6

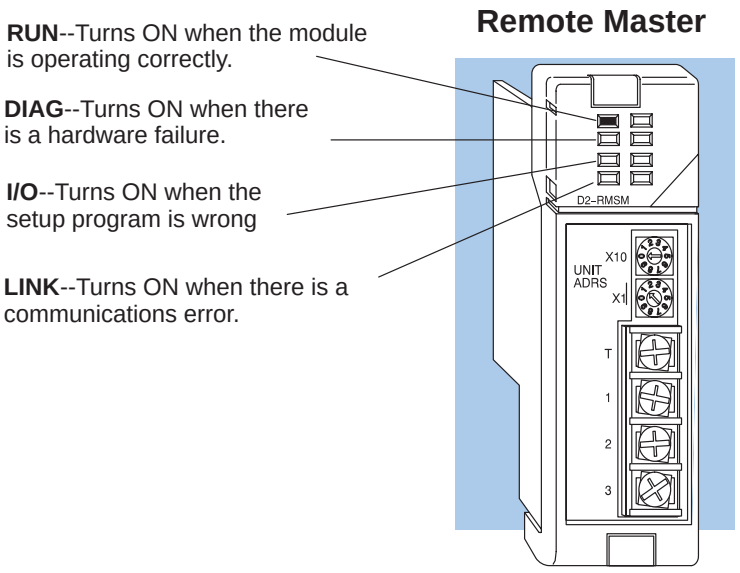
Diagnostics and Troubleshooting

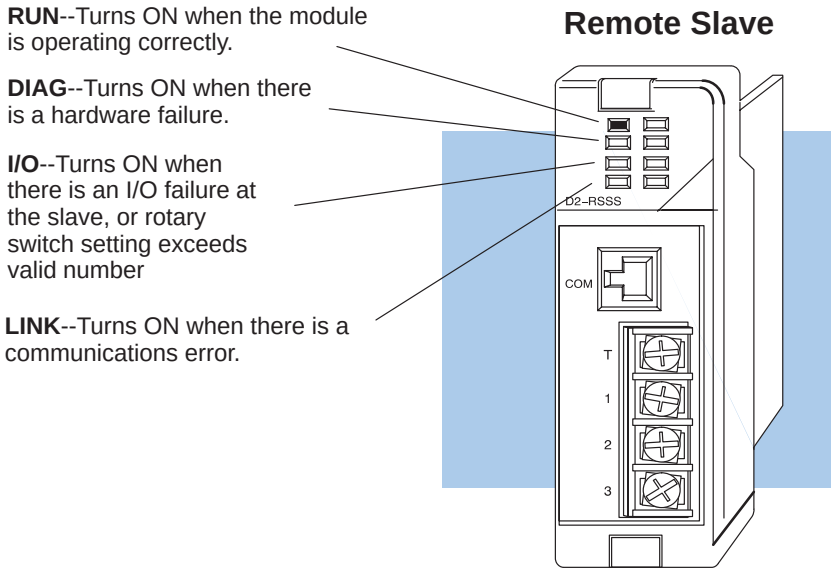
In This Chapter. . . .

Troubleshooting Remote I/O

Module Indicators

Check the indicators on the Remote Master and Slave units to verify that the network is operating correctly. The following diagram shows the proper indicator conditions.





Troubleshooting Quick Steps

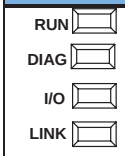
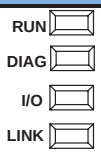
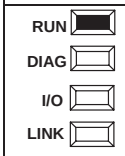
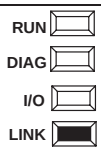
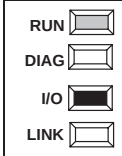
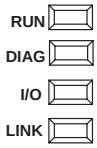
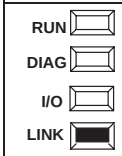
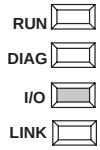
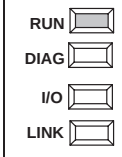
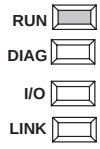
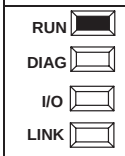
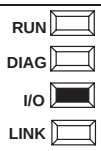
If the remote I/O channel does not seem to be working correctly, check the following items. These items represent the problems found most often.

