EP-ROM Programmer

1 8 9 0

INSTRUCTION MANUAL

W A R R A N T Y

The MINATO ELECTRONICS INC. warrants each instrument it manufacures to be free from defects in material and workmanship under normal use and service for the period of one year from the date of purchase. This warranty extends only to original purchaser and does not apply to any instrument which has been subjedct to misuse, accident, or abnormal operating conditions.
Device sockets are not covered under this warranty.

All requests for repairs and replacement parts should be directed to the MINATO ELECTRONICS INC. or the nearest MINATO representative in your area. Please indicate the model and serial number giving full details of the problem encountered.

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P R E F A C E

This manual provides complete operating and maintenance instructions for the 1890 compact programmer.

Reader's Guide

This manual is organized into 10 sections.

SECTION 1, INTRODUCTION AND SPECIFICATIONS, provides a brief description and specifications of the 1890.

SECTION 2, UNPACKING AND REPACKING, provides unpacking and repacking information.

SECTION 3, PREPARATIONS FOR USE, provides information on setting up.

SECTION 4, OPERATION, provides complete operating instructions.

SECTION 5, THEORY OF OPERATION, provides an over all functional description of the 1890.

SECTION 6, PROGRAMMING THEORIAL, provides considerations and techniques to help you to use the 1890 effectively.

SECTION 7, MAINTENANCE, provides maintenance information for the 1890.

SECTION 8, TROUBLE SHOOTING, provides a brief trouble shooting informatin of the 1890.

SECTION 9, REPLACEABLE PARTS LIST, provides an illustrated replacable parts list for the 1890.

SECTION 10, INDEX

C O N T E N T S

C O N T E N T S (C o n t i n u e d)

CONTENTS (Continued)

C O N T E N T S (C o n t i n u e d)

1 INTORODUCTION AND SPECIFICATIONS

1.1 Introduction

Minato Electronics' PROM Programmer Model 1890 is a multifunctional inexpensive programmer which incorporates the latest LSI technology and Minato's experience over many years. This model can program a maximum 2 Mbits data into a 256 kbytes buffer memory (standard). The model 1890 can easily communicate with a computer through RS232C and Centronic interfaces as standard.
Compact, light in weight, and multifunctional, The 1890 substantially increase the number of applications for you.

1.2 Features

- o Light in weight and Compact.
- o Multifunctional.
- o Up to 1 Mbits devices programmable.
- o Full self-test functions.
- o Inexpensive.

1.3 Specifications

Programmable devices	: MOS. C-MOS,EPROM, EE-PROM
Buffer memory (RAM)	: 256Kbytes(2Mbits); standard
Data input methods	: Master Device Copy
	: Through RS232C Interface
	: Through Centronics Interface
Functions	: Silicon Signature
	Diagnostic Self Check
	Voc Margin Check
	Output Level Check
	Device Condition Check
	Programmer RAM check/program
Interfaces	: RS232C. baud rate : 110 to 19,200
	: Centronics
Display	: 32-character LCD (16digits X 2 lines)
General specifications	: Power supply : 85 to 264 VAC. 50/60Hz
	: Power consumption : 50VA
	: Operating temperature : +5 to +35 ^{0}C
	: Dimensions & welght :
	300(W) X 290(D) X 65(H)mm ;2.8kg
Accessory	: Power cord
	Mini Fuse 3W

2 UNPACKING AND REPACKING

2.1 Introduction

Unpacking and Repacking procedures are described in this section.

2.2 Unpacking

Your instrument was shipped with:

* 1890 Main unit.
* OU-900 Programming Unit
* AC power cord.
* This manual.

If anything is missing or damaged in shipment, contact the place of purchase.

2.3 Repacking

Use the original container if reshipment is necessary. If the original container is not available, the instrument should be carefully wrapped with shock-absorbing material.

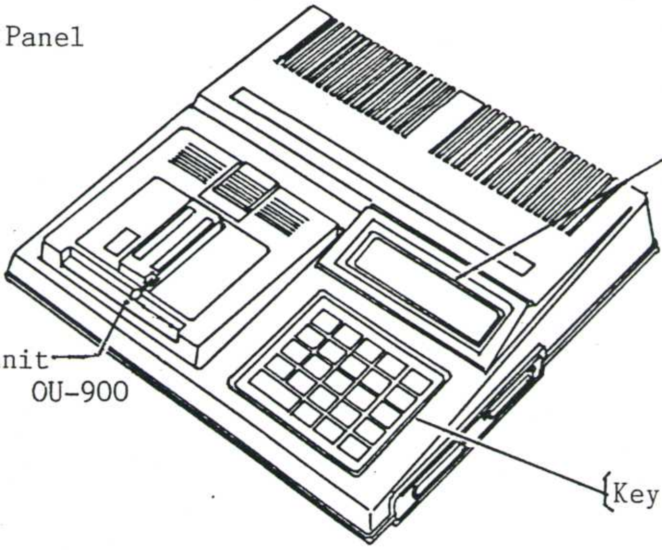
3 PREPARATIONS FOR USE

3.1 Introduction

Various preparations for operating your 1890 are described in this section. Be sure to read, in particular, the paragraphs about power supply (because misuse may cause a damege of the 1890).

3.2 Names of Components

3.2.1 Operation Panel



3.2.2 Key Board

The [EDIT] mark on each key description that the key should be used only in the Edit Mode.

(1) START Key | START |
This key is used to start Copy, Blank, Program, Verify, Continuous and other modes and the various functions.

(2) RESET Key | RESET |
This key is used to stop the each execution or return to the initial mode.

(3) MEMORY INITIALIZE / 0 Key | INT | [EDIT]
This key is used to initialize the buffer memory or inputting 0 (hexadecimal number).

(4) FORMAT / 1 Key | FORMAT | [EDIT]
This key is used to complement the data in buffer memory or inputting 2 (hexadecimal number).

(5) COMPLEMENT / 2 | COMP | [EDIT]
This is for complementing buffer mrmory data or inputting 2 (hexadecimal number).

(6) SEARCH / 3 Key | SER | [EDIT]
This key is used to search for the data in buffer memory or inputting 3 (hexadecimal number).

(7) PAE / 4 Key | PAE | [EDIT]
This key is used to specify the range of memory for each mode execution or inputting 4 (hexadecimal number).

(8) CHANGE / 5 Key | CH | [EDIT]
This is used to change the buffer memory data or inputting 5 (hexadecimal number).

(9) INSERT / 6 Key | INSERT | [EDIT]
This key is used to insert a data into the buffer memory or inputting 6 (hexadecimal number).

(10) DELETE / 7 Key | DEL | [EDIT]
This key is used to delete a data in the buffer memory or inputting 7 (hexiadecimal number).

(11) PROGRAM MODE / 8 Key | PROG |
This key is used to select the program mode or inputting 8 (hexadecimal number).

(12) VERIFY MODE / 9 Key | VER |
This key is used to select the verify mode or inputting 9 (hexadecimal number).

(13) CONTINUOUS MODE / A Key | CONT |
This key is used to select the continuous mode or inputting A (hexadecimal nubmer).

(14) REMOTE MODE / B Key | REM |
This key is used to select the remote mode or inputting B (hexadecimal number).

(15) EDIT MODE / C Key | EDIT |
This key is used to select the edit mode or inputting C (hexadecimal number).

(16) I/O MODE / D Key | I/O |
This key is used to select the I/O mode or inputting D (hexadecimal number).

(17) COPY MODE / E Key | copy |
This key is used to select the copy mode or inputting E (hexadecimal number).

(18) BLANK CHECK Key | BLANK |
This key is used to check the device erase condition or inputting F (hexadecimal number).

(19) DEVICE SELECT Key | DEVICE |
This key is used to program or read automatically a device information.

(20) INCREMENT Key | | | [EDIT]
This key is used to change a displayed data or entry several data.

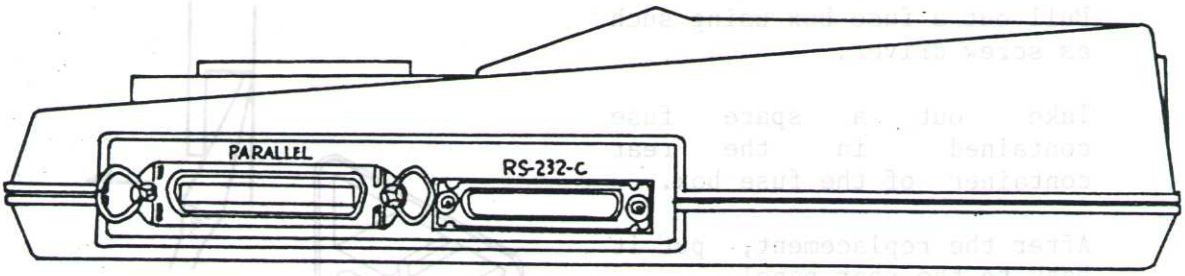
(21) DECREMENT Key | | | [EDIT]
This key is used to change a displayed data or entry several data.

(22) ENTRY Key | ENTRY | [EDIT]
This is used to enter the various operating conditions.

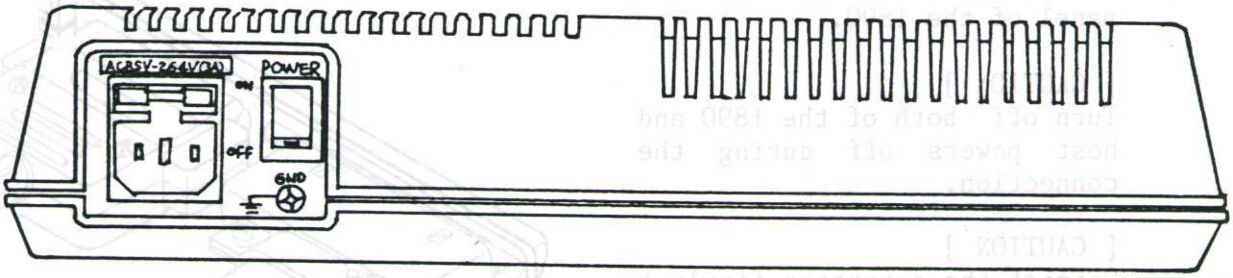
(23) ADDRESS MODE Key | A MODE | [EDIT]
This key is used to select the address mode.

(24) SYSTEM COMMAND Key | S.COM | [EDIT]
This key is used to select the system control command mode.

3.2.3 Side Panel



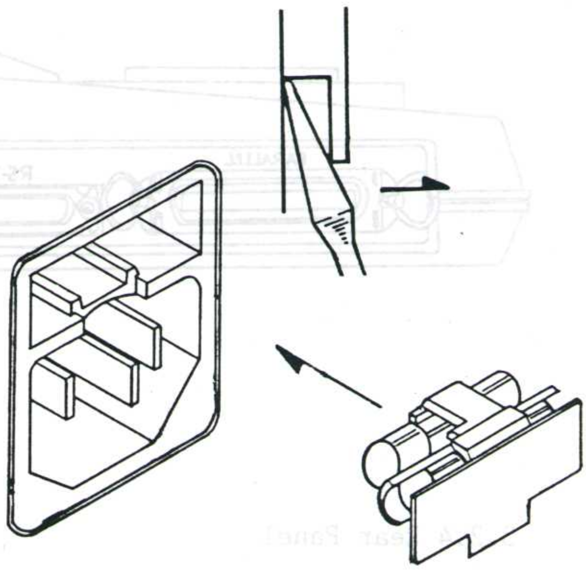
3.2.4 Rear Panel



3.3 Fuse Replacement

[WARNING]
Pull out the power cord before the fuse replacement start.

Pull out a fuse box using such as screw driver.



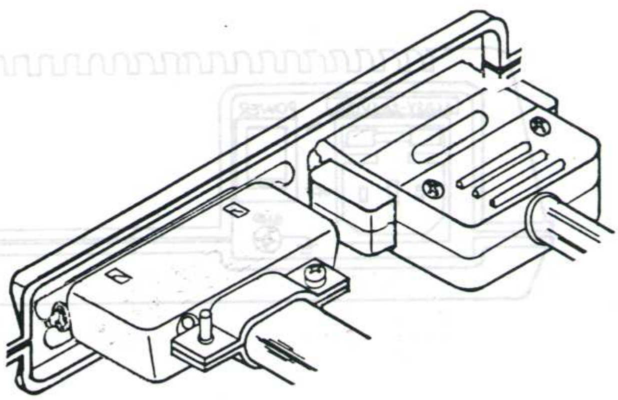
Take out a spare fuse contained in the rear container of the fuse box.

After the replacement, put it back to the rear panel.

[CAUTION]
Use the fuse specified in the 1.3 Specifications.

3.4 Communication Cable Connection

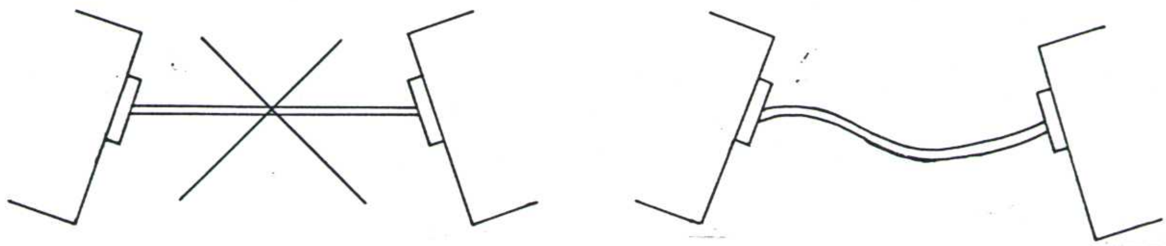
Check the connector type first and connect it to the side panel of the 1890.



[CAUTION]
Turn off both of the 1890 and host powers off during the connection.

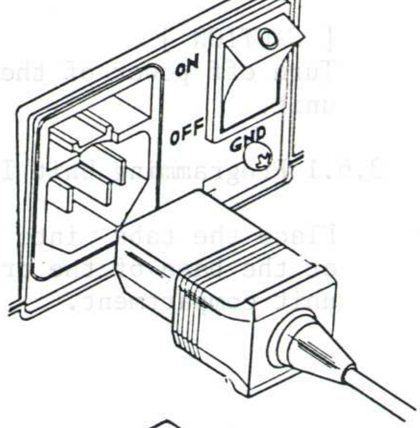
[CAUTION]
Connect the connector firmly to avoid wrong data communication.

[CAUTION]
The cable should always be kept loose.



3.5 Power Cord Connection

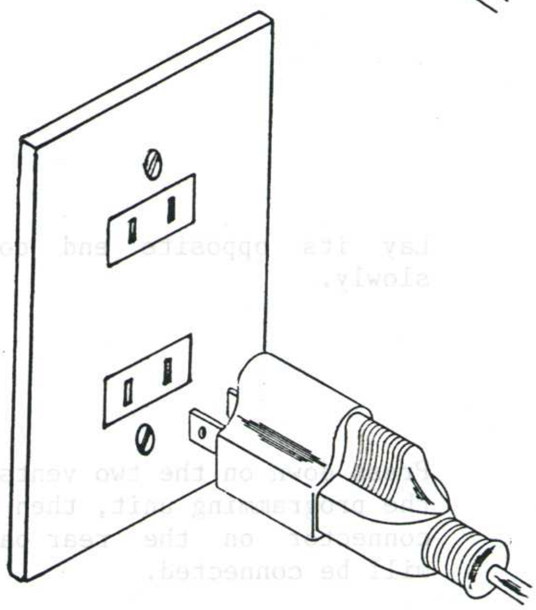
Connect the power cord.



Connect the power cord plug to the commercial line (85-264 VAC).

[CAUTION]
Confirm the line voltage is between 85 to 264 VAC, before connecting the power cord.

[NOTE]
The power supply unit of this instrument integrates an automatic voltage level sending circuit so that the instrument can be used without operating any switch as long as the line voltage is between 85 to 264 VAC.

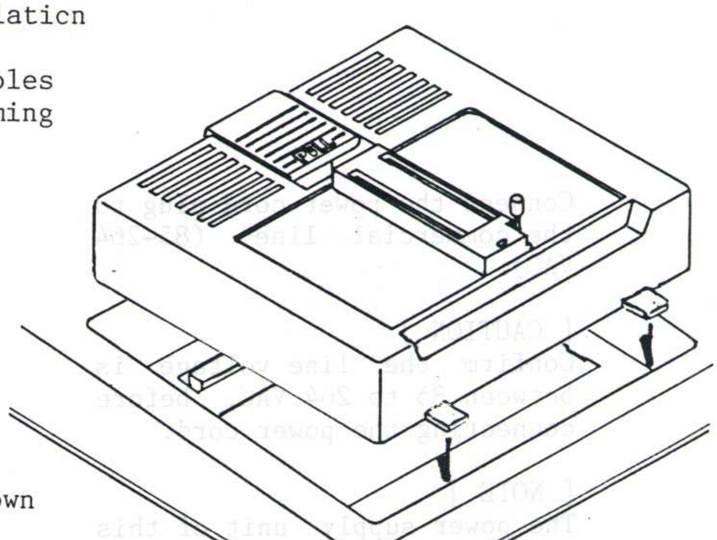


3.6 Programming Unit Installation

[CAUTION]
Turn off power of the 1890 when installing or removing the programming unit.

3.6.1 Programming Unit Installation

Place the tabs into the holes at the base of the programming unit compartment.



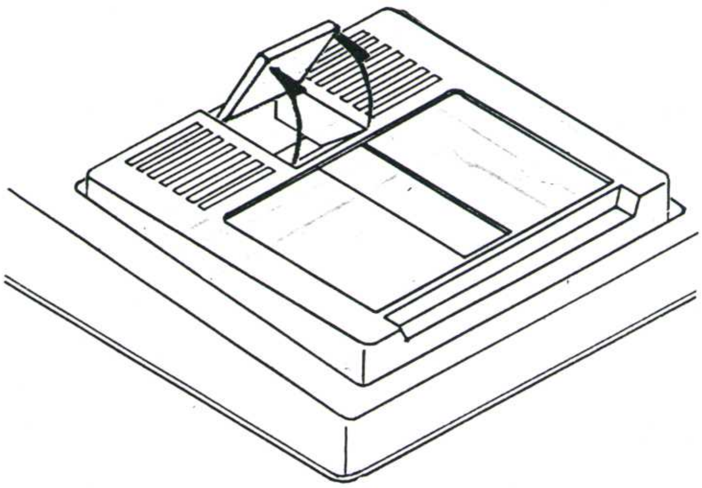
Lay its opposite end down slowly.

Press down on the two vents of the programming unit, then the connector on the rear panel will be connected.

3.6.2 Programming Unit Removal

Pull the lever to remove the unit.

Lift the unit slowly.



3.7 Power On / Off

3.7.1 Power On

[CAUTION]
Do not turn on the power when the device is installed in the socket. The device may be destroyed if the power is turned on when installed.

Turn on the power switch on rear panel. After the power on, the 1890 will execute a self-test mode.

```
SELF CHECK
 MEMORY TEST     1
```

[CAUTION]
If you switch off your programmer and then switch it on again immediately, a random assortment of LCD segments may be displayed. In such a case, switch off the instrument and wait for at least three seconds before switching it on again.

< Self-test mode >

```
SELF CHECK
Analog SW1
```

```
SELF CHECK
Function 1
```

```
SELF CHECK
Driver
```

```
SELF CHECK
Function 2
```

```
SELF CHECK
P.S  CHECK
```

```
MODEL 1890   V1.0
 [ OU900 V 1.0 ]
```

Your 1890 will pass the self-test and execute initial mode (Command Request Mode), when all diagnostic points have passed. The following messages will be displayed during the self-test.

```
EDIT      AM 08081
   2716   cdE110
```

When the programming unit is not installed, the following message will be displayed. In this case, turn off the power and install the programming unit.

```
MODEL 1890 V 1.3
 UNIT NOT READY
```

If an error is found in the buffer memory during the self-test, the following message will be displayed. Consult the place of purchase.

```
SELF TEST
     MEMORY ERROR
```

If an error is found in the power supply module, the following message will be displayed. Consult the place of purchase.

```
SELF TEST
        PS-1 ERROR
```

3.7.2 Power Off

Turn the power switch off.

[CAUTION]
Remove the device before turn off the power.

3.8 Device Installation

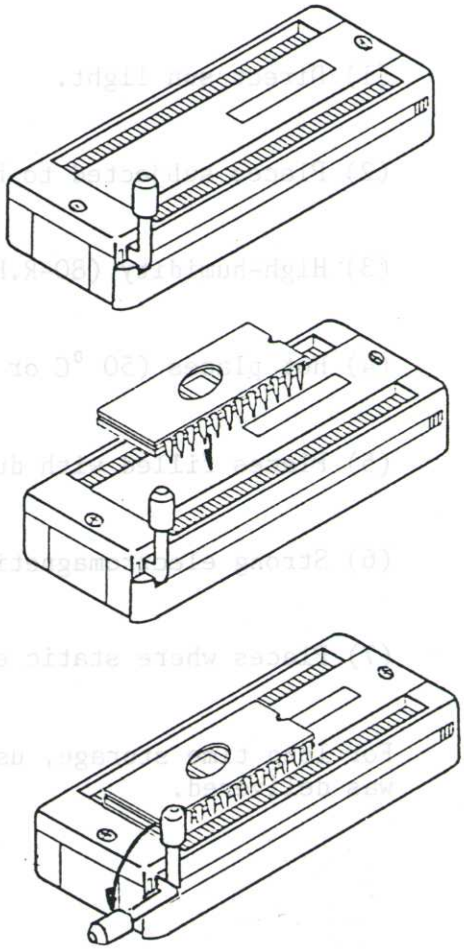
[CAUTION]
Turn on the power of the 1890 and install the device after the self-test mode.

(1) Turn on the power.

(2) Pull the socket lever up.

(3) Place the device in the socket.

(4) Press the lever down.

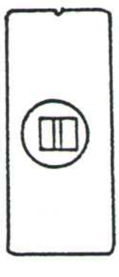


[CAUTION]
Do not place the device upside down.

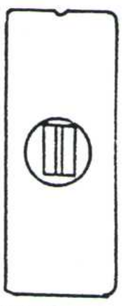
This instrument integrates a device check function so the error message will be displayed and will not execute any read/program to the device. This function protects the device from incorrect operation and installation.

[NOTE]
This function will not execute when the device check mode is turned off.
For more details, refer to 4.6 SYSTEM CONTROL COMMAND.

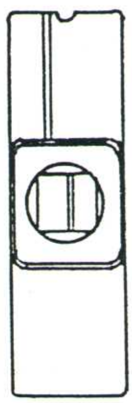
24 Pin



28 Pin



40 Pin



3.9 Storage

3.9.1 Storage

When this instrument is to be stored, avoid the following conditions :

(1) Direct sun light.

(2) Places subjected to heavy vibrations.

(3) High-humidity (80-R.H. or more).

(4) Hot places (50 ^{0}C or over).

(5) Places filled with dust, corrosive gas or salt.

(6) Strong electromagnetic fields.

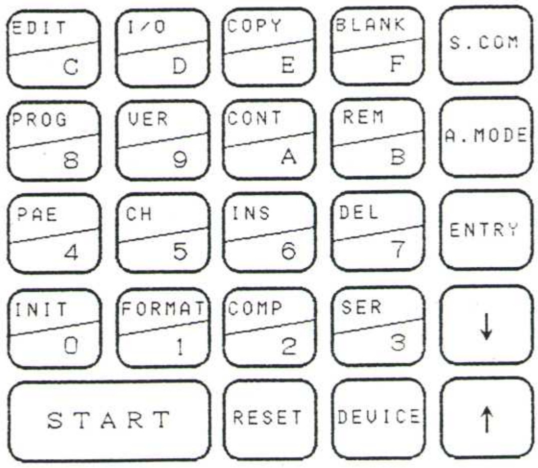
(7) Places where static electricity is likely to be generated.

For long time storage, use the original package used when your 1890 was delivered.

4 OPERATION

4.1 Introduction

This section describes how to use your 1890 properly. Please take time to read this manual carefully so that you can take full advantage of the wide variety of programming functions offered by the 1890.



Operation is mainly categorized into below three modes:

EDIT Mode
I/O Mode
REMOTE Mode

4.2 Edit Mode

This function is used for changing memory data and operating conditions.
In the EDIT Mode the following keys are used :

PAE	:	Address area set
CH	:	Data change
INS	:	Data insertion
DEL	:	Data deletion
INIT	:	Buffer memory initialization
FORMAT	:	Communication data format set
COMP	:	Data complement
SER	:	Data search

In the EDIT Mode, input an address in five digits and data in two digits.
If six digits are inputted for an address, the last five of them is entered and first one digit is ignored.
If three digits are inputted for a data, the last two of them is entered and first one digit is ignored.

The 1890 accepts up to the last address selected in the DEVICE mode. If the input address is exceed the device address capacity, the exceeded digits are ignored.

[Example]

Device address capacity	3 F F F F	
inputted	4 0 0 0 0	4 is ignored
entered	0 0 0 0 0	

Be careful not to input the exceeded addresses range.

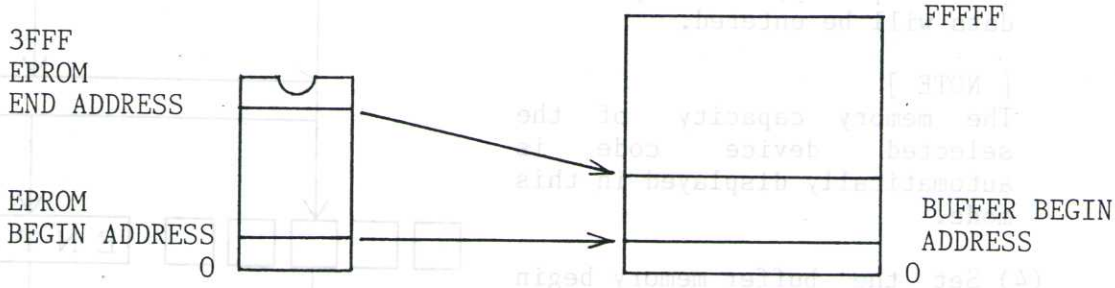
4.2.1 PAE : Address Area Set

The address range for program, copy, change, and other functions are set by this key.

These three parameters are set in this mode:

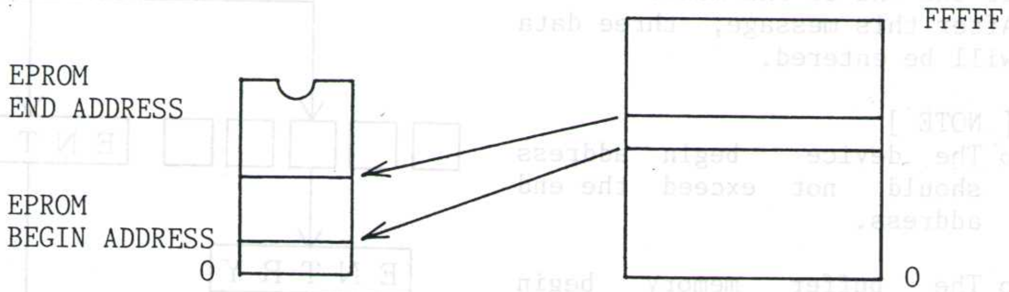
- o Read / program begin address.
- o Read / program end address.
- o Built-in buffer memory start address.

o Read



If the address area of the device exceeds the remaining area of the buffer memory, error message will be displayed in COPY, VERIFY or PROG mode.

o Program



[NOTE]
Input 5 digits in the address input.
(Input 0005F when input address is 5F.)

(1) Press the | PAE | key.

(2) Input the device begin address.
If the | ENTRY | or | ↑ | key is pressed after pressing the | PAE | key, the previous data will be entered.

(3) Input the device end address.
If the | ENTRY | or | ↑ | key is pressed after pressing the | ENTRY | key, the previous data will be entered.

[NOTE]
The memory capacity of the selected device code is automatically displayed in this mode.

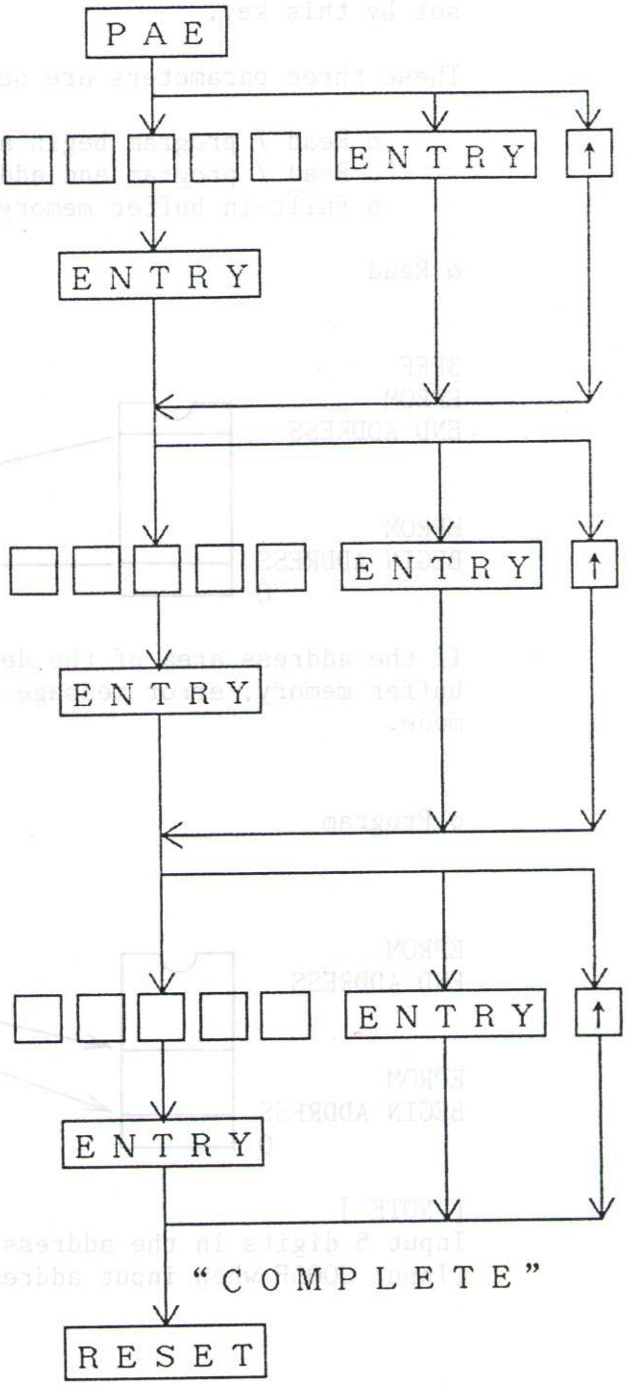
(4) Set the buffer memory begin address.
If the | ENTRY | or | ↑ | key is pressed after pressing the | ENTRY | key, the previous data will be entered.

(5) "COMPLETE" will be displayed at the end of PAE mode.
After this message, three data will be entered.

[NOTE]
o The device begin address should not exceed the end address.

o The buffer memory begin address should not exceed the end address.

o Confirm the buffer memory has enough free memory capacity before accessing the device in such as copy and program and other modes.



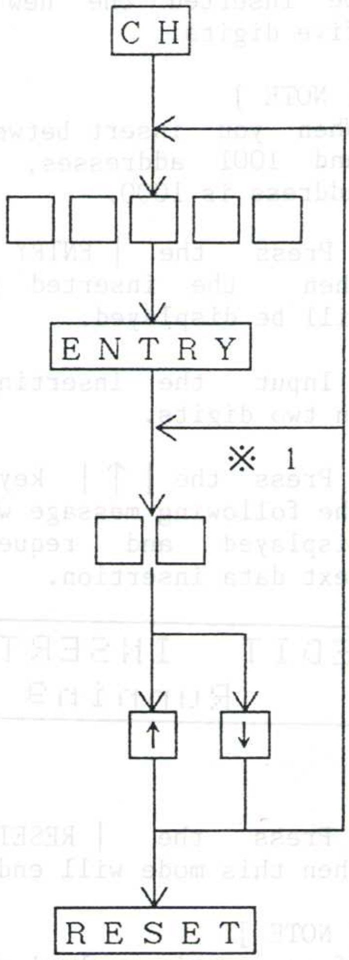
☐ is a numeric key.

4.2.2 CH : Data Change

The data in the buffer memory can be changed or inputted.

(1) Press the | CH | key.
Address 0 and its data will be displayed.

```
EDIT  CHENGE
      00000 FF FF
```



(2) Input address in five digits.

If you skip the address input 0 will be entered.

(3) Press the | ENTRY | key, then new address will be entered and displayed.

(4) Input new data in two digits.

(5) Press the | ↑ | or | ↓ | key to enter the data.

When the | ↑ | key is pressed next address will be displayed for next input.
When the | ↓ | key is pressed previous address will be displayed.

(6) Press the | RESET | key, then this mode will end.

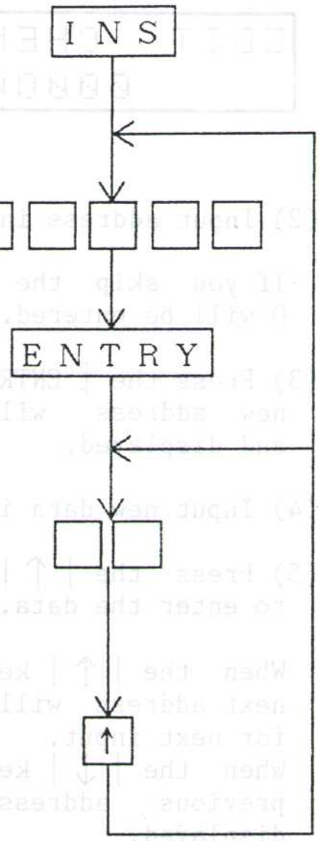
[NOTE] *1
When the | ENTRY | key is pressed, the input data is accepted as address, and the | ↑ | or | ↓ | key is pressed, the input data is accepted as data.

To change the address by one step use the | ↑ | key or the | ↓ | key and repeat the procedure from (4).

4.2.3 INS : Data Insertion

New data can be inserted into the stored data in buffer memory. Each data element position the following inserted address is incremented by one.

(1) Press the | INS | key.



(2) Input address which are to be inserted the new data in[1] five digits.

[NOTE]
When you insert between 1000 and 1001 addresses, input address is 1000.

(3) Press the | ENTRY | key, then the inserted address will be displayed.

(4) Input the inserting data in two digits.

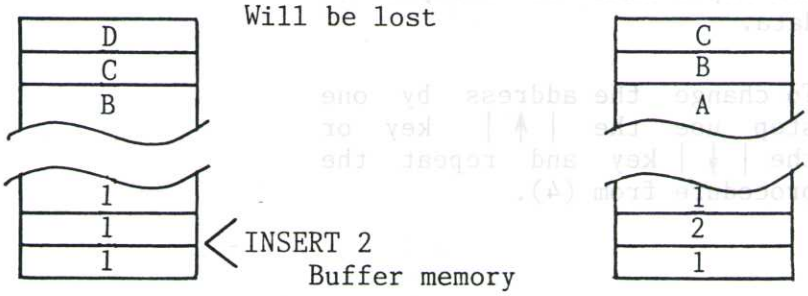
(5) Press the | ↑ | key, then the following message will be displayed and requested a next data insertion.

```
EDIT   INSERT
     Running
```

(6) Press the | RESET | key, then this mode will end.

[NOTE]
If you continuously insert new data, repeat the procedure from (4).

[CAUTION]
After each insertion, the last data in the buffer memory will be lost.



4.2.4 DEL : Data Deletion

The data in the buffer memory can be deleted.

(1) Press the | DEL | key, then the following message will be displayed.

```
EDIT    DELETE
     00000  00000
```

(2) Input deletion begin address in five digits.

(3) Press the | ENTRY | key.

(4) Input deletion end address in five digits.

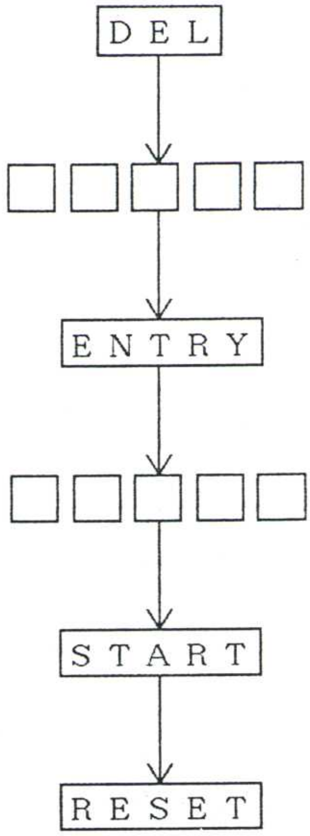
(5) Press the | START | key, then the following message will be displayed and the deletion will be started.

```
EDIT    DELETE
        Running
```

The following message is displayed when the deletion is finished.

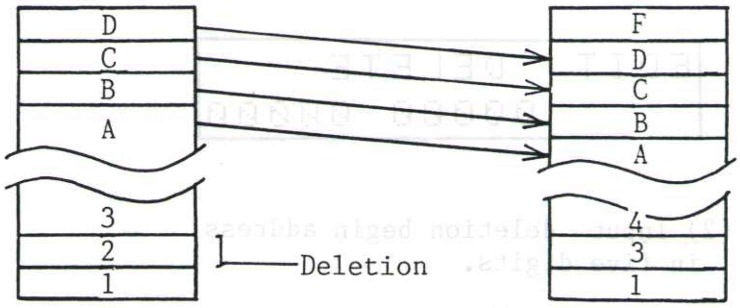
```
EDIT    DELETE
        COMPLETE
```

[NOTE]
The error message will be displayed, if the input data is not correct.



(6) Press the | RESET | key, then this mode will end.

[NOTE]
After deletion, device blank data (0 or F) will be programmed to new empty are in the latter part of buffer memory.

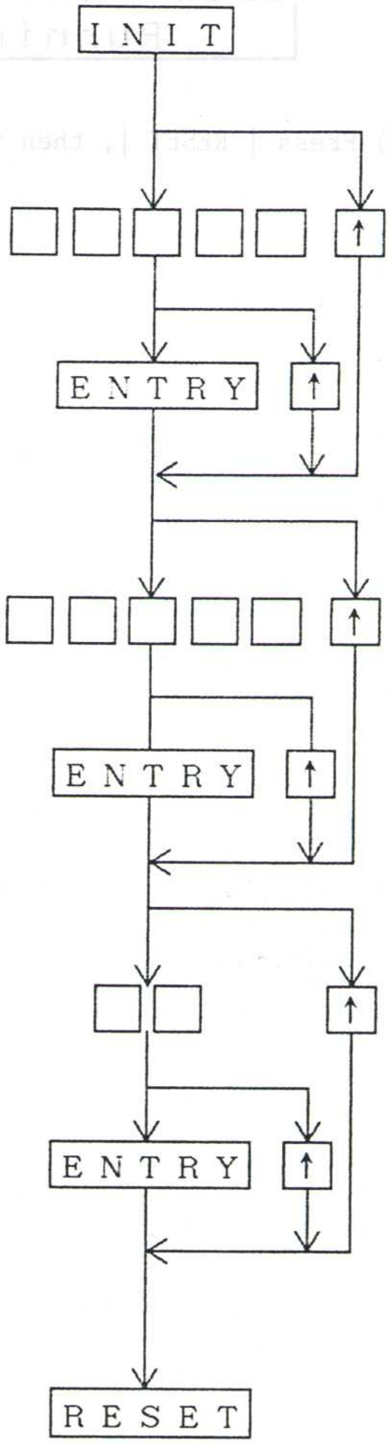


4.2.5 INIT : Buffer Memory Initialization

The same data can be programmed in all addresses are specified.

(1) Press the | INIT | key, then the following message will be displayed.

```
EDIT   INITIALIZE
BEGIN ADD   00000
```



(2) Input initialization begin address in five digits.
[NOTE]
When the | ↑ | key is pressed before inputting the address, the address data being displayed will be inputted.
This case, skip to (4).

(3) Press the | ENTRY | key.

(4) Input initialization end address in five digits.
[NOTE]
When the | ↑ | key is pressed before inputting the address, the address data being displayed will be entered.
In this case, skip to (6).

[NOTE]
The default data of address is the last address of the buffer memory.

(5) Press the | ENTRY | key.

(6) Input initializing data in two digits.
When the | ↑ | key is pressed before inputting the data, the data being displayed will be entered.
[NOTE]
The default data of initialization is FF.

(7) Press the | ENTRY | key, then the following message will be displayed and initialization will begin.

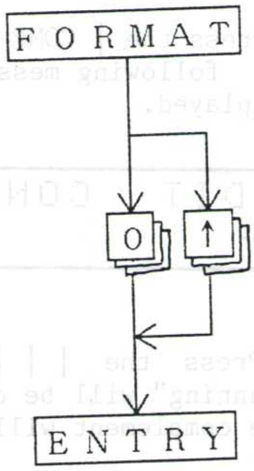
```
EDIT  INITIALIZE
   Running
```

(8) Press | RESET |, then this mode will end.

4.2.6 FORMAT : Communication Data Format Setting

Interfacing data format and communication conditions can be programmed in this mode.
Several conditions are selected by the | ↑ | key or numeral key.

(1) Press the | FORMAT | key, then the data format previously set will be displayed.




```
EDIT      FORMAT
 0   MINATO HEX
```

(2) Input the format number or select the condition by the | ↑ | key.

(3) Press the | ENTRY | key, then "COMPLETE" will be displayed.

(4) Press the | RESET | key, then this mode will end.

[NOTE]
The standard 1890 does not have format data in D, E, F register, so error message will be displayed when you select the D, E, or F.

Data Format Types

No.	DATA FORMAT
0	MINATO
1	INTEL HEX
2	HP 64000 ABS
3	BINARY
4	MOTOROLA
5	ASC II OCT
6	ASC II HEX
7	TEKTRONIX

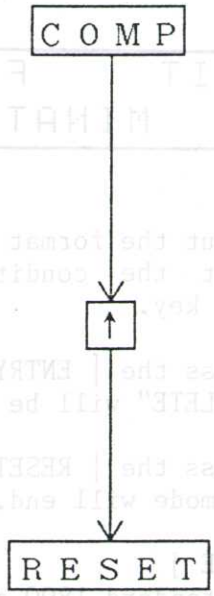
No.	DATA FORMAT
8	TEKTRONIX
9	TEXAS SDS-MAX
A	BNPF
B	BHLF
C	NO FORMAT
D	XXXX
E	XXXX
F	XXXX

4.2.7 COMP : Data Complement

The bits of the data already stored in the buffer memory can be complemented. (0 to 1, 1 to 0).
[NOTE]
In this mode, the address range can not be specified. So the whole buffer memory is complemented.

(1) Press the | COMP | key, then the following message will be displayed.

```
EDIT   CONPLEMENT
           PUSH ^
```



(2) Press the | | | key, then "Running" will be displayed and the complement will be started.

"COMPLETE" will be displayed when finished.

(3) Press the | RESET | key, then this mode will end.

4.2.8 SER : Data Search

The particular data row (4 bytes) in the buffer memory can be searched for and its address displayed.

(1) Press the | SER | key, then the following message will be displayed.

```
EDIT   SEARCH
BEGIN  ADD   00000
```

(2) Input search begin address in five digits.

(3) Press the | ENTRY | key to enter the begin address.

(4) Input the search end address in five digits.

(5) Press the | ENTRY | key to enter the end address.

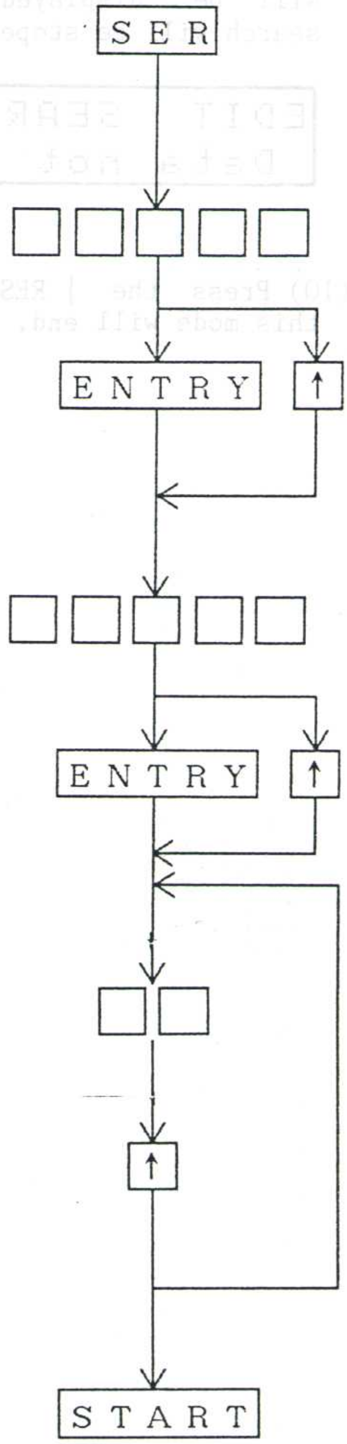
(6) Input search data in two digits each. Press the | ↑ | key to enter each two digits data.

(7) Press the | START | key, then the following message will be displayed and search started.

```
EDIT   SEARCH
      Running
```

(8) When the set data row is found, the following message will be displayed and the serch will be stoped.

```
EDIT   SEARCH
             0009B
```



If the | START | key is pressed again, search will be continued from the next address.

(9) When the set data row is not found, the following message will be displayed and the search will be stoped.

```
EDIT    SEARCH
 Data not found
```

(10) Press the | RESET |, then this mode will end.

4.3 I/O Mode

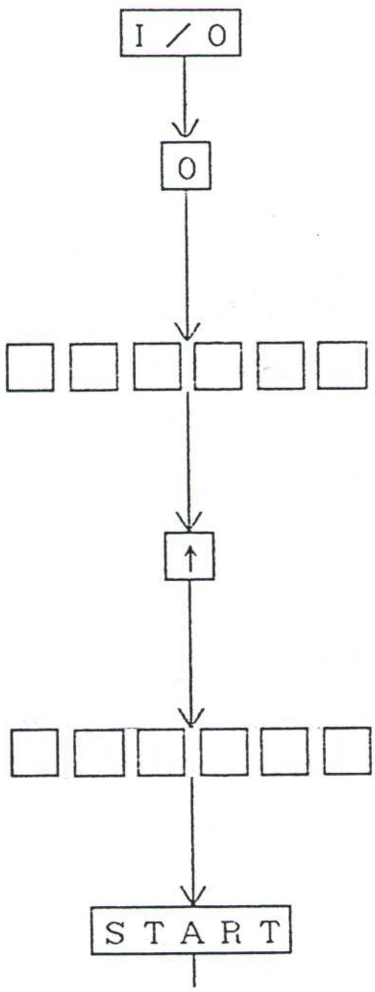
Interface conditions for communication between the 1890 and a personal computer or other host instruments.

No.	Interface
0	Data In by RS232C.
1	Data Out by RS232C.
2	Data In by Centronics.
3	Data Out by Centronics.
4	
5	
6	
7	Interface Condition Program.

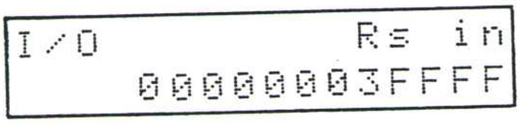
[NOTE]
When sending or receiving the data from begin address to end address, the both data in begin address and in end address are included.

4.3.1 RS232C Input

In this mode, data are inputted through the RS232C.



(1) Press the | I/O | key, then the following message will be displayed.



(2) Input the begin address in six digits.
The received data are stored in the communication buffer memory once and stored.

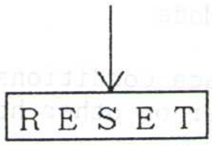
(3) Press the | ↑ | key to enter it.

(4) Input the end address in six digits.

(5) Press the | START | key to open the interface.

During the data receive, "DATA IN" will be displayed. When the receive ends, "COMPLETE" will be displayed.

(6) Press the | RESET | key,
then this mode will end.

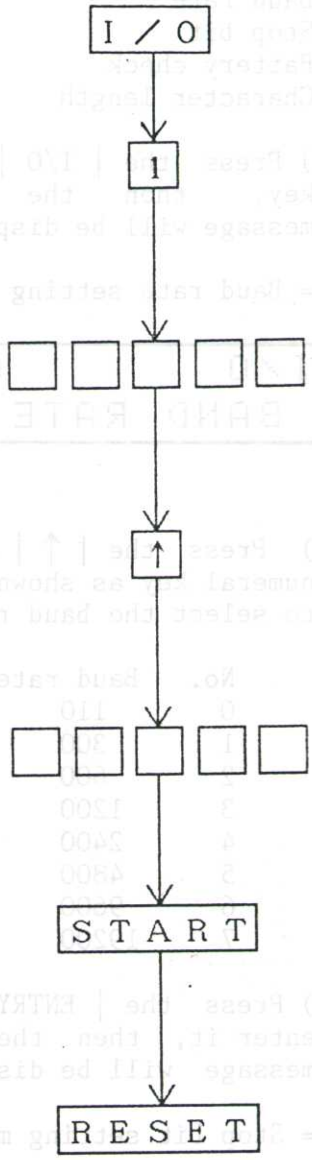


4.3.2 RS232C Output

In this mode, data can be received through the RS232C.

(1) Press the | I/O | key, then the following message will be displayed.

```
I/O            Rs in
      00000 3FFFF
```



(2) Input the begin address in five digits.
The data in specified buffer memory area are transfered.

(3) Press the | ↑ | key to enter it.

(4) Input the end address in five digits.

(5) Press the | START | key to send the data.

(6) During the transfer, "DATA OUT" will be displayed. When the transfer ends, "COMPLETE" will be displayed.

(7) Press the | RESET | key, then this mode will end.

4.3.3 Communication Conditions Set

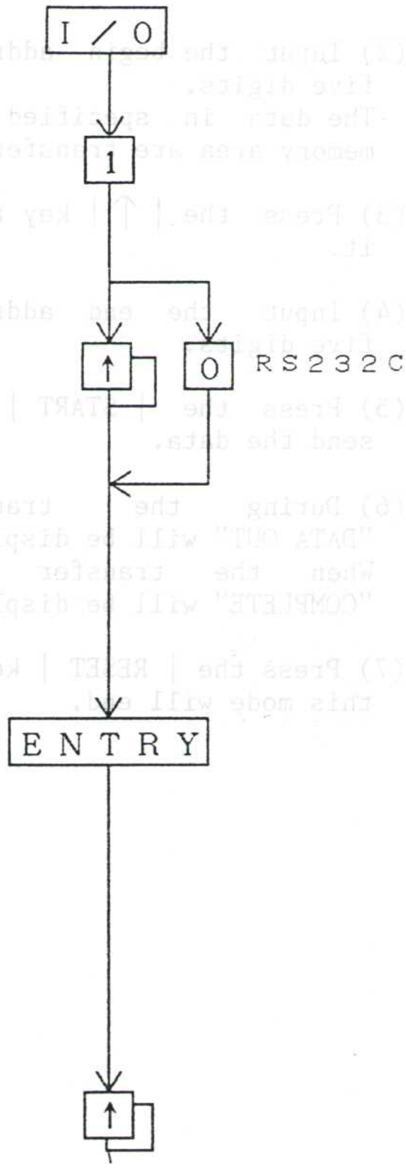
The following communication conditions are set :

RS232C	Centronics
Baud rate	Presence/absence of echo back.
Stop bit	xON/xOFF.
Battery check	CR
Character length	

(1) Press the | I/O | and | 7 | key, then the following message will be displayed.

= Baud rate setting mode =

```
I/O           CONFIG
 BAND RATE       300
```



(2) Press the | ↑ | key or any numeral key as shown in below to select the baud rate.

No.	Baud rate
0	110
1	300
2	600
3	1200
4	2400
5	4800
6	9600
7	19200

(3) Press the | ENTRY | key to enter it, then the following message will be displayed.

= Stop bit setting mode =

```
I/O           CONFIG
 STOP BIT          1
```

(4) Press the | ↑ | key to select the number of stop bits. Chose from 1, 1.5, or 2 charactors.

(5) Press the | ENTRY | key to enter it, then the following message will be displayed.

= Parity bit setting mode =

```
I/O          CONFIG
 PARITY        EVEN
```

(6) Press the | ↑ | key to select one of these parity bit :

even-number parity
odd-number parity
no-parity

(7) Press the | ENTRY | key to enter it, then the following message will be displayed.

=Character length setting mode=

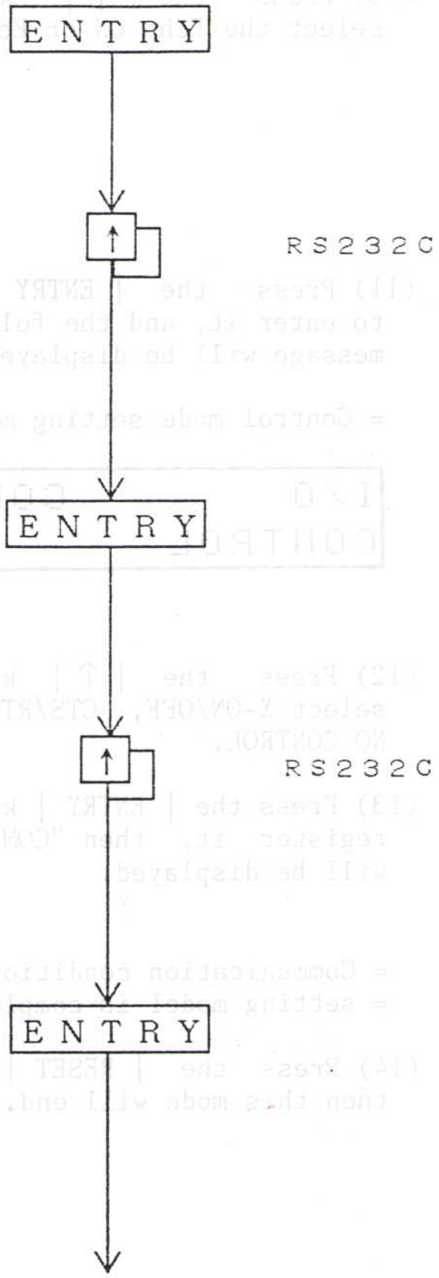
```
I/O          CONFIG
CHARACTER         7
```

(8) Press the | ↑ | key to select one of these character lengths:
7 or 8.

(9) Press the | ENTRY | key to enter it, then the following message will be displayed.

= Echo condition setting mode =

```
I/O          CONFIG
ECHO            ON
```



(10) Press the | ↑ | key to select the Echo ON or Eco OFF.

(11) Press the | ENTRY | key to enter it, and the following message will be displayed.

= Control mode setting mode =

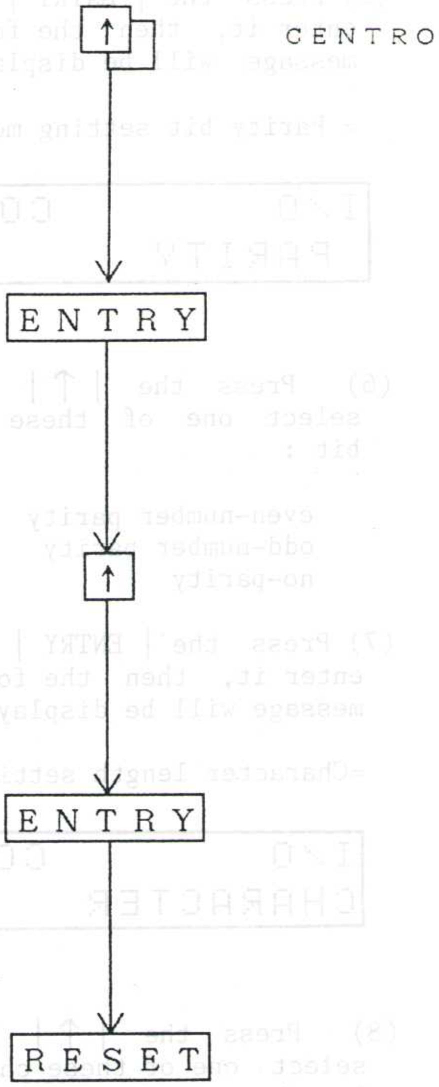
```
I/O          CONFIG
CONTROL         CTS
```

(12) Press the | ↑ | key to select X-ON/OFF, CTS/RTS, or NO CONTROL.

(13) Press the | ENTRY | key to register it, then "COMPLETE" will be displayed.

= Communication condition =
= setting model is completed =

(14) Press the | RESET | key, then this mode will end.



4.4 Device Code Entry

The device information for programming can be entered in this mode. Device information can be entered by any of these three methods :

1. Direct input of the device code.
2. Selecting a device code from the 1890 menu display.
3. Device code entry by the silicon signature function.

[CAUTION]
The Device address range and the buffer memory address range are initialized as shown in below when the device select is executed.

Device address range - - - - From 0 to device last address
Buffer memory begin address - 0 address
Address mode - - - - - - - - - Normal

4.4.1 Device Code Input

The device code (refer to the 4.8.2 Programmable Device List) can be programmed from the keyboard.

(1) Press the | DEVICE | key, then the following message will be displayed.

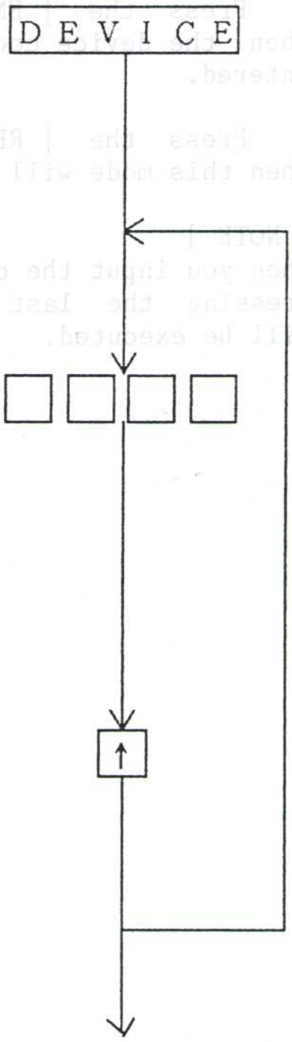
```
    2716    cdE110
Vpp=25.00V   50ms
```

Selected device now

(2) Input a device code number in four digits according to the device code table, then the following message will be displayed.

```
KEY IN -->cd/028
```

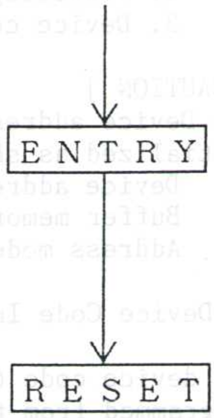
(3) Press the | ↑ | key, then the device information corresponding to the device code will be displayed.



```
MBM_1028   cdE740
Vpp=12.50V   .5ms
```

When the corresponding device code is not found, the error message will be displayed. In this case, input the correct code number.

```
KEY IN -->cd1111
*CODE UNDEFINE *
```



(4) Press the | ENTRY | key, then the device code will be entered.

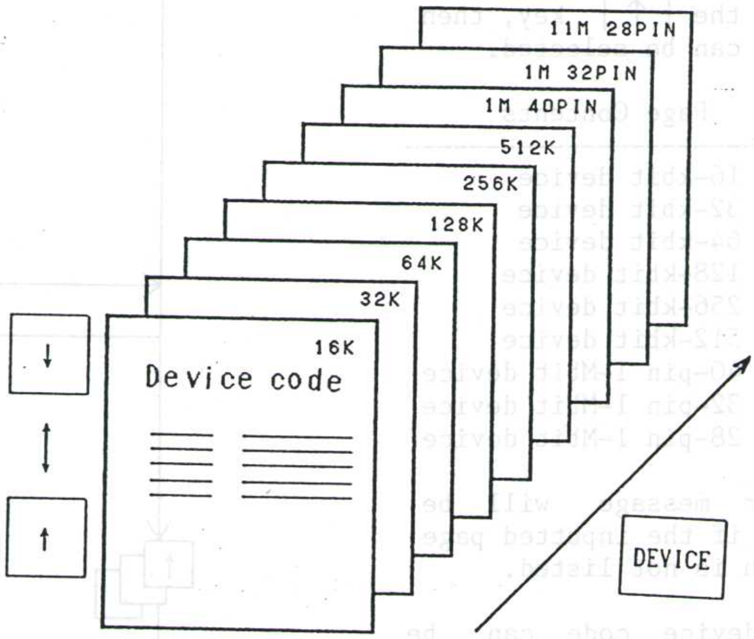
(5) Press the | RESET | key, then this mode will end.

[NOTE]
When you input the code number 0000 and press the | ENTRY | key after pressing the last digit, automatic registration by silicon signature will be executed.

4.4.2 Device Code Display and Entry

The 1890 has a built-in device code memory, which is divided by device memory capacity (called page classification) and each memory capacity page contents various devices according to its manufacturers (this subdivision is called line classification).

Each page is changed by the | DEVICE | key and each line is change by the | ↑ | or | ↓ | key.



(1) Press the | DEVICE | key, then the previously set device code will be displayed.

```
    2716   cdE110
VPP=25.00V  50ms
```

(2) The each page can be changed and the first device code and its device information on the each page will be displayed by pressing the | DEVICE | key.

Or input the page code listed on below table in four digits and press the | ↑ | key, then each page can be selected.

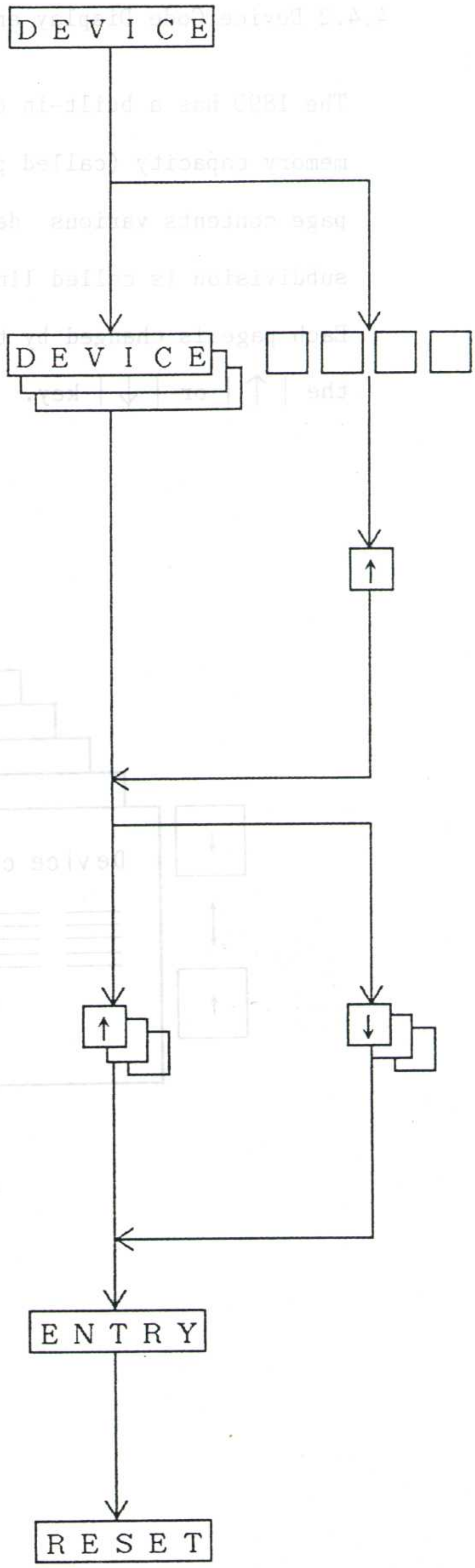
Page Code	Page Contents
0016	16-kbit device
0032	32-kbit device
0064	64-kbit device
0128	128-kbit device
0256	256-kbit device
0512	512-kbit device
1024	40-pin 1-Mbit device
1000	32-pin 1-Mbit device
1028	28-pin 1-Mbit device

The error message will be displayed if the inputted page code which is not listed.

