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M68HC705X4 PROGRAMMER BOARD

(REVision A PWBs only)

INTRODUCTION

This application note describes the programming technique used to program and verify the XC68HC705X4 microcontroller (MCU) internal OTPROM/EPROM, and how to construct the programmer board (PGMR) used in conjunction with this application note. All that is required to program the XC68HC705X4 OTPROM/EPROM MCU is the PGMR and a +5 volt and V_{PP} dc power supply.

The PGMR can be fabricated for either dual-in-line package (DIP) MCU device programming, or small outline integrated circuit (SOIC) MCU device programming.

PROGRAMMING TECHNIQUE

The PGMR programming technique allows the user program, contained in an external EPROM, to be copied into the internal PROM (OTPROM/EPROM) of the XC68HC705X4 MCU device.

The XC68HC705X4 MCU device is inserted into the PGMR. The applicable program/verify routine is selected via jumper header J1, and power is applied to the PGMR via switch S1. The MCU is taken out of reset and placed in the run mode via switch S2, and MCU control is transferred to the bootstrap ROM. The selected programming routine is then executed.

PROGRAM AND VERIFY MCU PROM

In the program and verify MCU PROM routine, the contents of an external 8K EPROM are copied into the MCU PROM areas of the applicable device. There is a direct correlation of addresses between the two devices. Non-MCU PROM addresses are ignored so data contained in those areas are not accessed. Unprogrammed external EPROM address locations should contain $00 to speed up the programming operation. During the programming routine, the PROGRAM LED D2 is illuminated. At the end of the programming routine, D2 is turned off, and the verification routine is entered. If the contents of the MCU PROM and external EPROM exactly match, then the VERIFY LED D3 is illuminated.

During the verification routine, all locations are compared to the data residing in external EPROM. The verification routine will stop if a discrepancy has been detected and the error address location will be placed on the external memory address bus.

Verify MCU PROM

The verify MCU PROM contents routine is normally entered automatically after the MCU PROM is programmed. Direct entry of this mode will cause the MCU PROM contents to be compared to external EPROM contents residing at the same address locations. Both D2 and D3 LEDs are turned off at this time until verification is completed. Upon completion of the verification routine (every location verified) the VERIFIED LED D3 is illuminated. If D3 does not illuminate, a discrepancy has been detected and the error address location will be placed on the external memory address bus.

NOTE

MCU PROM blank checking can be accomplished by placing $00 into the external EPROM (U2) and following the above verify MCU PROM routine.

PROGRAMMING MODULE PREPARATION

The PGMR must be prepared/configured prior to any program/verify operations. Board preparation consists of the external power source (+5V and V_{PP}), EPROM installation, DIP PGMR configuration, and SOIC PGMR configuration.

External Power Source

Power connector P1 is used to connect an external power supply to the PGMR. A +5 Vdc @ 100 mA power source is connected to connector P1 pins labeled +5V and GND. The programming voltage power source is connected to pins labeled V_{PP} and GND. Refer to the specific device data sheet for programming voltage (V_{PP}) specifications.

NOTE

The programming voltage (V_{PP}) must be measured at U3 pin 1 or U4 pin 1 during programming cycle (D2 PROGRAM LED illuminated).

EPROM Installation

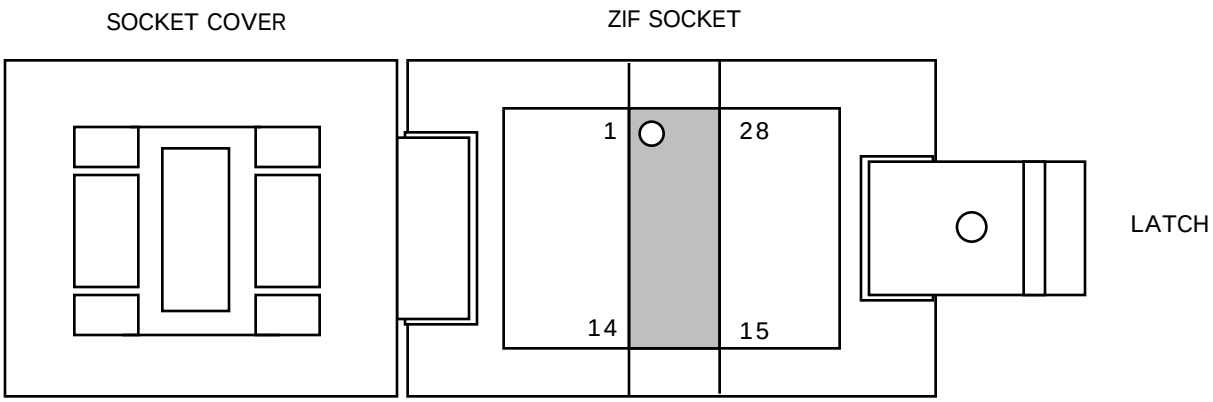
The basic EPROM device used on the PGMR (at location U2) is a 2764 or 27C64, 8K EPROM, 28-pin device. This EPROM device contains the user code to be programmed into the applicable PROM MCU device.

