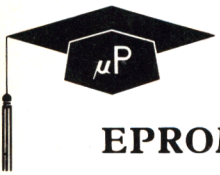


# EPB-MPF

## EPROM Programmer Board

## Operation Manual



**Multitech** INDUSTRIAL CORP.

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# I. Introduction

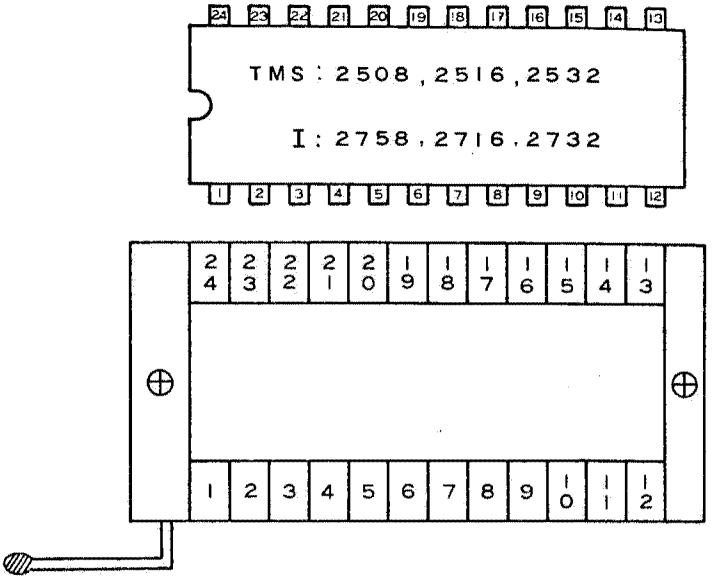
The EPB-MPF is an EPROM programmer board for the MICRO-PROFESSOR, provides the programming capability for the following EPROMS.

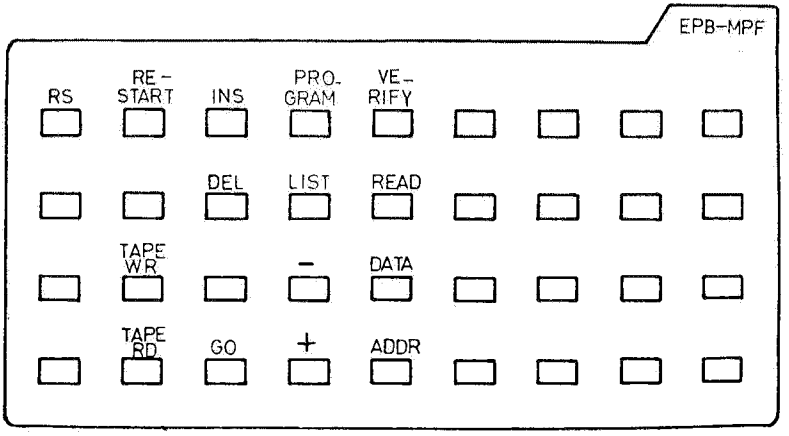
| | 1K x 8 | 2K x 8 | 4K x 8 |
|---|---|---|---|
| TI : | TMS2508, | TMS2516, | TMS2532, |
| Intel : | I2758, | I2716, | I2732, |
| Option : | 2758S1865, | | |

The EPB-MPF interfaces with the MPF-I by using a flat ribbon cable and utilizes the monitor for writing data to EPROM. Actually the EPB-MPF has two 40 pin male connectors - P1 and P2, P1 is to interface with the CPU BUS of MPF-I and P2 is for system expansion (for example, is to interface with SSB-MPF). Regarding the pin function of P1 and P2, please refer to 4-2. The MPF-I is usually covered by a name plate which has all kinds of keyfunctions, so it is quite convenient to operate the EPB-MPF.

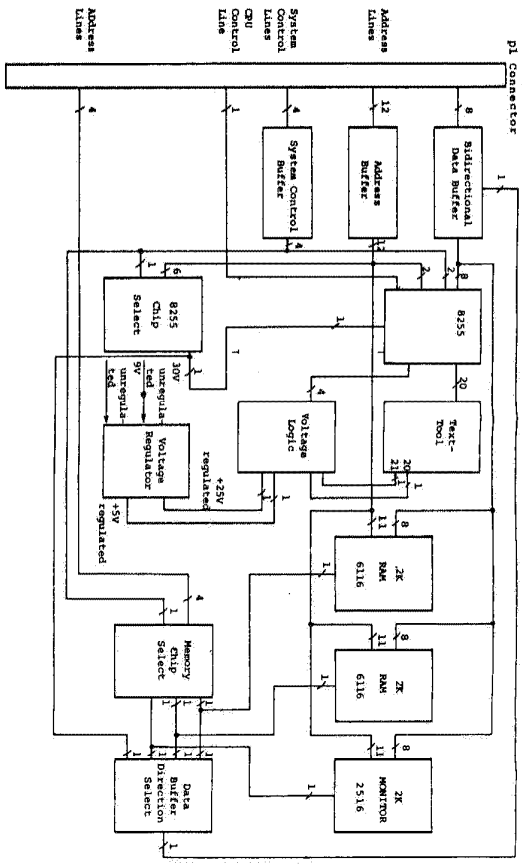
Installation Procedure:

1. All power should be turned off.
2. Connect the CPU BUS of MPF-I with P1 on the EPB-MPF by flat cable.
3. Plug in the MPF-I power plug.
4. Plug in the EPB-MPF power plug.
5. Plug IC into textool, the indentation should face the left. (Please refer to next page )
6. As power adaptor output has no load, the voltage is 33V and 13.5V respectively; but the voltage is 30V and 10V when power adaptor output has load. Users can check whether the voltage of 723 pin 10 is 25.5V, if not, they can adjust VR 100K to 25.5V.
7. To cover the EPB Name Plate on the MPF-I original keyboard location, then users can start operating.


24 23 22 21 20 19 18 17 16 15 14 13
TMS : 2508 , 2516 , 2532
I : 2758 , 2716 , 2732
1 2 3 4 5 6 7 8 9 10 11 12
24 23 22 21 20 19 18 17 16 15 14 13
1 2 3 4 5 6 7 8 9 10 11 12


EPB-MPF
RS
RE-START
INS
PRO-GRAM
VE-RIFY
DEL
LIST
READ
TAPE WR
DATA
TAPE RD
GO
ADDR

## II. EPB-MPF Block Diagram



# III. EPB-MPF Specifications

## 3.1 Hardware Specifications

1. Compatiable with MPF-I. Use 40 pin flat ribbon cable and male connector to interface with MPF-I.

2. ROM: Single +5V EPROM 2516 x 1, total 2k bytes.
   Monitor EPROM Address: 9000 - 97FF.

3. RAM: Static RAM - 6116 x 2, total 4K bytes.
   Basic RAM Address: 8000 - 8FFF.

4. I/O Port: Programmable I/O port 8255x 1, total 24 parallel I/O lines.
   I/O address: CC - CF.

5. Display: MPF-I display.

6. Keyboard: MPF-I keyboard compatible . Use MPF-I keyboard covered with a name plate to replace MPF-I keyboard name plate during EPROM programming operation.

7. Audio Tape Interface: MPF-I compatible interface.

8. System Power Consumption: +25V/30mA and +5V/350mA.

9. Main Power Input: +30V 75mA and +9V 400mA adaptor is provided, power adaptor input 110/220V.

10. Textool: 24 pin zero insertion force socket.

11. Interface Connector/Cable: 40 pin flat ribbon cable and male connector used to interface with MPF-I.

12. Extension Connector: 40 pin flat ribbon cable male connector provides the bus for CPU option.

13. Physical Characteristic:

    Height : 1.60 cm
    Width : 11.15 cm
    Depth : 15.4 cm

## 3.2 Software Specifications

EPB-MPF has a high performance 2K-byte monitor program with 15 function keys and is designed for easy operation. The following is a simple description of the key functions:

1. 

: Read data from EPROM to RAM buffer.

