Setup Guide

D-Link®

D-Link
Building Networks for People

DFE-570TX for Windows 2000
Network Adapter Load Balancing and Failover

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DFE-570TX

for **Windows** 2000
Setup Guide

Introduction to DFE-570TX

DFE-570TX from D-Link is a software-only solution that provides dynamic fail over and allows customers to load balance network traffic across multiple network adapters in the server. DFE-570TX is an elegantly simple yet extremely effective solution for increasing server availability and performance. The software's hardware independence and protocol independence allow easy integration into any NT/2000 server environment, making it ideal for mission-critical database servers, electronic commerce, web servers and file servers.

DFE-570TX eliminates the network interface as a single point of failure by providing redundancy across multiple network adapters in a DFE-570TX array. DFE-570TX ensures that users maintain non-stop access to key resources on the network, even if one or more of the network interface connections go down. If a connection to an adapter is lost, DFE-570TX will instantly take the adapter out of the array and balance the traffic across the remaining NICs with no loss of data and, just as importantly, without loss of connection.

DFE-570TX can eliminate network interface performance bottlenecks by distributing traffic among the multiple Ethernet ports on the server. The software instantly routes connections to different adapters as users access the server. This process effectively increases network interface bandwidth by a factor equal to the number of adapters on the server. To the server, these multiple adapters appear as a single network interface. To the remote workstation or web surfer, the server appears immediately available without the delay caused by congestion during high-access periods.

Key Features

- **Increased performance with network traffic Load Balancing.**

- **Can more than triple your server's throughput.**

- **Instant failover across multiple NICs without loss of data.**

- **Remote management with Web-based Enterprise Manager.**

- **Supports IP, IPX and NetBEUI and AppleTalk.**

- **Compatible with any NIC card – not vendor specific.**

- **Supports Ethernet, Fast Ethernet, Gigabit Ethernet.**

- **Provides detailed throughput graphing and reporting.**

Important Information

The following sections cover important information you need to successfully install DFE-570TX. Please read this section carefully. This information is intended to help you get up and running quickly and minimize the "gotchas" that can waste hours of installation time.

What's New in DFE-570TX for Windows 2000

The Windows 2000 version of DFE-570TX is different in a number of ways from the Windows NT version of DFE-570TX.

- New Setup Program no longer requires DFE-570TX to be installed from within the Network Control Panel. However, DFE-570TX still installs as a protocol transport under each Local Area Connection.

- The main DFE-570TX interface is no longer accessed from the Network Control Panel. It is now accessed from the Windows Start Menu.

- The new interface combines the Status Tab, Advanced Tab and the Graph Utility from D-Link 2.1 into one program.

- The setup and configuration functions are in a separate utility that is accessed from the Properties page of the DFE-570TX service.

- DFE-570TX no longer installs a "virtual miniport adapter" which was used to configure protocol information for the array. DFE-570TX now utilizes the IP address from the primary adapter or Local Area Connection.

- The Local Area Connection name for the primary adapter (in the Network and Dial-up Connections folder) is renamed so that it is easily identified.

Requirements

DFE-570TX is an NDIS Intermediate driver that performs all of its functions in the Kernel mode of Windows 2000. Because DFE-570TX operates in kernel mode, it should work well with almost any server configuration and application. A few specific requirements, however, should be met before DFE-570TX can successfully operate on your server.

- *Operating Systems:*
  Microsoft Windows 2000 Professional, Server or Advanced Server

- *Miscellaneous: 32 MB RAM; 2 MB hard disk space; CD-ROM; SVGA video adapter; mouse or compatible pointing device*

Recommended: **As with most applications, it is recommended that you install the latest Service Packs and or Hot Fixes from Microsoft prior to installing DFE-570TX.**

Microsoft Cluster Server

If installing Microsoft Cluster Server with DFE-570TX, DFE-570TX must be installed first. After installing DFE-570TX, an advanced configuration option must be set to allow Microsoft Cluster Server to bind to the DFE-570TX Virtual adapter. The *Clustering Support* option can be found on the Advanced Tab in DFE-570TX. For more detail on setting this option please refer to the Advanced Settings topic on page 13.

Hardware Driver Compatibility

Windows 2000 drivers are based on the NDIS specification. Starting with NDIS 4.0 the NDIS spec was updated to incorporate advanced features such as the use of Intermediate drivers which sit between the Windows Protocol Stack and the lower-level hardware drivers. The 4.0 spec also outlines how the lower-level drivers communicate with Intermediate drivers. DFE-570TX operates differently depending on the types of lower-level drivers used.

