

# Vanguard Managed Solutions

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Vanguard Applications Ware  
IP and LAN Feature Protocols

Ethernet Basics Guide

# Notice

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## Overview

### Introduction

Ethernet is a common implementation of LAN topology where stations are connected using a bus topology. Stations access the Ethernet using Carrier Sense with Multiple Access and Collision Detection (CSMA/CD).

This guide explains how to use configure Vanguard ports for Ethernet operations.

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# Ethernet LAN

## Introduction

This section provides a brief description of how Vanguard products use Ethernet.

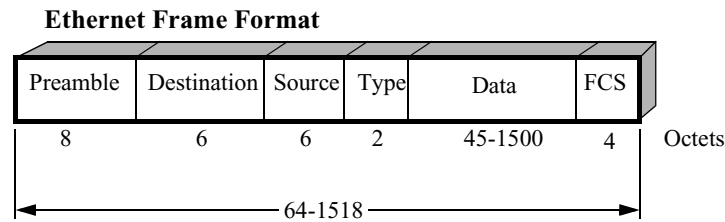
## Vanguard Support for Ethernet

Vanguard Ethernet functionality complies with the IEEE 802.3 specifications and provides Transparent Bridging to transport many different protocols over the Wide Area Network (WAN) to remote destinations. Supported protocols include:

- Novell Netware
- DECnet
- Banyan Vines

## Example of Basic Ethernet Frame Format

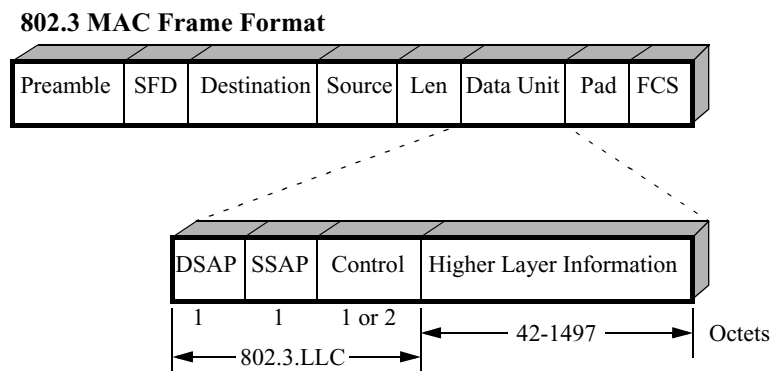
Figure 1 shows the basic frame formats for Ethernet frames supported by Vanguard products.



**Figure 1. Frame Format for Ethernet Frames**

## 802.3 MAC Frame Format

Figure 2 shows the supported 802.3 Ethernet MAC Frame format.



**Figure 2. 802.3 Ethernet MAC Frame Format Example**

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**Example of  
Ethernet Bridge  
Operation**

Figure 3 shows an example of two Ethernet LANs connected across a WAN using two Vanguard products as bridges. The example shows a Frame Relay WAN application, but you can also bridge across an X.25 WAN.



**Figure 3. Ethernet Bridge Example**

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## Multiple LAN Ethernet

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### What Is It?

The Multiple LAN Ethernet feature lets your Vanguard 6520 nodes perform bridging and routing of LAN traffic across multiple LANs.

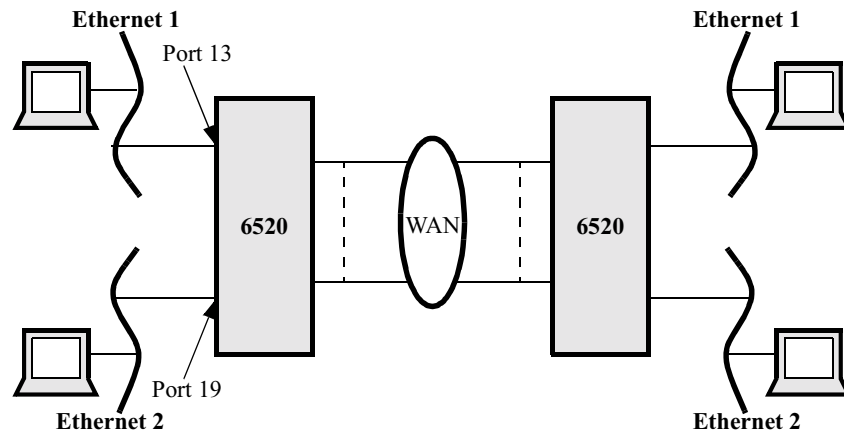
Before Multiple Ethernet LAN, the Vanguard 6520 supported only one Ethernet LAN port for remote bridging and routing of LAN traffic. However, with the Multiple Ethernet LAN feature, you can bridge and route LAN traffic locally and remotely using up to two LAN ports on each Vanguard 6520 node, as shown in Figure 4.

