask is shown, including the length in bits.

1.4.2.7 IEEE 802.3 and "Ethernet" Networks

The name Ethernet covers the generic "Ethernet" as well as the specific IEEE 802.3 standard Ethernet. These are not the same logical interface. The IEEE 802.3 interface uses a different header packet format (Ethernet using one field as a packet type rather than the packet length of the IEEE 802.3 interface). This difference in header format makes the two interfaces incompatible.

IEEE 802.3 Ethernet is becoming more common and is often used on IBM RS6000 host computers. You may not be aware of these differences because of the informal usage of the name "Ethernet". The difference may only appear when you connect to another device which doesn't support IEEE 802.3 and find it doesn't communicate.

The HDS ViewStation automatically detects both Ethernet and IEEE 802.3 packets and communicates with both using the proper interface. When the ViewStation first connects to its Ethernet, it sends two packets, one in Ethernet format and one in IEEE 802.3 format. Based on which packet format is used for the reply, the ViewStation uses that interface format for the responding host. This is the Network Type field in the Ethernet menu, with Auto-sense mode as the default setting for the ViewStation. You can also specifically select the interface type.

1.4.2.8 Use of Network Trailers

Data is transported over a network in packets. Trailer encapsulated packets are just modified IP packets with the IP packet header moved to the end of the packet. The ViewStation receives trailer encapsulated packets but does not transmit trailer packets.

1.4.3 Token Ring Interface

The HDS ViewStation supports Token Ring communications with its PC Card adapter card and a Token Ring "HDS PC Card Token-Ring 16/4 Adapter" card. This is an available option for all ViewStation models.

The ViewStation's Token Ring communication complies with IEEE 802.5 standards and uses IEEE 802.2 packet types. With HDSware version 3.2, Token Ring support is built into the bootprom and the Token Ring Communications menu allows your IP address entry and other settings.

Earlier HDSware versions (version 3.0.2 and bootprom v3.0.2-E) required some manual settings and interface control in the configuration file. [If you are using the v3.0.2-E bootprom with 4Mb capacity, you must have a jumper set (position JP7 on the ViewStation FX; position JP6 on ViewStation Ultra) to indicate the higher bootprom capacity. This applies to user upgrades only; factory installation adds the jumper automatically.]

The IP address setup is simple but depends on the system administrator assigning addresses and adding the ViewStation addresses to the configuration lists and other network-level functions. This discussion won't discuss those tasks in detail but will show the general process required. All systems are different and the system administrator must make the adjustments for your network arrangement, for the host computers and their requirements, and the locations of various lists and addresses on your system.

1.4.2.6 Network Addressing

Each device using network communications has a unique, permanent hardware address, a 48-bit number assigned at the time of its manufacture. This is called the Ethernet address. For the ViewStation this number is assigned by HDS for each unit. (This hardware address is shown on the boot screen, with the "hwconfig" command in the Console window, and on a label on the back panel). This is an identification for the ViewStation that other devices use in network communications. See also Section 1.1.12.1.

In addition, each device on a network has a logical address, called the Internet Protocol address, or IP address, which must be unique for its own network. The IP address is assigned by the system administrator according to your particular network configuration and conventions. These assignments are done in an orderly way to avoid duplication of an address, but also to group addresses into network subdivisions, or to conform to national and international addressing conventions for wide-area communications, and so on.

These addresses and their forms are important because they are used to control access to network broadcasts, or netmasks, or access to network gateway hosts. These things are discussed in Section 1.5.6.1.

An IP address is in the form *nnn.nnn.nnn.nnn*, with each field ranging between 0 and 255; a typical address would be: 128.91.6.11. Usually the first two number groups represent a unique address in the general network and the last two number groups apply to local networks and individual units.

For systems using the Remote Configuration option, the filename for each unit is usually given as the hexadecimal representation of the IP address. Thus the remote configuration filename might be:

IP address: 128.91.6.11	Configuration filename: 805B060B

The IP addresses are usually given to the other devices on the network with a communication technique called ARP, or Address Resolution Protocol. This is a message by the ViewStation to all devices on the network which requests, "Match my hardware address with my IP address." All the devices on the network register these two addresses for the ViewStation so they know what device is communicating and where it can be found. This requires that the ViewStation information and assigned address be entered in the network's ARP data base, which must be done by the system administrator (some systems do this automatically when a new device is connected to the network). Refer to Section 1.6.5 for more details about ARP operation.