NDIS 4.0 and NDIS 5.0 Drivers

DFE-570TX takes advantage of NDIS 4.0 and 5.0 compatible drivers to provide instant failover (less than < 500 ms) because NDIS 4.0 and 5.0 drivers notify Intermediate drivers like DFE-570TX instantly of any failures or changes in status through "Status Indications." When an adapter fails, a Status Indication is sent to DFE-570TX and failover occurs instantly without losing a single packet in most cases. Also, when an adapter with an NDIS 4.0 driver is brought back online, DFE-570TX will instantaneously add the adapter into the array and redistribute the traffic.

Recommended: **Always check with your NIC manufacturer's web site to make sure you have the latest driver—preferably an NDIS 4.0 or 5.0 version. NDIS 4.0 and 5.0 drivers provide instant failover capability to DFE-570TX.**

NDIS 3.x Drivers

Not all NIC manufacturers have released NDIS 4.0 versions of their drivers. However, DFE-570TX can still provide a high level of failover performance with NIC drivers that do not send "Status Indications." For non-NDIS 4.0 drivers, DFE-570TX utilizes "Status Packets" that are generated by DFE-570TX so each adapter can poll the other adapters in the array to make sure they are still alive. This process generates a small amount of traffic on the network and introduces some latency in the failover process. However, even when using Status Packets, DFE-570TX can provide failover within 1 or 2 seconds with only three to four packets lost on average.

Before You Install - a Checklist

Use this checklist to make sure your environment is set up correctly for DFE-570TX to be installed properly. It is highly recommended you follow each of the steps in the order given.

- Before you run the Win2000, please make sure all cables, switches and hubs are set up and working properly.
- Windows 2000 is running properly.
- All NICs have been installed and checked for proper operation.
- All protocols, drivers, and network services are installed and operate correctly.
- The latest service pack or necessary Hot fixes from Microsoft has been installed.
- The necessary Hot Fixes have been installed.

Quick Setup Guide

Installing DFE-570TX

Step 1
Insert CD in the CD-ROM drive of the server. If you downloaded DFE-570TX, copy the self-extracting executable that was downloaded from the D-Link Web site to the server that DFE-570TX is to be installed on.

Step 2
Start the setup program by launching D:\Win2000\DLinkW2k.EXE. (Assume D: is CD drive)

Step 3
When prompted, read the software license agreement and click yes to continue if you agree to the terms.
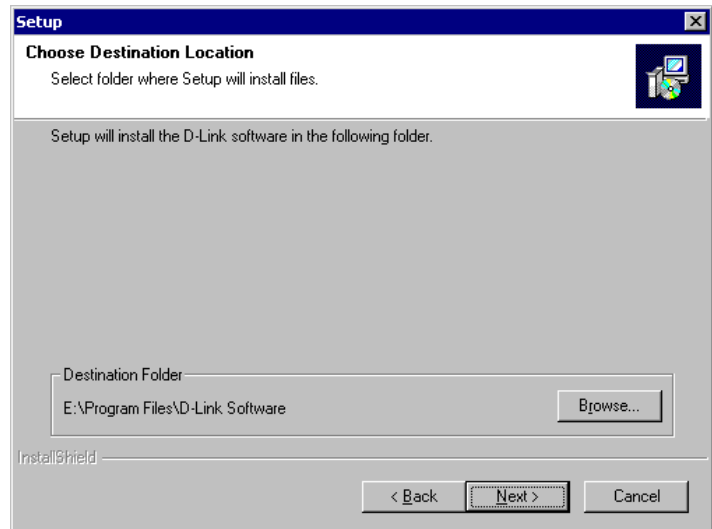
Figure 1. Select the destination directory to copy the DFE-570TX files to.
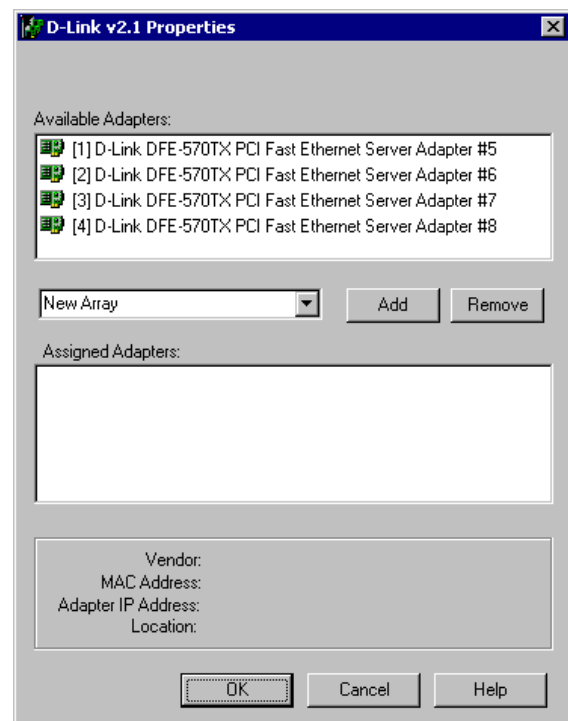
Step 4
Select the destination directory you wish to install the DFE-570TX support files to. The default location is **c:\Program Files\D-Link Software**.