You should configure the first LAN card in your device as Bridge Link Number 1 or Router Interface Number 1. Failure to do so may cause your device to perform continuous resets when you power up the device after reinstalling an earlier release of operating software.

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### Sample Application

Figure 4 shows a sample application for the Multiple Ethernet LAN feature.



**Figure 4. Example of Multiple Ethernet LAN**

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### Limitations

The Vanguard 6520 supports only two Ethernet LAN ports at one time. If you configure more than two Ethernet ports on a Vanguard 6520, the system initializes only the first two ports you configure during system powerup.

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### Bridging

In a transparent Bridging environment, if you connect both Ethernet LAN ports to the same Ethernet segment, you must enable Spanning Tree. Failure to enable Spanning Tree in this configuration is a violation of the rules of transparent bridging.

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### Routing

In IP/IPX or AppleTalk routing environments, do not connect both Ethernet LAN ports to the same Ethernet segment with identical routing decision values. This is not supported.



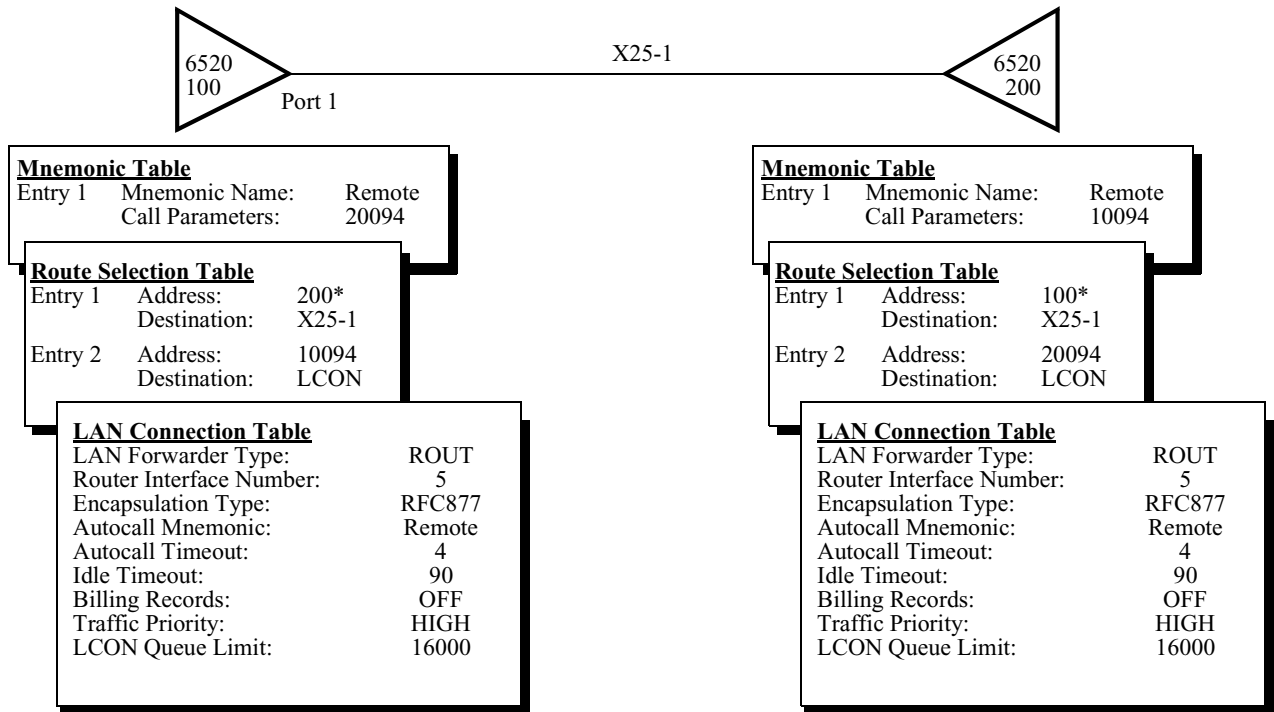
## Configure Multiple Ethernet LAN

Follow these steps to configure your device for Multiple Ethernet LAN.

