

# Introduction

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## In This Chapter. . . .

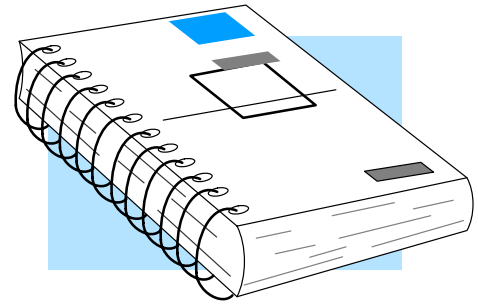
- Manual Overview
  - Ethernet Remote Master (ERM) Module
  - How the PLC CPU Updates Remote I/O Points
  - Frequently Asked Questions
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## Manual Overview

### The Purpose of this Manual

This manual describes how to use the **Ethernet Remote Master (ERM) Modules**. You will find information about:

- Configuring the ERM module
- Network layouts and cabling
- Maintenance and troubleshooting



### Other Reference Materials

Other **DirectLOGIC™** manuals may be useful for your application.

#### User Manuals

- |                                                       |             |            |
|-------------------------------------------------------|-------------|------------|
| • DL205 User Manual                                   | part number | D2-USER-M  |
| • DL405 User Manual                                   | part number | D4-USER-M  |
| • Ethernet Base Controller Manual (205/405)           | part number | H24-EBC-M  |
| • Terminator I/O Ethernet Base Controller User Manual | part number | T1H-EBC-M  |
| • Terminator I/O Installation and I/O Manual          | part number | T1K-INST-M |
| • WinPLC User Manual                                  | part number | H2-WPLC-M  |

### Who Should Read this Manual

If you need a high-speed Ethernet remote I/O communications link between a **DirectLogic** PLC or WinPLC local base and remote ethernet slaves and you understand the basics of installing and programming PLCs, this is the right manual for you. This manual provides the information needed to setup and configure the ERM module and its Ethernet slaves.

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- **Table of Contents** – chapter and section listing of contents, in the front of this manual
- **Quick Guide to Contents** – chapter summary listing on the next page
- **Appendix** – module specifications and Ethernet standards

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## Conventions Used



When you see the “light bulb” icon in the left-hand margin, the paragraph to its immediate right will give you a **special tip**.  
The word **TIP:** in boldface will mark the beginning of the text.



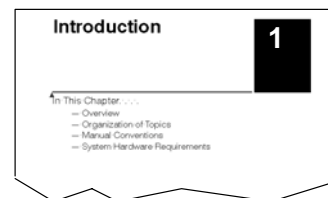
When you see the “notepad” icon in the left-hand margin, the paragraph to its immediate right will be a **special note**.  
The word **NOTE:** in boldface will mark the beginning of the text.



When you see the “exclamation mark” icon in the left-hand margin, the paragraph to its immediate right will be a **warning**. This information could prevent injury, loss of property, or even death (in extreme cases).  
The word **WARNING:** in boldface will mark the beginning of the text.

### Key Topics for Each Chapter

The beginning of each chapter will list the key topics that can be found in that chapter.



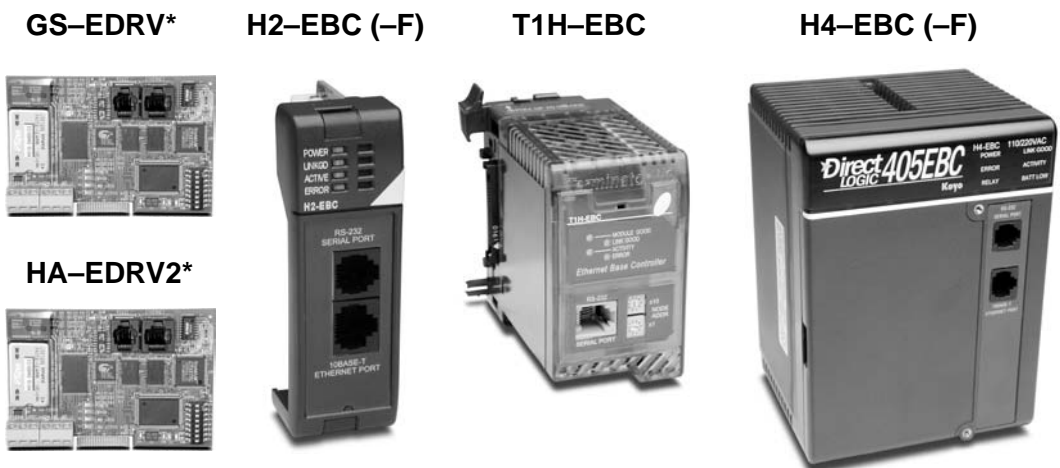
# Ethernet Remote Master (ERM)