2. 

: Verify EPROM with RAM buffer.

3. 

: Display or modify data on RAM buffer.

4. 

: Restart to initial state of EPB-MPF.

5. 

: Write data from RAM buffer to EPROM.

6. 

: Store data in RAM buffer onto the cassette tape.

7. 

: Load data from the recorder.

8. 

: Delete 1 byte from data of the current display address of RAM buffer.

9. 

: Insert 1 byte into data of the address following by the current display address by RAM buffers.

10. 

: Check contents of next memory address.

11. 

: Check contents of last memory address.

12. 

: Execute the keyfunction of EPB-MPF.

13. 

: System Reset. The display shows UPF--1 controlled by the monitor of MPF-I but not the monitor of EPB-MPF.

14. 

: Set the address of RAM buffer.

15. 

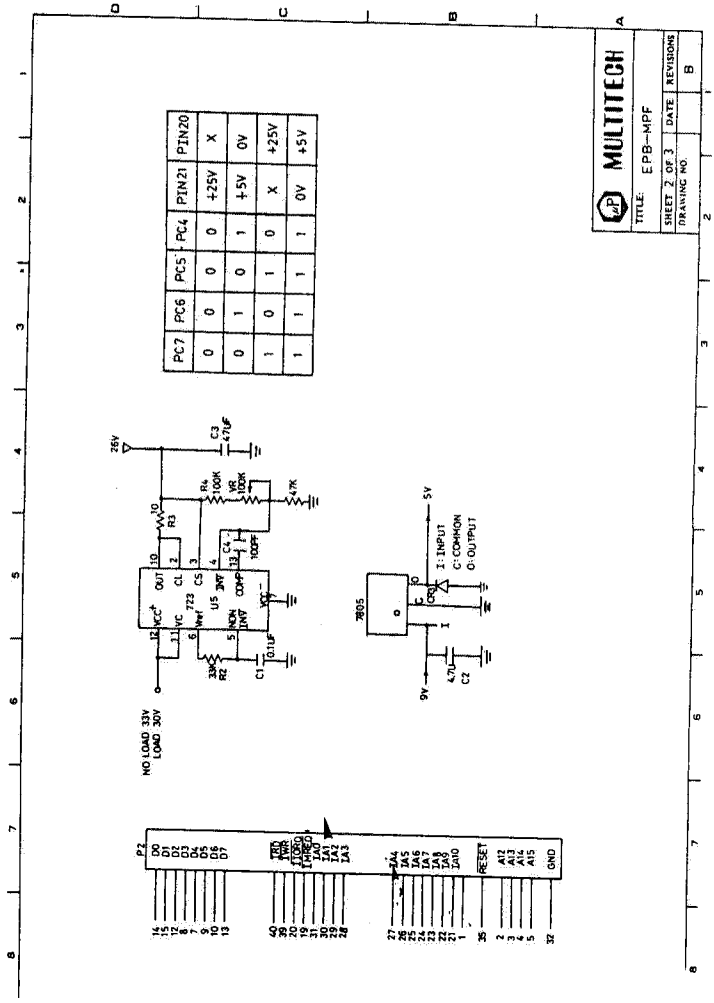
: Input data to RAM buffer.

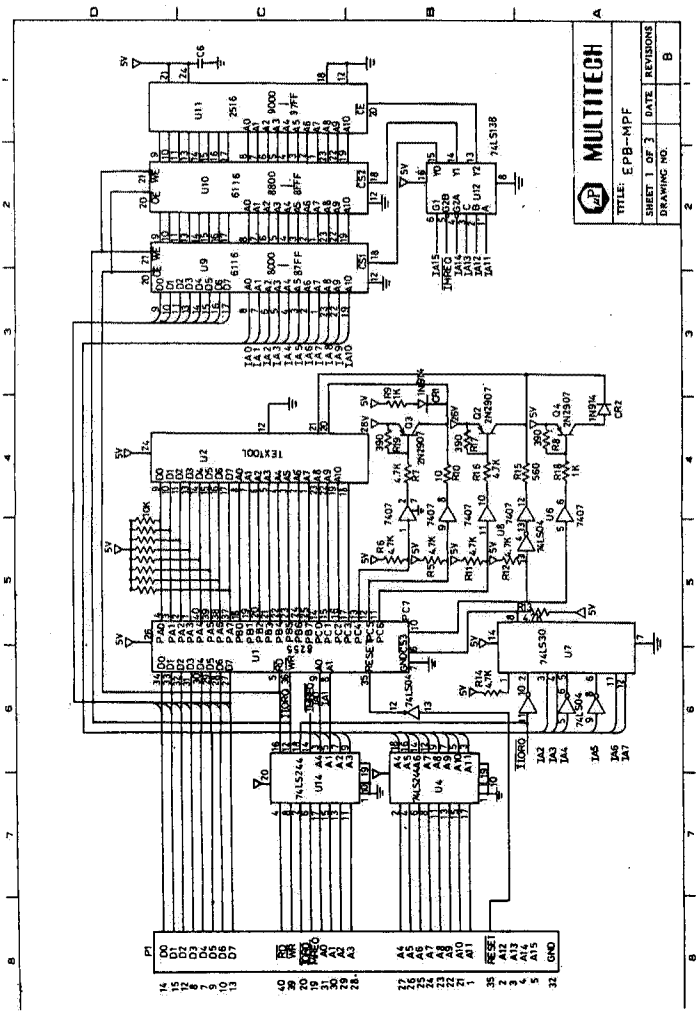
16. 

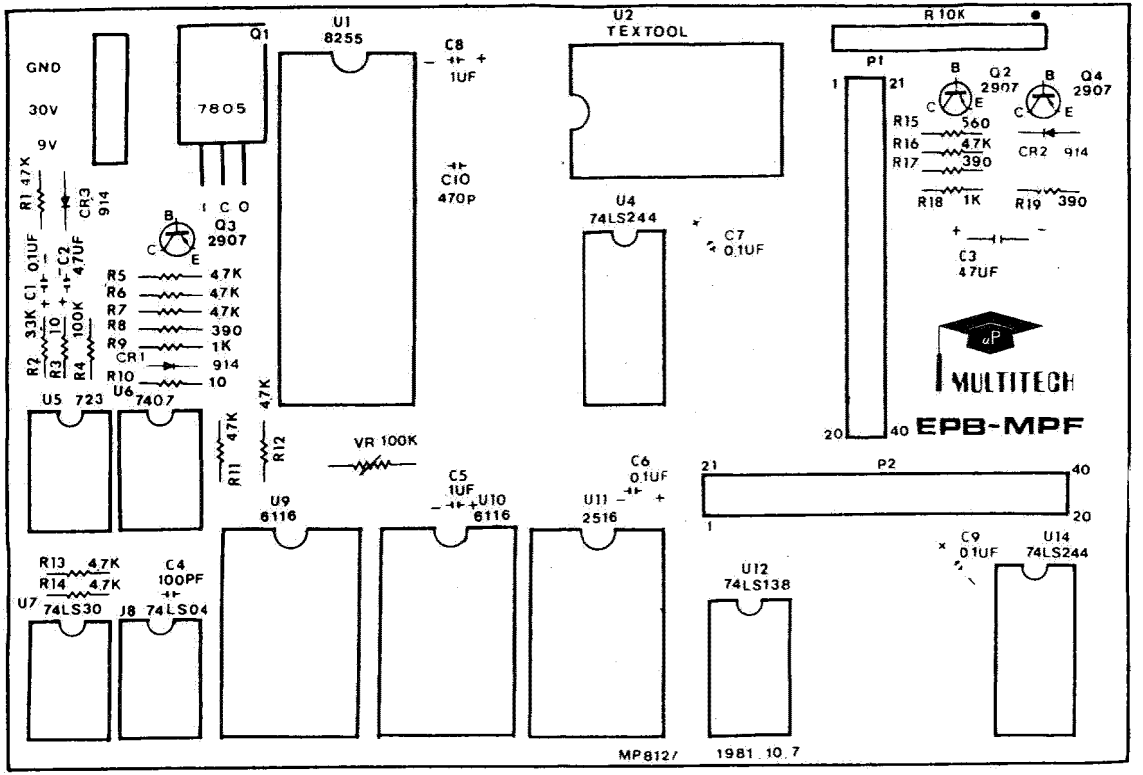
: Set new EPROM type.

