1747 Open Controller System Overview

(Catalog Number 1747-OC series)

Product Data

Photo/Slide #

Photo/Slide #

What's Inside

Introducing the Open Controller System

Rockwell Automation Allen-Bradley, a world leader in automation solutions, introduces the first in a family of open controllers that combine the reliability, quality, and industrial packaging Allen-Bradley is known for, with the flexibility and value of personal computer technology, to create an open control platform.

Building on A-B experience in PLC-based control, the open controller provides a rugged, PC-based control platform for industrial automation applications. Use the open controller with Rockwell Automation software-based solutions, third party software products, or your own, custom-developed software.

An ideal solution for control applications

OEMs can maintain their investment and value in custom application code and use the open controller to add the benefits of standard A-B control products that are supported world wide. End users who want to extend their applications or implement automation where a PC-based platform is more suitable can use the open controller and benefit from using the same I/O as A-B programmable controllers, reducing inventory, training, and upgrade costs.

Comparing the open controller to traditional programmable controllers

The open controller is similar to traditional programmable controllers in that it offers:

- an integrated, local I/O scanner that provides deterministic I/O response from the high-performance 1746 I/O subsystem
- reliable, industrialized packaging and the use of field-proven chassis, power supplies, and I/O products
- long-term product availability using modular, upgradable, add-on options with field-installable designs

The open controller differs from traditional programmable controllers in that it supports:

- commercial and real-time kernels and operating systems, such as MS-DOS®, Windows® 3.*x*, Windows® 95, Windows NT™, OS/9000, OS/2®, VrTX, QNX, and Controlware™.
- standard, commercially-available development tools, such as Microsoft™ and Borland C/C++ compilers.
- customization through the use of standard development tools and the ability to add value-add algorithms in the form of protected executable code.
- the growing breadth of commercially available PCMCIA cards (PC Cards) to let you scale the open controller system by adding network and peripheral interfaces for such items as CDROM drives, hard drives, modem cards, network cards, and special-purpose cards.

A combination of PC technology and A-B-based innovation

The open controller system takes advantage of A-B's standard, small chassis package, which enables access to:

- local 1746 I/O and 1747 scanner (A-B and third-party modules)
- remote I/O (1746, 1771, Flex™, ArmorBlock™, and others)
- communication networks (DH+™, DH-485, Ethernet, DeviceNet™, etc.)

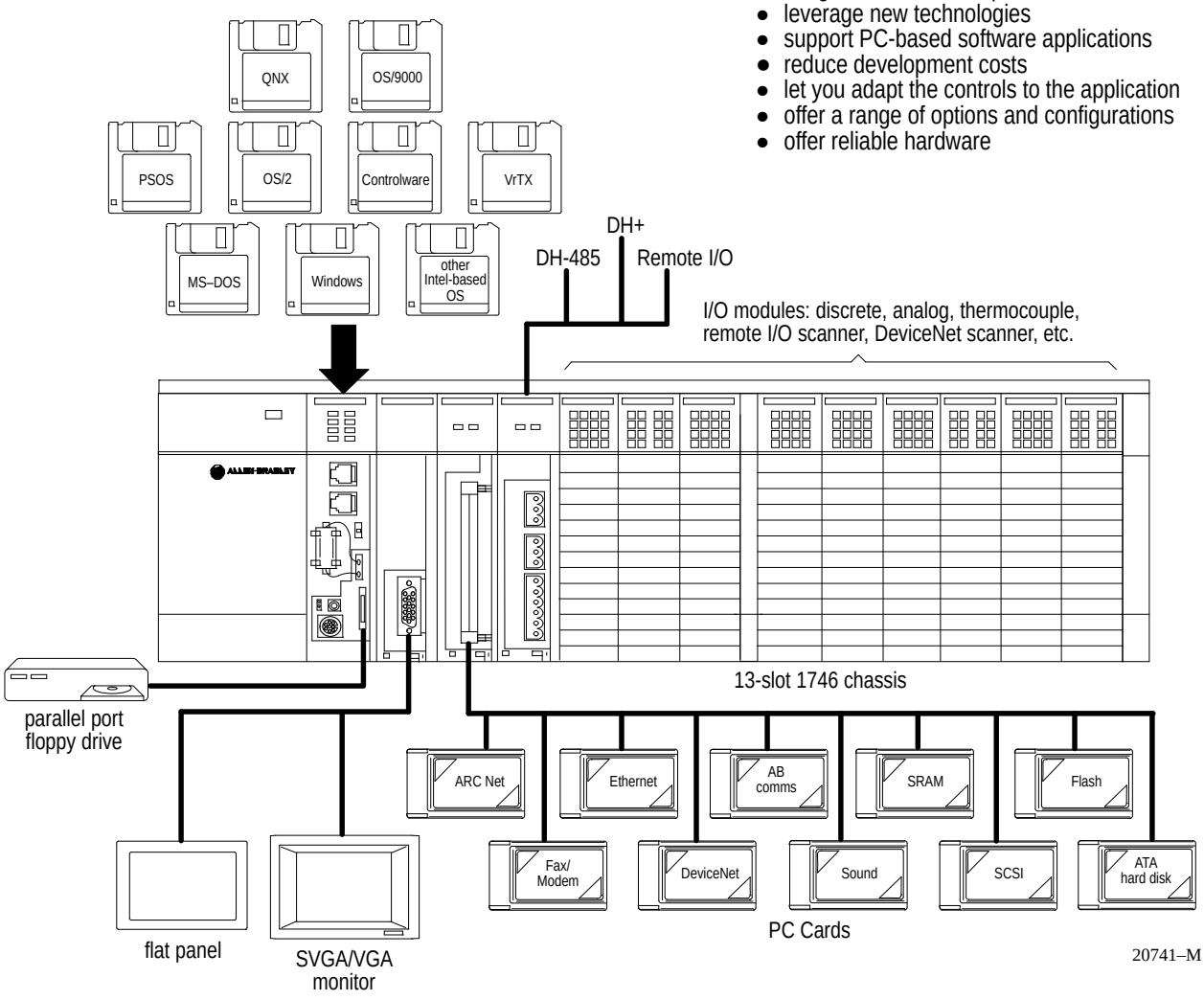
Standard PC interfaces on the open controller include:

- two serial ports (COM1 and COM2)
- one parallel port
- VGA™/SVGA support (available via optional module)
- PC Card support (available via optional module)

The following figure shows how the open controller can combine its A-B standard packaging with standard, PC-based interfaces:

The open controller combines PC technology and A-B control technology to:

- integrate control and operator functions
- leverage new technologies
- support PC-based software applications
- reduce development costs
- let you adapt the controls to the application
- offer a range of options and configurations
- offer reliable hardware



Does the open controller system meet my needs?

Whether your application is an embedded solution using custom-developed software, or a large distributed application requiring features of a traditional programmable controller, the open controller can meet your needs.

The open controller system provides solutions for:

- markets and applications where traditional programmable controllers may not be the desired control platform
- OEMs and VARs who want to port existing PC-based software executables to an A-B control solution
- users that want to take advantage of commercial technologies, hardware, and standards
- users that want to use PC-based development tools across a range of PC platforms
- applications that require rugged, industrial control and I/O solutions
- applications with operator interface requirements
- applications with soft controller requirements

The open controller can support Rockwell Automation software products, third-party software products, or your own custom application code. The open controller combines these software options with A-B field-proven I/O, flexible networking options, and other industrial control products. The open controller provides the choices you want with the ruggedness you need.