Step 5
Next the setup program will create a folder off of the Start Menu to access the main DFE-570TX utility and documentation. The default folder is **\D-Link Software** off the root of the Start Menu. Either select the default or input the correct folder name.

Step 6
The DFE-570TX Properties dialog should be displayed. This dialog allows you to configure all of the adapters that you want to add to the DFE-570TX Array. Choose the first adapter in the "Available Adapters" list at the top of the dialog and select **Add...**

Figure 2. Adding adapters to the Array.

Step 7

You will be prompted to give the new array a name. Simply type over "New Array" in the pull-down list in the middle of the dialog. In the example at the right, an array called "Group1" was added.

Step 8

Next you are asked if you want to use this adapter's protocol information as the primary address for the array. If this is the primary IP of the machine you want advertised to clients, select **Yes.** Otherwise, select **No** and continue adding the other adapters to the array. When finished, click **OK.**

NOTE: When prompted to use an adapter's protocol information, you can only select YES for one adapter per array. The adapter chosen to use its protocol information will become the PRIMARY adapter of the array.   To change protocol information for the array, you must change the protocol information for the primary adapter.

NOTE: All available adapters must be assigned to an array. If you do not want load balancing or failover for a single adapter, assign it to a separate array by itself.

Step 9

When finished configuring the array, close the DFE-570TX Properties dialog and return the Setup program. Click the **finish** button to complete the setup.

Verifying Protocol Information of the Array

Once the setup program is complete you will want to verify the correct protocol information is configured for the array(s). Unlike earlier versions of DFE-570TX, the software does not install its own virtual adapter for each array. Instead it utilizes the protocol information from the array's primary adapter.

> **NOTE:** The IP Configuration under TCP/IP for the Primary Local Area Connection is the IP information used for the DFE-570TX array. Changing the IP information in the Primary Local Area Connection will change the IP information for the array.

To change or edit the IP address of the array, it is necessary to modify the IP of the array's primary adapter. Each array or group that is configured in DFE-570TX will have a primary connection associated with it. The primary Local Area connection is chosen during install when you select the IP address for the array. The adapter with the IP address chosen for the array becomes the primary Local Area connection for the array. Its name in the Network and Dial-up Connections folder is updated to "*Group* Primary Local Area Connection" where *Group* is the name of the array you created in DFE-570TX. To view the Primary Local Area Connection, perform the following steps:

Step 1

From the Start Menu, select Settings, Network and Dial-up Connections.

Step 2.

Select the Local Area connection titled "*Group* Primary Local Area Connection" where *Group* is the name of the array you wish to edit.
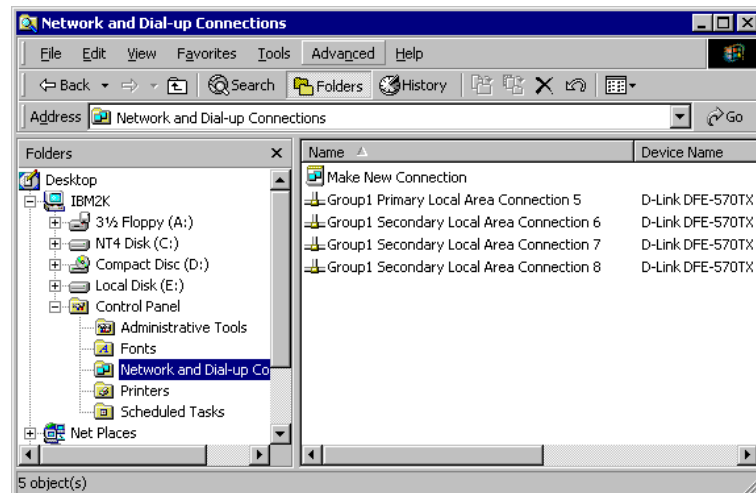

Figure 3. The title of each Local Area Conneciton is changed to reflect the array name it is associated with in DFE-570TX.

