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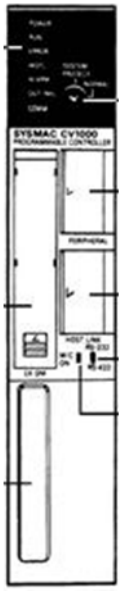
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CV500-CPU01-EV1 | CV1000-CPU01-EV1 | CV2000-CPU01-EV1 | CVM1-CPU01-EV2 | CVM1-CPU11-EV2 | CVM1-CPU21-EV2 | CV500-CPU01-EV1 | C500 | C1000 | C2000

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SYSMAC CVM1 | CPUs & Overview



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2-1 System Configuration

This section provides illustrations of CV-series PC Systems, which can be classified into five different types of configuration.

- Systems with only a CPU Rack
- Systems with only CV-series Expansion I/O Racks.
- Systems with an Expansion CPU Rack.
- Systems with a Single CV-series Expansion I/O Rack.
- Systems with C500 Expansion I/O Racks.

If only a CPU Rack is used, an I/O Control Unit is not required, but the CPU Rack is otherwise the same as those in the following examples. The specific Units used in the configuration are described in more detail later.

The maximum I/O capacity with any configuration is 512 points (32 words) for the CV500 or CVM1-CPU01-EV2; 1,024 points (64 words) for the CV1000 or CVM1-CPU11-EV2; and 2,048 points (128 words) for the CV2000 or CVM1-CPU21-EV2. The I/O capacity will be less depending on the Racks and the types of Units mounted.

Systems with only CV-series Expansion I/O Racks

The following figure shows an assembled CV-series CPU Rack and seven Expansion I/O Racks. Up to seven Expansion I/O Racks may be connected in one or two series from the CPU Rack.

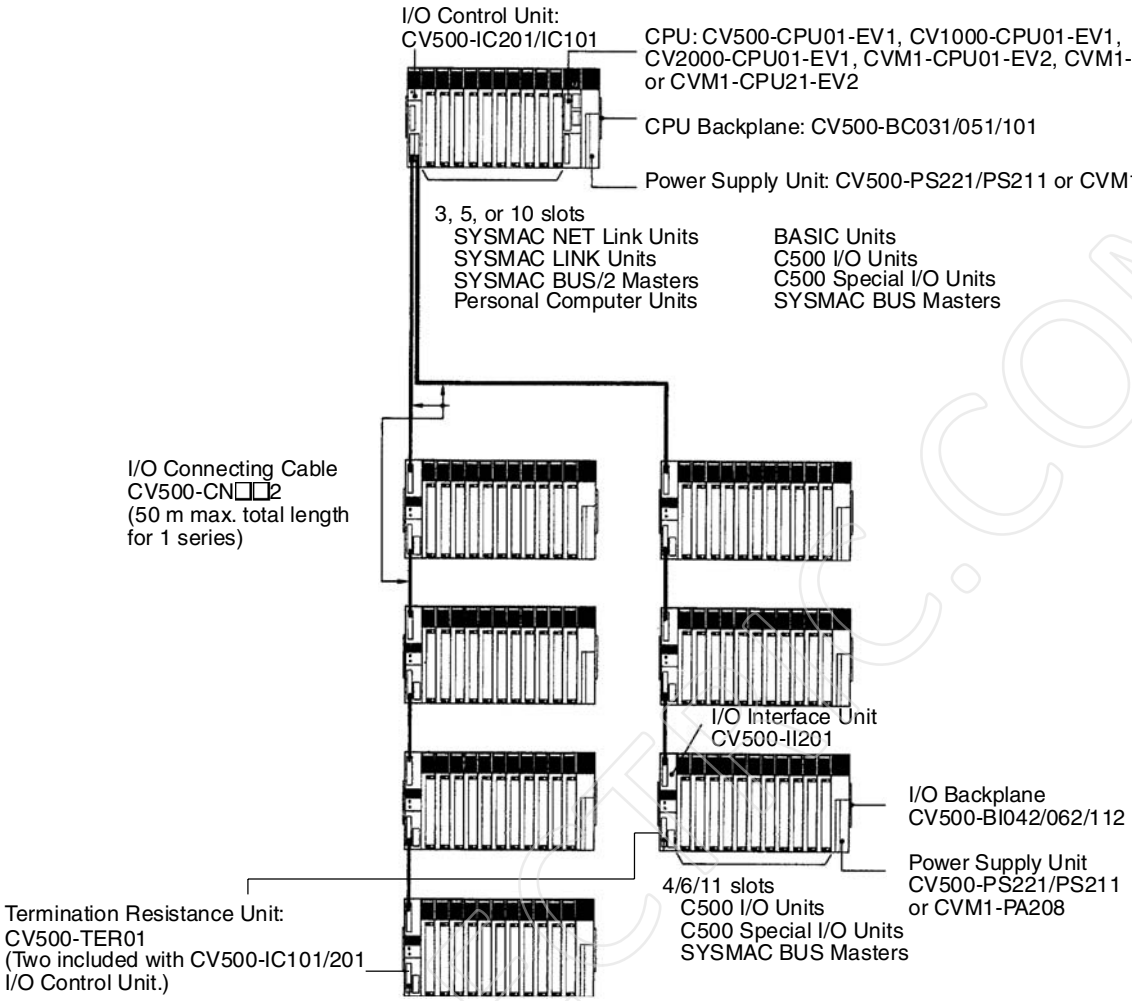
Series 1: Right connector on I/O Control Unit

Series 2: Left connector on I/O Control Unit

The total length of I/O Connecting Cable must be 50 m or less for each series and a Termination Resistance Unit must be connected to the last Rack or to the unused I/O Control Unit connector.