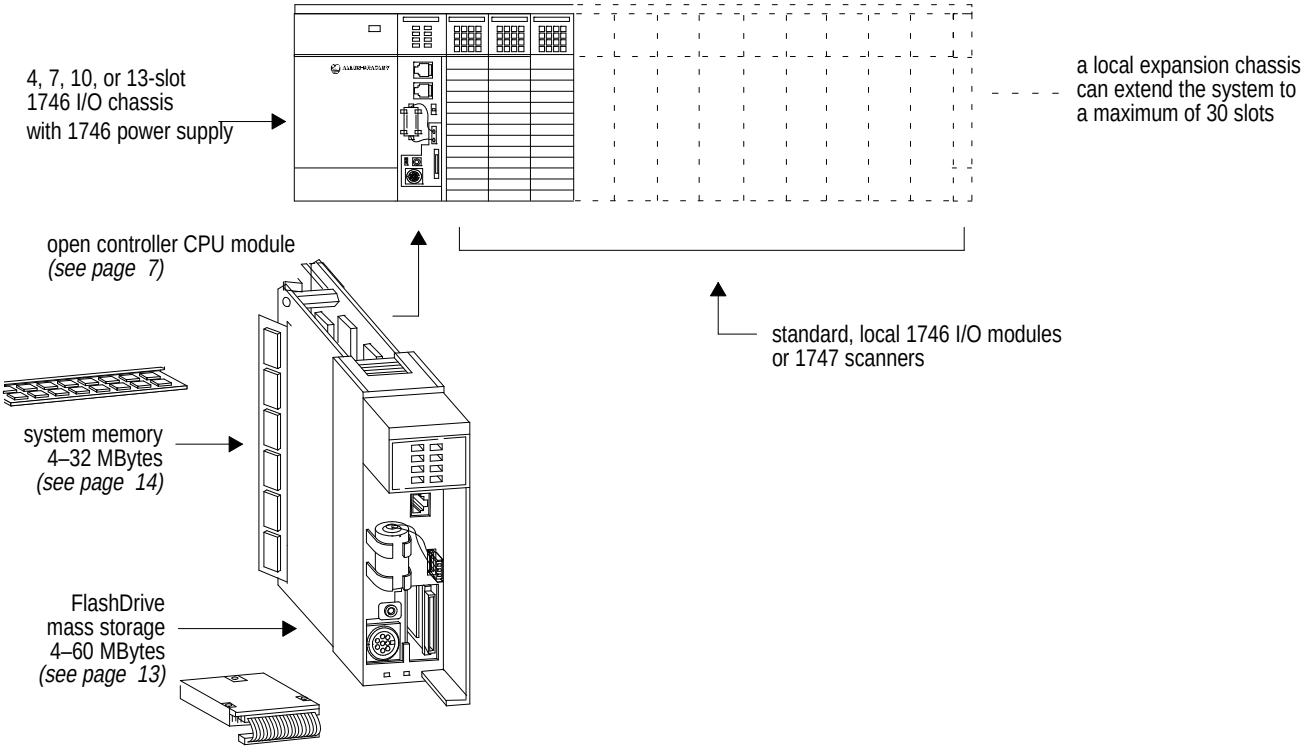
Building an Open Controller System

There are two basic configurations of an open controller system:

- an embedded control system which uses a standalone open controller CPU module and its I/O system
- an expanded, embedded control system which adds a PCI expansion bus and option modules to the open controller CPU module (like the ISA/PCI bus expansion capabilities of a PC)

Building an embedded control system (standalone)

The open controller CPU module can operate alone with 1746 I/O modules. In this configuration example, the open controller system depends on local I/O or distributed I/O connected via a remote I/O or DeviceNet scanner in the local chassis.



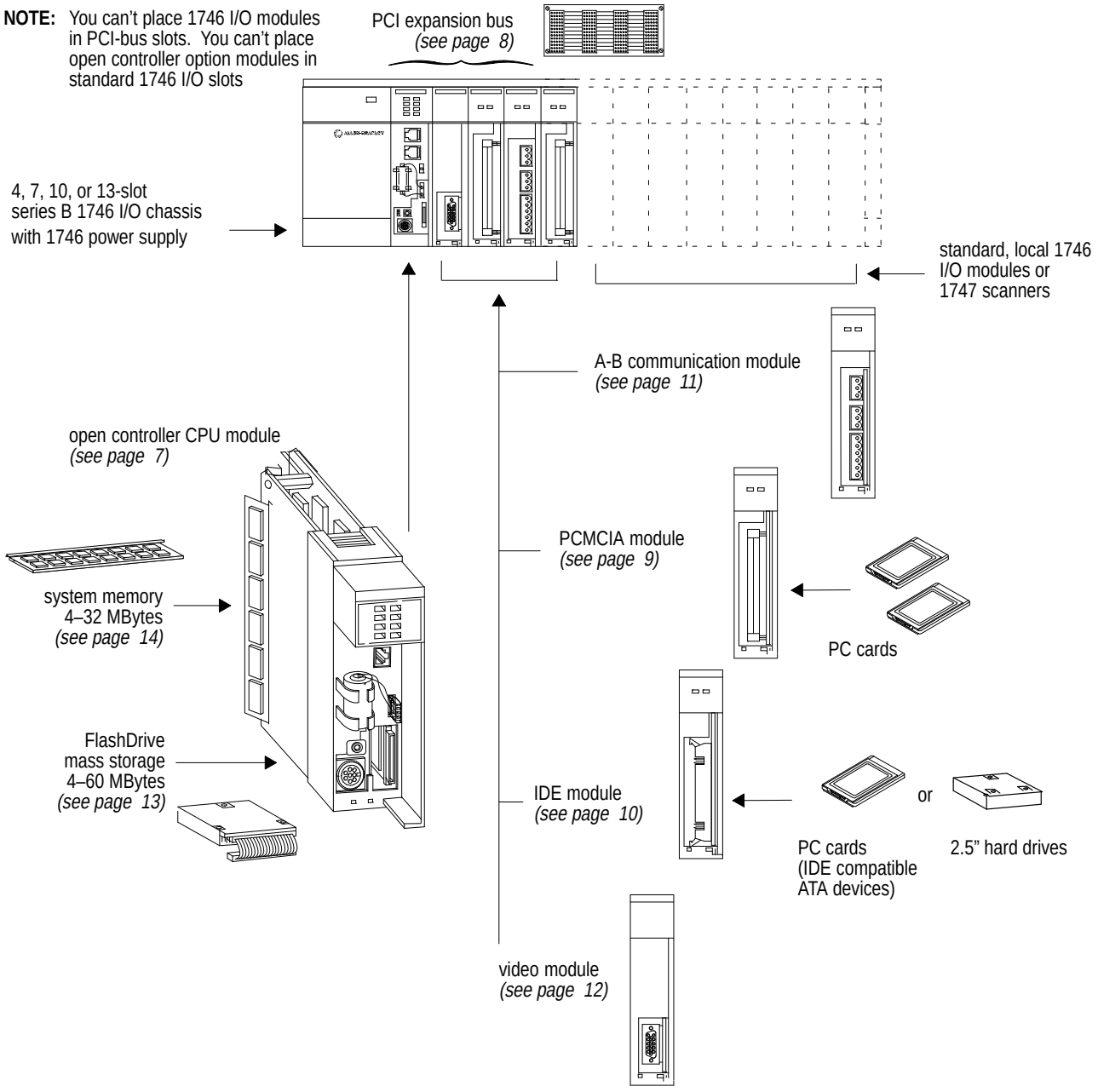
This configuration could be appropriate where only a control algorithm is needed with no typical, PC-like requirements (such as video) or network communications (such as Ethernet).

This configuration supports A-B remote I/O links via the 1747-SN remote I/O scanner and DeviceNet links via the 1747-SDN DeviceNet scanner.

