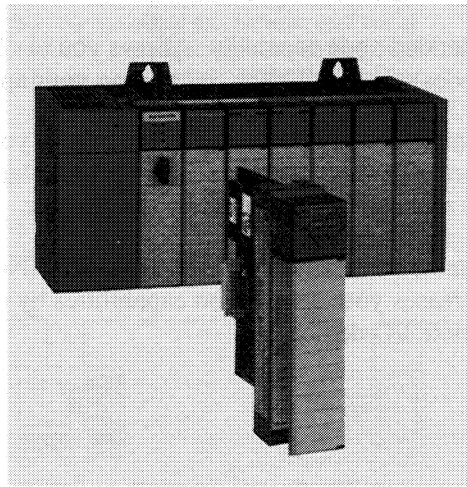
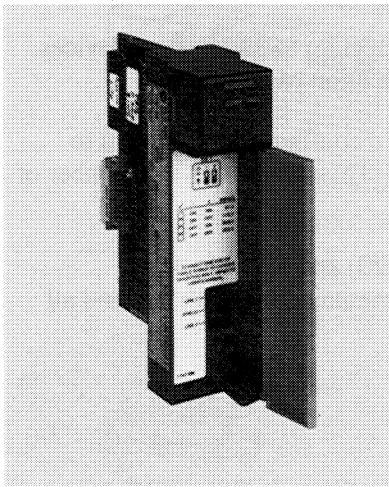




Remote I/O Scanner (Catalog Number 1747-SN)

Product Data



Surpass the present control capabilities of your SLC 500™ processor (SLC 5/02™ or later) by installing the Allen-Bradley Remote I/O (RIO) link. At communication rates up to 230.4K baud, the Remote I/O Scanner provides connectivity of your SLC 500 processor to Allen-Bradley operator interface devices, drives, and 1771 I/O products.

Reduce your wiring costs in remote applications with the time-proven Remote I/O (RIO) link. The RIO link enables the SLC 500 processor to exchange input and output information with up to 32 devices (nodes) via a single twisted pair cable. In addition to remote communication with 1746, 1771, and 1794 (Flex I/O) I/O systems, the Remote I/O scanner also enables communication with 1791 Block I/O. This reduces the amount of wiring and the time needed for installation.

Take advantage of the scanner's increased data transfer capability. The RIO scanner supports both block and discrete I/O transfer in normal and complementary configurations. This flexibility allows the scanner to handle a variety of applications.

Features and Benefits

Selectable baud rates. Provides you the ability to choose the communication rate which gives optimum performance and noise immunity over various cable distances.

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.

Block transfer read and write capability. Allows the scanner to exchange large amounts of data (up to 64 words) with any Allen-Bradley or Pyramid Solution Partner (PSP) compatible devices that use block transfer. For example, 1771 analog I/O and Allen-Bradley drives.

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.

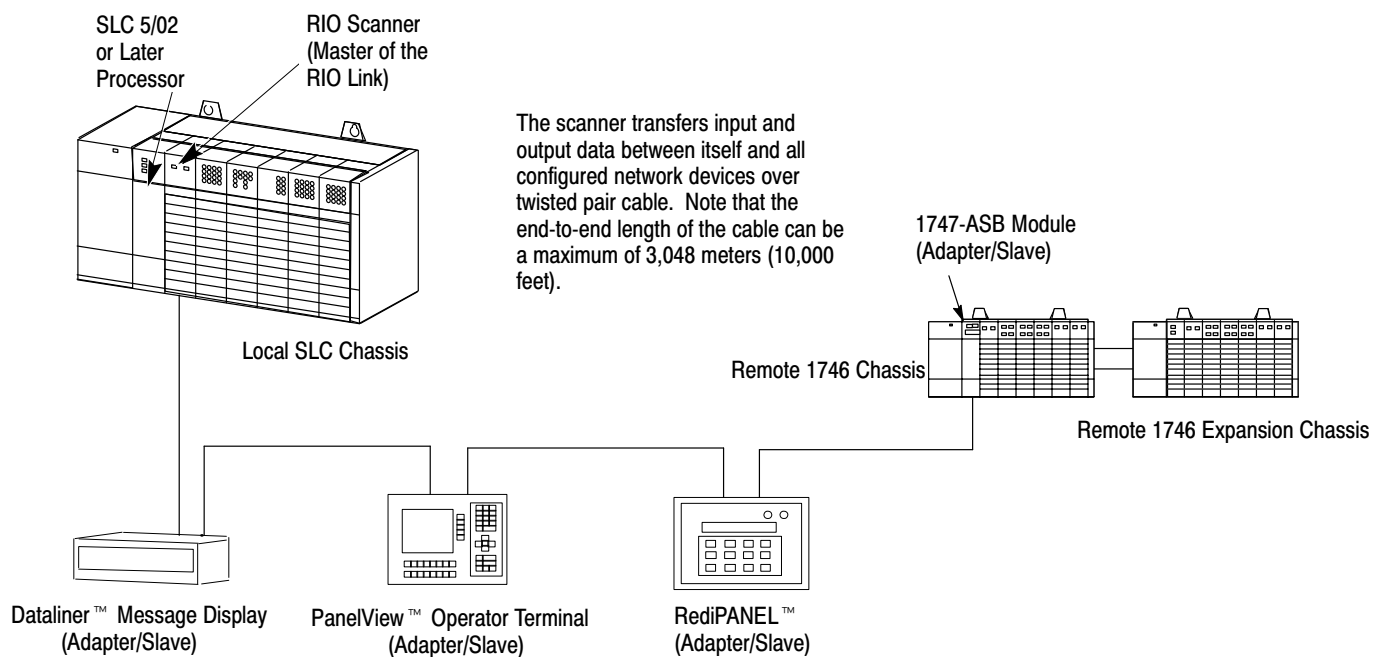
Remote connectivity to 1746, 1771, 1794 (Flex I/O) and 1791 Block I/O. Increases your application capabilities by communicating with any and all remote I/O devices.

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System Overview

The Remote I/O (RIO) Scanner, Catalog Number 1747-SN, is the remote I/O scanner for the SLC 500. It enables communication between an SLC processor (SLC 5/02™ or later) and remotely located (3,048 meters [10,000 feet] maximum) 1746 I/O chassis and other RIO compatible Allen-Bradley operator interface and control devices.

The 1747-SN Scanner communicates with remotely located devices using the A-B Remote I/O link. The RIO link consists of a single master (scanner) and multiple slaves (adapters). Communication between devices occurs over twisted pair cable with the devices daisy-chained together. The scanner can reside in any slot of the local SLC chassis except for slot 0.