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Units can be mounted to any slot on the Racks shown for them below.



Systems with an Expansion CPU Rack

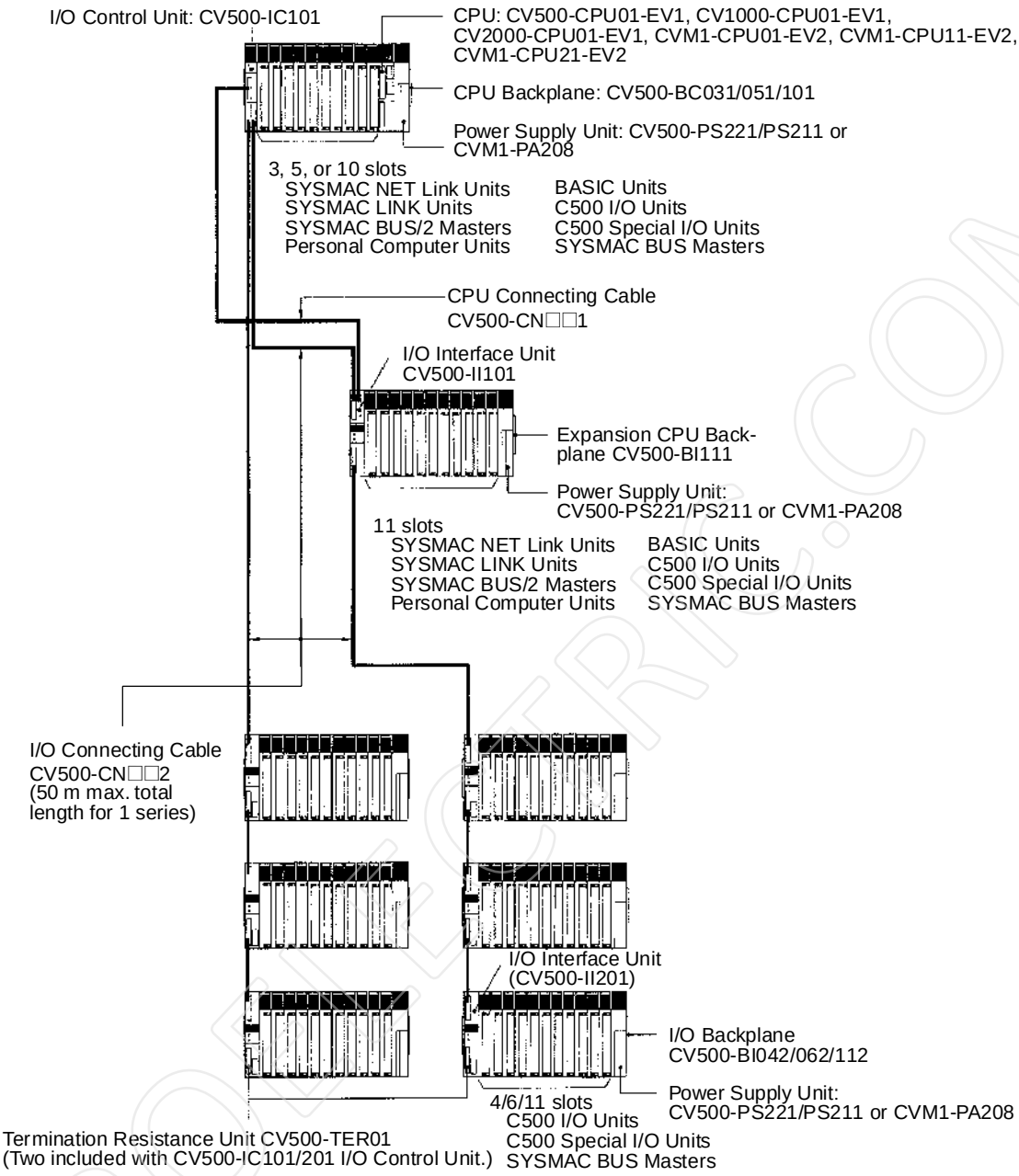
When nine or more CPU Bus Units (Temperature Controller Data Link Units, SYSMAC NET Link Units, SYSMAC LINK Units, SYSMAC BUS/2 Remote I/O Master Units, Ethernet Units, BASIC Units, and Personal Computer Units) are required in a System, the CPU Rack may be extended by connecting an Expansion CPU Rack to enable mounting up to 16 CPU Bus Units.