Expanding an open controller system

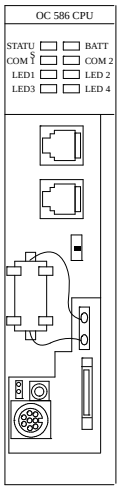
Incrementally add the hardware you need to create the open controller system that fits your application. You can add these options to the standalone open controller system:

- VGA/SVGA video interface module for driving operator interface monitors
- PCMCIA interface modules for adding PC Cards
- IDE interface modules for adding additional disk drive capacity
- A-B communication interface module for DH+, remote I/O, and DH-485 connectivity
- open controller PCI bus to support the option modules



Open controller CPU module

catalog number 1747-OCE*xxxx*



The open controller CPU module:

- resides in the left slot of any 1746 chassis (you need a series B or greater chassis if you plan to use any open controller option modules)
- can address any valid SLC local expansion chassis configuration (30 slot maximum)
- can address all 1746 I/O and communication modules (including the 1747-SN remote I/O and 1747-SDN DeviceNet scanners)
- supports system memory (DRAM) and non-volatile storage options (IDE-compatible FlashDrive™)

You can order the open controller CPU module with or without system memory DRAM, FlashDrive memory, and software options. See page 23.

The open controller CPU module comes with a:

- 1747-BA battery
- 1747-OCFAN1 chassis fan
- external watchdog wiring kit
- screws and ribbon cable to embed a FlashDrive within the CPU module (you can purchase the FlashDrive pre-installed in the module or separate from the module)
- diagnostic utility disk

functional specifications

Characteristic:	Description:
main PC-based CPU	5x86 @ 100 MHz
local I/O scanner	188 @ 33 MHz
battery backup	for 8K dual port RAM and real-time clock
BIOS	AMI BIOS
output	external watchdog contact

hardware specifications

Characteristic:	Description:
battery	1747-BA lithium battery (contains 0.23 g lithium) two (2) year life span (may vary based on temperature)
serial communication	two (2) isolated serial ports COM1 supports RS-232 COM2 supports RS-232, RS-422, or RS-485 configurable baud rates: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 115200 bits/sec
parallel communication	one (1) enhanced parallel port
keyboard connection	miniature PS/2 style DIN connector keyboard not required
LEDs	four (4) diagnostic/status LEDs four (4) user-definable LEDs (LED1 – LED4)
switches	reset of both the 5x86 CPU and the local I/O scanner user-definable 3-position switch
jumpers	3-position jumper for selecting the COM2 serial mode user-definable 2-position jumper

environmental specifications

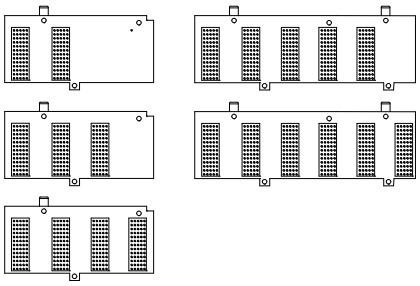
Characteristic:	Values/Ranges:
slot temperature	
operating	**with chassis fan** 0° to 60° C (32 to 140° F) **without chassis fan** 0° to 30° C (32 to 86° F)
storage	-40° to 85° C (-40 to 185° F)
relative humidity	5% to 95% noncondensing
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement
shock	
operating	30 G peak for 11ms
storage	50 G peak for 11ms
weight	14.0 oz (396.9 g)
power dissipation	2.25 A @ 5V dc
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5

communication cables (not provided with the CPU)

Communication:	Specifications:
serial	catalog number 1747-OCS92 two 2 ft (0.61 m) RJ45 to 9-pin, D-shell converter cables **Communication rate:** / **Maximum cable length:** RS-232 50 ft (15.24 m) RS-422 4000 ft (1219.20 m) RS-485 4000 ft (1219.20 m)
parallel	catalog number 1747-OCP252 one 2 ft (0.61 m) micro 25-pin to 25-pin D-shell converter cable maximum cable length 10 ft (3.05 m)

PCI expansion bus

catalog number 1747-OCPCI*x*



The PCI expansion bus is a field-installable backplane that you need when you configure an open controller system with any of the available option modules. You install the PCI bus in a series B 1746 chassis. You only need one PCI expansion bus per open controller chassis.

PCI (Peripheral Component Interconnect) is an industry standard that defines a high-speed interface (local bus) that allows peripherals to connect to the same bus as the system memory. The open controller PCI bus adheres to the electrical and logical standards of commercial desktop PCI and industrial, passive-bus CompactPCI. The pin and socket connector on the open controller PCI bus is unique so that the expansion bus fits into the 1746 chassis.

The PCI bus provides a wide bandwidth to a limited number of peripherals (as many as 5 option modules in an open controller system) while the 1746 I/O bus handles the I/O functions.

These non-proprietary, well-defined, electrical and logical standards mean you can depend on the PCI bus to provide:

- high-speed data transfer rates
- soft configuration of modules on the PCI bus
- plug and play support of modules on the PCI bus

When planning your open controller system:

- make sure you select a PCI bus with enough slots
- you cannot place 1746 I/O modules in PCI bus slots or open controller option modules in local 1746 I/O bus slots

functional specifications

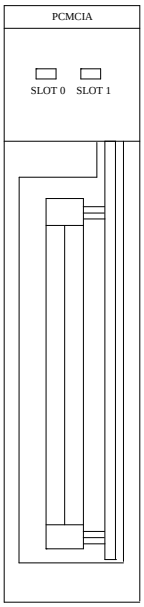
Characteristic:	**Description:**	
number of slots available	**If you need:**	**Choose catalog number:**
	2 slots	1747-OCPCI2
	3 slots	1747-OCPCI3
	4 slots	1747-OCPCI4
	5 slots	1747-OCPCI5
	6 slots	1747-OCPCI6
	Important: The 1747-OCPCI5 and 1747-OCPCI6 expansion bus only fit in a 7-slot or 13-slot chassis.	
communication rate	32 bits @ 33 MHz 132 MBytes/sec	
backplane	passive	
connector	100 (5 x 20) pin and socket	
chassis	field-installable in series B 1746 I/O chassis only one (1) bus allowed per chassis	

environmental specifications

Characteristic:	**Values:**	
temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5% to 95% noncondensing	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11ms	
storage	50 G peak for 11ms	
weight	4.0 oz (113.4 g) for 1747-OCPCI4	
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5	

PCMCIA interface module

catalog number 1747-OCPCM1, 1747-OCPCM2



The PCMCIA interface module supports PC Cards, which are small, credit-card size adapters that let you expand your open controller system with options such as:

- memory
- disk storage
- I/O capabilities
- network communications
- modem/serial interfaces
- SCSI adapters

This module lets you use A-B or commercially-available PC Cards to expand open controller system capabilities. For example, add a standard Ethernet interface card to access an Ethernet link. The PCMCIA interface module supports cards that adhere to PCMCIA 2.1 specifications.

You can purchase the PCMCIA interface module with or without SystemSoft™ CardSoft™ card and socket services for DOS and Windows 3.*x* operating systems. Card and socket services enable communications between system software and the PCMCIA socket adapter. Check your PC Card documentation for compatibility to SystemSoft card and socket services.

functional specifications

Characteristic:	Description:	
available configurations	**If you need:** stand-alone bundled with SystemSoft card and socket services	**Choose catalog number:** 1747-OCPCM1 1747-OCPCM2
maximum PC Card configurations	2 Type II cards **or** 1 Type III and 1 Type II card	
bus communications	PCI requires 1747-OCPCI*x* to communicate with the open controller CPU module	
LEDs	two (2) diagnostic/status LEDs (one for each slot)	
number of modules per open controller system	two (2) PCMCIA interface module per chassis	

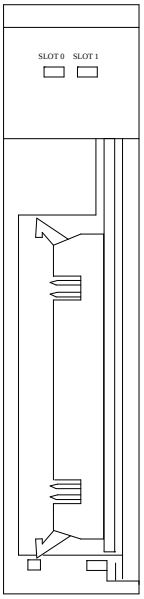
environmental specifications

Important: The environmental specifications of commercially-obtained PC cards might require you to derate the overall system environmental specifications.

Characteristic:	Values:	
slot temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5 to 95% without condensation	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11 ± 1 ms	
storage	50 G peak for 11 ± 1 ms	
weight	8.0 oz (226.8 g)	
power dissipation	0.15 A @ 5V dc **Note:** this does not include current requirements for the PC Cards you use	
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5	

IDE interface modules

catalog number 1747-OCIDE1, 1747-OCIDE25



The IDE interface modules provide expanded disk storage capacity for the open controller system.