1. Cable and connections. Incorrectly wired cables and loose terminations cause the majority of problems. Verify you've selected the proper cable configuration and check the cable, making sure it is wired correctly. Also check the cable routing to ensure that the installation guidelines in Chapter 3 were followed.
2. Incorrect Baud Rate. Make sure you've set all D2–RSSS units to match the communication parameters set on the master station (D2–RMSM, D2–250 or D3–350 bottom port, D4–RM, D4–SM).
3. Incorrect protocol. Make sure you've set all D2–RSSS units to match the protocol setting on the master station (D2–RMSM, D2–250 or D3–350 bottom port, D4–RM, D4–SM).
4. Setup program. Check the setup program for errors such as incorrect pointers or constants, or writing to the wrong module address. Be sure that the total inputs and outputs values match the sum of the individual slave input and output ranges; otherwise, the D2–RMSM *will not* accept the setup data.

NOTE: If you need more in-depth troubleshooting, see the chart on the next page. It provides several different indicator patterns that may help identify your exact problem.

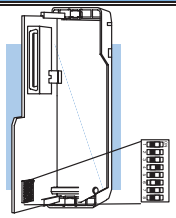
Troubleshooting Chart The following chart identifies the indicator status, possible cause, and corrective action for a variety of commonly found problems.

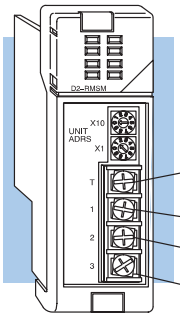
off on flash

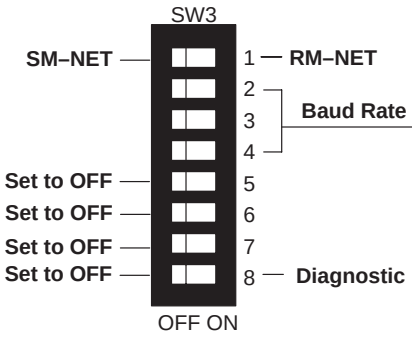
Master Station Indicators	Slave Station Indicators	Possible Cause	Corrective Action
 RUN is off.		1. Master PLC power is disconnected. 2. Remote Master is defective.	1. Check the PLC power source. 2. Replace the Remote Master.
 RUN is on.	 LINK is on.	1. Switch setting on master or slave station is incorrect. 2. Communications wiring is incorrect.	1. Check the DIP switches on Remote Master and slaves to ensure their baud rate and protocol settings match. 2. Check the communications wiring and termination resistors.
 RUN is flashing, I/O is on.		1. Setup program is not correct. 2. I/O totals do not match values in D2–RMSM shared memory 124 and 126.	1. Check the setup program to ensure pointer values and configuration constants are correct. 2. Check the I/O totals against the sum of the individual slave ranges in the setup program.
 LINK is on.	 I/O is flashing	1. I/O module failure at slave. 2. Slave module is missing 24VDC power. 3. Slave base pwer budget overloaded.	1. Check the I/O modules in the slave unit for failures.
 Lights blink in sequence, then all lights turn on.	 Lights blink in sequence, then all lights turn on	1. Module's Diagnostic DIP switch is ON.	1. Check the Diagnostic DIP switch on Master or slave to ensure that it is off.
 RUN is on.	 I/O is on.	1. Rotary switches' setting for slave ID exceeds valid address for chosen protocol.	1. Check rotary switches on slave for valid unit number: must be 31 or less for SM–NET, must be 7 or less for RM–NET

Switch Settings & Port Pinouts

Master Switch Settings and Terminal Wiring







Switch Positions

Baud	2	3	4
19.2K	OFF	OFF	OFF
38.4K	ON	OFF	OFF
153.6K	OFF	ON	OFF
307.2K	ON	ON	OFF
614.4K	OFF	OFF	ON

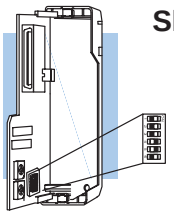
T–Terminating point that is connected to point 1 with a jumper at the master and final slave base units.

