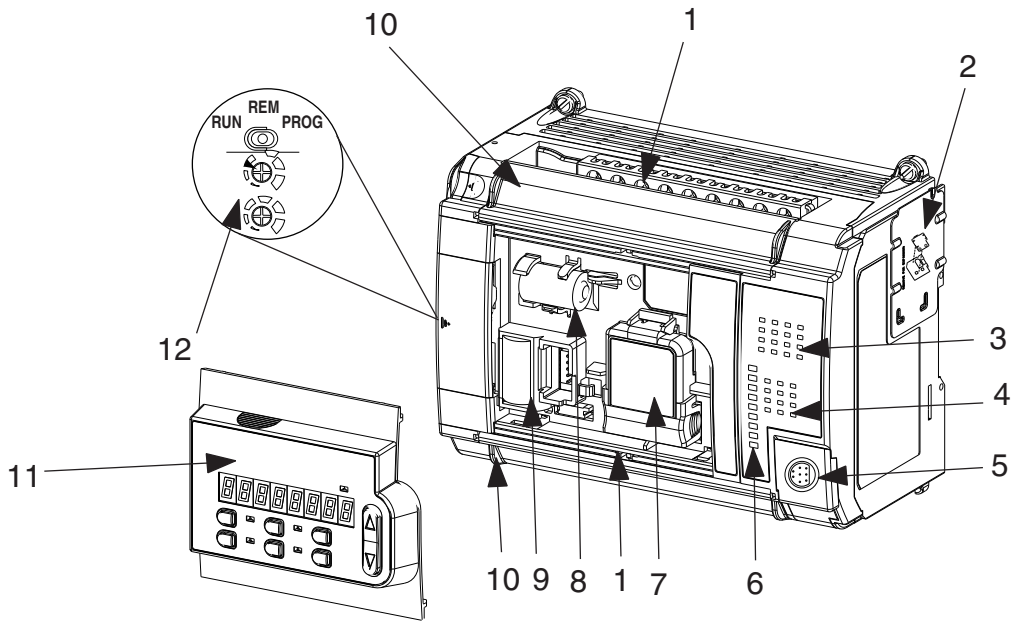# Hardware Overview

Hardware Features

The MicroLogix 1500 programmable controller is composed of a base unit, which contains a power supply, input and output circuits, and a processor. The controller is available with 24 or 28 points of embedded I/O. Additional I/O may be added using Compact I/O™ modules.

Figure 1 - Controller Hardware Features

Controller Description

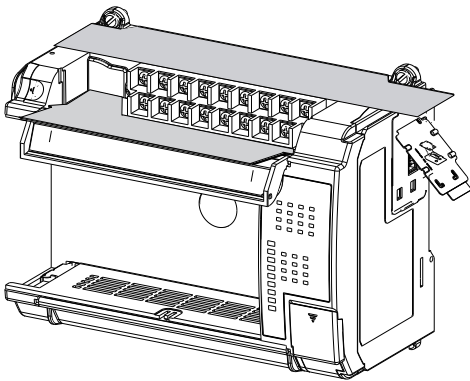|	Description		Description
1	Removable terminal blocks	7	Memory module/Real-time clock[1]
2	Interface to expansion I/O, removable ESD barrier	8	Replacement battery[1]
3	Input indicators	9	Battery
4	Output indicators	10	Terminal doors and label
5	Communication port	11	Data access tool[1]
6	Status indicators	12	Mode switch, trimpots

(1)   Optional

Component Descriptions

A MicroLogix 1500 controller is composed of a processor (1764-LSP or enhanced 1764-LRP with RS-232 port) and a base unit. The FET transistor outputs are available on the 1764-28BXB base unit only.

