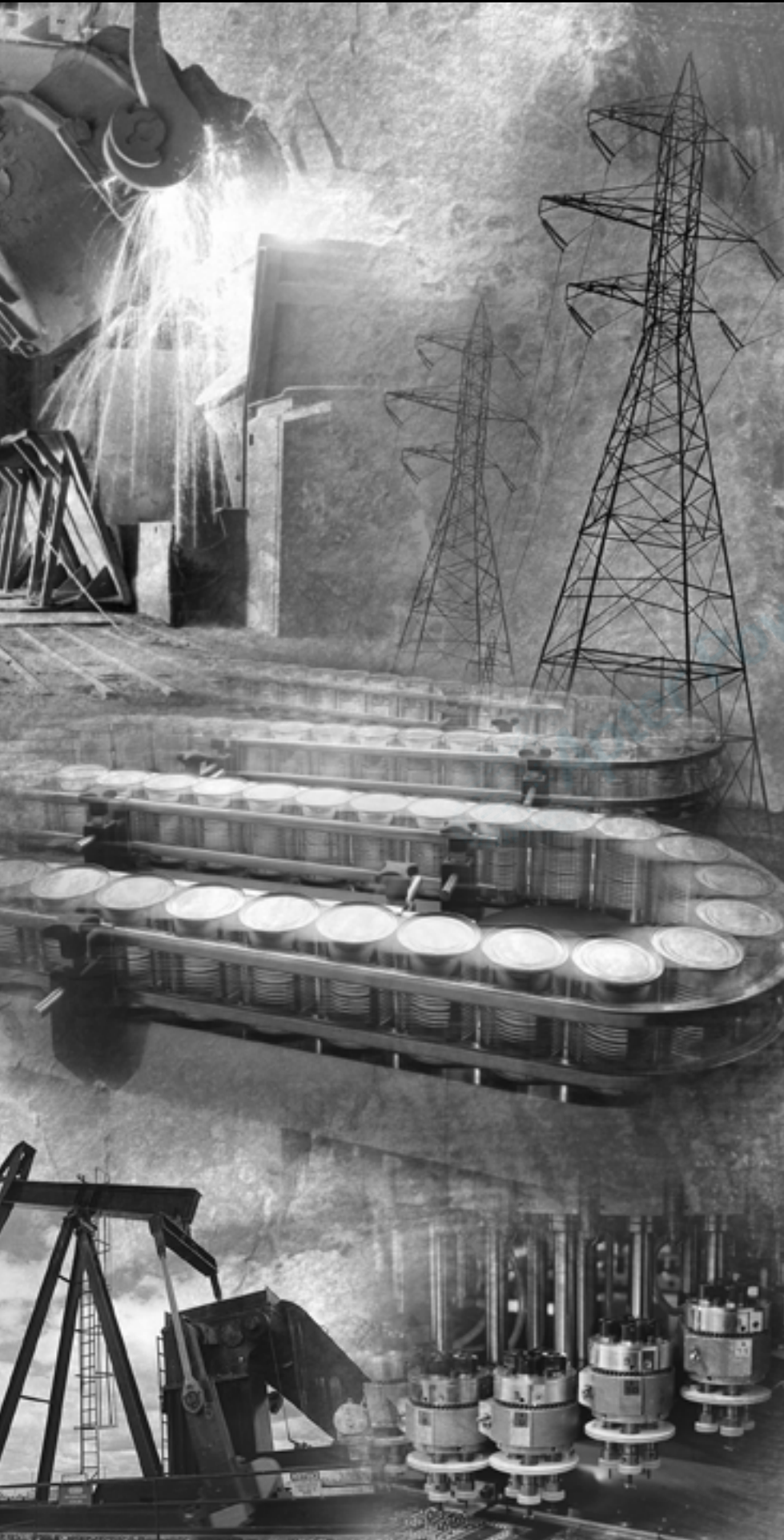




Allen-Bradley

ControlNet Scanner

1747-SCNR

Reference Manual

**Rockwell
Automation**

Install and Connect the ControlNet Scanner

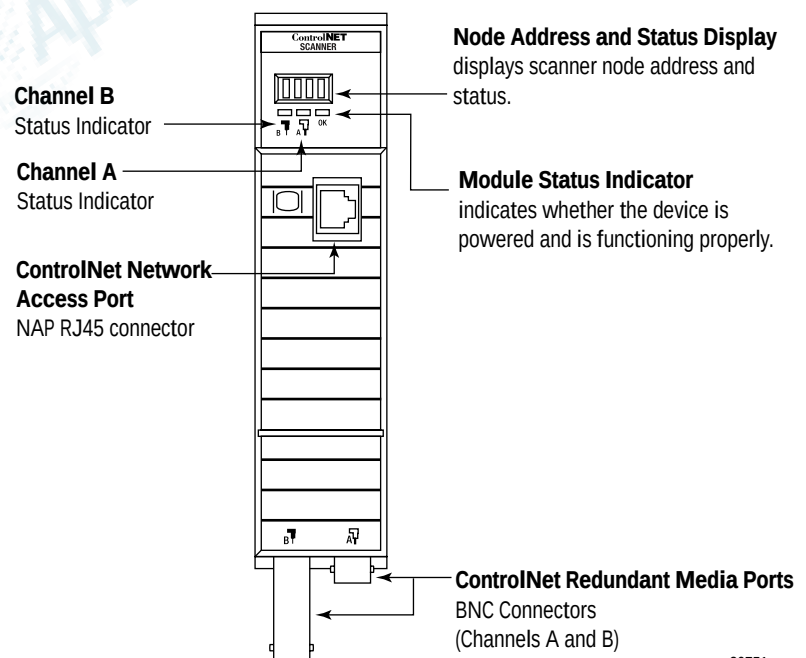
What This Chapter Contains

This chapter describes how to install and connect your ControlNet 1747-SCNR scanner. See the table that shows where to find specific information in this chapter.

