Allen-Bradley

Technical Data

Backup Scanner

Catalog Number 1747-BSN

With all the features of a remote I/O scanner plus backup capability, the 1747-BSN is the right choice for redundant processor applications.

Take advantage of automatic transfer of remote input data between two modular SLC 500™ (5/02 or higher) processors over a High-Speed Serial Link (HSSL). The primary 1747-BSN module is continually updating a copy of the remote input image table in an interface located in the secondary 1747-BSN module.

Increase your machine or process up-time and reduce costs associated with equipment failure. The Backup Scanner enables you to guard against shutdowns by providing you with the capability to transfer control of the process to a secondary system, without interrupting machine or process operation.

Features and Benefits

Guards your application against shutdowns. The backup option enables you to transfer control of a process to a secondary system, without interrupting machine or process operation.

Isolation of the systems. Guarantees that a fault in one system does not affect the other.

Substitution of equipment without process interruption. The faulted system can be repaired while the other system is controlling the process.

Remote programming capability for secondary processor. Both processors are addressable on the Data Highway Plus™ (DH+) network.

Connections for remote I/O (RIO) or DH+ network. Each 1747-BSN module routes one remote I/O network or one DH+ network to the active processor.

Connections for one RS-232/485 network (DF-1, DH485, or ASCII). Each 1747-BSN module can route one RS-232/485 network to the active processor.

Use of standard SLC 5/02 or higher and 1746 platform. No need for special chassis, processor, or software.

RIO link cable of 3,048 meters (10,000 feet) maximum. Devices can be distributed over a wide physical area, increasing your application possibilities.

Time-proven Allen-Bradley Remote I/O link architecture. By offering a wide range of compatible RIO Allen-Bradley devices, the amount of data transferred increases your application potential.

Extended node capability. Allows you to connect up to 32 physical devices (nodes) on an RIO link, increasing your application capabilities.

Complementary I/O. This feature allows you to configure your system to more efficiently use the scanner's I/O image. This maximizes the number of I/O that can be controlled by the scanner.

High-speed data transfer between two complementary 1747-BSNs. This allows the two processors to update data tables between primary and secondary processors.

System Overview

The 1747-BSN Backup Scanner Module provides a high-speed communication channel between two modular SLC 500 (5/02 or higher) processors. The 1747-BSN backup system includes one or more sets of complementary modules. Each 1747-BSN set consists of one 1747-BSN module residing in the primary system and one complementary 1747-BSN module in the secondary or backup system. The primary system controls the operation of remote I/O, while the secondary system monitors communications via the high-speed serial link (HSSL) and is available to take over control in the event of a fault in the primary system.

The backup scanner has the capability to switch over two communication channels. The first channel is configurable as Remote I/O or DH+. The second channel is used to switch one RS-232/485 (DF-1, DH485, or ASCII) channel in order to provide connection for electronic operator interfaces, modems, or other devices.

A backup system using the 1747-BSN modules supports up to eight BSN modules in each processor chassis, connected by a local status link (LSL). Only I/O residing in the remote chassis is backed up. Local I/O is not backed up.

NOTE During the transfer of control from one processor to another (switchover), the output modules in the remote chassis maintain their last state until the secondary processor program takes control. The secondary processor program is not synchronized with the primary program.

SLC and Scanner Asynchronous Operation

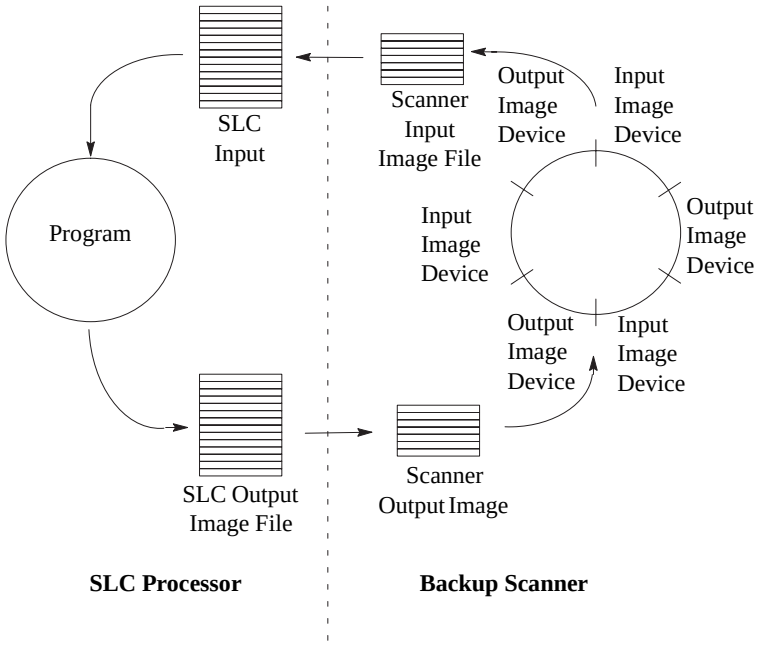
Just like 1747-SN RIO scanner operation, the SLC processor scan and backup scanner scan are independent (asynchronous) of each other. The SLC processor reads the scanner input image file during its input scan and writes the output image file to the scanner during its output scan. The scanner continues reading inputs and writing outputs to the scanner I/O image file, independent of the SLC processor scan cycle.

