SIEMENS

SIMATIC TIWAY 1

Peerlink

User Manual

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Overview of the Module

1.1 General Description

The Peerlink™ module is a member of the family of intelligent input/output (I/O) modules. It is also in a special category of intelligent modules which are part of the SIMATIC® TIWAY™ network family. You may wish to refer to the TIWAY I Systems Manual (Manual No. TIWAY-8101) for more information on TIWAY networking products.

Peerlink modules are an integral part of the Peerlink network, which is a local area network designed to achieve peer-to-peer communication. The module provides high-speed dissemination of data from any Programmable Controller (P/C) station on the network to all other stations on the network.

The double-wide Series 500™ module fits into the I/O base (two adjacent slots) of the Series 500 P/Cs and allows them to be connected to a Peerlink network. There are two Series 500 options for users with different industrial needs: PPX:500-5053, which uses a single communication channel, and PPX:500-5054, which has two communication channels. The Series 505™ module, PPX:505-7354, is a single-wide module and has two communication channels.

All models of the Peerlink module have a dipswitch bank by which you may configure the module, a RUN/TEST mode toggle switch, a RESET button, and indicator lights. Their functions and configurations are described in greater detail in the Installation section. Figure 1-1 illustrates the models of the Peerlink module.

Peerlink is an intelligent I/O module which controls its own initialization process, network and P/C interfaces, error detection, and fault recovery. There is no need for a host computer, complex network design, or protocol. The only P/C programming required is that a V Memory starting address must be specified in order to tell the module where to log in its data in each P/C. Peerlink operates by using a broadcast method of data transmission, where one module is designated as the "active monitor." This means that this module is responsible for initiating all network communications. The active monitor polls each station on the network and each station responds by broadcasting its message on the network. Appendix B contains an example of how to set up a simple Peerlink network.
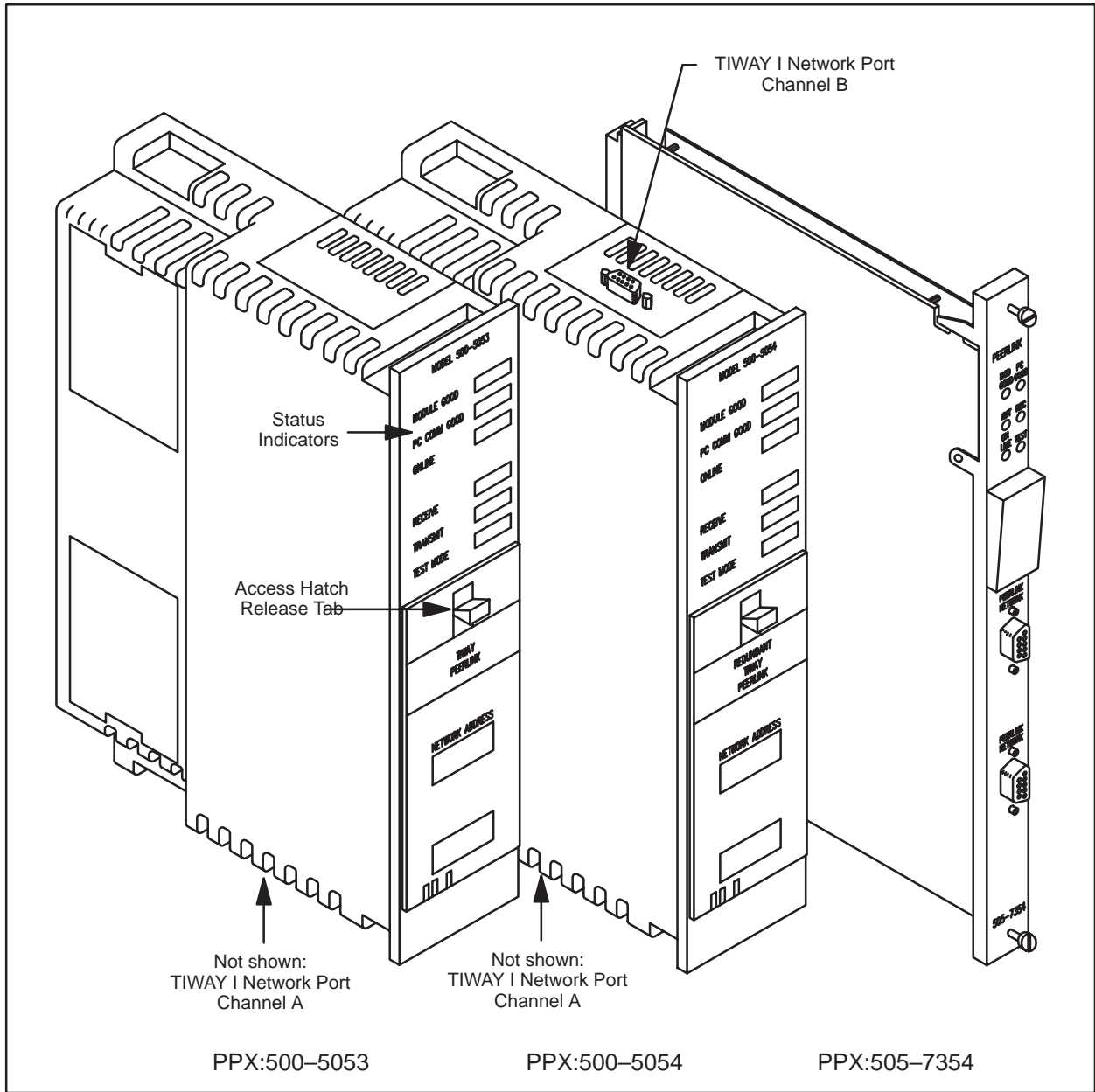
Figure 1-1   Peerlink Modules

The term "station" refers to a P/C with a Peerlink module that is assigned a specific network address. Each station on a Peerlink network is capable of transmitting up to 16 words of data (16-bit words) to every other station on the network. This means that each station can receive up to 240 words of data if a system with a maximum load of 16 stations (each transmitting 16 words) is used.

Peerlink is compatible with SIMATIC® TI560™ Class controllers which include SIMATIC® TI560™, SIMATIC® TI565™, and SIMATIC® TI560T™, and with SIMATIC® TI530™ Class controllers which include SIMATIC® TI520™, SIMATIC® TI520C™, SIMATIC® TI530™, SIMATIC® TI530C™, SIMATIC® TI530T™, SIMATIC® TI525™, and SIMATIC® TI535™.

1.2 PPX:500-5053—Single Communication Channel

Peerlink PPX:500-5053, which uses one communication channel, provides an active monitor and a backup, or "passive monitor", selected by the active monitor. This model might be preferred in applications where media loss is not a problem but where continuous operation in necessary in the event that the active monitor fails. Figure 1-2 illustrates a typical single-channel Peerlink network with both active and passive monitors assigned.

The active monitor (station #1 in this drawing) automatically assigns the station with the next higher network address as the passive monitor. If station #1 fails, the passive monitor (station #2) assumes the role of active monitor, designates a new passive monitor, and network operation continues.
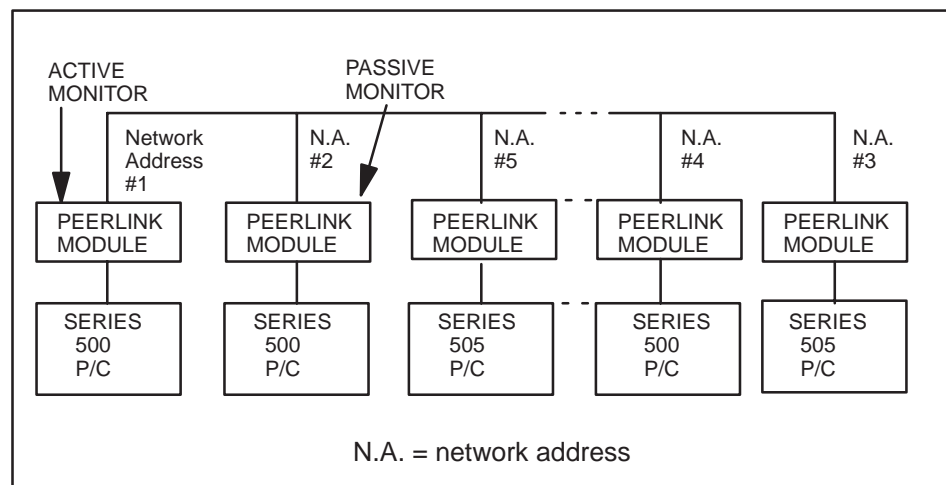
Figure 1-2   Diagram of PPX:500-5053 or PPX:505-7354 Network

Peerlink models PPX:500-5054 and PPX:505-7354 can operate like the PPX:500-5053, but also offer a dual communication channel option. By setting a switch on the module, you may use a single communication channel with both active and passive monitors.

In the dual communication channel option, if one network cable becomes disabled, communication automatically switches to the other network cable, allowing network communication to be maintained without interruption. Communication will always occur on the channel which detects the most active stations on the network. This model might be preferable in applications where the Peerlink cables could be easily damaged.

Figure 1-3 illustrates a typical network using the dual communication channel option. The passive monitor option is not available when dual communication channels are used.
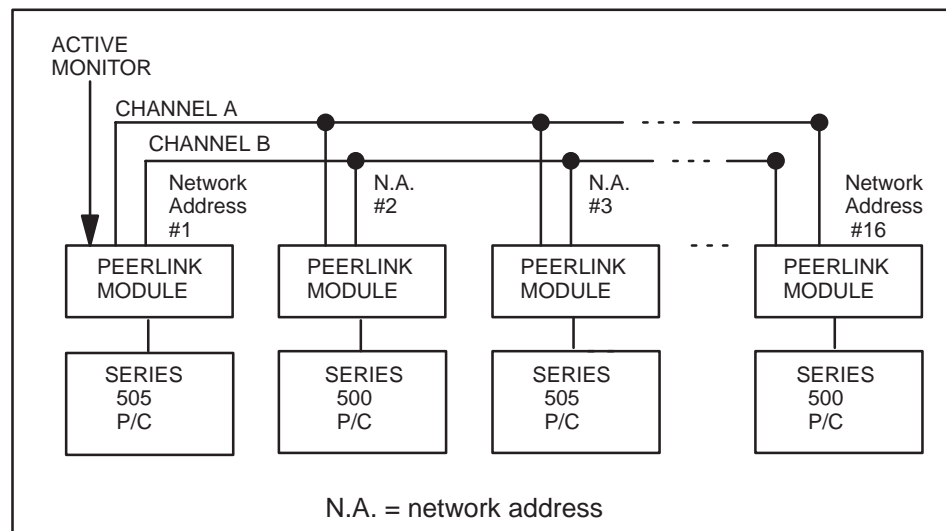
Figure 1-3   Dual Channel Network

Chapter 2

Network Operation

2.1 Overview

TIWAY Peerlink modules can be used to create peer-to-peer applications requiring rapid communications between P/Cs. Peerlink modules can also act as a complement to the TIWAY I network by off-loading high speed message transfers between P/Cs from
TIWAY I. This enables TIWAY I to better perform its functions of overall data acquisition and supervisory control.

Peerlink modules use a bit-oriented protocol similar to High-Level Data Link Control (HDLC) for network control. This protocol provides high throughput efficiency and very high data integrity. You may wish to refer to the TIWAY I Systems Manual (PPX:TIWAY-8101) for more information about TIWAY I protocol.

Peerlink operates by using a broadcast method of data transmission, where one module is designated as the "active monitor." This means that this module is responsible for initiating all network communications. The active monitor polls each station on the network and each station responds by broadcasting its message on the network.

The active monitor is responsible for network initialization and maintenance. When the Peerlink module is turned on, the active monitor builds a list of active stations, assigns a passive monitor if the single media option is being used, and gives each station a time slot when it should broadcast its data. During normal operation, the active monitor continues to assign time slots to active stations. It also performs a network maintenance function which consists of adding or deleting stations to or from the network.

In single channel communications, the active monitor designates one Peerlink module as a passive monitor. If the active monitor fails, the passive monitor will function like an active monitor. In dual channel communications, there is not passive monitor.

The basic network operation is the granting of a time slot to a station followed by a broadcast of data by the station. The information frame sent by a network station contains a message field consisting of up to 16 words of data that is broadcast to all stations connected to the network.

For each Peerlink station on the network, there must be 16 words of V Memory allocated in each P/C. For example, if you have two Peerlink stations, each P/C must have 32 words of contiguous V Memory space reserved. If you have 16 Peerlink stations, each P/C must have 256 words reserved. You specify the location of this V Memory space by using normal I/O output words 4 and 5 which specify the starting address of the Peerlink data table.

NOTE: Since output word 4 is used only with TI560 Class P/Cs, if you are using a TI530 Class P/C, output word 4 should always be set to all zeroes.

Modules on a Peerlink network are interconnected on a serial bus "multidrop" line (Local Line) consisting of a shielded twisted pair cable. The total cable length cannot exceed 10,000 feet using premium cable such as Belden® 9860. Figure 2-1 illustrates a typical multidrop bus configuration.
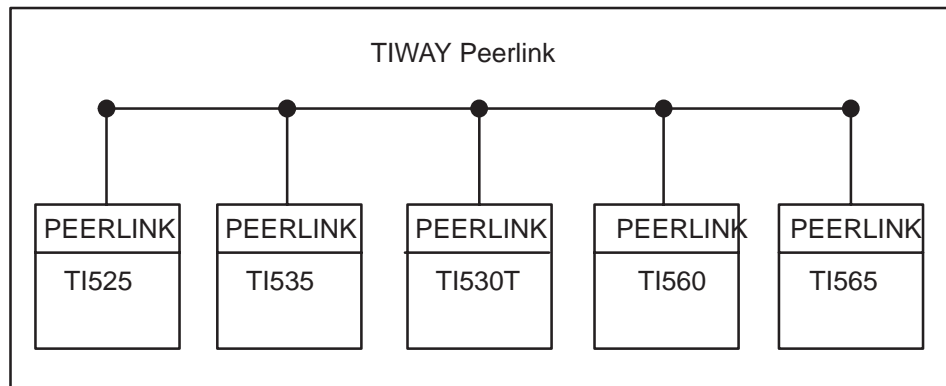
Figure 2-1   TIWAY Peerlink Multidrop Bus Configuration

2.2   Data Transmission

The Peerlink network uses the TIWAY I Local Line, which is a physical signaling technique (baseband, differential current drive). All Peerlink modules transmit data on the Peerlink network at 115.2K bits per second.

The Peerlink network update time or network scan is defined as the time it takes every Peerlink module on the network to update every other Peerlink module on the network with its data. The Peerlink network update time is dependent upon the number of stations on a network and on the number of words transmitted. For this reason, the number of words being transmitted is dipswitch-selectable, to allow you to keep network update time to a minimum.

Figure 2-2 and Figure 2-3 illustrate the network scan times as a result of the number of stations on the network and the number of words sent. For example, if the network configuration consisted of 8 stations with each transmitting 10 words, you could read from the chart that the network scan would be 31 milliseconds. Likewise, the scan for redundant communication channels would be 36 milliseconds.

These are typical scan times, depending on the data sent, and only when sending the same number of words from each P/C. In any case, the network scan time will not vary more or less than 5% from the times given in the charts.