For Information About	See Page
Identifying scanner features	1-1
Preparing the module for installation	1-2
Selecting the ControlNet node address	1-3
Inserting the 1747-SCNR into an SLC chassis	1-4
Connecting the 1747-SCNR to a ControlNet network	1-5
SLC 500 I/O configuration	1-8

Identify Scanner Module Features

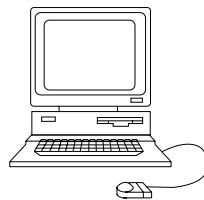
The following drawing identifies the features of the 1747-SCNR scanner.



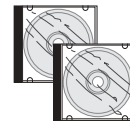
30751

Prepare for Module Installation

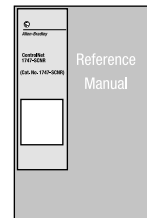
Before you install your module, you need the following items:



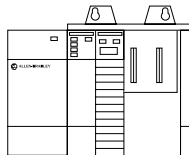
Personal Computer with
Microsoft Windows



RSNetWorx for
ControlNet
software,
Catalog Number
9357-CNETL3



1747-SCNR Scanner Reference
Manual, Publication 1747-RM623
(this manual)



SLC 1746 Chassis with SLC
5/02, 5/03, 5/04, or 5/05 Processor
and Appropriate Programming
Software (RSLogix 500 Software)



ControlNet 1784-PCC (shown),
or 1784-PCIC, or 1784-KTCX15,
or 1770-KFC15 Module

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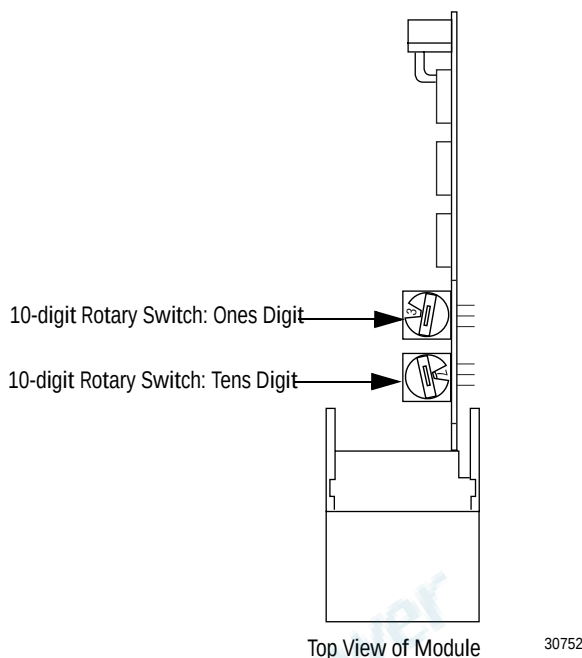
Before you install the module, you must know how to do this.

- Program and operate an Allen-Bradley SLC 500 programmable controller.
- Install and configure the devices on your ControlNet network.

The 1747-SCNR scanner fits in any slot of the chassis except for the leftmost slot of the first chassis, which is reserved for the SLC 500 processor.

Select the ControlNet Node Address

Select the ControlNet node address of the 1747-SCNR module by setting the two 10-digit rotary switches on the top of the scanner.



You can select a node address from 01 to 99 for a device on a ControlNet link. Zero (00) is not a valid node address.

IMPORTANT

Since 00 is the default value from manufacturing, you must change the node address when using the scanner for the first time. Turning on the scanner with the node address set to 00 clears the module memory back to the factory default.

Insert the 1747-SCNR Scanner Into the Chassis

To insert the 1747-SCNR scanner into the SLC chassis complete these procedures.