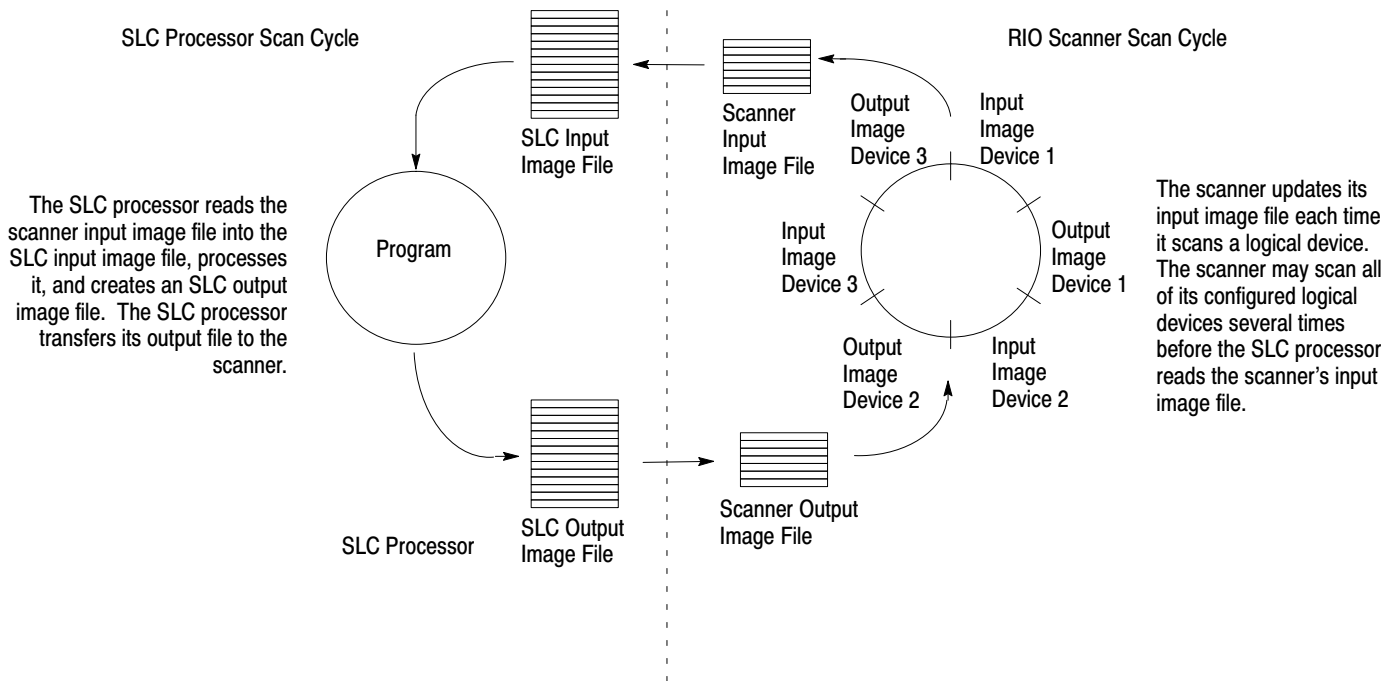
When installed in an SLC 500 modular system using an SLC 5/02 (or later) processor, the scanner supports up to 4 logical racks of data (up to 16 physical devices in normal mode; up to 32 devices in complementary mode) on the RIO link. The scanner provides discrete and block I/O transfers to any combination of quarter, half, three quarter, or full logical rack devices. The SLC system supports multiple scanners in the SLC 500 processor chassis. The number depends on your processor memory and power supply capability.

SLC and Scanner Asynchronous Operation

The SLC processor scan and RIO 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 RIO 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 RIO scanner updates its I/O files on a per logical rack basis.

The figure below illustrates the asynchronous operation of the SLC processor and RIO scanner.



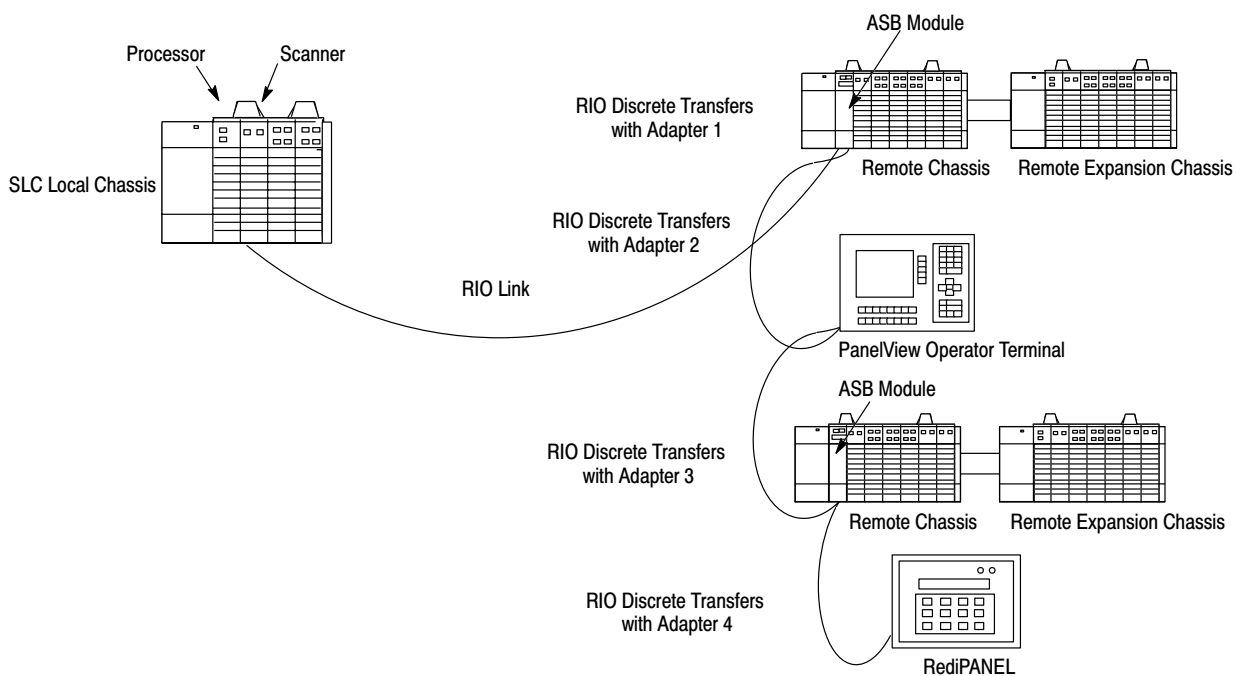
Important: The outputs of the RIO are updated *after* the end of the first SLC processor scan.

How the Scanner Interacts With Adapters

The 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. (These include run, adapter reset, and reset decide commands.) 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.

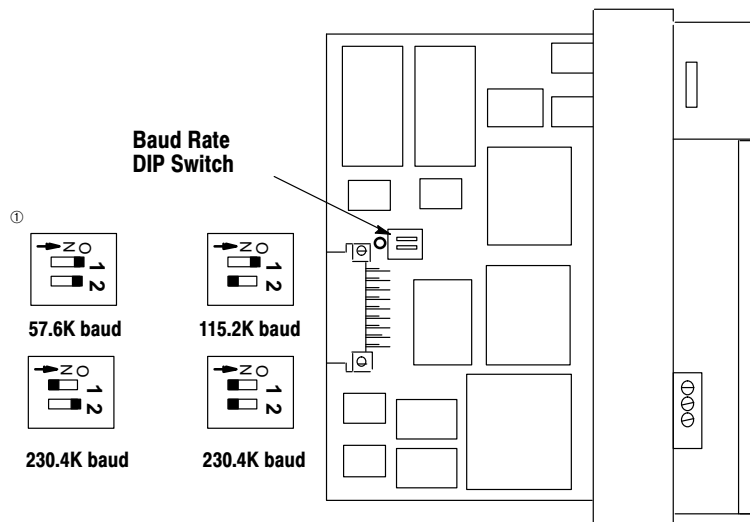
Important: RIO discrete transfers are asynchronous with the processor scan.



