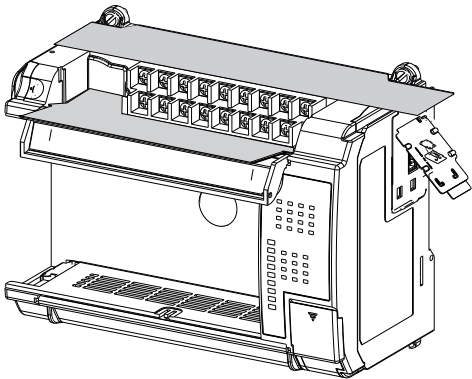


Base Unit

Figure 2 - Base Unit Hardware Features



Catalog Number	Line Power	Inputs	Outputs	High Speed I/O
1764-24AWA	120/240V AC	12 120V AC	12 relays, 2 isolated relays per unit	Not applicable
1764-24BWA	120/240V AC	8 standard 24V DC 4 fast 24V DC	12 relays, 2 isolated relays per unit	4 20 kHz input
1764-28BXB	24V DC	8 standard 24V DC 8 fast 24V DC	6 relays, 2 isolated relays per unit 4 standard 24V DC FET 2 fast 24V DC FET	8 20 kHz input 2 20 kHz output

Processors

Figure 3 - Processor - 1764-LSP

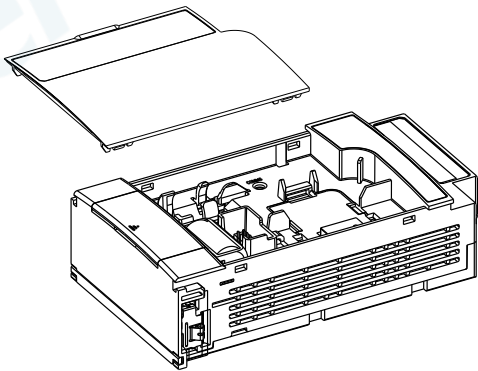


Figure 4 - Processor - 1764-LRP

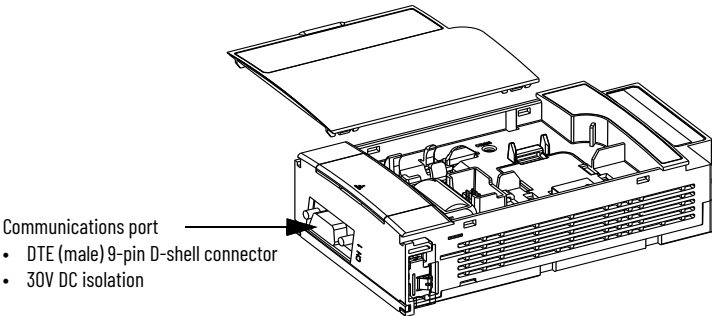
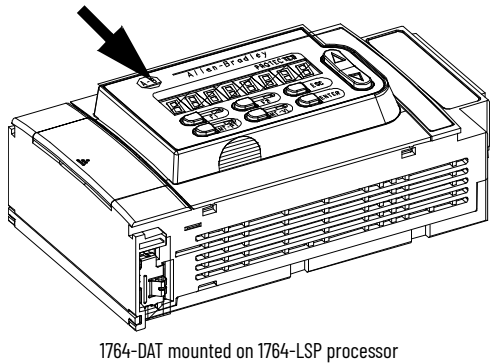
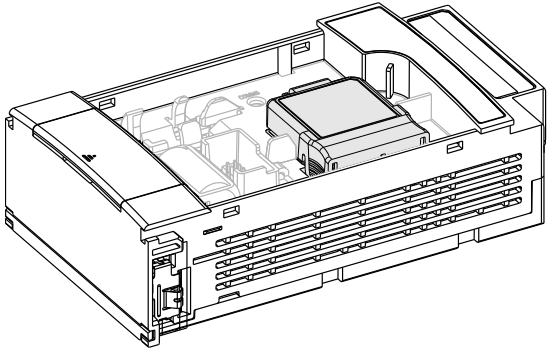


Figure 5 - Data Access Tool - 1764-DAT



Memory Modules/Real-time Clock

Figure 6 - Memory Module Mounted on the 1764-LSP Processor



[Table 1](#) lists the available memory modules and real-time clock modules.

