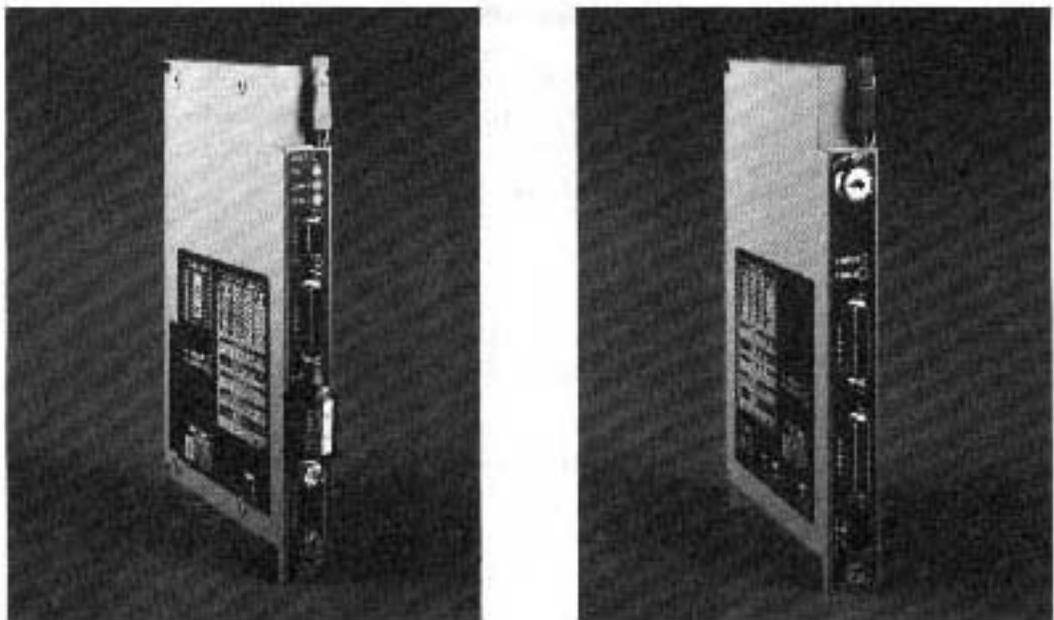# 1771 Control Coprocessor

(Cat. No. 1771-DMC, -DMC1, -DMC4, and -DXPS)

Product Data

Complement your PLC® ladder programming. You can write control coprocessor programs in BASIC, C, or assembler languages. These user programs run asynchronously to and independently of the PLC control logic, but they have access to its memory. You can use PLC control-logic programs to start and stop your C, BASIC, or assembler programs.

Add only the functionality that you need. You can configure the control coprocessor as either a 1-slot (main) or 2-slot (main and serial expander) module. Versions of the main module are:

Control Coprocessor Main Module Selection	Catalog Number
256 Kbytes	1771-DMC
1 Mbyte with Ethernet ®	1771-DMC1
4 Mbytes with Ethernet	1771-DMC4

You can also install additional RAM memory in your main module.

You can use the serial expander module (1771-DXPS) with any version of the main module. This module provides additional serial ports and an ASCII display.

This partitioning of functionality ensures that you are not burdened with costs where you do not need features.

The control coprocessor is simple to install. The control coprocessor resides in the same 1771 Universal I/O chassis as the PLC programmable controller, or adapter module, and I/O modules. All communication ports have standard pin assignments and can use "off-the-shelf" cables.

Allen-Bradley offers one-stop shopping. In addition to the main and serial expander modules, Allen-Bradley offers several types of Ethernet cables and transceivers as well as a Program Development Software package.

Benefits

The control coprocessor expands the capability of a PLC programmable-controller system by running C, BASIC, and assembler programs that perform tasks such as:

- storing, analyzing, and manipulating input, output, and other information gathered from the PLC programmable controller

- communicating with devices external to the PLC programmable-controller system via the Ethernet port or the asynchronous serial communication port(s)
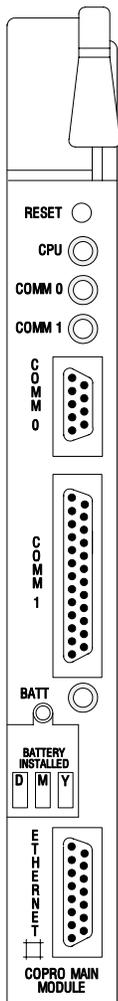
You can use the control coprocessor for applications such as:

- complex math or application-specific algorithm calculation using C and/or BASIC programs

- production scheduling or historical-data logging/tracking

- high-speed search and compare of very large files or look-up tables

- protocol conversion for interfacing a PLC programmable controller with a variety of field devices

Hardware Overview
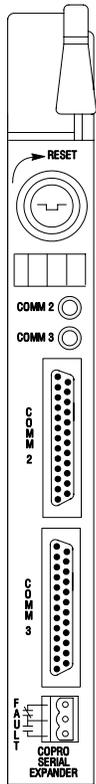
Table 1 describes the hardware elements for the main module.