Depending on your SLC processor, RIO link configuration, and application program size, the scanner may complete multiple scans before the SLC processor reads the scanner's input image file. The scanner updates its I/O files on a per logical rack basis.

Figure 1 on page 4 illustrates the asynchronous operation of the SLC processor and backup scanner.

Figure 1 SLC Processor Scan Cycle

The SLC processor reads the scanner input image file into the SLC input image file, processes it, and creates an SLC output image file. The SLC processor transfers its output file to the



The scanner updates its input image file each time it scans a logical device. The scanner may scan all of its configured logical devices several times before the SLC processor reads the

IMPOR-

Once a BSN scanner changes from secondary to primary, the outputs of the RIO are updated *after* the end of the first SLC processor scan.

How the Scanner Interacts With Adapters

The backup scanner's function is to continuously scan the adapters on the RIO link in a consecutive manner. The scan consists of one or more RIO discrete transfers to each adapter on the RIO link.

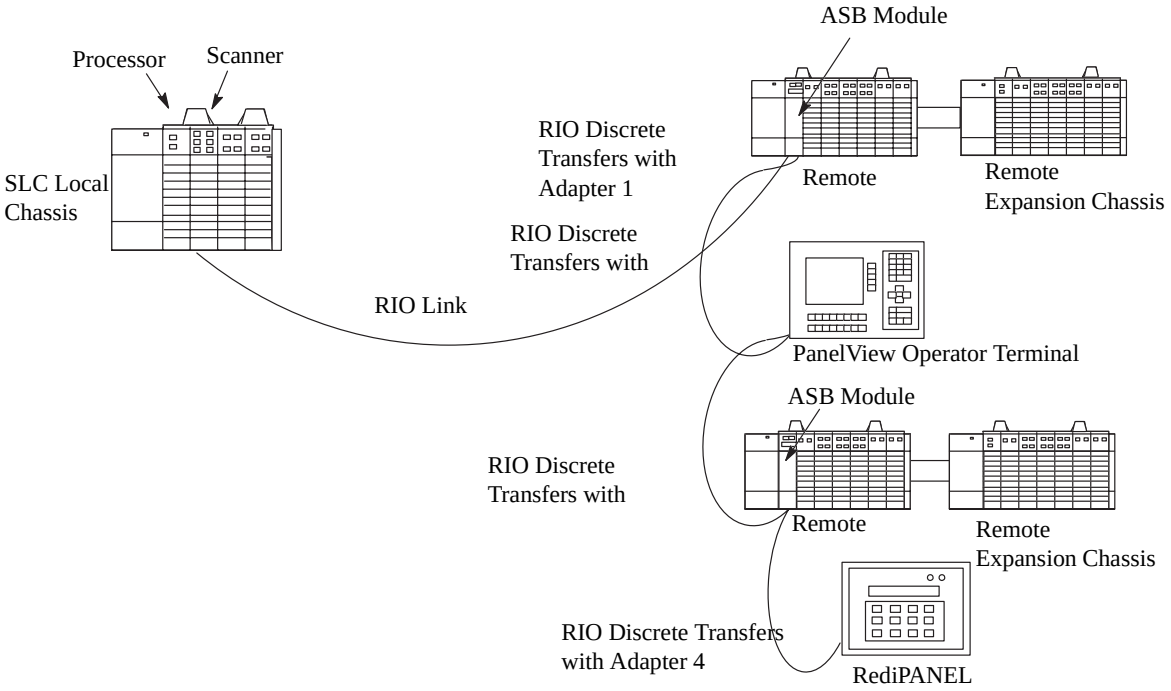
RIO discrete transfers consist of the scanner sending output image data and communication commands to the adapter that instruct the adapter on how to control its output. The adapter responds by sending input data to the scanner. The scanner performs as many RIO discrete transfers as necessary to update the entire adapter image. If RIO discrete transfers do not occur, data is not exchanged between the scanner and adapter.