> **Note:** When DFE-570TX is installed, the title of each Local Area Conneciton is changed to reflect the array name it is associated with in DFE-570TX. Also, the Primary and Secondary adapters (connections) are identified for each array.
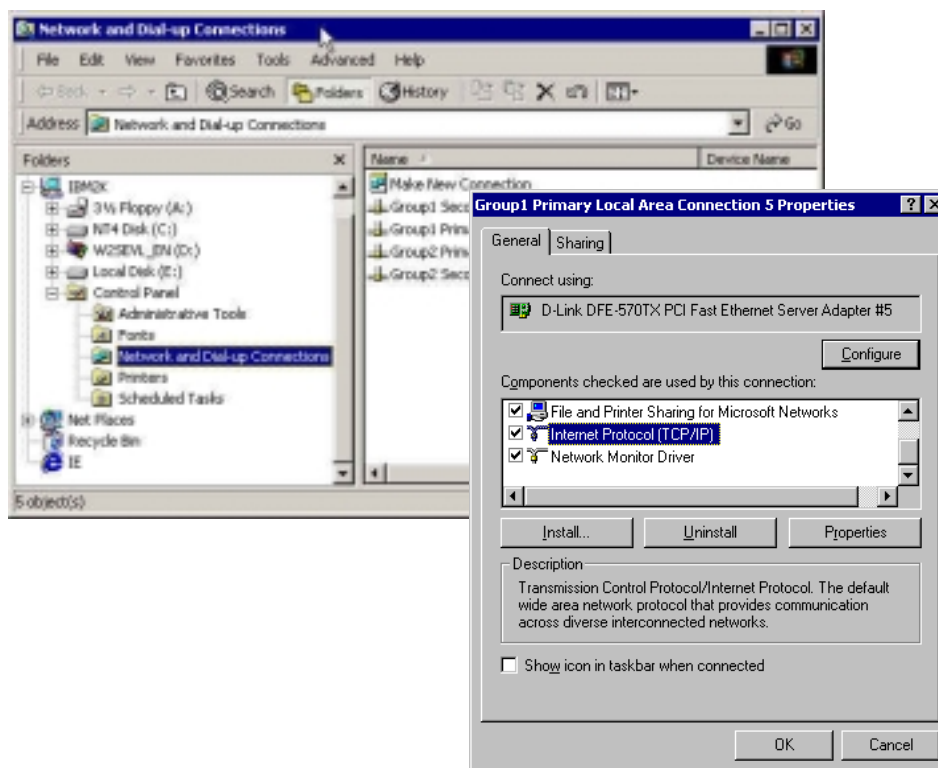
Step 3
Display the properties for the array's Primary Local Area Connection.

Step 4
Select Internet Protocol (TCP/IP) and select the Properties button.

Step 5
Verify that the correct IP information is listed for the Primary connection. If needed, edit the IP address information as you would any other adapter.

Figure 4. To change the IP Information for the array, change the IP Information for the array's "Primary Local Area Connection."

Using the DFE-570TX Statistics Utility

Launching the DFE-570TX Statistics Utility

At any time, you can instantly gauge the status of any port in a DFE-570TX array and view performance statistics on each array or individual ports. To view statistics and status information for DFE-570TX simply launch the main user interface from the Start Menu. If the default settings were used during setup, DFE-570TX can be found in the **D-Link Software** folder off of the Start Menu.   The DFE-570TX Statistics Utility consists of 5 tabs on the left and a graph area on the right.   The five tabs include:

- **Settings** – used to configure the appearance of the graph on the right.

- **Protocol Stats** – displays detailed statistics in tabular form for all protocols for the selected device.

- **Device Stats** – displays detail statistics in tabular form broken out by sub-component.

- **Status** – provides a tree view of all groups and adapters for the server and their current status.

- **Advanced** – allows for advanced configuration options used by the failover and load balancing functions.
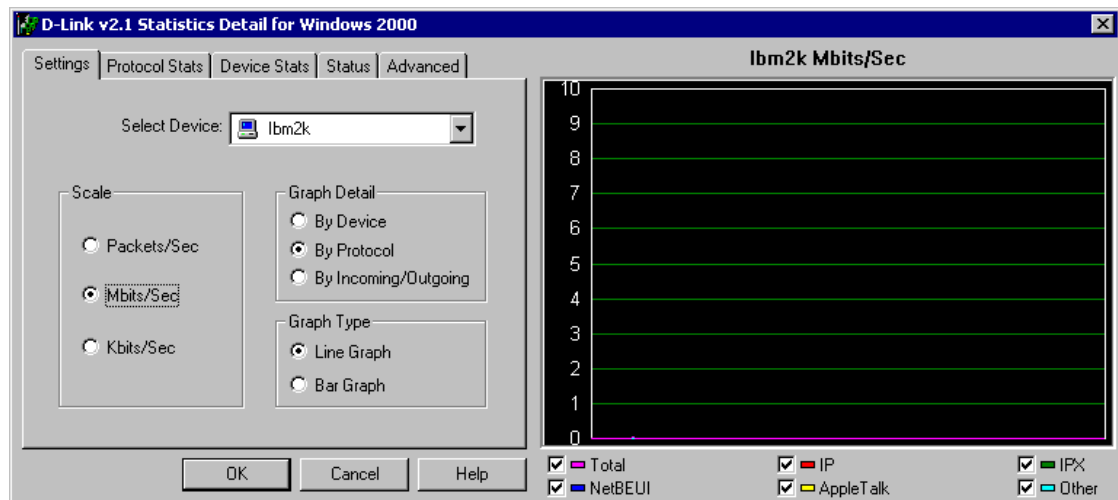