Table 1
Main-Module Hardware Elements

Hardware Element	Description
RESET Switch	Use the reset switch to reinitialize the control coprocessor When the serial expander module is installed, use the keyswitch to reinitialize the coprocessor
LEDs	Four status indicators provide information on the CPU, COMM0 port, COMM1 port, and battery
COMM0 Port	This is a 9-pin, optically isolated, serial communication port that supports communication defined by EIA RS-232C standards Use this port to connect: • personal computers • terminals • other peripheral devices
COMM1 Port	This is a 25-pin, optically isolated, serial communication port that supports communication defined by EIA RS-232C, -423, and -485 standards You can also use this port with most RS-422A equipment as long as: • termination resistors are not used • the distance and transmission rate are reduced to 200 ft at 19.2 kbps Use this communication port to connect peripheral devices such as: • personal computers • terminals • bar-code readers • weigh scales • printers
Battery	This battery provides backup power for control coprocessor memory during power failure or normal down time Use the 3.0 volt lithium battery (1770-XYC) that is provided with your coprocessor
Ethernet Port (1771-DMC1 and 1771-DMC4 only)	The 1771-DMC1 and 1771-DMC4 versions of the control coprocessor include an Ethernet communication port that connects to thick-wire, thin-wire, or twisted-pair networks via a standard 15-pin transceiver connection These modules use TCP/IP protocol and have resident FTP and TELNET utilities You can program client/server applications for an Ethernet port using the TCP/IP socket library; an Internet socket library is supplied with the PCBridge software A downloadable driver is also available—as a part of the PCBridge software—that provides INTERCHANGE™ server functionality; when the coprocessor is attached to a standard PLC-5 processor, this provides Ethernet connectivity
Optional RAM	You can install additional RAM in the main module to expand user memory The following single inline memory modules (SIMMs) are available: **Memory Size** — **Catalog Number** 256 Kbytes — 1771-DRS 1 Mbyte — 1771-DRS1 4 Mbytes — 1771-DRS4

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Table 2 describes the hardware elements for the optional serial expander module.

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Table 2
Serial Expander Module Hardware Elements

Hardware Element	Description
Keyswitch	This is a 2-position, spring-loaded keyswitch
	The RESET position is used to reinitialize the control coprocessor without cycling power
ASCII Display	The 4-character alphanumeric display shows information on the state of the control coprocessor, as provided by user programs
LEDs	The two status indicators provide information on the COMM2 and COMM3 ports
COMM2 Port and COMM3 Port	These are 25-pin, optically isolated, serial communication ports that support communication defined by EIA RS-232C, -423, and -485 standards
	You can also use the port with most RS-422A equipment as long as:
	• termination resistors are not used
	• the distance and transmission rate are reduced to 200 ft at 19.2 kbps
	Use these communication ports to connect peripheral devices such as:
	• terminals
	• personal computers
	• bar-code readers
	• weigh scales
	• printers
Fault Relay	The relay contact switches on a detected main-module hardware fault; the relay will handle 500 mA at 30 Vac/dc (resistive)

Communication with a PLC Programmable Controller

The control coprocessor communicates with a programmable controller through a direct connection to the programmable controller—direct-connect mode—or via the 1771 I/O chassis backplane—standalone mode.