IMPOR-

RIO discrete transfers are asynchronous with the processor scan.

See Figure 2 on page 5.

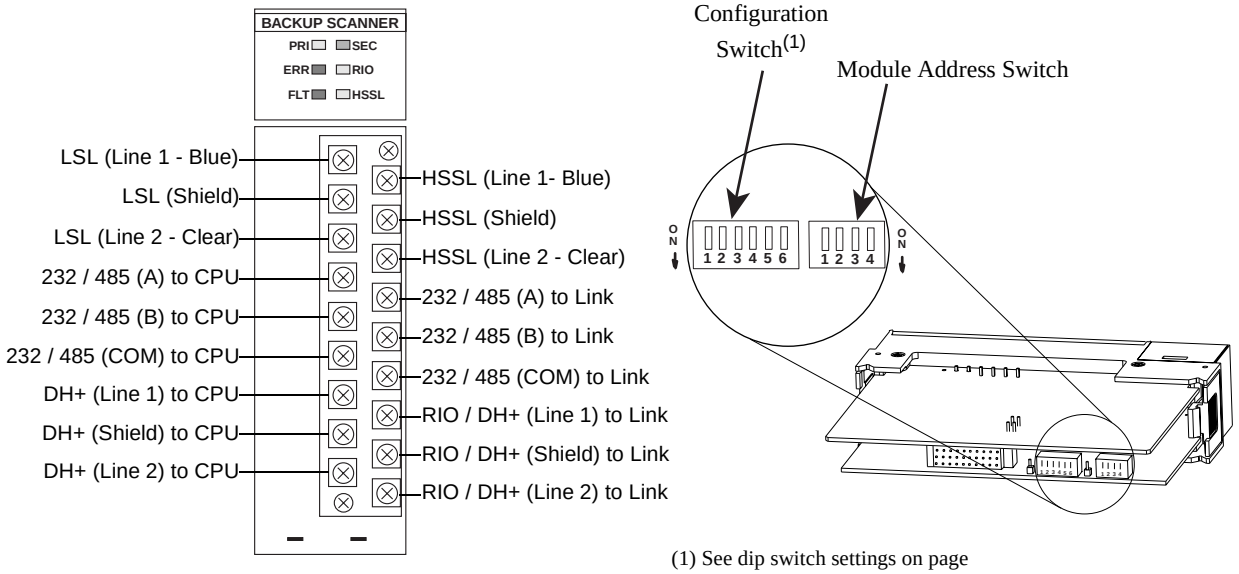
Figure 2 RIO Discrete Transfer



Hardware Overview

The scanner easily installs in an SLC chassis like other SLC 500 discrete I/O or specialty modules. The 1747-BSN uses a standard green removable terminal block on the front of the module. Diagnostic LEDs indicate scanner operating status. The FAULT LED indicates the overall operating status of the scanner and the RIO LED indicates the RIO link communication status.

Figure 3 1747-BSN Features



(1) See dip switch settings on page

Wiring

The system examples on pages 6 through 8 have been simplified to show only the type of wiring described. Keep the following considerations in mind when planning your system:

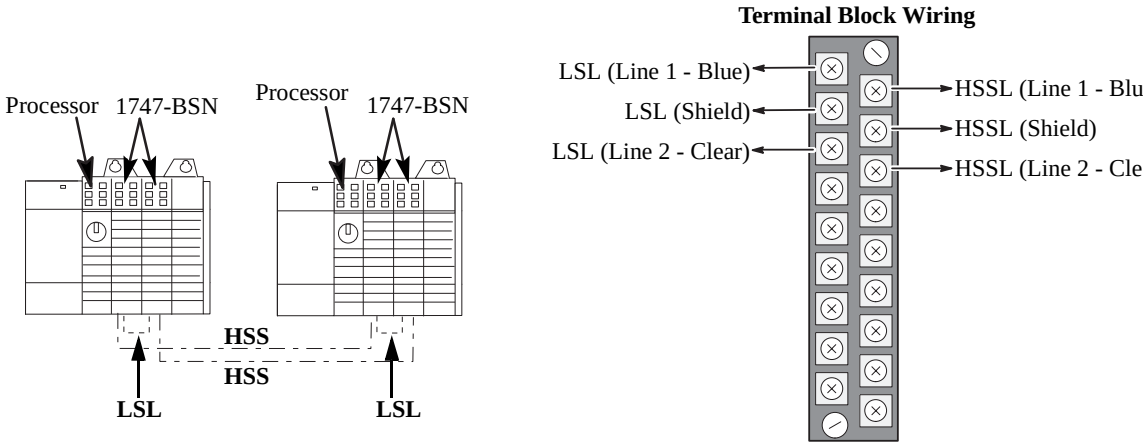
- When wiring a system using 1747-BSN backup scanners, you must connect the High-Speed Serial Link (HSSL) between the primary and secondary backup scanners. The Local Status Link (LSL) is required only when more than one 1747-BSN module per chassis is used.
- RIO/DH+ connections are dependent upon your system setup and are mutually exclusive.
- RS-232 connections are also optional, dependent upon your system setup.

