

# Motorola Semiconductor Engineering Bulletin

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## EB350

## How to Use the MC68HC812A4 in Special Expanded Narrow Mode Using the M68HC12AEVB

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### Introduction

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The MC68HC812A4 (812A4) is designed primarily as an expanded mode microcontroller. It can be operated in expanded narrow mode for 8-bit peripheral devices and in expanded wide mode for 16-bit peripheral devices.

The M68HC12A4EVB (A4EVB) is designed to accommodate expanded narrow mode of operation, although in the factory it is configured in expanded wide mode.

The steps to set up the evaluation board are described in this engineering bulletin. They are designed to help guide users to configure emulation RAM (random-access memory) in expanded narrow mode and to utilize a third-party debugger to debug in C language.



## Hardware Setup

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Setting up the A4EVB in special expanded narrow mode requires modifying the evaluation board.

Follow these steps to make the modification:

- When setting up the evaluation board, turn off the power to the A4EVB.
- Jumpers W42 and W34 should be shunted between pins 1 and 2. W30 should be left floating or pulled out.
- Remove the 74HC32 chip from U3.
- Make a wire jumper from pin 2 on U3 socket to pin 3. This will make a direct connection from the RAM-CS signal to RAM-MSB-CS. Chip enable (CE) on pin 22 will have a direct connection to chip select header W11.
- Select CSP0 by shunting W11-8 between pin 2 and pin 3. CSP0 is enabled from reset and should be used to test the application program properly.
- Insert RAM chip in socket U6B. Notice that U6A does not have address line 0 routed, and it is used for expanded wide mode. On the other hand, U6B does have address line 0 routed directly and is designed for the use of expanded narrow mode.
- When memory paging is enabled, the EVB includes the footprint for a 28- and 32-pin RAM footprint. Address lines 16 and 18 are hardwired to U6B. However, address line 17 needs to be configured via jumper header W12 by shunting pin 3 and pin 4.

## Software Setup Using P&E's SDBUG12 Program

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When using a software debugger in special expanded narrow mode, it is important to note that the mode register has to be modified.

To start the program, simply get into the directory where the executable is loaded. Type **sdbug12 freq x000000** where x is the A4EVB's bus speed.

When this command is typed, either COM1 or COM2 can be used.

Contact P&E Microcomputer Systems, Inc., at its Web site, [www.pemicro.com](http://www.pemicro.com), for specifics.


Once the SDBUG12 screen is displayed, execute a register modify to ensure the software is communicating properly with the PC. Type **A 55** and watch the screen value for the A accumulator value change. Reset it to 0 by typing **A 00** and observe the A accumulator value change.

So far, the microcontroller is in special single-chip mode. For expanded narrow mode functionality, the mode register needs to be written twice with \$39 which will provide access to external peripherals in expanded narrow format and gain access to the bus in 8-bit mode where the data is provided on data lines d8 to d15.

Make sure the chip select control register (CSCTL) has CSP0 enabled. Execute a memory modify command by typing **mm 3C**, and when the enter key is pressed, the debugger will provide the current value and designate a field to place the new value in. If the register does not show the proper value (\$20) for CSP0 to be enabled, set it to the proper value.

To check U6B's accessibility, simply execute a memory modify command at a memory location inside the RAM's address space. Type **mm <address>**, and the command will respond with the current value and prompt for the new value.

If this is successful, download an S19 record to the microcontroller, provided that the record is within RAM's range.

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