The Ethernet Remote Master (**ERM**) module provides a low-cost, high-speed Ethernet Remote I/O link for **DirectLogic** 205/405 PLC systems and WinPLC systems. The ERM connects the local CPU base(s) to the ethernet remote slave modules via a 10BaseT (twisted pair, copper wire) or 10BaseFL (fiber optic) Ethernet link. Each ERM module can support up to sixteen slaves when used in **DirectLogic** 205/405 PLC systems. When used in Think & Do WinPLC systems, a limitation of one ERM with one slave applies per system.



## Ethernet Remote Slaves

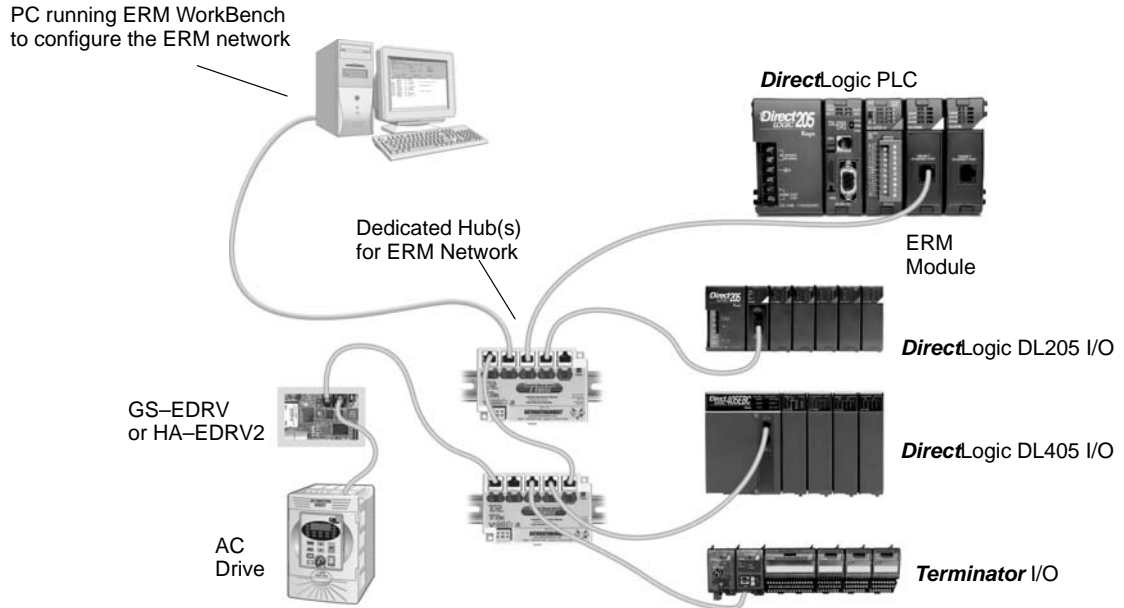
The following Ethernet Base Controller (EBC) slave modules and Ethernet Interfaces for AC Drives are supported by the ERM module. The remote I/O network may consist of a combination of these slaves. The ERM module can support up to sixteen slaves when used in **DirectLogic** 205/405 PLC systems. When used in Think & Do WinPLC systems, the ERM module is limited to supporting one slave. The EBC slave updates all of its I/O data (including analog I/O) internally at a high rate that is independent of the rate that the ERM may poll the EBC for its I/O data. This allows the ERM to read the most current I/O data regardless of PLC scan times or other slave I/O cycle times.