Scan Time (ms)

Number of Words
per Station

16
14
12
10
8
6
4
2
1

Number of Stations
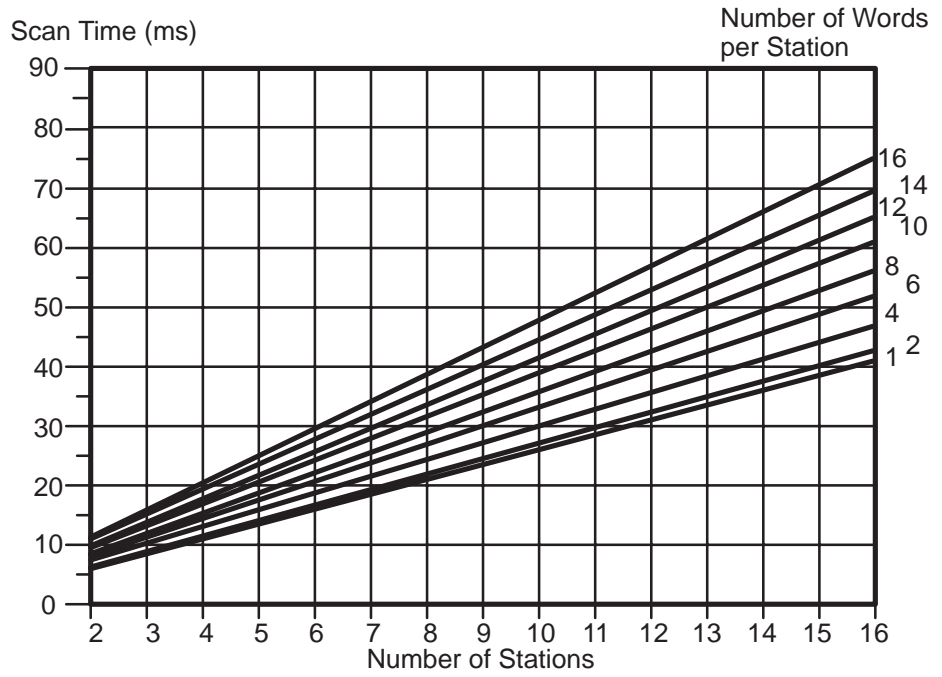
Figure 2-2   Single Media Network Scan Time

Scan Time (ms)

Number of Words
per Station

16
14
12
10
8
6
4
2
1

Number of Stations
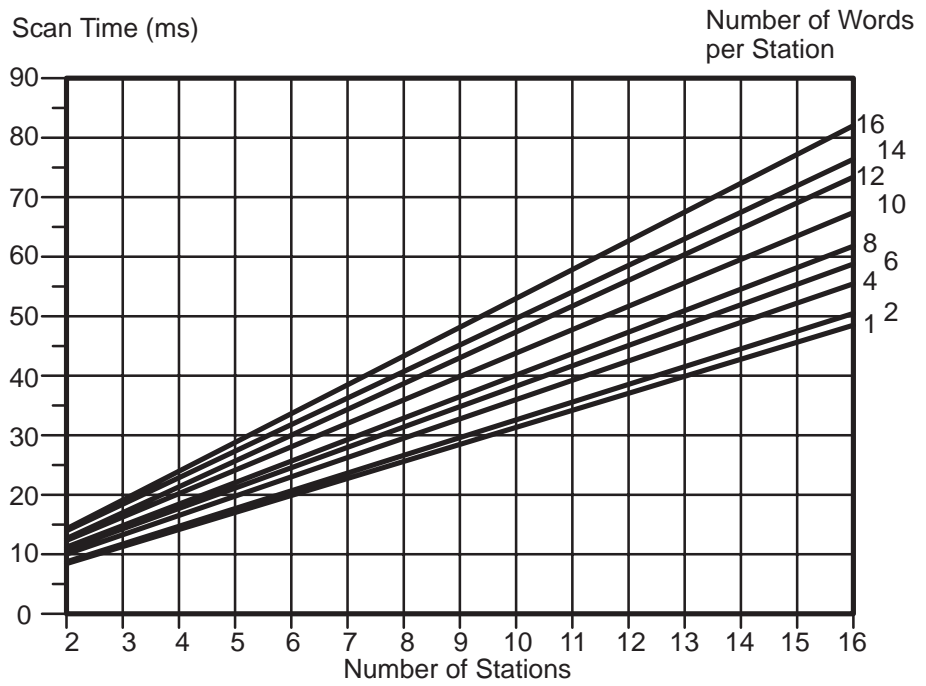
Figure 2-3   Redundant Media Network Scan Time

Data Transmission (continued)

2.2.2
Peerlink to P/C
Data Transmission

Peerlink modules use a high speed block transfer method to transfer data from the module to the P/C. This method was chosen to achieve the performance requirements of a peer-to-peer network. There are several installation and performance requirements to be considered because of this. They follow:

• The module can be located in any base in a TI560 Class P/C. In all other P/Cs, a Peerlink module can be used only in the local I/O base.

• While you may select (by dipswitch) less than 16 words of data to be transmitted on the Peerlink network, a Peerlink module always transfers 16-word blocks to its P/C. If you have set less than 16 words by dipswitch on a Peerlink module, the module will write zeroes to the other locations. Therefore, for each station on the network, 16 words of V Memory must be allocated in each P/C whether they are used or not.

• It is also important that network addresses be assigned in sequential order beginning with network address #1. For example, if there were two stations on your network labeled addresses 1 and 2, Peerlink would write only to the first 32-word locations allocated in V Memory. However, if you labeled them addresses 1 and 16, Peerlink would use all 256 V Memory locations despite the fact that there are only two stations on the network.

2.2.3
P/C to P/C
Data Transmission

To understand how long it will take to update a network considering the entire cycle of P/C-to-Peerlink data transfer, Peerlink-to-Peerlink transfers, and the final Peerlink-to-P/C transfer, you should keep in mind certain worst-case conditions. The P/C scan runs asynchronously from the Peerlink network scan. The different P/Cs on the network may also be scanning at different rates. Therefore, the total cycle from data in one P/C being transmitted to the data table in other P/Cs varies.

Typically, a transfer from the V Memory table in one P/C to the V Memory table in another P/C would take:

1 P/C scan of P/C transmitting data	+	1 network scan	+	1 P/C scan of P/C receiving data

Worst case could be:

1 P/C scan of P/C transmitting data	+	1 network scan	+	2 P/C scans of P/C receiving data
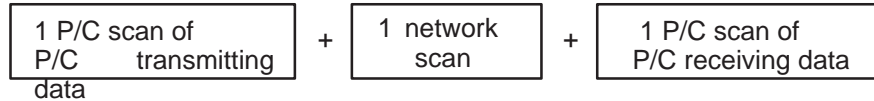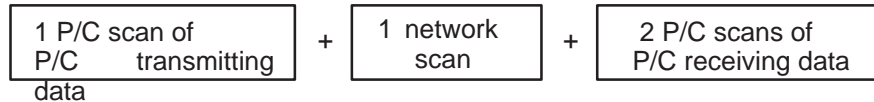
It is also possible for a slower P/C to "miss" an update cycle from a P/C which has a faster scan time.

To avoid the potential problem of missing data where one P/C runs faster than another, you may wish to implement some type of hand-shaking. An example of this is shown in the application example in Appendix D.

2.3 Set-up Considerations

- Generally, any station on a Peerlink network can be designated as the active monitor.

- You should always assign network addresses consecutively, beginning with network address 1. Since you must allocate 16 words of V Memory for each station on a Peerlink network, the higher the number of the last network address, the more memory space you will need to reserve in each P/C's V Memory. If you have 4 Peerlink stations in a network, and you number them 1, 2, 3, and 4, you will need to reserve only 64 (16 x 4) words of V Memory. If you skip numbers, for instance, numbering them 1, 6, 12, and 16, you will need to reserve 256 (16 x 16) words of V Memory.

- The passive monitor (in single communication channel mode only) is usually the next-highest network address from the active monitor. There are some exceptions to this:

  1. If one Peerlink station powers-up before another, the active monitor recognizes the first powered-up module with the next-highest network address as the passive monitor.

  2. When a Peerlink module which has been designated as the passive monitor fails or is reset, the active monitor will log it off the network temporarily and will designate the first module in the active list as the passive monitor. Reset occurs under three different conditions: (1) when the RESET button is pressed; (2) upon power-up; and (3) when the network is recovering from a fault condition (such as when a cable is re-connected).

- With Peerlink operating in single channel mode, the manner in which the passive monitor is assigned may be used to protect your operation if a cable breaks. If network addresses (N.A.) are assigned so that the active monitor is at one end of the physical network, and the passive monitor is at the other end, then in the event of a cable break on the trunk, both halves of the network can continue operating as shown below:

  ```
                                            X  Cable Break
  ┌──────────┬──────────┬──────────┬──────────┬───────┐
  │ N.A. #1  │ N.A. #3  │ N.A. #4  │ N.A. #5  │ N.A.  │
  │          │          │          │          │  #2   │
  ├────────┐ │        ┌─┴────────┐ │        ┌─┴───────┤
  │ Active │ │        │          │ │        │ Passive │
  │ Monitor│ │        │          │ │        │ Monitor │
  └────────┘ └────────┘          └─┘        └─────────┘
  ```
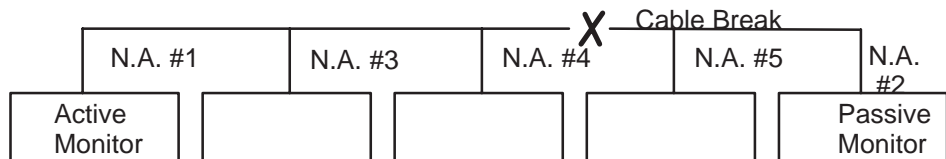
  In the example above, the active monitor would assign a new passive monitor (station 3, since it is the next highest network address that the active monitor can hear). The station 2 passive monitor would take over the communications bus on that side of the cable break, and assign station 5 as the passive monitor. Since the two halves could not talk to each other, they would operate as two separate networks. The new network configuration would look like this:

  ```
  ┌──────────┬──────────┬──────────┬──────────┬───────┐
  │ N.A. #1  │ N.A. #3  │ N.A. #4  │ N.A. #5  │ N.A.  │
  │          │          │          │          │  #2   │
  ├────────┐ ├────────┐ │        ┌─┴───────┐ ┌┴───────┤
  │ Active │ │Passive │ │        │ Passive │ │ Active │
  │ Monitor│ │Monitor │ │        │ Monitor │ │ Monitor│
  └────────┘ └────────┘ └────────┘└─────────┘└────────┘
  ```
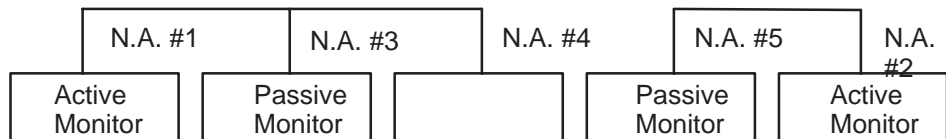
  When the cable break is repaired, the network will automatically reconfigure. (Note that after the cable break is repaired, the location of the passive monitor might still be station 2, but might also be one of the other stations if station 2 were not the first to respond after the cable break is repaired.)

- Using normal I/O, you can obtain complete network status information and check the operation of the network using the Network Status Words WX1, WX2, and WX3.

Once the network is connected, and the dipswitches set, the V Memory table in the P/C at which you wish the network data to appear must be specified. It should be a sequential block of V Memory which is not used for anything else.

The number of words allocated should equal 16 times the highest addressed station number on the network. The only thing that Peerlink requires is that you specify the starting address of this table through normal I/O. When you have done this, Peerlink will automatically begin logging in data. The first 16 words are designated for network address #1, the next 16 words for network address #2, and so on. The station designated as network address #1 would transmit in the first block of 16 words. It would receive data from the rest of the network in the remaining blocks. The station designated as network address #2 would transmit data in the second block of 16 words, and so on. A block diagram of this is shown in Figure 2-4.

The system configuration forms provided in Appendix A may make documenting your system easier.

NOTE: When you are doing a PROGRAM to RUN or a single scan in a P/C, the Peerlink station may momentarily go off-line. If it is the active or passive monitor, the network configuration may change (i.e., another station may take over as active or passive monitor). If it is an active monitor in a dual-channel network, the network operation may stop momentarily.

P/C
Station #1
(Network
Address 1)

P/C
Station #2
(Network
Address 2)

P/C
Station #3
(Network
Address 3)

P/C
Station #4
(Network
Address 4)

P/C
Station #5
(Network
Address 5)

vaaa — Network Address #1
vaaa + offset — Network Address #2
Network Address #3
Network Address #4
Network Address #5
vaaa + offset — Network Address #16

vbbb — Network Address #1
vbbb + offset — Network Address #2
Network Address #3
Network Address #4
Network Address #5
vbbb + offset — Network Address #16

vccc — Network Address #1
vccc + offset — Network Address #2
Network Address #3
Network Address #4
Network Address #5
vccc + offset — Network Address #16

vddd — Network Address #1
vddd + offset — Network Address #2
Network Address #3
Network Address #4
Network Address #5
vddd + offset — Network Address #16

veee — Network Address #1
veee + offset — Network Address #2
Network Address #3
Network Address #4
Network Address #5
veee + offset — Network Address #16

vaaa, vbbb, vccc, vddd, veee = V Memory starting address (V100, V200...)
Offset = (Network Address −1) x 16

V Memory starting address (Vaaa, Vbbb, etc.) + offset for a particular network address is equal to the starting address of that particular network address' data.

data transmitted to all other stations

data received from station with appropriate network address

Figure 2-4   P/C V Memory Tables Allocated for Peerlink Network Data

Installing and Initializing the Peerlink Module

3.1   Overview

This section describes how to mount the Peerlink module in the Series 500 and Series 505 I/O base, connect the communication cables to the Peerlink module, and initialize the system for operation. The Programmable Controller (P/C) and the programming device (such as a VPU200) are assumed to be in place before you install a Peerlink module.

Table 3-1 lists the software release levels required for using the Peerlink modules with the P/Cs listed.

Table 3-1   P/C Models with Peerlink Part Numbers

P/C Model	Part No.
TI520 Rel. 2.0	2461446-0003
TI530 Rel. 2.0	2460607-0004
TI520C Rel 1.0	2491824–0001
TI530C Rel 1.0	2491816–0001
TI530T Rel 1.5	2491895–0006
TI560 Rel 1.0	2493498–0001
TI565 Rel 1.0	2493498–0001
TI525 Rel 2.2	2586279–0004
TI535 Rel 1.0	2591717–0001

Before you insert the Peerlink module, you should consider the power budget of the I/O base which you are planning to use. The power consumption for Peerlink modules is given in the specifications section at the back of this manual.

Before inserting the Peerlink module into a Series 505 I/O base, determine which slot the Peerlink module will occupy in the I/O base. In the Series 500 I/O base, determine which 2 adjacent slots the Peerlink module will occupy on the I/O base. Then clear output words (WYs) or force them to zeroes, and power–down the I/O base of the P/C. This is done to prevent erroneous network operation prior to actual initialization.

WARNING

To minimize the risk of potential electrical shock hazard, power to the P/C must be disconnected before you insert or remove Peerlink modules from the I/O base.

Installation Steps Summary

The following steps are required to install the Peerlink module for models PPX:500–5053, PPX:500–5054, and PPX:505–7354.

1. Disconnect power to the P/C system (I/O base, power supply, etc.).

2. Set the configuration dipswitches on the Peerlink module.

3. Insert the module into the base and secure it.

4. Power up the P/C system.

5. Connect the network cables.

6. Log the module into the P/C I/O map.

7. Use the Peerlink diagnostics and LED status indicators to be sure the module is operating correctly.

Each step will be discussed in the following sections.

3.2   Setting the Dipswitches

As Figure 3-1 and Figure 3-2 illustrates, there are two blocks of dipswitches on the Peerlink module. However, only the 10–switch block is used for configuring the module.

WARNING

All Peerlink modules on the same network should be configured for the same media mode (single or redundant channels). Mixing modes may result in erratic network behavior, causing potential for personal injury or property damage.

---

1.   **Switch 10.** If you are working with Peerlink model PPX:500-5053, set dipswitch #10 to 0, indicating that you are using a single communications channel. For Peerlink models PPX:500–5054 and PPX:505–7354, set the dipswitch to 1 for redundant media, or to 0 for single media.

2.   **Switch 9.** Set dipswitch #9 to 1 if the Peerlink module will be an active monitor; otherwise set it to 0. Only one module in the network may be selected as the active monitor.

3.   **Switches 8 through 5.** Select the number of 16-bit words to be sent in each transmission. You may select a different number of words to be transmitted for each module. Remember that you should select only the number of words actually needed in order to increase network throughput time. Table 3-2 illustrates dipswitch settings for the number of words to be transmitted.

4.   **Switches 4 through 1.** Select the network address of the Peerlink module. You should assign network addresses in sequential order, beginning with 1. Since you must allocate 16 words of V memory for each P/C on a Peerlink network, the higher the number of the last network address, the more memory space you will need to reserve in each P/C's V memory. Table 3-3 shows the dipswitch settings for network addresses.

MODULE GOOD

P/C COMM GOOD

ONLINE

RECEIVE

TRANSMIT

TEST MODE

10 **Redundant (1)**/Single (0)
Communication Channel(s)
9 **Active Monitor (1)**/
Non–Monitor (0)

8

7 Number of Words
to Transmit = 10
6 (See Table 3-2)

5

4

3 Network Address = 2
(See Table 3-3)
2

1

1   0

0 = Slide right

1 = Slide left

Peerlink
Configuration
Dipswitches
(See Chart at
Right)

10
9
8
7
6
5
4
3
2
1

Not Used
(Set to Zero)

8
7
6
5
4
3
2
1

1–0
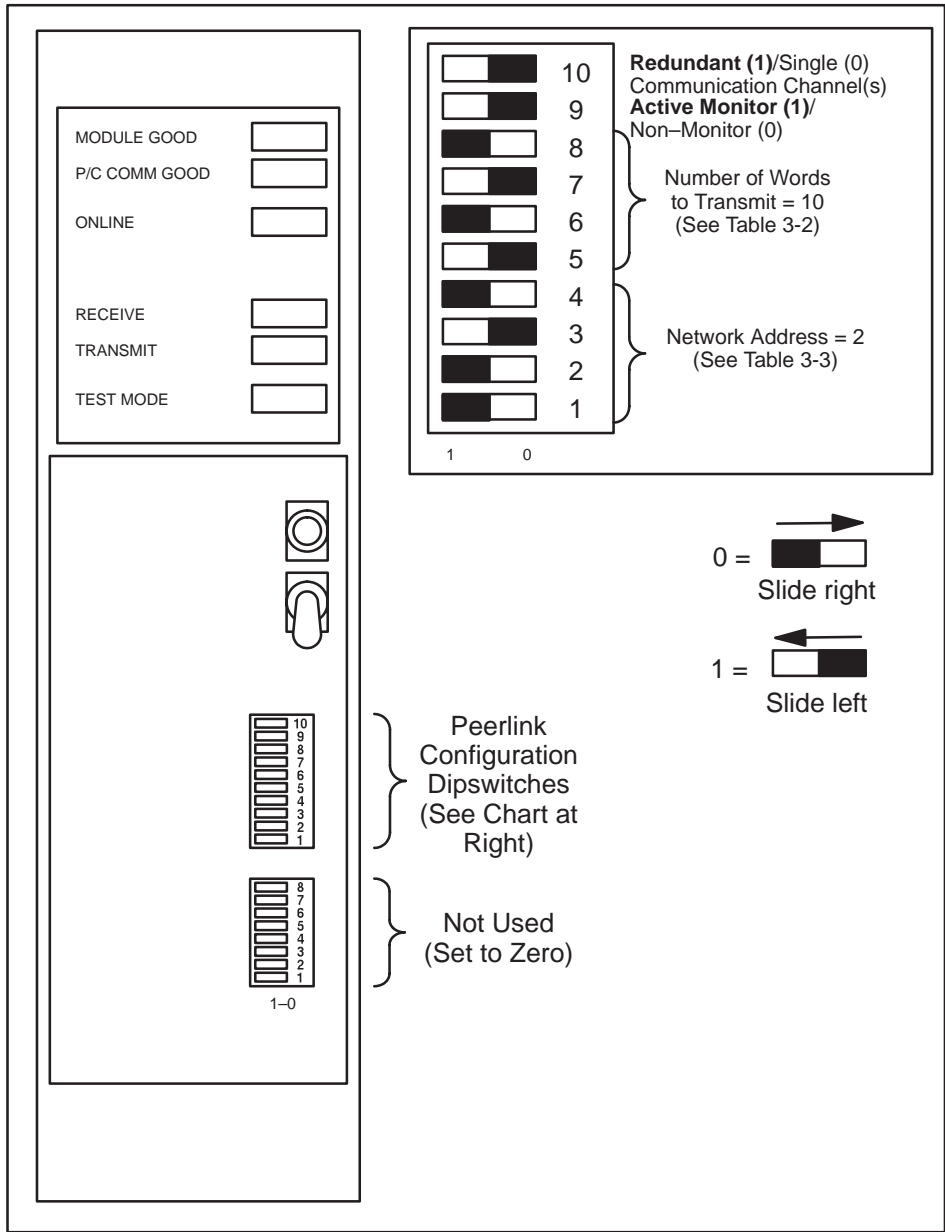
Figure 3-1   Series 500 Peerlink Module (with Access Cover Removed)

