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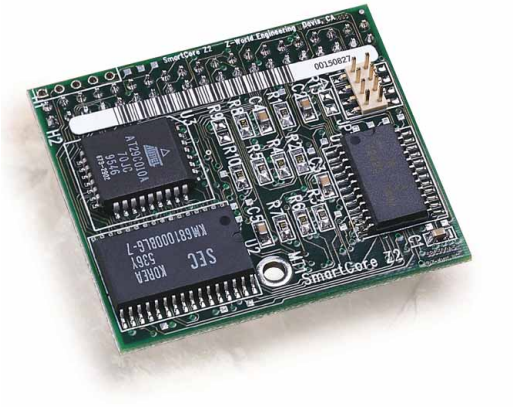

CM7000 Series

C-Programmable Core Module

User's Manual

Revision F

CM7000 Series Core Modules User's Manual

Part Number 019-0018 • Revision F
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ABOUT THIS MANUAL

This manual describes the CM7000 Series core modules, their subsystems, and the CM7100 Evaluation Kit. For ease of reference, this manual uses "CM7000" as a generic term referring to any of the CM7100 or CM7200 Series modules. "CM7100" refers to any of the CM7100 Series modules, and "CM7200" refers to the CM7200 Series. Specific models are referenced when appropriate.

Instructions are also provided for using Dynamic C functions.

Assumptions

Assumptions are made regarding the user's knowledge and experience in the following areas:

- Ability to design and engineer a target system that uses a CM7000.
- Understanding of the basics of operating a software program and editing files under Windows on a PC.
- Knowledge of the basics of C programming.

For a full treatment of C, refer to the following texts:

The C Programming Language by Kernighan and Ritchie
C: A Reference Manual by Harbison and Steel

- Knowledge of basic Z80 assembly language and architecture.

For documentation from Zilog, refer to the following texts:

Z180 MPU User's Manual
Z180 Serial Communication Controllers
Z80 Microprocessor Family User's Manual

Acronyms

Table 1 is a list of acronyms that may be used in this manual.

Table 1. Acronyms

Acronym	Meaning
EPROM	Erasable Programmable Read Only Memory
EEPROM	Electronically Erasable Programmable Read Only Memory
LCD	Liquid Crystal Display
LED	Light Emitting Diode
NMI	Nonmaskable Interrupt
PIO	Parallel Input / Output Circuit (Individually Programmable Input / Output)
PRT	Programmable Reload Timer
RAM	Random Access Memory
RTC	Real Time Clock
SIB	Serial Interface Board
SRAM	Static Random Access Memory
UART	Universal Asynchronous Receiver Transmitter

Icons

Table 2 displays and defines icons that may be used in this manual.

Table 2. Icons

Icon	Meaning	Icon	Meaning
	Refer to or see		Note
	Please contact		High Voltage
	Caution	Tip	Tip
	Factory Default		

Conventions

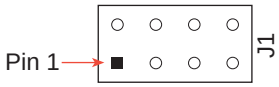
Table 3 lists and defines typographical conventions that may be used in this manual.

Table 3. Typographical Conventions

Example	Description
`while`	Courier font (bold) indicates a program, a fragment of a program, or a Dynamic C keyword or phrase.
`// IN-01…`	Program comments are written in Courier font, plain face.
Italics	Indicates that something should be typed instead of the italicized words (e.g., in place of *filename*, type a file's name).
Edit	Sans serif font (bold) signifies a menu or menu selection.
. . .	An ellipsis indicates that (1) irrelevant program text is omitted for brevity or that (2) preceding program text may be repeated indefinitely.
[ ]	Brackets in a C function's definition or program segment indicate that the enclosed directive is optional.
‹ ›	Angle brackets occasionally enclose classes of terms.
a | b | c	A vertical bar indicates that a choice should be made from among the items listed.

Pin Number 1

A black square indicates pin 1 of all headers.



Measurements

All diagram and graphic measurements are in inches followed by millimeters enclosed in parenthesis.

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CHAPTER 1: OVERVIEW

Introduction

The CM7000 is a microprocessor core module. The CM7000 combines a complete system engine with integrated development software. You build your own controller around the plug-in CM7000.

