

Ethernet Made Easy

The purpose of this course is to familiarize you with the Ethernet Made Easy selection tool located at networks.national.com. This tutorial will explain the different options and selection choices of the selection tool. At the end of this tutorial a test will be given to ensure you fully understand the concepts.

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1. Course Navigation

1.1 Course Navigation



1.1 Course Navigation

This course is organized like a book with multiple chapters. Each chapter may have one or more pages.

- The previous and next arrows move you forward and back through the course page by page. 
- The left navigation bar takes you to any chapter. It also contains the bookmarking buttons, 'save' and 'go to.' To save your place in a course, press the 'save' button. The next time you open the course, clicking on 'go to' will take you to the page you saved or bookmarked.
- The top services bar contains additional information such as glossary of terms, who to go to for help with this subject and an FAQ. Clicking home on this bar will take you back to the course beginning.
- Don't miss the hints, references, exercises and quizzes which appear at the bottom of some pages.



2. Ethernet Made Easy

This course will go over basic Ethernet concepts as well as different options such as Ethernet speed and connection options.

- 2.1 Overview
- 2.2 Where do I begin?
- 2.3 The Ethernet Frame
- 2.4 Main components of the Ethernet Frame
- 2.5 Data Rates
- 2.6 Data Payload
- 2.7 Mac/PHY or just PHY
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2.1 Overview

Ethernet has become the predominant method for connecting devices in home and office environments over the last decade. Originally developed in the 1970's by XEROX, it has become the IEEE standard 802.3.

Fast data transfer rates, ease of implementation, and interoperability coupled with a continuing reduction in prices have all led to the market domination of Ethernet products. These factors have served to drive Ethernet into more broad-based applications such as white goods and Industrial markets as the drive for standardization continues.

By the end of this course the user should be able to:

- Understand the Ethernet Framing System
- Explain the difference in Ethernet Speed by terms such as overhead and data rate.

- Knowledge of all aspects of the Ethernet Made Easy Tool, including what all the different options stand for and how to use them.



Explore for yourself the Ethernet Made Simple tool at networks.national.com



Net Links

[Ethernet Made Easy](#)



2.2 Where do I begin?

Let's start at the beginning at networks.national.com.

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System Solutions:

- Here at see 3 columns. Select, Design, and Explore
- We will focus on the middle column called Design.
- This is where the Ethernet Made Easy tool is located.

Resources:



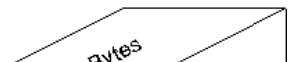
2.3 The Ethernet Frame

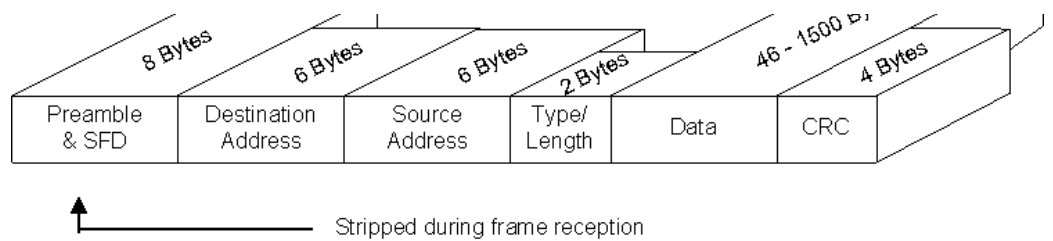
Now before we get into how to use the Selection Tool at networks.national.com. We will have a basic review on the Ethernet Frame and its basic components.

The Ethernet Frame describes the important portion of the Ethernet system. It tells what is to be send along with overheard information. This overhead information include destination address, source address and data integrity checks.

The frame is shown in the following figure.

Ethernet Frame Format





2.4 Main components of the Ethernet Frame

The Ethernet Frame basically tells who is sending the information, who is suppose to receive it and what the information is.