<i>Step</i>	<i>Action</i>	<i>Result/Description</i>
<b>1</b>	Make a local CTP connection to a Vanguard 6520 node.	CTP is physically connected to the device you are configuring.
<b>2</b>	From the CTP Main menu, select <b>Configure-&gt;Port</b> .	The Port record appears.
<b>3</b>	Configure the Port record as you normally do for an Ethernet LAN connection.	The Bridge Link Number and Router Interface parameters appear in this record.
<b>4</b>	At the Bridge Link Number: parameter, type in a number <b>1 to 4</b> to identify the bridge link, and press Return. <b>■Note</b> The default value for this parameter is 1.	This matches this port configuration to a specific bridge link number within the bridging configuration. If the bridge link you select is already used, a warning message appears, but your input is retained in the CMEM.
<b>5</b>	At the Router Interface Number: parameter, type in a number <b>1 to 4</b> to identify the router interface. <b>■Note</b> The default value for this parameter is 1.	This matches this port configuration to a router link number within the router configuration. If the router interface number you select is already used, a warning message appears, but your input is retained in the CMEM.
<b>6</b>	Type ; and press Return to save the record.	This saves the record.
<b>7</b>	Perform a Node boot from the Boot menu.	This implements your changes, but if you want the new bridge link to be active, you must configure the Bridge Link record under the Configure Bridge menu. Go to the following step. By default, the bridge link is not activated until you activate it.
<b>8</b>	To activate the bridge link, select <b>Configure Bridge-&gt;Bridge Link Parameters</b> from the CTP Main menu.	The Bridge Link Parameters menu appears.
<b>9</b>	Type ; and press Return.	The record is saved.
<b>10</b>	Perform a Bridge Link boot from the Boot menu.	This enables the bridge link.

**Configuration Example**

Figure 5 is a sample configuration showing the critical parameters for configuring an RFC877 LAN Connection between two Vanguard 6520 nodes.



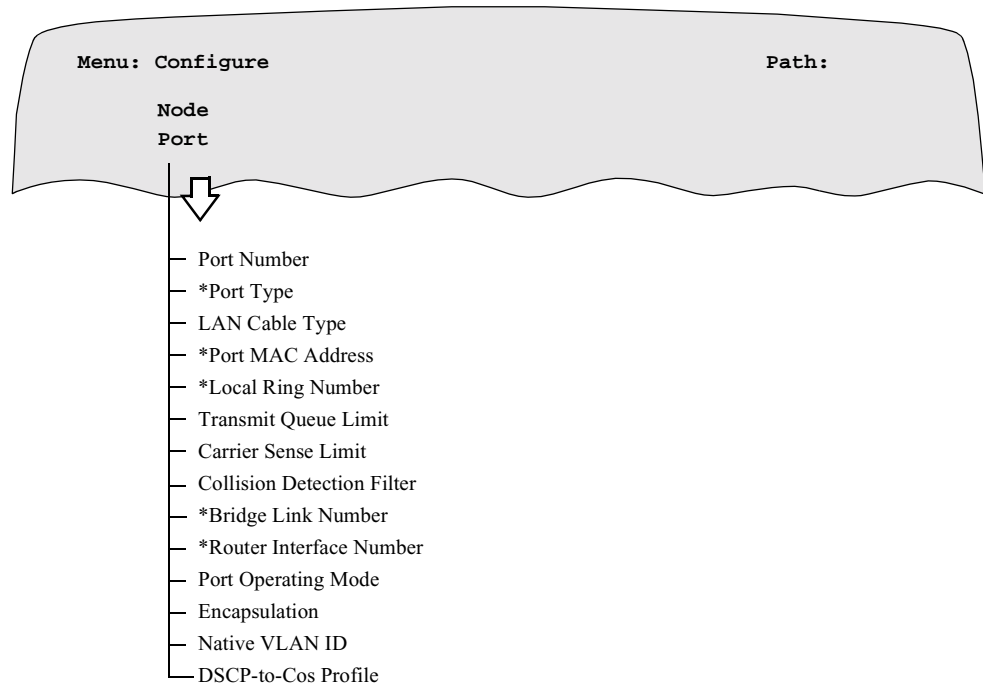
**Figure 5. RFC877 LAN Connection Between Two Vanguard 6520 Nodes**

# Configuration

## Introduction

This section describes the Ethernet Port Parameters

Figure 6 shows the location of the Ethernet Port Record and lists the parameters.



**Figure 6. Ethernet Port Record**

## Parameters

These parameters make up the Ethernet LAN Port Record.

### ■ Note

An asterisk (\*) in the parameter name indicates that a node boot is required for changes to take effect.