Local Status Link and High-Speed Serial Link Wiring

The High-Speed Serial Link connects complementary 1747-BSN modules. The HSSL allows network commands to be transferred between BSN modules using DH+. Retentive data can be transferred between the primary and secondary processors via the HSSL via ladder logic supporting handshake data transfer. The complementary BSN modules are connected using Belden™ 9463 cable.

The Local Status Link exchanges status information between 1747-BSN modules in the same chassis without programming. The BSN modules are connected using Belden 9463 cable.

Figure 4 HSSL and LSL Connections



RIO Network and RIO Link Wiring

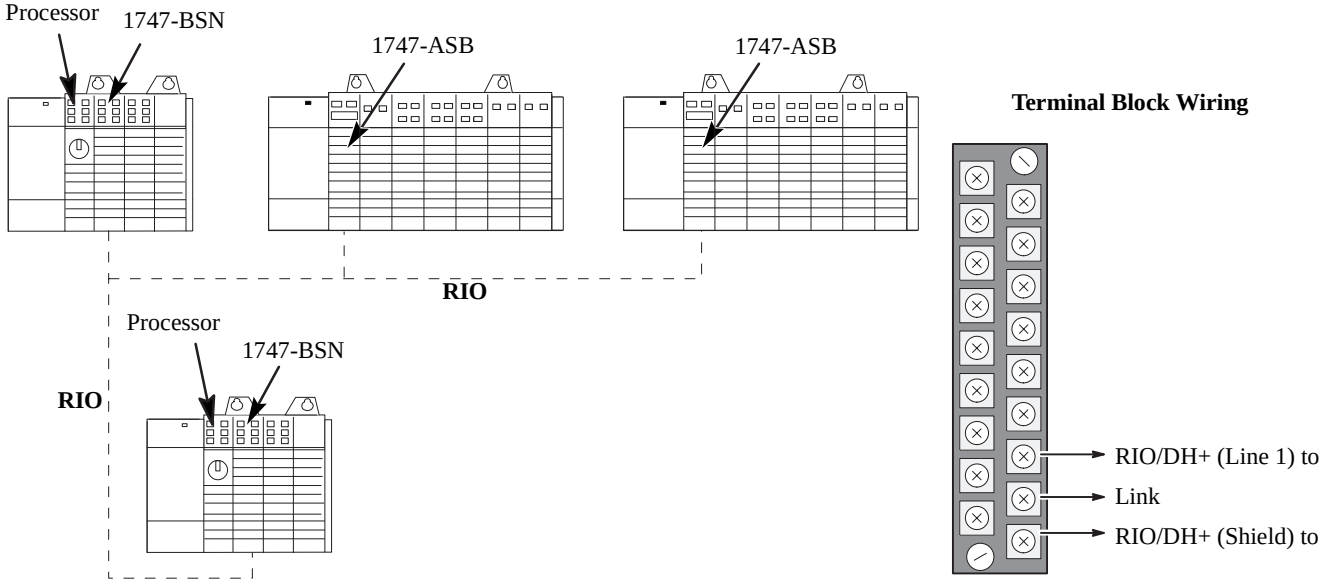
In primary mode, the 1747-BSN module can act as a RIO scanner, supporting discrete I/O control, RIO block transfers, and RIO passthru. In secondary mode, the BSN module monitors the primary BSN. If the primary BSN module fails, the secondary module becomes primary.

The scanner is connected to other devices using the RIO link. There are no restrictions governing the space between each device, provided the maximum cable distance is not exceeded.

A 1/2 Watt terminating resistor (included with the module) must be attached across line 1 and line 2 of the connectors at *each* end (scanner and last physical device) of the RIO link. The value of the resistor depends on the baud rate and extended node capability, as shown in the table on page 14.

IMPOR- To use extended node, all devices on the RIO link must support it. Refer to each device's user manual.

