**MOTOROLA SEMICONDUCTORS HONG KONG LIMITED**

**A/P CSIC MCU DEVELOPMENT SYSTEMS**

**M68HC705T10PGMR USER'S GUIDE (REV1.0)**

## 1. INTRODUCTION

This document contains information on the operation of M68HC705T10PGMR, a programmer board for programming MC68HC705T10 devices.

The on-chip EPROM feature of MC68HC705T10 MCU enables the user to emulate the MC68HC05T10 device. EPROM programming is facilitated through a program contained in the on-chip bootstrap ROM of the MC68HC705T10, and this program is invoked by using the programmer board described herein. Besides programming, verification between the contents of the MCU EPROM can also be performed with this board.

## 2. PROGRAMMER BOARD OPERATION

Operating procedure for the M68HC705T10PGMR is described in this section. The M68HC705T10PGMR enables programming of the MCU internal EPROM or ROM areas directly from an external 27256 EPROM. The 27256 external EPROM should contain the data to be programmed. To perform programming, the MC68HC705T10 MCU device and the target code 27256 EPROM should be inserted into the MCU socket and the EPROM socket on the programmer board respectively. There is a direct correspondence of addresses between the target MCU and the external EPROM, locations of the external EPROM not in the internal EPROM or ROM address range are omitted, as are locations containing the data $00, thus speeding up the programming operation. Bootstrap mode function of the MC68HC705T10 are selected via S1-4. Placing S5 from the RESET state to RUN state will enable the MCU to enter the selected bootstrap mode.

The procedure for invoking the bootstrap routine is as follows:

1. Place S7 and S6 in OFF position.

2. Connect +5V, Vpp (+13 V) and GND to power connector.

3. Place the 27256 EPROM and MC68HC705T10 in the U2 and U3 sockets respectively.

4. Select the desire bootstrap routine via S1-4.

5. Place switch S6 and then S7 to ON position.

6. Place switch S5 to run the selected bootstrap function.

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7.  During programming/verification operation, the LED DS2 is illuminated to indicate program-
    ming operation. The operation is finished and indicated by the verified LED DS1.

8.  When the operation is completed, place switch S5 to RESET position.

9.  Place switch S7 and then S6 to OFF position.

10. Remove the MC68HC705T10 from the programming socket.

11. Repeat  step 3 to 10 to program additional MCUs.

Once the bootstrap mode is entered, mode switch setting of S1-4 is scanned and the selected boot-
strap routine will be executed accordingly, refer to the following table for mode selection.

    1 = ON
    0 = OFF

    X = Don't Care

| S1-4 | | | | Bootstrap Mode |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | |
| 0 | 0 | 0 | 0 | Program & Verify HC05 |
| 0 | 1 | 0 | 0 | Verify HC05 Contents |
| 0 | X | 1 | 0 | Load program in RAM & Execute |
| 0 | 1 | 0 | 1 | Secure & Verify HC05 |
| 1 | X | X | X | Execute program in RAM |

### 2.1 Program and Verify EPROM

This routine enables the contents of an external EPROM to be copied into the EPROM area of
MC68HC705T10 device. The programming LED DS2 will be illuminated while programming is
in progress. When programming operation is completed, the verification routine is entered. If the
contents of the MCU EPROM and external EPROM are the same, the verification LED DS1 will
be illuminated within 2 minute.

### 2.2 Verify EPROM Contents

When this routine is executed the contents of the MCU EPROM are compared with those of the
external EPROM. LED DS1 & DS2 will turn off to indicate verification is being performed. Upon
completion of the verification routine (i.e. every location verified), the VERIFIED LED DS1 is
illuminated. If DS1 does not illuminated within 10 seconds, a discrepancy has been detected and
the error address location will be placed on the external memory address bus.

## 2.3 Load program in RAM and Execute

In this routine, user programs are loaded into MCU RAM via the M-bus interface system, and then executed. Data is loaded sequentially, starting at RAM location $40, until the last byte is loaded. Program control is then transferred to the RAM program starting at location $41. The first byte loaded is the count of the total number of bytes in the program plus the count byte. The program starts at the second byte in RAM. During the firmware initialization stage, the M-Bus interface is configured as a slave receiver. The slave address of the MCU is $C6.

If immediate execution is not desired after loading the RAM program, it is possible to hold off execution. This is accomplished by the setting of the byte count to a value that is greater than the overall length of the loaded data. When the last byte is loaded, the firmware will halt operations expecting additional data to arrive. At this point, switch S5 is placed in the RESET position which will reset the MCU but keep the RAM program intact. All other routines (modes) can now be entered from this state, including the one which will execute the program EPROM in RAM, once switch S5 is placed in the RUN position.

To ensure that security is properly enabled, attempt to perform another program and verify, or verify only routine. If the proper LED does not illuminate, the EPROM has been properly secured.


## 2.4 Secure and Verify EPROM

This routine is used after the EPROM is successfully programmed. Only the security (SEC) bit of the Option Register ($7FDF) is programmed. Then a normal verify EPROM contents is performed as described in section 2.2.


## 2.5 Execute Program in RAM

Using this routine, the MCU will transfer control to a program that has been previously loaded into RAM. This program will be executed once the bootstrap mode has been entered, if mode switch S1 is in "1" position. No firmware initialization will take place. The program must start at RAM location $0041 to be compatible with the load program in RAM routine.