Hardware Overview

The scanner easily installs in an SLC chassis like other SLC 500 discrete I/O and specialty modules. Diagnostic LEDs indicate scanner operating status. The FAULT LED indicates the overall operating status of the scanner and the COMM LED indicates the RIO link communication status.

The scanner communicates over the RIO link via Belden cable #9463. The cable connects to the scanner through a removable terminal on the front of the module. (Refer to the RIO link connector in the diagram on the following page.)



① This is the default position as shipped from the factory.

RIO Link Wiring

The scanner is connected to other devices on the RIO link in a daisy chain (serial) configuration. There are no restrictions governing the space between each device, provided the maximum cable distance (Belden 9463) 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 that follows.

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

| 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) |

Allen-Bradley Compatible Devices

| Catalog Number | Device | Comments |
|-----------------------|--|--|
| 1785-LT/x | PLC-5/15™ (in adapter mode) | Extended node capability in adapter mode. |
| 1785-LT2 | PLC-5/25™ (in adapter mode) | Extended node capability in adapter mode. |
| 1785-LT3 | PLC-5/12™ (in adapter mode) | Extended node capability in adapter mode. |
| 1785-L30x | PLC-5/30™ (in adapter mode) | Extended node capability in adapter mode. |
| 1785-L40x | PLC-5/40™ (in adapter mode) | Extended node capability in adapter mode. |
| 1785-L60x | PLC-5/60™ (in adapter mode) | Extended node capability in adapter mode. |
| 1771-ASC | Remote I/O Adapter Module | |
| 1771-ASB | Remote I/O Adapter Module | Series A, B, and C; extended node capability for Series B and C. |
| 1771-AM1 | 1-Slot I/O Chassis W/Integral Power Supply and Adapter | Extended node capability. |
| 1771-AM2 | 2-Slot I/O Chassis W/Integral Power Supply and Adapter | Extended node capability. |
| 1784-F30D | Plant Floor Terminal Remote I/O Expansion Module | Extended node capability. |
| 1771-RIO | Remote I/O Interface Module | |
| 1771-JAB | Single Point I/O Adapter Module | Extended node capability. |
| 1771-DCM | Direct Communication Module | |
| 1778-ASB | Remote I/O Adapter Module | Extended node capability. |
| 1747-DCM | Direct Communication Module | Extended node capability. |
| 2706-xxx ^① | DL40 Dataliner | Extended node capability for Series B and C. |
| 2705-xxx | RediPANEL | Requires half logical rack configuration if you want to use stored messages. Extended node capability. |
| 2711-xx | PanelView Terminal | You can address PanelView Terminals as up to four full logical racks of discrete I/O. You can also assign partial logical racks. Extended node capability. |
| 1336-G2 | Remote I/O Adapter for 1336 AC Industrial Drives | Extended node capability. |
| 1395-NA | Remote I/O Adapter for 1395 DC Industrial Drives | Extended node capability. |
| 1791-xxx | Block I/O Products | The adapter is built into the block. |
| 1747-ASB | SLC 500 Remote I/O Adapter Module | Extended node capability. |
| 1794-ASB | Flex I/O 24VDC Remote I/O Adapter | |

^① Must be Catalog Number 2706-ExxxxxB1.

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 scanner enters the run or test mode.

G file information cannot be accessed during scanner operation.

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. Below is a description of their functions.

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 on 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 SLC 5/04™ 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. (A word consists of 16 bits of data.) 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 input and output 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.

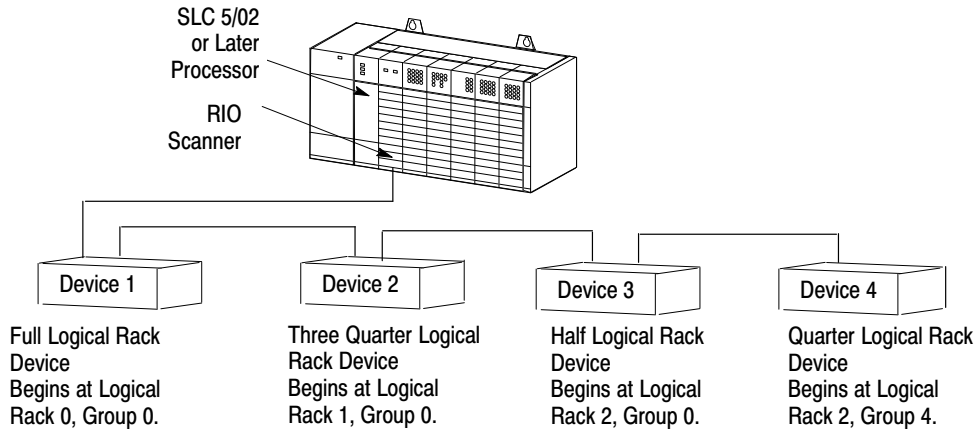
Important: The illustration below shows only the input image configuration of the scanner's I/O image. The output image configuration is the same.

Input Image Half of a Scanner's I/O Image

| | | Bit Number (decimal) | | | | | | | | | | | | | | | | | |
|---------------------------|-----------------------|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|----------------------------|
| | | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RIO Logical Rack 0 | Rack 0 Group 0 | Word 0 | | | | | | | | | | | | | | | | } | Quarter Logical Rack |
| | Rack 0 Group 1 | Word 1 | | | | | | | | | | | | | | | | | |
| | Rack 0 Group 2 | Word 2 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 0 Group 3 | Word 3 | | | | | | | | | | | | | | | | | |
| | Rack 0 Group 4 | Word 4 | | | | | | | | | | | | | | | | | |
| | Rack 0 Group 5 | Word 5 | | | | | | | | | | | | | | | | | |
| | Rack 0 Group 6 | Word 6 | | | | | | | | | | | | | | | | } | Half Logical Rack |
| | Rack 0 Group 7 | Word 7 | | | | | | | | | | | | | | | | | |
| RIO Logical Rack 1 | Rack 1 Group 0 | Word 8 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 1 Group 1 | Word 9 | | | | | | | | | | | | | | | | | |
| | Rack 1 Group 2 | Word 10 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 1 Group 3 | Word 11 | | | | | | | | | | | | | | | | | |
| | Rack 1 Group 4 | Word 12 | | | | | | | | | | | | | | | | | |
| | Rack 1 Group 5 | Word 13 | | | | | | | | | | | | | | | | | |
| | Rack 1 Group 6 | Word 14 | | | | | | | | | | | | | | | | } | Three Quarter Logical Rack |
| | Rack 1 Group 7 | Word 15 | | | | | | | | | | | | | | | | | |
| RIO Logical Rack 2 | Rack 2 Group 0 | Word 16 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 2 Group 1 | Word 17 | | | | | | | | | | | | | | | | | |
| | Rack 2 Group 2 | Word 18 | | | | | | | | | | | | | | | | } | Full Logical Rack |
| | Rack 2 Group 3 | Word 19 | | | | | | | | | | | | | | | | | |
| | Rack 2 Group 4 | Word 20 | | | | | | | | | | | | | | | | | |
| | Rack 2 Group 5 | Word 21 | | | | | | | | | | | | | | | | | |
| | Rack 2 Group 6 | Word 22 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 2 Group 7 | Word 23 | | | | | | | | | | | | | | | | | |
| RIO Logical Rack 3 | Rack 3 Group 0 | Word 24 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 3 Group 1 | Word 25 | | | | | | | | | | | | | | | | | |
| | Rack 3 Group 2 | Word 26 | | | | | | | | | | | | | | | | } | Full Logical Rack |
| | Rack 3 Group 3 | Word 27 | | | | | | | | | | | | | | | | | |
| | Rack 3 Group 4 | Word 28 | | | | | | | | | | | | | | | | | |
| | Rack 3 Group 5 | Word 29 | | | | | | | | | | | | | | | | | |
| | Rack 3 Group 6 | Word 30 | | | | | | | | | | | | | | | | } | Not Used In This Example |
| | Rack 3 Group 7 | Word 31 | | | | | | | | | | | | | | | | | |
| | | Bit Number (octal) | | | | | | | | | | | | | | | | | |
| | | 17 ₈ | 16 ₈ | 15 ₈ | 14 ₈ | 13 ₈ | 12 ₈ | 11 ₈ | 10 ₈ | 7 ₈ | 6 ₈ | 5 ₈ | 4 ₈ | 3 ₈ | 2 ₈ | 1 ₈ | 0 ₈ | | |