**Table 3-2   Dipswitch Settings
for Number of Words to be Sent**

No. of Words	5	6	7	8
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1
16	0	0	0	0

**Table 3-3   Dipswitch Settings
for Network Address Selection**

Network Address	1	2	3	4
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1
16	0	0	0	0

SINGLE NON-MONITOR
REDUNDANT ACTIVE MONITOR

0 < > 1

10
9
8
7
6
5
4
3
2
1

1
2
3
4 } NUMBER OF WORDS

1
2
3
4 } NETWORK ADDRESS

8
7
6
5
4
3
2
1

NOT USED
(MUST BE SET TO ZEROS)

NUMBER OF WORDS AND NET. ADDR. SELECT

4321
1-0001
2-0010
3-0011
4-0100
5-0101
6-0110
7-0111
8-1000
9-1001
10-1010
11-1011
12-1100
13-1101
14-1110
15-1111
16-0000

866Y LISTED IND CONTROL EQUIP

LR44226

0 = Press left

1 = Press right

Network Configuration Parameters

Figure 3-2   Series 505 Peerlink Module Dipswitches

3.3 Inserting the Module

NOTE: The Peerlink module may be placed in any I/O base of the 560 Class P/Cs. In all other Series 500 and Series 505 P/Cs, the Peerlink module must be placed only in the local I/O base (bases 0 or 1).

Before inserting the Series 500 module, you should decide whether you want to protect it by "keying" the module's position in the I/O base. As shown in Figure 3-3, keying is accomplished by placing the three keys provided in the right-hand slot of the two slots occupied by the module so that they fit into the notches on the module edge card. This prevents another I/O module from being mistakenly inserted into the slots reserved for the Peerlink module.
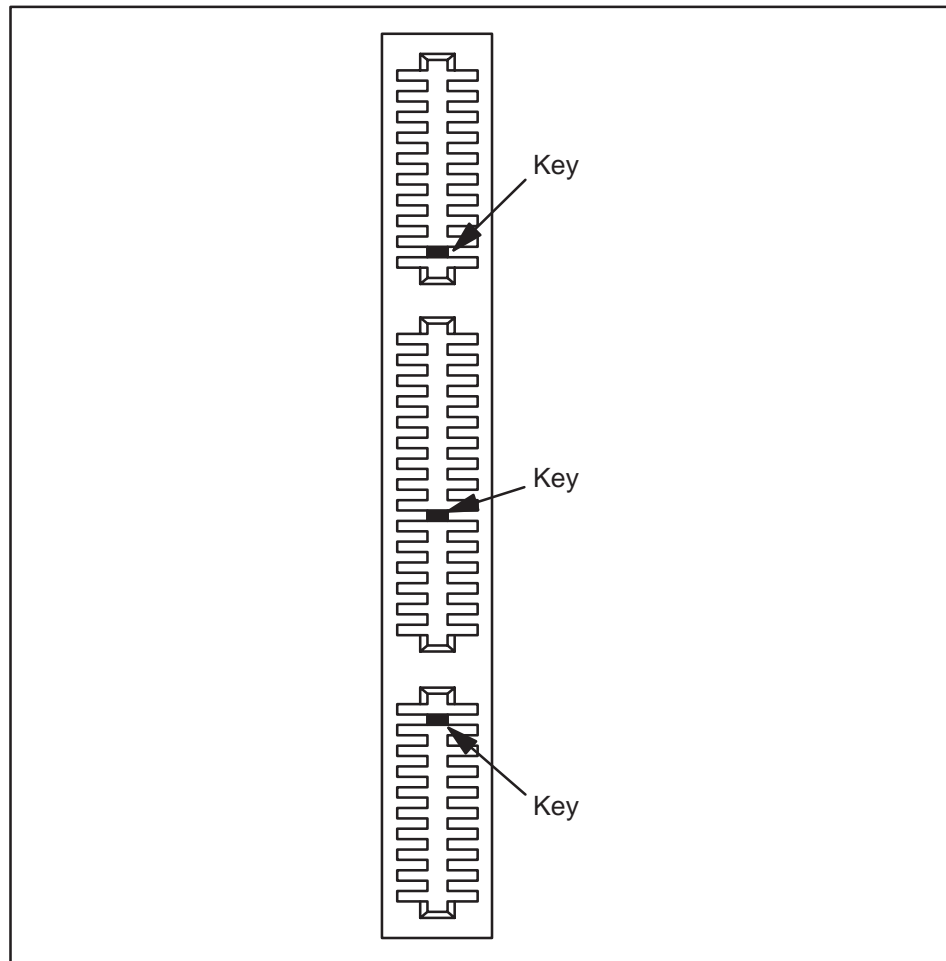
Figure 3-3   Keying the Peerlink Module

Once the keys are in place (if you wish to key the module), you should orient the module so that the indicators are on the top half of the module and carefully push the module into the I/O base as shown in Figure 3-4. When the module is fully seated in the I/O base, tabs will hold the module in place. To take the module out, pull the tabs away from the module and take it out of the I/O base, being careful not to damage the edge card.
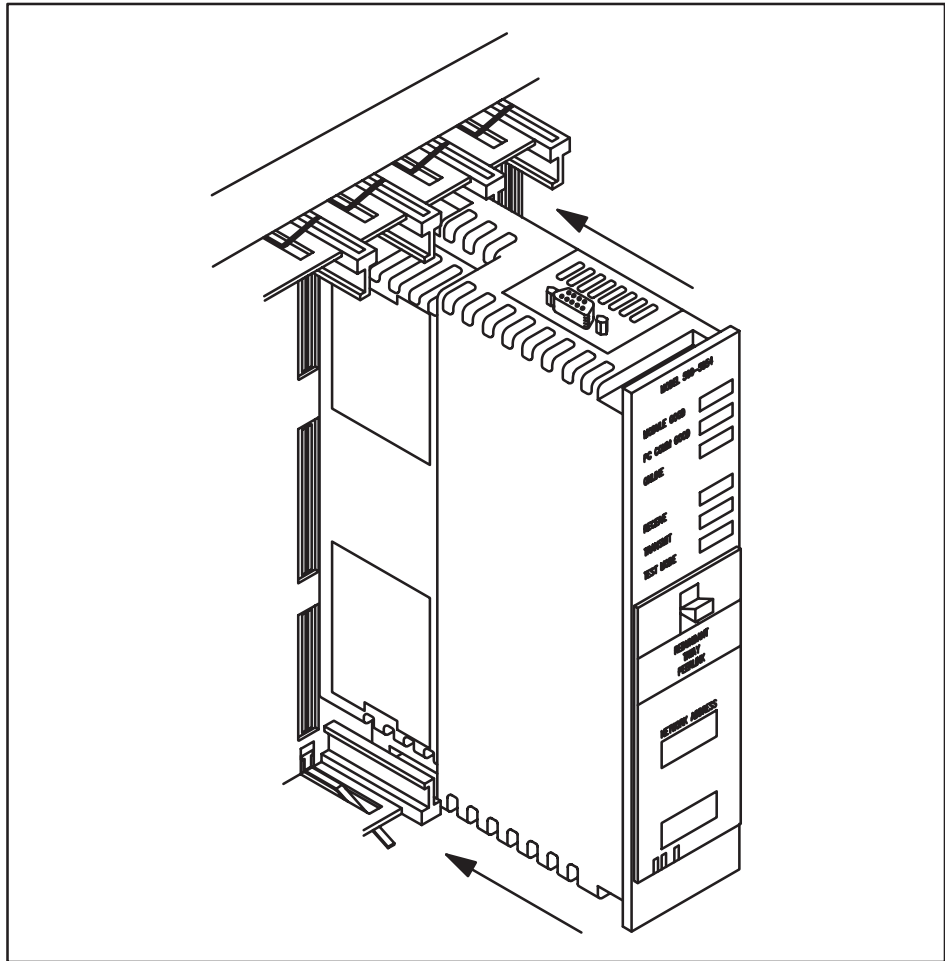
Figure 3-4   Mounting the Peerlink Module (Series 500)

For the Series 505 Peerlink module, insert it into the I/O base as shown in Figure 3-5. Then secure it with the bezel screws.
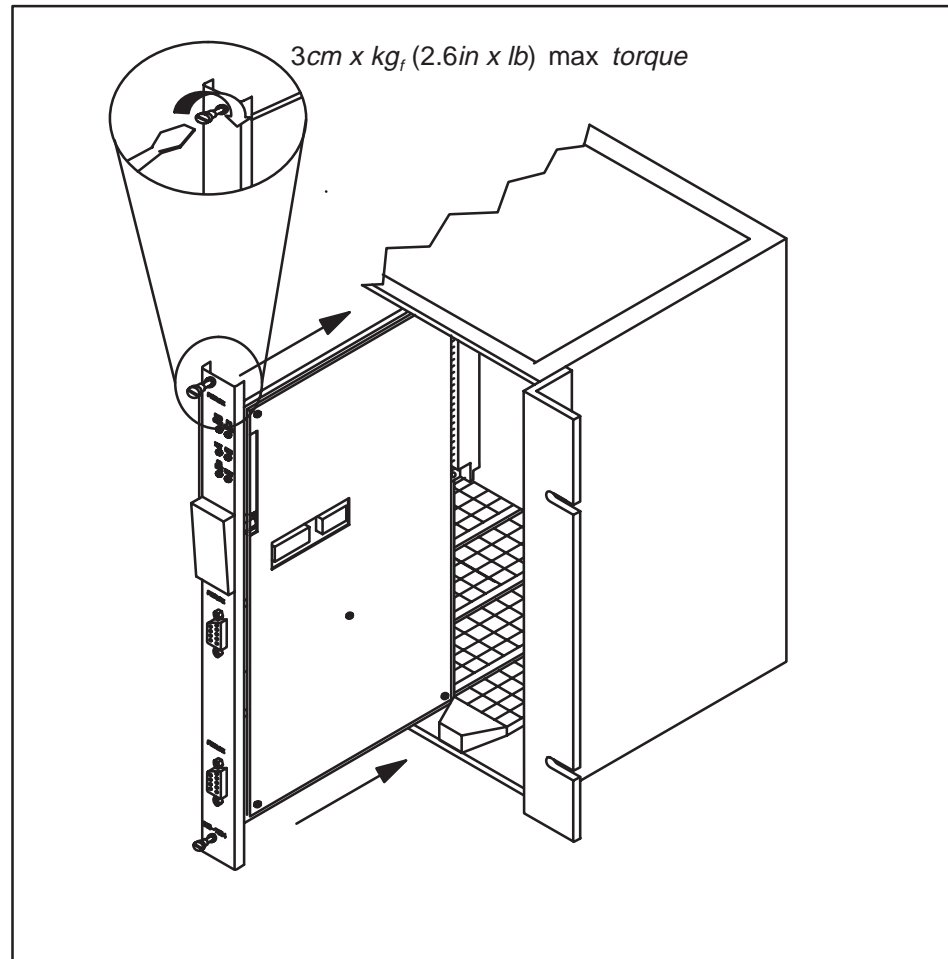
Figure 3-5   Mounting the Peerlink Module (Series 505)

WARNING   **Do not insert or remove Peerlink modules while power is applied to the P/C, since doing this may alter the P/C memory or cause a P/C fatal error resulting in possible personal injury or property damage.**

3.4 Powering-up the Module

When the Peerlink module has been inserted into the I/O base, apply power to the Peerlink module by powering–up the P/C.

WARNING

Do not insert or remove Peerlink modules while power is applied to the P/C. Doing so can cause the P/C to alter memory, or may cause erratic network behavior, causing potential for personal injury or property damage.

As soon as power is applied to the module, it will go through a power-up diagnostics routine (See the "Diagnostics" section for a more detailed description of power-up diagnostics.) When the diagnostics routine is complete, only the MODULE GOOD indicator will light (P/C COMM GOOD may light if a valid V Memory starting address has been set). If this is not the case, please refer to the sections on "Troubleshooting" and "Technical Assistance."

In some installations when both Peerlink and PPX:505–49XX series of relay modules are used, noise errors may be induced when switching high voltage in the relay module, (voltage > 40 V rms). This is the result of internal arcing of the relay contacts.

If you encounter this problem, place a snubber consisting of a 47 ohm 1/4 watt resistor and a 0.022 μF capacitor across the relay contact terminals on the terminal block. Snubbers were not included in the relay modules in order to meet the need for lower current leakage in many applications.

NOTE: Snubber components must be UL component recognized and/or CSA Certified for use across the rated voltage being switched by the relay module.

3.5   Network Cable Installation

3.5.1
Overview

After you have set the dipswitches on the Peerlink modules and inserted the modules into the I/O base, you need to connect the network cables to each Peerlink module on the network. This section discusses some general considerations for planning and installing a network cable system.

The network cable is designed to operate with shielded twisted-pair cable which has a characteristic impedance of   124 ohms. The interface is a male, 9-pin D-type receptacle with pin assignments as shown in Table 3-4 below. The connecting cable consists of a main cable or spine with droplines or taps for each Peerlink station.

Table 3-4   Pin Assignments for Network Cable Connector

Pin	Name	Description
1		No connection
2		No connection
3	Shield	Cable shield and signal common
4		No connection
5		No connection
6	LLM+	Positive biased signal line
7		No connection
8		No connection
9	LLM–	Negative biased signal line

For consistency in installation, always connect the LLM+ (Pin 6 of the Local Line Connector) to the white strand of the twisted pair and to the terminal marked "W" in the tap housing. Connect the blue strand to the LLM– (Pin 9 of the Local Line Connector) and to the terminal marked "B" in the tap housing. The Cable Shield and Signal Common should be connected to Pin 3 of the Local Line Connector and to terminal "G" inside the tap housing.

3.5.2
Peerlink Network
Hardware
Components

The hardware components of a Peerlink network are explained in the sections below and consist of the following:

● TIWAY I Tap Housing (PPX:500-5606)

● Twisted-pair cabling (customer-supplied)

Tap Housing: The tap housing, shown in Figure 3-6, is made by Siemens Industrial Automation, Inc. specifically for the TIWAY I network. The tap housing can be mounted rigidly to a NEMA panel or other enclosure. It can also be used to splice cables in a cable tray without being rigidly mounted. The tap housing not only provides an orderly connection to the TIWAY I network, but also contains terminating resistors, resists moisture, relieves strain, and provides noise isolation for attached cabling. One tap housing is provided with Peerlink model PPX:500-5053; two are provided with Peerlink model PPX:500-5054 and PPX:505–5374. Additional tap housings may be ordered from your Applications Engineering Distributor or from Siemens Industrial Automation, Inc. under part number PPX:500-5606.

The terminating resistors mentioned in the last paragraph are very important. They must be used to ensure that the main line cable is properly terminated and biased. Each tap housing is supplied with terminating resistors which should only be installed at each end of the main (trunk) cable. At each end, a terminating resistor must be connected between LLM+ and the cable shield and also between LLM– and the cable shield inside the tap housing.