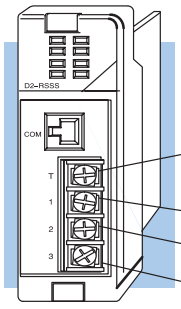
1--1st wire of twisted pair (+ Txd/Rxd)

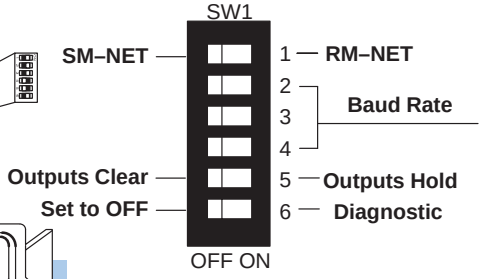
2--2nd wire of twisted pair (– Txd/Rxd)

3--Shield connection

Slave Switch Settings and Terminal Wiring







Switch Positions

Baud	2	3	4
19.2K	OFF	OFF	OFF
38.4K	ON	OFF	OFF
153.6K	OFF	ON	OFF
307.2K	ON	ON	OFF
614.4K	OFF	OFF	ON

T–Terminating point that is connected to point 1 with a jumper at the master and final slave base units.

1--1st wire of twisted pair (+ Txd/Rxd)

2--2nd wire of twisted pair (– Txd/Rxd)

3--Shield connection

Special CPU Memory for Diagnostics

Communication Status Flags in V-memory

This table provides a listing of the individual flags in V-memory for communication status. The corresponding bit of V-memory turns ON when the slave is communicating. Station 0 represents the master; its bit turns on when communication begins with its slaves. You may use ***Direct***SOFT or the application program to monitor these flags. If there is a communications error, this memory may not show the correct data.

	Master in Slot No.:							
	0	1	2	3	4	5	6	7
Station	N/A	V7661	V7662	V7663	V7664	V7665	V7666	V7667
0	Bit 0							
1	Bit 1							
2	Bit 2							
3	Bit 3							
4	Bit 4							
5	Bit 5							
6	Bit 6							
7	Bit 7							
8	Bit 8							
9	Bit 9							
10	Bit 10							
11	Bit 11							
12	Bit 12							
13	Bit 13							
14	Bit 14							
15	Bit 15							

Error Flags in V-memory

This table provides a listing of the individual flags in V–memory for slave errors. The corresponding bit of V-memory turns ON when the slave has an error. Station 0 represents the master; its bit turns on when an error occurs with any slave. You may use ***Direct***SOFT or the application program to monitor these flags. If there is a communications error, this memory may not show the correct data.

	Masster in Slot No.:							
	0	1	2	3	4	5	6	7
Station	N/A	V7671	V7672	V7673	V7674	V7675	V7676	V7677
0	Bit 0							
1	Bit 1							
2	Bit 2							
3	Bit 3							
4	Bit 4							
5	Bit 5							
6	Bit 6							
7	Bit 7							
8	Bit 8							
9	Bit 9							
10	Bit 10							
11	Bit 11							
12	Bit 12							
13	Bit 13							
14	Bit 14							
15	Bit 15							

D2–RMSM Memory for Diagnostics

The following tables describe the shared memory locations in the D2–RMSM Remote Master which provide status and error information about the module and its attached remote I/O network.

Hardware Status This table lists the status bytes available in the D2–RMSM shared memory which report the hardware settings. You can implement logic to read these bytes to check your configuration without having to remove the module.

