AUTOMATIONDIRECT.com

Ethernet Remote Master Module Manual

Manual Number: H24-ERM-M

WARNING

Thank you for purchasing automation equipment from **Automationdirect.com®**, doing business as, **AutomationDirect**. We want your new automation equipment to operate safely. Anyone who installs or uses this equipment should read this publication (and any other relevant publications) before installing or operating the equipment.

To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

At a minimum, you should follow all applicable sections of the National Fire Code, National Electrical Code, and the codes of the National Electrical Manufacturer's Association (NEMA). There may be local regulatory or government offices that can also help determine which codes and standards are necessary for safe installation and operation.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.

Our products are not fault-tolerant and are not designed, manufactured or intended for use or resale as on-line control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of the product could lead directly to death, personal injury, or severe physical or environmental damage ("High Risk Activities"). **AutomationDirect** specifically disclaims any expressed or implied warranty of fitness for High Risk Activities.

For additional warranty and safety information, see the Terms and Conditions section of our catalog. If you have any questions concerning the installation or operation of this equipment, or if you need additional information, please call us at 1-770-844-4200.

This publication is based on information that was available at the time it was printed. At **AutomationDirect** we constantly strive to improve our products and services, so we reserve the right to make changes to the products and/or publications at any time without notice and without any obligation. This publication may also discuss features that may not be available in certain revisions of the product.

Trademarks

This publication may contain references to products produced and/or offered by other companies. The product and company names may be trademarked and are the sole property of their respective owners. **AutomationDirect** disclaims any proprietary interest in the marks and names of others.

Copyright 2018, Automationdirect.com® Incorporated
All Rights Reserved

No part of this manual shall be copied, reproduced, or transmitted in any way without the prior, written consent of **Automationdirect.com® Incorporated**. **AutomationDirect** retains the exclusive rights to all information included in this document.

ADVERTENCIA

Gracias por comprar equipo de automatización de **Automationdirect.com®**. Deseamos que su nuevo equipo de automatización opere de manera segura. Cualquier persona que instale o use este equipo debe leer esta publicación (y cualquier otra publicación pertinente) antes de instalar u operar el equipo.

Para reducir al mínimo el riesgo debido a problemas de seguridad, debe seguir todos los códigos de seguridad locales o nacionales aplicables que regulan la instalación y operación de su equipo. Estos códigos varian de área en área y usualmente cambian con el tiempo. Es su responsabilidad determinar cuales códigos deben ser seguidos y verificar que el equipo, instalación y operación estén en cumplimiento con la revisión mas reciente de estos códigos.

Como mínimo, debe seguir las secciones aplicables del Código Nacional de Incendio, Código Nacional Eléctrico, y los códigos de (NEMA) la Asociación Nacional de Fabricantes Eléctricos de USA. Puede haber oficinas de normas locales o del gobierno que pueden ayudar a determinar cuales códigos y normas son necesarios para una instalación y operación segura.

Si no se siguen todos los códigos y normas aplicables, puede resultar en daños al equipo o lesiones serias a personas. No garantizamos los productos descritos en esta publicación para ser adecuados para su aplicación en particular, ni asumimos ninguna responsabilidad por el diseño de su producto, la instalación u operación.

Nuestros productos no son tolerantes a fallas y no han sido diseñados, fabricados o intencionados para uso o reventa como equipo de control en línea en ambientes peligrosos que requieren una ejecución sin fallas, tales como operación en instalaciones nucleares, sistemas de navegación aérea, o de comunicación, control de tráfico aéreo, máquinas de soporte de vida o sistemas de armamentos en las cuales la falla del producto puede resultar directamente en muerte, heridas personales, o daños físicos o ambientales severos ("Actividades de Alto Riesgo"). **Automationdirect.com** específicamente rechaza cualquier garantía ya sea expresada o implicada para actividades de alto riesgo.

Para información adicional acerca de garantía e información de seguridad, vea la sección de Términos y Condiciones de nuestro catálogo. Si tiene alguna pregunta sobre instalación u operación de este equipo, o si necesita información adicional, por favor llámenos al número 1-770-844-4200 en Estados Unidos.

Esta publicación está basada en la información disponible al momento de impresión. En **Automationdirect.com** nos esforzamos constantemente para mejorar nuestros productos y servicios, así que nos reservamos el derecho de hacer cambios al producto y/o a las publicaciones en cualquier momento sin notificación y sin ninguna obligación. Esta publicación también puede discutir características que no estén disponibles en ciertas revisiones del producto.

Marcas Registradas

Esta publicación puede contener referencias a productos producidos y/u ofrecidos por otras compañías. Los nombres de las compañías y productos pueden tener marcas registradas y son propiedad única de sus respectivos dueños. Automationdirect.com, renuncia cualquier interés propietario en las marcas y nombres de otros.

PROPIEDAD LITERARIA 2018, AUTOMATIONDIRECT.COM® INCORPORATED
Todos los derechos reservados

No se permite copiar, reproducir, o transmitir de ninguna forma ninguna parte de este manual sin previo consentimiento por escrito de **Automationdirect.com® Incorprated**. **Automationdirect.com** retiene los derechos exclusivos a toda la información incluida en este documento. Los usuarios de este equipo pueden copiar este documento solamente para instalar, configurar y mantener el equipo correspondiente. También las instituciones de enseñanza pueden usar este manual para propósitos educativos.

AVERTISSEMENT

Nous vous remercions d'avoir acheté l'équipement d'automatisation de **Automationdirect.com®**, en faisant des affaires comme, **AutomationDirect**. Nous tenons à ce que votre nouvel équipement d'automatisation fonctionne en toute sécurité. Toute personne qui installe ou utilise cet équipement doit lire la présente publication (et toutes les autres publications pertinentes) avant de l'installer ou de l'utiliser.

Afin de réduire au minimum le risque d'éventuels problèmes de sécurité, vous devez respecter tous les codes locaux et nationaux applicables régissant l'installation et le fonctionnement de votre équipement. Ces codes diffèrent d'une région à l'autre et, habituellement, évoluent au fil du temps. Il vous incombe de déterminer les codes à respecter et de vous assurer que l'équipement, l'installation et le fonctionnement sont conformes aux exigences de la version la plus récente de ces codes.

Vous devez, à tout le moins, respecter toutes les sections applicables du Code national de prévention des incendies, du Code national de l'électricité et des codes de la National Electrical Manufacturer's Association (NEMA). Des organismes de réglementation ou des services gouvernementaux locaux peuvent également vous aider à déterminer les codes ainsi que les normes à respecter pour assurer une installation et un fonctionnement sûrs.

L'omission de respecter la totalité des codes et des normes applicables peut entraîner des dommages à l'équipement ou causer de graves blessures au personnel. Nous ne garantissons pas que les produits décrits dans cette publication conviennent à votre application particulière et nous n'assumons aucune responsabilité à l'égard de la conception, de l'installation ou du fonctionnement de votre produit.

Nos produits ne sont pas insensibles aux défaillances et ne sont ni conçus ni fabriqués pour l'utilisation ou la revente en tant qu'équipement de commande en ligne dans des environnements dangereux nécessitant une sécurité absolue, par exemple, l'exploitation d'installations nucléaires, les systèmes de navigation aérienne ou de communication, le contrôle de la circulation aérienne, les équipements de survie ou les systèmes d'armes, pour lesquels la défaillance du produit peut provoquer la mort, des blessures corporelles ou de graves dommages matériels ou environnementaux («activités à risque élevé»). La société **AutomationDirect** nie toute garantie expresse ou implicite d'aptitude à l'emploi en ce qui a trait aux activités à risque élevé.

Pour des renseignements additionnels touchant la garantie et la sécurité, veuillez consulter la section Modalités et conditions de notre documentation. Si vous avez des questions au sujet de l'installation ou du fonctionnement de cet équipement, ou encore si vous avez besoin de renseignements supplémentaires, n'hésitez pas à nous téléphoner au 1-770-844-4200.

Cette publication s'appuie sur l'information qui était disponible au moment de l'impression. À la société **AutomationDirect**, nous nous efforçons constamment d'améliorer nos produits et services. C'est pourquoi nous nous réservons le droit d'apporter des modifications aux produits ou aux publications en tout temps, sans préavis ni quelque obligation que ce soit. La présente publication peut aussi porter sur des caractéristiques susceptibles de ne pas être offertes dans certaines versions révisées du produit.

Marques de commerce

La présente publication peut contenir des références à des produits fabriqués ou offerts par d'autres entreprises. Les désignations des produits et des entreprises peuvent être des marques de commerce et appartiennent exclusivement à leurs propriétaires respectifs. **AutomationDirect** nie tout intérêt dans les autres marques et désignations.

Copyright 2018, Automationdirect.com® Incorporated
Tous droits réservés

Nulle partie de ce manuel ne doit être copiée, reproduite ou transmise de quelque façon que ce soit sans le consentement préalable écrit de la société **Automationdirect.com® Incorporated**. **AutomationDirect** conserve les droits exclusifs à l'égard de tous les renseignements contenus dans le présent document.

Ethernet Remote Master Module

AUTOMATIONDIRECT.com

Please include the Manual Number and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

Manual Number: H24-ERM-M
Issue: 2nd Edition. Rev. B
Issue Date: 12/18

Publication History		
Issue	**Date**	**Description of Changes**
1st Edition	6/01	Original
1st Edition, Revision A	9/02	Added DL250–1 and DL260 CPUs; removed DL250 references; added new ERM Workbench 1.1 and NedtEdit 2.4 features; added Appendix E
2nd Edition	2/13	Added H2-ERM100 and H4-ERM100; updated format
2nd Edition, Revision A	5/14	Added Appendix F. H2-EBC(100) Analog Module Addressing
2nd Edition, Revision B	12/18	Added D2-262 and D4-454 references. General update.

TABLE OF CONTENTS

Chapter 1 - Introduction

Introduction **1–2**
- Purpose of this Manual 1–2
- Other Reference Materials 1–2
- Who Should Read this Manual 1–2
- Technical Support 1–2

Conventions Used **1–3**
- Key Topics for Each Chapter 1–3

Ethernet Remote Master (ERM) **1–4**
- Ethernet Remote Slaves 1–4
- Configuring the Ethernet Remote I/O Network 1–5
- Running the Ethernet Remote I/O Network 1–5
- ERM / ECOM Systems 1–6
- Dedicated ERM Network 1–6

How the PLC CPU Updates Remote I/O Points **1–7**

Frequently Asked Questions **1–8**

Chapter 2 - ERM / Slave Network Addressing Modes

ERM/Remote Slave Network Identifiers **2–2**
- ERM / Slave Configuration Tools 2–2
- ERM / Slave Module ID 2–3
- IP Address 2–4
- Ethernet Address 2–4
- Using Multiple Network Identifiers 2–4

Chapter 3 - Installation and Network Layout

Inserting the ERM Module in the I/O Base 3–2
DL205/Do-more! Slot Choices 3–2
H2–ERM (100, -F) Module Installation 3–2
DL405 Slot Choices 3–3
H4-ERM(100, -F) Module Installation 3–4
Which Modules are Supported in the Ethernet Slaves 3–4
ERM Network Layouts 3–5
Configuring the Ethernet Remote I/O Network 3–5
Running the Ethernet Remote I/O Network 3–5
ERM / ECOM Systems 3–6
Network Cabling 3–7
ERM Supports Three Standards 3–7
10/100BaseT Networks 3–7
10/100BaseT 3–8
UTP Cable 3–8
10BaseFL 3–8
Fiber Optic Cable 3–8
Fiber Optic Module ST Connector 3–8
Maximum Cable Length 3–9

Chapter 4 - Configuring the ERM And Slave Modules with ERM Workbench

ERM Workbench Software 4–2
Launching ERM Workbench 4–2
Adding IPX Network Protocol Support on PCs with Windows XP (32 bit only) or Earlier Operating Systems 4–3
Running ERM Workbench PLC Wizard 4–4
Step 1: Choosing the ERM Network Configuration 4–4
Step 2: Connecting the ERM Workbench PC to the ERM Network 4–4
Establishing Communication with the ERM 4–5
Step 3: Select and Configure the Slaves 4–5
Step 4: Map I/O to PLC Memory 4–6
Step 5: Download Configuration to ERM 4–6
ERM Workbench Main Configuration Window 4–7

Running ERM Workbench 4–8
Connecting the ERM Workbench PC to the Network Modules 4–8
Configure the ERM 4–9
Configuring the ERM 4–9
Selecting PLC as Interface 4–9
PLC Map 4–10
Advanced ERM Configuration 4–10
Select the Slaves 4–11
Selecting the Slaves 4–11
Configure the Slaves 4–12
Setting the Slave's Parameters 4–12
Write Configuration to ERM 4–14
Analog I/O Data Registers 4–15
Analog I/O Data Registers 4–15
Reserved PLC Memory for ERM 4–16
ERM Status Word / Reset Slave Code 4–16
Saving ERM Configuration to Disk 4–17
Clear ERM Configuration 4–17
Printing/Exporting the ERM Configuration 4–17

Chapter 5 - Using NetEdit

Using NetEdit 5–2
The NetEdit Window 5–2
Ethernet Communication Protocol 5–2
Adding IPX Network Protocol Support on PCs with Windows XP (32 bit only) or Earlier Operating Systems 5–3
Ethernet Address 5–3
Module ID / IP Address / Name / Description 5–4
Module Information 5–4
Using NetEdit to Configure the EBC Base 5–5
EBC Settings Tab 5–5
General Settings 5–6
Serial Port 5–6

I/O Base 5–6
Show Base Contents 5–7
Update Firmware 5–8
Update Booter 5–8
Restore Factory Defaults 5–8

Chapter 6 - Maintenance and Troubleshooting

Isolating a Communication Problem 6–2
Diagnostic Tools and Techniques 6–2
Troubleshooting Chart 6–2
ERM Module Diagnostic LEDs 6–4
Slave Module Diagnostic LEDs 6–4
EBC LEDs 6–4
Error Indicator 6–4
Using ERM Workbench for Troubleshooting 6–5
Read from ERM 6–5
Reserved PLC Memory for ERM 6–6
Detailed ERM Statistics 6–6
Select Slaves Window 6–7
Using NetEdit for Troubleshooting 6–8
Select a Module 6–8
Module Information 6–8
Change Protocol 6–9
Replacing the ERM / Slave Module 6–9
Diagnosing Network Cable Problems 6–10

Appendix A - General Specifications

General Specifications A-2
Specifications A-2
Ethernet Standards A-4

Appendix B - ERM/Slave Diagnostics and Error Codes

ERM Diagnostics **B–2**
ERM Status Word / Resetting the Slave B–2
DirectLOGIC Example B–3
Do-more! Example B–3
ERM Status Word Error Codes **B–4**
Reading ERM Statistics **B–5**
Reading ERM Statistics using Ladder Logic with ***Direct***LOGIC B–5
Reading ERM Statistics using Ladder Logic with Do-more! B–6
Reading Error Codes from Slaves **B–7**
Reading Error Codes from Slaves with ***Direct***LOGIC B–7
Reading Error Codes from Slaves with Do-more! B–9
Slave Diagnostic Word Memory **B–10**
Current / Last State Slave Error Codes **B–12**
Extended Slave Error Codes **B–13**

Appendix C - ERM and ERM Workbench Default Settings

ERM and ERM Workbench Factory Default Settings **C–2**

Appendix D - Mapping ERM Slave I/O in a Think & Do WinPLC Slave System

Mapping ERM Slave I/O Points **D–2**
Launching Connectivity Center Tool D–2
Connecting to the WinPLC Base I/O D–2
Connecting to the ERM Slave I/O D–3
Mapping I/O Points to Data Items D–3

Appendix E - Configuring Terminator I/O Analog Output Modules

Analog Output Module Control Byte E–2
DirectLOGIC..... E–2
Do-more E–2
DirectSOFT E–3
Do-more Designer..... E–4

Appendix F - H2-EBC(100) Analog Module Addressing

H2-EBC(100) Analog Module Addressing - H2/4-ERM(100)..... F–2

Introduction

Chapter 1

In This Chapter...

Introduction 1–2
Conventions Used 1–3
Ethernet Remote Master (ERM) 1–4
How the PLC CPU Updates Remote I/O Points 1–7
Frequently Asked Questions 1–8

Introduction

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

- Do-more! User Manual, part number H2-DM-M
- DL205 User Manual, part number D2-USER-M
- DL405 User Manual, part number D4-USER-M
- Ethernet Base Controller Manual (DL205/DL405), 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 User 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 ***Direct***Logic 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.

Technical Support

We strive to make our manuals the best in the industry. We rely on your feedback to let us know if we are reaching our goal. If you cannot find the solution to your particular application, or, if for any reason you need technical assistance, please call us at:

770-844-4200

Our technical support group will work with you to answer your questions. They are available Monday through Friday from 9:00 A.M. to 6:00 P.M. Eastern Time. We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company.

http://www.automationdirect.com

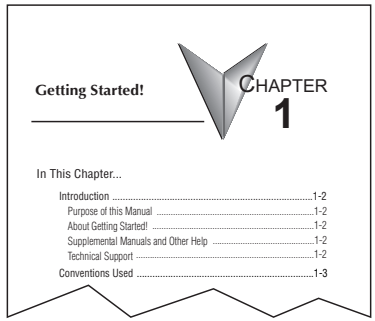
Conventions Used

When you see the "note pad" icon in the left-hand margin, the paragraph to its immediate right will be a special note. Notes represent information that may make your work quicker or more efficient. The word ***NOTE:*** *in boldface will mark the beginning of the text.*

When you see the "exclamation point" 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. Any warning in this manual should be regarded as critical information that should be read in its entirety. 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.


Getting Started!

CHAPTER 1

In This Chapter...

Introduction 1-2
Purpose of this Manual 1-2
About Getting Started! 1-2
Supplemental Manuals and Other Help 1-2
Technical Support 1-2
Conventions Used 1-3

Ethernet Remote Master (ERM)

The Ethernet Remote Master (ERM) module provides a low-cost, high-speed Ethernet Remote I/O link for *Direct*Logic 205/405, Do-more! PLC systems, and WinPLC systems. The ERM connects the local CPU base(s) to the Ethernet remote slave modules via a 10/100BaseT (twisted pair, copper wire) or 10BaseFL (fiber optic) Ethernet link. Each ERM module can support up to sixteen slaves when used in *Direct*Logic 205/405 or Do-more! PLC systems. When used in Think & Do WinPLC systems, a limitation of one ERM with one slave applies per system.

H2-ERM(100)

H2-ERM-F

H4-ERM(100)

H4-ERM-F

Note: The H2-ERM module was discontinued in 2014 but is still covered in this manual.

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 *Direct*Logic 205/405 or Do-more! 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.

GS-EDRV*

GS-EDRV100*

***For use with AC Drives**

H2-EBC (100, -F)

T1H-EBC(100)

H4-EBC (-F)

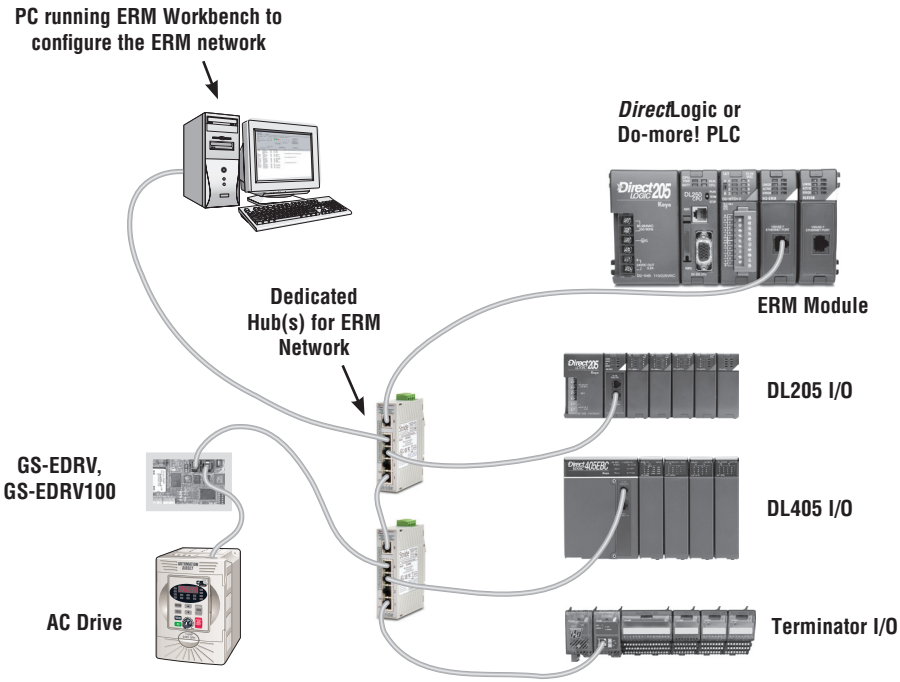
Configuring the Ethernet Remote I/O Network

Use a PC equipped with a 10/100BaseT 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

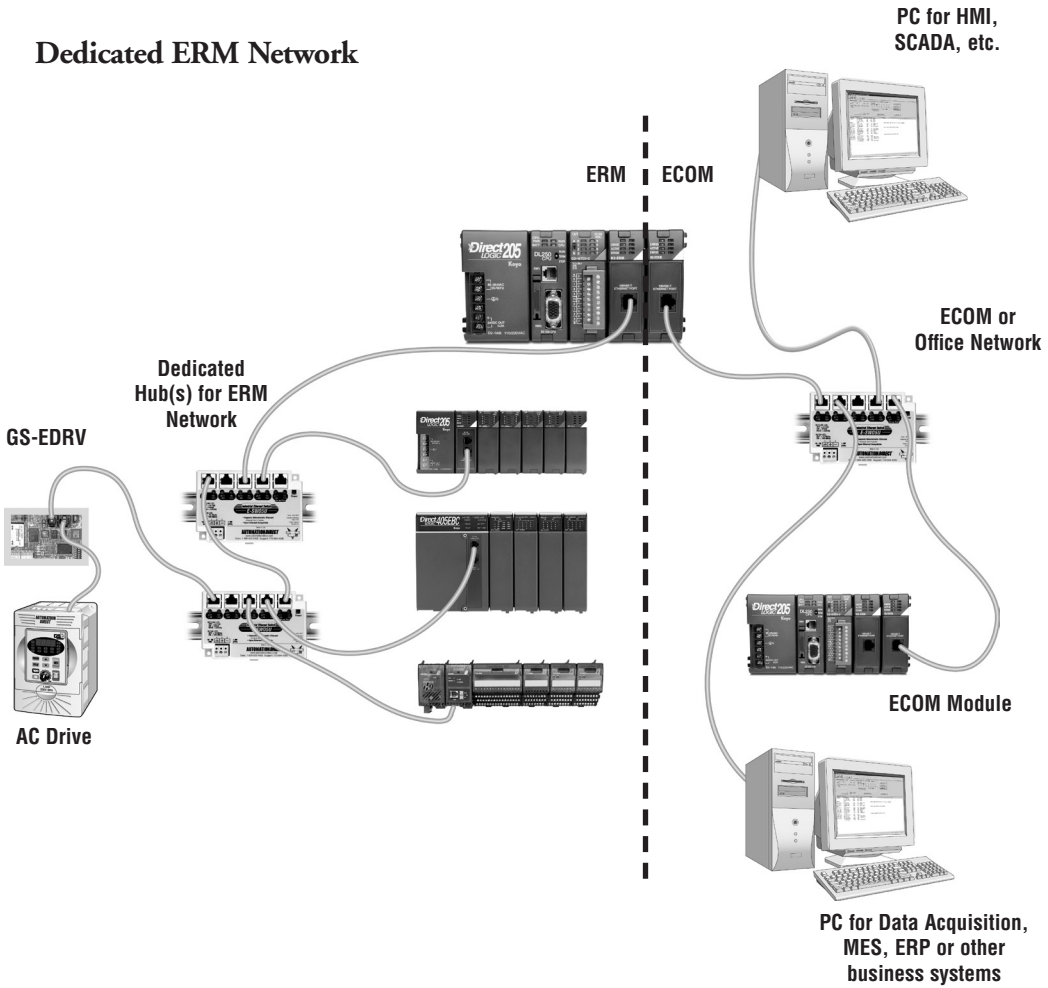
Once the ERM I/O network is configured and running, the PC can be removed from the network.