Top cover removed for clarity.
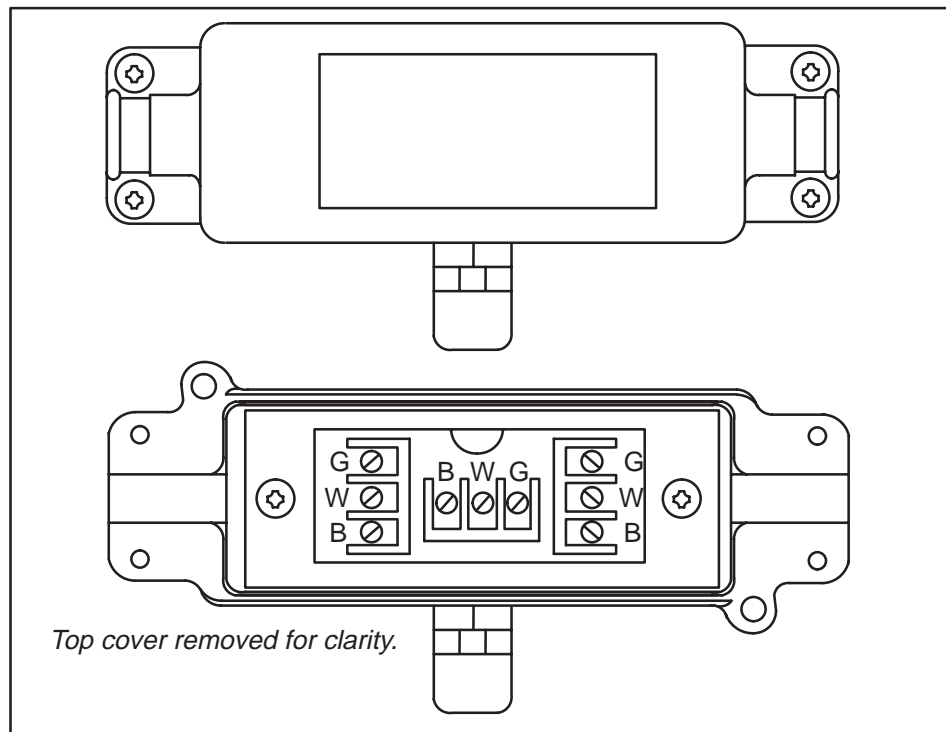
Figure 3-6   TIWAY I Tap Housing

Twisted Pair Cabling: Siemens recommends Belden 9860 twisted pair cabling or its equivalent for use as the Peerlink network spine. For distances less than 3000 feet, Belden 9271 or its equivalent is acceptable for the trunk line. Belden 9271 or the equivalent should be used for the dropline. Brands other than those listed here will be specified by Siemens upon request.

3.5.3
Important Planning Considerations:

Some major points to consider during the planning phase of a Peerlink network are:

- Always make the network flexible enough to allow for re-arrangement of plant equipment.

- Since network system noise is usually picked up by its interconnecting wiring, steps should be taken at the outset to by pass or eliminate noise sources.

- If cable redundancy is desired, the two cables should never be routed along the same path, since the environmental and other factors which disable one cable will very likely disable the second cable.

Aside from physical obstructions such as posts, walls, and partitions, electrical interference should also be avoided. Some sources of such interference:

- Power distribution mains

- Arcing motors

- Fluorescent lighting

- Undesired signal transfer (cross-talk) between adjacent circuits

- Poor cable-to-equipment impedance matching

In general, network cabling should never come into direct contact with any electrical conductor, and if cabling is installed inside a conduit, the conduit should be grounded in accordance with applicable electrical codes. A minimum of three feet of distance should be kept between all network cabling and the following.

- Power lines

- Generators

- Electric motors

- Electric welders

- Transformers

- Induction furnaces and heaters

- Rectifiers

- All sources of microwave radiation

3.5.4
Tap Spacing

Local Line signal characteristics require that the minimum distance between tap nodes be calculated using the length of the droplines at the last tap node. A tap node consists of either a single tap on the Peerlink trunk cable or a pair of taps separated by less than the minimum tap node separation distance. The minimum distance between a given tap node and the next tap node on the network is equal to one-half the length of the longest drop line at the given node.

Example 1 of Figure 3-7 illustrates how this calculation is performed. For the 100′ taps, the next tap node cannot be closer than 50′ or one-half the tap length. Likewise, the next tap to the 60′ tap node cannot be closer than 30′ (60 ÷ 2).

No limit is placed upon the number of Peerlink modules that can be daisy-chained to form a drop line off the main trunk as long as the resulting drop length is no greater than 100 feet. Figure 3-7 illustrates three typical examples of tap spacing.

Example One:

Not Less
Than 30'

100'   100'   25'

Not Less   Each Not
Than 50' 100'   Less   60'
              Than 50'

This is considered as a double drop from the closest
tap. The next nearest tap must then be greater than 50i
away.

Example Two:

100'   25'   25'

100'   Min 50'

Example Three:

Overall Dropline length
can be up to 100 feet.

No limit on
number of Peerlink Mod-
ules Daisy-Chained on
one Dropline

100'   50'   100'

100'

Tap Droplines less than 3 feet in
length are not considered in cal-
culating distance to next tap.

Figure 3-7   Tap Spacing Examples

3.5.5
Cable Routing

Cable routing should be planned as if the path between all stations on the network were free of obstructions. The next step is to modify the first routing to account for obstructions, then calculate the amount of cable needed.

CAUTION

Observe all local and national electrical and fire codes when installing wiring.

In general, there are three routes network cabling may take.

- Under-floor routing

- In-ceiling routing

- Surface duct routing

Any combination of these three routes may be used on a single network. The choice is often determined by whether the building (or buildings) in which the network is being installed is new construction, or is an existing building. The following paragraphs describe some of the advantages and disadvantages of each type of cable routing.

Under-floor Routing: For under-floor routing, the cable can be enclosed within ducts or, with raised flooring, in the "open air." Under-floor systems enclosed in ducts are usually expensive, and while they are better protected against unauthorized taps than are "open air" systems, they often make future expansion of the network more difficult and expensive.

"Open air" under-floor cabling systems usually provide good access, and allow maximum network expansion and flexibility.

Network Cable Installation (continued)

In-ceiling Routing: For in-ceiling routing, network cables are usually supported in troughs or hooks and clamps every 10 or 15 feet. Some advantages of in-ceiling installation are that:

- It provides flexibility.

- Installation can be made at low cost.

- It ensures accessibility to cabling.

Some disadvantages are

- It is impractical for buildings without drop ceilings.

- Working in high ceilings can be hazardous.

- Ceilings often collect dust and other debris.

Surface Duct Routing: Surface ducting for network cabling is usually installed along the baseboards or is attached to walls at desktop height. While surface ducting ordinarily protects cables from both physical and EMI effects, it may also require that Peerlink station devices be positioned near a wall.

Figure 3-8 illustrates the Peerlink module and the location of the network ports. To connect the network cable, first remove the plastic dust cover(s) on the TIWAY Peerlink network port connectors. Next, carefully insert the cable connector into the port. Be sure to secure the cable by tightening the screws on either side of the connector.

Figure 3-8 provides a pin diagram for the Peerlink interface on the module.
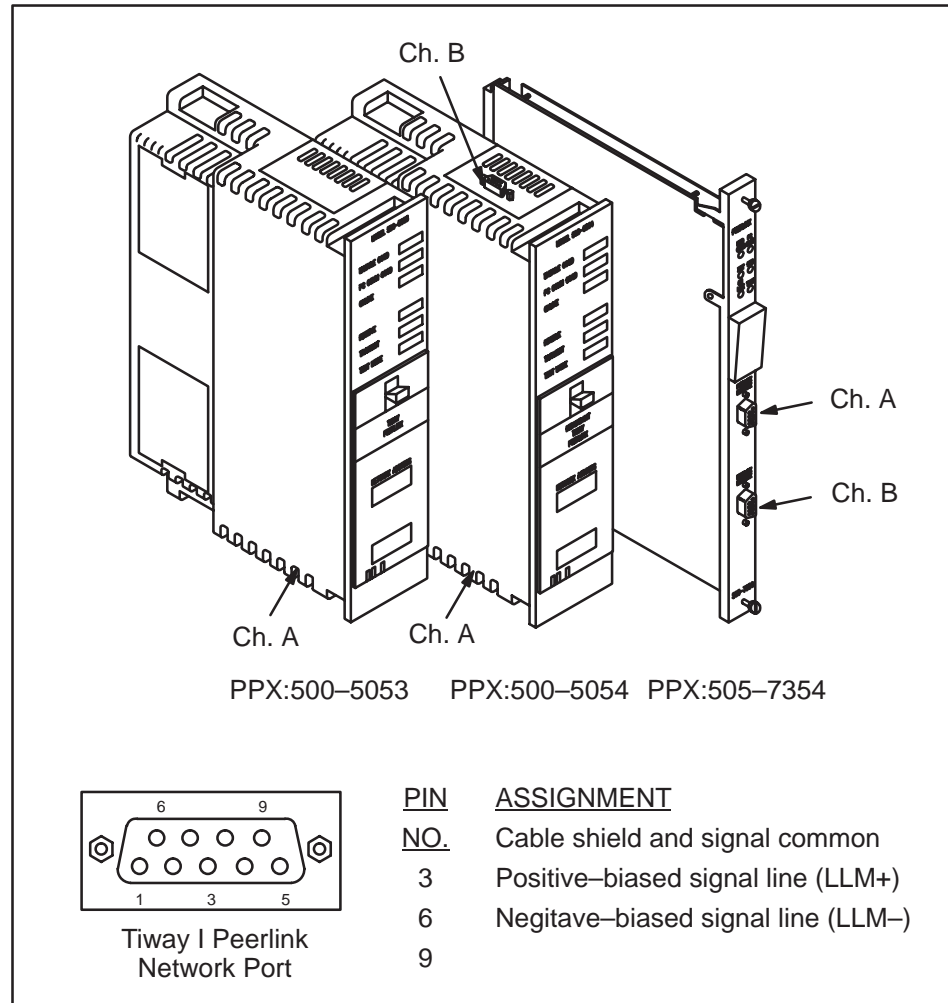
Figure 3-8   Location and Pin Connections for TIWAY Peerlink Network Ports

3.7 Checking That the Module is Logged In

3.7.1
Updating the I/O Configuration Definition

After inserting the module into the base, update the I/O configuration in the controller. If any module is statically logged in on a TI530 Class P/C, the Peerlink module will not automatically be logged in. A VPU or other programming device must be connected to the controller to register and verify controller module communication.

3.7.2
Selecting the I/O Configuration

With your VPU or other programming device, select the I/O Configuration option. For example, if you have the module inserted into the first slot of the first I/O base, configure it as displayed in Figure 3-9. Refer to the manual that came with the programming device for instructions.

I/O Address
The Peerlink module is logged in as three input words (WX) and five output words (WY).

Base Number
Displays number of the current base.

I/O MODULE DEFINITION FOR :   CHANNEL 1   BASE 00

Slot	I/O Address	Number of Bit and Word I/O				Special Function
		X	Y	WX	WY	
1	 0001	 00	.. 00	.. 03	.. 05	.... Yes
2	 0000	 00	.. 00	.. 00	.. 00	.... No
3	 0000	 00	.. 00	.. 00	.. 00	.... No
4	 0000	 00	.. 00	.. 00	.. 00	.... No
5	 0000	 00	.. 00	.. 00	.. 00	.... No
6	 0000	 00	.. 00	.. 00	.. 00	.... No
7	 0000	 00	.. 00	.. 00	.. 00	.... No
8	 0000	 00	.. 00	.. 00	.. 00	.... No

Slot Number
Install the Peerlink into any available I/O slot.

SF Module
The Peerlink is a SF Module. The default for this definition is **NO**.

Figure 3-9   Sample I/O Definition Chart

3.7.3
Viewing the I/O Configuration Chart

Use SHOW to view the I/O Configuration Chart. If the Peerlink module is installed in slot 1, for channel 1, base 00, the I/O chart will appear as displayed in Figure 3-10.

I/O CONFIGURATION CHART FOR : CHANNEL 1, BASE 00							
I/O POINTS							
Slot 1 WX001	WX002	WX003	WY004	WY005	WY006	WY007	WY008
Slot 2 00000	00000	00000	00000	00000	00000	00000	00000
Slot 3 00000	00000	00000	00000	00000	00000	00000	00000
Slot 4 00000	00000	00000	00000	00000	00000	00000	00000
Slot 5 00000	00000	00000	00000	00000	00000	00000	00000
Slot 6 00000	00000	00000	00000	00000	00000	00000	00000

Figure 3-10   I/O Configuration Chart

Normal I/O

Once you have plugged in the Peerlink module and connected the cables, you will need to use a SIMATIC® VPU200™ or other programming device to allocate V Memory and to set up any necessary network diagnostics.

WARNING

Be sure there is enough V Memory space allocated for the Peerlink data table in each P/C. Otherwise, Peerlink data in V Memory will write over existing data.

Peerlink logs into normal I/O as three input words (WXs) and five output words (WYs). The three input words contain network status information. The first two output words describe the starting address of the V Memory table containing the network data. The last three output words are not used.

4.1   Beginning Network Operation

The two output words which are used in Peerlink modules are described here first because after the output words are set, the network will begin transmitting data. You can then use the input words (WX1, WX2, and WX3) to check network operating status.

4.1.1
Output Word WY4

This 16-bit word is for use with the 560 Class P/Cs only. There is no WY4 in the 525 and 535 P/Cs. In all other P/Cs it must be set to zero.

4.1.2
Output Word WY5

Output word 5 is the starting address of the V Memory table allocated to the Peerlink network in each P/C. Data written to V Memory are read during each network scan and P/Cs on the network update their data tables accordingly.

Output words WY4 and WY5 comprise a 32-bit address for V Memory starting address. Model 560 Class P/Cs require all 32 bits (the double-precision display format) to address all of their V Memory. 530 Class P/Cs only require 16-bit V Memory address, so on these models, WY4 must be set to zeroes. To understand the double-precision method of representing a 32-bit address, you should refer to the *565 Program Design Guide* (Manual No. 565-8102).

The starting address for the V Memory table must be chosen based on the smallest memory capacity CPU on the Peerlink network. You should not use address V4095 when the P/C has only 4,096 memory locations.

After you have inserted the Peerlink module, set the dipswitches, installed the network cables, applied power, and set the output word values, the Peerlink network should automatically begin working. For example, if you put integer value 100 in WY5, data would start logging in at V100 and you would see network operation begin. When this occurs, the MODULE GOOD, P/C COMM GOOD, and ONLINE indicators should light, and the RECEIVE and TRANSMIT indicators should both light. The only indicator which should not be lit is TEST MODE. If this is not the case, you should refer to the Troubleshooting section of this manual.

4.2   Network Status Words

To check the operation of all the Peerlink modules on the network, you should use input words WX1, WX2, and WX3 (network status words) as described in the following sections and in the application examples in Appendices B and C.

**4.2.1
Input Word 1
(WX1)**

Input word 1 defines which stations are active on network communication channel A. Bit 1 corresponds to network address 1, bit 2 to network address 2, and so on.

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1

Figure 4-1   WX1 Bit Addresses

By looking at this input word, you would be able to tell the network addresses 1, 2, 3, 5, 6 and 7 are active on the network.

Each of these bits represents a corresponding network address which is operating on the network. Suppose that you have a network with 16 Peerlink modules installed and connected. All 16 bits in WX1 should be set to "1." If there are any zeroes, you should check to see which network addresses the zeroes correspond to, and make sure that those modules are correctly inserted and that the Peerlink network cables are connected securely. Then look at WX1 again to see if all 16 bits are set to "1."

4.2.2
Input Word 2
(WX2)

Input word 2 defines which units are active on network communication channel B. The only time you should see any "1"s for bits in WX2 is if you are using a Peerlink model PPX:500-5054 and PPX:505–7354 with dipswitch #10 set to "1" (for redundant media).

If you have a four-station network operating normally with redundant media (Model PPX:500-5054 and PPX:505–7354), input words 1 and 2 will look the same:

Channel A

Input Words 1 and 2:

0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1

1   2   3   4
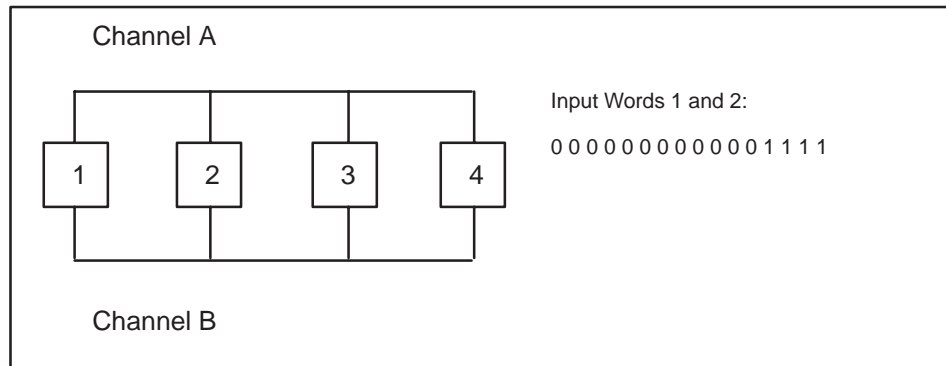
Channel B

If a cable break were to occur between stations 2 and 3 on Channel A, only stations 1 and 2 would appear on Channel A; stations 3 and 4 would have dropped off that channel. All stations would communicate on Channel B. By checking bit 13 of input word 3, you could tell which channel is active.

Channel A

X

Input Word 1:

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1

1
A.M.   2   3   4

Input Word 2:

0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
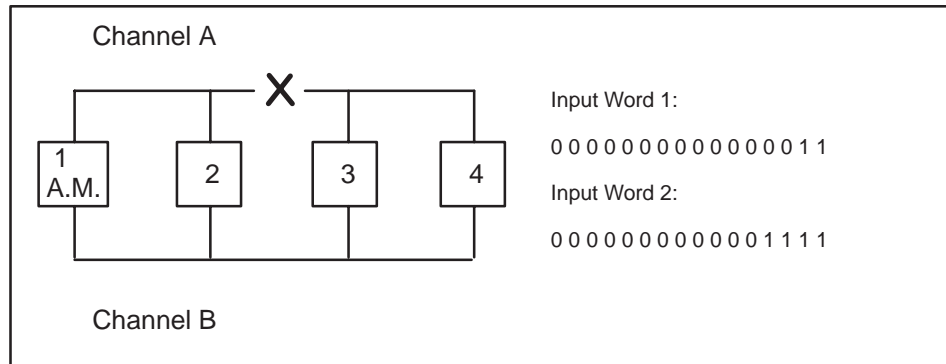
Channel B

Note that with a redundant-media network, if operation is normal, communication will be on Channel A. If there is a cable break or a media failure on one of the channels, stations will run on the channel having the largest number of active stations.