# IV. Theory of Hardware Circuit

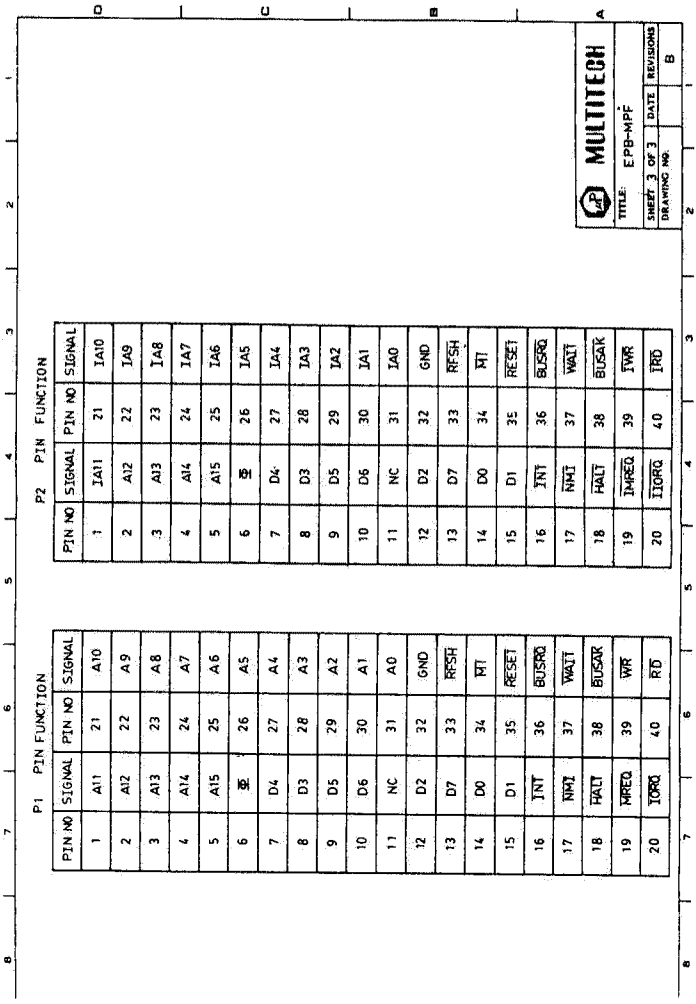
## 4.1 EPB-MPF Hardware Circuit




MULTITECH
TITLE: EPB-MPF
SHEET 1 OF 3
DRAWING NO.
DATE
REVISIONS
B


GND
30V
9V
R1 47K
CR3 914
C1 0.1UF
C2 47UF
R2 33K
R3 10
R4 100K
Q1
7805
I C O
U1
8255
C8 1UF
C10 470P
U2
TEXTOOL
R 10K
P1
1
21
20
40
B
C
E
Q2 2907
Q4 2907
R15 560
R16 47K
R17 390
R18 1K
R19 390
CR2 914
C3 47UF
Q3 2907
R5 4.7K
R6 4.7K
R7 4.7K
R8 390
R9 1K
CR1 914
R10 10
U6 7407
U5 723
R11 4.7K
R12 4.7K
VR 100K
U4 74LS244
C7 0.1UF
C5 1UF
U10 6116
U9 6116
U11 2516
C6 0.1UF
P2
21
40
1
20
R13 4.7K
R14 4.7K
U7 74LS30
C4 100PF
J8 74LS04
U12 74LS138
C9 0.1UF
U14 74LS244
MULTITECH
EPB-MPF
MP8127
1981.10.7

## 4.2 EPB-MPF Pin Function P1 & P2



P1 PIN FUNCTION

| PIN NO | SIGNAL | PIN NO | SIGNAL |
|---|---|---|---|
| 1 | A11 | 21 | A10 |
| 2 | A12 | 22 | A9 |
| 3 | A13 | 23 | A8 |
| 4 | A14 | 24 | A7 |
| 5 | A15 | 25 | A6 |
| 6 | 5V | 26 | A5 |
| 7 | D4 | 27 | A4 |
| 8 | D3 | 28 | A3 |
| 9 | D5 | 29 | A2 |
| 10 | D6 | 30 | A1 |
| 11 | NC | 31 | A0 |
| 12 | D2 | 32 | GND |
| 13 | D7 | 33 | RFSH |
| 14 | D0 | 34 | MI |
| 15 | D1 | 35 | RESET |
| 16 | INT | 36 | BUSRQ |
| 17 | NMI | 37 | WAIT |
| 18 | HALT | 38 | BUSAK |
| 19 | MREQ | 39 | WR |
| 20 | IORQ | 40 | RD |

P2 PIN FUNCTION

| PIN NO | SIGNAL | PIN NO | SIGNAL |
|---|---|---|---|
| 1 | IA11 | 21 | IA10 |
| 2 | A12 | 22 | IA9 |
| 3 | A13 | 23 | IA8 |
| 4 | A14 | 24 | IA7 |
| 5 | A15 | 25 | IA6 |
| 6 | 5V | 26 | IA5 |
| 7 | D4 | 27 | IA4 |
| 8 | D3 | 28 | IA3 |
| 9 | D5 | 29 | IA2 |
| 10 | D6 | 30 | IA1 |
| 11 | NC | 31 | IA0 |
| 12 | D2 | 32 | GND |
| 13 | D7 | 33 | RFSH |
| 14 | D0 | 34 | MI |
| 15 | D1 | 35 | RESET |
| 16 | INT | 36 | BUSRQ |
| 17 | NMI | 37 | WAIT |
| 18 | HALT | 38 | BUSAK |
| 19 | IMREQ | 39 | IWR |
| 20 | IIORQ | 40 | IRD |

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TITLE: EPB-MPF

SHEET 3 OF 3 | DATE | REVISIONS

DRAWING NO. | B

## 4.3 Theory of Operation

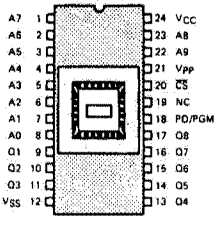
EPROM is the abbreviation for Erasable Read Only Memory which is a kind of Read Only Memory that can write data and rewrite new data into it. The method of clearing the contents of EPROM is to put it under a ultraviolet ray source about 20 to 30 minutes. Each kind of EPROM has its own pin function, and there are three kinds of voltage 0V, +5V, +25V are needed for EPROM programming. So, the voltage logic of EPB-MPF must support different voltage to the same pin for different type of EPROM. By the hardware circuit users will observe that U1 (8255) has three ports: PA0-PA7 controls data bus, PB0-PB7 and PC0-PC3 control address bus, but PC4-PC7 controls the voltage logic to provide the different voltage for pin 21 and pin 20 with the different EPROM type.

For example, the process of writing data into a single 5V 2716 (or 2516), is adding an extra 25V source on its pin 21 (Vpp) and supplys both address and data, then a byte is written in. Continuing this process until all the bytes are programmed. Time is very critical during the process, if it is not properly controlled, it would cause the damage of 2716.