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.**

Dedicated ERM Network



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	Process
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–5 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 and Do-more! 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. 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/Do-more! 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 10/100BaseT 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 10/100BaseT, but 10/100BaseT 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 10/100BaseT.

ERM/Slave Network Addressing Modes

In This Chapter...

ERM / Remote Slave Network Identifiers 2–2

ERM/Remote Slave Network Identifiers

This chapter describes the various network identifiers used by the ERM and its slave modules. Each module on a network must be uniquely identified. There are three identifiers that can be used to make a module unique.

The three module identifiers are:

- Module ID
- IP (Internet Protocol) Address (a slave may be used on the Internet, but I/O cycle time may be very high)
- Ethernet Address (MAC Address)

The first two are user-selectable. The third one is set at the factory. A Name may be assigned to a module, but the ERM cannot address a slave by its Name.

The identifiers are used to link the ERM module to its remote slaves The decision about which type of identifier to use is an important one. Much of the decision depends on the protocol requirements of your particular application. Ease of maintenance and troubleshooting also must be considered before deciding which type to use.

Identifiers	Protocol	How to Set	Format	Restrictions/Notes
Module ID	IPX	DIP Switch	Slave Number 1–63, Set ERM to 0	Module ID can be changed without NetEdit. Disables Module ID in NetEdit.
		NetEdit	Slave Number 1-65535 Set ERM to 0	DIP Switch must be set to "0". Must use NetEdit to set Module ID.
IP Address	UDP/IP	NetEdit	4 Three-digit Numbers xxx.xxx.xxx.xxx (See Page 2–4)	See Your Network Administrator, Only for UDP/IPAdminist
Ethernet Address	IPX	Set at Factory	12 Hex digits	Factory-assigned

ERM / Slave Configuration Tools

ERM Workbench software utility **must** be used to configure the ERM and its slave modules. If either Module ID (set by dip switch) or Ethernet Address is used for network identification, then ERM Workbench is all that is needed to configure the network modules. ERM Workbench is described in detail in Chapter 3.

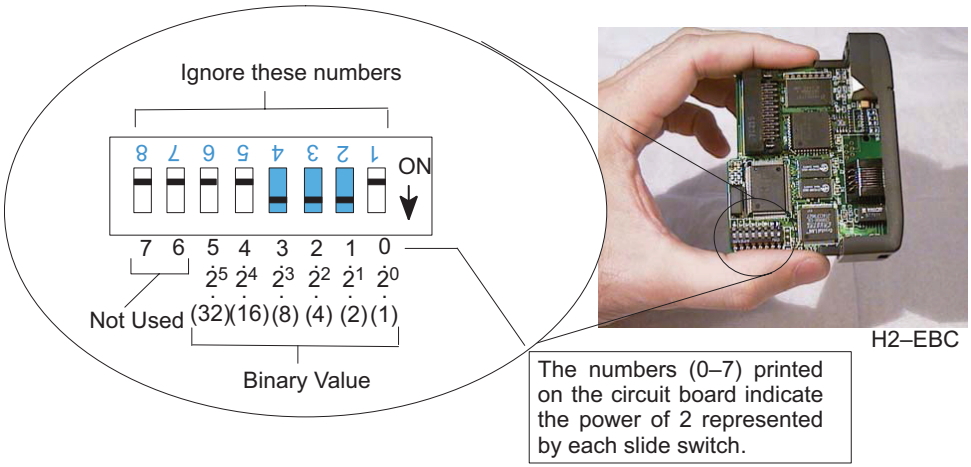
NetEdit software utility will be needed in addition to the ERM Workbench if IP Addressing (UDP/IP) is necessary or if the Module ID is software set. If the H4–EBC slave is used with analog I/O or the high speed counter, NetEdit will be required to configure the H4–EBC. NetEdit is described in detail in Chapter 4.

ERM / Slave Module ID

You can assign the Slave Module ID:

- Using the DIP switches on the module (1–63).
- Using the configuration tools in NetEdit that is included within the ERM Workbench utility (1–65535).

Use the DIP switch if you want the ability to install or change slave modules without using a PC to set the Module ID. Set the module's DIP switch, insert the module in the base, and connect the network cable. Your Module ID is set on powerup, and your module is ready to communicate on the network.



If you prefer to be able to set or change all Module IDs on your network from a single PC, use the tools in NetEdit. In chapter 4, we step through the use of NetEdit and the network identifier options.

The Module ID equals the *sum* of the binary values of the slide switches set in the ON position. For example, if you set slide switches 1, 2, and 3 to the ON position, the Module ID will be 14. This is found by adding 8+4+2=14. The maximum value you can set on the DIP switch is 32+16+8+4+2+1=63. This is achieved by setting switches 0 through 5 to the ON position.

IP Address

An IP Address can be assigned to the ERM module or its slaves if your network requires one. Normally, a network administrator will assign an IP Address to each device on the network. Since it is recommended to use a separate dedicated network for your ERM , you do not have to use the IP Address, unless you are using the UDP/IP protocol. Use the Module ID or Ethernet Address for each module when using the IPX protocol.

You can use NetEdit within the ERM Workbench utility to give the ERM or its slave modules an IP Address. Each ERM and slave must have a unique IP Address.

The module ships from the factory with an IP Address of 255.255.255.255. This is not a usable IP Address for normal communications. It only serves as a default setting which can be changed using NetEdit. The **valid settings** are **0 through 254**. You do not have to change the default IP Address unless you are using IP Address protocol. The default setting does not cause conflicts with other network communications.

If you change the default IP Address for linking to other network devices, you must change all four "255" fields. If any field contains **the number 255** ***and*** **other fields have been changed, the module will** ***not*** **be recognized on the network.**

Example

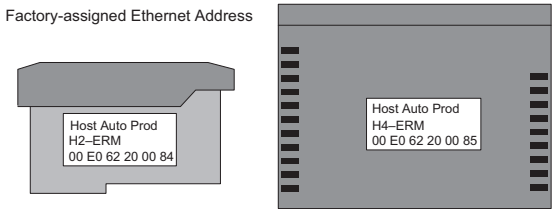
Valid IP Address: 192.168.100.002

No! ~~255~~.168.100.002

WARNING: There cannot be duplicate IP Addresses on your network. If you are using the IP Address, all modules must have a unique number.

Ethernet Address

A unique Ethernet Address is assigned to each module at the factory and will not change. It is printed on a label attached to each module. The Ethernet Address is recognized by ERM Workbench and NetEdit. The Ethernet Address is a twelve digit number with no deliberate relationship to your network or functional areas of your plant. It does not usually serve as a convenient and easily remembered identifier for the module.



Using Multiple Network Identifiers

Using one type of identifier does not limit your use of the other identifier types. IP addressing, Module ID and Ethernet Addressing may be used on one dedicated remote I/O network.

Installation and Network Layouts

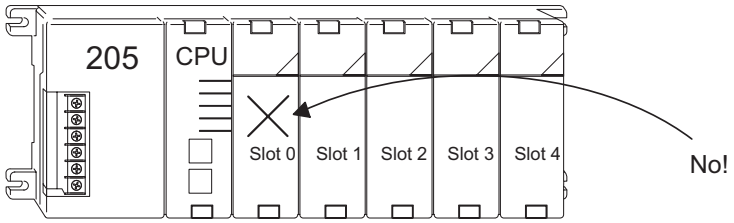
In This Chapter...

Inserting the ERM Module in the I/O Base 3–2
ERM Network Layouts 3–5
Network Cabling 3–7

Inserting the ERM Module in the I/O Base

DL205/Do-more! Slot Choices

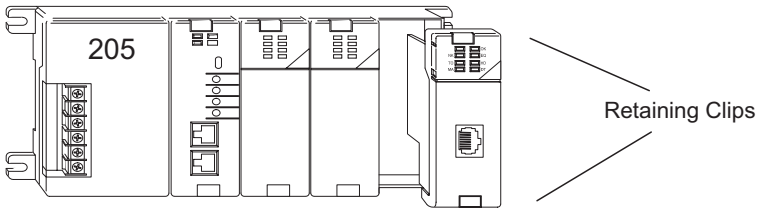
The DL205 and Do-more! systems support placement of the ERM module in the CPU-base only. It does not support installation of the ERM in local expansion or remote I/O bases. The number of usable slots depends on how many slots your base has. See the chart below for limitations on slot selection. The D2–230 CPU does not support the ERM modules.



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Module Type	CPU	Base	Usable Slots
H2–ERM(100, -F)	D2-240 D2-250-1 D2-260 D2-262	D2–03B–1, D2–03BDC1–1	1
		D2–04B–1, D2–04BDC1–1	1, 2
		D2–06B–1, D2–06BDC1–1, D2–06BDC2–1	1, 2, 3, 4
		D2–09B–1, D2–09BDC1–1, D2–09BDC2–1	1, 2, 3, 4, 5, 6, 7
	H2-DM1 / H2-DM1E	Any Base	Any Slot

H2–ERM (100, -F) Module Installation

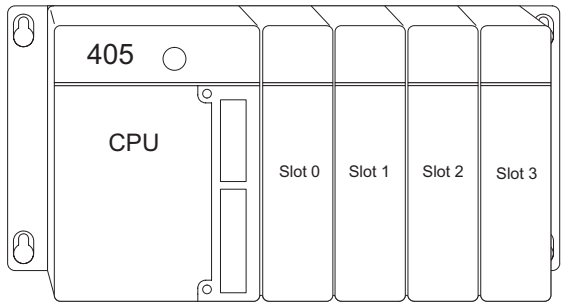


To install the ERM module, line up the module's printed circuit board with the grooves in the base and push the module until it is flush with face of the base power supply. If you feel more than moderate resistance when you push the module into the base, the circuit board may not be aligned with the grooves in the base. When the module is firmly seated in the slot, depress the top and bottom retaining clips to lock the module in place.

NOTE: *When adding modules to your PLC always confirm that your power budget will accommodate the added module. See the User Manual for your PLC for more information about calculating the power budget. See Appendix A for the power consumption of the ERM modules.*

DL405 Slot Choices

For PLC systems with D4–430 and D4–440 CPUs, the ERM modules can reside in any I/O slot but only in the CPU-base. The D4–450 and D4-454 CPUs allow the installation of the ERM module in the CPU-base or in local expansion bases. If the ERM module is used in a local expansion base, all bases in the system must be the "–1" type bases. The valid part numbers for these bases are D4–04B–1, D4–06B–1, and D4–08B–1. The "–1" on the end of the part number indicates that the base supports specialty modules including the ERM. The "–1" bases can be connected as local expansion bases or remote bases. They are not the same thing. Remote bases do not support the ERM modules!



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

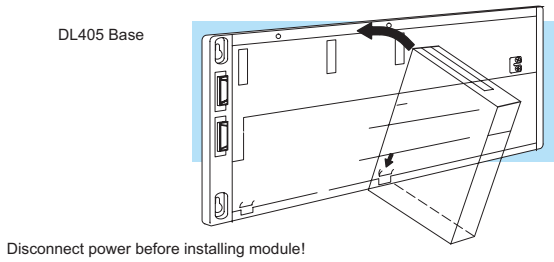
Module Type	CPU	Base	Usable CPU-Base Slots	Usable Expansion Base Slots
H4–ERM(100, -F)	D4–430/D4-440	D4–04B, D4–04B–1	0, 1, 2, 3	N/A
		D4–06B, D4–06B–1	0, 1, 2, 3, 4, 5	N/A
		D4–08B, D4–08B–1	0, 1, 2, 3, 4, 5, 6, 7	N/A
H4–ERM(100, -F)	D4–450/D4-454	D4–04B	0, 1, 2, 3	N/A
		D4–06B	0, 1, 2, 3, 4, 5	N/A
		D4–08B	0, 1, 2, 3, 4, 5, 6, 7	N/A
		D4–04B–1	0, 1, 2, 3	0, 1, 2, 3*
		D4–06B–1	0, 1, 2, 3, 4, 5	0, 1, 2, 3, 4, 5*
		D4–08B–1	0, 1, 2, 3, 4, 5, 6, 7	0, 1, 2, 3, 4, 5, 6, 7*

**** You must use the "–1" base for the CPU-base and all local expansion bases.***

NOTE: *Before installing the ERM module, confirm that your power budget will accommodate the added module. See the PLC user manual for your PLC for more information about calculating the power budget. See Appendix A for the power consumption of the ERM modules.*

H4-ERM(100, -F) Module Installation

To insert the ERM module in a DL405 base, place the bottom tab of the module into the notch at the bottom of the base. Pivot the module toward the base as shown below. Ensure that each module is tightly seated and secured with the captive screw at the top of the module.



Which Modules are Supported in the Ethernet Slaves

The Ethernet remote I/O slaves accept the most commonly used I/O modules for the DL205/Do-more!, DL405 systems and Terminator I/O systems (AC, DC, AC/DC, Relay an Analog). The table below lists by category those modules that you may use in a remote I/O slave. A few specialty modules that are supported in the slaves are listed below.

Module/Unit	Remote Slave	Module/Unit	Remote Slave
PLC CPUs	No	H2–CTRIO(2)	Yes
DC Input Modules	Yes	D2–CTRINT	No
AC Input Modules	Yes	H4–CTRIO, D4–HSC	Yes
AC/DC Input Modules	Yes	D2–EM	No
DC Output Modules	Yes	Communications and Networking Modules	No
AC Output Modules	Yes		
Relay Output Modules	Yes		
Analog I/O Modules	Yes		
Thermocouple Module	Yes		
RTD Module	Yes		

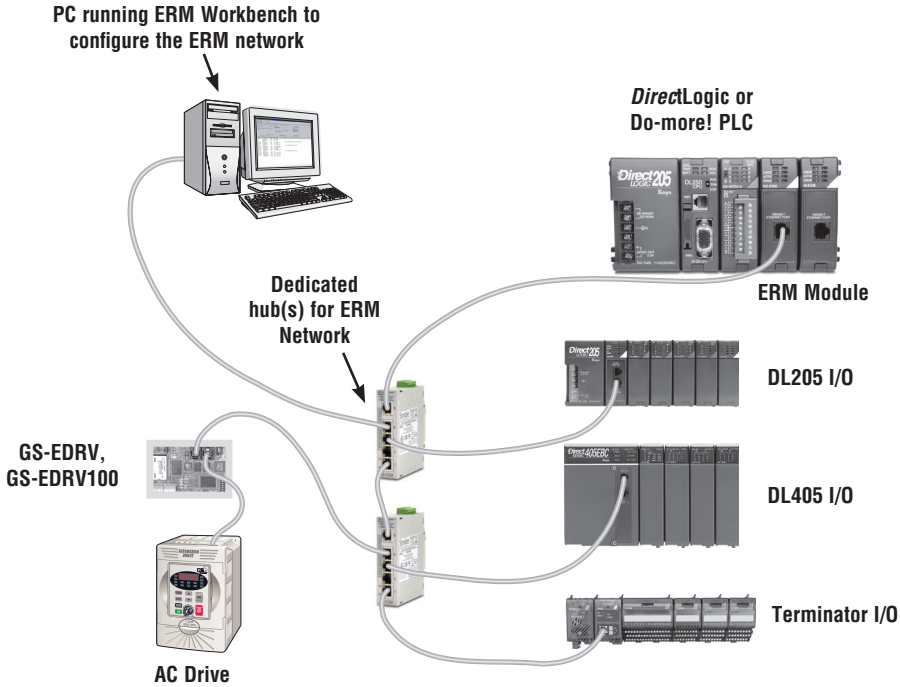
NOTE: *The User Manual for Analog I/O Modules discusses scan times for updating analog I/O data for modules installed in local bases. Please be aware that the scan times for updating are different for remote I/O modules installed in remote bases. The CPU scan is asynchronous with the remote scan by the master module. Thus, an analog input module installed in a remote base, for example, may not have its data updated by the CPU "once every scan per channel" as stated in the user manual. The CPU scan may, in fact, cycle several times while the remote scan is taking place. Take this into account in applications where the timing is critical.*

ERM Network Layouts

Each ERM module can support up to 16 remote slaves (if a WinPLC system is used, only one slave can be supported by the ERM module). The slaves supported are the H4–EBC(–F), H2–EBC(–F), T1H–EBC, GS–EDRV100 and HA–EDRV2. A hub or repeater connects multiple slaves into a star topology. Multiple hubs or repeaters can be used to create a star–bus–star topology. Once the ERM I/O network is configured and running, the PC can be removed from the network.

Configuring the Ethernet Remote I/O Network

Use a PC equipped with a 10/100BaseT 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.

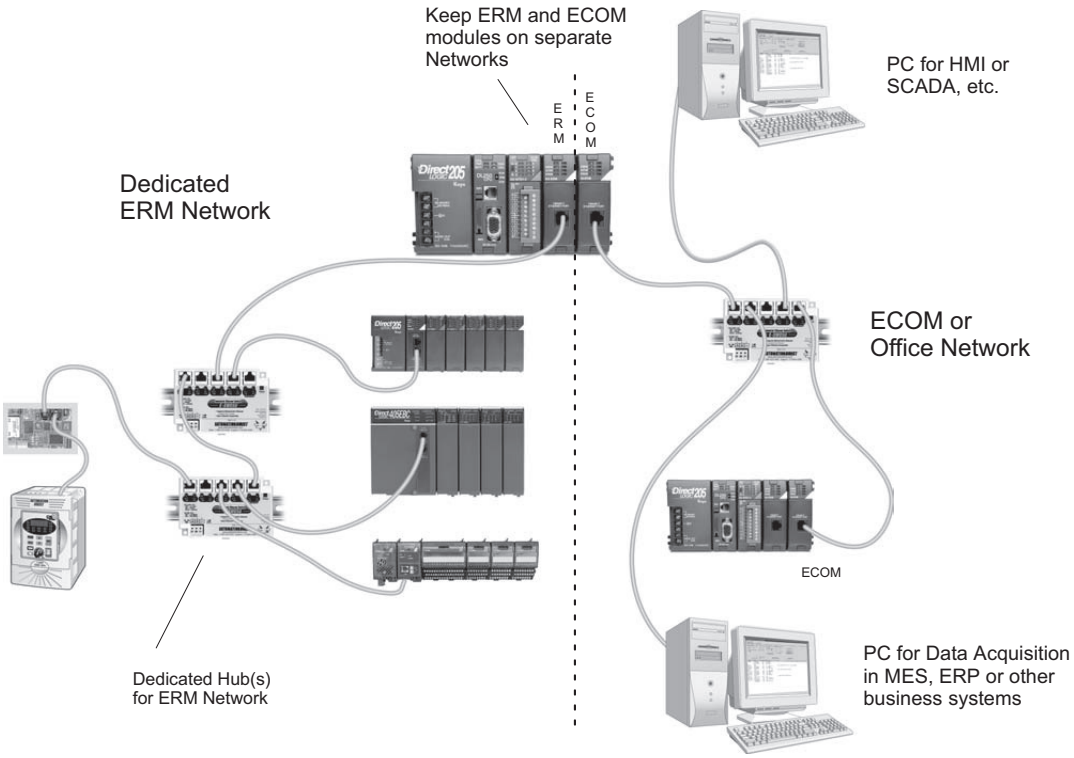


Running the Ethernet Remote I/O Network

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.



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.

Network Cabling

ERM Supports Three Standards

Three types of ERMs are available. The H2-ERM and H4-ERM support the 10BaseT standard. The H2-ERM100 and H4-ERM100 support the 10/100BaseT standard. The H2-ERM-F supports the 10BaseFL standard. The 10/100BaseT standard uses twisted pairs of copper wire conductors, and the 10BaseFL standard is for fiber optic cabling.

10/100BaseT
Unshielded twisted-pair cable with RJ45 connectors

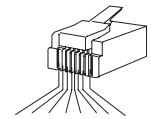
10BaseFL
62.5 / 125 MMF fiber optics cable with ST-style connectors

10/100BaseT Networks

The cable used to connect a PLC (or PC) to a hub or repeater is called a patch (straight-through) cable. The cable used to connect two Ethernet devices (Point–to–Point) together is a crossover cable. We recommend that you purchase cables pre-assembled with connectors for convenient and reliable networking.

This diagram illustrates the standard wire positions in the RJ45 connector. We recommend all ERM 10/100BaseT cables to be Category 5, UTP cable.

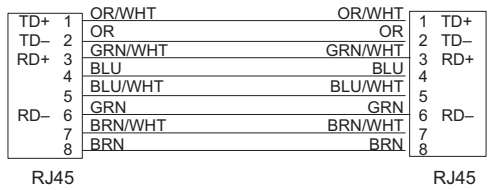
10/100BaseT



1 2 3 4 5 6 7 8

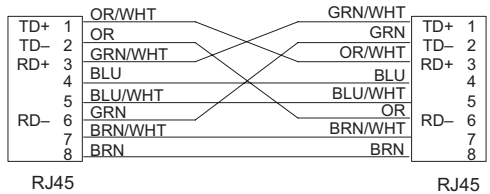
8-pin RJ45 Connector (8P8C)

Patch (Straight–through) Cable



RJ45 RJ45

Crossover Cable



RJ45 RJ45

10/100BaseT

Most 10/100BaseT hubs or repeaters use a patch (straight-through) cable for connecting the network devices (PLCs or PCs). For hub-to-hub connections a crossover type cable is commonly required. The figures on the previous page show pin assignments and insulation color codes for patch (straight-through) and crossover type Ethernet cables.

UTP Cable

The ERM has an eight-pin modular port that accepts RJ45 type connectors. UTP (Unshielded Twisted-Pair) cable is rated according to its data-carrying ability (bandwidth) and is given a "category" number. We strongly recommend using a category 5 cable for all ERM connections.

