

## Motorola Semiconductor Engineering Bulletin

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# EB335

### How to Use the MC68HC812A4 in Single-Chip Mode Using the M68HC12A4EVB

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#### Introduction

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The MC68HC812A4 (812A4) is designed primarily as an expanded mode microcontroller. However, it has the ability to run in single-chip mode because of the capability to map its 4096 bytes of EEPROM (electrically erasable programmable read-only memory) onto the interrupt and reset vector area. Some small program applications needing a 16-bit microcontroller can utilize this feature.

For engineers/designers familiar with the MC68HC811E2, the 812A4 behaves very much like it.

This engineering bulletin illustrates how to program the 812A4's EEPROM with the use of its background debug mode.



## Programming EEPROM in Special Single-Chip Mode

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Programming the EEPROM can be done using PROG12S from P&E Microcomputer Systems, Inc. ([www.pemicro.com](http://www.pemicro.com)). This process is fast and inexpensive.

The S19 record must be originated (ORG'd) at the start of EEPROM. For PROG12S to come up in special single-chip mode, it is important to set MODA and MODB low and remove the BKGD shunt for BKGD to transfer data in and out.

To program the EEPROM, follow these steps:

1. Hardware setup (setting up the evaluation board, A4EVB)

Jumpers W42 and W34 should be shunted between pins 1 and 2. W30 should be left floating.

Next, connect the SDIL (Motorola serial debug interface) pod to header J5. The 6-pin header is used for the M68HC12 Family instead of the 10-pin header. It is important to connect pin 1 on header J5 to pin 1 on the cable. This is achieved by lining up the ribbon's red wire to pin 1 on the header.

For pinout documentation on the SDIL connector, refer to *MC68HC812A4 Advance Information*, Motorola document order number MC68HC812A4/D, or download it from the Web site [www.mcu.motsps.com](http://www.mcu.motsps.com).

2. Software setup using P&E's PROG12S program

To start the program, simply get into the directory where the executable is loaded. Type **prog12s freq x000000** where x is the bus speed of the target. For instance, x = 8 for 8-MHz operation.

If this command is typed, make sure you are on COM1. It is also possible to connect to COM2. Contact P&E at [www.pemicro.com](http://www.pemicro.com) for specifics or read the documentation for PROG12S.

Once the PROG12S programming screen is displayed, execute a bulk erase, load the S19 record, and proceed with programming of the EEPROM.

Before exiting the program, execute a verify command. This command reads the EEPROM pattern and compares it with the S19 record. To have complete success, the application program should set the stack to address \$BFF and clear the COPCTL to disable the COP watchdog.

3. Running the application program
  - a. Hardware setup for single-chip mode (setting up the A4EVB)

Turn off the power.

Disconnect the SDIL.

Jumpers W42, W34, and W30 should be shunted between pins 1 and 2.

Turn on the power.
  - b. Application program verification

Use an oscilloscope to monitor the reset line in single-chip mode with the slope set to going low. Press RUN on the scope after releasing RESET. Also, if the application program toggles a port pin, this guarantees that the program is running.

If the scope never triggers on reset, the code is running successfully.

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