M68EML05X32/D
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HC05X32 LOW VOLTAGE EMULATOR MODULE USER'S MANUAL

Fourth Edition

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CHAPTER 1
INTRODUCTION

This user's manual explains connection, configuration, and operation information specific to the M68EML05X32 Low Voltage Emulator Module (X32LVEM). The X32LVEM makes possible emulation and debugging of target systems based on these microcontroller units (MCUs):

MC68HC(7)05B16	MC68HC05X16
MC68HC(7)05B32	MC68HC(7)05X32

The X32LVEM can be part of two development systems. This chapter describes those systems and explains the layout of the X32LVEM.

The MC68HC705X32 is the resident MCU in the X32LVEM.

This EM board will allow for low voltage emulation down to 3V +/- 10%.

1.1 DEVELOPMENT SYSTEMS

Your X32LVEM can be part of two Motorola development tools: the HC05 Motorola Modular Development System (MMDS05) or the M68HC05EVS Evaluation System (HC05EVS).

1.1.1 Motorola Modular Development System (MMDS05)

The MMDS05 is an emulator system that provides a bus state analyzer and real-time memory windows. The unit's integrated design environment includes an editor, an assembler, user interface, and source-level debug. A complete MMDS05 consists of:

- **a station module** — the metal MMDS05 enclosure, containing the control board and the internal power supply. Most system cables connect to the MMDS05 station module. (The cable to an optional target system, however, runs through an aperture in the station module enclosure to connect directly to the emulator module.)
- **an emulator module (EM)** — such as the X32LVEM: a printed circuit board that enables system functionality for a specific set of MCUs. The EM fits into the station module through a sliding panel in the enclosure top. The EM has a connector for the target cable.
- **two logic clip cable assemblies** — twisted-pair cables that connect the station module to your target system, a test fixture, a clock, or any other circuitry useful for evaluation or analysis. One end of each cable assembly has a molded connector, which fits into station-module pod A or pod B. Leads at the other end of each cable terminate in female probe tips. Ball clips come with the cable assemblies.

- **a 9-lead RS-232 serial cable** — the cable that connects the station module to the host computer RS-232 port.
- **a 9- to 25-pin adapter** — a molded assembly that lets you connect the 9-lead cable to a 25-pin serial port.
- **system software** — software, on 3-1/2 inch diskettes.
- **MMDS05 documentation** — an MMDS05 operations manual (MMDS05OM/D) and the appropriate EM user's manual.

As mentioned, your X32LVEM gives the MMDS05 the ability to emulate MC68HC(7)05B16, MC68HC05X16, MC68HC(7)05B32, and MC68HC(7)05X32 MCUs. By substituting a different EM, you can enable your MMDS05 to emulate an MCU of a different series. (Your Motorola representative can explain all the EMs available.)

Chapter 2 explains how to configure and use your X32LVEM as part of an MMDS05 system. For information about MMDS05 software or the station module, see the MMDS05 operations manual. For layout and configuration information pertaining to a different EM, see the corresponding EM user's manual.

1.1.2 M68HC05EVS Evaluation System (HC05EVS)

An HC05EVS is an economical, two-board tool for designing, debugging, and evaluating target systems based on an MC68HC05 MCU. A complete HC05EVS consists of:

- **a platform board (PFB)** — the bottom board, which supports the emulator module. The platform board has connectors for power and for the terminal or host computer.
- **an emulator module (EM)** — such as the X32LVEM: a printed circuit board that enables system functionality for a specific set of MCUs. The EM fits onto the PFB. The EM has connectors for a target cable and for a cable to a logic analyzer.
- **an RS-232 serial cable** — the cable that connects the PFB to the host computer RS-232 port.
- **system software** — software, on 3-1/2 inch diskettes.
- **HC05EVS documentation** — an HC05EVS operations manual (HC05EVSOM/D) and the appropriate EM user's manual.

As mentioned, your X32LVEM gives the MMDS05 the ability to emulate MC68HC(7)05B16, MC68HC05X16, MC68HC(7)05B32, and MC68HC(7)05X32 MCUs. By substituting a different EM, you can enable your HC05EVS to emulate an MCU of a different series. (Your Motorola representative can explain all the EMs available.)

Chapter 3 explains how to configure and use your X32LVEM as part of an HC05EVS system. For information about HC05EVS software or the platform board, see the HC05EVS operations manual. For layout and configuration information pertaining to a different EM, see the corresponding EM user's manual.

1.2 EM LAYOUT

Figure 1-1 shows the layout of the X32LVEM. Jumper J1 enables low voltage operation. J2 enables clock stretching. J3 and J5 select the clock source for the board. J4 enables the timer stop feature. J6 enables the wired-or interrupt. J7, J8, J13 and J14 configure the board for different MCUs. J9 and J10 configure the RESET source. J11 and J12 select between internal and external VDD1 and VSS1 operating voltages. J15 selects EEPROM memory configuration.

Connectors P5 and P6, provide the interface to the target system. If you install the X32LVEM in the MMDS05 station module, the target cable passes through the slit in the station module enclosure. Connector P4 connects to a logic analyzer. (Connector P4 has more significance for an EVS system, as an MMDS05 system includes a bus analyzer.) Expansion header connectors P2 and P3 connect together the EM and the control board (for an MMDS05) or the EM and the platform board (for an EVS). P1 allows the connection of a low voltage supply to the X32LVEM.

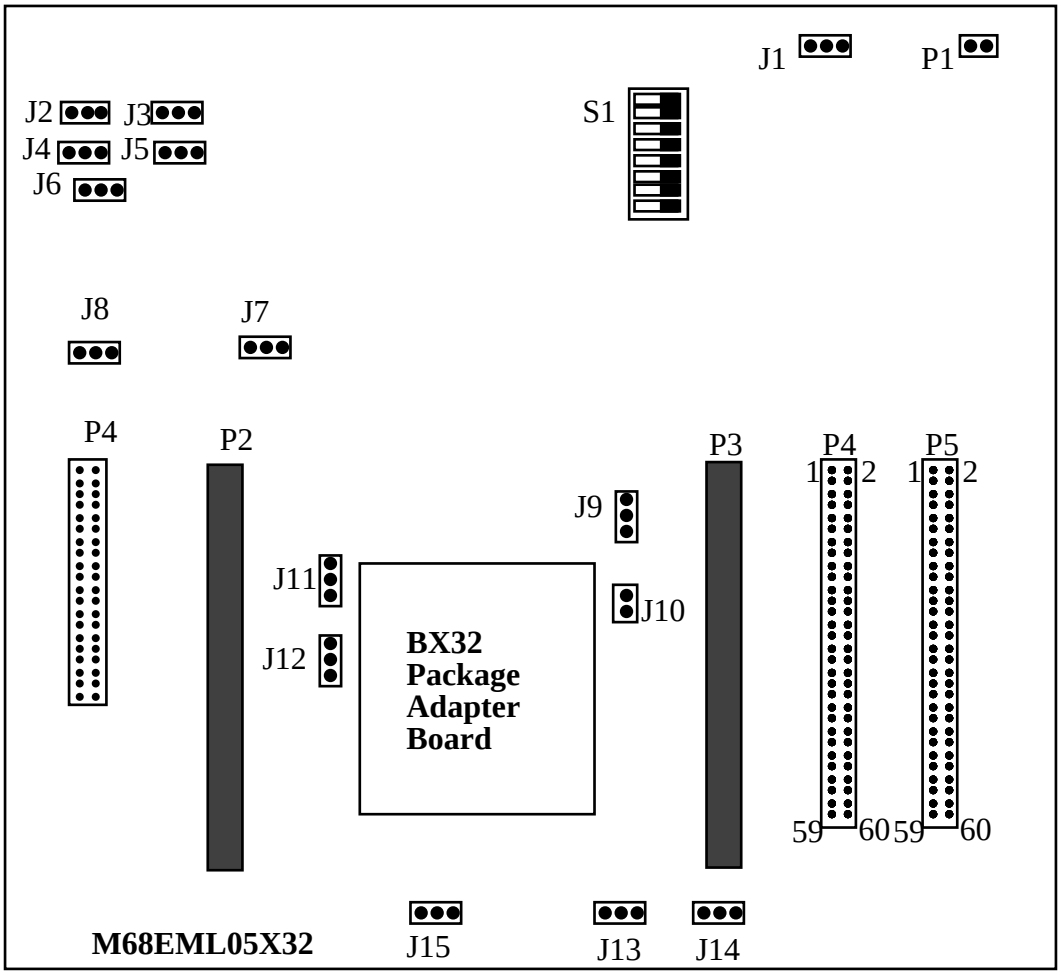
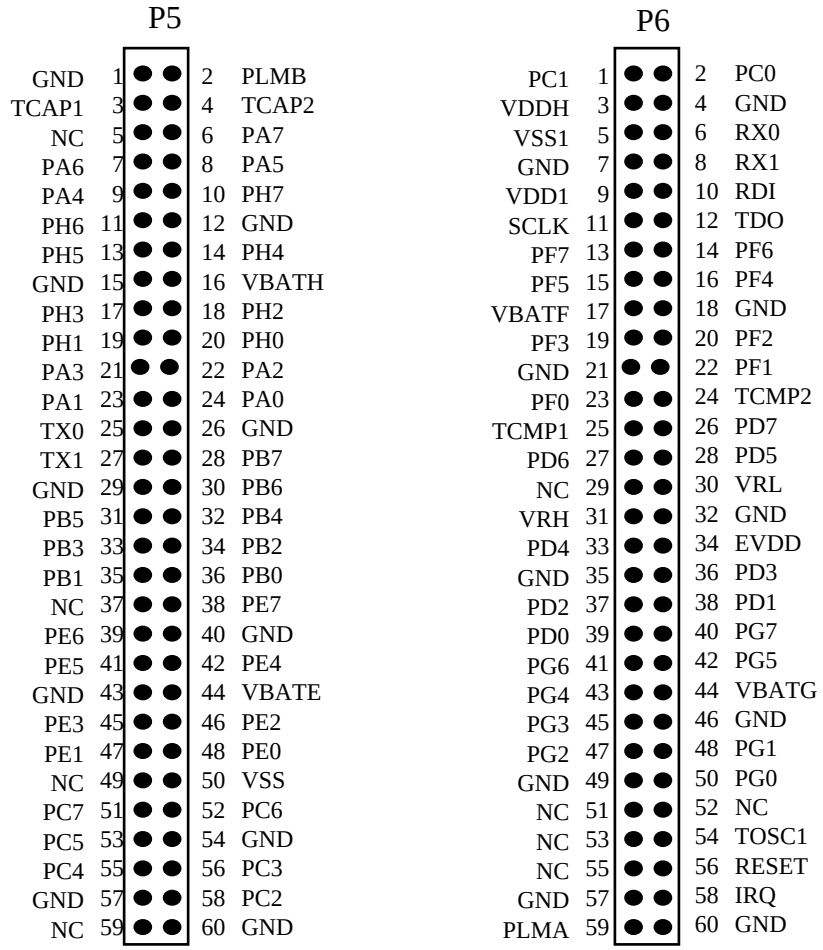


Figure 1-1 M68EML05X32 Emulator Module

1.3 CONNECTOR P5 AND P6 PIN ASSIGNMENTS

Figure 1-2 shows the pin assignments for connector P5 and P6. For signal descriptions, consult the technical data book for the specific MCU.



