



Article ID: 1459

## Q&A

# Using the Express 5000/FSU Series to Connect an AS/400 to Remote Controllers via SDLC Protocol

---

**Q:**

**Using the Express 5000/FSU Series to Connect an AS/400 to Remote Controllers via SDLC Protocol**

**A:**

## Introduction

When used in an SNA/SDLC network, the Express 5000 series (previously known as the FSU series) provides local spoofing by emulating the primary and secondary SDLC roles. The Express 5000 series performs conversion from SDLC to frame relay and also terminates SDLC links, providing primary and secondary emulation between Express 5000 series products. Local spoofing improves performance by reducing traffic across the frame relay network and allows definite response times on the SDLC links.

To perform spoofing, the Express 5000 products automatically set themselves up to provide primary or secondary emulation based on the receipt of the SNRM (Set Normal Response Mode) from an SDLC device. The Express 5000 products look for SNRM on all ports and assumes a secondary role once SNRM is received. The Express 5000 products then bring up the LLC2 (Logical Link Control 2) link across the frame relay network to another ADTRAN FRAD (Frame Relay Access Device) which assumes a primary role. This allows the Express 5000 products to operate with PU Type 2.1 devices.

## Before You Begin

The following ADTRAN products are capable of performing this SDLC application: FSU, FSU 5622, Express 5110, Express 5200, Express 5210. For the purposes of this technical note, we will be using the Express 5200 in our example network shown in Figure 1. The example network consists of a host AS/400 and two remote controllers, using an Express 5200 at each location for connectivity to the 56K frame relay lines.

In this technical note, we will be configuring the units via a VT100 terminal session

through the Control Port instead of using the front panel. To connect via a terminal session, you will need an RJ45 straight-through 8-pin cable, the ADTRAN-provided RJ45-to-DB25 adapter, and a male DB25 to female DB9 cable (sometimes referred to as a modem cable). If your ADTRAN-provided adapter is an RJ45-to-DB9, you will not need the additional DB25 to DB9 cable.

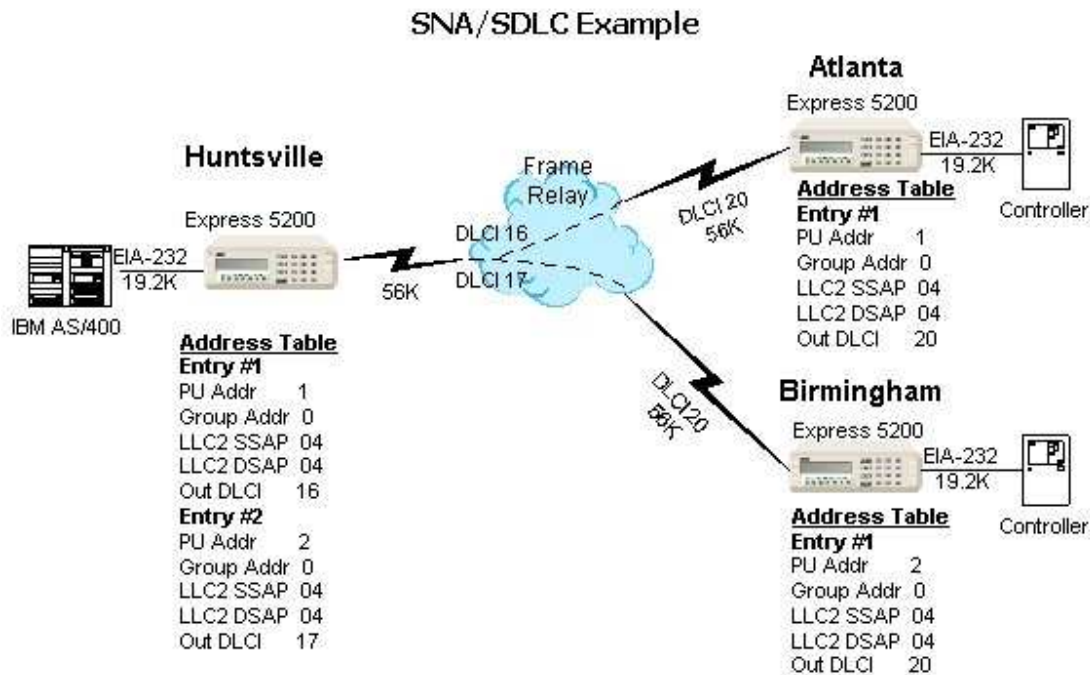


Figure 1

## Configuring the Host Express 5200

We will begin configuring the host Express 5200 first by connecting a PC's com port to the Control Port of the unit. Connect the RJ45 straight-through 8-pin cable between the Control Port of the Express 5200 and the ADTRAN-provided RJ45-to-DB25 adapter. Now connect the DB25 to DB9 cable between the ADTRAN adapter and the com port of your PC. Configure a VT100 emulation program, such as Windows Hyperterminal, to 9600 8-N-1.

Press <enter> a few times and the Login prompt will be displayed. The default password is *adtran*. Once logged in, the **Main Menu** will be displayed as shown in Figure 2.