(3) Each device code can be changed and its information will be displayed by pressing the | ↑ | key.

(4) Press the | ENTRY | key, then this code will be entered.

(5) Press the | RESET | key, then this mode will end.



4.4.3 Silicon Signature Input

The device information (signature) is integrated in a device can be read and its device code will be entered automatically.

(1) Insert the device in the socket.

(2) Press the | DEVICE | key, then the following message will be displayed.

```
   27256    cdE510
Vpp=12.50v 1.0ms
```

Selected device

(3) Press the | ENTRY | key, then the device signature will be read and its code will be displayed.

When no device is inserted in the socket, or when the device code corresponding to the inserted device is not memorized, the following message will be displayed. When this display appears, refer to the 4.4.1 Device Code Input or 4.4.2 Device Code Display and Entry.

```
KEY IN -->cd0000
*CODE UNDEFINE *
```

4.5 Device Access Mode

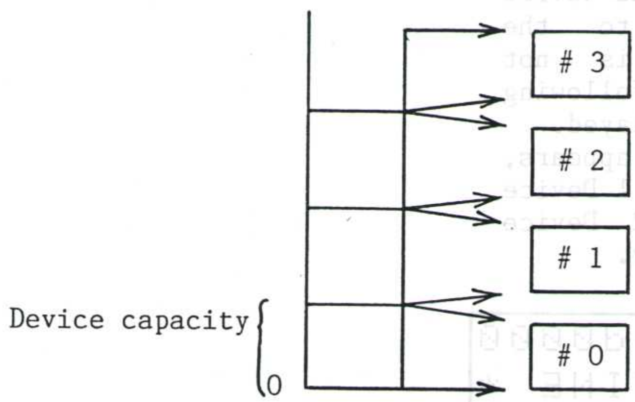
Several operating information for device access modes are described.

[NOTE]
If you use the EE-ROM, refer to 4.5.8 ERASE.

4.5.1 Block

The address range can be set by the | PAE | key. but if you program the data into some devices continuously, this function will be very useful.

[NOTE]
The address in the memory is usually managed by the address area set by the | PAE | key, but in this mode the memory is managed by the block number.



Buffer memory

The buffer memory is divided by the capacity of the device selected.
The seven divided address area is allocated to each block.
Use each block number to program into the device in this mode.
Refer to 4.5.3 COPY for key operations.

[NOTE]
When the BLOCK Mode is selected, the address range specified by PAE is ignored.

4.5.2 Address Mode

The buffer memory of the 1890 is internally managed in 8 bits, but the addresses can be handled as if in 16 bits or 32 bits so that 16 bits and 32 bits data can be handled easily.

AM08 08 0

Device data size

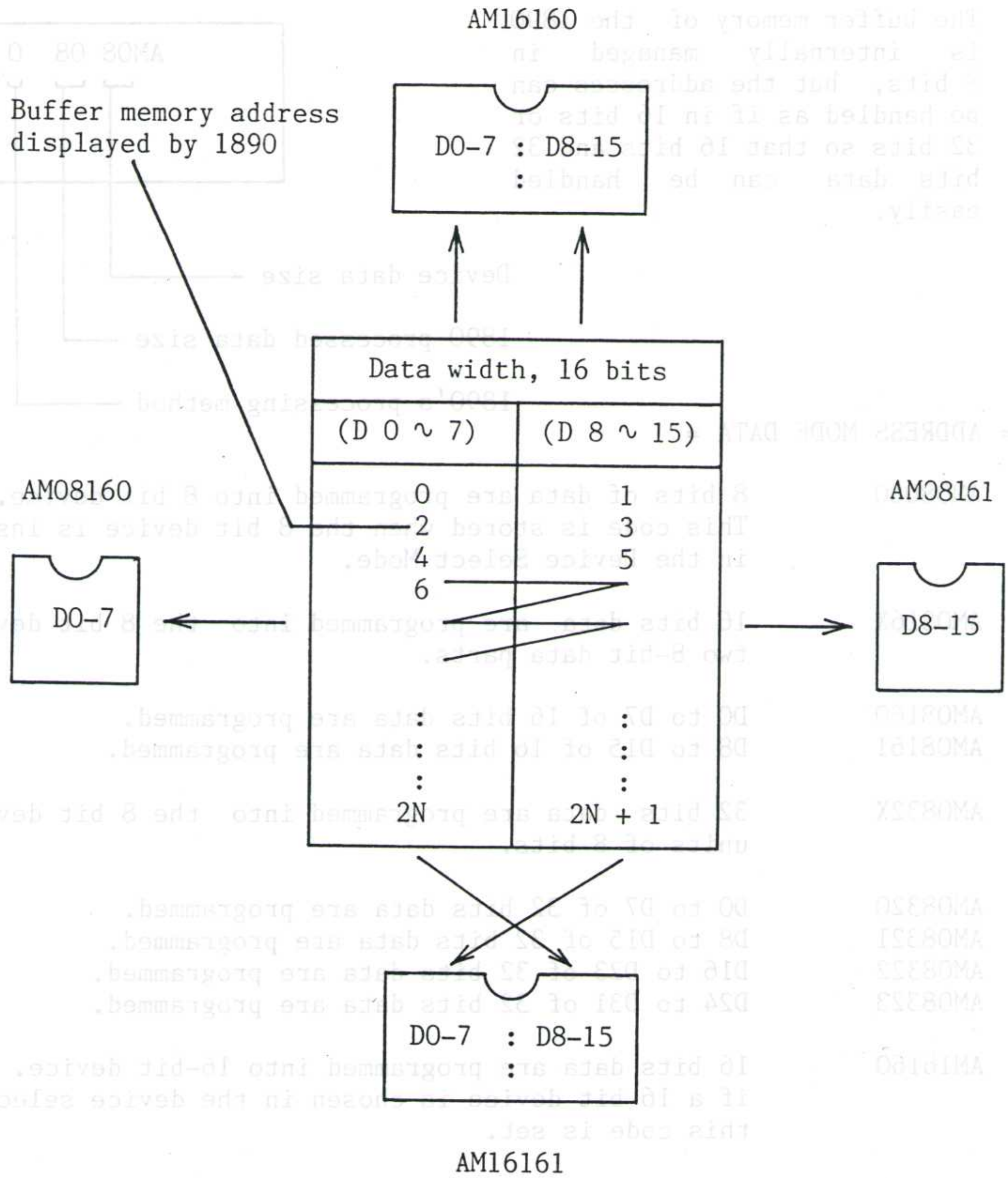
1890-processed data size

1890's processing method

= ADDRESS MODE DATA =

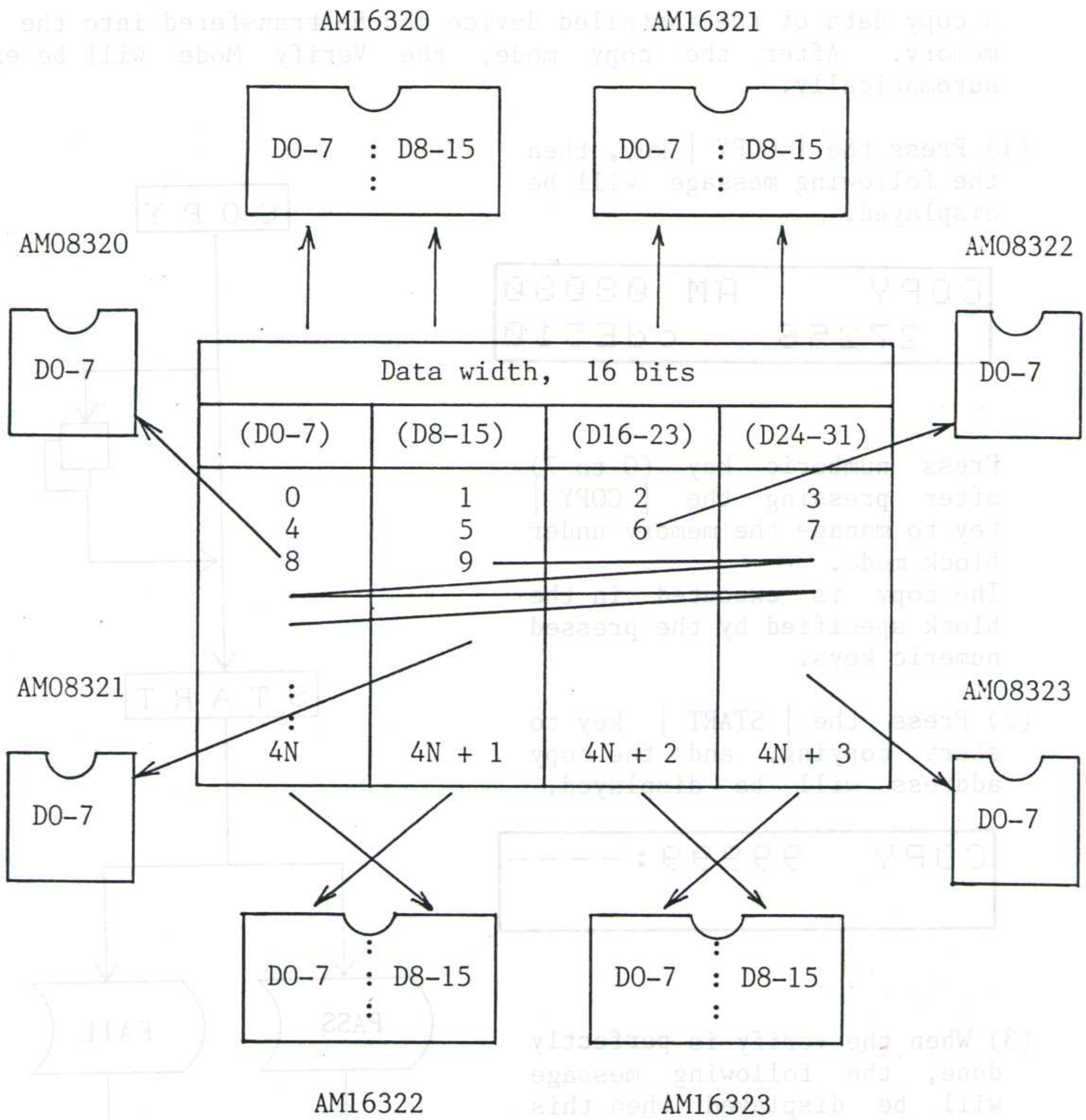
AM08080	8 bits of data are programmed into 8 bit device. This code is stored when the 8 bit device is installed in the Device Select Mode.
AM0816X	16 bits data are programmed into the 8 bit device as two 8-bit data parts.
AM08160	D0 to D7 of 16 bits data are programmed.
AM08161	D8 to D15 of 16 bits data are programmed.
AM0832X	32 bits data are programmed into the 8 bit device in units of 8 bits.
AM08320	D0 to D7 of 32 bits data are programmed.
AM08321	D8 to D15 of 32 bits data are programmed.
AM08322	D16 to D23 of 32 bits data are programmed.
AM08323	D24 to D31 of 32 bits data are programmed.
AM16160	16 bits data are programmed into 16-bit device. if a 16 bit device is chosen in the device select mode this code is set.
AM16161	When 16 bits data are programmed into 16 bit device, D1 to D7 and D8 to D15 are swapped.
AM1632X	32 bits data are programmed into 16 bit device in units of 16 bits.
AM16320	D0 to D15 of 32 bits data are programmed.
AM16321	D16 to D31 of 32 bits data are programmed.
AM16322	D0 to D7 and D8 to D15 in D0 to D15 of 32 bits data are swapped.
AM16323	D16 to D23 and D16 to D24 in D16 to D32 of 32 bits data are swapped.

16-bit DATA



AM16160
Buffer memory address displayed by 1890
D0-7 : D8-15
Data width, 16 bits
(D 0 ∿ 7)
(D 8 ∿ 15)
AM08160
AM08161
0
1
2
3
4
5
6
D0-7
D8-15
2N
2N + 1
D0-7 : D8-15
AM16161

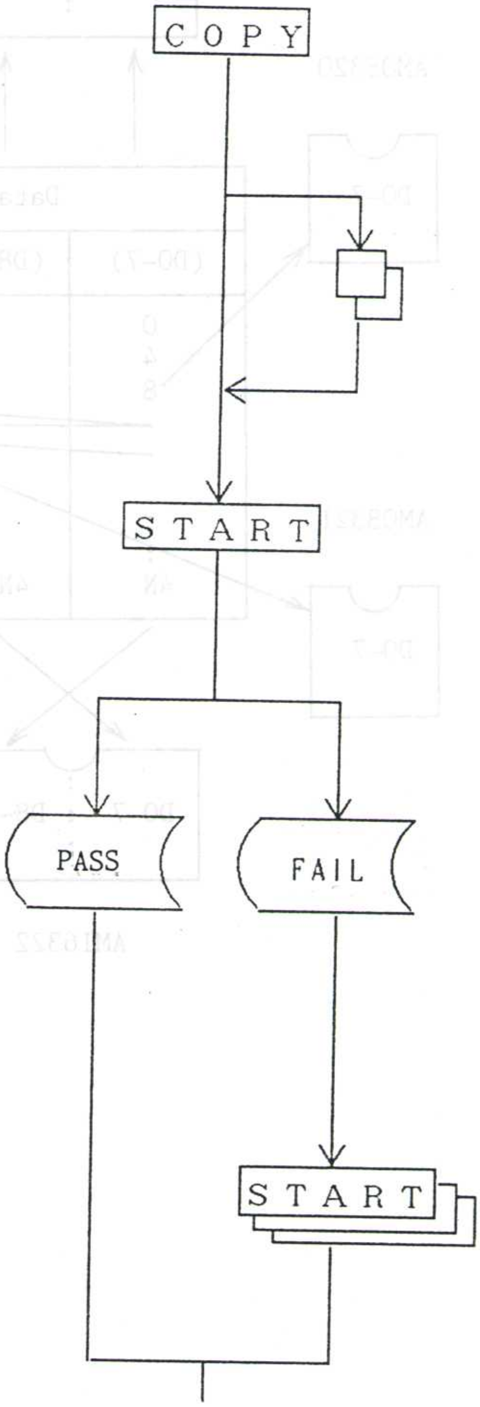
32-bit DATA



AM16320
AM16321
D0-7 : D8-15
D0-7 : D8-15
AM08320
AM08322
D0-7
D0-7
Data width, 16 bits
(D0-7)
(D8-15)
(D16-23)
(D24-31)
0
1
2
3
4
5
6
7
8
9
AM08321
AM08323
4N
4N + 1
4N + 2
4N + 3
D0-7
D0-7
D0-7 : D8-15
D0-7 : D8-15
AM16322
AM16323

4.5.3 Copy

A copy data of the installed device can be transfered into the buffer memory. After the copy mode, the Verify Mode will be executed automatically.



(1) Press the | COPY | key, then the following message will be displayed.

```
COPY        AM 08080
  27256    cdE510
```

Press numberic key (0 to 7) after pressing the | COPY | key to manage the memory under block mode.
The copy is executed in the block specified by the pressed numeric keys.

(2) Press the | START | key to start copying, and the copy address will be displayed.

```
COPY   99999:----
```

(3) When the verify is perfectly done, the following message will be displayed when this mode finished.

```
COPY SUM:36A7 83
****   PASS   ****
```

If any error is found, the device address, device data, buffer memory address, buffer memory data and "FAIL" will be displayed.

Press the | START | key, then the VERIFY will be re-executed from the next address.

[NOTE]
Once "FAIL" is displayed, it will remain on the display until | RESET | key is pressed.

(4) Press the | RESET | key, then this mode will back to the initial mode.

4.5.4 Blank Check

This mode is prepared to check the device is completely erased.
(Erased in the memory range set by PAE).

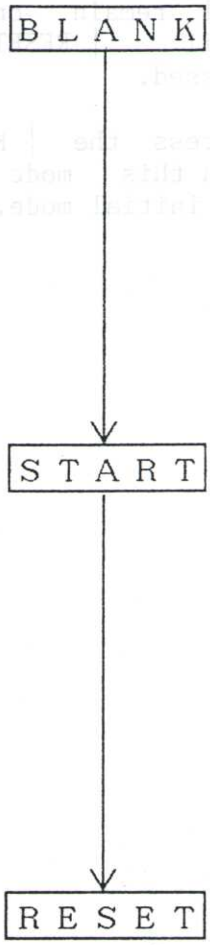
(1) Press the | BLANK | key, then the following message will be displayed and executed the blank check.

```
BLANK     AM 08080
  2732A    cdE211
```

(2) Press the | START | key to begin the blank check.
If the erase is not perfect the blank check will stop at the unerased address and the following message will be displayed.

```
BLANK 00000:02
*FAIL*
```

(3) Press the | RESET | key, then this mode will end.



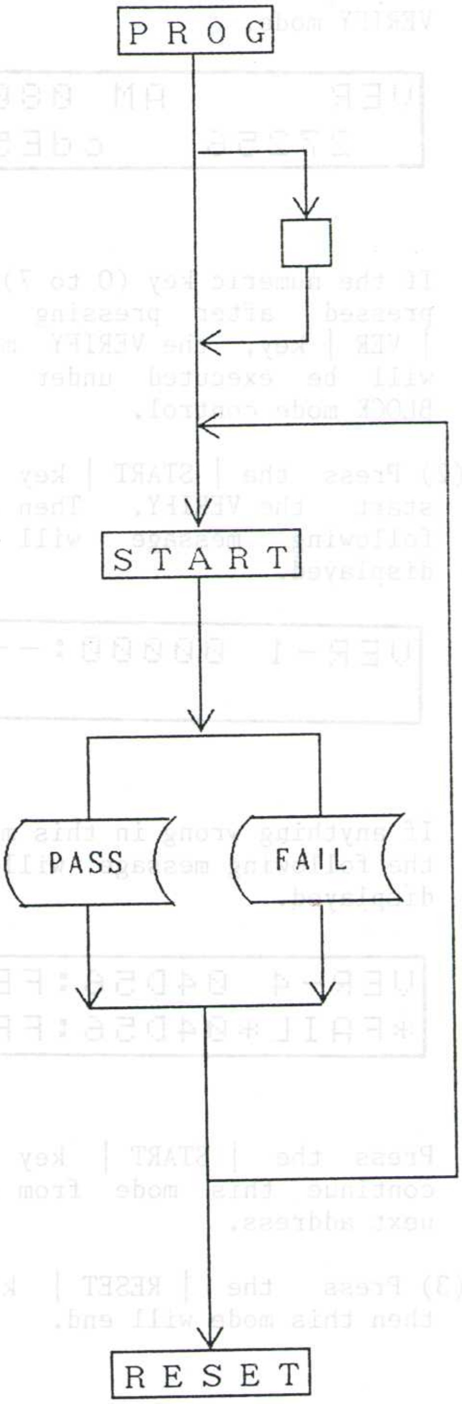
4.5.5 Program

The buffer memory data are programmed into a device in this mode. After the program, VERIFY is automatically executed.

(1) Press the | PROG | key, and the following message will be displayed.

```
PROG         AM  08080
   27256      cdE510
```

If the numeric key (0 to 7) is pressed after pressing the | PROG | key, then program into the block which is specified in the BLOCK mode.



(2) Press the | START | key to execute the PROGRAM mode, and the following message will be displayed.

```
PROG    99999:----
```

If there is an error in this mode, the following message will be displayed.

```
PROG    0000F:00
*FAIL*0000F:0C
```

Press the | START | key, to continue this mode from the next address.

(3) Press the | RESET | key, then this mode will end.

4.5.6 Verify

This mode is used to compare 1890 buffer memory data and device data.

(1) Press the | VER | key, then the following message will be displayed and executed the VERIFY mode.

```
VER        AM 08080
   27256    cdE510
```

If the numeric key (0 to 7) is pressed after pressing the | VER | key, the VERIFY mode will be executed under the BLOCK mode control.

(2) Press the | START | key to start the VERIFY. Then the following message will be displayed.

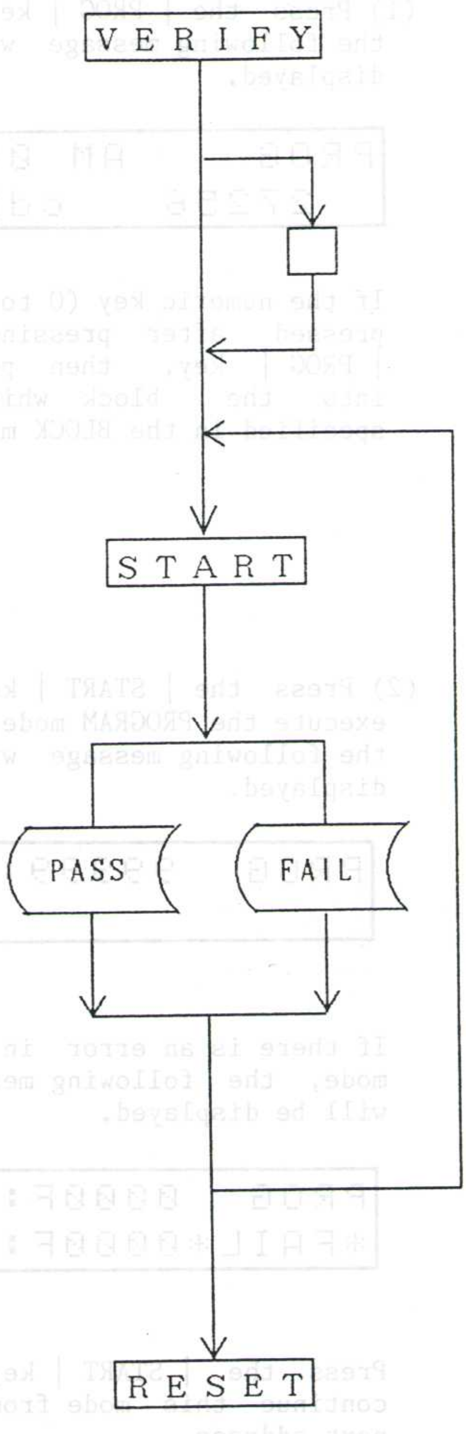
```
VER-1  00000:----
```

If anything wrong in this mode the following message will be displayed.

```
VER-4  04D56:FE
*FAIL*04D56:FF
```

Press the | START | key to continue this mode from the next address.

(3) Press the | RESET | key, then this mode will end.



4.5.7 Continuous

This mode is used for automatic continuation of the three operations of BLANK, PROGRAM, and VERIFY.

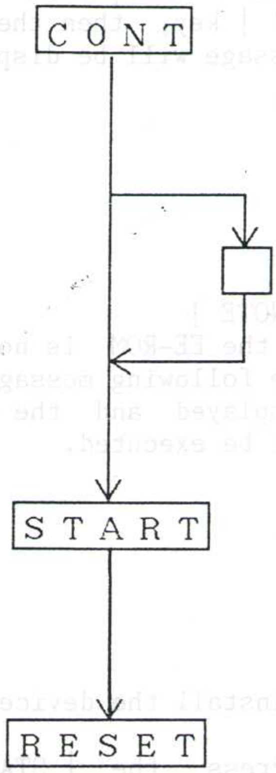
(1) Press the | CONT | key, then the following message will be displayd and executed the COPY mode.

```
CONT        AM  08080
   27256      cdE510
```

If the numeric key (0 to 7) is pressed after pressing the | CONT | key, the PROGRAM and VERIFY will be executed under the BLOCK mode control.

(2) For the individual operations of BLANK, PROGRAM, and VERIFY, refer to the each paragraphs.

(3) Press the | RESET | key, then this mode will end.



4.5.8 Erase

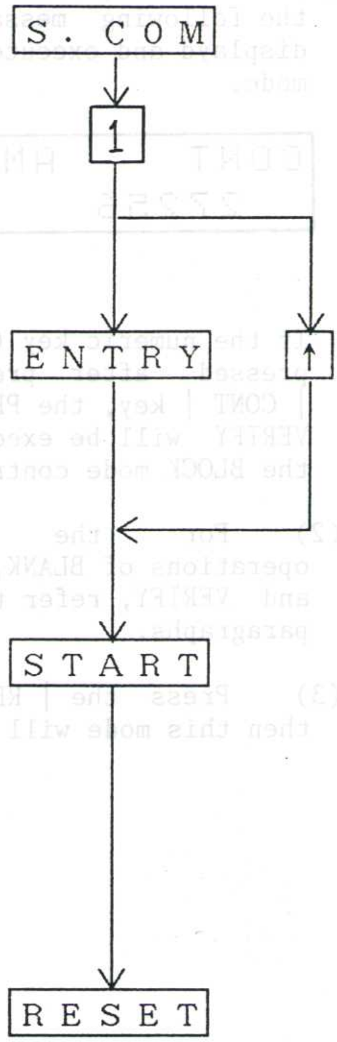
The ERASE mode is executed when EE-ROM is selected.

(1) Press the | S.COM | key and | 1 | key, then the following message will be displayd.

[NOTE]
If the EE-ROM is not selected, the following message will be displayed and the erase will not be executed.

(2) Install the device.

(3) Press the | START | key, then the EE-ROM will be erased.
The blank check is executed after the erase.



4.6 System Control Command

The Vcc voltage set, device check on/off, and buzzer on/off can be programmed by the SYSTEM CONTROL COMMAND.

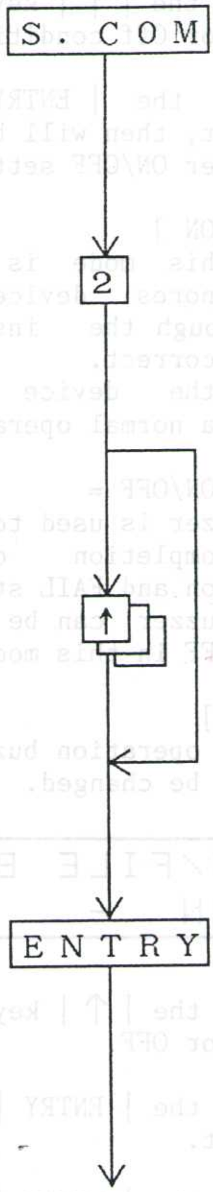
[NOTE]
These data for the system control are initialized when the DEVICE SELECT is executed.

= VERIFY voltage level =
The following four levels are available. The default value is set at Vcc=4.50/5.50 V.

Vcc = 4.75/5.25 V
Vcc = 4.50/5.50 V
Vcc = 4.50/6.00 V
Vcc = 4.50/6.50 V

(1) Press the | S. COM | key and the | 2 | key, then the following message will be displayed and the VERIFY voltage level setting mode will be executed.

```
READ Vcc SELECT
  Vcc=4.50/5.50V
```

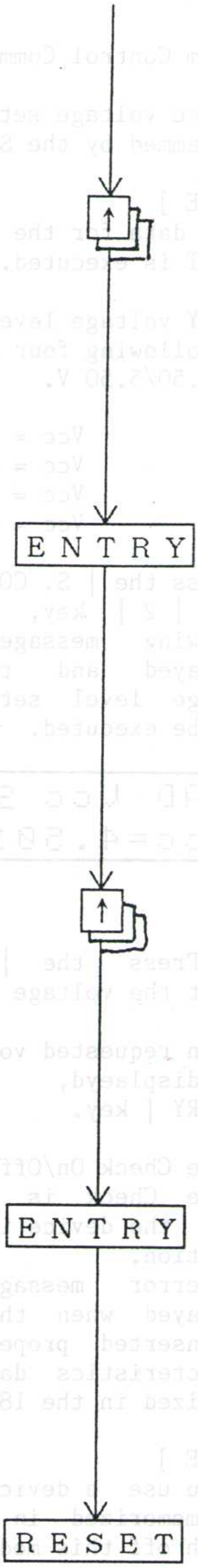


(2) Press the | ↑ | key to select the voltage level.

(3) When requested voltage level is displaeyd, press the | ENTRY | key.

= Device Check On/Off =
Device Check is prepared to check the device installation condition.
The error message will be displayed when the device is not inserted properly or its characteristics data is not memorized in the 1890.

[NOTE]
If you use a device which is not memorized in the 1890, switch off this mode.



[CAUTION]
If this mode is switched off, Check the device installation before turn on the power. Otherwise the device may be destroyed if the device is not installed properly.

```
DEVICE CHECK
 - ON  -
```

(4) Press the | ↑ | key to select the On or Off condition.

(5) Press the | ENTRY | key to enter it, then will be changed to Buzzer ON/OFF setting mode.

[CAUTION]
When this mode is off, the 1890 ignores device errors even though the installation is not correct.
Keep the device check ON during a normal operation.

= Buzzer ON/OFF =
The buzzer is used to announce the completion of each operation and FAIL stop.
This buzzer can be switched ON or OFF in this mode.

[NOTE]
The key operation buzzer sound can not be changed.

```
PASS/FILE BUZZER
 -  ON    -
```

(6) Press the | ↑ | key to select the ON or OFF.

(7) Press the | ENTRY | key to enter it.

(8) Press the | RESET | key to return to the initial mode.

4.7 Error Message

The error messages of this model are shown below :

Self-check Error

```
SELF CHECK ERROR
           E-xx
```

Consult the place of purchase.

System Error

```
*System Error:**
```

Consult the place of purchase.

Device Check Error

```
*Check  Error:10
```

Failure insertion or poor pin contact.

Overcurrent Detection Error

```
*Over current:11
```

Overcurrent is sensed.
Failure insertion or device.

Signature Check Error

```
*Illegal ID   :12
```

The device code set by the signature does not match the device inserted.

Socket Error

```
*Bad  Socket :13
```

Socket poor pin contact.

Memory Range Setting Error

```
Buffer over   :14
```

Buffer memory size is exceeded.
It might also occur in the case of an illegal setting in the address mode or illegal operation of PAE.

4.8 Programmable Devices

4.8.1 Programmable Devices

The programmable devices by your 1890 are listed in the next page.

The symbols *, # and @ following the device code in the table mean as shown below.

* -- A device has the silicon signature. It permits device setting by signarure by this unit.

@ -- An EE-PROM which can be over programmed. The ERASE and BLANK execution are skiped in the CONT mode.

-- An EE-PROM which can be over programmed. The CHIPERASE, BLANK, PROGRAM, and VERIFY are automatically executed continuously.

4.8.2 Programmable Device List

OU900 V-1.0 1987.9.11

TYPE	SIZE	PIN	CODE
AMD			
Am2716	2K× 8	24	E110
Am2716B	2K× 8	24	E111
Am2817A	2K× 8	28	D117 @
Am2732	4K× 8	24	E210
Am2732A	4K× 8	24	E211
Am2732B	4K× 8	24	E213
Am2764	8K× 8	28	E311
Am2764A	8K× 8	28	E318*
Am2864A	8K× 8	28	D311 @
Am9864A	8K× 8	28	D313 @
Am27128	16K× 8	28	E411
Am27128A	16K× 8	28	E414*
Am27256	32K× 8	28	E511*
Am27512	64K× 8	28	E611*
Am27C1024	64K×16	40	E710*
CYPRESS			
CY7C282	2K× 8	24	E010
CY7C292	2K× 8	24	E113
FUJITSU			
MB8516/MBM2716	2K× 8	24	E110
MB8532/MBM2732	4K× 8	24	E210
MBM2732A/C32A	4K× 8	24	E211
MBM2764/C64	8K× 8	28	E313
MBM28C64/65	8K× 8	28	D311 @
MBM27128/C128	16K× 8	28	E413*
MBM27256/C256A	32K× 8	28	E510*
MBM27C256H	32K× 8	28	E510*
MBM27C256	32K× 8	28	E512*
MBM27C512	64K× 8	28	E610*
MBM27C1028	64K×16	28	E740
MBM27C1024	64K×16	40	E712*
MBM27C1000	128K× 8	32	E722*
MBM27C1001	128K× 8	32	E723*
HITACHI			
HN462716	2K× 8	24	E110
HN48016	2K× 8	24	D110 #
HN462732	4K× 8	24	E210
HN482732A	4K× 8	24	E211
HN462532	4K× 8	24	E212
HN482764/27C64	8K× 8	28	E311
HN58C65	8K× 8	28	D311 @
HN58064	8K× 8	28	D312 #
HN4827128	16K× 8	28	E411*
HN27128A	16K× 8	28	E412*
HN27256/C256	32K× 8	28	E510*
HN27512/C512	64K× 8	28	E610*
HN27C1024	64K×16	40	E714*
HN27C101	128K× 8	32	E720*
HN27C301	128K× 8	32	E721*
INTEL			
i2716	2K× 8	24	E110
i2816A	2K× 8	24	D113 @
i2816B	2K× 8	24	D116 @
i2817A	2K× 8	28	D117 @
i2732	4K× 8	24	E210
i2732A	4K× 8	24	E211
i2764	8K× 8	28	E311*
i2764A/C64	8K× 8	28	E312*
i87C64	8K× 8	28	E317*
iP2764A	8K× 8	28	E31A*
i2864A	8K× 8	28	D311 @
i27128	16K× 8	28	E411*
i27128A	16K× 8	28	E412*
iP27128A	16K× 8	28	E415*
i27256/C256	32K× 8	28	E510*
i87C256	32K× 8	28	E513
iP27256	32K× 8	28	E514*
i27512	64K× 8	28	E610*
i27513	64K× 8	28	E612
iP27512	64K× 8	28	E613*
i27210	64K×16	40	E715*
i27011	128K× 8	28	E741*
i27010	128K× 8	32	E728*
MATSUSHITA			
MH2716	2K× 8	24	E110
MH2732	4K× 8	24	E210
MH2764	8K× 8	28	E311
MH27128	16K× 8	28	E411
MITSUBISHI			
M5L2716	2K× 8	24	E110
M5L2732	4K× 8	24	E210
M5L2764	8K× 8	28	E311
M5M28C64	8K× 8	28	D313 @
M5L27128/C128	16K× 8	28	E411
M5M27128A	16K× 8	28	E412*
M5L27256/C256	32K× 8	28	E510*

MITSUBISHI

TYPE	SIZE	PIN	CODE
H5L27512/C512	64K× 8	28	E610*
H5M27C102	64K×16	40	E716*
H5M27C100	128K× 8	32	E729*
H5M27C101	128K× 8	32	E72A*

MOTOROLA

TYPE	SIZE	PIN	CODE
HCM2716	2K× 8	24	E110
HCM2532/L32	4K× 8	24	E212
HCM68764/66/L764	8K× 8	24	E315

N. S

TYPE	SIZE	PIN	CODE
MM2716/C16	2K× 8	24	E110
NMC9817	2K× 8	28	D117
NMC2732/C32/E	4K× 8	24	E210
NMC27C32B	4K× 8	24	E214
NMC27C64	8K× 8	28	E31B
NMC98C64A	8K× 8	28	D311
NMC27C128	16K× 8	28	E417
NMC27C256	32K× 8	28	E516
NMC27C512	64K× 8	28	E614
NMC27C1024	64K×16	40	E717*

NEC

TYPE	SIZE	PIN	CODE
uPD2716	2K× 8	24	E110
uPD2732	4K× 8	24	E210
uPD2732A	4K× 8	24	E211
uPD2764/C64	8K× 8	28	E311
uPD27C64A	8K× 8	28	E312*
uPD28C64	8K× 8	28	D311 @
uPD27128/C128	16K× 8	28	E411*
uPD27C128A	16K× 8	28	E412*
uPD27256A/C256A	32K× 8	28	E510*
uPD27256/C256	32K× 8	28	E512*
uPD27512/C512	64K× 8	28	E610*
uPD27C1024	64K×16	40	E711*
uPD27C1000	128K× 8	32	E726*
uPD27C1001	128K× 8	32	E727*

OKI

TYPE	SIZE	PIN	CODE
MSM2716	2K× 8	24	E110
MSM2816A	2K× 8	24	D116 @
MSM2764/C64	8K× 8	28	E311
MSM2864A	8K× 8	28	D311 @
MSM27128/C128	16K× 8	28	E411
MSM27C256	32K× 8	28	E514
MSM27C512	64K× 8	28	E613

RICOH

TYPE	SIZE	PIN	CODE
RD5H32/27C32	4K× 8	24	E211
RD27C64	8K× 8	28	E311
RD687C64	8K× 8	24	E316
RD27C256	32K× 8	28	E510

SEEQ

TYPE	SIZE	PIN	CODE
DQ2816A/5516A	2K× 8	24	D116 @
DQ2817A/H	2K× 8	28	D117 @
DQ52B23/23H	4K× 8	28	D210 @
DQ2764(5133)	8K× 8	28	E311*
DQ52B33/33H	8K× 8	28	D310 @
DQ2864A	8K× 8	28	D311 @
DQ2864/H	8K× 8	28	D313 @
DQ27128(5143)	16K× 8	28	E411*
DQ27C256	32K× 8	28	E510*

SGS

TYPE	SIZE	PIN	CODE
M2764A	8K× 8	28	E312*
M27128A	16K× 8	28	E412*
M27256	32K× 8	28	E510*

SHARP

TYPE	SIZE	PIN	CODE
LH5762/63J	8K× 8	28	E312
LH5764J	8K× 8	28	E31A
LH5749J	8K× 8	24	E31E
LH57126/127J	16K× 8	28	E412
LH57128J	8K× 8	28	E415
LH57256	32K× 8	28	E515

TEXAS

TYPE	SIZE	PIN	CODE
TMS2516	2K× 8	24	E110
TMS27C292	2K× 8	24	E113
TMS2732A	4K× 8	24	E211
TMS2532	4K× 8	24	E212
TMS2532A	4K× 8	24	E216
TMS2564	8K× 8	28	E314
TMS2764	8K× 8	28	E311
TMS27128	16K× 8	28	E411
TMS27C128	16K× 8	28	E412*
TMS27256/C256	32K× 8	28	E510*
TMS27C512	64K× 8	28	E610*

TOSHIBA

TYPE	SIZE	PIN	CODE
TMM323D	2K× 8	24	E110
TMM2732	4K× 8	24	E210
TMM27/2464	8K× 8	28	E311
TMM27/2464A	8K× 8	28	E31A*

TYPE	SIZE	PIN	CODE
TOSHIBA			
TMM27/24128	16K× 8	28	E411
TMM27/24128A	16K× 8	28	E415*
TMM27/24256	32K× 8	28	E512*
TC57/54256	32K× 8	28	E512*
TMM27/24256A	32K× 8	28	E514*
TC57/54256A	32K× 8	28	E514*
TMM27/24512	64K× 8	28	E613*
TC57/54512	64K× 8	28	E613*
TC571024	64K×16	40	E713*
TC571000	128K× 8	32	E724*
TC571001	128K× 8	32	E725*
WSI			
WS57C191J	2K× 8	24	E112
WS57C43J	4K× 8	24	E215
WS57C49J	8K× 8	24	E31D
WS57C64J	8K× 8	28	E31C
WS57C128J	16K× 8	28	E418
WS57C256J	32K× 8	28	E517*
XICOR			
X2816A	2K× 8	24	D113 @
X2816B	2K× 8	24	D116 @
X2864A/B/H	8K× 8	28	D311 @
X28C64	8K× 8	28	D311 @
X28256	32K× 8	28	D510 @

4.9 Remote Control

The 1890 can be controlled remotelly through the RS232C interface.

4.9.1 Remote Control Commands

The commands for controlling your 1890 through the RS232C are as follows :

No.	COMMAND	REMARKS
1	A	Address mode selection
2	B	Blank check
3	BO	Checksum output
4	C	Data change
5	D	Data deletion
6	E	Remote mode cancel
7	F	Memory initialize
8	I	Data insertion
9	L	Data output (list output)
10	MD	Address range setting
11	N	Device select
12	OP	Copy
13	OT	Continuous operation
14	P or PL	Data output through the RS232C
15	PH	Data output through the RS232C
16	RL	Data input through the RS232C
17	RH	Data input through the parallel port
18	RL	Memory data comparison with transfered data through the RS232C
19	RH	Memory data comparison with transfered data through the centronics
20	S	Communication format selection
21	T	Data move
22	V	Verify
23	W	Program
24	Z or ER	Erase

4.9.2 Remote Mode Start

Press the | REM | key, then the following message will be displayed and the 1890 will be in the Remote mode.

REMOTE MODE

[NOTE]
If the communication cable is not connected, this comment is not displayed. Press the | RESET | key.

At this moment, the programmer outputs " CR/LF#^" to the interface and will be requesting for input from the interface. (^ means a space "8H20".)

[CAUTION]
If communication conditions (format, baud rate, etc.) are not set accurately, perfect communication can not be expected.

When each command is received ,the 1890 send the "CR/LF". And after the each job selected by the command is finished, sends ^.
If the received data contains a contradiction, "?" is sent.

4.9.3 A or AM : Address Mode Selection

Each type of the address modes can be selected by 0 to C (hexadecimal number) :

No.	Address mode	No.	Address mode
0	AM08080	7	AM16160
1	AM08160	8	AM16161
2	AM08161	9	AM16320
3	AM08320	A	AM16321
4	AM08321	B	AM16322
5	AM08322	C	AM16323
6	AM08323		

[Example]

#^ A^1CR ⟶ "CR/LF #^"

No.

REMOTE MODE AM 08160

4.9.4 B : Blank Check

Check the device installed.

[Example]

#^ BCR

```
REMOTE MODE
****   PASS   ****
```

When no device is installed, the error message is transfered.

```
REMOTE MODE
 Check Error :10
```

When the device is not deleted, the 1890 displays "FAIL" and sounds an error alarm.

4.9.5 BO or CS : Check Sum Output

The sum value and EXOR value of the data within the specified address range are outputted.
The operation address range is specified by the | PAE | key or the MD command.

[Example]

#^ [BO CR] ——> "xxxx^YY CR/LF#^"

#^ [CS CR] ——> "xxxx^YY CR?LF#^"

XXXX : sum value (hexadecimal number in 4 digits)
YY : EXOR value (Ditto)

4.9.6 C : Data Change

The data in the buffer memory can be changed.
When this command is inputted, the specified address and the data there are outputted. When data to be changed are inputted, the next address and the data there are outputted. This operation is repeated until CR is inputted. CR/LF is automatically outputted every eight addresses outputted.
When the highest address in the buffer area is exceeded, the 1890 returns to address 0.

[Example]

#^ [C^ 12345CR] ——> "12345^DD-"

[XX] ——> "XX^EE-"

- Data at next address

[YY] ——> "YY^FF-"

⋮

[CR] ——> "CR/LF#^"

When the address is omitted and #^ [CCR] inputted, address 0 becomes the start address.

4.9.7 D : Data Deletion

The data in specified address range can be deleted.

[Example]

#^ | D^XXXXX,YYYYYCR | ——→ "CR/LF" + "#^"

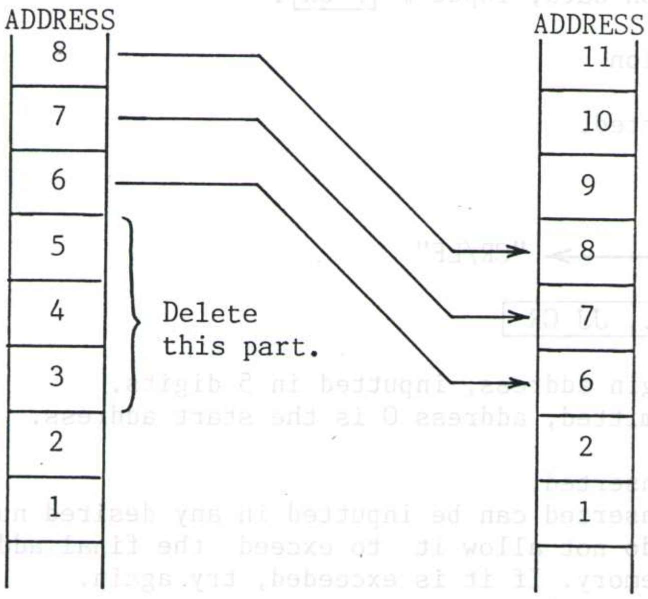
After reception of command — After execution of command

XXXXX : Deletion begin address, inputted in 5 digits.
When it is omitted, address 0 becomes the start address.

YYYYY : Deletion end address, inputted in 5 digits.
When it is omitted, the buffer memory last address becomes the end address.

#^ | 00003, 00008CR |

The result of this command execution.



At the last three addresses, the brank condition of the device is stored. "OFFH" will be stored when the 27256 is selected.

4.9.8 E : Remote Mode Cancel

This command ends the Remote Mode.

[Example]

#^ | E CR | ——→ "CR/LF"

4.9.9 F : Memory Initialize

The data in specified address range can be initialized.

[Example]

#^ F^XXXXX, YYYYY, DD CR

XXXXX : Initialization begin address, inputted in 5 digits.
When the addressis omitted, address 0 is the starting point.

YYYYY : Initialization end address, inputted in 5 digits.
When the address is omitted, the buffer memory end address is the end.

DD : Initializing data, inputted in 2 digits.
When the data input is omitted, a blank state of the selected device is set.
If you omit the all of the begin address, end address and initialization data, input #^ F CR .

4.9.10 I : Data Insertion

New data can be inserted.

[Example]

#^ I^XXXXX CR ⟶ "CR/LF"

DD, EE, FF, ..., JJ CR

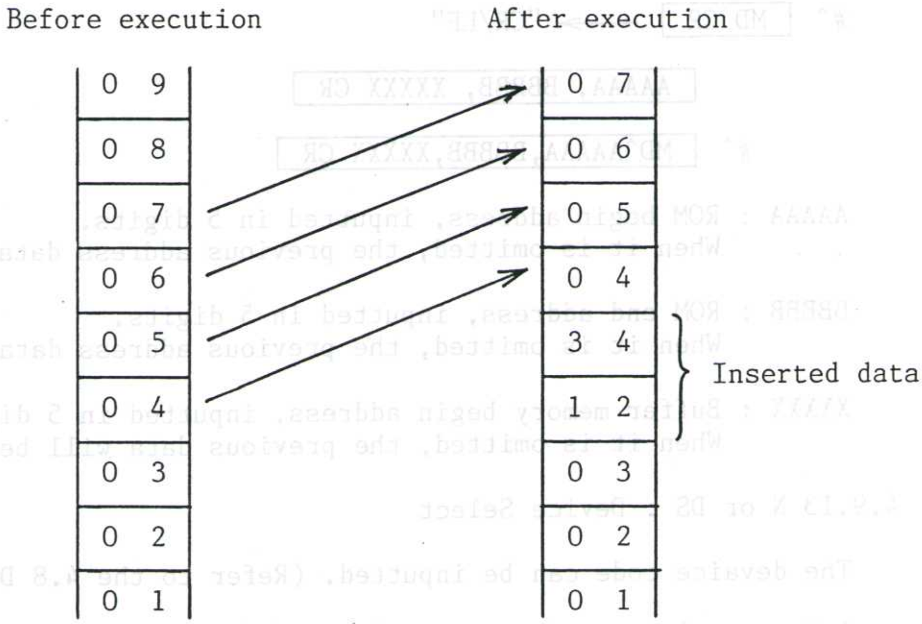
XXXXX : Insertion begin address, inputted in 5 digits.
When it is omitted, address 0 is the start address.

DD,EE : Data to be inserted.
Data to be inserted can be inputted in any desired number of bytes, but do not allow it to exceed the final address of the buffer memory. If it is exceeded, try again.
Put " , " between data.

The content of the memory after the execution of this command is as shown in below :

#^ I^NNNNNCR

12,43CR



4.9.11 L : List Output

This specifies the address range for list output and executes the list output.

[Example]

#^ L^XXXXX, YYYYY, CR

→ XXXXX^DD^EE^FF^ ..... SS CR
ZZZZZ^TT^UU^VV^ .....

XXXXX : Output begin address, inputted in 5 digits.
When it is omitted, address 0 is the starting point.

YYYYY : Output end address, inputted in 5 digits.
When it is omitted, the final address is the end address.

"CR/LF" is automatically outputted every 16 addresses.

4.9.12 MD : Address Area Setting

The device address range and buffer memory begin address for the read/program are set in this mode.

[Example]

#^ $\boxed{\text{MD CR}}$ ——> "CR/LF"

$\boxed{\text{AAAAA, BBBBB, XXXXX CR}}$

#^ $\boxed{\text{MD\^{}AAAAA,BBBBB,XXXXX CR}}$

AAAAA : ROM begin address, inputted in 5 digits.
When it is omitted, the previous address data will be entered.

BBBBB : ROM end address, inputted in 5 digits.
When it is omitted, the previous address data will be entered.

XXXXX : Buffer memory begin address, inputted in 5 digits.
When it is omitted, the previous data will be entered.

4.9.13 N or DS : Device Select

The devaice code can be inputted. (Refer to the 4.8 Device Code List.)

[Example]

#^ $\boxed{\text{DS\^{}DDDD CR}}$ ——> "CR/LF#^"

DDDD : Device code, inputted in 4 digits.
When the code is omitted, ERROR is displayed.

4.9.14 OP or CP : Data Copy

The device data are copied in the buffer memory.

[Example]

#^ $\boxed{\text{OP CR}}$

The mode excute the same procedure as in the key operation.

4.9.15 OT or CO : Continuous Operation

The CONT Mode can be executed.

[Example] : #^ $\boxed{\text{OTCR}}$

This CONT mode is the same as key operation.

4.9.16 P or PL : Data Output

This sets the address range for buffer memory data output and executes the output.
P or PL : data output at the RS232C port.
PH : data output at the Centronics port.

[Example]

#^ $\boxed{\text{P^XXXXX, YYYYYCR}}$

XXXXX : The begin address is inputted in 5 digits.
When it is omitted, address 0 is the start address.

YYYYY : The end address is inputted in 5 digits.
When it is omitted, the memory final address is the end address.
The format of the data outputted by this command should be matched the conditions set by the " S " command. (Refer to 4.3.3)

4.9.17 RL or RH : Data Input

This specifies the address range for receiving data from the host and executes it.
RL : data input through the RS232C.
RH : data input through the Centronic.

[Example]

#^ $\boxed{\text{RL^XXXXX, YYYYYCR}}$

XXXXX : Buffer memory storage begin address.
When it is omitted, address 0 is the start address.

YYYYY : Buffer memroy storage end address.
When it is omitted, the last buffer address is the end address.
When an address is specified in the data format, "YYYYY" is ignored.

[Example of data transfer] (Minato format)

[#<u>00000</u>^<u>DD</u>^EE^FF^ ..... ^JJ]

Address Data

[NOTE]
No echo back during data input.

4.9.18 RLV or RHV : Data Comparison

This specifies the address range in which external data and buffer memory data are compared and executes the comparison.

RLV : input through the RS232C. RHV : input through the Centronics.

[Example]

#^ $\boxed{\text{RLV^XXXXX, YYYYYCR}}$

XXXXX : Buffer memory comparison begin address.
When it is omitted, address 0 is the starting point.

YYYYY : Buffer memory comparison end address.
When it is omitted, the memory final address is the end address.
When the address is specified in the data format, "YYYYY" is ignored.

When a different data is inputted, the error message is immdedistely displayed and the data comparison mode ended.

4.9.19 S : Format Select

This selects the communication format to be used for P, PL, PH, PL, PH, RLV and RHL. A hexadecimal number 0 to F.

[Example]

#^ $\boxed{\text{S^1CR}}$

The format number are as shown below :

0	MINATO HEX
1	INTEL HEX
2	HP64000 ABS
3	BINARY
4	MOTOROLA
5	ASC II HEX
6	ASC II OCT
7	TEKTRONIX
8	TEKTRONIX
9	TEXAS SDS-MAX
A	BNPF
B	BHPF
C	NO FORMAT
D	NO FORMAT CODE
E	NO FORMAT CODE
F	NO FORMAT CODE

4.9.20 T : Data Transfer

The data can be transfered within the buffer memory.
[Example]

#^ | ^T^XXXXX, YYYYY, ZZZZZ CR |

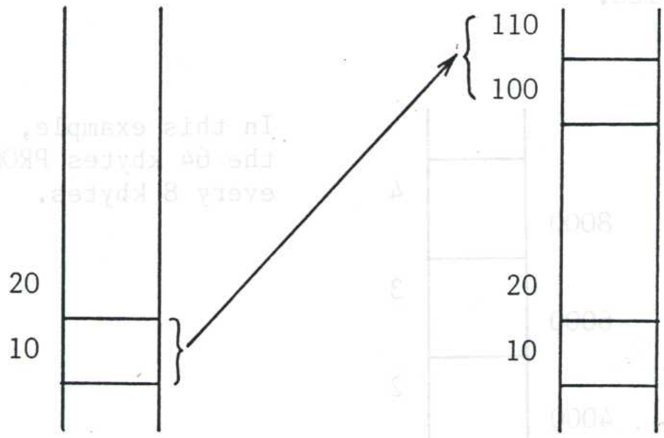
XXXXX : Buffer memroy transfer begin address.
When it is omitted, error message is transfered.

YYYYY : Buffer memory transfer end address.
When it is omitted, error message is transfered.

ZZZZZ : Buffer first emmory destination addess. When it is omitted, error message is transfered.

[NOTE]
When the transfer data exceed the final address in the buffer memroy, the error message will be displayed.

#^<u>T^10, 20, 100CR</u>



The contents of address 100-110 are copied the addresses 10-20.

The contents of addresses 10-20 are the same.

4.9.21 V : Verify Check

This command executes VERIFY.

[Example]

#^ $\boxed{\text{V CR}}$

The operation is the same as the execution of CONT command execution.

4.9.22 W : Data Program

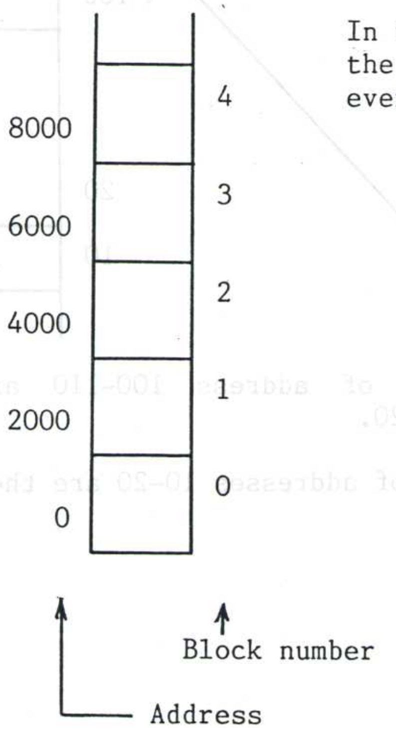
The data in the buffer memory are programmed into the device.

[Example]

#^ $\boxed{\text{W\^{}NCR}}$

N : block number. (For more information about the block number refer to the Address Mode)

The above command is to program the data of the Nth block into the device.



In this example, the memory of the 64 kbytes PROM is divided every 8 kbytes.

4.10 RS232C Interface

4.10.1 Hardware Specifications

Baud rate	110, 300, 600, 1200, 2400, 4800, 9600, 19200 bauds
Start bit	1 bit
Data bit	7,8 bits
Parity	None, odd number, even number
Stop bit	1, 1.5, 2 bits
Synchronizing method	Start/stop synchronization
Communication method	Full duplex

4.10.2 Signal Functions and Connections

The names and connections of signals in the 1890 are as follows

Signal name	Code name	Pin number	Direction of signal MODEL 1890	Ext.eqpt
Protective Ground (FG)	AA	1		
Transmitted Data (TXD)	BA	2	←	
Received Data (RXD)	BB	3	→	
Request to Send (RTS)	CA	4	←	
Clear to Send (CTS)	CB	5	→	
Date Set Ready (CSR)	CC	6	→	
Signal Ground (SG)	AB	7	—	
Data Terminal Ready (DTR)	CD	20	←	
Carrier Detector (CD)	CE	8	→	

1. AA : Protective ground.

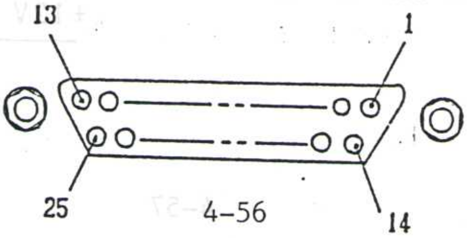
2. BA : Receive data (transfered from the external equipment)

3. BB : Send data (transfer to the external equipment)

4. CA : Request to send (RTS)
   ON : The external equipment is ready to to recive.
   OFF : The external equipment is not ready to receive.

5. CB : Clear to send (CTS)
   ON : The 1890 is ready to receive.
   OFF : The 1890 is not ready to receive.

6. CC : data set ready (DSR)
   ON : The 1890 is ready to send/receive.
   OFF : The 1890 is not ready to send/receive.



7. AB : signal ground

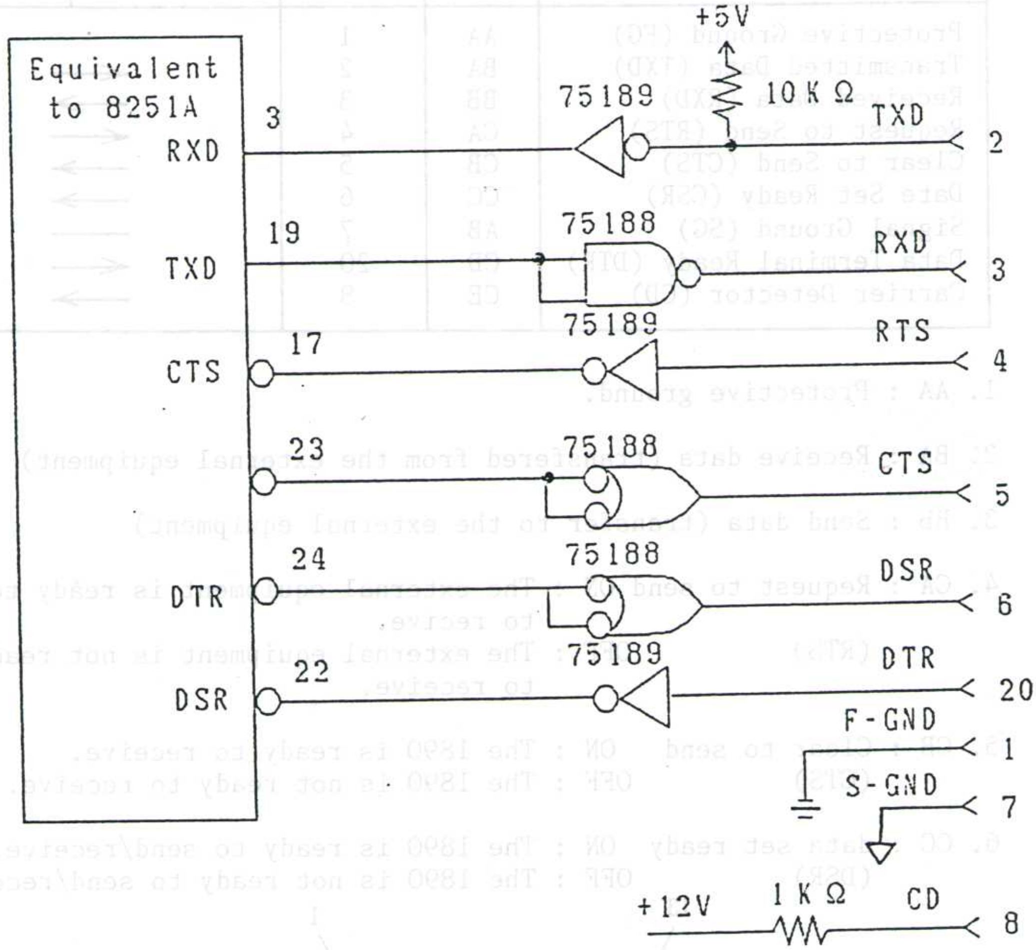
20. CD : Data terminal ready ON : The external equipment is ready to send/receive.
(DTR) OFF : The external equipment is not ready to send/receive.

8. CE : carrier sense ON : The 1890 received the carrier.
(CD) : No OFF state

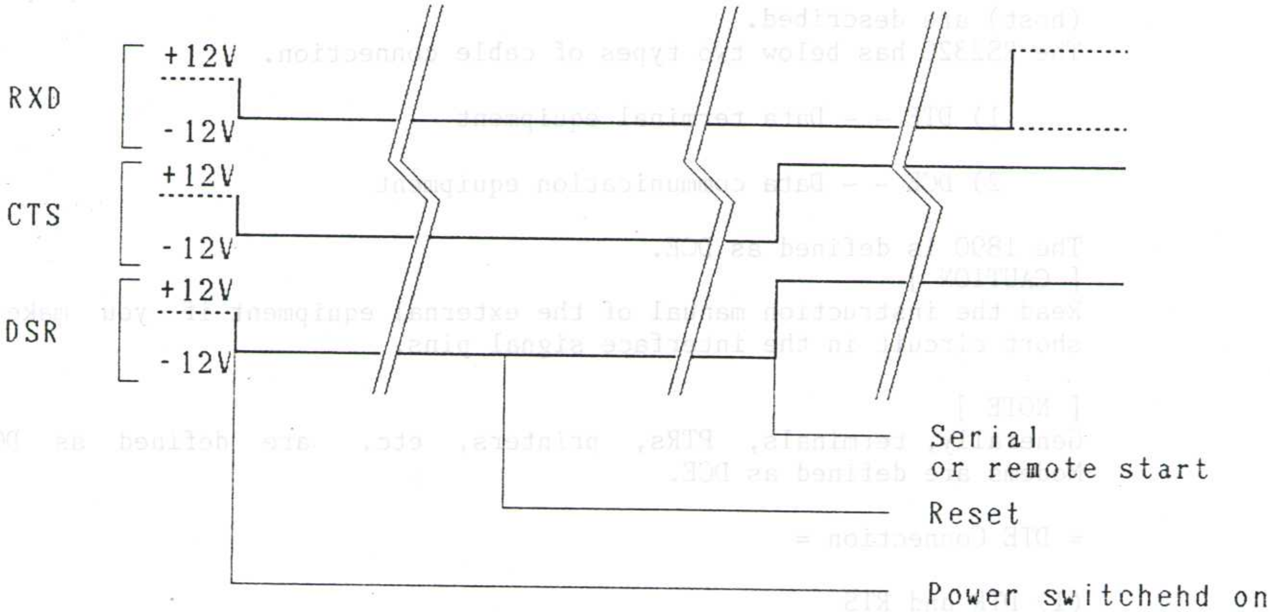
o Interface Signal Polarity

Voltage	Data signal	Control siganl
+3V +12V -3V -12V	0 1	ON OFF

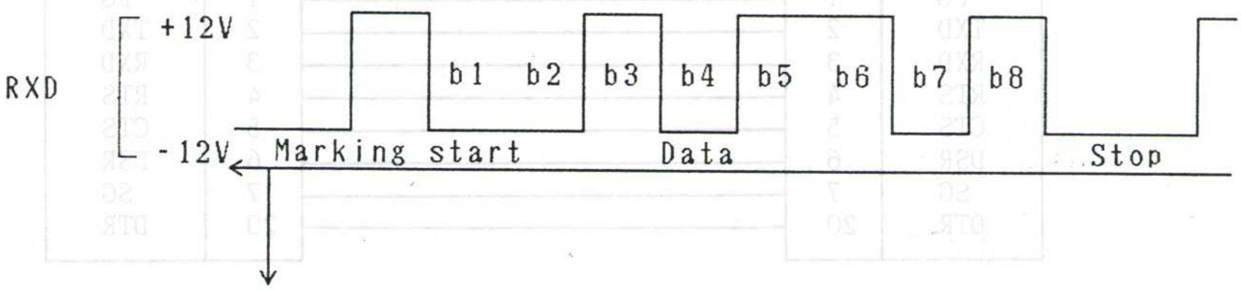
o Interface Signal Output



o Output Signal Levels



o Transmitted Data



o Received Data

The signal of external equipment should be low level (refer to (1)) during the un-transfered condition.