ATTENTION



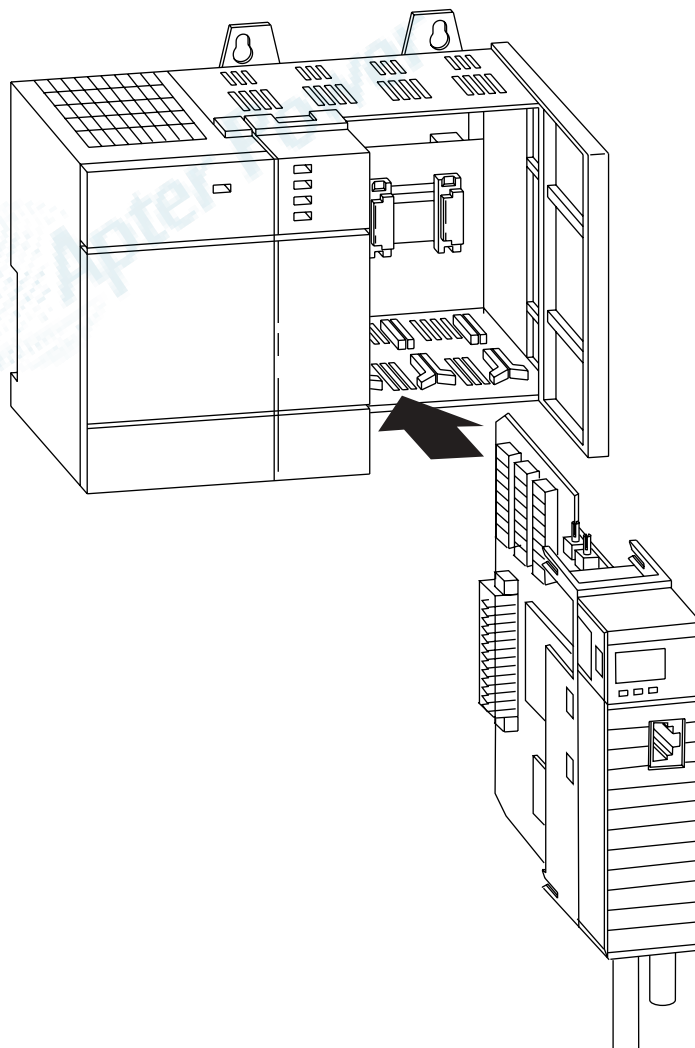
Do not install the 1747-SCNR scanner with the chassis power supply on. Installing the module with the chassis power supply on may damage the module.

1. Turn off the SLC chassis power supply.

IMPORTANT

If you disconnect the ac power, you lose the chassis ground. Electrostatic damage (ESD) protection is lost.

2. Select a slot for the module in the chassis, choosing any slot except the left-most slot of the first chassis, which is reserved for the SLC 500 processor.

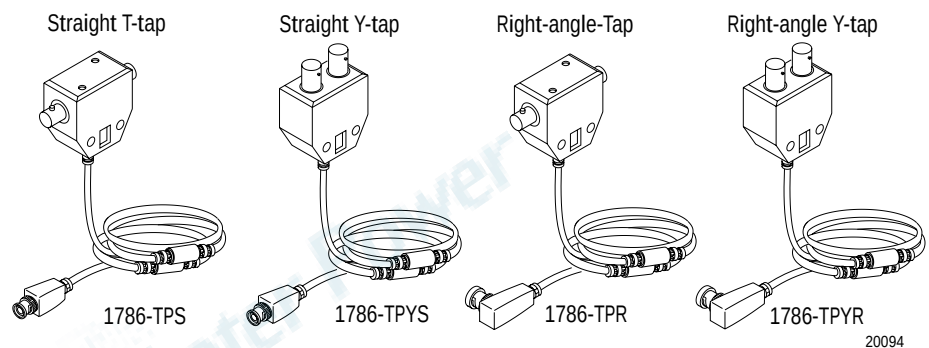


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3. Insert the module into the slot you have selected, noting that we recommend that you insert the 1747-SCNR scanner as close to the chassis power supply as possible.
4. Apply firm and even pressure to seat the module in the I/O chassis backplane connectors.
5. Restore power to the SLC chassis.

Connect to a ControlNet Network

Connect the 1747-SCNR scanner to a ControlNet network via a tap with a 1 m (39.4 in.) drop cable. Four taps are available from Rockwell Automation, Inc., as shown in the figure.



IMPORTANT

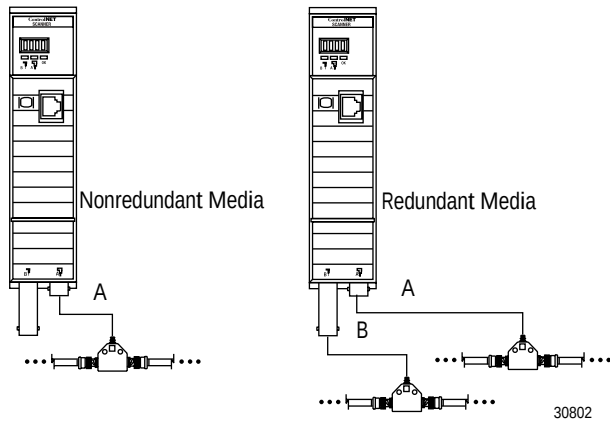
Allen-Bradley ControlNet taps contain passive electronics and must be purchased from Rockwell Automation for the network to function properly.

After terminating your segments, connect your node to the network.

WARNING



If you connect or disconnect the ControlNet cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.



Remove the tap's dust cap—located on the straight or right-angle connector—and set it aside.

If Your Network Supports **Connect the Tap's Straight or Right-angle Connector**

Nonredundant media	To the channel A connector on the scanner—channel B is not used. ⁽¹⁾
Redundant media	From the trunk-cable A to channel A on the scanner and from trunk-cable B to channel B on the scanner

⁽¹⁾ We recommend using channel A for nonredundant media.

For detailed information on planning and installing your ControlNet system, see the table for a list of related publications.