Figure 2

1. Enter 1 and press <enter> to select **Configuration**. See Figure 3.

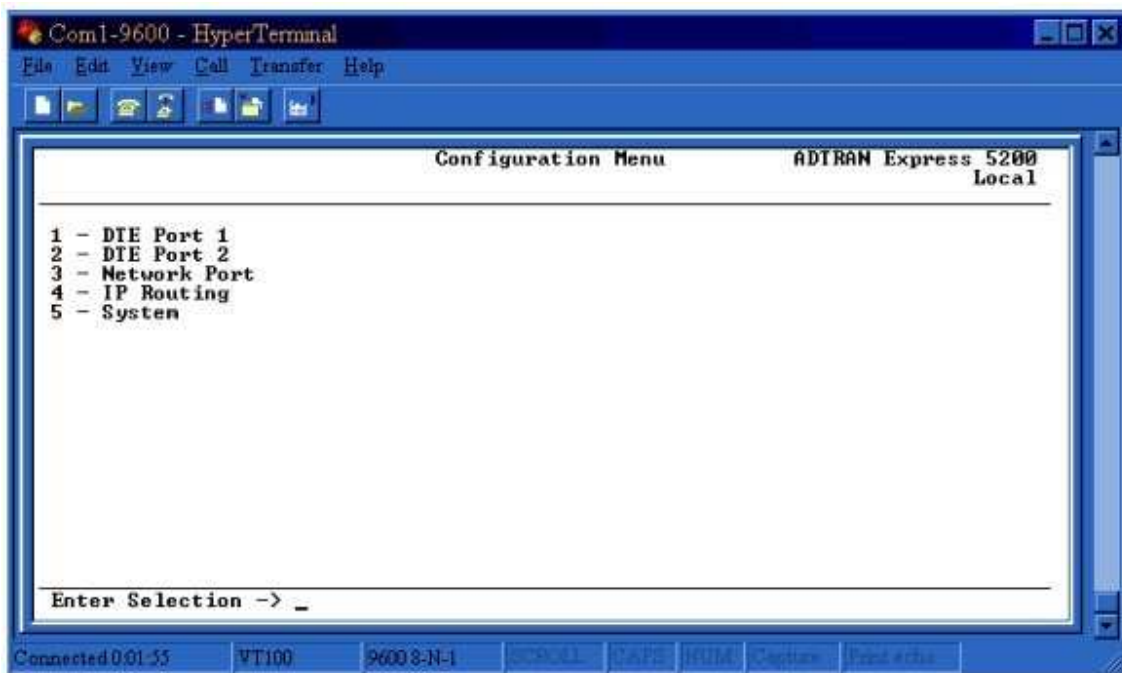
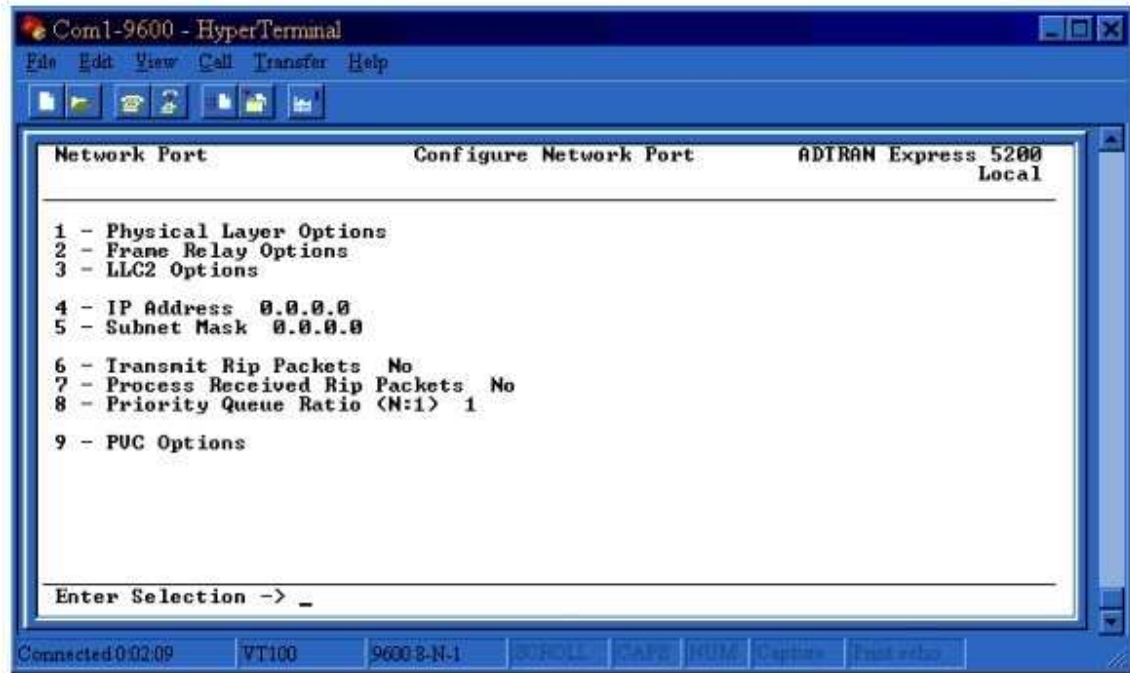


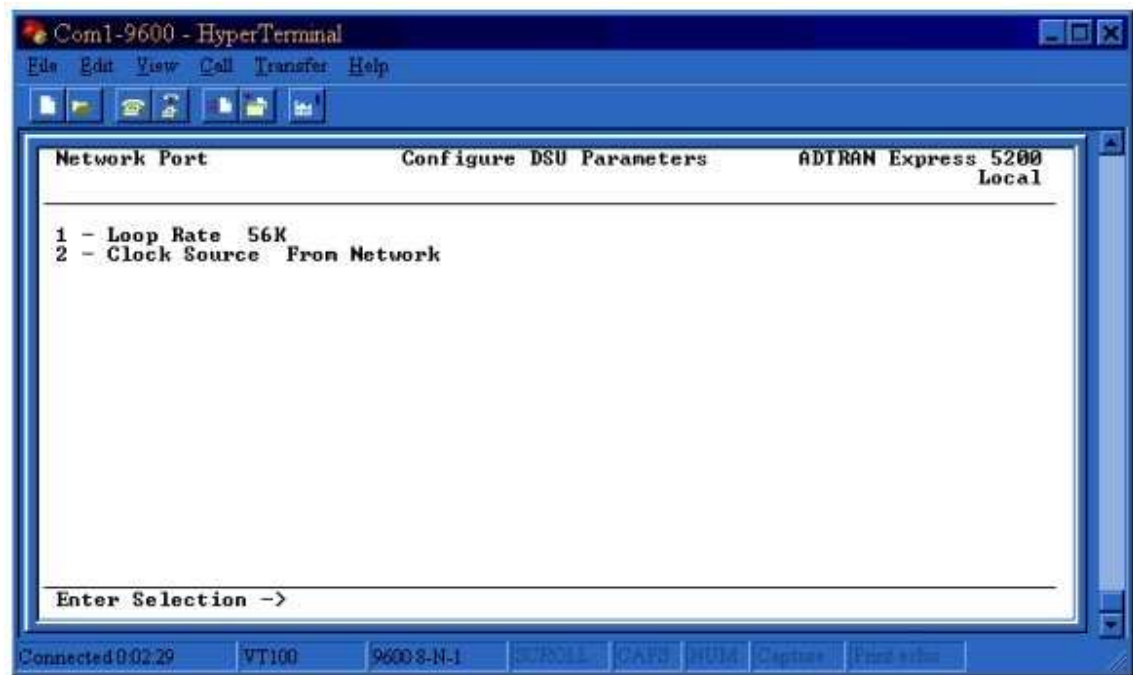
Figure 3

2. Enter 3 and press <enter> to select **Network Port**. See Figure 4. The **Network Port** is the port that will be connected to the frame relay line provided by Telco.



**Figure 4**

3. Enter 1 and press <enter> to select **Physical Layer Options**. Select the appropriate rate for the frame relay line, either 56K or 64K. For the example network in Figure 1, we will be using 56K. The **Clock Source** option should remain as *From Network* to take timing from the frame relay line. See Figure 5.