4.10.3 How to Connect to External Equipment

The hardware infromation to connect the 1890 to the external equipment (host) are described.
The RS232C has below two types of cable connection.

1) DTE - - Data terminal equipment

2) DCE - - Data communication equipment

The 1890 is defined as DCE.
[CAUTION]
Read the instruction manual of the external equipment if you make a short circuit in the interface signal pins.

[NOTE]
Generally, terminals, PTRs, printers, etc. are defined as DCE.
Modems are defined as DCE.

= DTE Connection =

(1) DTR and RTS

DTE

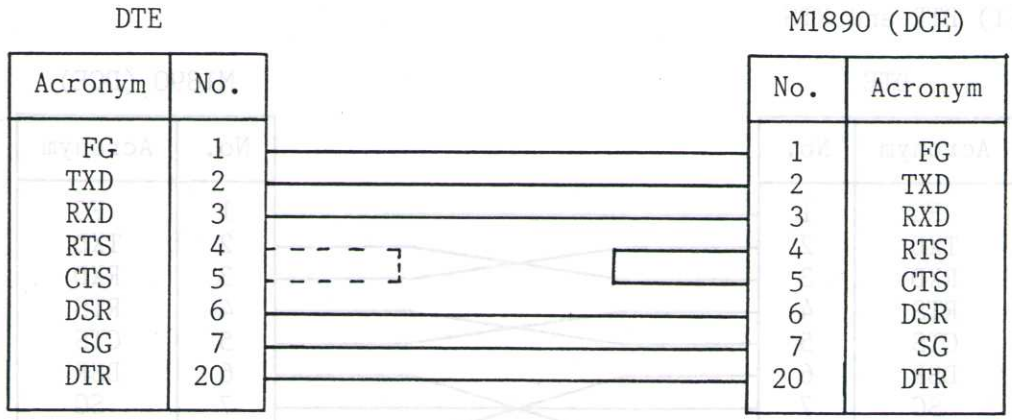
Acronym	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

M1890 (DCE)

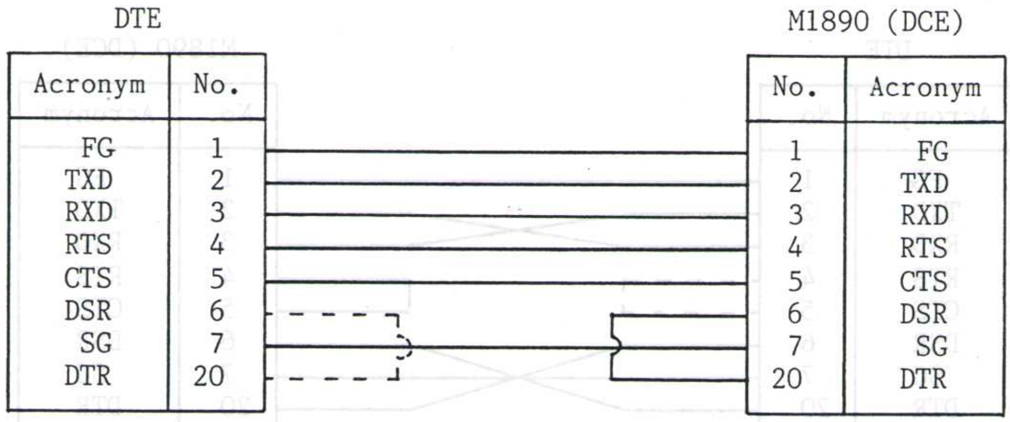
No.	Acronym
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

DTE acceptable eqipments are shown below:
- o HP64000-to-modem
- o ADM-3A (CRT terminal)
- o Intel MDS
- o PC-8800

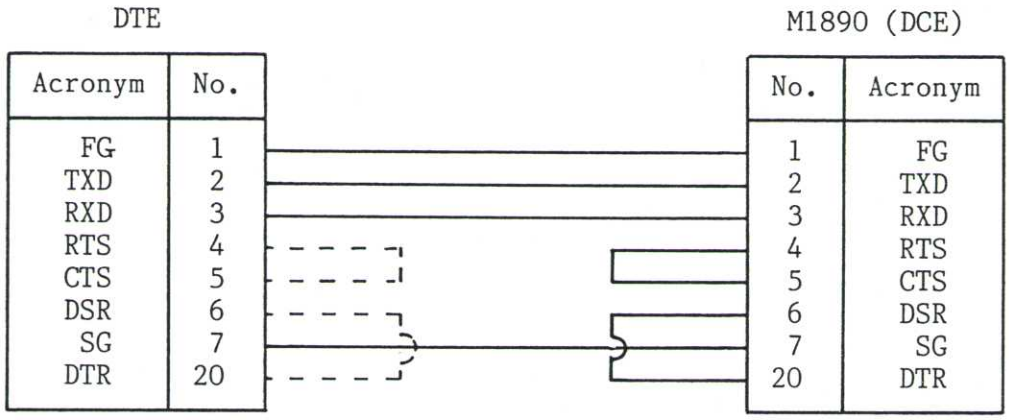
(2) DTR



(3) RTS

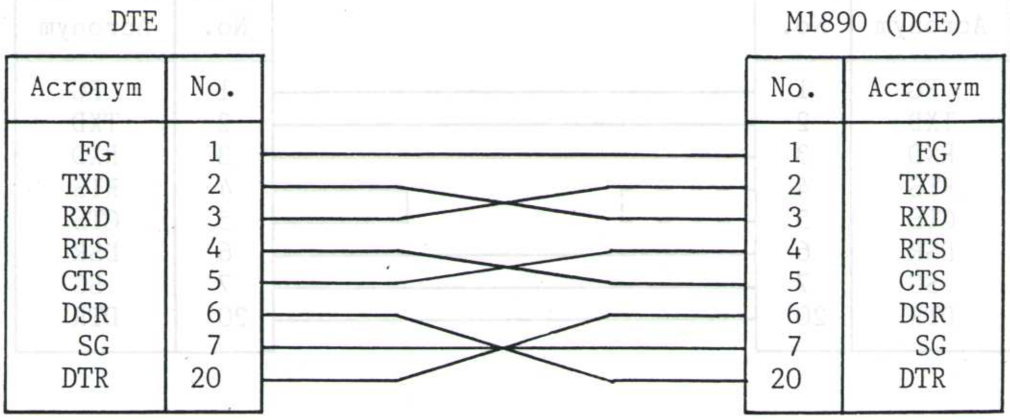


(4) NO CONTROL

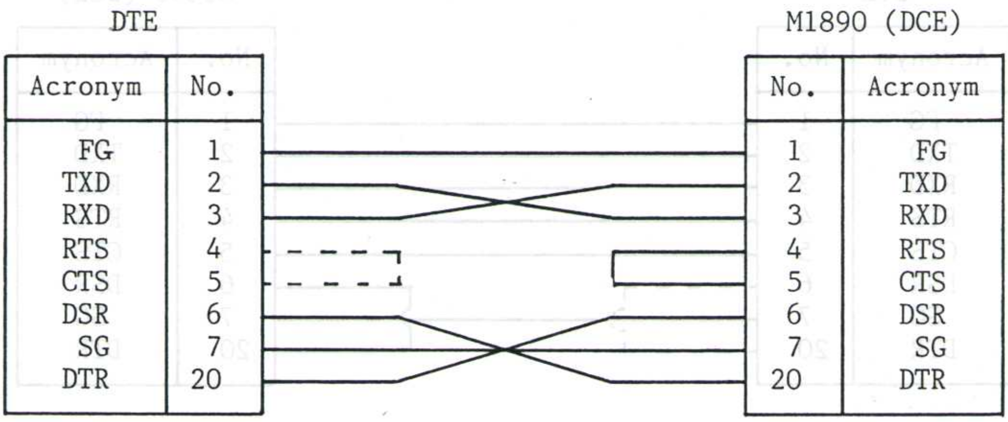


= DCE Connection =

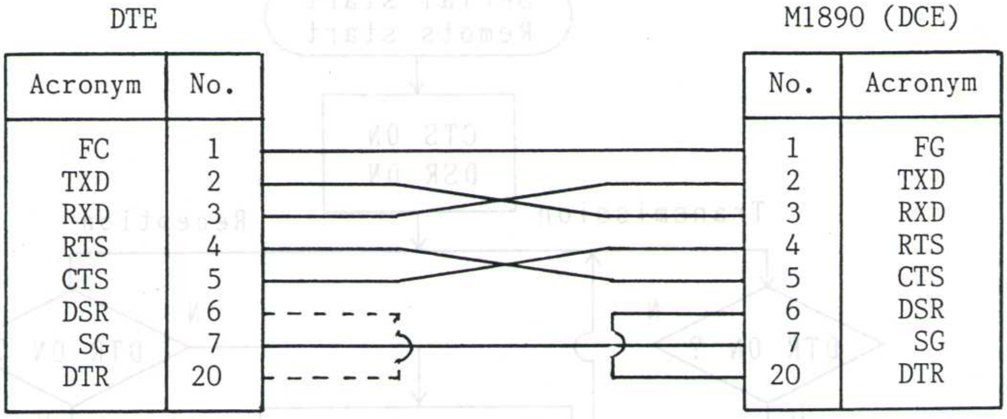
(1) DTR and RTS



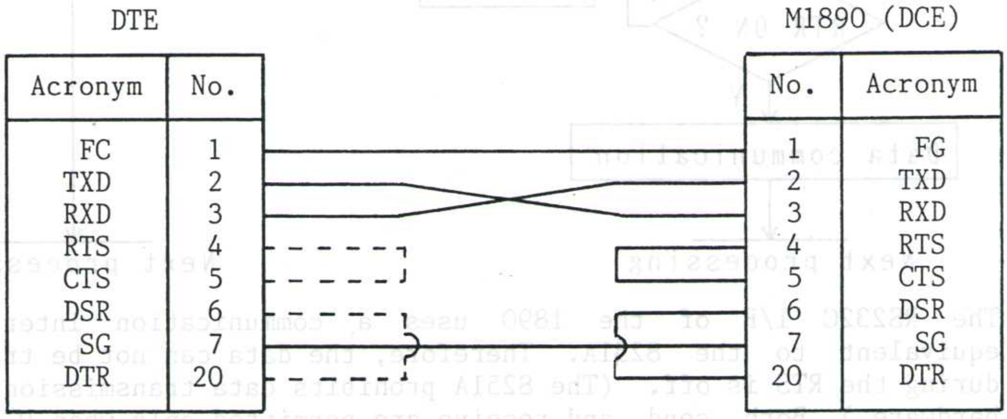
(2) DTR



(3) RTS



(4) NO CONTROL



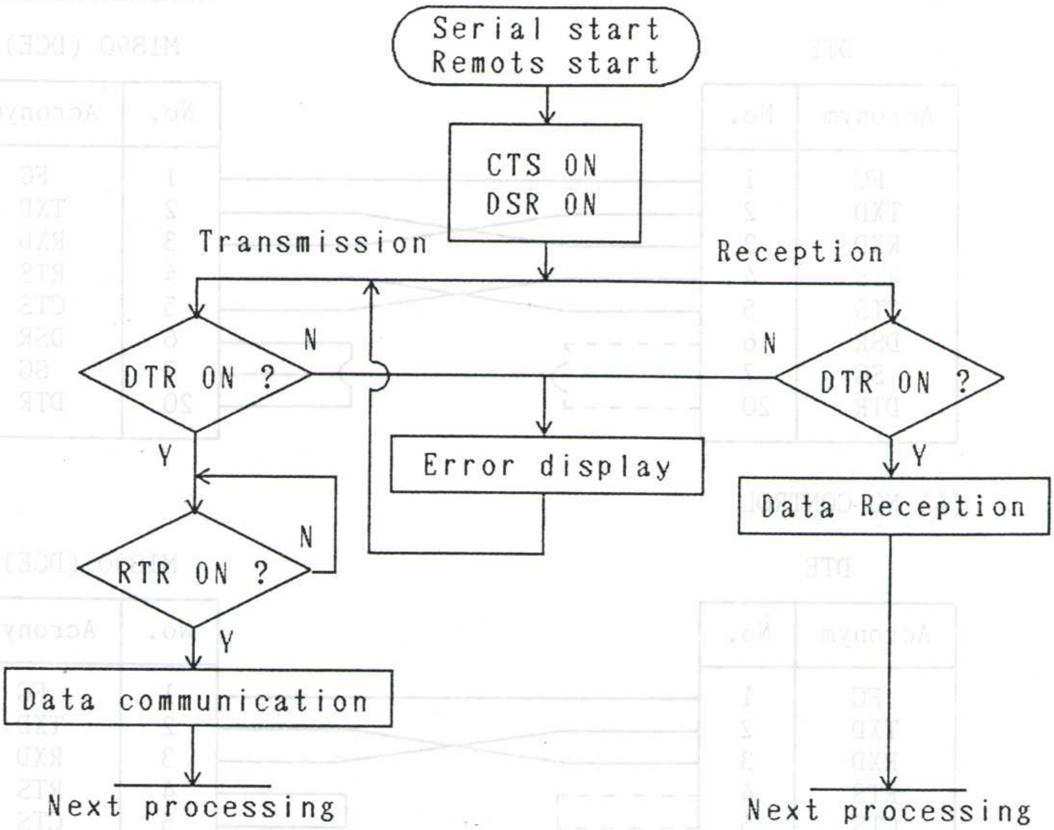
[NOTE]

The pin connections here is based on DTE RS232C interface standard.

4.10.4 Control Method and Protocol

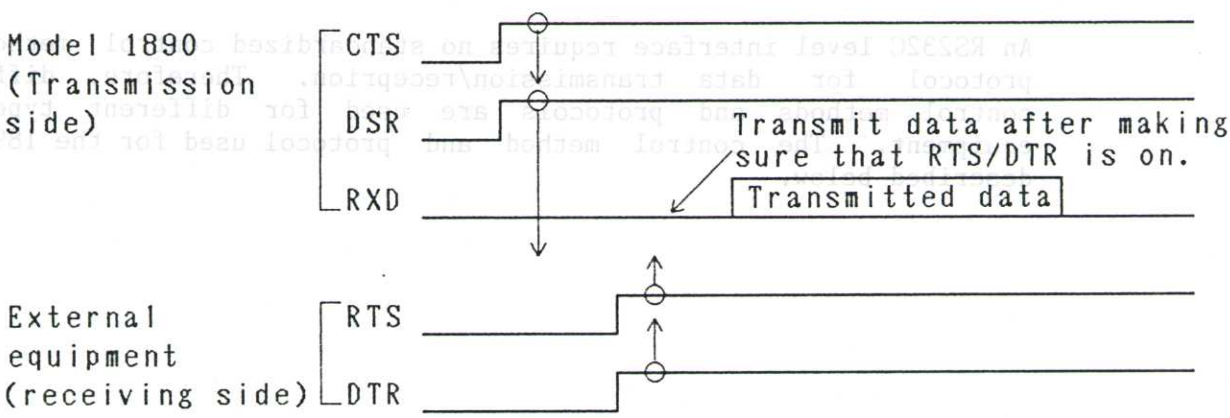
An RS232C level interface requires no standardized control method or protocol for data transmission/receprion. Therefore, different control methods and protocols are used for different types of equipment. The control method and protocol used for the 1890 are described below.

Control Process

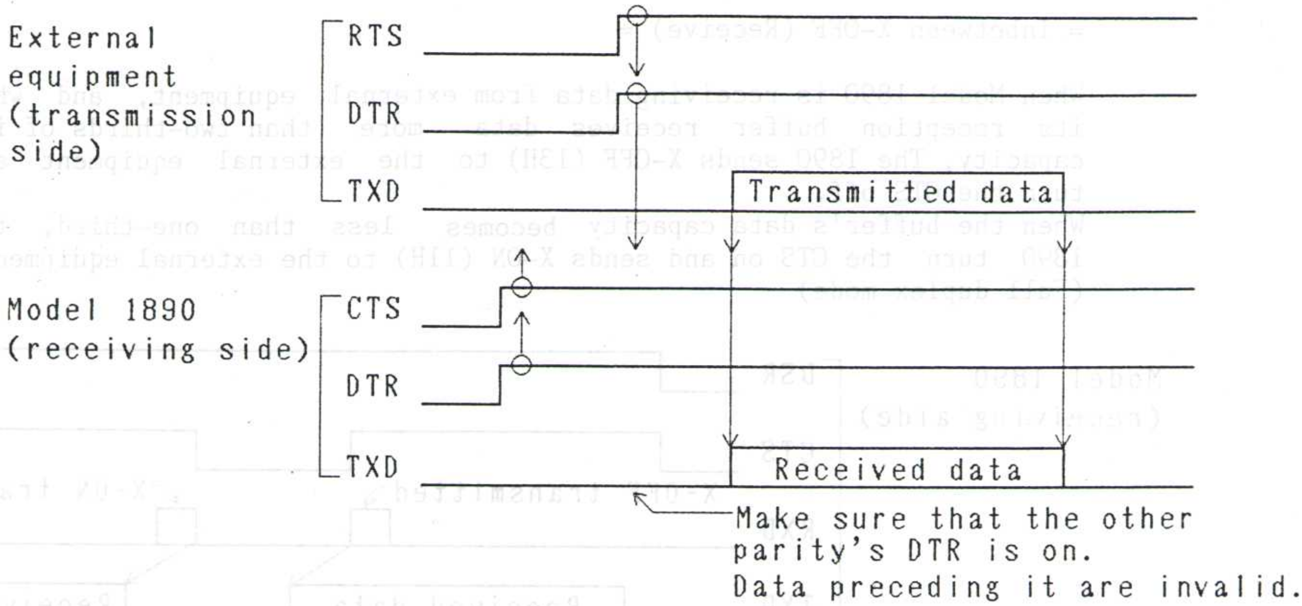


The RS232C I/F of the 1890 uses a communication interface IC equivalent to the 8251A. Therefore, the data can not be transfered during the RTS is off. (The 8251A prohibits data transmission by its hardware.) Both send and receive are permitted only when DTR is on. If off, ERROR is displayed on the display panel and wait until the DTR signal become on.

o Data Send (example)



o Data Receive (example)

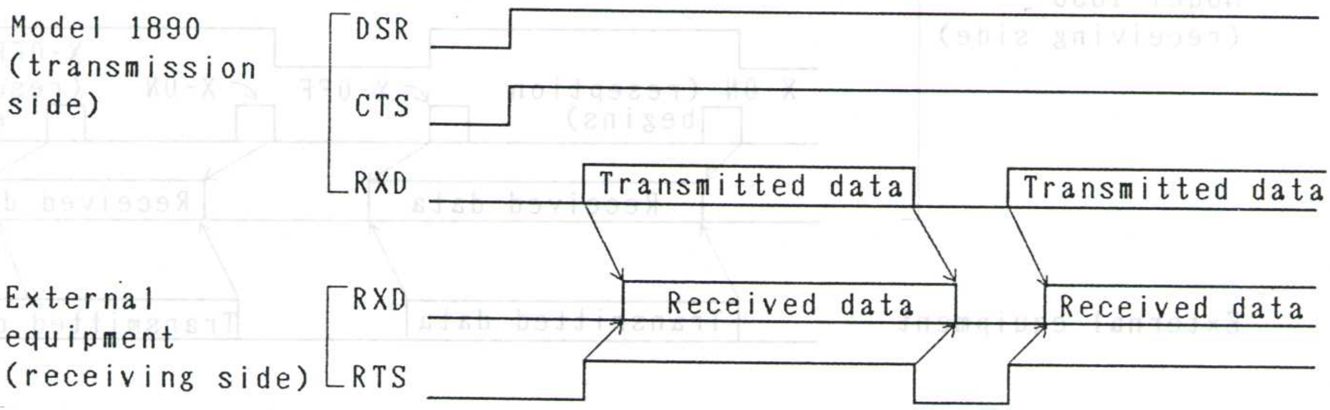


Data Transfer Protocol

Two types of controls are available.
1) No control
2) X/ON-X/OFF control

2 Kbytes memory buffer is prepeared for the interface.

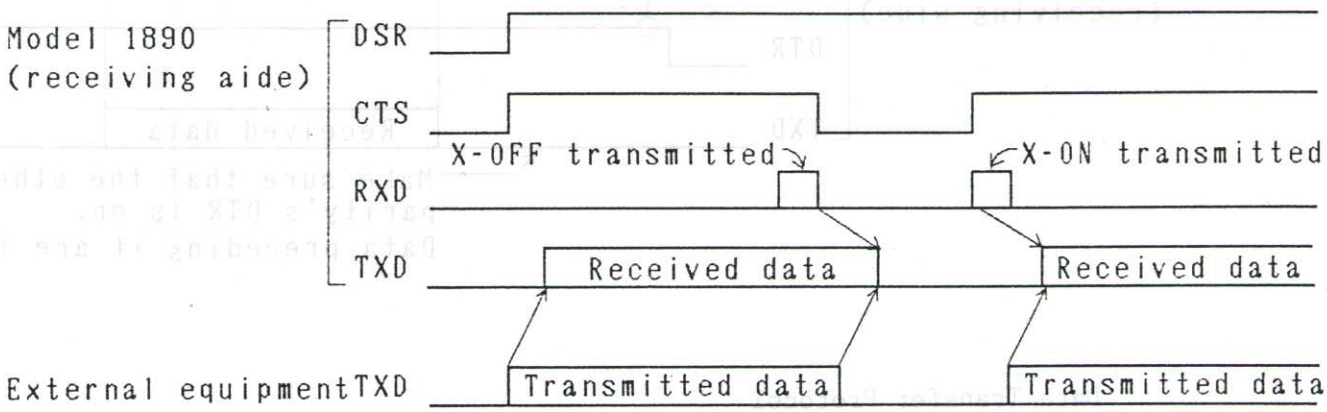
1) No control



2) X/ON-X/OFF control

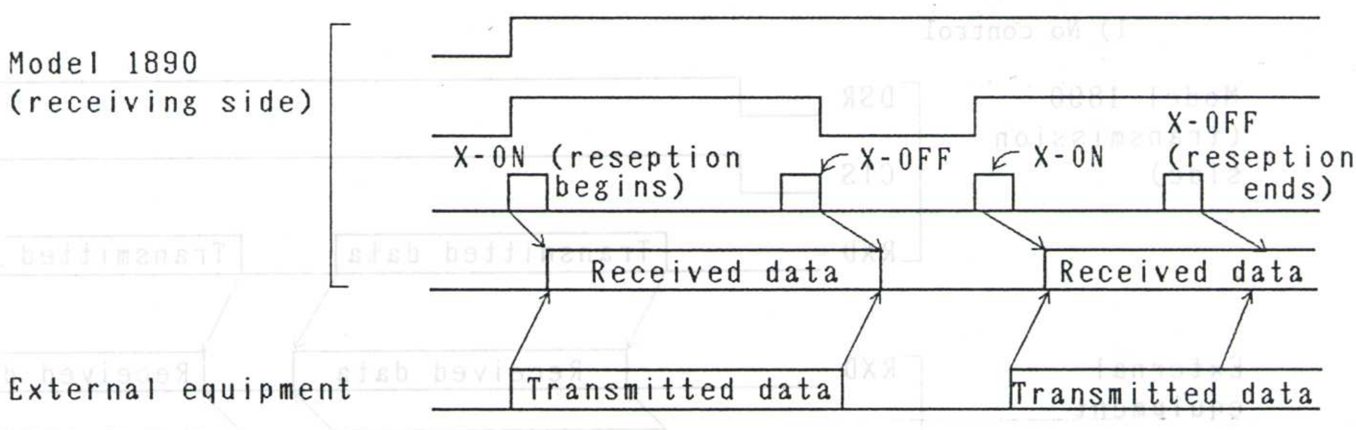
= Inbetween X-OFF (Receive) =

When Model 1890 is receiving data from external equipment, and when its reception buffer receives data more than two-thirds of its capacity, The 1890 sends X-OFF (13H) to the external equipment and turn the CTS off.
When the buffer's data capacity becomes less than one-third, the 1890 turn the CTS on and sends X-ON (11H) to the external equipment. (Full duplex mode)

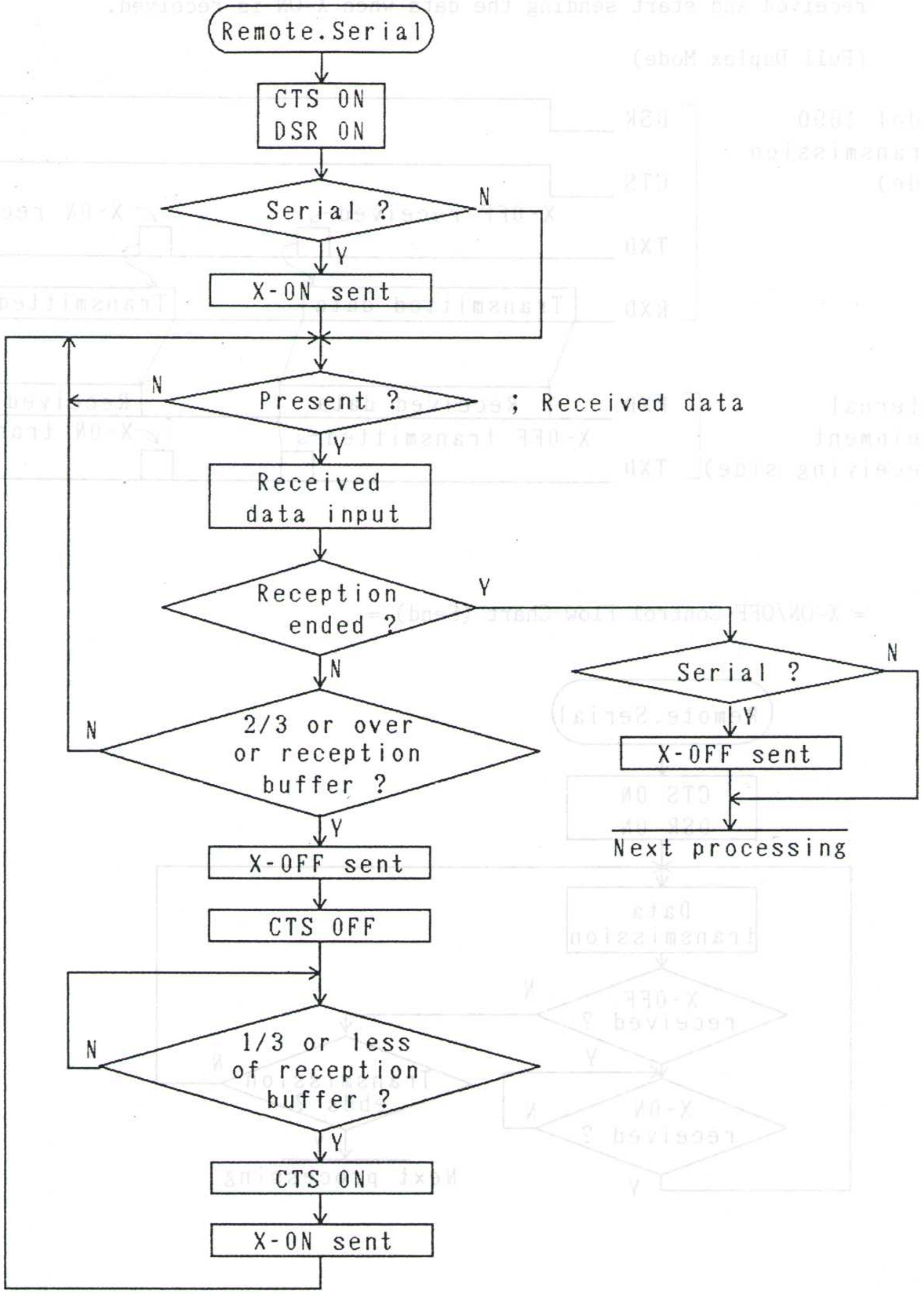


= X-ON Start (Receive) =

The X-ON is sent at the beginning and the X-OFF is sent after the all data transfer.



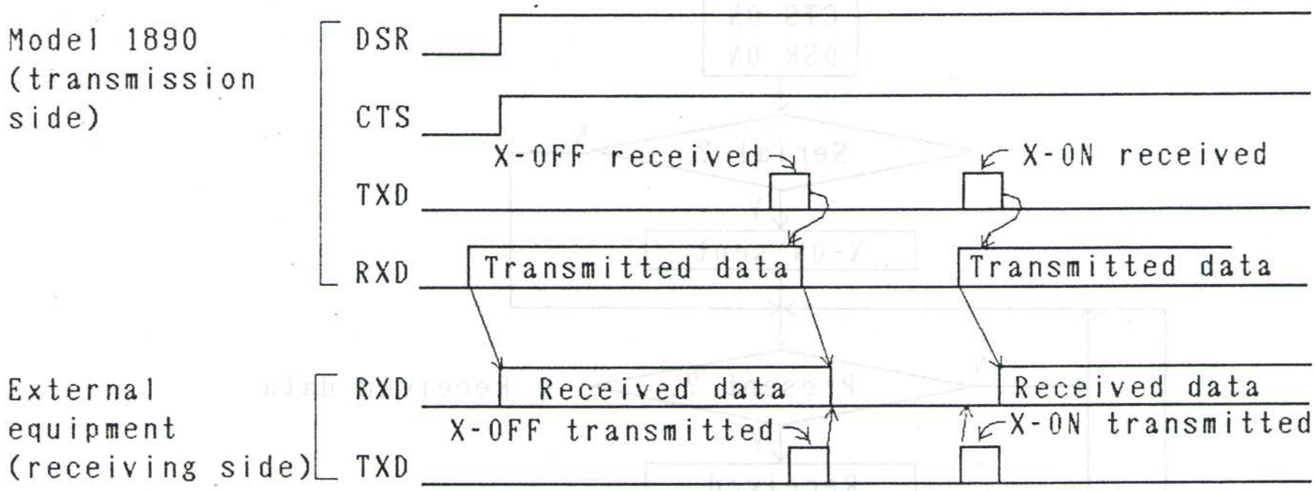
= X-ON/OFF Control Flow Chart (Receive) =



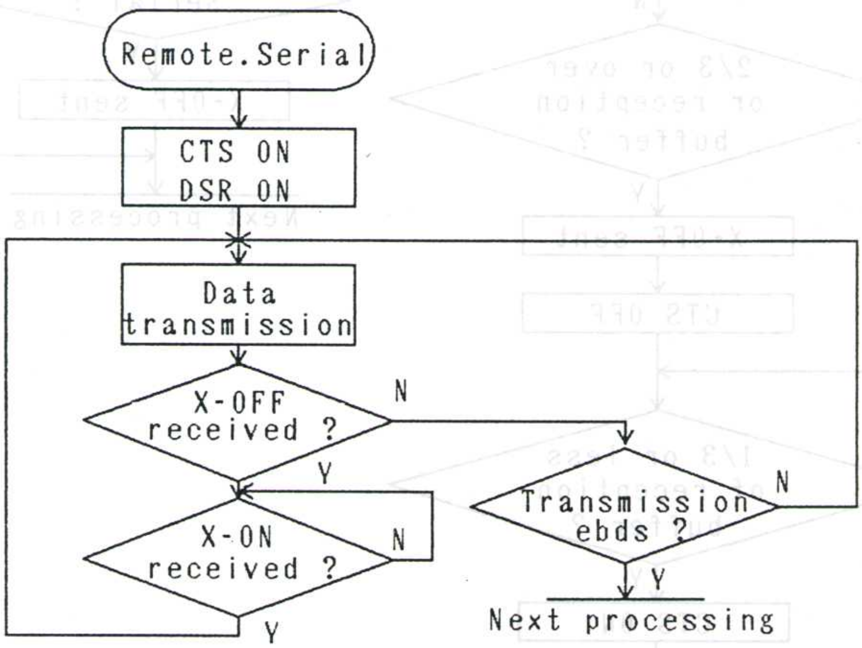
= Inbetween X-OFF (Send) =

The 1890 stops sending data to external equipment, when X-OFF is received And start sending the data when X-ON is received.

(Full Duplex Mode)



= X-ON/OFF Control Flow Chart (Send) =



4.11 Centronics Interface

The parallel interface of the 1890 can be used for both of data output and input.

4.11.1 Data Output

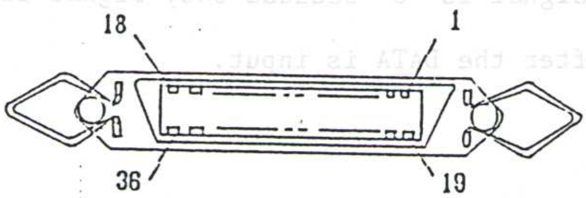
Data output control is based on the Standard Centronics Interface Specifications.

Signal name	I/O	Pin number	Logic
DATA 1 to 8	Output	2 to 9	1
DATA STB	Output	1	1
ACK	Input	10	0
BUSY	Input	11	1
PE	Input	12	1
FAULT	Input	32	0
INPUT.PRIME	Output	31	1
S. G.		19 to 29	
F. G.		17	

DATA 1to8 :
Data

DATA STB
Data strobe signal (Data in external equipment is ready.)

[NOTE]
BUSY, PE, FAULT, INPUT PRIME are not used. Do not connect them.



4.11.2 Data Input

Use only the following signals for data input :

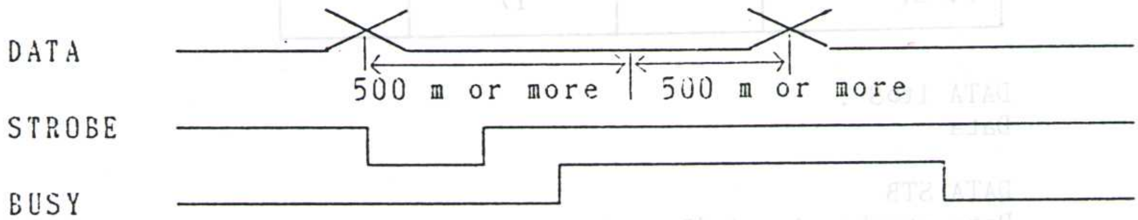
Signal name	I/O	Pin number	Logic
DATA 1 to 8	Input	2 to 9	1
DATA STB	Output	1	1
ACK	Input	10	
S.G.		19 to 29	
F.G.		17	
BUSY	Output	18 , 36	1

DATA 1 to 8
Data.

DATA STB
Completed the data input.

ACK
Data are set at the rising edge of this signal.

1890	PC9801
2 - 9	2 - 9
10	1
18	11
19-29	14
PIN NO	PIN NO



DATA are input at the rising edge of the strobe signal. Signal output side must output the DATA and the strobe signal when the busy signal is "0" because busy signal is output for a while soon after the DATA is input.

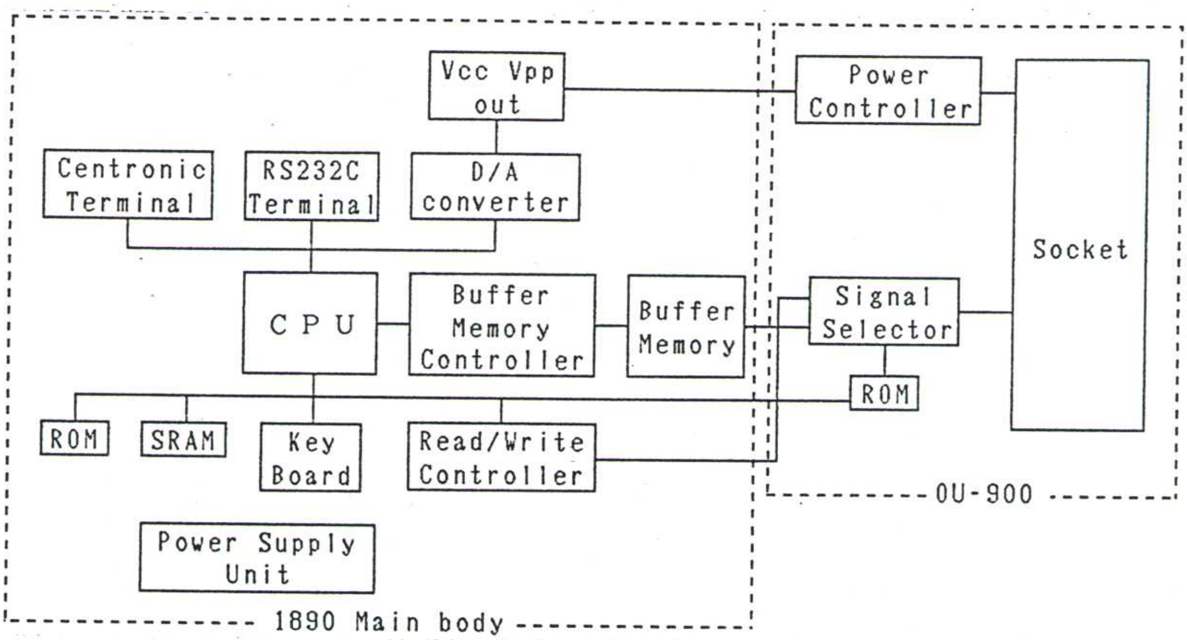
5 THEORY OF OPERATION

5.1 Introduction

This section describes a brief theory of your 1890 operation.
The 1890 consists of two units: the main body and the programming unit. This combination is designed to support the future device by just replacing the programming unit.

5.2 Block Diagram

The block diagram 1890 and OU-900



The device data are memorized in the programming unit, so future programming unit will support the future devices.

5.3 Control Unit

(1) Power Supply

The power supply of the 1890 is a highly stable wide-level power supply incorporating the latest switching regulation technology. This power supply automatically adjust the input voltage of 85 to 264 VAC, you can simply use this model without any operation of the line voltage switch.

(2) Display

A 32-character LCD device is used for easy-to-understand display of various comments and error messages.

(3) Vcc/ Vpp Generator

The Vcc/ Vpp output voltage is controlled by a 10 bits D/A converter. Therefore, a variety of voltages can be programmed and high stable voltage supply can be expected.

(4) Read/Program Pulse Controller

The Read/Program Pulse Controller is designed to support the verious types of devices and cntrols each supplying pulse.

(5) Buffer Memory

A large-capacity buffer memory (2 Mbits).
This memory will be able to expanded to 8 Mbits memory in the future. (Not fixed the delivery schedule.)

5.4 Programming Unit

(1) Power Controller

To execute the verify more precisely, the output voltage level can be selected (Vcc = 4.5, 4.75, 5.25, 5.5, 6.0 or 6.5 V). The overvoltage detection circuit (shutdown circuit) is built in, the 1890 does not destroy the device even when it is installed incorrectly.

(2) Signal Selector

Versatile signal selection enable to support one socket for 28 to 40 pins devices. The self check circuit finds the device fault and poor pin connections, so the 1890 does not program wrong data into the device.

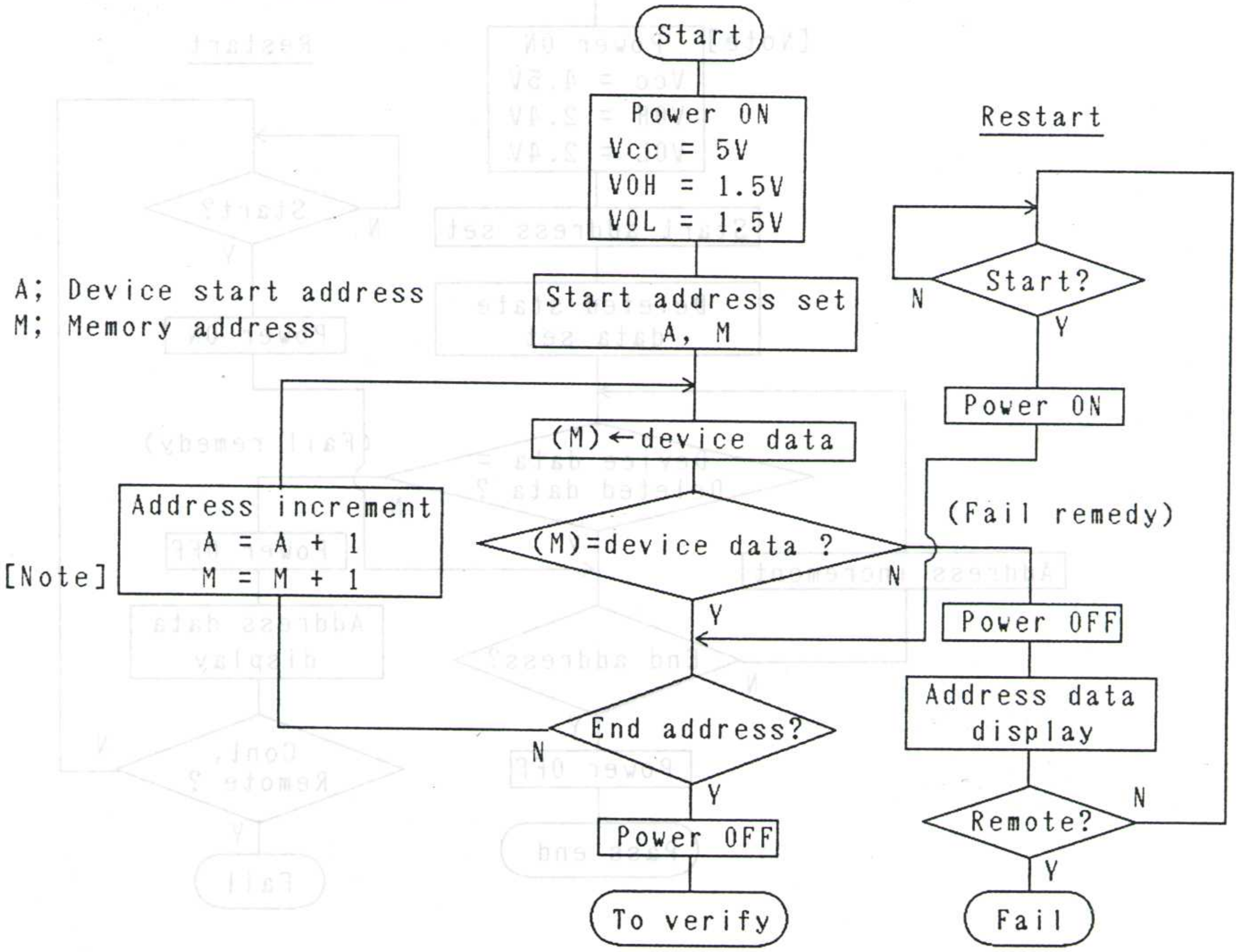
5.5 Operation Mode

This unit has the following six operation modes for device read/program.

COPY	COPY → VERIFY
BLANK	BLANK
VERIFY	VERIFY VERIFY1: Vcc = LOW, Voh CHECK VERIFY2: Vcc = LOW, Voh CHECK VERIFY3: Vcc = HIFH, Voh CHECK VERIFY4: Vcc = HIGH, Voh CHECK
PROGRAM	PROGRAM → VERIFY
CONTINUOUS	BLANK (EP-ROM) → PROGRAM → VERIFY CHIPERASE (EEP-ROM) → BLANK → PROGRAM → VERIFY (over programmable EEP-ROM)
ERASE	CHIPERASE → BLANK (That parmits over program EEP-ROM) BYTEERASE → BLANK

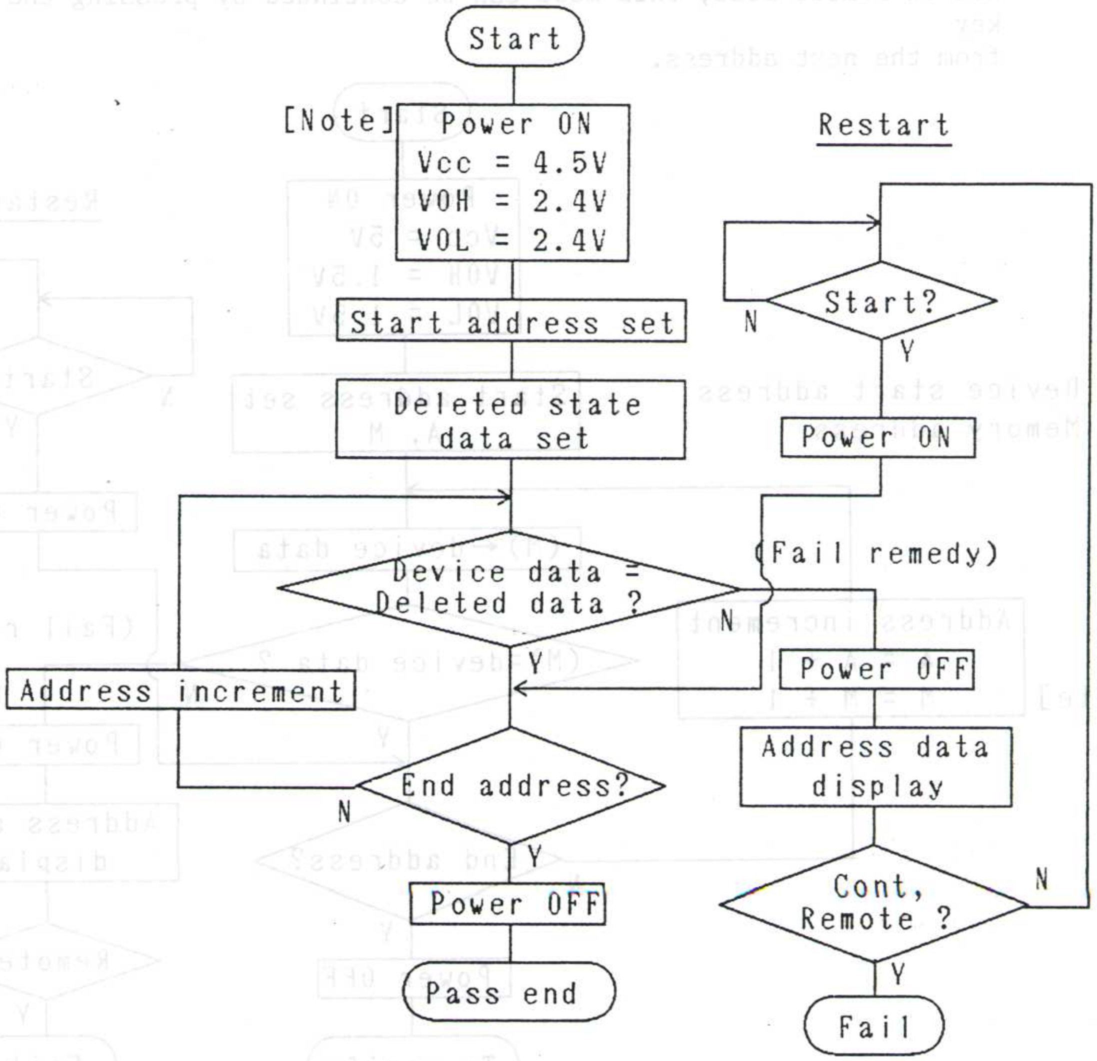
5.5.1 Copy Mode

The data in the device are read and stored into the buffer memory.
When the COPY is finished, the VERIFY mode is executed automatically.
When the fail condition is found in remote mode, this mode is terminated.
Not in remote mode, this mode can be continued by pressing the START key
from the next address.



5.5.2 Blank Check Mode

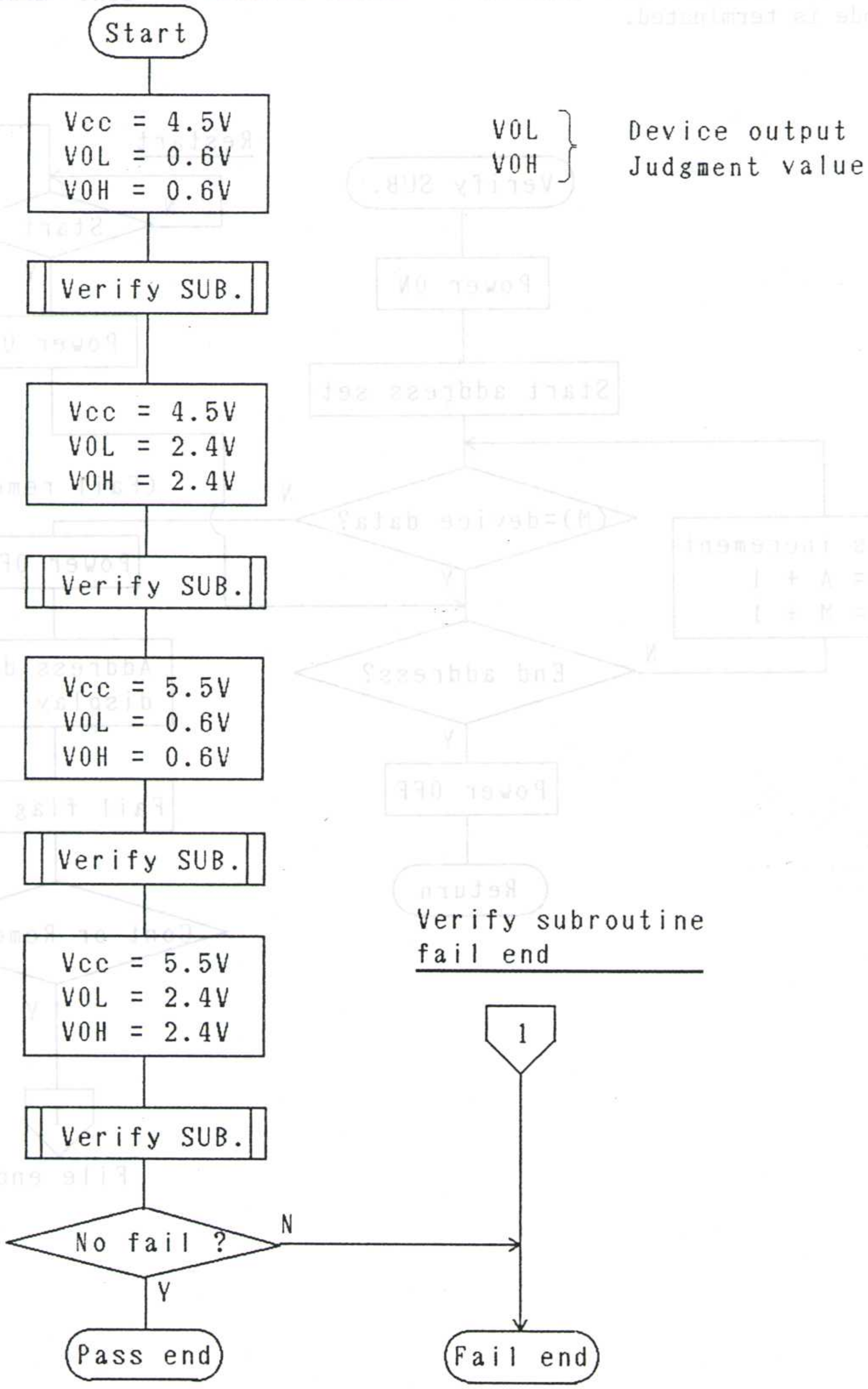
This mode check the device is erased(cleared) or not. If the fail condition is found in either remote mode or cont mode, this mode is terminated. In other cases, this mode can be continued by pressing the START key.



[NOTE]
The value of Vcc can be set to 4.75 V or 4.5 V by key operation.
The initial voltage of Vcc is 4.5 V.

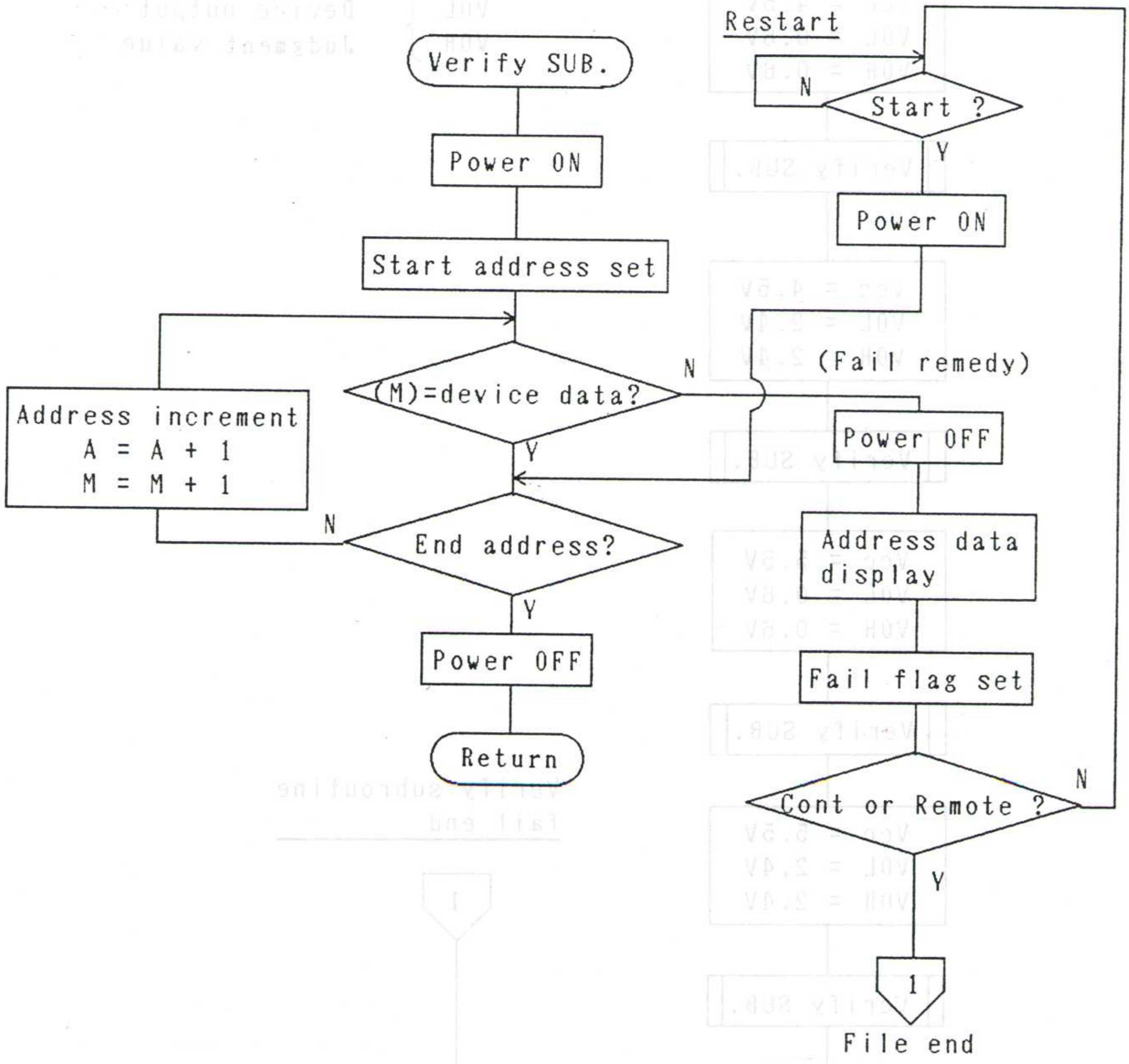
5.5.3 Verify Mode

The data in the device and the data in the buffer memory are compared. Totally four kinds of comparison are executed by changing the Vcc voltage and judge level of the device.



VERIFY SUBROUTINE

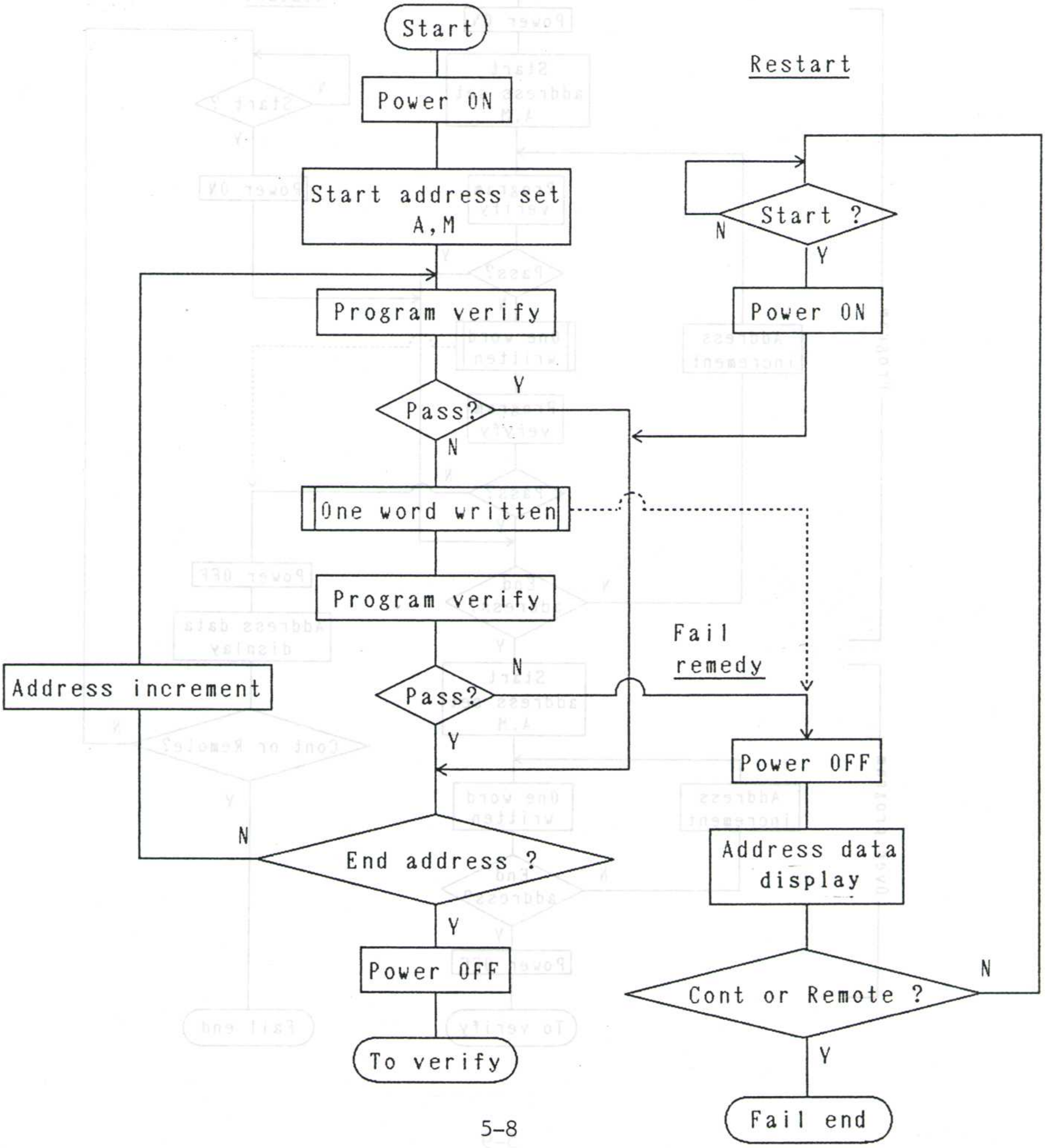
PASS/ FAIL judgment and branching based on its results are made by this subroutine.
If fail condition is found in the either remote or cont mode, this mode is terminated.



5.5.4 Program Mode

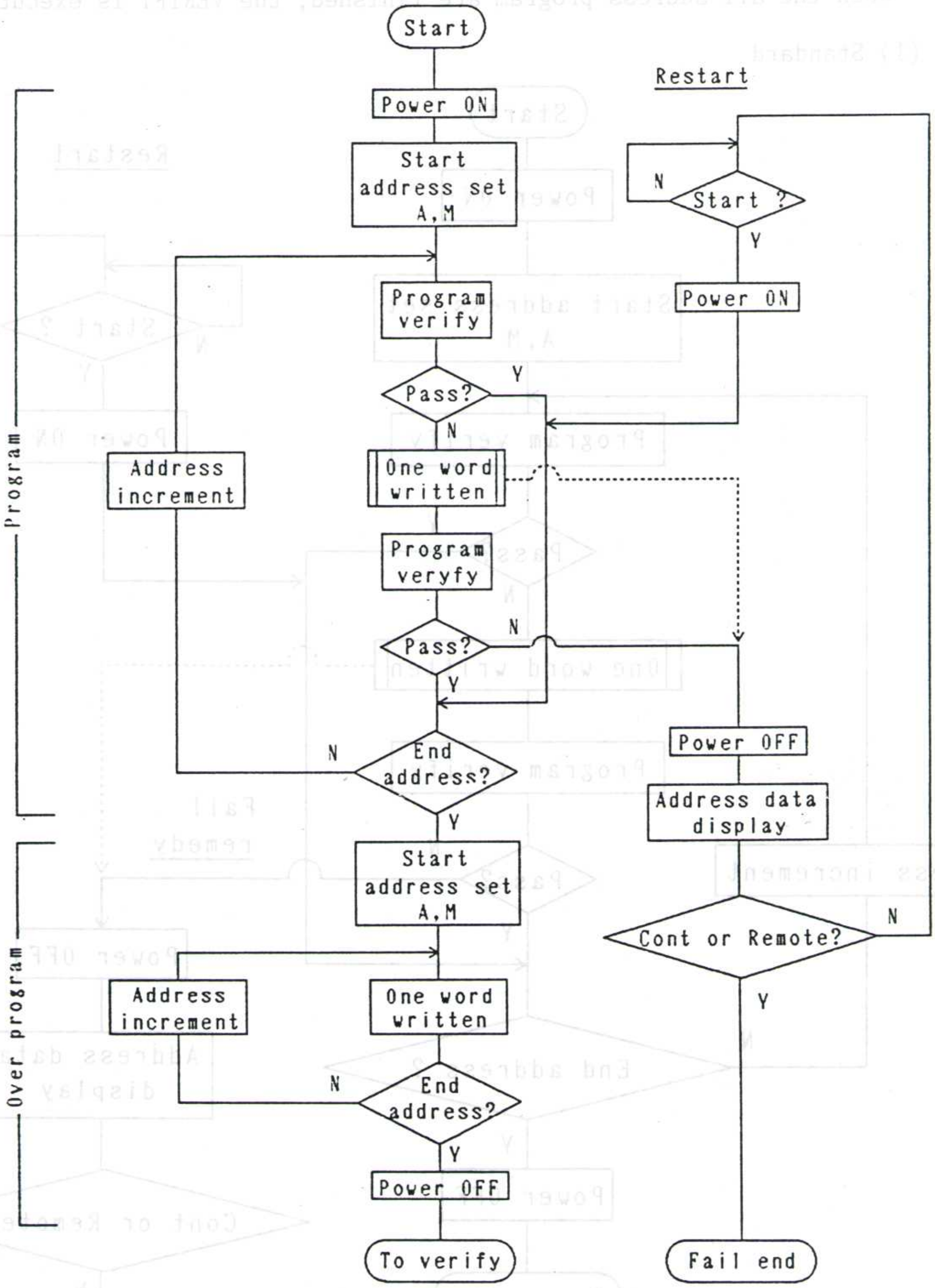
The data in the buffer memory are programmed into the device.
When the data of the memory and buffer are the same,the address is skipped.
The each programmed data is checked every time.
When the all address program are finished, the VERIFY is executed.