Table 1 - Memory Modules and Real-time Clocks

Catalog Number	Description	Memory Size
1764-RTC	Real-time clock	Not applicable
1764-MM1	Memory module	8K
1764-MM1RTC	Memory module and real-time clock	8K
1764-MM2 ⁽¹⁾	Memory module	16K
1764-MM2RTC ⁽¹⁾	Memory module and real-time clock	16K
1764-MM3 ⁽²⁾	Memory module	16K
1764-MM3RTC ⁽²⁾	Memory module and real-time clock	16K

(1) For 1764-LRP programs greater than 8K, use the 1764-MM2 or 1764-MM2RTC.
(2) The 1764-MM3xxx modules have the same user memory as the 1764-MM2xxx modules except recipe data size. Recipe data, which was stored to the Data Log Queue in the MicroLogix 1500 LRP can be stored to the 1764-MM3xxx modules. There is no difference in functionality between the 1764-MM2xxx and 1764-MM3xxx modules except that the 1764-MM3xxx modules can save recipe data from the Data Log Queue.

Cables

Use only the communication cables that are listed in [Table 2](#) in Class I Division 2 hazardous environment.

Compact I/O Expansion Modules

Compact I/O expansion modules (Bulletin 1769) can be connected to the MicroLogix 1500 controller. A maximum of either 8 or 16 expansion I/O modules can be used, depending upon your system. See [System Requirements for Using Expansion Modules on page 15](#).

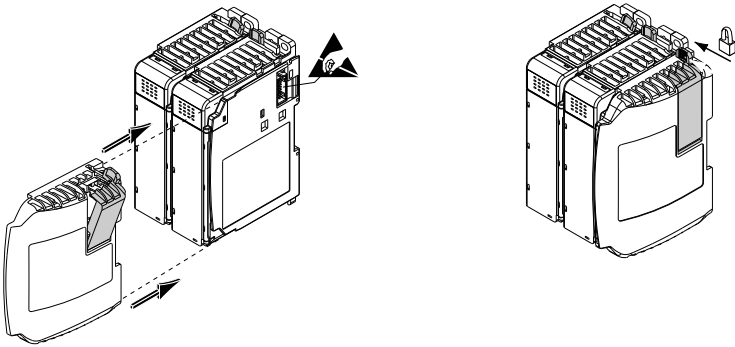
See [System Loading and Heat Dissipation on page 103](#) for more information on system configurations.

End Cap

An end cap terminator (1769-ECR or 1769-ECL) must be used at the end of the group of I/O modules attached to the MicroLogix 1500 controller. The end cap terminator is not provided with the base or processor units. It is required when using expansion I/O modules.

[Figure 7](#) shows the right end cap (1769-ECR). The left end cap (1769-ECL) is shown in [Figure 8](#).

Figure 7 - Add an End Cap



Expansion Power Supply and Cables

With Operating System Firmware Revision Number (FRN) 3 or later, you can connect an additional bank of I/O to your controller. Using an expansion power supply increases the system's capacity for adding expansion I/O modules. The additional I/O bank is connected to the controller with a specially designed cable. The additional I/O bank must include a power supply and an end cap.

 Depending on the system configuration, each controller can support up to 16 expansion I/O modules. See the [System Requirements for Using Expansion Modules](#) below. Also see [System Guidelines on page 16](#) for system limitations and illustrations of expansion I/O banks.

System Requirements for Using Expansion Modules

To support a maximum of 8 I/O modules in an additional I/O bank, you must have the following:

Table 4 - Requirements to Support a Maximum of 8 I/O Modules

Product	Catalog Number or Software Version	
MicroLogix 1500 Processor	1764-LSP, series A, revision C or later	
	1764-LSP, series B or later	
	1764-LRP, series B or later	
MicroLogix 1500 Base Unit	1764-24AWA, series A or later	
	1764-24BWA, series A or later	
	1764-28BXB, series A or later	
Operating System Version	Firmware revision number (FRN) 3 or later ⁽¹⁾	
Programming Software	1764-LSP, series A	RSLogix 500, version 3.01.09 or later
	1764-LSP, series B	RSLogix 500, version 4.00.00 or later
	1764-LRP, series B	
	1764-LSP, series C	RSLogix 500, version 5.00.00 or later
	1764-LRP, series C	

Table 4 - Requirements to Support a Maximum of 8 I/O Modules (Continued)

Product	Catalog Number or Software Version
1 Power Supply (optional)	1769-PA2, 1769-PA4 1769-PB2, 1769-PB4
1 Cable (optional)	1769-CRL1, 1769-CRL3, 1769-CRR1, 1769-CRR3
1 End Cap (required)	1769-ECL, 1769-ECR

(1) You can check the FRN by looking at word S:59 (Operating System FRN) in the Status File.