NOTE

NOTE: Ports E, F, H, G and associated VBAT pins are no connects on the standard 05X32LVEM.

Figure 1-2. Connector P5 and P6 Pin Assignments

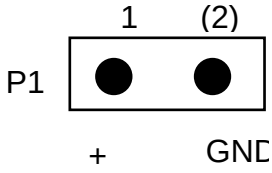
As connector P4 has more importance to an HC05EVS than to an MMDS05, pin assignments for connector P4 are in Chapter 3.

To configure your X32LVEM for use as part of an MMDS05, follow the instructions of Chapter 2. To configure your X32LVEM for use as part of an HC05EVS, follow the instructions of Chapter 3.

1.4 CONNECTOR P1 DESCRIPTION

Connector P1 is provided to allow the emulator board to operate at target specific voltages. The X32LVEM is specified to operate from 3V +/- 10% to 5V. Lower or higher voltages than those specified may result in damage to the EM board and or the platform/MMDS05 board.

The pinout of connector P1 is shown below.



The terminal marked + is intended to be the positive voltage with respect to the terminal marked GND.

NOTE

The GND reference on connector P1 is directly connected to the GND for the whole emulator system.

The voltage supply on P1 must be able to support a much greater current demand than would the MCU on its own. Allow at least 400mA at 5V.

If jumper J1 selects the LV supply then that power should be present. To prevent damage to the emulator the board includes some protection circuitry that will supply a limited current should the voltage at P1 drop below ≈ 2.4V. Although this will allow the board to operate it is not advised to use this source since the limited current available may cause the board to fail unpredictably.

Also bear in mind that the X32 itself operates at the lower voltage and so notice must be taken of any reduced performance specified for the part at lower voltages e.g. operating frequency and EEPROM programming.

1.5 COP WATCHDOG EMULATION CONSIDERATIONS

All of the devices emulated by this system include on-chip COP watchdogs. These watchdogs are configurable in the emulator according to the following procedures.

On M68HC(7)05B16/32, M68HC05X16 and M68HC(7)05X32 the COP and other system functions are controlled by the Mask Option Register. The value that this contains is determined at reset by the value on switch S1 (see 2.1.10 or 3.1.10). The COP watchdog bit is MOR bit 7. Set this bit according to the system requirements - switch closed for watchdog enable.

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CHAPTER 2
MMDS05 CONFIGURATION AND OPERATION

This chapter explains how to configure and use your X32LVEM as part of an MMDS05. For other parts of system installation or configuration, see the MMDS05 operations manual (MMDS05OM/D). (If you will use your X32LVEM as part of an HC05EVS system, go to Chapter 3 for corresponding information.)

Paragraph 2.1 explains how to set X32LVEM jumper headers. Paragraph 2.2 explains considerations pertaining to the MCU you emulate. Paragraph 2.3 explains remaining system installation.

Note that you can configure a X32LVEM already installed in the MMDS05 station module enclosure. To do so, switch off station-module power, remove the panel, then follow the guidance of this chapter.

CAUTION

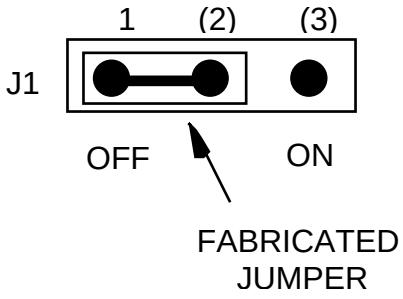
Be sure to switch off power if you reconfigure an installed EM. Reconfiguring EM jumper headers with power left on can damage MMDS05 circuits.

2.1 SETTING X32LVEM JUMPER HEADERS

Your X32LVEM has 15 jumper headers, J1 to J15 and one switch pack, S1. Paragraphs 2.1.1. and 2.1.10 explain how to configure these headers and the switch pack.

2.1.1 Low Voltage Select (J1)

Jumper header J1 determines if the MCU operating voltage should be supplied from connector P1 or from the main +5V supply. The diagram below shows the factory configuration: the fabricated jumper between pins 1 and 2 disables the low voltage feature.

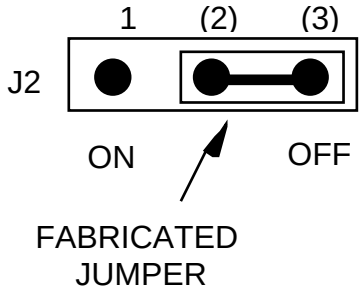


IMPORTANT NOTE

If jumper J1 is in the ON position the user must supply an external supply to the P1 connector. A high impedance supply of 2.7V is supplied to the MCU when the low voltage option is selected, the user must supply a greater voltage than this to the P1 connector.The power up sequence should be as follows: Power up MMDS05, then apply target power to the target system. On powering down remove target power first then power down the MMDS05.

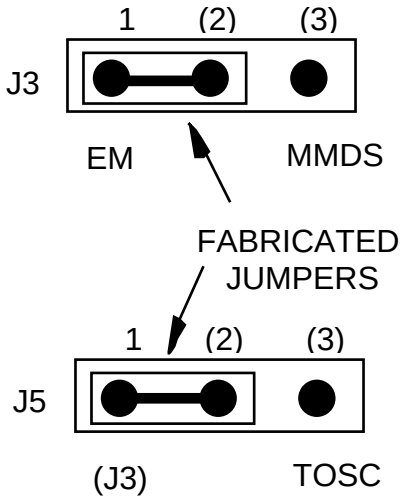
2.1.2 Stretch Select (J2)

When set to ON jumper header J2 stretches the MCU clock source by one cycle when in background mode. This feature allows the X32LVEM to operate at a faster than normal clock frequency when used on an EVS system. The factory set configuration for this jumper is shown below: OFF (2-3) this is the only valid setting for this jumper when using an MMDS05 system.



2.1.3 Clock Select (J3 and J5)

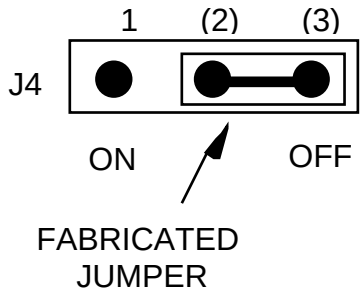
Jumper headers J3 and J5 select the source of the clock oscillator for the MCU. You may choose between on-board oscillator (EM), MMDS supplied oscillator (MMDS) or clock from the target system (TOSC). To select either EM or MMDS you must place the J5 jumper at the (J3) position as well as correctly selecting the J3 setting. The diagram below shows the factory configuration: the fabricated jumper on J3 between pins 1 and 2 selects the X32LVEM on-board canned oscillator clock source.



Alternatively, you may use a clock source originating from the control board. To do so, reposition the J3 jumper between pins 2 and 3, then use the MMDS05 OSC command to select a frequency. To select a clock from the target system position jumper header J5 between pins 2 and 3. In this case the position of the jumper header on J3 is not important.

2.1.4 Timer Stop Select (J4)

Jumper header J4 determines if the MCU timers should be stopped in background mode. The diagram below shows the factory configuration: the fabricated jumper between pins 2 and 3 disables the timer stop feature.

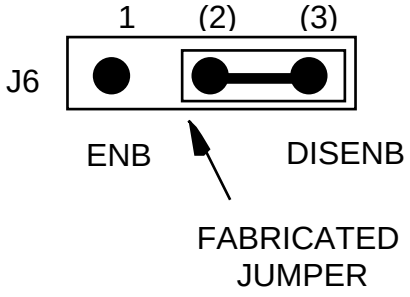


NOTE

When ON the internal timers on the X32 MCU are stopped when the emulator is stopped. The timers will continue to run when the emulator executes a GO. The timers will also increment when an internal register or memory to the X32 is examined. In this case the timers will 'creep' forward by a small number of cycle counts when the emulator is accessing the internal feature.

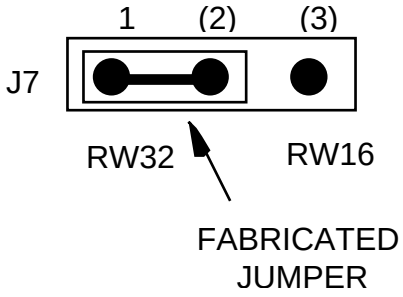
2.1.5 Keyboard Enable/Disable Select (J6)

Jumper header J6 selects if wired-or interrupts (WOI) interrupts are enabled or disabled. The diagram below shows the factory configuration: the fabricated jumper between pins 1 and 2 enables WOI. The J6 jumper between pins 2 and 3 disables the WOI interrupts.

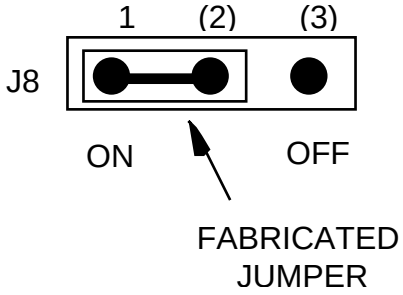


2.1.6 Emulated MCU Select (J7, J8, J13 and J14)

The X32LVEM provides four jumpers to allow selection of the appropriate emulated and installed MCU. J7 selects the correct R/W source; this changes between the X16 and X32. If an X32 MCU is installed in the X32LVEM board then the jumper header must be set between positions 1 and 2; this is the factory configuration. If an X16 MCU is installed then the jumper header must be re-placed between pins 2 and 3.



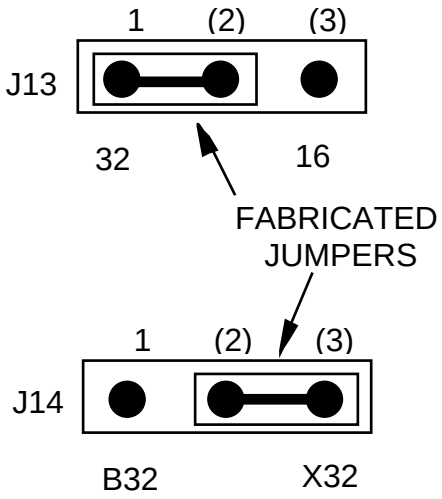
J8 selects whether or not the address line A14 is selected or not; this determines the size of the memory map accessible to the MCU. If you wish to emulate an X32 or B32 then the jumper header must be set between pins 1 and 2; this is the factory configuration. If you wish to emulate an X16 or B16 then the jumper header must be re-placed between pins 2 and 3.



NOTE

When an X32 MCU is installed in the X32LVEM this jumper allows you to select between X32 (ON) and X16 (OFF) emulation. However, when an X16 MCU is installed in the X32LVEM the OFF position is the only valid setting.