## 4.4 The Pin Funciton and Operation Voltage

**TMS 2508**

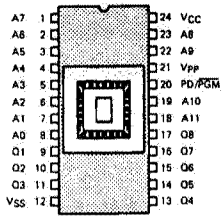
TMS 2508
24-PIN CERPAK
DUAL-IN-LINE PACKAGE
(TOP VIEW)




| PIN NOMENCLATURE | |
|---|---|
| A(N) | Address Inputs |
| $\overline{CS}$ | Chip Select |
| PD/PGM | Power Down/Program |
| NC | No Internal Connection |
| O(N) | Input/Output |
| $V_{CC}$ | +5 V Power Supply |
| $V_{PP}$ | +25 V Power Supply |
| $V_{SS}$ | 0 V Ground |

**TMS 2516**

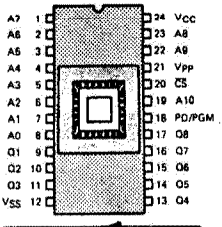
24-PIN CERAMIC
DUAL-IN-LINE PACKAGE
(TOP VIEW)




| PIN NOMENCLATURE | |
|---|---|
| A(N) | Address Inputs |
| PD/$\overline{PGM}$ | Power Down/Program |
| O(N) | Input/Output |
| $V_{CC}$ | +5 V Power Supply |
| $V_{PP}$ | +25 V Power Supply |
| $V_{SS}$ | 0 V Ground |

**TMS 2532**

24-PIN CERPAK
DUAL-IN-LINE PACKAGE
(TOP VIEW)




| PIN NOMENCLATURE | |
|---|---|
| A(N) | Address Inputs |
| $\overline{CS}$ | Chip Select |
| PD/PGM | Power Down/Program |
| O(N) | Input/Output |
| $V_{CC}$ | +5 V Power Supply |
| $V_{PP}$ | +25 V Power Supply |
| $V_{SS}$ | 0 V Ground |

**TMS 2508 operation**

| FUNCTION | PIN | MODE | | | | | |
|---|---|---|---|---|---|---|---|
| | | READ | OUTPUT DISABLE | POWER DOWN | START PROGRAMMING | INHIBIT PROGRAMMING | PROGRAM VERIFICATION |
| PD/PGM | 18 | $V_{IL}$ | Don't Care | $V_{IH}$ | Pulsed $V_{IL}$ to $V_{IH}$ | $V_{IL}$ | $V_{IL}$ |
| $\overline{CS}$ | 20 | $V_{IL}$ | $V_{IH}$ | Don't Care | $V_{IH}$ | $V_{IH}$ | $V_{IL}$ |
| $V_{PP}$ | 21 | +5 V | +5 V | +5 V | +25 V | +25 V | +25 V (or +5 V) |
| $V_{CC}$ | 24 | +5 V | +5 V | +5 V | +5 V | +5 V | +5 V |
| O | 9-11, 13-17 | O | HI-Z | HI-Z | D | HI-Z | O |

**TMS 2516 operation**

| FUNCTION (PINS) | MODE | | | | | |
|---|---|---|---|---|---|---|
| | Read | Output Disable | Power Down | Start Programming | Inhibit Programming | Program Verification |
| PD/PGM (18) | $V_{IL}$ | Don't Care | $V_{IH}$ | Pulsed $V_{IL}$ to $V_{IH}$ | $V_{IL}$ | $V_{IL}$ |
| $\overline{CS}$ (20) | $V_{IL}$ | $V_{IH}$ | Don't Care | $V_{IH}$ | $V_{IH}$ | $V_{IL}$ |
| $V_{PP}$ (21) | +5 V | +5 V | +5 V | +25 V | +25 V | +25 V (or +5 V) |
| $V_{CC}$ (24) | +5 V | +5 V | +5 V | +5 V | +5 V | +5 V |
| O (9 to 11, 13 to 17) | O | HI-Z | HI-Z | D | HI-Z | O |

**TMS 2532 operation**

| FUNCTION (PINS) | MODE | | | | |
|---|---|---|---|---|---|
| | Read | Output Disable | Power Down | Start Programming | Inhibit Programming |
| PD/PGM (20) | $V_{IL}$ | $V_{IH}$ | $V_{IH}$ | Pulsed $V_{IH}$ to $V_{IL}$ | $V_{IH}$ |
| $V_{PP}$ (21) | +5 V | +5 V | +5 V | +25 V | +25 V |
| $V_{CC}$ (24) | +5 V | +5 V | +5 V | +5 V | +5 V |
| O (9 to 11, 13 to 17) | O | HI-Z | HI-Z | D | HI-Z |

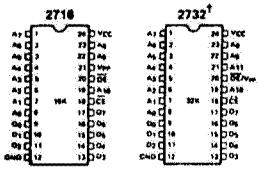
## 2758

### PIN CONFIGURATION

### MODE SELECTION

| MODE \ PINS | $\overline{CE}/\overline{PGM}$ (18) | $A_9$ (19) | $\overline{OE}$ (20) | $V_{PP}$ (21) | $V_{CC}$ (24) | OUTPUTS (9-11, 13-17) |
|---|---|---|---|---|---|---|
| Read | $V_{IL}$ | $V_{IL}$ | $V_{IL}$ | +5 | +5 | $D_{OUT}$ |
| Standby | $V_{IH}$ | $V_{IL}$ | Don't Care | +5 | +5 | High Z |
| Program | Pulsed $V_{IL}$ to $V_{IH}$ | $V_{IL}$ | $V_{IH}$ | +25 | +5 | $D_{IN}$ |
| Program Verify | $V_{IL}$ | $V_{IL}$ | $V_{IL}$ | +25 | +5 | $D_{OUT}$ |
| Program Inhibit | $V_{IL}$ | $V_{IL}$ | $V_{IH}$ | +25 | +5 | High Z |

### PIN CONFIGURATION




†Refer to 2732 data sheet for specifications

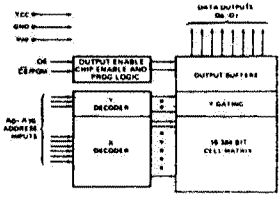
### PIN NAMES

| | |
|---|---|
| $A_0$ - $A_{10}$ | ADDRESSES |
| $\overline{CE}/\overline{PGM}$ | CHIP ENABLE/PROGRAM |
| $\overline{OE}$ | OUTPUT ENABLE |
| $O_0$ - $O_7$ | OUTPUTS |

### MODE SELECTION

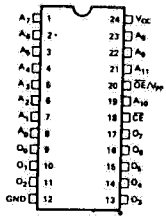
| MODE \ PINS | $\overline{CE}/\overline{PGM}$ (18) | $\overline{OE}$ (20) | $V_{PP}$ (21) | $V_{CC}$ (24) | OUTPUTS (9-11, 13-17) |
|---|---|---|---|---|---|
| Read | $V_{IL}$ | $V_{IL}$ | +5 | +5 | $D_{OUT}$ |
| Standby | $V_{IH}$ | Don't Care | +5 | +5 | High Z |
| Program | Pulsed $V_{IL}$ to $V_{IH}$ | $V_{IH}$ | +25 | +5 | $D_{IN}$ |
| Program Verify | $V_{IL}$ | $V_{IL}$ | +25 | +5 | $D_{OUT}$ |
| Program Inhibit | $V_{IL}$ | $V_{IH}$ | +25 | +5 | High Z |

### BLOCK DIAGRAM




## 2732

### PIN CONFIGURATION

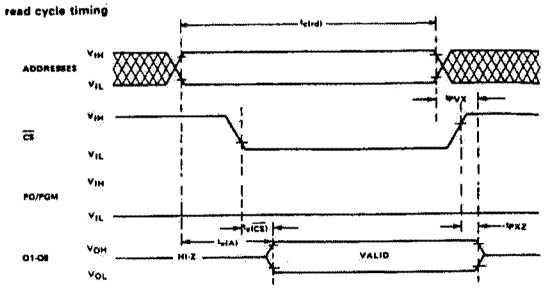


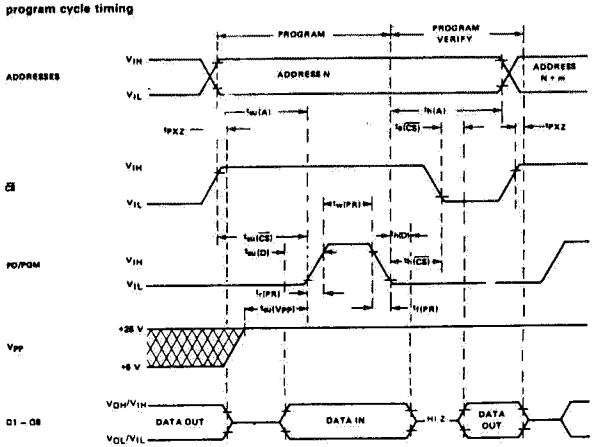
### MODE SELECTION

| MODE \ PINS | $\overline{CE}$ (18) | $\overline{OE}/V_{PP}$ (20) | $V_{CC}$ (24) | OUTPUTS (9-11,13-17) |
|---|---|---|---|---|
| Read | $V_{IL}$ | $V_{IL}$ | +5 | $D_{OUT}$ |
| Standby | $V_{IH}$ | Don't Care | +5 | High Z |
| Program | $V_{IL}$ | $V_{PP}$ | +5 | $D_{IN}$ |
| Program Verify | $V_{IL}$ | $V_{IL}$ | +5 | $D_{OUT}$ |
| Program Inhibit | $V_{IH}$ | $V_{PP}$ | +5 | High Z |