**4.2.3
Input Word 3
(WX3)**

Input word 3 shows several pieces of information as shown in
Figure 4-2.

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│  MSB                                                           LSB     │
│                                                                       │
│  16    15   14   13   12   11   10   9    8   7   6   5    4   3   2   1│
│                                                                       │
│   └─────┘    │    │    └──────────────┘    └──────────┘    └──────────┘│
│                                                                       │
│    Error                  Passive              Active Moni-   Module's │
│    Code                   Monitor Sta-         tor    Station Station Ad-│
│                           tion Address         Address       dress    │
│                                                                       │
│         Single (0) or Re-                                             │
│         dundant (1) Me-                                               │
│         dia                                                           │
│                                                                       │
│         Comm.   Channel                                               │
│         Currently   Active                                            │
│         (A=0; B=1)                                                    │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
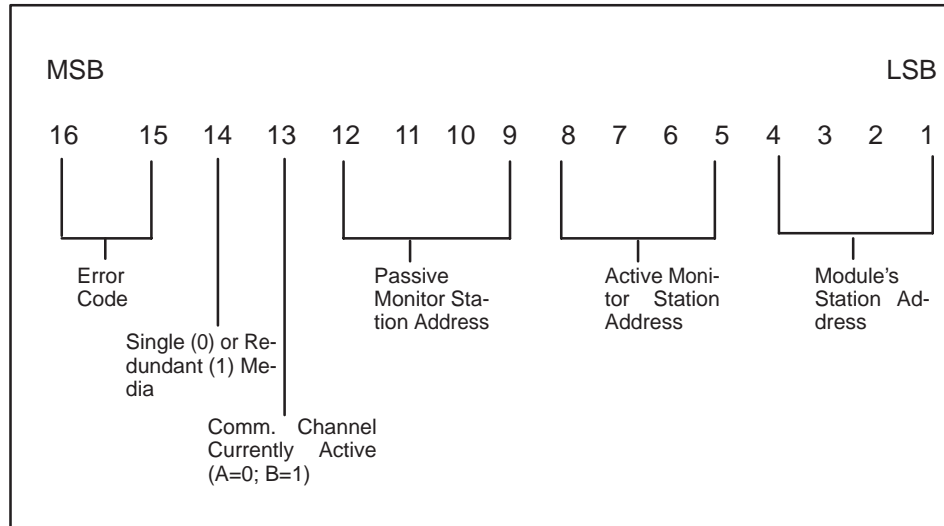
Figure 4-2   Input Word 3 (WX3)

NOTE: The passive monitor may not always appear to be the next highest
network address from the active monitor. The active monitor will designate
as passive monitor the next ACTIVE station which has the next highest
network address at the time of the assignment.

The following sections describe what each of the 16 bits of WX3 signifies and how to interpret the bit values.

4.2.4
Error Code:
Bits 15 and 16

This is an indication from the Peerlink module to the P/C of an incorrect V Memory table starting address. The error codes are defined below:

Bit 16	Bit 15	Meaning
0	0	No error
0	1	V Memory table starting address out of range*
1	0	Unused
1	1	Unused

*__NOTE:__ Error 01 (V Memory table starting address out of range) may occur temporarily (for a few P/C scans) under the following conditions: (1) when the module is powered-up, (2) when RESET is pressed, or (3) when the module is recovering from a fault. Under these conditions, the error message should change to 00 (no error) within the next few P/C scans.

4.2.5
Single/Redundant
Media: Bit 14

This bit reflects the setting of dipswitch 10 on the Peerlink module. If the setting for redundant media is selected, this bit will be a "1"; if a single communication channel is used, the bit will be set to "0". For Model PPX:500-5053 the bit should always be set to "0". Model PPX:500-5054 and Model PPX:505-7354, however, can act with either single or dual communication channels, and bit 14 could be set to either "1" or "0".

NOTE: You cannot mix single and redundant media Peerlink modules on the same network.

4.2.6
Communication
Channel Active:
Bit 13

This bit shows which channel is currently being used for communication. The bit will be set to "0" if Channel A is being used, and it will be set to "1" if Channel B is being used. If bit 14 (single/redundant media) is "0", then bit 13 will also be "0".

Network Status Words (continued)

4.2.7
Passive Monitor
Address: Bits 9–12

These 4 bits define the station address of the Peerlink module that is the passive monitor.

NOTE: When using redundant communication channels, since there is no passive monitor option, these 4 bits will show the same address as the active monitor.

4.2.8
Active Monitor
Address: Bits 5–8

These 4 bits define the station address of the Peerlink module that is the active monitor.

4.2.9
Station's Own
Address: Bits 1–4

These 4 bits define the station's own network address.

You should check all of the bits in input words 1, 2, and 3 to verify that they reflect the dipswitch settings you have selected for each Peerlink module.

Diagnostic Tests and Troubleshooting

5.1 Diagnostic Tests

There are several test modes built into the Peerlink module software.

- Power-up/reset
- Continuous (run-time)
- User-selected.

The following sections describe each test mode.

5.1.1
Power-Up Test

This test executes the initialization routine following a reset. Whenever the module is powered-up to reset, it will run through this test routine to make sure that the module hardware is operating properly. While the tests are executing, all of the front panel indicators light. If the tests are all passed successfully, the MODULE GOOD indicator lights, and the TEST indicator goes out. The P/C COMM GOOD indicator will be on only if the V Memory starting address is valid and the P/C has logged the module into its base.

The diagnostic tests include a RAM data and address verification test, a ROM test using an error-checking routine, a P/C to Peerlink communications test, and a communications controller test. The communications controller test is internal and does not send any signals out to the network; therefore, it will not disrupt communication between other modules on the network.

If the Peerlink module cannot pass one of these tests, the TEST indicator will light and the module will go into an idle state until RESET is pressed. When you press RESET, the module will repeat the power-up diagnostic routine.

5.1.2
Operational
Diagnostic Test

This test executes during all normal modes of the Peerlink module's operation, off-line or on-line. This diagnostic does not disturb normal operation of the network.

If a problem is detected during the operational diagnostics, the module will restart itself and run power-up diagnostics.

An operational diagnostics failure is treated in the same way as a power-up test failure.

5.1.3
User-Initiated
Diagnostic Test

You may wish to run the user-initiated test, which is a more extensive diagnostic routine than the other two tests described earlier, as part of a preventive maintenance program. You should only run the test when the Peerlink module is off-line, since the test will disrupt the system operation.

CAUTION

Remember to physically disconnect the Peerlink module from the network before starting the user-initiated diagnostic test. Failure to do this will cause a temporary communication error on the network.

To run the user-initiated test, disconnect all of the network connections from the module. Open the front access door and place the RUN/TEST mode switch in the position for TEST mode. Press RESET. The test will begin executing. See Figure 5-1.

This test will perform both internal and external loopback, jabberstop, and baud rate sub-tests to each channel. If a media card in the Peerlink module communications is faulty, the test will fail.

While the user-initiated diagnostic test is running, the TEST indicator will be lit and all other indicators will be off. If the test has been completed successfully, all the indicators will flash in unison three times. Then, if all indicators except for ONLINE stay lit while TEST flashes, the Peerlink module has passed the diagnostic routines. The module will not resume operation, however, until you re-connect the network cables, place the RUN/TEST switch in the RUN mode, and press the RESET button on the module. After RESET is pressed, Peerlink will go through the power-on diagnostic routine described earlier in this section.

MODULE GOOD

P/C COMM GOOD

ONLINE

RECEIVE

TRANSMIT

TEST MODE

Reset

Run/Test

PPX:500–5053 and PPX:500–5054

PEERLINK

MOD PC
GOOD GOOD

XMT REC

ON TEST
LINE

RUN

TEST

Run/Test

RESET

Reset

PEERLINK
NETWORK

PEERLINK
NETWORK

505–7354

PPX:505–7354
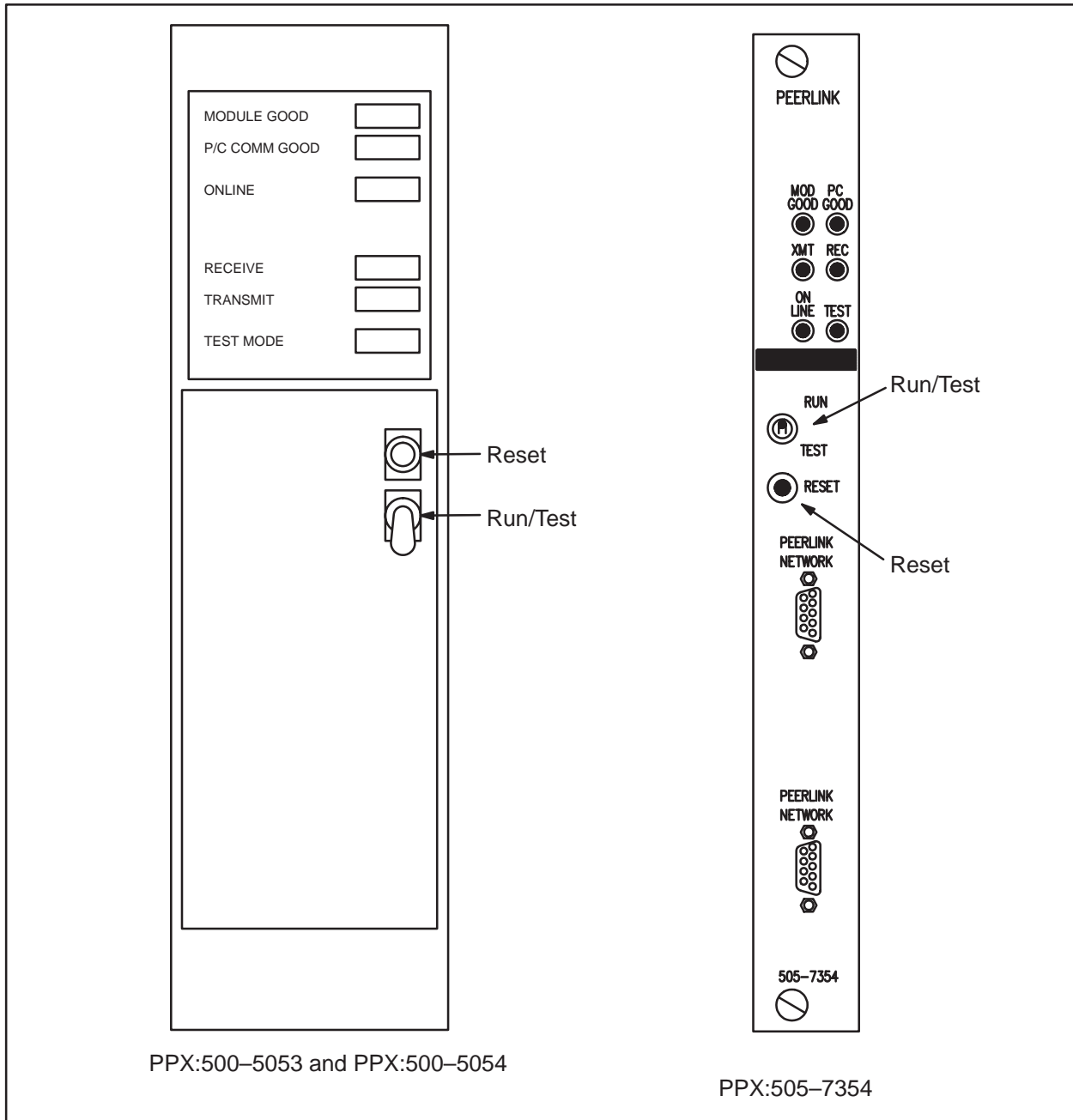
Figure 5-1   Peerlink Diagnostic Test Switches

If the Peerlink module fails one of the user-initiated diagnostic tests routines, the front panel indicators will light as described in the following.

LED	Description
MODULE GOOD	Lights when the module passes the ROM and RAM integrity tests.
P/C COMM GOOD	Lights when the module passes the communications integrity tests.
TRANSMIT	Lights (with the RECEIVE LED) when Channel A passes the integrity tests.
RECEIVE	Lights when Channel B passes the integrity tests.

When the TEST indicator begins flashing, the user-initiated diagnostic routing is complete. If the Peerlink module fails more than one test, more than one indicator will be off.

In the power-up diagnostic routine, the user-initiated test, and the operational test, the outcome of the P/C COMM test depends upon the status of the P/C. If the P/C is in a fatal error mode, the Peerlink module interprets this as a P/C COMM test failure. If the P/C COMM indicator is off at the end of the test, before assuming that there is really a P/C COMM error, you should make sure that:

- V Memory starting address is valid

- P/C is not in a fatal error mode

- Connection between the module and the P/C is secure (Check that any keys used are in the proper slot in the base, and that the module is firmly seated and latched in place)

The tools used in troubleshooting with the Peerlink module are the six indicator lights, the three normal I/O input words (WXs) sent to the P/C, and P/C auxiliary functions. By checking the network status bits (WXs) when you first set up the Peerlink network, you may be able to detect and solve configuration problems quickly.

Before attempting to use a Peerlink network, you should check that the following things have been done:

- All Peerlink modules should match in their settings for either single or redundant communication channels; all stations should be set up the same way.

- Communication cables should be set up so that all Channel A ports are connected only to other Peerlink Channel A ports; Channel B ports to Channel B ports. Do not crosswire the channels.

- Each module should have a unique network address.

- There should be only one active monitor on any Peerlink network.

Table 5-1 below lists some problems which you might encounter, with possible remedies.

Table 5-1   Peerlink Troubleshooting Chart

Symptom	Possible Problem	Solution
Module passes power-up test; MODULE GOOD light is on, but P/C COMM GOOD is off.	V Memory offset words (WYs to the module) have not been initialized or are set to an invalid value (zeroes, for example).	Determine the block of V Memory where the Peerlink module should write, and set the output words (WYs) so that they reflect the starting address of the data table. See page 4-3 of this manual.

Table 5-1   Peerlink Troubleshooting Chart (Continued)

Symptom	Possible Problem	Solution
Module passes power-up test; MODULE GOOD light is on, but P/C COMM GOOD does not come on for several seconds.	If you have pressed RESET, it may take the module several scans to log itself back in.	This is normal. It may take the P/C COMM GOOD indicator a few seconds to light.
P/C COMM GOOD indicator stays off.	The Peerlink module may be in a distributed base. It should be in the local I/O base. or Module not logged into I/O configuration table.	Move Peerlink to the local base. Set the appropriate V Memory output words (WYs) for the new slot location. or Log in the Peerlink module.
MODULE GOOD, RECEIVE, and P/C COMM GOOD light, but TRANSMIT stays off.	Peerlink station has the same address as the active monitor.	Check dipswitch settings for network address; change as necessary.
TRANSMIT or RECEIVE indicators flash.	Excessive communication errors are occurring because of an improperly terminated line.	Check that terminating resistors are installed properly. See page 3-13 of this manual
Module GOOD and P/C COMM indicators are on; all others are off.	No network communication is taking place.	Check to see that all modules are connected correctly, that station numbers are unique, and that exactly one module is selected as the active monitor.

Table 5-1   Peerlink Troubleshooting Chart (Continued)

Symptom	Possible Problem	Solution
RECEIVE or TRANSMIT indicators are not lit after user-initiated diagnostic test.	User-initiated diagnostic test may have been run while the module is connected to the network.	Disconnect module from network; re-run diagnostic test.
Module stays in a loop: resetting, running diagnostics, resetting.	Switch-selected active monitor on single channel is alone on the network.	This is normal operation. The active monitor will continue to reset until some other station responds to its communications.
Module fails the power-up test. Pressing RESET takes 10 seconds to be recognized	No communication with P/C	Check P/C GOOD light on the P/C. If light is off, re-check the connection between the Peerlink module and the base.
P/C GOOD light goes out or a memory scramble condition occurs in the P/C.	Peerlink module was inserted or removed with the power on.	Power the P/C down; disconnect P/C battery; insert Peerlink module with the power off. Reload the P/C program.
Bits 5-8 of input word 3 (active monitor address) appear as 0000.	No active monitor has been selected; bits 5-8 will default to zeroes.	Set dipswitch on the active monitor station designating it as the active monitor.
Bits 15 and 16 of input word 3 show error code 01 (V Memory table starting address out of range); active/passive monitor addresses are invalid.	If V Memory starting address is invalid the active/passive monitor addresses may also be invalid. A Peerlink station with an invalid V memory starting address does not take part in the network scan.	Correct the V Memory starting address.

Table 5-1   Peerlink Troubleshooting Chart (Continued)

Symptom	Possible Problem	Solution
All indicators and normal I/O words appear normal, but no data appears to be transmitted.	You may be trying to write data to an address which is "receive" only.	Check your data table and transmit data only in the 16-word block associated with your module.
	or	
settings	You may have two stations set to the same address.	Verify the address on each Peerlink.
	or	
	You may have the dipswitches set incorrectly.	Verify the dipswitch settings.

Chapter 6
Technical Assistance

Technical Assistance	If you need additional help, or information, contact your Siemens Industrial Automation, Inc. distributor or sales agent. If you need assistance in contacting your distributor or sales office in the United States, call 800–964–4114. If additional technical assistance is needed, call the SIA Technical Services Group in Johnson City, Tennessee at 615–461–2522.
Other Relevant Documents	Other manuals which you may find helpful to refer to are listed below, with manual numbers.