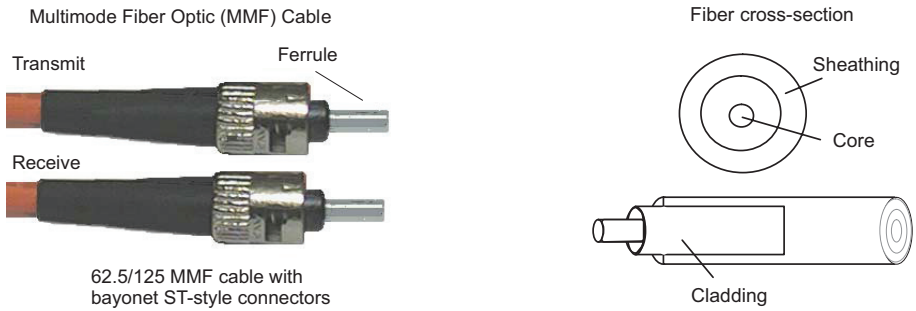
10BaseFL

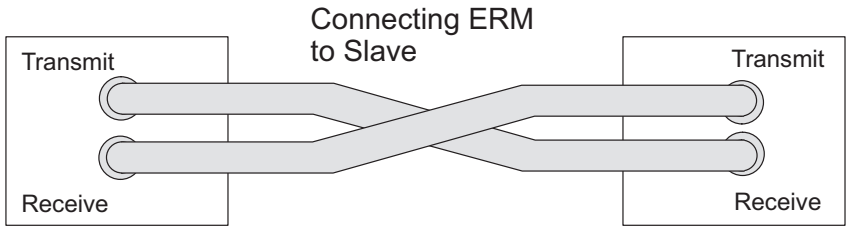
Each module has two bayonet ST-style connectors. The ST-style connector uses a quick release coupling which requires a quarter turn to engage or disengage. The connectors provide mechanical and optical alignment of fibers. Each cable segment requires two strands of fiber: one to transmit data and one to receive data. The ST-style connectors are used to connect the H2–ERM–F or H4–ERM–F module to another H2–ERM–F or H4–ERM–F module or a fiber optic hub or repeater.

Fiber Optic Cable

The H2–ERM–F and H4–ERM–F modules accept 62.5/125 multimode fiber optic (MMF) cable. The glass core diameter is 62.5 micrometers and the glass cladding is 125 micrometers. The fiber optic cable is highly immune to noise and permits communications over much greater distances than 10/100BaseT.

Fiber Optic Module ST Connector

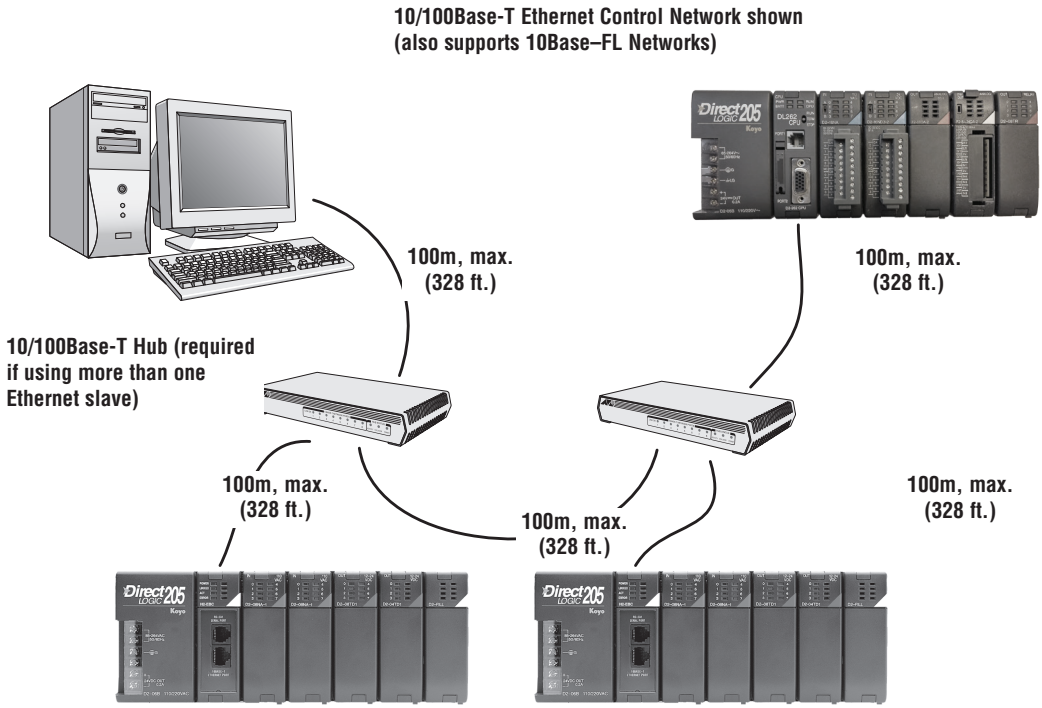




Maximum Cable Length

The maximum distance per 10/100BaseT cable segment is 100 meters or 328 feet. Repeaters extend the distance. Each cable segment attached to a repeater can be up to 100 meters. Two repeaters connected together extend the total range to 300 meters. For really long distances, consider using Ethernet/Fiber media converters like the SE-MC2U-ST.

The maximum distance per 10BaseFL cable segment is 2,000 meters or 6,560 feet (1.2 miles). Repeaters extend the distance. Each cable segment attached to a repeater can be 2,000 meters. Two repeaters connected together extend the total range to 6,000 meters.



Configuring the ERM and Slave Modules with ERM Workbench

In This Chapter...

ERM Workbench Software 4-3
Running ERM Workbench PLC Wizard 4-5
Running ERM Workbench 4-9
Configure the ERM 4-10
Select the Slaves 4-12
Configure the Slaves 4-13
Write Configuration to ERM 4-15
Analog I/O Data Registers 4-16
Reserved PLC Memory for ERM 4-17
Saving ERM Configuration to Disk 4-18
Clear ERM Configuration 4-18
Printing/Exporting the ERM Configuration 4-18

ERM Workbench Software

Ethernet Remote Master (ERM) Workbench is a software utility that must be used to configure the ERM and its remote Ethernet slaves. The ERM Workbench supports two methods of configuring the ERM I/O network. Both methods are explained later in this chapter.

The two configuration methods are:

- ERM Workbench PLC Wizard – simplifies the ERM I/O network configuration procedure when a PLC is used as the CPU Interface.
- ERM Workbench – configures an ERM I/O network whether the CPU Interface is a PLC or WinPLC, and allows access to all ERM I/O network parameters.

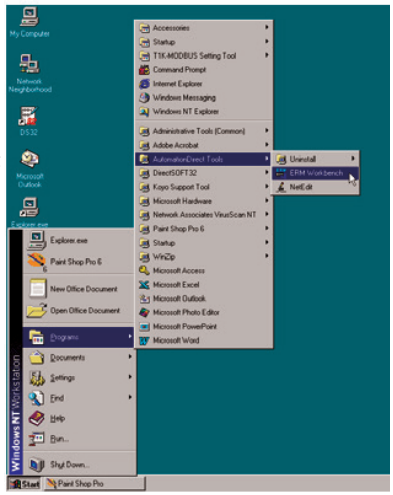
NetEdit, a software utility that can be called from within the ERM Workbench, can be used to set the Ethernet master/slave Module ID, set an IP address if necessary or configure DL405 EBCs with analog I/O modules. Both ERM Workbench and NetEdit can be used to monitor the remote I/O network and to perform diagnostic and troubleshooting tasks.

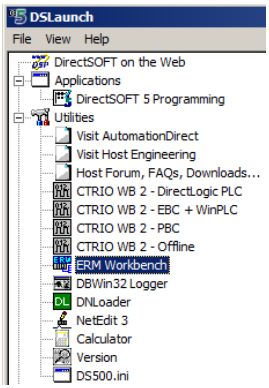
ERM Workbench software is installed as a utility program when you install DirectSOFT or Do-more! Designer. The latest version of ERM Workbench is also available for download from Host Engineering's web site (www.hosteng.com). ERM Workbench consists of several files, all of which must be located in the same directory. The installation process places the files in the C:\HAPTools directory (default). The files may be placed in another directory, but remember all of the ERM Workbench files must be placed within the same directory.

Launching ERM Workbench

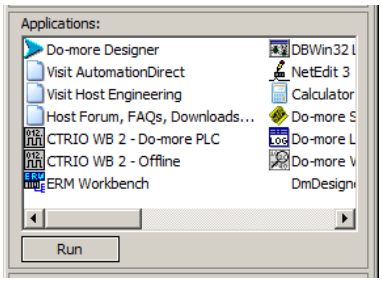
There are four methods to launch ERM Workbench:

1. Using the Windows Start menu Programs>AutomationDirect Tools>ERM Workbench (on right)





2. Launching *Direct*SOFT, then select PLC >Tools>ERM Workbench
3. Launching *Direct*SOFT, then select Utilities>ERM Workbench (on left)
4. Launching Do-more! Designer, then select ERM Workbench from the Launchpad (on left)

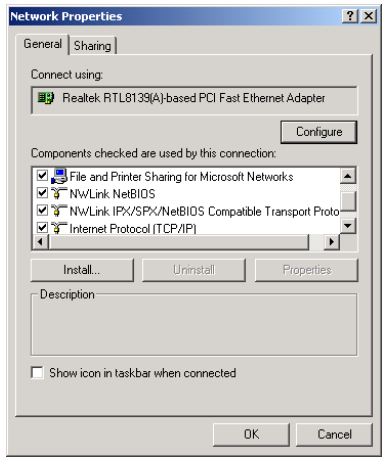


Adding IPX Network Protocol Support on PCs with Windows XP (32 bit only) or Earlier Operating Systems

You may have already set up your PC with selected networking protocols for Ethernet communications. If not, you will need to select the protocols now for communication with the ERM module. We strongly recommend that you include the IPX protocol. The description below applies to Windows 2000 (Windows 98/NT/XP have slightly different steps). If you are not familiar with this procedure, you may need to have your Network Administrator perform this task.

For Windows 2000, go from My Computer on your Windows desktop to Control Panel. Double click on Network and Dial–up Connections, then double click on the desired Network Device to see the installed Protocols. If IPX is not listed among the protocols already loaded, add it now by clicking on the Install button. For Windows XP, go from Start>Settings>Control Panel. The steps are the same as Windows 2000 from this point.

Add the TCP/IP protocol if it is necessary for your application. The TCP/IP selection will give you support for the UDP/IP protocol. Also, add the IPX protocol if it is not already active.



NOTE: *We strongly recommend you load IPX protocol on your PC for the connection from your PC to the Ethernet modules. Use UDP/IP in your application, if required,but also add IPX to your list of active protocols. Having IPX loaded on your PC gives you a backup for troubleshooting communication problems.*

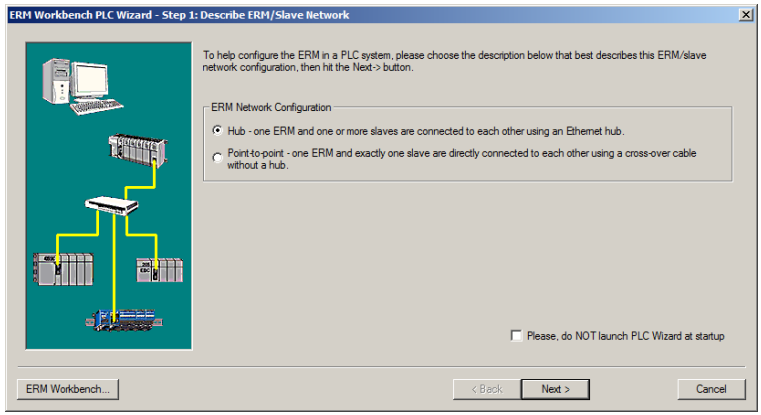
Running ERM Workbench PLC Wizard

Run ERM Workbench PLC Wizard by launching *Direct*SOFT or Do-more! Designer, then select ERM Workbench as mentioned on the previous page. The Wizard allows the ERM network to be easily and completely configured without having to use the more advanced ERM Workbench utility.

NOTE: *The ERM module and ERM Workbench utility factory default settings are located in Appendix C. These defaults will be applied during the ERM network configuration unless otherwise changed. Some of the settings can be changed within the ERM PLC Wizard, but all can be changed using the ERM Workbench utility.*

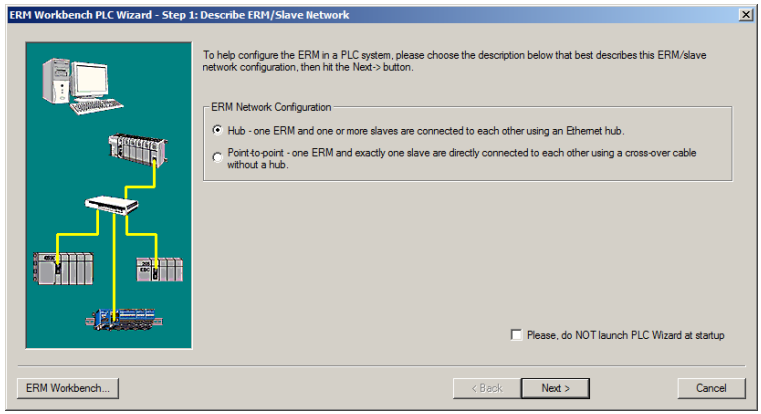
Step 1: Choosing the ERM Network Configuration

Select either Hub or Point–to–point to describe the ERM network system that will be used. This example assumes that a Hub network is used. Once a selection has been made, click on the Next button.



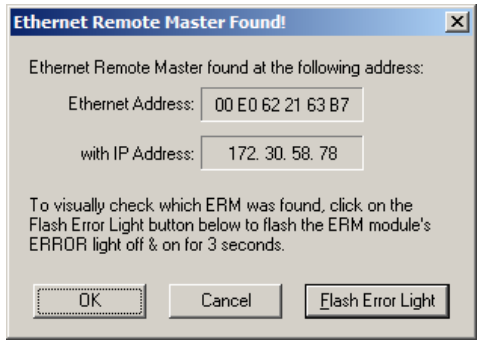
Step 2: Connecting the ERM Workbench PC to the ERM Network

Connect the ERM Workbench PC to the dedicated ERM network hub. If only one slave is used, connect the PC directly to that slave. Then click on the Next button.



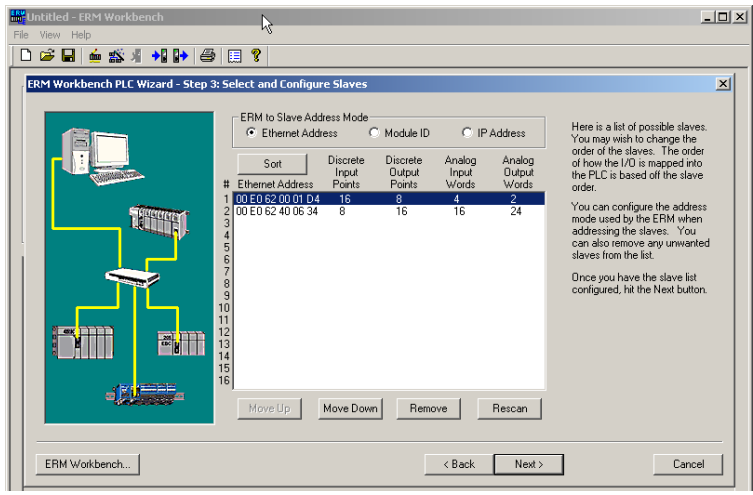
Establishing Communication with the ERM

The following window will be displayed if an ERM module is found on the network. Click on the Flash Error Light button to confirm that the correct ERM module has been found (the ERM's LED will flash for 3 seconds). If the PC is connected directly to the slave in a Point–to–point network, this window will not be displayed until the PC is connected directly to the ERM module.



Step 3: Select and Configure the Slaves

The Select and Configure Slaves window will display all of the slaves found on the dedicated ERM network. The order of how the I/O is mapped into the PLC is based on the slave order. The ERM to Slave Address Mode selection determines the address mode in which the ERM module will use to communicate with its slaves. Chapter 2 describes the ERM / Slave Addressing Modes. Click on the Next button once the slave list is configured.



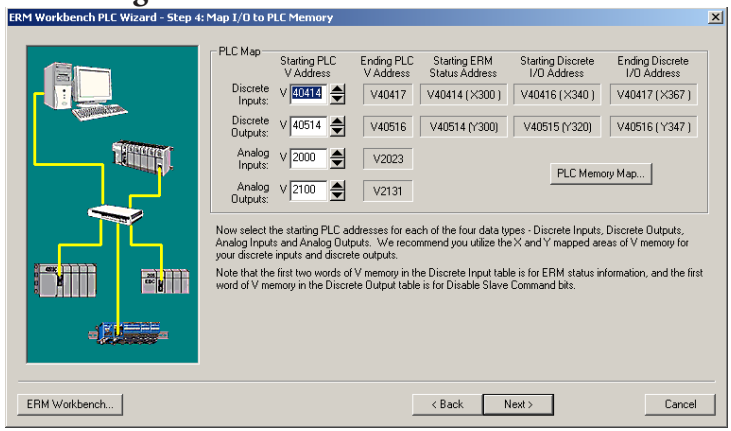
NOTE: *Due to the manner in which I/O is grouped into PLC addresses, it is advisable, for future expansion purposes, to pad the base with extra I/O. The wizard does not offer the option to add unused addresses. To pad the addresses, add extra I/O before running the wizard. If the padding is not created, adding an I/O module to the base in the future will offset a wide range of I/O in the PLC's memory map.*

Step 4: Map I/O to PLC Memory

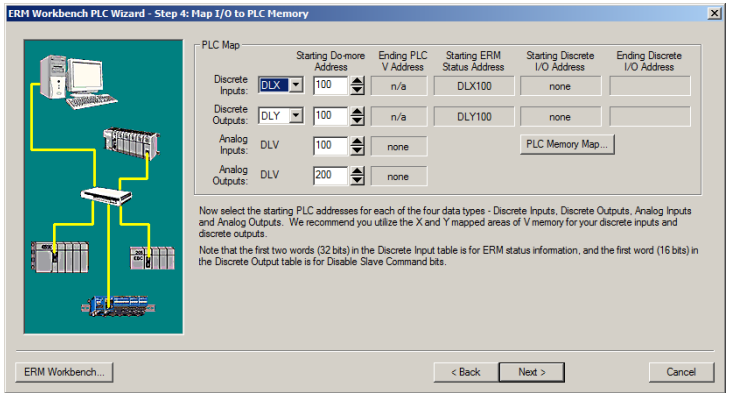
Select the starting PLC memory addresses for each of the four I/O types: Discrete Inputs, Discrete Outputs, Analog Inputs and Analog Outputs. Be sure that the selected starting addresses do not conflict with any local I/O or any memory locations used in the ladder logic program. Note that the first two words of memory in the Discrete Input table is reserved for ERM status information and the first word of memory in the Discrete Output table is reserved for Disable Slave Command bits. For more detailed information on PLC I/O mapping, refer to the "PLC Map" section and the "Reserved PLC Memory for ERM" section. Click on the Next button once the starting PLC addresses have been selected.

Step 5: Download Configuration to ERM

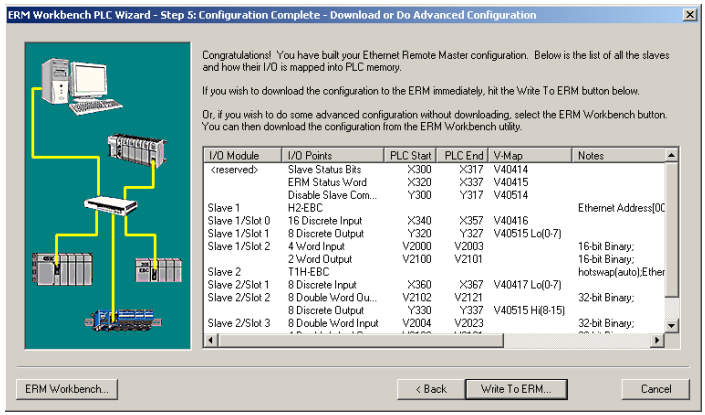
DirectLOGIC



Do-more!



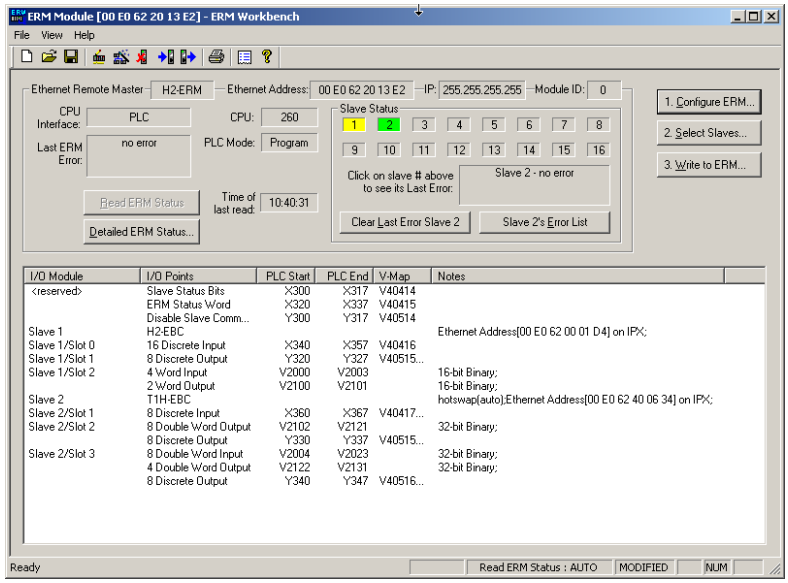
The following window displays how the slave I/O will be mapped into the PLC memory. The network I/O modules and I/O points are listed by slave and slot number. This configuration is written to the ERM by clicking on the "Write to ERM" button. If any advanced configuration needs to be done, click on the ERM Workbench button. The modified configuration can then be downloaded from the ERM Workbench utility to the ERM module.



ERM Workbench Main Configuration Window

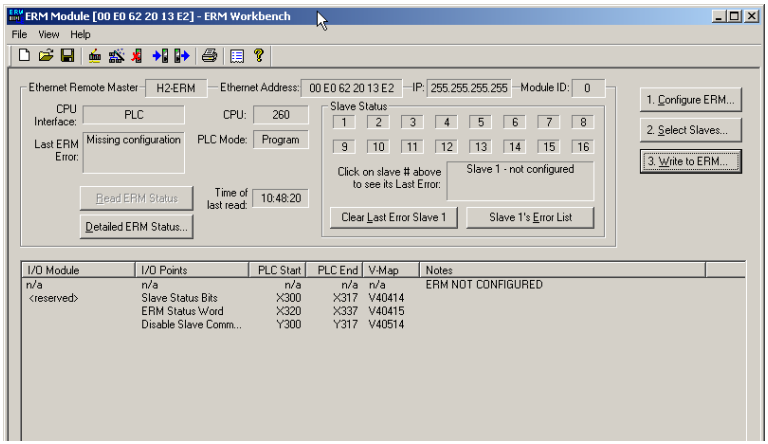
The ERM Workbench main configuration window will be displayed once the configuration is written to the ERM. Refer to the "Write Configuration to ERM" section for a complete description of the window fields.