\*For use with AC Drives

### Configuring the Ethernet Remote I/O Network

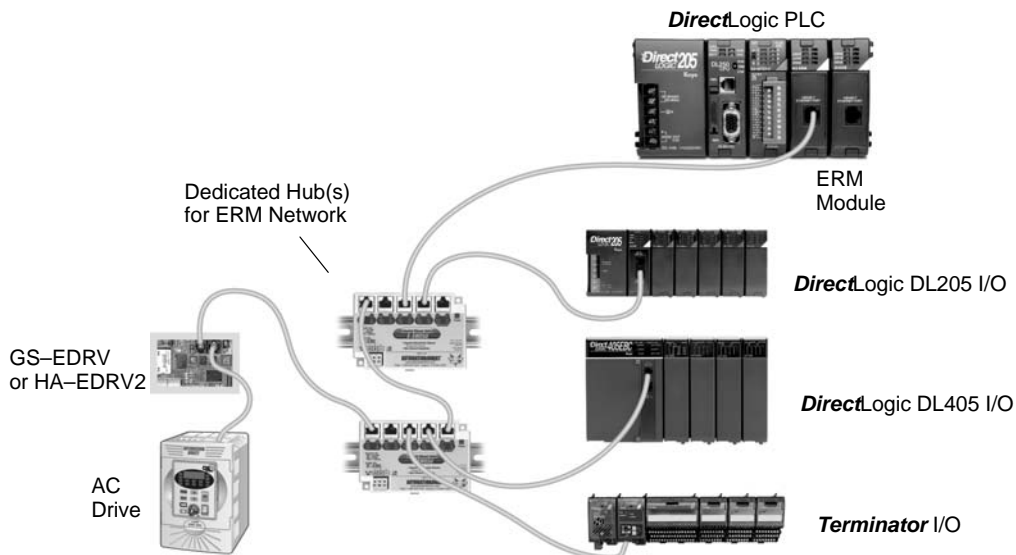
Use a PC equipped with a 10BaseT or 10BaseFL network adapter card and the Ethernet Remote Master (ERM) Workbench software configuration utility that comes with this manual to configure the ERM module and its slaves over the ethernet remote I/O network.



**Warning:** We recommend using a dedicated Ethernet remote I/O network for the ERM and its slaves. While Ethernet networks can handle a very large number of data transmissions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the network.