Features

- Small size: 1.80" × 2.05" (45.7 mm × 52.1 mm)
- Microprocessor: Z180 running at 9.216 MHz or 18.432 MHz, including two DMA channels, two serial ports, and two programmable timers (PRTs)
- SRAM: 32K or 128K (512K factory-installed SRAM is also available)
- EPROM:

  CM7100—32-pin DIP socket accommodates up to 512K EPROM

  CM7200—128K flash EPROM at 128 bytes/sector (256K factory-installed flash EPROM is also available)
- I/O support: six chip-select lines, supporting 64 addresses each, control the application's hardware
- Low electromagnetic interference
- Software written for either CM7100 or CM7200 Series is binary-compatible with the other

Options

The CM7000 is available with two types of memory—CM7100s have ROM and CM7200s have flash EPROM.

CM7100 Series

Table 1-1 lists the features of each model in the CM7100 Series.

Table 1-1. CM7100 Series Features

Model	Features
CM7100	18.432 MHz clock, 128K SRAM, 512-byte EEPROM, real-time clock, and ADM691 supervisor
CM7110	CM7100 with 9.216 MHz clock
CM7120	CM7100 with 9.216 MHz clock and 32K SRAM
CM7130	CM7100 with 9.216 MHz clock and 32K SRAM. Without ADM691 supervisor, real-time clock and EEPROM.

The CM7100 is available in one of the models listed in Table 1-1 or as part of the Evaluation Kit. The Evaluation Kit contains the following items.

- CM7110 with special EPROM containing sample programs.
- Prototyping Board.
- Manual (with schematics), cables, AC adapter, trial version of Dynamic C development software.

The trial version of Dynamic C included with the Evaluation Kit contains only the libraries associated with the Evaluation Kit. Once a decision is made to proceed with normal development, the standard or deluxe version of Dynamic C must be purchased. The Development Board supplied with the Developer's Kit and the development EPROM are also available for separate purchase.

For help with upgrading to a full-scale system, call your Z-World Sales Representative at (530) 757-3737.

A Developer's Kit is available for the CM7100. The Developer's Kit contains the following items.

- Development EPROM.
- Development Board, which plugs into the CM7100 EPROM socket to emulate ROM with RAM to make it easier to develop and debug large programs.
- Manual (with schematics), cables, and AC adapter.

A 128K EPROM and an LCD/Keypad module (the LCD/Keypad module requires a 9.216 MHz clock) are available separately.

Figure 1-1 shows the CM7100 board layout.

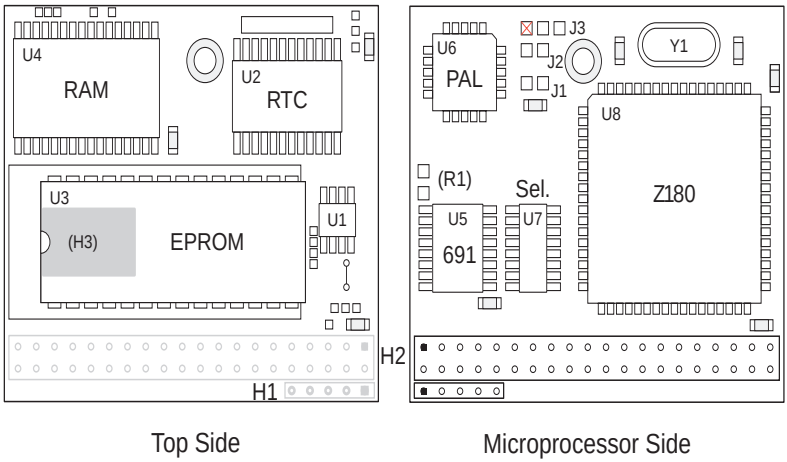

Figure 1-1. CM7100 Board Layout

CM7200 Series

Table 1-2 lists the features of each model in the CM7200 Series.

Table 1-2. CM7200 Series Features

Model	Features
CM7200	18.432 MHz clock, 128K SRAM, real-time clock, ADM691 supervisor, and 128K flash EPROM
CM7210	CM7200 with 9.216 MHz clock
CM7220	CM7200 with 9.216 MHz clock and 32K SRAM
CM7230	CM7200 with 9.216 MHz clock and 32K SRAM. Without ADM691 supervisor and real-time clock.