The 1747-OCIDE1 is a carrier module that supports as many as two, user-supplied PC Cards that are IDE-compatible ATA memory devices. These devices can be flash memory or rotating media. Once installed in the module, the PC Cards appear as native IDE drives to the open controller system.

The 1747-OCIDE25 is a carrier module that supports one, user-supplied 2.5" IDE hard drive. Once installed in the module, the hard drive appears as a native IDE drive to the open controller system.

Each IDE interface module has two connectors to external 3.5" IDE drives, such as CDROM drives and hard drives.

functional specifications

Characteristic:	Description:	
supported media	1747-OCIDE1	two IDE-compatible, ATA PC Cards mounted internally
	1747-OCIDE25	one 2.5"IDE rotating hard drive mounted internally
maximum PC Card configurations	2 Type II cards **or** 1 Type III and 1 Type II card	
external connections	two standard IDE 3.5" headers	
drive configuration	configure drives as primary or secondary and master or slave	
bus communications	PCI requires 1747-OCPCI*x* to communicate with the open controller CPU module	
number of modules per open controller system	one (1) IDE interface module per chassis	

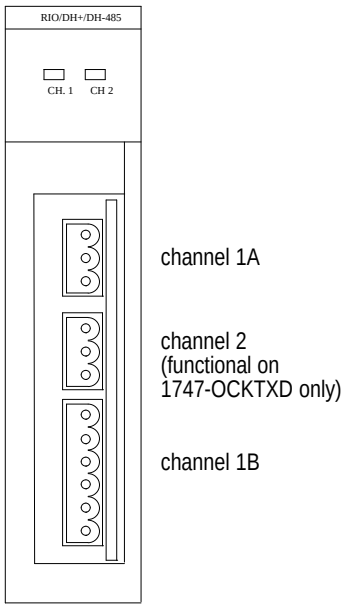
environmental specifications

Important: The environmental specifications of the ATA memory cards or the 2.5" disk drive you select cards might require you to derate the overall system environmental specifications.

Characteristic:	Values:	
slot temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5 to 95% without condensation	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11 ± 1 ms	
storage	50 G peak for 11 ± 1 ms	
weight	5.99 oz (170.09 g) for 1747-OCIDE1 5.49 oz (155.92 g) for 1747-OCIDE25	
power dissipation	0.10 A @ 5V dc **Note:** this does not include current requirements for the PC Cards or 2.5" disk drive you use	
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5	

A-B communication interface module (remote I/O, DH+, DH-485)

catalog number 1747-OCKTX, 1747-OCKTXD



The A-B communication interface module can:

- communicate with nodes on DH+ networks
- communicate with nodes on DH-485 networks
- act as a remote I/O scanner

The 1747-OCKTX module is a single-channel interface to these networks. Connect channel 1A to a remote I/O or DH+ link or connect channel 1B to a DH-485 link.

The 1747-OCKTXD is a dual-channel interface. Connect channel 1A to a remote I/O or DH+ link or connect channel 1B to a DH-485 link. Connect channel 2 to a remote I/O or DH+ link.

For DH+ and DH-485 communications:
Your application (or C program) must communicate with the OCKTX dual port and must generate the appropriate DH+ or DH-485 commands. You can use these API software libraries to integrate with the OCKTX dual port:

- INTERCHANGE™ software (9351-DKTS for DOS, 9351-WKTS for Windows 3.x and Windows 95)
- RSLinx™ software toolkit (9355-WABC for Windows NT)

Or, obtain a license to the dual port toolkit (1784-DP4) to develop your own drivers to interface with the OCKTX dual port.

For remote I/O communications:
Your application (or C program) must communicate with the OCKTX dual port, download remote I/O binaries, and generate commands to monitor and control a remote I/O network. Obtain a license to use the 6001-RIO toolkit to develop application programs to control a remote I/O link.

functional specifications

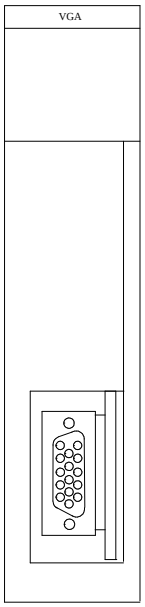
Characteristic:	Description:
1747-OCKTX	CH 1A (3-pin Phoenix) runs DH+ and remote I/O CH 1B (6-pin Phoenix) runs DH-485
1747-OCKTXD	CH 1A (3-pin Phoenix) runs DH+ and remote I/O CH 1B (6-pin Phoenix) runs DH-485 CH 2 (3-pin Phoenix) runs DH+ and remote I/O
maximum line lengths and communication rates	DH+: 10,000 ft (3048 m) @ 57.6k bit/s 5,000 ft (1,524 m) @ 115.2 kbits/s 2,500 ft (762 m) @ 230.4 kbits/s DH-485: 4,000 ft (1219 m) @ 1200, 2400, 4800, 9600, or 19,200 bits/s remote I/O: 2,500 ft (762 m) @ 230.4K bit/s 5,000 ft (1524 m) @ 115.2k bit/s 10,000 ft (3048 m) @ 57.6k bit/s
bus communications	PCI requires 1747-OCPCI*x* to communicate with the open controller CPU module
LEDs	one (1) diagnostic/status LED per channel
number of modules per open controller system	dependent on: • available memory • available interrupts • available PCI bus slots • software drivers

environmental specifications

Characteristic:	Values:	
slot temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5 to 95% without condensation	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11 ± 1 ms	
storage	50 G peak for 11 ± 1 ms	
weight	11.0 oz (311.8 g)	
power dissipation	1747-OCKTX	0.50 A @ 5V dc
	1747-OCKTXD	0.80 A@ 5V dc
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5	

Video interface module

catalog number 1747-OCVGA1



The video interface module supports VGA/SVGA monitors for applications that require an operator interface or video display. This PCI-based video interface module supports high data transfers for today's graphics-oriented software packages.

You must supply the monitor and video cable. The video interface module supports these A-B monitors (you still need to supply the cable):

- 2711-MT14, 14" VGA monitor with touchscreen
- 2711-MK14C, 14" VGA monitor with keypad
- 6156 series, 14" monitors
- 6157 series, 20" monitors

functional specifications

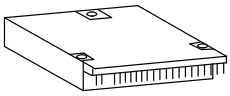
Characteristic:	Description:
VGA/SVGA support	640 x 480 pixels non-interlaced 800 x 600 pixels non-interlaced 1024 x 768 pixels non-interlaced 1280 x 1024 pixels interlaced
LCD support	800 x 600 pixels full screen
video memory	2 Mbytes
drivers	comes with drivers for DOS, Windows 3.*x*, and Windows 95
video cable	user-supplied, VGA-compatible cable maximum cable length is 16 ft (4.88 m) requires 15-pin mini D-sub connector
bus communications	PCI requires 1747-OCPCI*x* to communicate with the open controller CPU module
number of modules per open controller system	one (1)

environmental specifications

Characteristic:	Values:	
slot temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5 to 95% without condensation	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11 ± 1 ms	
storage	50 G peak for 11 ± 1 ms	
weight	6.0 oz (170.1 g)	
power dissipation	0.25 A @ 5V dc	
agency certification	UL A191 identified CE for all applicable directives CSA Class I, Div 2, Group A, B, C, D, Temp Code T5	

FlashDrive storage memory

catalog number 1747-OCSD*xxx*



The optional, IDE-compatible FlashDrive provides non-volatile storage directly on-board the open controller CPU module for the operating system, application software, and data. The FlashDrive is designed for high-shock and vibration resistance.

The FlashDrive appears as an IDE disk to the operating system, allowing for easier development and support of software. You can connect the FlashDrive within a remote personal computer by using the 2.5" to 3.5" adapter cable to any standard, IDE ribbon-cable connection in a personal computer.