### Port Number

Range:	Dependent on hardware platform
Default:	1
Description:	Represents the physical port number.  <b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.

**\*Port Type**

Range:	NULL, ETH
Default:	ETH
Description:	<p>Specifies the port type:</p> <p>NULL: Reserves the port for future use and does not require that you set any parameters.</p> <p>ETH: Specifies this port as an Ethernet port.</p> <p><b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

**LAN Cable Type**

Range:	AUI, UTP
Default:	AUI
Description:	<p>Specifies the type of cable and connector to use for the LAN interface:</p> <ul style="list-style-type: none"> <li>• UTP: Unshielded Twisted Pair (RJ-45)</li> <li>• AUI: Attachment Unit Interface (DB-15)</li> </ul> <p><b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

**\*Port MAC Address**

Range:	00-00-00-00-00-00 to FE-FF-FF-FF-FF-FF
Default:	00-00-00-00-00-00
Description:	<p>Specifies the MAC address of the LAN port.</p> <p>If you enter 00-00-00-00-00-00, the Burned In Address (BIA) of the LAN hardware (if present) is used.</p> <p><b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

### Transmit Queue Limit

Range:	20 to 500
Default:	50
Description:	<p>Specifies the number of frames that can be queued to the LAN transmitter before any frame is dropped. In multiple Ethernet systems, you may need to set this to a high value.</p> <p><b>Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

### Carrier Sense Filter

Range:	0 to 7
Default:	0
Description:	<p>Specifies the width required of the carrier sense signal, in bit times, before it is recognized as active. Carrier sense deactivation is recognized immediately. This function is useful in noisy cable environments.</p> <p><b>Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

### Collision Detect Filter

Range:	0 to 7
Default:	0
Description:	<p>Specifies the width required of the collision detection signal, in bit times, before the network recognizes that a collision has occurred.</p> <p><b>Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

**\*Bridge Link Number**

Range:	1 to 4
Default:	1
Description:	<p>Specifies the number of the Bridge Link associated with this LAN port.</p> <p><b>■ Note</b> Make sure that the corresponding Bridge Link Record is configured.</p> <p><b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

**\*Router Interface Number**

Range:	1 to 4
Default:	1
Description:	<p>Specifies the number Router Interface associated with this LAN port.</p> <p><b>■ Note</b> You must perform a node boot for changes to this parameter to take effect.</p>

**Port Operating Mode**

Range:	AUTO, 1000FD, 100FD, 100HD, 10FD, 10HD
Default:	AUTO
Description:	<p>Specifies whether this LAN port runs in 1000Mbit Full-Duplex, 100Mbit Full-Duplex, 100Mbit Half-Duplex, 10Mbit Full-Duplex, 10Mbit Half-Duplex, or Auto-Negotiation mode.</p> <p><b>■ Note</b> Vanguard 7300 Series - Release 6.4 and greater software supports 1000FD on ports 101 and 103 using the IBM750FX CPU card. ETH1 is port 101, ETH2 is port 103. Port 102 is the COM port.</p>

**VLAN Parameters**

The following parameters have been added to the Ethernet port record to support VLAN applications. VLAN is available in Release 6.2.R000 and greater software.

**802.1Q Encapsulation**

Range:	None, 802.1Q
Default:	None
Description:	This parameter selects the Ethernet frame encapsulation methods supported on this port. The possible options are: None - Standard Ethernet frame format is supported. 802.1Q - IEEE 802.1Q format Ethernet frame formats are supported.
Boot Type:	Port

**Native VLAN ID**

Range:	1 to 4094
Default:	1
Description:	This parameter configures the native VLAN ID for this port. Untagged frames received on this port will be assigned to the native VLAN.
Boot Type:	Port

**DSCP-to-Cos Profile**

Range:	0 to 4
Default:	0
Description:	This parameter selects the DSCP-to-Cos mapping profile to use when setting CoS values in outgoing frames based on the DSCP field in outgoing packets. Values 1 through 4 select the associated profile. A setting of 0 means no profile is used and that CoS values are not based on DSCP values.
Boot Type:	Port

## Ethernet LAN Port Statistics

### Introduction

When you select Detailed LAN Port Statistics, a screen appears containing information about LAN Ports.

This section describes the statistics available for an Ethernet LAN connection.