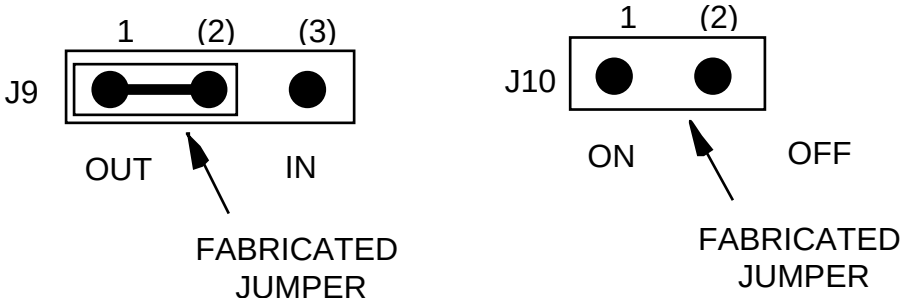
J13 selects between X/B16 and X/B32 MCUs while J14 selects between X and B type MCUs. The factory configuration of these jumper headers selects X32 MCU emulation. To emulate an X16 MCU replace the J14 jumper between pins 2 and 3; note that you do not have to replace the installed X32 in this case, however if an X16 MCU is installed then jumper J13 must be placed between pins 2 and 3. To emulate a B32 MCU set jumper header J13 between pins 1 and 2 and jumper header J14 between pins 1 and 2. See section 2.2 for a description of the appropriate settings of all four jumpers



2.1.7 RESET Selection (J9 and J10)

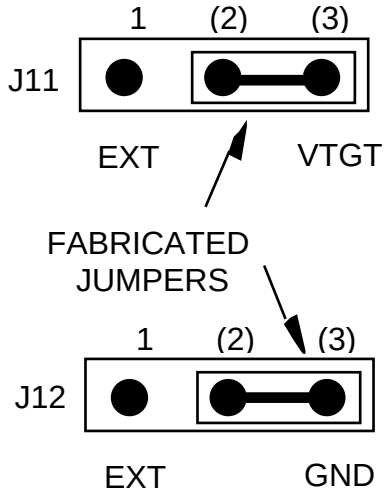
Jumper headers J9 and J10 control the source of the reset to the emulator board. The figures below show the factory configuration: no fabricated jumper installed. This is the correct position, unless the low voltage feature is enabled, and enables your software to control resets. When using the low voltage enable function both the select headers J9 and J10 must be configured as shown in the table below:

LOW VOLTAGE	J9 JUMPER POSITION	J10 JUMPER POSITION
ON	1-2	NOT FITTED
OFF	NOT FITTED	1-2



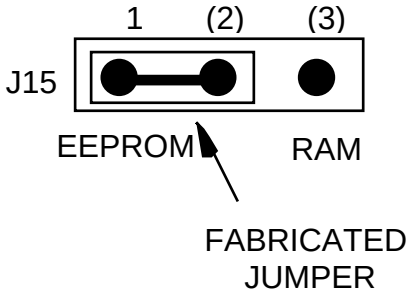
2.1.8 VDD1 and VSS1 Voltage Selection (J11 and J12)

Jumper header J11 selects between an internal VDD1 source and an external VDD1 source. Jumper header J12 selects between an internal VSS1 source and an external VSS1 source. The factory set configuration for this jumpers are shown below. In both cases jumper header between pins 2 and 3 select the emulator operating voltages.



2.1.9 EEPROM / RAM Select (J15)

Jumper header J15 selects between using MCU EEPROM or emulation system RAM. The factory set configuration for this jumper is shown below: EEPROM (1-2) selects MCU EEPROM. RAM (2-3) selects emulation system RAM and this replaces the on-chip EEPROM.

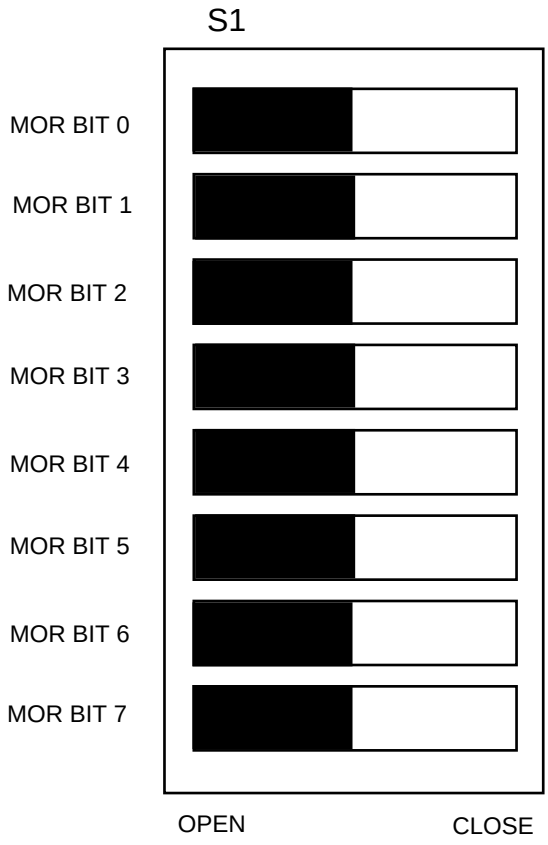


NOTE

When the jumper header is set between pins 2 and 3 the internal EEPROM on the X32 is inaccessible. You must also enable emulator RAM on the MMDS05 using the SETMEM command before this RAM can be used.

2.1.10 MOR Register Switches (S1)

The factory configuration of switch S1 is shown below. This sets the MOR to what would be it normal erase value of zero. For further information on the mask option register consult the device technical data.



2.2 THE EMULATED MCU

Your MMDS05 system uses a specific personality file for the MCU type being emulated. For example, to emulate an MC68HC705X32 the system uses personality file 00223Vxx.MEM. Table 2-1 lists all the personality files that pertain to the B32EM. Note that personality file names follow the pattern **00ZZZVxx.MEM**, where **ZZZ** is the EM identifier or MCU name, and **xx** is the version of the file.

EMULATED MCU	PERSONALITY FILE	RESIDENT MCU	COMMENTS
MC68HC(7)05X32	00223Vxx.MEM	MC68HC705X32	See paragraph 2.2.1
MC68HC(7)05B32	00222Vxx.MEM	MC68HC705X32	See paragraph 2.2.2
MC68HC05X16	00205Vxx.MEM	MC68HC705X32	See paragraph 2.2.3
MC68HC(7)05B16	00204Vxx.MEM	MC68HC705X32	See paragraph 2.2.4

Table 2-1 MCUs and Personality Files

MMDS05 software loads the personality file upon powerup; the default personality file is 00222Vxx.MEM for the X32. To replace the default personality file with a different one, use the LOADMEM command. (For more information about the LOADMEM command, see the explanation in the MMDS05 operations manual.)

Alternatively, you can insert the line LOADMEM 00ZZZVxx.MEM in the STARTUP.05 script file. This way, the system automatically loads the specified personality file as part of system startup. (For more information about the STARTUP.05 script file, see the SCRIPT command explanation in the MMDS05 operations manual.)

2.2.1 MC68HC(7)05X32 Emulation

To emulate the X32 MCU configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	ON	32	X32

When emulating a MC68HC(7)05X32 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC(7)05X32 features, see the corresponding technical data book.

Limitations: The ECLK out function on PC2 is not supported.

2.2.2 MC68HC(7)05B32 Emulation

To emulate the B32 MCU configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	ON	32	B32

When emulating a MC68HC(7)05B32 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC(7)05X32 features, see the corresponding technical data book.

Limitations: The ECLK out function on PC2 is not supported.

2.2.3 MC68HC05X16 Emulation

To emulate the X16 MCU with an X32 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	OFF	16	X32

To emulate the X16 MCU with an X16 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW16	OFF	16	X32

When emulating a MC68HC05X16 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC05X16 features, see the corresponding technical data book.

Limitations: The ECLK out function on PC2 is not supported.

2.2.4 MC68HC(7)05B16 Emulation

To emulate the B16 MCU with an X32 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	OFF	16	B32

To emulate the B16 MCU with an X16 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW16	OFF	16	B32

When emulating a MC68HC(7)05B16 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC(7)05B16 features, see the corresponding technical data book.

Limitations: The ECLK out function on PC2 is not supported.

2.3 REMAINING SYSTEM INSTALLATION

When you have configured headers J1 to J15 and switch pack S1, you are through with X32LVEM configuration:

- To install the X32LVEM in an MMDS05 station module, remove the panel from the station-module top. Fit together EM connectors P2 and P3 (on the bottom of the board) and control-board connectors P11 and P12. Snap the corners of the EM onto the plastic standoffs. Connect the target cable, if appropriate. Replace the panel.

At this point, you are ready to make remaining cable connections, as necessary, and restore power. For instructions, consult the MMDS05 operations manual (MMDS05OM/D).

CHAPTER 3

HC05EVS CONFIGURATION AND OPERATION

This chapter explains how to configure your X32LVEM for use as part of an HC05EVS. For other parts of system installation or configuration, see the HC05EVS operations manual (HC05EVSOM/D). (If you will use your X32LVEM as part of an MMDS05 system, go to Chapter 2 for configuration information.)

Paragraph 3.1 explains how to set X32LVEM jumper headers and switch pack S1. Paragraph 3.2 explains considerations pertaining to the MCU you emulate. Paragraph 3.3 lists limitations on using the X32LVEM in an HC05EVS. Paragraph 3.4 explains pin assignments and signal descriptions for the logic analyzer connector (P1). Paragraph 3.5 explains remaining system configuration.

Note that you can configure a X32LVEM already installed on the HC05EVS platform board. To do so, disconnect platform-board power, then follow the guidance of this chapter.

CAUTION

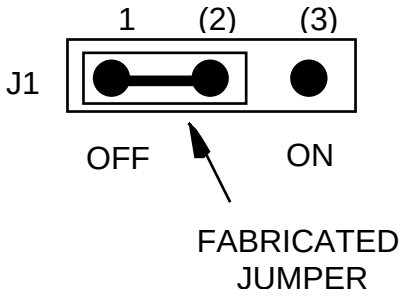
Be sure to disconnect power if you reconfigure an installed EM. Reconfiguring EM jumper headers with power left on can damage HC05EVS circuits.

3.1 SETTING X32LVEM JUMPER HEADERS

Your X32LVEM has 15 jumpers, J1 to J12 and one switch pack, S1. Paragraphs 3.1.1. and 3.1.10 explain how to configure these headers and the switch pack.

3.1.1 Low Voltage Select (J1)

Jumper header J1 determines if the MCU operating voltage should be supplied from connector P1 or from the main +5V supply. The diagram below shows the factory configuration: the fabricated jumper between pins 1 and 2 disables the low voltage feature.

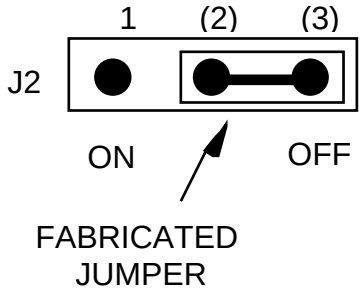


IMPORTANT NOTE

If jumper J1 is in the ON position the user must supply an external supply to the P1 connector. A high impedance supply of 2.7V is supplied to the MCU when the low voltage option is selected, the user must supply a greater voltage than this to the P1 connector.The power up sequence should be as follows: Power up EVS, then apply target power to the target system. On powering down remove target power first then power down the EVS.