In the Slave Status box, the status of a specific slave can be displayed by clicking on the slave number 1–16. The numbers are highlighted in either normal, green, yellow or red. Normal (default) indicates that the slave is not configured. Green indicates the ERM is successfully communicating with that particular slave. Yellow indicates I/O is updating, but some error exists within the I/O of that slave (i.e. module missing 24VDC, unused analog channels exist, broken transmitter or module missing terminal block, etc.). Red indicates I/O is not updating and that the ERM is not communicating with that slave. Clicking on the Slave's Error List button will display the error conditions for that particular slave. The error codes are then defined under the Error List button.



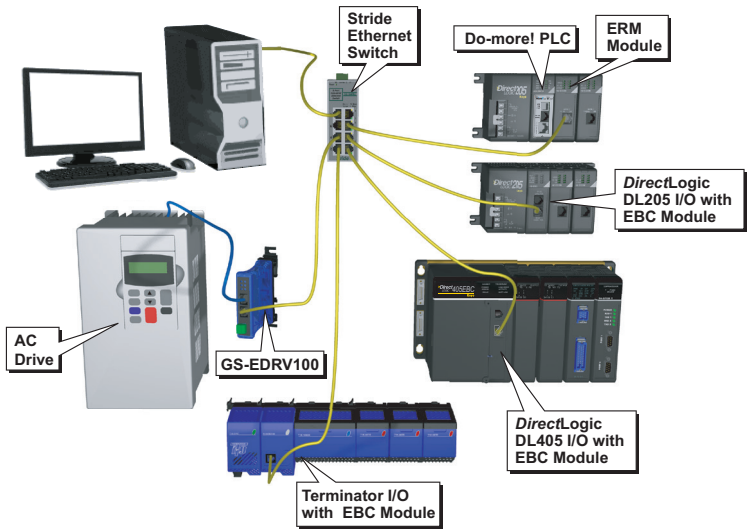
Running ERM Workbench

First, run the ERM Workbench PLC Wizard by launching ***Direct***SOFT or Do-more! Designer, then select ERM Workbench as previously mentioned in the Launching ERM Workbench Section. With the wizard opened, click the ERM Workbench button in the lower left hand side of the ERM Workbench PLC Wizard window. Checking the "Please do Not Launch PLC Wizard at startup" box will disable the Wizard from launching, but can be accessed from View menu>PLC Wizard. The following window will be displayed.



Connecting the ERM Workbench PC to the Network Modules

The ERM Workbench PC will need to be connected to the ERM network to configure the modules as described in this chapter. A hub is not necessary if only one network slave is used. In this case, the PC will need to be connected directly to the slave module to configure the slave. Then, the PC will need to be connected directly to the ERM module to configure the ERM.

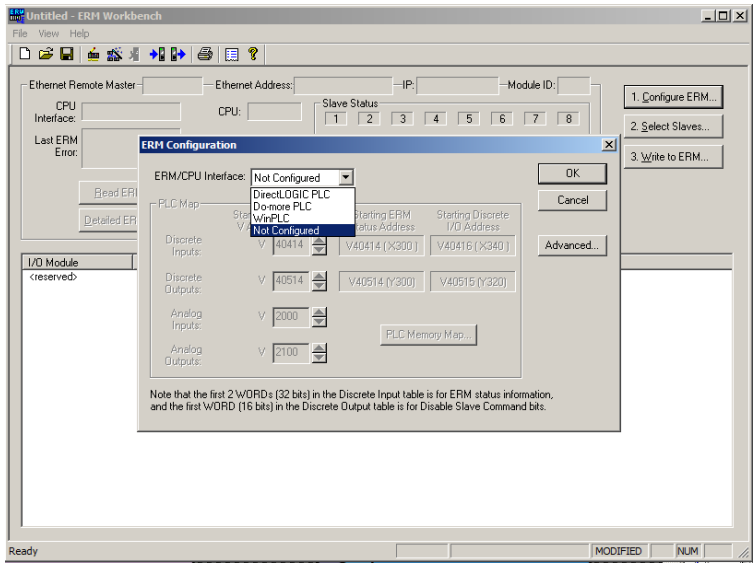


Configure the ERM

NOTE: *The ERM module and ERM Workbench utility factory default settings are located in Appendix C. These defaults will be applied during the ERM network configuration unless otherwise changed. The default settings can be changed during configuration, module by module, within the ERM Workbench. Also, the ERM Workbench> View menu>Options allows the default settings to be change at a system level that will apply to all the new module configurations.*

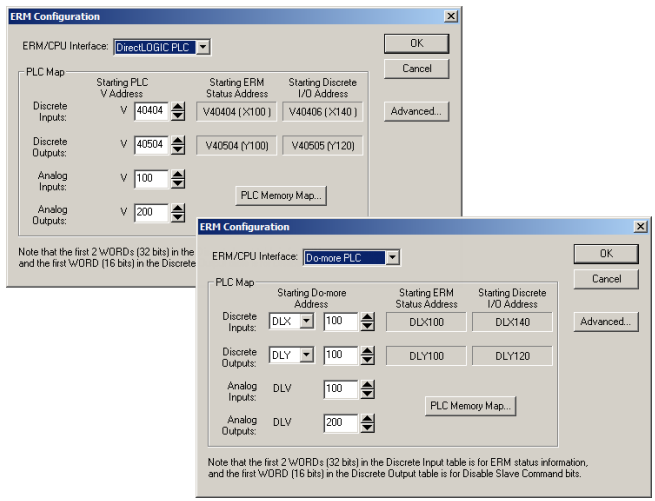
Configuring the ERM

Click on "1. Configure ERM" button. Then select either DirectLOGIC PLC, Do-more! PLC or WinPLC as the ERM / CPU Interface.



Selecting PLC as Interface

If either PLC is selected, the PLC Map is enabled. If WinPLC is selected, the PLC Map will remain disabled. The PLC Map is explained on the next page. Clicking on the PLC Memory Map button displays the valid memory ranges for each PLC that supports the ERM module.



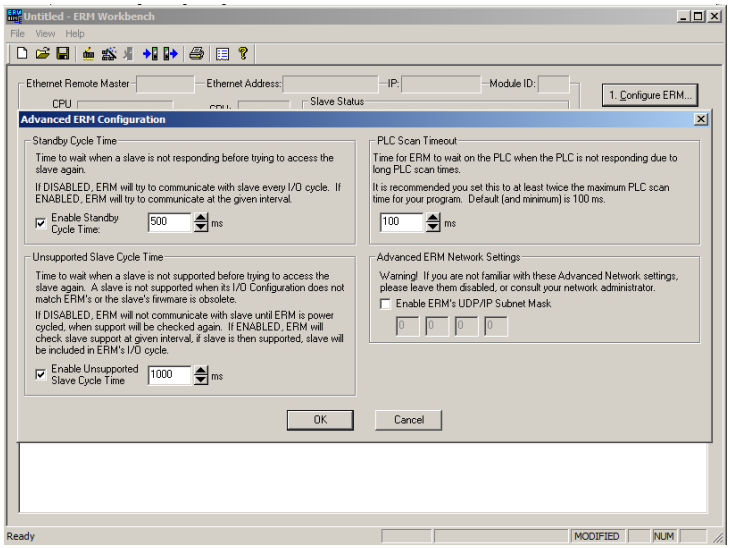
PLC Map

A starting PLC memory address must be specified for each of the four types of I/O. The ending address for each I/O type is determined by the amount of each I/O type used by the slaves. The PLC Map is divided into 4 separate tables.

1. Discrete Inputs: This is where the ERM will Write all of the slaves' Discrete Input data.
2. Discrete Outputs: The ERM will Read this from the PLC and Write it to the slaves Discrete Outputs.
3. Analog Inputs: This is where the ERM will Write all of the slaves' Analog Input data.
4. Analog Outputs: The ERM will Read this from the PLC and Write it to the slaves Analog Outputs.

It is recommended to use the V404xx or DLX3xx (X's) for Discrete inputs and V405xx or DLY3xx (Y's) for Discrete Outputs that are beyond the expansion base I/O that exists. The default addresses are V40414 (X300) and V40514 (Y300) for DirectLOGIC users and DLX300 and DLY300 for Do-more! users. Note that the Starting PLC address and the Starting Discrete I/O Address are not the same. The first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. Adjust these address as needed, but do not map over local I/O used and be sure the PLC supports the alternate addresses selected.

Advanced ERM Configuration



Clicking on the ERM Configuration "Advance" button displays the following window.

Standby Cycle Time is the time the ERM will wait before trying to communicate with a slave that had a communication error. Enabling this feature will help overall I/O throughput when one slave errors in a multi–slave network.

If the Standby Cycle Time is disabled, the ERM will try to communicate with the slave in error every I/O cycle. If enabled, the ERM will try to communicate with the slave in error at the given time interval.

PLC Scan Timeout is the time for the ERM to wait on the PLC when the PLC is not responding due to long PLC scan times. It is recommended to keep it at the default of 100ms or twice the maximum PLC scan time, whichever is greater.

Unsupported Slave Cycle Time is the time the ERM will wait before trying to communicate with a slave that cannot be supported by the ERM. An unsupported slave may have an I/O configuration that does not match the ERM's or may have obsolete firmware. If disabled, the ERM will not try to communicate with the unsupported slave again until ERM power is cycled. If enabled, the ERM will check slave support at the given time interval. If the slave is then supported, the slave will be included in the ERM's I/O cycle.

Advanced ERM Network Settings are used to configure the ERM's UDP/IP subnet mask for IP address handling. Consult your network administrator if needed.

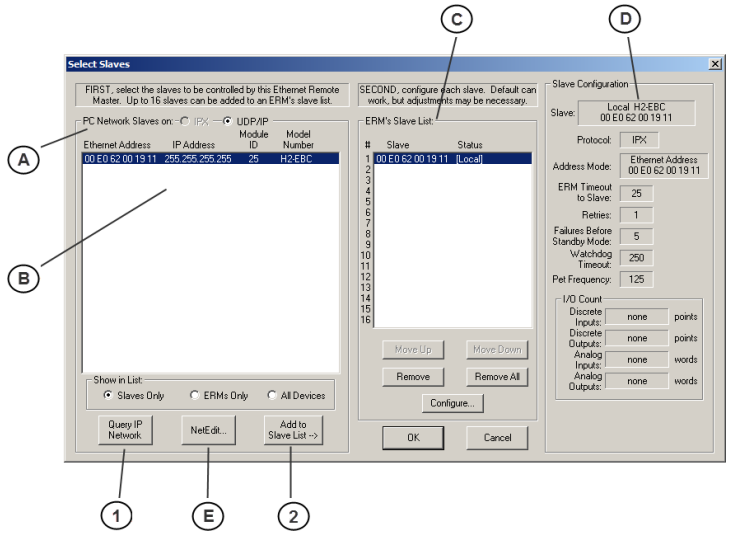
Select the Slaves

Selecting the Slaves

Select "2. Select Slaves" button. In order to select and configure the slaves, the PC running ERM Workbench needs to be connected to the specific remote Ethernet slave network.

NOTE: *A Think & Do WinPLC can only support one slave per ERM module. A PLC can support up to sixteen slaves per ERM modules.*

A. In the upper left corner of the Select Slaves window is a P**C Network Slaves on** protocol group list. Clicking on either the **IPX** or **UDP/IP** radio button determines which protocol is used by the PC running ERM Workbench to communicate with the remote master and slave modules. The ERM and its slave modules understand either protocol. Only one of the protocols needs to be installed on the PC to configure the ERM.



B. The left column displays the Ethernet Address, IP Address, Module ID and Model number of the slaves currently on the remote I/O network. If slaves are added or removed from the network, click on the Query Network button (1) to update the list.

C. The center column displays the **ERM's Slave List**. To add a slave to the ERM's List, either double click on a slave in the PC Network Slave List or select the slave and click on the Add to Slave List button (2). Slaves can also be removed from the ERM's List by clicking on the Remove button. One ERM can support up to 16 remote slaves.

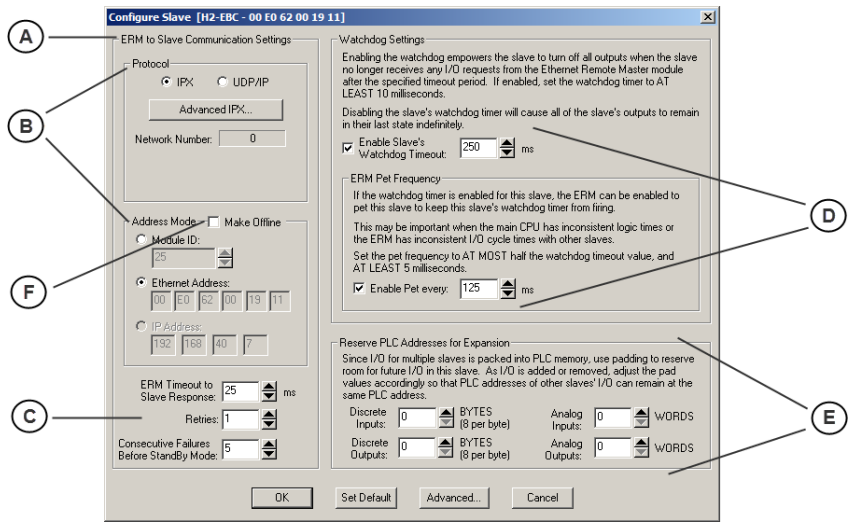
D. The right column displays the Slave Configuration of the slave that is selected in the ERM's Slave List.

E. **NetEdit** can be used to assign IP Addresses to the remote I/O network modules if required. NetEdit is also required if Module ID is to be software set or if the 405 EBC is used with analog I/O modules. Normally, a network administrator will assign an IP Address to each module on the network. Since it is recommended to use a dedicated remote I/O network, it is not necessary to assign IP Address unless the **UDP/IP** protocol must be used. Refer to Chapter 4 "Using NetEdit" for more information.

Configure the Slaves

Setting the Slave's Parameters

Remote slave parameters (protocol, address mode, timeout, etc.) are set individually for each slave. To configure a slave, select a specific slave in the ERM's Slave List by either double clicking on that slave or by clicking on the "Configure" button once the slave is highlighted. The following window will display the settings of the selected slave module.



A. The left column, **ERM to Slave Communication Settings**, determines the protocol, address mode and the communication Timeout Settings the ERM module will use to communicate with the specific slave selected.

B. In the **Protocol** box, click on either the IPX or UDP/IP radio button to select which protocol the ERM will use to communicate with the selected slave. If UDP/IP protocol is selected, a valid IP address must be assigned using NetEdit. The Address Mode determines which network identifier will be used by the ERM to address the selected slave. IPX protocol supports either Module ID or Ethernet Address. UDP/IP protocol supports only IP Addressing.

C. **ERM Timeout to Slave Response**, **Retries** and **Consecutive Failures Before Standby Mode** times can be set for each slave. The default time values should be adequate for most applications. The values may need to be raised in applications where IP addressing and routers are used or if a dedicated remote I/O network is not used.

D. Enabling the **Slave's Watchdog Timeout** runs in the slave and allows the slave to turn off all outputs when the slave no longer receives any I/O requests from the ERM module. Any outputs that were on at the time of the error will turn off after the specified time elapses. Set the **ERM Pet Frequency** runs in the ERM to reset the watchdog timer in the slave to avoid any nuisance timeouts due to main CPU inconsistent logic times or ERM I/O cycle times. Disabling the slave's WatchDog timer will cause all of the outputs to remain in their last state indefinitely (hold) when the slave no longer receives any I/O requests.

E. **Reserve PLC Addresses for Expansion** allows future I/O modules to be added or existing modules to be removed from a slave without affecting the PLC addresses of the other slaves on the network. Pad the discrete inputs and outputs using bytes (8 points per byte) and the analog I/O using words (2 bytes). Padding can only be done for I/O at the end of a slave I/O base, not between two I/O modules on the slave.

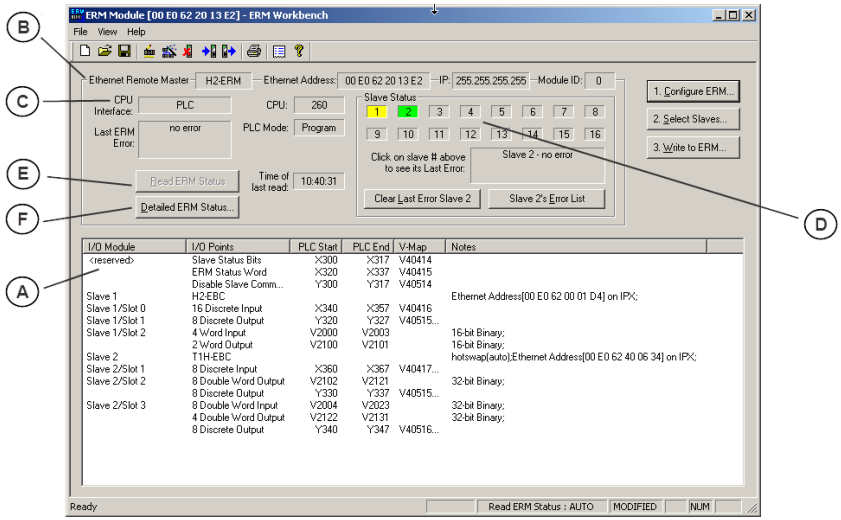
F. The **Make Offline** feature may be useful for users or OEMs that require duplicating a system several times. For example, a system may consist of 3 EBCs. An offline ERM configuration allows each additional ERM to be configured without actually connecting its slaves at configuration time. Once the initial ERM system is configured, its ERM Workbench configuration file can be used to create another configuration file with different slave addresses. Checking the Make Offline checkbox allows slave addresses to be manually set that should be used by the ERM. This does not change the address in the slave, but changes the ERM configuration to address a different slave without connecting it on the network when configuring the ERM.

Once the CPU Interface and Slaves have been selected and configured, the network I/O modules and I/O points will be listed by slave and slot number as shown on the next page (A.). The next step will be to write the configuration to the ERM module

NOTE: *If the slave is configured by a Do-more! CPU, it will report back one extra word that indicates that it is talking to a Do-more! processor. Cycle the power to the slave to place the slave back into ERM mode.*

Write Configuration to ERM

After the ERM CPU interface has been selected and the slaves have been configured, click on the "3. Write to ERM" button to write the configuration information to the ERM module. Once the download is complete, the following window can be used to check slave status and view detailed ERM status, etc.



A. Once the CPU Interface and Slaves have been configured using the steps on the previous pages, the network I/O modules and I/O points will be listed by slave and slot number. This configuration will be written to the ERM by clicking on the "3. Write to ERM" button. If using a PLC CPU as the interface, note that the Starting PLC address and the Starting Discrete I/O Address are not the same. The first two words of memory in the Discrete Input table is reserved for ERM/slave status information, and the first word of memory in the Discrete Output table is reserved for Disable Slave Command bits. The PLC memory map information is not displayed if a WinPLC is selected as the CPU interface. See the following section "Reserved PLC Memory for ERM" for detailed information. This table can be sorted by I/O module address or PLC Memory Address.

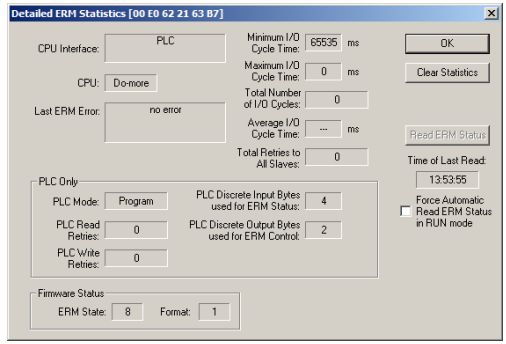
B. The top row lists the ERM's Ethernet Address, IP Address and Module ID. It is highly recommended that the Ethernet Address of the modules is placed on a label near the module in a visible location.

C. The PLC **CPU** or WinPLC Interface information is listed.

D. In the **Slave Status** box, the status of a specific slave can be displayed by clicking on the slave number 1–16. The numbers are highlighted in either normal, green, yellow or red. Normal (default) indicates that the slave is not configured. Green indicates the ERM is successfully communicating with that particular slave. Yellow indicates I/O is updating, but some error exists within the I/O of that slave (i.e. module missing 24VDC, unused analog channels exist, broken transmitter or module missing terminal block, etc.). Red indicates I/O is not updating and that the ERM is not communicating with that slave. Clicking on the **Slave's Error List** button will display the error conditions for that particular slave. The error codes are then defined under the **Error List** button.

E. When the CPU Interface is in the Run Mode, the **Read ERM Status** button will be highlighted. Each time the button is clicked, the most current ERM Status information will be read and displayed.

F. **Detailed ERM Status** provides status of the module including ERM I/O Cycle Times. This is the time required for the ERM module to update all of its I/O points. Remember the ERM and the PLC CPU operate asynchronously from one another. The PLC CPU scan will be faster than the ERM I/O Cycle Time. Thus, the remote I/O points will not be updated every PLC CPU scan.



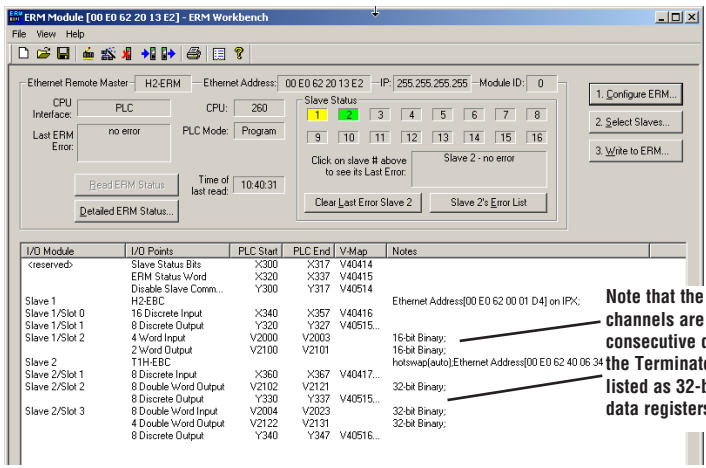
Analog I/O Data Registers

Analog I/O Data Registers

Analog input data is mapped channel by channel in decimal format (binary) into consecutive memory locations when used in an EBC base. Each individual analog I/O channel has its own 16–bit memory location. For example, an 8 channel analog input module with starting DirectLOGIC PLC V memory address of V2000 would map the 8 channels of analog data into V2000 – V2007, respectively.

Analog output data needs to be in decimal format (binary). For ***Direct***LOGIC users, be sure to convert any BCD values to decimal before sending the data to the analog output registers. Refer to the Analog I/O Manuals for conversion examples. Terminator analog I/O modules consume two (Double) words per channel (32–bits). See Appendix E for configuring Terminator I/O analog output module control byte.