To support a maximum of 16 I/O modules in an additional I/O bank, you must have the following:

Table 5 - Requirements to Support a Maximum of 16 I/O Modules

Product	Catalog Number or Software Version
MicroLogix 1500 Processor	1764-LSP, series C or later 1764-LRP, series C or later
MicroLogix 1500 Base Unit	1764-24AWA, series B or later 1764-24BWA, series B or later 1764-28BXB, series B or later
Operating System Version	Firmware revision number (FRN) 6 or later ⁽¹⁾
Programming Software	RSLogix 500, version 5.10.00 or later
1 Power Supply (optional)	1769-PA2, 1769-PA4, 1769-PB2, 1769-PB4
1 Cable (optional)	1769-CRL1, 1769-CRL3, 1769-CRR1, 1769-CRR3
1 End Cap (required)	1769-ECL, 1769-ECR

(1) You can check the FRN by looking at word S:59 (Operating System FRN) in the Status File.

IMPORTANT

If your processor is at an older revision, you must upgrade the operating system to FRN 3 or later to use an expansion cable and power supply (or to FRN 6 or later to allow up to 16 expansion modules). Go to rok.auto/pcdc to download the operating system upgrade.

MicroLogix 1500 base units are not field upgradeable from series A to series B.

Adding an I/O Bank*System Guidelines*

A maximum of one 1769 expansion cable can be used in a MicroLogix 1500 system, allowing for two banks of I/O modules (one connected directly to the controller and the other connected with the cable). Each I/O bank requires its own power supply (bank 1 uses the controller's embedded power supply).

**ATTENTION: LIMIT OF ONE EXPANSION POWER SUPPLY**

The expansion power supply cannot be connected directly to the controller. It must be connected using an expansion cable. Only one power supply (embedded in the base unit or an expansion power supply) may be used on an I/O bank. Exceeding these limitations may damage the power supply and result in unexpected operation.

Understand Communication Protocols

Use the information in this appendix to understand the differences in communication protocols. The following protocols are supported from the RS-232 communication channel:

- DF1 Full-duplex
- DF1 Half-duplex slave
- DH-485
- Modbus RTU slave (1764-LSP and 1764-LRP series B processors only)
- ASCII (1764-LSP and 1764-LRP series B processors only)

See [Communication Connections on page 47](#) for information about required network devices and accessories.

RS-232 Communication Interface

The communications port on the MicroLogix 1500 controller utilizes an RS-232 interface. RS-232 is an Electronics Industries Association (EIA) standard that specifies the electrical characteristics for serial binary communication. It provides you with a variety of system configuration possibilities. RS-232 defines electrical connection characteristics; not protocols.

One of the biggest benefits of an RS-232 interface is that it lets you integrate telephone and radio modems into your control system (using the appropriate DF1 protocol only, not DH-485 protocol), but it is for point-to-point connections only between two devices.

DF1 Full-duplex Protocol

DF1 Full-duplex protocol provides a point-to-point connection between two devices. DF1 Full-Duplex protocol combines data transparency (American National Standards Institute ANSI - X3.28-1976 specification subcategory D1) and 2-way simultaneous transmission with embedded responses (subcategory F1).

MicroLogix 1500 controllers support the DF1 Full-duplex protocol via RS-232 connection to external devices such as computers, or other controllers that support DF1 Full-duplex.

DF1 is an open protocol. See the DF1 Protocol and Command Set Reference Manual, publication [1770-RM516](#), for more information.