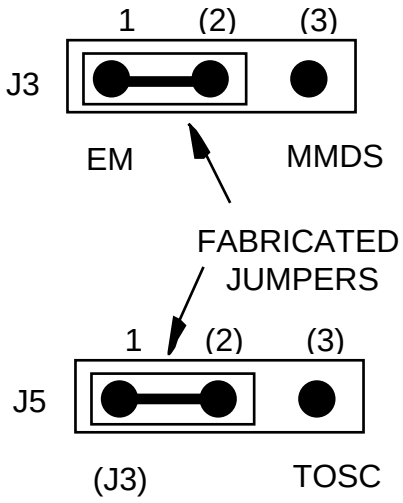
3.1.2 Stretch Select (J2)

When set to ON jumper header J2 stretches the MCU clock source by one cycle when in background mode. This feature allows the X32LVEM to operate at a faster than normal clock frequency when used on an EVS system. The factory set configuration for this jumper is shown below. When the jumper is set between pins 1 and 2 the EVS will operate at half speed when in terminal mode.



3.1.3 Clock Select (J3 and J5)

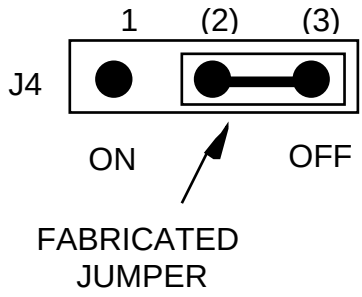
Jumper headers J3 and J5 select the source of the clock oscillator for the MCU. You may choose between on-board oscillator (EM) or clock from the target system (TOSC). To select EM you must place the J5 jumper at the (J3) position as well as correctly selecting the J3 setting. The diagram below shows the factory configuration: the fabricated jumper on J3 between pins 1 and 2 selects the X32LVEM on-board canned oscillator clock source.



To select a clock from the target system position jumper header J5 between pins 2 and 3. In this case the position of the jumper header on J3 is not important.

3.1.4 Timer Stop Select (J4)

Jumper header J4 determines if the MCU timers should be stopped in background mode. The diagram below shows the factory configuration: the fabricated jumper between pins 2 and 3 disables the timer stop feature.

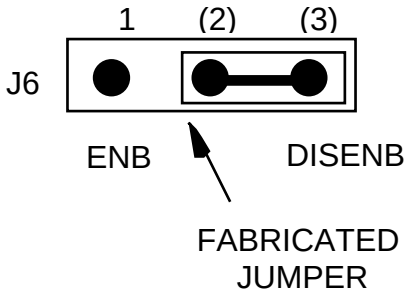


NOTE

When ON the internal timers on the X32 MCU are stopped when the emulator is stopped. The timers will continue to run when the emulator executes a GO. The timers will also increment when an internal register or memory to the X32 is examined. In this case the timers will 'creep' forward by a small number of cycle counts when the emulator is accessing the internal feature.

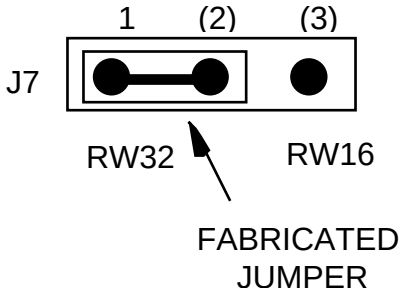
3.1.5 Keyboard Enable/Disable Select (J6)

Jumper header J6 selects if wired-or interrupts (WOI) interrupts are enabled or disabled. The diagram below shows the factory configuration: the fabricated jumper between pins 1 and 2 enables WOI. The J6 jumper between pins 2 and 3 disables the WOI interrupts.

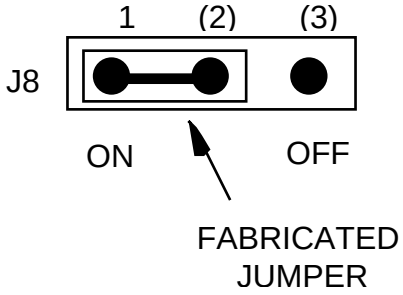


3.1.6 Emulated MCU Select (J7, J8, J13 and J14)

The X32LVEM provides four jumpers to allow selection of the appropriate emulated and installed MCU. J7 selects the correct R/W source; this changes between the X16 and X32. If an X32 MCU is installed in the X32LVEM board then the jumper header must be set between positions 1 and 2; this is the factory configuration. If an X16 MCU is installed then the jumper header must be re-placed between pins 2 and 3.



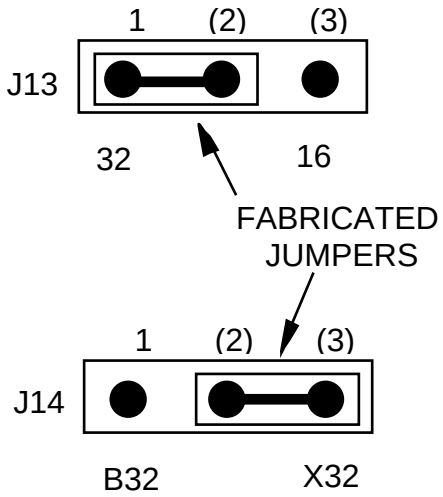
J8 selects whether or not the address line A14 is selected or not; this determines the size of the memory map accessible to the MCU. If you wish to emulate an X32 or B32 then the jumper header must be set between pins 1 and 2; this is the factory configuration. If you wish to emulate an X16 or B16 then the jumper header must be re-placed between pins 2 and 3.



NOTE

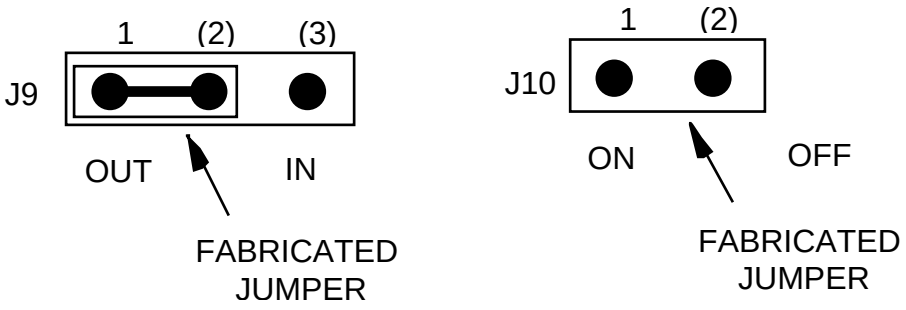
When an X32 MCU is installed in the X32LVEM this jumper allows you to select between X32 (ON) and X16 (OFF) emulation. However, when an X16 MCU is installed in the X32LVEM the OFF position is the only valid setting.

J13 selects between X/B16 and X/B32 MCUs while J14 selects between X and B type MCUs. The factory configuration of these jumper headers selects X32 MCU emulation. To emulate an X16 MCU replace the J14 jumper between pins 2 and 3; note that you do not have to replace the installed X32 in this case, however if an X16 MCU is installed then jumper J13 must be placed between pins 2 and 3. To emulate a B32 MCU set jumper header J13 between pins 1 and 2 and jumper header J14 between pins 1 and 2. See section 2.2 for a description of the appropriate settings of all four jumpers



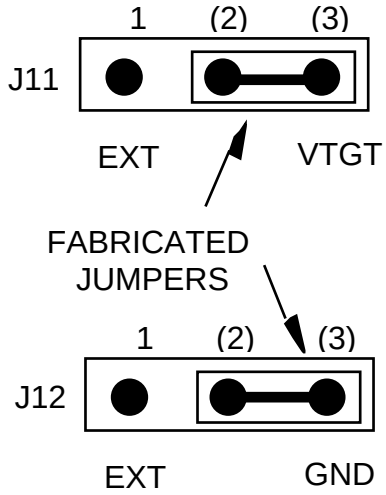
3.1.7 RESET Selection (J9 and J10)

Jumper header J9 controls the path of a target reset. The diagram below shows the factory configuration: the fabricated jumper between pins 1 and 2 enables the EVS to drive a reset to a target system. The fabricated jumper between pins 2 and 3 allows the target system to drive reset to the EVS provided that a fabricated jumper is installed between pins 1 and 2 of J3 on the PFB. Jumper header J10 is part of RESET signal control: no fabricated jumper should be installed on J10 when LVX32EM is used as part of an EVS system



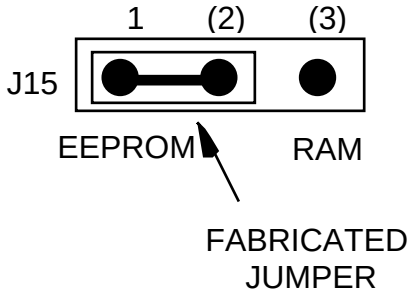
3.1.8 VDD1 and VSS1 Voltage Selection (J11 and J12)

Jumper header J11 selects between an internal VDD1 source and an external VDD1 source. Jumper header J12 selects between an internal VSS1 source and an external VSS1 source. The factory set configuration for this jumpers are shown below. In both cases jumper header between pins 2 and 3 select the emulator operating voltages.



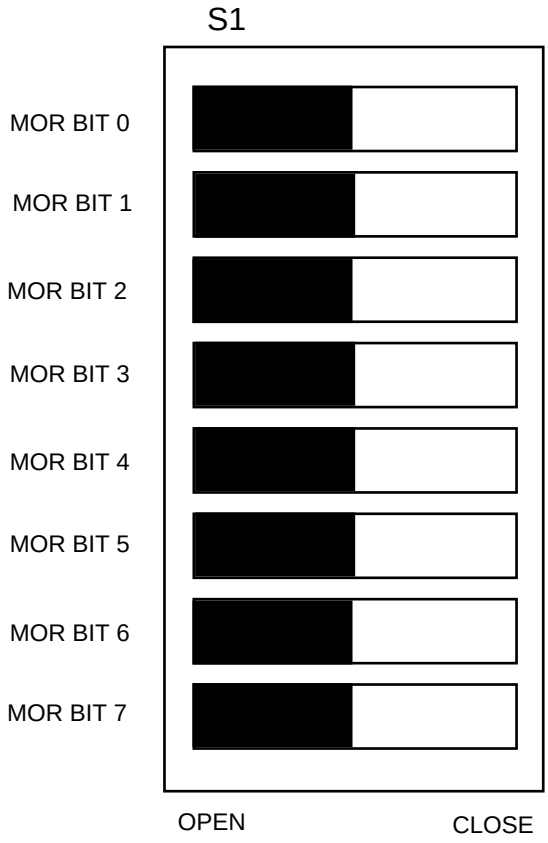
3.1.9 EEPROM / RAM Select (J15)

Jumper header J15 selects between using MCU EEPROM or emulation system RAM. The factory set configuration for this jumper is shown below: EEPROM (1-2) selects MCU EEPROM. RAM (2-3) selects emulation system RAM and this replaces the on-chip EEPROM.



3.1.16 MOR Register Switches (S1)

The factory configuration of switch S1 is shown below. This sets the MOR to what would be it normal erase value of zero. For further information on the mask option register consult the device technical data.