Example Scanner I/O Image

The illustrations below show a scanner's input image of 4 RIO link devices.



Important: The illustration below shows only the scanner's *input* image. The output image looks the same.

| | | Bit Number | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Input File Address | |
|---------------------------|----------------|------------|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------------|----------|
| RIO Logical Rack 0 | Rack 0 Group 0 | Word 0 | | | | | | | | | | | | | | | | | I:e.0 | Device 1 |
| | Rack 0 Group 1 | Word 1 | | | | | | | | | | | | | | | | | I:e.1 | |
| | Rack 0 Group 2 | Word 2 | | | | | | | | | | | | | | | | | I:e.2 | |
| | Rack 0 Group 3 | Word 3 | | | | | | | | | | | | | | | | | I:e.3 | |
| | Rack 0 Group 4 | Word 4 | | | | | | | | | | | | | | | | | I:e.4 | |
| | Rack 0 Group 5 | Word 5 | | | | | | | | | | | | | | | | | I:e.5 | |
| | Rack 0 Group 6 | Word 6 | | | | | | | | | | | | | | | | | I:e.6 | |
| | Rack 0 Group 7 | Word 7 | | | | | | | | | | | | | | | | | I:e.7 | |
| RIO Logical Rack 1 | Rack 1 Group 0 | Word 8 | | | | | | | | | | | | | | | | | I:e.8 | Device 2 |
| | Rack 1 Group 1 | Word 9 | | | | | | | | | | | | | | | | | I:e.9 | |
| | Rack 1 Group 2 | Word 10 | | | | | | | | | | | | | | | | | I:e.10 | |
| | Rack 1 Group 3 | Word 11 | | | | | | | | | | | | | | | | | I:e.11 | |
| | Rack 1 Group 4 | Word 12 | | | | | | | | | | | | | | | | | I:e.12 | Not Used |
| | Rack 1 Group 5 | Word 13 | | | | | | | | | | | | | | | | | I:e.13 | |
| | Rack 1 Group 6 | Word 14 | | | | | | | | | | | | | | | | | I:e.14 | |
| | Rack 1 Group 7 | Word 15 | | | | | | | | | | | | | | | | | I:e.15 | |
| RIO Logical Rack 2 | Rack 2 Group 0 | Word 16 | | | | | | | | | | | | | | | | | I:e.16 | Device 3 |
| | Rack 2 Group 1 | Word 17 | | | | | | | | | | | | | | | | | I:e.17 | |
| | Rack 2 Group 2 | Word 18 | | | | | | | | | | | | | | | | | I:e.18 | |
| | Rack 2 Group 3 | Word 19 | | | | | | | | | | | | | | | | | I:e.19 | |
| | Rack 2 Group 4 | Word 20 | | | | | | | | | | | | | | | | | I:e.20 | Device 4 |
| | Rack 2 Group 5 | Word 21 | | | | | | | | | | | | | | | | | I:e.21 | |
| | Rack 2 Group 6 | Word 22 | | | | | | | | | | | | | | | | | I:e.22 | |
| | Rack 2 Group 7 | Word 23 | | | | | | | | | | | | | | | | | I:e.23 | |
| RIO Logical Rack 3 | Rack 3 Group 0 | Word 24 | | | | | | | | | | | | | | | | | I:e.24 | Not Used |
| | Rack 3 Group 1 | Word 25 | | | | | | | | | | | | | | | | | I:e.25 | |
| | Rack 3 Group 2 | Word 26 | | | | | | | | | | | | | | | | | I:e.26 | |
| | Rack 3 Group 3 | Word 27 | | | | | | | | | | | | | | | | | I:e.27 | |
| | Rack 3 Group 4 | Word 28 | | | | | | | | | | | | | | | | | I:e.28 | |
| | Rack 3 Group 5 | Word 29 | | | | | | | | | | | | | | | | | I:e.29 | |
| | Rack 3 Group 6 | Word 30 | | | | | | | | | | | | | | | | | I:e.30 | |
| | Rack 3 Group 7 | Word 31 | | | | | | | | | | | | | | | | | I:e.31 | |