OCTAL ADDRESS	FUNCTION	DETAIL	# Bytes
122	Status of Rotary Switches on module – **Read Only**	Data is 00 to 1F hex, representing the address of the module set by the Rotary Switches	1
123	Status of DIP Switches on module – **Read Only**	Bit status represents the setting of each switch on the module's DIP Switch , which sets configuration parameters. 0=OFF, 1=ON. Bit 0 SW1 status Bit 1 SW2 status Bit 2 SW3 status Bit 3 SW4 status Bit 4 SW5 status Bit 5 SW6 status Bit 6 SW7 status Bit 7 SW8 status	1

Bus Scan Status This table lists the status words that provide information on bus performance. The user can implement logic to read the status, as well as set the bus scan upper limit parameter.

OCTAL ADDRESS	FUNCTION	DETAIL	# Bytes
160	Current bus scan time – **Read Only**	BCD value of current bus scan, in msec	2
162	Bus scan time upper limit	User can store BCD value of bus scan upper limit, in msec. Default is 100 msec.	2
164	Shortest bus scan time – **Read Only**	BCD value of shortest bus scan detected since CPU went into RUN mode, in msec	2
166	Longest bus scan time – **Read Only**	BCD value of longest bus scan detected since CPU went into RUN mode, in msec	2
170	Bus scan counter – **Read Only**	BCD value of number of bus scans detected since CPU went into RUN mode	2
172	Overlimit Bus scan counter – **Read Only**	BCD value of number of bus scans which have exceeded the scan time upper limit	2

Network Errors This table lists the shared memory addresses that report network errors and their locations. The user can read these errors to assist in troubleshooting.

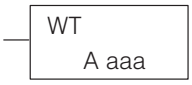
OCTAL ADDRESS	FUNCTION	DETAIL	# Bytes
140	Network Error Flags – **Read Only**	Bit status represents network errors detected by the D2–RMSM. 0=OK, 1=ERROR Bit 0 Configuration Error (see Address 142 for details) Bit 1 Communication Error (see Address 144 for details) Bit 2 Diagnostics Error (see Address 150 for details)	2
142	Configuration Error Code – **Read Only**	Error code in BCD 20 Total inputs exceeds 512 21 Total outputs exceeds 512 24 I/O address out of I/O range 25 I/O address allocated to bad range 29 A slave has more than 512 points 70 Discrepancy between current configuration and old one 71 A module is in the wrong slot. 72 Slave configuration is different from old one 73 Different slave is there	1
143	Station Number of Configuration Error – **Read Only**	Station number in BCD	1
144	Communication Error Code – **Read Only**	Error code in BCD 01 slave does not respond 02 wrong I/O information 03 I/O update error : CRC check error	1
145	Station Number of Communication Error Code – **Read Only**	Station number in BCD	1
146	Communication Error Counter – **Read Only**	Number of communication errors detected since CPU went into RUN mode, in BCD	2

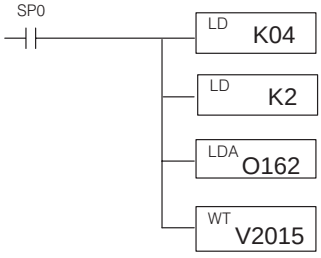
OCTAL ADDRESS	FUNCTION	DETAIL	# Bytes
150	Diagnostics Error Code	Error code in BCD 0201 Terminal block removed 0202 Module not present 0203 Blown fuse 0206 Low battery voltage 0226 Power capacity exceeded	2
153	Station number of Diagnostics error – **Read Only**	station number in BCD	1

How to Access Diagnostics Information

To access diagnostics information, we exchange data with the D2–RMSM module. The remote master unit is an intelligent module, which means it operates asyncronously from the CPU, and it has its own memory. We use the CPU instructions described below to communicate with an intelligent module.