If you use another type of Ethernet connection and are starting the ViewStation with Bootp, you can change the Ethernet type by using the ViewStation’s Monitor Mode, which is discussed in detail in Section 1.6.2 of this manual.

You may be connected to only one type of Ethernet at any given time.

- **Choosing Twisted-Pair Ethernet**

Connect to the Twisted-pair port; select ThinWire in Setup Mode. This is the Default configuration and setting.

- **Choosing ThinWire Ethernet**

Connect to the ThinWire port; select ThinWire in Setup Mode (the default setting)

- **Choosing ThickWire Ethernet**

Connect to the ThickWire port; select ThickWire in Setup Mode

The Twisted-pair Ethernet interface is auto-sensed; all that is required is that you make the Twisted-pair connection. To use ThinWire Ethernet, just connect the ThinWire connector; the ThinWire interface is the Factory Default setting in Setup Mode. If you want to use ThickWire Ethernet, you must choose the ThickWire setting in Setup Mode (the Ethernet Connections submenu of the Communications Options menu). If you are starting for the first time and do not have a flashPROM board which allows you to get into Setup Mode before you connect to the network, you can modify the Thin/Thick Ethernet setting in Monitor mode.

1.4.2.5 Logical Connection to the Ethernet

Setting up an HDS ViewStation in an X environment for the first time is a fairly simple procedure, but it involves a number of steps and processes that may be unfamiliar to users. The process amounts to identifying the ViewStation to the other parts of the network and exchanging addresses so everyone can communicate with each other.

In the simplest case, you enter the Ethernet IP address number assigned to your ViewStation in Setup Mode (in the HDSware menu or in this menu) and don't change it after that. In another case, you can use the BOOTP or the RARP utilities to determine the IP address from the network (if those services are available on your network). These techniques are discussed in Section 1.6. These network-based addressing techniques allow the IP address (and other Setup Mode entries) to be modified by the system administrator remotely without having to change the addresses on each device.

The IP (Internet Protocol) address allows all devices on the network to communicate with the ViewStation and vice versa. If your network is simple, you just have to enter the ViewStation address. If the network is more complex, including connections to other networks, you must also set the network mask and the gateway address fields also (these are discussed in the Setup Mode sections where this data is entered). You may have to give the ViewStation more than one IP address (one for Ethernet, one for Token Ring, one for SLIP, etc.). The ViewStation supports up to four IP addresses and routes packets from one network to another. Refer to Section 1.4.5 in this chapter for a discussion of the ViewStation’s routing.

Ethernet to the ViewStation. If you have only a single Ethernet cable, you must use a T connector with a terminator on the other side since you cannot connect it directly to the ViewStation's BNC connector.

ThickWire Connection to the DB15 Connector

ThickWire Ethernet uses the DB15 connector on the back panel. (The DB15 coaxial cable doesn't usually connect directly to the ThickWire Ethernet, but attaches to a Medium Access Unit (MAU), which in turn connects to the thick coaxial cable.)

1.4.2.3 Twisted-pair Ethernet with Link Integrity and SQE Settings

The Twisted-pair Ethernet connection runs with Link Integrity and SQE enabled, in compliance with the IEEE 802.3 10BaseT standards. Some systems do not observe this standard completely and need to have other settings. If you have a hubs and routers on your network, you may find that you need to disable the Link Integrity setting of the Twisted-pair interface. Link Integrity pulses are sent at the end of each transmission to verify communications between the hub and devices on the Twisted-pair network.

The ViewStation can disable Link Integrity either by software or hardware settings. If you use the Twisted-pair interface with the Ethernet type set to "ThinWire" (on the Communications menu of Setup Mode), the ViewStation uses Link Integrity; this is the Default setting. If you set the Ethernet type to "ThickWire" with the Twisted-pair interface in use, then Link Integrity is turned Off.

You can also control the Link Integrity pulse setting by selections on Jumper 16 on the main circuit board. With jumpers 1-2 selected for JP16, Link Integrity is enabled; this is the factory setting. With jumpers 2-3 selected for JP16, Link Integrity is disabled.

Another setting that is often thought to be related is the SQE signal. An SQE signal is sent on the collision detection line to verify that collision detection is working. Some systems want to disable these signals, because they increase the traffic on the network. The ViewStation uses the SQE signals internally only, as communication between the Ethernet controller and the Ethernet transceiver chips on the main circuit board. Since the ViewStation does not send the SQE signals on the network, requirements for the presence or absence of SQE signals is not a concern for ViewStation users.