e = slot number of the SLC chassis containing the scanner

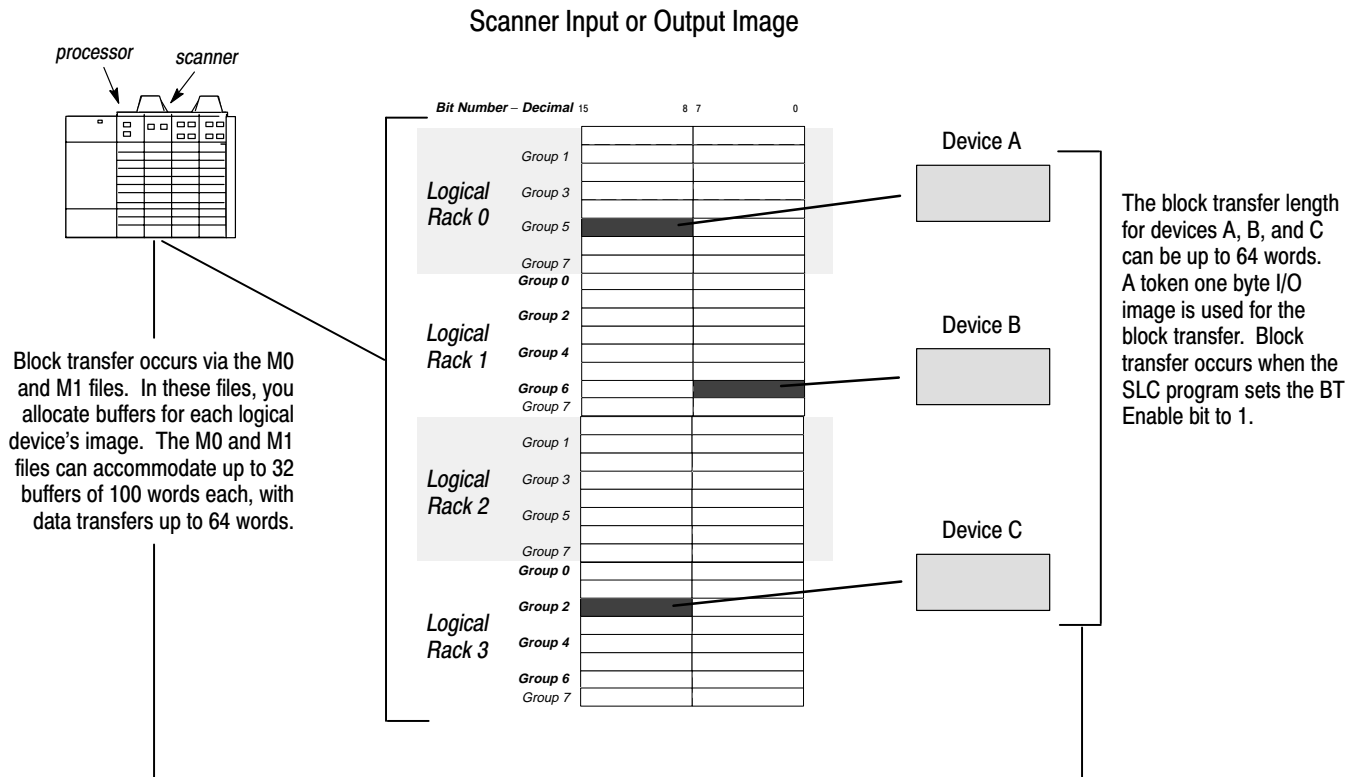
Taking Advantage of Block Transfer

RIO Block Transfer (BT) is a data transfer mechanism that allows your scanner to control the transfer of up to 64 words of data to or from a remote device over the Allen-Bradley RIO link. A *Block Transfer Read* (BTR) is used when you want to transfer data from a remote device to the SLC. A *Block Transfer Write* (BTW) is used when an SLC processor writes data to a remote device.

Use block transfer when:

- A device's I/O image does not discretely fit into the scanner's I/O image.
- You want to maximize the number of remote devices that a single scanner can scan.
- A device requires block transfers for communication.

You assign one byte of I/O image (which represents each logical device) to the scanner's I/O image. During block transfer execution, this one byte image acts as a handshake between the scanner and the adapter. The scanner and adapter perform block transfers through buffers that you allocate in the scanner's M0 and M1 files.

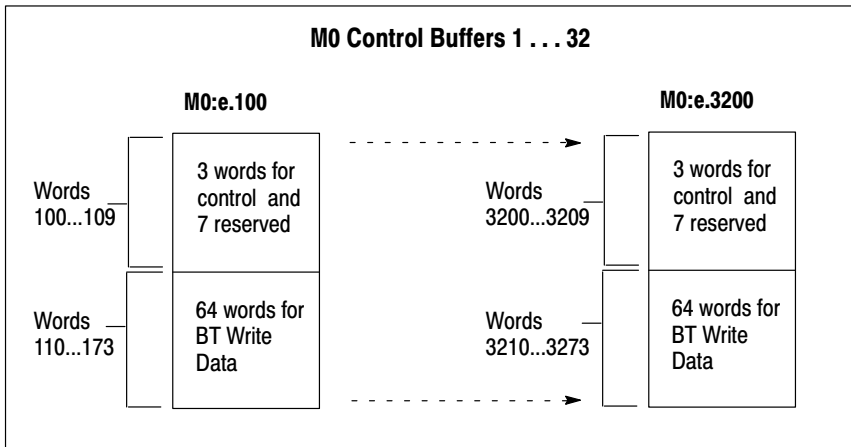


RIO Block Transfer Functional Overview

The RIO scanner performs block transfers through control/status buffers that you allocate in the scanner's M0 and M1 files. For BTWs, the M0 BT buffer contains BTW control information and BTW data, while a corresponding M1 BT buffer contains only BTW status information. For BTRs, the M0 BT buffer contains only BTR control information, while a corresponding M1 BT buffer contains BTR status information and BTR data. Block transfers occur asynchronous to RIO link discrete transfers. Note that block transfers occur as RIO scan time allows – discrete I/O transfers have first priority.

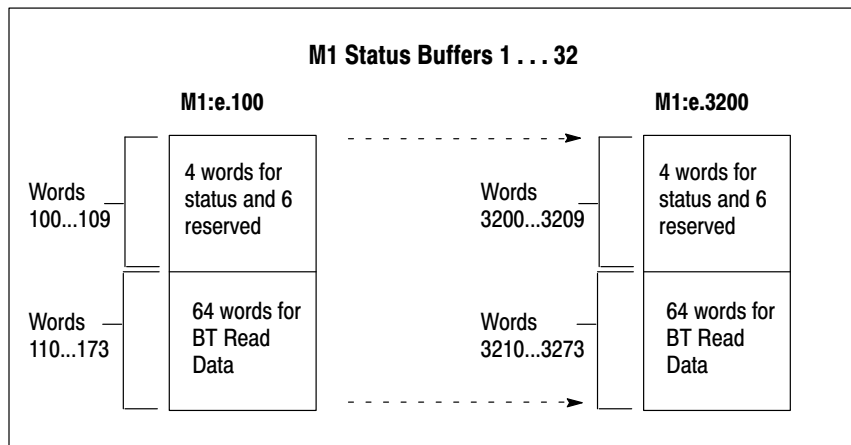
A total of 32 block transfer control/status buffers exist in the M0 (output/control) and the M1 (input/status) files. Block transfer buffers consist of:

- 3 BT control words in an M0 file BT buffer
- 4 BT status words in an M1 file BT buffer
- 64 words of BTW data in an M0 file and 64 words of BTR data in an M1 file



You use an M0 file BT control buffer to initiate a BT. The corresponding M1 file displays the status of the block transfer.

BT buffers reside on 100 word boundaries in the M0/M1 files starting at word 100. For example, BT buffer 1 resides at M0:e.100 and M1:e.100; BT buffer 2 resides at M0:e.200 and M1:e.200; while BT buffer 16 resides at M0:e.1600 and M1:e.1600. Note that the “e” in these examples refers to the physical chassis slot number in which the scanner resides.



All block transfer buffers (M0 and M1) are cleared (set to zero) either when the RIO scanner goes through a power cycle or when the SLC processor commands the scanner to change mode from Program to Test mode, Program to Run mode, or Test to Run mode.

Block Transfer Application Example

In the following example, a technician is required to:

- install a 4 to 20 mA transducer located approximately 701 meters (2,300 feet) from an SLC 5/03 processor
- bring the analog input value from the remote transducer into the SLC processor as well as display the analog value on a meter at the remote location using a remote I/O chassis
- display 0 to 100% on the meter and accept a 4 to 20 mA signal
- interface to 16 discrete inputs and 16 discrete outputs at this same remote location

The local system consists of:

- a Catalog Number 1747-L532 processor (SLC 5/03™) in slot 0
- a Catalog Number 1747-SN scanner (RIO Scanner) in slot 1 with only 1/4 logical rack of the I/O image available

We assume that:

- the 1747-SN already has 3 3/4 of its image used
- with only 1/4 logical rack of image remaining, the three I/O modules must be made to fit in this image size

With only 1/4 logical rack of image to work with, the remote system consists of:

- 4-slot remote chassis with a 1747-ASB in slot 0
- 1746-IV16 module in slot 1
- 1746-OV16 module in slot 2
- 1746-NIO4I in slot 3

For the remote chassis to keep its image size to 1/4 logical rack, select 2-slot addressing. The discrete modules use the entire image for logical rack 3, group 6 in a complementary slot pair arrangement and the combination analog module uses the image for logical rack 3, group 7. This image size for the analog module is 1 input and 1 output word short of what is required by the NIO4I module. Therefore, block transfer to/from the analog module will be used. (BT operations only require one input and one output byte.) In the future, the other analog input and output on the 1747-NIO4I may be used.