3.2 THE EMULATED MCU

The factory ships the X32LVEM with an MC68HC705X32 resident MCU, which is appropriate for emulating MC68HC705X32/B32 and MC68HC705X16/B16 series MCUs.

3.2.1 MC68HC705X32 Emulation

To emulate the X32 MCU configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	ON	32	X32

When emulating a MC68HC705X32 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC705X32 features, see the corresponding technical data book.

3.2.2 MC68HC705B32 Emulation

To emulate the B32 MCU configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	ON	32	B32

When emulating a MC68HC705B32 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC705X32 features, see the corresponding technical data book.

3.2.3 MC68HC05X16 Emulation

To emulate the X16 MCU with an X32 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	OFF	16	X32

To emulate the X16 MCU with an X16 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW16	OFF	16	X32

When emulating a MC68HC05X16 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC05X16 features, see the corresponding technical data book.

3.2.4 MC68HC705B16 Emulation

To emulate the B16 MCU with an X32 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW32	OFF	16	B32

To emulate the B16 MCU with an X16 MCU installed configure jumpers J7, J8, J13, J14 as follows

J7	J8	J13	J14
RW16	OFF	16	B32

When emulating a MC68HC705B16 using the X32EM you should not to write to location $004F as this may cause a system malfunction. Also S-records downloads should avoid this location or write 0 into it.

For more information about the MC68HC705B16 features, see the corresponding technical data book.

3.3 EVS LIMITATIONS

This paragraph explains the limitations that apply to using your X32EM in an HC05EVS.

Limitation 1. CLI/RTI. You may not trace a clear interrupt mask (CLI) or return from interrupt (RTI) instruction with an interrupt enabled and pending, due to MCU interrupt handling. Attempting such a trace causes an interrupt in the monitor map; this forces a software reset of the HC05EVS. User breakpoints remain in the user map as SWI instructions; you must remove such SWI instructions.

Limitation 2. Branch. Do not trace a conditional branch instruction (such as BRCLR) that branches to itself. As the monitor places an SWI instruction on the object of the branch, the system never would execute the instruction. However, it would appear to you that the instruction had executed. You may enter a G command while the PC points to this type of instruction as long as the instruction is not a breakpoint address.

Limitation 3. IRQ/SWI. Whenever possible, avoid mixing interrupt requests (IRQs) and user software interrupts (SWIs). This prevents a possible IRQ-SWI timing problem: a concurrent hardware interrupt and SWI could cause an HC05EVS failure that could stop program execution. To recover from such a failure (which occurs very infrequently, statistically), press the master reset switch (SW3).

Limitation 4. Memory Map. You must be aware of the memory map of the MCU being simulated; be sure to use only valid ROM locations. The HC05EVS does not provide protection to limit user programs to the exact amount of MCU ROM available. (For information about memory maps, consult the technical data book for the MCU.)

Limitation 5. COP. The COP is not supported by the current platform board.

Limitation 6. At slow E clock rates the MCU will be unable to load S-records correctly. This is due to communication overruns, due to the inability of the MCU to service the ccommunication chip fast enough. To avoid this problem you can slow the transmission rate (not baud rate) or use a faster clock to load the MCU and then slow the clock down.

Limitation 7. ECLK out function on PC2 is not supported.

3.4 LOGIC ANALYZER CONNECTOR P4

Figure 3-1 shows the pin assignments for logic analyzer connector P4. Table 3-2 lists signal descriptions for this connector.

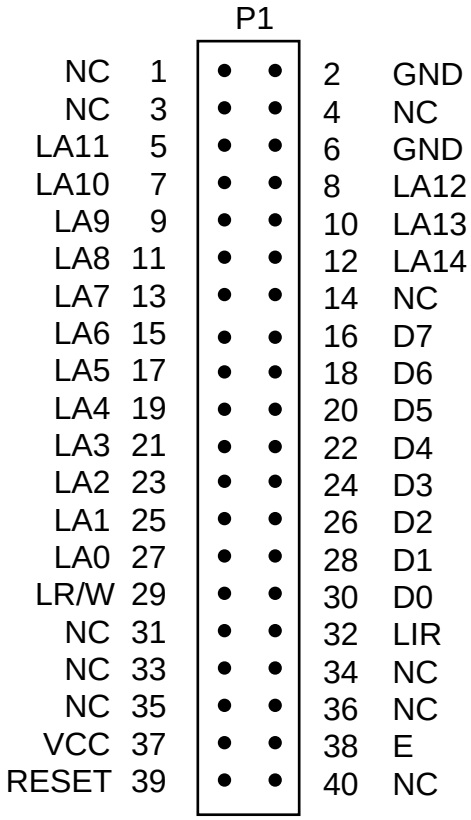


Figure 3-1. Connector P4 Pin Assignments

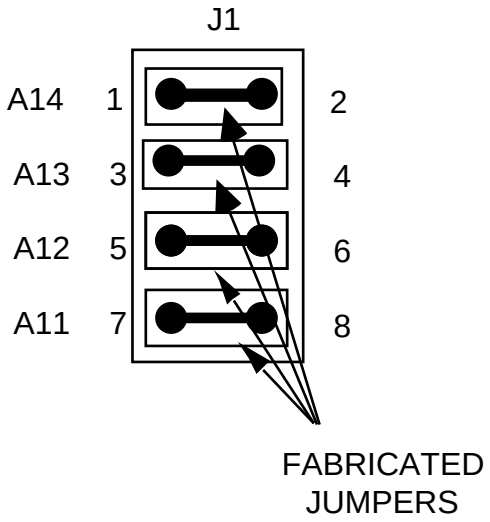
PIN	MNEMONIC	SIGNAL
1, 3, 4, 12, 14, 31, 33 — 36, 40	-----	No connection
2, 6	GND	GROUND
5, 7, 9, 11. 13. 15. 17, 19, 21, 23, 25, 27	LA11 — LA0	LATCHED ADDRESSES (bits 11—0) - MCU latched output address bus.
8, 10,12	LA12, LA13, LA14	LATCHED ADDRESSES (bit 12 and 13) - MCU latched output address bus.
16, 18, 20, 22, 24, 26, 28, 30	AD7 — AD0	DATA BUS (bits 7—0) - MCU multiplexed I/O data bus.
29	LR/W	LATCHED READ/WRITE - Active-high output signal that indicates the direction of data transferred on the bus.
32	LIR	LOAD INSTRUCTION REGISTER - Open-drain, active-low output signal that indicates an instruction is starting.
37	VCC	+5 VDC POWER - Input voltage (+5 Vdc @ 1.0 A) used by EVS logic circuits.
38	E	EXTERNAL CLOCK - Internally generated output clock signal used as a timing reference. The frequency of E clock is 1/2 the input frequency of the signal on the OSC2 pin.
39	RESET	RESET - Active-low bidirectional signal for starting an EVS reset.

Table 3-1 Logic Analyser Connector Pin Description

3.5 REMAINING SYSTEM INSTALLATION

When you have configured headers J1 to J9 and switch S1, you are through with X32LVEM configuration.

Find jumper header J1 of the HC05EVS platform board. Make sure that three fabricated jumpers are installed, per the diagram below.



To install the X32LVEM on an HC05EVS platform board, fit together EM connectors P2 and P3 (on the bottom of the board) and platform-board connectors P3 and P4. Snap the corners of the EM onto the plastic standoffs.

At this point, you are ready to make remaining cable connections, as necessary, and restore power. For instructions, consult the HC05EVS operations manual (HC05EVSOM/D).

LOW VOLTAGE X32EM CPU BOARD

REVISIONS		
REV	DESCRIPTION	DATE
2	Modifications as ECN 096	10/3/94
3	Modifications as ECN 162	As Date:

NOTES, UNLESS OTHERWISE SPECIFIED

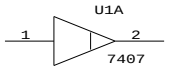
1. VCC PIN LOCATIONS :

   VCC IS APPLIED TO PIN 8 OF ALL 8-PIN IC's, PIN 14 OF ALL 14-PIN IC's, PIN 16 OF ALL 16-PIN IC's, PIN 20 OF ALL 20-PIN IC's, ETC.

2. GROUND PIN LOCATIONS :

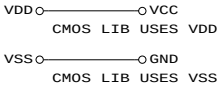
   GROUND IS APPLIED TO PIN 4 OF ALL 8-PIN IC's, PIN 7 OF ALL 14-PIN IC's, PIN 8 OF ALL 16-PIN IC's, PIN 10 OF ALL 20-PIN IC's, ETC.

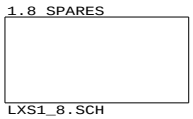
3. DEVICE TYPE, PIN NUMBERS, AND REFERENCE DESIGNATOR OF GATES ARE SHOWN AS FOLLOWS :

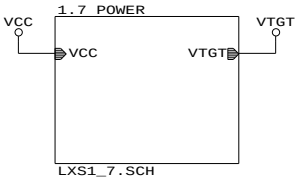


7407 = DEVICE TYPE
1 AND 2 = PIN NUMBERS
U1A = REFERENCE DESIGNATORS

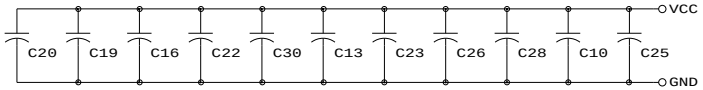
4. RESISTANCE VALUES ARE IN OHMS.
5. RESISTORS ARE 1/4 WATT, 5%.
6. CAPACITANCE VALUES ARE IN MICROFARADS.
7. IC's NAMES SUFFIXED WITH A 'T' USE VTGT POWER.