Publication	Publication Number
ControlNet Coax Tap Installation Instructions	1786-IN007
ControlNet Network Access Cable Installation Instructions	1786-TD006
Industrial Automation Wiring and Grounding Guidelines	1770-IN041

Connect Programming Terminal to a ControlNet Network

You can connect the programming terminal to a ControlNet network through a:

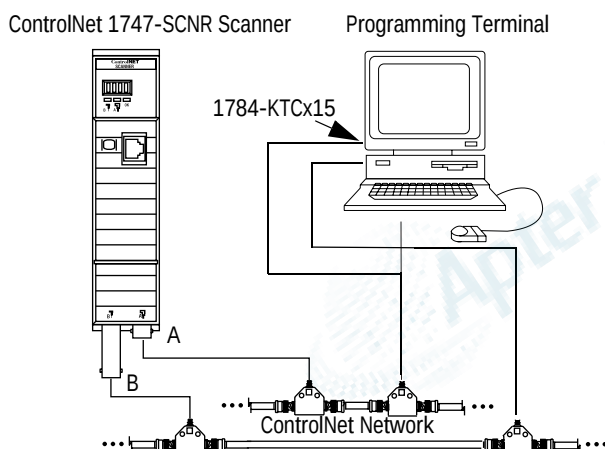
- ControlNet product NAP using a network access cable (1786-CP).
- tap on a ControlNet network.

ATTENTION

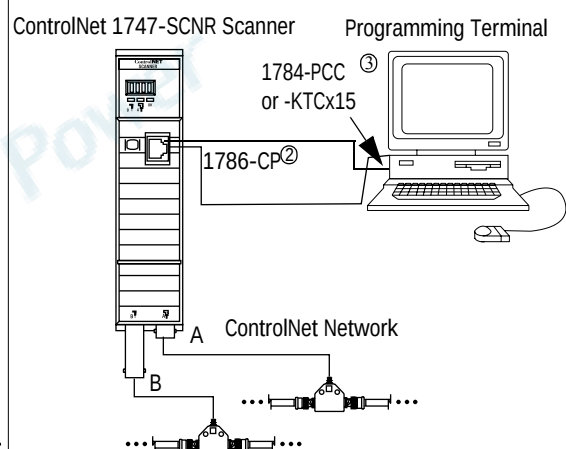


Do not connect the same communication card to both the NAP and a tap on the ControlNet network.

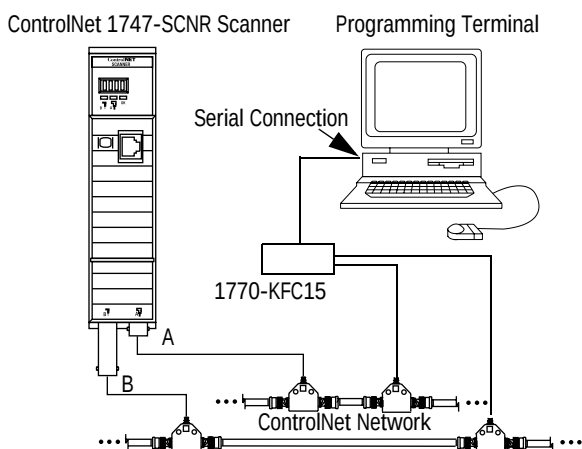
Using 1784-PCIC communication card on coax media ①



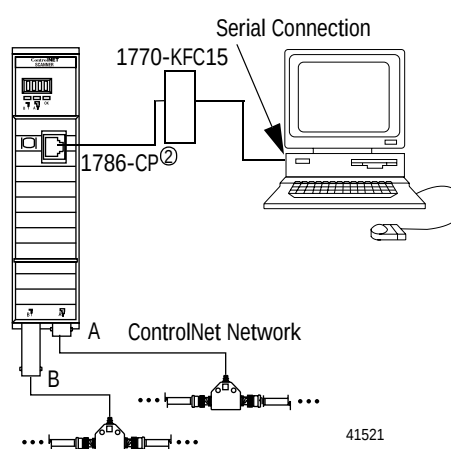
Using 1784-PCC or -PCIC communication card and NAP ①



Using 1770-KFC15 communication interface on coax media ①



Using 1770-KFC15 communication interface and NAP ①



① Shown with redundant media (redundant media is not required).

② The network access cable (1786-CP) can be plugged into any ControlNet product's NAP to provide programming capability on the ControlNet network. A programming terminal connected through this cable is counted as a node and must have a unique address.

③ The 1784-PCC ships with its own ControlNet cable (1784-PCC1).

ATTENTION


Use the 1786-CP cable when connecting a scanner to the network through a NAP. Using a commercially-available RJ-style cable could result in network failure.

SLC 500 I/O Configuration for the 1747-SCNR Module

Select the I/O card. If you do not have an I/O card, complete the following procedure.

Open RSLogix 500 software and use the following procedure to configure the 1747-SCNR module.

In the RSLogix 500 project Window:

1. Open the I/O Configuration window.
2. Select the 1747-SCNR slot number.
3. Select the 1747-SCNR module from the current available cards list. If it is not available, perform the following steps:
 - a. Choose the other ..Requires I/O card type ID line in the Current cards available list.
 - b. In the Other type I/O Card window, type 13628.
 - c. On the line associated with the scanner slot, the I/O Configuration window will report the following:

OTHER I/O Module- ID Code = 13628
 - d. Double-click the scanner line to open the Advanced I/O Configuration window.
 - e. Set M0 Length to 1651 (decimal) and M1 Length to 608 (decimal).
4. Close the I/O Configuration and Advanced I/O Configuration windows.