SIMATIC TIWAY I Systems Manual	PPX:TIWAY-8101
SIMATIC TI520 User's Manual	PPX:520-810
1	
SIMATIC TI530 User's Manual	PPX:530-810
1	
SIMATIC TI560/TI565 User's Manuals	PPX:560/565-
8105	
SIMATIC TI520C/TI530C/TI530T Manual Set	2462158–002
6	
VPU200™/TI520/TI530C/TI525 Programming Manual	PPX:530–811
6	
SIMATIC TISOFT2™ TI560/TI565 User's Manual	PPX:TISOFT
2–8102	
SIMATIC TI520/TI530/TI530C TISOFT3™ User's Manual	PPX:TISOFT
3–8102	
SIMATIC TI560/TI565 TISOFT3 User's Manual	PPX:TISOFT
3–8104	
TISOFT1™ & 2 Rel. 2.0 User's Manual	PPX:TS1&2–
8101	
VPU200 User's Manual	PPX:VPU200
–8102	

Systems Configuration Forms
for TIWAY Peerlink Network

It is important to keep complete, up-to-date records on system configuration. Below are some sample record-keeping forms for use with a TIWAY Peerlink Network. These may be photocopied.

Type of Peerlink Used
(Redundant or Non-redundant Media):_____

Table A-1   System Configuration

P/C Type or Reference	Peerlink Base/ Slot No.	Network Address	# of Words Transmitted	Active/ Non-Monitor

Table A-2   V Memory Table Allocation

Network Address: _____
V-memory Table Starting Address:_____

	V Memory Locations	Comments
Network Address		
Network Address		
Network Address		

Appendix B

Network Set-Up Example

B.1   Introduction

This section contains a simple example of how to set up a two-station Peerlink network. The example will take you through all of the initialization steps outlined in this manual.

You may wish to refer to the TI520C/TI530C/TI530T Manual Set (Manual No. 2462158–0026) and the VPU200/TI520/TI530C/TI525 Programming Guide (Manual No. PPX:530-8116) if you need specific information about the TI530T P/C or about the VPU200.

For this example, the following assumptions are being made:

- The single communication channel option is being used on both Peerlink modules.

- You need to transmit 4 words of data.

- Peerlink station #1 is assigned network address 1 and Peerlink station #2 is assigned network address 2. Station #2 should be the switch-selected active monitor.

- Each Peerlink module is placed in slots 1 and 2 of the local I/O bases for two TI530T P/Cs.

You should designate in the space provided on the front label of each Peerlink module the network address assigned to that module.

Before you insert a Peerlink module into the I/O base, first determine which 2 adjacent slots the Peerlink module will occupy on the I/O base, clear output words (WYs) or force them to zeroes, and power-down the I/O base of the P/C. This is performed to prevent erroneous network operation prior to actual initialization.

WARNING   **To minimize the risk of potential electrical shock hazard, disconnect power to the P/C before you insert or remove Peerlink modules from the I/O base.**

B.2   Installation

B.2.1
Inserting the
Module

Place each Peerlink module into slots 1 and 2 of the I/O bases for both TI530T P/Cs as described in the Installation section of this manual.
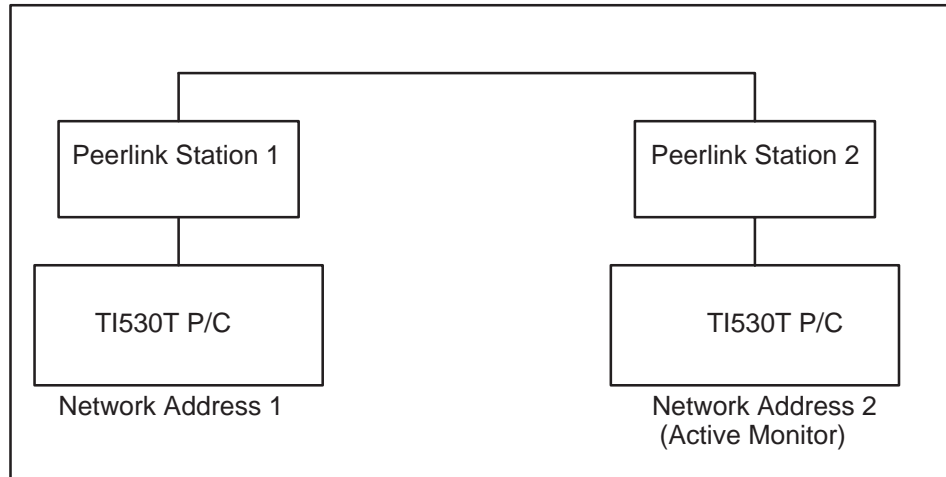
B.2.2
Setting the
Configuration
Dipswitches

Since this network is using the single communication channel option, and network address #2 has been designated as the active monitor, you would set the configuration dipswitches as shown below:
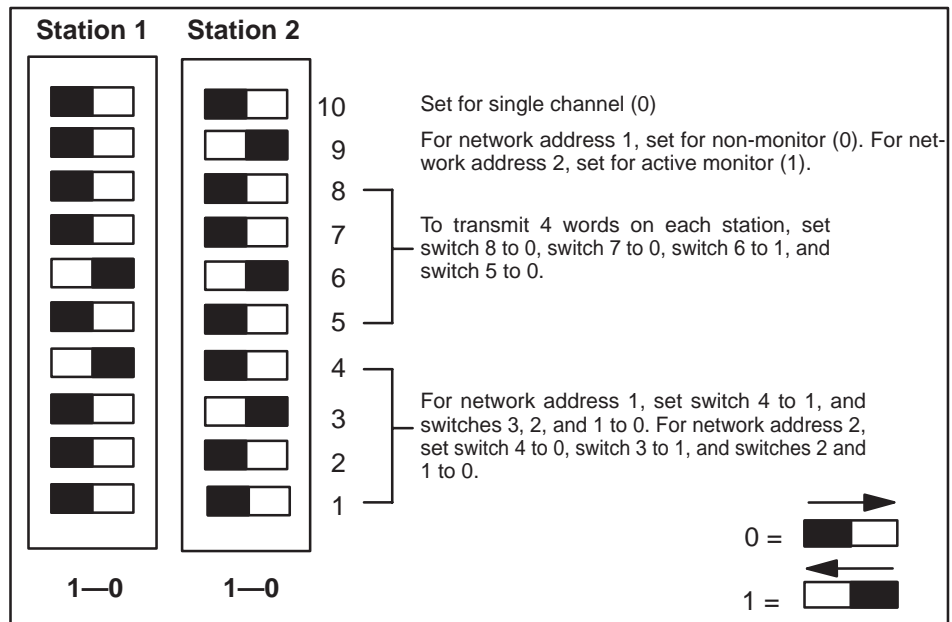
Installation (continued)

B.2.3
Connecting
Network Cables

Once the dipswitches on each module have been set, connect the modules on the Peerlink network by plugging in the 9-pin cable connectors to each Peerlink module. Since you are only using one communication channel, you will only need to connect one 9-pin connector (into Channel A, which is located on the bottom of the module).

B.2.4
Powering-Up
the Module

After the network cables have been connected, apply power to the P/C. The module will go through its power-up diagnostics. When the diagnostics are complete, the TEST indicator light will go out and MODULE GOOD will be lit.

B.2.5
Checking That
The Module

Is Logged In

Using TISOFT or a VPU200, perform a "read base" to see if the Peerlink module is logged into the memory of the P/C. If you

inserted a Peerlink module in slots 1 and 2 of each 530T I/O base, you would see a display on the VPU similar to Figure B-1.

I/O MODULE DEFINITION FOR : CHANNEL 1   BASE 00

Slot	I/O Address	Number of Bit and Word I/O				Special Function
		X	Y	WX	WY	
1	 0001	 00	.. 00	.. 03	.. 05	.... Yes
2	 0000	 00	.. 00	.. 00	.. 00	.... No
3	 0000	 00	.. 00	.. 00	.. 00	.... No
4	 0000	 00	.. 00	.. 00	.. 00	.... No
5	 0000	 00	.. 00	.. 00	.. 00	.... No
6	 0000	 00	.. 00	.. 00	.. 00	.... No
7	 0000	 00	.. 00	.. 00	.. 00	.... No
8	 0000	 00	.. 00	.. 00	.. 00	.... No

Figure B-1   Logging the Peerlink Module

Peerlink modules log into normal I/O as three input words (WXs) and five output words (WYs). You can access the WXs to obtain network status information. Before you read the WXs, however, you should set up WY4 and WY5 (the output words) and the V memory data table.

**B.2.6
Setting the
Output Words**

The output words WY4 and WY5 are used to define the starting address of the V memory table allocated to the Peerlink network in each P/C. For TI530Ts, only WY5 is used; WY4 should be set to zeroes. For each P/C on the network, you need to specify a sequential block of V memory words equal to 16 times the highest network address. For this example, in which the highest network address is 2, you need to allocate 32 words of V memory in each TI530T. If you defined the V memory table starting address for station 1 as V150 by forcing WY5 to 150 in P/C #1, and for station 2 as V250 by forcing WY5 to 250 in P/C #2, the chart below would illustrate the organization of the V memory tables. For example, if you wrote the value 333 to V150 in P/C #1, you would see 333 appear in V250 in P/C #2. If you wrote the value 777 to V266 in P/C #2, you would see 777 appear in V166 in P/C #1.
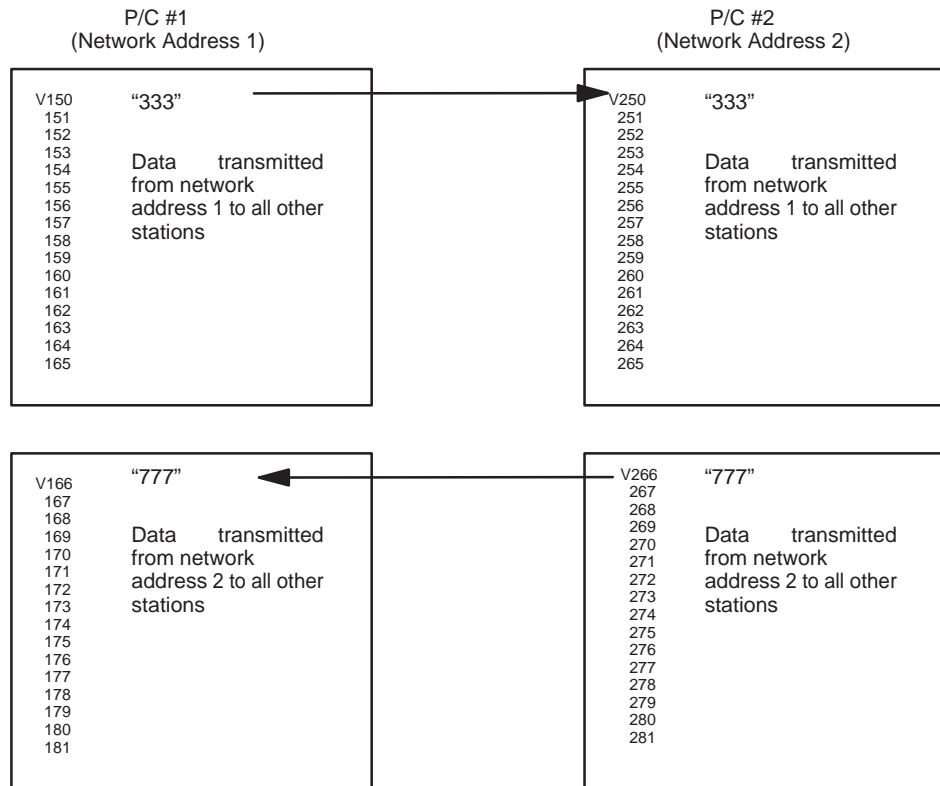
As soon as the output words are set, Peerlink modules begin transmitting data on the network. You should see all indicators except for TEST MODE illuminated.

Installation (continued)

B.2.7
Checking
Network Status

You should now be able to use the three input words to check
the status of the network and the module. Input words 1 and 2 (WX1,
WX2) show which units are active on network communication channels A
and B, respectively. WX3 gives all address information (for the active and
passive monitors, and for the Peerlink module itself), identifies which
communication channel is currently being used by a particular Peerlink
module, shows whether the single or redundant media option is being used,
and shows any error codes.

For example, for the two-station network described earlier, WX1 would look
like this (only the values of the bits will appear on the VPU screen):

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Since stations 1 and 2 are both active on Channel A, and the single
communications channel option is being used, the only 1s which would
appear on the screen would be for bits 1 and 2. WX2 would be all zeroes,
since there is no communication on Channel B.

For station 1, WX3 would look like this:

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1

No Errors — Channel A — Single Channel — Passive Monitor Address — Active Monitor Address — Module Network Address

For station 2, WX3 would look like this:

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0

No Errors (bits 16, 15)

Single Channel (bit 14)

Channel A (bit 13)

Passive Monitor Address (bits 12–9)

Active Monitor Address (bits 8–5)

Module Network Address (bits 4–1)

In this example, since station 2 was designated as the active monitor, station 1 then became the passive monitor. If station 2 were to fail for any reason, station 1 would take over the role of active monitor until station 2 recovered.

Appendix C
Programming Examples with Dual or Single Communication Channels

C.1 Introduction

This section contains two programming examples which illustrate how to use Peerlink network diagnostics using the three normal I/O status words. The first programming example is designed for a Peerlink system with dual communication channels; the second is designed for a system using a single communication channel.

Status Words

There are three words of module and network status information reported to the P/C from the Peerlink module. These are normal I/O words 1, 2, and 3 which are described in this manual beginning on page 4-4. You can use these status words as valuable diagnostic tools. For instance, you can use them when debugging your system (to locate such things as configuration or cable problems). You can also use them during normal operation to ensure that all stations are active and working properly. They can indicate a station which is down or help pinpoint a cable break, and allow your system to act on this information accordingly.

Once the Peerlink network has been installed and is running, it will continue to run with little intervention from either the ladder logic or the operator. In many applications no checking need be done by the ladder program. In some applications, the program designer may wish to incorporate checks in the ladder logic program to give an indication of the network status. The following sample programs illustrate how these status words might be used to verify the operation of the module, the status of the network, and the status of each Peerlink module on the network.

The format of the three normal I/O words is repeated here for reference:

	MSB															LSB
BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Figure C-1   Input Word 1 (WX1)

Each of these bits represents a corresponding network address which is active on the network on Channel A. This example shows network addresses 1, 2, 3, 4, 5, 6, 7 and 8 active on the network on Channel A.

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Figure C-2   Input Word 2 (WX2)

Each of these bits represents a corresponding network address which is active on the network on Channel B. If you are using single media, then all zeroes should appear in this word. If everything is operating normally and you are using redundant media, Input Word 1 should look exactly like Input Word 2. A difference in these two words would indicate a cable break or a station which is down.

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0

No Errors — Dual Channel — Channel A — Passive Monitor Address — Active Monitor Address — Module Network Address

Figure C-3   Input Word 3 (WX3)

C.2   Example #1: Dual Communication Channels

This program performs two functions:

- It verifies that the module is set up correctly by checking the network address, V Memory starting address, and redundant media setting.

- It verifies that each station which should be active on the network is logged in on the active channel lists (status words 1 and 2). If the correct bit is not set, indicating that the module being read is not active on the network, then the data for that module will not be valid.

**C.2.1
Network
Configuration**

This program is designed for 8 stations with network addresses 1, 2, 3, 4, 5, 6, 7, and 8. Status words 1 and 2 should look the same as those shown above if everything is operating correctly.

For simplicity, this program will run in the P/C at network address 2 (station 2), although you may want to modify this to run in every P/C on your network. In addition, the following assumptions have been made in this program:

- The active monitor will be selected as network address 1.
- Dual communication channels are connected to all modules.
- Station 2 will be located in Base 0, slots 1 and 2, with its I/O address starting at WX1.
- The starting address of the V Memory table in station 2 will be V1.

**C.2.2
Program
Operation**

This program is designed to first load the value of the V Memory starting address (V1) into WY4 and WY5. With 8 active stations this will allocate a block of 128 V Memory locations in station 2 (V1-V128).

The next step will be to ensure that the module (station 2) has been set up correctly by checking for proper network address, V Memory starting address and redundant media setting. The way to do this is by using status word 3 (WX3), and by masking off the bits which are not important for information at the moment – bits 5-13. The result of WX3 after the unused bits are cleared is then compared with the expected WX3 value. C1 is turned on if the module configuration is correct; therefore, it can be used as an indicator that the module has not been configured correctly.

If the module configuration is correct, WX1 (network active list for Channel A) is compared against the expected active list (V304). If this is correct, C3 is turned on. If C3 is off, this indicates that at least one Peerlink module has logged off Channel A.

In using redundant media, WX2 should also be checked, therefore the next step is to compare the expected active list against WX2. C4 will turn on if this is correct. If C4 is off, this indicates that at least one Peerlink module has logged off Channel B.

While C3 and C4 can be indicators that a station has dropped off the network, it is necessary to determine exactly which station has logged-off or if a faulty or broken connection is causing communication to switch from Channel A to B. The following steps demonstrate this.

Since the network will be running on the channel with the most active stations, it is necessary to check WX3 for operation on Channel A or B. If Channel A is active, the value of WX1 will be loaded into V303 for later comparison. If Channel B is active, the value of WX2 will be loaded into V303. C2 will be turned on if Channel B is active. Since redundant media will normally operate on Channel A this probably indicates a cable problem or partial module failure on Channel A. C2 can therefore be used to indicate a problem on Channel A. A counter may also be included here to record the number of times the network is active on Channel B.

The last step may be skipped (using a JMP statement) if C3 and C4 are on. These last steps are implemented in order to determine exactly which stations are down. They also provide the P/C with the knowledge that it should not use data from the particular station being checked if it is determined not to be active. After determining which channel is active, each station is checked by making sure that the appropriate bit is set in the network active list (**BITP** instruction).