The 2.5" to 3.5" adapter cable is available as part of the cable kit 1747-OCSDCK. This cable kit also includes an additional ribbon cable for attaching the FlashDrive to the open controller CPU module (one of these ribbon cables already ships with the open controller CPU module).

You can order the open controller CPU module already bundled with a FlashDrive. Or, you can order a FlashDrive separately from Allen-Bradley or directly from Sandisk distributors around the world. See page 23.

Important: If you purchase FlashDrives from sources other than A-B, those FlashDrives are not covered under the A-B warranty/repair policy.

If you choose not to use a FlashDrive in your open controller system, you need an IDE interface module.

functional specifications

Characteristic:	Description:	
general access time	2.5 msec maximum	
sleep to write access	2.0 msec maximum	
sleep to read access	50 msec typical	
reset to ready access	400 msec maximum	
data transfer rate		
to/from flash	3.0 MBytes/sec burst	
to/from host	6.0 MBytes/sec burst	
number of writes per sector	300,000 (90 years for a typical PC)	
for individual spares	**If you need:**	**Choose catalog number:**
	4 MBytes	1747-OCSD4
	10 MBytes	1747-OCSD10
	20 MBytes	1747-OCSD20
	60 MBytes	1747-OCSD60
number of FlashDrives per open controller CPU	one (1) per open controller CPU module embedded within the CPU module	
cable kit	1747-OCSDCK, which includes: one ribbon cable; one 2.5" to 3.5" adapter cable one master/slave drive jumper	

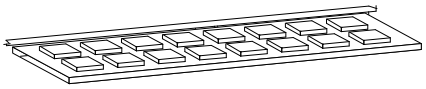
environmental specifications

Note: these specifications are for the FlashDrive only, not for an open controller system

Characteristic:	Values:	
temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5% to 95% noncondensing	
vibration	15 G maximum peak acceleration	
shock		
operating	1000 G peak for 11 ± 1 ms	
storage	1000 G peak for 11 ± 1 ms	
dc input voltage	5V ± 10%	
weight	1.3 oz (38.0g)	
power dissipation		
sleep	< 5mA	
read	36 to 100 mA	
write	36 to 125 mA	

System memory

catalog number 1747-OCDR*x*



The DRAM provides 4, 8, 16, or 32 Mbytes of system memory for the open controller CPU module. Each DRAM has gold-plated pins and fits in a single 72-pin SIMM slot in the open controller CPU module.

You can order the open controller CPU module with or without a system memory DRAM. See page 23. You can order a DRAM separately from Allen-Bradley or from other commercial vendors.

Important: If you purchase a commercially-available DRAM, it must meet these specifications:

- 72 gold-plated pins
- real parity
- 70 nanosecond access time

functional specifications

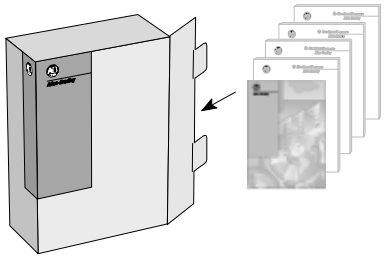
Characteristic:	**Description:**	
access time	70 nanoseconds	
parity	1Mx36	4MBytes
	2Mx36	8MBytes
	4Mx36	16MBytes
	8Mx36	32MBytes
memory sizes available	**If you need:**	**Choose catalog number:**
	4 MBytes	1747-OCDR4
	8 MBytes	1747-OCDR8
	16 MBytes	1747-OCDR16
	32 MBytes	1747-OCDR32
connector	one 72-pin SIMM slot gold-plated	
number of DRAM SIMMs per open controller CPU	one per open controller CPU module embedded within the CPU module	

environmental specifications

Characteristic:	**Values:**	
slot temperature		
operating	0° to 60° C	(32 to 140° F)
storage	-40° to 85° C	(-40 to 185° F)
relative humidity	5 to 95% without condensation	
vibration	10 to 500 Hz 2.0 G maximum peak acceleration .012 in (peak-to-peak) displacement	
shock		
operating	30 G peak for 11 ± 1 ms	
storage	50 G peak for 11 ± 1 ms	
weight	1.0 oz (28.3 g)	

Documentation set

catalog number 1747-OCDOC1



Each open controller component ships with only its installation instructions. The majority of the open controller documentation has been unbundled from the open controller hardware. Associated user manuals are in the documentation set, so you can order as many copies as you need.

The open controller documentation set contains one copy of each available open controller document. The set comes packaged in a 2” box you can place on your shelf.

Support contracts

catalog number 1747-OCTS

Due to the PC-based architecture of the open controller, the telephone support provided with the purchase price of the open controller consists primarily of determining if the system software and hardware is operating within documented specifications. The tools for this support are:

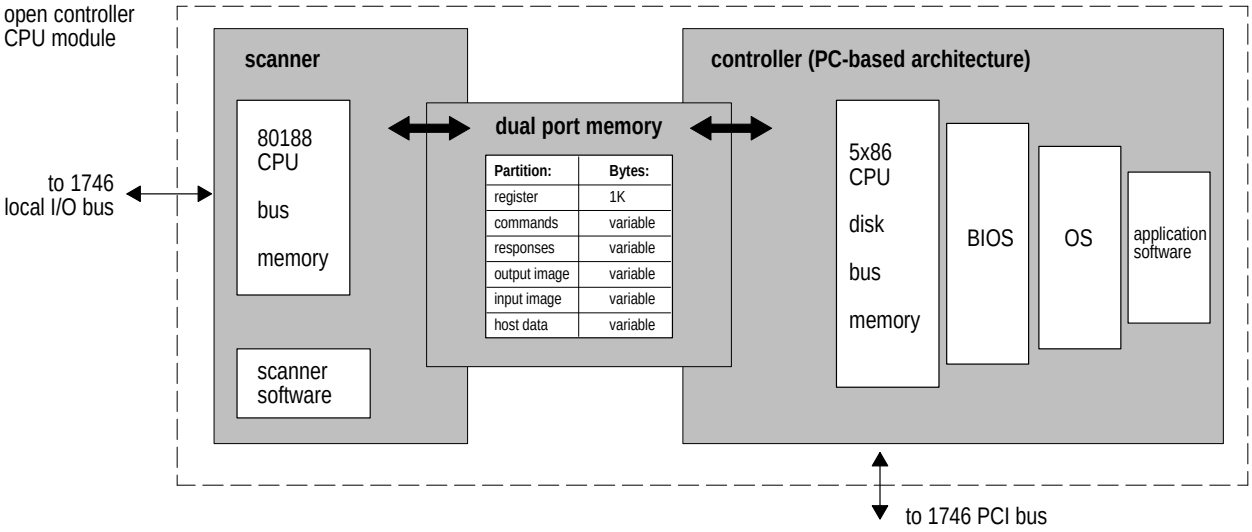
- diagnostic utility disk that ship with the open controller CPU module
- open controller system diagnostic LEDs

When you purchase an open controller system, you also receive firmware upgrades during the 12-month warranty period.

You can purchase extended support in blocks of 5 hours by ordering support contracts (1747-OCTS). Out-of-warranty update service is also available (1747-OCUS). For more information, see page 25.

Understanding the Open Controller Architecture

The open controller architecture consists of two CPUs (scanner and controller) that share dual-port memory. The scanner scans the 1746 local I/O bus and reads/writes inputs and outputs to/from the dual-port registers. The controller has a PC-based architecture with a 5x86 class CPU to run your application software.



The dual port is an 8K byte memory partition that provides an interface between the integrated scanner and your application software that resides on the controller.