**Figure 5**

4. Press <Esc> to return to the previous menu. Enter 2 and press <enter> to select **Frame Relay Options**. Select the appropriate frame relay **Signal Type** as determined by the frame relay service provider. For the example network, we will be using *ANSI T1.617-D* (also known as Annex D) signaling. See Figure 6.

**NOTE:** If you are connecting to a point-to-point DDS line which does not have frame relay, then the **Signal Type** will need to be set to *None*.

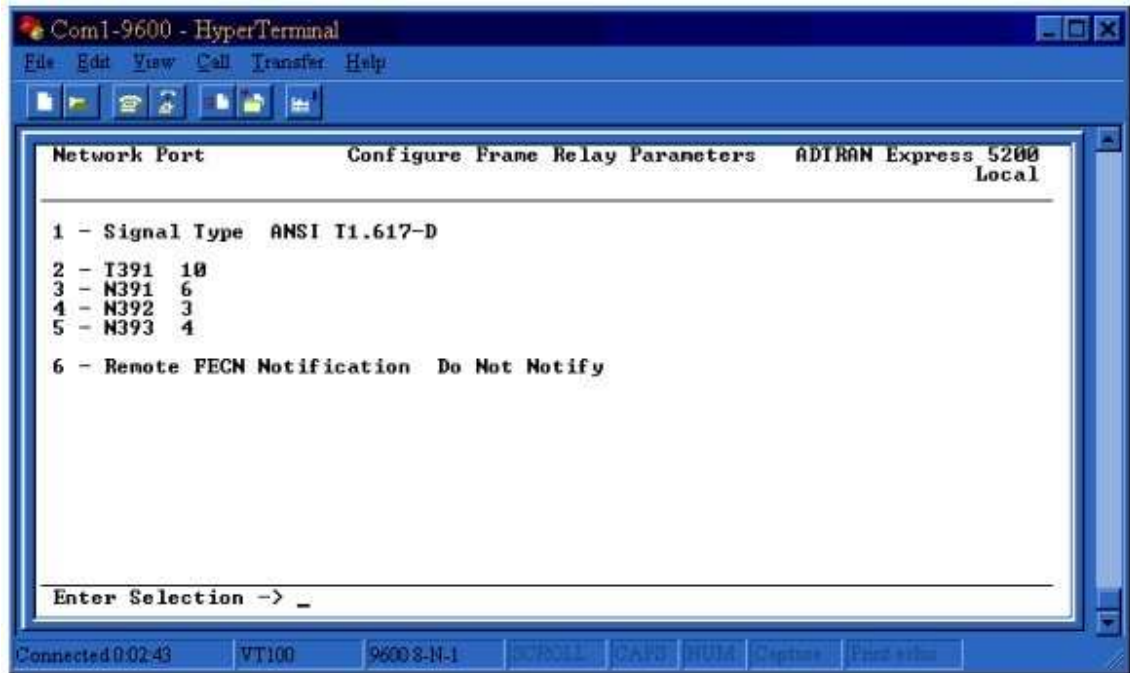


Figure 6

5. Press <Esc> to return to the previous menu. Enter 9 and press <enter> to select **PVC Options**. In order for the Express 5200 to take statistics on each PVC (Permanent Virtual Circuit) individually, the DLCI (Data Link Connection Identifier) numbers must be specified in the **PVC Options** table. For the example network, we will be using DLCI 16 to communicate with the Atlanta remote and DLCI 17 to communicate with the Birmingham remote. Therefore, we will need two entries in the **PVC Options** table.
6. Enter 1 and press <enter>, then enter the first DLCI value of 16 for the Atlanta remote. Notice that DLCI 16 is denoted as **Current Entry 1** in the upper left-hand corner. See Figure 7. To configure the second DLCI in the table, enter 4 and press <enter> to select **Add. Current Entry 2** will be displayed. Enter 1 and press <enter>, then enter the second DLCI value of 17 for the Birmingham remote. See Figure 8.