Scanner Configuration

The technician addresses the 1747-ASB to logical rack 3, starting logical group 6. Since the analog module's image (2 input/output words) will not fit into one logical group (1 input/output word), he must use block transfer to read analog input values and write to analog outputs. In this example, the SLC processor will receive the analog input data via BTR, scale it, and send it to the analog output via a BTW.

As shown in the G file below, the 1747-ASB consumes 1/4 logical rack of the scanner's I/O image table beginning at logical rack 3, starting at group 6.

G File

| | RIO Rack 3 Starting Group | | | | RIO Rack 2 Starting Group | | | | RIO Rack 1 Starting Group | | | | RIO Rack 0 Starting Group | | | |
|------------------------|------------------------------|---|---|---|------------------------------|---|---|---|------------------------------|---|---|---|------------------------------|---|---|---|
| | 6 | 4 | 2 | 0 | 6 | 4 | 2 | 0 | 6 | 4 | 2 | 0 | 6 | 4 | 2 | 0 |
| Device Address, Word 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Device Size, Word 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

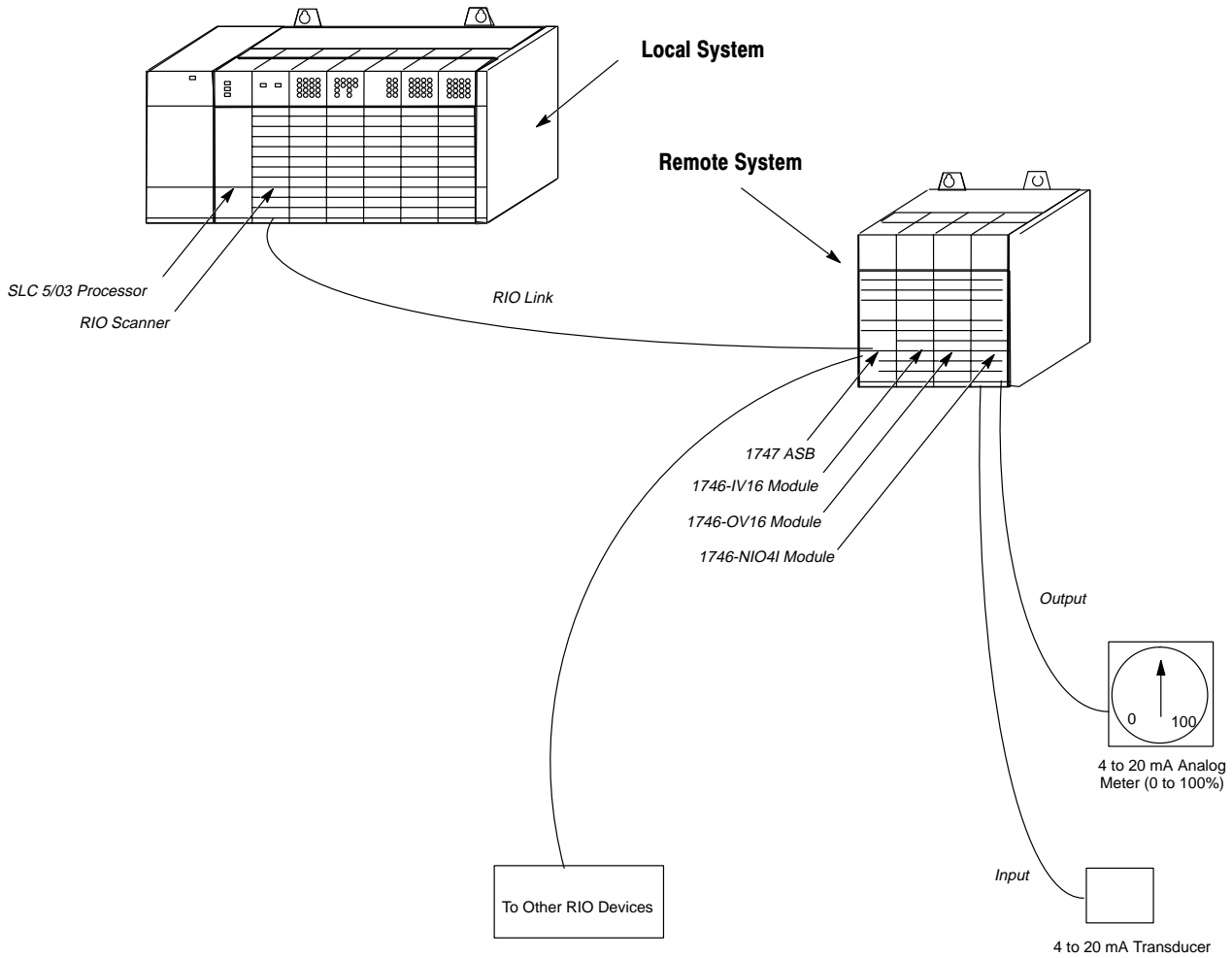
The scanner input file is shown below.

| | Bit Number | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Input File |
|---------------|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------|
| Rack 0 | Rack 0 Group 0 | Word 0 | | | | | | | | | | | | | | | | I:1.0 |
| | Rack 0 Group 1 | Word 1 | | | | | | | | | | | | | | | | I:1.1 |
| | Rack 0 Group 2 | Word 2 | | | | | | | | | | | | | | | | I:1.2 |
| | Rack 0 Group 3 | Word 3 | | | | | | | | | | | | | | | | I:1.3 |
| | Rack 0 Group 4 | Word 4 | | | | | | | | | | | | | | | | I:1.4 |
| | Rack 0 Group 5 | Word 5 | | | | | | | | | | | | | | | | I:1.5 |
| | Rack 0 Group 6 | Word 6 | | | | | | | | | | | | | | | | I:1.6 |
| | Rack 0 Group 7 | Word 7 | | | | | | | | | | | | | | | | I:1.7 |
| Rack 1 | Rack 1 Group 0 | Word 8 | | | | | | | | | | | | | | | | I:1.8 |
| | Rack 1 Group 1 | Word 9 | | | | | | | | | | | | | | | | I:1.9 |
| | Rack 1 Group 2 | Word 10 | | | | | | | | | | | | | | | | I:1.10 |
| | Rack 1 Group 3 | Word 11 | | | | | | | | | | | | | | | | I:1.11 |
| | Rack 1 Group 4 | Word 12 | | | | | | | | | | | | | | | | I:1.12 |
| | Rack 1 Group 5 | Word 13 | | | | | | | | | | | | | | | | I:1.13 |
| | Rack 1 Group 6 | Word 14 | | | | | | | | | | | | | | | | I:1.14 |
| | Rack 1 Group 7 | Word 15 | | | | | | | | | | | | | | | | I:1.15 |
| Rack 2 | Rack 2 Group 0 | Word 16 | | | | | | | | | | | | | | | | I:1.16 |
| | Rack 2 Group 1 | Word 17 | | | | | | | | | | | | | | | | I:1.17 |
| | Rack 2 Group 2 | Word 18 | | | | | | | | | | | | | | | | I:1.18 |
| | Rack 2 Group 3 | Word 19 | | | | | | | | | | | | | | | | I:1.19 |
| | Rack 2 Group 4 | Word 20 | | | | | | | | | | | | | | | | I:1.20 |
| | Rack 2 Group 5 | Word 21 | | | | | | | | | | | | | | | | I:1.21 |
| | Rack 2 Group 6 | Word 22 | | | | | | | | | | | | | | | | I:1.22 |
| | Rack 2 Group 7 | Word 23 | | | | | | | | | | | | | | | | I:1.23 |
| Rack 3 | Rack 3 Group 0 | Word 24 | | | | | | | | | | | | | | | | I:1.24 |
| | Rack 3 Group 1 | Word 25 | | | | | | | | | | | | | | | | I:1.25 |
| | Rack 3 Group 2 | Word 26 | | | | | | | | | | | | | | | | I:1.26 |
| | Rack 3 Group 3 | Word 27 | | | | | | | | | | | | | | | | I:1.27 |
| | Rack 3 Group 4 | Word 28 | | | | | | | | | | | | | | | | I:1.28 |
| | Rack 3 Group 5 | Word 29 | | | | | | | | | | | | | | | | I:1.29 |
| | Rack 3 Group 6 | Word 30 | | | | | | | | | | | | | | | | I:1.30 |
| | Rack 3 Group 7 | Word 31 | | | | | | | | | | | | | | | | I:1.31 |
| | Bit Number (octal) | 17 ₈ | 16 ₈ | 15 ₈ | 14 ₈ | 13 ₈ | 12 ₈ | 11 ₈ | 10 ₈ | 7 ₈ | 6 ₈ | 5 ₈ | 4 ₈ | 3 ₈ | 2 ₈ | 1 ₈ | 0 ₈ | |