The following explanation serves the theory of writing data in I2716 which is the pin function compatiable with TMS 2516. The method of writing I2716 is to put +25V on the Vpp (pin 21), convey the essential address or data, and transfer the 50ms cycle to the CE/PROG (pin 20). After handling these procedures, users first write 1 byte and then continue one by one.

The read cycle timing as well as the program cycle timing of I2516 are shown below:



In view of the circuit, U1 (8255) is divided into three ports: PA0-PA7, PB0-PB7, and PC0-PC3 to control the keyfunction of textool. Besides, PC4-PC7 can control the voltage logic to provide the different voltage for pin 21 and pin 20 with the different EPROM type.

Since these EPROMs operate from a single +5V (in the read mode), they are ideal for use in microprocessor system. One other (+25V) supply is needed for proramming but all programming signals are TTL level, requiring a single 50ms pulse. Locations may be programmed singly, in blocks, or at random. Total programming time for all bits of I2716 or TMS 2516 is 100 seconds.

Note: Avoid taking off EPROM or pressing the [MON] key while EPB-MPF is at program cycle timing.

There are three parameters must be set before executing PROGM command. Suppose they have any errors, press [PROGM] key and then [- E r r] is shown.

1. S - Store the starting address of the data which will be written into EPROM

2. E - Store the ending address of the data which will be written into EPROM.

3. D - Store starting address of the EPROM where the data will enter.

There are four conditions as the value of parameter is wrong:

1. The ending addrss (E) is smaller than the starting address (S).

2. The data length (E - S + 1) is larger than 800H (for 2K) (400H for 1K, 1000H for 4K)

3. The starting address of EPROM (D) is equal or larger than 800H (for 2K). (400H for 1K, 1000H for 4K)

4. The ending address of EPROM (D + E - S) is equal or larger than 800H (for 2K). (400H for 1K, 1000H for 4k)

Once any errors occur, the display will show [- E r r].

# V. General Conception

## 5.1 Function of Monitor Program

Before executing the keyfunction of EPB-MPF, user should enter the EPB-MPF monitor program. As the address of the EPB-MPF monitor is 9000 - 97FF, the way to enter the EPB-MPF is to set the starting address on 9000 and then press [=] key. When MPF-I display shows [0.0.0.0.-E] , it means the EPB-MPF monitor already starts and is ready to input the EPROM type. MPF-I keyfunction, which has lost its original use, has been replaced by the EPB-MPF keyfunction. Users just need to press [=] if they want to return to the MPF-I monitor.

The monitor function is indicated as follows:

1. Read the data from EPROM to RAM buffer, users can store, modify, verify, duplicate, and display it.

2. Input the data of RAM buffer to recorder, or read the data from recorder to RAM buffer.

Example: Read the data of 2716 to RAM buffer and then verify it.
( Put EPROM on textool before reading data.)

| Key | Display | Comments |
|---|---|---|
| RS | UPF--1 | ;System reset |
| ADDR, IY 9, AF 0, AF 0, AF 0 | 9.0.0.0.31 | ;Set the starting address of EPB-MPF monitor program. |
| GO | 0.0.0.0.-E | ;Execute the EPB-MPF monitor. |
| DE 2, HL 7, BC 1, DE 6 | 2.7.1.6.-E | ;Key in the EPROM type. |
| GO | 2716-E | ;The initial state of EPB-MPF. |
| READ | rEAd | ;Key in the READ command |
| GO | | ;Executing the read command, the display is blank. |

| | | |
|---|---|---|
| | PASS-Γ | ;The end of read command. |
| VERIFY | 0.0.0.0.-S | ;The monitor sets the starting address on 0000 and the ending address on 07FF automatically. Users can verify the data of any region through setting both the starting address and the ending address. |
| GO | | ;Execute the verify command. |
| | PASS-H | ;All data are matched, showing PASS-H. |

[Description]

1. Users should execute the keyfunction in the initial state of EPB-MPF, it stands for controlling by the EPB-MPF monitor. The display will show 2508-E , 2758-E , 2516-E , 2716-E , 2532-E , or 2732-E , as EPB-MPF is in the initial state, it expresses the EPROM type has been confirmed and users can start to execute the keyfunction at this moment.

2. Suppose users don't put EPROM on the textool, the data reading from textool all shows FF.

3. Press RESTART key in case users intend to return to the initial state.

4. If users try to change the EPROM type, they must press RS key and reset the EPROM type.

5. Press the keyfunction directly if command has finished and users are ready to execute the new one.

## 5.2 RAM Addressing

Though the addresses of RAM buffer are 8000 - 8FFF, we make use of software technique to cause the display show 0000 - 0FFF instead of 8000 - 8FFF. All of these designs are for user's convenience. For example, it means the value of 8356 in RAM addressing is 38 when the display shows 03563.8.. So the addresses of 8000 - 8FFF in MPF-I are the same as the addresses of 0000 - 0FFF in EPB-MPF. Now the following example could prove the both area's addresses are similar.

Example: Compare the addresses of 0068 in EPB-MPF with the addresses of 8068 in MPF-I.

| Key | Display | Comments |
|---|---|---|
| RS | UPF--1 | ;System Reset. |
| ADDR IX 8 AF 0 DE 6 IX 8 | 8.0.6.8.×× | ;The content of address 8068 is XX. |
| ADDR IY 9 AF 0 AF 0 AF 0 | 9.0.0.0. 31 | ;The starting address of EPB-MPF monitor. |
| GO | 0.0.0.0.-E | ;The EPB-MPF monitor is ready to accept the EPROM type. |
| DE 2 BC 5 AF 0 IX 8 | 2.5.0.8.-E | ;Set the EPROM type on 2508. |
| GO | 2508-E | ;The initial state of EPB-MPF. |
| LIST | LIST | ;Key in the list command. |
| GO | 0000×.×. | ;The first address in RAM buffer. |
| ADDR | 0.0.0.0.×× | |
| AF 0 AF 0 DE 6 IX 8 | 0.0.6.8.×× | ;The six-eighth address in EPB-MPF monitor equals to the address of 8068 in MPF-I monitor. |

## VI. Operation Introduction

The EPB-MPF keyfunctions should be operated under the monitor's control. After executing the addresses of 9000 in EPB-MPF monitor, the display will show [0.0.0.0. -E] and users can key in the EPROM type. If any wrong types are shown, users press [-] key and the display becomes [0.0.0.0 -E]. But the display will show [xxxx -E] in case of no errors. As EPB-MPF is in the initial state, the display will show [2508-E], [2758-E], [2516-E], [2716-E], [2532-E], [2732-E], etc. Pressing [-] key will not affect the value of RAM. Users may reset the EPROM type and re-execute the EPB-MPF monitor if they intend to change the EPROM type.

