

# MAINTENANCE AND TROUBLESHOOTING

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## CHAPTER 6

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## 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:

- the Ethernet module itself (hardware or firmware)
- the setup of the ethernet module
- the 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.

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## 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: <input type="checkbox"/> Off <input checked="" type="checkbox"/> On <input checked="" type="checkbox"/> Flash	
ERM Module LEDs	Corrective Action

LINKGD <input type="checkbox"/>	OR	LINKGD <input type="checkbox"/>
ACT <input type="checkbox"/>		ACT <input type="checkbox"/>
ERROR <input checked="" type="checkbox"/>		ERROR <input checked="" type="checkbox"/>
Error ON		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: <input type="checkbox"/> Off <input checked="" type="checkbox"/> On <input checked="" type="checkbox"/> Flash	
ERM Module LEDs	Corrective Action

LINKGD   
 ACT   
 ERROR

**No LEDs**

1. Try another cable that you know works. Check pinouts (see page 3–6).
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 ON  
 ACT Flashing**

LINKGD   
 ACT   
 ERROR

**LINKGD ON  
 ACT ON**

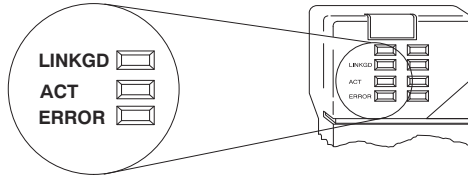
1. Try another cable between PC and hub or other module and hub.
2. Try another port on the hub or another hub.
3. Confirm that ERM module is in a usable slot in the PLC base (see pages 3–2 and 3–3) and that the CPU Interface and its firmware support the ERM module.
4. Look for errors in the setup of the ERM module or in the communication program.

## ERM Module Diagnostic LEDs

### ERM LEDs

The ERM module has three indicator lights which show the status of the following:

- signal path between the ERM and the hub or slaves
- signal between ERM or between a PC and an ERM
- ERM module hardware



### Link Good Indicator

The **green** Link Good (**LINKGD**) LED is **steady on** when the ERM module is correctly connected to an active device on the network and is receiving 5VDC operating voltage from the PLC power supply. The LINKGD LED verifies that the proper cables are connected, and the ERM module is functioning correctly. If a mismatch with the 10/100BaseT or 10BaseFL connections occurs this LED will not be illuminated.

### ACT Indicator

The red Activity (**ACT**) LED flashes to indicate that the module sees data travelling on the network. If any network device is sending or receiving data, the ACT LED will be illuminated. In idle mode (no network traffic) this LED is OFF. During heavy communication loads this LED will be steady on.

### Error Indicator

If the ERM module's red ERROR indicator is flashing or steady on, a fatal error has occurred. The error may be in the ERM module itself, or a network problem may be causing this symptom. The ERROR indication can be caused by a faulty ground, an electrical spike or other types of electrical disturbances. Cycle power to the system to attempt clearing the error.

## 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.

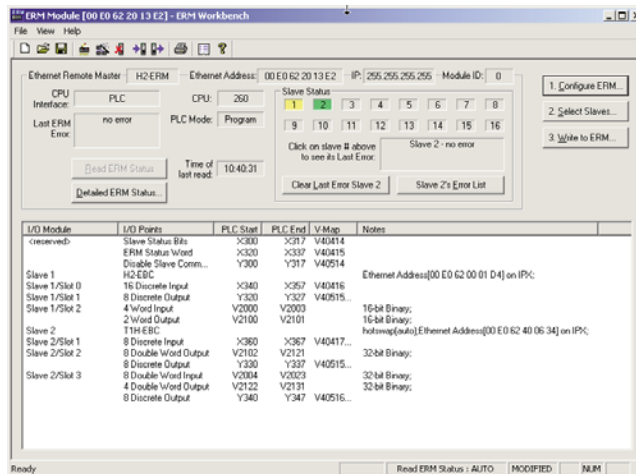
## Using ERM Workbench for Troubleshooting

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.