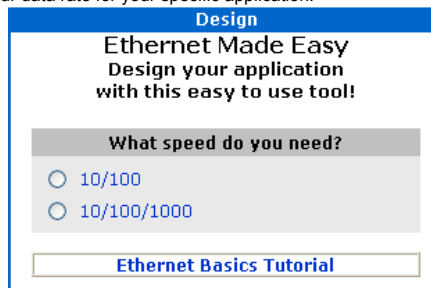
- **Preamble**
The preamble illustrates the beginning of a frame and synchronizes the Ethernet system that a frame is about be delivered.
- **Destination Address**
Tells the Ethernet system where the data is suppose to send to.
- **Sources Address**
Tells the Ethernet system where the data is coming from.
- **Type or Length**
This data lets the Ethernet System know what high level protocol is being used, for example TCP/IP (Type interpretation is >1536 bytes). The length of the information portion of the frame can also be designated in this field (Length interpretation <1536).
- **Data Length**
The data contained in the Ethernet Frame can be from 46 to 1500 bytes. However it cannot be less than 46 bytes or a special procedure called "padding" has to be employed. In this case, the frame is padded with blank data so that it adds up to 46 bytes.
- **The CRC stands for Cyclic Redundancy Check.** This is the check sum to make sure the data contains no errors.



2.5 Data Rates

The data contained in the Ethernet Frame can be from 46 to 1500 bytes. However it cannot be less than 46 bytes or a special procedure called "padding" has to be employed. In this case, the frame is padded with blank data so that it adds up to 46 bytes.

- **10 Mb/s**
Data rate: 10 Mb/s Signaling: Differential, bi-level Return Loss: 11.5dB @5 & 10 MHz (~100m) Cabling: CAT-3 twisted pair (telephone wire) Encoding: None Wires used: 2 pair (each Simplex) Specification: IEEE 802.3 Bit error rate: 1 error in 10e8 bits
- **100 Mb/s**
Data rate: 100 Mb/s Signaling: 125 MHz, Differential, MLT-3 (Multi Level Transition) Return Loss: 19.0dB @1 - 100 MHz (~100m) Cabling: CAT-5 twisted pair, 100 Ohm Encoding: 4b5b (4 bits of data in 5 bits transmitted) Wires used: 2 pair (each Simplex) Specification: IEEE 802.3u Bit error rate: 1 error in 10e10 bits
- **1000 Mb/s**
Data rate: 1000 Mb/s Signaling: 125 MHz, Differential, PAM-5 (Pulse Amplitude Modulation) Return Loss: 19.0dB @1 - 100 MHz (~100m) Cabling: CAT-5 twisted pair, 100 Ohm Encoding: 8b10b (8 bits of data for 10 bits transferred) Wires used: 4 pair (each Full Duplex) Specification: IEEE 802.3ab Bit error rate: 1 error in 10e10 bits
- The first selection screen is where you can decide on your data rate for your specific application.



2.6 Data Payload

As stated before in the framing section in a 10 Mb/s system the data rate is not actually 10 Mb/s. The 10 Mb/s is the total of all the data plus the overhead bits.

	Min Size Pkt	Max Size Pkt
10 Mb/s	7.62 Mb/s	9.87 Mb/s
100 Mb/s	76.2 Mb/s	98.7 Mb/s
1000 Mb/s	762. Mb/s	987. Mb/s

Ethernet frame excluding the Preamble and the SFD

- Everything beyond the packet size is just overhead.

The above table summaries the minimum and maximum data payload for each data rate.



2.7 Mac/PHY or just PHY

Each of National's Ethernet chips supports the OSI (Open System Interconnect) Physical layer connections. This physical layer is all hardware and defines the physical and electrical portions of the network. This is where all the ones and zeros are passing through.

A MAC or Media Access Controller connects the physical layer with another connection like PCI. An example of a standalone MAC would be the DP83820. The purpose of this chip is to connect a standalone Ethernet PHY with a PCI interface.

- Your next selection after the data rate will be an option for Mac/Phy or just PHY as shown here.

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Begin by selecting your ethernet requirements

What speeds do you need?