When the serial expander module is used in either mode, place it immediately adjacent to the main module—i.e., under the same locking tab.
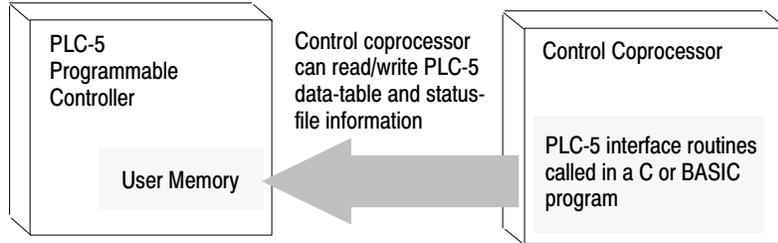
Direct-Connect Mode

In direct-connect mode, either the control coprocessor or the PLC-5® programmable controller initiates communications. The control coprocessor can read from and write to the PLC-5 programmable-controller data table asynchronously to the ladder-program scan.
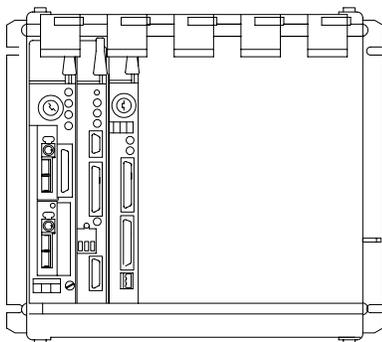
A control coprocessor and serial expander in direct-connect communication with a PLC-5 programmable controller

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You can directly connect the control coprocessor to a PLC-5 processor that has the coprocessor expansion port—e.g., a PLC-5/11™, PLC-5/20™, PLC-5/20E™, PLC-5/30™, PLC-5/40™ (series B, revision B or later), PLC-5/40E™, PLC-5/40L™, PLC-5/60™ (series B, revision B or later), PLC-5/60L™, PLC-5/80™, or PLC-5/80E™ programmable controller.

The **control coprocessor can initiate direct-access communication** to PLC-5 user memory as shown here.

You do not need to program your PLC-5 programmable controller to support these calls.

| PLC-5 Programmable Controller | Control coprocessor can read/write PLC-5 data-table and status-file information | Control Coprocessor |

A **PLC-5 control-logic program can initiate direct-access communication** to the control processor as shown here.
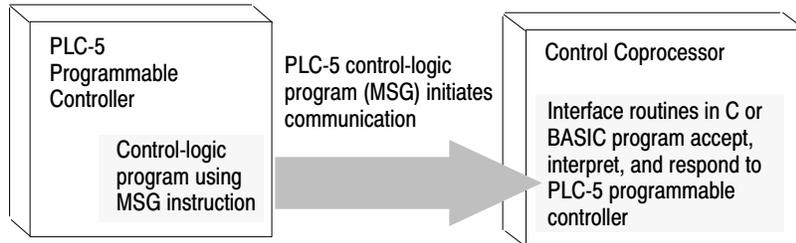
A **PLC-5 control-logic program can initiate back-plane communication** with the control processor in direct-connect mode via:

- discrete I/O read/write
- block-transfer read/write

Standalone Mode

Tip We recommend that you use 1-slot addressing for standalone mode.

In standalone mode, you do not connect the control coprocessor directly to the PLC programmable controller. The control coprocessor can reside in the same chassis as the programmable controller or in a remote chassis.

Only the programmable controller initiates communication with a standalone control coprocessor.

Communication is via the backplane using discrete- or block-transfer read/write instructions.
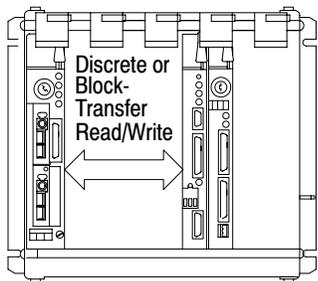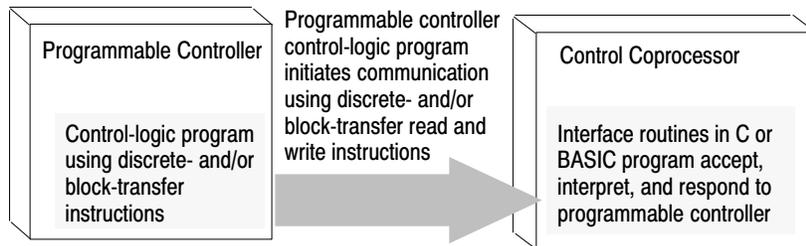
Communicates, **in the same chassis**, with a PLC-5 or mini PLC-2® programmable controller via the backplane
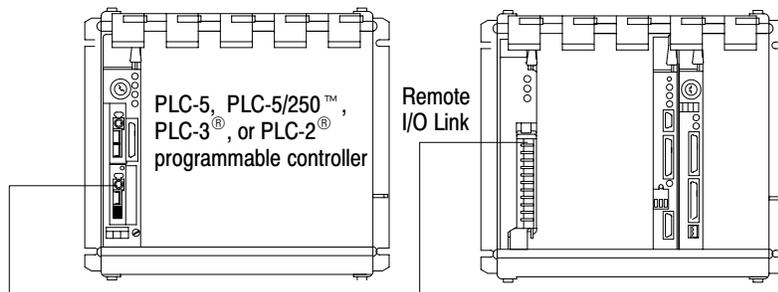
Communicates, **from a remote chassis**, with the programmable controller via an I/O adapter module (1771-ASB)

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Programming Overview

This section provides an overview of the programming interface and capabilities of the control coprocessor.

