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# M68EM05C9 EMULATOR USER'S MANUAL

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### 1.3 CONNECTORS P4 AND P5 PI

Figure 1-2 shows the pin assignments for connectors P4 and P5. The pin assignments correspond with the signal names of the MCU. See the pin assignments table in the data book for the specific MCU.

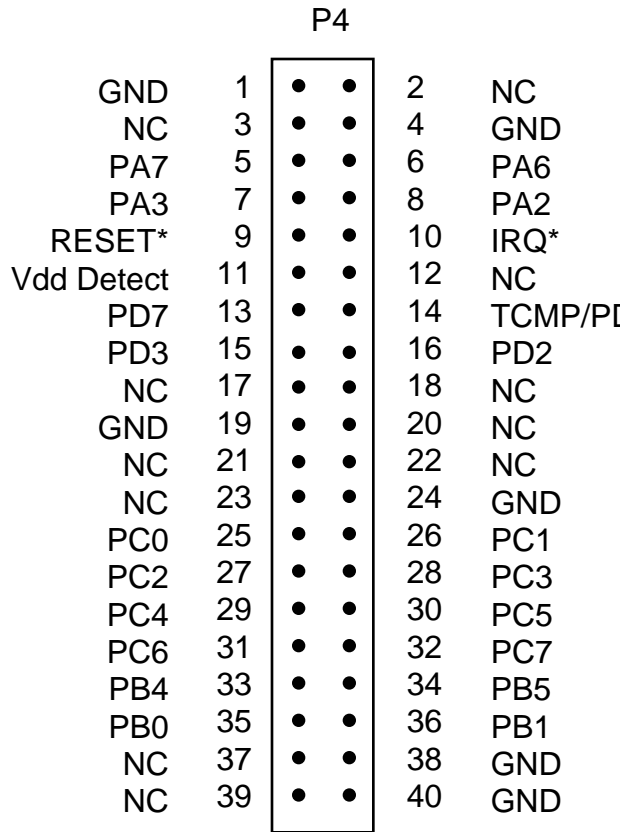


Figure 1-2. Connectors P4

As connector P1 has more importance to an HCC, the pin assignments for connector P1 are in Chapter 3.

To configure your C9EM for use as part of an HCC, see Chapter 2. To configure your C9EM for use as part of a target system, see Chapter 3.

### 1.5 COP WATCHDOG EMULATION

Some of the devices emulated by this system in sections 2.2.x and 3.2.x for further configuration details.

This user's manual explains connection, configuration, and use of the M68EM05C9 Emulator Module (C9EM). It also covers debugging of target systems based on these microprocessors.

MC68HC05C4A	MC68HC705C4A
MC68HC05C9A	MC68HC705C9A

The C9EM also emulates the following parts that are not listed in the table above:

MC68HC05C2	MC68HC05C3
MC68HC05C8	MC68HC705C8

The C9EM can be part of two development systems: the MMDS05 Development System and explains the layout of the C9EM.

## 1.1 DEVELOPMENT SYSTEMS

Your C9EM can be part of two Motorola development systems: the MMDS05 Development System (MMDS05) or the M68HC05C9 Emulator Module (C9EM).

### 1.1.1 Motorola Modular Development System

The MMDS05 is an emulator system that provides a graphical user interface, memory windows. The unit's integrated design environment includes a graphical user interface, and source-level debug. A complete list of features is provided in the MMDS05 user manual.

- **a station module** — the metal MMDS05 enclosure provides the internal power supply. Most system cables connect to the station module enclosure to connect directly to the target system.
- **an emulator module (EM)** — such as the M68HC05C9 Emulator Module (C9EM) provides system functionality for a specific set of microprocessors through a sliding panel in the enclosure cable.
- **two logic clip cable assemblies** — the M68HC05C9 Emulator Module (C9EM) module to your target system, a test fixture for system evaluation or analysis. One end of each cable fits into station-module pod A or pod B. The other end fits into female probe tips. Ball clips come with the cable.

- a **9-lead RS-232 serial cable** — the host computer RS-232 port.
- a **9- to 25-pin adapter** — a moulded adapter to a 25-pin serial port.
- **system software** — software, on 3-1/2 inch floppy disk.
- **MMDS05 documentation** — an MMDS05 user's manual and the appropriate EM user's manual.