1.4.2.4 Selecting the Ethernet Physical Type

The factory base configuration for ViewStation has the Ethernet Twisted-pair connector. The ThinWire and ThickWire connectors are present on the optional Communications board. The server uses the ThinWire setting as its default configuration. Since the Twisted-pair connector is auto-sensed, no selections need be made for the ViewStation to communicate on its Twisted-pair port. (Refer also to the previous section for the interaction of Twisted-pair with Thin- or ThickWire Setup Mode selections.)

local network. If the comparison shows different values, access must be obtained through the gateway. This field is password protected.

The **Ethernet Type** field selects the Ethernet type. The ViewStation has Twisted-pair as its factory configuration, with ThinWire and ThickWire Ethernet on an optional Communications board. The Twisted-pair interface is sensed automatically when connected, so no setting is necessary in Setup Mode.

The Setup Mode setting is for ThinWire (see the following sections for the effect of this setting on Twisted-pair connections). You can also select the ThickWire connection in Setup Mode or in Monitor Mode.

The **Network Type** field selects the Ethernet type, either generic "Ethernet" or IEEE 802.3 Ethernet. The default setting is Auto Sense, so the ViewStation makes this decision for you if you don't know which type is in use.

Refer to Section 1.4.2.7 for a more complete discussion of these Ethernet types.

1.4.2.2 Physical Connection to the Ethernet Network

There are three kinds of physical Ethernet networks: Twisted-pair, ThinWire, and ThickWire. These Ethernet networks are most easily distinguished by the connectors they use. These connectors are RJ45, BNC, and DB15, respectively.

The Twisted-pair Ethernet uses an RJ45 connector and wire similar to telephone jacks and cables to connect to the network. ThinWire Ethernet uses a thin, flexible coaxial cable with a T-type BNC connector for each node connection on the network. It is sometimes called thinnet or cheapernet. ThickWire Ethernet uses a rigid cable with nodes that connect to the devices with a thick coaxial cable ending in a DB15 connector. ThickWire Ethernet frequently uses an intermediate connecting device called a Medium Access Unit.

The HDS ViewStation has no special requirements for its connection with any of these Ethernet types, but all networks are somewhat different so you should consult with your system administrator to see what is needed for your network connection.

Twisted-pair Connection to the RJ45 Connector

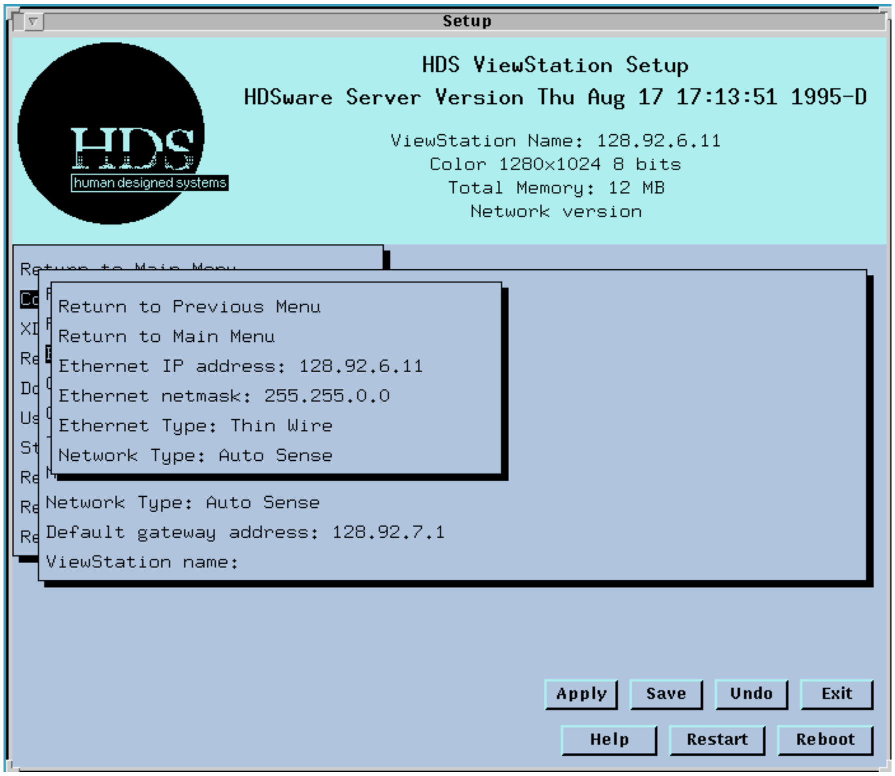
Twisted-pair Ethernet uses an RJ45 connector on the back panel. This is a plastic telephone-type connector. Make sure it is fully inserted and locked.