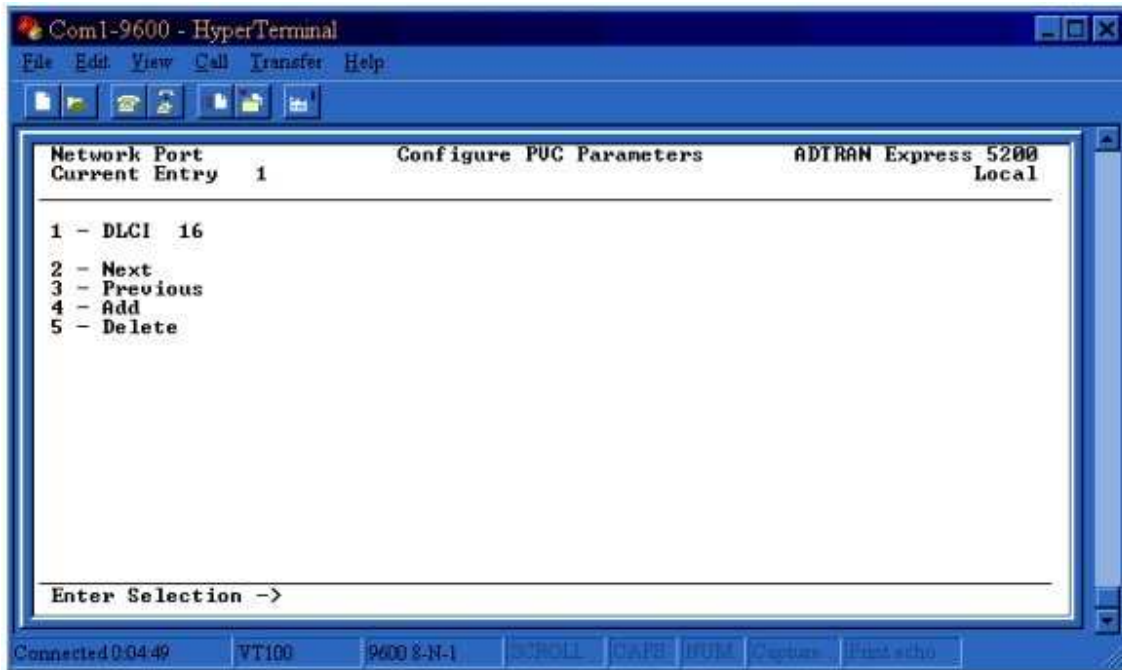


Figure 7

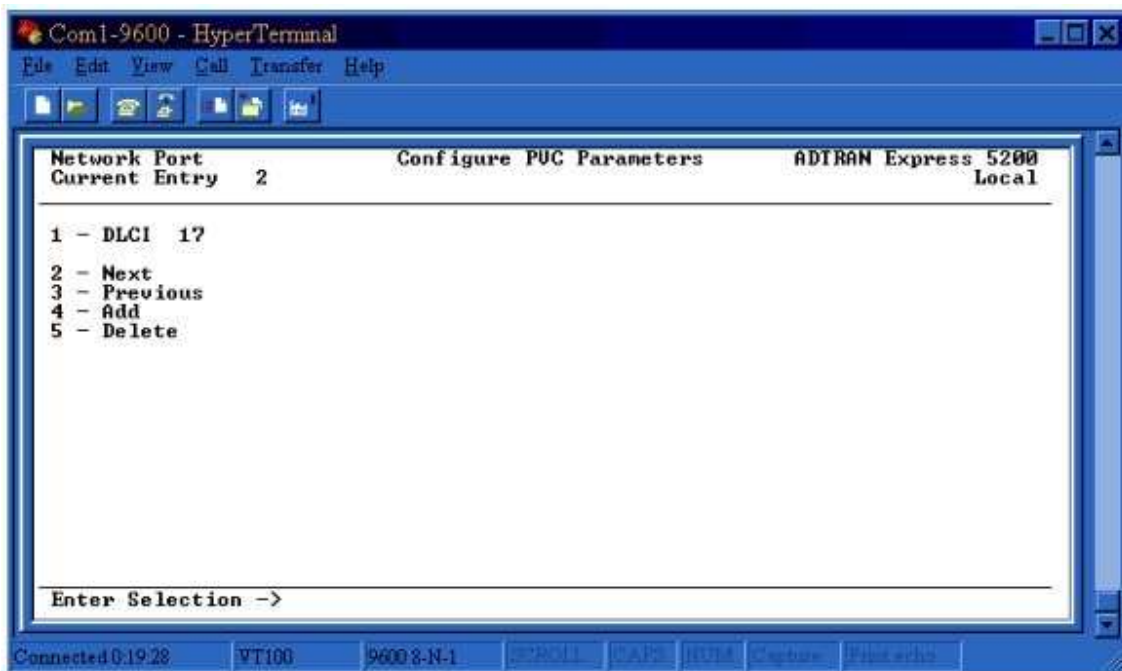


Figure 8

7. Press <Esc> twice to return to the menu shown in Figure 3. Enter 1 and press <enter> to select **DTE Port 1**. Enter 1 and press <enter> to select Protocol. Select **SDLC** as the **Protocol**. The menu in Figure 9 will be displayed.

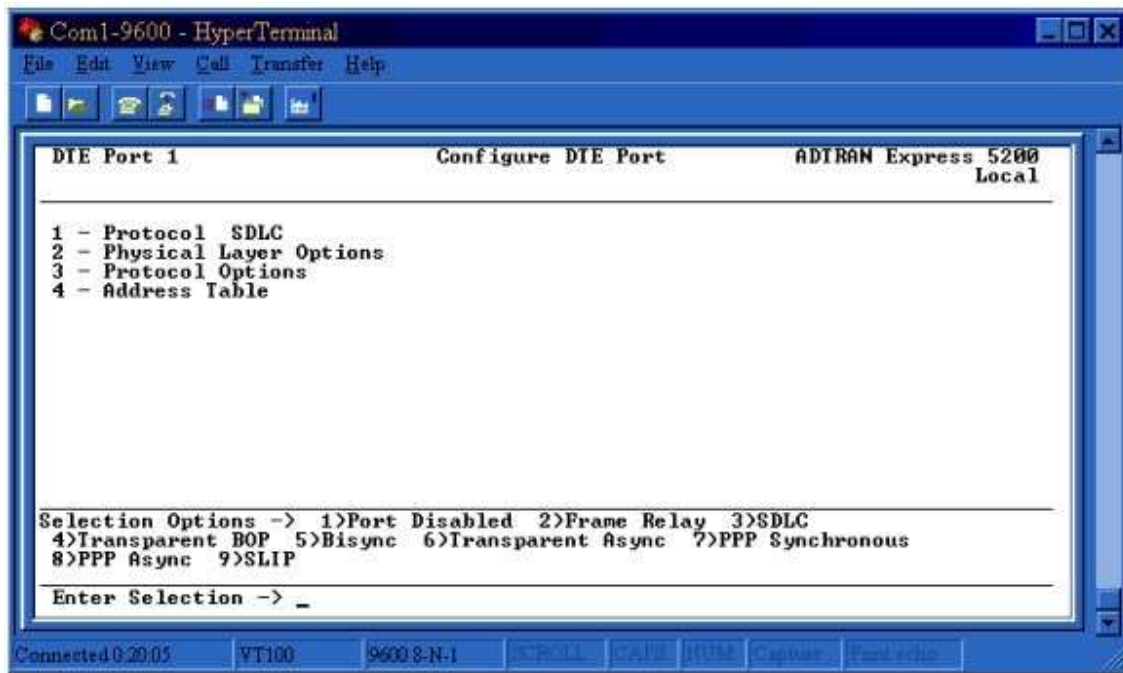
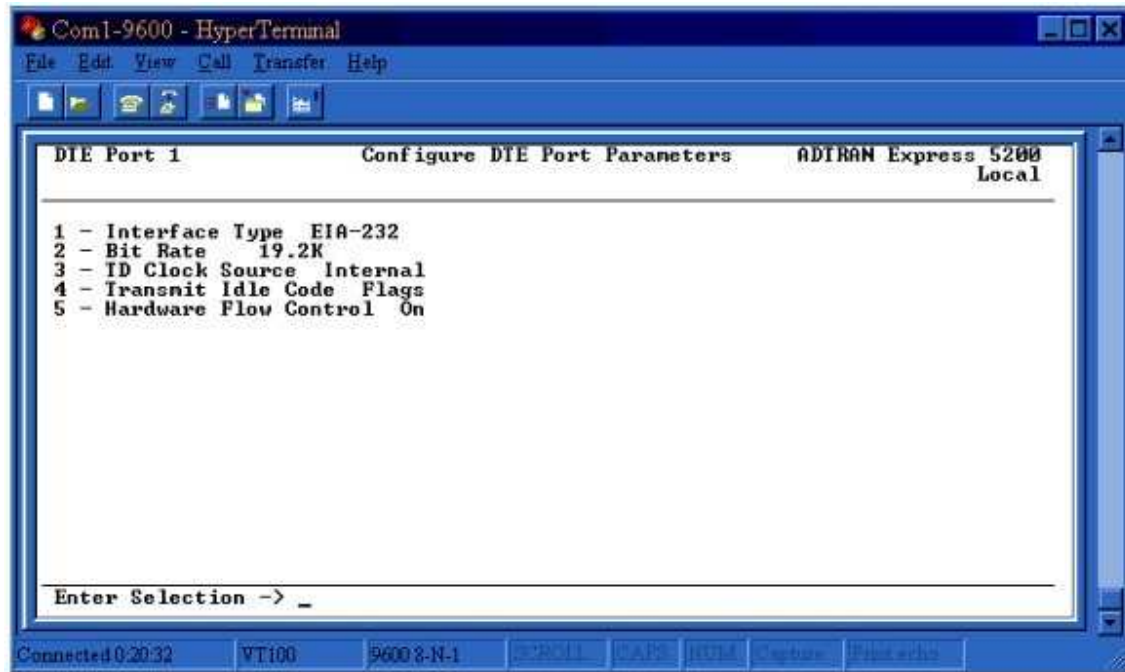