As mentioned, your C9EM gives the MMDS05 series MCUs. By substituting a different EM, you can emulate a different series MCU of a different series. (Your Motorola representative can explain the details.)

Chapter 2 explains how to configure and use your C9EM. For information about MMDS05 software or hardware operations manual. For layout and configuration information, see the corresponding EM user's manual.

### 1.1.2 M68HC05EVS Evaluation System

An HC05EVS is an economical, two-board tool for evaluating systems based on an MC68HC05 MCU. A complete evaluation system consists of:

- a **platform board (PFB)** — the bottom board. The platform board has connectors for power, ground, and logic.
- an **emulator module (EM)** — such as the C9EM, which provides system functionality for a specific set of MCUs. The EM has connectors for a target cable and for a cable to the host computer.
- an **RS-232 serial cable** — the cable that connects the host computer RS-232 port to the EM.
- **system software** — software, on 3-1/2 inch floppy disk.
- **HC05EVS documentation** — an HC05EVS user's manual and the appropriate EM user's manual.

As mentioned, your HC05C9 EVS emulates a specific series of MCUs. By substituting a different EM, you can emulate a different series MCU of a different series. (Your Motorola representative can explain the details.)

Chapter 3 explains how to configure and use your HC05C9 EVS. For information about HC05EVS software or hardware operations manual. For layout and configuration information, see the corresponding EM user's manual.

## 1.2 EM LAYOUT

Figure 1-1 shows the layout of the C9EM. Jumper J4 determines the logic level of the EM. Jumper J5 determines the logic level of the clock source. Jumper J6 determines the logic level of the connector. Switch array S1 determines which device is emulated. Switch array S2 determines which device is emulated. The user can set the port B mask option for CxA devices.

Connectors P4 and P5 provide the interface to the target cable. Connectors P1 and P2 provide the interface to the MMDS05 station module, the target cable port, and the host computer enclosure. Connector P1 connects to a logic analyzer for an EVS system, as an MMDS05 system in a target cable enclosure. Connectors P2 and P3 connect together the EM and the platform board (for an EVS).

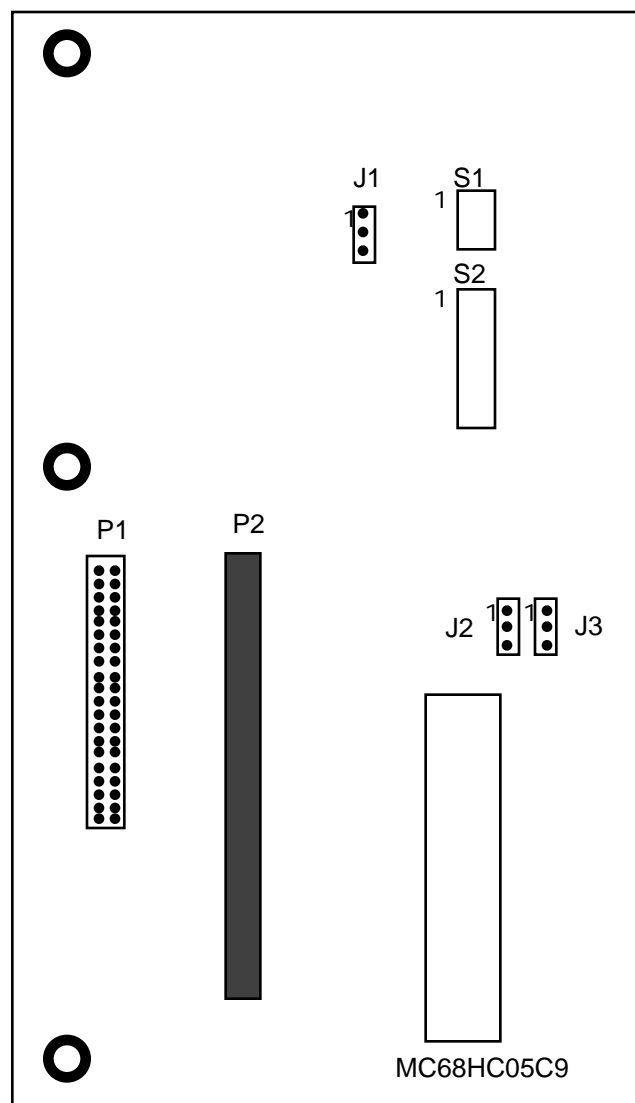


Figure 1-1. HC05C9

**2.1.3 Emulation Device Selection (J1, S**

Switch array S1 and jumper J1 together allow th emulated. S1 is used to select the size of the n some device specific features. J1 determines wh for the CA style devices. The following table required for each MCU emulated. Section 2.2 d used with each device and the operation of 1 necessary. **Note that devices in *italics* have present for historical reasons only.**