The WT instruction writes a block of data (1–128 bytes max.) to an intelligent I/O module from a block of V-memory in the CPU. The function parameters (module base/slot address, number of bytes, and the intelligent I/O module memory address) are loaded into the first and second level of the accumulator stack, and the accumulator by three additional instructions. In the WT instruction, Aaaa specifies the starting V-memory address where the data will be written from in the CPU. Listed below are the steps to program the WT instruction:





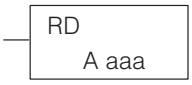
Load the base number (0) into the first byte and the slot number (1–7) into the second byte of the second level of the accumulator stack.

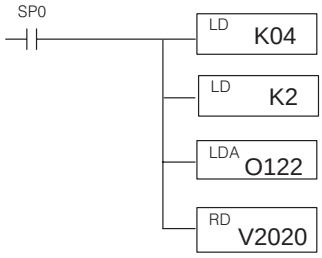
Load the number of bytes to be transferred into the first level of the accumulator stack.

Load the intelligent module address which will receive the data into the accumulator. We use the LDA to convert the octal address into its HEX equivalent.

Insert the WT instruction, which specifies the starting V–memory location where the data will be written from in the CPU.

The RD instruction reads a block of data (1–128 bytes max.) from an intelligent I/O module into the CPU's V–memory. The function parameters (module base/slot address, number of bytes, and the intelligent I/O module memory address) are loaded into the first and second level of the accumulator stack, and the accumulator by three additional instructions. In the RD instruction, Aaaa specifies the starting V–memory address where the intelligent module stores the data in the CPU. Listed below are the steps to program the RD instruction:





Load the base number (0) into the first byte and the slot number (1–7) into the second byte of the second level of the accumulator stack.

Load the number of bytes to be transferred into the first level of the accumulator stack.

Load the intelligent module address from which the data will be read into the accumulator. The parameter must be a HEX value.

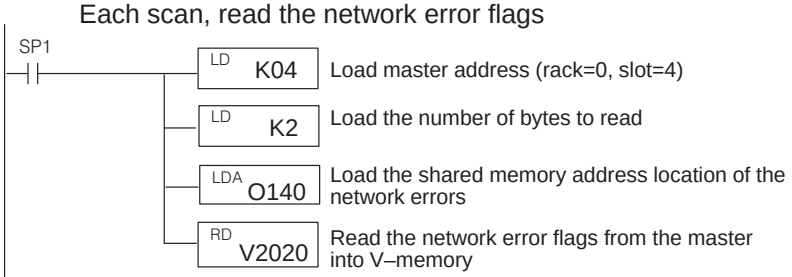
Insert the RD instruction, which specifies the starting V–memory location where the data will be stored.

Example 1: Reading Diagnostic Errors

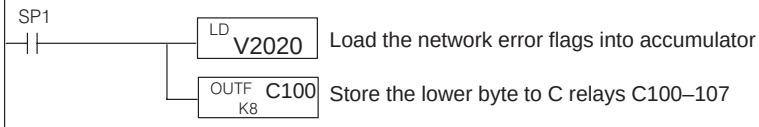
The diagnostic error information can assist you in locating errors on a remote I/O network, either during installation or for a previously operating system. During installation, we might expect configuration errors caused by incorrect switch settings or an invalid setup program. For a previously operating system, the diagnostics can help locate such faults as a slave not responding, an I/O module not present, or a loose terminal block.

In this example, we read the network error flags each scan, and if there is a configuration error present, we read the error details.