Only one Expansion CPU Rack may be connected to a CPU Rack. A system that includes an Expansion CPU Rack can be extended by connecting up to six Expansion I/O Racks. The Expansion I/O Racks may be connected in one or two series from the CPU Rack. The total length of I/O Connecting Cable must be 50 m or less for each series and a Termination Resistance Unit must be connected to the last Rack or to the unused I/O Control Unit connector.

Using an Expansion CPU Rack does not increase the maximum I/O capacity of the PC; it only increases the number of CPU Bus Units that can be used.

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Units can be mounted to any slot on the Racks shown for them below.

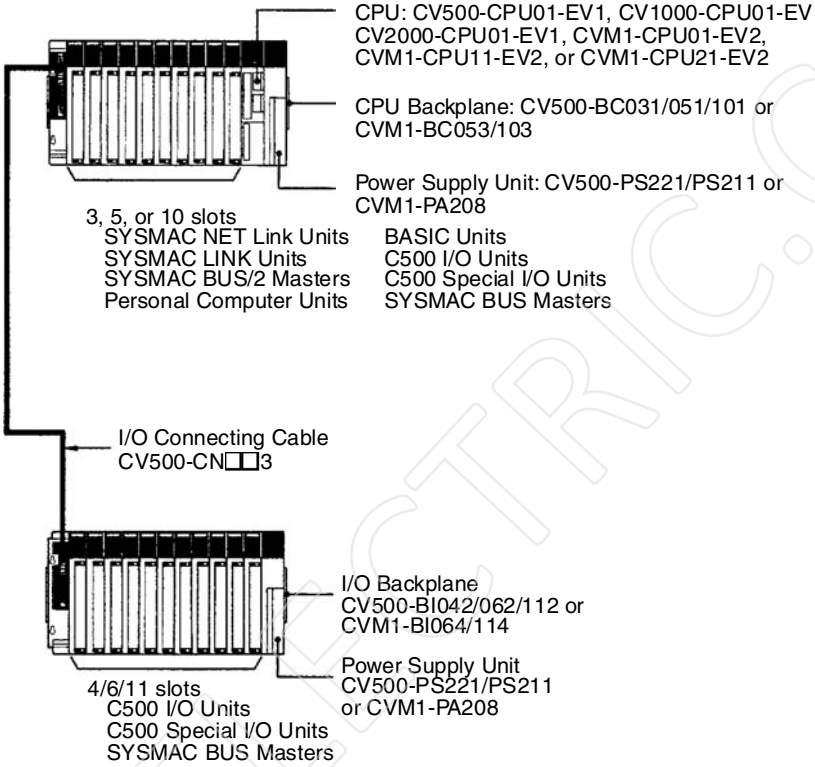


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Systems with a Single Expansion I/O Rack

When only one Expansion I/O Rack is required, a simplified system configuration may be used. The CPU Backplane can be connected directly to the Expansion I/O Backplane without the use of the I/O Control and I/O Interface Units. Termination Resistance Units are also not required.

All Units except for CPU Bus Units (Temperature Controller Data Link Units, SYSMAC NET Link Units, SYSMAC LINK Units, SYSMAC BUS/2 Masters, Ethernet Units, Personal Computer Units, and BASIC Units) can be mounted to any of the Backplanes for which they listed in the following diagram. CPU Bus Units can be mounted to any slot on any CPU Backplane except for the CVM1-BC053 or CVM1-BC103 Backplane, on which CPU Bus Units can be mounted only to the rightmost 3 and 6 slots, respectively.