**Table 2-1. MCUs En**

DEVICE	S1 SWITCH	S1 SWITC
	1	2
<i>M68HC05C2</i>	<i>CLOSED</i>	<i>CLOSE</i>
<i>M68HC05C3</i>	<i>CLOSED</i>	<i>CLOSE</i>
<i>M68HC05C4</i>	<i>CLOSED</i>	<i>CLOSE</i>
<i>M68HC805C4</i>	<i>CLOSED</i>	<i>CLOSE</i>
<i>M68HC05C8</i>	<i>CLOSED</i>	<i>CLOSE</i>
<i>M68HC705C8</i>	<i>OPEN</i>	<i>CLOSE</i>
<i>M68HC05C9</i>	<i>CLOSED</i>	<i>OPE</i>
<i>M68HC705C9</i>	<i>CLOSED</i>	<i>OPE</i>
M68HC05C4A	CLOSED	CLOSE
M68HC705C4A	CLOSED	CLOSE
M68HC05C8A	CLOSED	CLOSE
M68HC705C8A	OPEN	CLOSE
M68HC05C9A	CLOSED	OPE
M68HC705C9A	CLOSED	OPE
M68HC05C12A	CLOSED	OPE

This chapter explains how to configure and us other parts of system installation or configura (MMDS05OM/D). (If you will use your C9EM Chapter 3 for corresponding information.)

Paragraph 2.1 explains how to set C9EM considerations pertaining to the MCU you emula installation.

Note that you can configure a C9EM already enclosure. To do so, switch off station-modul guidance of this chapter.

**CAUTI**

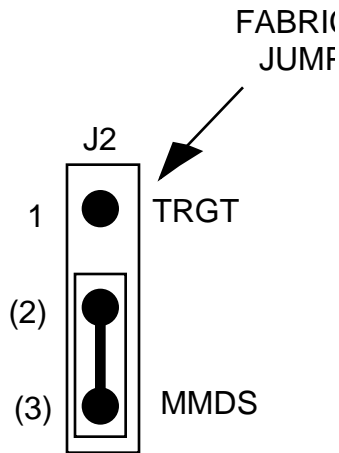
Be sure to switch off power if you reconf EM jumper headers with power left on car

**2.1 SETTING C9EM JUMPER HE**

Your C9EM has four jumper headers, J1 thro Paragraphs 2.1.1. through 2.1.4 explain how to c

### 2.1.1 Clock Source Select Headers (J2 and J3)

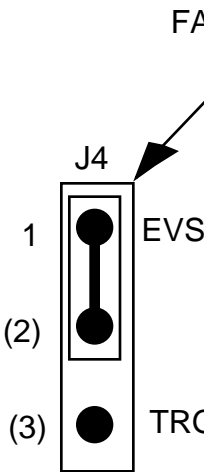
Jumper headers J2 and J3 select the source of the clock. You can choose between on-board oscillator (EM), MMDS, or TRGT from the target system (TRGT). To select MMDS position as well as correctly selecting the J2 set configuration: the fabricated jumper on J3 between pins 2 and 3, then position the J2 jumper between pins 1 and 2.



Alternatively, you may use a clock source originating from the target system. To use a clock source originating from the target system, position the J3 jumper between pins 2 and 3, then position the J2 jumper between pins 1 and 2.

### 2.1.2 Reset Select Header (J4)

Jumper header J4 controls the path of a target reset. The correct configuration is the fabricated jumper between pins 1 and 2. This is the only correct J4 configuration.



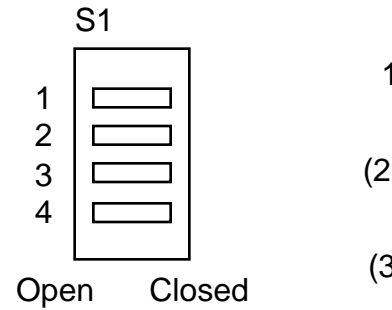
NOT

The J2 pins 2-and-3 configuration is not supported in the MMDS05 system. Such a configuration is not supported by the RESEtin and RESEtOut commands.