(1) Standard



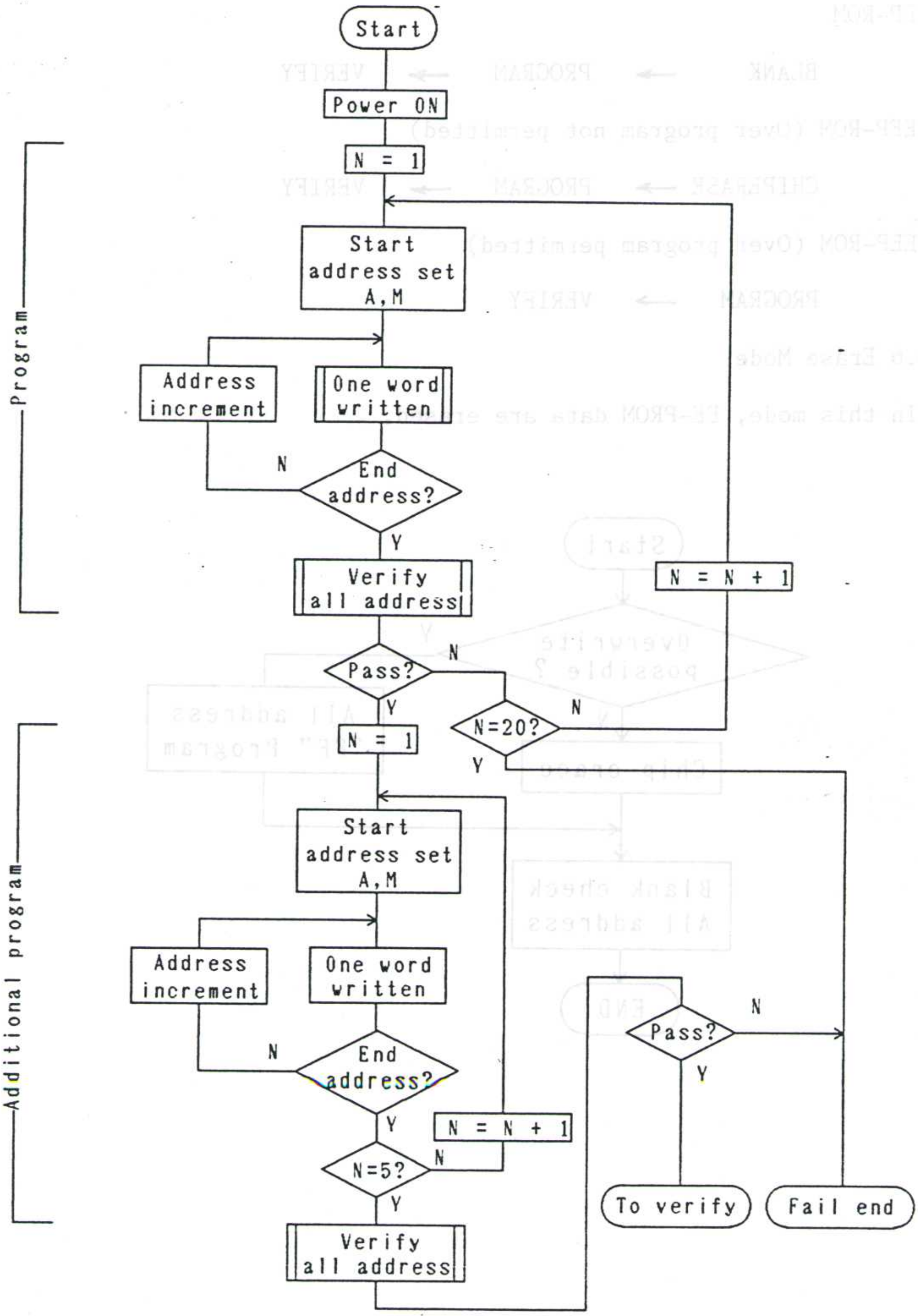
(2) AMD

When finished the all address programs, fixed pulse wide over program is executed.



(3) Loop Program

Program to each address and executes the verify after the all address programs.
If fail condition is found, start the program again from the beginning.



5.5.5 Continuous Mode

BLANK, PROGRAM and VERIFY are executed continuously.
If the device does not accepts an over program in EEP-ROM, ERASE mode is executed.
If accepts, execute only PROGRAM and VERIFY.

EP-ROM

BLANK → PROGRAM → VERIFY

EEP-ROM (Over program not permitted)

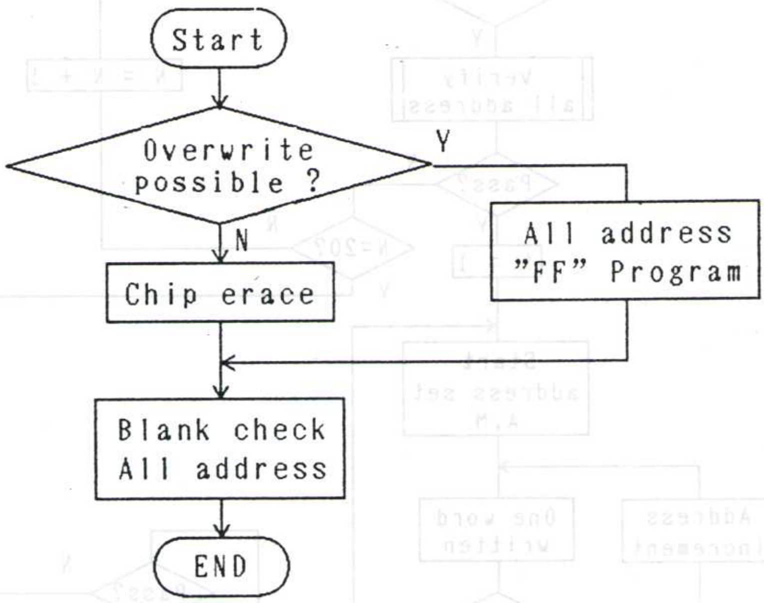
CHIPERASE → PROGRAM → VERIFY

EEP-ROM (Over program permitted)

PROGRAM → VERIFY

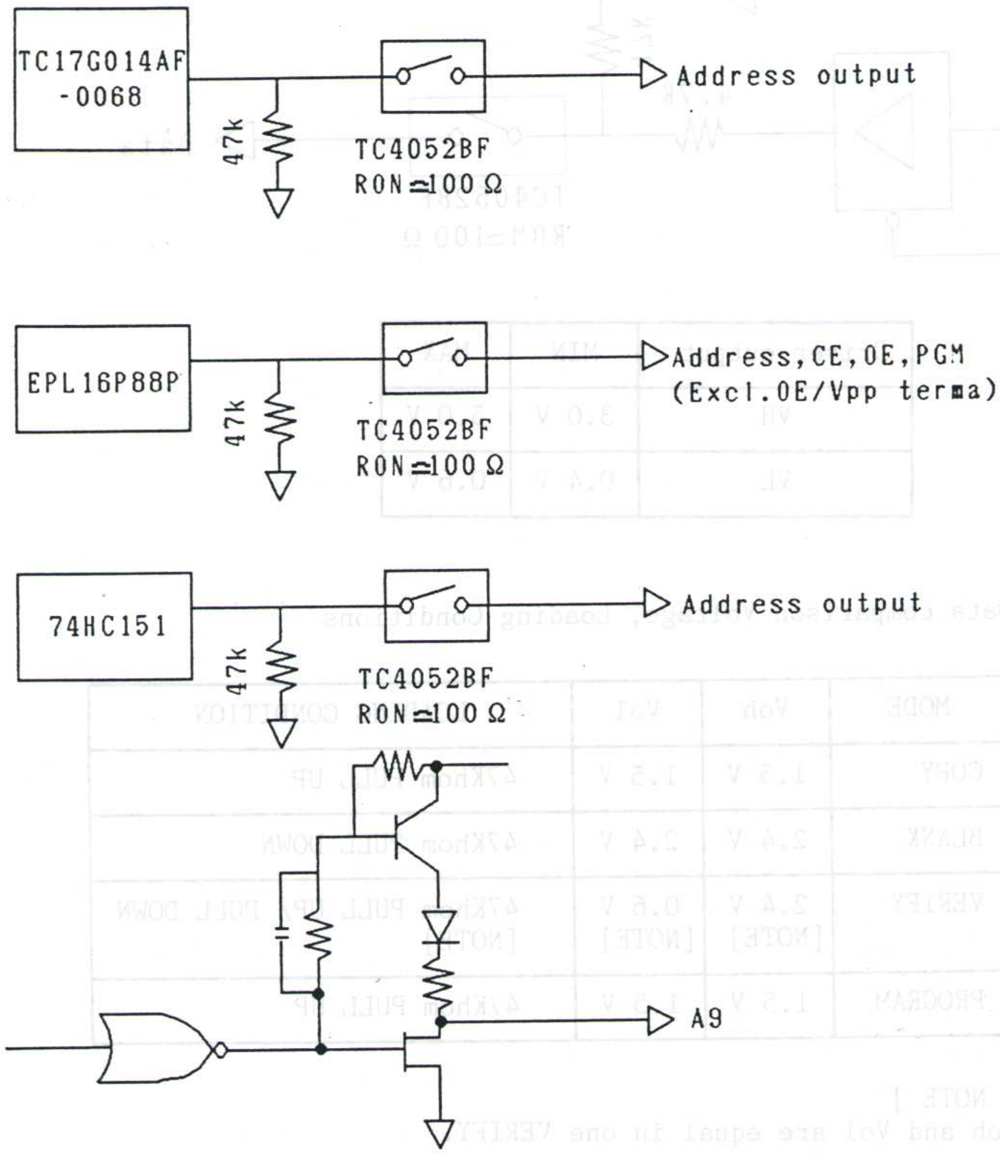
5.5.6 Erase Mode

In this mode, EE-PROM data are erased.



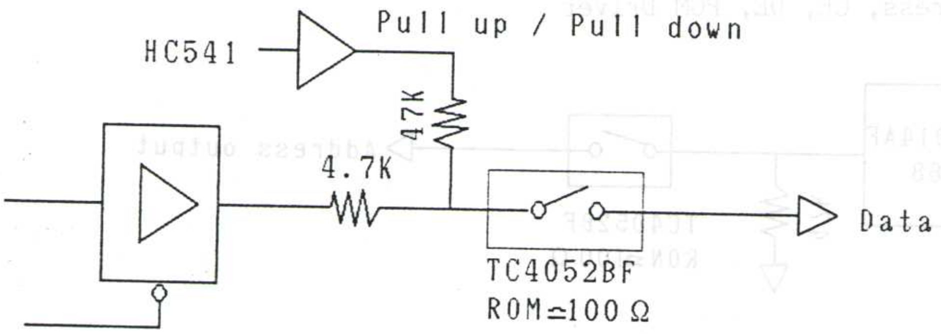
5.6 Electrical Characteristics

5.6.1 Address, CE, DE, PGM Driver



Driver output	MIN	MAX
VH	3.0 V	5.0 V
VL	0	0.4 V

5.6.2 Data Driver



Driver output	MIN	MAX
VH	3.0 V	5.0 V
VL	0.4 V	0.6 V

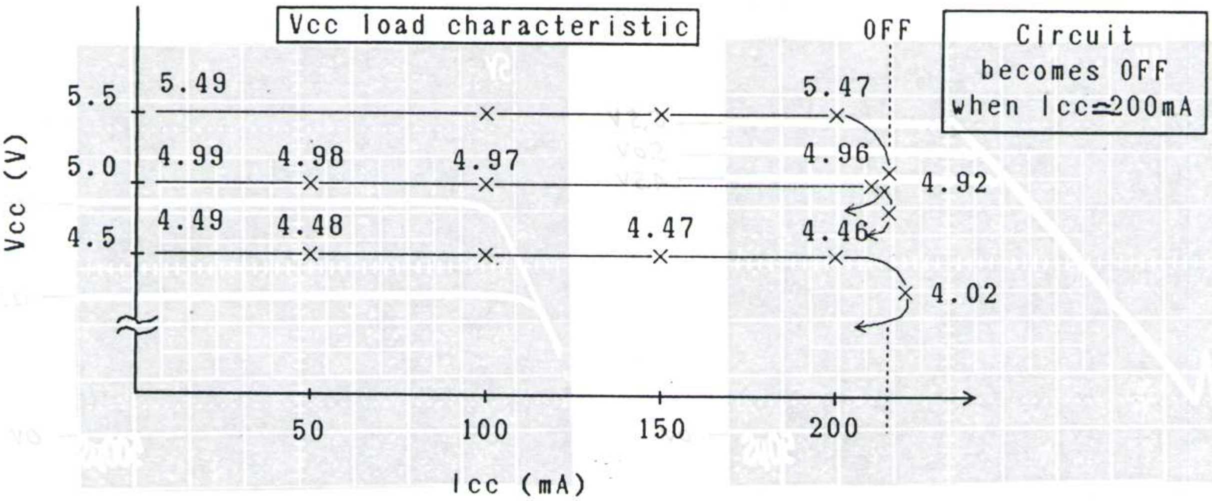
Data comparison Voltage, Loading Conditions

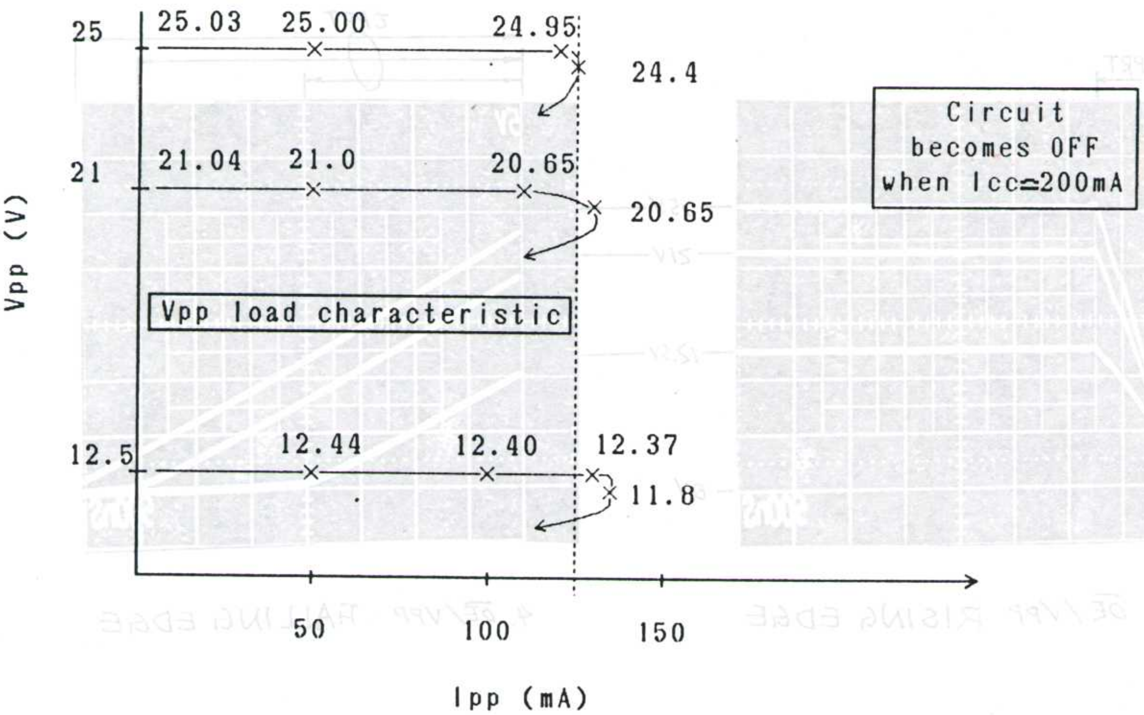
MODE	Voh	Vol	LOADING CONDITION
COPY	1.5 V	1.5 V	47Khom PULL UP
BLANK	2.4 V	2.4 V	47Khom PULL DOWN
VERIFY	2.4 V [NOTE]	0.6 V [NOTE]	47Khom PULL UP/ PULL DOWN [NOTE]
PROGRAM	1.5 V	1.5 V	47Khom PULL UP

[NOTE]
Voh and Vol are equal in one VERIFY.
Four kinds of verify are executed in the verify mode.
When the judge level is 0.6 V, output is pulled up.
When it is 2.4 V, output is pulled down.

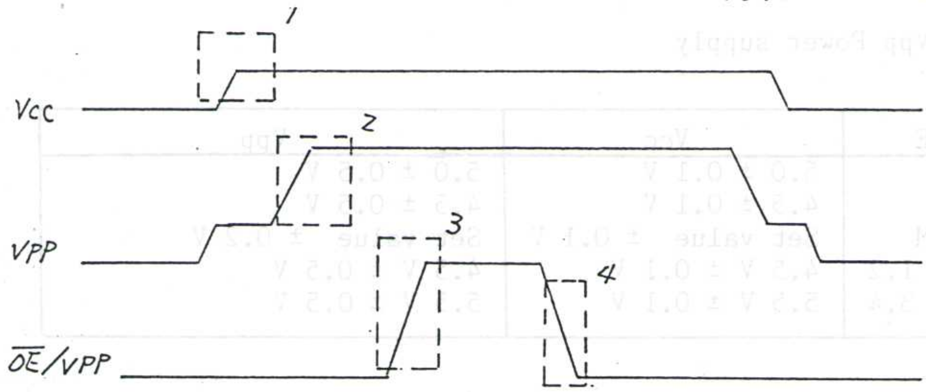
5.6.3 Vcc, Vpp Power supply

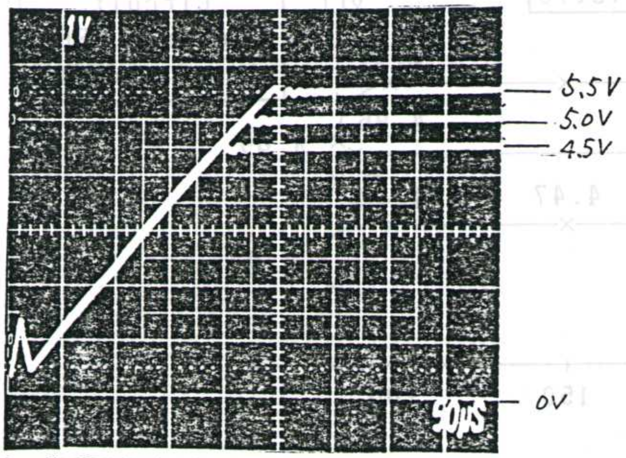
MODE	Vcc	Vpp
COPY	5.0 ± 0.1 V	5.0 ± 0.5 V
BLANK	4.5 ± 0.1 V	4.5 ± 0.5 V
PROGRAM	Set value ± 0.1 V	Set value ± 0.2 V
VERIFY 1,2	4.5 V ± 0.1 V	4.5 V ± 0.5 V
VERIFY 3,4	5.5 V ± 0.1 V	5.5 V ± 0.5 V



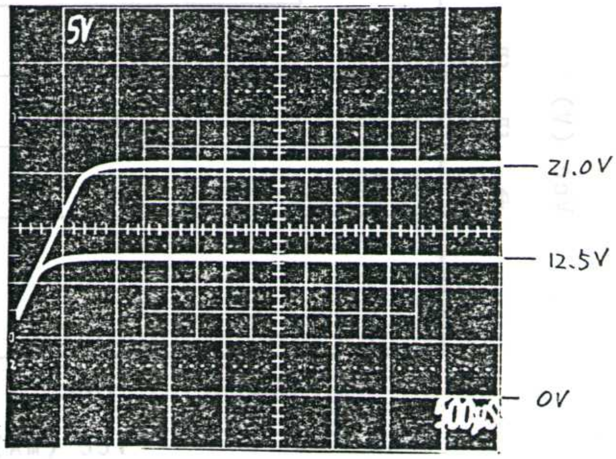


RISING AND FALLING EDGES CHARACTORITICS

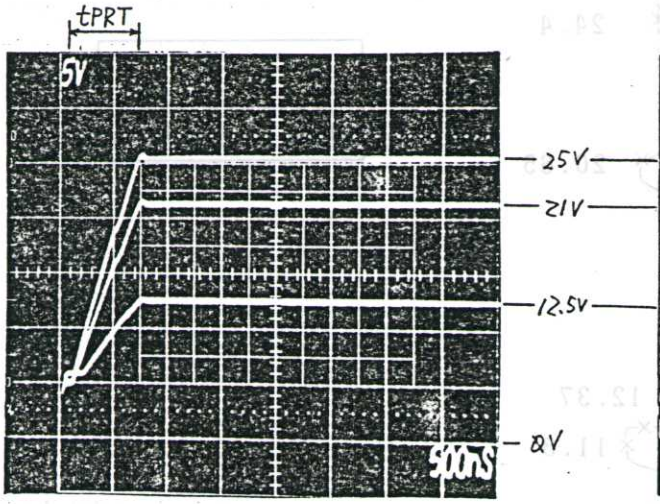




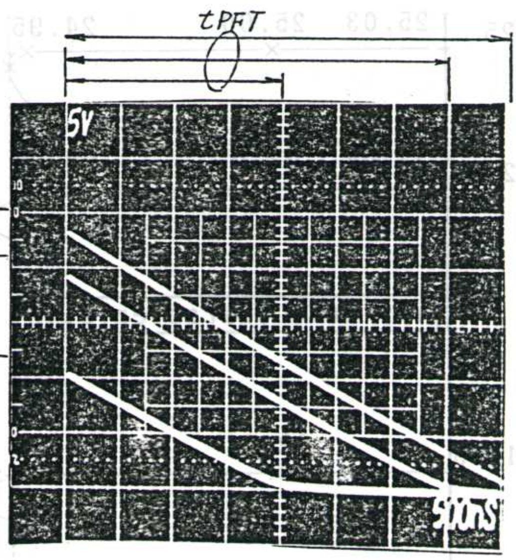
1, Vcc RISING EDGE



2. VPP FALLING EDGE



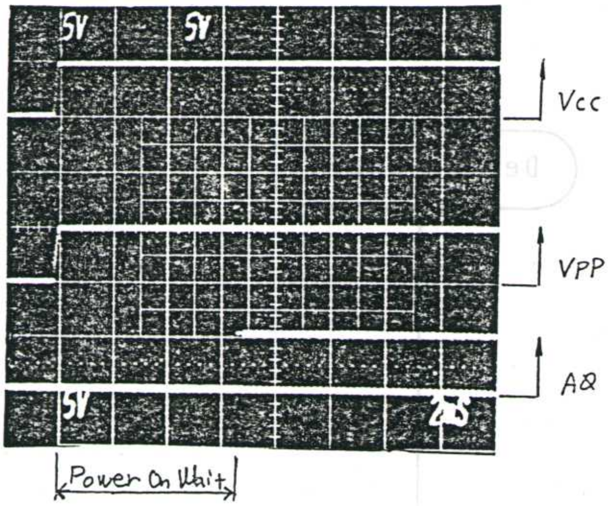
3. OE/VPP RISING EDGE



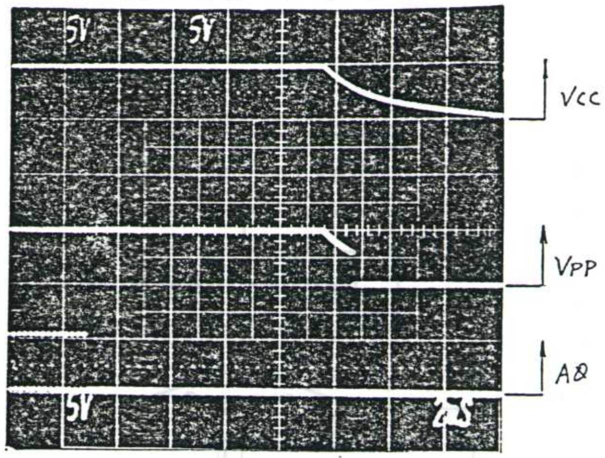
4. OE/VPP FALLING EDGE

5.6.4 Data Read

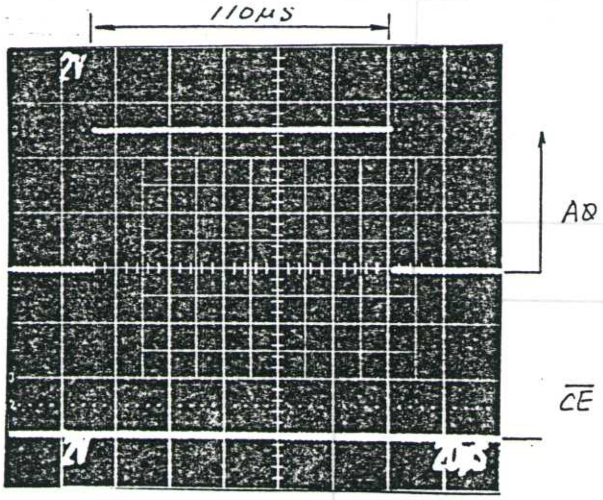
POWER ON (COPY)



POWER OFF (COPY)



16 BIT ROM READ CYCLE (VERIFY)

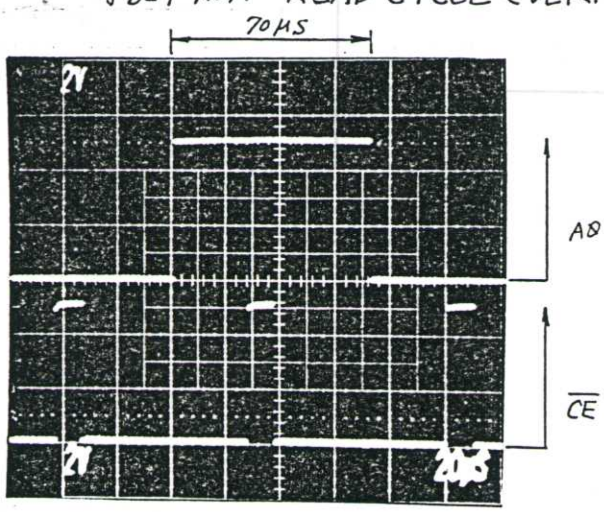


16 BIT ROM

	tCYC
COPY	148µS
BLANK	70µS
VERIFY	110µS

($\overline{CE}$ is fixed 'L')

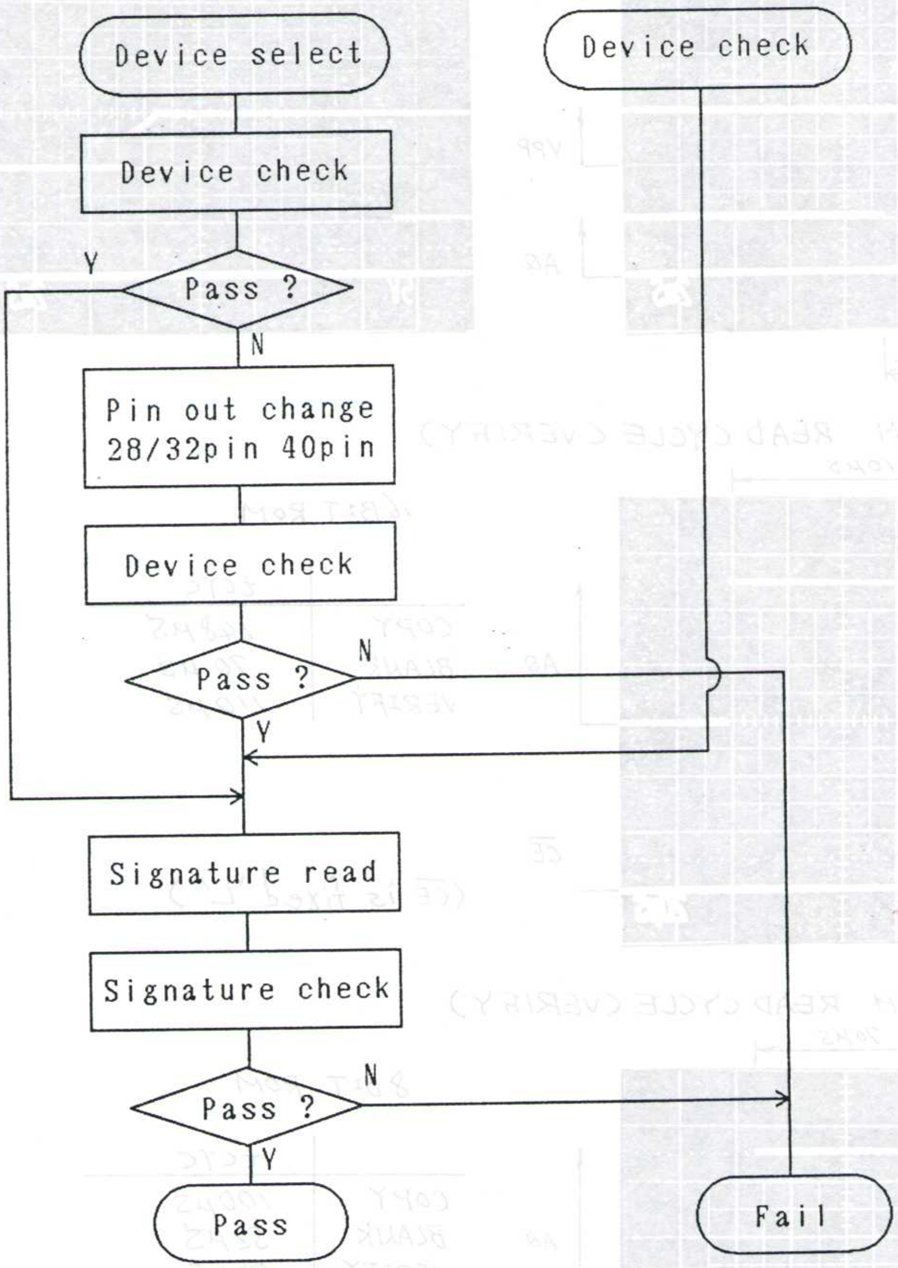
8 BIT ROM READ CYCLE (VERIFY)



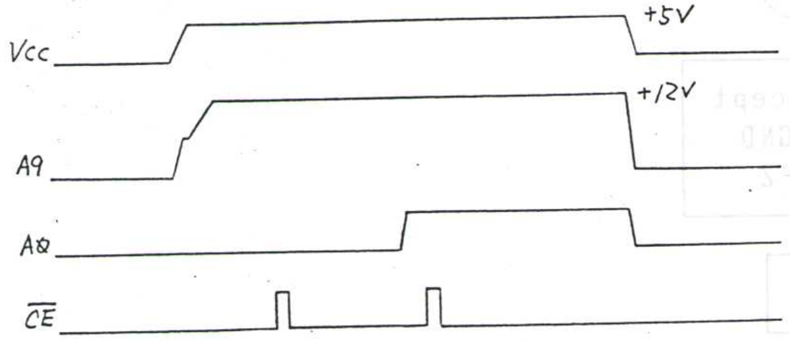
8 BIT ROM

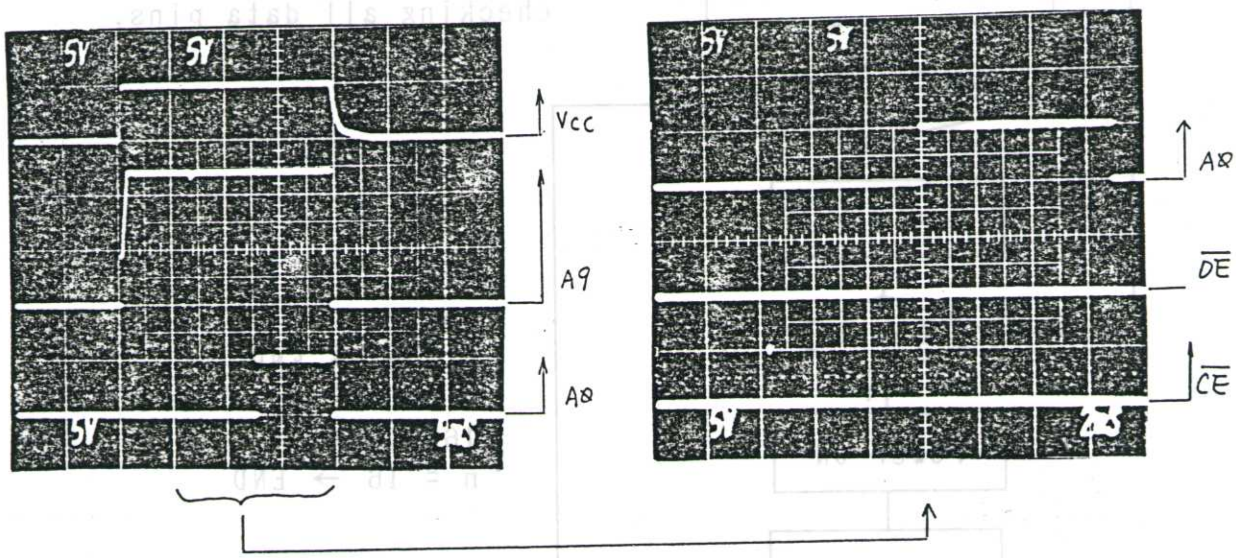
	tCYC
COPY	100µS
BLANK	52µS
VERIFY	72µS

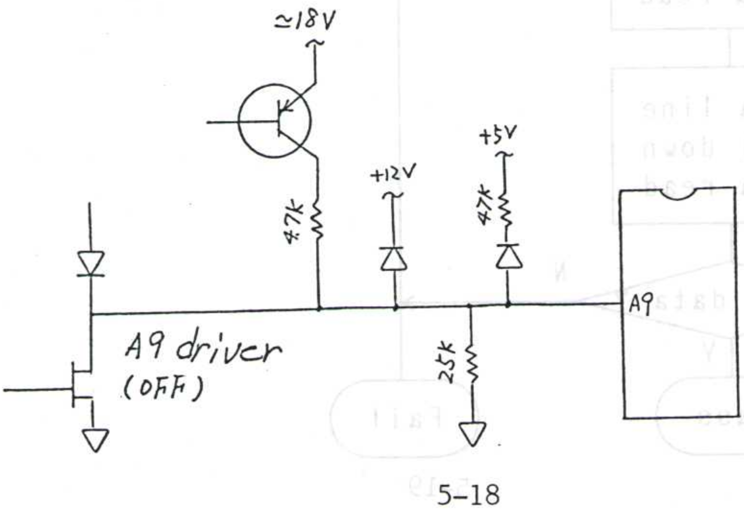
5.6.5 Signature Read



◦ SIGNATURE READ WAVE FORM

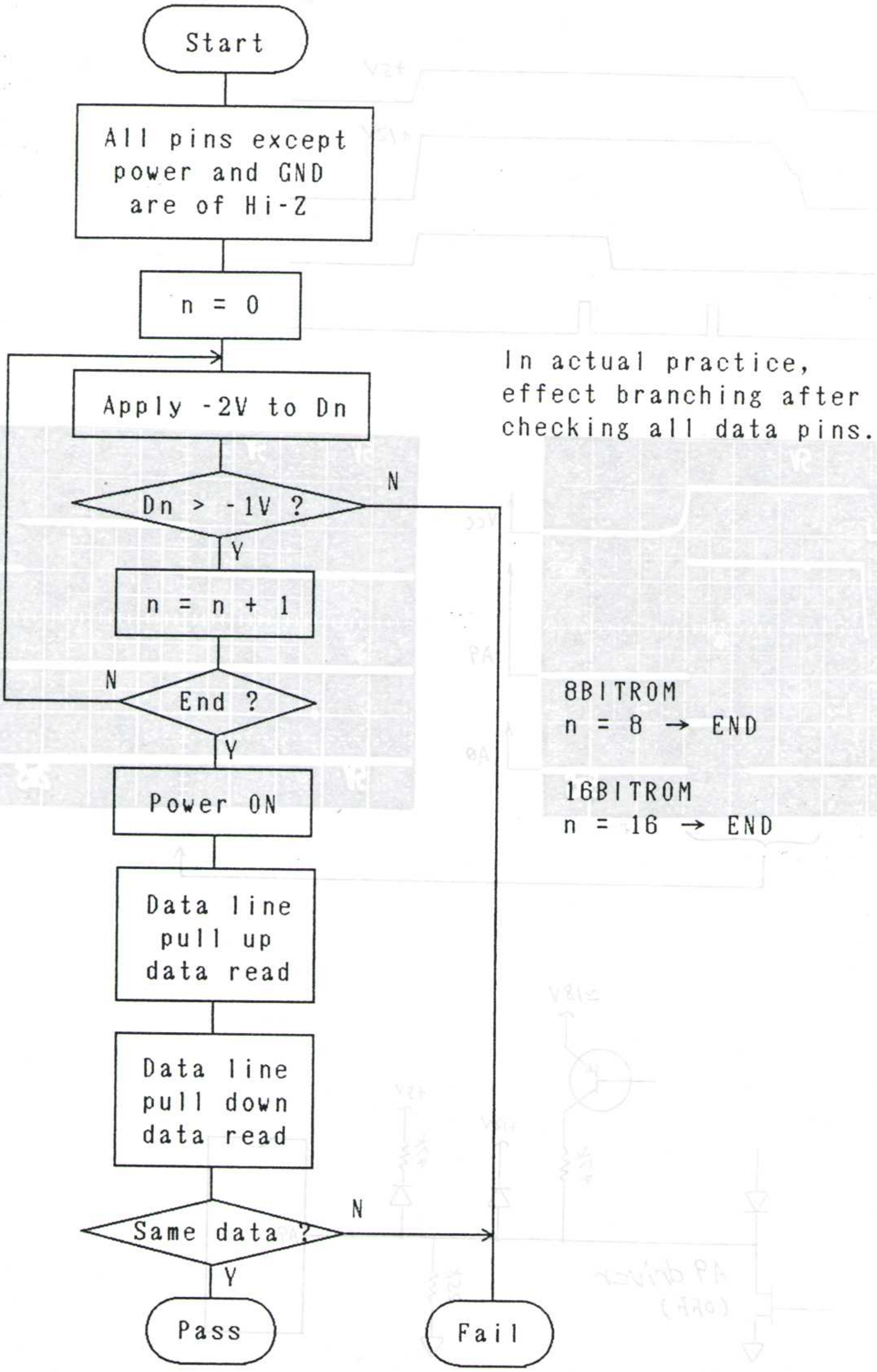


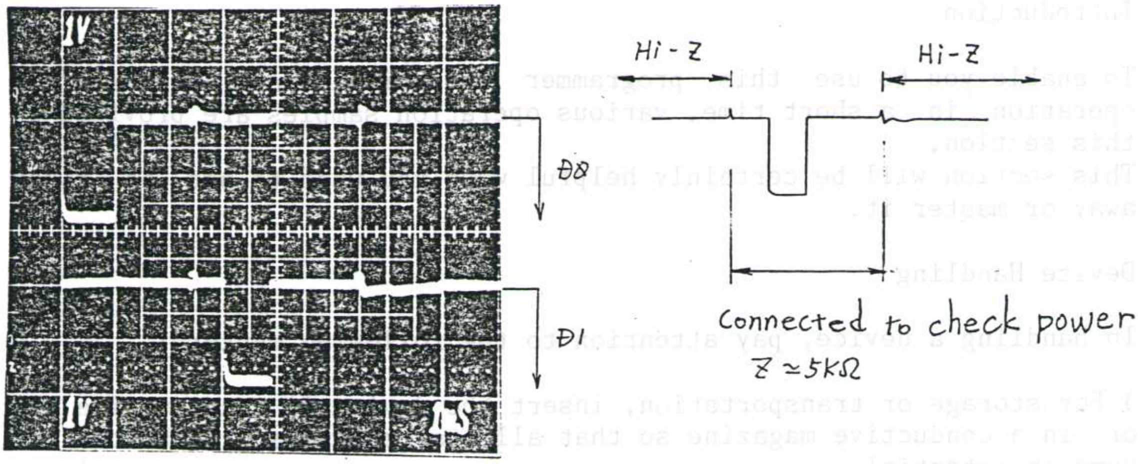




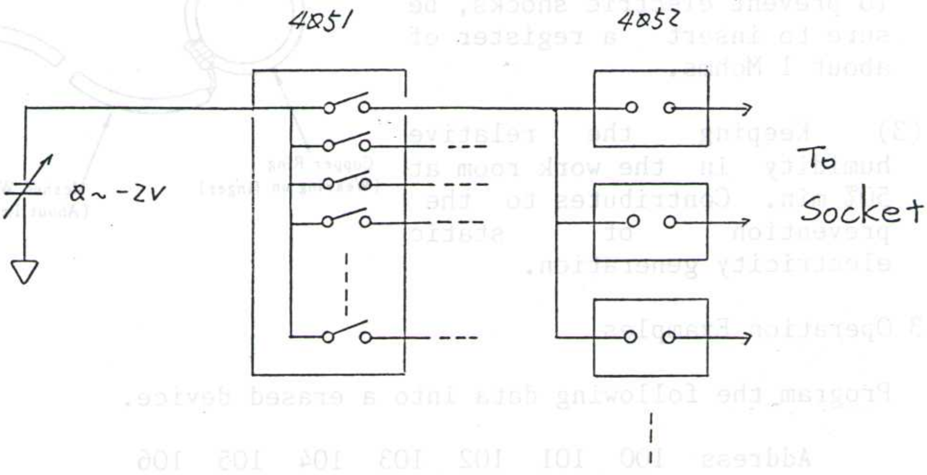
5.6.6 Device Check

The poor pin contact and overcurrent are checked in the device check mode.





1V
1V
1mS
D0
D1
Hi-Z
Hi-Z
Connected to check power
Z ≃5KΩ



4051
4052
0~-2V
To
Socket

6 PROGRAMMING TUTORIAL

6.1 Introduction

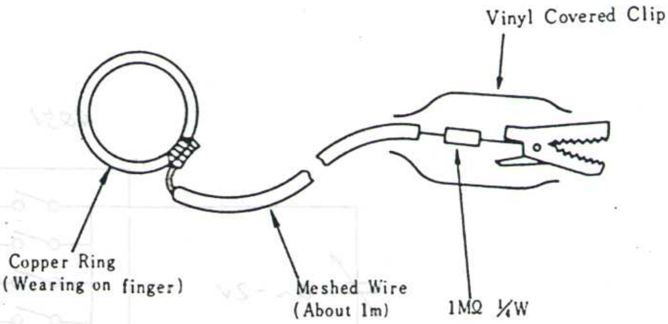
To enable you to use this programmer effectively and master this operation in a short time, various operation samples are provided in this section.
This section will be certainly helpful when you want to use it right away or master it.

6.2 Device Handling

In handling a device, pay attention to the following matters:

(1) For storage or transportation, insert the device in a conductive mat or in a conductive magazine so that all its terminals will become the same in potential.

(2) When you touch the device ground your body.
An example of human body grounding is shown.
To prevent electric shocks, be sure to insert a register of about 1 Mohms.



(3) Keeping the relative humidity in the work room at 50% min. Contributes to the prevention of static electricity generation.

6.3 Operation Examples

Program the following data into a erased device.

Address	100	101	102	103	104	105	106
Data	06	0C	18	30	60	C0	03

(1) Press the | EDIT | and | PAE | keys to select the adress range setting mode.

```
EDIT     ADD  ENTRY
BEGIN ADD     00000
```

(2) Input five digits of address data to set the ROM begin address.

|0| |0| |1| |0| |0| |ENTRY|

```
EDIT     ADD  ENTRY
BEGIN ADD     00100
```

(3) Input five digits of address data to set the ROM end address(FFO).

|0| |0| |F| |F| |0| |ENTRY|

```
EDIT      ADD ENTRY
END ADD       00FF0
```

(4) Input five digits of address data to set the begin address in the buffer memory.
|0| |0| |0| |0| |0| |ENTRY|

```
EDIT      ADD ENTRY
BUF ADD       00000
```

(5) The address range set is completed.

```
EDIT      ADD ENTRY
     COMPLETE
```

(6) Press the | INIT | key to select the INITIALIZE mode.
Press the | ↑ | key and input 0.

```
EDIT   INITIALIZE
BEGIN ADD   00000
```

(7) Press the | ↑ | key and input 0.

```
EDIT   INITIALIZE
END ADD      3FFFF
```

(8) Press the | ↑ | key and input FF.

```
EDIT   INITIALIZE
DATA            FF
```

(9) Initialization ends.

```
EDIT   INITIALIZE
     COMPLETE
```

(10) Press the | CH | key to select the data change mode.

```
EDIT   CHANGE
    00000 FF FF
```

(11) Press the 0, 6, and | ↑ | keys.
Input the below data .

```
EDIT   CHANGE
    00000   FF06
```

|0| |C| | ↑ |

|1| |8| | ↑ |

|3| |0| | ↑ |

|6| |0| | ↑ |

|C| |0| | ↑ |

|0| |3| | ↑ |

(12) Press the | RESET | key to end.

(13) Installed the erased device press the | DEVICE | and | ENTRY | keys to read device information.

```
  27256    cdE510
*** SET END ***
```

(14) Press the | BLANK | and |START| keys to make a blank check.

```
BLANK 07FFF:----
****   PASS   ****
```

(15) Press the | PROG | and | START | keys to begin writing.

```
PROG SUM:7B80 84
****   PASS   ****
```

6.4 Operations List

1 Device select

DEVICE | | | | | (↑) | ENT

Device code

DEVICE | DEVICE | ↑ | ENT

Any desired number of times

DEVICE | ENT   Setting by signature

2 Read/Program operation

| | START   Normal operation

| | 0 N 7 | START   BLOCK mode

(COPY | BLANK | PROG | VER | CONT)

S. COM | 1 | START   Erease (EEP-ROM only)

3 Operation rauge setting

$\boxed{\text{EDIT}}$ $\boxed{\text{PAE}}$ Device Begin address $\boxed{\text{ENT}}$

Device End address $\boxed{\text{ENT}}$

Buffer memory Begin address $\boxed{\text{ENT}}$

$\boxed{\uparrow}$ Skip

$\boxed{\text{A.MODE}}$ $\boxed{\uparrow}$ $\boxed{\text{ENT}}$ Address mode

4 Setting others

$\boxed{\text{S. COM}}$ $\boxed{2}$ $\boxed{\uparrow}$ $\boxed{\text{ENT}}$

5 Test mode

$\boxed{\text{S. COM}}$ $\boxed{3}$ ($\boxed{\text{ENT}}$) $\boxed{\uparrow}$ $\boxed{\text{ENT}}$

or

$\boxed{\text{S. COM}}$ $\boxed{3}$ $\boxed{\text{ENT}}$ $\boxed{\uparrow}$ $\boxed{\text{START}}$

7 MAINTENANCE

*** W A R N I N G ***

THIS MAINTENANCE INSTRUCTIONS ARE INTENDED FOR USE BY QUALIFIED PERSONNEL ONLY.
DO NOT PERFORM ANY OF THE TEST IN THIS SECTION UNLESS YOU ARE QUALIFIED TO DO SO.

7.1 Introduction

This section provides maintenance information for this model and includes a performance test, Electrical characteristic test, and Waveform Details.

7.2 Recommended Equipment

Test equipment recommended for the electrical characteristic test and Wave monitor listed below.

Multimeter for DC level measurement

Oscilloscope for waveform monitor.

7.3 Performance Test

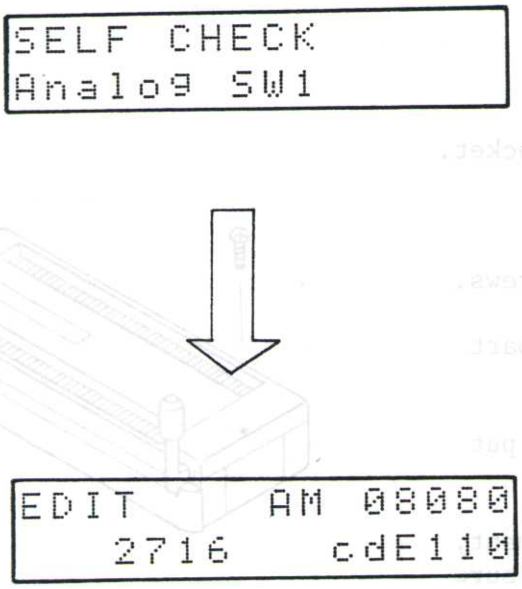
7.3.1 Appearance Check

Examine the appearance of Model 1890 for deformation and the loss of any component.
CHECK the IC sockets to avoid the poor pin contacts.

[NOTE]
If the case is dirty, switch off power and gently wipe off the stain with a cloth slightly wetted wite water or petroleum.
Do not use thinner, bezene and other simillar material. They will discolor and deform the case, display, and key boards.

7.3.2 Performance Check

Turn on the power and make sure that the self-test is executed without any fail.



For more details about the self-test, refer to the 3.7.1 Power On.

7.3.3 Device Socket

If the socket becomes worn, reading and programming errors occur more frequently. The most of read/program errors are caused by poor pin contact. The rust or stain on the contact pins prevent pin contact.

[IMPORTANT]
Replace the device socket by a new one at least once a year whether it has been used or not.

[NOTE]
The socket is an expendable parts so it is not covered under warranty.

(1) Check points

o Has one year passed since the socket had been used.

o Are the contact pins still glossy.

o Are the contact pins stained.

o Is there no dust on the socket.

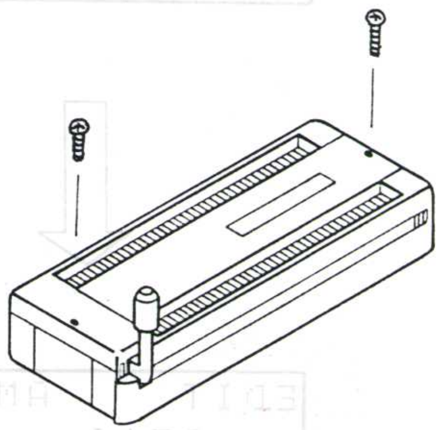
(2) How to replace the socket

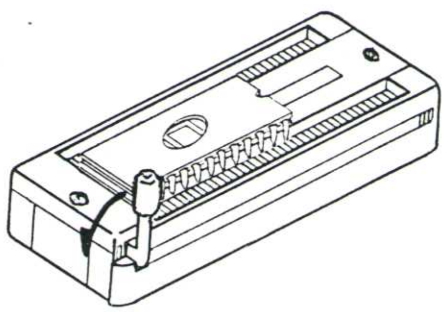
1 Remove the two upper screws.

2 Replace only the upper part of the socket.

3 Mount a new socket and put two screws.

4 After the socket replacement, install the device and make sure that read/program will be done without any fail.



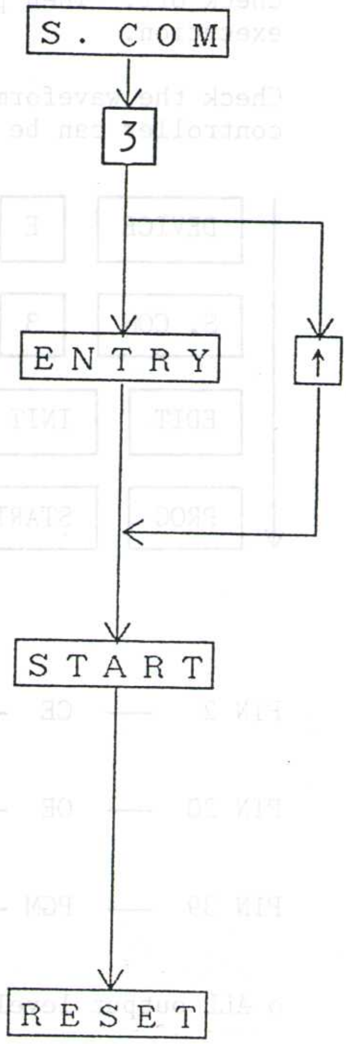


7.4 Electrical Characteristic Test (OU-900 is installed)

7.4.1 Test Mode Selection

(1) Press the | S. COM | key and then the | 3 | key, the 1890 will switch to the test mode and the following message will be displayed.

```
AC TEST MODE SET
  - OFF -
```



(2) Change the condition by pressing the | ↑ | key.
Press the | ENTRY | key, and the following message will be displayed.

Press the | ENTRY | key repeatedly until the item to be executed is displeyed.

(3) Press the | START | key, then the test mode will be executed.

(4) Press the | RESET | key to end.

[NOTE]
These seven items are prepared for the test mode.

1. Program pulse monitor.
2. Repetition of VERIFY, etc.
3. Vpp, Vcc, Power Supply Pulse Monitor.
4. Vpp, Vcc, level monitor.
5. Inverse device insertion check.
6. Address pulse monitor.
7. Data pulse monitor.

[CAUTION]
Once the test mode is executed, address range setting and other operating conditions might change. Reset the device code after this mode mode execution.

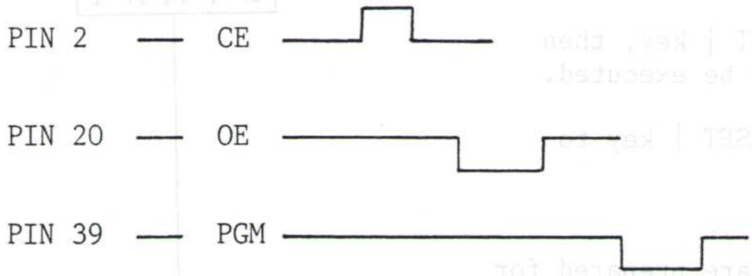
7.4.2 Program Pulse Monitor

Used for monitoring the program pulse waveform.
Initialize program data at FF, set the AC test mode on, and device check off. Then program pulse can be observed during the program mode execution.

Check the waveform of OE, CE and PG6. The all driver outputs on the controller can be checked in this one check.

DEVICE	E	7	1	1	ENT	; 40 pins, 1 Mbits is selected.
S. COM	3	↑	ENT	RESET		; AC test mode "ON."
EDIT	INIT	↑	↑	↑		; Memory initialize.
PROG	START					; Program waveform output.

If failed, press | RESET | and | START |.



o ALL output levels should be Voh > 4 V and Vol < 0.5V.

[NOTE]
Theare are no timing restrictions.

7.4.3 Vcc, Vpp Pulse Monitor

Make sure that there is no overshoot or oscillation at the rising edge of Vcc or Vpp.

[S.COM] [3] [ENTRY] [EMTRU] [STRAT] ..... [RESET]

End time

```
POWER 0000INCE
***  Running  ***
```

According to the device cords below, Make sure that each pin is switching properly (particularly relays).

Vpp -	1	40	- Vcc	CODE E710 Vcc PIN40 Vpp PIN1
Vpp -	5	36	- Vcc	CODE E720 Vcc PIN36 Vpp PIN5
Vpp -	7	34	- Vcc	CODE E311 Vcc PIN34 Vpp PIN7
		32	- Vcc	CODE E110 Vcc PIN32 Vpp PIN29
		30	- OE/Vpp	CODE E210 Vcc PIN32 Vpp PIN30
		29	- Vpp	

[NOTE]
Do not have to check the timing and voltage level.

7.4.4 Vcc Vpp Level Monitor

This mode is prepared to check the voltage level and loaded wave characteristics. Both of Vcc and Vpp are checked at several points by changing the device code. Check points are only pin 1 and pin 40.

Check Procedure (Voltage Check)

o Set Am27C1024 and execute the P.S. DC test.

[S.COM] [3] [ENT] [ENT] ... [ENT]

[START] ; Vcc = 4.5V 0.1V, Vpp = 4.5V 0.3V

[START] ; Vcc = 5.0V 0.1V, Vpp = 5.0V 0.3V

[START] ; Vcc = 5.5V 0.1V, Vpp = 5.5V 0.3V

[START] ; Vcc = 6.0V 0.1V, Vpp = 12.5V 0.2V

(Reset from the beginning)

o Check the output voltage level.

o Set 2764 (code E311) and 2716 (code E110) and check the same test.

2716 Vcc = 5.0V ± 0.1V, Vpp = 25.0V ± 0.5V

2764 Vcc = 6.0V ± 0.1V, Vpp = 21.0V ± 0.5V

Check Procedure (Loaded Characteristic Check)

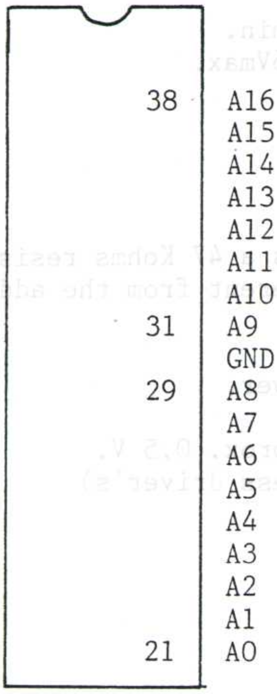
The Icc is approx. 220mA and Ipp is approx. 130mA over the whole operating range in the OU-900 programming unit.

7.4.5 Address Pulse Monitor

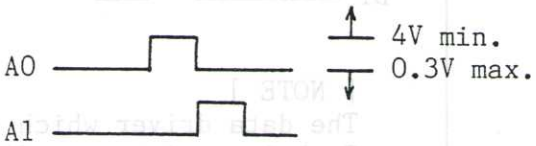
Use the TEST Mode to check the waveform of the address driver output.

| DEVICE | | 1 | | 0 | | 2 | | 4 | | ↑ | | ENT | ; 40 pins, 1M bits is selected.

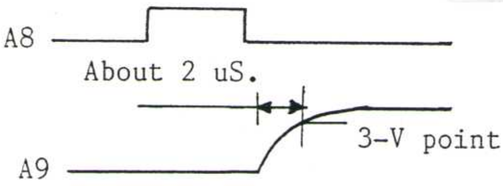
| S.COM | | 3 | | ENT | | ENT | ... | ENT | ; | START | after selecting address driver test.



o A shift pattern is outputted at A0-A16. Check the waveform.



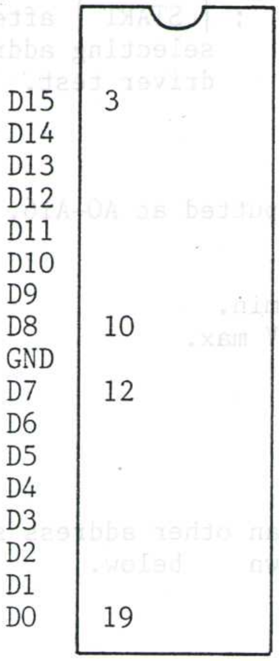
o The A9 rises slower than other address signal and waveform is as shown below.



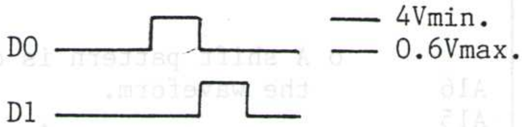
7.4.6 Data Drive Pulse Monitor

Check the waveform of the data driver output.

| S.COM | 3 | ENT | ENT | ... | ENT | ; | START | after selecting data driver test.



o A shift pattern is outputted at D0-D15. Check the waveform.



[NOTE]
The data driver which has a 47 Kohms resistance. So below points are different from the address signals.

o Rise and fall are slower.

o The " L " level is approx. 0.5 V. (Higher than the address driver's)

7.5 Waveform Details

Detail Waveforms of each code number programming are listed.