- 10/100
- 10/100/1000

Do you want an integrated Mac/PHY or PHY device only

- Integrated Mac/PHY
- PHY device only



2.8 PCI Interface

The PCI Interface options will allow the user to select devices that include the PCI option build in. This can be used in personal computers and servers where a simple build in solution is desired.

- The PCI interface selection screen is shown here.

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Begin by selecting your ethernet requirements

What speeds do you need?

- 10/100
- 10/100/1000

Do you want an integrated Mac/PHY or PHY device only

- Integrated Mac/PHY
- PHY device only

Do you want a PCI interface? [help](#)

- Yes
- No

- Note your PCI interface option is only displayed if you have selected Integrated MAC/PHY device only.



2.9 Selection Results

Once you have selected your data rate, OSI layer options, and available PCI interface, the appropriate Ethernet products will be displayed.

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Recommended Parts

Part	No. of	MAC	Supply	I/O	Power	Temp	Temp
------	--------	-----	--------	-----	-------	------	------

	Part Number	Pkg	No. of Ports	MAC Interface	Voltage (V)	Voltage (V)	typ (mW)	min (°C)	max (°C)	Select
<input checked="" type="radio"/>	DP83847	LLP-56	1	MII	3.3	3.3, 5V tolerant	351	0	+70	
<input type="radio"/>	DP83848	48 LQFP	1	MII/RMII	3.3	3.3	< 270	0 -40 -40	+70 +85 +125	

Review of your selection criteria	
Speed	10/100
Device Type	PHY
MAC Interface	MII

[→ DESIGN RESOURCES](#)

- As an example, we have selected a 10/100 Mbps, with a PHY device only.



2.10 Ethernet Made Easy Review Test

2.10.1

Select the appropriate answer for each question or enter the answer in the blank provided. When you are done, click the button to submit your answers and find out your score.



1. What is the IEEE standard for Ethernet?

- A. IEEE 802.3
- B. RS-232
- C. IEEE 1394
- D. IEEE 1284

1 Correct Answer: A



2. The Ethernet system is made up of _____ of data.

- A. frames
- B. buckets
- C. containers
- D. boxes

2 Correct Answer: A



3. Which of the following is NOT part of the Ethernet frame?

- A. Preamble
- B. Time
- C. Source Address
- D. Frame Check Sequence

3 Correct Answer: B



4. What type of cabling should be used for a 100 MB/s system?

- A. CAT 1
- B. CAT 3
- C. CAT 5
- D. CAT 7

4 Correct Answer: C



5. For an advertised 100 MB/s system, the actually data payload is _____ 100 MB/s

- A. Less then
- B. Greater then
- C. Equal to
- D. half of

5 Correct Answer: A



6. In a 100 MB/s system the 100 MB/s speed is the sum of the data payload and all overheard bits such as destination address, preamble etc.

- A. The above statement is false.
- B. The above statement is true.
- C. The above statement is false in only certain cases.
- D. The above statement is false in all cases.

6 Correct Answer: B



7. What does the Physical layer of the OSI represent?

- A. The physical and electrical characteristics of the system.
- B. Communications between systems to establish maintain and end sessions

- C. Protocol conversions, encryption and decryption
- D. FTP and email.

7 Correct Answer: A



8. When dealing with Ethernet systems what does MAC stand for?

- A. Media Access Controller
- B. Machine Always Crashes
- C. Mandatory Access Control
- D. Mixed Analog Controller

8 Correct Answer: A



9. Where is the Ethernet Made Simple tool located?

- A. networks.national.com
- B. ethernet.national.com
- C. national.com/appinfo/networks
- D. All of the above

9 Correct Answer: D



10. What are the first options available at the Ethernet Made Simple tool?

- A. 10/100
- B. 10/100/1000
- C. 10/100/1000/10000
- D. A and B

10 Correct Answer: D



Contact/Help Information

For additional information on getting started go to http://www.national.com/analog/training/getting_started

To contact us, and send feedback go to

<http://www.national.com/feedback/newfeed.nsf/newfeedback?openform&category=pwdesignuniv>

For Frequently Asked Questions go to

<http://www.national.com/analog/training/faqs>

Thank you,
PowerWise Design University Team