User Interface

You can develop programs and communicate with the control coprocessor using a DOS-based computer or an ASCII terminal. See Table 3.
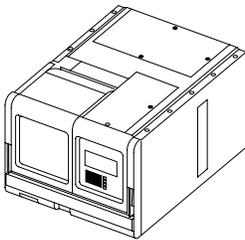
Table 3
Programming Terminals

With this device:	You can:
DOS-based computer	• initialize and configure the control coprocessor • initialize and configure the Ethernet port • develop C, BASIC, and assembler programs • perform program debugging • initiate and terminate tasks using the OS-9 operating system command-line interface
ASCII terminal	• develop BASIC programs • perform program debugging • initiate and terminate tasks using the OS-9 operating system command-line interface

Program-Development Software

The PCBridge software package (1771-PCB) operates on a DOS-based personal computer. This software package supports offline and online user activities.

Use this software to:

- download/upload files and executable modules—or files and modules—to/from the control coprocessor

- develop and edit source files

- compile, assemble, and link multiple source files written in C or assembler

- emulate an ASCII terminal, which allows your personal computer to act as a console device to the control coprocessor

- use various online programs, such as basic (BASIC language environment) and SrcDbg (source-level debugger for C programs)

- access configuration (offline options) and other miscellaneous utilities

- initialize and configure the Ethernet port
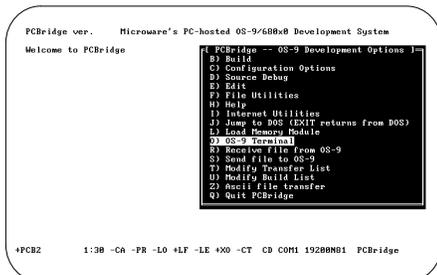
Control-Coprocessor Operating System

The control-coprocessor operating system is Microware OS-9™.
This real-time, multitasking operating system offers:

- command-line interface

- semaphore utilities

- inter-task communication facilities

- run-time task creation and deletion facilities

- task-prioritization facilities

- task-scheduling utilities

- unified I/O and file system for access to RAM disk and
  communication ports

See the OS-9 Operating System User Manual, publication 1771-6.5.102,
for more information.

Programming Languages

You develop C, BASIC, and assembler programs using the PCBridge
software. You can also develop and edit BASIC programs on the
control coprocessor using a terminal or a personal computer for
terminal emulation.

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Product Specifications

Table 4 lists general specifications for the control coprocessor.

**Table 4
Control-Coprocessor Specifications**

Backplane Current	Main module	• 2.50 Amps at +5 Vdc (1771-DMC module with no Ethernet) • 4.00 Amps at +5 Vdc (1771-DMC1 or -DMC4 module with Ethernet and transceiver)[1]
	Serial expander module	1.5 Amps at +5 Vdc
Fault Relay	Serial expander module	500 mA at 30 Vac/dc (resistive)
Environmental Conditions	Operating temperature	0–60° C (32–140° F)
	Storage temperature	-40–85° C (-40–185° F)
	Relative humidity	5–95% (without condensation)
Time-of-Day Clock and Calender	Maximum variations at 60° C	±5 minutes per month
	Typical variations at 20° C	±20 seconds per month
Communication Ports[2]	COMM0	RS-232C; 9-pin
	COMM1, COMM2, and COMM3	RS-232C, -423, -485, and -422A compatible; 25-pin
	Ethernet port	TCP/IP protocol using FTP, TELNET, and socket library routines; INTERCHANGE server, SNMP compatible (MIB I); 15-pin standard transceiver
Communication Rates	COMM0, COMM1, COMM2, and COMM3 ports	110, 150, 300, 600, 1200, 2400, 4800, and 9600 bps, 19.2 Kbps, and 38.4 Kbps
	Ethernet	10 Mbps
Location	1771-I/O chassis	• direct-connect to a PLC-5 programmable controller • same chassis as a programmable controller, but standalone • remotely located from a programmable controller and standalone
Keying	Main module (on the upper C connector)	• between 24 and 26 • between 30 and 32
	Serial expander module (one on the upper C and two on the lower D connectors)	• between 16 and 18 (upper C connector) • between 2 and 4 (lower D connector) • between 16 and 18 (lower D connector)
Agency Certification	(Only when product is marked)	• CSA certified • CSA Class I, Division 2, Groups A, B, C, D • UL listed
Battery Life	Main module	1 year