The EBC slave modules automatically maps the analog I/O data in/out of memory, thus multiplexing ladder logic or pointer method is not necessary.

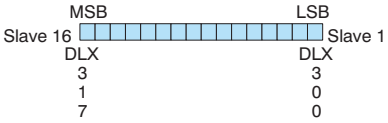


Reserved PLC Memory for ERM

The first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. The default memory addresses DLX300/X300 and DLY300/Y300 are used in this example.

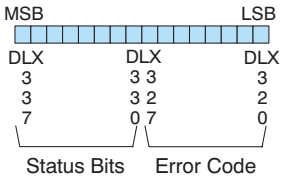
Do-more!

Slave Status Bits



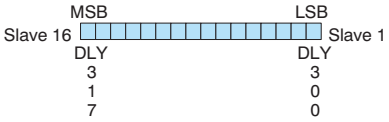
The Slave Status Bits can be monitored to detect if a slave is in error.

ERM Status Word



The ERM Status Word contains the ERM error code and Status Bits (see the following description and Error Codes in Appendix B). Bit 8 indicates that the ERM is disabling a slave.

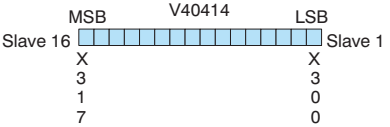
Disable Slave Bits



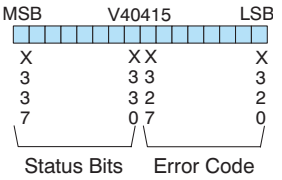
The Disable Slave Bits can be used to disable a slave from communicating with the ERM module. Bit ON = disable that specific slave. RESET = re-enable the specific slave.

***Direct*LOGIC**

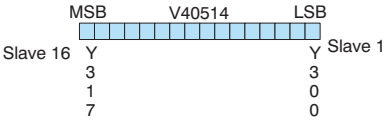
Slave Status Bits



ERM Status Word



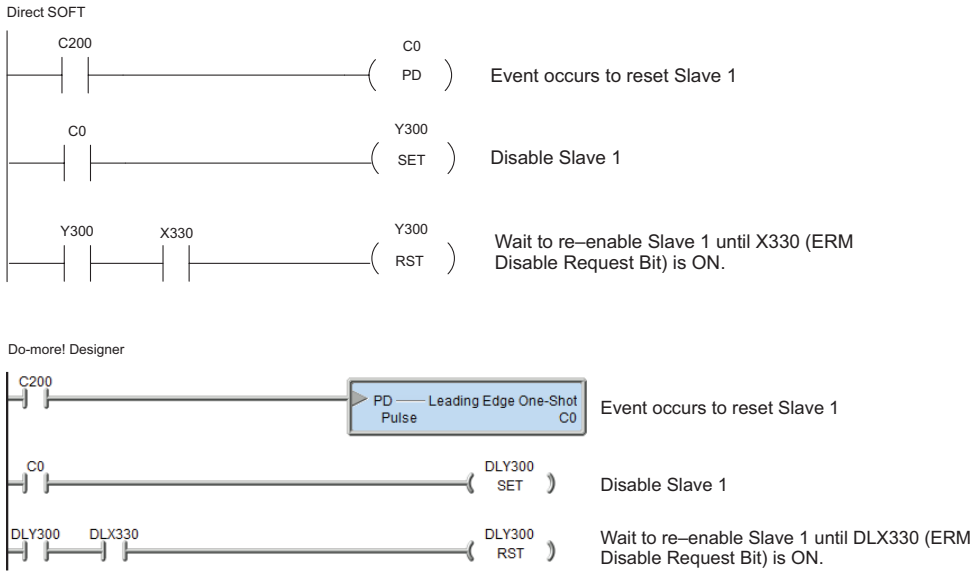
Disable Slave Bits



ERM Status Word / Reset Slave Code

The ERM Status Word contains the current ERM Error Code in the Least Significant Byte and the Status Bits in the Most Significant Byte. When using the Slave Disable Bits, the ERM must recognize the request to disable a slave before attempting to re–enable that slave. This closed loop feedback is necessary due to the asynchronous scans of the ERM and PLC. X330 (DLX330 for Do-more!) is the only feedback bit for ALL slave disabling bits (Y300 – Y317 or DLY300 – DLY317). Either disable multiple slaves all on the same scan or serialize the disable process by using ladder logic interlocks.

Use the following ladder logic code to manually reset a slave. For example, use this resetting method when “Hot Swapping” a Terminator I/O module on a slave that is set up to be manually reset using ladder logic. The default for the Terminator EBC is automatic rescan after “Hot Swapping” and I/O module.



Saving ERM Configuration to Disk

The ERM configuration can be saved to disk as an ERM Workbench File (*.erm). The Save command allows you to specify a name and location for the configuration. See File>Save.

Clear ERM Configuration

The Clear ERM command allows you to clear the existing configuration from an ERM module. This function is useful when changing the ERM network configuration or experiencing configuration difficulties. See File>Clear ERM.

Printing/Exporting the ERM Configuration

The ERM Configuration can be printed or exported as a text(.txt) or comma separated variable(.csv) file. The ERM Configuration can be sorted by either the Slave/Base/Slot Address or the PLC Memory Address. The ERM/Slave Status can also be included with the print or export. See File>Print/Export.

Chapter 5
Using NetEdit

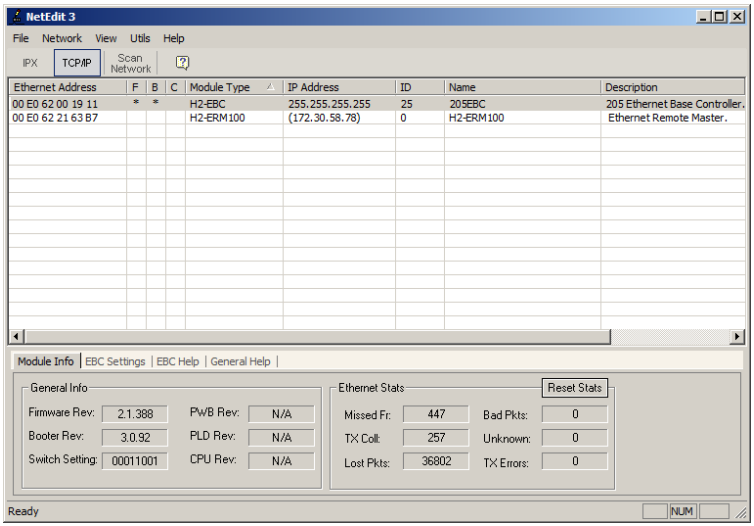
In This Chapter...

Using NetEdit 5–2
Using NetEdit to Configure the EBC Base 5–5

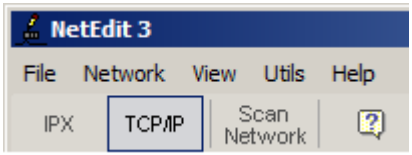
Using NetEdit

The NetEdit Window

NetEdit is a software utility which can be used to set network identifiers (Module ID, or IP Address) for the network master and slave modules. NetEdit is accessed from the ERM Workbench "Select Slaves" window or the View>NetEdit Window. NetEdit can also be used for diagnostic and troubleshooting tasks. This section steps through the individual segments of the NetEdit utility and the function of each.



Ethernet Communication Protocol



In the upper left corner of the NetEdit window, under the toolbar, you will find there are two protocol choices: IPX and TCP/IP. The ERM and its slave modules understand IPX and TCP/IP protocols. Both protocols are permanently resident in the firmware of the modules.

When you click on one of these buttons, you are selecting the protocol you want your PC to use to allow NetEdit to communicate with the master or slave modules. You are not telling the module which protocol to use. IPX is a Novell standard in widespread use, and TCP/IP is a popular protocol supported by the configured protocols in your PC.

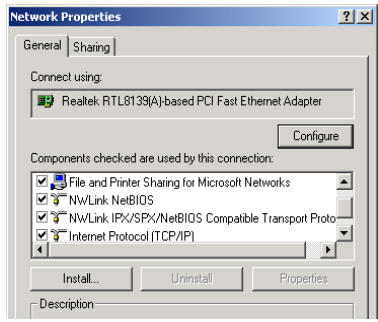
NOTE: *The protocol choice in NetEdit tells your PC which protocol to use to link NetEdit to the master or slave modules. You are not selecting which protocol the remote I/O network will use.*

Adding IPX Network Protocol Support on PCs with Windows XP (32 bit only) or Earlier Operating Systems

You may have already set up your PC with selected networking protocols for Ethernet communications. If not, you will need to select the protocols now for communication with the ERM module. We strongly recommend that you include the IPX protocol. The description below applies to Windows 2000 (Windows 98/NT/XP have slightly different steps). If you are not familiar with this procedure, you may need to have your Network Administrator perform this task.

For Windows 2000, go from My Computer on your Windows desktop to Control Panel. Double click on Network and Dial–up Connections, then double click on the desired Network Device to see the installed Protocols. If IPX is not listed among the protocols already loaded, add it now by clicking on the Install button. For Windows XP, go from Start>Settings>Control Panel. The steps are the same as Windows 2000 from this point.

Add the TCP/IP protocol if it is necessary for your application. The TCP/IP selection will give you support for the UDP/IP protocol. Also, add the IPX protocol if it is not already active.



NOTE: *We strongly recommend you load IPX protocol on your PC and use it for your module links. Use TCP/IP in your application, if required, but also add IPX to your list of active protocols. Having IPX loaded on your PC gives you a backup for troubleshooting communication problems.*

Ethernet Address

NetEdit lists the Ethernet Addresses along with Module Type, IP Address, Module ID, Module Name and Module Description of any modules currently on the remote I/O network.

If modules are added or removed from the network, click on the Scan Network button to update the list. Notice that the Ethernet Address is the factory-assigned address that is on the permanent label on the module.

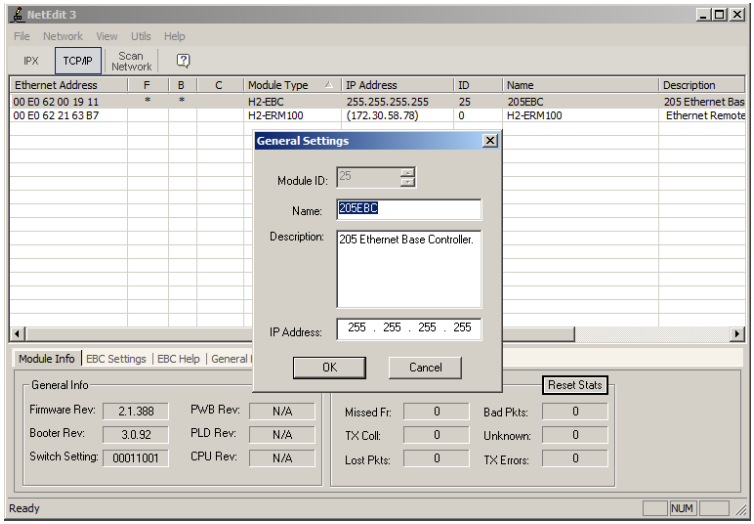
Select a specific module here by clicking on the Ethernet Address or by using the arrow keys. The selected module is highlighted.

IPX | TCP/IP | Scan Network

Ethernet Address	F	B	C	Module Type	IP Address	ID	Name	Description
00 E0 62 00 19 11	*	*		H2-EBC	255.255.255.255	25	205EBC	205 Ethernet Base Controller.
00 E0 62 21 63 B7				H2-ERM100	(172.30.58.78)	0	H2-ERM100	Ethernet Remote Master.

Module ID / IP Address / Name / Description

To assign a Module ID, IP Address, Name and Description to the module, double-click on the specific module to get the General Settings window. In this window you can configure the available options.



Module IDs must be unique for each module, but they do not have to be in sequence. The DIP switches must all be set to zero to enable any software to change the Module ID. If not set to zero then the Module ID will be read only.

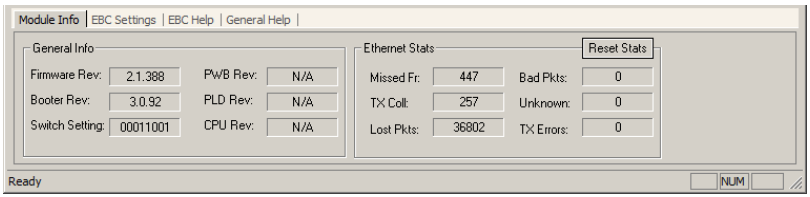
The Name field and Description field are optional. The ERM cannot address a slave by Name or Description.

To set an IP Address, highlight the number in each of the four boxes, and overwrite the number. Use the twelve-digit number assigned to the module by your network administrator. If you change the IP Address, do not use the number “255” in any field. Doing so will cause communication problems.

Clicking the OK button sends all entries to the module’s flash memory.

Module Information

The Module Information box provides the module Version, Booter and Dip switch settings, as well as, Ethernet Stats and Errors.



The Version and Booter refers to the module’s firmware version. The Dip switch setting reflects the Module ID.

NOTE: *The module information and settings on this page apply to the selected (highlighted) module. To select a module, click on its Ethernet Address in the Module list.*

The Ethernet Stats are statistics related to communication errors. These statistics are explored in Chapter 6, Maintenance and Troubleshooting.

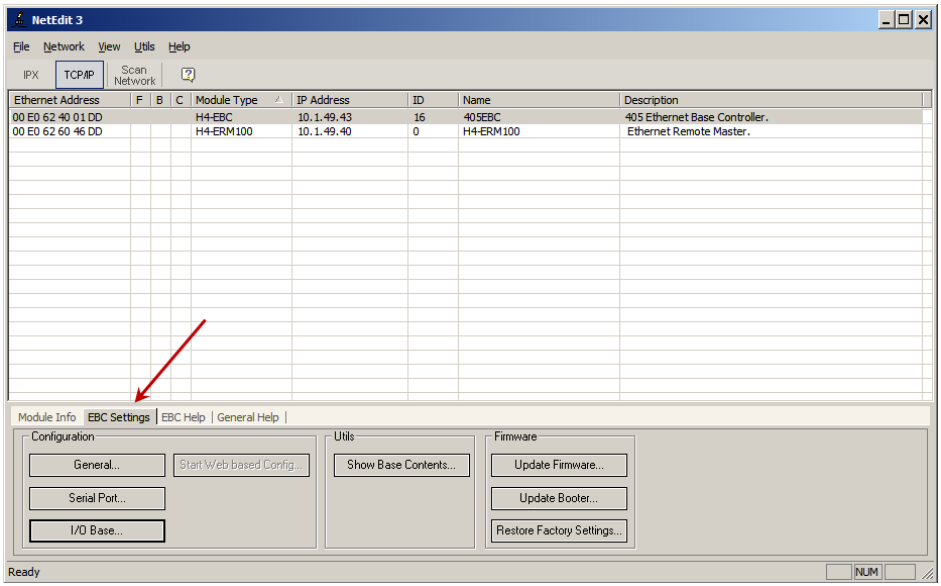
Click on the Reset Stats button to reset all categories to 0 (zero).

Using NetEdit to Configure the EBC Base

NOTE: *The following configuration information applies only to the H4–EBC(–F) and the DL405 I/O. The H2–EBC(–F) and associated DL205 I/O are self-configuring and do not require this additional step.*

EBC Settings Tab

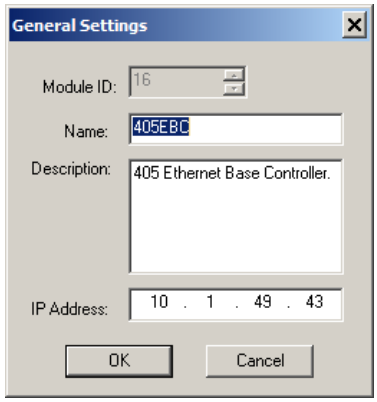
When an EBC is selected from the module list, an EBC Settings tab becomes available, as seen below.



The following options are available through this tab:

- General Settings: Set Module ID, Name, Description and IP Address
- Serial Port: Configure Serial port communication parameters (Note: the serial port is not compatible with an Hx-ERM as the master)
- I/O Base: Specify installed analog cards
- Show Base Contents: Generate, print and save a report of installed modules
- Update Firmware: Load new firmware from file
- Update Booter: Load a new booter from file
- Restore Factory Defaults: Return configurable options to factory defaults

General Settings



Assign a module ID: The module ID is only required when the master's address mode is set to Module ID.

Assign a meaningful name and description: These will appear when browsing for convenient identification.

Assign an IP address: An IP Address is only required when the master's address mode is set to IP Address.

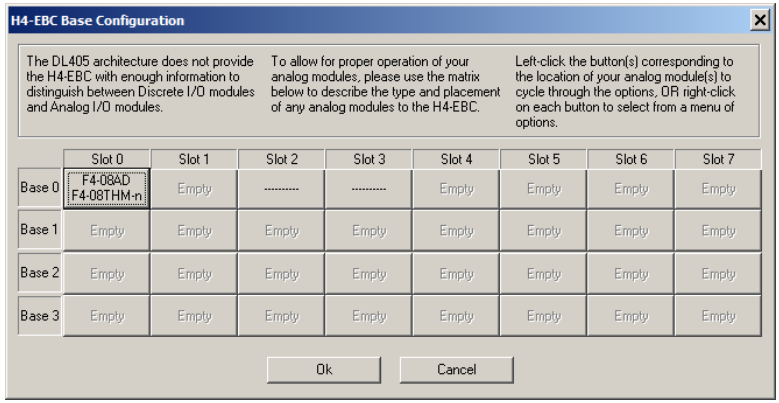
Serial Port

Set the desired parameters for the serial port.

NOTE: *The serial port is not supported when used with an Hx-ERM or Hx-ERM100 master.*

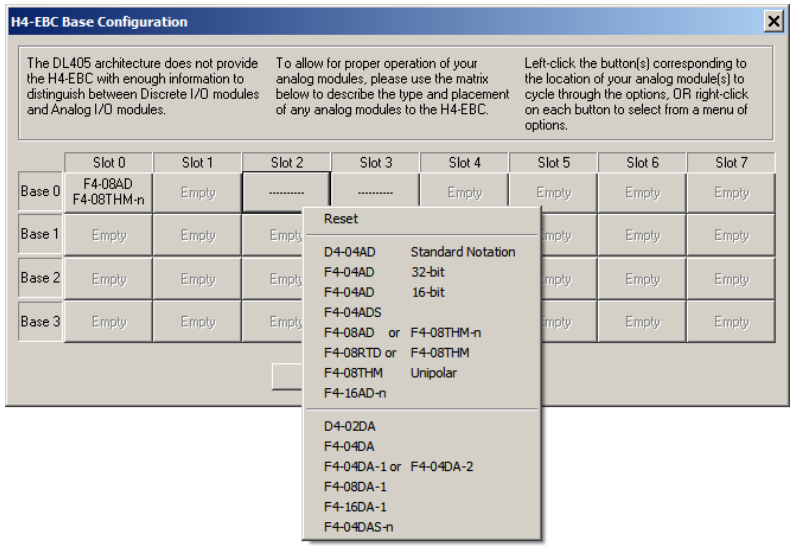
I/O Base

When you click on the I/O Base button, the H4–EBC Base Configuration screen pops up, as shown below. The H2–EBC and the T1H–EBC are self-configuring and do not require this step.



The default symbol "----------" appears on the configuration screen where digital or analog modules are present. For digital modules, you do not need to make any changes. The H4–EBC recognizes the digital modules and is self-configuring for the digital modules.

If you are using analog modules, you must let the H4–EBC know that by doing the following. Click on the slot location where the analog module is located. Continue clicking on the same slot location until the part number of your analog module appears. You can also right-click on the slot location to pick the desired module from a list.

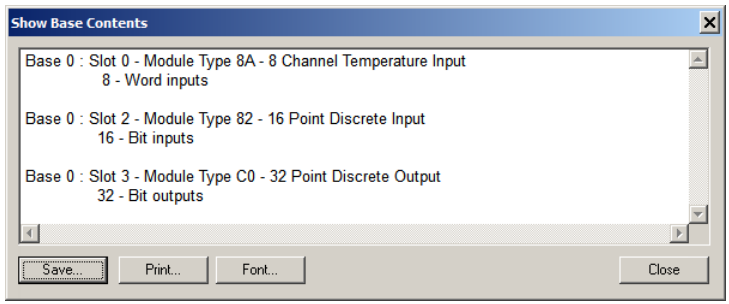


Once the correct part numbers are chosen for each of your analog modules, click the OK button to save the configuration into flash memory onboard the module. Leave the symbol "----------" wherever you have a digital module.

If you are using a D4–HSC High Speed Counter module, the word "Intelligent" will appear in gray. The High Speed Counter module is configured automatically and no other action is required other than clicking on the OK button.

Show Base Contents

Opens a report of the installed modules which can then be printed or saved.



Update Firmware

Use this dialog to update the module's firmware. Pick the firmware file from disk. Firmware files may be downloaded from www.HostEng.com.

Update Booter

Use this dialog to update the module's booter. Pick the booter file from disk. Booter files may be downloaded from www.HostEng.com.

Restore Factory Defaults

Use this button to reset all user configurable settings to the factory defaults. A warning dialog will appear to verify this action. Select OK to restore to the defaults.

Maintenance and Troubleshooting

In This Chapter...

Isolating a Communication Problem 6–2
Troubleshooting Chart 6–2
ERM Module Diagnostic LEDs 6–4
Slave Module Diagnostic LEDs 6–4
Using ERM Workbench for Troubleshooting 6–5
Reserved PLC Memory for ERM 6–6
Using NetEdit for Troubleshooting 6–8
Diagnosing Network Cable Problems 6–10

Isolating a Communication Problem

If you are experiencing a problem communicating with an ERM module or one of its slaves, the problem can usually be isolated to one of four components of the communication link:

- Ethernet module itself (hardware or firmware)
- The setup of the Ethernet module
- Cabling or connections
- Other external influences, such as electrical noise, heavy communication traffic on the network or exceeding the power budget

Diagnostic Tools and Techniques

Several available tools and techniques can help you isolate a communication problem:

- The LEDs on the face of the module indicate the status of the link, the module, and the network communications.
- Replacing the module may determine whether the problem is in the module.
- NetEdit and the ERM Workbench display a list of the active modules on the network and their protocol and configuration settings.
- Cable testing devices can pinpoint short or open circuits or diagnose attenuation problems and other cabling problems.

Troubleshooting Chart

The following chart summarizes the different types of communication failures you could experience. In each case the **CPU PWR LED** must be **on**, and you must be attempting to communicate with the module in question.

NOTE: *The ERM Workbench Utility allows the user to flash the error LED for 3 seconds to help identify the ERM module visually. Do not mistake this user initiated event with a true ERM error condition.*

The meaning of the **diagnostic LEDs** is explained on page 6-4.