### Running the Ethernet Remote I/O Network

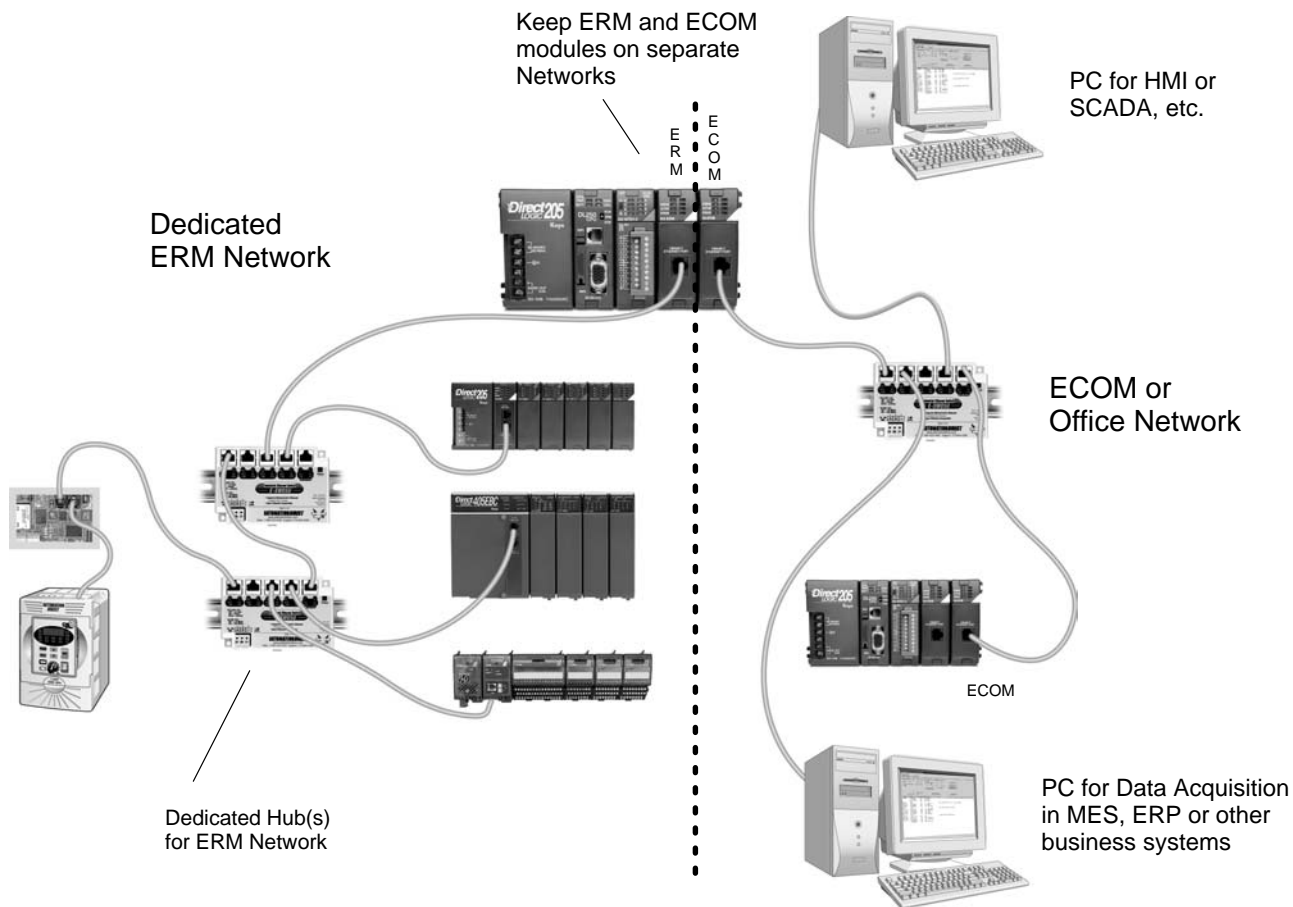
Once the ERM I/O network is configured and running, the PC can be removed from the network.



**ERM / ECOM Systems**

Keep ERM networks, multiple ERM networks and ECOM / office networks isolated from one another as shown below. Do not attempt to connect an ECOM module or non ERM Workbench PC to a hub that the dedicated ERM network is using. **Having an ECOM module(s) on an ERM Ethernet network can adversely affect the reliability and the speed of the ERM slave I/O.**

Introduction



## How the PLC CPU Updates Remote I/O Points

The PLC CPU, ERM and Remote Slave (EBC) modules work together to update the remote I/O points. There are three **asynchronous** scan cycles working together to transfer the remote I/O data between the PLC and the I/O modules: the EBC scan, the ERM scan and the PLC scan. These are described below.

During each PLC CPU scan, the ERM is allowed one access to the PLC's memory. The access can be a write to the PLC or a read from the PLC, but not both. There are four types of data that are processed: discrete inputs, discrete outputs, analog inputs and analog outputs. The ERM can only process one of these four data types on any given scan. If all data types are used, it will take four PLC scans to completely update all of the remote I/O points. The largest amount of data that the PLC can process in a single request is 128 bytes. If any of the four I/O types exceeds 128 bytes of data, it will take multiple scans to process that type's data.