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

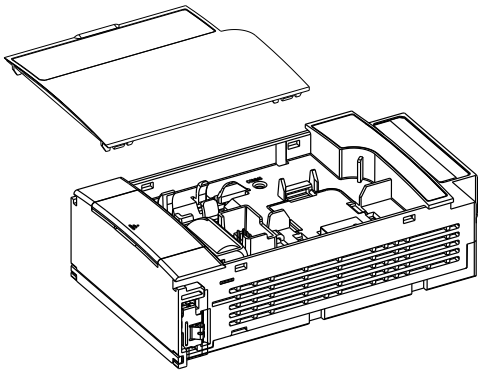**Figure 3 - Processor – 1764-LSP**
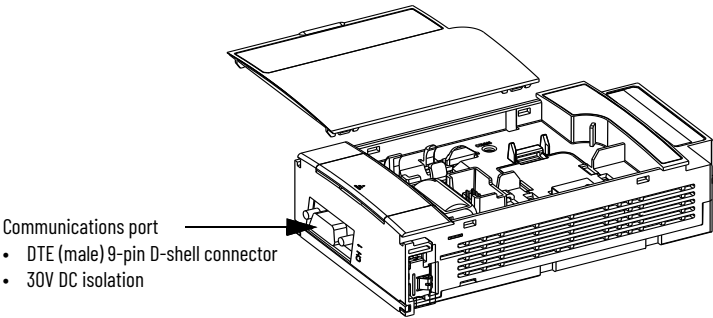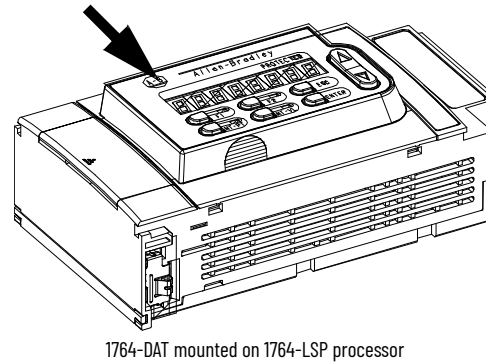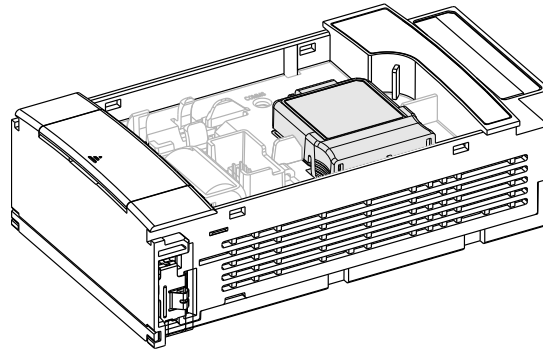

Figure 4 - Processor – 1764-LRP

Communications port
- DTE (male) 9-pin D-shell connector
- 30V DC isolation

Figure 5 - Data Access Tool – 1764-DAT

1764-DAT mounted on 1764-LSP processor

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-MM3*xxx* modules have the same user memory as the 1764-MM2*xxx* 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-MM3*xxx* modules. There is no difference in functionality between the 1764-MM2*xxx* and 1764-MM3*xxx* modules except that the 1764-MM3*xxx* 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.

Table 2 - Cables for Use in Class I Division 2 Hazardous Environment

Catalog Number	Catalog Number
1761-CBL-PM02, series C or later	2707-NC8, series B or later
1761-CBL-HM02, series C or later	2707-NC9, series B or later
1761-CBL-AM00, series C or later	2707-NC10, series B or later
1761-CBL-AP00, series C or later	2707-NC11, series B or later
1761-CBL-PH02, series A or later	—
1761-CBL-AH02, series A or later	—

Programming

Program the MicroLogix 1500 controller using RSLogix 500® software, version 4.00.00 or later. Certain features are only available when using the most current version of the software, as specified in <u>System Requirements for Using Expansion Modules on page 15</u>.

<u>Table 3</u> lists the firmware release numbers, feature and functionality enhancements, and the required version of RSLogix 500 Starter software.