Troubleshooting Chart	
Legend: Off On Flash	
ERM Module LEDs	Corrective Action
LINKGD ACT ERROR — Error ON **OR** LINKGD ACT ERROR — Error Flashing	**1. Cycle power on the CPU Interface unit. This will clear the ERROR if it was due to a transient condition.** **2. Try another cable that you know works. Check pinouts (see page 3–7).** **3. Try another port on the hub or another hub.** **4. Replace module.**

Troubleshooting Chart (Continued)	
Legend: ▭ Off ▬ On ▨ Flash	
ERM Module LEDs	**Corrective Action**
LINKGD ▭ ACT ▭ ERROR ▭ **No LEDs**	1. Try another cable that you know works. Check pinouts (see page 3–7). 2. Try another port on the hub or another hub. 3. Replace module.
LINKGD ▬ ACT ▭ ERROR ▭ **Only LINKGD ON**	1. Try another cable between PC and hub. 2. Try another port on the hub or another hub. 3. Make sure you have not exceeded the recommended cable length for your network cable. The link signal could arrive with sufficient strength even though the data transmission does not. 4. Could be related to Windows configuration. Consult Windows documentation.
Note: This is also the indication of proper operation! Troubleshoot only if you are failing to exchange data.	
LINKGD ▬ ACT ▨ ERROR ▭ OR LINKGD ▬ ACT ▬ ERROR ▭ **LINKGD ON ACT Flashing** **LINKGD ON ACT ON**	1. Try another cable between PC and hub or other module and hub. 2. Try another port on the hub or another hub. 3. Confirm that ERM module is in a usable slot in the PLC base (see pages 3–2 and 3–3) and that the CPU Interface and its firmware support the ERM module. 4. Look for errors in the setup of the ERM module or in the communication program.

ERM Module Diagnostic LEDs

LED	H2-ERM, H4-ERM	H2-ERM100	H4-ERM100
STATUS	N/A	Blinks while module is booting. On solid when module is ready.	N/A
LINKGD	On when module has established communications with the connected Ethernet device, typically a switch.		
ACTIVE	Indicates network activity. May appear solid ON during heavy traffic.		
ERROR	Indicates an internal fatal error of the ERM module. See Note 1.	Indicates an error from a network device or a fatal internal error of the ERM module. See Note 2.	
100MBIT	N/A	On solid when linked at 100Mbps.	

Note 1: *The ERROR LED on H2-ERM or H4-ERM modules indicates a fatal internal error. Cycle power to clear the error. If the error will not clear, replace the module.*

Note 2: *The ERROR LED on H2-ERM100 or H4-ERM100 modules indicates that some error is present. Refer to troubleshooting section of this manual to determine the error. Example errors:*

- *Cannot communicate with an ECOM(100) or GS-EDRV(100).*
- *Hardware installed in a base does not match the hardware configuration.*
- *An analog module error bit is ON.*
- *Fatal error. If a fatal error has occurred ERM Workbench and NetEdit are unlikely to successfully communicate with the ERM. Try cycling power to the ERM. If the error will not clear, replace the module.*

Slave Module Diagnostic LEDs

EBC LEDs

Hx–EBCs LED Diagnostic information is located in the Troubleshooting Guidelines chapter in the Ethernet Base Controller Manual (H24–EBC–M) and for the T1H–EBC in (T1H–EBC–M) manual.

Error Indicator

A specific ERM network condition that can cause the EBCs ERROR LED indicator to illuminate is if the watchdog timer times out. This can result from the slave being disconnected from the ERM network.

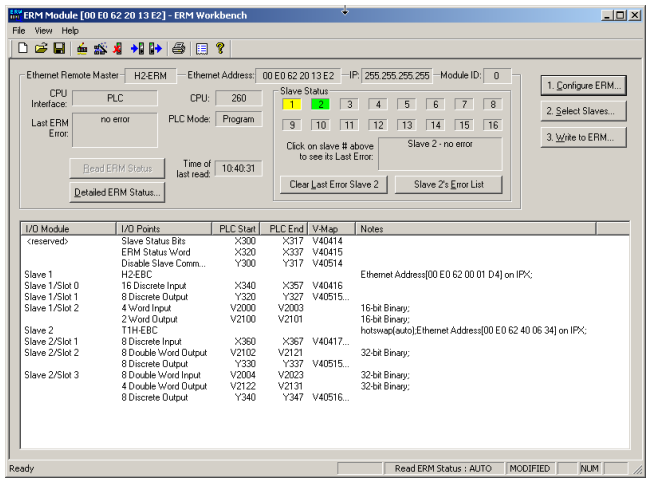
Using ERM Workbench for Troubleshooting

ERM Workbench can be used for troubleshooting an ERM Ethernet remote I/O system. It allows you to:

- View slave status and Detailed ERM Statistics.
- See active modules on the network.
- Examine or change the slave module's configuration settings.

Read from ERM

To view the current configuration in the ERM module, launch ERM Workbench and click on "Read from ERM" under the File menu or tool bar. The following ERM main configuration window will be displayed.



The ERM main configuration window lists the ERM's Ethernet Address, IP Address, Module ID just below the menu to identify the connected ERM. If the fields are blank, select File > Read From ERM to read a specific ERM's configuration.

In the *Slave Status box*, the status of a specific slave can be displayed by clicking on the slave number 1–16. The numbers are highlighted in either normal, green, yellow or red. **Normal** indicates that the slave is not configured. **Green** indicates the ERM is successfully communicating with that particular slave. **Yellow** indicates I/O is being updating, but some error exists within the I/O of that slave and that there are no I/O module errors in the slave. **Red** indicates I/O is not being updating or that the ERM is not communicating with that slave. A description of the error will be listed.

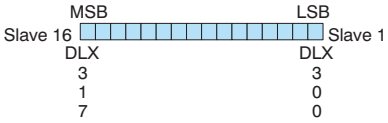
The network I/O modules and I/O points are listed by slave and slot number. For a PLC, the first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. The PLC memory map information is not displayed if a WinPLC is selected as the CPU interface.

Reserved PLC Memory for ERM

The first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. The default memory addresses DLX300/X300 and DLY300/Y300 are used in this example.

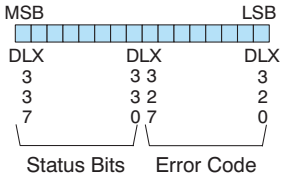
Do-more!

Slave Status Bits



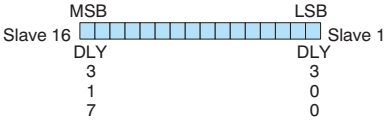
The Slave Status Bits can be monitored to detect if a slave is in error.

ERM Status Word



The ERM Status Word contains the ERM error code and Status Bits (see the following description and Error Codes in Appendix B). Bit 8 indicates that the ERM is disabling a slave.

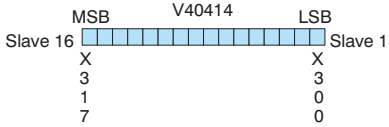
Disable Slave Bits



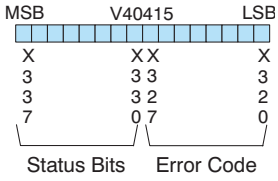
The Disable Slave Bits can be used to disable a slave from communicating with the ERM module. Bit ON = disable that specific slave. RESET = re-enable the specific slave.

***Direct*LOGIC**

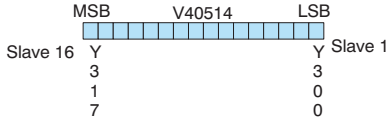
Slave Status Bits



ERM Status Word

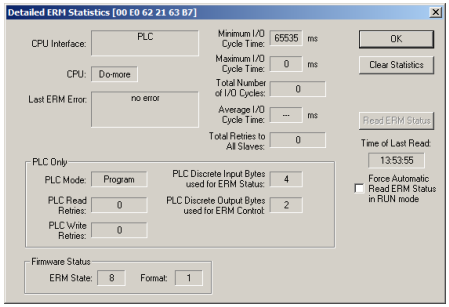


Disable Slave Bits



Detailed ERM Statistics

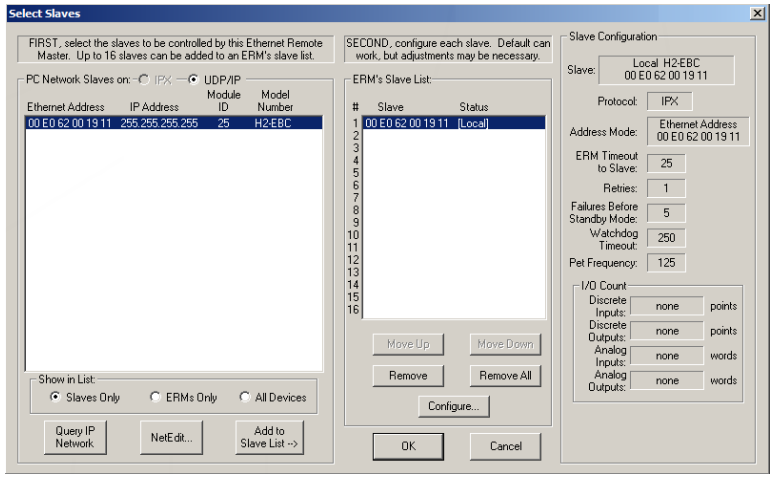
Detailed ERM Statistics provides I/O Cycle Times, Total Retries to All Slaves and CPU Interface information. This information may be helpful when trying to diagnose a remote I/O network problem. The maximum I/O Cycle Time is the time for the ERM to 1) read the remote slave inputs and write the data to the CPU and 2) for the ERM to read the output data from the CPU and write the data to the remote slaves.



Select Slaves Window

The left column displays the Ethernet Address, IP Address, Module ID and Model number of the modules currently on the remote I/O network. This means you are linking to the modules from your PC. If you are linking to a module but the ERM is failing to communicate with the module, you can conclude that:

- The module is working.
- The cabling is satisfactory from the PC to the hub and from the hub to the ERM module
- The hub is working.
- The problem may be an addressing issue. If the ERM is configured to use IP protocol, make sure that the IP Address for the ERM and slave is valid and unique. If the ERM is configured to use IPX protocol, make sure that either the Module ID or Ethernet Address in the slave is correct and unique.



If the ERM or slave module is not on the list, try clicking on either the IPX or UDP/IP radio button (Query is automatically done when the protocol in the center column is changed). Confirm that your PC has IPX and TCP/IP protocol loaded.

Make sure the desired network slaves are in the ERM's Slave List. The right column displays the *Slave Configuration* of the specific slave that is selected in the ERM's Slave List.

NetEdit can be accessed from this window. NetEdit is a software utility that can be used to set the Module ID, set an IP Address or configure the 405 EBCs for analog I/O modules if necessary. See the following section for details on NetEdit.

Using NetEdit for Troubleshooting

NetEdit is a software utility within ERM Workbench which came with this manual. To review the procedures for accessing and using NetEdit, see Chapter 5. It allows you to:

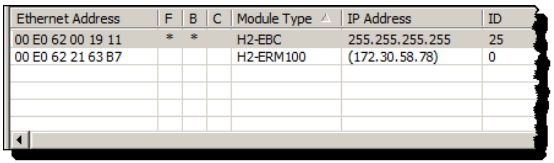
- See active modules on the network.
- Examine and change the modules' configuration settings.
- See the firmware revision number.
- Review statistical information about communication errors by type.

If you can see the ERM and slave modules on the list in the Module box (described below), you are *linking* to the module from your PC. If you are linking to the module but failing to communicate with the module, you can conclude that:

- The module is working.
- The cabling is satisfactory from the PC to the hub and from the hub to the ERM module.
- The hub is working.
- The problem is in one of the other components of the communication link.

Select a Module

The Module box shows the Ethernet Addresses of all modules which are currently linked to the NetEdit utility. If your ERM or slave module is not on this list, try the following:

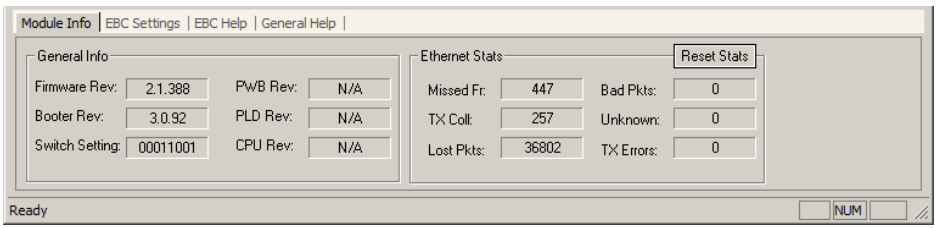


- Change Protocol selection and click on Query Network. See Change Protocol on the next page.
- Confirm that your PC has IPX or TCP/IP protocol loaded.
- Confirm that the module's LINKGD LED is on.

NOTE: *The Ethernet Address is permanently assigned at the factory, and it is recorded on a label on the side of the ERM module. See page 2-4 if you need help locating the label. It is recommended to record the module's Ethernet Address on a label and affix it near the module in a visible location.*

Module Information

The Module Information box provides the module Version, Booter and Dip switch settings, as well as, Ethernet Stats and Errors. Verify that all modules of the same type have the same firmware version.



Ethernet Stats

If you are able to see the *problem* module on the list of modules currently active on the network, you can **select** the module to see the *Ethernet Stats* for that module. Select the module by clicking on the Ethernet Address in the Module box.

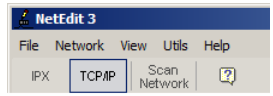
To begin a new statistical record, click the **Reset Stats** button.

The diagnostic information available in the *Ethernet Stats* box is:

- Missed Frames – frames lost due to unavailability of buffer space.
- TX Collisions – detected when RXD+ and RXD– become active during a data transmission. Two devices are trying to communicate at the same time.
- Lost Packets – packets that overflow the queue.
- Bad Packets – packets that fit the Ethernet standard but are not in the right format for the EBC module.
- Unknown Type – a foreign command was received and could not be interpreted. This will probably happen only during software driver development.
- TX Errors – the Ethernet standard number of retries were attempted for a transmission.

Change Protocol

If you are experiencing a problem communicating from your PC to a module that does not appear on the list of active modules, try changing the protocol and clicking on **Scan Network**. You may be able to link to your module with the other protocol.



Replacing the ERM / Slave Module

If you set up your original ERM or slave module using NetEdit, you will need to duplicate the settings in the new module using the same procedure.

WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Diagnosing Network Cable Problems

If you are experiencing communication problems, swapping cables is one of the simplest diagnostic procedures you can perform. If the network operates correctly with a different cable, you have isolated and cured the problem. If possible, use a short run of cable to test the network because problems with longer cable runs can be more difficult to diagnose and are more often intermittent.

If you are unable to swap cables, verify the proper operation of all other network components. You probably have a cable problem if you have verified that your:

- ERM module is working correctly.
- ERM module configuration is correct.
- RLL program is correct.
- Hubs are working correctly.
- Windows configuration is correct.
- Network adapter card is the correct type, and it is working correctly.

It is a good maintenance practice to test network cables periodically and maintain a permanent record of cable characteristics. A number of cable test instruments are available to test 10/100BaseT and 10BaseFL networks. These instruments will check the electrical or optical characteristics of your cabling, including:

- Continuity – This is a check to make sure the communication pairs are wired correctly, and that the wires are continuous from end to end. In the case of fiber optic network this is a test to be sure light is transmitted from one end of the cable to the other.
- Attenuation – This refers to the amount of signal loss over the cable segment at the signal frequency of interest. The 10/100BaseT specification allows for a maximum signal loss of 11.5 decibels (dB) for the entire link at the signal frequency used by 10Mbps Ethernet. The 10BaseFL specification calls for the optical loss in link segment to be no greater than 12.5 dB.
- Crosstalk – Crosstalk occurs when a signal in one pair of wires is electromagnetically coupled to an adjacent pair. This is critical for 10/100BaseT networks which are susceptible to noise interference. 10BaseFL networks are virtually immune to noise interference.

NOTE: *Any significant difference between the cable characteristics of the transmitter and receiver can cause communication errors.*

Ethernet devices continually monitor the receive data path for activity as a means of verifying their link is working correctly. When the network is idle, each network device (including the ERM module) sends a periodic *link test* signal to verify that the network is working. If the link test signal or other network activity is not received periodically, the LINKGD LED on the ERM module is turned off.

General Specifications

In This Appendix...

General Specifications A-2
Ethernet Standards A-4

General Specifications

Specifications

H2–ERM / H2-ERM100 and H4-ERM / H4–ERM100 General Specifications	
Module Type	Ethernet I/O Communications Master Module
Quantity of Modules	Defined by CPU, base configuration and power Per Basebudget
Quantity of Slaves per ERM	16 max.
Diagnostics	LEDs, ERM Workbench, NetEdit
Communications	H2-ERM / H4-ERM: 10BaseT Ethernet H2-ERM100 / H4-ERM100: 10/100BaseT Ethernet
Data Transfer	H2-ERM / H4-ERM: 10 Million bits per second H2-ERM100 / H4-ERM100: 100 Million bits per second
Extension Port	RJ45
Link Good Indicator (LINKGD)	Green LED
Activity Indicator (ACT)	Red LED
Error Indicator (ERROR)	Red LED
Power Consumption	H2-ERM / H4-ERM: 320mA @ 5VDC (Supplied by DL205/DL405 base) H2-ERM100 / H4-ERM100: 300mA @ 5VDC (Supplied by DL205/DL405 base)
Operating Temperature	32° to 140° F (0° to 60° C)
Storage Temperature	–4° to 158° F (–20° to 70° C)
Relative Humidity	30% – 95% RH (non-condensing)
Environmental Air	No corrosive gases permitted
Networking Protocols Supported	UDP/IP, IPX
Manufacturer	Host Automation Products
Link Distance	100 meters (328 feet)

H2–ERM–F / H4–ERM–F General Specifications	
Module Type	Ethernet I/O Communications Master Module
Quantity of Modules	Per Base Defined by CPU, base configuration and power budget
Quantity of Slaves per ERM	16 max.
Diagnostics	LEDs, ERM Workbench , NetEdit
Communications	10BaseFL Ethernet (fiber optic)
Data Transfer	10 Million bits per second
Extension Port	ST-style fiber optic connector
Link Good Indicator (LINKGD)	Green LED
Activity Indicator (ACT)	Red LED
Error Indicator (ERROR)	Red LED
Power Consumption	450mA @ 5VDC (Supplied by DL205/DL405 base)
Operating Temperature	32° to 140° F (0° to 60° C)
Storage Temperature	–4° to 158° F (–20° to 70° C)
Relative Humidity	30% – 95% RH (non-condensing)
Environmental Air	No corrosive gases permitted
Networking Protocols Supported	UDP/IP, IPX
Manufacturer	Host Automation Products
Link Distance	Up to 2,000 meters (2km), 6,560ft (1.2 miles)

Ethernet Standards

Various institutes and committees have been involved in establishing Ethernet data communication standards. These specification standards assure Ethernet network compatibility for products from a broad variety of manufacturers.

The ERM module complies with American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers standard ANSI/IEEE 802.3, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Methods and Physical Layer Specifications. This standard has been adopted by the International Organization for Standardization (ISO) as document ISO/IEC 8802–3.

The Electronic Industries Association (EIA) and Telecommunications Industries Commercial Building Telecommunications Wiring Standard designated EIA/TIA–568A defines implementation of 10BaseT (twisted pair) and 10BaseF (fiber optics) for Ethernet communications.

The same two organizations produced EIA/TIA TSB40–Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware. The purpose of this document is to specify transmission performance requirements and connecting hardware requirements.

ERM/Slave Diagnostics and Error Codes

In This Chapter...

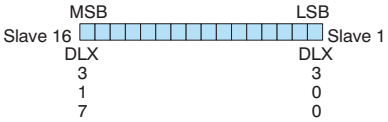
ERM Diagnostics B-2
ERM Status Word Error Codes B-4
Reading ERM Statistics B-5
Reading Error Codes from Slaves B-7
Slave Diagnostic Word Memory B-10
Current / Last State Slave Error Codes B-12
Extended Slave Error Codes B-13

ERM Diagnostics

The first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. The default memory addresses DLX300/X300 and DLY300/Y300 are used in this example.

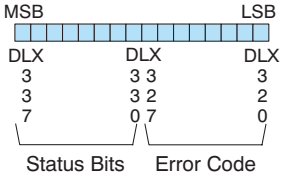
Do-more!

Slave Status Bits



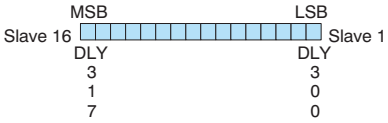
The Slave Status Bits can be monitored to detect if a slave is in error.

ERM Status Word



The ERM Status Word contains the ERM error code and Status Bits (see the following description and Error Codes in Appendix B). Bit 8 indicates that the ERM is disabling a slave.

Disable Slave Bits

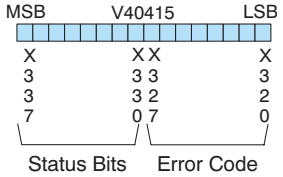


The Disable Slave Bits can be used to disable a slave from communicating with the ERM module. Bit ON = disable that specific slave. RESET = re-enable the specific slave.

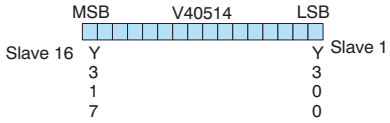
***Direct*LOGIC**

Slave Status Bits

ERM Status Word



Disable Slave Bits



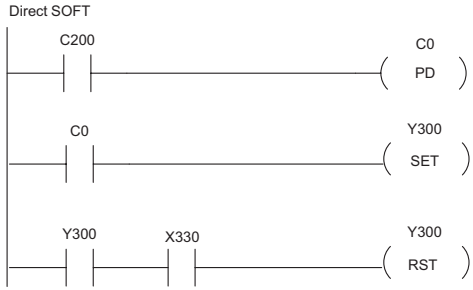
ERM Status Word / Resetting the Slave

The ERM Status Word contains the current ERM Error Code in the Least Significant Byte and the Status Bits in the Most Significant Byte. Currently, only bit 8 is used in the MSB designating the ERM is disabling Slave.

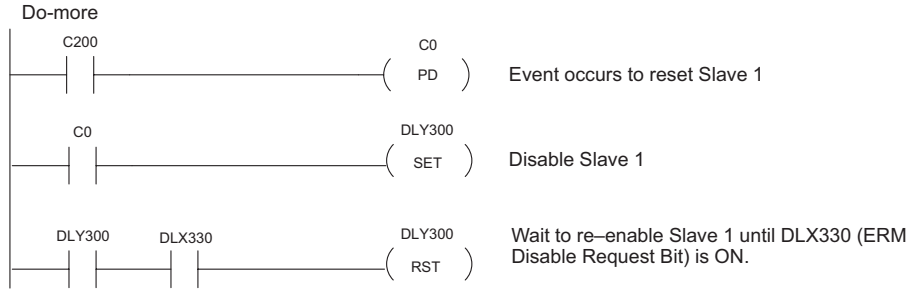
When using the Slave Disable Bits, the ERM must recognize the request to disable a slave before attempting to re–enable that slave. This closed loop feedback is necessary due to the asynchronous scans of the ERM and PLC. X330 (***Direct*LOGIC**) or DLX330 (Do-more!) is the only feedback bit for ALL slave disabling bits (DLY300/Y300 – DLY317/Y317). Either disable multiple slaves all on the same scan or serialize the disable process by using ladder logic interlocks.