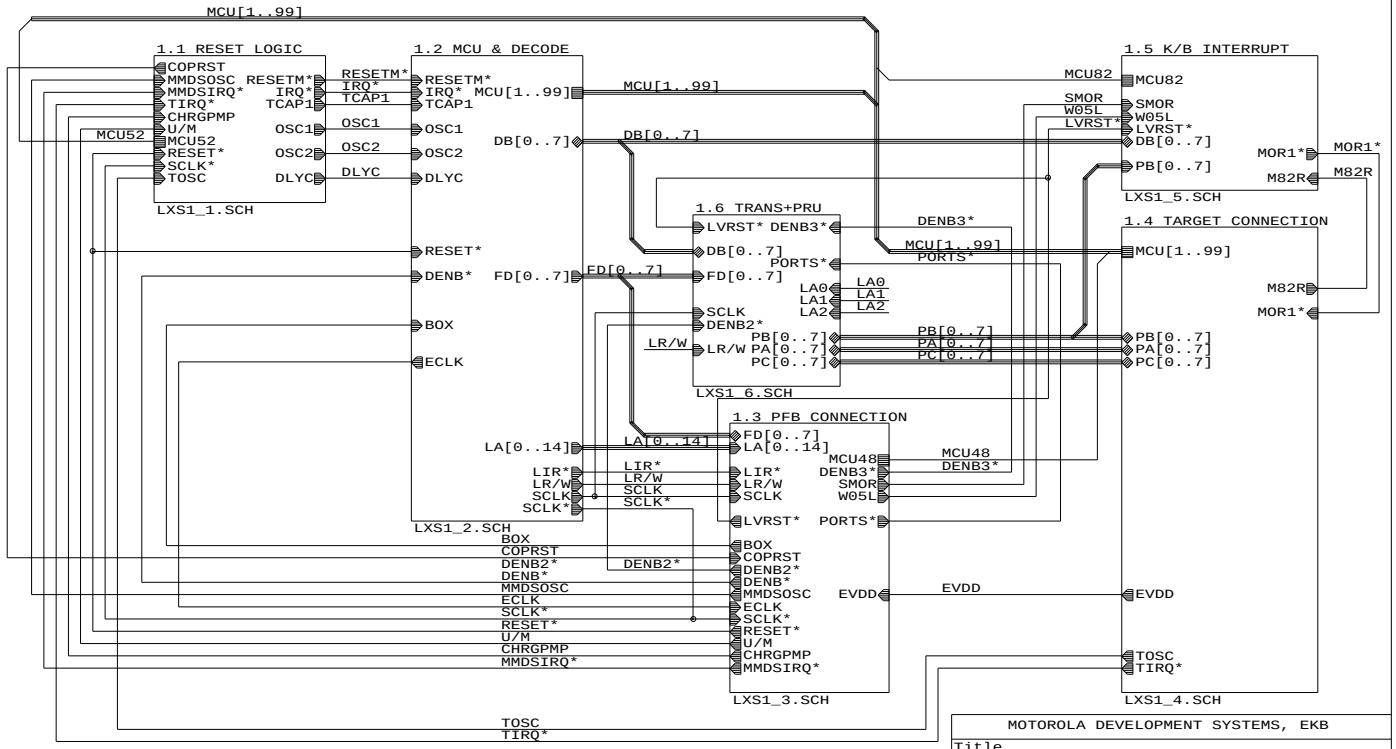






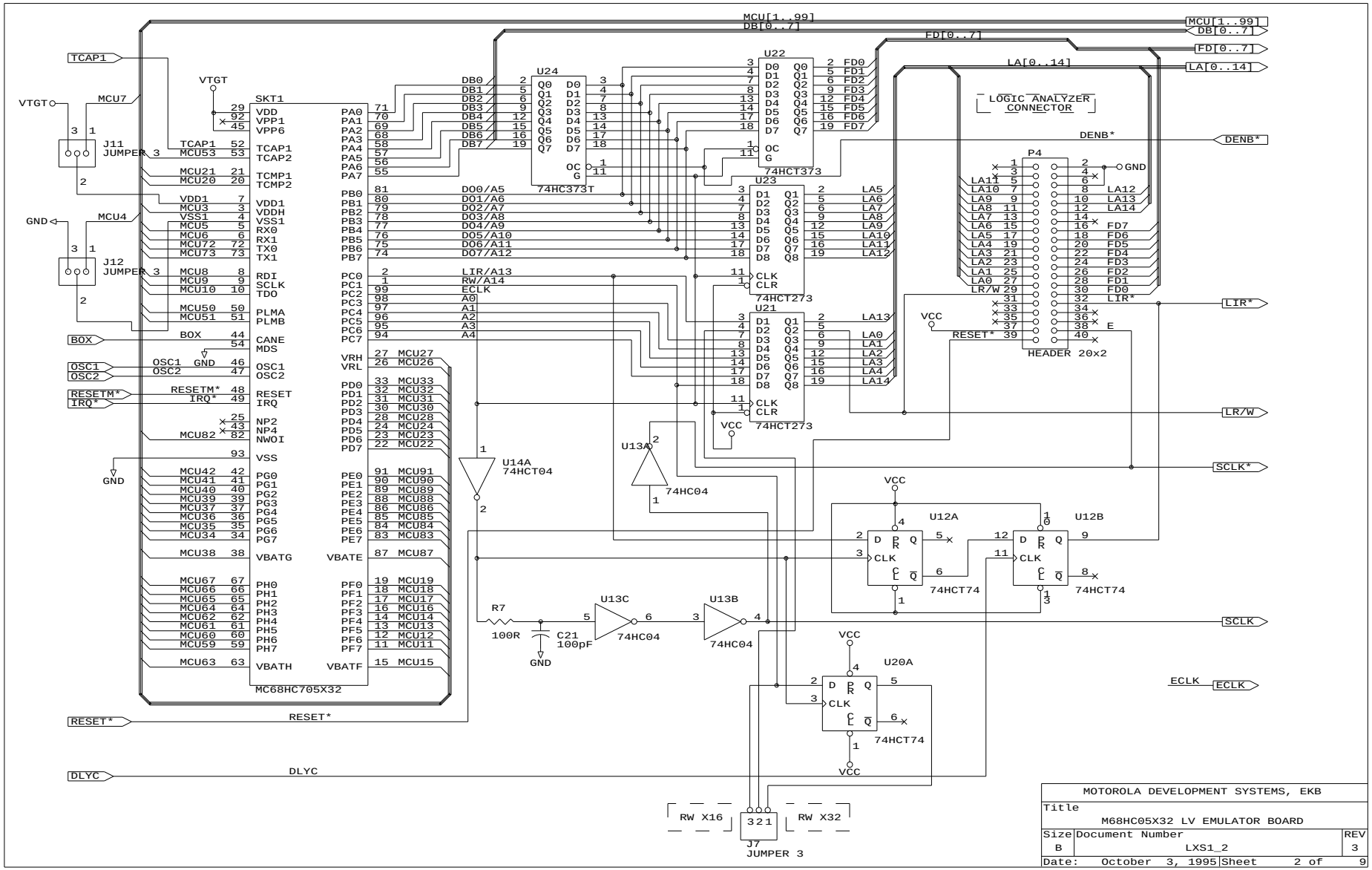
Decouple Caps for ICs as labeled.
All caps are 0.01 uF @ 50 V



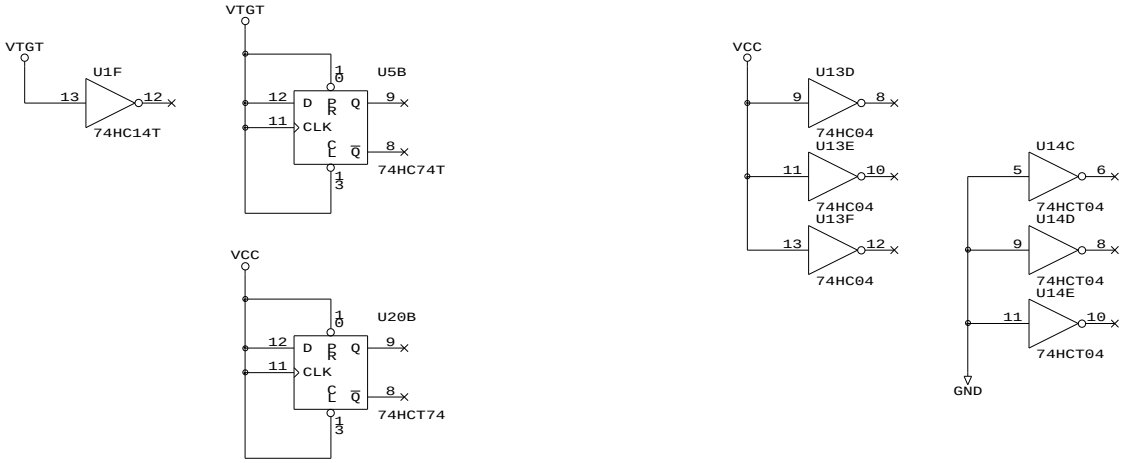


COMPUTER GENERATED DRAWING : DO NOT REVISE MANUALLY

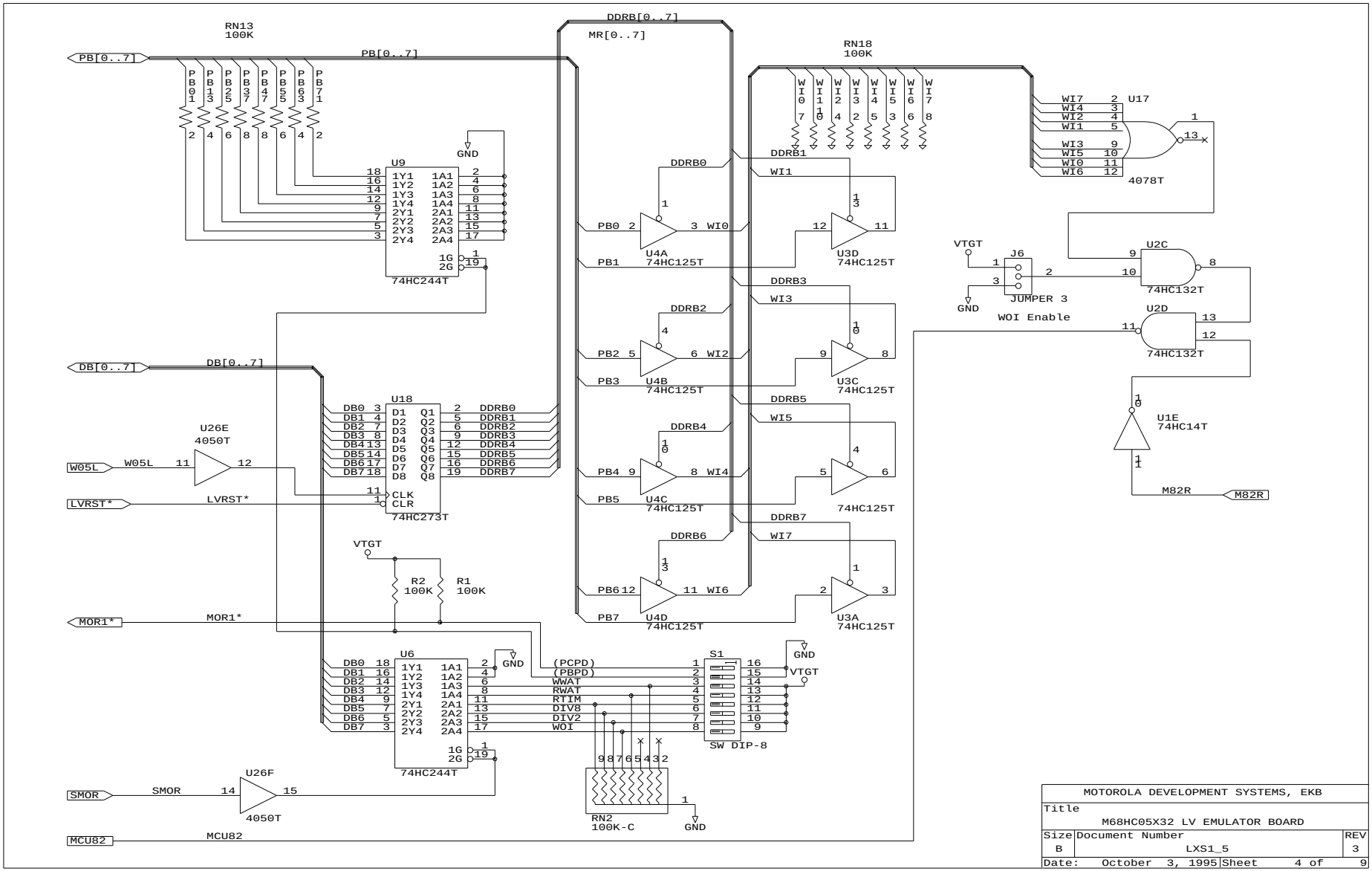
MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: 05X32LVEM	REV: 3
Date: October 3, 1995	Sheet 1 of 9	