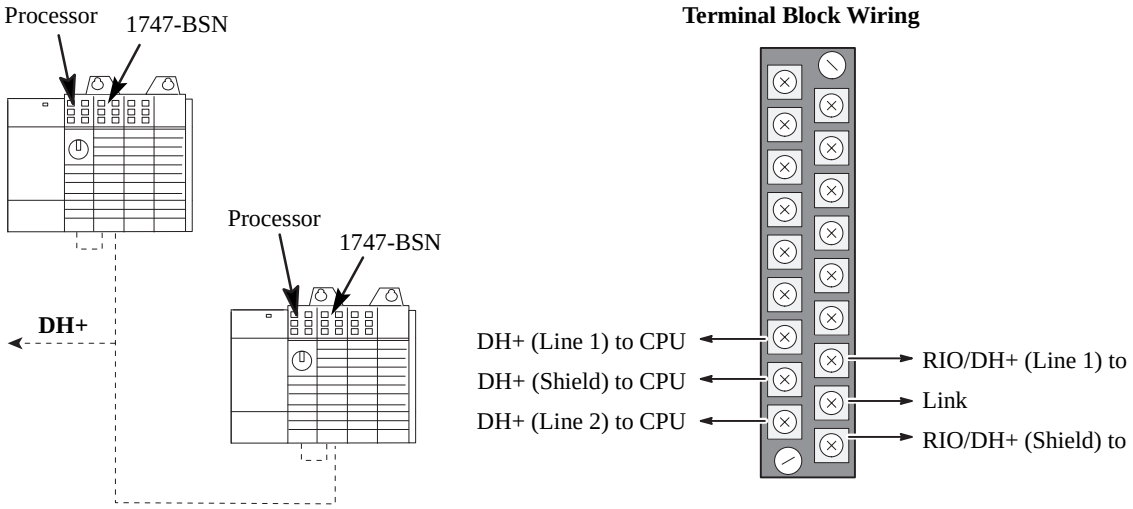
Figure 5 RIO System



DH+ Network Wiring

The 1747-BSN module acts as a smart switch, selectively allowing both processors to be addressed on the DH+ network at node addresses *n* (primary) and *n+1* (secondary), where *n* is the DH+ node address used in the control program.

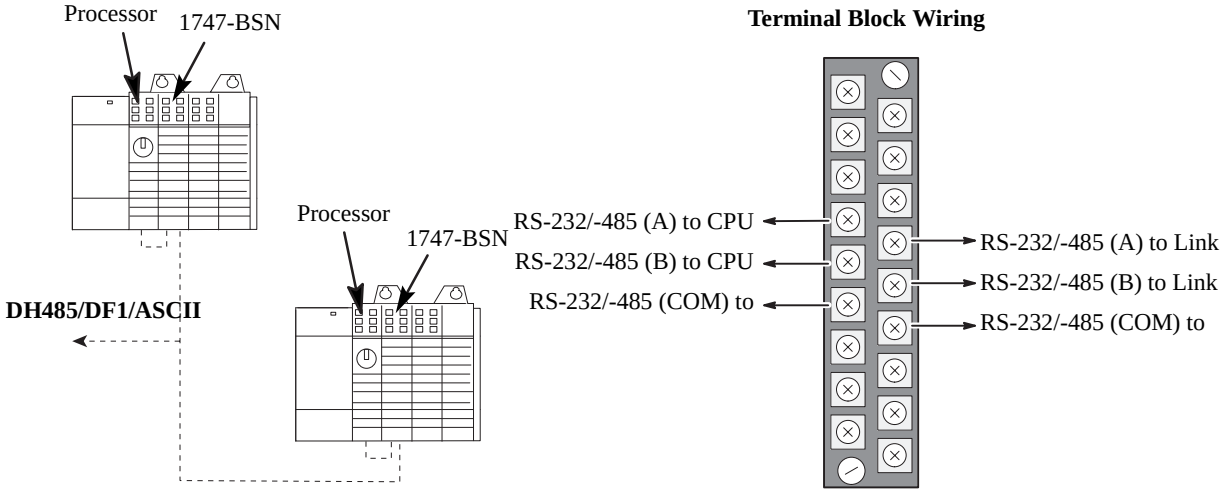
Figure 6 DH+ System



RS-232/RS-485 Network Wiring

The 1747-BSN module supports RS-232 or RS-485 communications for the primary processor only. The RS-232 or RS-485 network can use the same BSN module as the DH+ or RIO network.