Figure 9

8. Enter 2 and press <enter> to select **Physical Layer Options**. Select the appropriate **Interface Type** and **Bit Rate**. For the example network in Figure 1, we will be using EIA-232 and 19.2K. **TD Clock Source** should remain as *Internal* unless the AS/400 is configured to provide timing. **Transmit Idle Code** should remain as *Flags* unless the AS/400 is configured to expect ones for its idle code. **Hardware Flow Control** should always be *On* since the AS/400 relies on the RTS and CTS leads for flow control.





**Figure 10**

9. Press <Esc> to return to the previous menu. Enter 3 and press <enter> to select **Protocol Options**. Select the appropriate **Data Format**, NRZ or NRZI, according to how your AS/400 is configured. For the example, we will be using *NRZ*. The remaining options should be left as default. See Figure 11.

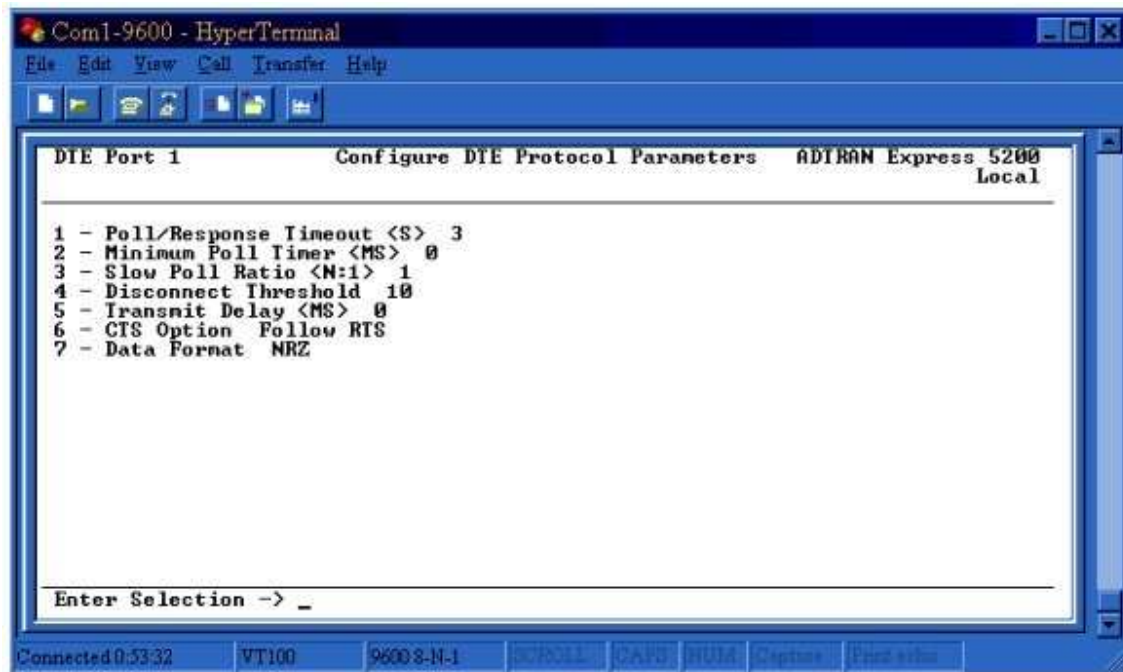


Figure 11

10. Press <Esc> to return to the previous menu. Enter 4 and press <enter> to select **Address Table**. Since the host Express 5200 in the example network has two PVCs (one to each remote), there will be two entries in the SDLC **Address Table**. The following values should be entered into the configuration.

	Atlanta (Figure 13)	Birmingham (Figure 12)
<b>PU Address</b>	1	2
<b>Group Address</b>	0	0
<b>LLC2 SSAP</b>	4	4
<b>LLC2 DSAP</b>	4	4
<b>Outgoing DLCI</b>	16	17

11. The **PU Address** (Physical Unit Address), also known as station address, must match the value configured in the AS/400. The **LLC2 SSAP** (Source Service Access Point), **LLC2 DSAP** (Destination Service Access Point), and **Outgoing DLCI** values are independent from the AS/400 configuration. These fields must be configured appropriately between the host and remote units for the proper transfer of data. See Figures 12 and 13. It is important to note that the **LLC2 SSAP** and **LLC2 DSAP** fields are hexadecimal values and can only be increments of 4, such as 4, 8, C, 10, etc.

**NOTE:** Each entry in the **Address Table** must be unique among the **LLC2 SSAP**, **LLC2 DSAP**, and **Outgoing DLCI** fields. In the example above, the two

entries differ in the DLCI field, Atlanta being DLCI 16 and Birmingham being DLCI 17. In the case where there are two controllers located at the remote which use the same DLCI, the LLC2 DSAP would need to be different. Since this field is in hexadecimal and must be in increments of 4, the LLC2 DSAP could be 4 and 8, respectively.