[1] This is an approximate value. See Chapter 2 of the 1771 Control Coprocessor User Manual, publication 1771-6.5.95, for instructions on calculating backplane current requirements.

[2] With the 1771-DMC module (256 Kbytes), DF1 is not available on the communication ports; if you add an optional 1- or 4-Mbyte SIMM, however, the communication ports will initialize with DF1 capability.

Product Compatibility

Table 5 lists products compatible with the control coprocessor.

Table 5
Other Allen-Bradley Products Compatible with the Control Coprocessor

Programmable Controllers	I/O Chassis	Adapter Modules	Terminals or Personal Computers
Direct-Connect Mode • PLC-5/11 processor • PLC-5/20 processor • PLC-5/20E processor • PLC-5/30 processor • PLC-5/40 (series B, revision B or later) processor • PLC-5/40E processor • PLC-5/40L processor • PLC-5/60 (series B, revision B or later) processor • PLC-5/60L processor • PLC-5/80 processor • PLC-5/80E processor **Standalone Mode** in a programmable-controller chassis • any PLC-5 processor • mini PLC-2 processor **Standalone Mode** in a remote chassis • any PLC-5, PLC-5/250 processor • PLC-3 processor • PLC-2 processor (remote I/O only)	Any Universal 1771 I/O chassis	Any 1771-ASB adapter module in a remote chassis	**Terminals:** • VT220 (DEC) • other ASCII terminal **Personal Computers:** • IBM® PC/AT • T47 • T50 • T53 • T60

Control-Coprocessor Memory

Table 6 shows RAM configuration. You can configure the free user portion of RAM for your requirements. You can also change the default size of the TAG table.

Table 6
RAM Configuration

Total RAM	Default RAM-Disk Size	RAM Required by the System	Default TAG Table[1]	Free User RAM[2]
256 Kbytes (1771-DMC)[3]		120 Kbytes	0	72 Kbytes
1 Mbyte (1771-DMC1)	64 Kbytes	215 Kbytes	80 Kbytes	665 Kbytes
4 Mbytes (1771-DMC4)		215 Kbytes	80 Kbytes	3737 Kbytes

[1] To change the default size of the TAG table, see the section in Chapter 3 of the 1771 Control Coprocessor User Manual, publication 1771-6.5.95, on configuring the control coprocessor (CC_CFG utility).

[2] To configure the control coprocessor RAM free user memory, see Chapter 3 of the 1771 Control Coprocessor User Manual, publication 1771-6.5.95, on configuring the control-coprocessor system memory (MEM_CFG utility).

[3] Source debugging for C programs does not work with this memory configuration. Debugging requires a minimum of 512 Kbytes.

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Table 7 lists the optional RAM single inline memory modules (SIMMs) that you can add to your control coprocessor.

Table 7
Additional RAM Memory—Optional[1]

Memory Size	Catalog Number
256 Kbytes	1771-DRS
1 Mbyte	1771-DRS1
4 Mbytes	1771-DRS4

[1] These optional RAM SIMMS are **not** the same as those used in generic personal computers, which are dynamic RAM. The 1771-DRS RAM SIMMS are special static RAM chips.

CSA Certification

CSA certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label. See the CSA Hazardous Location Approval Supplemental Product Information, publication ICCG-4.1, for more information.

UL Certification

Underwriters Laboratories Inc. (UL) performs safety investigations of electrical and electronic equipment and products as well as other equipment and products. After product samples have been safety tested and are found to comply with applicable safety requirements, UL authorizes a manufacturer to apply the appropriate UL Mark on products that continue to comply with the requirements. In the case of Allen-Bradley's control coprocessor, it is the presence of the UL Listing Mark on the individual product that indicates UL certification.

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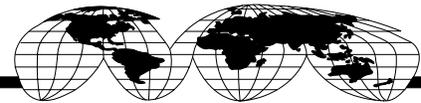
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