MCU[1..99]
DB[0..7]
FD[0..7]
LA[0..14]
TCAP1
VTGT
MCU7
J11
JUMPER
GND
MCU4
J12
JUMPER
BOX
OSC1
OSC2
RESETM*
IRQ*
SKT1
MC68HC705X32
U24
74HC373T
U22
74HCT373
U23
74HCT273
U21
74HCT273
LOGIC ANALYZER CONNECTOR
P4
HEADER 20x2
DENB*
LIR*
LR/W
SCLK*
ECLK
U14A
74HCT04
U13A
74HC04
U13C
74HC04
U13B
74HC04
R7
100R
C21
100pF
U12A
U12B
74HCT74
U20A
74HCT74
RESET*
DLYC
RW X16
RW X32
J7
JUMPER 3
MOTOROLA DEVELOPMENT SYSTEMS, EKB
Title
M68HC05X32 LV EMULATOR BOARD
Size B
Document Number LXS1_2
REV 3
Date: October 3, 1995
Sheet 2 of 9

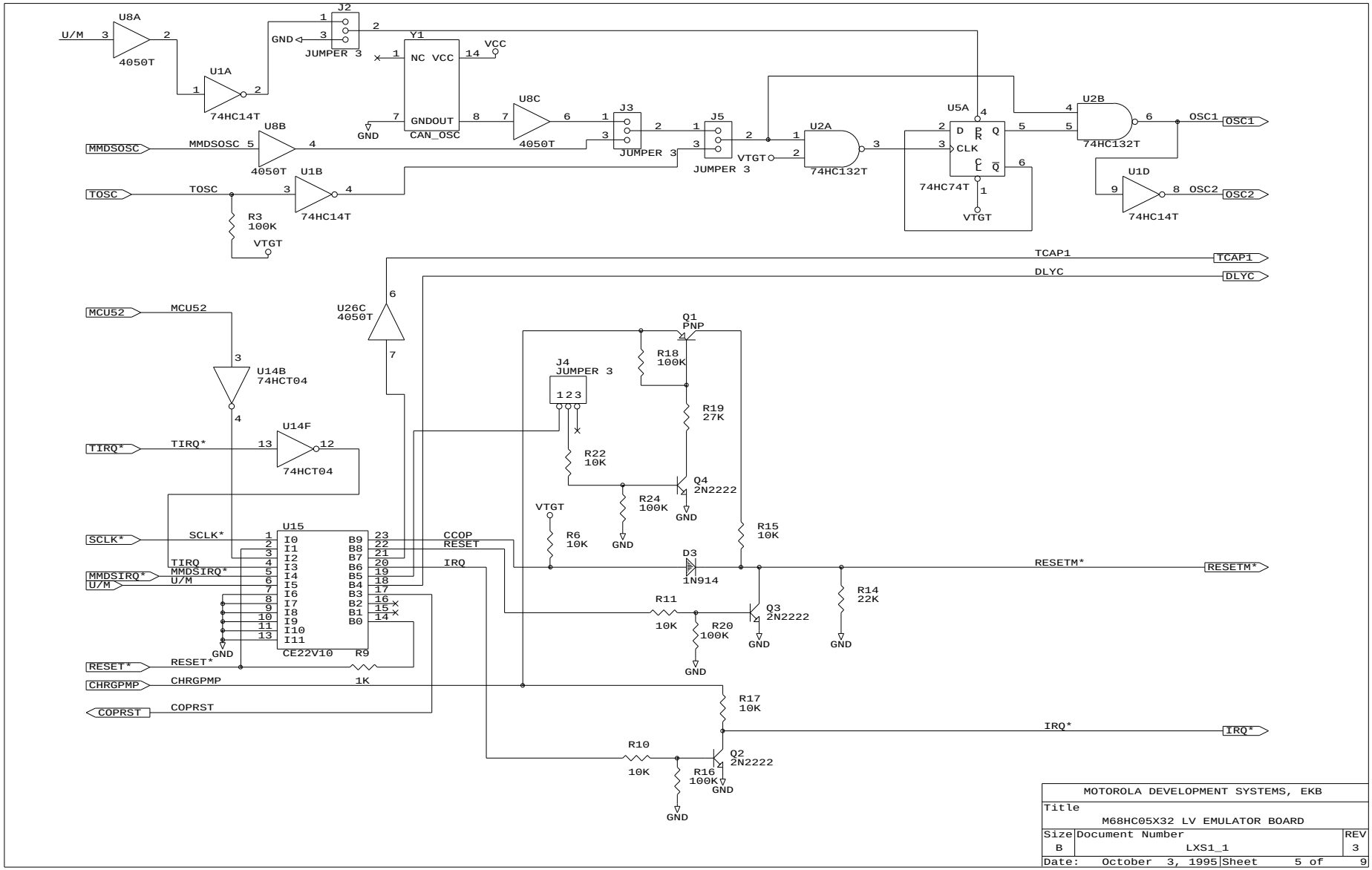
SPARES



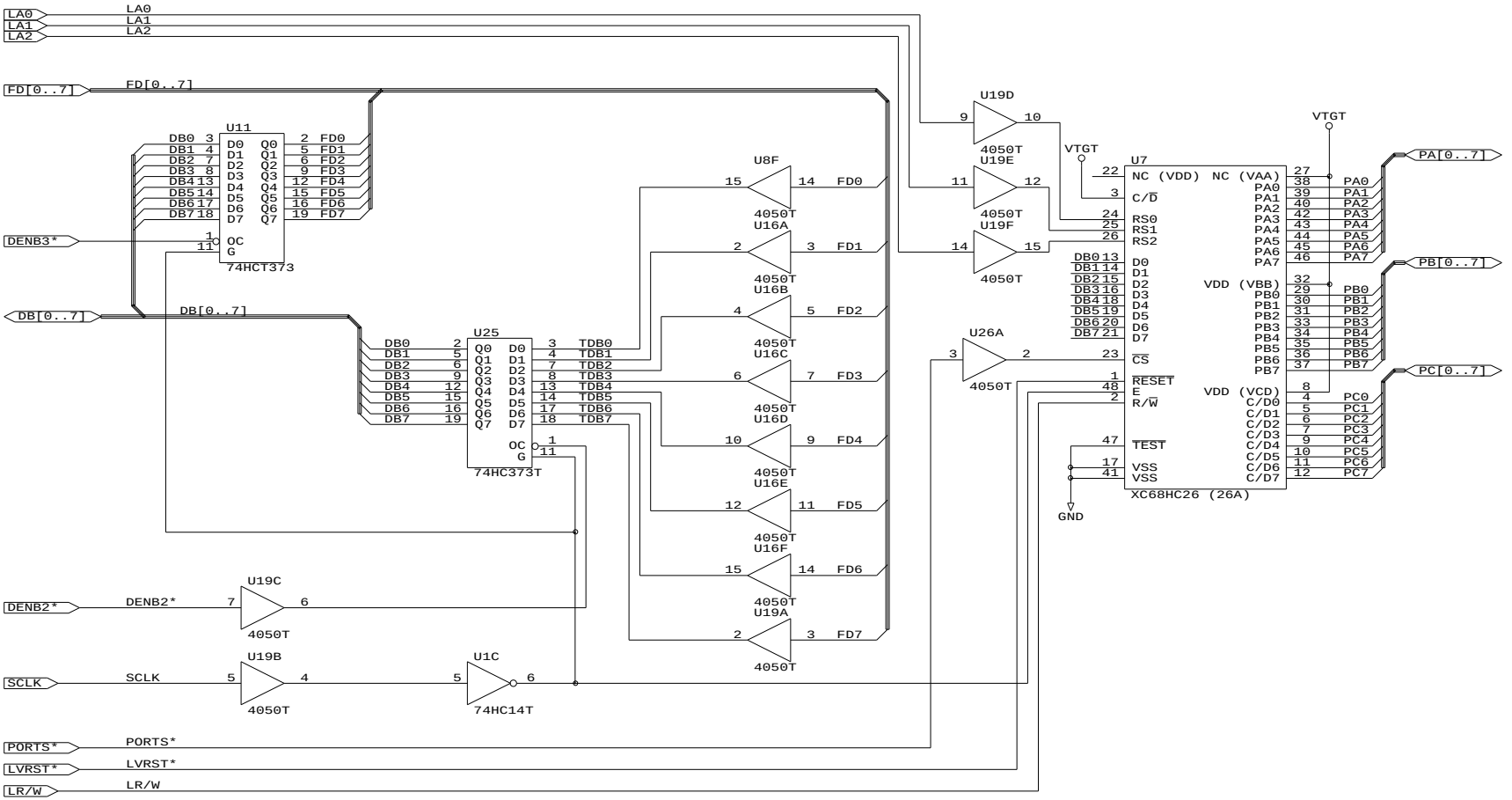
MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: LXS1_8	REV: 3
Date: October 3, 1995	Sheet 3 of 9	