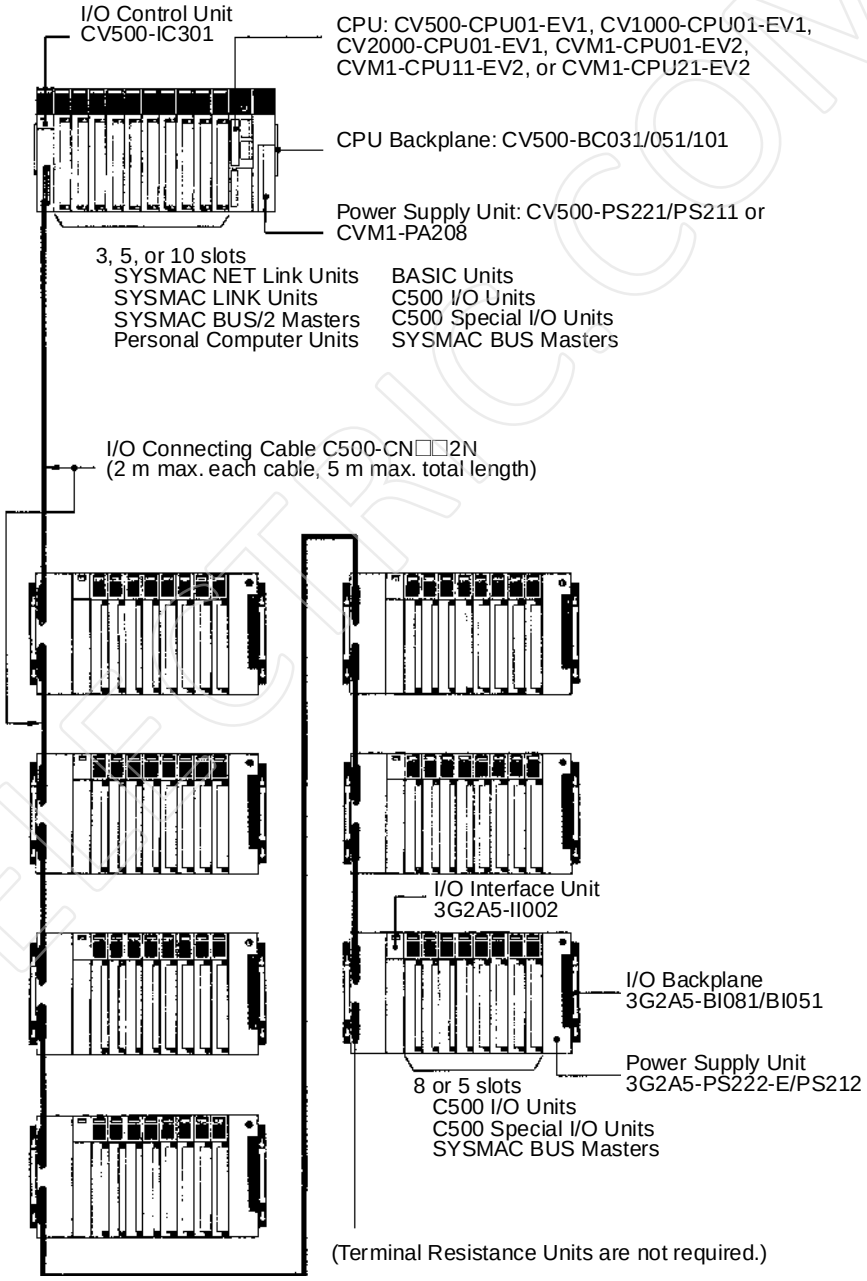
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Systems with C500 Expansion I/O Racks

The following figure shows an assembled CV-series CPU Rack and seven C500 Expansion I/O Racks. Up to seven C500 Expansion I/O Racks may be connected to the CPU Rack. The total length of the I/O Connecting Cable must 5 m or less and each section of I/O Connecting Cable must be 2 m or less. Termination Resistance Units are not necessary.

Expansion I/O Racks for the CV-series cannot be used together with C500 Expansion I/O Racks.

Units can be mounted to any slot on the Racks shown for them below.



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Rack Configurations

The following table summarizes the components required to form each type of Rack in the different configurations. The number of each component required for the System is given in parentheses. The following combinations form the basic Racks to which the other Units indicated in the first part of this section can be added.

Configuration	CPU Rack		Connecting cable	Expansion Rack		
	CPU Backplane	I/O Control Unit		I/O Interface Unit	Expansion Backplane	Termination Resistance Unit
CPU Rack only	CV500-BC031, CV500-BC051, CV500-BC101, CVM1-BC053, or CVM1-BC103 (one)	Not needed	Not needed	Not needed	Not needed	Not needed
CPU Rack and Expansion CPU Rack only	CV500-BC031, CV500-BC051, or CV500-BC101 (one)	CV500-IC101 (one)	CV500-CN□□1 (one) CV500-CN□□2 (one)	CV500-II101 (one)	CV500-BI111 (one)	CV500-TER01 (Two included with I/O Control Unit.) (two)
CPU Rack, Expansion CPU Rack, and Expansion I/O Racks	CV500-BC031, CV500-BC051, or CV500-BC101 (one)	CV500-IC101 (one)	CV500-CN□□1 (one) CV500-CN□□2 (one)	CV500-II101 (one)	CV500-BI111 (one)	CV500-TER01 (Two included with I/O Control Unit.) (two)
			CV500-CN□□2 (one for each Expansion I/O Rack)	CV500-II201 (one for each Expansion I/O Rack)	CV500-BI042, CV500-BI062, or CV500-BI112 (one for each Expansion I/O Rack)	
CPU Rack and Expansion I/O Racks	CV500-BC031, CV500-BC051, or CV500-BC101 (one)	CV500-IC201 or CV500-IC101 (one)	CV500-CN□□2 (one for each Expansion I/O Rack)	CV500-II201 (one for each Expansion I/O Rack)	CV500-BI042, CV500-BI062, or CV500-BI112 (one for each Expansion I/O Rack)	
CPU Rack with Single Expansion I/O Rack	CV500-BC031, CV500-BC051, CV500-BC101, CVM1-BC053, or CVM1-BC103 (one)	Not needed	CV500-CN□□3 (one)	Not needed	CV500-BI042, CV500-BI062, CV500-BI112, CVM1-BI064, or CVM1-BI114 (one)	Not needed
CPU Rack with C500 Expansion I/O Racks	CV500-BC031, CV500-BC051, or CV500-BC101 (one)	CV500-IC301 (one)	C500-CN□□2N (one for each Expansion I/O Rack)	C500-II002 (one for each Expansion I/O Rack)	C500-BI081 or C500-BI051 (one for each Expansion I/O Rack)	Not needed

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Mounting Locations

The following table below summarizes the Units that can be mounted to CPU, Expansion CPU, Expansion I/O, and Slave Racks. For detailed information about the Units listed below, refer to the operation manual for the individual Unit.