Prepare to Use the ControlNet Scanner

What This Chapter Contains

Read this chapter to understand how to use your ControlNet 1747-SCNR Scanner. The following table describes what this chapter contains and where to find specific information.

For Information About	See Page
What your scanner does	2-1
Communicating with your SLC processor	2-1
Understanding ControlNet data transfer	2-3
Understanding 1747-SCNR mapping	2-5
Communicating with your devices	2-9

What Your Scanner Does

In a typical configuration, the scanner acts as an interface between ControlNet devices and an SLC processor. The scanner communicates with ControlNet devices over the network to do this:

- Read inputs from a device.
- Write outputs to a device.
- Issue native ControlNet requests to a remote node on the ControlNet link (CIP client).
- Download configuration data.

Communicating with Your SLC Processor

The scanner communicates with the processor in the form of M1/M0 File Transfers and/or Discrete I/O (DIO). Information exchanged includes the following.

- Device I/O data
- Status and control information
- CIP client requests and responses
- Local database

An M1/M0 file transfer is a method of moving large amounts of data between an SLC 500 processor and its scanner.

Discrete input and output (DIO) is the transfer of one to 32 words between an SLC 500 processor and a scanner. All 32 words of input data and all 32 words of output data are updated on each SLC program scan.

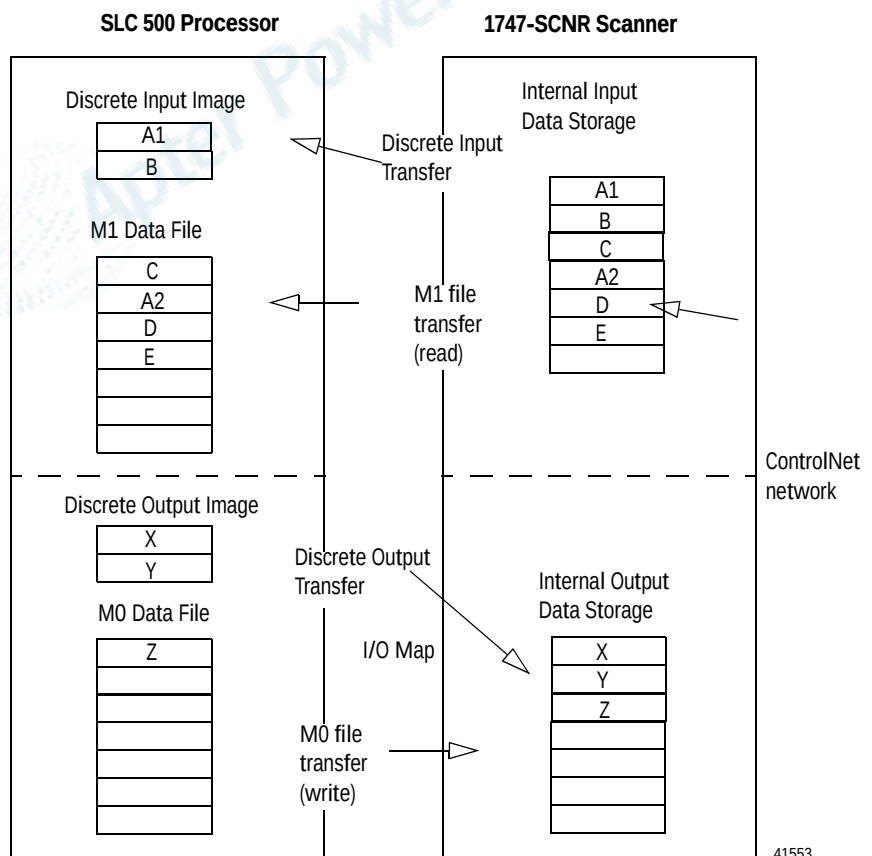
Communicating with Your SLC processor Using M1 and M0 Files

Your processor can communicate with the scanner via M1 file transfer reads and M0 file transfer writes.

The scanner does not send data to your processor. Data transfer between your scanner and the processor must be initiated by the processor. For example, data is sent, or written, to the scanner by your processor by placing the data in the M0 file. This data is organized in the scanner and then, based on the area you updated, the appropriate action is initiated to send it on the ControlNet network.

An M1 file transfer is the transfer of data from the scanner to the processor. The scanner makes data collected from the network's devices available for the processor to read.

An M0 file transfer is the transfer of data from the SLC 500 processor to the scanner. The processor writes data to the scanner's memory.



41553

The ControlNet system places your scheduled transfers in the first part of each network update interval (NUI). Time is automatically reserved for network maintenance, and unscheduled transfers are performed during the remainder of the interval.

Unscheduled messaging on a ControlNet network is non-deterministic. Your application and your configuration (for example, number of nodes, application program, NUT) determine how much time there is for unscheduled messaging.

IMPORTANT

The ControlNet network reserves time for at least one unscheduled transfer per NUI.

Understand 1747-SCNR Mapping

The 1747-SCNR scanner and the SLC processor exchange the following information through the backplane:

- Input data
- Output data
- Status data
- Command data
- CIP messages

The 1747-SCNR mapping is described in the following. Bit field descriptions follow each table.