### What You See in This Screen

Figure 7 is an example of the Detailed LAN Port Statistics screen for Ethernet.

```

Detailed LAN Port Statistics: Port 5                               Page: 1 of 1
Port Number: 5          Port Type: ETH          Port Status: ENABLE
Bridge Link Number:2   Router Interface Number: 2
RX Error Condition: Normal          Carrier: Present
TX Error Condition: Normal          Port Address: 08-00-3E-00-50-B2
Port Operating Mode: Half
Last Statistics Reset:

Physical Summary:
RX FCS Errors: 1          TX Carrier Sense Discards: 0
RX Alignment Errors: 14   TX Max Collisions Discards: 0
RX Collisions: 0         TX Total Discards: 0
RX Short Frames: 14      TX Multi Collisions: 0
RX Long Frames: 0        TX Late Collisions: 0
RX Congestions: 0        TX Single Collisions: 0
RX HA Discards: 3228

Data Summary:          RX          TX
Bytes 255345          21883
Frames 1146           51
Avg Frame Len 122     255
FPS 14                0

Press any key to continue ( ESC to exit ) ...
    
```

**Figure 7. Ethernet Detailed LAN Port Statistics**

### Description of Terms

This table describes the information in the Detailed LAN Port Statistics screen:

<b>Screen Term</b>	<b>Description</b>
Port Number	Number of the port displaying statistics.
Port Type	ETH: Configured Value of the Port type.
Port Status	Can be either Enable or Disable depending upon the Port Control command.
Bridge Link Number	Indicates the Bridge Link Number that is configured for the port.
Router Interface Number	Indicates the Router Interface Number that is configured for the port.



<b>Screen Term</b>	<b>Description (continued)</b>
RX Error Condition	Indicates if the number of errors found in the Physical Summary is either excessive or normal. RX indicates frames coming into the Vanguard product. The determination of excessive or normal is a hardcoded setting within the Vanguard product.
Carrier	Indicates if a signal has been detected from the ethernet segment.
TX Error Condition	Indicates if the number of errors found in the Physical Summary is either excessive or normal. TX indicates frames that are leaving the Vanguard product. The determination of excessive or normal is a hardcoded setting within the Vanguard product.
Port Address	Indicates the configured MAC port address assigned to this port.
Port Operating Mode	Specifies whether this LAN port runs in 1000Mbit Full-Duplex, 100Mbit Full-Duplex, 100Mbit Half-Duplex, 10Mbit Full-Duplex, 10Mbit Half-Duplex, or Auto-Negotiation mode.
RX FCS Errors	Ethernet transceiver received frame with a checksum error. Frame is discarded.
RX Alignment Errors	Ethernet transceiver received a frame that does not end on an octet boundary. Frame is discarded.
RX Collisions	While Ethernet transceiver is receiving a frame, it detects a collision on the Ethernet. These frames are discarded.
RX Short Frames	Ethernet transceiver received a frame whose length is less than 64 bytes. These frames are discarded.
RX Long Frames:	Ethernet transceiver received a frame whose length (including CRC) is greater than 1518. These frames are discarded.
RX Congestions:	Ethernet transceiver received a frame but did not have any buffer space to store the frame. These frames are discarded.
RX HA Discards:	The Ethernet LAN Card Hardware Accelerator (HA) function indicates to the Ethernet transceiver not to receive frames that are destined to Stations on the Local LAN. These frames are not received by the Ethernet transceiver, and are referred to as RX HA Discards.
TX Carrier Sense Discards:	The number of frames that were lost when the Ethernet transceiver detected a "No Carrier" condition on the Ethernet LAN when it was attempting to transmit. This is usually due to the Ethernet LAN Port Cable being disconnected.

<b>Screen Term</b>	<b>Description (continued)</b>
TX Single Collisions	This is the number of times that the Ethernet transceiver attempted to transmit a frame and a collision occurred during the frame preamble. Collisions are usually indicative of heavy LAN traffic or 802.3 LAN length specifications being exceeded.
TX Multi Collisions	This is the number of times that the Ethernet transceiver made multiple attempts to transmit a frame and a collision occurred during the frame preamble on each attempt.
TX Max Collisions Discards:	This is the number of times that the Ethernet transceiver made 16 attempts to transmit a frame and a collision occurred during the frame preamble on each attempt. After 16 attempts, the Ethernet transceiver drops the frame it tried to transmit.
TX Late Collisions:	This is the number of times that the Ethernet transceiver attempted to transmit a frame and a collision occurred after the frame preamble, and during the actual data of the frame. A frame where a late collision occurred is lost.
TX Total Discards:	This is the number of frames that the Ethernet transceiver transmitter dropped. It is the sum of TX Carrier Sense Discards and TX Max Collisions Discards, plus the number of frame dropped due to Transmit Queue Overflow.

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