DIP PGMR Configuration

For dual-in-line package (DIP) device programming, the PGMR printed wiring board (PWB) must be fabricated with a DIP zero-insertion-force (ZIF) socket located at U3.

SOIC PGMR Configuration

For small outline integrated circuit (SOIC) MCU device programming, the PGMR PWB must be fabricated with SOIC ZIF sockets located at U4. 28-pin SOIC device installation techniques are shown on the following page.



MC68HC705X4DW SOIC DEVICE INSTALLATION

PROGRAMMING OPERATION

To program the XC68HC705X4 MCU PROM, perform the following steps:

1. Place switch S1 to POWER-OFF (left) position.
2. Install MCU and EPROM devices into PGMR.
3. Place switch S2 to RESET-IN (left) position.
4. Place switch S1 to POWER-ON (right) position.
5. Select program / verify routine via jumper header J1.

   Install the fabricated jumper on J1 to verify that data in the EPROM and data in the MCU is the same. Remove the fabricated jumper from J1 to program and verify an XC68HC705X4 MCU.
6. Place switch S2 to RESET-OUT (right) position.

   PROGRAM LED illuminates signifying programming sequence being performed. VERIFY LED illuminates signifying verification is completed.
7. Place switch S2 to RESET-IN (left) position.
8. Remove power (via S1), or select and run new routine.

PROGRAMMER BOARD CONSTRUCTION

The PGMR is a two-sided Printed Wiring Board (PWB). Table 1 provides the parts list for the PGMR. Component tolerances are generally not critical. Use of Integrated Circuit (IC) or Zero Insertion Force (ZIF) sockets are recommended for both EPROM and MCU devices located at U2 through U4. This will simplify the removal and installation of both devices. Figure 1 is the schematic diagram for the PGMR board.

TABLE 1 - PGMR Parts List

REFERENCE DESIGNATION	COMPONENT DESCRIPTION
C1,C3	Capacitor, 47 µF @ 35 Vdc
C2,C4-C7, C10	Capacitor, 0.1 µF @ 50 Vdc
C8, C9	Capacitor, 33pF @ 50 Vdc (Note 1)
D1	Diode, 1N4735
D2, D3	LED, HP # HLMP-4700 or equivalent
J1	Header, 2-pin, single row, 3M #929450-01-30
P1	Power connector, Augat # RDI 2SV-03
R1	Resistor, 100K, 1/4W, 5%
R2,R5,R9	Resistor, 10K, 1/4W, 5%
R3, R4	Resistor, 1K, 1/4W, 5%
R6, R7	Resistor, 51, 1/4W, 5%
R8	Resistor, 1M, 1/4W, 5%
S1, S2	Switch, DPDT, Augat ALCO # MHS223
U1	I.C., 74HC4040
U2	I.C., 2764 or 27C64, 8K EPROM
U3	I.C., XC68HC705X4P OTPROM/EPROM MCU, DIP
U4	I.C., XC68HC705X4DW OTPROM/EPROM MCU, SOIC (optional – user installed)
XU2	Socket, DIP, 28-pin ZIF, Welcon # 613-7280316
XU3	Socket, DIP, 28-pin ZIF, Welcon # 613-7280316
XU4	Socket, SOIC, 28-pin ZIF, Yamaichi # IC51-0282-334-1 (optional – user installed)
Y1	4 MHz crystal or ceramic resonator

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