7.5.1 16K Bit EP-ROM

(1) i2716	CODE E110
(2) Am 2716B	CODE E111
(3) WS57C191	CODE E112, E215, E31D
(4) CY7C292/282	CODE E113, E010

7.5.2 32K Bit EP-ROM

(1) i2732/32A	CODE E210, E211
(2) TMS2532/32A/64	CODE E212, E216, E314
(3) Am2732B, NMC27C32B	CODE E213, E214

7.5.3 64K/128K Bit EP-ROM

(1) i2764/128, MBM2764/128	CODE E311, E411, E313, E413
(2) i2764A/128A	CODE E312, E412
(3) MCM68764, RD687C64	CODE E315, E316
(4) Am2765A/128A, iP2764A/128A NMC27C64/C128, WS57C64/C128	CODE E318, E414, E31A, E415 E31B, E417, E31C, E418
(5) LH5749	

7.5.4 256K Bit EP-ROM

(1) i27256	CODE E510
(2) Am27256, iP27256, NMC27C256	CODE E511, E514, E516
(3) MBM27C256	CODE E512
(4) LH57256, WS57C256	CODE E515, E517

7.5.5 512K Bit EP-ROM

(1) i27512, i27513	CODE E610, E612
(2) Am27512, iP27512, NMC27C512	CODE E611, E613, E614

7.5.6 1M Bit EP-ROM

(1)	HN27C101, HN27C301 MBM27C1000, MBM27C1001 UPD27C1000, UPD27C1001 M5M27C100, M5M27C101	CODE E720, E721 E722, E723 E726, E727 E729, E72A
(2)	i27010, TC571000, TC571001	CODE E724, E725, E728
(3)	UPD27C1-24, MBM27C1024 HN27C1024, M5M27C102	CODE E711, E712 E714, E716
(4)	Am27C1024, TC571024 i27210, NMC27C1024	CODE E710, E713 E715, E717
(5)	MBM27C1028	CODE E740

7.5.7 EEP-ROM

(1)	HN48-16	CODE D110
(2)	i2816A, DO52B13	CODE D113
(3)	X2816A, X2816B	CODE D116
(4)	Am2817, X28164A, Am9864, X28256	CODE D117, D311, D313, D510
(5)	DO52B23H, DO52B33H	CODE D210, D310
(6)	HN58064	CODE D312

= How to read the pulse specification table =

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			10	uS	3

Required pulse spec.
(by the device manufacture)

Actual supplying pulse spec.
(by the 1890)

Photograph number

7.5.1 16K Bit EP-ROM

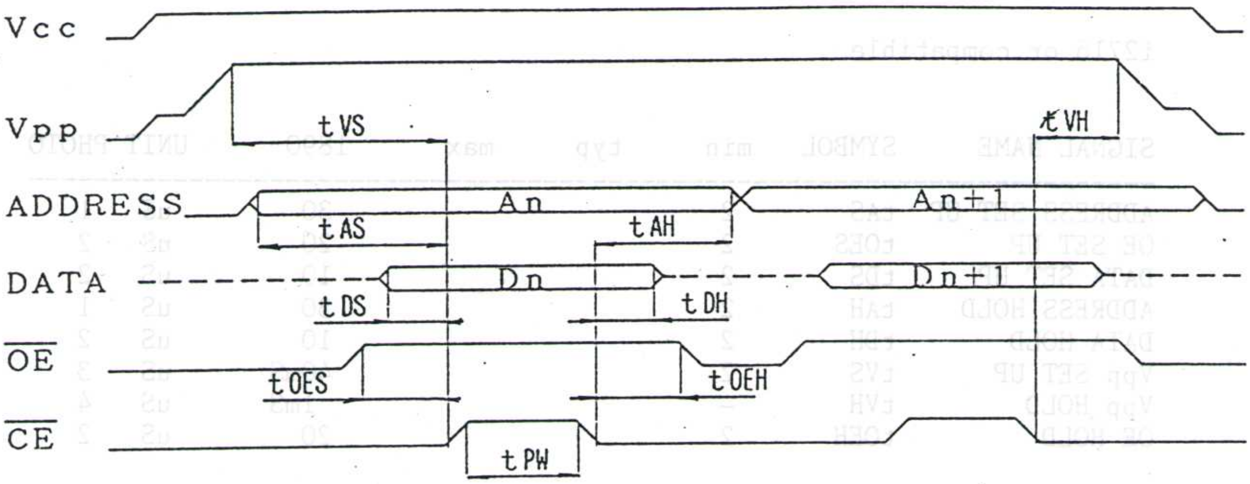
(1) CODE E110

i2716 or compatible

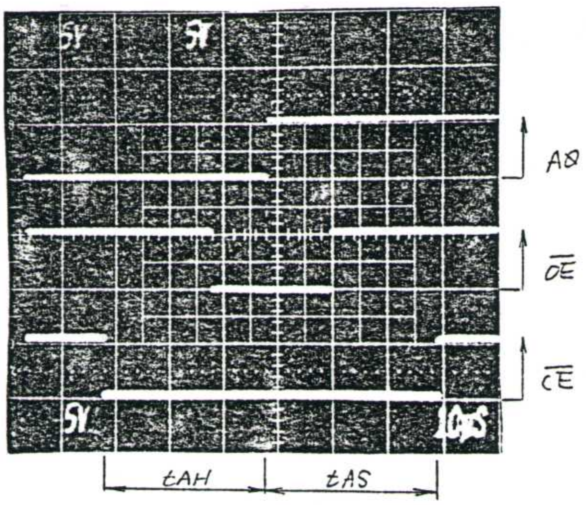
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			30	uS	1
OE SET UP	tOES	2			20	uS	2
DATA SET UP	tDS	2			10	uS	2
ADDRESS HOLD	tAH	2			30	uS	1
DATA HOLD	tDH	2			10	uS	2
Vpp SET UP	tVS	2			40mS	uS	3
Vpp HOLD	tVH	-			1mS	uS	4
OE HOLD	tOEH	2			20	uS	2

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc		5.0		5.0	V	3,4
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	3,4
PROGRAM	tPW	45	50	55	50	mS	5
OVER PROGRAM	tOPW	-	-	-		mS	-
MAXIMUM PULS NO.	N		1		1		5

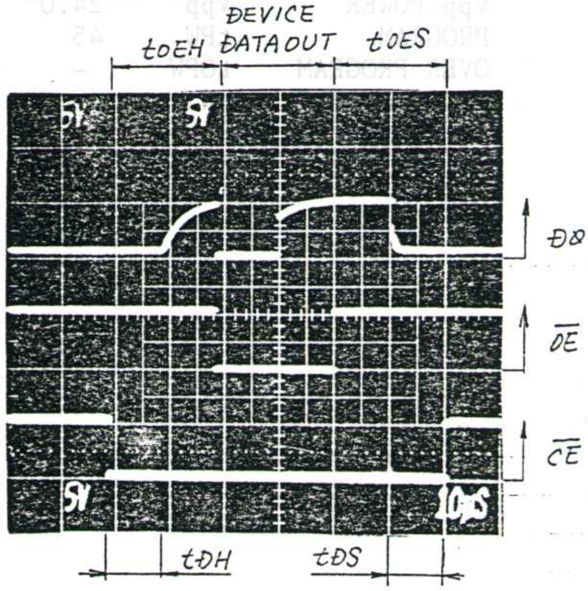
CODE E110



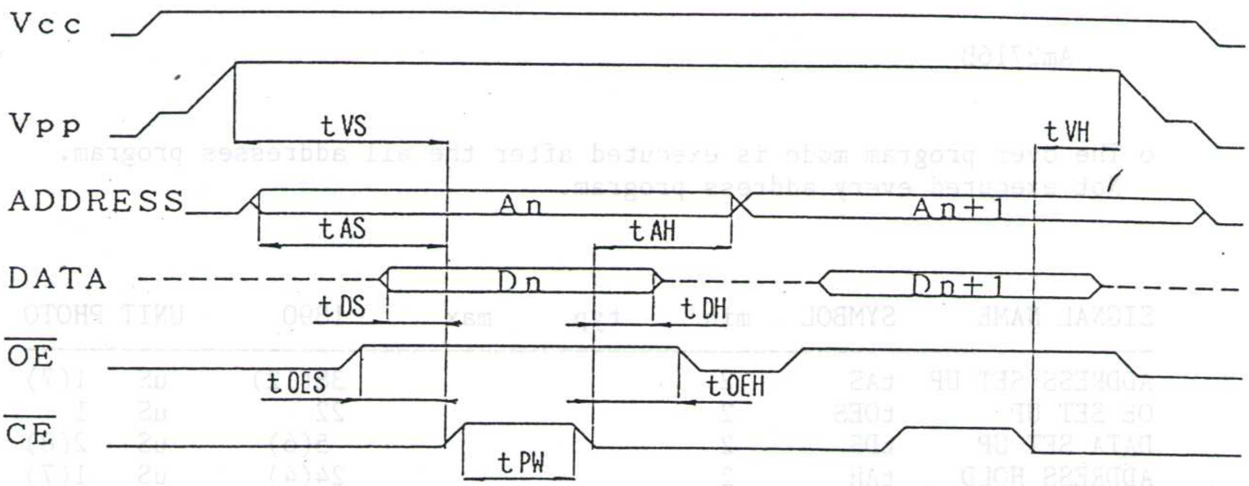
1. ADDRESS SETUP / HOLD



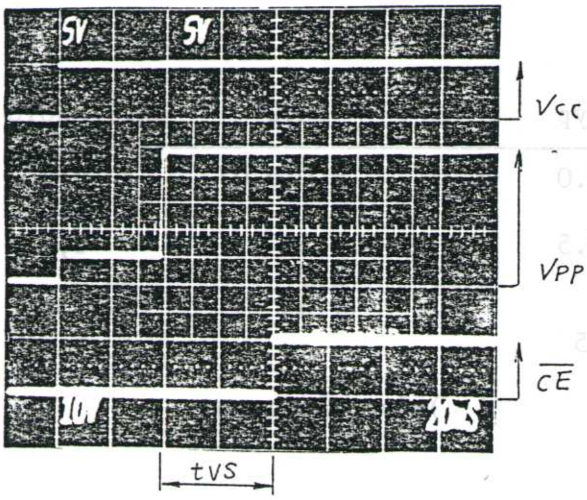
2. DATA SETUP / HOLD



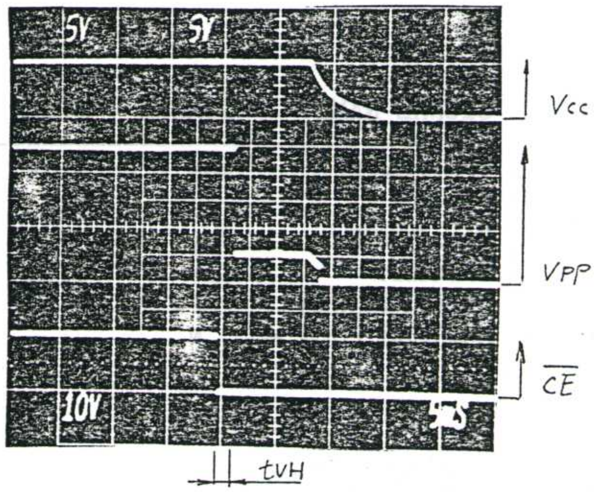
CODE E110



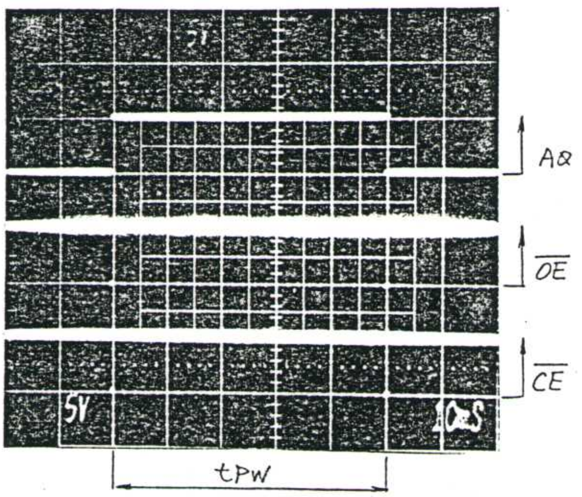
3. POWER ON



4. POWER OFF



5. PROGRAM PULSE



(2) CODE E111

Am2716B

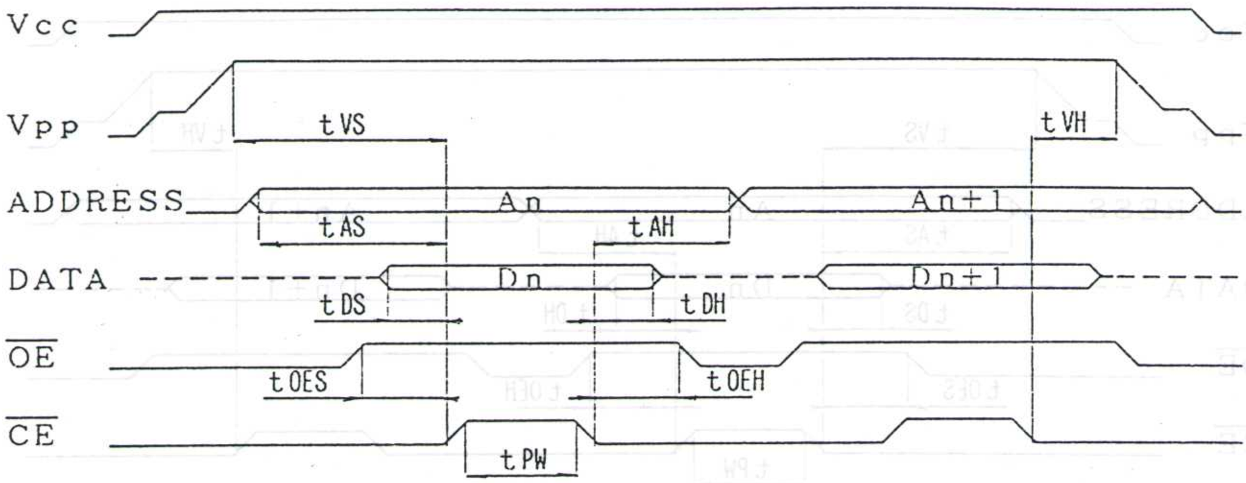
o The over program mode is executed after the all addresses program.
  Not executed every address program.

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			38(12)	uS	1(7)
OE SET UP	tOES	2			22	uS	1
DATA SET UP	tDS	2			5(6)	uS	2(8)
ADDRESS HOLD	tAH	2			24(4)	uS	1(7)
DATA HOLD	tDH	2			40mS	uS	2(8)
Vpp SET UP	tVS	2			1mS	uS	3
Vpp HOLD	tVH					uS	4

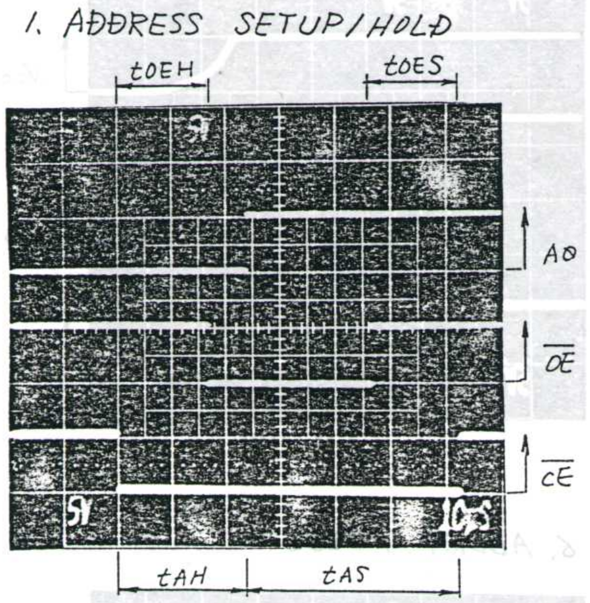
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	1,2(9)
Vpp POWER	Vpp		12.5		12.5	V	1,2
PROGRAM	tPW	0.95		1.05	1.0	mS	5
OVER PROGRAM	tOPW	1.9		55	1.95	mS	10
MAXIMUM PULS NO.	N		15				6

( ):Over Program

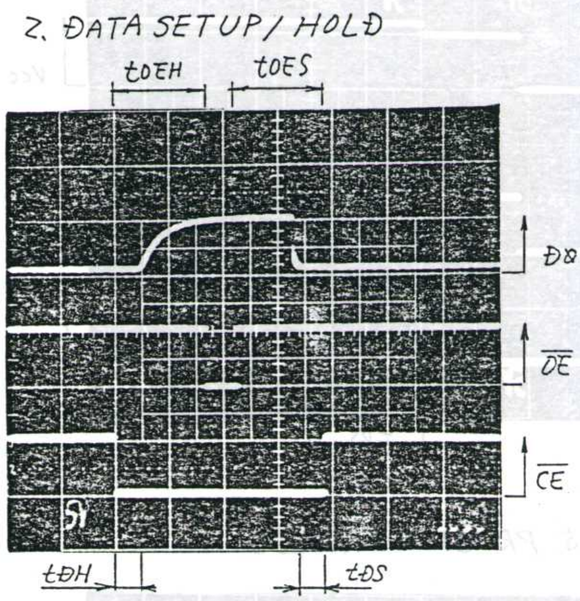
CODE E111



Vcc
Vpp
ADDRESS
DATA
OE
CE
t VS
t VH
An
An+1
t AS
t AH
Dn
Dn+1
t DS
t DH
t OES
t OEH
t PW

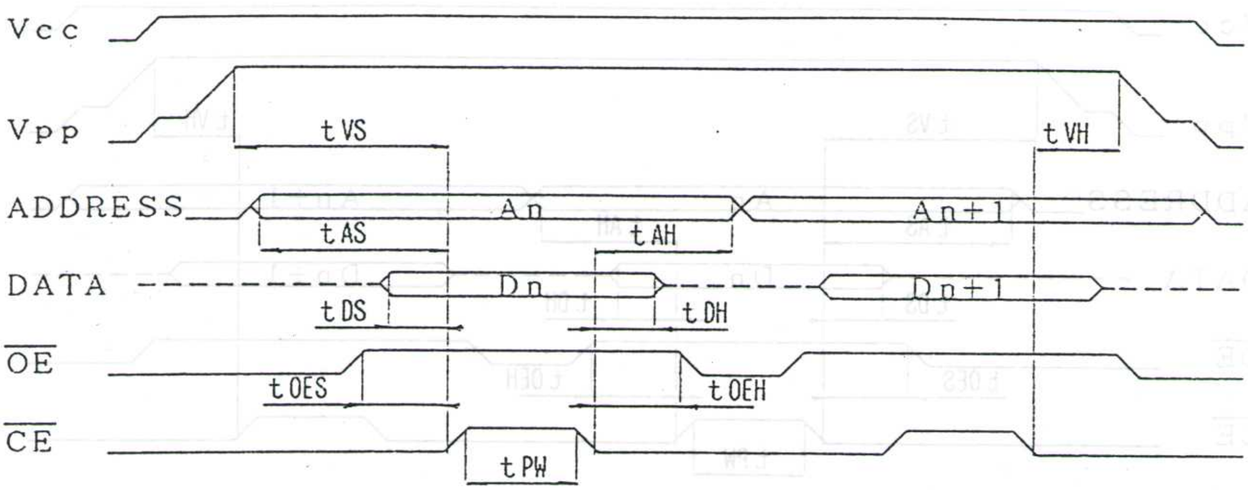


1. ADDRESS SETUP/HOLD
tOEH
tOES
A0
OE
CE
tAH
tAS

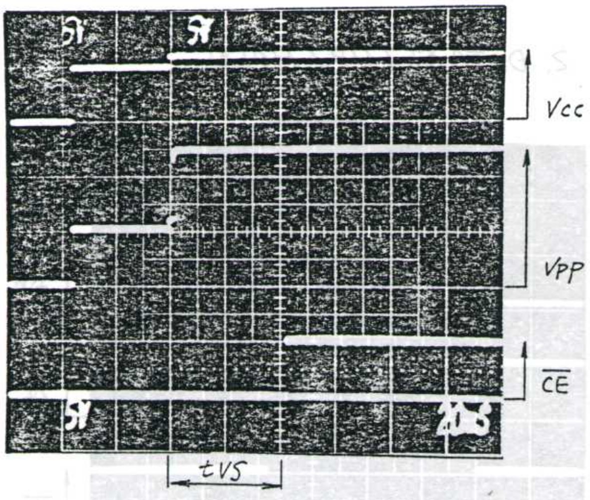


2. DATA SETUP/HOLD
tOEH
tOES
D0
OE
CE
tDH
tDS

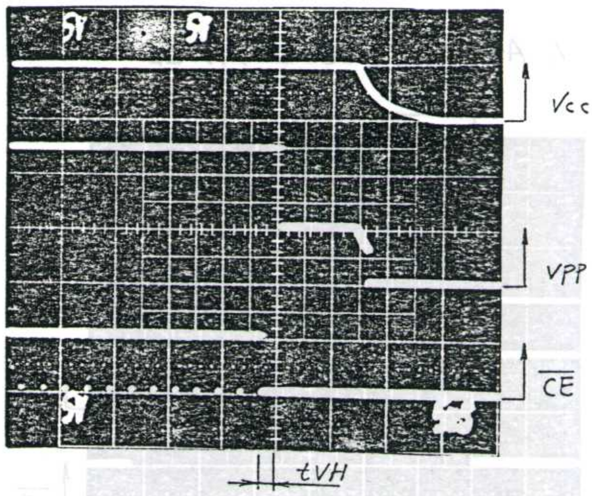
CODE E111



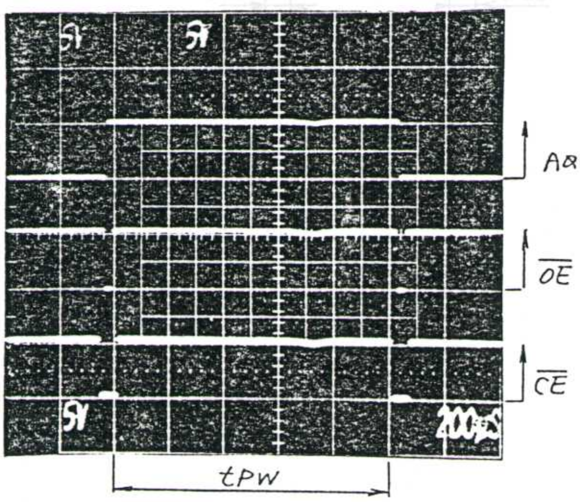
3. POWER ON



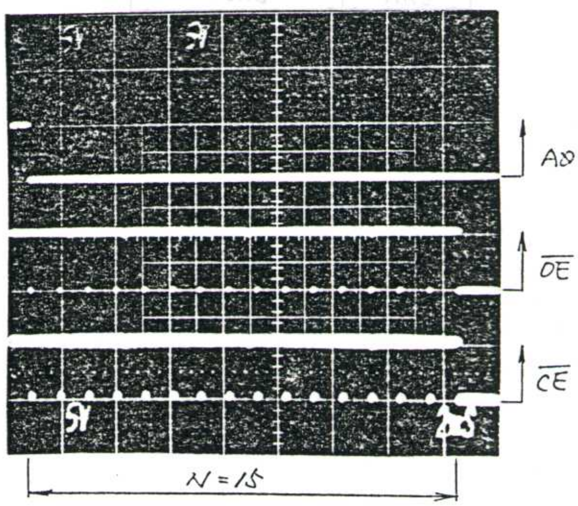
4. POWER OFF



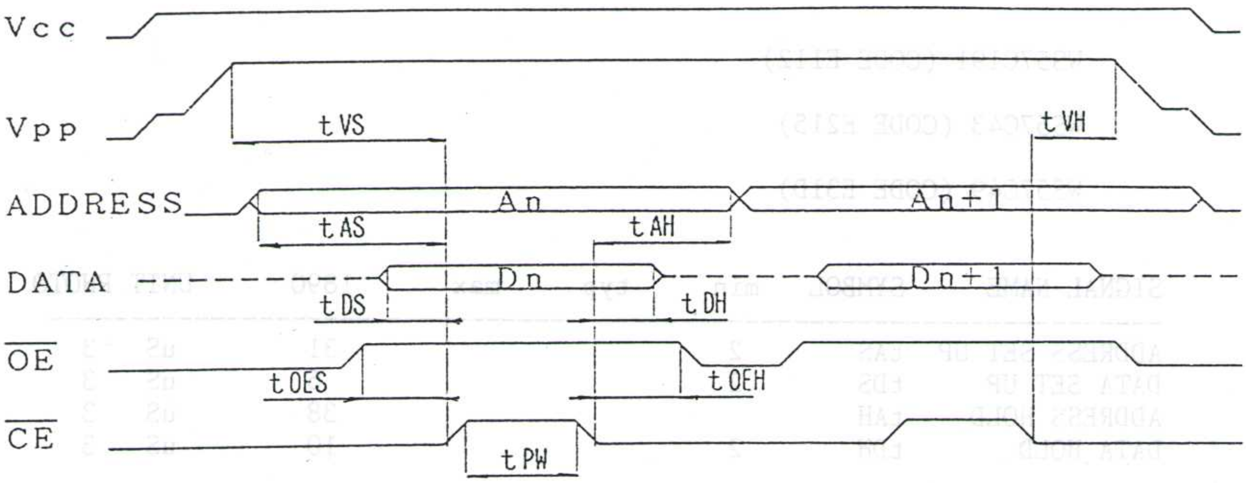
5. PROGRAM PULSE



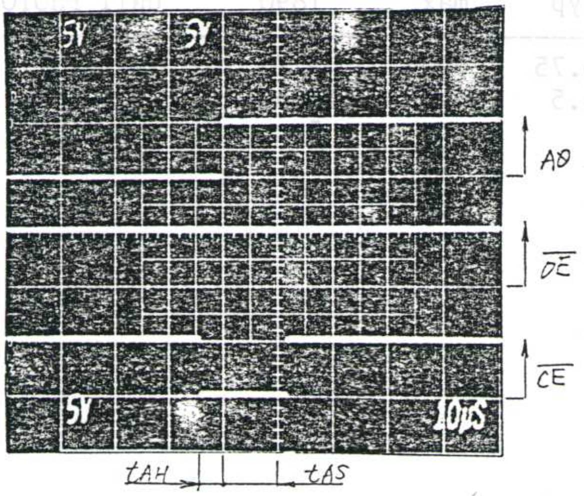
6. ABORT PULSE



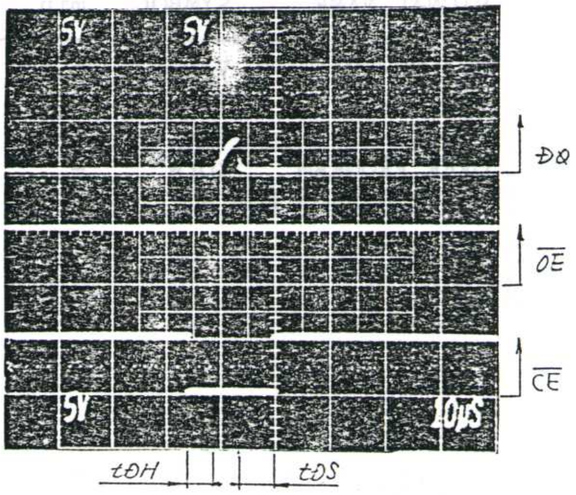
CODE E111



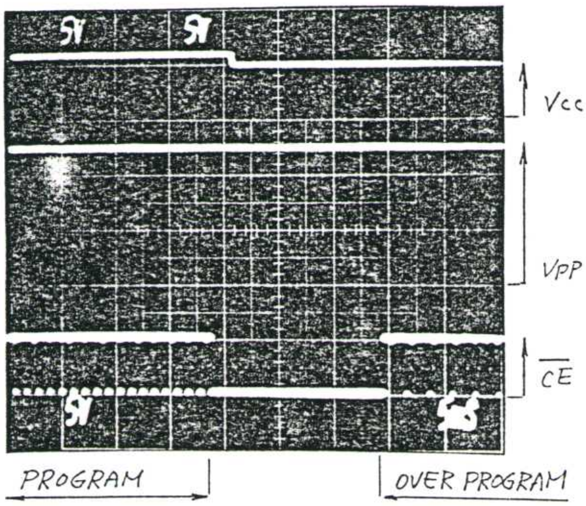
7. ADDRESS SETUP/HOLD



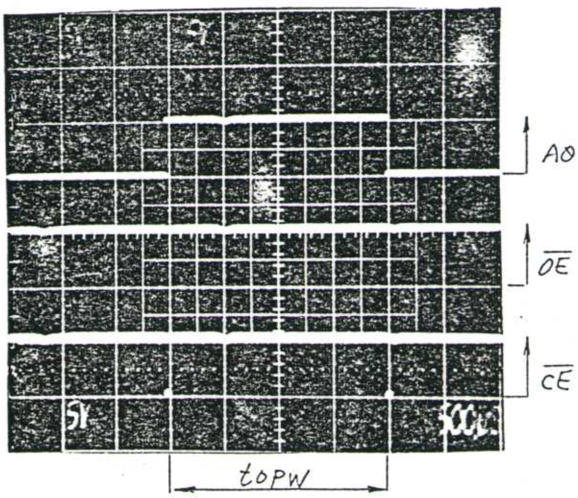
8. DATA SETUP/HOLD



9. PROGRAM ~ OVER PROGRAM



10. OVER PROGRAM PULSE



(3) Code E112, E215, E31D

WS57C191 (CODE E112)

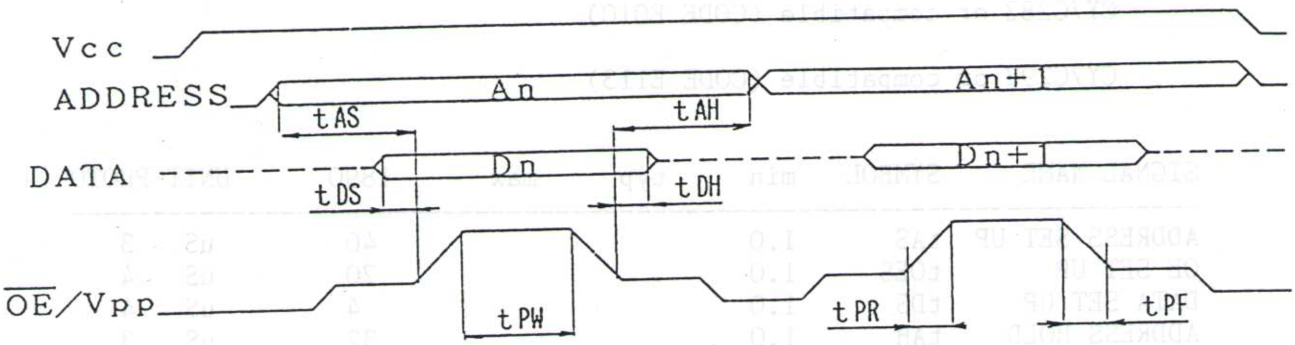
WS57C43 (CODE E215)

WS57C49 (CODE E31D)

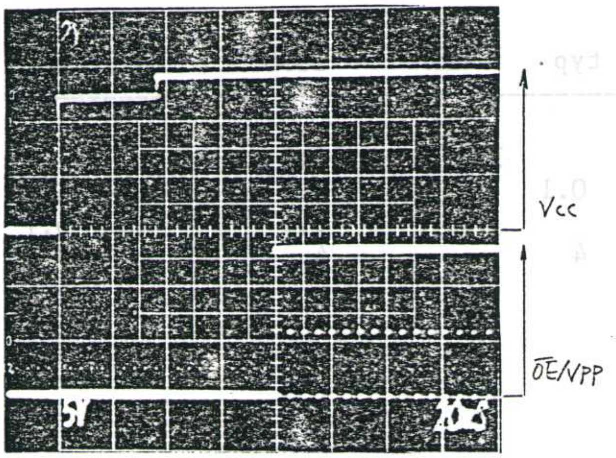
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			31	uS	3
DATA SET UP	tDS	2			6	uS	3
ADDRESS HOLD	tAH				38	uS	3
DATA HOLD	tDH	2			10	uS	3

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.46	5.75	6.04	5.75	V	1,2
Vpp POWER	Vpp	13.0	13.5	14.0	13.5	V	1,2
PROGRAM	tPW	5			5	mS	4
OVER PROGRAM	tOPW	–	–	–	–	mS	
MAXIMUM PULS NO.	N		1				

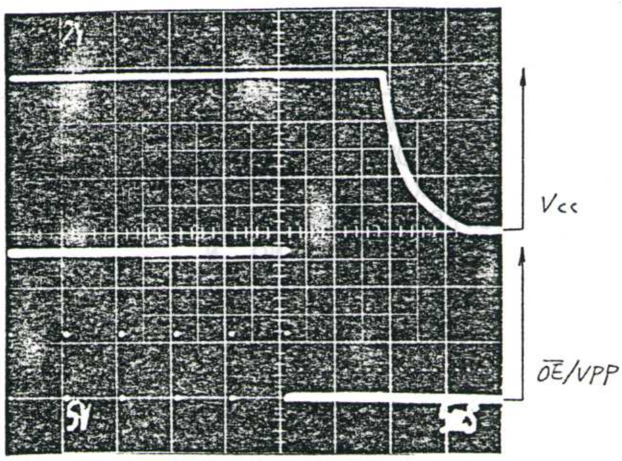
CODE E112 E215 E31D



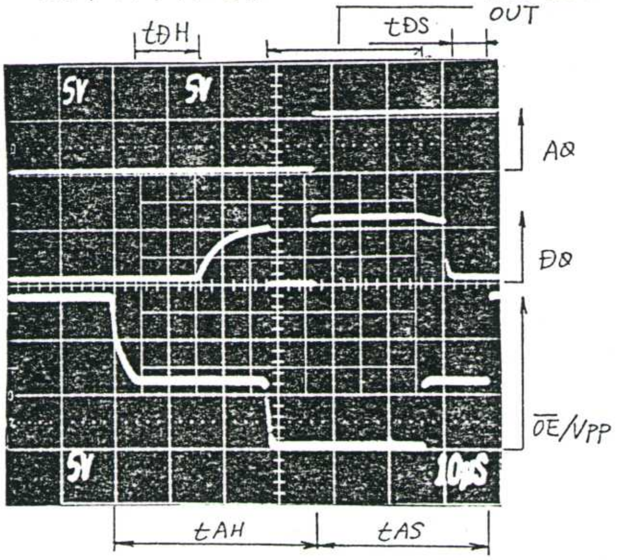
POWER ON



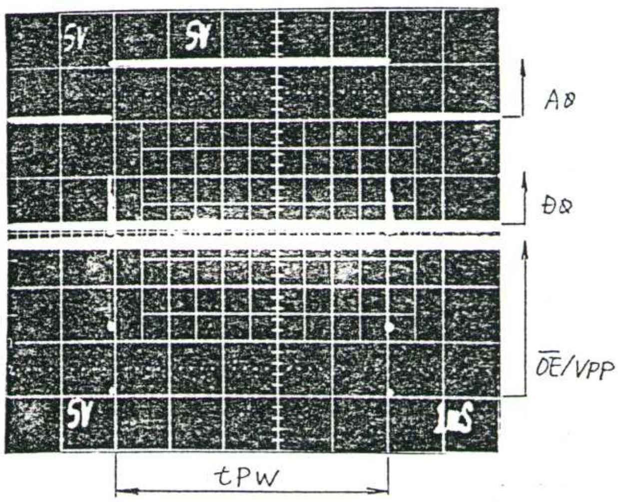
POWER OFF



SET UP/HOLD



PROGRAM PULSE



(4) Code E010, E313

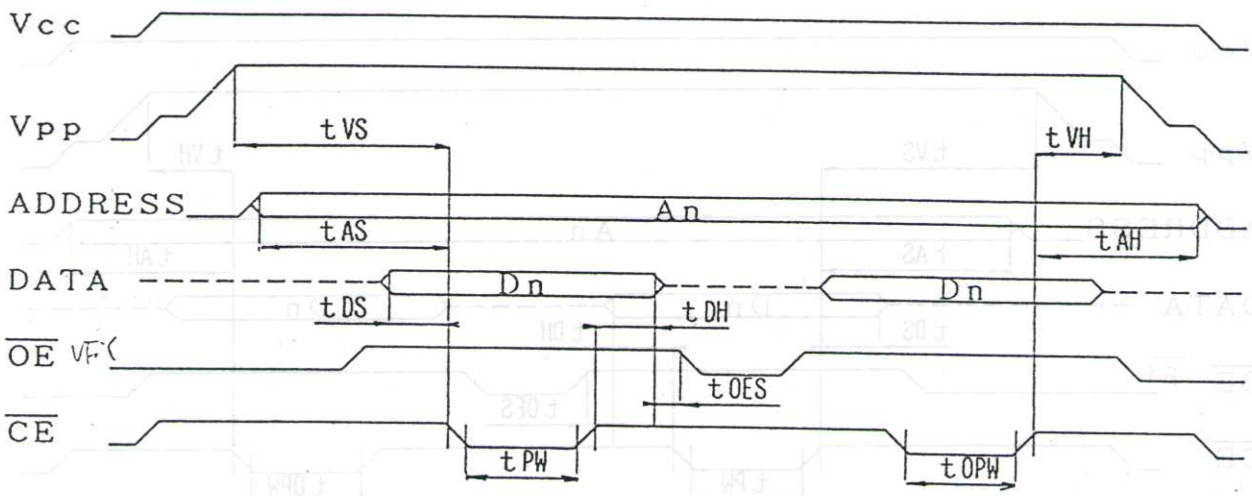
CY7C282 or compatible (CODE E010)

CY7C292 or compatible (CODE E113)

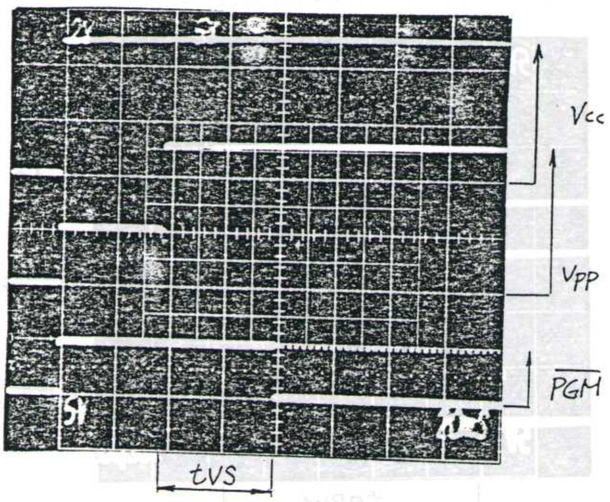
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	1.0			40	uS	3
OE SET UP	tOES	1.0			20	uS	4
DATA SET UP	tDS	1.0			4	uS	4
ADDRESS HOLD	tAH	1.0			32	uS	3
DATA HOLD	tDH	1.0			10	uS	4
Vpp SET UP	tVS	-			40	mS	1
Vpp HOLD	tVH	-			40	mS	2

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75		5.25	5.0	V	1,2
Vpp POWER	Vpp	13.0		14.0	13.0	V	1,2
PROGRAM	tPW		0.1		0.1	mS	5
OVER PROGRAM	tOPW	2.4		9.6	9.6	mS	6,7
MAXIMUM PULS NO.	N		4		4		7

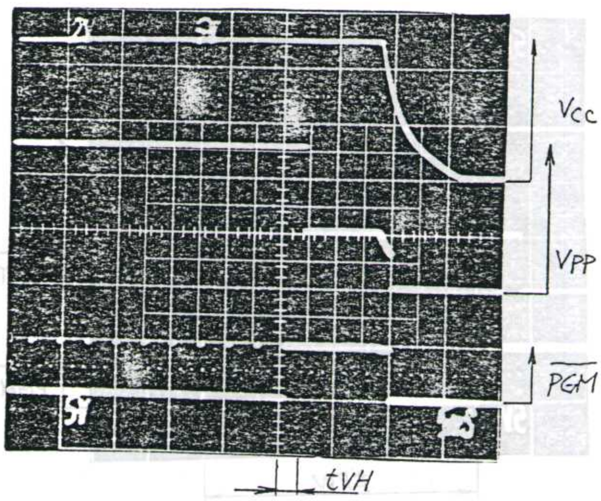
CODE E010 E113



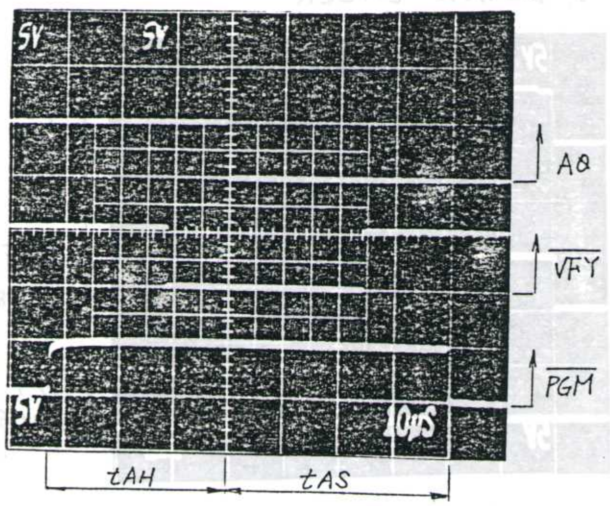
1. POWER ON



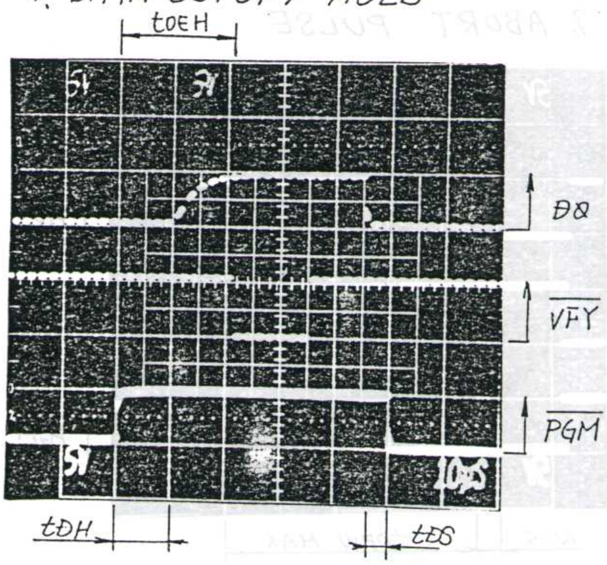
2. POWER OFF



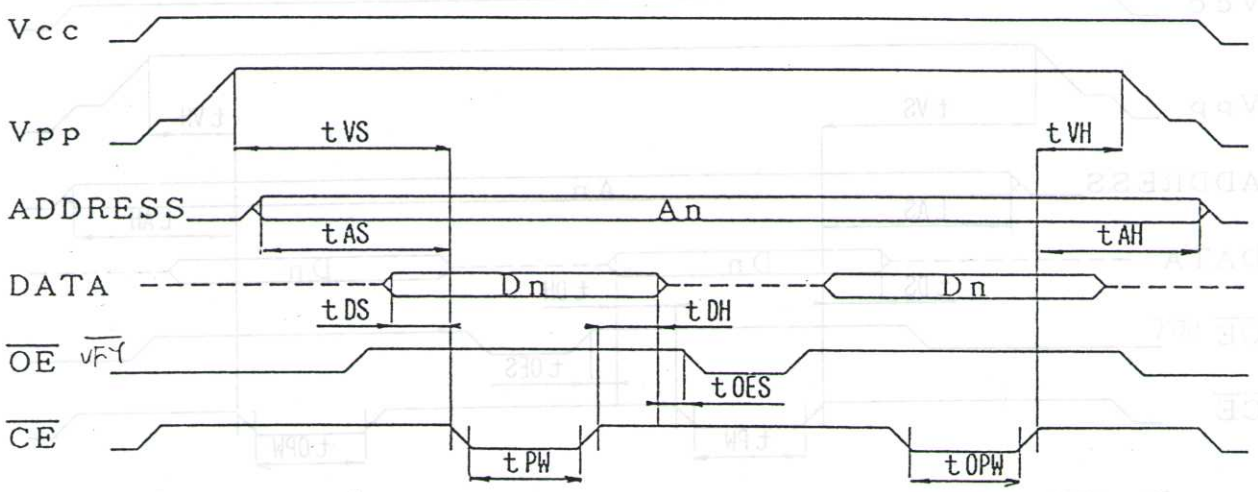
3. ADDRESS SETUP/HOLD



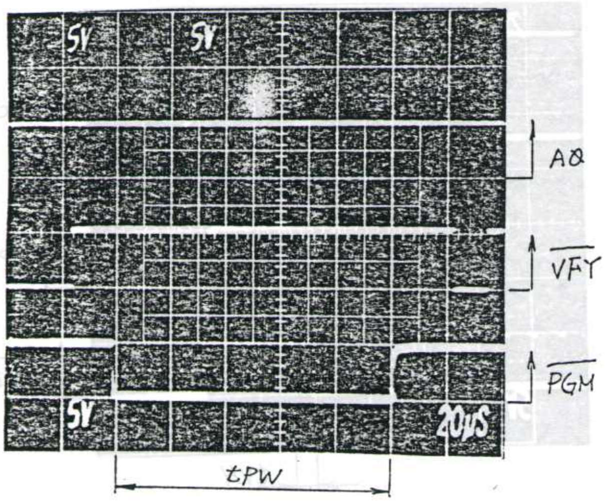
4. DATA SETUP/ HOLD



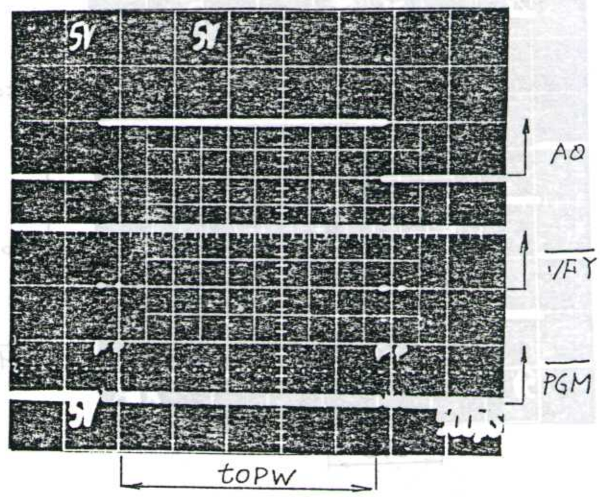
CODE E010 E113



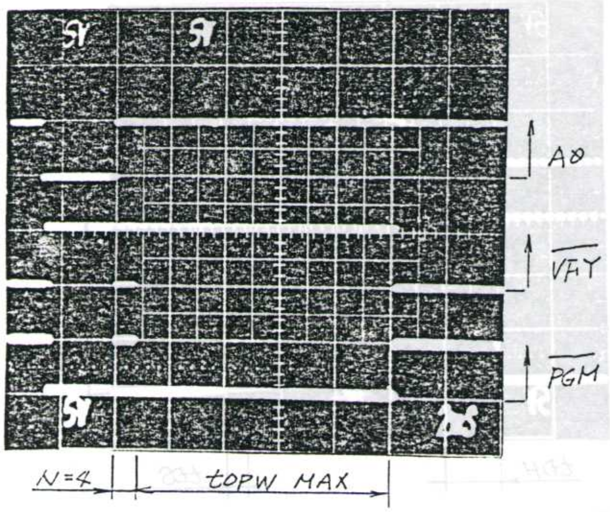
5. PROGRAM PULSE



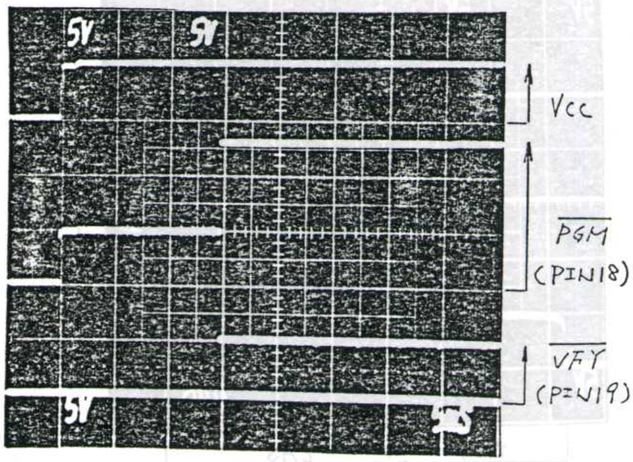
6. OVER PROGRAM PULSE



7. ABORT PULSE



8. BLANK CHECK



7.5.2 32K Bit EP-ROM

(1) Code E210, E211

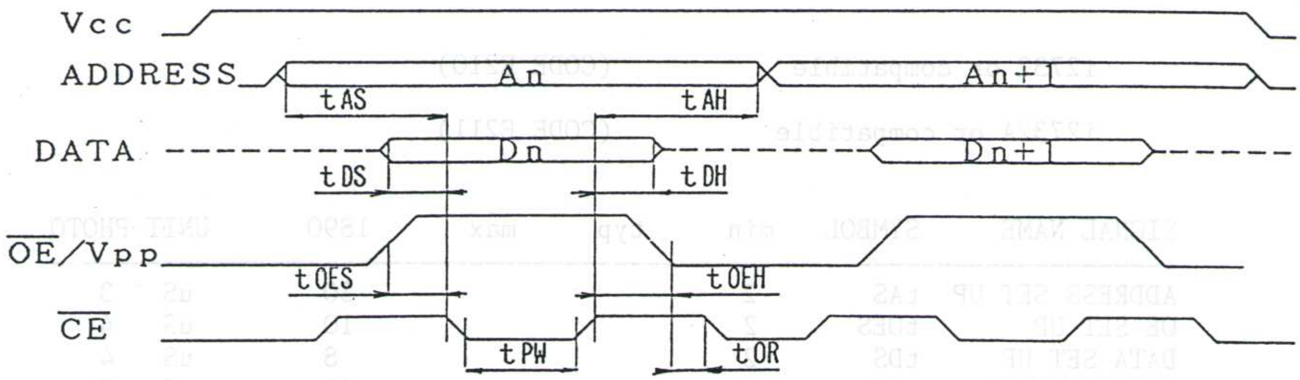
i2732 or compatible	(CODE E210)
i2732A or compatible	(CODE E211)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			30	uS	3
OE SET UP	tOES	2			10	uS	4
DATA SET UP	tDS	2			8	uS	4
ADDRESS HOLD	tAH	0			25	uS	3
DATA HOLD	tDH	2			10	uS	4
Vcc SET UP	tVS	-			80	mS	1
OE HOLD	tOEH	2			10	uS	4
Vpp RECOVERY	tVR	2			12	nS	3

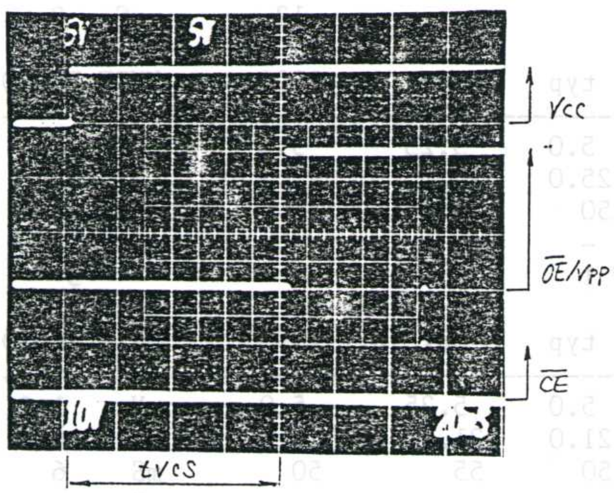
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	5
PROGRAM	tPW	45	50	55	50	mS	5
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		1		1		5

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	6
PROGRAM	tPW	45	50	55	50	mS	6
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		1		1		6

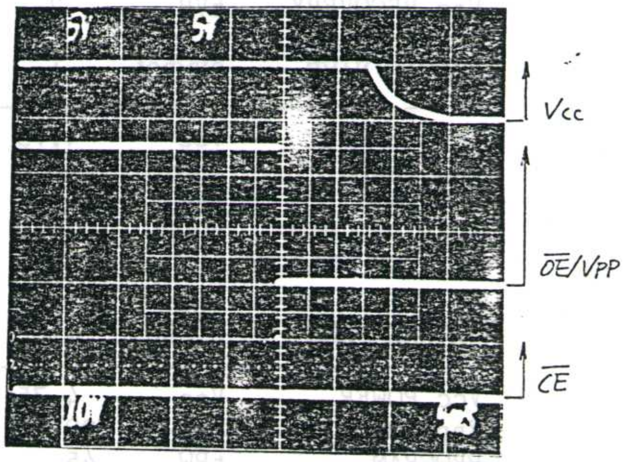
CODE E210 E211



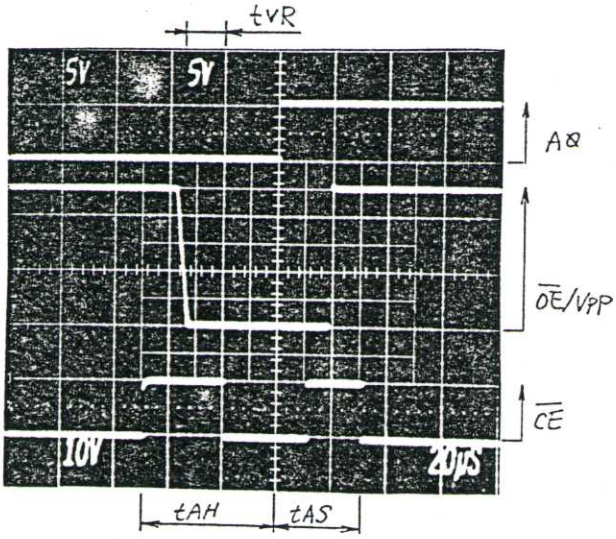
1. POWER ON



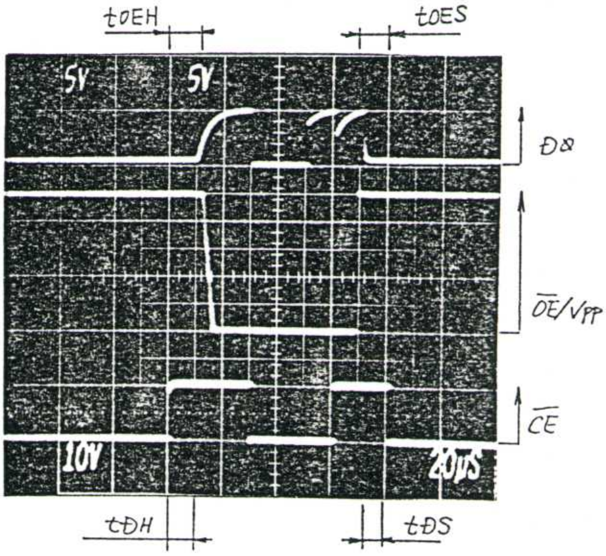
2. POWER OFF



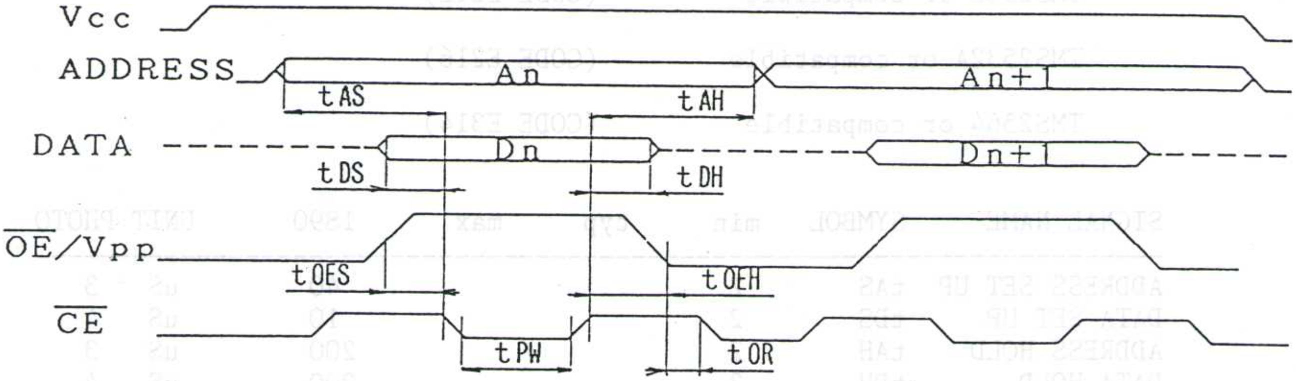
3. ADDRESS SETUP/HOLD



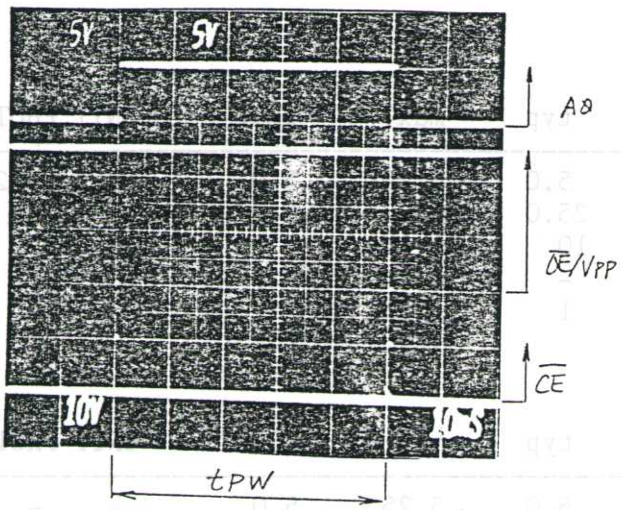
4. DATA SET UP/HOLD



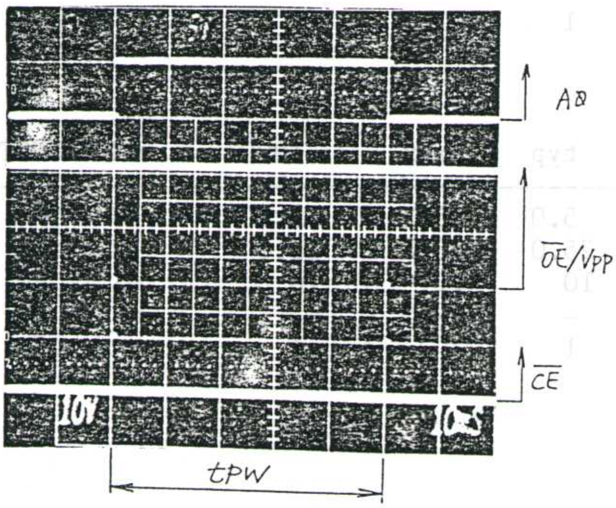
CODE E210 E211



5. 2732 PROGRAM PULSE



6. 2732A PROGRAM PULSE



(2) Code E212, E216, E314

TMS2532 or compatible (CODE E212)

TMS2532A or compatible (CODE E216)

TMS2564 or compatible (CODE E314)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			40	uS	3
DATA SET UP	tDS	2			10	uS	4
ADDRESS HOLD	tAH	2			200	uS	3
DATA HOLD	tDH	2			200	uS	4
Vpp SET UP	tVS	0			10	uS	3
Vpp HOLD	tVH	2			10	uS	3
Vpp RECOVERY	tVR	0			40	nS	3

CODE E212(TMS2532)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	5
PROGRAM	tPW	9	10	11		mS	5
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		1				5

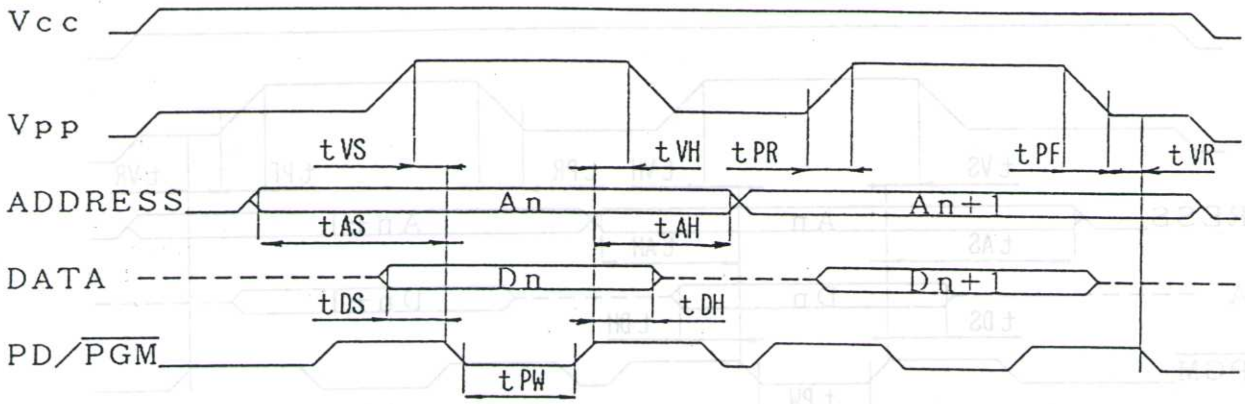
CODE E216(TMS2532A)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	-
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	6
PROGRAM	tPW	9	10	11	10	mS	6
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		1		1		6

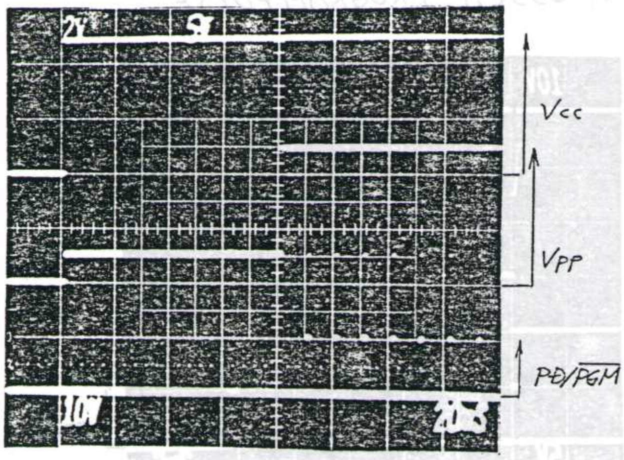
CODE E314(TMS2564)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	-
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	7
PROGRAM	tPW	9	10	11	10	mS	7
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		1		1		7

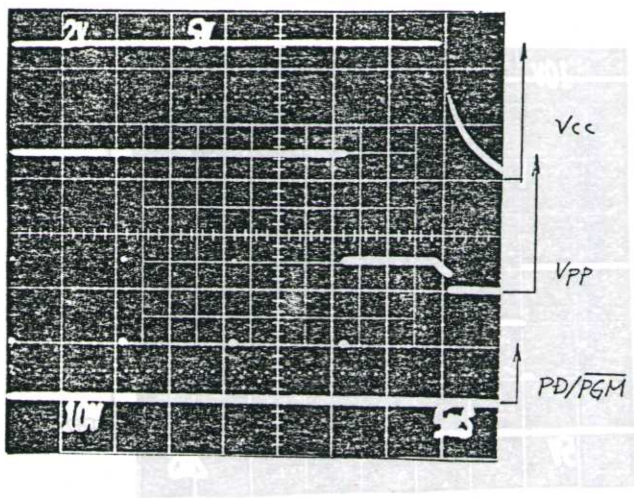
CODE E212 E216 E314



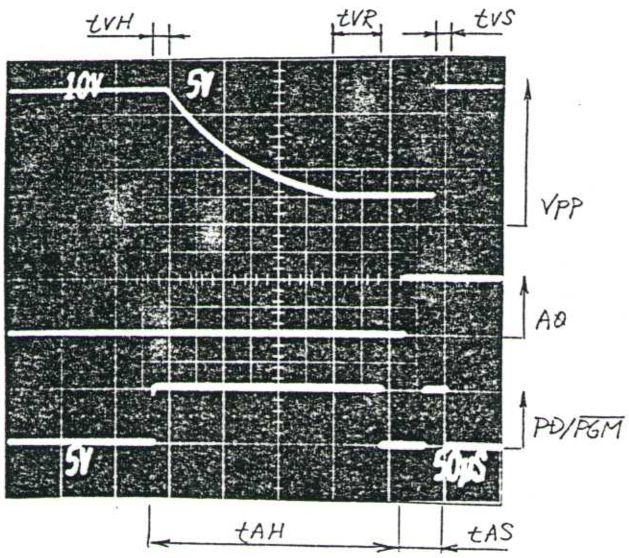
1. POWER ON



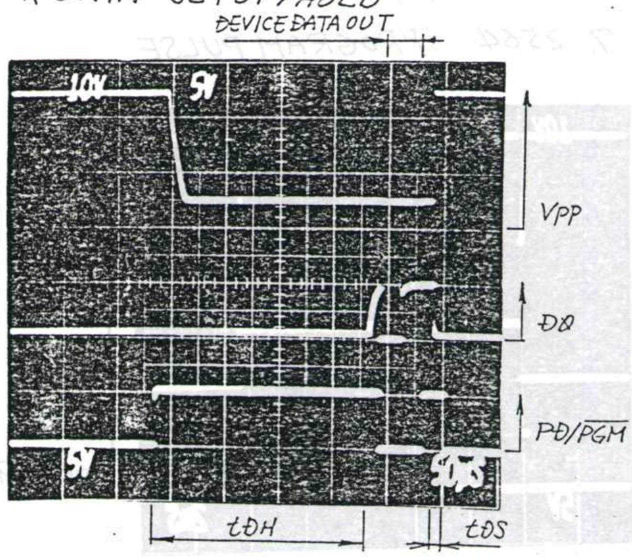
2. POWER OFF



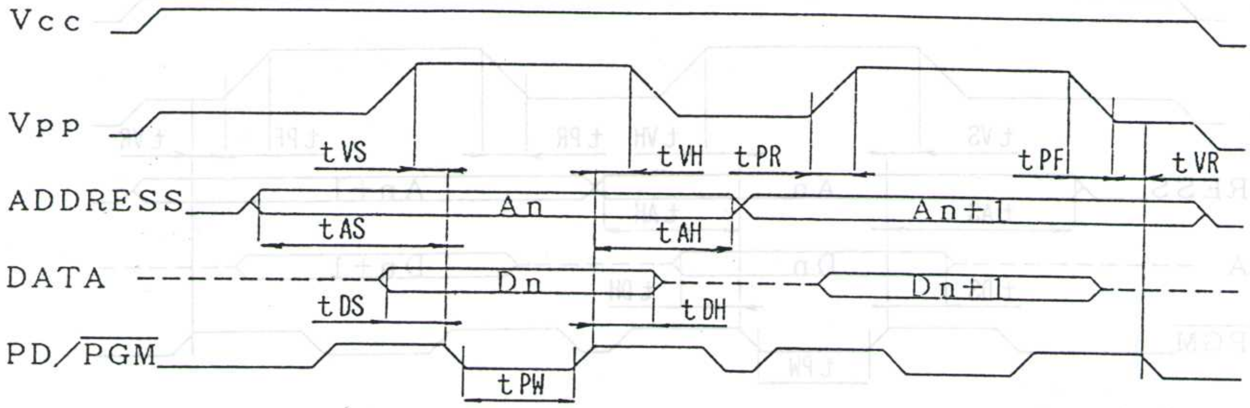
3. ADDRESS SETUP/HOLD



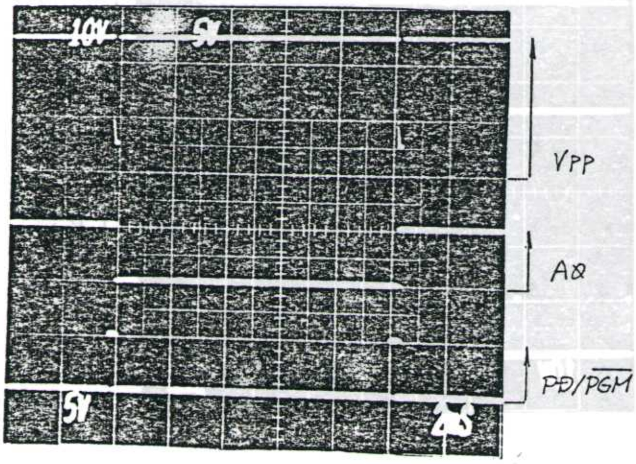
4. DATA SETUP/HOLD



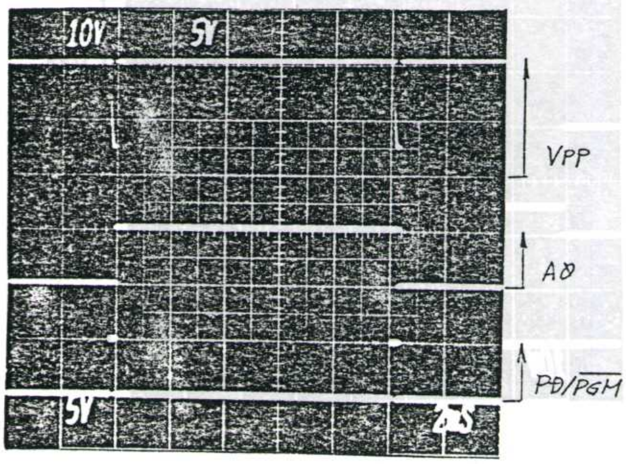
CODE E212 E216 E314



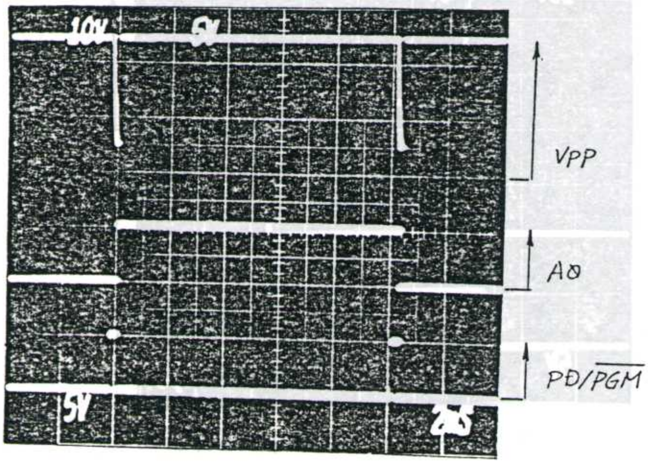
5. 2532 PROGRAM PULSE



6. 2532A PROGRAM PULSE



7. 2564 PROGRAM PULSE



(3) Code E213, E214

Am2732B (CODE E213)