Your application (the code you develop) uses the dual port memory to communicate with the scanner, to handle control functions on the 1746 backplane, such as:

- scanner commands and responses
- battery and scanner status
- scan rate frequency and timing
- I/O image counters
- priority messages and interrupts
- semaphores to ensure data integrity
- software-generated watchdogs
- control of the 4 user-definable LEDs, the 3-position switch, and the 2-position jumper

The scanner functionality of the dual port supports I/O control functions, such as:

- synchronizing scans to the application
- forcing I/O
- discrete-input interrupts
- I/O module-driven interrupts (such as for the 1746-BAS module)
- I/O slot enables and disables
- I/O resets

In addition to providing access to the control scanner, the dual port memory also provides non-volatile storage for:

- I/O values
- application parameters (timers, counters, presets)

Communicating with the Open Controller

Your controller application software communicates with the scanner to control I/O by reading and writing to the dual-port registers. Use one of these methods to access the dual-port registers:

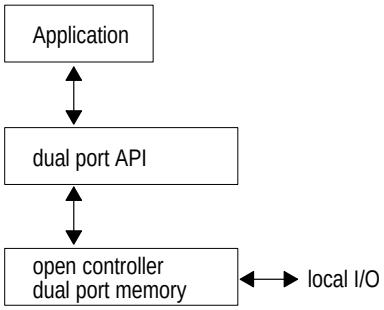
- Use the library of function calls in the open controller API (1747-OCAPID) to access dual-port registers.
- Use a software package, such as Controlware, that has built-in drivers that access the open controller dual-port registers
- Develop your own drivers to access the dual-port registers. The dual-port documentation is available through the A-B technology licensing program.

Using the open controller dual port API

The dual port APIs (1747-OCAPID and 1747-OCAPINT) provide libraries of C function calls for interfacing with the open controller dual port memory. This library provides calls for typical control functions, such as:

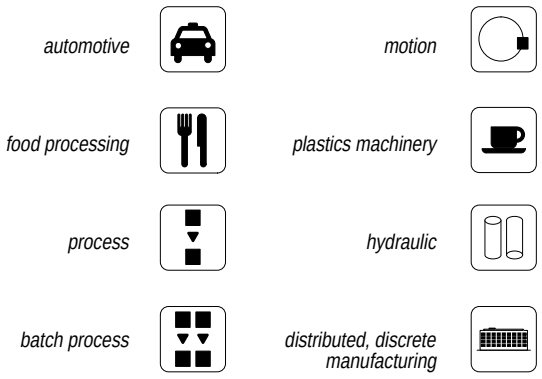
- configure I/O files
- initialize the scanner
- define user LEDs, 3-position switch, 2-position jumper, and external watchdog
- read open controller status
- read/write input/output data
- enable/disable forces

The dual port API supports Microsoft and Borland C compilers in the DOS and Windows NT environments for any programming language that supports the Pascal calling convention. The DOS API is compiled as a 16-bit MS-DOS library using the 80386 instruction set. The Windows NT API is a standard 32-bit DLL.



Typical applications

While the open controller is adaptable for most applications, some typical control applications are:



Sample code for reading the input image table

```
HANDLE       Handle;
WORD     inputdata[2];
int          retcode;
    retcode = OC_ReadInputImage( Handle, NULL, 6, 0, 2, inputdata );
    /* Read slot 6 data, first 2 words, directly from the input image */
    /* table to inputdata buffer */
```

Using Controlware on the open controller

Controlware is a deterministic, multi-tasking environment that runs on DOS systems. Controlware incorporates a real-time control executive and development tools for machine, process, and motion control applications.

The Controlware development tools include:

- Commander for Controlware: a DOS-based MMI package that lets you create graphical operator interface screens
- PRO for Controlware: a relay-ladder programming package that allows on-line, real-time programming

Controlware is best suited for:

- distributed control applications
- applications or users that require the control to be augmented by C/C++ or other standard, PC-type programming languages

Controlware lets you mix multiple programming languages, such as ladder, C, BASIC, and assembler.

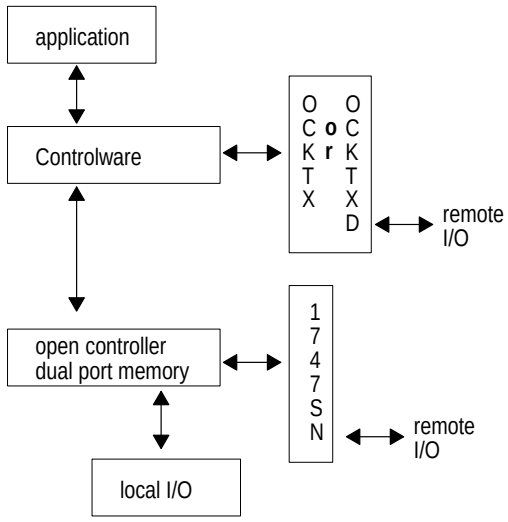
Controlware interfaces with the open controller dual-port memory to control local I/O. Controlware can:

- read and write I/O data
- configure 1746 I/O using G files
- transfer data using M0/M1 files

Controlware provides the necessary drivers to control remote I/O through the 1747-OCKTX, -OCKTXD communication interface module or the 1747-SN module.

Sample code for defining data and manipulating LEDs

```
LOAD 1747OC
  PRE = SC
  DPR = 0C800H
    IRQ = 11, SCAN TIME = 55, SCANNER RESET=always
      RACK = 1:10
        SLOT = 5:1746–NO4I
        SLOT = 8:1746–IB16
        SLOT = 9:1746–OB16
PUBLIC UBYTE          _SCLED1 (LED1)            ! LED 1
PUBLIC UBYTE          _SCLED2 (LED2)            ! LED 2
PUBLIC UBYTE          _SCLED3 (LED3)            ! LED 3
PUBLIC UBYTE          _SCLED4 (LED4)            ! LED 4
BIN UWORD             _SC9O (LIGHTS)            ! OUTPUTS
BIN UWORD             _SC8I (inputs)            ! INPUTS
bin ubyte sequence = 1
Load KTXRIO
  DPRAM = 0cf00H, IRQ = 10, hOST W = 50, BAUD = 115.2k, AUTO
    ADAPTER = 0:0–3
PUBLIC UDWORD Speed=100
bin uword boxes=1
uword timer1
bit tim1lmt
bit move
bit one
word error1
```




```
|This rung causes the lights pattern to rotate Left to Right when pattern = 1  |
|                                                                               |
|                                                                               |
|           one      tim1lmt                                                    |
|-------+---| |----+---| |----+---------+---------+--------Math-------+        |
|                                                  |       lights      |        |
|                                                  |  rrb              |        |
|         +         +         +         +         +         1         |        |
|                                                  |  –>               |        |
|                                                  |       lights      |        |
|         +         +         +         +         +                   |        |
|                                                  |                   |        |
|                                                  |                   |        |
|         +         +         +         +         +                   |        |
|                                                  |                   |        |
|                                                  |                   |        |
|         +         +         +         +         +                   |        |
|                                                  |       error1      |        |
|                                                  |                   |        |
|         +         +         +         +         +-------------------+        |
```

Developing Applications

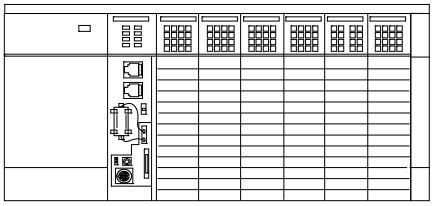
How you develop your applications and how you program control tasks depends on the hardware and software options you select for your open controller system. The flexibility of the open controller means that you can use the software applications you want, but it also means that you have to consider control tasks more than if you were developing applications for traditional programmable controllers.

The following configurations provide a high-level look at the control requirements for typical open controller systems. These configurations start with a standalone open controller and progress into more sophisticated systems.