Use the following ladder logic code to manually reset a slave. For example, use this resetting method when "Hot Swapping" a Terminator I/O module on a slave that is set up to be *manually* reset using ladder logic. The default for the Terminator EBC is *automatic* rescan after "Hot Swapping" an I/O module.

*Direct*LOGIC Example



Do-more! Example



ERM Status Word Error Codes

The following table describes the errors that will be reported to the ERM Status Word.

Error Code (Decimal)	Description
E0	No error.
E3	Configured bit inputs overlap system input bits.
E4	Configured bit outputs overlap system output bits.
E5	More than one device found with same module ID.
E6	More than one device found with same IP address.
E7	ERM could not read slave's error information – slave not responding.
E8	Device not supported; may be old firmware or configuration error.
E9	Device timed out on a function request after retries.
E13	Gateway address needed, but not specified
E14	Subnet mask needed, but not specified.
E15	Configured module ID's do not match modules in device.
E16	Number of bit inputs specified in ERM is less than actual in slaves.
E17	Number of bit outputs specified in ERM is less than actual in slaves.
E18	Number of word inputs specified in ERM is less than actual in slaves.
E19	Number of word outputs specified in ERM is less than actual in slaves.
E20	Invalid base definition for this device.
E21	ERM has not been configured
E22	Overflow of internal buffer E22.
E23	Overflow of internal buffer E23.
E24	Overflow of internal buffer E24.
E25	Overflow of internal buffer E25.
E26	Overflow of internal buffer E26.
E27	Configuration error: input words configured not enough.
E28	Configuration error: output words configured not enough.
E221	ERM to CPU backplane error.
E223	PLC family unknown.
E224	ERM to CPU backplane error.
E225	Backplane code error returned from PLC.
E226	General backplane error returned from PLC.
E227	Timeout on PLC backplane error.
E228	ERM to CPU backplane error.
E231	ERM to CPU backplane error.

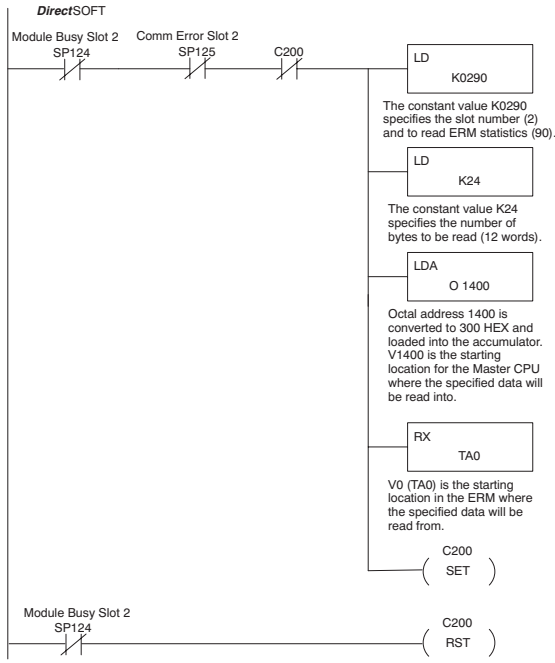
Reading ERM Statistics

Reading ERM Statistics using Ladder Logic with *Direct*LOGIC

The following ladder logic example reads the ERM statistics from the ERM module. 12 words (24 bytes) of statistical data are stored in the ERM's memory starting at V0 (TA0). Use slave address of 90 when reading ERM statistics. In the example below, the RX instruction stores the statistical data from the ERM module to V1400 – V1413 in the CPU's memory. More information on the RX network instruction can be found in the PLC User Manual. The ERM module is located in slot 2 of the I/O base in this example. Refer to the Special Relays Appendix in the PLC User Manual to identify each slot's Module Busy and Comm Error bits.

The format of the ERM's statistics is as follows:

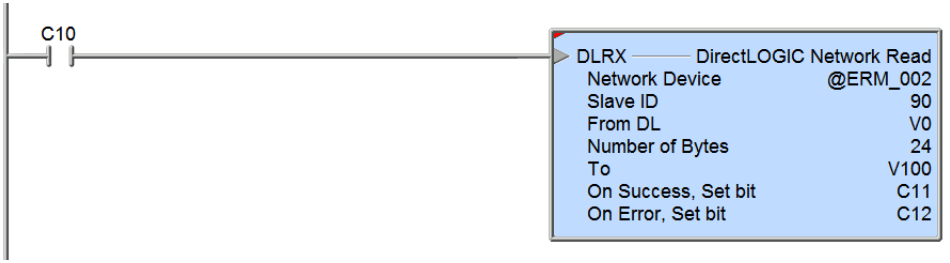
PLC Address	Description of Statistic	Format
Addr + 0	Minimum I/O Scan in milliseconds	Word / Decimal
Addr + 1	Maximum I/O Scan in milliseconds	Word / Decimal
Addr + 2,3	Total accumulated time in milliseconds	DWord / Decimal
Addr + 4,5	Total number of I/O Scans	DWord / Decimal
Addr + 6,7	Number of PLC Read Retries	DWord / Decimal
Addr + 10,11	Number of PLC Write Retries	DWord / Decimal
Addr + 12,13	Number of Slave Retries	DWord / Decimal



Reading ERM Statistics using Ladder Logic with Do-more!

The following ladder logic example reads the ERM statistics from the ERM module. 12 words (24 bytes) of statistical data are stored in the ERM's memory starting at V0 (TA0). Use slave address of 90 when reading ERM statistics. In the example below, the DLRX instruction stores the statistical data from the ERM module to V100 – V111 in the CPU's memory. More information on the DLRX network instruction can be found in the Do-more! help file. The ERM module is located in slot 2 of the I/O base in this example. Interlocking is not required in Do-more!. Turning on C10 will result in one read of the ERM.

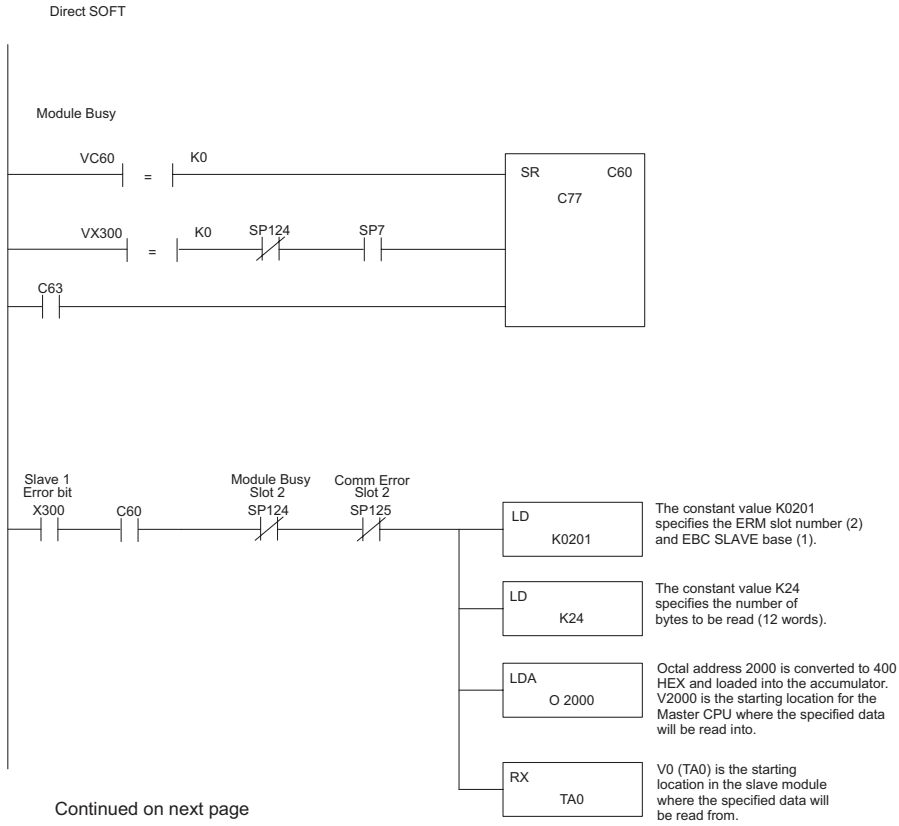
PLC Address	Description of Statistic	Format
Addr + 0	Minimum I/O Scan in milliseconds	Word / Decimal
Addr + 1	Maximum I/O Scan in milliseconds	Word / Decimal
Addr + 2,3	Total accumulated time in milliseconds	DWord / Decimal
Addr + 4,5	Total number of I/O Scans	DWord / Decimal
Addr + 6,7	Number of PLC Read Retries	DWord / Decimal
Addr + 8,9	Number of PLC Write Retries	DWord / Decimal
Addr + 10,11	Number of Slave Retries	DWord / Decimal



Reading Error Codes from Slaves

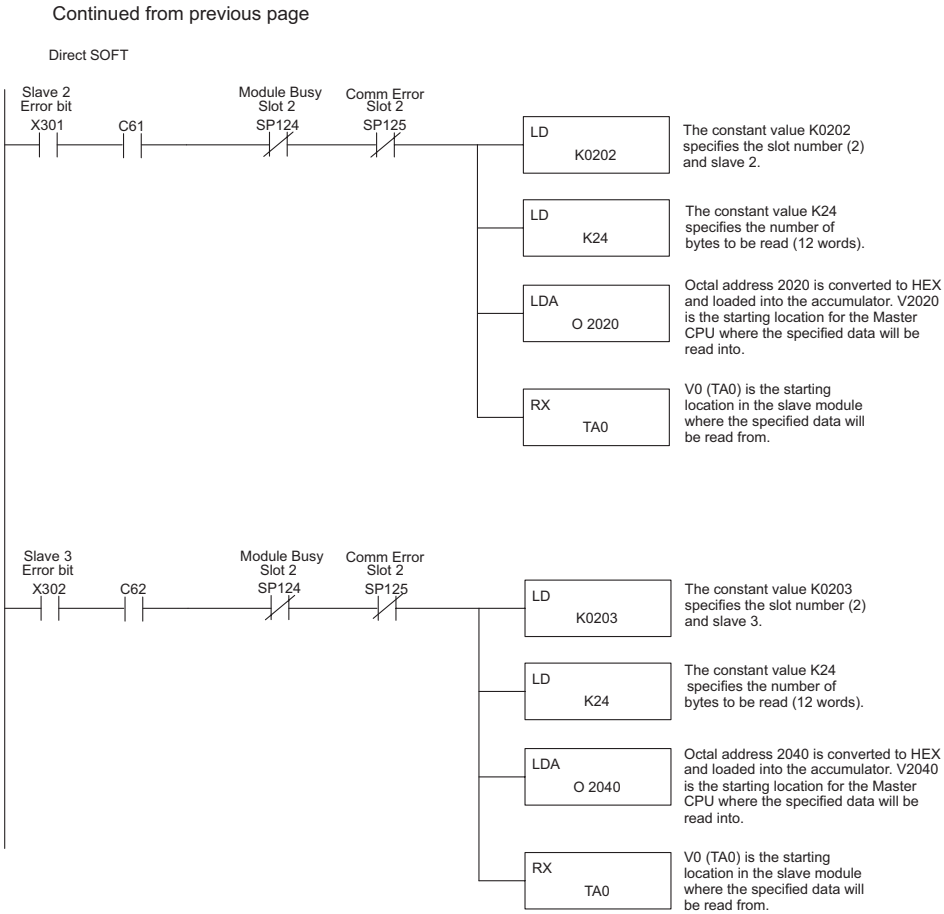
Reading Error Codes from Slaves with *Direct*LOGIC

The following ladder logic example reads the Error Codes from three slaves (1–3). The slaves' error data is stored in their memory starting at V0 (TA0). Up to 36 words (72 bytes) of error codes can be read from a slave depending on the number of bases and I/O modules (slots) used per slave. In the example below, the RX instruction stores the Error data read from Slave 1 into V2000 – V2013 and from Slave 2 into V2020 – V2033, etc. in the CPU's memory. More information on the RX network instruction can be found in the PLC User Manual The ERM module is located in slot 2 of the 205 I/O base in this example. Refer to the Special Relays Appendix in the PLC User Manual to identify each slot's Module Busy and Comm Error bits. Refer to the Slave Diagnostic Word Memory Table in this chapter for a description of the word information read from the slaves. This example reads words V0 – V11 (24 bytes) from the slaves.



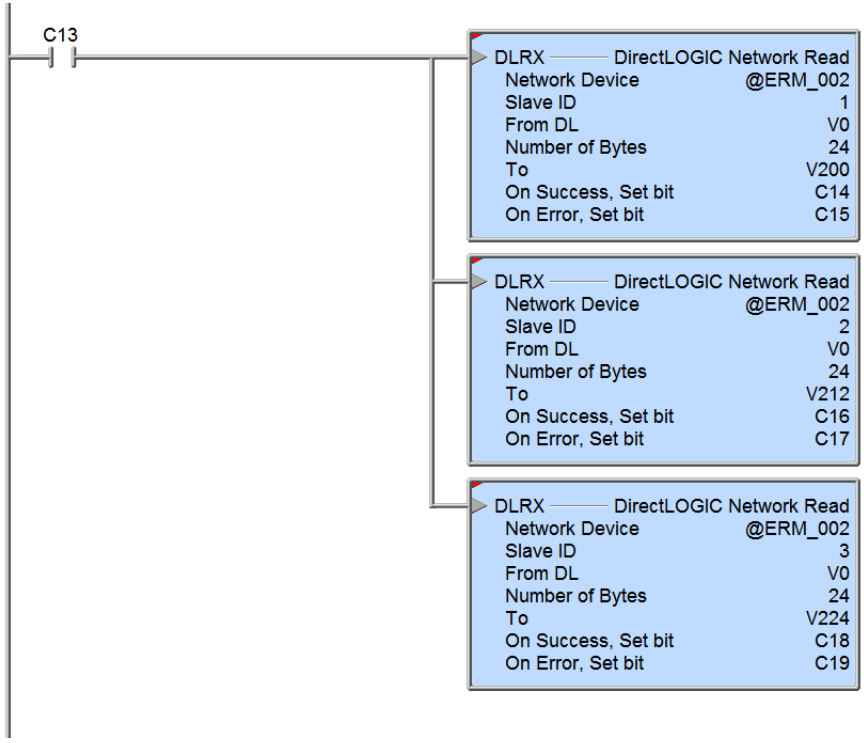
Continued on next page

Continued from previous page



Reading Error Codes from Slaves with Do-more!

The following ladder logic example reads the Error Codes from slaves (1–3). The slaves' error data is stored in their memory starting at V0 (TA0). Up to 36 words (72 bytes) of error codes can be read from a slave depending on the number of bases and I/O modules (slots) used per slave. In the example below, the DLRX instructions read 24 bytes of Error data from Slave 1 to CPU memory V200 – V211, from Slave 2 to CPU memory V212 – V223 and from Slave 3 to CPU memory V224 – V235. More information on the DLRX network instruction can be found in the Do-more! help file. The ERM module is located in slot 2 of the 205 I/O base in this example. Refer to the Slave Diagnostic Word Memory Table on the following page for a description of the word information read from the slaves. Interlocking reads to the three slaves is not required. The CPU will manage the reads. Turning on C13 will result in one read of Slave 1, then a read of Slave 2, then a read of Slave 3.



Slave Diagnostic Word Memory

The following table describes the Word information that is obtained when a slave's diagnostic information is read (RX) by the PLC CPU into its memory. Applies to DL205/405 and Terminator EBC modules.

Word	Description
V +0	Current slave error code: Bits 0 – 11 Type of Error: Bits 12–15: (Bit 12 SET = I/O Error Condition;SET = I/O Warning) Bit 13
V +1	Slave module slot in error (slots 0 – 15).
V +2	Slave module slot in error (slots 16 – 31).
V +3	Slave's Last error code
V +4	Extended error code module in slot 0.
V +5	Extended error code for module in slot 1.
V +6	Extended error code for module in slot 2.
V +7	Extended error code for module in slot 3.
V +8	Extended error code for module in slot 4.
V +9	Extended error code for module in slot 5.
V +10	Extended error code for module in slot 6.
V +11	Extended error code for module in slot 7.
V +12	Extended error code for module in slot 8 or base 1 slot 0.
V +13	Extended error code for module in slot 9 or base 1 slot 1.
V +14	Extended error code for module in slot 10 or base 1 slot 2.
V +15	Extended error code for module in slot 11 or base 1 slot 3.
V +16	Extended error code for module in slot 12 or base 1 slot 4.
V +17	Extended error code for module in slot 13 or base 1 slot 5.
V +18	Extended error code for module in slot 14 or base 1 slot 6.
V +19	Extended error code for module in slot 15 or base 1 slot 7.
V +20	Extended error code for module in slot 16 or base 2 slot 0.
V +21	Extended error code for module in slot 17 or base 2 slot 1.
V +22	Extended error code for module in slot 18 or base 2 slot 2.
V +23	Extended error code for module in slot 19 or base 2 slot 3.
V +24	Extended error code for module in slot 20 or base 2 slot 4.
V +25	Extended error code for module in slot 21 or base 2 slot 5.
V +26	Extended error code for module in slot 22 or base 2 slot 6.
V +27	Extended error code for module in slot 23 or base 2 slot 7.
V +28	Extended error code for module in slot 24 or base 3 slot 0.
V +29	Extended error code for module in slot 25 or base 3 slot 1.
V +30	Extended error code for module in slot 26 or base 3 slot 2.

Continued on following page

Continued from previous page

Word	Description
V +31	Extended error code for module in slot 27 or base 3 slot 3
V +32	Extended error code for module in slot 28 or base 3 slot 4.
V +33	Extended error code for module in slot 29 or base 3 slot 5.
V +34	Extended error code for module in slot 30 or base 3 slot 6.
V +35	Extended error code for module in slot 31 or base 3 slot 7.

Current / Last State Slave Error Codes

The following table lists the Current and Last State Slave error codes for Word 0 and Word 3 in the Slave Diagnostic Word Memory Table. Applies to 205/405 and Terminator EBC modules.

Error Code (Decimal)	Description
E0	No error.
E121	Channel failure.
E122	Unused analog input channels exist.
E139	Broken transmitter on one of the analog input channels (if supported by analog module)
E142	Multiple channels failed.
E153	The module which was in this slot is no longer responding. User has removed a module in a Terminator I/O slave system. If Automatic Reset (default) is enabled for this slave, it will reset itself once the replacement module is inserted. If Manual Reset is enabled for this slave, the user must 1) SET the slave disable flag for that slave in the first diagnostic output word, 2) wait for bits 8–15 in second diagnostic input word to equal 1, then 3)RESET the slave disable flag in the first diagnostic output word.
E154	I/O configuration has changed. See E153 for reset methods.
E200–E216	Unused analog input channels exist at channel xx (1–16), where xx = Value –200. (Example: E212 indicates unused analog channel exists at channel 12.

Extended Slave Error Codes

The following table lists the Extended Slave error codes for Words 4–35 in the Slave Diagnostic Word Memory Table. Applies to DL205/405 and Terminator EBC modules.

Error Code (Decimal)	Description
E32–E63	Bitwise error where bit 5 is always SET. Look at bit 0 thru bit 4 to get a possible list of errors. Example 34 decimal = 22 hexadecimal (Bit 5 SET and Bit 1 SET). BIT — Type of Error 0 — Terminal block off 1 — External P/S voltage low 2 — Fuse blown 3 — Bus error 4 — Module initialization error (intelligent module) 5 — Fault exists in module (this bit is SET if any of the above bits are SET)
E117	Write attempt to an invalid analog channel.
E119	Data not valid. Subnet mask or IP address not allowed // EBC SDK data packet not constructed properly.
E121	Analog input channel error.
E122	Unused analog input channels exist.
E139	Broken transmitter on one of the analog input channels.
E142	Channel failure.
E146	Communications failure. Hitachi drive on–board relay set.
E153	The module which was in this slot is no longer responding. User has removed a module in a Terminator I/O slave system. If Automatic Reset is enabled for this slave, it will reset itself once the replacement module is inserted. If Manual Reset is enabled for this slave, the user must 1) SET the slave disable flag for that slave in the first diagnostic output word, 2) wait for bits 12–15 in second diagnostic input word to equal 1, then 3) RESET the slave disable flag in the first diagnostic output word.
E154	One or more new modules has been inserted into the base. See E153 for reset methods.
E155	Terminator module status error. One or more of the modules in the T1H–EBC base has an error. For more detail check extended errors
E200– E216	Unused analog input channels exist at channel xx (1–16), where xx = Value –200.

ERM and ERM Workbench Default Settings

In This Appendix...

ERM and ERM Workbench Factory Default Settings.....C–2

ERM and ERM Workbench Factory Default Settings

The following factory default settings or values can be changed by using the tools within the ERM Workbench utility.

Item	Default
Protocol	IPX
Address Mode	Ethernet Address
ERM Timeout to Slave	25ms
ERM Retries	1
Slave Watchdog	250ms
ERM Pet Slave Watchdog	0 (disabled)
ERM Consecutive Comm Failures to Slave Before Placing Slave in Standby Mode	5
Slave Padding	0
Bit Input Address	***Direct***LOGIC: V40414 (X300); Do-more!: (DLX300)
Bit Output Address	***Direct***LOGIC: V50514 (Y300) Do-more!: (DLY300)
Word Input Address	***Direct***LOGIC: V2000 Do-more!: DLV2000
Word Output Address	***Direct***LOGIC: V2100 Do-more!: DLV2100
Standby Cycle Time	500ms
Unsupported Slave Cycle Time	1000ms
PLCScan Timeout	100ms

Mapping ERM Slave I/O in a Think & Do WinPLC System

In This Appendix...

Mapping ERM Slave I/O Points D–2

Mapping ERM Slave I/O Points

The purpose of this appendix is to identify that the Think & Do ConnectivityCenter tool is used to configure (map) the ERM remote slave I/O points to Data Items. We recommend that you are familiar with the "Getting Started" and "Creating a Project" chapters in the Think & Do Studio Learning Guide before attempting to configure the ERM I/O in ConnectivityCenter.

NOTE: *The ERM and its slaves need to be configured using ERM Workbench before using Think & Do ConnectivityCenter to map the ERM slave I/O points to Data Items.*

Launching Connectivity Center Tool

To launch Connectivity Center:

1) Launch Think & Do Studio ProjectCenter from the Windows desktop by clicking on Start > Programs > Think & Do Studio > ProjectCenter. Or, click on the ProjectCenter icon to start.

2) Click on the File Menu and either Open your Think & Do Project or select New.