A Developer's Kit is available for the CM7200. The Developer's Kit contains the following items.

- Prototyping Board.
- Manual (with schematics), cables and AC adapter.
- Serial Interface Board 2.

The following optional accessories are available for the CM7200.

- Flash Programmer to program flash EPROM.
- 256K factory-installed flash EPROM.
- LCD/Keypad module (2 × 20 LCD and 2 × 6 keypad) for use with CM7200 modules with a 9.216 MHz clock.

Figure 1-2 shows the CM7200 board layout.

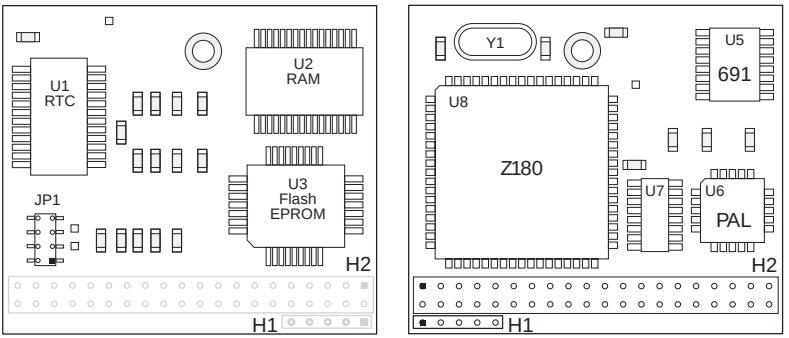

Figure 1-2. CM7200 Board Layout

Software Development and Evaluation Tools

Dynamic C, Z-World's Windows-based real-time C language development system, is used to develop software for the CM7000. The host PC downloads the executable code through the CM7000's RS-232 serial port or through the Serial Interface Board 2 to one of the following places:

- battery-backed RAM,
- ROM written on a separate EPROM programmer and then substituted for the Z-World development EPROM, or
- flash EPROM.

Dynamic C allows fast in-target development and debugging.

Z-World's Dynamic C reference manuals provide complete software descriptions and programming instructions.

For ordering information or more details about the various options and prices, call your Z-World Sales Representative at (530) 757-3737.

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CHAPTER 2: GETTING STARTED

Programming Setup

Dynamic C, Z-World's C-language development system, is used to develop applications for the CM7000. As a program compiles, Dynamic C downloads it directly to the CM7000's memory via one of the PC COM ports. Serial communication is normally at 19,200 bps, and can be as high as 57,600 bps. The CM7000 remains connected to the PC in most instances while a program is undergoing development. The mechanics of connecting a CM7000 and a PC vary depending on the CM7000 version and the programming strategy.

The programming strategy for a CM7100 depends on the hardware setup. Only one programming method is available for the CM7200 regardless of whether the Developer's Kit or in-target development is used.

CM7100

Four methods are available to program the CM7100.

1. Using the Prototyping Board. This method is recommended for programming the CM7110 supplied in the Evaluation Kit. This CM7110 has a special EPROM that contains the BIOS and sample programs.

   Method 1 may also be used to program other CM7100s. Since an EPROM is not normally included with CM7100s, except for the CM7110 in the Evaluation Kit, which comes with a special EPROM, a custom EPROM with the contents of the Dynamic C **2903.BIN** file must first be burned according to the details in the section "Programming EPROMs" in Chapter 3, "System Development."

2. Using the Development Board. The Development Board is included in the Developer's Kit with full Dynamic C, and is also sold separately.

3. Using the Development Board with full Dynamic C, and with the CM7100 embedded in your target system.

4. Directly in your system without a Development Board. This method requires some hardware setup and minor modifications to the Dynamic C EPROM code.

Methods 1 and 2 are normally used for evaluation or experimentation. Method 3 requires some hardware setup, and ultimately must be used to program a working system. Method 4 can be the fastest and most powerful.

Once program development has been completed, recompile the program for EPROM. An EPROM is burned in a separate operation and is then installed in the EPROM socket on the CM7100.