I:1.29 ← IV16 - OV16 uses O:1.30.
 I:1.30 ← 1746-NIO4I also uses O:1.31.
 I:1.31 ←

= used by other devices

System Layout Diagram

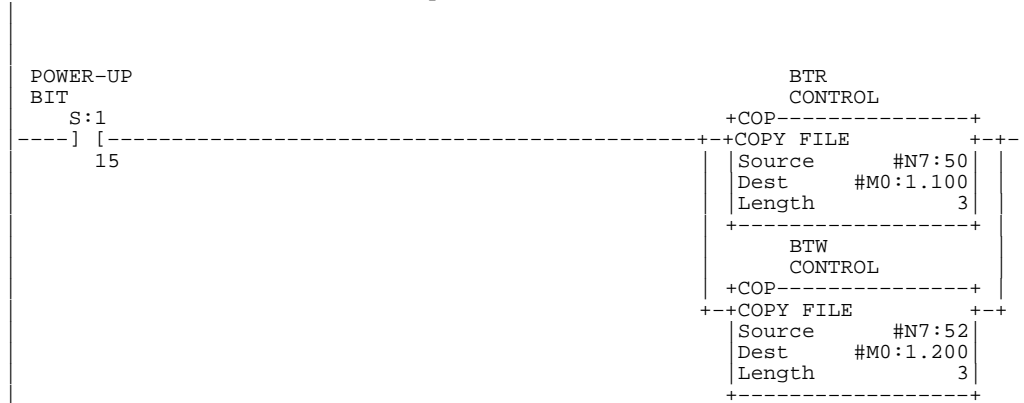


Example Program

The following program samples the analog input data from the 1746-NIO4I module located in the remote I/O chassis every 100 ms by executing a BTR every 100 ms. This data is then scaled for the 4 to 20 mA output and sent back to the analog module via a BTW. The meter will then display the 4 to 20mA analog output as a 0 to 100% scale. Refer to the system layout diagram above. Also refer to the Analog Module User Manual, Catalog Number 1746-6.4 Series B for details on analog input and output ranges as well as scaling.

Rung 2:0

Configure the BT operation type, length and RIO address (R, G, S in decimal) at power-up. N7:50/7 must be set to a "1" to indicate a BTR operation and N7:53/7 must be a "0" to indicate a BTW operation.



Rung 2:1

Copy the BTR status area to an integer file only when a BTR is in progress. This status data will then be used throughout the program and will limit the number of M-File accesses.



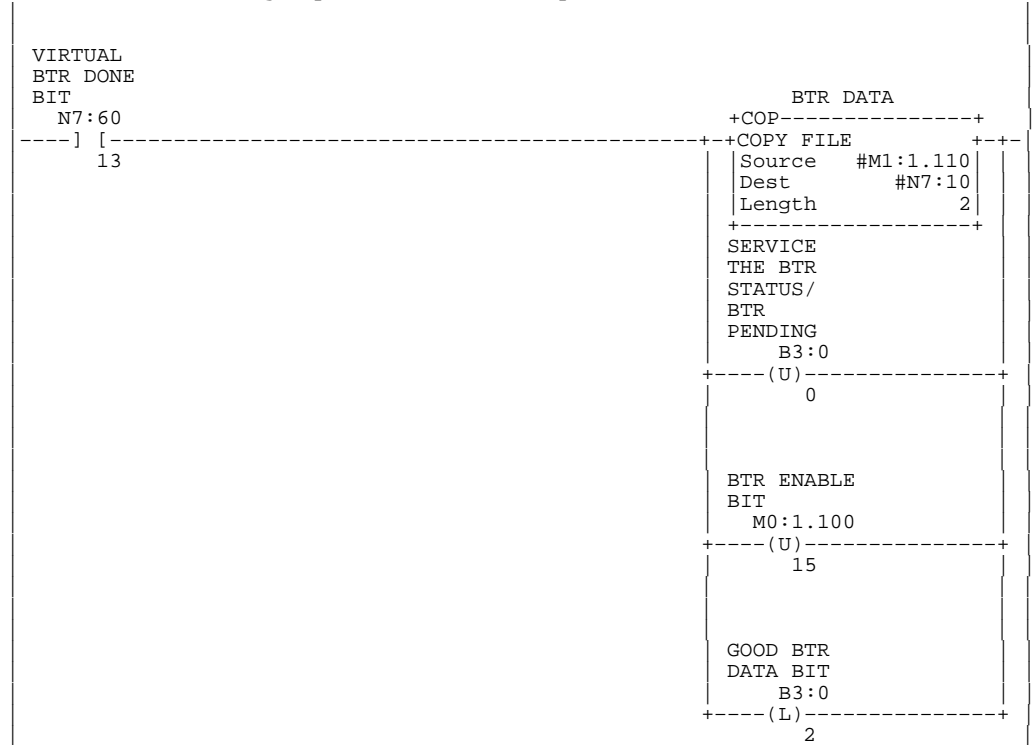
Rung 2:2

Copy the BTW status area to an integer file only when a BTW is in progress. This status data will then be used throughout the program and will limit the number of M-File accesses.