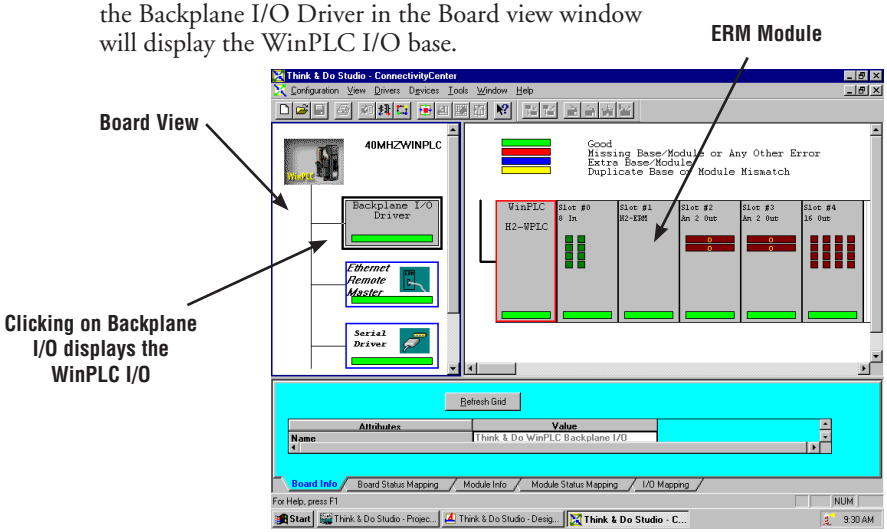
3) Within ProjectCenter select Windows CE – Think & Do WinPLC as the Runtime Target.

4) Then click Tools > ConnectivityCenter to launch ConnectivityCenter. Or, click on the ConnectivityCenter shortcut in the Project Explorer.

5) Once in ConnectivityCenter click on Configuration > Connect or click on the Connect toolbar button.

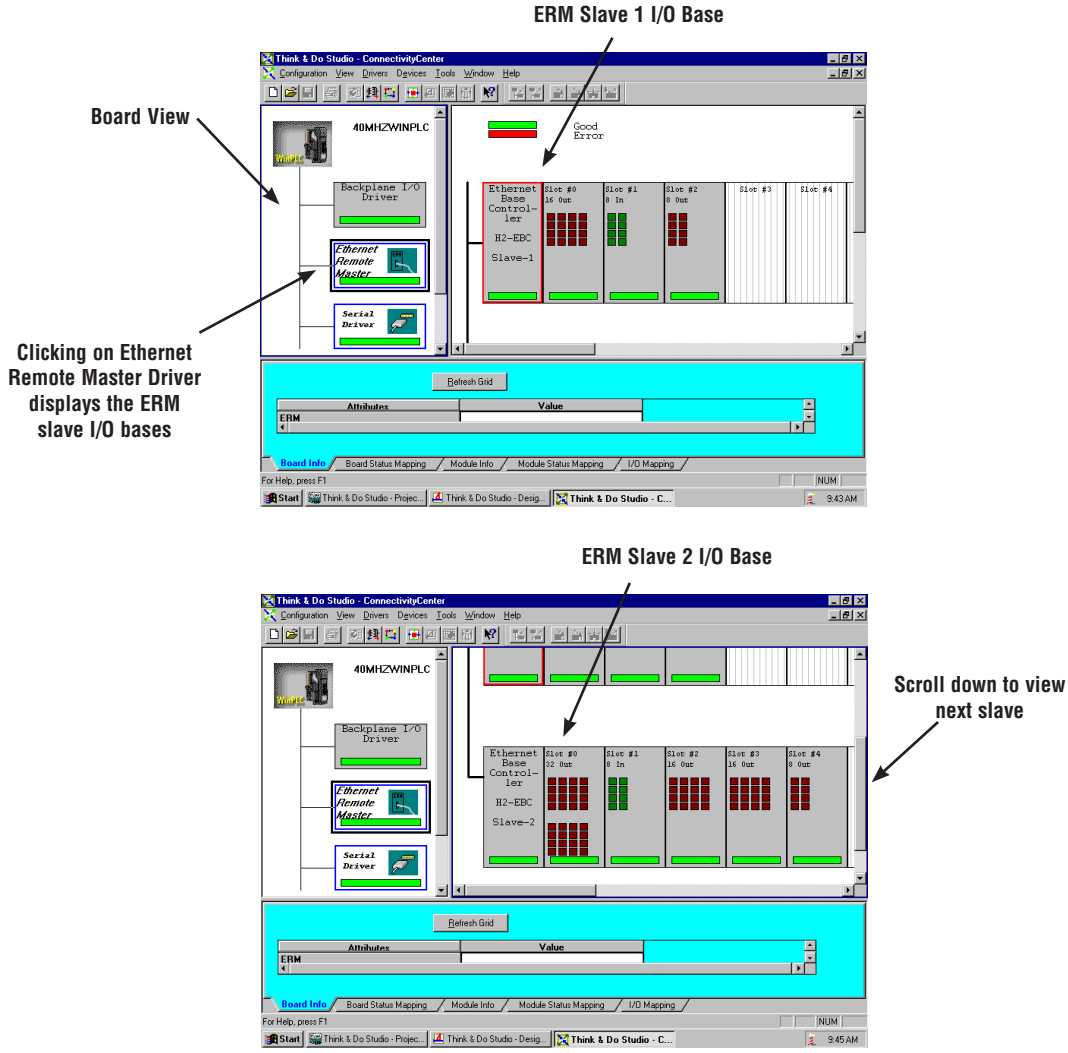
Connecting to the WinPLC Base I/O

ConnectivityCenter will draw a picture of your WinPLC / ERM I/O network. Clicking on the Backplane I/O Driver in the Board view window will display the WinPLC I/O base.



Connecting to the ERM Slave I/O

Clicking on the Ethernet Remote Master Driver in the Board view window will display the ERM slave I/O base(s).



Mapping I/O Points to Data Items

This procedure is discussed in detail in the "Creating a Project" chapter in the Think & Do Studio Learning Guide. This will map your real world I/O to Data Items.

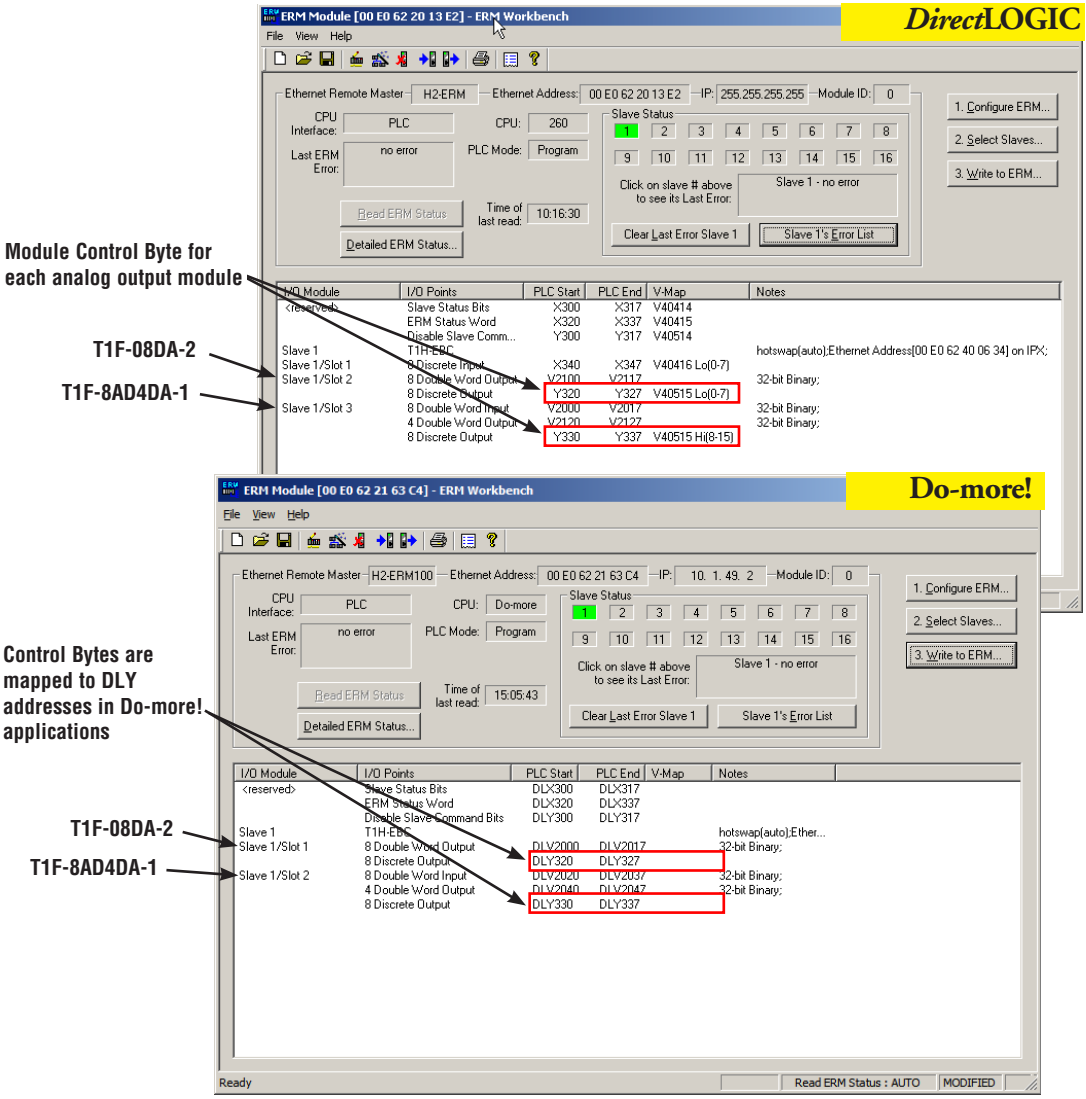
Configuring Terminator I/O Analog Output Modules

In This Chapter...

Analog Output Module Control Byte E–2

Analog Output Module Control Byte

Terminator I/O analog voltage and current output and combination analog modules require configuring via the module control byte. Analog input modules do not require configuration. The *Direct*LOGIC example below shows an ERM network Terminator I/O slave with a discrete input module in slot 1, an analog voltage output module in slot 2 and a combination analog current module in slot 3. Note that the module control bytes are automatically mapped to the "Y" data type registers. The bits within the module control byte are used to enable or disable the analog outputs, select bipolar or unipolar output and select the voltage or current output range. For Do-more! applications, the control bits are mapped to DLY addresses, an example is shown below.



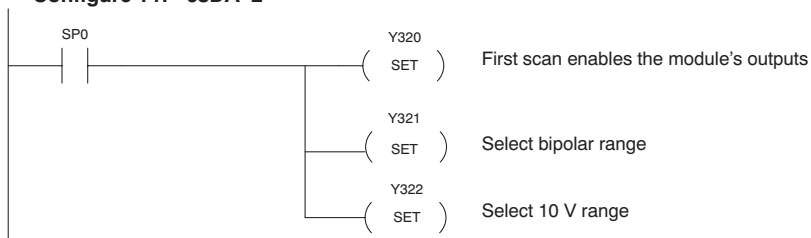
The table below defines the bits of an analog module control byte. Example "Y" bit addresses are listed for the analog module control bytes from the ERM network example on the previous page, along with their equivalent Do-more! addresses. The module control byte addresses will vary depending on the location of the analog module in the system, the number of slaves, the amount of output modules used in an ERM network and the starting discrete output address that is user specified. ERM Workbench will list the appropriate control byte for any Terminator analog module that requires configuration.

Module Control Byte of 8 and 16-Channel Analog Output Modules and Analog Combination Modules			
Bit Definitions		**Example Bit Addresses for T1F–08DA–2**	**Example Bit Addresses for T1F–8AD4DA–1**
Bit 0	Outputs Enable 0 = All outputs OFF 1 = All outputs Enabled	DL: Y320 Do-more!: DLY320	DL: Y330 Do-more!: DLY330
Bit 1	Unipolar / Bipolar 0 = Unipolar selected 1 = Bipolar selected	DL: Y321 Do-more!: DLY321	DL: Y331 Do-more!: DLY331
Bit 2	5V / 10V Range 0 = 5V range 1 = 10V range	DL: Y322 Do-more!: DLY322	DL: Y332 Do-more!: DLY332
Bit 3	0–20 mA / 4–20 mA Range 0 = 0–20 mA range 1 = 4–20 mA range	DL: Y323 Do-more!: DLY323	DL: Y333 Do-more!: DLY333
Bit 4–7	Reserved for system use	–	–

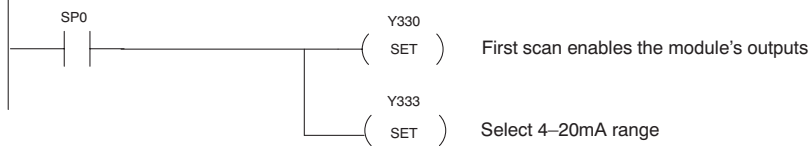
The following example ladder logic code configures the analog output and combination analog modules used in the previous examples. The T1F–08DA–2 is configured for outputs enabled with 10V bipolar range. The T1F–8AD4DA–1 is configured for outputs enabled with 4–20mA unipolar range. The RST instruction can be used to reset the bits, if necessary.

***Direct*SOFT**

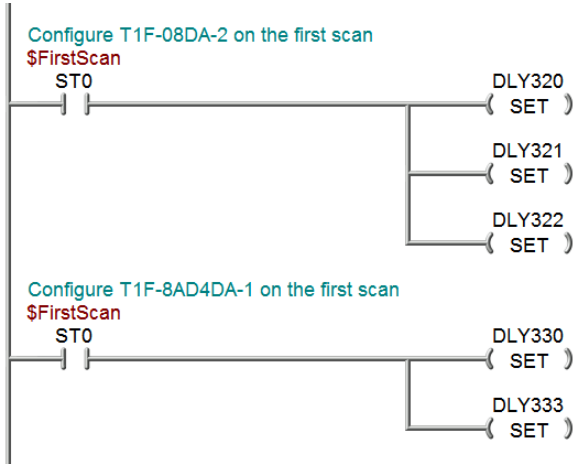
Configure T1F–08DA–2



Configure T1F–8AD4DA–1



Do-more! Designer



H2-EBC(100) Analog Module Addressing

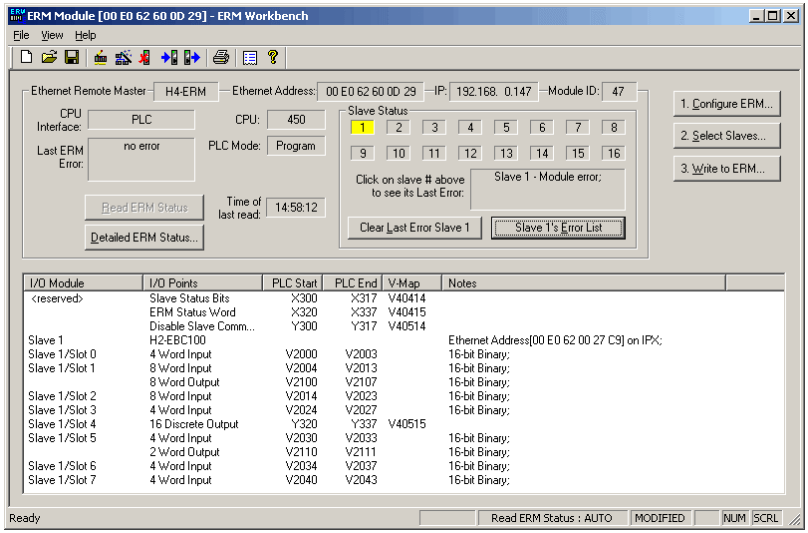
In This Appendix...

H2-EBC(100) Analog Module Addressing - H2/4-ERM(100) F–2

H2-EBC(100) Analog Module Addressing - H2/4-ERM(100)

When using an ERM to EBC configuration, the analog module data in the H2-EBC(100) base is mapped to V-memory or Discrete I/O. Certain Diagnostics Data is not automatically mapped. If needed, the Diagnostics Data can be accessed as described in H24-ERM-M Appendix B.

The ERM Workbench software will tell you what the mapping is for each I/O module in the H2-EBC(100) base. Once you have configured the H2-ERM(100) or H4-ERM(100) using ERM Workbench you will get a screen similar to the following:



For the example above, the I/O configuration for Slave 1 is:

Slot 0 = F2-04THM
Slot 1 = F2-8AD4DA-1
Slot 2 = F2-08AD-1
Slot 3 = F2-04RTD
Slot 4 = D2-12TR
Slot 5 = F2-4AD2DA
Slot 6 = F2-04AD-2
Slot 7 = F2-04AD-1

Use the addresses shown in the ERM Workbench along with the following table to access the analog I/O with your ERM master.

For example, to configure the input resolution of the F2-8AD4DA-1 module located in Slot 1 of the system, the data provided above along with the table below would show that V memory location V2104 is required. Also, to read the current temperature detected by Channel 3 of the RTD module in Slot 3, V memory location V2026 is required.

H2-EBC(100) Analog Module Addressing - H2-ERM(100)			
Part Number	**Channel Data**	**Module Configuration Data**	**Diagnostics Data***
F2-04AD-1 (L) **F2-04AD-2 (L)**	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4	None	No Broken Transmitter Detection If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' = 121** • 'Other' = Cycles 1 thru 3***
F2-08AD-1	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Word 5 = Ch5 Word 6 = Ch6 Word 7 = Ch7 Word 8 = Ch8	None	Channels with broken transmitter: • Channel=0 counts • 'Error' =121** • 'I/O Module Status Word 1' = Channel Number** If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =121** • 'Other' = Cycles 1 thru 7***
F2-08AD-2	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Word 5 = Ch5 Word 6 = Ch6 Word 7 = Ch7 Word 8 = Ch8	None	No Broken Transmitter Detection If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =121** • 'Other' = Cycles 1 thru 7***
F2-4AD2DA	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Output Words: Word 1 = Ch1 Word 2 = Ch2	None	No Broken Transmitter Detection If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =121** • 'Other' = Cycles 1 thru 3***
F2-8AD4DA-1	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Word 5 = Ch5 Word 6 = Ch6 Word 7 = Ch7 Word 8 = Ch8 Output Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4	Output Words: Word 5 = Input Resolution Word 6 = N/A Word 7 = Track and Hold Word 8 = Not Used	Channels with broken transmitter: • Channel=0 counts • 'Error' = 142** • 'I/O Module Status Word 1' = Bit On for Each Channel with Broken Transmitter** If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =142** • 'Other' = 0xFF***

*** Diagnostics Data is not automatically mapped. If needed, the Diagnostics Data can be accessed via ERM Workbench or ladder as described in H24-ERM-M Appendix B.**

**** See Extended Slave Error Codes in Appendix B for further details.**

***** 'Other' is a field accessible only in ERM Workbench by clicking the button: Slave N's Error List. This field cannot be read programmatically.**

H2-EBC(100) Analog Module Addressing - H2-ERM(100)			
Part Number	**Channel Data**	**Module Configuration Data**	**Diagnostics Data***
F2-8AD4DA-2	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Word 5 = Ch5 Word 6 = Ch6 Word 7 = Ch7 Word 8 = Ch8 Output Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4	Output Words: Word 5 = Input Resolution Word 6 = Range Selection Word 7 = Track and Hold Word 8 = Not Used	No Broken Transmitter Detection If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =121** • 'Other' = 0xFF***
F2-04THM **F2-04RTD**	Input Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4	None	Channels with broken transmitter: • Channel=0 counts • 'Error' = 142d** • 'I/O Module Status Word 1' = Bit On for Each Channel with Broken Transmitter** If No 24VDC or No Terminal Block: • All channels = 0 counts • 'Error' =121** • 'Other' = 0x0F***
F2-02DA-1(L) **F2-02DA-2(L)**	Output Words: Word 1 = Ch1 Word 2 = Ch2	None	None
F2-02DAS-1 **F2-02DAS-2**	Output Words: Word 1 = Ch1 Word 2 = Ch2	None	None
F2-08DA-1 **F2-08DA-2**	Output Words: Word 1 = Ch1 Word 2 = Ch2 Word 3 = Ch3 Word 4 = Ch4 Word 5 = Ch5 Word 6 = Ch6 Word 7 = Ch7 Word 8 = Ch8	None	None

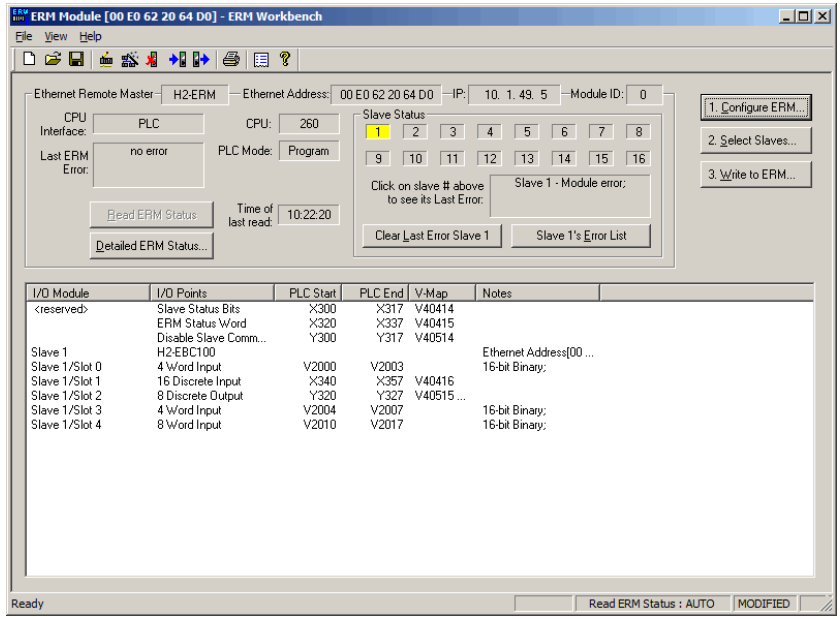
*** Diagnostics Data is not automatically mapped. If needed, the Diagnostics Data can be accessed via ERM Workbench or ladder as described in H24-ERM-M Appendix B.**

**** See Extended Slave Error Codes in Appendix B for further details.**

***** 'Other' is a field accessible only in ERM Workbench by clicking the button: Slave N's Error List. This field cannot be read programmatically.**

F2-04RTD Example (Module in Slot 3)

Using the 'ERM Workbench' dialog below and the 'H2-EBC(100) Analog Module Addressing - H2-ERM(100)' chart above, we can find the addresses that contain channel data for the F2-04RTD module in Slot 3. Diagnostics Data is not automatically mapped. If needed, the Diagnostics Data can be accessed via ERM Workbench or ladder as described in H24-ERM-M Appendix B.



Input Channel	Address	Error Words
Channel 1	V2004	The Slave Diagnostic Word for slot 3 would be mapped to V + 7 (the eighth address in your chosen V-memory range). The H24-ERM-M manual Appendix B contains an example.
Channel 2	V2005	
Channel 3	V2006	
Channel 4	V2007	