CM7100 Method 1 — Prototyping Board

1. Check to make sure the power to the Prototyping Board is ***not*** connected.
2. Check header J3 on the microprocessor side of the CM7100. The surface-mounted jumper should connect pins 2–3 to reflect the 128K memory of the special EPROM. This factory default setting is shown in Figure 2-1.

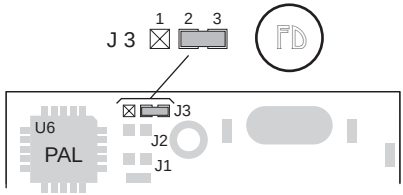

Figure 2-1. CM7100 Header J3 Configured for Special EPROM

3. Plug the CM7100 into the Prototyping Board as shown in Figure 2-2. Plug header H2 of the CM7100 into connector H3 of the Prototyping Board. Pins 1 of the header and connector must match. The CM7100 will hang over the battery on the Prototyping Board. For maximum stability, install the supplied standoff between the CM7100 and the Prototyping Board.

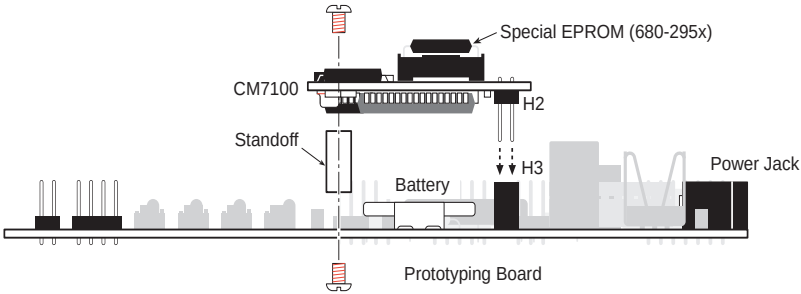

Figure 2-2. Connecting CM7100 to Prototyping Board

4. If using the CM7110 from the Evaluation Kit, make sure the CM7110 has the special 32-pin EPROM (Z-World part number 680-295x) installed at U3 as shown in Figure 2-3. Custom-burned EPROM are also installed at location U3.

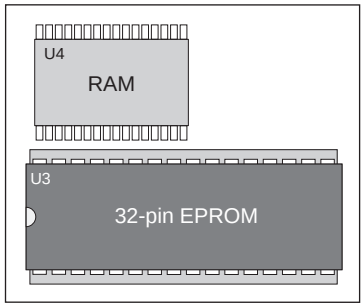

Figure 2-3. Installation of 32-pin EPROM

5. Place jumpers across headers J2, J3, and J4 on the Prototyping Board to enable headers J6–J11 on the Prototyping Board. The Prototyping Board is shown in Figure 2-4.