Communicating only with local I/O

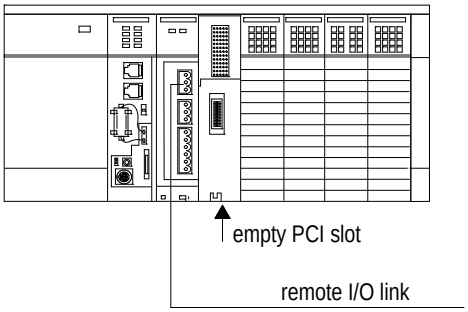
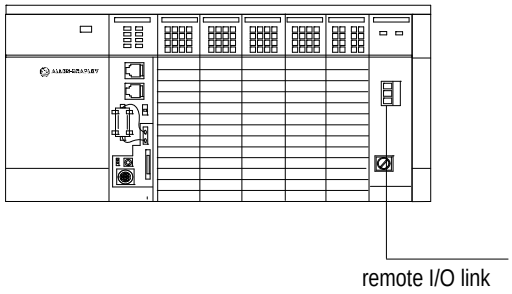
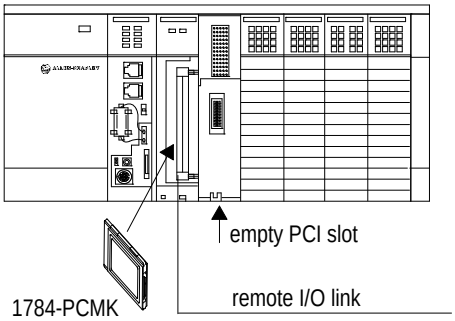
This is the simplest open controller configuration. You link the dual port API with your application program. Then you can call a series of C function calls to:

- read and write I/O data
- configure 1746 I/O using G files
- transfer data using M0/M1 files



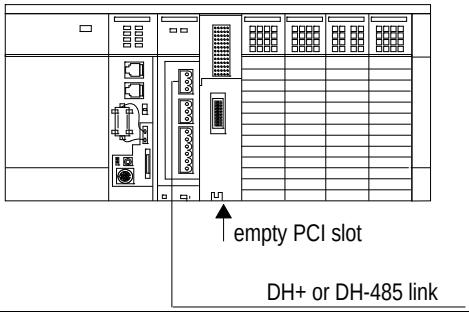
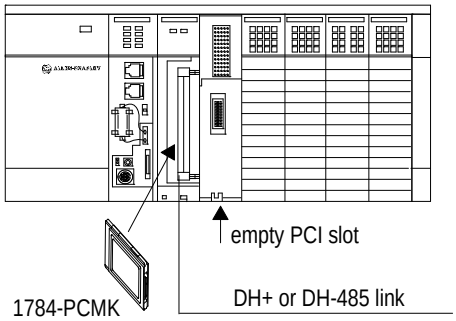
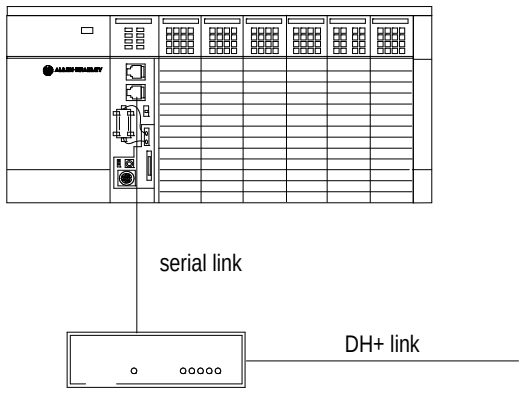
Communicating over a remote I/O network

In addition to local I/O, the open controller can control remote I/O devices using these methods:

Device:	Description:
1747-OCKTX, -OCKTXD communication module 	Your application still uses the dual port API or the Controlware scanner drivers to configure and control local I/O. Additionally, your application program must: — download remote I/O binaries to the 1747-OCKTX, -OCKTXD module — send/receive commands from the 1747-OCKTX, -OCKTXD module dual port Software packages such as Controlware and other soft controllers have built-in remote I/O drivers for the 1747-OCKTX, -OCKTXD modules. Or you can use the 6001-RIO toolkit to assist in developing your own drivers.
1747-SN scanner 	Your application still uses the dual port API to configure and access the M0/M1 files for data transfer. You have to generate the C code to access the necessary functions. Or you can use the Controlware scanner drivers.
1747-OCPCM1, -OCPCM2 PCMCIA module 	If you use a 1747-OCPM1 module with a 1784-PCMK card, use the dual port API to configure and control local I/O. Additionally, your application program must: — download remote I/O binaries to the 1784-PCMK card — send/receive commands from the 1784-PCMK card Software packages such as Controlware and other soft controllers have built-in remote I/O drivers for the 1784-PCMK card.

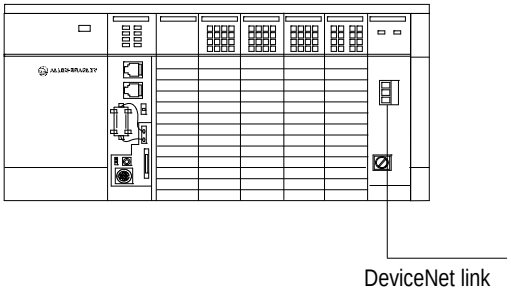
Communicating over a DH+ or DH-485 network

You can configure the open controller to communicate with devices on a DH+ or DH-485 network using these devices:

Device:	Description:
1747-OCKTX, -OCKTXD communication module 	Software packages such as INTERCHANGE, RSLinx, and Controlware offer API libraries for generating DH+ and DH-485 commands. If you are not using one of these software packages, you must develop your application code to: — download DH+/DH-485 binaries to the open controller KTX/PCMK module dual port — send/receive commands from the open controller KTX/PCMK module dual port Allen-Bradley offers these toolkits to assist you in developing your own application code to generate DH+ and DH-485 commands: — 1784-DP4 for the 1747-OCKTX, -OCKTXD module — 1784-DP3 for the 1784-PCMK communication card Controlware has DH+ and DH-485 drivers to allow your application to send and receive messages over DH+ and DH-485 networks.
1747-OCPCM1, -OCPCM2 PCMCIA module 	
1770-KF2 serial-to-DH+ communication bridge 	If you use a serial communication bridge, you must either write your own serial driver or use a commercially-available driver that offers the features you need. The 1770-KF2 serial bridge provides a user manual that explains how to send commands over a serial link to the 1770-KF2 bridge to communicate with devices on a DH+ network.

Communicating over a DeviceNet network

This configuration is similar to communicating over remote I/O using a 1747-SN scanner. Your application program uses the dual port API or the Controlware scanner drivers to configure and access the M0/M1 files for data transfer. You can use a 1784-PCD card in a PCMCIA module to configure the DeviceNet link, if you are running Windows on the open controller system.



Communicating over an Ethernet network

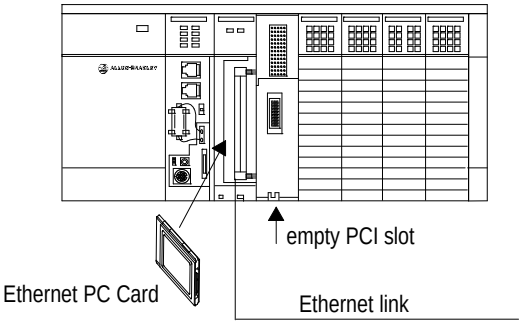
To connect to an Ethernet network, use a PC card that provides Ethernet connectivity (such as a Xircom or 3COM Ethernet adapter) within a 1747-OCPCM1, -OCPCM2 module.

Typically, you need PC card drivers (usually supplied with the adapter), card and socket services, and Ethernet protocol drivers (such as TCP/IP) to communicate with other devices on the network.

Application software and operating systems that communicate over an Ethernet network typically have drivers to work with an Ethernet protocol. For example:

- INTERCHANGE looks for a specific TCP/IP protocol driver
- Windows provides networking software to communicate with other devices on the network that are running Windows
- Controlware communicates via the NetBIOS™ protocol

Use an Ethernet API to make software connections over the network to other host computers running the same network software.