NOTE: The manner in which the TI530 Class P/C reads data is the reverse from Peerlink. For example, in Peerlink, status word 1 looks like this:

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

In using the BITP instruction, bit 1 in Peerlink would be bit 16 for the TI530 Class P/C.

Table C-1   Variables List for Example #1

Data Areas Used	Description
V1-128	Peerlink data table
V300	Mask value for WX3 bits 1110 0000 0000 1111
V301	WX3 after unused bits are cleared
V302	Expected WX3 value 0010 0000 0000 0010
V303	Active station list for active channel
V304	Expected value of active list
C1	Turns on if module configuration is correct
C2	Turns on if Channel B is being used
C3	Turns on if Channel A active list is correct
C4	Turns on if Channel B active list is correct
C5	Turns on if configuration is OK to proceed
C7	Station 1 data valid
C8	Station 3 data valid

C.2.3
Sample Program 1: Checking Configuration with Dual Channel Usage

```
   C51                                                                          C50
───┤/├──────┌──────────────┐──────┌──────────────┐   Set V Memory starting    ─( )─
            │     LDC      │      │     LDC      │   address to V1
            │              │      │              │
            │  A:   WY4    │      │  A:   WY5    │
            │              │      │              │
            │  N = 0       │      │  N = 1       │
            └──────────────┘      └──────────────┘

   C51                                                                          C50
───┤/├──────┌──────────────┐──────┌──────────────┐──────┌──────────────┐      ─( )─
            │     LDC      │      │     BITS     │      │     WAND     │
            │              │      │              │      │              │
            │  A:   V300   │      │  A:   300    │      │  A:   WX3    │
            │              │      │              │      │  B:   V300   │
            │  N = 24591   │      │  N = 1       │      │  C:   V301   │
            └──────────────┘      └──────────────┘      └──────────────┘
```
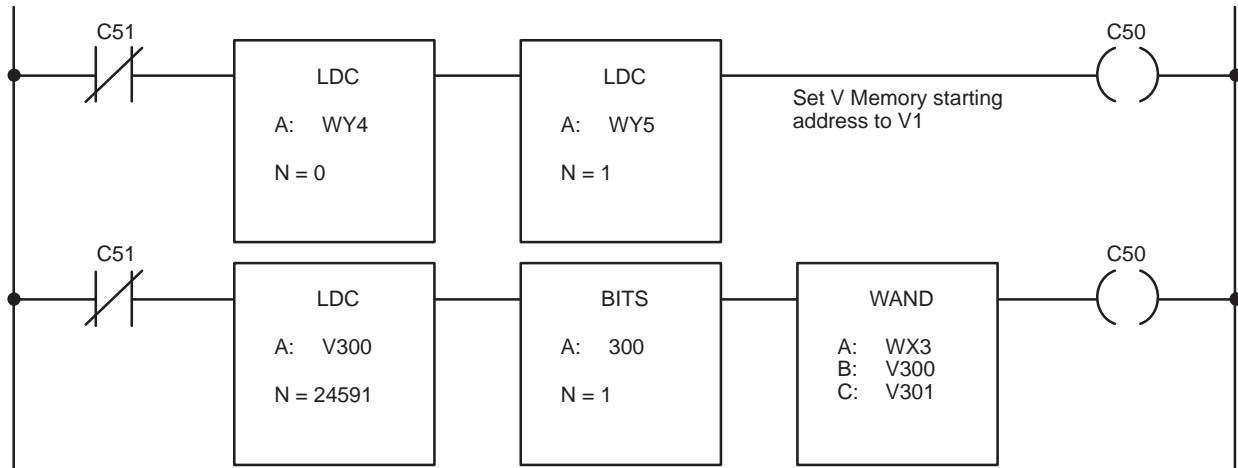
Read WX3 and mask off unused bits for comparision.

```
                            1110  0000  0000  1111
Error Code ─────────────────┘│                ││││
                             │                ││││──── Module Address
Single/Redundant ────────────┘
```

```
   C51                                                                          C1
───┤/├──────┌──────────────┐──────┌──────────────┐   Compare status word to ex- ─( )─
            │     LDC      │      │     CMP      │   pected value.
            │              │      │              │
            │  A:   V302   │      │  A:   V301   │   001X  XXXX  XXXX  0010
            │              │      │  B:   V302   │
            │  N = 8194    │      │              │
            └──────────────┘      └──────────────┘

   C1                                                                           C3
───┤ ├──────┌──────────────┐──────┌──────────────┐   Compare WX1 against       ─( )─
            │     LDC      │      │     CMP      │   expected active list.
            │              │      │              │
            │  A:   V304   │      │  A:   WX1    │   0000  0000  1111  1111
            │              │      │  B:   V304   │
            │  N = 255     │      │              │
            └──────────────┘      └──────────────┘

   C1                                                                           C4
───┤ ├──────┌──────────────┐   Compare WX2 (channel B) against                 ─( )─
            │     CMP      │   same expected active list.
            │              │
            │  A:   WX2    │
            │  B:   V304   │
            │              │
            └──────────────┘
```

```
    C1                                                                    C2
 ───┤ ├──────┌──────────────┐──────────────────────────────────────────( )───
             │     BITP      │   Check the active channel indicator.
             │               │   Turn on C2 if B is being used.
             │   A:   WY3    │
             │               │
             │   N = 4       │
             └──────────────┘

    C1     C2                                                             C50
 ───┤ ├────┤/├────────┌──────────────┐────────────────────────────────( )───
                      │     MOVW      │   Channel A is being used so
                      │               │   read WX1 (channel A active
                      │   A:   WX1    │   list) into V303 for future use.
                      │   B:   V303   │
                      │               │
                      │   N = 1       │
                      └──────────────┘

    C1     C2                                                             C50
 ───┤ ├────┤ ├────────┌──────────────┐────────────────────────────────( )───
                      │     MOVW      │   Channel B is being used so
                      │               │   read WX2 (channel B active
                      │   A:   WX2    │   list) into V303 for future use.
                      │   B:   V303   │
                      │               │
                      │   N = 1       │
                      └──────────────┘

    C1                                                                    C7
 ───┤ ├──────┌──────────────┐──────────────────────────────────────────( )───
             │     BITP      │   If bit set in active list for active channel,
             │               │   then okay to use the data.
             │   A:   V303   │
             │               │
             │   N = 16      │
             └──────────────┘

    C7
 ───┤ ├──────┌──────────────────────────────┐───────────────
             │   Use the data for station #1 │
             └──────────────────────────────┘

    C1                                                                    C8
 ───┤ ├──────┌──────────────┐──────────────────────────────────────────( )───
             │     BITP      │   If bit set in active list for active channel,
             │               │   then okay to use the data.
             │   A:   V303   │
             │               │
             │   N = 14      │
             └──────────────┘

    C8
 ───┤ ├──────┌──────────────────────────────┐───────────────
             │   Use the data for station #3 │
             └──────────────────────────────┘
   Repeat for each station used.
```

C.3   Example #2: Single Communication Channel

This program performs the following functions:

- It verifies that the module is set up correctly by checking the network address, V Memory starting address, and single media setting.

- It checks the active channel bit, since single media should always be running on Channel A.

- It verifies that each station which should be active on the network is logged in on the active channel list (status word 1). If the correct bit for a particular station is not set, then the data for that module will not be valid. This indicates that a station is down or that there is a cable break.

**C.3.1
Network
Configuration**

This program is designed for 4 stations with network addresses 1, 2, 3, and 4. Status word 1 should read:

MSB   LSB

BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

For simplicity, this program will run in the P/C at network address 4 (station 4), although you may want to modify this to run in every P/C on your network. In addition, the following assumptions have been made in this program:

- The active monitor will be selected as network address 1.

- Single communication channels are connected to all modules.

- Station 4 will be located in Base 1, slots 7 and 8 with its I/O address starting at WX113.

- The starting address of the V Memory table in station 4 will be V500.

C.3.2
Program
Operation

This program is designed to first load the value of the V Memory starting address (V500) into WY116 and WY117. With 4 active stations this will allocate a block of 64 V Memory locations in station 4 (V500-V563).

The next step will be to ensure that the module (network address 4) has been set up correctly by checking for proper network address, V Memory starting address, single media setting and Channel A active bit. The way to do this is by using status word 3 (WX115), and by masking off the bits which are not important for information at the moment—bits 5-12. The result of WX115 after the unused bits are cleared is then compared with the expected WX115 value. C1 is turned on if the module configuration is correct; therefore, it can be used as an indicator that the module has not been configured correctly.

If the module configuration is correct, WX113 (network active list for Channel A) is compared against the expected active list (V304.) If this is correct, C3 is turned on. If C3 is off, this indicates that at least one Peerlink module has logged off Channel A.

This last step may be skipped (using a JMP statement), if C3 is on. These last steps are implemented in order to determine exactly which stations are down. They also provide this station with the knowledge that it should not use data from the particular station being checked if it is determined to be inactive. Each station on the network is checked by making sure that the appropriate bit is set in the network active list (BITP instruction).

NOTE: The manner in which the TI530 Class P/C reads data is the reverse from Peerlink. For example, in Peerlink, status word 1 looks like this:

MSB   LSB
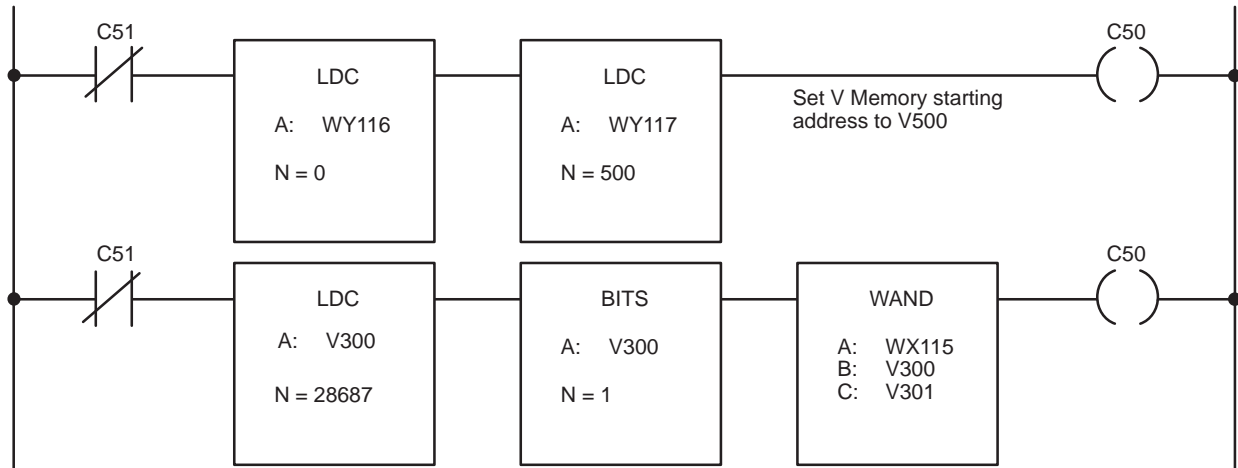
BIT	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
VALUE	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

In using the BITP instruction, bit 1 in Peerlink would be bit 16 for the TI530 Class P/C.

Table C-2   Variables List for Example #2

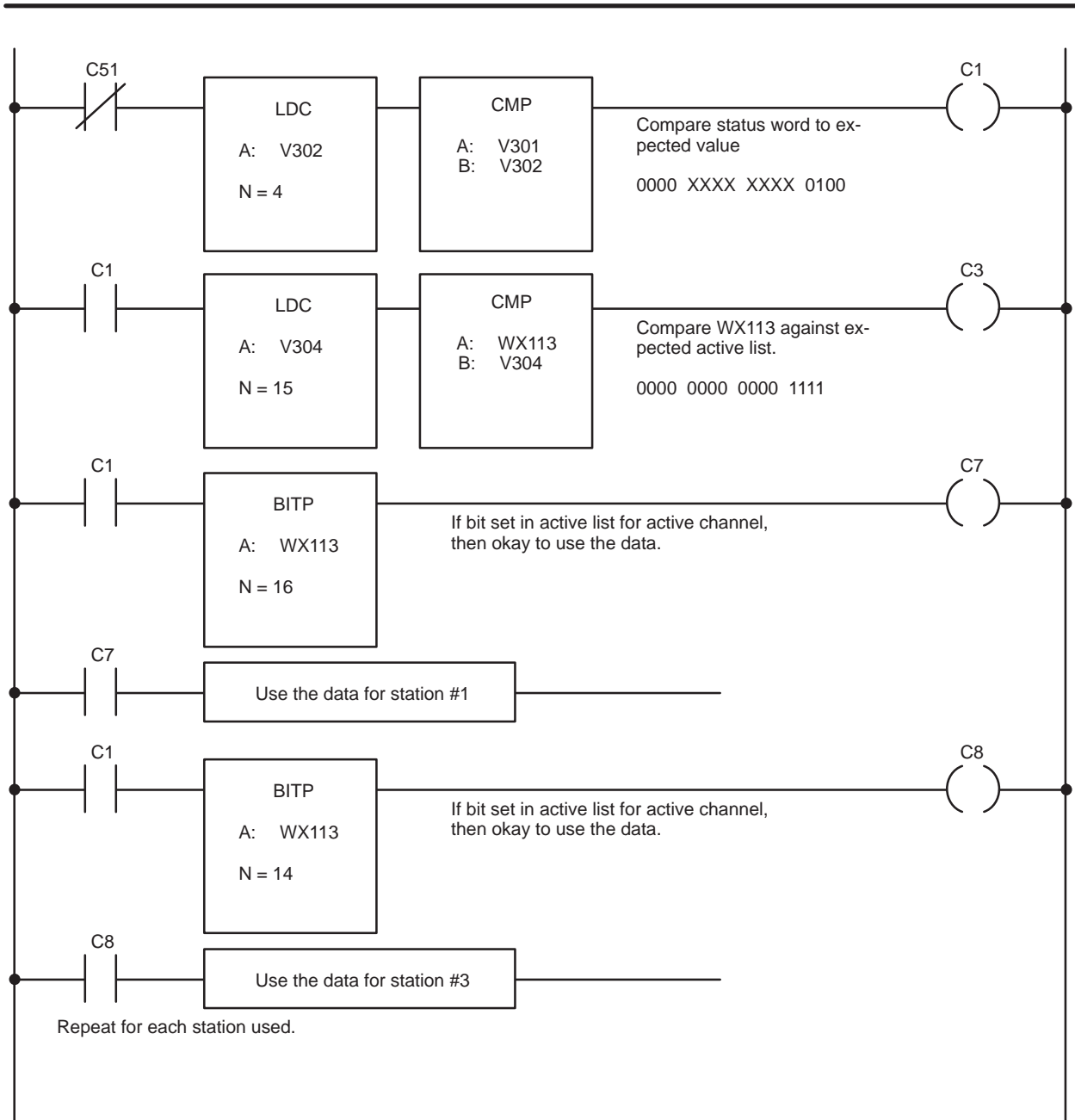| Data Areas Used	Description
V500-V563	Peerlink data table
V300	Mask value for WX115 bits 1111 0000 0000 1111
V301	WX115 after unused bits are cleared
V302	Expected WX115 value 0000 0000 0000 0100
V304	Expected value of active list
C1	Turns on if module configuration is correct
C3	Turns on if Channel A active list is correct
C7	Station 1 data valid
C8	Station 3 data valid
WY116, WY117	V Memory starting address

C.3.3
Sample Program 2:
Checking
Configuration
With Single
Channel Usage

```
      C51                                                                   C50
──────┤/├──────┌─────────────┐──────┌─────────────┐                    ──( )──
               │     LDC     │      │     LDC     │   Set V Memory starting
               │             │      │             │   address to V500
               │ A:   WY116  │      │ A:   WY117  │
               │             │      │             │
               │ N = 0       │      │ N = 500     │
               └─────────────┘      └─────────────┘

      C51                                                                   C50
──────┤/├──────┌─────────────┐──────┌─────────────┐──────┌─────────────┐──( )──
               │     LDC     │      │     BITS    │      │     WAND    │
               │             │      │             │      │             │
               │ A:   V300   │      │ A:   V300   │      │ A:   WX115  │
               │             │      │             │      │ B:   V300   │
               │ N = 28687   │      │ N = 1       │      │ C:   V301   │
               └─────────────┘      └─────────────┘      └─────────────┘
```

Read WY115 and mask off unused bits for comparision.

```
                          1111  0000  0000  1111
                           │││    │                │││
      Error Code ──────────┘││    │                │││
                            ││    │                │││────── Module Address
  Single/Redundant ─────────┘│
                             │
     Active Channel ─────────┘
```

```
        C51                                                                            C1
  ─────┤/├─────┌──────────────┐──┌──────────────┐──  Compare status word to ex-      ─( )──
              │     LDC      │  │     CMP      │     pected value
              │              │  │              │
              │  A:   V302   │  │  A:   V301   │     0000  XXXX  XXXX  0100
              │              │  │  B:   V302   │
              │   N = 4      │  │              │
              └──────────────┘  └──────────────┘

        C1                                                                             C3
  ──────┤├─────┌──────────────┐──┌──────────────┐──  Compare WX113 against ex-      ─( )──
              │     LDC      │  │     CMP      │     pected active list.
              │              │  │              │
              │  A:   V304   │  │  A:   WX113  │     0000  0000  0000  1111
              │              │  │  B:   V304   │
              │   N = 15     │  │              │
              └──────────────┘  └──────────────┘

        C1                                                                             C7
  ──────┤├─────┌──────────────┐──  If bit set in active list for active channel,    ─( )──
              │     BITP     │    then okay to use the data.
              │              │
              │  A:   WX113  │
              │              │
              │   N = 16     │
              └──────────────┘

        C7
  ──────┤├─────┌──────────────────────────────┐──
              │   Use the data for station #1 │
              └──────────────────────────────┘

        C1                                                                             C8
  ──────┤├─────┌──────────────┐──  If bit set in active list for active channel,    ─( )──
              │     BITP     │    then okay to use the data.
              │              │
              │  A:   WX113  │
              │              │
              │   N = 14     │
              └──────────────┘

        C8
  ──────┤├─────┌──────────────────────────────┐──
              │   Use the data for station #3 │
              └──────────────────────────────┘

  Repeat for each station used.
```

System Performance Examples

D.1   Determining Worst Case Total Scan Time

In the simple transfer line application shown in Figure D-1, data is continuously being sent from P/C 1 down the line to other P/Cs. Data is also being sent up the line as feedback information.
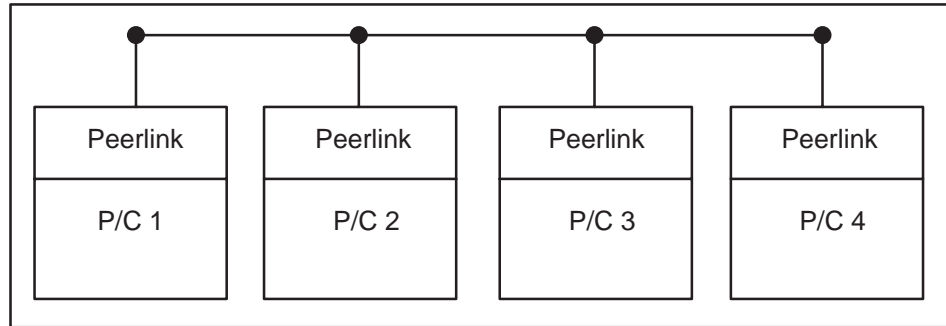
Figure D-1   Simple Transfer Line Application

Assume that this application requires that no more than 150 milliseconds pass from the time that P/C 4 receives some status condition information to the time that information must arrive at all of the other P/Cs. The reason for this is that each P/C may need to act on that information immediately to allow the line to run more efficiently, or to prevent unnecessary waste in case of a fault condition.