Figure 5. The DFE-570TX Statistics Utility.

Status Tab - Viewing NIC Card Status and Alerts

Within the Status tab, you can view the status of each NIC instantly. DFE-570TX keeps track of five different states for each NIC in an array. These states are represented using different color icons for the NICs in the tree view. The five states with explanations are shown below.
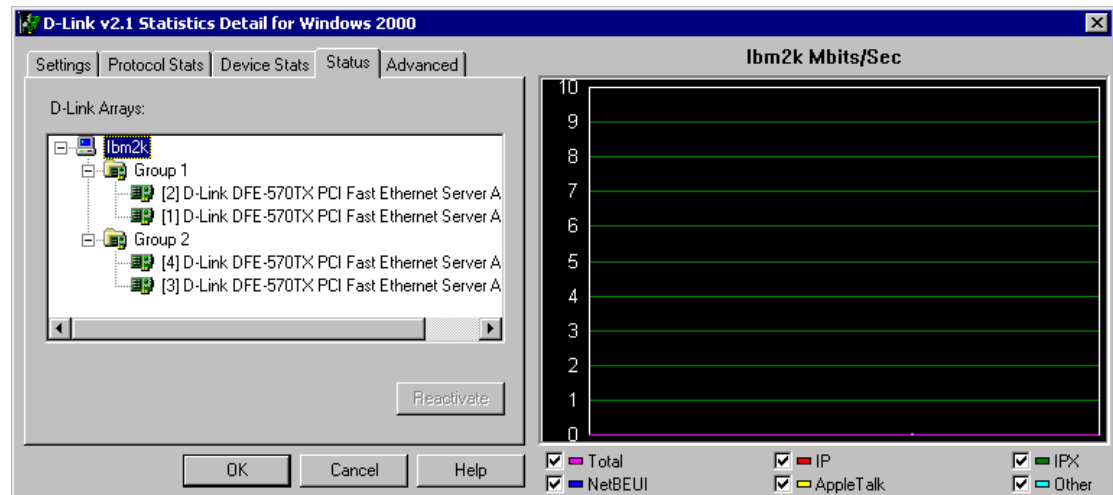

Figure 6. Viewing status information for each adapter in the array with the Status tab.

Green Adapter – Adapter's normal state. Adapter is working properly and has not failed since system start.

Green Adapter with Red X - Adapter is currently down and has failed for the first time.

Yellow Adapter - Adapter is currently working properly. However, yellow state indicates there has been a failure previously. DFE-570TX will automatically reactivate adapters that indicate that they are working properly again.

Yellow Adapter with Red X - Adapter is currently down and has been down multiple times before.

Red Adapter - Adapter has failed more than three times in one hour (default) and DFE-570TX has pulled the adapter from the array. This state prevents DFE-570TX from constantly failing over on faulty adapters that should be replaced.

NOTE: DFE-570TX will permanently remove a NIC if it determines that the NIC card has failed more than three times in one hour (achieving the red state above). If you will be testing failover functionality, you may want to adjust this default. Otherwise, if you pull the wire on a NIC card more than three times, you will have to reactivate the adapter from the Status Tab to add the NIC back into the array. Refer to the Advanced Tab- Advanced Configuration Options below to change these defaults.

Reactivating Adapters

Normally, if an adapter fails but later indicates it is online again, DFE-570TX will automatically add the adapter back into the array. However, if the adapter fails three times within one hour (default), DFE-570TX will permanently remove the adapter from the array. These thresholds can be modified under the Failover Settings section (see below).

To reactivate a permanently removed adapter, select the adapter and press the Reactivate button. If there are no problems inserting the adapter, the adapter will then be added back to its array without needing to reboot. Caution should be used when reactivating an adapter. If the adapter has failed several times, the adapter may be experiencing intermittent hardware problems and may need to be replaced. An adapter with hardware problems may cause other network problems to occur on the network.