Once the EPB-MPF monitor starts to execute command, EPB-MPF monitor will examine U9, U10, and U11 whether they have any problems. The display shows [bAdU09] if U9 (the address of 8000 - 87FF in RAM) is out of order; moreover, [bAdU10] is expressed when U10 does not function very well. But [bAdU11] or RADOM DATA are shown if U11 has some troubles.

[Description]

1. Read data from EPROM to RAM buffer to store, modify, verify, duplicate, display etc.

2. Users can use LIST command to modify or display the data in RAM buffer.

3. We use VERIFY command to compare the data of EPROM in the socket with RAM buffer of the same address.

4. It also can use PROGRAM command to duplicate an EPROM.

5. When reading is completed, the display will show [PASS-r]. User can execute LIST command to check whether the data in RAM buffer is correct or not.

## 6.1 Read data from EPROM to RAM buffer-[READ] Key

The following procedures guide users how to implement the read command which can read the data from EPROM in the textool to RAM buffer.

1. Users should put EPROM in the textool before executing the read command, or the data reading from textool will be FF.
2. Before pressing [READ] key, users need to make sure whether the EPB-MPF is in the initial state that means [xxxx-E] is shown.
3. When the display is in the initial state, the other step is shown as follows:

| Key | Display | Comments |
|---|---|---|
| READ | ⌐EAd | ;It get ready to read. |
| GO | | ;Begin to read. |
| | PASS-⌐ | ;The contents of EPROM read into RAM buffer. |

Example: The EPROM type on textool is 2532, reading its contents into RAM.

| Key | Display | Comments |
|---|---|---|
| ADDR IY 9 AF 0 AF 0 AF 0 | 9.0.0.0.31 | ;Set the starting address of EPB-MPF monitor program. |
| GO | 0.0.0.0.-E | ;Wait to key in the EPROM type. |
| DE 2 BC 5 HL 3 DE 2 | 2.5.3.2.-E | ;The EPROM type is 2532. |
| GO | 2532-E | ;The initial state of EPB-MPF. |
| READ | ⌐EAd | ;Set READ mode. |
| GO | | ;Execute the READ command. |
| | PASS-⌐ | ;The READ command is finished. |

[Description]

1. In case the EPROM type is 2508 or 2758, it means to load in the 1K bytes data. The situation is similar in 2516, 2716(2K) and 2532, 2732(4K).

2. After completing the READ command, users can utilize LIST command to display or modify the data in RAM buffer.

3. Check whether EPROM is blank or not. At first, don't put EPROM onto textool and the loading value will be FF. Now put EPROM onto textool, press [VERIFY] and [GO].

## 6.2 Display and modify the data in RAM buffer - [ ] Key

Six keyfunction are used with the [LIST] key to display or modify the data in RAM buffer.

1. Substitute memory - [ADDR] and [DATA] key.
2. Data deletion - [DEL] key.
3. Data insertion - [INS] key.
4. Check the next memory address - [+] key.
5. Check the last memory address - [-] key.

Users should take the following steps to display or modify data in RAM buffer.

1. The EPB-MPF must be in initial state before pressing the [LIST] key.
2. If it is in initial state, do the steps as follows.

| Key | Display | Comments |
|---|---|---|
| [LIST] | LEST | ;Set LIST mode |
| [GO] | 0000××.×. | ;It always displays the first byte of data in RAM buffer. |

Example: Display the contents of memory locations. Start the address at 0586 and end the address in 0588. Change the contents of 0587 into 56.

| Key | Display | Comments |
|---|---|---|
| RS | UPF--1 | ;Set the starting address of EPB-MPF monitor progarm. |
| ADDR IY 9 AF 0 AF 0 AF 0 | 9.0.0.0.31 | |
| GO | 0.0.0.0.-E | |
| DE 2 BC 5 BC 1 DE 6 | 2.5.1.6.-E | ;The EPROM type is 2516. |
| GO | 2516-E | ;The initial state of EPROM monitor. |
| LIST | LIST | ;Set LIST mode. |
| GO | 0000××.×. | ;The first byte of data in RAM buffer. |
| ADDR | 0.0.0.0.×× | ;The four index points notify user to input address. |
| AF 0 BC 5 IX 8 DE 6 | 0.5.8.6.×× | ;The contents of address 0586 is XX. |
| + | 0587××.×. | ;The contents of address 0587 is XX. |
| + | 0588××.×. | ;The contents of address 0588 is XX. |
| - | 0587××.×. | |
| BC 5 DE 6 | 05875.6. | ;Change the contents of 0587 into 56. |

[Description]:

1. ADDR , DATA , INS , and DEL are only used in LIST MODE.
2. Press GO key, and then the value of address 0000 will be shown.

## 6.3 Substitute memory- [ADDR] and [DATA] Key

The ADDR or DATA commands must be used in LIST mode.

[ADDR] <address>[ [DATA] [<data>]] [+] [<data>] [+]

Example: Check the contents in 0000 - 0003.

| Key | Dispaly | Comments |
|---|---|---|
| | ××××-E | ;It is in the initial state of EPB-MPF. |
| [LIST] | LIST | ;Set LIST mode. |
| [GO] | 0000××.×. | ;The content of ADDR 0 is xx. Note:Display format for ADDR. |
| [+] | 0001××.×. | ;Note that the [+] key increments the ADDR counter by ONE. |
| [+] | 0002××.×. | |
| [+] | 0003××.×. | ;Contents of ADDR 0003 is xx. |

ADDR DATA

0 . 0 . 0 . 0 . 0 0

[Data Bytes]

[Address Bytes]

Example: Continue the above example. Change the contents of 0300 into AB, 0301 into CD.

| Key | Display | Comments |
|---|---|---|
| ADDR | x.x.x.x.xx<br>{ADDR field} | ;4 index points in ADDRESS field notify USER to input ADDRESS. |
| AF 0 HL 3 AF 0 AF 0 | 0.3.0.0.xx | ;Enter 0300 by pressing the appropriate KEYS. |
| DATA | 0300x.x.<br>{DATA field} | ;By pressing the Data function KEY indicates to the USER to input DATA into the DATA Field. |
| HL 3 SP A | 03003.A. | ;Enter 3A into the DATA FILED. |
| I-IF B | 0300A.B. | ;Enter B into the DATA filed. If DATA is more than two Digits the last two will be used. |
| + | 0301x.x. | ;AD Field increases by one. The 2 index points in the DATA Field notify user to input Data. |
| SZ:H C ·PNC D | 0301C.D. | ;Enter Data by pressing the C and D Keys. |

[Description]:

Addr means address. After pressing this key the display is in the standard format, i.e. the left four digits stand for the address and the right two digits stand for the data. The address field is indexed by four points and required 4 digits. If more than 4 digits are keyed in, only the last 4 are accepted. If less than 4 digits is entered, the address being displayed is assumed.

When [DATA] is pressed, the index points will be shifted to the rightmost two digits notifying the user to enter data. The content of RAM will be replaced by the entered data. Pressing [+] or [-] will increase or decrease the address field. If the index points are already in the data field then it is unnecessary to press [DATA]. After pressing [ADDR], the user may press [+] or [-] directly.

If the user attempts to change the contents of ROM, the display will blank out. After releasing the key, the display will return.

## 6.4 Data insertion- [INS] Key

The INS command must be used in LIST mode.

[INS] <data>

When the display is of the Addr-Data form. the input data will be inserted after the displayed address.

Example: Assume the contents of RAM are as follows:

| | ADDRESS | OLD DATA | DATA AFTER INSERTION |
|---|---|---|---|
| | 0200 | 00 | 00 |
| | 0201 | 11 | 11 |
| | 0202 | 22 | 22 |
| insert 33 here-> | 0203 | 44 | 33 |
| | 0204 | 55 | 44 |
| | 0205 | 66 | 55 |

| Key | display | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF. |
| [LIST] | LIST | ;Set LIST mode. |
| [GO] | 0000××.×. | |
| [ADDR] [AF 0] [DE 2] [AF 0] [DE 2] | 0.2.0.2.22 | ;To change the display to Addr-Data form and enter the address of the insertion. |
| [INS] | 02030.0. | ;Insert one byte after 0202, address field becomes 0203. Key in data 33. |
| [HL 3] [HL 3] | 02033.3. | |
| [ADDR] [AF 0] [DE 2] [AF 0] [AF 0] | 0.2.0.0.00 | Check |
| [+] | 02011.1. | |
| [+] | 02022.2. | |
| [+] | 02033.3. | |
| [+] | 02044.4. | |
| [+] | 02055.5. | |

[Description]:

The valid region for this key is the same as [-] . After insertion, the last byte of the inserted block is lost.