(Note that the ViewStation Twisted-pair interface runs with SQE and Link Integrity enabled, in compliance with the IEEE 802.3 10BaseT standards. Some systems do not observe this standard completely. Hubs and routers for Twisted-pair networks should be set according to the standard. If you observe delays in echoing characters on the Twisted-pair network, there may be a problem with your settings. Refer to the next section for a more complete discussion of this issue.)

ThinWire Connection to the BNC Connector

The HDS ViewStation is set up to use ThinWire Ethernet in its factory configuration. You can make the physical connection just by attaching the Ethernet cable to the BNC connector on the back panel. You must use a T connector to connect the

1.4.2.1 Ethernet Communications Menu



HDS ViewStation Setup
HDSware Server Version Thu Aug 17 17:13:51 1995-D
ViewStation Name: 128.92.6.11
Color 1280x1024 8 bits
Total Memory: 12 MB
Network version

Return to Previous Menu
Return to Main Menu
Ethernet IP address: 128.92.6.11
Ethernet netmask: 255.255.0.0
Ethernet Type: Thin Wire
Network Type: Auto Sense

Network Type: Auto Sense
Default gateway address: 128.92.7.1
ViewStation name:

The Ethernet Communications Menu offers several important settings for your Ethernet connection.

The **Ethernet IP address** field lets you set the IP address for the ViewStation’s Ethernet connection (this may also be set in the HDSware menu on the Main Menu, or by some network service like BOOTP or RARP). The actual value is assigned by the system administrator appropriate to your network.

The **Ethernet netmask** field specifies which parts of the your IP address must match the IP addresses of other devices on the local network. If the indicated parts of the addresses don't match identically, a gateway host computer must be used to obtain access to those other addresses.

For instance, entering a netmask of 255.255.0.0 means that the first two groups of numbers in the address must match identically, but that the last two groups can be any numbers. Thus, if your IP address is 128.91.2.2, you can connect directly to any other devices with addresses 128.91.nnn.nnn. You would have to use a gateway to connect to a device with an address 128.92.nnn.nnn. The netmask setting defines the addressing characteristics of your local network.

In precise terms, access to the gateway is based on the comparison between the result of a logical AND operation with the ViewStation IP address and the network mask to the result of a logical AND operation with the host IP address and the network mask. If the comparison shows identical values, the address is on the

The **Token Ring Communications** menu lets you set an IP address for your Token Ring interface as well as other settings for your Token Ring network.

The **Network timeout value** field sets the time interval that a request waits for a response. If you make a request to logon to some host on the network, the request will wait for the specified length of time before it either makes the connection, or gives up and ends the request process. If your timeout value is 15 seconds, a logon request will fail if it has to wait longer than 15 seconds. This value should be some brief time, 15 or 20 seconds, (based on the host's response time and load) so you will know a process has failed without too much waiting.

The **IP Broadcast Address** field sets the network wildcard address, typically 0.0.0.0 or 255.255.255.255. The system administrator sets the correct value for this field. Some systems prefer to use a local network broadcast, such as, 128.91.0.0 or 128.91.255.255. Your system administrator will choose this value.

The **Default Gateway address** field lets you specify a gateway host. A gateway host computer is a computer on your local network that connects to other networks. Refer also to network routing discussed in Section 1.4.5.

The **ViewStation Name** field lets you enter the ViewStation's name, which is used to identify the ViewStation on the network (if available to a name server or entered in the host's */etc/hosts* file) and also as the display name in the ViewStation's setting of the display environment variable (with keystrokes Alt-F12, etc. See Section 1.8.2.3 for more detail).