Advanced Tab- Advanced Configuration Options

The Advanced Tab in the DFE-570TX interface allows for advanced configuration options used by the failover and load balancing functions. There are three groups of advanced settings located on the Advanced Tab. The first section allows for reactivation of permanently removed adapters without rebooting the server. The next section provides settings for disabling load balancing and Microsoft Cluster Server support. Finally, the third section contains settings for the operation of the failover function. Each group of settings will be described in detail.
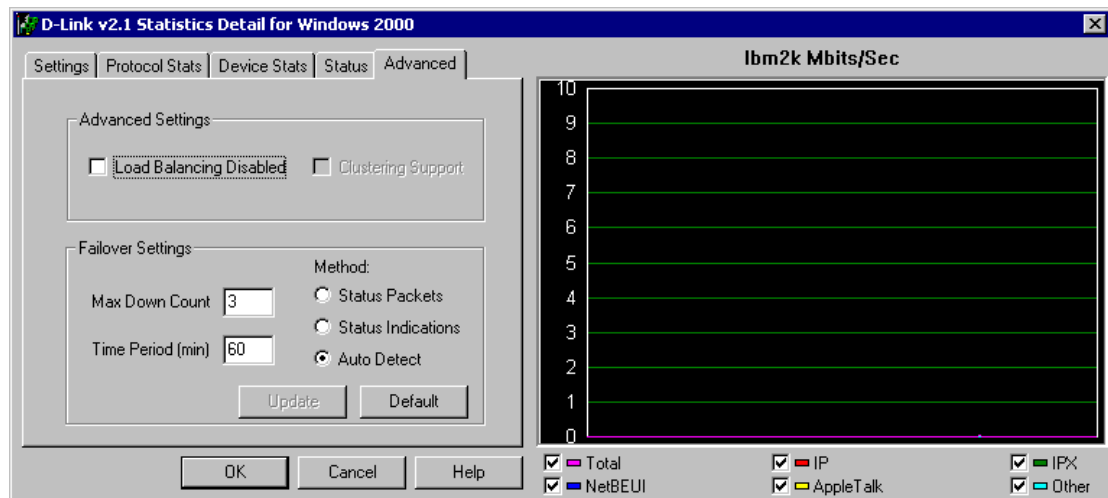

Figure 8. Configuring failover and load balancing settings with the Advanced tab.

Advanced Settings

The Advanced Settings section provides for the configuration of two optional settings. First, selecting the checkbox next to "Load Balancing Disabled" will disable the load balancing function. This setting will send data only through the primary adapter, but still provides for instantaneous failover. The Checkbox next to "Clustering Support" will change settings to the DFE-570TX virtual driver so that Microsoft Cluster Server can be used with DFE-570TX.

NOTE: Both of these settings require a reboot to take effect.

Failover Settings

The Failover Settings section provides options that control the failover function. Each setting is discussed below.

The first column of options set the conditions to permanently remove adapters from the array. The setting for **Max Down Count** is the number of times an adapter must go down (and comes back online) in the defined time period before being permanently removed. The default value for this field is 3. A value of zero (0) disables this feature so that an adapter can fail repeatedly without being permanently removed.

The setting for **Time Period** is the amount of time (in minutes) the **Max Down Count** setting must be exceeded before an adapter is permanently removed. The default value for this field is 60 minutes (1 hour).

The second column of settings control the method used to detect that an adapter has failed. The **Status Packets** method sends a status packet from one adapter to another in order to determine if the receiving adapter is available.

The **Status Indication** method uses NDIS 4.0 functionality to have an adapter inform DFE-570TX that an adapter has failed or is functioning properly again. Not all adapters support this method but it does provide for faster failover.

The **Auto Detect** method determines at system startup which method (Status Packets or Status Indications) should be used to provide the best failover method for the installed adapters.

After any setting has been changed, the Update button will become active. Once all changes have been made, press the Update button for the settings to automatically go into effect. No reboot is required and all settings are saved for use after rebooting. To restore all settings back to their default values, press the Default button. Press the Update button to have these settings go into effect. If any changes have been made and the OK button is pressed, the new settings will then automatically be applied.