The inserted address is one byte after the displayed address. Pressing this key causes all the data after the displayed address to be shifted down one position. Then the address field is incremented by one and the user may enter the data he wants to insert.

## 6.5 Data deletion - [DEL] Key

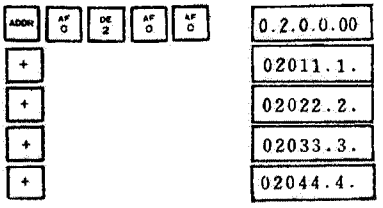
The DEL command must be used in LIST mode.

This key is valid when the display is of the Addr-Data form. Pressing this key causes the data of the displayed address to be deleted. All the data below this address is shifted up one position.

Example: Assume the present contents of RAM and the desired contents are as follows:

| | ADDRESS | OLD DATA | DATA AFTER DELETING |
|---|---|---|---|
| | 0200 | 00 | 00 |
| | 0201 | 11 | 11 |
| delete address -> | 0202 | 11 | 22 |
| | 0203 | 22 | 33 |
| | 0204 | 33 | 44 |
| | 0205 | 44 | XX |

| Key | Display | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF. |
| [LIST] | LIST | ;Set LIST mode. |
| [GO] | 0000×.×. | |
| [ADDR] [AF 0] [DE 2] [AF 0] [DE 2] | 0.2.0.2.11 | ;To change the display to the Addr-Data form and enter the address to be deleted. |
| [DEL] | 02022.2. | The old contents of 0202 have been deleted and data below it has been shifted up. The new contents of 0202 is 22, which was the original contents of 0203. |




Check

[Description]:

Data in ROM can not be deleted. The valid regions for this key are 0000 - 0FFF. When the deleted address is between 0000 - 0FFF, all the data after this address shift up one position. The last one 0FFF is filled with 0.

## 6.6 System reset- [ ] Key

Pressing the reset buttom will display [UPF--1] and get back to MPF-I monitor program.

There are two possible results. When the MPF-I monintor is reset.

1. Power on

   a. Disable interrupt (IFF set to 0);
   b. I register set to 0;
   c. Interrupt mode set to 0;
   d. user's PC is set to 1800.
   e. User's SP is set to 1F9F;
   f. Break point is disabled.
   g. Set the content of 1FEE to 66 and set the content of 1FEF to 00. When 0038 is executed the CPU will jump to 0066. This is equivalent to pressing [ ] .
   h. MPF-I is displayed one character at one time from right to left.

2. Press [ ]

   (a) - (e) are the same as (1). The contents of 1FEE & 1FEF and break point are unaffected. 'UPF--I' is dislayed (all digits) simultaneously.

## 6.7 Verify the data of EPROM with the data of RAM buffer- [VERIFY] Key

[VERIFY] <address> [+] <address> [GO]

Verify command can compare the data in EPROM with the data in RAM buffer. If the starting address or the ending address has no change, the EPB-MPF monitor will automatically set and verify the data of EPROM. For example, the EPROM type is 2716 and then the EPB-MPF monitor will set the starting address on 0000, the ending address on 07FF.

Example: Compare the data of 0150 ~ 0250 in RAM buffer with the same address of EPROM in the socket.

| Key | Display | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF. |
| [VERIFY] | 0.0.0.0.-S | ;S is the menmonic of starting address in RAM buffer. |
| [AF 0] [BC 1] [BC 5] [AF 0] | 0.1.5.0.-S | ;Set the starting address on 0150. |
| [+] | x.x.x.x.-E | ;E is the mnemonic of ending address. |
| [AF 0] [DE 2] [BC 5] [AF 0] | 0.2.5.0.-E | ;Set the ending address on 0250. |
| [GO] | | ;Execute the VERIFY command. |
| | PASS-H | ;VERIFY finished. |

[Description]:

1. Write the data of RAM address 0100 - 0250 into EPROM, so the starting address of EPROM where the data will enter is 0000.

2. The [VERIFY] command may compare the data of EPROM in the socket with the same address of RAM buffer. If the result does not match, the display will first show the address in RAM buffer which does not match and then the display is blank for a while, showing [E.xxd.xx]. It means the left three LED is the data of EPROM and the right three LED is the data of RAM buffer. Press [=] key and continue this process. The display will show [PASS-H] if all the data matches. The rest data can be deduced accordingly.

3. Set the starting address, the ending address beforehand and key in the data, if users want to compare data in blocks.

4. Suppose the [VERIFY] command loads in the wrong parameter that is to say E<S, the display appears [-Err] .

## 6.8 Return to the initial state of EPB-MPF- [RESTART] Key

Press [RESTART] key at any time, the display will show [xxxx-E] which means EPB-MPF is in the initial state. If the command is accomplished and is to do another one, users can press [RESTART] key directly.

Example: Read and verify the data of 2532 in EPROM, and then return to the initial state of EPB-MPF monitor.

Put 2532 into textool before pressing [READ] key.

| Key | Display | Comments |
|---|---|---|
| [RS] | UPF--1 | |
| [ADDR] [F 9] [AF 0] [AF 0] [AF 0] | 9.0.0.0.31 | ;The starting address of EPB-MPF monitor. |
| [GO] | 0.0.0.0.-E | ;The EPB-MPF monitor is ready to accept the EPROM type. |
| [DE 2] [BC 5] [HL 3] [DE 2] | 2.5.3.2.-E | ;The EPROM type is 2532. |
| [GO] | 2532-E | ;The initial state of EPB-MPF monitor. |
| [READ] | ⌐EAd | ;Set the READ command. |
| [GO] | | ;Execute the READ command. |
| | PASS-⌐ | ;The READ command is finished. |
| [VERIFY] | 0.0.0.0.-S | ;Set the VERIFY command. |
| [GO] | | ;Execute the VERIFY command. |
| | PASS-H | ;The VERIFY command is finished. |
| [RESTART] | 2532-E | ;The initial state of EPB-MPF monitor. |

[Description]:

1. Read the data of 2532 in EPROM to RAM buffer and verify, so the result must be same and then PASS-H appears.

2. Once users take off EPROM and press VERIFY the data will show FF.

3. If users want to modify the data of 0532 in RAM buffer and then find it out in the EPB-MPF monitor, please use the LIST command.

4. As -Err is shown, pressing RESTART key can return to the initial state of EPB-MPF monitor.

## 6.9 Write the data in RAM buffer to EPROM- [PROM] Key

The primary function of [PROM] key is to write data in RAM buffer at one time. The procedure is as below:

[PROGM] <address> [+] <address> [+] <address> [GO]

| Key | Display | Comments |
|---|---|---|
| | ××××-E | ;The initial sta of EPB-MPF monitor. |
| [PROGM] | x.x.x.x.-S | ;Notify users the starting address to write in RAM buffer. |
| [+] | x.x.x.x.-E | ;Notify users the ending address (03FF for 1K, 07FF for 2K, 0FFF for 4K) to write in RAM buffer. |
| [+] | x.x.x.x.-d | ;Notify users the address which EPROM starts to write. |

Example: Write the data 0200 - 0250 in RAM buffer to EPROM in its address 0000. Make sure the EPROM address must be blank (FF). In case the purpose is only for test, users don't need to put EPROM onto textool but make the value in RAM buffer be FF.

| Key | Display | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF monitor. |
| PROGM | ×.×.×.×.-S | |
| AF 0 DE 2 AF 0 AF 0 | 0.2.0.0.-S | |
| + | ×.×.×.×.-E | |
| AF 0 DE 2 BC 5 AF 0 | 0.2.5.0.-E | |
| + | ×.×.×.×.-d | |
| AF 0 AF 0 AF 0 AF 0 | 0.0.0.0.-d | |
| GO | ××××××. | ;Start to write ad display the data or address which is proceeding. |
| | 0050×.×. | ;The last data and address in writing procedure. |

[Description]

1. The EPB-MPF monitor still execute the PROGM command, though EPROM is not on the textool. Users can check whether the Vpp pin of textool has 25V voltage. Anyhow the different EPROM types have the different pin functions.