Unit	CPU Rack	Expansion CPU Rack	Expansion I/O Racks	Slave Racks (CV- or C-series)	Remarks
16-/32-/64-point I/O Units	Yes	Yes	Yes	Yes	---
Service Power Supplies	Yes	Yes	Yes	Yes	---
Interrupt Input Units	Yes	Yes	**No**	**No**	Up to 4 Units can be mounted. When mounting to the Expansion CPU Rack, set the rack number to 1.
C500 Special I/O Units	Yes	Yes	Yes	Yes The following cannot be mounted to SYSMAC BUS/2 Slave Racks: NC103, NC221, NC222, CP131, FZ001, PID01, and MCC01. The following cannot be mounted to SYSMAC BUS Slave Racks: NC221, NC222, CT041, and FZ001. All other Special I/O Units can be mounted.	Up to 8 of the following Units can be mounted: Analog Input, Analog Output, High-speed Counter, PID, Position Control, Magnetic Card, ASCII, ID Sensor, and Ladder Program I/O. Position Control Units, NC103-E, and PID Units use 2 slots. READ(190)/WRIT(191) cannot be used with Units mounted to SYSMAC BUS Slave Racks.
BASIC Units	Yes	Yes	**No**	**No**	Up to 16 CPU Bus Units can be used with each PC, including 2 Remote I/O Master Units for the CV500 or CVM1-CPU01-EV2 or 4 for the CV1000, CV2000, CVM1-CPU11-EV2, or CVM1-CPU21-EV2, up to a 4 each of the SYSMAC NET Link, SYSMAC LINK Units, Host Link Unit, or Ethernet Unit, and 1 DeviceNet Master Unit. A Personal Computer Unit requires 4 slots.
Temperature Controller Data Link Unit	Yes	Yes	**No**	**No**	
Personal Computer Units	Yes	Yes	**No**	**No**	
SYSMAC NET Link Units	Yes	Yes	**No**	**No**	
SYSMAC LINK Units	Yes	Yes	**No**	**No**	
SYSMAC BUS/2 Remote I/O Master Units	Yes	Yes	**No**	**No**	
Ethernet Units	Yes	Yes	**No**	**No**	
DeviceNet Master Unit	Yes	Yes	**No**	**No**	
SYSMAC BUS Remote I/O Master Units	Yes	Yes	Yes	**No**	Up to 4 Units can be mounted to a CV500 or CVM1-CPU01-EV2 and eight Units to a CV1000, CV2000, CVM1-CPU11-EV2, or CVM1-CPU21-EV2.
SYSMAC BUS I/O Link Units	Yes	Yes	Yes	**No**	I/O cannot be set to 16 input/16 output.

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Configuration Limits

The following two tables indicate limits on the system configuration. The first table indicates limits for the basic System. The second table indicates limits for Remote I/O Systems.

Basic System

Item	CV500 or CVM1-CPU01-EV2	CV1000 or CVM1-CPU11-EV2	CV2000 or CVM1-CPU21-EV2
Number of I/O points	512 points (32 words)	1,024 points (64 words)	2,048 points (128 words)
Number of connectable Expansion CPU Racks	1		
Number of connectable Expansion I/O Racks	7 (6 if an Expansion CPU Rack is also used)		
Number of I/O slots on CPU Rack	3/5/10		
Number of I/O slots on Expansion CPU Rack	11		
Number of I/O slots on Expansion I/O Rack	4/6/11		

Remote I/O Systems

Item		SYSMAC BUS/2 (see note 2)		SYSMAC BUS		
		CV500 or CVM1-CPU01-EV2	CV1000, CV2000, CVM1-CPU11-EV2, or CVM1-CPU21-EV2	CV500 or CVM1-CPU01-EV2	CV1000, CV2000, or CVM1-CPU11-EV2	CVM1-CPU21-EV2
Limits per PC	No. of remote I/O points	1,024 pts (64 words)	2,048 pts (128 words)	512 pts (32 words)	1,024 pts (64 words)	2,048 pts (128 words)
	No. of Remote Masters	2	4	4	8	
	No. of Slave Racks	---	---	8	16	
Limits per Remote I/O Master Unit	No. of Slaves (see note 1)	58M Slaves: 8 Units		2	8	
		122M Slaves: 4 Units				
		54MH Slaves: 4 Units				
	No. of remote I/O points	58M Slaves: 464 input and 464 output		512 pts (32 words)		
		122M Slaves: 976 input and 976 output				
		54MH Slaves: 432 input and 432 output				
	Combined No. of Slaves, I/O Link Units, Optical I/O Units, and I/O Terminals	---		64 (optical) 32 (wired)		
Expansion I/O Backplanes		CV500-BI112/062/042		C500-BI081/051		

Note

1. 58M Slaves are counted as one Unit and 122M and 54MH Slaves are counted as two Units in figuring the total of eight connectable Units. 58M, 122M, and 54MH classifications are set with a switch on the Slave.
2. A SYSMAC BUS/2 Slave must be designated “54MH” to use READ(190)/ WRIT(191) for Special I/O Units mounted to it. These instructions cannot be used for SYSMAC BUS Slaves regardless.