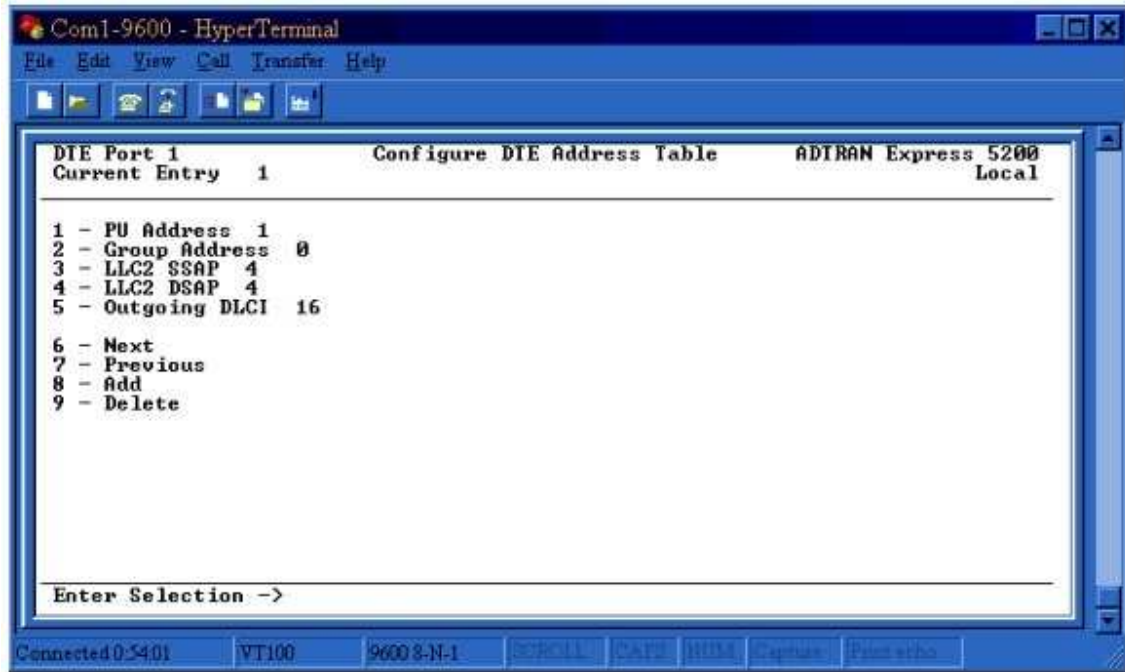
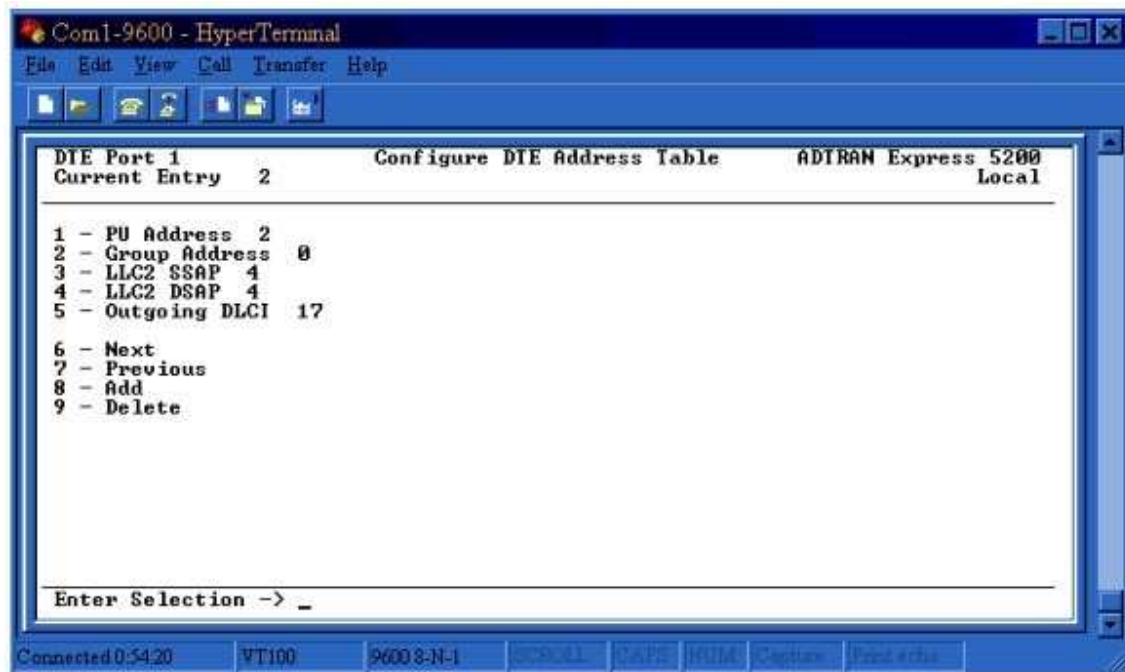


Figure 12



**Figure 13**

11. Press <Esc> twice to return to the Configuration menu. Select **System** and press <enter>. If you do not have voice cards installed on the Express 5200 units, it is more efficient to disable fragmentation. Since we are not doing voice in the example network, we will disable fragmentation by setting the **Support Fragmentation** option to *No*.

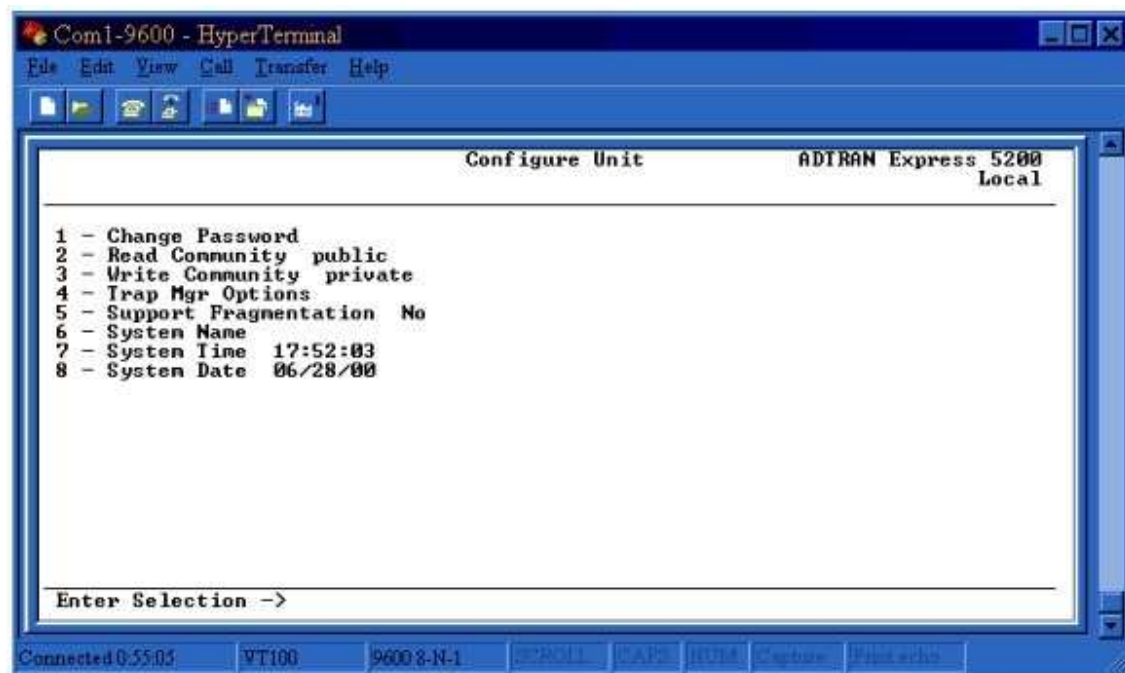


Figure 14

Once the configuration is complete, press <Esc> twice to return to the **Main Menu**. Enter 4 and press <enter> to select **Save Configuration**. This will cause the unit to reboot and the changes will be saved.