Figure 7 RS-232/485 System



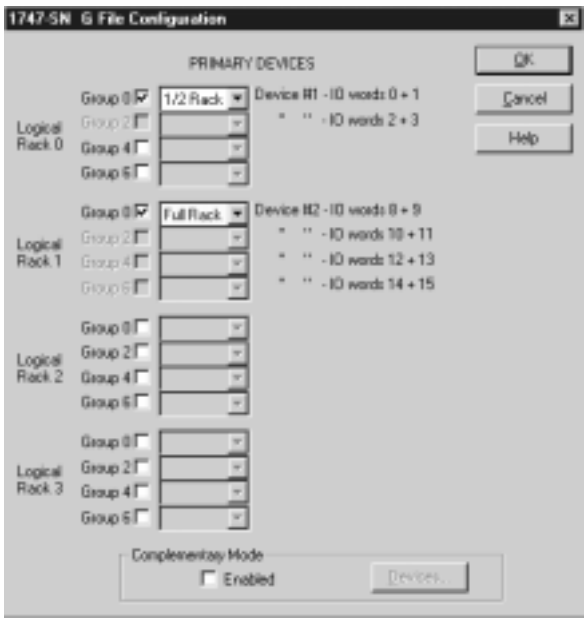
Configuring the Scanner and Special Control Status Functions

G Files

G files are the software equivalent of DIP switches. You use the G file to configure each network device to the scanner. It specifies the address of each RIO device and the discrete data size transferred for each device. G file information is entered during SLC programming and downloaded when the processor enters the run or test mode. Figure 8 shows the G-file configuration screen in RSLogix 500™.

NOTE G file information cannot be accessed during scanner operation.

Figure 8 G-file Configuration Screen



M Files

The scanner provides RIO link device control and status information through M0 and M1 files. The M0 file is an output and control file. The M1 file is an input and status file. A description of their functions follows.

M0 files:

- stop scanning an RIO device (Device Inhibit)
- reset device outputs to off while in the test or run mode (Device Reset)
- reset device outputs to off when leaving the run mode (Remote Output Reset)
- control read and write Block Transfers
- contain Block Transfer write data

M1 files provide:

- baud rate
- device and rack configurations
- active device status
- Block Transfer status information
- Block Transfer read data

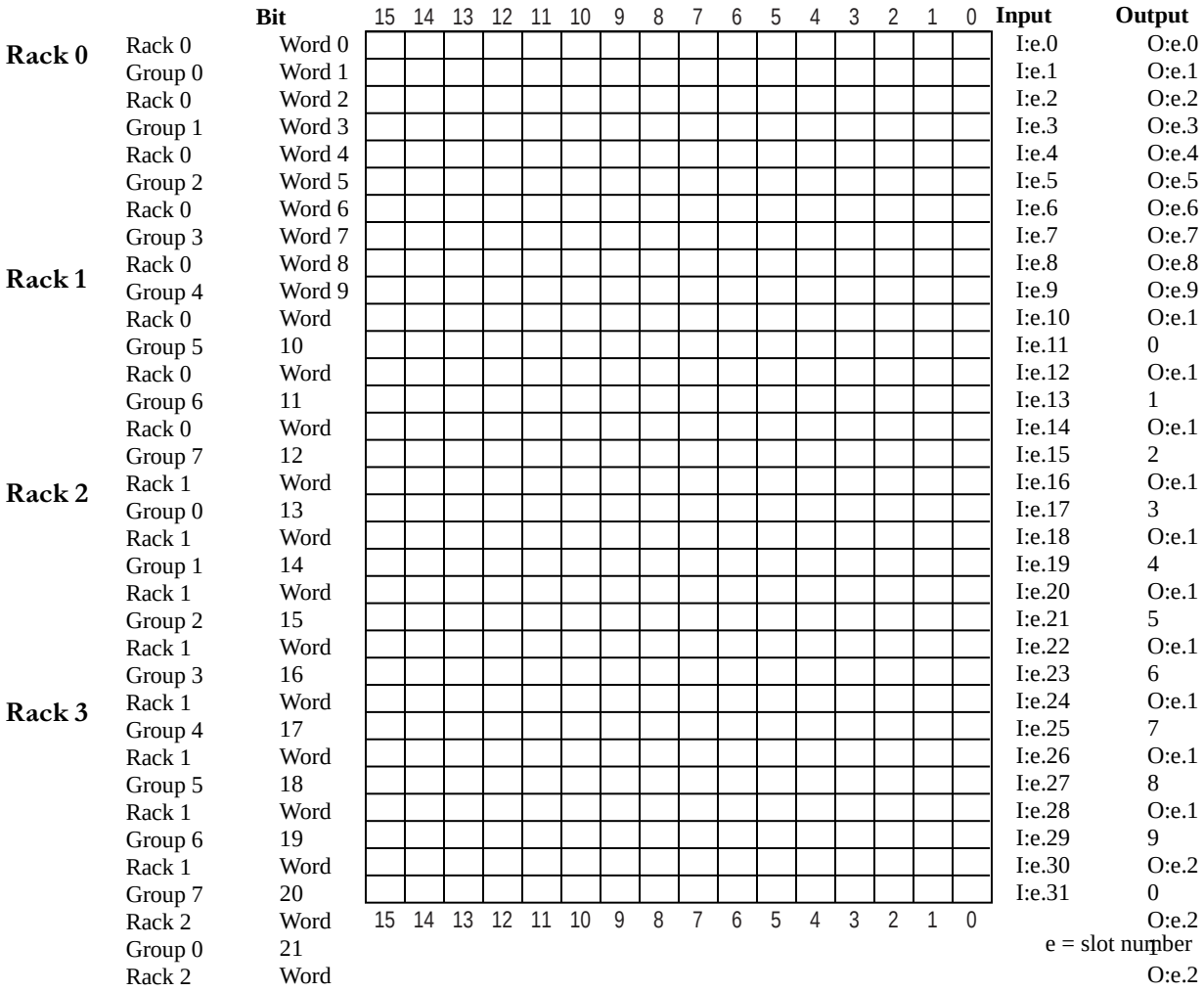
The SLC 5/03™ and higher processors allow you to monitor the actual state of each addressed M0/M1 file in your ladder program or data table. However, the SLC 5/02 processor does not allow you to monitor the actual state of each M0/M1 address.