Discrete Input File

Word Offsets	Word Size	ControlNet Transfer Mode	Contents	Description
0	1	N/A	Module Status (see the next section, "Module Status")	Bit field reporting general status information.
1-31	31	Scheduled	ControlNet Input Data	You can map up to 31 words of input data using RSNetWorx for ControlNet software.

Module Status (I:e.0)

Bit 0	1747-SCNR Module Faulted.
Bit 1	1747-SCNR Communication Module Fault The 1747-SCNR scanner is not on line. See M1 word 2 (M1:e2) for the ControlNet network status.
Bit 2	1747-SCNR Connection Fault There is a fault in at least one scheduled connection.
Bit 3-7	Reserved.
Bit 8	Reset 1747-SCNR Module Acknowledge The 1747-SCNR scanner will complement this bit each time the scanner is reset due to complementing the Reset module command bit (O:e.0/8 where e is the scanner slot number). See Example of Reset Bit Management.
Bit 9	Disable ControlNet Scheduled Connections Acknowledge The 1747-SCNR scanner will set this bit when the Disable ControlNet Scheduled Connections Command bit is set (O:e.0/9) and all scheduled connections have been closed. The 1747-SCNR scanner will clear this bit when the Disable ControlNet Scheduled Connections Command bit is cleared.
Bit 10	Scanner Mode The 1747-SCNR scanner clears this bit when it is in idle mode. The 1747-SCNR Scanner sets this bit when it is in run mode.
Bit 11-15	Reserved.

1747-SCNR M1 File

Word Offsets	Word Size	ControlNet Transfer Mode	Contents	Description
0	1	N/A	Reserved	Reserved for future use.
1	1	N/A	Module Status (See the next page "Module Status")	Value indicating the current operational status of the module. See the Troubleshooting for probable causes and recommended actions.
2	1	N/A	ControlNet Status (See the next page "ControlNet Status")	Value indicating the current channel LEDs.
3-255	253	Scheduled	ControlNet Input Data	You can map scheduled input data in this area using RSNetWorx for ControlNet software.
256-599	344	N/A	Reserved	Reserved.
600-607	8	N/A	Connection Status	Bit field reporting scheduled connections status. Two consecutive bits per scheduled connection: Connection State (Even bit numbers) 1:connection opened 0:connection closed Remote Device Mode (Odd bit numbers) 1:remote device is in run mode 0:remote device is in idle mode

Module Status (M1:e.1)

See Troubleshooting for probable causes and recommended actions.

Value	Description
0x20	The scanner is not configured.
0x21	The current configuration is not valid.
0x22	Connections are configured, but no connections are established.
0x23	Connections are configured, but only 25% are successfully established.
0x24	Connections are configured, but only 50% are successfully established.
0x25	Connections are configured, but only 75% are successfully established.
0x26	All configured connections are established.
0x42	The node address is set to 00. This caused the scanner to erase network and connection configuration stored in flash.
0x43	The scanner detected a network error due to a ControlNet cable problem or there are no other nodes on the network.
0x44	The scanner has the same ControlNet address as another device on the network.

ControlNet Status (M1:e.2)

See the table that contains bit numbers and their descriptions.

Bit 0-2	Channel A status	
	Value	LED State
	000	Off
	001	Green
	010	Flashing green/off
	011	Flashing red/off
	100	Flashing red/green
	101	Alternating red/off
	110	Alternating red/green
	111	Red
Bit 3	Reserved	
Bit 4-6	Channel B status	
	Value	LED State
	000	Off
	001	Green
	010	Flashing green/off
	011	Flashing red/off
	100	Flashing red/green
	101	Alternating red/off
	110	Alternating red/green
	111	Red
Bit 7-15	Reserved	

Discrete Output File

Word Offsets	Word Size	ControlNet Transfer Mode	Contents	Description
0	1	N/A	Module Command	Bit field used to send commands to the 1747-SCNR Scanner.
1-31	31	Scheduled	ControlNet Output Data	You can map up to 31 words of output data using RSNetWorx for ControlNet software.

Module Command (O:e.0)

Bit 0-7	Reserved
Bit 8	Reset Scanner Command By complementing this bit, you reset the 1747-SCNR scanner (the reset occurs when the SLC slot is de-activated). It is important to note that if you do not disable the slot while the scanner is resetting, the SLC module will fault with the error code nn57h (specifically, I/O module in slot nn did not respond to a lock shared memory command in the requested time limit) where nn is the slot number of the scanner. This is why the reset bit change is not taken into account until the slot is disabled.
Bit 9	Disable ControlNet Scheduled Connections Command When the bit value is 1, the 1747-SCNR scanner will close all scheduled connections. When the bit value is 0, the 1747-SCNR scanner will enable all scheduled connections.
Bit 10	Scanner Mode Command When the bit value is 0, the 1747-SCNR scanner is forced to Idle mode. When the bit value is 1, the scanner's mode will be determined by the mode of the processor in slot 0.
Bit 11-15	Reserved

1747-SCNR M0 File

Word Offsets	Word Size	ControlNet Transfer Mode	Contents	Description
0-2	3	N/A	Reserved	Reserved.
3-255	253	Scheduled	ControlNet Output Data	Using the RSNetWorx for ControlNet software, you can map scheduled output data in this area.
256-699	444	N/A	Reserved	Reserved.
700-955	256	Unscheduled	Local Database	Memory area used by remote devices to read or write data using CIP messaging or PLC-5 messaging.
1000-1650	651	Unscheduled	CIP Client Message Area	Memory used to send CIP client requests. These messages are then sent by the 1747-SCNR module as unscheduled messaging.