It is possible for the PLC's scan to be faster than the ERM's processing scan. This is largely dependent on the size of the application program, as well as the type and number of remote I/O points. If there are I/O points that must be updated every PLC scan, it is recommended that those points be placed in the CPU base or local expansion base.

**1) PLC CPU Scan:** executes program logic and scans local I/O. The PLC User Manual describes the PLC scan in detail.

**2) ERM Scan:** there are four I/O types that can be processed by the ERM: discrete inputs, discrete outputs, analog inputs and analog outputs. It takes a least one for each of the four I/O types present to complete an ERM scan. The typical ERM cycle is as follows:

### PLC Scan

N	Read discrete output data from the PLC
N+1	Read analog output data from the PLC
	Write all of the output data to the EBCs
	Collect input data from the EBCs
N+2	Write discrete inputs to the PLC
N+3	Write analog inputs to the PLC

**3) Remote Slave Scan (EBC):** constantly collects all discrete and analog input data from the input modules in the base. This keeps the most recent input data available whenever the ERM requests it. The EBC writes to the output modules as the data is received from the ERM.

In general, it will take four PLC scans to completely update the remote I/O. You can use the ladder logic example on page B-4 to get the ERM update statistics. This will provide detailed information about the ERM's processing time.

## Frequently Asked Questions

### Q. Which protocols are supported by the ERM module?

A. A protocol is a set of rules that allows computers to connect with one another specifying the format, timing, sequencing, and error checking for data packet transmission. The ERM module supports Novell IPX and UDP/IP (Universal Datagram Protocol/Internet Protocol). When configuring the ERM and EBCs., your PC must support one of these protocols. However, the ERM and slaves can utilize their own protocol selection regardless of the protocols supported by your PC.

### Q. Can I create multiple remote I/O networks by putting more than one ERM in a single PLC / WinPLC base?

A. Yes, for *Direct*Logic PLCs, but Think & Do WinPLC systems are limited to one ERM module with one slave per system to ensure reliable system performance. If more than one EBC slave is desired in a Think & Do WinPLC system, please contact Entivity's technical support at 734-205-5000 or e-mail [info@entivity.com](mailto:info@entivity.com). Be sure to consult Chapter 2 for important installation information, and be sure not to exceed the PLC power budget (see the module specifications in Appendix A and the PLC User Manual). Also, it is very important to keep each ERM and its slave(s) isolated from other ERMs and their slaves.

### Q. What does it mean to “set up” the ERM module?

A. The ERM module must be configured using the Ethernet Remote Master Workbench to know how many slaves and I/O points there will be on the remote I/O network. There are also other advanced ERM settings to configure.

### Q. How much remote I/O can I have?

A. The ERM module supports up to 16 additional DL205 EBC bases, 16 Terminator I/O EBC systems, 16 fully expanded DL405 EBC systems, Ethernet Interfaces for AC Drives or any combination of the four. If a WinPLC is the system interface, the ERM can only support one slave.

### Q. Can I reserve slots in a base for future I/O expansion?

A. Yes, the “Padding” feature within the Slave Configuration window of the ERM Workbench allows reserving addresses for future I/O modules at the end of each of the EBC slave systems (not between modules).

### Q. Can I program or use an operator interface on the EBC slave when used with an ERM?

A. No, the serial port on the EBC slave is not supported at this time when used with an ERM module.

### Q. Which LAN topology should I use?

A. ERM modules are available for connecting to 10BaseT or 10BaseFL (fiber optic) networks. The cable distances and environmental conditions often dictate which media type should be used. The most popular and flexible topology currently is 10BaseT, but 10BaseT is susceptible to electrical noise and is limited to relatively short cable runs. On the other hand, it is very simple and inexpensive, and repeaters can be used to extend its cable length limitations. 10BaseFL allows much longer cable runs with immunity to electrical noise. The fiber optic cable and hubs are currently more expensive than those for 10BaseT.