**2.2.5 705C8A Emulation**

To emulate the exact OPTION register RAM/R MC68HC705C8A, use a MC68HC705C8A sub the use of the RAM/ROM available, and watchd as the resident MCU. When using the MC68 writes to the OPTION register should be made t

For more information about the MC68HC705C corresponding technical data books.



**2.2.6 (7)05C9A Emulation**

To emulate an MC68HC(7)05C9A, use the MC6

For more information about the MC68HC05C corresponding technical data books.

**2.2.7 C12A Emulation**

To emulate the watchdog feature on a MC68HC resident MCU. The watchdog feature on the MC C12A.

For more information about the MC68HC05C corresponding technical data books.

**2.2.8 C2, C3, C4(A), C8, C8(A), C12A Emulation**

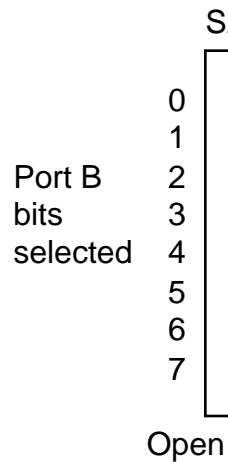
To emulate an MC68HC05C2,C3,C4(A),C8, C8(A), C12A resident MCU. Remember that these devices do not have an OPTION register. For accurate emulation, do not use any of the address

For example, the MC68HC705C9 has an OPTION register. This register can enable extra RAM and ROM in memory, be this register when emulated one of the above devices. bit which determines IRQ sensitivity; either edge triggered or level used to emulate the IRQ mask option on these devices.

For more information about the MC68HC05C features, see the corresponding technical data books.

**2.1.4 Port B Keyboard Interrupt Mask Option**

Switch array S2 selects which bits in port B have keyboard interrupt mask bits on CxA type devices. (The switch S2 settings should be programmed that you require for the device; in the 705C8A devices, the bits selected are only active when programmed as interrupt mask bits. In such cases a resistive pull up is activated on the keyboard interrupt bit for the keyboard interrupt bit close the relevant switch. To select the CA option. Switch array S2 is organized as follows:



## 2.2 THE EMULATED MCU

Your MMDS05 system uses a specific personality file. For example, to emulate an MC68HC05C9 on C9EM, use the personality file 0021AVxx.MEM. Table 2-1 lists the personality files for the C9EM. Note that personality file names follow the format **ZZZ** is the EM identifier or MCU name, and **xx** in *italics* have been or will soon be replaced only.

Table 2-2. MCUs and Personality Files

EMULATED MCU	PERSONALITY FILE
M68HC05C2	00C2_V01.MEM
M68HC05C3	00C3_V01.MEM
M68HC05C4	00C4_V01.MEM
M68HC805C4	00C4_V01.MEM
M68HC05C8	00218V01.MEM
M68HC705C8	00219V01.MEM
M68HC05C9	0021AV01.MEM
M68HC705C9	0021AV01.MEM
M68HC05C4A	00C4AV01.MEM
M68HC705C4A	00C4AV01.MEM
M68HC05C8A	00218V01.MEM
M68HC705C8A	00219V01.MEM
M68HC05C9A	0021AV01.MEM
M68HC705C9A	0021AV01.MEM
M68HC05C12A	00C12V01.MEM

MMDS05 software loads the personality file specified in the personality file with a different one, use the LOADMEM command. For more information about the LOADMEM command, see the explanation in the MMDS05 operator's manual.

Alternatively, you can insert the line LOADMEM in the MMDS05 script file. This way, the system automatically loads the personality file at system startup. (For more information about the LOADMEM command explanation in the MMDS05 operator's manual.)

### 2.2.1 Resident MCU Substitution

The socket at C9EM location U9 contains the resident MCU. To substitute a different resident MCU, you must first remove the resident MCU with an MC68HC705C9 resident MCU, which is the only supported resident MCUs with some qualifications as described in the MMDS05 operator's manual.

Occasionally it may be necessary to replace the resident MCU at a lower level of emulation of a particular feature.