NMC27C32B (CODE E214)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			45(40)	uS	1(7)
OE SET UP	tOES	2			15(12)	uS	2(8)
DATA SET UP	tDS	2			14(20)	uS	2(8)
ADDRESS HOLD	tAH	2			32(32)	uS	1(7)
DATA HOLD	tDH	2			12(30)	uS	2(8)
Vpp SET UP	tVS	2			80mS	uS	3(11)
Vpp HOLD	tVH	-			16(12)	uS	2(8)
Vpp RECOVERY	tVR	-			5(-)	nS	2

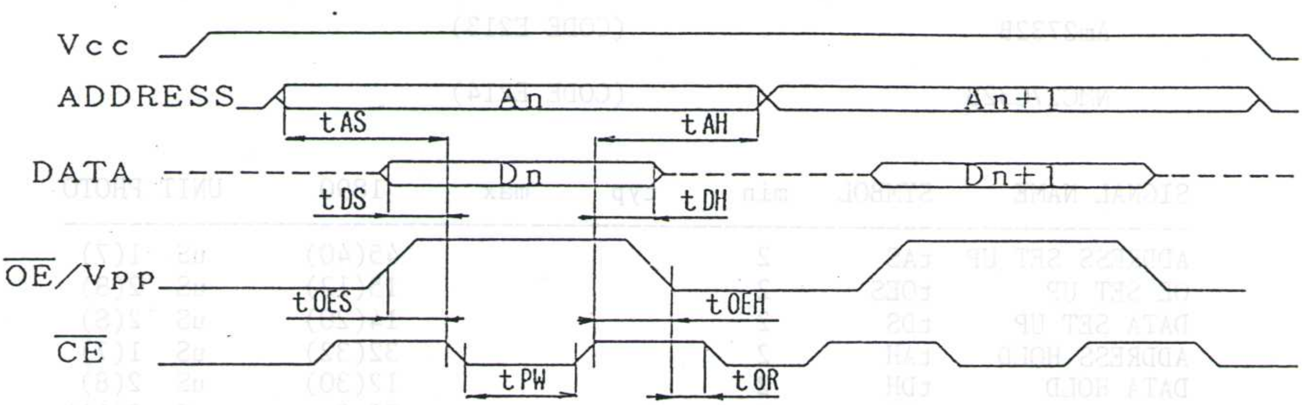
CODE E213(Am2732B)

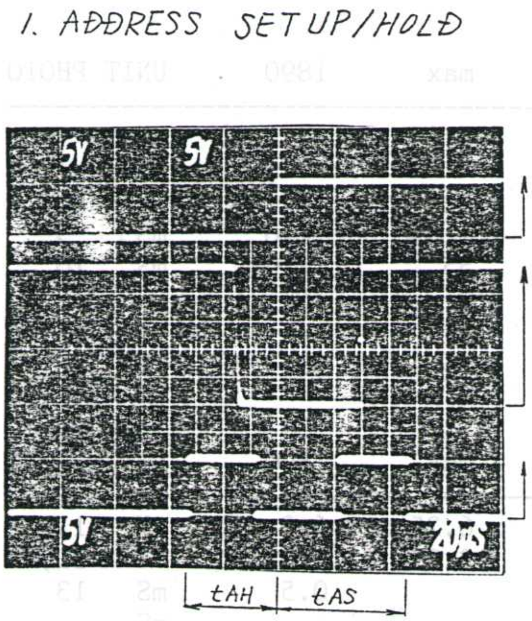
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	3,4(9)
Vpp POWER	Vpp		12.5		12.5	V	3,4
PROGRAM	tPW	0.95		1.05	1.0	mS	5
OVER PROGRAM	tOPW	1.9		55	2.0	mS	10
MAXIMUM PULS NO.	N		15		15		6

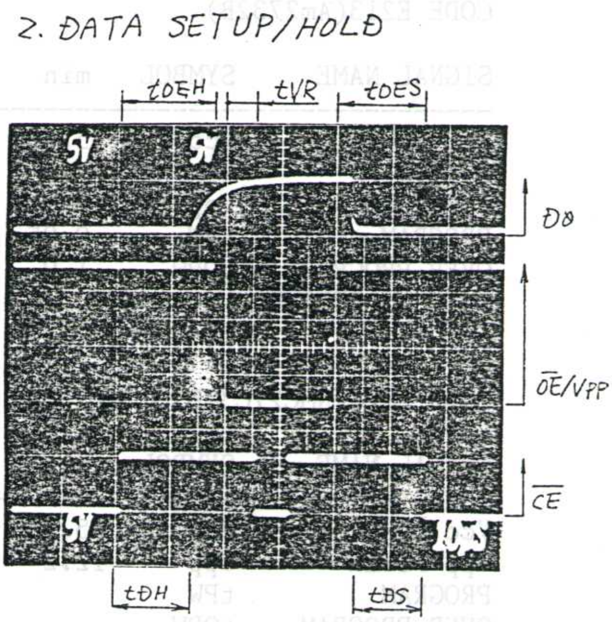
CODE E214(NMC27C32B)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	11,12
Vpp POWER	Vpp	12.2	13.0	13.3	13.0	V	11,12
PROGRAM	tPW		0.5		0.5	mS	13
OVER PROGRAM	tOPW		-			mS	
MAXIMUM PULS NO.	N		20		20		14

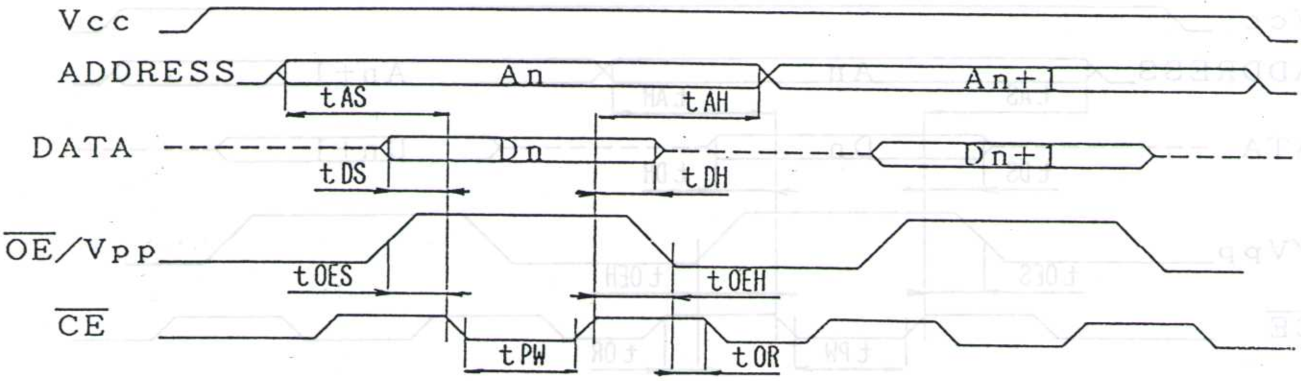
CODE E213 E214



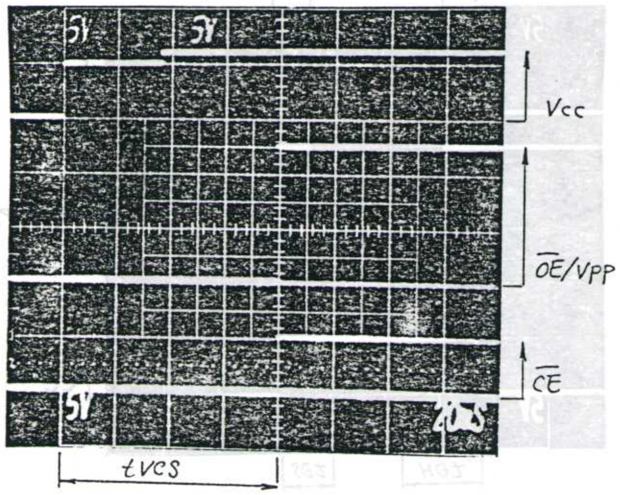




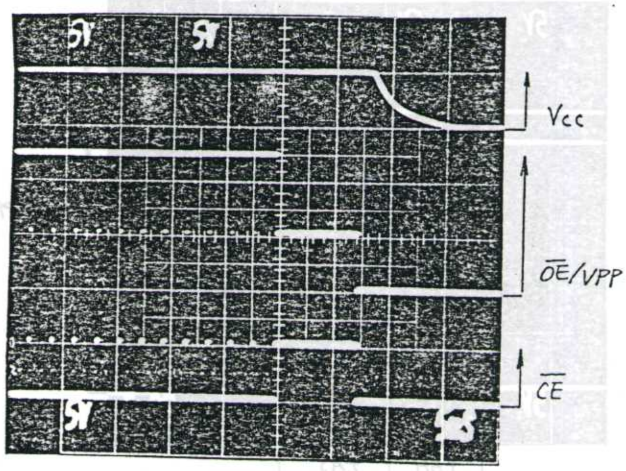
CODE E213



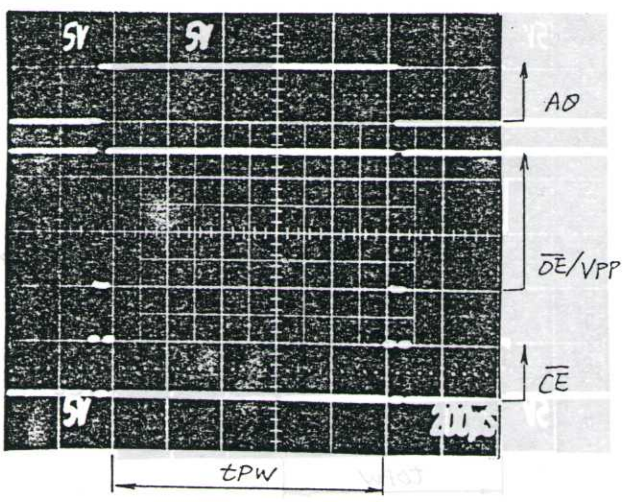
3. POWER ON



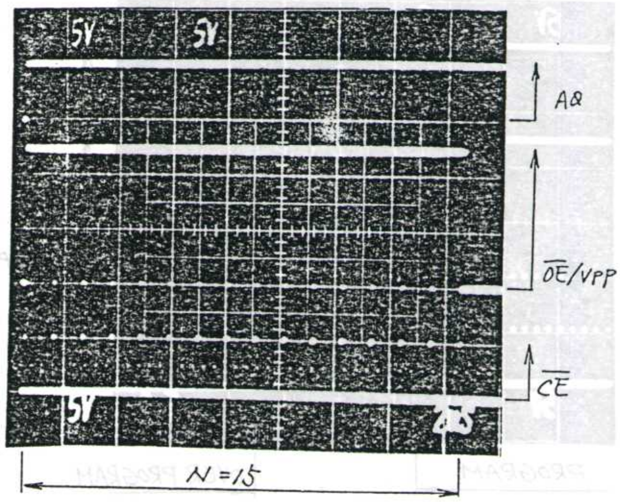
4. POWER OFF



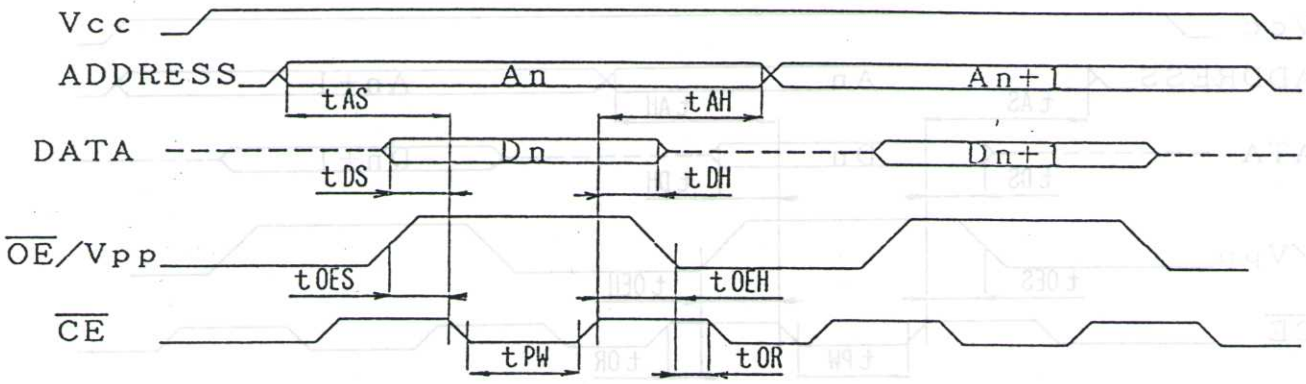
5. PROGRAM PULSE



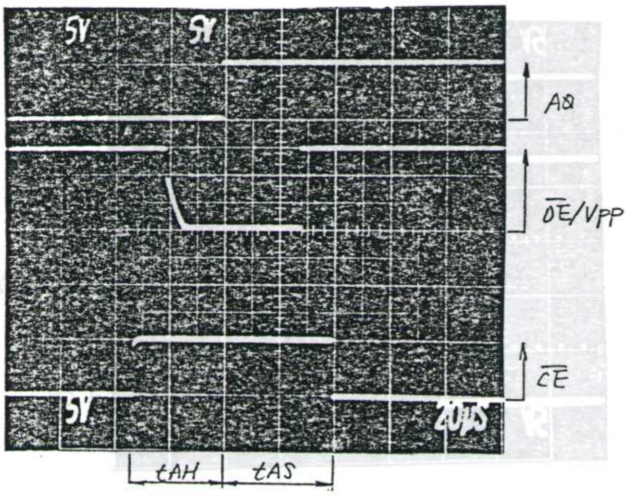
6. ABORT PULSE



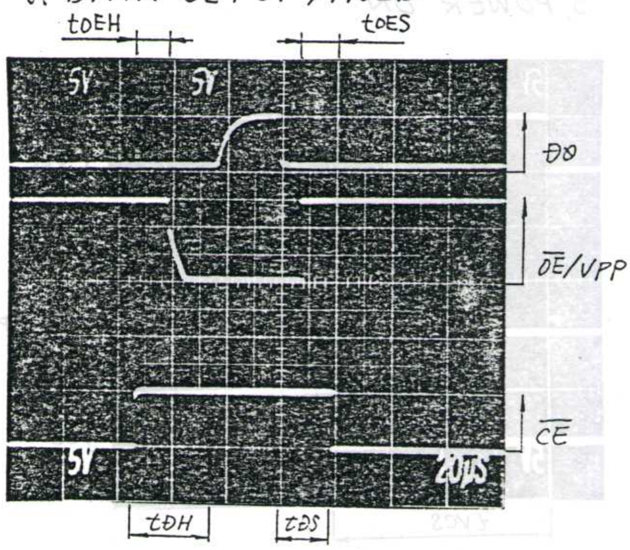
CODE E213



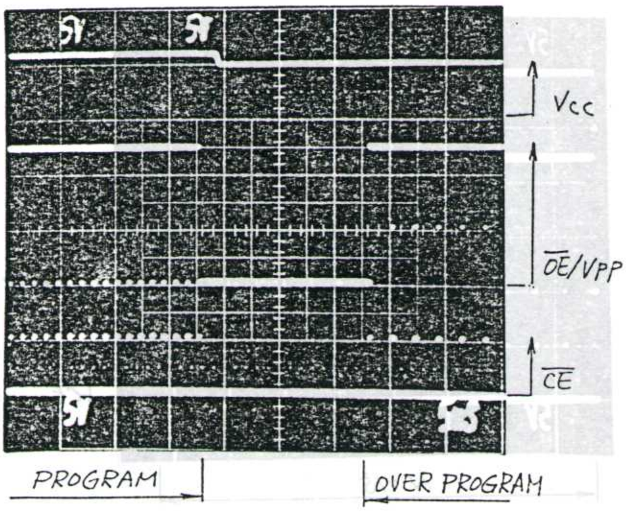
7. ADDRESS SETUP/HOLD



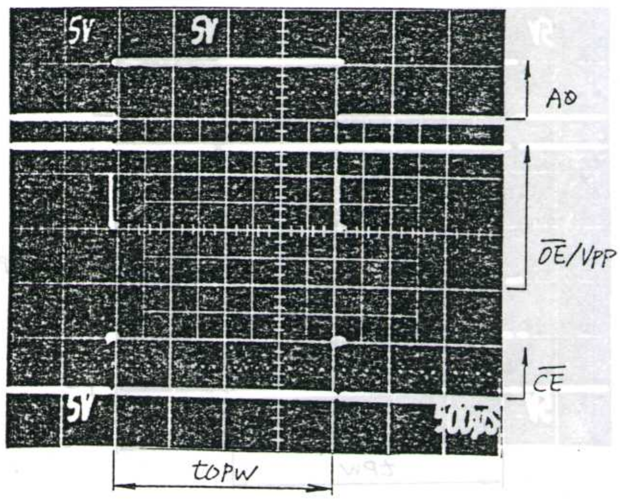
8. DATA SETUP/HOLD



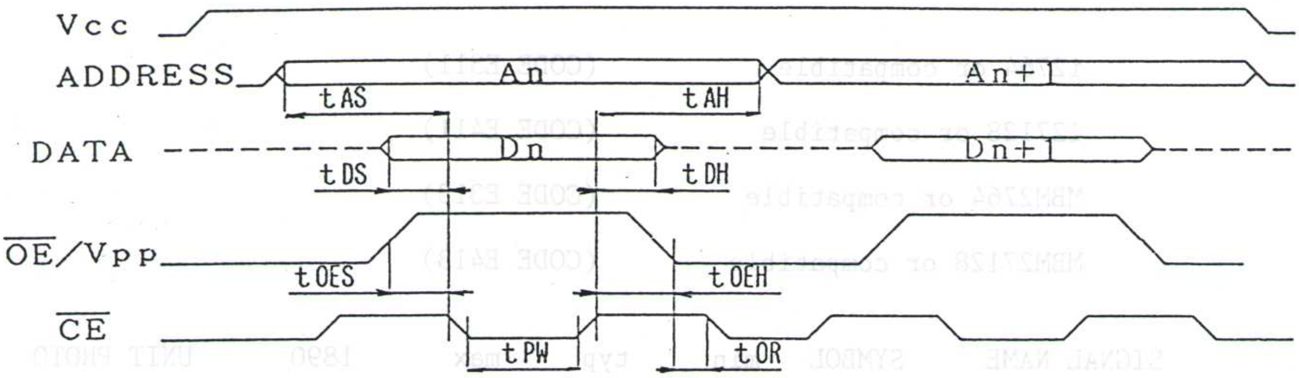
9. PROGRAM ~ OVER PROGRAM



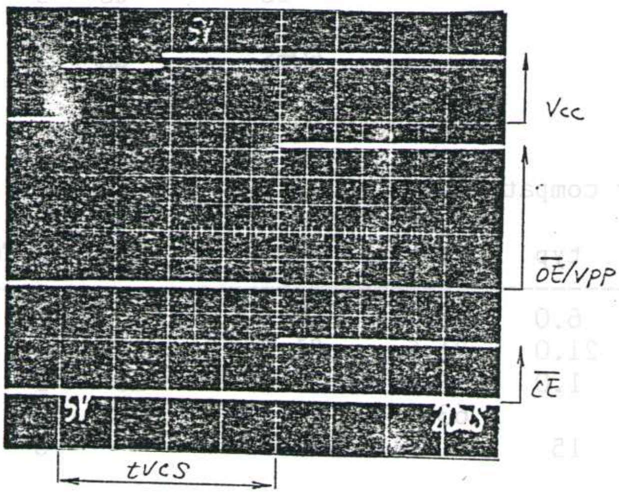
10. OVERPROGRAM PULSE



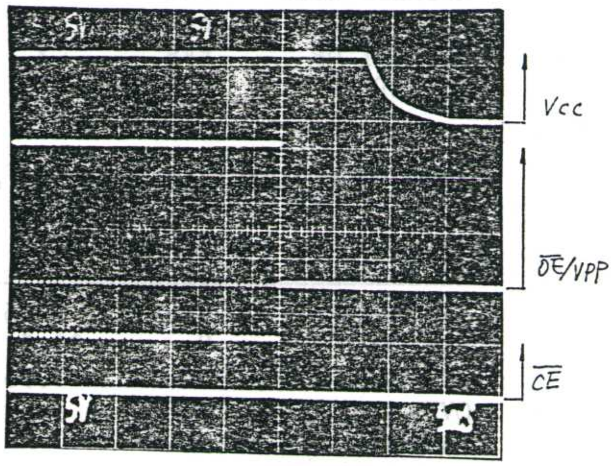
CODE E214



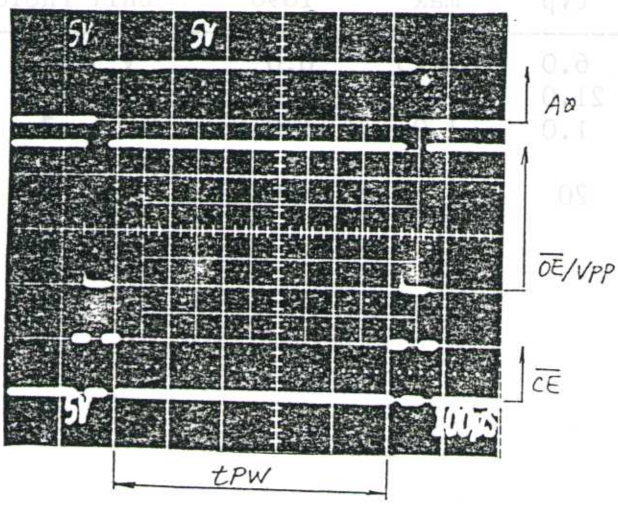
11. POWER ON



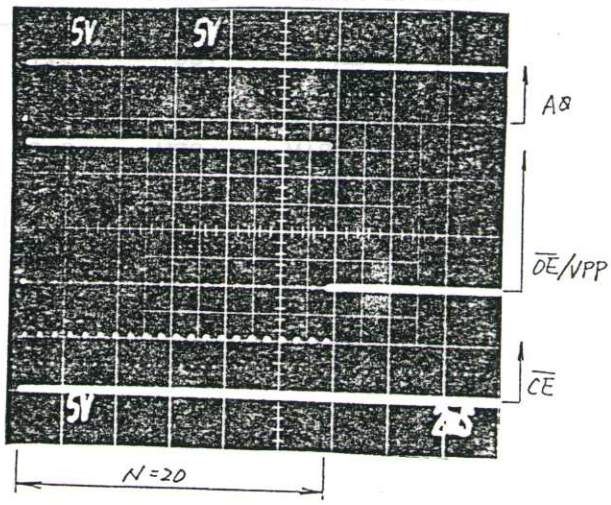
12. POWER OFF



13. PROGRAM PULSE



14. ABORT PULSE



7.5.3 64K / 128K Bit EP-ROM

(1) Code E311, E411, E313, E413

i2764 or compatible	(CODE E311)
i27128 or compatible	(CODE E411)
MBM2764 or compatible	(CODE E313)
MBM27128 or compatible	(CODE E413)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			68	uS	3
OE SET UP	tOES	2			50	uS	4
DATA SET UP	tDS	2			6	uS	4
ADDRESS HOLD	tAH	0			18	uS	3
DATA HOLD	tDH	2			5	uS	4
Vpp SET UP	tVS	2			40mS	uS	1
CE SET UP	tCES	2			36	uS	3

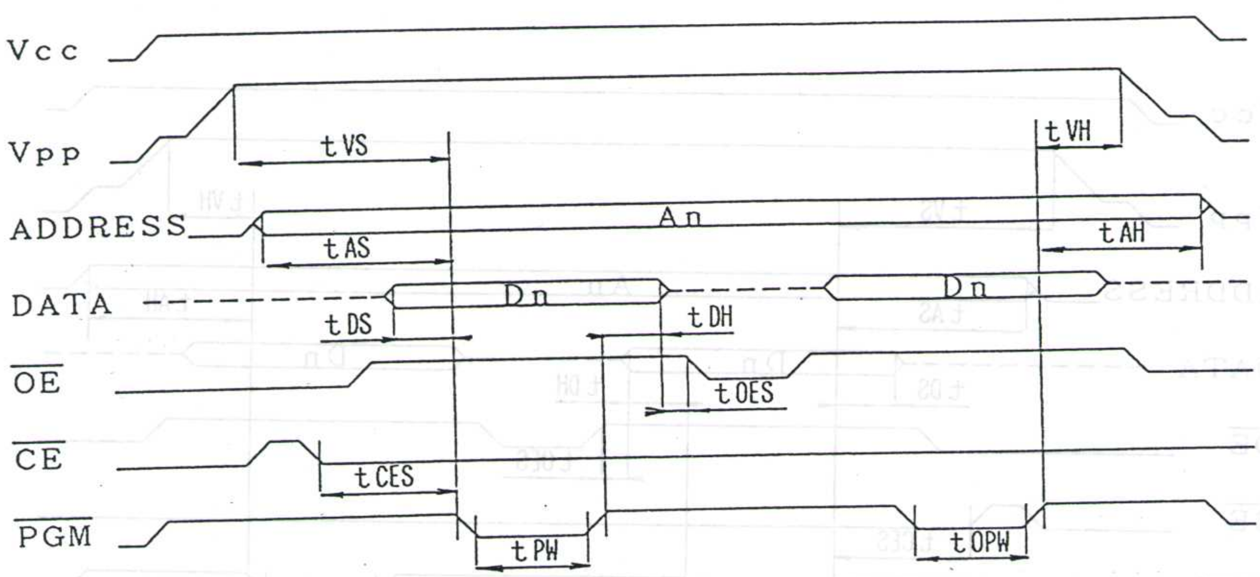
CODE E311,E411 (i2764,i27128 or compatible)

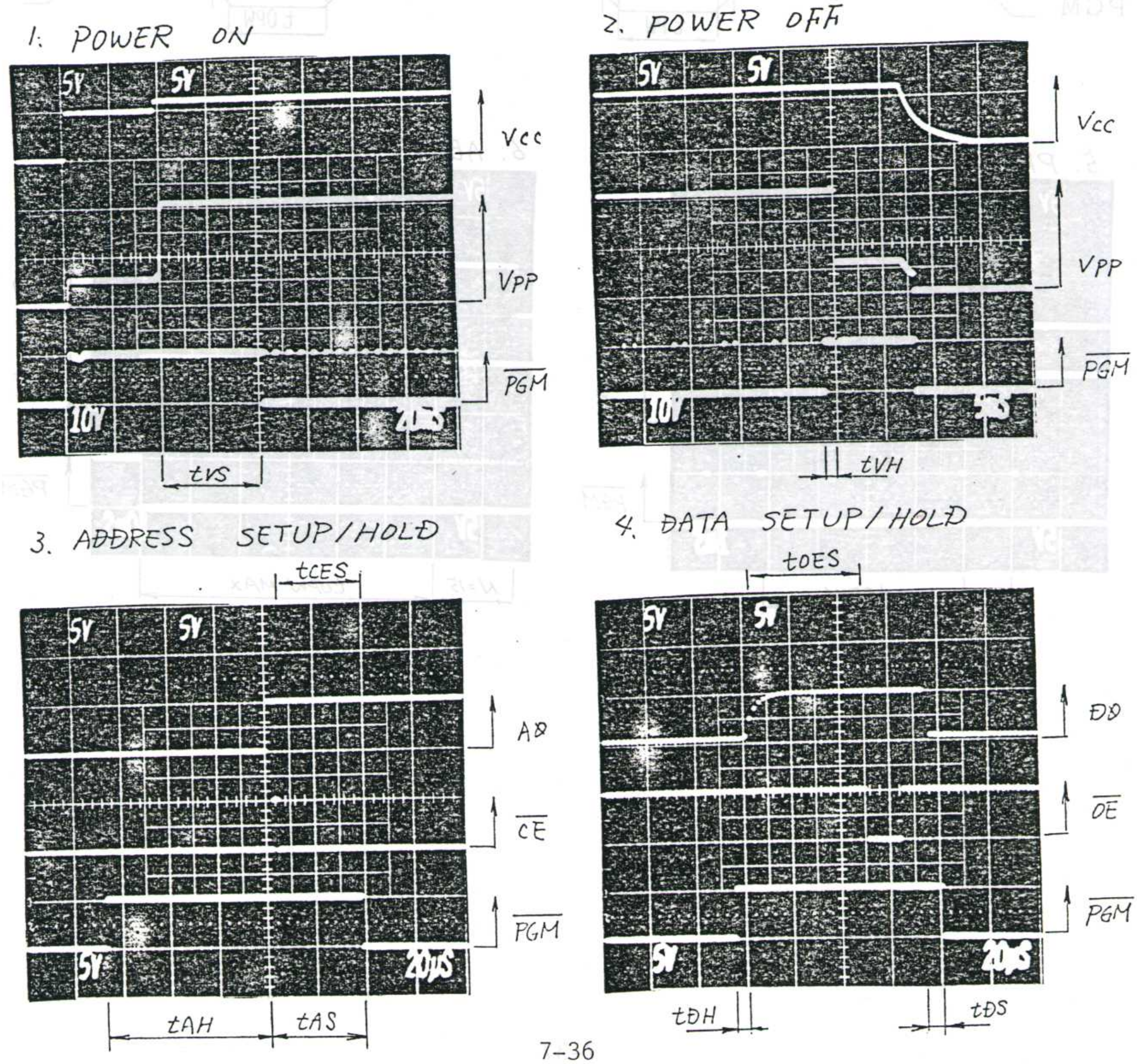
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	1
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	5
OVER PROGRAM	tOPW	3.8		63		mS	5,6
MAXIMUM PULS NO.	N		15		15		6

CODE E2313,E413 (MBM2764,MBM27128 or compatible)

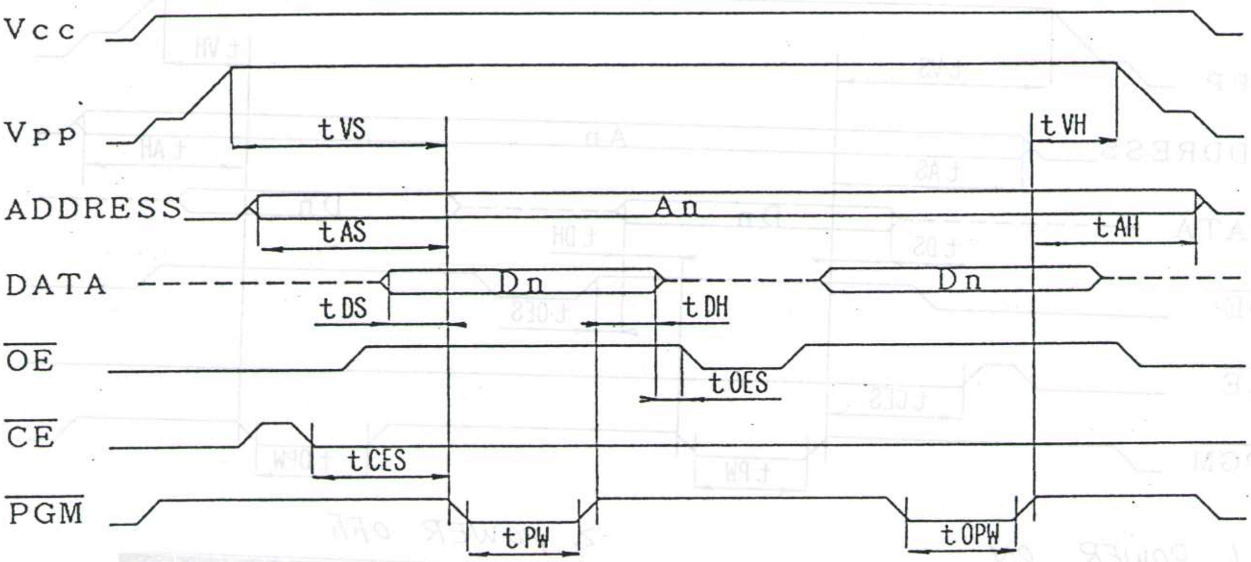
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	1
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	7
OVER PROGRAM	tOPW	0.95		21		mS	7,8
MAXIMUM PULS NO.	N		20		20		8

CODE E311 E411 E313 E413

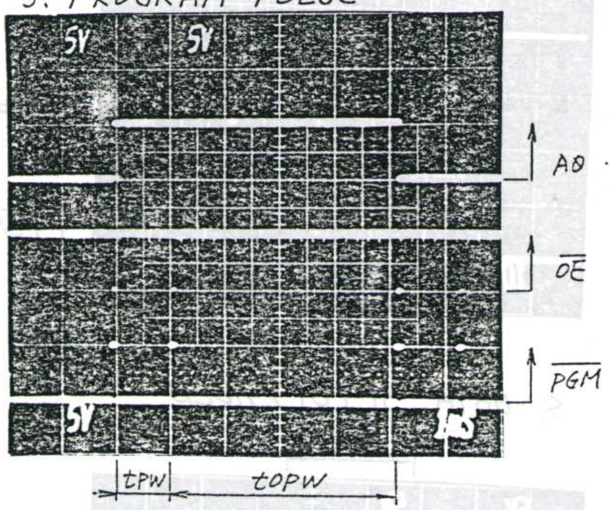




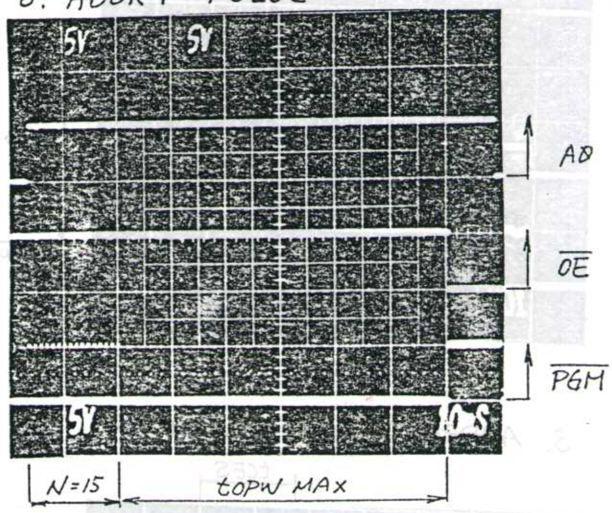
CODE E311 E411



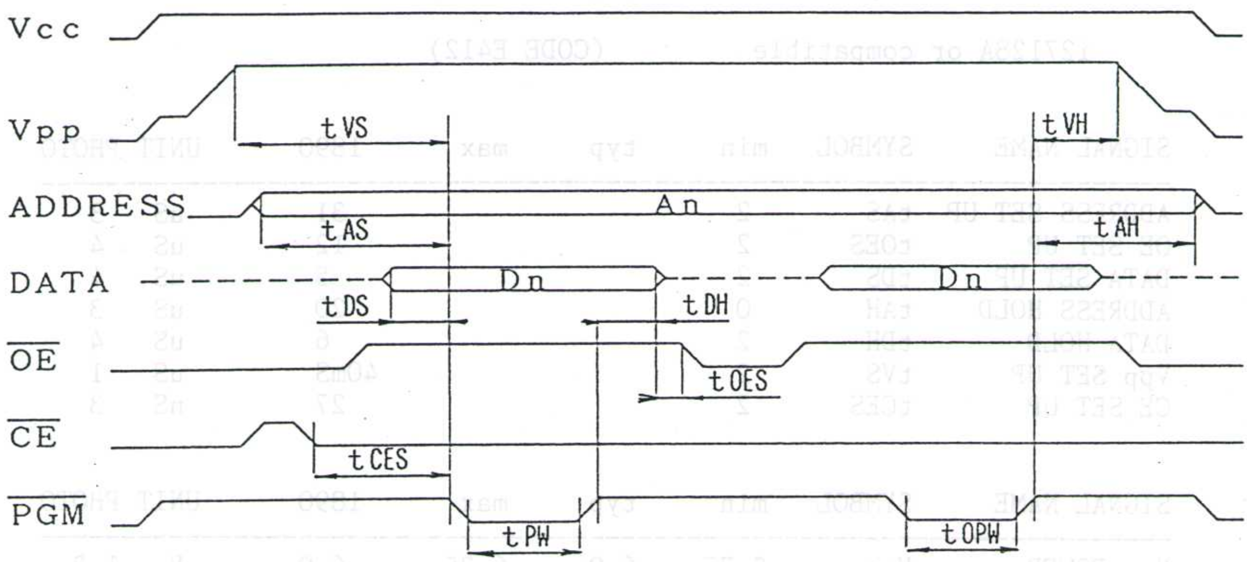
5. PROGRAM PULSE



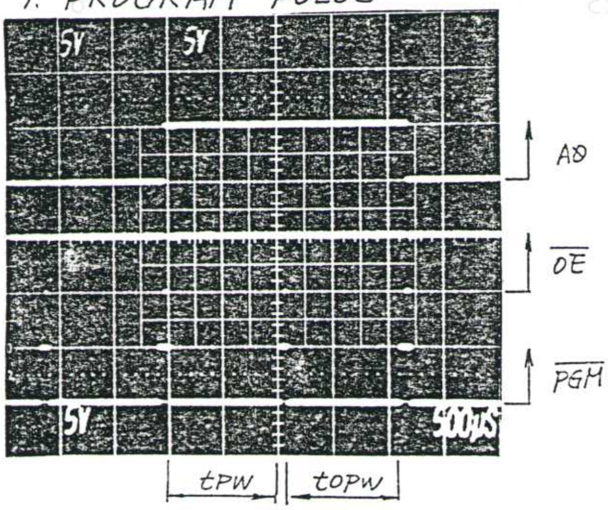
6. ABORT PULSE



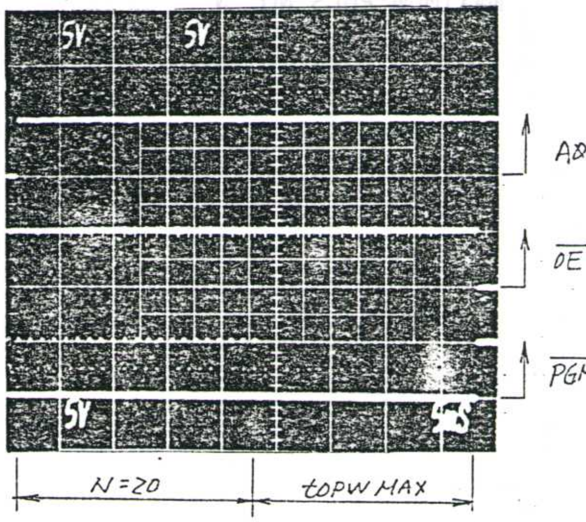
CODE E313 E413



7. PROGRAM PULSE



8. ABORT PULSE



(2) Code E312, E412

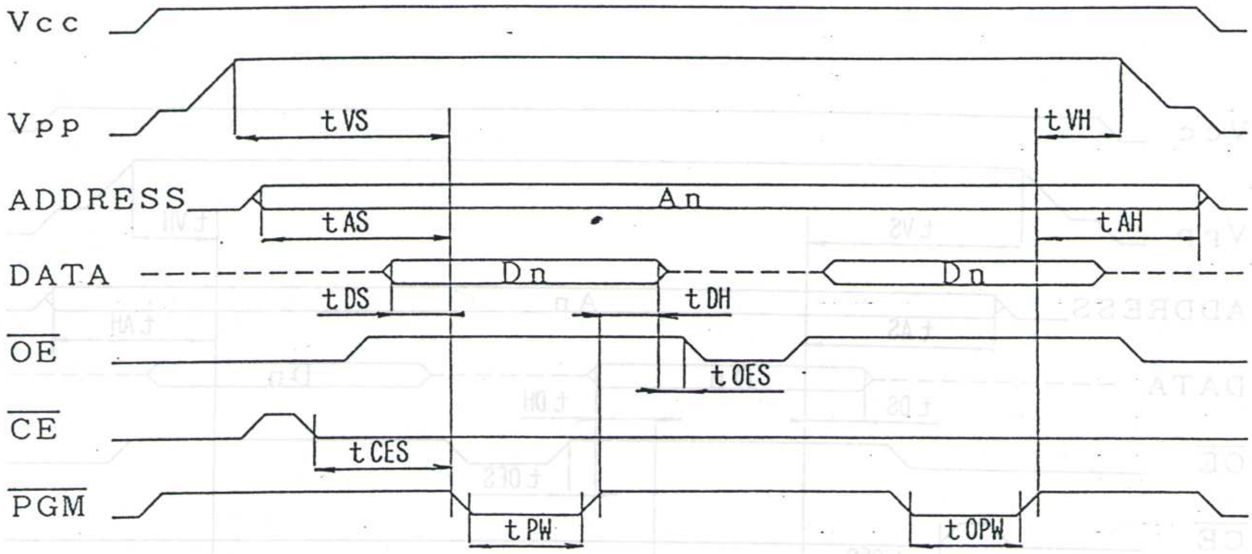
i2764A or compatible (CODE E312)

i27128A or compatible (CODE E412)

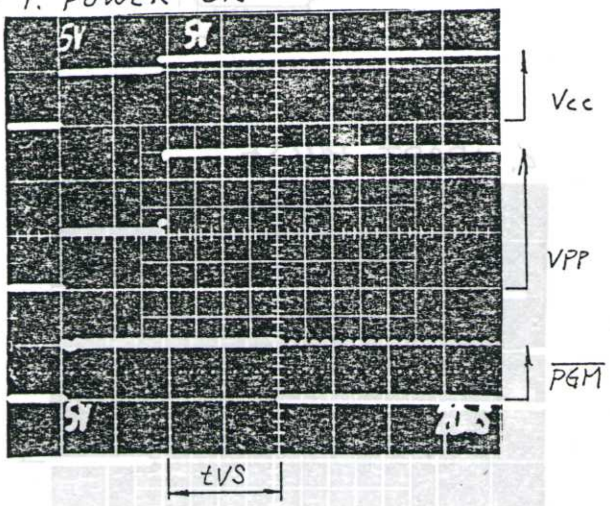
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			31	uS	3
OE SET UP	tOES	2			12	uS	4
DATA SET UP	tDS	2			5	uS	4
ADDRESS HOLD	tAH	0			20	uS	3
DATA HOLD	tDH	2			6	uS	4
Vpp SET UP	tVS	2			40mS	uS	1
CE SET UP	tCES	2			27	nS	3

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	5
OVER PROGRAM	tOPW	2.85		78.75		mS	5
MAXIMUM PULS NO.	N		25				6

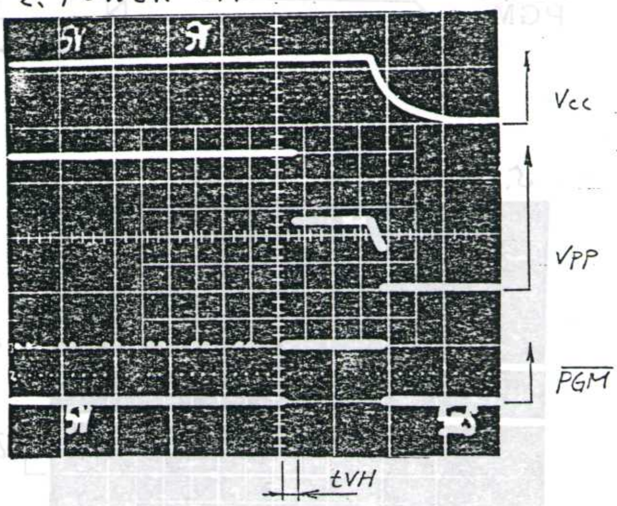
CODE E312 E412



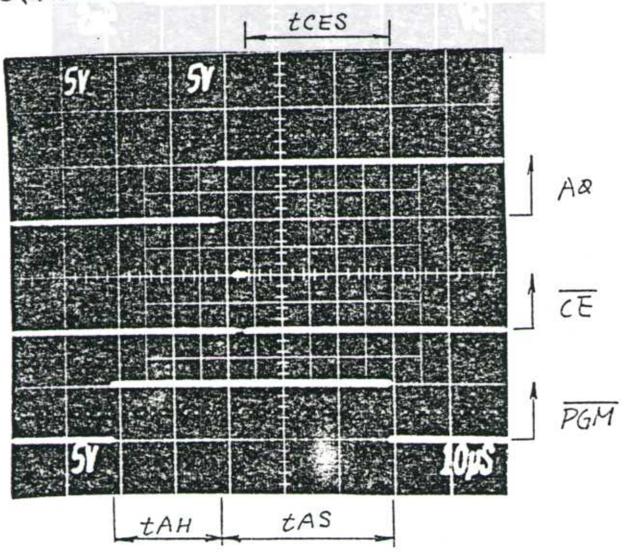
1. POWER ON



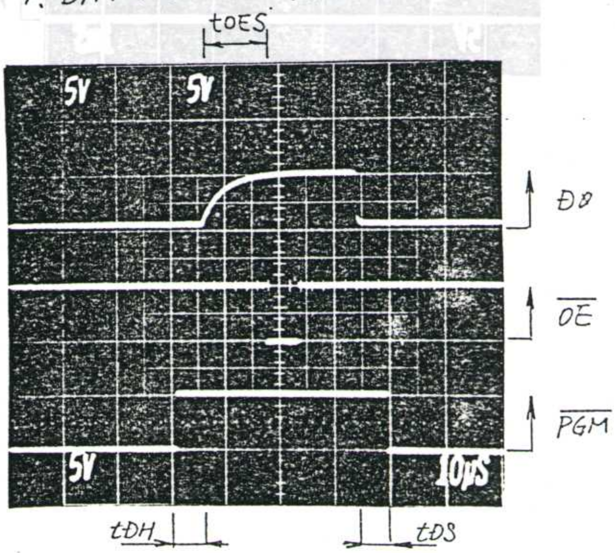
2. POWER OFF



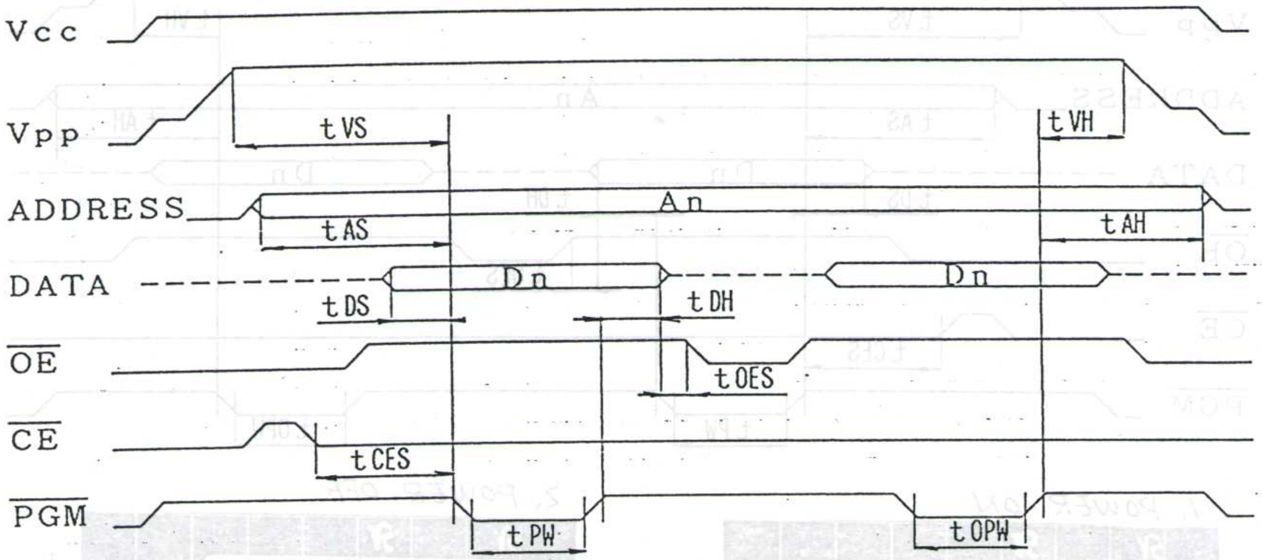
3. ADDRESS SETUP/HOLD



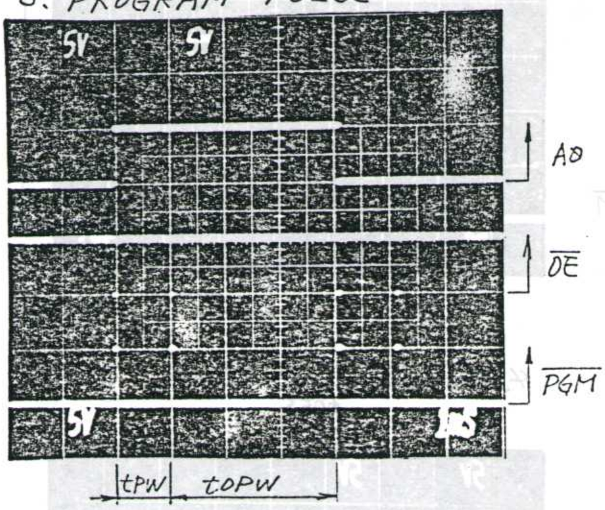
4. DATA SETUP/HOLD



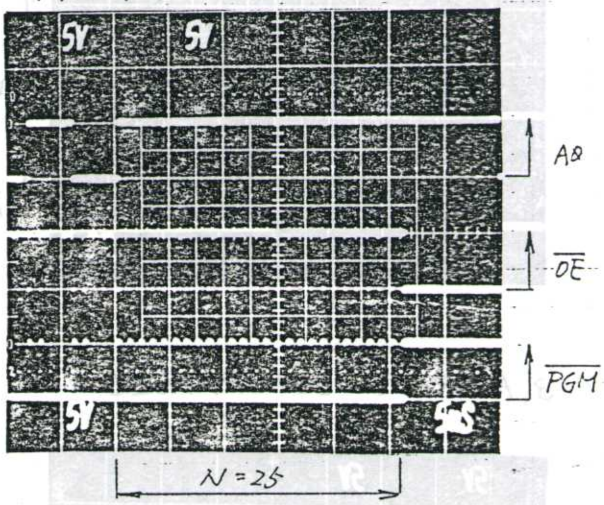
CODE E312 E412



5. PROGRAM PULSE



6. ABORT PULSE



(3) Code E315, E316

MCM68764168766 (CODE E315)

RD687C64 (CODE E316)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			38	uS	3
DATA SET UP	tDS	2			7	uS	3
ADDRESS HOLD	tAH	2			6	uS	3
DATA HOLD	tDH	2			6	uS	3

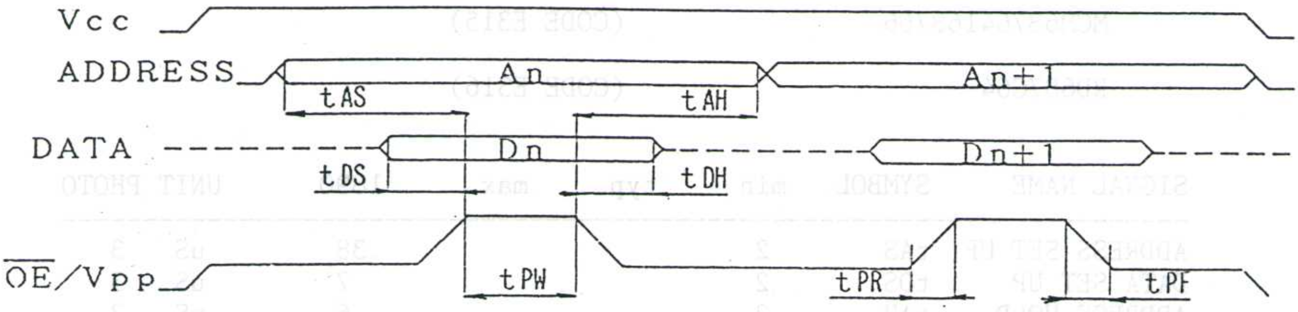
CODE E315 (MCM68764/68766)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	6
PROGRAM	tPW	1.95	2.0	2.1	2.0	mS	6
OVER PROGRAM	tOPW	-	-	-	2.0 X 5	mS	-
MAXIMUM PULS NO.	N	6		25	20		-

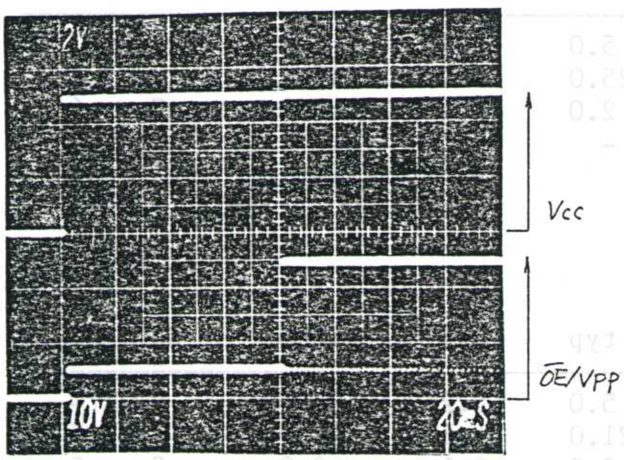
CODE E316 (RD687C54)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	-
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	5
PROGRAM	tPW	1.9	2.0	2.1	2.0	mS	5
OVER PROGRAM	tOPW	-	-	-	2.0 X 5	mS	-
MAXIMUM PULS NO.	N	6		25	20		-

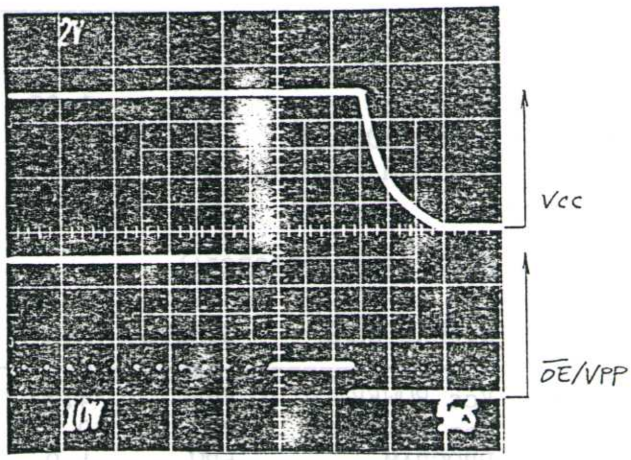
CODE E315 E316



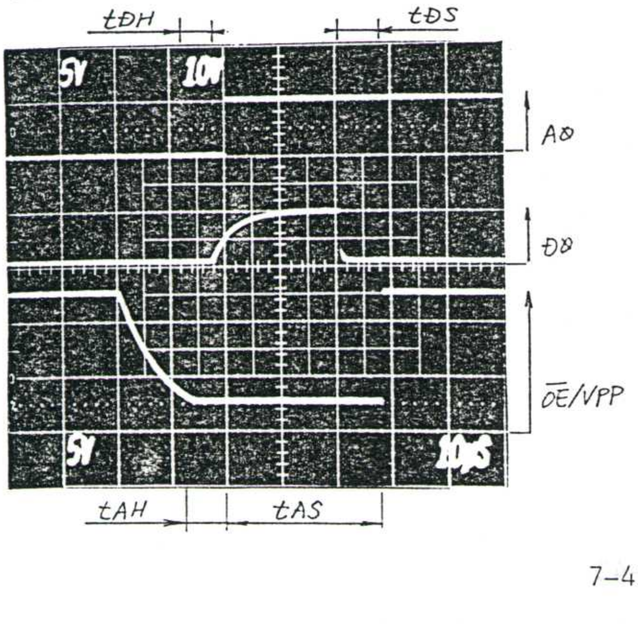
1. POWER ON



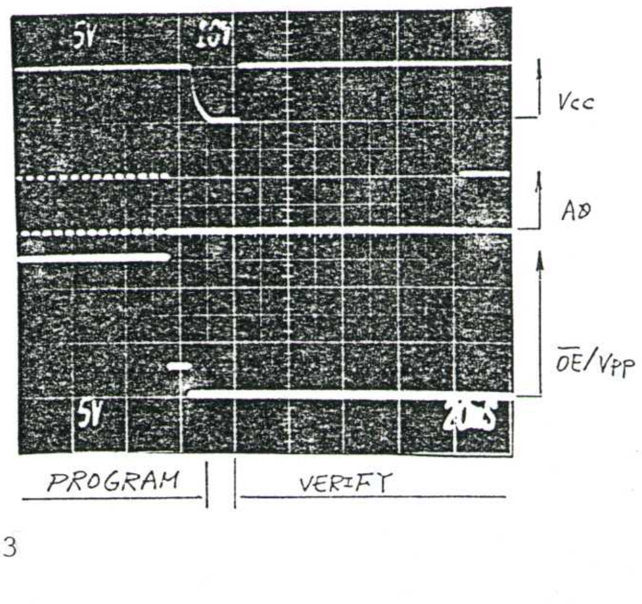
2. POWER OFF



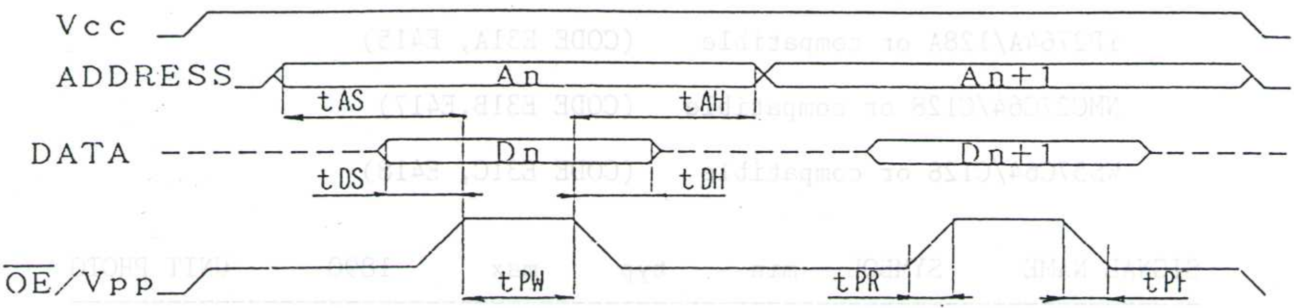
3. ADDRESS/DATA SETUP/HOLD



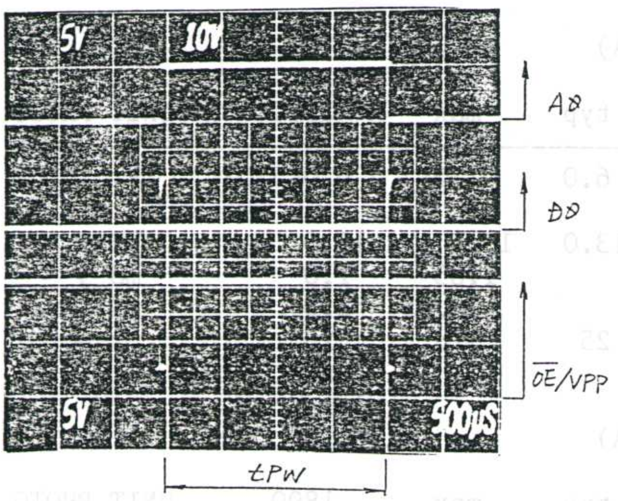
4. PROGRAM ~ VERIFY



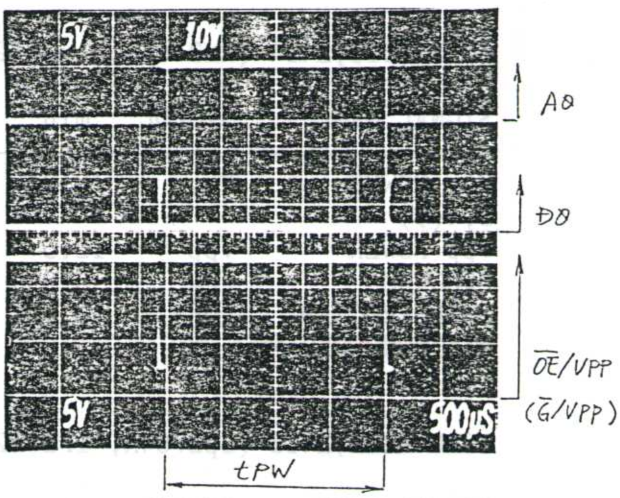
CODE E315 E316



5. RD687C64 PROGRAM PULSE



6. MCM68764 PROGRAM PULSE



(4) Code E318, E31A, E31B, E31C, E414, E415, E417, E418

Am2764A/128A or compatible (CODE E318, E414)

iP2764A/128A or compatible (CODE E31A, E415)

NMC27C64/C128 or compatible (CODE E31B,E417)

WS57C64/C128 or compatible (CODE E31C, E418)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			31(12)	uS	1(7)
OE SET UP	tOES	2			12(-)	uS	2
DATA SET UP	tDS	2			6(6)	uS	2(8)
ADDRESS HOLD	tAH	0			24(4)	uS	1(7)
DATA HOLD	tDH	2			4(4)	uS	2(8)
Vpp SET UP	tVS	2			40mS	uS	
3,11,15							
Vpp HOLD	tVH	-			1mS	uS	
3,12,16							
CE SET UP	tCES	2			25	uS	1

CODE E318,E414 (Am2764A, Am27128A)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	
3,4(9)							
Vpp POWER	Vpp	12.5	13.0	13.5	13.0	V	3,4
PROGRAM	tPW	0.95		1.05	1.0	mS	5
OVER PROGRAM	tOPW	1.95		78.85	2.0	mS	10
MAXIMUM PULS NO.	N		25		25		6