Only Input and Output data (from Input file, Output file, M0 ControlNet Output data area, and M1 ControlNet Input data area) are exchanged during scheduled time.

Data transfer to the M0 Local Database is performed using Unscheduled messaging. Services available to read or write in this area are Set Attribute Single, Get Attribute Single, Set Member, and Get Member.

Communicating with Your Devices

The 1747-SCNR scanner supports up to 64 simultaneous scheduled connections and up to 50 simultaneous unscheduled connections. The 1747-SCNR scanner also supports up to 32 simultaneous incoming unconnected requests.

I/O Scheduled Data Transfer

Data received from the devices, or input data, is organized by the scanner and made available to your processor in the Input file or the M1 ControlNet data area.

Data received from your SLC processor, or output data, is stored within the Output file or M0 ControlNet data area. The 1747-SCNR scanner can then send the data to your remote ControlNet devices.

All scheduled data transfer to Input, Output, M0 and M1 files must be mapped on a ControlNet network. You have to specify where I/O data is to be read from or written to, in other words, mapped. Data size and location within 1747-SCNR data files have to be configured for each connection you want to setup with a remote device. The configuration is performed using RSNetWorx for ControlNet software.

Unscheduled Data Server

The scanner supports some CIP data server functionality on a specific local database of 256 words located in the M0 file. Any device on ControlNet can read or write in this database using the supported services as described in Local Database Access Using PLC-5 MSG Instructions and Local Database and ControlNet Data Files Access Using CIP Messaging.

The SLC processor that has read and write access to this area is then able to receive or modify data into the database.

Using this Local Database:

- a device can send data to an SLC processor using unscheduled data transfer.
- two devices can exchange unscheduled data by using this database as a proxy data storage.
- a PLC-5 controller can exchange data with the SLC processor by reading or writing in this area using MSG instructions.
- an HMI can exchange data with the SLC processor by reading or writing in this area using PLC-5 type read and write commands.

Troubleshoot

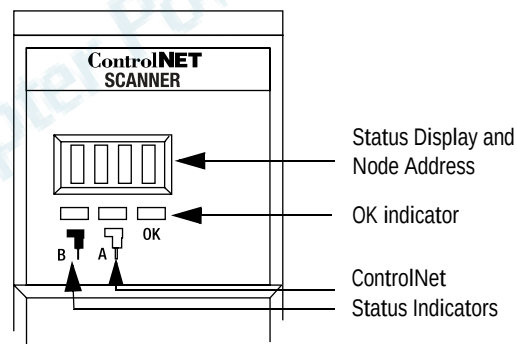
What This Chapter Contains

The following table describes what this chapter contains and its location.

For Information About	See Page
Troubleshooting	4-1
Apply chassis power	4-2
Alphanumeric display	4-2
OK indicator and display mnemonics	4-3

Troubleshoot with the Status Indicators and Status Display

The 1747-SCNR module has indicators on the front plate, as shown in the figure.



30750-M

These indicators are the following.

- An alphanumeric display (of status and node address)
- A and B status indicators
- OK

Use these indicators to troubleshoot the scanner.

Apply Chassis Power

When you apply chassis power, the module address and status display cycles through the following mnemonics:

1. **POST** - The 1747-SCNR runs Power On Self Test.
2. **1111, 2222, etc.** - The 1747-SCNR is executing its startup sequence.
3. The 1747-SCNR firmware version is displayed temporarily after startup.
4. **A#nn** (where nn = ControlNet node address) then **I/OI** or **I/OX** (based on the number of connections configured and established) then **IDLE** or **RUN** (based on the scanner mode).

Alphanumeric Display

The four character alphanumeric display provides you with additional visual information about the current operational status of the module.

See the tables that describe problems that may occur while using your 1747-SCNR module, the probable causes, and the recommended action.

OK Indicator and Display Mnemonics

The OK indicator is handled consistently with the ControlNet specifications for the Identity object.

Sequence	OK Indicator	Alphanumeric Display	Module Status Word (M1 file)	Description	Probable Cause	Recommended Action
Startup	Alternating red/green	POST	N/A	The 1747-SCNR module is running Power On Self Test.	Power was applied to the module.	No action required.
		FIRM WARE	N/A	1747-SCNR firmware revision. This is a temporary display after start up.	Power was applied to the module.	No action required.
Run time	Green	A#XX	N/A	ControlNet node address	None	No action required.
		I/O ■	0x26	All configured connections are established.	None	No action required.
		IDLE	N/A	The scanner is in idle mode.	The SLC processor in slot 0 is in program mode or the Scanner Mode Command bit of the Module Command word is clear (O:e.0/10 where e is the scanner slot number).	If you want to put the scanner into run mode, put the SLC processor in slot 0 into run mode and set the Scanner Mode Command bit of the Module Command word (O:e.0/10) using an unconditional OTE instruction.
		RUN	N/A	The scanner is in run mode.	The SLC processor in slot 0 is in run mode and the Scanner Mode Command bit of the Module Command word is set (O:e.0/10).	If you want to put the scanner into program mode, either put the SLC processor in slot 0 into program mode or clear the Scanner Mode Command bit of the Module Command word (O:e.0/10).
		EDIT	N/A	The scanlist in the 1747-SCNR is being modified.	Edits have been enabled with RSNetWorx for ControlNet software. Note that previously configured connections will be reestablished if lost. Newly configured or changed connections will not be established until edits are accepted.	Finish modifying the scanlist with RSNetWorx for ControlNet software and then accept edits. Cancel edits with RSNetWorx for ControlNet software.