Scanner I/O Image Concepts

The scanner's I/O image consists of RIO logical racks and I/O groups. A full RIO logical rack consists of eight input image and eight output image words. Each word within an RIO logical rack is assigned an I/O group number from 0 to 7.

You assign each device on the RIO link a portion of the scanner's image. Devices can occupy a quarter logical rack (2 I/O words), half logical rack (4 I/O words), three-quarter logical rack (6 I/O words), or full logical rack (8 I/O words). You may configure devices to start at any even I/O group number within an RIO logical rack. More than one physical device's (adapter) I/O information can reside in a single logical rack. Also, a device can consist of more than one logical rack.

Figure 9 Image Configuration



Input and Output Image Word Transfers

The SLC processor transfers the scanner's four logical racks (32 input image and 32 output image words) of discrete remote I/O image data into the SLC input and output image files. You can adjust the size of the scanner input and output image file during configuration of your SLC system so that the scanner only transfers the discrete I/O data your application program requires. Configuration is done through the configuration file (G file).

Block Transfers

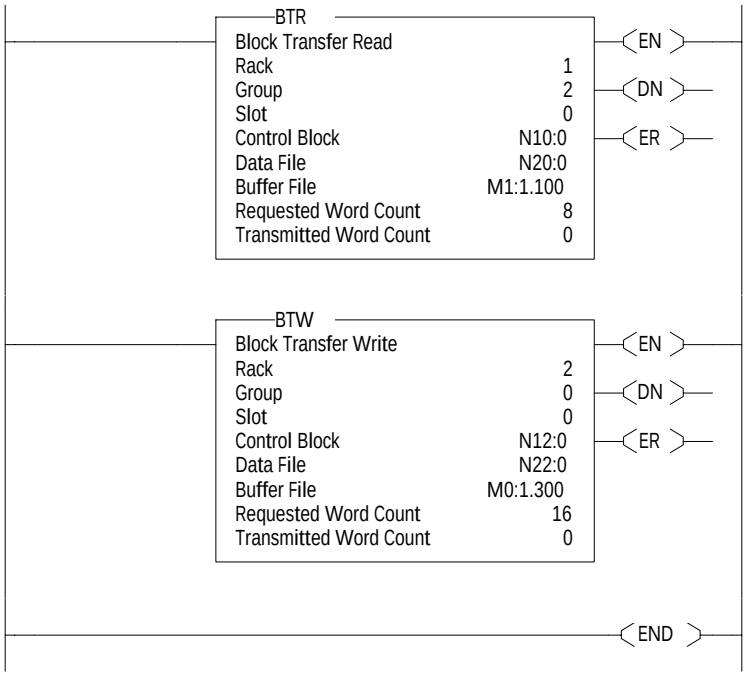
Like the 1747-SN, the 1747-BSN module supports the use of block transfer read and write commands for configuring drives or specialty modules. Block transfer commands can be used with SLC 5/03 (OS310), SLC 5/04 (OS410), or SLC 5/05 (OS510) or later processors.