CODE E31A,E415 (ip2764A, iP27128A)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	6.0	6.25	6.5	6.25	V	11,12
Vpp POWER	Vpp	12.5	12.75	13.0	12.75	V	11,12
PROGRAM	tPW		0.1		0.98	mS	13
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N		25		25		14

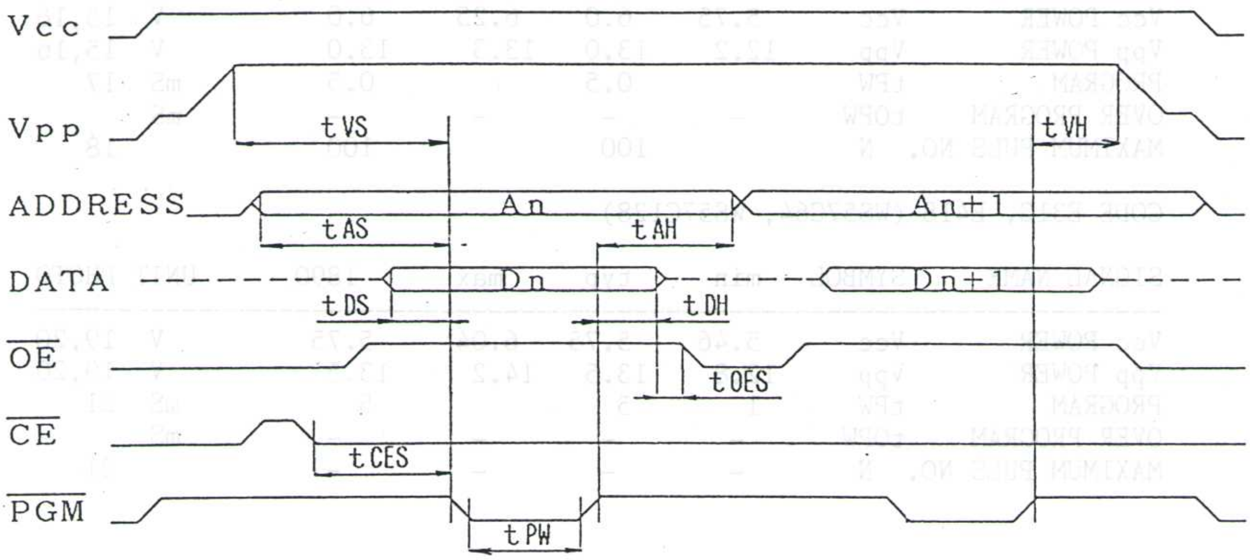
CODE E31B, E417 (NMC27C64, NMC27C128)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	15,16
Vpp POWER	Vpp	12.2	13.0	13.3	13.0	V	15,16
PROGRAM	tPW		0.5		0.5	mS	17
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N		100		100		18

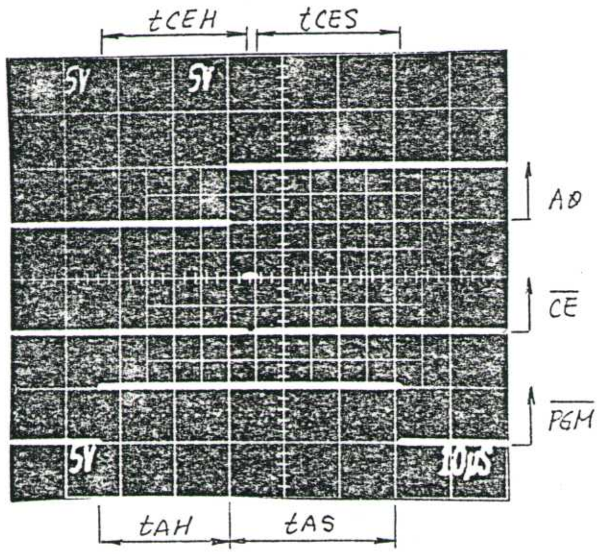
CODE E31C, E418 (WS57C64, WS57C128)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.46	5.75	6.04	5.75	V	19,20
Vpp POWER	Vpp	12.8	13.5	14.2	13.5	V	19,20
PROGRAM	tPW	1	5		5	mS	21
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N	-	-	-	-		21

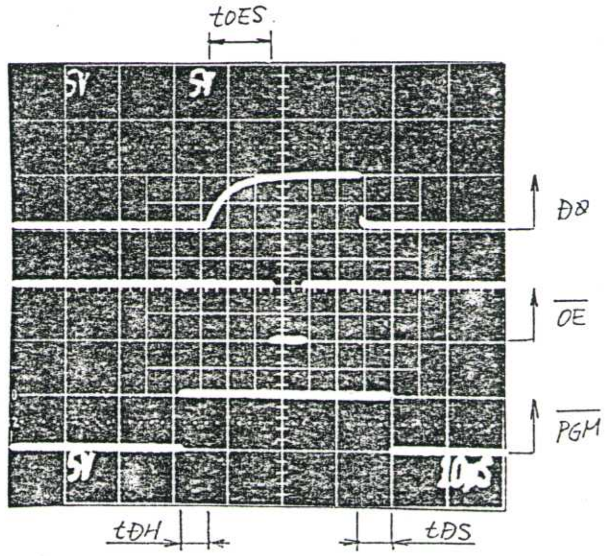
CODE E318 E31A E31B E31C E414 E415 E417 E418



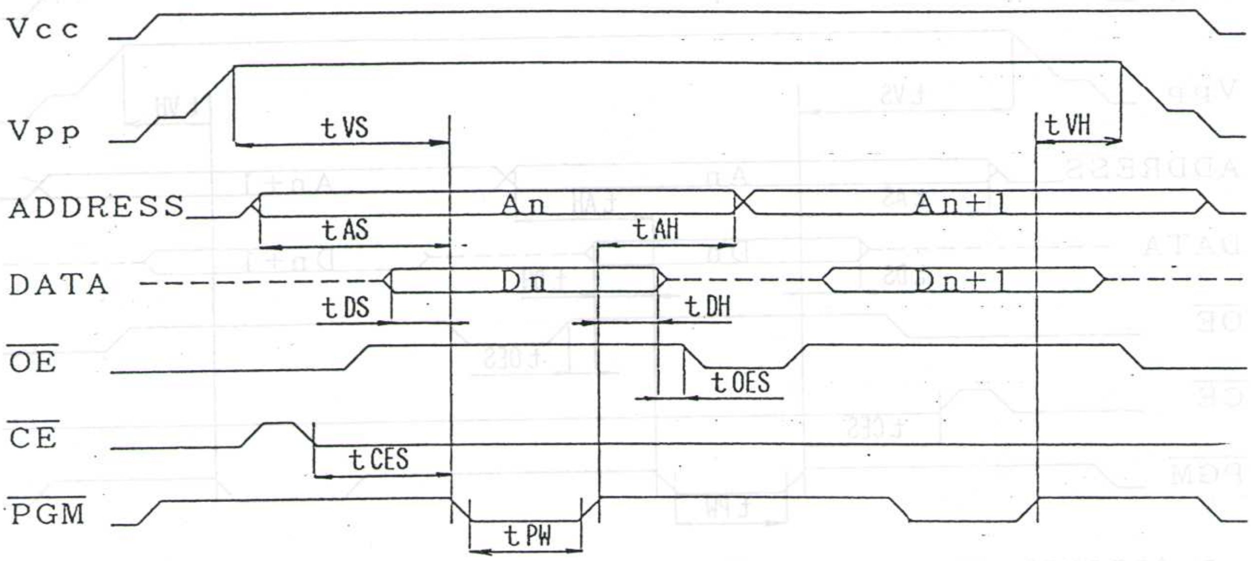
1. ADDRESS SETUP / HOLD



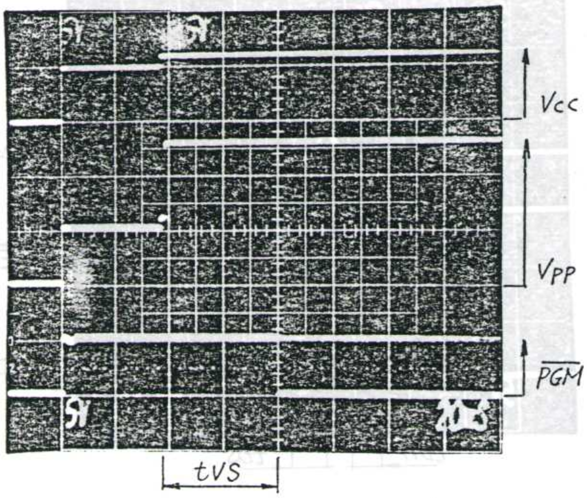
2. DATA SETUP / HOLD



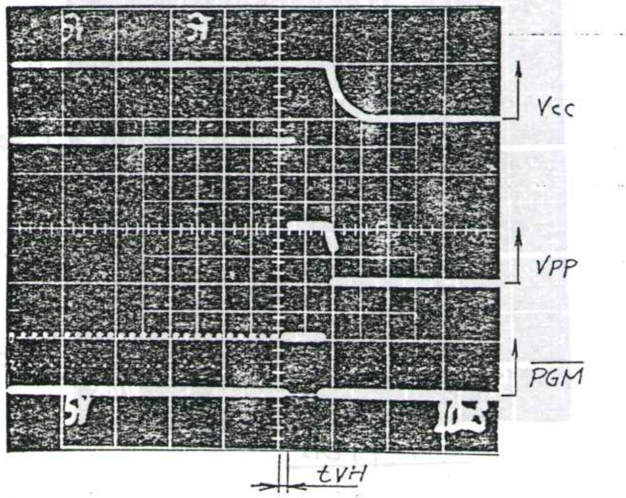
CODE E318 E414



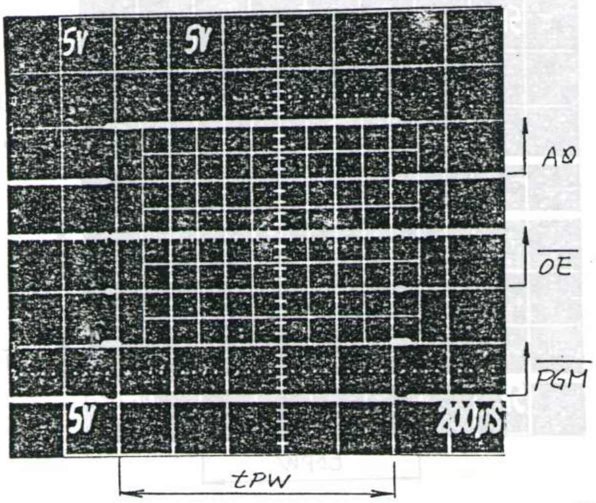
3. POWER ON



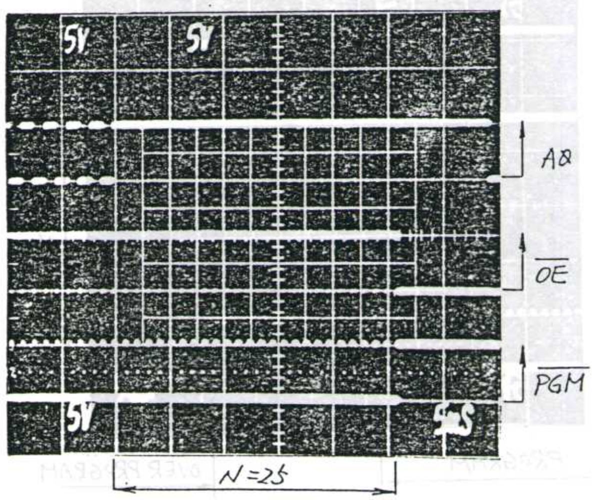
4. POWER OFF



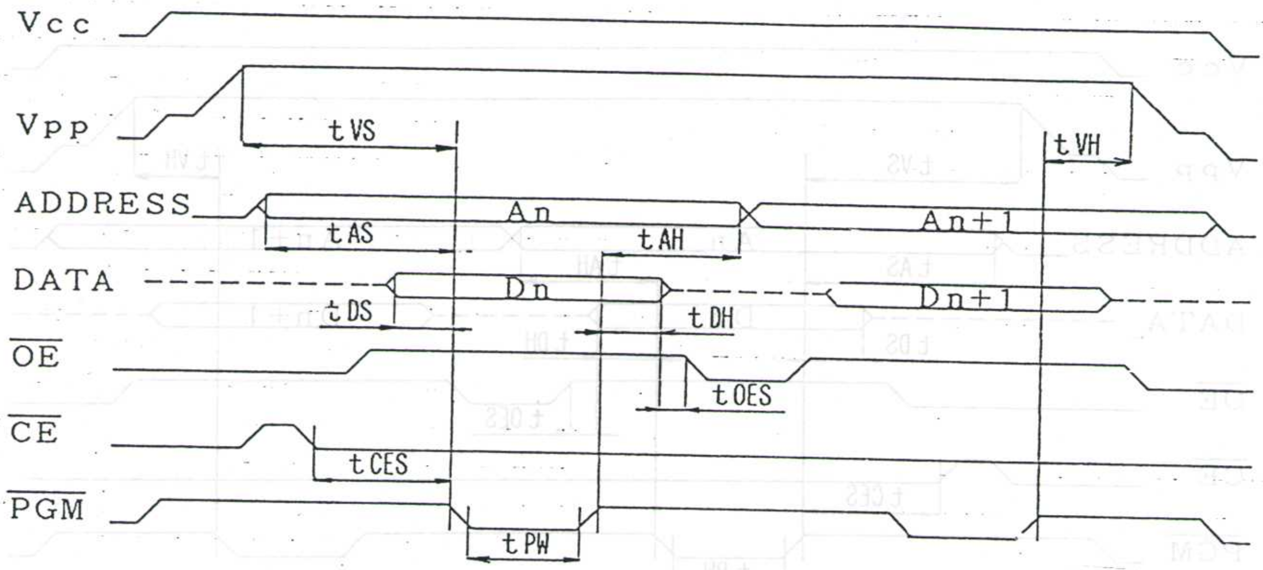
5. ADDRESS SETUP/HOLD



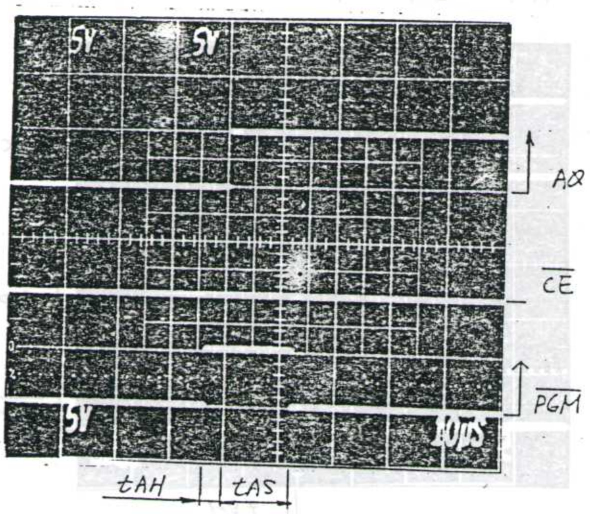
6. ABORT PULSE



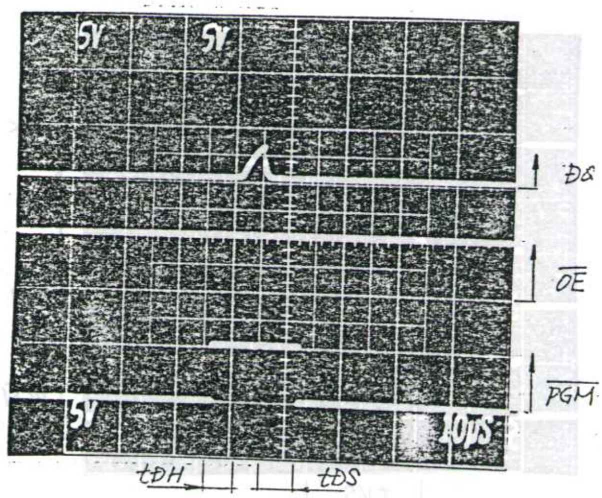
CODE E318 E414



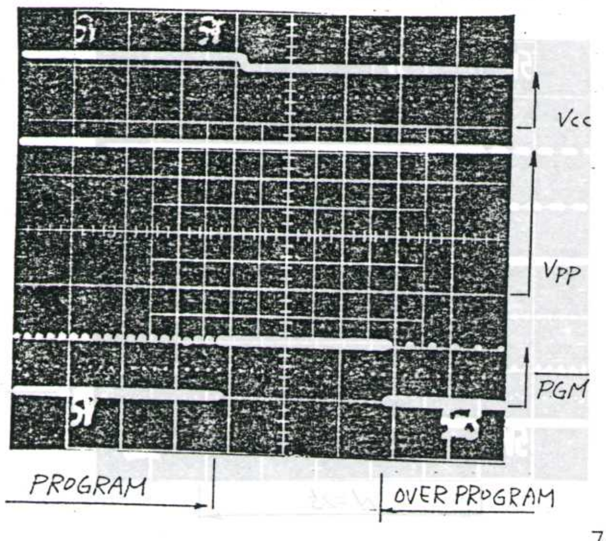
7. ADDRESS SETUP/HOLD



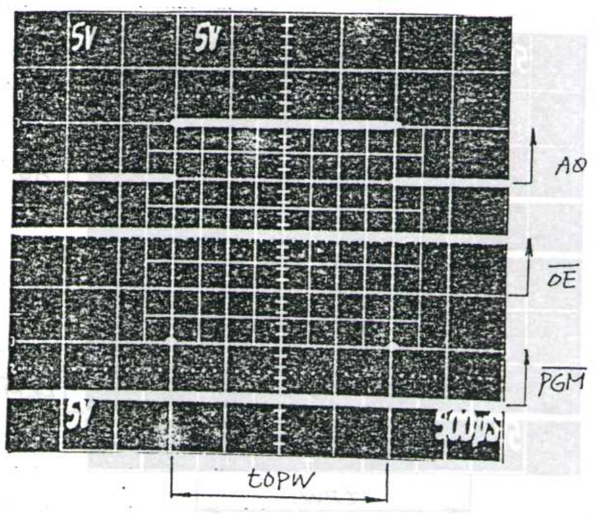
8. DATA SETUP/HOLD



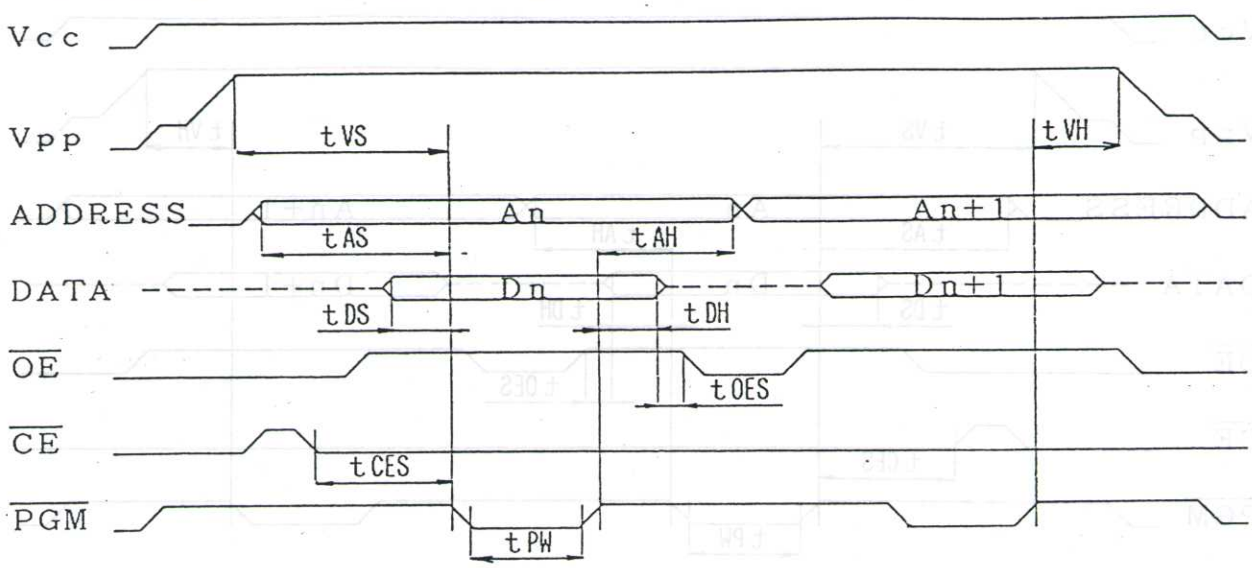
9. PROGRAM ~ OVER PROGRAM



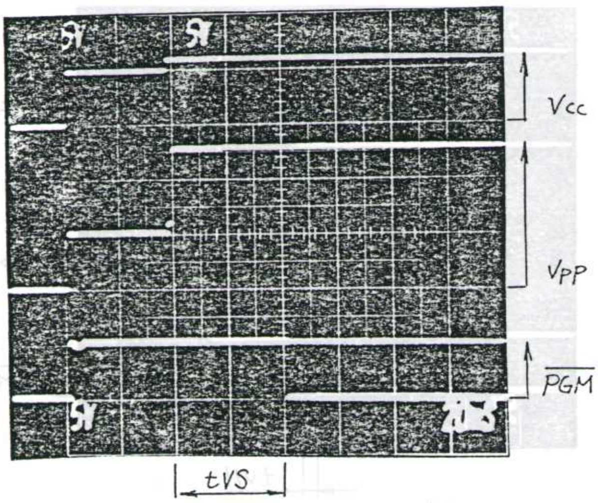
10. OVER PROGRAM PULSE



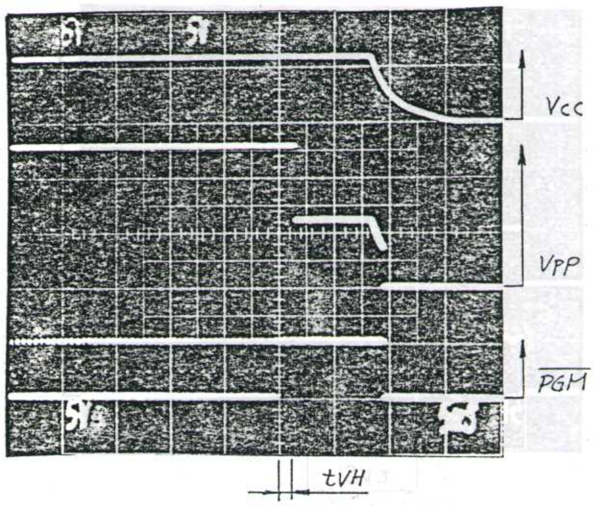
CODE E31B E417



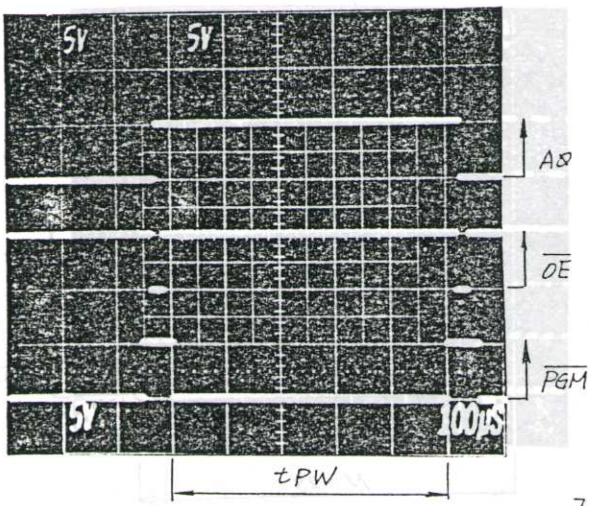
15. POWER ON



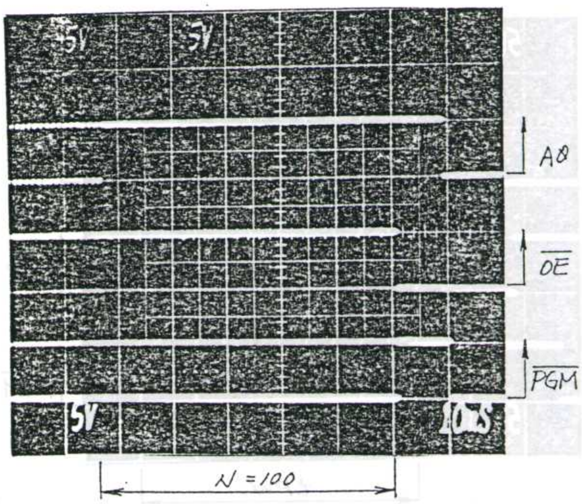
16. POWER OFF



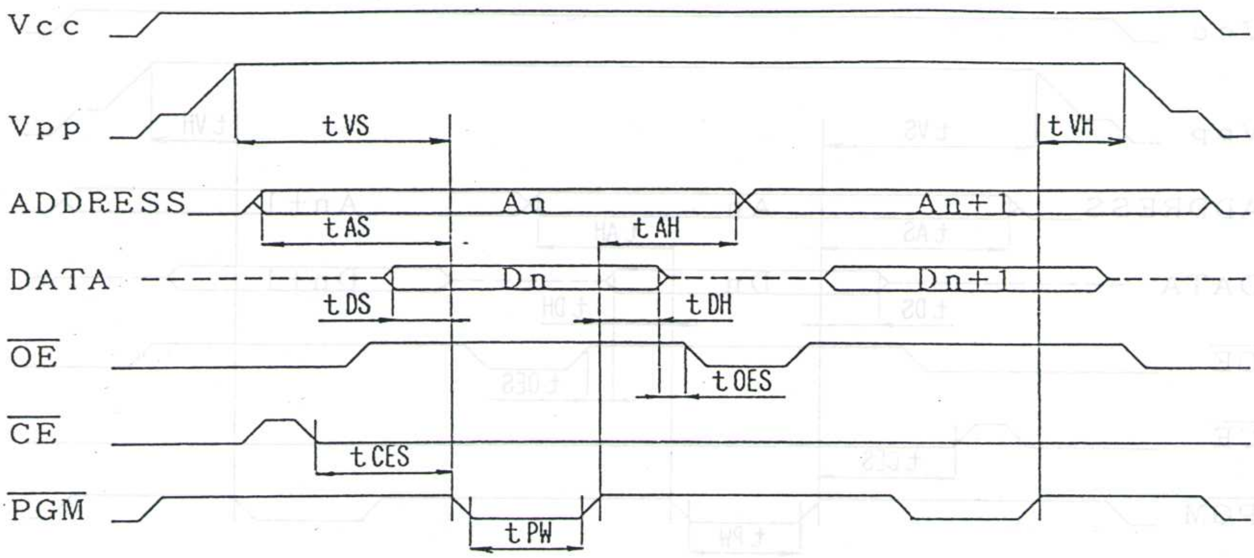
17. PROGRAM PULSE



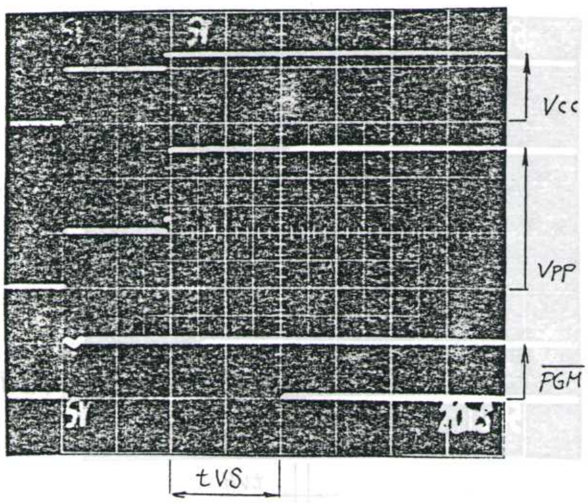
18. ABORT PULSE



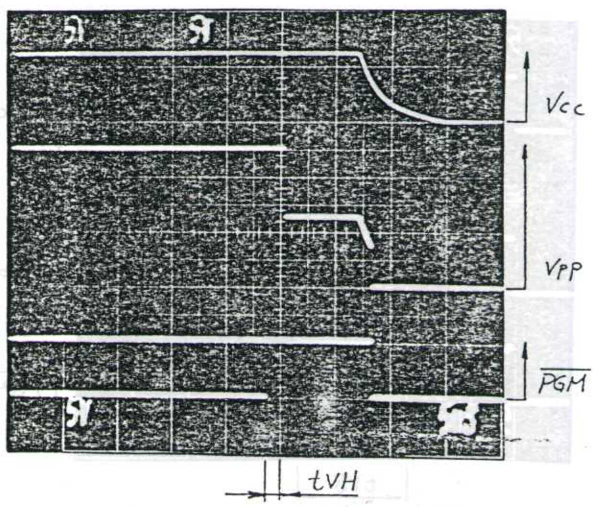
CODE E31A E415



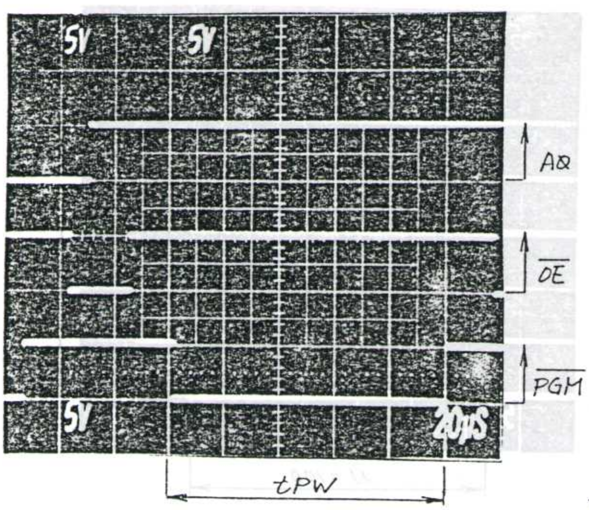
11. POWER ON



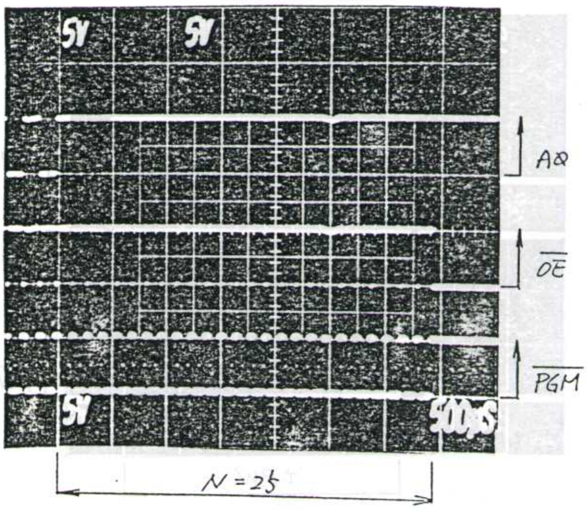
12. POWER OFF



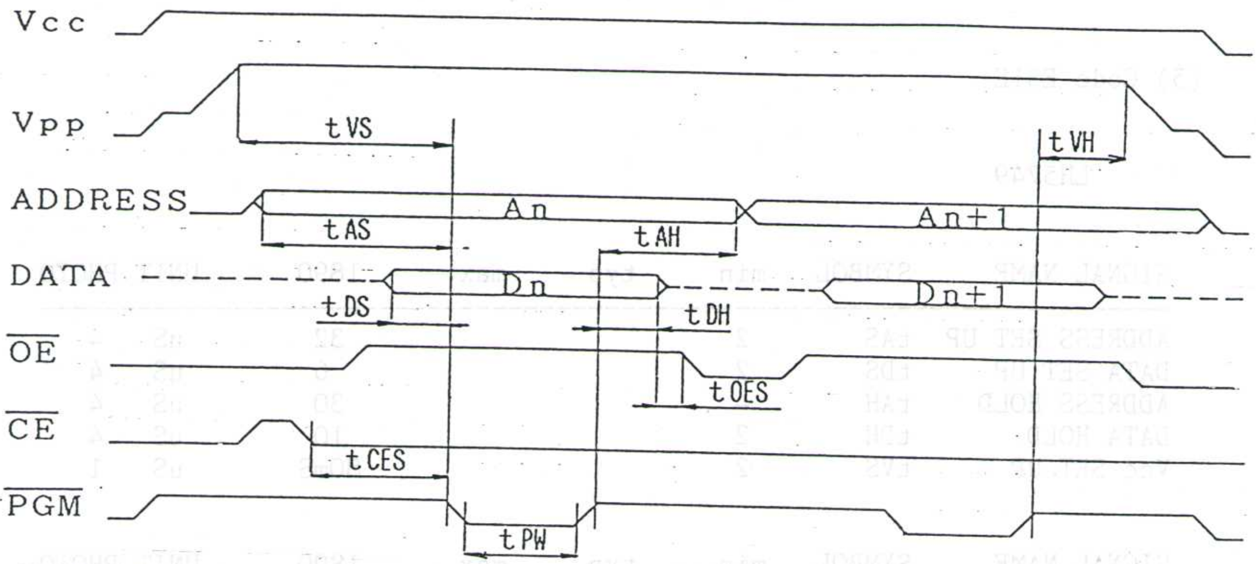
13. PROGRAM PULSE



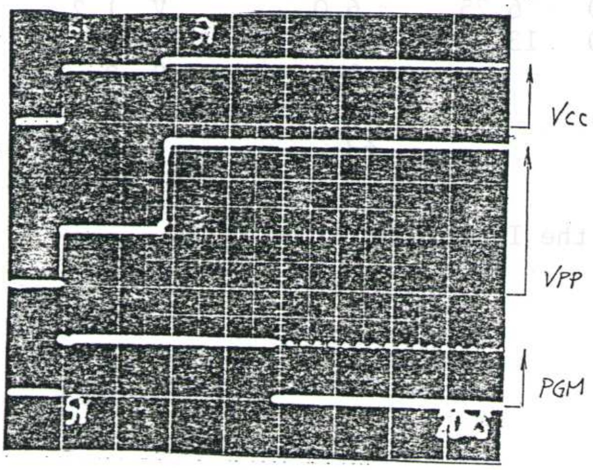
14. ABORT PULSE



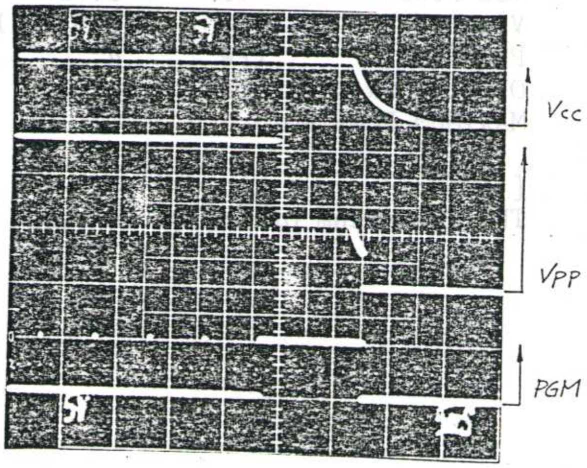
CODE E31C E418



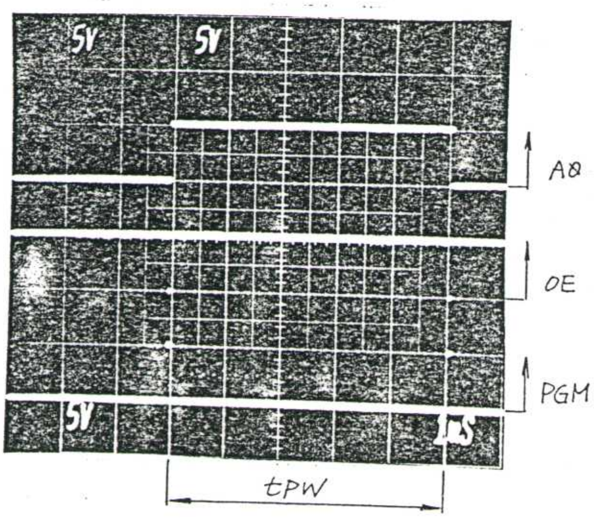
19. POWER ON



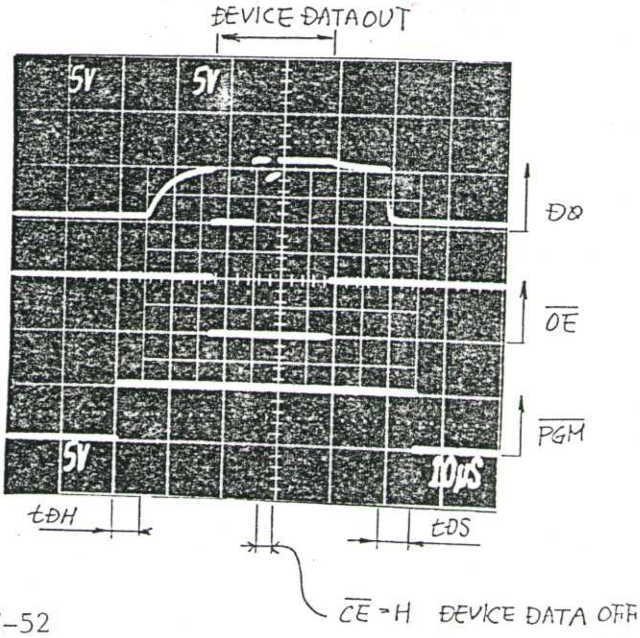
20. POWER OFF



21. PROGRAM PULSE



22. DATA SETUP/HOLD



(5) Code E31E

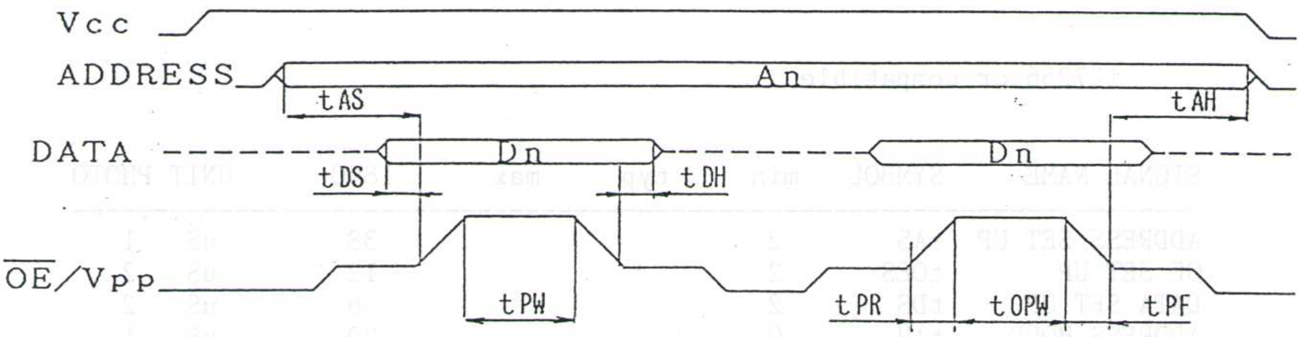
LH5749

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			32	uS	4
DATA SET UP	tDS	2			6	uS	4
ADDRESS HOLD	tAH	-			30	uS	4
DATA HOLD	tDH	2			10	uS	4
Vcc SET UP	tVS	2			80mS	uS	1

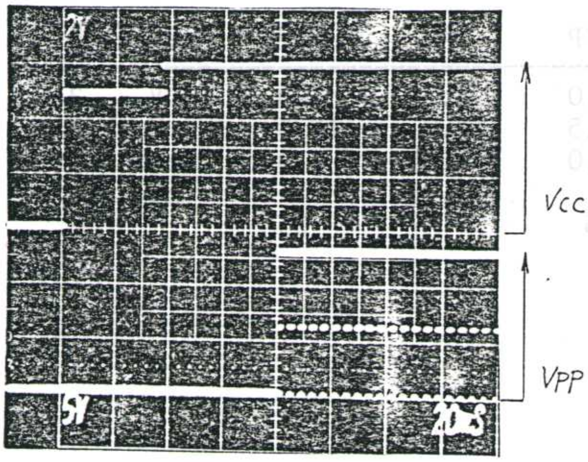
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.5	13.0	13.5	13.0	V	1,2
PROGRAM	tPW	4			1	mS	3
OVER PROGRAM	tOPW	-	-	-	-	N X 3 mS	3
MAXIMUM PULS NO.	N	-	-	-	25		4

[NOTE]
The algorithm of LH5749 is based on the Interigent II.

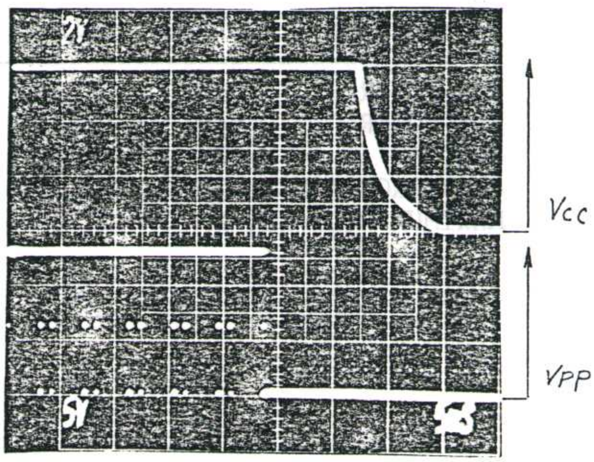
CODE E31E



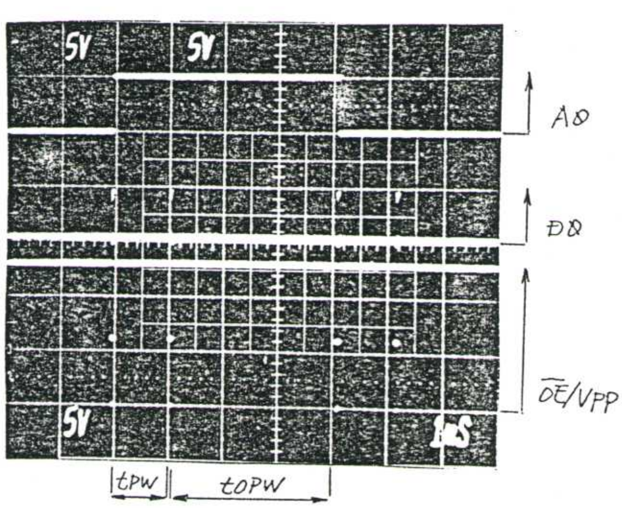
1. POWER ON



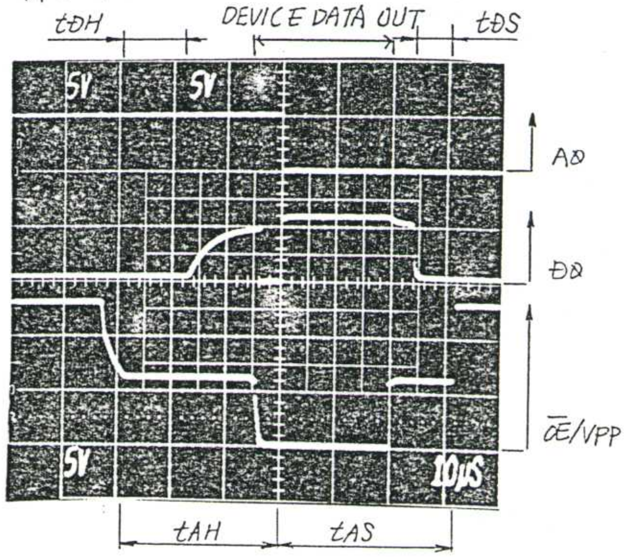
2. POWER OFF



3. PROGRAM PULSE



4. ADDRESS/DATA SETUP/HOLD



7.5.4 256K Bit EP-ROM

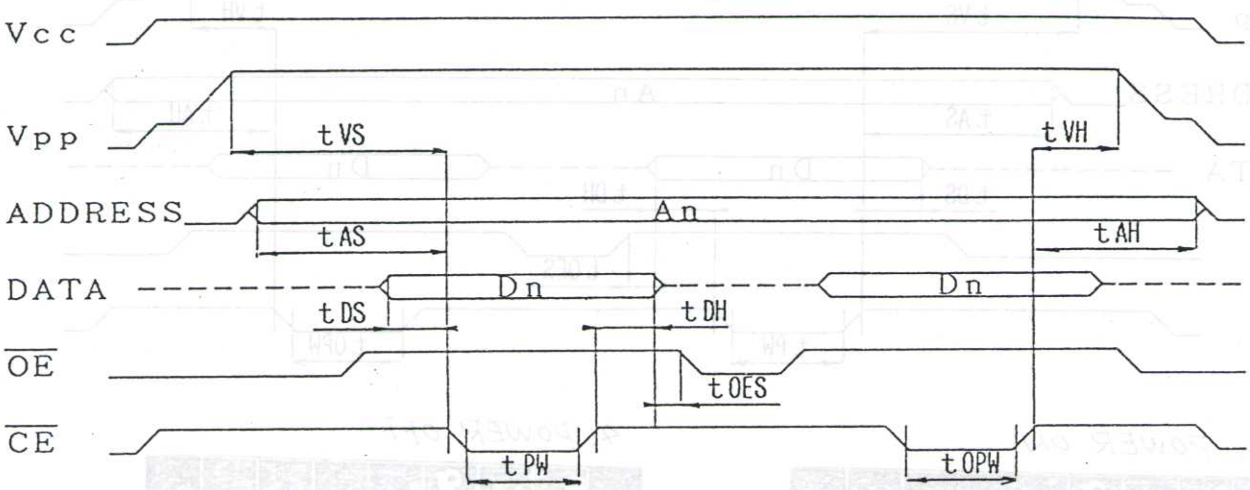
(1) Code E510

i27256 or compatible

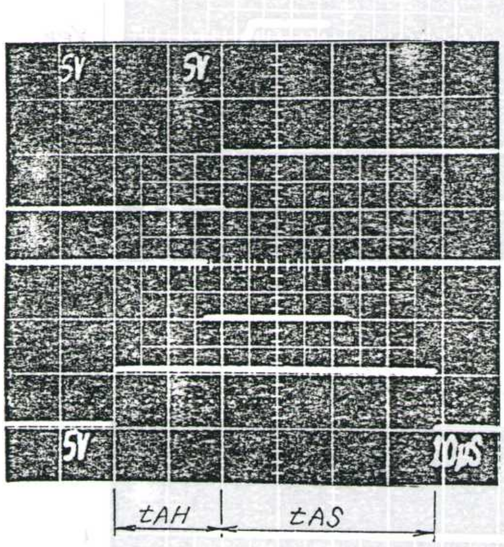
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			38	uS	1
OE SET UP	tOES	2			12	uS	2
DATA SET UP	tDS	2			6	uS	2
ADDRESS HOLD	tAH	0			20	uS	1
DATA HOLD	tDH	2			5	uS	2
Vpp SET UP	tVS	2			40mS	uS	3
Vpp HOLD	tVH	-			1mS	uS	4

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	3,4
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	3,4
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	5
OVER PROGRAME	tOPW	2.85		78.75		mS	
MAXIMUM PULS NO.	N		25		25		6

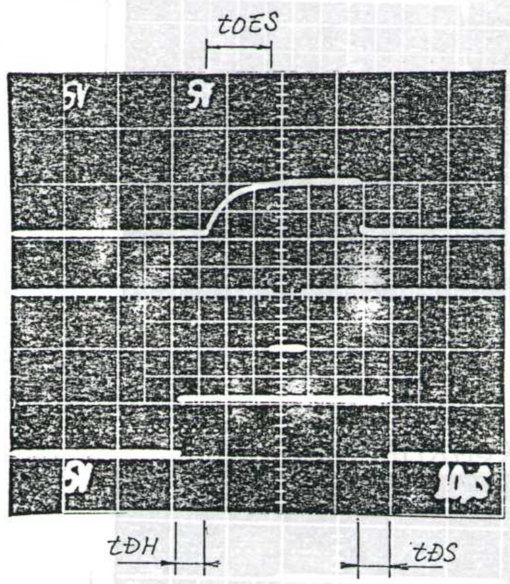
CODE E510



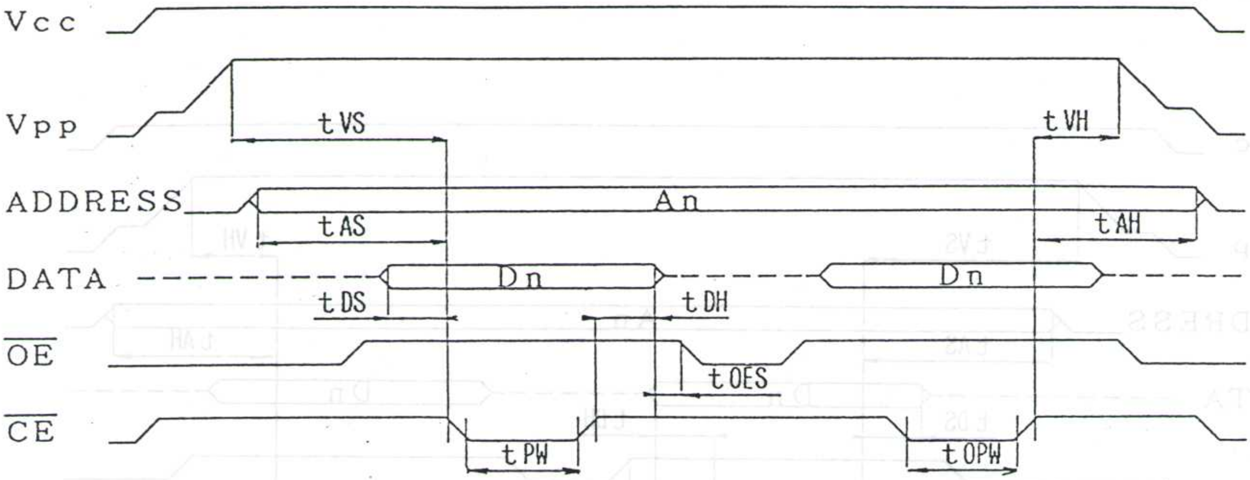
1. ADDRESS SETUP/HOLD



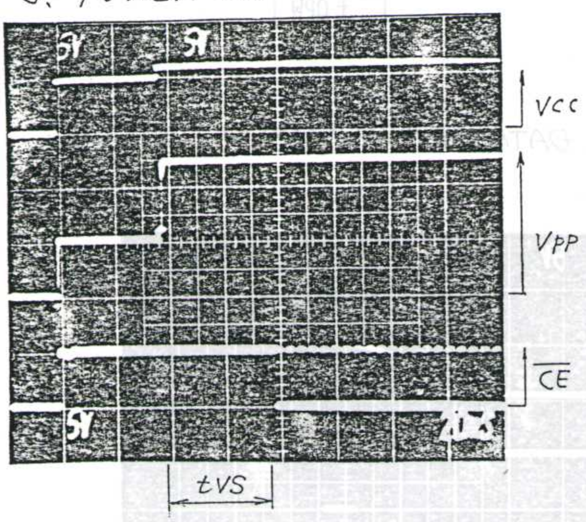
2. DATA SETUP/HOLD



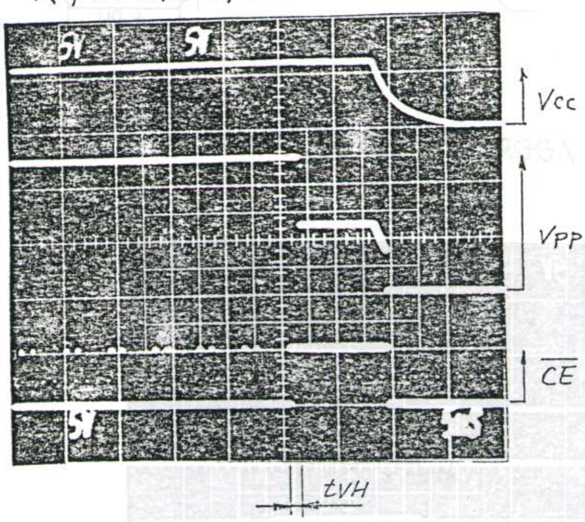
CODE E510



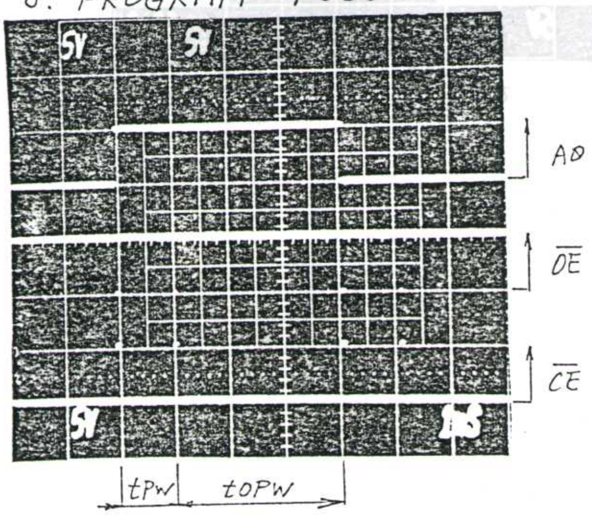
3. POWER ON



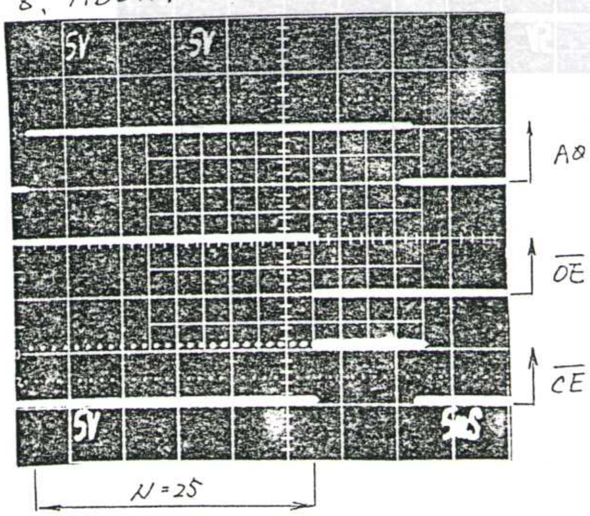
4. POWER OFF



5. PROGRAM PULSE



6. ABORT PULSE



(2) Code E511, E514, E516

Am27256 or compatible (CODE E511)
iP27256 or compatible (CODE E514)
NMC27C256 or compatible (CODE E516)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			38(12)	uS	1(7)
OE SET UP	tOES	2			12(-)	uS	2
DATA SET UP	tDS	2			5(7)	uS	2(8)
ADDRESS HOLD	tAH	0			24(4)	uS	1(7)
DATA HOLD	tDH	2			5(5)	uS	2(8)
Vpp SET UP	tVS	2			40mS	uS	3
Vpp HOLD	tVH	–			1mS	uS	4

CODE E511 (Am27256)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	3,4,9
Vpp POWER	Vpp	12.2	13.0	13.3	13.0	V	3,4
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	5
OVER PROGRAM	tOPW	1.95		78.75		mS	10
MAXIMUM PULS NO.	N		25				6

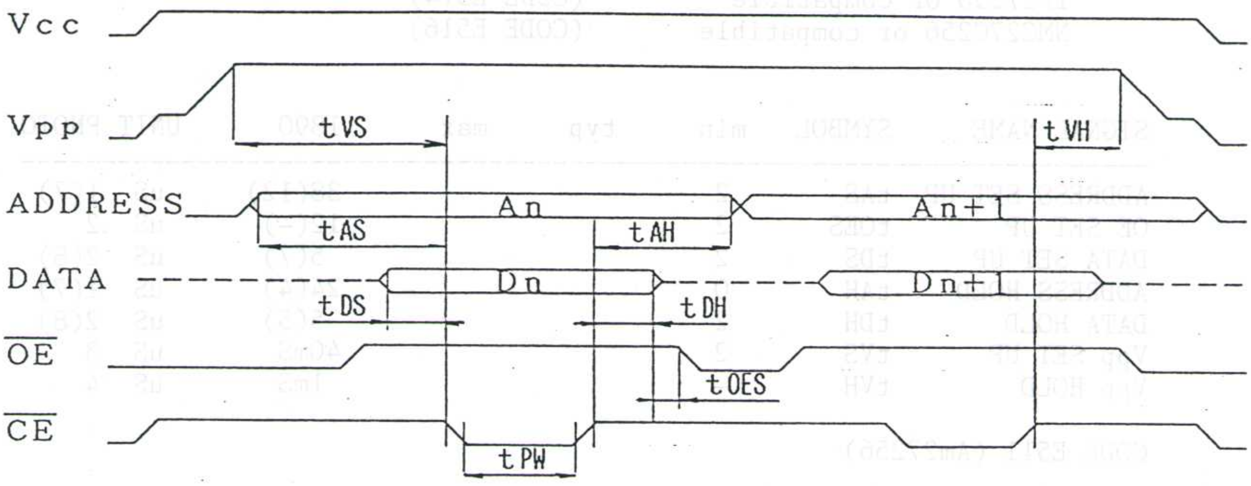
CODE E514 (iP27256)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	6.0	6.25	6.5	6.25	V	3,4
Vpp POWER	Vpp	12.5	12.75	13.0	12.75	V	3,4
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	5
OVER PROGRAM	tOPW	–	–	–	–	mS	10
MAXIMUM PULS NO.	N		25				6

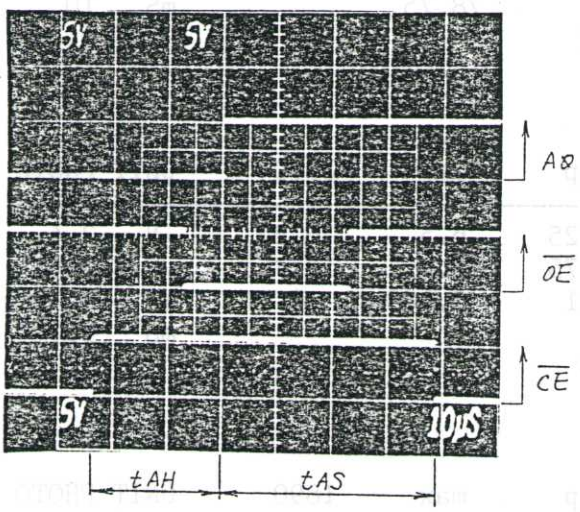
CODE E516 (NMC27C256)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	15,16
Vpp POWER	Vpp	12.2	13.0	13.3	13.0	V	15,16
PROGRAM	tPW	0.5	0.5	50	0.5	mS	17
OVER PROGRAM	tOPW	–	–	–	–	mS	
MAXIMUM PULS NO.	N				100		18