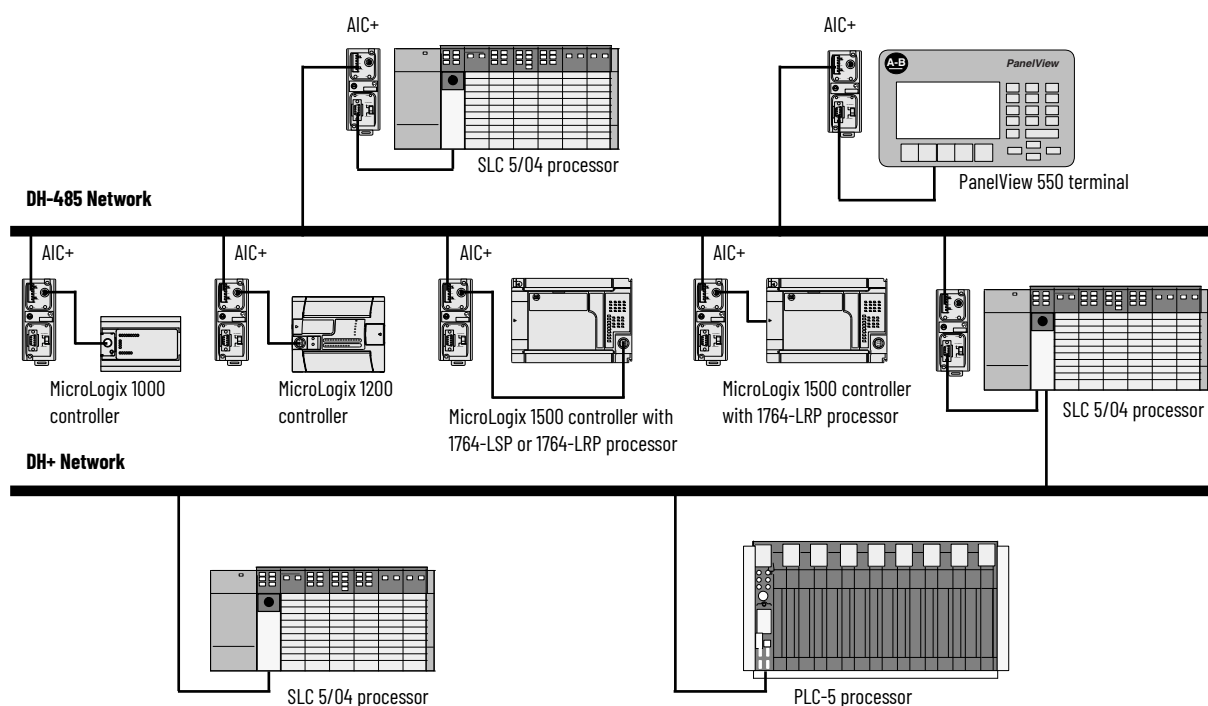
DF1 Full-duplex protocol (also referred to as DF1 point-to-point protocol) is useful where RS-232 point-to-point communication is required. DF1 protocol controls message flow, detects and signals errors, and retries if errors are detected.

For information about required network connecting equipment and examples of DF1 Full-duplex connections, see [Communication Connections on page 47](#).

DF1 Half-duplex Protocol

DF1 Half-duplex protocol is a multi-drop single master/multiple slave network. DF1 Half-duplex protocol supports data transparency (American National Standards Institute ANSI - X3.28-1976 specification subcategory D1). In contrast to DF1 Full-duplex, communication takes place in one direction at a time. With an active Half-duplex master, you can use the RS-232 port on the MicroLogix 1500 controller as a Half-duplex programming port and a Half-duplex peer-to-peer messaging port.

Figure 47 - Communication Between DH-485 and DH+ Networks with MicroLogix Controllers



Modbus RTU Slave Communication Protocol

IMPORTANT

This section applies to MicroLogix 1500, 1764-LSP and 1764-LRP, series B and later processors only.

Modbus RTU slave is a Half-duplex, master-slave communications protocol. The Modbus network master initiates and controls all communications on the network. Modbus protocol allows a single master to communicate with a maximum of 255 slave devices.

When a MicroLogix 1200 or MicroLogix 1500 Communications port is configured for Modbus RTU slave operation, you must define where Modbus data (coils, contacts, and registers) is mapped into the MicroLogix data space.

The Modbus address space is comprised of seven distinct memory ranges. Four of these ranges can be mapped into MicroLogix data files. Three Modbus ranges are fixed to MicroLogix file 2, the Status file. [Table 42](#) illustrates the Modbus to MicroLogix mappings.