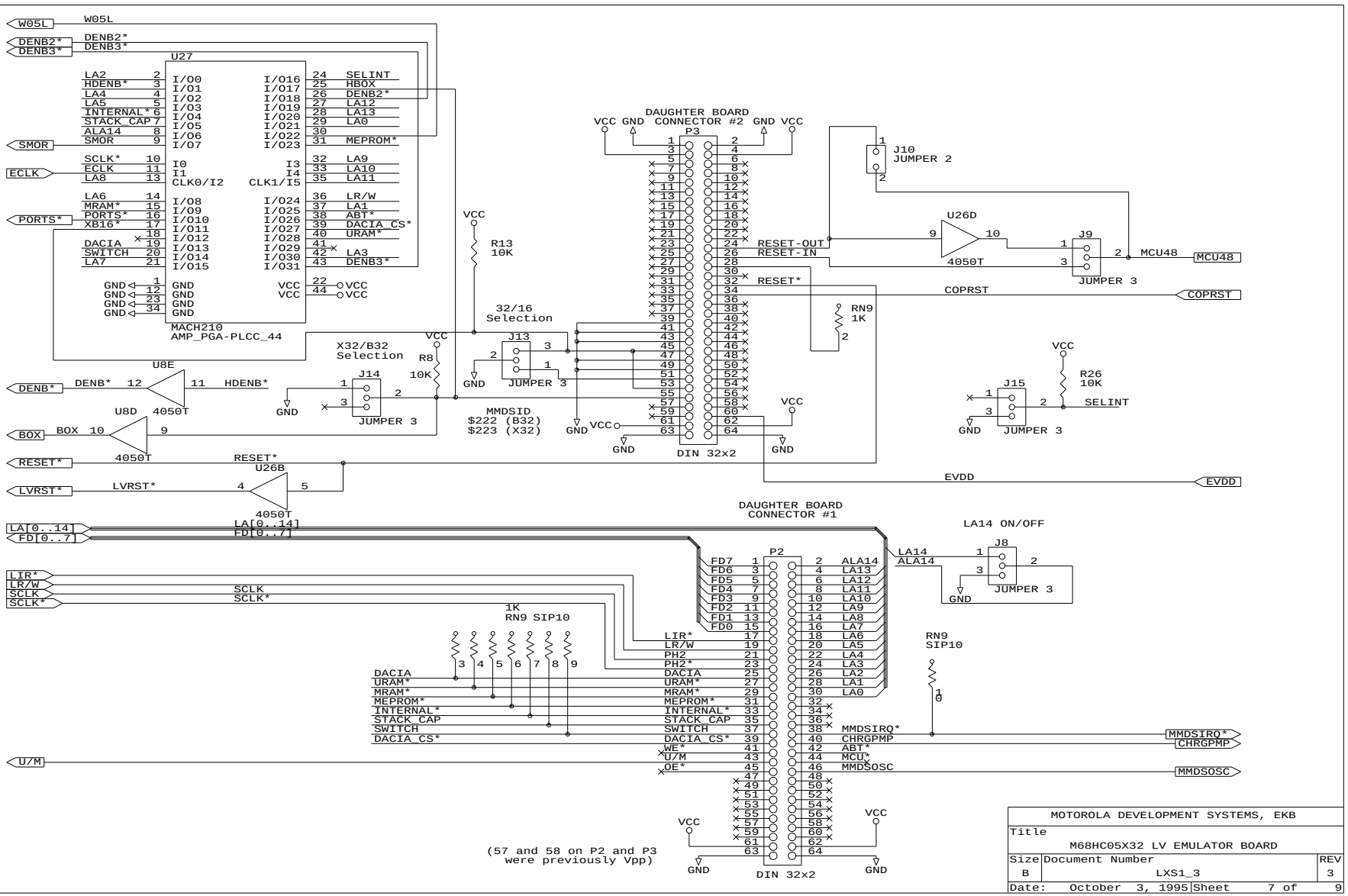
MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: LXS1_5	REV: 3
Date: October 3, 1995	Sheet 4 of 9	



MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: LXS1_1	REV: 3
Date: October 3, 1995	Sheet 5 of 9	



MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: LXS1_6	REV: 3
Date: October 3, 1995	Sheet 6 of 9	


W05L
DENB2*
DENB3*
U27
SMOR
ECLK
PORTS*
MACH210
AMP_PGA-PLCC_44
U8E
U8D 4050T
BOX
RESET*
LVRST*
U26B
4050T
LA[0..14]
FD[0..7]
R13
10K
32/16
Selection
X32/B32
Selection
R8
10K
J13
J14
JUMPER 3
MMDSID
$222 (B32)
$223 (X32)
DAUGHTER BOARD
CONNECTOR #2
P3
DIN 32x2
J10
JUMPER 2
U26D
4050T
J9
MCU48
RESET-OUT
RESET-IN
RESET*
COPRST
RN9
1K
J15
R26
10K
SELINT
EVDD
DAUGHTER BOARD
CONNECTOR #1
P2
LA14 ON/OFF
J8
LA14
ALA14
LIR*
LR/W
SCLK
SCLK*
SCLK
SCLK*
1K
RN9 SIP10
RN9
SIP10
DACIA
URAM*
MRAM*
MEPROM*
INTERNAL*
STACK_CAP
SWITCH
DACIA_CS*
WE*
U/M
OE*
MMDSIRQ*
CHRGPMP
ABT*
MCU*
MMDSOSC
(57 and 58 on P2 and P3
were previously Vpp)
MOTOROLA DEVELOPMENT SYSTEMS, EKB
Title
M68HC05X32 LV EMULATOR BOARD
Size B
Document Number LXS1_3
REV 3
Date: October 3, 1995
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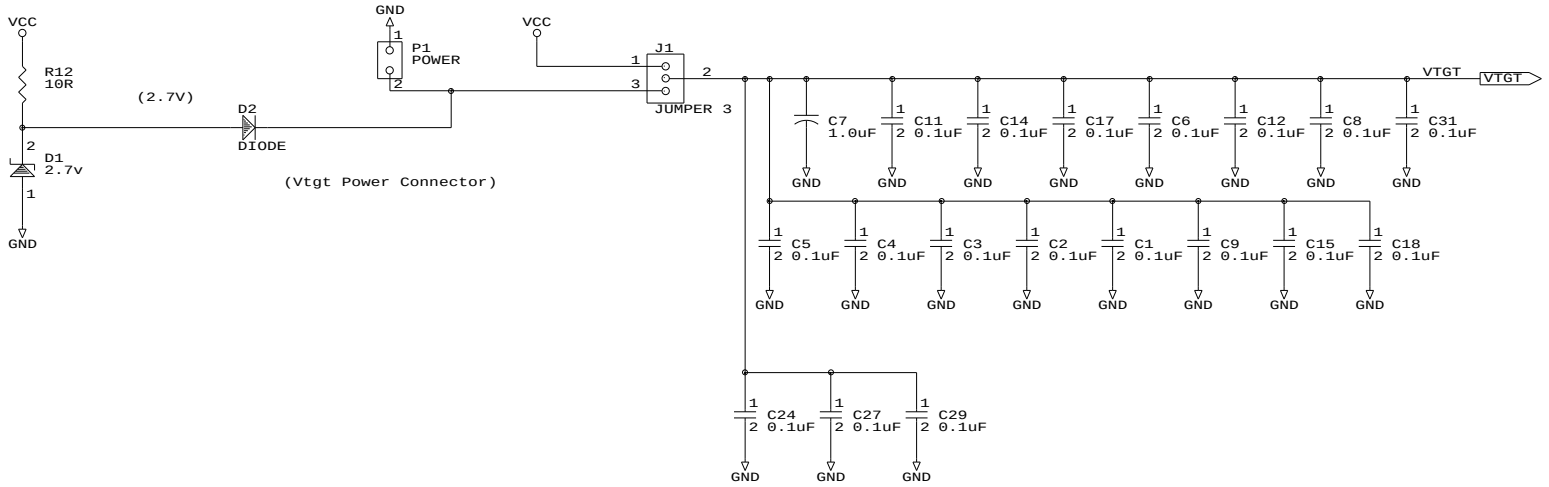
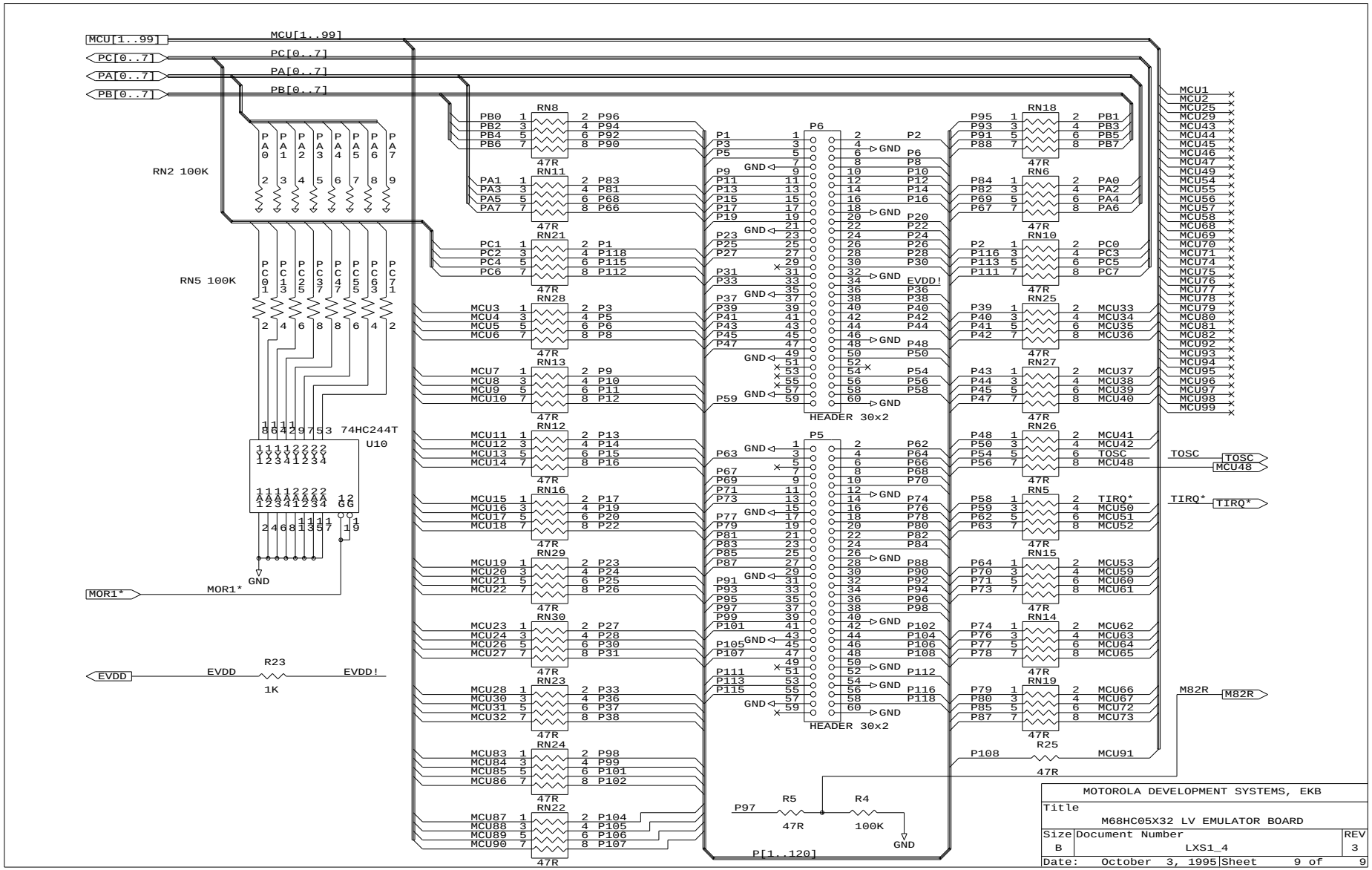


MOTOROLA DEVELOPMENT SYSTEMS, EKB		
Title: M68HC05X32 LV EMULATOR BOARD		
Size: B	Document Number: LXS1_7	REV: 3
Date: October 3, 1995	Sheet 8 of 9	


MCU[1..99]
PC[0..7]
PA[0..7]
PB[0..7]
RN2 100K
RN5 100K
74HC244T
U10
MOR1*
GND
EVDD
R23
1K
EVDD!
RN8
RN11
RN21
RN28
RN13
RN12
RN16
RN29
RN30
RN23
RN24
RN22
47R
P6
P5
HEADER 30x2
R5
47R
R4
100K
P[1..120]
RN18
RN6
RN10
RN25
RN27
RN26
RN5
RN15
RN14
RN19
R25
TOSC
TIRQ*
M82R
MOTOROLA DEVELOPMENT SYSTEMS, EKB
M68HC05X32 LV EMULATOR BOARD
LXS1_4
October 3, 1995
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