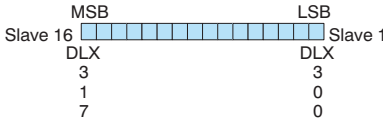
The network I/O modules and I/O points are listed by slave and slot number. For a PLC, the first two words of memory in the Discrete Input table is used for ERM/slave status information, and the first word of memory in the Discrete Output table is for Disable Slave Command bits. The PLC memory map information 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.

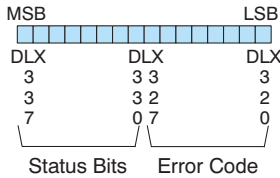
### Do-more

#### Slave Status Bits



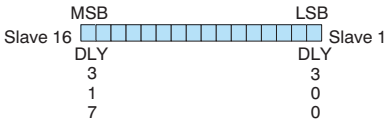
The Slave Status Bits can be monitored to detect if a slave is in error.

#### 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.

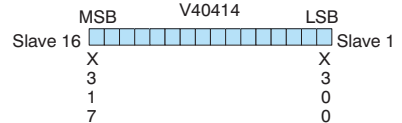
#### Disable Slave Bits



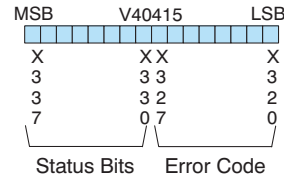
The Disable Slave Bits can be used to disable a slave from communicating with the ERM module. Bit ON = disable that specific slave. RESET = re-enable the specific slave.

### DirectLOGIC

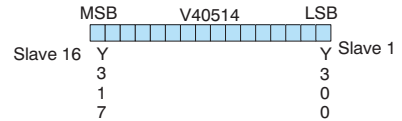
#### Slave Status Bits



#### ERM Status Word



#### Disable Slave Bits



## Detailed ERM Statistics

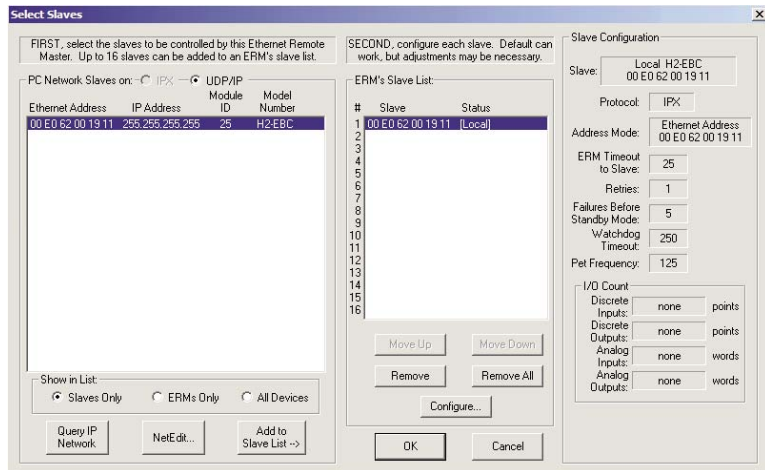
Detailed ERM Statistics provides I/O Cycle Times, Total Retries to All Slaves and CPU Interface information. This information may be helpful when trying to diagnose a remote I/O network problem. The maximum I/O Cycle Time is the time for the ERM to 1) read the remote slave inputs and write the data to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

Ethernet Address	F	B	C	Module Type	IP Address	ID
00 E0 62 00 19 11	*	*		H2-EBC	255.255.255.255	25
00 E0 62 21 63 B7				H2-ERM100	(172.30.58.78)	0

- 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.

Module Info | EBC Settings | EBC Help | General Help

General Info				Ethernet Stats			
Firmware Rev:	2.1.388	PWB Rev:	N/A	Missed Fr:	447	Bad Pkts:	0
Booter Rev:	3.0.92	PLD Rev:	N/A	Tx Coll:	257	Unknown:	0
Switch Setting:	00011001	CPU Rev:	N/A	Lost Pkts:	36802	Tx Errors:	0

Ready NUM



### 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.

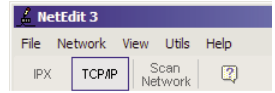
To begin a new statistical record, click the **Reset Stats** button.

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 you:

- 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.



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

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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.