Table 42 - Modbus to MicroLogix Memory Map

Modbus Addressing	Description	Valid MicroLogix Addressing		
		File Type	Data File Number	Address
0001...4096	Read/write Modbus coil data space	Bit (B) or Integer (N)	3...255	Bits 0...4095
10001...14096	Read-only Modbus contact data space	Bit (B) or Integer (N)	3...255	Bits 0...4095
30001...30256	Read-only Modbus input register space	Bit (B) or Integer (N)	3...255	Words 0...255
30501...30532	Modbus communication parameters	Communication Status Files	2	Words 0...31
31501...31566	Read-only system status file space	Status (S)	2	Words 32...65
40001...40256	Read/write Modbus holding register space	Bit (B) or Integer (N)	3...255	Words 0...255
41501...41566	Read/write system status file space	Status (S)	2	Words 0...65

For more information on how to configure your MicroLogix 1500 controller for Modbus RTU slave protocol, see the MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual, publication [1762-RM001](#). For more information about the Modbus protocol, see the Modbus Protocol Specifications (available from www.modbus.org).

ASCII Protocol

IMPORTANT This section applies to MicroLogix 1500, 1764-LSP and 1764-LRP, series B and later processors only.

ASCII protocol provides connection to other ASCII devices, such as bar code readers, weigh scales, serial printers, and other intelligent devices.

You can use ASCII protocol by configuring the RS-232 port, channel 0 for ASCII driver (*For the 1764-LRP only, you can select either Channel 0 or Channel 1*).

See the MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual, publication [1762-RM001](#) for detailed configuration information.

When the driver is set to ASCII, the parameters described in [Table 43](#) can be changed.

Table 43 - ASCII Channel Configuration Parameters

Parameter	Description	Programming Software Default
Baud Rate	Toggles between the communication rate of 300, 600, 1200, 2400, 4800, 9600, 19.2K, and 38.4K	1200
Parity	Toggles between None, Odd, and Even	None
Termination 1	Specifies the first termination character. The termination character defines the one or two character sequence used to specify the end of an ASCII line received. Setting the first ASCII termination character to undefined (\ff) indicates no ASCII receiver line termination is used.	\d
Termination 2	Specifies the second termination character. The termination character defines the one or two character sequence used to specify the end of an ASCII line received. Setting the second ASCII Termination character to undefined (\ff) and the first ASCII Termination character to a defined value (\d) indicates a single character termination sequence.	\ff
Control Line	Toggles between No Handshaking, Half-duplex Modem, and Full-duplex Modem	No Handshaking
Delete Mode	The Delete Mode allows you to select the mode of the "delete" character. Toggles between Ignore, CRT, and Printer. Delete Mode affects the characters echoed back to the remote device. When Delete Mode is enabled, the previous character is removed from the receive buffer. - In CRT mode, when a delete character is encountered, the controller echos three characters to the device: backspace, space, and backspace. This erases the previous character on the terminal. - In Printer Mode, when a delete character is encountered, the controller echos the slash character, then the deleted character. Enable the Echo parameter to use Delete Mode.	Ignore
Echo	When Echo Mode is enabled, all of the characters received are echoed back to the remote device. This allows you to view characters on a terminal connected to the controller. Toggles between Enabled and Disabled.	Disabled
XON/XOFF	Allows you to Enable or Disable XON/ XOFF software handshaking. XON/XOFF software handshaking involves the XON and XOFF control characters in the ASCII character set. When the receiver receives the XOFF character, the transmitter stops transmitting until the receiver receives the XON character. If the receiver does not receive an XON character after 60 seconds, the transmitter automatically resumes sending characters. Also, when the receive buffer is more than 80% full, an XOFF character is sent to the remote device to pause the transmission. Then, when the receive buffer drops to less than 80% full, an XON character is sent to the remote device to resume the transmission.	Disabled
RTS Off Delay (x20 ms)	Allows you to select the delay between when a transmission is ended and when RTS is dropped. Specify the RTS Off Delay value in increments of 20 ms. Valid range is 0...65535.	0
RTS Send Delay (x20 ms)	Allows you to select the delay between when RTS is raised and the transmission is initiated. Specify the RTS Send Delay value in increments of 20 ms. Valid range is 0...65535.	0