2. Attention: Don't put EPROM onto textool or take EPROM from it as the command is proceeding.

3. The display shows [-Err] if the loading parameter bring forth any mistakes (Please refer to 4-4). Press [RESTART] key, the command will go back to the initial state of EPB-MPF monitor.

4. Before executing [PROGM] command, EPB-MPF will check whether the EPROM is blank or not. As long as data exists, [FULL] is shown. No matter what the value happens, you can press [↵] key if you intend to continue writing the data.

5. The EPB-MPF monitor in executing [PROGM] command is not only writing the data but checking the value. If EPROM is out of order, naturally the data could not write into it. At this moment, EPB-MPF sounds and then the display shows [xxxxHH] . "xxxx" stands the address in EPROM is out of order, but "HH" is to notify users that a bad address exists and they can press [↵] key if they continue writing data. Refer to 2732, the new monitor is to be examined after writing but not be checked one by one as writing the data. The data of origin monitor is located in 9000H - 9712H, but the data of new version is 9000H - 97B3H

6. If we want to write only one byte, then the values for S and E must be the same. Moreover, if we want to change one bit of this byte, all we have to do is to press [↵] key after the pattern "FULL" is shown on the display. (Notice that the bit can only be changed from 1 to 0)

7. Note: Suppose in the initial state of EPB-MPF users test the voltage of pin 20 or pin 21 on textool is 25V, it indicates there is something wrong at transistor Q2, Q3, or 7407. Users must stop operating the procedure but change transistor Q2, Q3, or 7407 to avoid damaging EPROM.

## 6.10 Storing data onto tape- [TAPE WR] Key

EPB-MPF takes advantage of the audio tape interface in MPF-I to store the data of RAM buffer onto tape.

Cassette tape is a large capacity non-volatile storage medium. MPF-I contains hardware and software drivers.

[TAPE WR] <file name> [+] <address> [+] <address> [GO]

Example: Store the data of 0000 - 0100 on tape, use 1234 as file name.

| Key | Dispaly | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF. |
| [TAPE WR] | ×.×.×.×.-F | ;F is the mnemonic of filename. |
| [BC 1] [DE 2] [HL 3] [AF 4] | 1.2.3.4.-F | Filename = 1234 |
| [+] | ×.×.×.×.-S | ;S is the mnemonic of starting address. |
| [AF 0] [AF 0] [AF 0] [AF 0] | 0.0.0.0.-S | ;Stating address = 0000. |
| [+] | ×.×.×.×.-E | ;E is the mnemonic of ending address. |
| [AF 0] [BC 1] [AF 0] [AF 0] | 0.1.0.0.-E | ;Ending address = 0100 |
| [AF 0] [AF 0] [AF 0] [AF 0] | | ;Connect the microphone of the tape recorder to MPF-I MIC. Start recording by pressing PLAY and REC key of recorder. |
| ( PLAY & REC ) | | |
| [GO] | | Begin to output data. During transfer the display is dark, but the TONE-OUT LED is on. |
| | ××××××. | ;When transfer is completed, the ending address is displayed. |

[Description]:

1. Pressing [TAPE WR] , the display becomes [x.x.x.x.-F] . F means file name. It is used to distinguish different data sets stored on a single cassette. It is also used to read back data. Press [+] and the display becomes [x.x.x.x.-S] . S represents the starting address of the data to be written. Press [+] again and the display becomes [x.x.x.x.-E] . E represents the ending address of the data to be written. Before pressing [=] , you must connect the microphone of the recorder to MIC jack of MPF-I and press PLAY and REC to start recording. If the recorder is not ready and you press [=] data is still sent out. This data will not be recorded on tape. During transfer the display is blank, the TONE-OUT LED is on and a tone sounds.

2. For the setting data of 0000 - 0FFF in EPB-MPF equals to the data of 8000 - 8FFF in MPF-I, transfering the data of 0000 - 0FFF to tape in the EPB-MPF monitor is similar in transfering the data of 8000 - 8FFF to tape in the MPF-I monitor.

## 6.11 Reading data from tape- [TAPE RD] Key

[TAPE RD] <filename> [GO]

Example: Read data from recorder, filemane is 1234, the tape is prepared by [TAPE WR] key.

| Key | Display | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EMP-MPF. |
| [TAPE RD] | x.x.x.x.-F | ;F is the mnemonic of filename. |
| [BC 1] [DE 2] [HL 3] [AF 4] | 1.2.3.4.-F | ;Filename = 1234. Connect the recorder (using earphone jack) to the EAR jack in MPF-I. |
| [GO] | | ;Start execution. The display is blank while EPB-MPF is searching for the filename. |
| ( PLAY ) | ..... | ;Press PLAY of recorder. The recorder output volume should be turned to maximum. EPB-MPF echoes the signal read from tape on its own speaker (if the volume is too low, then there will be no sound). Every file name read by the monitor will be displayed for 1.5 seconds. When the desired file is found, '-' is changed into '-'. When finished, the last address read in is displayed. |
| | 1234-F | |
| | ------ | |
| | ××××x.x. | |

[Description]:

1. Before execution, the user must connect the recorder (using earphone jack) to the EAR jack in MPF-I. Turn the volume of the recorder to maximum. Then press [ ] , and finally, start the recorder (PLAY). Initially, the display is [ . . . . . ] . When the desired file is found, the display becomes [ - - - - - - - ] .

   Starting and ending addresses are already stored on the tape so there is no need to input them. The user just needs to input the file name. A check is also recorded on the tape which EPB-MPF will check when reading back. If not matched, the dispaly will be [ -Err ]. If matched, the last input byte will be displayed.

   If the data read from the tape are stored in a system stack, errors will occur. Care must be taken when you prepare tape data by [ ] . The tape data are echoed on the MPF-I speaker, so it is very easy to determine whether the tape is empty or not. This allows you to check a tape before recording data on it, so you do not destroy data previously recorded.

2. The [ ] key in EPB-MPF monitor is to store the address of 8000 - 8FFF in RAM buffer onto tape through MPF-I. So, the data also read to the same address (8000 - 8FFF) in RAM when it is back from tape.

3. If the data of tape is 1800 - 1FFF in RAM address which users want to store it onto the RAM buffer of EPB-MPF, they should read data by the [ ] key in MPF-I monitor and then move this value to 8000 - 8FFF by using the [ ] command.

4. If the parameter has any errors in executing [ ] or [ ] key, the display will show [ -Err ]. The above situation indicates the command returns to the MPF-I monitor, but the [ ] key has no any function under such situation. The command return to the MPF-I monitor just when [ -Err ] shows under the execution of [ ] and [ ] , but the rest is still in the EPB-MPF monitor.

Example: EPROM blank test

| Key | Dispaly | Comments |
|---|---|---|
| | ××××-E | ;The initial state of EPB-MPF. |
| READ | r E A d | ;Set READ command. There is no EPROM on textool. |
| GO | | ;Execute READ command. |
| | P A S S - r | ;READ finished. The data READ in are all FF. |
| VERIFY | 0.0.0.0.- S | ;Put the EPROM which you want to check onto textool. |
| GO | | ;Execute VERIFY command. |
| | P A S S - H | ;If the EPROM is blank then the display is P A S S - H , otherwise the display is ××××××× and stops at the first address which is not equal. |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