When you are ready to install the substitute MCU, you must first remove the resident MCU that you are grounded. Then remove the MC68HC705C9 resident MCU, and restore power.

### 2.2.2 C9 Emulation

To emulate either an MC68HC05C9 or MC68HC705C9 resident MCU. The C9 has single mask option for the C9 emulator operation.

### 2.2.3 (7)05C4A Emulation

To emulate the watchdog feature on a MC68HC05C4A resident MCU. The watchdog feature on the C4A and the C4 has no watchdog present.

For more information about the MC68HC05C4A emulation, see the corresponding technical data books.

### 2.2.4 705C8 Emulation

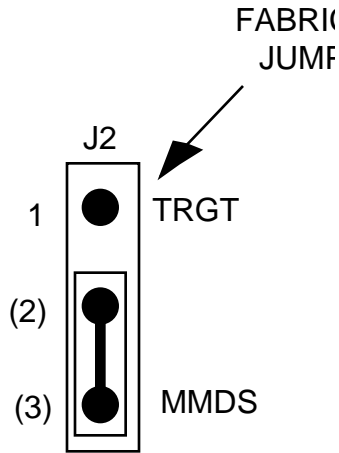
To emulate the exact OPTION register RAM/ROM on a MC68HC705C8 substitute for the resident MCU. If the MC68HC705C9 is available the MC68HC705C9 can be used. The MC68HC05C9 to emulate the MC68HC705C8 made to address \$3FDF rather than \$1FDF.

For more information about the MC68HC705C8 emulation, see the corresponding technical data books.



### 3.1.1 Clock Source Select Headers (J2 and J3)

Jumper headers J2 and J3 select the source of the clock. You can choose between on-board oscillator (EM) or clock module (TRGT). If you are using TRGT you must place the J3 jumper at the (2) position. The diagram below shows the factory default configuration. The J2 jumper between pins 1 and 2 selects the C9EM on-board oscillator.



NOT

The J2 pins 2-and-3 configuration is not supported in the HC05EVS system.

### 2.3 REMAINING SYSTEM INSTALLATION

When you have configured headers J1 through J4 and the resident MCU is appropriate, you are through with the hardware configuration.

- To install the C9EM in an MMDS05 static module top. Fit together EM connectors on the control-board connectors P11 and P12. Use the provided standoffs. Connect the target cable, if appropriate.
- If your C9EM already is installed in the static module (if necessary). Replace the panel.

At this point, you are ready to make remaining system connections. For instructions, consult the MMDS05C9/D.

**HC05EVS CONFIGURATION**

This chapter explains how to configure your C9EM and other parts of system installation or configuration (HC05EVSOM/D). (If you will use your C9EM, see Chapter 2 for configuration information.)

Paragraph 3.1 explains how to set C9EM jumper headers. Considerations pertaining to the MCU you emulate are discussed in the C9EM in an HC05EVS. Paragraph 3.4 explains how to connect the logic analyzer connector (P1). Paragraph 3.5 explains how to connect the logic analyzer connector (P1).

Note that you can configure a C9EM already installed on a platform-board. To do so, disconnect platform-board power, then follow the instructions in this chapter.

**CAUTION**

Be sure to disconnect power if you reconfigure C9EM jumper headers with power left on carrier board.

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**3.1 SETTING C9EM JUMPER HEADERS**

Your C9EM has four jumper headers, J1 through J4. Paragraphs 3.1.1 through 3.1.4 explain how to connect the headers.

### 3.2 RESIDENT MCU SUBSTITUT

The socket at C9EM location U9 contains the r with an MC68HC705C9 resident MCU, which MCUs with some qualifications as described in t

Occasionally it may be necessary to replace the level of emulation of a particular feature.

When you are ready to install the substitute MC that you are grounded. Then remove the MC resident MCU, and restore power.