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Rack is identical to Expansion I/O Racks in connected via I/O Control and I/O Interface Units.

SYSMAC BUS/2 Slave Racks

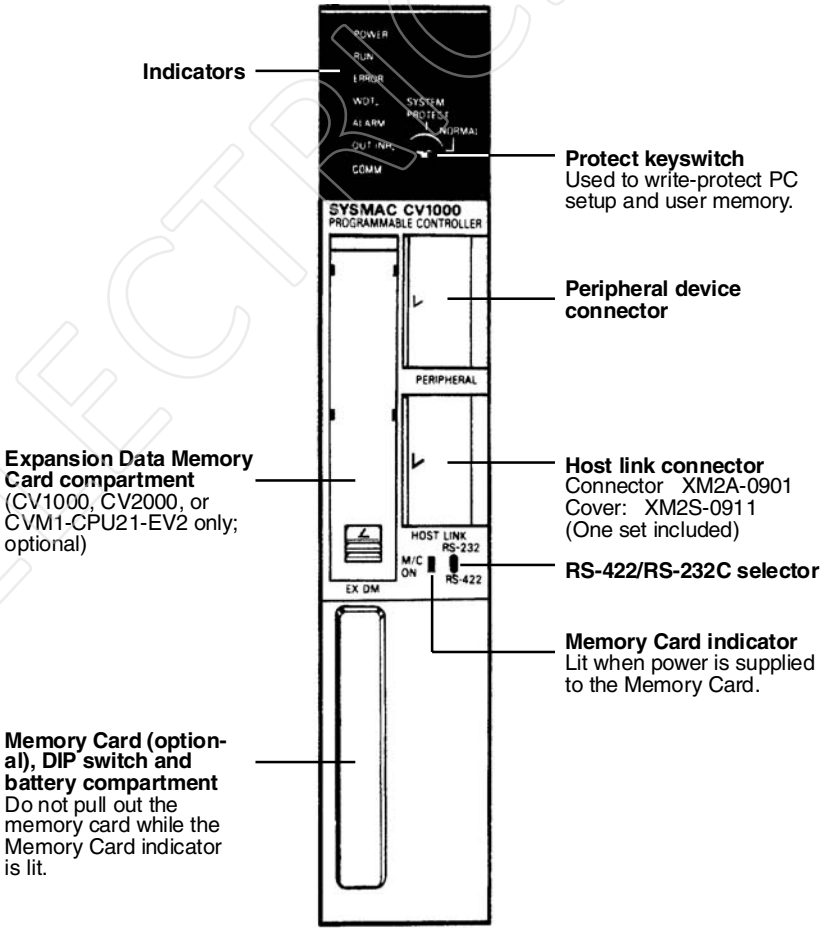
The SYSMAC BUS/2 Slave Racks use the same Expansion I/O Backplane and Power Supply Unit as the Expansion I/O Racks, but a Remote I/O Slave Unit is mounted instead of the I/O Interface Unit and the Slave Rack is connected from the Remote I/O Slave Unit to a Remote I/O Master Unit on the CPU or Expansion CPU Rack. Refer to the *SYSMAC BUS/2 Remote I/O System Manual* for details.

2-3 Rack Components

This section describes the main components that are used to construct CPU, Expansion CPU, and Expansion I/O Racks.

2-3-1 CPUs

Six CPU models are available, the CV500-CPU01-EV1, CV1000-CPU01-EV1, CV2000-CPU01-EV1, CVM1-CPU01-EV2, CVM1-CPU11-EV2, and CVM1-CPU21-EV2. The following figure shows the CV1000-CPU01-EV1.



Note The Memory Unit is built into CVM1/CV-series PCs; it is not necessary for the user to install one, as is necessary for some C-series PCs.

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Protect Keyswitch

The protect keyswitch write-protects the current PC Setup and user program memory. The user program memory can also be write-protected by the using the “Protect UM” function from the CVSS. When set to “SYSTEM PROTECT” this switch will write-protect the entire user program memory even if only part of it is protected using the “Protect UM” function from the CVSS.