Table 3 - Required Software Version by FRN Number

Controller	Firmware Release	Available for Sale Date	Catalog Number Series	Catalog Number Revision	OS FRN Number	Feature and Functionality Changes	Required Version of RSLogix 500/ RSLogix 500 Starter Software
1764-LSP	Initial Release	February 1999	A	B	2	Initial Release	3.01.00
	Enhancement	October 1999	A	C	3	Power Supply and Expansion Cable Compatibility	3.01.00
	Series B Release	March 2000	B	A	4	String Data File Type, ASCII Instruction Set, Modbus RTU Slave Protocol, Ramping (when using PWM outputs), Static Data File Protection, RTC Messaging	4.00.00
	Enhancement	October 2000	B	B	5	PTO Controlled Stop, Memory Module Program Compare Bit Enhancement	4.50.00
	Series C Release	September 2001	C	A	6	Floating Point Data File Support, Programmable Limit Switch (PLS), Real Time Clock Adjust (Copy Word), Absolute Value, Gray Code, Recipe, Message Instruction Support for 1769-SDN	5.10.00
1764-LRP	Initial Release	March 2000	B	A	4	Initial Release - Same Functionality as 1764-LSP	4.00.00
	Enhancement	October 2000	B	B	5	PTO Controlled Stop, Memory Module Program Compare Bit Enhancement	4.50.00
	Series C Release	September 2001	C	A	6	Floating Point Data File Support, Programmable Limit Switch (PLS), Real Time Clock Adjust (Copy Word), Absolute Value, Gray Code, Recipe, Message Instruction Support for 1769-SDN	5.10.00

Communication Options

The MicroLogix 1500 controller can be connected to a personal computer. It can also be connected to the DH-485 network with an Advanced Interface Converter (1761-NET-AIC), to an Ethernet network with an Ethernet Interface (1761-NET-ENI), or to a DeviceNet network with a DeviceNet Scanner module (1769-SDN). The controller can also be connected to Modbus SCADA networks as an RTU slave. See <u>Communication Connections on page 47</u> for more information on connecting to the available communication options.

The 1764-LRP processor provides an additional communication port. Each of the communication ports can be independently configured for any supported communication protocol. Channel 0 is on the base unit and Channel 1 is on the 1764-LRP processor.

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.

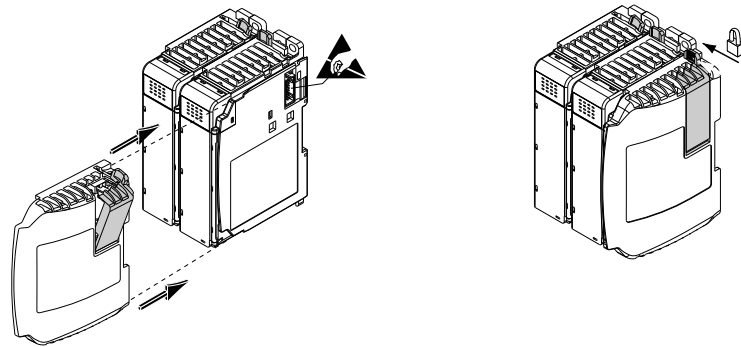See System Loading and Heat Dissipation on page 103 for more information on system configurations.

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 1764-LRP, series B	RSLogix 500, version 4.00.00 or later
	1764-LSP, series C 1764-LRP, series C	RSLogix 500, version 5.00.00 or later

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.

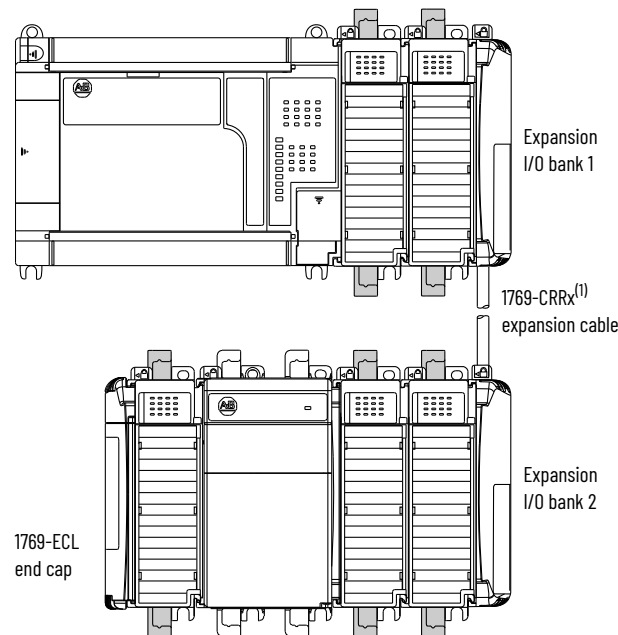| ⚠	**ATTENTION: REMOVE POWER** Remove system power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electric arc may occur. An electric arc can cause personal injury or property damage by: • Sending an erroneous signal to your system's field devices, causing unintended machine operation • Causing an explosion in a hazardous environment Electrical arcing causes excessive wear to contacts on both the module and its mating connector. See your power supply and I/O module's documentation for instructions on how to set up your system.