### Configuring the Remote Express 5200s

Using the VT100 terminal session, login to one of the remote Express 5200s and the **Main Menu** will be displayed. The remote Express 5200s will be configured the same as the host Express 5200 with the exception of the following menus:

**Configuration -> Network Port -> PVC Options**  
**Configuration -> DTE Port 1 -> Address Table**

According to the network diagram in Figure 1, both remotes are using DLCI 20 to communicate with the host. Therefore, the **DLCI** field under **PVC Options** should be 20 for both the Atlanta and Birmingham units. See Figure 15.

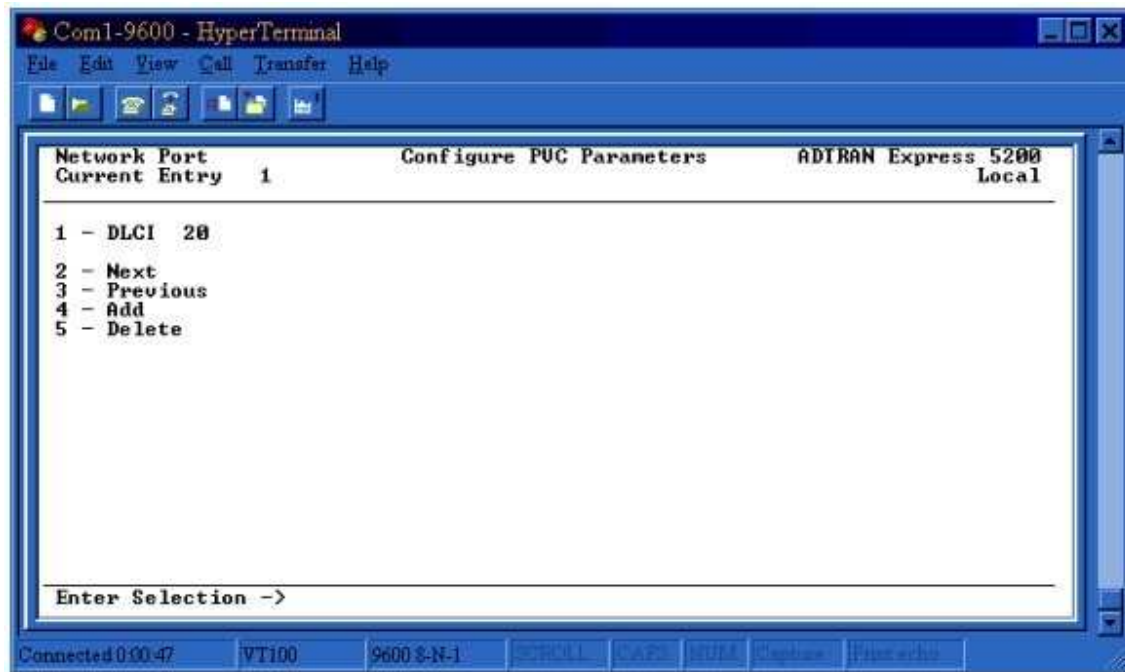


Figure 15

The host unit had two entries in the **Address Table** because there were two PVCs. However, each remote unit will only have one entry in the **Address Table** because each remote site has only one PVC. According to the network diagram in Figure 1, the following values should be used in the **Address Table** for the Atlanta remote. See Figure 16.

	Atlanta
<b>PU Address</b>	1
<b>Group Address</b>	0
<b>LLC2 SSAP</b>	4
<b>LLC2 DSAP</b>	4
<b>Outgoing DLCI</b>	20

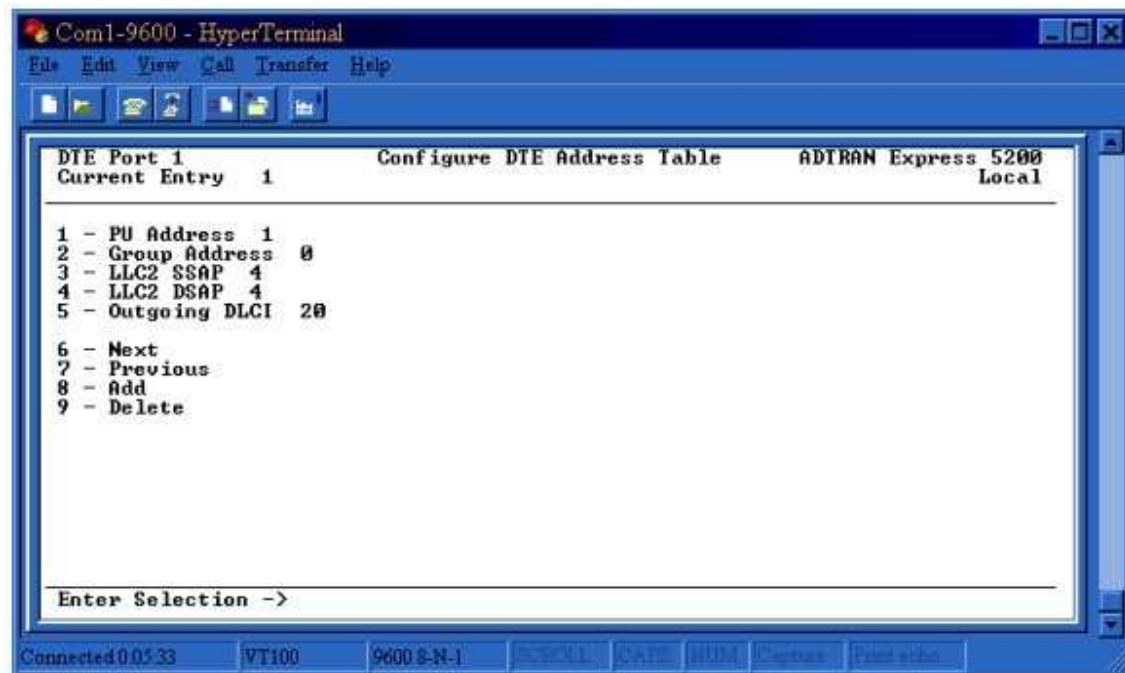


Figure 16

The following values should be used in the **Address Table** for the Birmingham remote. See Figure 17.