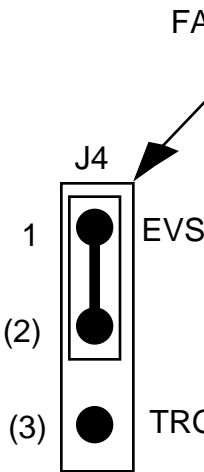
Table 3-2. Res

EMULATED MCU	RESIDENT MCU
M68HC05C2	MC68HC705C9
M68HC05C3	MC68HC705C9
M68HC05C4	MC68HC705C9
M68HC805C4	MC68HC705C9
M68HC05C8	MC68HC705C9
M68HC705C8	MC68HC705C9
M68HC05C9	MC68HC705C9
M68HC705C9	MC68HC705C9
M68HC05C4A	MC68HC705C9
M68HC705C4A	MC68HC705C9
M68HC05C8A	MC68HC705C9
M68HC705C8A	MC68HC705C9
M68HC05C9A	MC68HC705C9
M68HC705C9A	MC68HC705C9
M68HC05C12A	MC68HC705C9

Table 3-1 shows the resident MCU approp information in th reference paragraphs. Also no the information specific to the MCU you emulat

### 3.1.2 Reset Select Header (J4)

Jumper header J4 controls the path of a target r configuration: the fabricated jumper between p target when you press the user or master reset sv



Alternatively, you may enable the target system

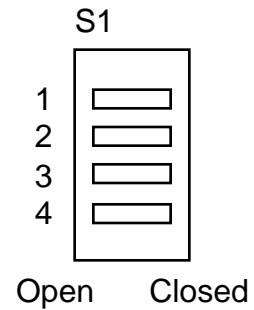
- Reposition the C9EM J4 jumper between p
- Insert a fabricated jumper into platform-bo

### 3.1.3 Emulation Device Selection (J1, S1)

Switch array S1 and jumper J1 together allow the emulation of various devices. S1 is used to select the size of the emulation and some device specific features. J1 determines which device is emulated for the CxA style devices. The following table lists the jumper settings required for each MCU emulated. **Note that device numbers have been replaced and are present for historical reasons only.**

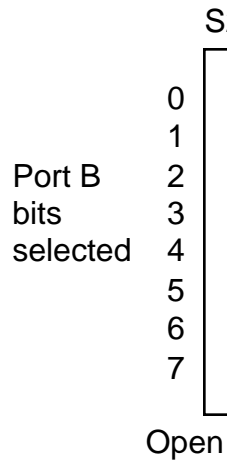
Table 3-1. MCUs Emulated

DEVICE	S1 SWITCH	
	1	2
M68HC05C2	CLOSED	CLOSED
M68HC05C3	CLOSED	CLOSED
M68HC05C4	CLOSED	CLOSED
M68HC805C4	CLOSED	CLOSED
M68HC05C8	CLOSED	CLOSED
M68HC705C8	OPEN	CLOSED
M68HC05C9	CLOSED	OPEN
M68HC705C9	CLOSED	OPEN
M68HC05C4A	CLOSED	CLOSED
M68HC705C4A	CLOSED	CLOSED
M68HC05C8A	CLOSED	CLOSED
M68HC705C8A	OPEN	CLOSED
M68HC05C9A	CLOSED	OPEN
M68HC705C9A	CLOSED	OPEN
M68HC05C12A	CLOSED	OPEN



### 3.1.4 Port B Keyboard Interrupt Mask

Switch array S2 selects which bits in port B have the keyboard interrupt mask option. For CxA type devices, the bits selected are only a subset of the port B data direction register, in such cases a jumper is required. To enable the mask option for the keyboard interrupt, set the jumper in S2 and ensure that jumper J1 selects the CxA style device. The following table shows the jumper settings that follow:



### 3.4 LOGIC ANALYZER CONNEC

Figure 3-1 shows the pin assignments for logic : descriptions for this connector.

		P
NC	1	•
NC	3	•
LA11	5	•
LA10	7	•
LA9	9	•
LA8	11	•
LA7	13	•
LA6	15	•
LA5	17	•
LA4	19	•
LA3	21	•
LA2	23	•
LA1	25	•
LA0	27	•
LR/W	29	•
NC	31	•
NC	33	•
NC	35	•
VCC	37	•
RESET	39	•

Figure 3-1. Connector

#### 3.2.1 Resident MCU Substitution

The socket at C9EM location U9 contains the r with an MC68HC705C9 resident MCU, which MCUs with some qualifications as described in t

Occasionally it may be necessary to replace the level of emulation of a particular feature.

When you are ready to install the substitute MC you are grounded. Then remove the MCU from MCU, and restore power.

#### 3.2.2 C9 Emulation

To emulate either an MC68HC05C9 or MC68 resident MCU. The C9 has single mask option f emulator operation.