The Peerlink network will use 4 stations with 4 words being transmitted from each station. A single communications channel is being used.

The scan time for P/C 4 is 25 milliseconds. The scan time for each of the other P/Cs is 40 milliseconds or less. Referring to the scan time chart in Figure D-2, you can see that 4 stations sending 4 words each yields a network scan of 13 milliseconds.
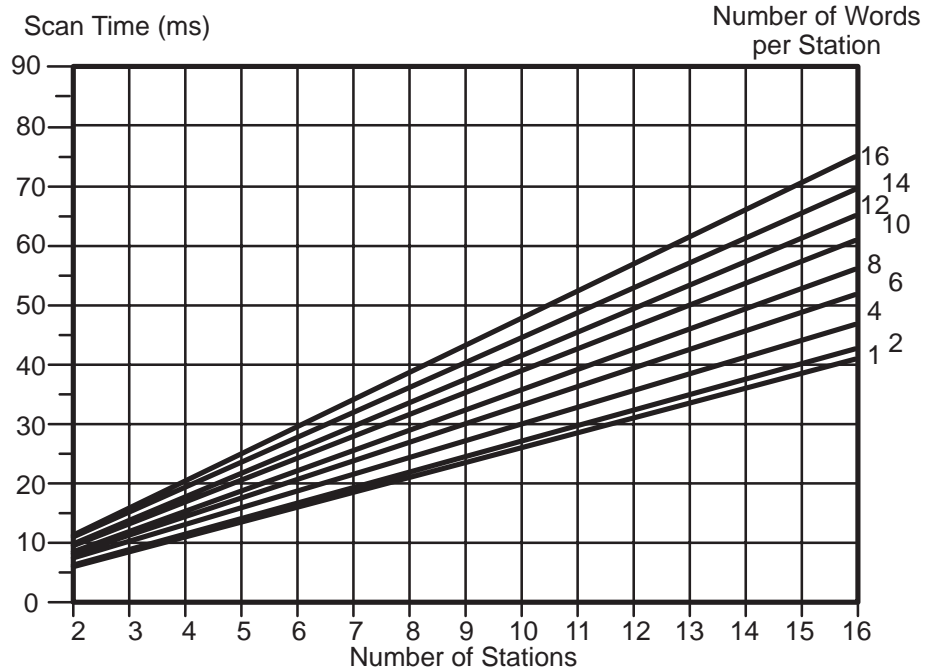
Figure D-2   Single Media Network Scan Time

Total P/C to P/C scan is the time it takes data to be transmitted from P/C to P/C using the Peerlink network as the medium. The formula for calculating this is

Total Scan = $\boxed{\begin{array}{l}\text{1 P/C scan of P/C}\\\text{transmitting data}\end{array}}$ **+** $\boxed{\begin{array}{l}\text{1 network}\\\text{scan}\end{array}}$ **+** $\boxed{\begin{array}{l}\text{2 P/C scans of P/C}\\\text{receiving data}\end{array}}$

Therefore, for this application, total P/C to P/C scan is:

Total Scan = (25 ms) + (13 ms) + (2x40 ms) = 118 ms

This would give you a 21% margin over the worst case timing requirement.

D.2 P/C Interlocking Between P/Cs with Different Scan Times

Peerlink distributes data from each P/C to every other P/C, assuring that the V Memory tables for each are updated with the latest data once per network scan. Since the P/Cs on the network are operating asynchronously and possibly at different rates, some data transmitted may never be seen by another P/C. For example, data being sent from a Peerlink on a fast P/C can be changing so fast that a slower P/C may "miss" some of the values.

In many applications, the data is not changing so quickly and this effect is unimportant. However, in some applications, certain precautions must be taken. Following are two scenarios illustrating two different means of assuring that each P/C is using current data.

D.2.1 Scenario 1

This first scenario simply keeps the data in V Memory constant for several scans, allowing the receiving station time to get the data. The exact time required will depend on the difference between the P/C scans involved.

The ladder logic shown below is for a P/C sending data to a slower P/C. The data to be transmitted has been calculated and placed into locations V300-V315 previously. This data is not moved into the allocated Peerlink V Memory table until a timer has counted down. This timer's preset must be at least equal to the worst case total scan time (1 P/C scan of transmitting P/C + 1 network scan + 2 P/C scans of the receiving P/C). In the example shown below, the transmitting P/C will prevent the slower P/C from missing data by only allowing the data to change once every 200 milliseconds.

Peerlink station #1   V Memory starting address = V1
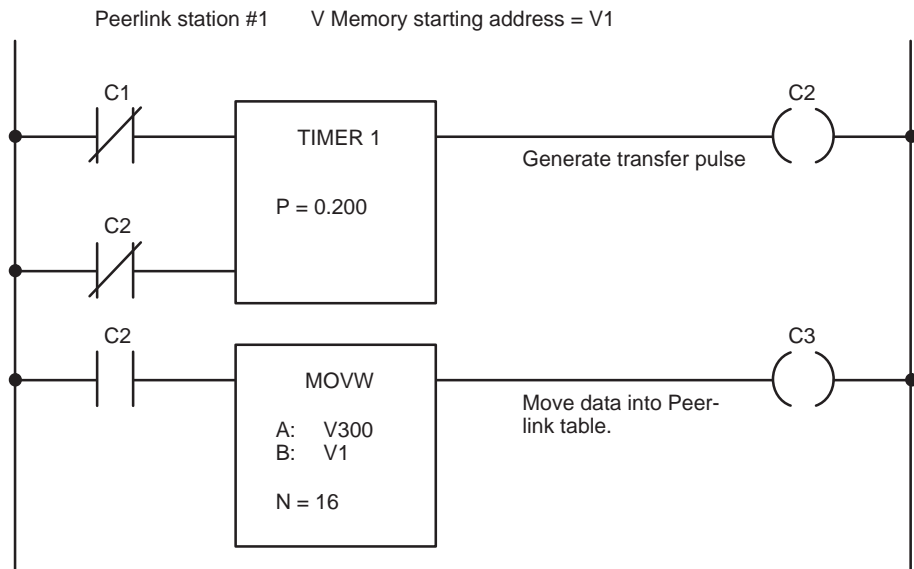
Figure D-3   P/C Interlocking—Scenario 1

**D.2.2
Scenario 2**

This next example may be used in applications where handshaking is required between P/Cs to acknowledge data sent or received. In this case, a transmitting P/C would send its data words with one word designated as a "command code". This command code or sequence number could then be interpreted by the receiving P/C when it receives the data. The receiving P/C would then respond by sending a "response" code to the transmitting P/C to inform it that it may now send the next set of data and use the received data.

The following data structures are used in this example:

P/C Transmitting Data Network Address 1	P/C Receiving Data Network Address 2
V Memory starting address V100 — Data to be transmitted from Network Address 1	V Memory starting address V200 — Data received from Network Address 1
COMMAND CODE	COMMAND CODE
V116 — Data received from Network Address 2	V216 — Data to be transmitted from Network Address 2
RESPONSE CODE	RESPONSE CODE

Table D-1   Variables List

Data Areas Used	Description
V51-V65	Data to be transmitted work area
V100-V131	V-memory Peerlink data table
V115	Command code
V131	Response code
V1	Constant to be loaded into Command Code

Figure D-4 is a ladder logic program that illustrates one method of implementing the handshaking routine. This sample program has been implemented in P/C Network Address 1. In this example, the data to be transmitted is collected or calculated in V Memory from V51 to V65. This is a temporary storage area. When the data is ready to be sent, it is moved to V100 (the V Memory starting address) for transfer onto the network. The 16th word will contain the command code or sequence number which serves as a unique identifier of this set of data. The data will be moved into the Peerlink V Memory table only once by using a one-shot. This occurs only once since you would not want to load another set of data until the correct response sequence is received from the other P/Cs.

The program will now wait for the correct sequence number or response code to appear in the appropriate V Memory locations allocated for each P/C. When the response code arrives it is compared against the expected value and if it is correct the received data is moved into a location to be used by the P/C and new data is transmitted.

The major timing concern here corresponds to data transfer to and from both P/Cs. This transfer represents a transmit/receive pair. The worst case timing sequence described in the "Data Transmission" section of this manual must be applied twice to determine the delay for the total cycle.
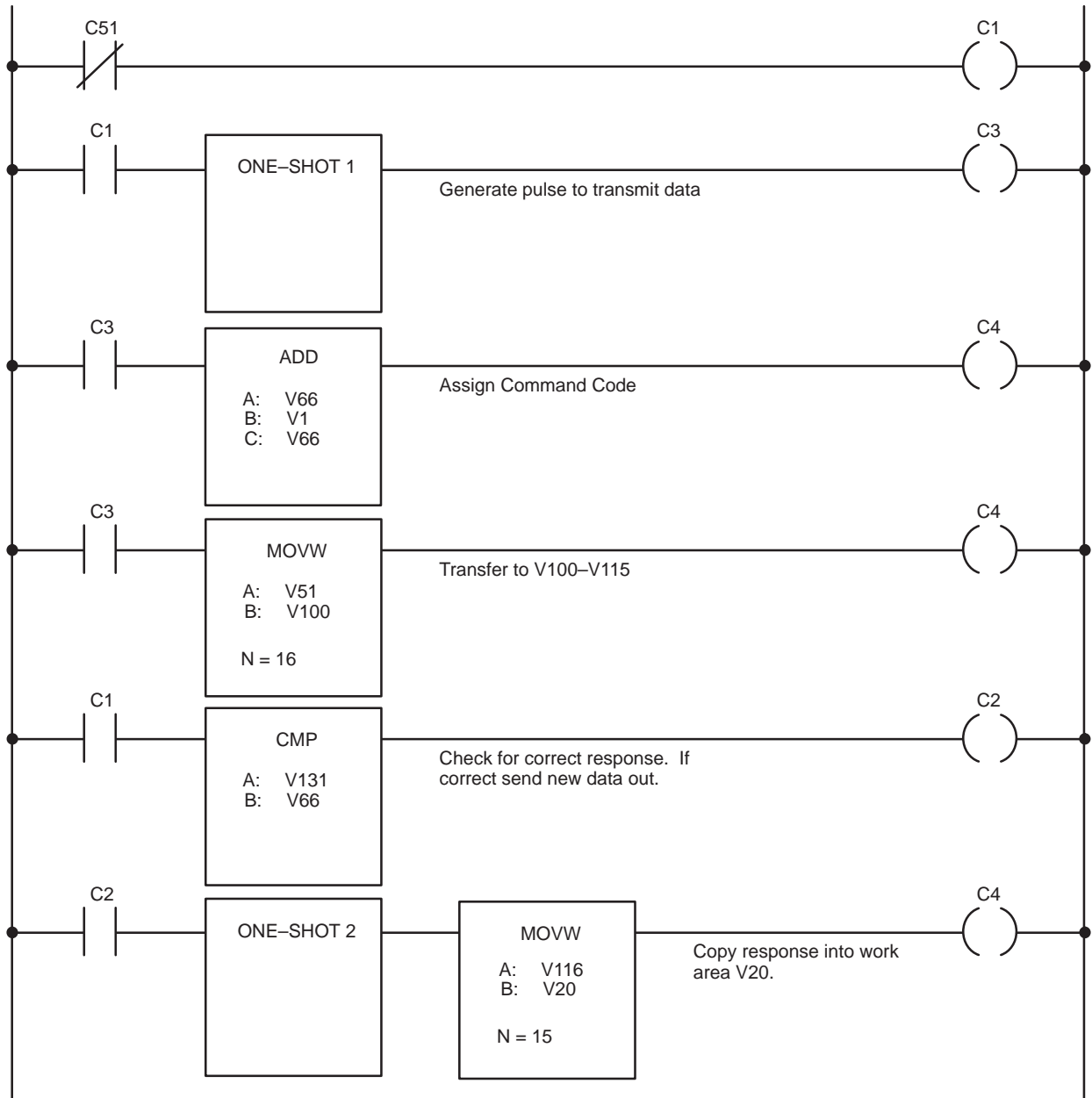
Figure D-4   Sample Handshaking Program

Peerlink Specifications

E.1 Operating Specifications

Channels per module:
PPX:500-5053	1 channel
PPX:500-5054	2 channels
PPX:505-7354	2 channels

Network transmission media   Shielded twisted pair

Total network distance   10,000 ft (Belden 9860 cable or equivalent)
3,250 ft (Belden 9271 cable or equivalent)

Maximum number of
modules on network   16

Data transferred per station   1 to 16 words (16-bit words)

Network update rate   15 ms - 4 stations at 8 words/station
30 ms - 8 stations at 8 words/station
40 ms - 8 stations at 16 words/station
60 ms - 16 stations at 8 words/station
80 ms - 16 stations at 8 words/station

Data transmission rate   115.2K bits per second

Undetected bit error rate 6×10^{-3} (calculated, with premium cable)

Power consumption:
PPX:500-5053	0.62 watts, –5 VDC
	6.50 watts, +5 VDC
PPX:500-5054	1.25 watts, -5 VDC
	6.90 watts, +5VDC
PPX:505-7354	8 watts, +5 VDC

Module size   Double-wide (occupies 2 slots, Models PPX:500–5053 and PPX:500–5054 only)
Single-wide (Model 505–7354)

E.2 PPX:500–5053 and PPX:500–5054 Environmental Specifications

Operating Temperature	0_ to 60_ C (32_ to 140_ F)
Storage Temperature	–40_ to 85_ C (–40_ to 185_ F)
Relative Humidity	5% to 95% noncondensing
Vibration	

Random	NAVMAT P–9492
	Test Fdc with
	  0.04g@/Hz, 80–350 Hz,
	  and 3dB/octave rolloff, 80–20 Hz
	  and 350–2000 Hz at 10 min/axis

Electrostatic Discharge	MIL–STD–883 5.5 kV/22 kV
Electrical Noise Immunity	
Conducted	MIL STD 461B, Part 4; CS01, CS02, CS06 IEC 255–4, Appendix E
Radiated	MIL STD 461B, Part 4; RS01, RS02, RS03
Corrosion Protection	All parts are of corrosion resistant material or are plated, or painted, as corrosion protection.
Agency Approvals	UL Listed, CSA Certified

E.3 PPX:505–7354 Environmental Specifications

Operating Temperature	0_ to 60_ C (32_ to 140_ F)
Storage Temperature	–40_ to 70_ C (–40_ to 158_ F)
Relative Humidity	5% to 95% noncondensing
Pollution Degree	2, IEC 664, 664A
Vibration	
Sinusoidal	IEC 68–2–6, Test Fc; 0.15 mm, peak-to-peak, 10-57 Hz; 1.0g 57-150 Hz
Random	NAVMAT P–9492 or IEC 68–2–34, Test Fdc with 0.04g@/Hz, 80–350 Hz, and 3dB/octave rolloff, 80–20 Hz and 350–2000 Hz at 10 min/axis
Impact Shock	IEC 68–2–27, Test Ea; Half Sine, 15g, 11 ms
Electrostatic Discharge	IEC 801, Part 2, Level 4 (15 kV)
Electrical Noise Immunity	
Conducted	IEC 801, Part 4, Level 3 MIL STD 461B, Part 4; CS01, CS02, CS06 IEC 255–4, Appendix E EEC 4517/79 Com(78) 766 Final, Part 4 IEEE 472, 2.5 kV
Radiated	IEC 801, Part 3, Level 3 MIL STD 461B, Part 4; RS01, RS02, RS03
Corrosion Protection	All parts are of corrosion resistant material or are plated, or painted, as corrosion protection.
Agency Approvals	UL Listed, CSA Certified

Index

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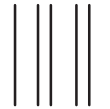
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