	<b>Birmingham</b>
<b>PU Address</b>	2
<b>Group Address</b>	0
<b>LLC2 SSAP</b>	4
<b>LLC2 DSAP</b>	4
<b>Outgoing DLCI</b>	20

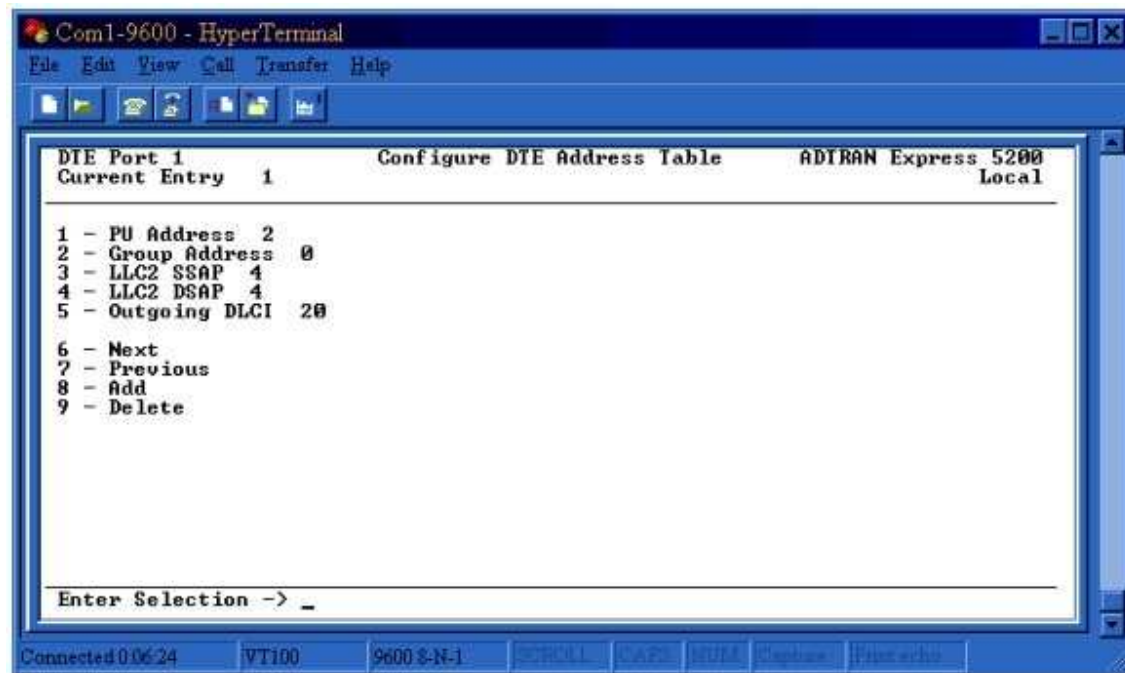


Figure 17

For the example network, all other options should match the configuration for the host unit.

**NOTE:** Remember to save the configuration. Changes to the configuration will not take effect until the save is complete.

## Testing & Troubleshooting

Before varying on the AS/400, there are a few items that should be checked.

1. Verify that the physical layer is up. From the **Main Menu**, go to **View Statistics, Network Port**. If the physical layer is up, **DSU State** will have a status of *56K Normal*. Below are all possible conditions and their meanings.

<b>56K Normal:</b>	Normal Condition for 56k circuit.
<b>64K Normal:</b>	Normal Condition for 64k circuit.
<b>Open Loop:</b>	No sealing current and no RX signal.
<b>OOS/OOF from Net:</b>	Out of service code received from the service provider.
<b>No Frame Sync:</b>	No frame sync for 64k loop.
<b>DSU In Test:</b>	The service provider has placed unit in test.
<b>No RX Signal:</b>	Sealing current present, but no RX signal.
<b>Check TELCO:</b>	Cable/wiring problem.



- 2.
3. Verify that the frame relay is up. From the **Main Menu**, go to **View Statistics, Network Port**. If the frame relay is up, **Signal State** will have a status of *Up*. If **Signal State** has a status of *Down*, then the Express 5200 is not communicating with the service provider's frame relay switch. Check the **TX Signal Frm** and **RX Signal Frm** fields under the **Signal Stats** heading. If you see **TX Signal Frm** incrementing but **RX Signal Frm** is not incrementing, the service provider's frame relay switch is not responding to the frame relay signaling. Try changing the network signaling type by going to **Configuration, Network Port, Frame Relay Options, Signal Type**. Try all three options (ANSI, ITU-T, LMI) one at a time. Remember to save the configuration after each change and the unit will reset. The initial **Signal State** will show *Up*; however, wait at least a full minute after the reset is complete to see if the **Signal State** stays at *Up*. This will allow the Express 5200 and frame relay switch to trade sufficient polls to determine if the circuit is really up. If you have tried each signaling type and the **Signal State** remains *Down*, contact the frame relay service provider.

Once the frame relay is up, try varying on the AS/400. If the link becomes stuck at Vary On Pending, use the following methodology to trace how far the frames are getting once they leave the AS/400.

1. While the AS/400 is varied on, look at the DTE statistics on the host Express 5200 which is connected to the AS/400. From the **Main Menu**, go to **View Statistics, DTE Port 1**. Look at **Rx Frames** and verify that you are receiving frames from the AS/400. If you are not receiving frames, check the physical connection. Verify that the Express 5200 is configured for the proper **Interface Type**, whether *EIA-232* or *V.35*. If the connection appears to be good, look at the **Errors** section on the DTE port's statistics. If you are taking errors, you may have the incorrect **Data Format** configured on the Express 5200. Look at the AS/400 configuration and verify whether it is configured for NRZ or NRZI. Make sure the Express 5200 matches this format by going to **Configuration, DTE Port 1, Protocol Options**. You may also want to check the AS/400 configuration and make sure that it is configured for Full Duplex.
2. On the remote Express 5200, go to **View Statistics, DTE Port 1**, and make sure that **Tx Frames** is incrementing. If **Tx Frames** is incrementing, the data from the AS/400 is getting all the way to the Controller. Now verify that **Rx Frames** is incrementing which means that the Express 5200 is receiving frames coming from the Controller. If **Rx Frames** is not incrementing, look at the **Errors** section on the DTE port's statistics see if you are taking errors. If you are taking errors, verify that the Express 5200 is configured for the same **Data Format** (*NRZ* or *NRZI*) that the Controller is providing. Also verify that the Express 5200 is configured for the proper **Interface Type** and that the physical connection is good.
3. Now go back to the host Express 5200 and go to **View Statistics, DTE Port 1**. Verify that **Tx Frames** is incrementing. This means that data coming from the remote Controller is being transmitted to the AS/400. If **Tx Frames** are not incrementing, you may not be receiving data from the remote Controller.

If you experience any problems using your ADTRAN product, please contact ADTRAN technical support @ 888-423-8726

---