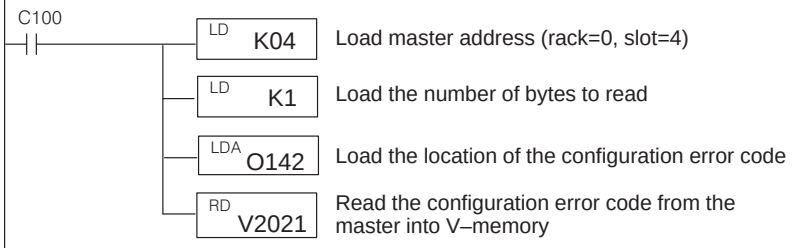
Each scan, read the network error flags



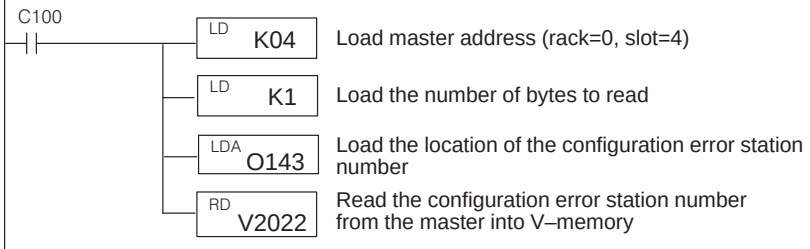
Move the network error flags to C relays to use as flags for testing



If there is a configuration error (C100 is ON), read the configuration error code



Read the station number where the configuration error occurred



To read communication errors (C101 ON) and diagnostic errors (C102 ON), implement similar logic to check the flag and read the error details.

You can then use the retrieved data in logic or display it in a Dataview in ***Direct***SOFT to determine the nature and location of the error. The Network Error Table describes the error codes.

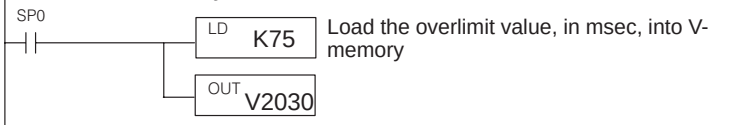
Example 2: Writing Bus Scan Overlimit and Reading Bus Scan Status

In certain applications, the scan time of the remote I/O bus can be an important factor in the response time of the system. Factors which affect the scan time include number of slaves on the bus and the baud rate. Required bus performance may dictate your system layout. For example, you may want to increase the number of remote channels in the system to decrease the number of slaves on each channel. Or you may need to choose SM–NET as the protocol to operate at a higher baud rate.

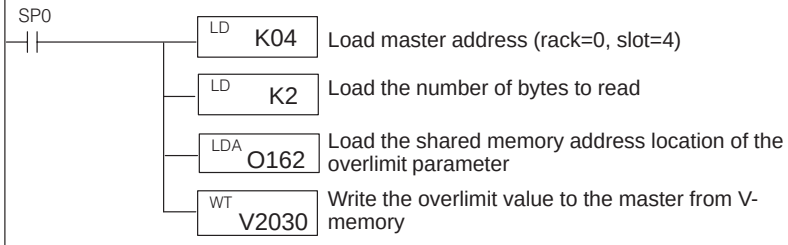
Bus scan performance data includes current bus scan time, the longest and shortest scans detected, a scan counter, and a scan overlimit counter. The overlimit counter records the number of times the scan has exceeded the overlimit value. The overlimit value, in msec, can be set by the user's logic; the default is 100 msec.

In this example, we demonstrate how to set the bus scan overlimit parameter, and then read the bus scan data to check performance.

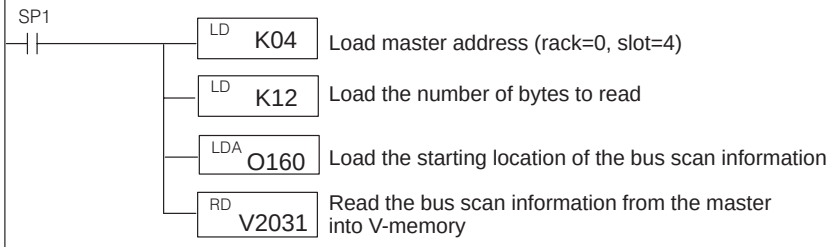
On the first scan, load the desired bus scan overlimit parameter value into V memory



Store the overlimit value to the D2–RMSM shared memory



On every scan, read all bus scan diagnostic information from the master into V-memory



You can then use the retrieved data in logic or display it in a Dataview in ***Direct***SOFT (shown on the next page) to monitor bus performance. The Bus Scan Status Table describes the definitions of the status values.

Bus scan performance data displayed in a Dataview