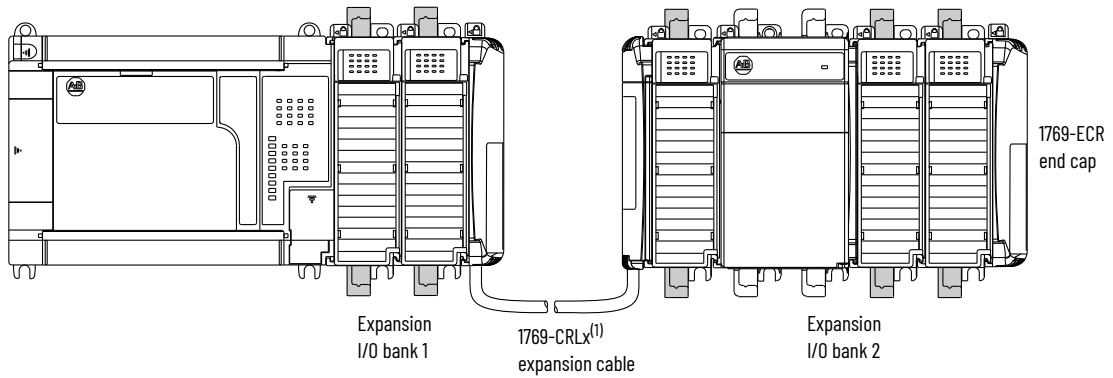| **IMPORTANT**	See the System Requirements for Using Expansion Modules on page 15 to determine the maximum number of expansion I/O modules you can use in your MicroLogix system. Also see System Loading and Heat Dissipation on page 103 for more information on system configurations.

Figure 8 and Figure 9 show a MicroLogix 1500 controller with an expansion I/O bank.

Figure 8 – Vertical Orientation

Expansion I/O bank 1

1769-CRRx[1] expansion cable

Expansion I/O bank 2

1769-ECL end cap

(1)   The x in this catalog number can be either a 1 or a 3 representing the length of the cable:
1 = 1 ft. (0.305 m) and 3 = 3.28 ft. (1 m)

Figure 9 - Horizontal Orientation

Expansion
I/O bank 1

1769-CRLx[(1)]
expansion cable

Expansion
I/O bank 2

1769-ECR
end cap

(1) The x in this catalog number can be either a 1 or a 3 representing the length of the cable:
1 = 1 ft. (0.305 m) and 3 = 3.28 ft. (1 m)

Address Expansion I/O

The expansion I/O is addressed as slots 1…16 (the controller's embedded I/O is addressed as slot 0). Power supplies and cables are not counted as slots. Modules are counted from left to right on each bank as shown in Figure 10 and Figure 11. For more information on addressing, see the MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual, publication 1762-RM001.

Figure 10 - Vertical Orientation

Embedded
I/O = Slot 0

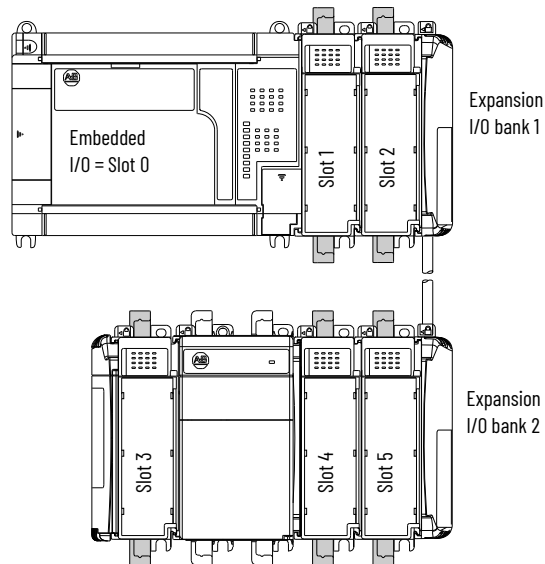Slot 1

Slot 2

Expansion
I/O bank 1

Slot 3

Slot 4

Slot 5

Expansion
I/O bank 2

Figure 11 - Horizontal Orientation

Embedded
I/O = Slot 0

Slot 1

Slot 2

Slot 3

Slot 4

Slot 5

Expansion I/O bank 1

Expansion I/O bank 2