#### 3.2.3 (7)05C4A Emulation

To emulate the watchdog feature on a MC68H the resident MCU. The watchdog feature on th the C4A and the C4 has no watchdog present.

For more information about the MC68HC05C corresponding technical data books.

#### 3.2.4 705C8 Emulation

To emulate the exact OPTION register RAM/R MC68HC705C8 substitute for the resident MC available the MC68HC705C9 can be used : MC68HC705C9 to emulate the MC68HC705C made to address \$3FDF rather than \$1FDF.

For more information about the MC68HC705 corresponding technical data books.

### 3.2.5 705C8A Emulation

To emulate the exact OPTION register RAM/R MC68HC705C8A, use a MC68HC705C8A sub the use of the RAM/ROM available, and watchd as the resident MCU. When using the MC68 writes to the OPTION register should be made t

For more information about the MC68HC705C corresponding technical data books.

### 3.2.6 (7)05C9A Emulation

To emulate an MC68HC(7)05C9A, use the MC6

For more information about the MC68HC05C corresponding technical data books.

### 3.2.7 C12A Emulation

To emulate the watchdog feature on a MC68HC resident MCU. The watchdog feature on the MC C12A.

For more information about the MC68HC05C corresponding technical data books.

### 3.2.8 C2, C3, C4(A), C8, C8(A), C12A E

To emulate an MC68HC05C2,C3,C4(A),C8, C resident MCU. Remember that these devices do For accurate emulation, do not use any of the ad

For example, the MC68HC705C9 has an OPTIO can enable extra RAM and ROM in memory, be this register when emulated one of the above de bit which determines IRQ sensitivity; either edg used to emulate the IRQ mask option on these de

For more information about the MC68HC05C features, see the corresponding technical data bo

## 3.3 EVS LIMITATIONS

This paragraph explains the limitations that ap (These limitations apply regardless of the reside

**Limitation 1. CLI/RTI.** You may not trace a interrupt (RTI) instruction with an interrupt e handling. Attempting such a trace causes an i software reset of the HC05EVS. User brea instructions; you must remove such SWI instruc

**Limitation 2. Branch.** Do not trace a condition branches to itself. As the monitor places an SW system never would execute the instruction. I instruction had executed. You may enter a G c instruction as long as the instruction is not a brea

**Limitation 3. IRQ/SWI.** Whenever possible, user software interrupts (SWIs). This preven concurrent hardware interrupt and SWI could o program execution. To recover from such a statistically), press the master reset switch (SW3

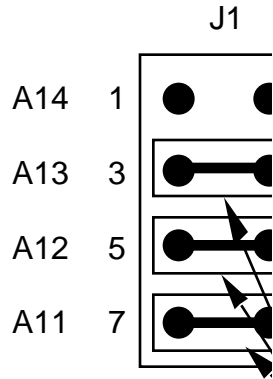
**Limitation 4. Memory Map.** You must be av simulated; be sure to use only valid ROM lo protection to limit user programs to the exac information about memory maps, consult the tec

**Limitation 5. COP.** The computer operating EPROM location for the resident MCU. Ac jumper header must enable write protection. C register change the value stored in user pseudo R

### 3.5 REMAINING SYSTEM INSTA

When you have configured headers J1 through J4 the resident MCU is appropriate, you are through

Find jumper header J1 of the HC05EVS platform jumpers are installed, per the diagram below.



To install the C9EM on an HC05EVS platform (on the bottom of the board) and platform-board the EM onto the plastic standoffs.

At this point, you are ready to make remaining power. For instructions, consult the HC05EVS c

Table 3-3. Logic Analyzer Conn

PIN	MNEMONIC	
1, 3, 4, 10, 12, 14, 31, 33 — 36, 40	-----	No connect
2, 6	GND	GROUND
5, 7, 8, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27	LA13 — LA0	LATCHED A output add
8	LA12	LATCHED output add
16, 18, 20, 22, 24, 26, 28, 30	AD7 — ADO	DATA BUS bus.
29	LR/W	LATCHED signal th transferred
32	LIR	LOAD INS active-low instruction
37	VCC	+5 VDC PC used by EV
38	E	EXTERNAL clock sign frequency of the sign
39	RESET	RESET - starting an