Block Transfer Write (BTW) data travels from the SLC processor across the chassis backplane via the scanner's M files. The backup scanner then sends the data across the RIO link to the adapter of an intelligent I/O module.

Block Transfer Read (BTR) data travels from the adapter of an intelligent I/O module over the RIO link to the backup scanner. The chassis backplane then transfers BTR data via the scanner's M files to the SLC processor. The SLC control program processes the data once the SLC receives it from the scanner.

Block transfer operations (BTR and BTW) can be addressed to any logical slot within the RIO scanner's four logical racks. Figure 10 shows the BTR and BTW commands in RSLogix 500.

Figure 10 Block Transfer Read and Write Commands in RSLogix 500



High-Speed Serial Link (HSSL) Data Transfer

M file status words are used to control the transfer of data from the primary SLC processor to the secondary SLC processor. This link should be used to transfer internal processor data that must be kept current in the secondary processor in the event that a switchover takes place.

Allen-Bradley Support

In today's competitive environment, when you buy any product, you expect that product to meet your needs. You also expect the manufacturer of that product to back it up with the kind of customer service and product support that will prove you made a wise purchase.

As the people who design, engineer, and manufacture your Industrial Automation Control equipment, Allen-Bradley has a vested interest in your complete satisfaction with our products and services.

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

Contact your local Allen-Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Specifications

The following tables provide operating and network specifications.

Operating Specifications

Description	Specification
Backplane Current Consumption	800 mA at 5V dc
Operating Temperature	+32°F to +140°F (0°C to +60°C)
Storage Temperature	-40°F to +185°F (-40C to +85°C)
Humidity	5 to 95% without condensation
Noise Immunity	NEMA Standard ICS 2-230
Agency Certification (when product or packaging is marked)	UL listed C-UL listed – Class I, Division 2, Groups A, B, C, D Temp. Code T3C CE compliant for all applicable directives
Data Transfer Over HSSL	2M bits/second
Maximum Pairs of 1747-BSN Modules Allowed Per Configuration	8 pairs (16 modules) for 16K words max. data transfer
Switchover Speed	50 ms max. (Outputs held in last state during switchover.)

Network Specifications

Baud Rate Determination of Maximum Cable Length and Terminating Resistor Size

Baud Rate		Terminating Resistor Size	Maximum Cable Distance (Belden 9463)
Using Extended Node Capability	All Baud Rates	82Ω 1/2 Watt Gray-Red-Black-Gold	3048 meters (10,000 feet) at 57.6K baud
			1524 meters (5,000 feet) at 115.2K baud
			762 meters (2,500 feet) at 230.4K baud
Not Using Extended Node Capability	57.6K baud	150Ω 1/2 Watt Brown-Green-Brown-Gold	3048 meters (10,000 feet)
	115.2K baud	150Ω 1/2 Watt Brown-Green-Brown-Gold	1524 meters (5,000 feet)
	230.4K baud	82Ω 1/2 Watt Gray-Red-Black-Gold	762 meters (2,500 feet)

Configuration Dip Switch Settings

The six-position Configuration DIP Switch is used to select the baud rate, configure the communication channel and identify each individual BSN module and the last BSN module. The tables below define the DIP switch configuration settings.

DIP Switch Position	Definition	Setting
1 and 2	Sets the communication channel baud rate	See the table on page 15
3	Channel configuration	DH+ = ON RIO = OFF
4	This user identification switch differentiates between BSN modules in the primary system and BSN modules in the secondary system, helping determine if switchover has occurred. This switch is user-configurable and will not affect the operation of the module.	User selectable
5	Reserved	
6	Identifies the last module in the local status link, if multiple BSN modules are used in each chassis. If only one module is used in each chassis, turn this switch to ON.	Last module = ON All others = OFF

DIP Switch Position for Baud Rate Selection

Baud Rate	SW 1	SW 2
57.6K baud	1 ON	1 ON
115.2K baud	1 ON	0 OFF
230.4K baud	0 OFF	1 ON
230.4K baud	0 OFF	0 OFF

Module Address Switch

The four-position Module Address DIP switch configures the BSN address in the LSL. The following table shows the address that corresponds to each setting.

Switch Position			1747-BSN Address
1	**2**	**3**	
OFF	OFF	OFF	1
ON	OFF	OFF	2
OFF	ON	OFF	3
ON	ON	OFF	4
OFF	OFF	ON	5
ON	OFF	ON	6
OFF	ON	ON	7
ON	ON	ON	8

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