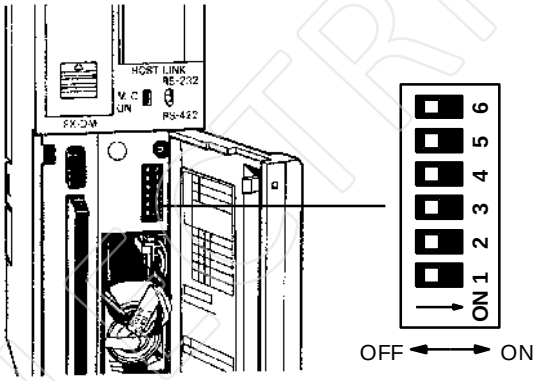
CPU Indicators

The following table describes the indicators on the front panel of the CPU.

Indicator	Operation
POWER (green)	Lights when power is supplied to the CPU.
RUN (green)	Lights when the PC is operating normally.
ERROR (red)	Lights when an error in the CPU causes operation to stop. When the ERROR indicator lights, the RUN indicator will go out and all outputs from Output Units will be turned OFF.
WDT (red)	Lights when a CPU error (watchdog timer error) has been detected. When the WDT indicator lights, the RUN indicator will go out and all outputs from Output Units will be turned OFF.
ALARM (red)	Lights when non-fatal error is detected.
OUTINH (orange)	Lights when the Output OFF Bit (A00015) is turned ON to turn OFF PC outputs.
COMM (orange)	Lit from when data is received from the host computer until the response is completed.

DIP Switch Settings

The DIP switch is used to set certain basic operational parameters for the CPU. To gain access to the DIP switches, open the cover of the Memory Card compartment as shown in the following figure. Turn off power to the PC before setting the DIP switch.



Pin	Function
6	Specifies whether the termination resistance is connected for the Host Link System. Turn this pin ON to connect the terminal resistance. When RS-422 is used set this pin to ON at the last PC connected in the Host Link System. When RS-232C is used, this pin does not affect Host Link System operation and may be set to either ON or OFF.
5	To transfer the user program file (AUTOEXEC.OBJ) and the PC Setup (AUTOEXEC.STD) from the Memory Card to the CPU on power application, set this pin to ON. If this pin is set to OFF, the PC Setup can be changed from the CVSS so that only the user program (AUTOEXEC.OBJ) is transferred when power is turned on. If program transfer is designated both with this pin setting and in the PC Setup, then both the program file and the PC Setup will be transferred. The user program will not be transferred when the system protect keyswitch on the front panel of the CPU is set to the SYSTEM PROTECT position, or memory is write-protected from the CVSS.

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<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>4</td><td>Set this pin to the ON position to establish the following communications settings for the host link interface. These are the most common setting for an IBM PC/AT interface.
Baud rate: 9,600 bps
Unit number: 0
Parity: Even
Data length: 7 bits
Stop bits: 2
When this pin is OFF, the communications settings for the host link interface are set in the PC Setup. Refer to the CVSS Operation Manuals for details on the PC Setup.
Note: The above settings apply to CPUs manufactured from July 1995 (lot number **75 for July 1995). For CPUs manufactured before July 1995 (lot number **65 for June 1995), only 1 stop bit will be set and the baud rate will be 2,400 bps.</td></tr>
<tr><td>3</td><td>Set this pin to ON when using the host link interface with a PT using NT Link communications. Set this pin to OFF when using the host link interface for host link communications.</td></tr>
<tr><td>1 and 2</td><td>These pins set the baud rate of the peripheral device connector. Set the rate to 50,000 bps when connecting the interface to the GPC or Programming Console.
<table>
<tr><th>Pin 1</th><th>Pin 2</th><th>Baud rate</th></tr>
<tr><td>0</td><td>0</td><td>50,000 bps</td></tr>
<tr><td>1</td><td>0</td><td>19,200 bps</td></tr>
<tr><td>0</td><td>1</td><td>9,600 bps</td></tr>
<tr><td>1</td><td>1</td><td>4,800 bps</td></tr>
</table></td></tr>
</table>

Memory Cards

Memory Cards can be used to store data or programs as files to expand the memory storing capacity of the PC. Memory Cards fit into the slot located on the lower left side of the CPU. Memory Cards are not provided with the PC and must be ordered separately and installed in the CPU. There are three types of Memory Cards that can be used for the CV-series PCs: RAM, EEPROM, or EPROM.

Memory type	Model	Capacity	Remarks
RAM	HMC-ES641	64K bytes	---
	HMC-ES151	128K bytes	
	HMC-ES251	256K bytes	
	HMC-ES551	512K bytes	
EEPROM	HMC-EE641	64K bytes	CV500-MCW□□ Memory Card Writer or Peripheral Device required
	HMC-EE151	128K bytes	
EPROM	HMC-EP551	512K bytes	CV500-MCW□□ Memory Card Writer or Peripheral Device required
	HMC-EP161	1M bytes	

For CPU Units with a lot number that contains the last-digit suffix of “6” (□□□6) or higher, the following products are available on the market and can be used as Memory Cards provided that they be used in the same manner as for the conventional Memory Cards.

- A 64K-byte, 128K-byte, 256K-byte, 512K-byte, 1M-byte, or 2M-byte RAM that conforms to JEIDA4.0. The 2M-byte RAM is not applicable to the CV500-MCW01 Memory Card Writer.