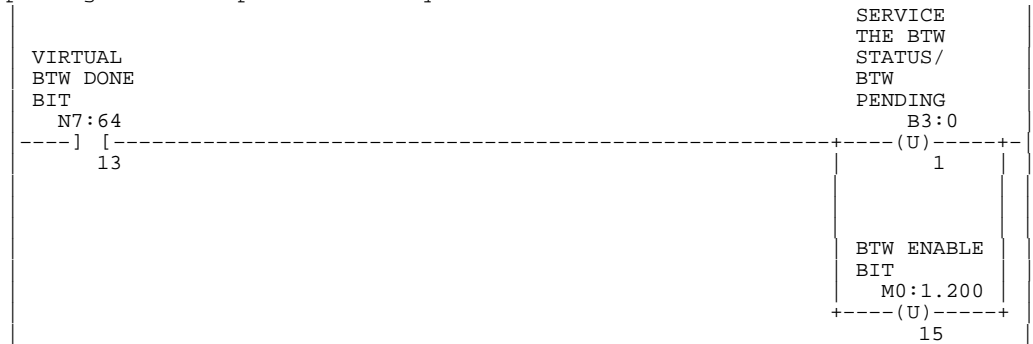
Rung 2:3

When a BTR successfully completes, buffer the block transfer data and unlatch both the BTR enable bit and the BTR pending bit. The data in this example is from analog input 0 located at remote address: Logical Rack 3, Group 7, left slot (0). This analog input is 4 to 20mA input from a transducer.



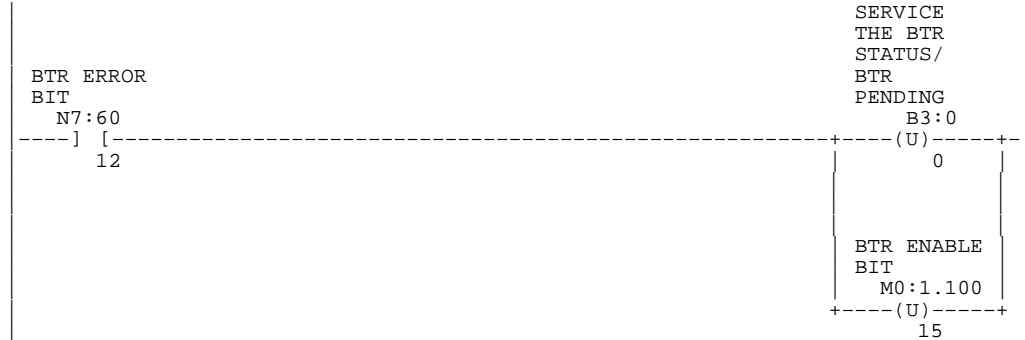
Rung 2:4

When a BTW successfully completes, unlatch the BTW enable bit and the BTW pending bit to complete a BTW sequence.



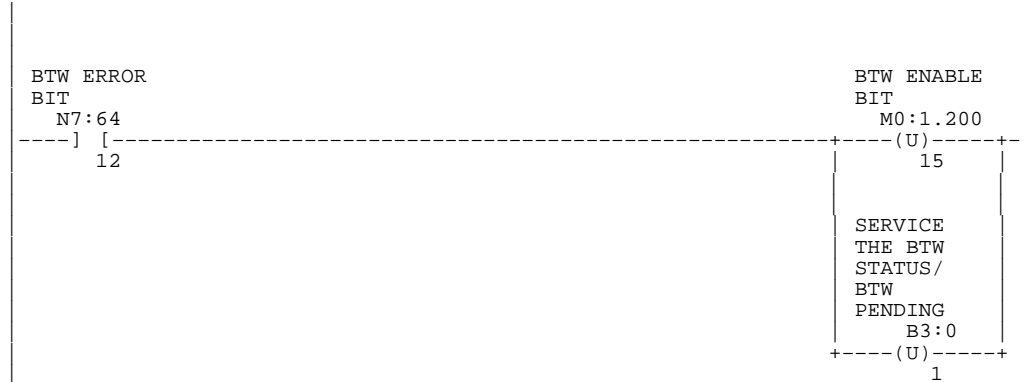
Rung 2:5

If a BTR errors, unlatch the BTR enable bit and the BTR pending bit. In addition, the BTR error code (N7:63 OR M1:1.103) must be viewed or buffered to determine the cause of the error.



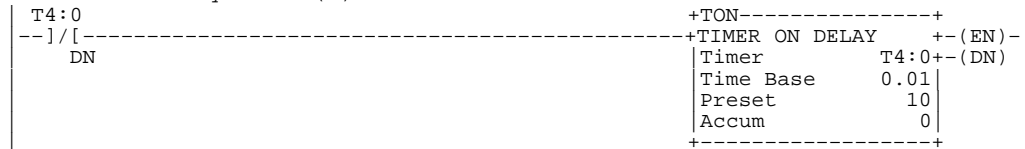
Rung 2:6

If a BTW errors, unlatch the BTW enable bit and the BTW pending bit. In addition, the BTW error code (N7:67 OR M1:1.203) must be viewed or buffered to determine the cause of the error.



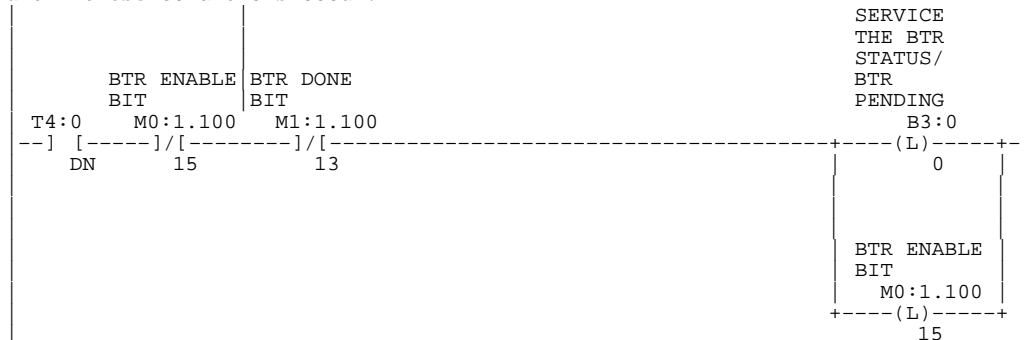
Rung 2:7

Free-running timer to execute a BTR to the analog input in Logical Rack 3, Group 7 left slot every 100ms (0).



Rung 2:8

Initiate a BTR every 100ms as long as a BTR is not in progress. A complete cycle requires that when complete or error, the ladder program unlatches the enable bit and the scanner then unlatches the done bit. A new BTR must not be initiated until these conditions occur.



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Specifications

The following tables provide operating and network specifications.

Operating Specifications

| Description | Specification |
|---|--|
| Backplane Current Consumption | 600 mA at 5V dc |
| Operating Temperature | +32° F to 140° F (0° to 60° C) |
| Storage Temperature | -40° F to +185° F (-40° C 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 style="list-style-type: none"> • CSA certified • CSA Class I, Division 2 Groups A, B, C, D certified • UL listed • CE marked for all applicable directives |

Network Specifications

Baud Rate Determination of Maximum Cable Length and Terminating Resistor Size

| Baud Rate | Maximum Cable Distance | Terminating Resistor Size |
|-------------|---------------------------|---------------------------|
| 57.6K baud | 3048 meters (10,000 feet) | 150Ω |
| 115.2K baud | 1525 meters (5,000 feet) | 150Ω |
| 230.4K baud | 750 meters (2,500 feet) | 82Ω |

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 |

SLC 500, SLC 5/02, SLC 5/03, SLC 5/04, PanelView, RediPANEL, Dataliner, PLC-5/12, PLC-5/15, PLC-5/25, PLC-5/30, PLC-5/40, and PLC-5/60, are trademarks of Allen-Bradley Company, Inc.



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