Settings Tab- Adjusting the Graph Settings

DFE-570TX also provides the ability to view detailed traffic statistics in real-time graphs and reports. The **Settings** tab allows you to customize how DFE-570TX graphs and displays throughput data, as well as select which device to graph throughput data on.   On this tab you can:

- **Change the scale to Packets/Sec, Mbits/Sec or Kbits/sec.**

- **Further breakout data by Incoming/Outgoing data, per adapter, or by protocol.**

- **Select between Bar Graph or Line Graph.**
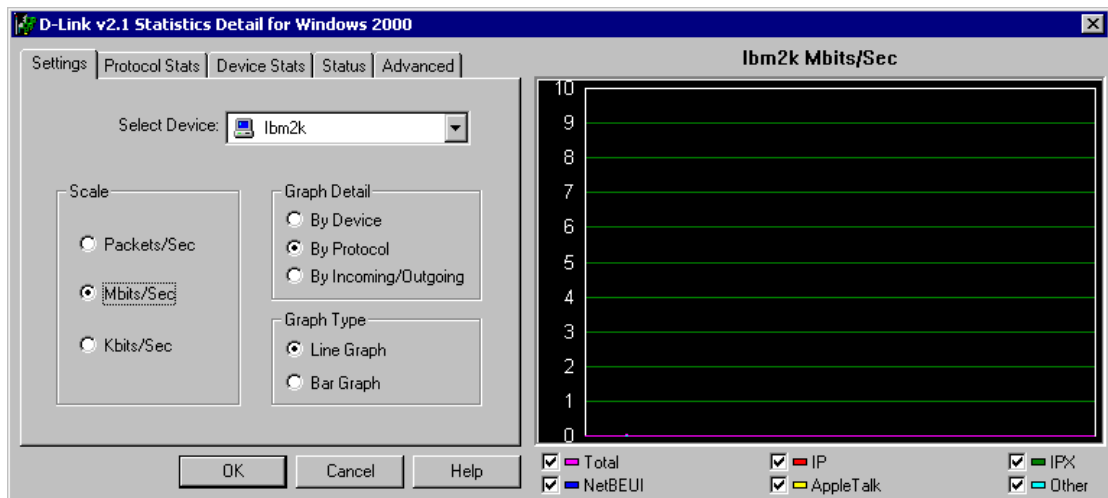
- **Select the device to graph data for.**

Figure 9. Chaning the apperance of the graph with the Settings tab.

Scale

To change the scale of any chart or graph, simply selected the appropriate option under Scale on the Graph Settings Tab. With DFE-570TX you can switch the scale from Packets per second, Megabits per second or Kbits per second.

Graph Detail

Graph Detail allows you to select how throughput totals are broken out for the currently selected device. You can choose to display breakout detail in three ways:

- **By Device**
  Allows you to view throughput from all of the sub-components that make up a device. For instance if the currently selected device is a Group (Array), then breakout totals will be displayed for each adapter that makes up that group.

- **By Protocol**
  This option allows you to view totals for each protocol running on the currently selected device in addition to the total throughput of the device.

- **By Incoming/Outgoing**
  This option allows you to view total incoming traffic to the device selected, total outgoing traffic in addition to the device's total overall throughput.

> **NOTE:** This option is grayed out for Bar Chart type graphs since both Incoming and outgoing traffic detail is provided in the other two options for Bar graphs.

You can further customize the graph by selecting or unselecting each breakout component on the legend below the graph.

Graph Type
DFE-570TX gives you two ways to view throughput data in real time – Line Graphs or Bar Charts.

Line Graph
The line graph is similar to Performance Monitor in Windows 2000. It gives you the ability to view data over time for total server throughput, by group, or adapter. Line graphs not only allow you to see total throughput for each device, but you can also view a variety of detailed statistics for each device including:

- Incoming and outgoing data

- Traffic for each protocol

- Traffic for each sub-component (i.e. adapters that make up an array)

Bar Graph
The bar graph option allows you to view throughput data for all components or protocols on the server at once as well as overall throughput for the server. The bars in the graph show both Incoming and outgoing data for each component. With the Bar graph option selected, you have the ability to see graph detail by Device or by protocol.

> **NOTE:** With Bar chart selected, the Incoming/Outgoing option under graph detail will be grayed out since this data is already incorporated in the bar charts for both "By Device" and "By Protocol" options.