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RAM and EEPROM Cards

Data can be randomly written to and read from RAM or EEPROM Cards, making it possible to easily stored programs. The memory of a RAM Cards is erased, however, when power is not supplied to the CPU or when the RAM Card is removed from the CPU without first being connected to a backup battery. EEPROM Cards cannot be written while mounted in the CPU. Data can be written to RAM Cards while they are mounted in the CPU by using the CVSS or by instructions in the user program.

Both the RAM and EEPROM Memory Cards are equipped with write-protect switches. Setting the write-protect switch to ON prevents data from being written to or erased from the Card. Setting the write-protect switch to OFF allows data to be written to or erased from the Card.



Four RAM Memory Card models are available, varying in memory capacity from 8K, 16K, 32K to 64K words. Two EEPROM Memory Card models are available, one containing 8K words of memory and the other 16K words of memory.

RAM Card Backup Battery

Insert a battery into a RAM Memory Card before mounting the Card into the CPU. Leave the battery in its holder. Battery life expectancies are given below. Replace the battery within the time listed. Refer to *SECTION 4 Inspection and Maintenance* for the battery replacement procedure.

Card	Capacity	Life
HMC-ES641	64K bytes	5 years
HMC-ES151	128K bytes	2 years
HMC-ES251	256K bytes	1 year
HMC-ES551	512K bytes	6 months

EPROM Cards

Data contained in the ROM Card is stored on EPROM chips and cannot be altered or erased during the CPU's operation. The EPROM chip is mounted to the Memory Card and the entire pack is installed in the CPU. Once data is written to the chip, the data will not be lost when the power to the PC is OFF.

ROM Cards are shipped unprogrammed. The ROM Card can be programmed using a CV500-MCW□□ Memory Card Writer.

The procedure for erasing EPROM Memory Card data is as follows:

1,2,3...

1. Open the memory card cover by pressing at an angle on the catch at the bottom edge of the card using a pointed object, such as a pen.
2. Erase the data from the EPROM chips by exposing the window of the EPROM chips to ultraviolet light. Any of a number of commercially available EPROM erasers may be used. To ensure complete erasure, the Memory Card should be subject to a minimum exposure as specified by the eraser manufacturer.
3. Close the cover and slide the catch back into place.

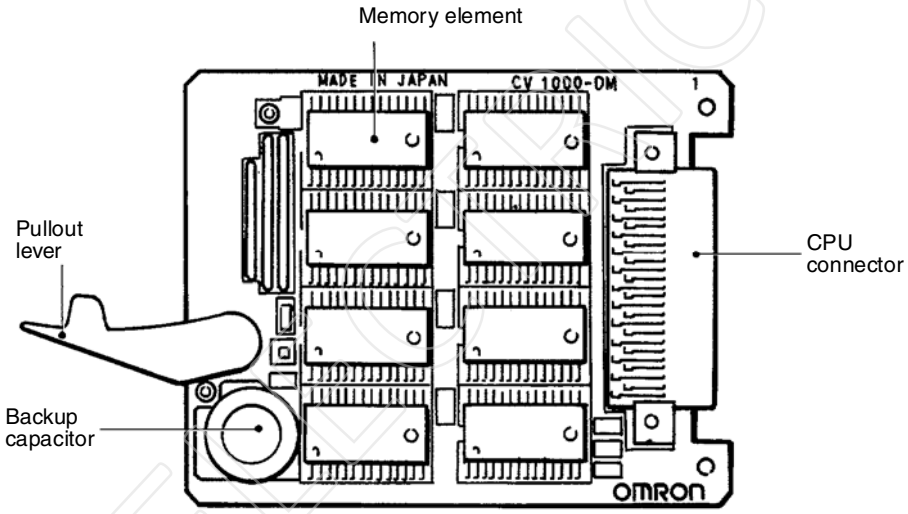
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Expansion Data Memory

An Expansion Data Memory Unit may be used only in a CV1000-CPU01-EV1, CV2000-CPU01-EV1, or CVM1-CPU21-EV2 CPU. The Expansion Data Memory Unit fits into the slot located on the upper left side of the CPU. The Expansion Data Memory Unit is optional. There are three models of Memory Units available with different memory capacities. The addition of an Expansion Data Memory Unit increases the data memory capacity of the CV1000, CV2000, or CVM1-CPU21 from 24K words (D00000 to D24575) to up to 256K words. Refer to the *CV-series PC Operation Manual: Ladder Diagrams* for details on PC memory and addressing conventions.

Model	Memory capacity	Word assignment
CV1000-DM641	64K words	E00000 to E32765 x 2 banks
CV1000-DM151	128K words	E00000 to E32765 x 4 banks
CV1000-DM251	256K words	E00000 to E32765 x 8 banks

When mounted to the CPU, the Expansion Data Memory Unit is backed up by the battery mounted in the CPU. Provided the Unit has been mounted to the CPU for a duration of at least 1 minute, a charged capacitor built-in to the Memory Unit allows the Unit to be removed from the CPU for up to 10 minutes without memory loss.



Expansion Data Memory Unit

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