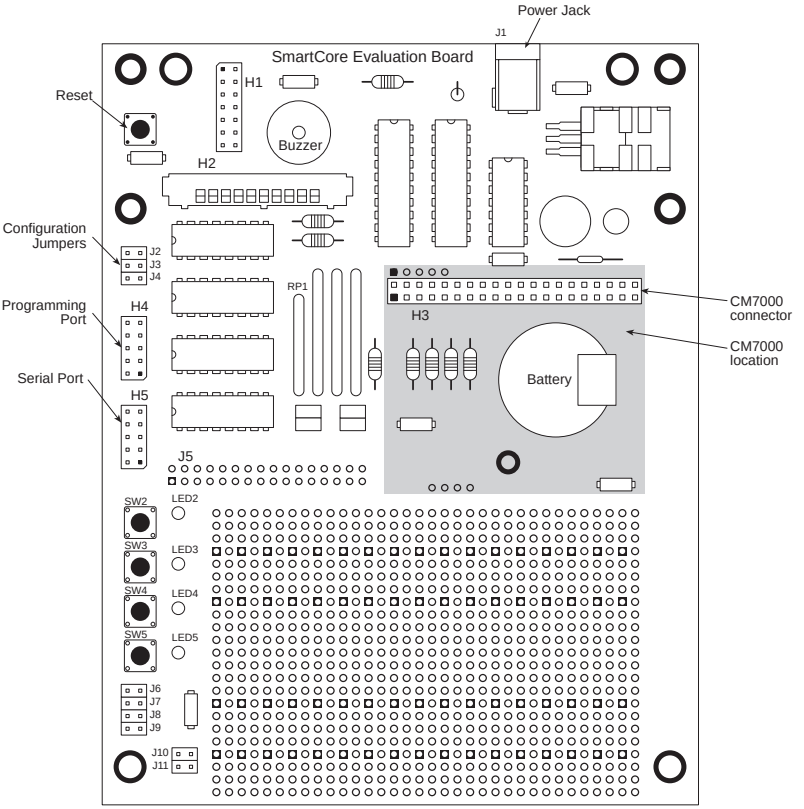

Figure 2-4. CM7100 Prototyping Board

It is necessary to place jumpers across headers J2, J3, and J4 to enable headers J6–J11 on the Prototyping Board. Note that this disables chip selects CS1, CS2, and CS3. The LEDs will not work when CS1 is disabled.

The BIOS on the special EPROM (Z-World part number 680-295x) supplied with the CM7110 in the Evaluation Kit does not support chip selects CS1, CS2, and CS3.

6. Set the Prototyping Board's jumpers. Jumpers across headers J10 and J11 affect the operational mode and the baud rate as shown in Figure 2-5. When both headers J10 and J11 are jumpered, the CM7100 checks headers J6–J9 at startup. If none of these headers is jumpered, the CM7100 will execute the program, if any, stored in RAM. If some of these headers are jumpered, a sample program stored in the special CM7100 EPROM will begin executing.

See Appendix F, "Prototyping Board," for more information on the Prototyping Board and the sample programs in the special EPROM.

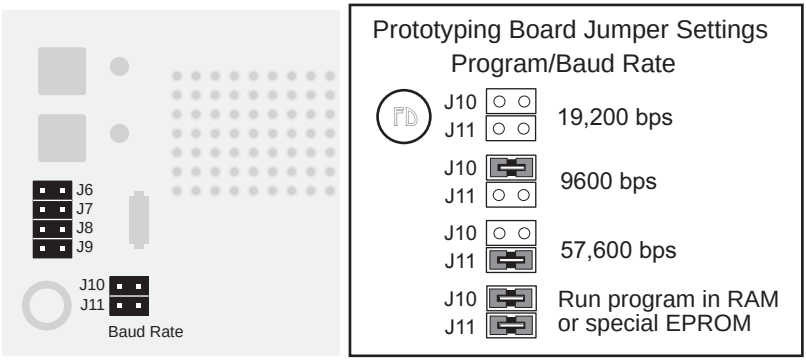

Figure 2-5. CM7100 Prototyping Board Program/Mode Jumper Settings

7. Connect the serial cable. Connect one end to the PC COM port. Then connect the 10-pin end to header H4 of the Prototyping Board as shown in Figure 2-6. Be careful to match the arrow on the connector to the location of pin 1 on header H4.
8. Apply power from the 9 V power supply to the Prototyping Board. The CM7100 is ready for programming, unless the jumpers were set in Step 6 to run a program stored in RAM or to run one of the sample programs stored in the special EPROM.

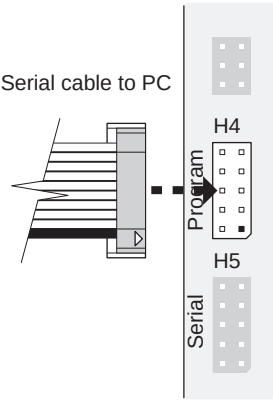

Figure 2-6. Serial Cable Connection to CM7100 Prototyping Board

CM7100 Method 2 — Development Board

1. Check to make sure the power to the Prototyping Board is ***not*** connected.
2. Check header J3 on the microprocessor side of the CM7100. The surface-mounted jumper should connect pins 2–3 to use the Development Board. This factory default setting is shown in Figure 2-1.
3. Plug the CM7100 into the Prototyping Board as shown in Figure 2-7. Plug header H2 of the CM7100 into connector H3 of the Prototyping Board. Pins 1 of the header and connector must match. The CM7100 will hang over the battery on the Prototyping Board. For maximum stability, install the supplied standoff between the CM7100 and the Prototyping Board.