Protocol Stats Tab

The Protocol Stats Tab displays detailed statistics in tabular form for all protocols on the selected device. The device's total throughput statistics are shown as well as totals for IP, IPX, NetBEUI and AppleTalk protocols.
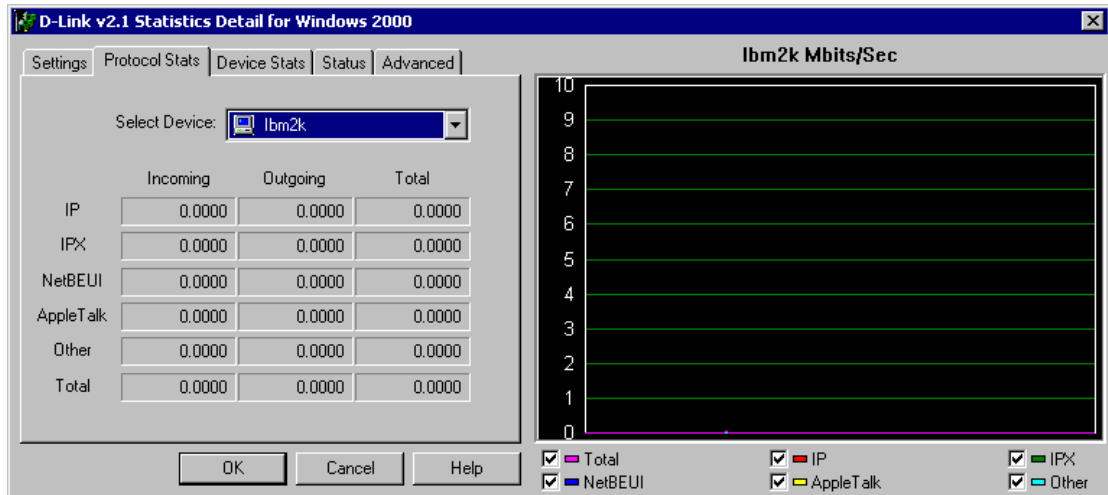

Figure 9. Viewing protocol statistics with the Protocol Stats tab.

Device Stats Tab

The Device Stats tab shows detail statistics in tabular form broken out by sub-component. Average, minimum and maximum values are displayed in the first row of data for the selected device. Throughput data for each sub-component of the device along with the device total are also displayed.
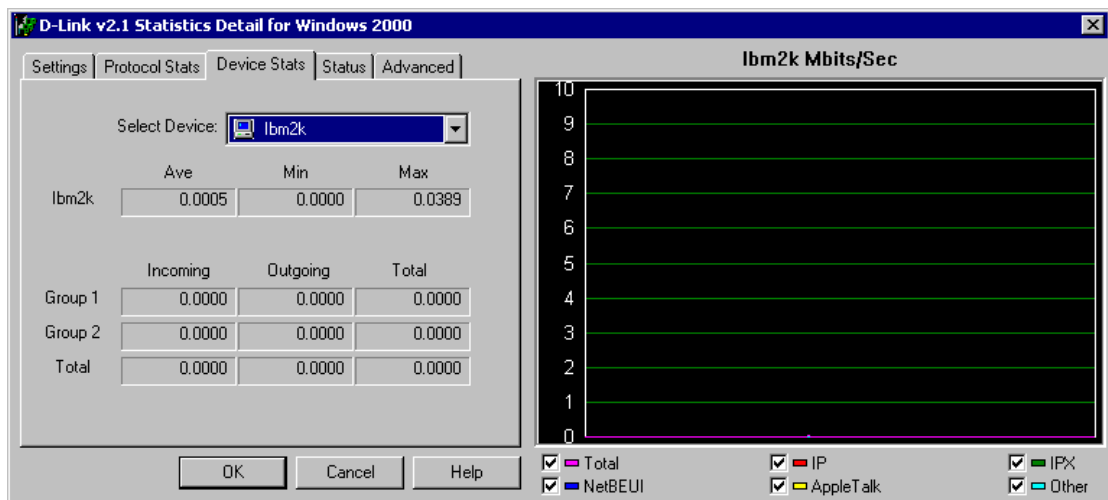

Figure 9. Viewing adapter statistics with the Device Stats tab.

Windows Event Log Messages

DFE-570TX will report all adapter errors and state changes to the Windows Event Log. To view messages in the Event Log, use the Event Viewer supplied by NT. Examples of all the events generated by DFE-570TX are shown below:

Downed Adapter:

```
The adapter <Adapter Name> in <Array Name> has lost network
connectivity and has been removed from the DFE-570TX Array.
```

Array has only one remaining Adapter:

```
There is only one functioning adapter in <Array Name> left.
```

All Adapters in Array are down:

```
All adapters in <Array Name> are down; therefore, users on this
segment can no longer communicate to this computer.
```

Failed Adapter comes online again:

```
The adapter <Adapter Name> in <Array Name> has regained network
connectivity and has been inserted back into the DFE-570TX Array.
```

Adapter has failed multiple times and is permanently removed:

```
The adapter <Adapter Name> in <Array Name> has lost network
connectivity and has been removed from the DFE-570TX Array.  The
adapter has gone down <###> times in the past <###> minutes;
therefore, the adapter will not be put back into the array.  It is
advisable that you investigate the cause of the lost connections and
possibly replace the adapter or cable.
```

Contacting D-Link Corporation

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