Sequence	OK Indicator	Alphanumeric Display	Module Status Word (M1 file)	Description	Probable Cause	Recommended Action
Run time	Flashing Green	I/OX	0x20	The scanner is not configured.	Module is not configured.	Use RSNetWorx for ControlNet software to download a new configuration.
			0x21	The current configuration is not valid. The scanner is not able to start any scheduled communication to remote devices. Only unscheduled communication is possible.	Module is not configured properly.	Use RSNetWorx for ControlNet software to schedule the existing configuration.
						Use RSNetWorx for ControlNet software to download a new configuration.
		I/O □	0x22	Connections are configured but no connections are established.	View the Connection Status screen in RSNetWorx for ControlNet software to see why the connections are not established.	Check to see if the 1747-SCNR and the remote devices are correctly connected to the ControlNet network.
		I/O ▣	0x23	Connections are configured but only 25% are successfully established.	Module bandwidth is exceeded.	Reduce the number of scheduled connections by: - using a discrete rack connection instead of multiple discrete module connections - combining multiple I/O racks into a single I/O rack - combining multiple peer-to-peer messages into one message.
		I/O ▤	0x24	50%		Increase your Network Update Time and/or increase the Requested Packet Intervals for scheduled data transfers.
		I/O ▥	0x25	75%		Increase your SLC 500 ladder program scan by adding more logic.
		EDIT	N/A	The scanlist in the 1747-SCNR module is being modified.	Edits have been enabled with RSNetWorx for ControlNet software. Note that previously configured connections will be reestablished if lost. Newly configured or changed connections will not be established until edits are accepted.	Finish modifying the scanlist with RSNetWorx for ControlNet software and then accept edits.
						Cancel edits with RSNetWorx for ControlNet software

Sequence	OK Indicator	Alphanumeric Display	Module Status Word (M1 file)	Description	Probable Cause	Recommended Action
Run time	Flashing Green	SIGM	N/A	A scanner signature mismatch has been detected. The 1747-SCNR scanner signature does not match the signature stored in the active keeper.	Module is not configured properly.	Use RSNetWorx for ControlNet software to schedule the existing configuration.
				The scanner is not able to start any scheduled communication to remote devices. Only unscheduled communication is possible.		Use RSNetWorx for ControlNet software to download a new configuration.
Errors	Off	None	N/A	Module is not communicating.	Power supply fault.	Check power supply, cable connectors, and seat module firmly in chassis.
	Flashing Green	N/A	0x43	Network error.	Cable error or no other nodes on the network.	Verify network cabling.
	Red	(Scrolling display showing fault details)	N/A	Module faulted.	Internal error detected.	Record fault details and contact Rockwell Automation representative or distributor.
	Flashing Red	A#00 FLSH CFG ERAS	0x42	Module erased network and connection configuration stored in flash.	Network node address is set to 00.	Power down the module and change the address switches.
		DUPL A#XX	0x44	Duplicate node address.	Another device with the same ControlNet address is on the link.	Power down the 1747-SCNR module and change the network address switches to a correct node.

ControlNet Status indicators may behave in these ways and display these additional color schemes as described:

- Steady – indicator is on continuously in the defined state.
- Alternating – the two indicators alternate between the two defined states at the same time (applies to both indicators viewed together). The two indicators are always in opposite states (out of phase).
- Flashing – the indicator alternates between the two defined states (applies to each indicator viewed independent of the other). If both indicators are flashing, they must flash together (in phase).

See the table that describes how the status indicator is behaving, the cause of the behavior, and the action you should take.

A  and B 	Probable Cause	Recommended Action
Off	No power	No action required or apply power.
Steady red	Faulty unit	Cycle power or reset unit. If fault persists, contact a Rockwell Automation representative or distributor.
Alternating red/green	Self-test	No action required.
Alternating red/off	Incorrect node configuration or duplicate ControlNet node address	Check network address and other ControlNet configuration parameters.
A  or B 	Probable Cause	Recommended Action
Off	Channel disabled	Program network for redundant media, if required.
Steady green	Normal operation	No action required.
Flashing green/off	Temporary network errors	Check media for items such as broken cables, loose connectors, and missing terminators.
Flashing red/off	Media fault	Check media for broken cables, loose connectors, missing terminators, etc.
	No other nodes present on the network	Add other nodes to the network.
Flashing red/green	Incorrect node address	Change 1747-SCNR node address so that it is less than or equal to SMAX. ⁽¹⁾
	Incorrect network configuration	Reconfigure ControlNet network so that SMAX ¹ is greater than or equal to 1747-SCNR node address.

⁽¹⁾ SMAX is the highest node address on a ControlNet network that can transmit scheduled data.