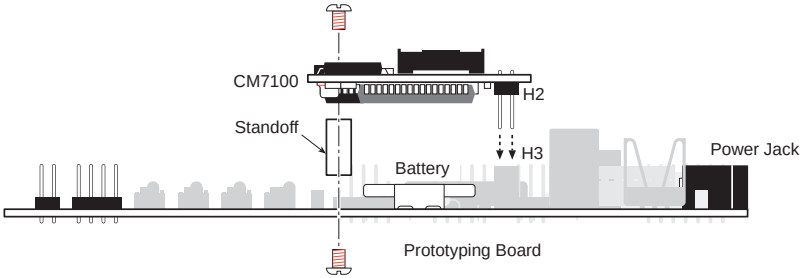

Figure 2-7. Connecting CM7100 to Prototyping Board

4. If an EPROM is installed in socket U3 on the CM7100, remove the EPROM. Plug a Dynamic C development EPROM (Z-World part number 680-290x) into the EPROM socket (U3) of the Development Board. See Figure 2-8.

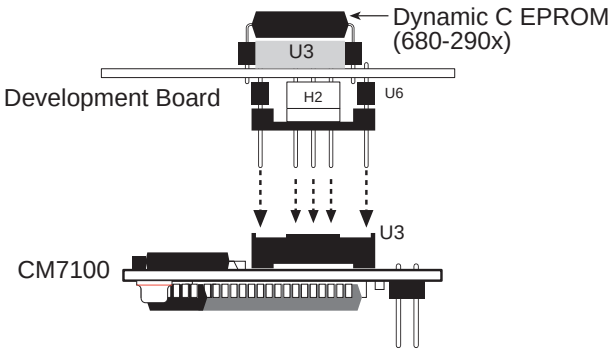

Figure 2-8. Installation of CM7100 Development Board and Development EPROM

5. Plug the Development Board into the EPROM (U3) and H3 sockets on the CM7100 as shown in Figure 2-8. Headers U6 and H2 on the underside of the Development Board must match the CM7100 EPROM and H3 sockets exactly.

> Be careful! The U6 and H2 pins on the Development Board are delicate and bend easily.

6. Check the jumpers on the Development Board. Figure 2-9 shows the locations of the relevant headers.

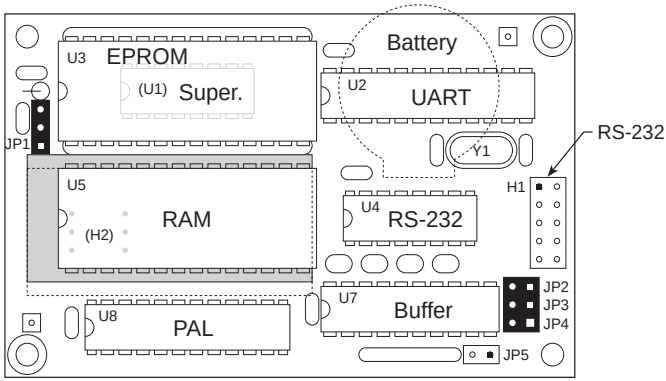

Figure 2-9. CM7100 Development Board

Figure 2-10 shows the jumper settings for different RAM sizes, operational modes, and baud rates.

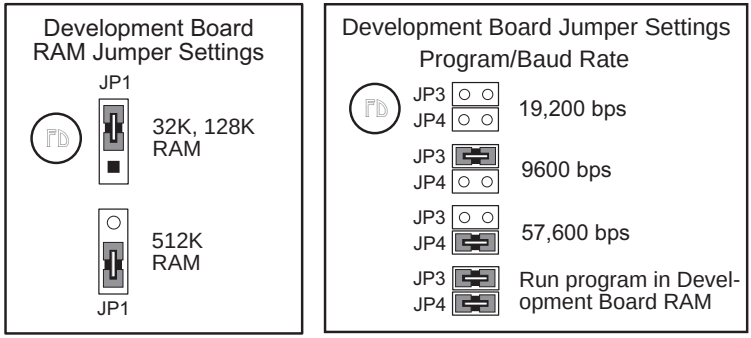

Figure 2-10. CM7100 Development Board Jumper Settings