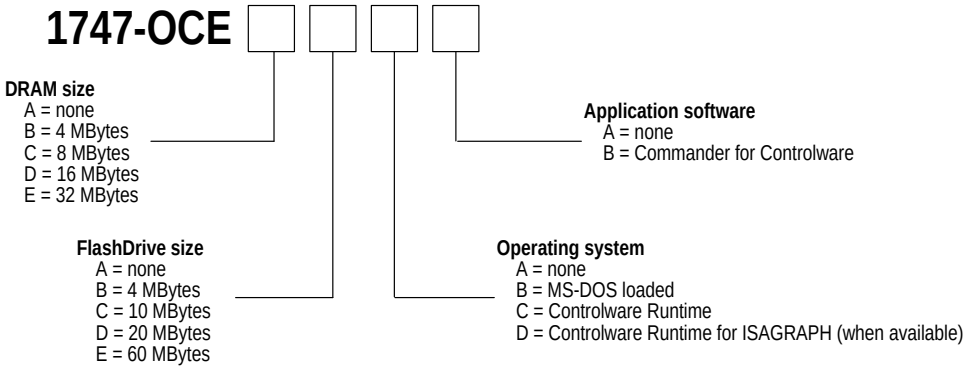


Ordering Information

Follow these steps to select/configure an open controller system.

1 Select an open controller CPU module

Select enough system memory DRAM and FlashDrive storage to run and store your application and data.



2 Select a chassis and power supply

Make sure the chassis has enough slots for open controller modules and 1746 I/O modules; make sure the power supply is sufficient.

For a:	Select from these catalog numbers:
chassis	4 slots 1746-A4 7 slots 1746-A7 10 slots 1746-A10 13 slots 1746-A13 You need a series B or greater chassis if you plan to use open controller option modules **Important:** The 1747-OCPCI5 and 1747-OCPCI6 expansion bus only fit in a 7-slot or 13-slot chassis.
power supply	1746-P1, -P2, -P3, -P4, or -P5

3 Select open controller option modules and peripherals

Make sure the open controller PCI expansion bus you select has enough slots for the option modules you plan to install. Each open controller option module must be in a PCI-bus slot – they cannot be placed in 1746 I/O slots.

If your application needs:	Select this item:	From these catalog numbers:	
any open controller option modules	PCI expansion bus	2 slots	1747-OCPCI2
		3 slots	1747-OCPCI3
		4 slots	1747-OCPCI4
		5 slots	1747-OCPCI5[1]
		6 slots	1747-OCPCI6[1]
PCMCIA slots	PCMCIA interface module	stand-alone	1747-OCPMC1
		bundled with SystemSoft card and socket services	1747-OCPCM2
IDE drives	IDE interface module	PC Card	1747-OCIDE1
		2.5” rotating media	1747-OCIDE25
access to A-B DH+, DH-485, or remote I/O links	A-B communication interface module	1 channel	1747-OCKTX
		2 channels	1747-OCKTXD
video interface	video interface module	1747-OCVGA1	
serial cables	serial adapter cables	1747-OCS92 (2 cables)	
	serial boot cable	1747-OCSBC (1 cable)	
parallel cable	parallel adapter cable	1747-OCP252 (1 cable)	
open controller reference material	open controller documentation set	1747-OCDOC1	

[1] The 1747-OCPCI5 and 1747-OCPCI6 expansion bus only fit in a 7-slot or 13-slot chassis.

Important: Installation instructions ship with the open controller components. If you want the available user manuals or a complete set of open controller documentation, you must purchase the documentation set 1747-OCDOC1.

4 Select development software (optional)

Some standard open controller system configurations use the following development software packages. How you choose to develop applications for your system determines whether these packages apply.

If your application:	Select from these items:	From these catalog numbers:	
accesses local 1746 I/O and local scanner modules	dual port API		
	MS-DOS	1747-OCAPID	
	Windows NT	1747-OCAPINT	
accesses remote I/O devices	Controlware	1747-OC series with Controlware bundles	
	remote I/O developer toolkit	6001-RIO (obtain license)	
accesses DH+ or DH-485 devices	INTERCHANGE	DOS	9351-DKTS
		Windows	9351-WKTS
		Ethernet	9351-WES
	RSLinx	9355-WABC	
	dual port toolkit for 1784-PCMK	1784-DP3 (obtain license)	
	dual port toolkit for 1747-OCKTX, -OCKTXD	1784-DP4 (obtain license)	

5 **Select spares** (optional)

These items all ship with the open controller CPU module. If you need extras, select from these catalog numbers:

If you need a spare:	Select from these catalog numbers:	
battery	1747-BA	
open controller chassis fan	1747-OCFAN1	
FlashDrive mass storage (DOS formatted)	4 MBytes	1747-OCSD4
	10 MBytes	1747-OCSD10
	20 MBytes	1747-OCSD20
	60 MBytes	1747-OCSD60
additional system memory DRAM	4 MBytes	1747-OCDR4
	8 MBytes	1747-OCDR8
	16 MBytes	1747-OCDR16
	32 MBytes	1747-OCDR32
FlashDrive cable kit, which includes: spare ribbon cable 2.5” to 3.5” adapter cable master/slave IDE drive jumper	1747-OCSDCK	

6 **Order system support** (optional)

Due to the PC-based architecture of the open controller, the telephone support provided with the purchase price of the open controller consists primarily of determining if the system software and hardware is operating within documented specifications.

If you need:	Select this catalog number:
additional phone support / 5 hours	1747-OCTS
out-of-wrranty update service	1747-OCUS

For more information, contact Rockwell Automation Technical Support Services at 216-646-6800.

Common terms

Acronym / Term:	Meaning:
5x86 CPU	low power CMOS design which placed 32-bit external/64-bit internal CPU technology into existing Intel 486 CPU locations equivalent to a Pentium 75 Mhz CPU
ATA	Advanced Technology Attachment a software/hardware protocol to store data on disk drives
BIOS	basic input/output system; low-level software drivers for PC hardware the open controller uses AMI BIOS
cache	a method used to store frequently accessed files in memory instead of reading from and writing to the hard disk; used to increase performance
card and socket services	software packages that manage the hardware resources of the physical sockets in a notebook computer and dynamically allocate resources to the PC Card hardware that reside in the sockets the 1747-OCPCM2 is a kit that includes the 1747-OCPCM1 module and CardSoft card and socket services
CompactPCI	industrial, passive-bus version of PCI an industry standard that defines a high-speed interface (local bus) for industrial, embedded computer applications
CPU	central processing unit the open controller has two CPUs: one handles main PC functions, the other scan local I/O
DRAM	Dynamic Random Access Memory low-cost memory used by PCs; batteries can't backup this type of memory due to the high power consumption the DRAM provides system memory for an application on the open controller CPU module
EISA	Extended Industry Standard Architecture an enhanced ISA bus (introduced in 1988) that allows multiple masters on the bus
flash memory	EEPROM memory that permits unlimited read operations and limited write operations
IDE	Integrated Drive Electronics hardware protocol for disk drives the FlashDrive is IDE compatible, which means you can connect the FlashDrive to any IDE-compatible ribbon-cable connector within a personal computer
interrupt	a "request-for-attention" signal sent by either hardware or software to have the CPU suspend operation and transfer control to an interrupt handler piece of software
ISA	Industry Standard Architecture an unofficial computer bus standard used in older XT/AT PC computers
PC	personal computer

Acronym / Term:	Meaning:	
PC Card	a credit-card sized adapter that adds memory, storage, and I/O capabilities to a personal computer with a PCMCIA interface	
	Type I	3.3 mm thick commonly used for flash memory
	Type II	5.0 mm thick commonly used for modem, LAN, and host communication products
	Type III	10.5 mm thick commonly used for rotating media hard drives and wireless communication devices
PCI	Peripheral Component Interconnect an industry standard that defines a high-speed interface (local bus) that allows peripherals to connect to the same bus as system memory	
PCMCIA	Personal Computer Memory Card International Association the association developed a series of hardware and software standards that define how to connect peripherals to notebook computers	
SIMM	Single Inline Memory Module small expansion card that holds extra memory chips for PCs the system memory DRAM for the open controller is a SIMM	
SRAM	Static Random Access Memory volatile RAM that uses very low power; batteries can back up this type of memory	

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