1.4.2 Ethernet Connections

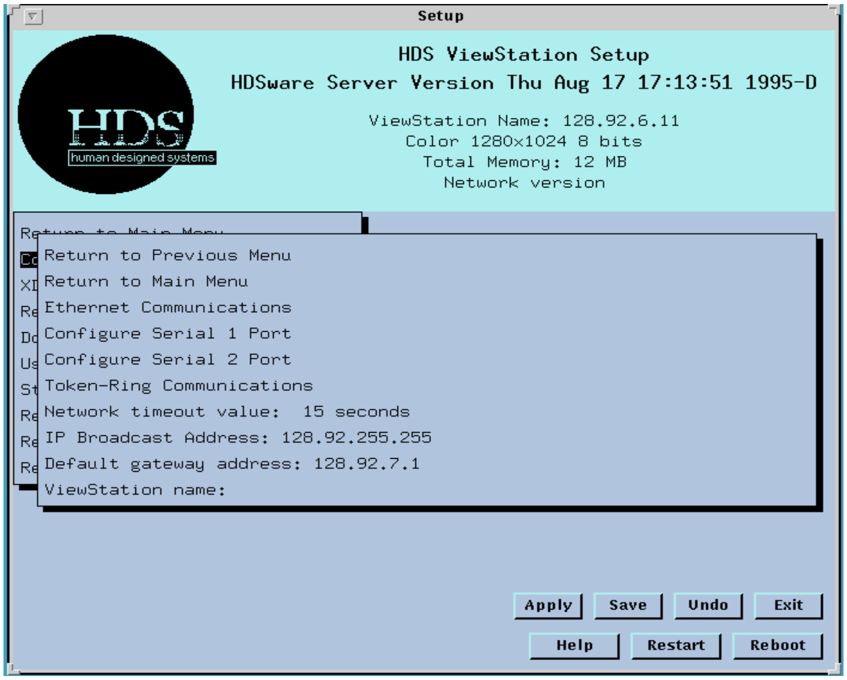
Connecting the HDS ViewStation to the Ethernet network involves two steps: the physical connection and the logical connection. The physical connection is usually a simple process of attaching the network cable to the connector on the back panel. The logical connection involves selecting the type of connection, obtaining an address on the network, and making some other simple settings. Obtaining a network address for the ViewStation is the function of the system administrator and is discussed later in the chapter along with other addressing procedures.

either for TCP/IP communication using the PPP, CSLIP, or SLIP protocols, or a direct serial connection to the computer (either one using a direct serial connection or a modem connection).

The direct serial connectivity can be especially useful when using the ViewStation's local terminal emulators, either the HDSterm client to make a connection as a VT320 terminal, or the HDS3270 client to make a connection as an IBM 3270 terminal, or the Tandem 6530 client when connecting to a Tandem computer. The direct connection lets the ViewStation's emulator and GUI (Motif, OPEN LOOK, or FVWM) run even if the host is not using a network or is not running the X Window System.

1.4.1 Communications Menu

The ViewStation's communications settings are controlled by the Communications Menu in Setup Mode, shown below:



HDS ViewStation Setup
HDSware Server Version Thu Aug 17 17:13:51 1995-D

ViewStation Name: 128.92.6.11
Color 1280x1024 8 bits
Total Memory: 12 MB
Network version

Network timeout value: 15 seconds
IP Broadcast Address: 128.92.255.255
Default gateway address: 128.92.7.1
ViewStation name:

The Communications Menu gives you settings for all your ViewStation communications interfaces.

The **Ethernet Communications** menu lets you select settings for your Ethernet interface, including your IP address.

The **Configure Serial 1 Port** menu lets you to select the operation for serial port 1, the RJ11 port. These options are discussed in Section 1.4.4.

The **Configure Serial 2 Port** menu lets you to select the operation for Serial Port 2, the DB25 port on the optional Communications board. These options are discussed in Section 1.4.4.

HDS ViewStation: Network Connections

This chapter describes the ViewStation connecting to Ethernet networks of different types, to Token Ring networks, and serial connections directly to a host or with PPP, SLIP, and CSLIP protocols.

Section 1.0 - HDS ViewStation

1.4 Network Connections

The HDS ViewStation and the X Window System are designed to work on a network, that is, a connection that includes a number of different devices, host computers, other ViewStations or workstations, etc. The X Window System is an environment which makes communications on the network appear to the user as if all devices are the same and that there is a direct connection between the ViewStation and the host computer (or computers).

The ViewStation supports up to four separate IP addresses for its connections, one for the Ethernet connection, one for the Token Ring connection, and one for PPP or SLIP connections on each of its serial ports.

- **Ethernet Connections**

Normal connectivity is with the Ethernet interface, either Twisted-Pair, ThinWire, or ThickWire. The HDS ViewStation also supports the IEEE 802.3 Ethernet interface. Although both use the name "Ethernet" they are different and incompatible. The ViewStation automatically detects the difference and uses the appropriate type of interface.

- **Token Ring Connections**

The ViewStation can use a Token Ring connection if it is equipped with a PC Card adapter board and a Token Ring PC Card module.

- **Serial Connections**

The ViewStation can also connect to host computers by means of serial connections, using either of the ViewStation's serial ports. The serial connection can be