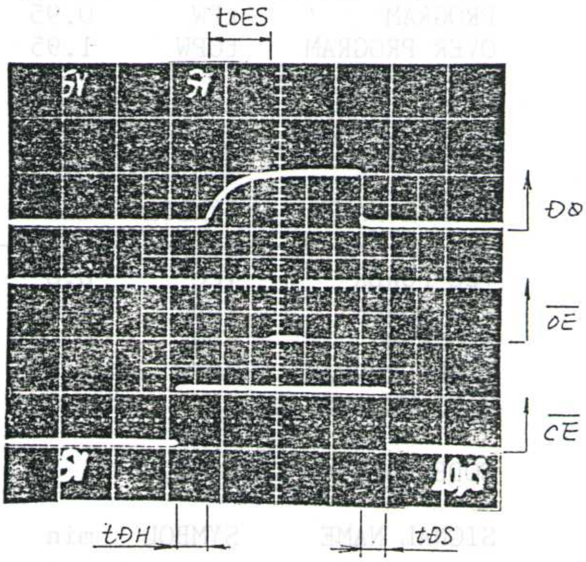
CODE E511 E514 E516



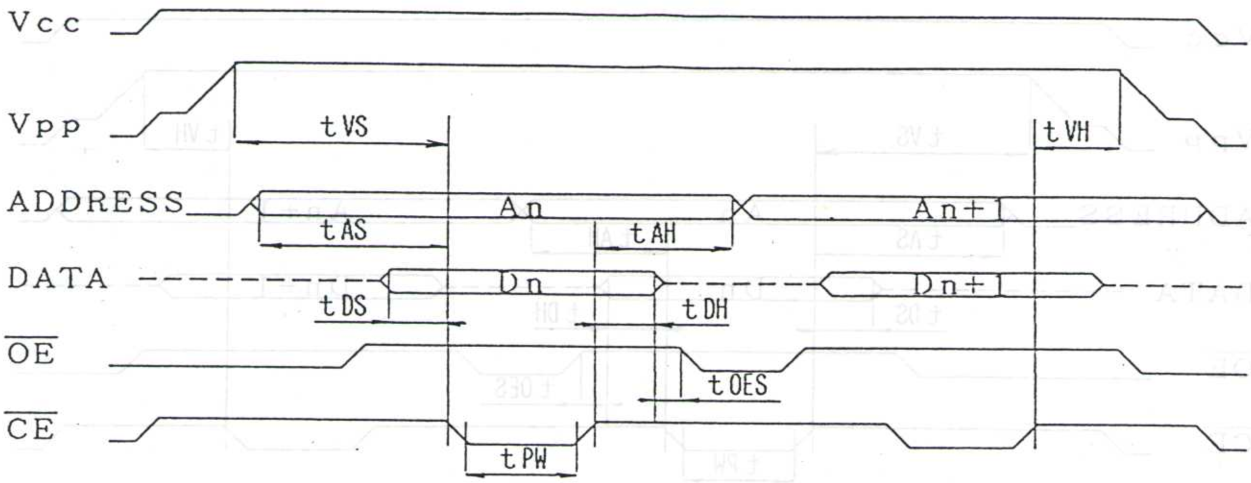
1. ADDRESS SETUP/HOLD



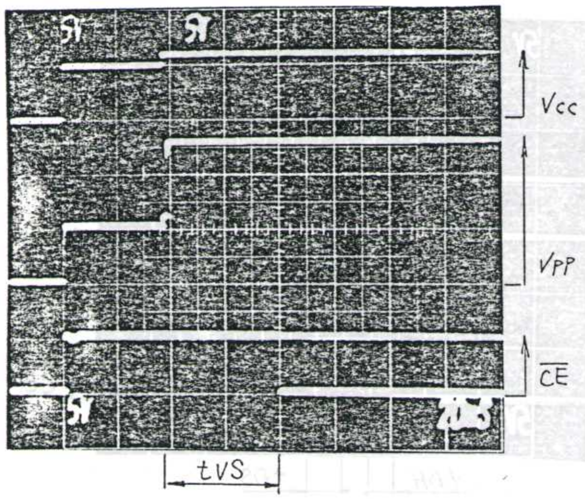
2. DATA SETUP/HOLD



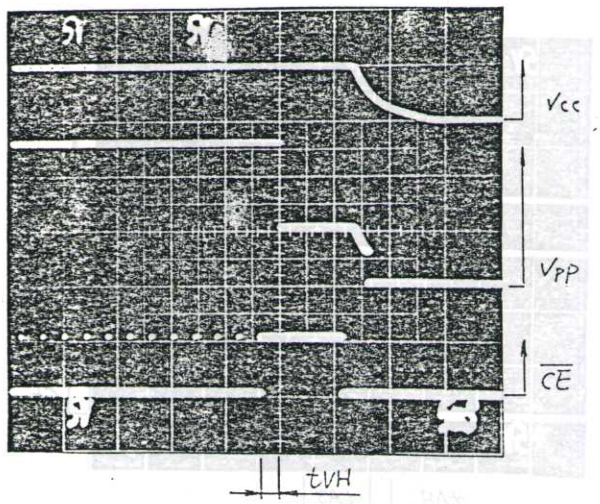
CODE E511



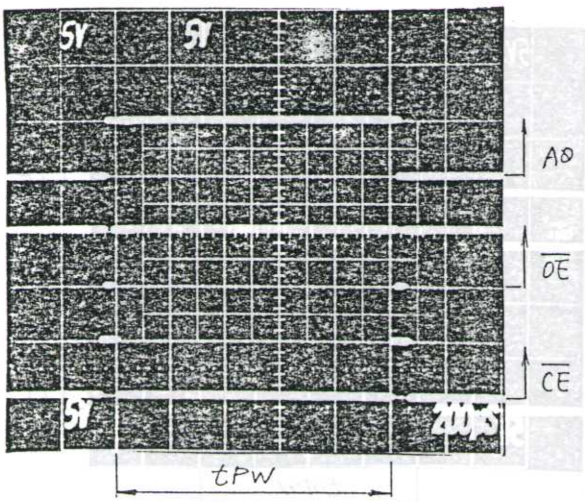
3. POWER ON



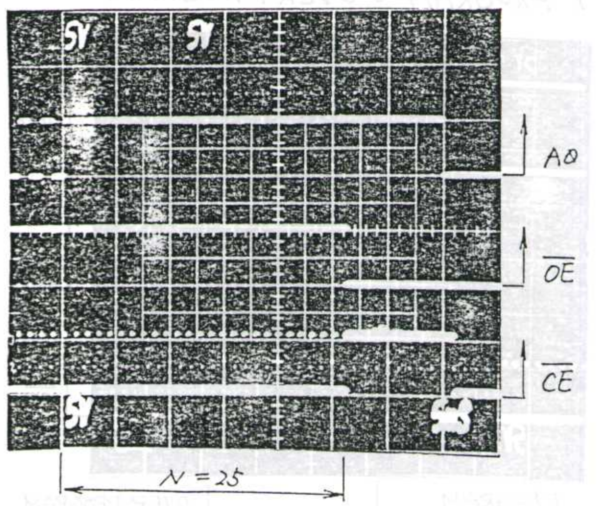
4. POWER OFF



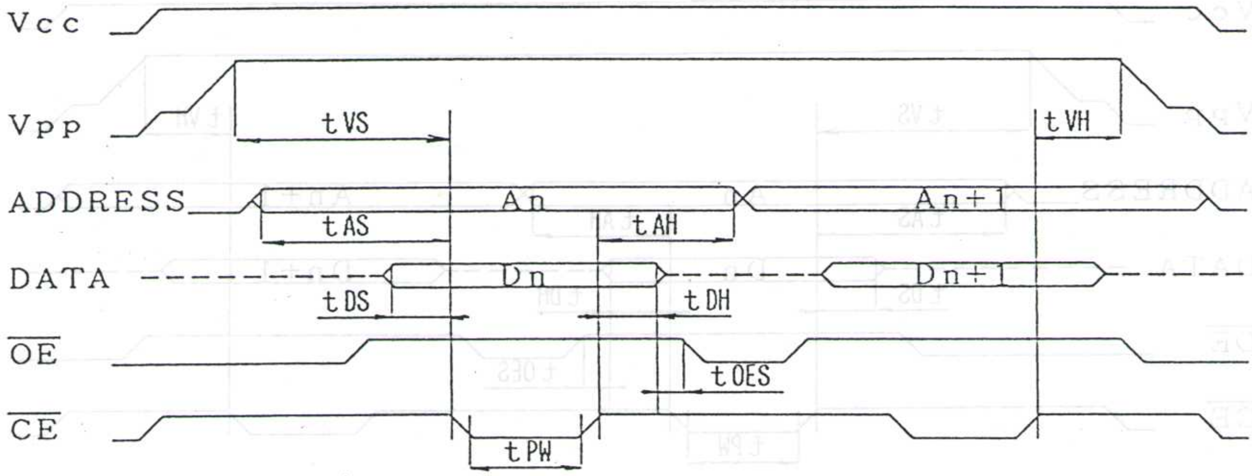
5. PROGRAM PULSE



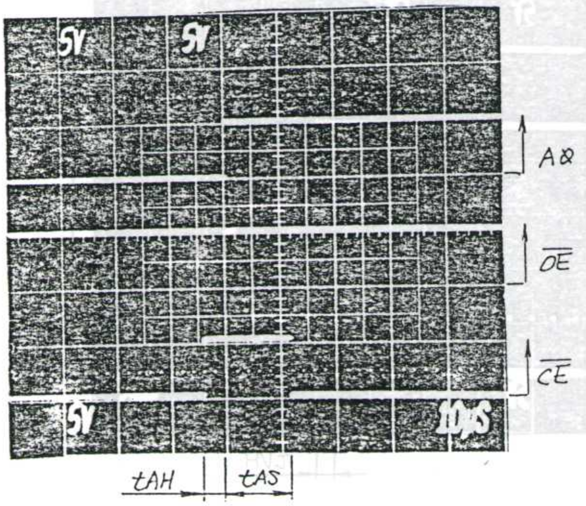
6. ABORT PULSE



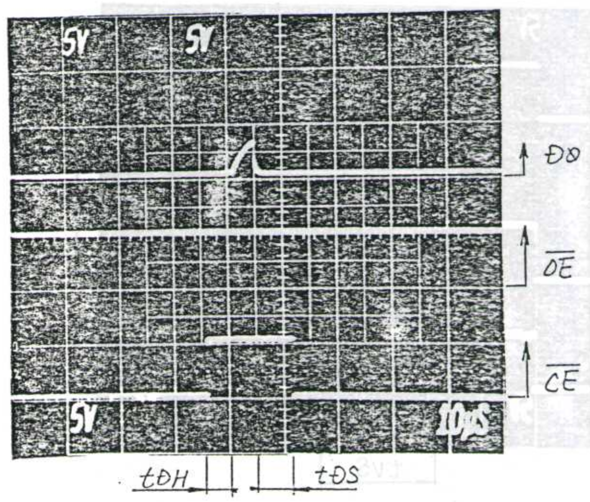
CODE E511



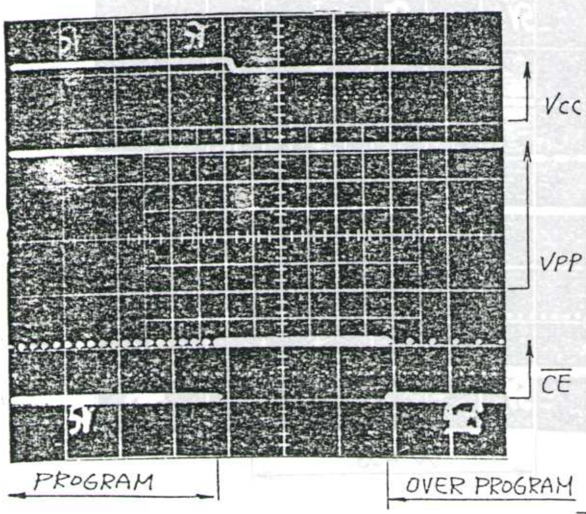
7. ADDRESS SETUP/HOLD



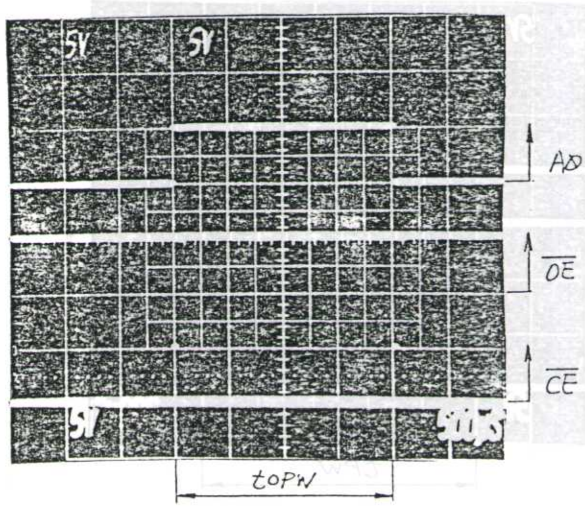
8. DATA SETUP/HOLD



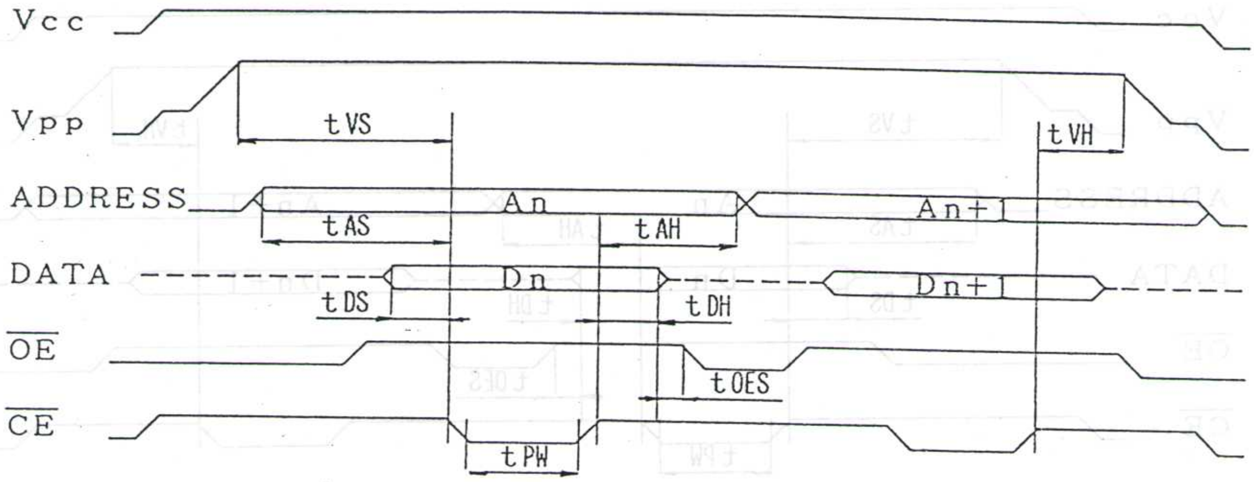
9. PROGRAM ~ OVERPROGRAM



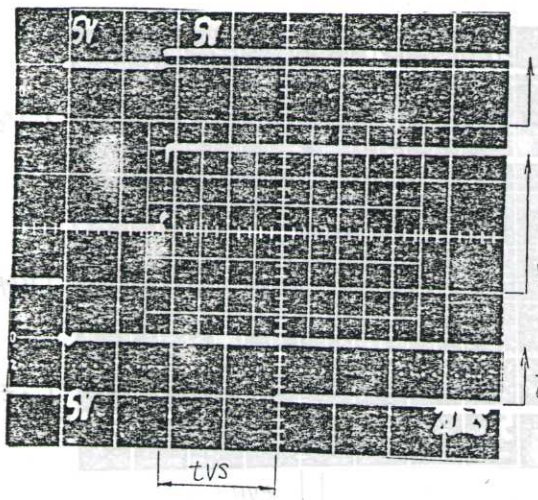
10. OVER PROGRAM PULSE



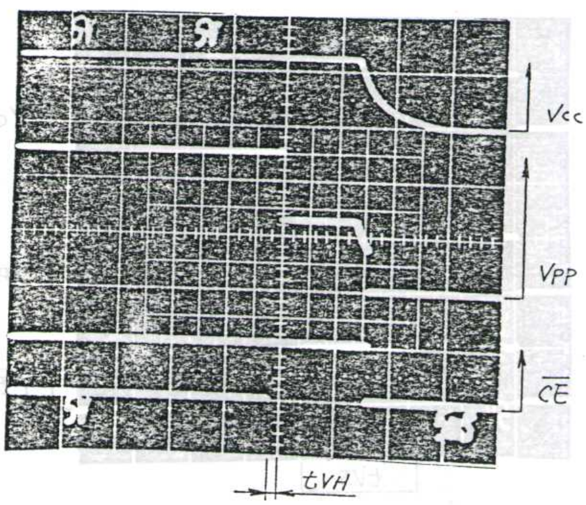
CODE E514



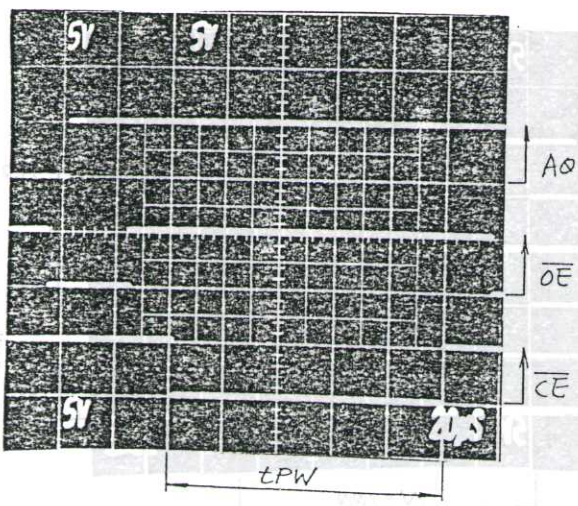
11. POWER ON



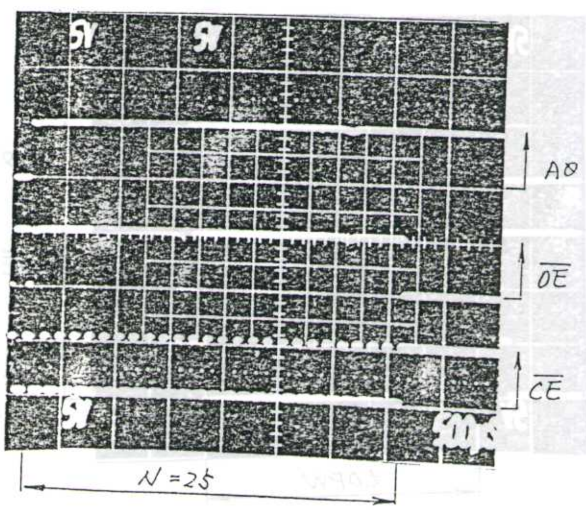
12. POWER OFF



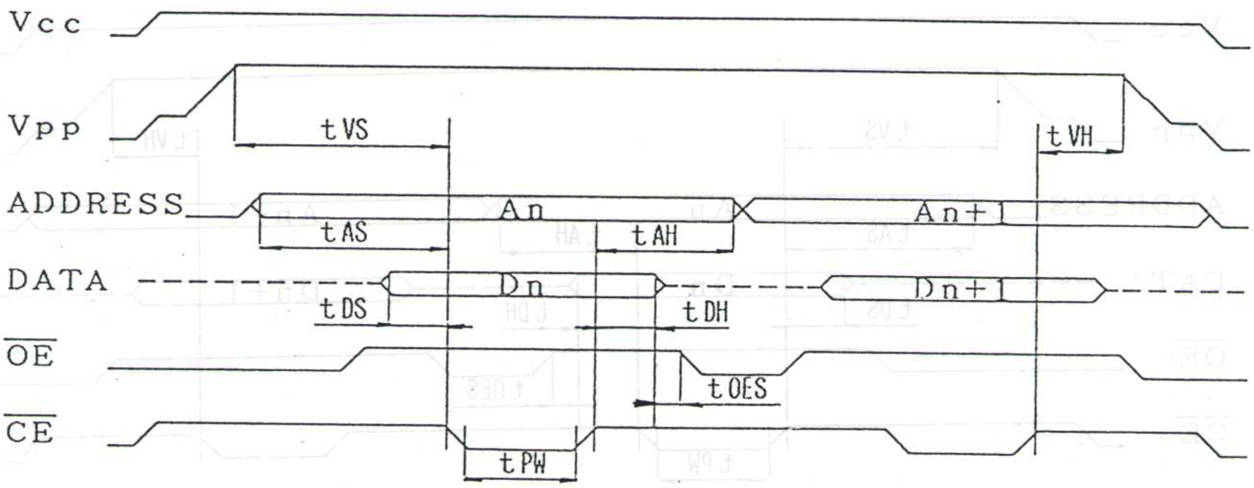
13. PROGRAM PULSE



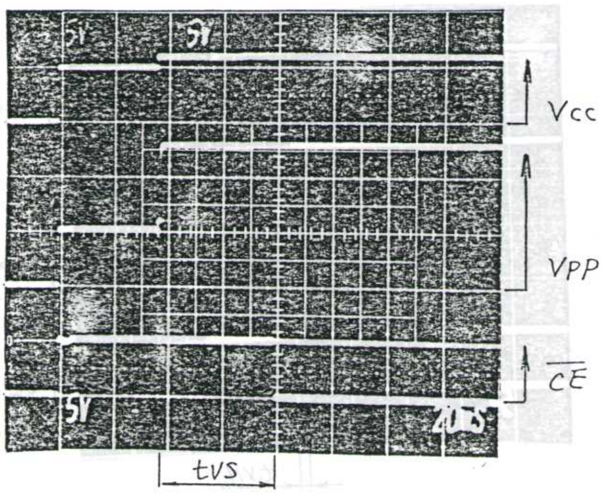
14. ABORT PULSE



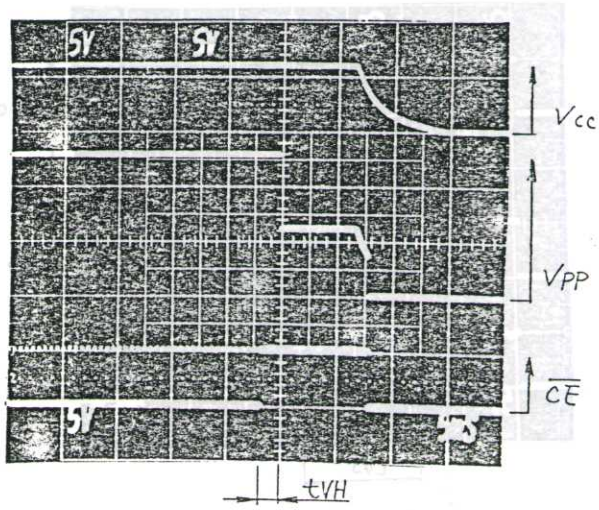
CODE E516



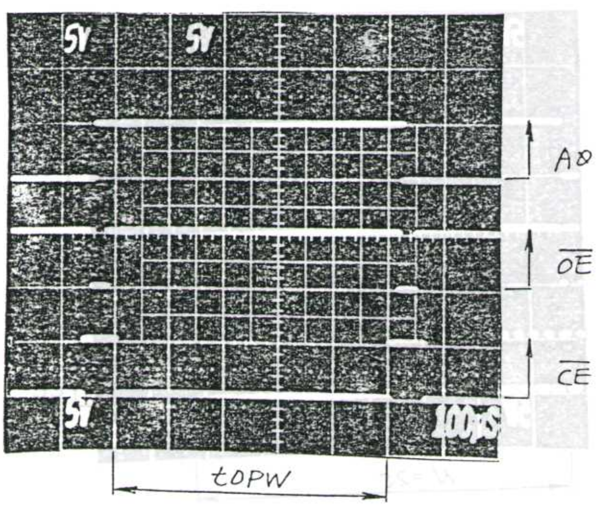
15. POWER ON



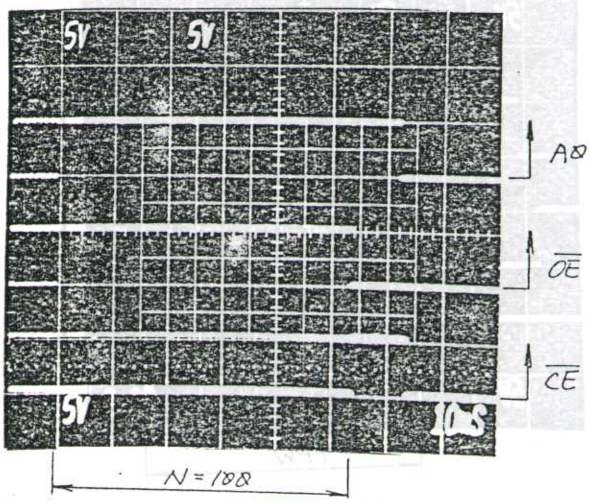
16. POWER OFF



17. PROGRAM PULSE



18. ABORT PULSE



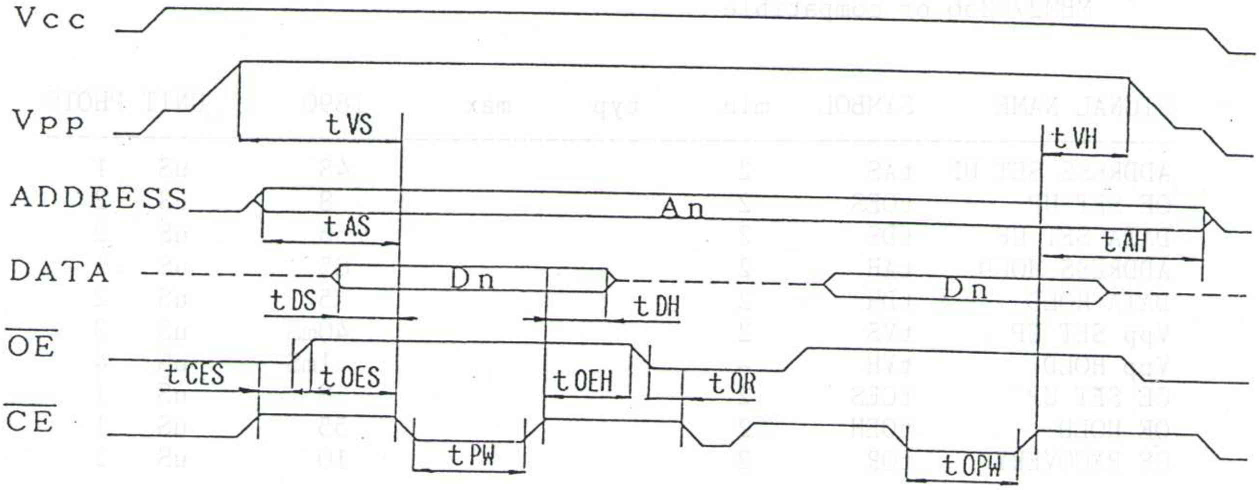
(3) Code E512

MBM27C256 or compatible

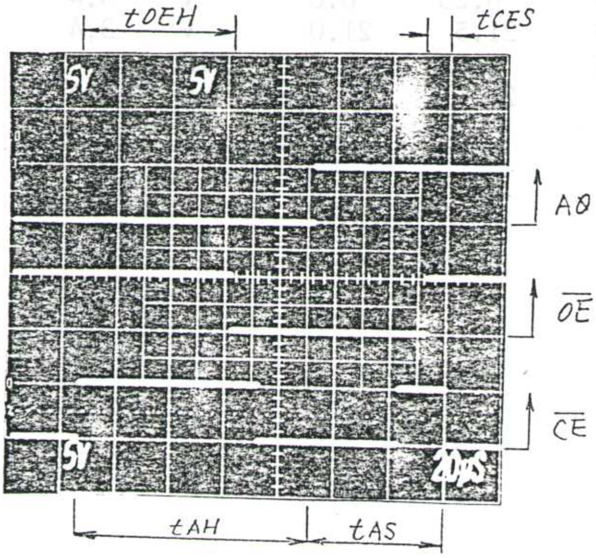
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			48	uS	1
OE SET UP	tOES	2			8	uS	2
DATA SET UP	tDS	2			6	uS	2
ADDRESS HOLD	tAH	2			85	uS	1
DATA HOLD	tDH	2			5	uS	2
Vpp SET UP	tVS	2			40mS	uS	3
Vpp HOLD	tVH	–			1mS	uS	4
CE SET UP	tCES	2			8	uS	1
OE HOLD	tOEH	2			55	uS	1
OE RECOVERY	tOR	2			10	uS	2

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	3,4
Vpp POWER	Vpp	20.5	21.0	21.5	21.0	V	3,4
PROGRAM	tPW	0.95	1.0	1.05	1.0	mS	5
OVER PROGRAM	tOPW	0.95		21		mS	5,6
MAXIMUM PULS NO.	N		20		20		6

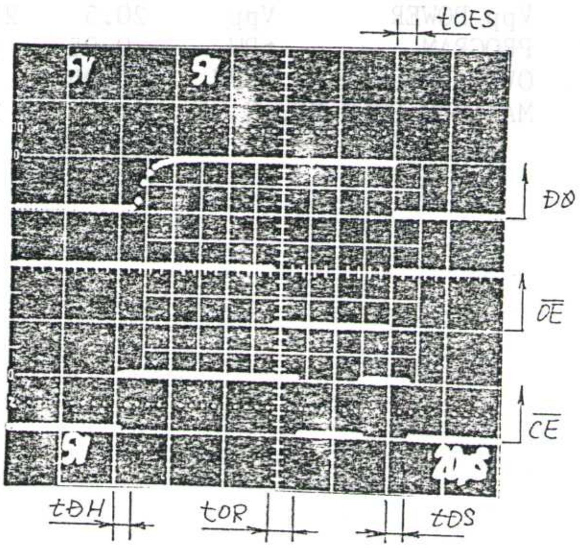
CODE E512



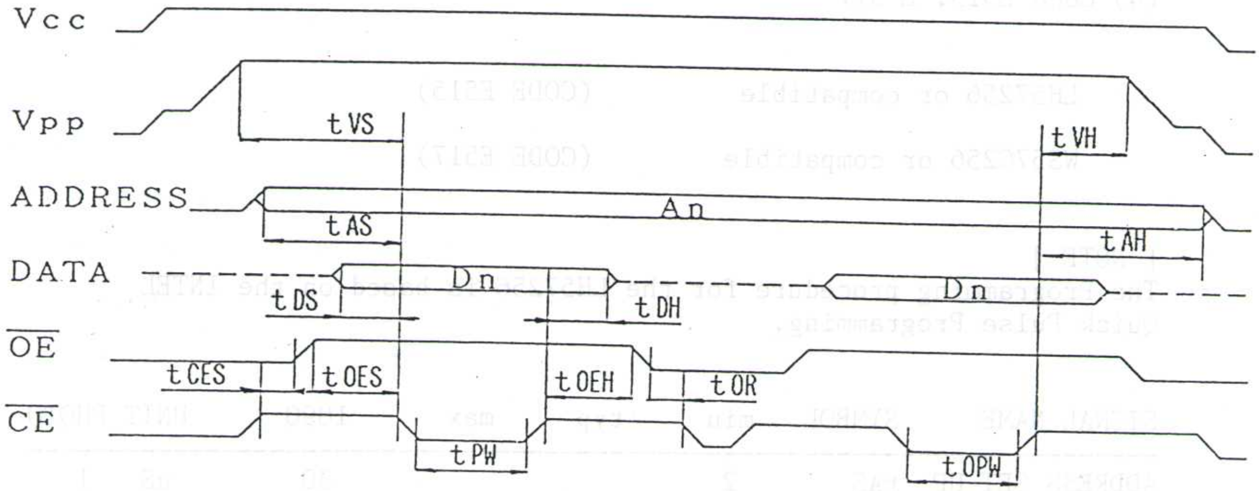
1. ADDRESS SETUP/HOLD



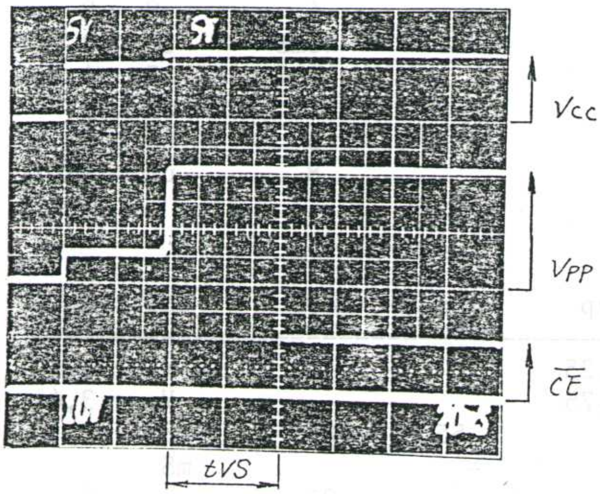
2. DATA SETUP/HOLD



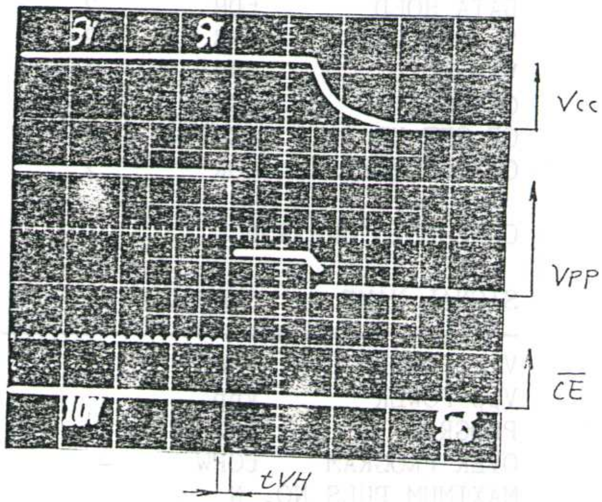
CODE E512



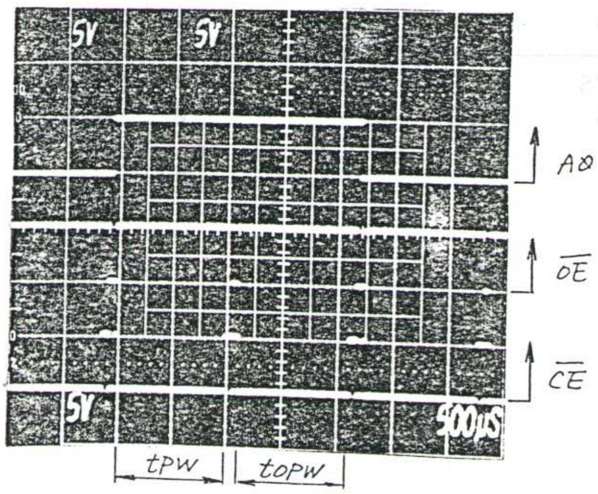
3. POWER ON



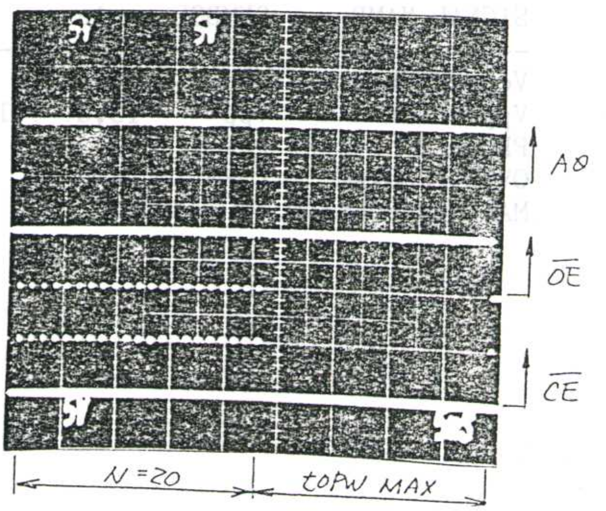
4. POWER OFF



5. PROGRAM PULSE



6. ABORT PULSE



(4) Code E515, E 517

LH57256 or compatible (CODE E515)

WS57C256 or compatible (CODE E517)

[NOTE]
The Programming procedure for the LH57256 is based on the INTEL Quick Pulse Programming.

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			30	uS	1
OE SET UP	tOES	2			7	uS	1
DATA SET UP	tDS	2			6	uS	2
ADDRESS HOLD	tAH	0			34	uS	1
DATA HOLD	tDH	2			4	uS	2
Vpp SET UP	tVS	2			40mS	uS	3,7
Vpp HOLD	tVH	–			1mS	uS	4,8
OE HOLD	tOEH	2			18	uS	1
CE SET UP	tCES	2			6	uS	2
OE RECOVERY	tOR	2			8	uS	2

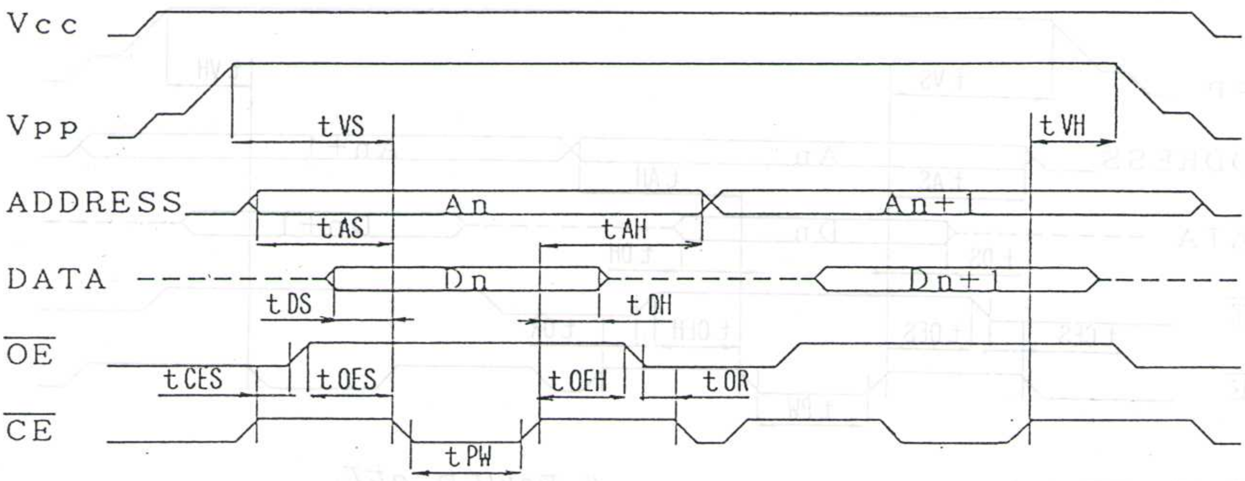
CODE E515 LH57256

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc		6.25			V	3,4
Vpp POWER	Vpp		12.75			V	3,4
PROGRAM	tPW	1		55	0.1	mS	5
OVER PROGRAM	tOPW	–	–	–		mS	
MAXIMUM PULS NO.	N		1		25		6

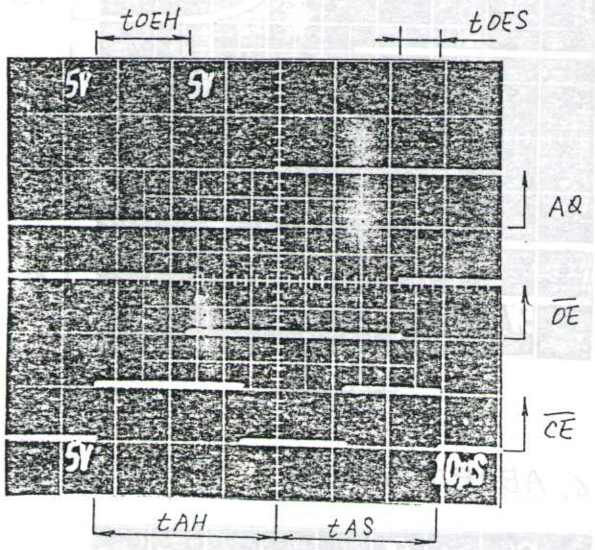
CODE E517 WS57C256

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.46	5.75	6.04		V	7,8
Vpp POWER	Vpp	13.0	13.5	14.0		V	7,8
PROGRAM	tPW	1	5		5	mS	10
OVER PROGRAM	tOPW	–	–	–		mS	
MAXIMUM PULS NO.	N		1		1		10

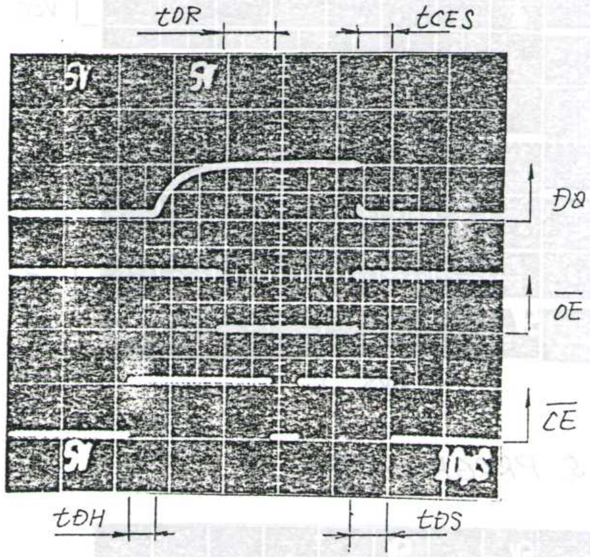
CODE E515 E517



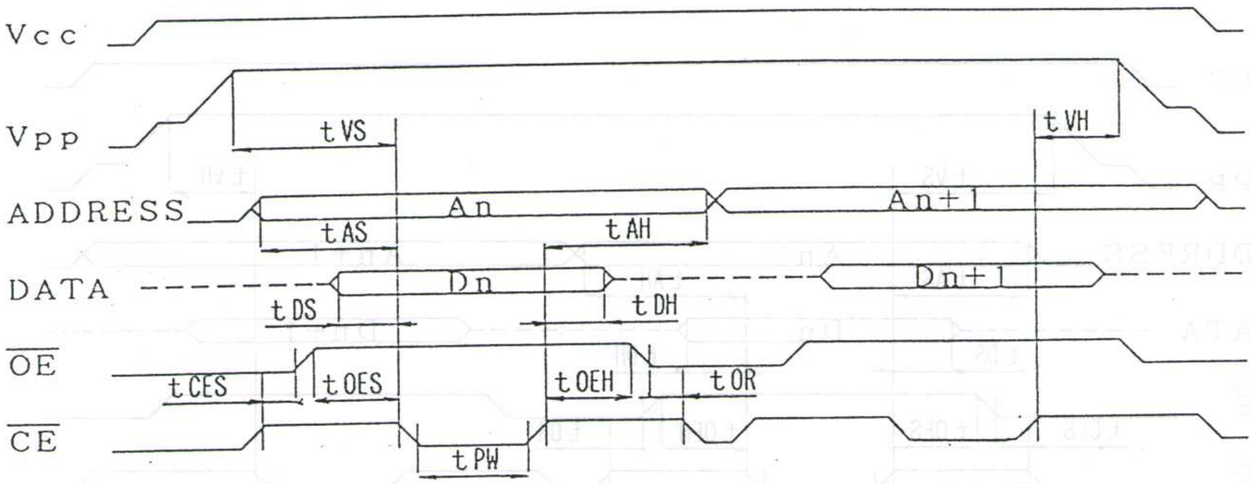
1. ADDRESS SETUP/HOLD



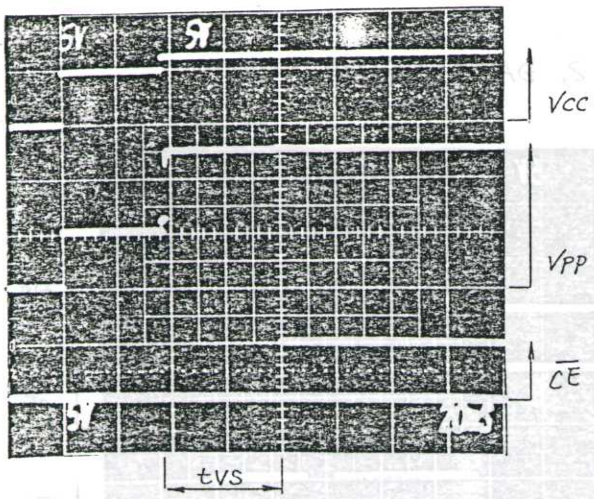
2. DATA SETUP /HOLD



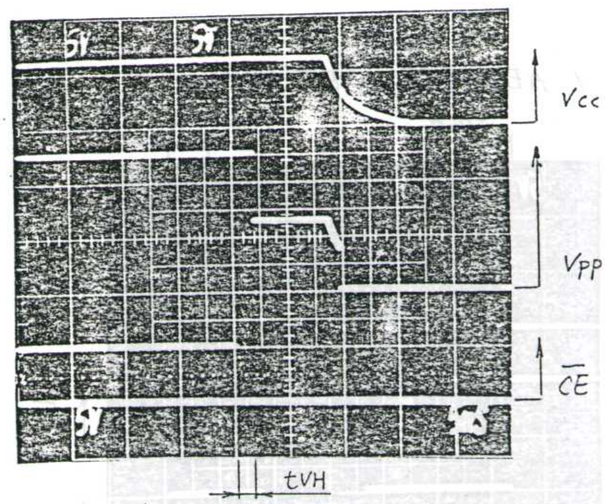
CODE E515



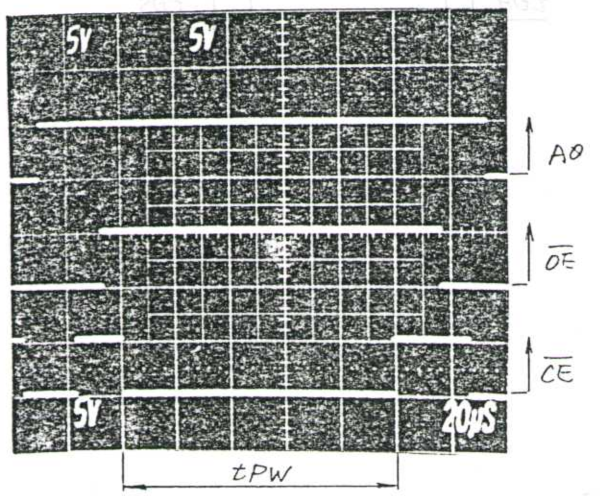
3. POWER ON



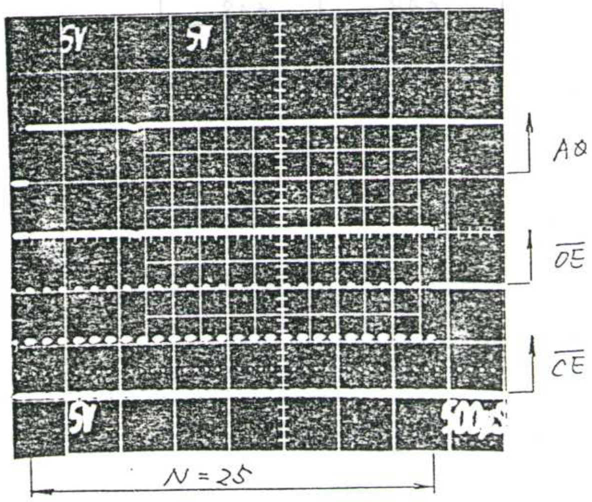
4. POWER OFF



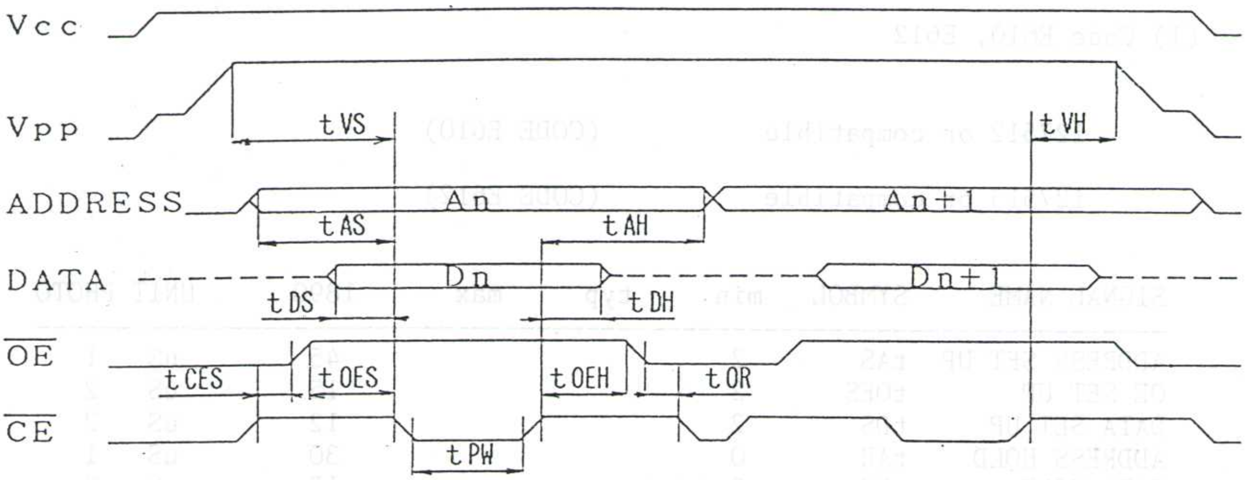
5. PROGRAM PULSE



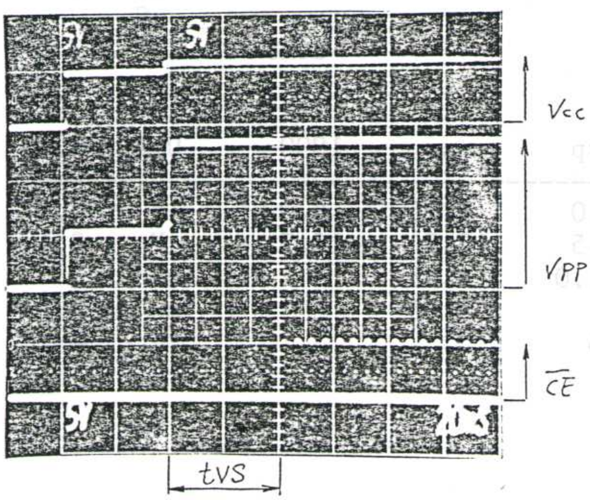
6. ABORT PULSE



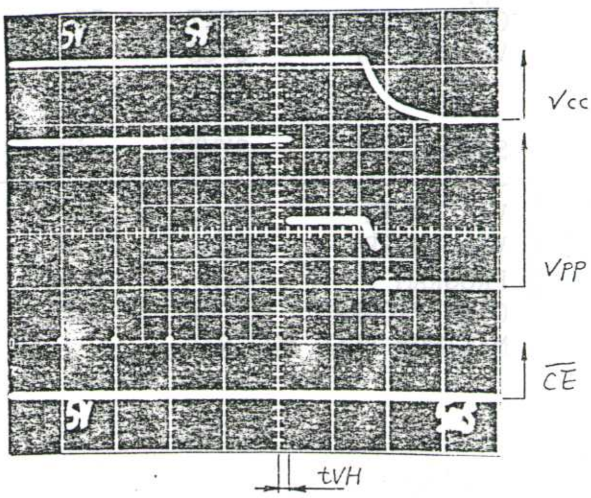
CODE E517



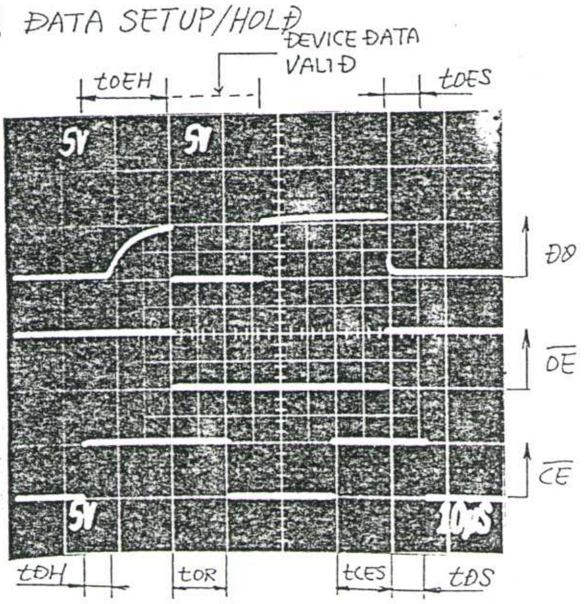
7. POWER ON



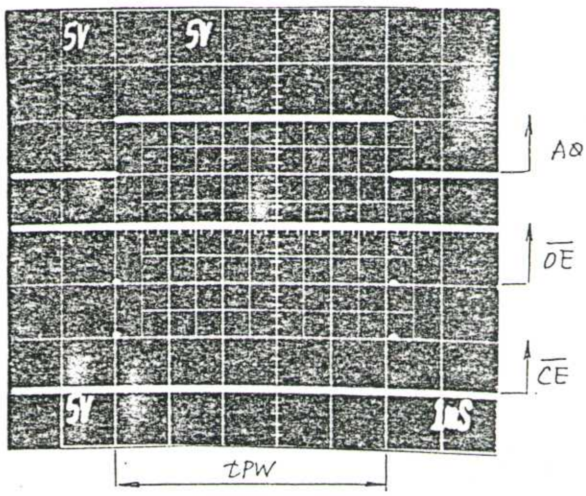
8. POWER OFF



9. DATA SETUP/HOLD



10. PROGRAM PULSE



7.5.5 512K Bit EP-ROM

(1) Code E610, E612

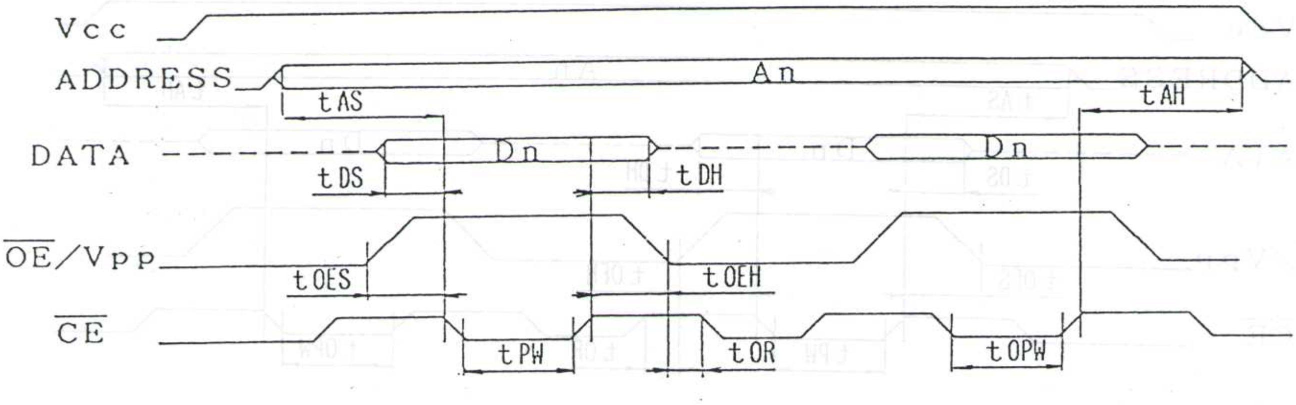
i27512 or compatible (CODE E610)

i27513 or compatible (CODE E612)

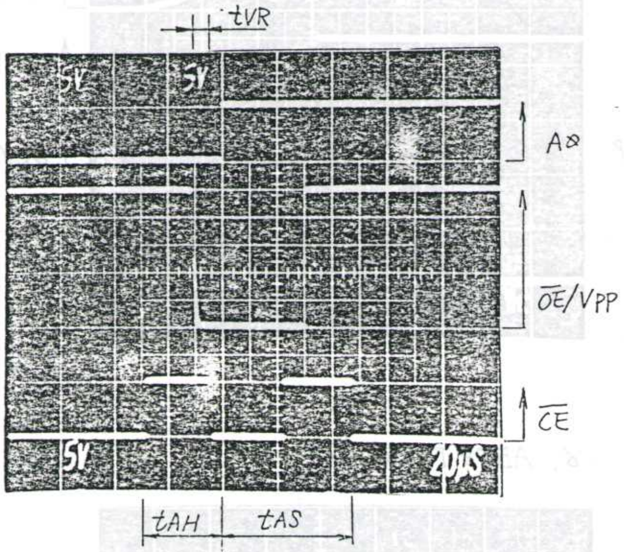
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			45	uS	1
OE SET UP	tOES	2			15	uS	2
DATA SET UP	tDS	2			12	uS	2
ADDRESS HOLD	tAH	0			30	uS	1
DATA HOLD	tDH	2			15	uS	2
OE HOLD	tOEH	2			18	uS	2
Vpp RECOVERY	tVR	2			5	uS	1
OE/Vpp SET UP	tPRT	50				nS	
Vcc SET UP	tVCS	2			80mS	uS	3

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	3,4
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	3,4
PROGRAM	tPW	0.95	1.0	1.05		mS	5
OVER PROGRAM	tOPW	2.8		78.75		mS	5
MAXIMUM PULS NO.	N		25				6

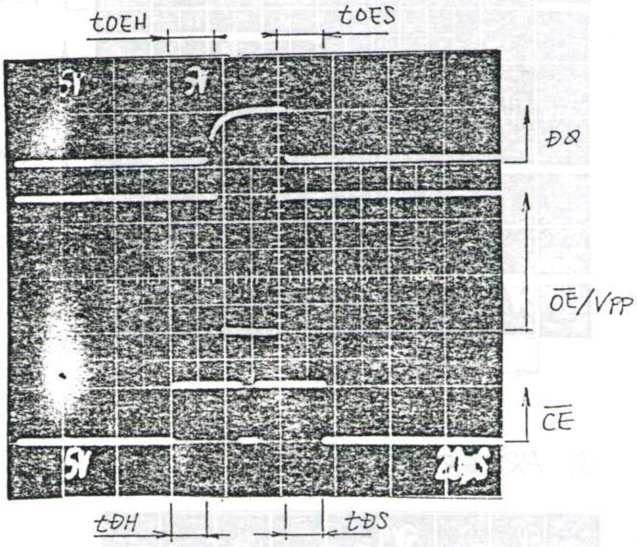
CODE E610 E612



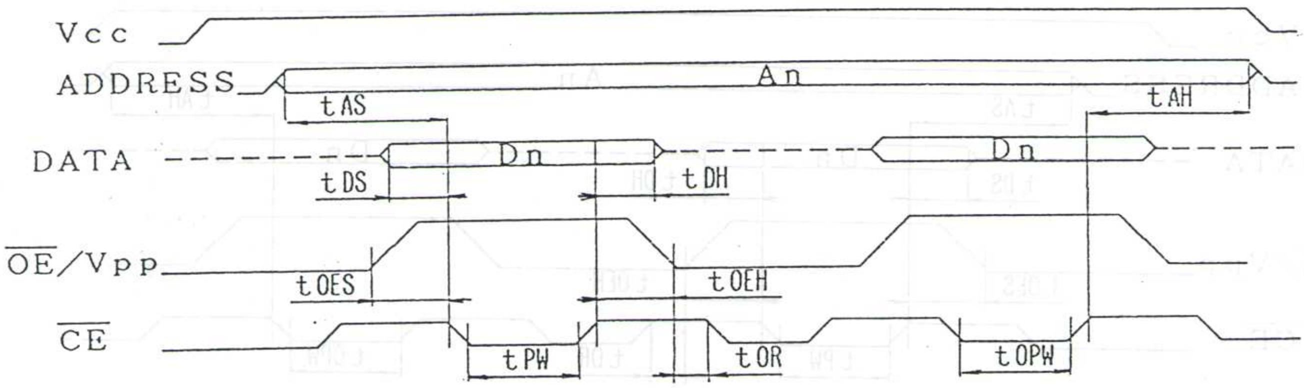
1. ADDRESS SETUP/HOLD



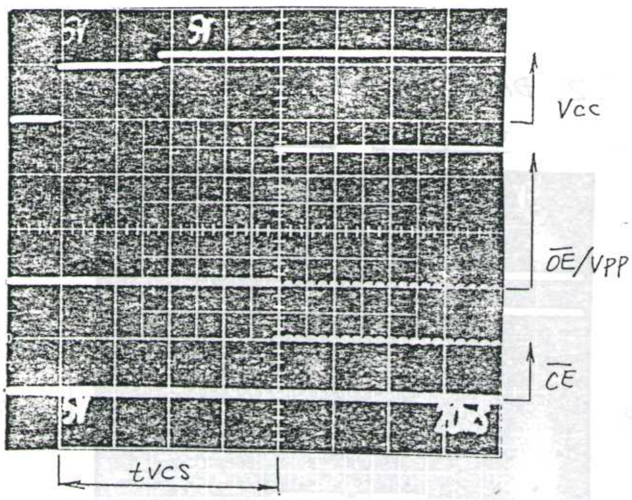
2. DATA SETUP/HOLD



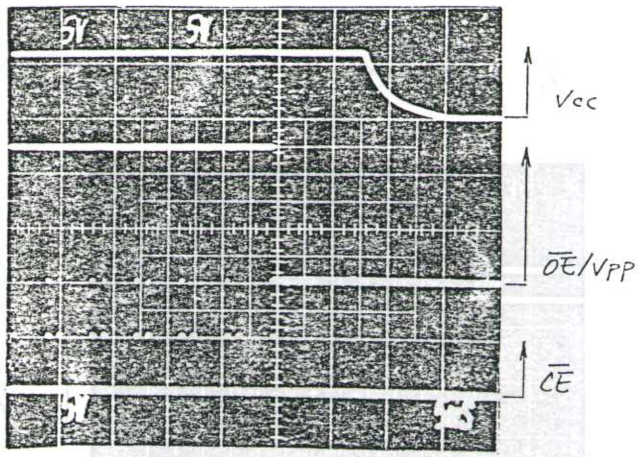
CODE E610 E612



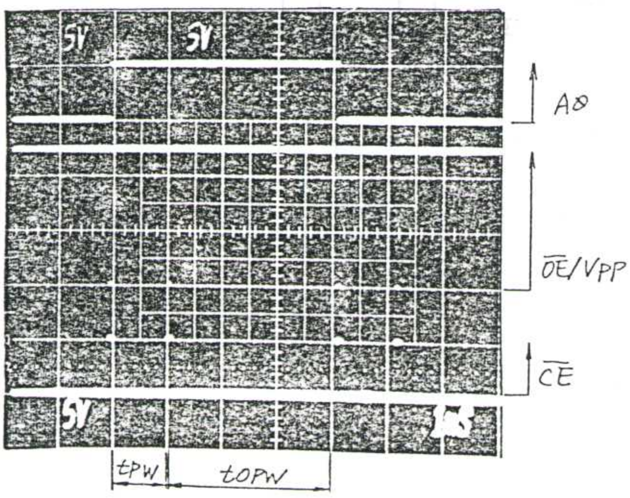
3. POWER ON



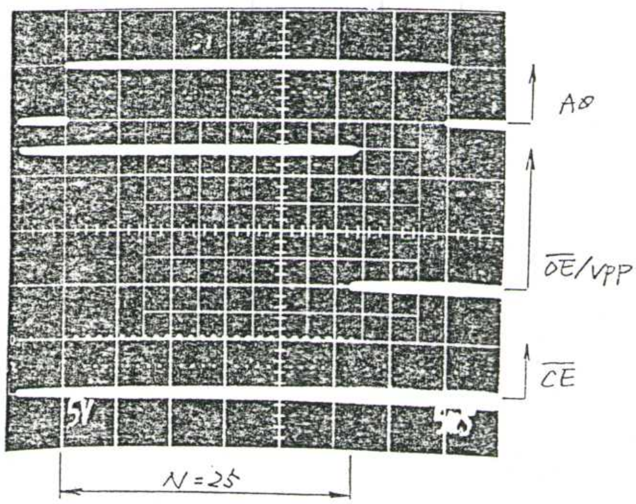
4. POWER OFF



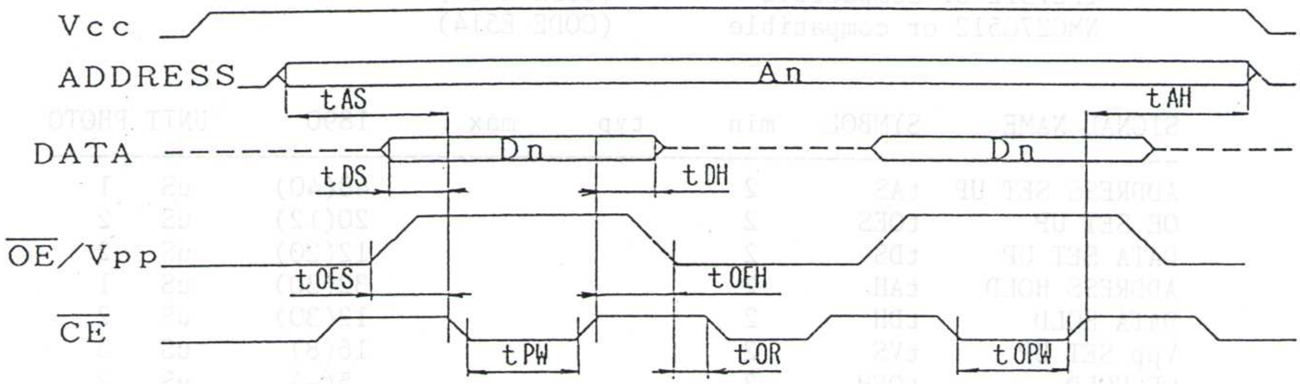
5. PROGRAM PULSE



6. ABORT PULSE

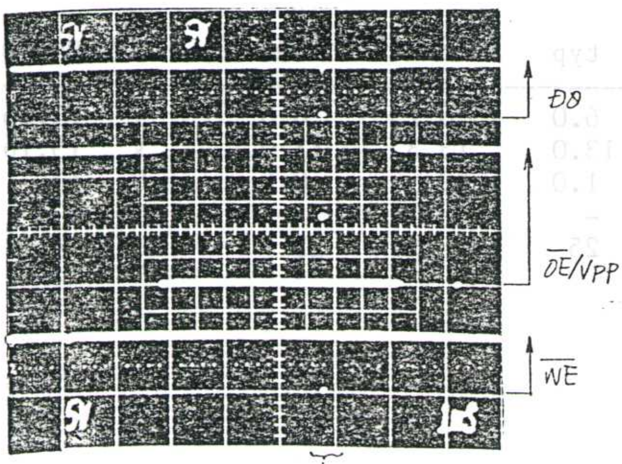


CODE E612

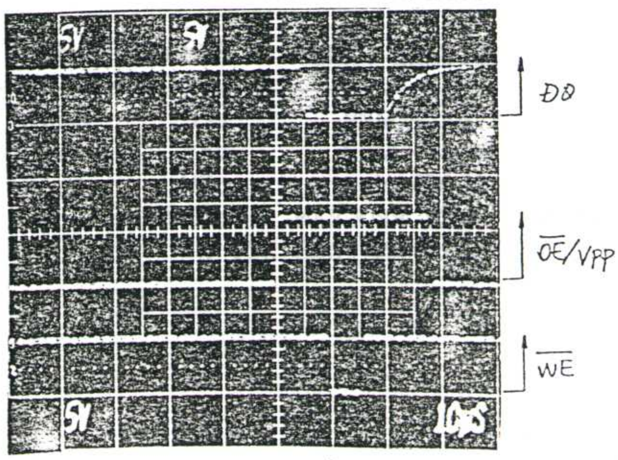


27513 PAGE SELECT WRITE

7. PAGE SELECT WRITE



8. PAGE SELECT WRITE



(2) Code E611, E613, E614

Am27512 or compatible (CODE E611)
iP27512 or compatible (CODE E613)
NMC27C512 or compatible (CODE E514)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			48(40)	uS	1
OE SET UP	tOES	2			20(12)	uS	2
DATA SET UP	tDS	2			12(20)	uS	2
ADDRESS HOLD	tAH	2			32(30)	uS	1
DATA HOLD	tDH	2			12(30)	uS	2
Vpp SET UP	tVS	2			16(8)	uS	3
OE HOLD	tOEH	2			5(-)	uS	2
Vpp RECOVERY	tVR	2				nS	1

CODE E611 Am27512

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	3,4,9
Vpp POWER	Vpp		13.0			V	3,4
PROGRAM	tPW	0.95	1.0		1.0	mS	5
OVER PROGRAM	tOPW		2.0		2.0	mS	10
MAXIMUM PULS NO.	N		25		25		6

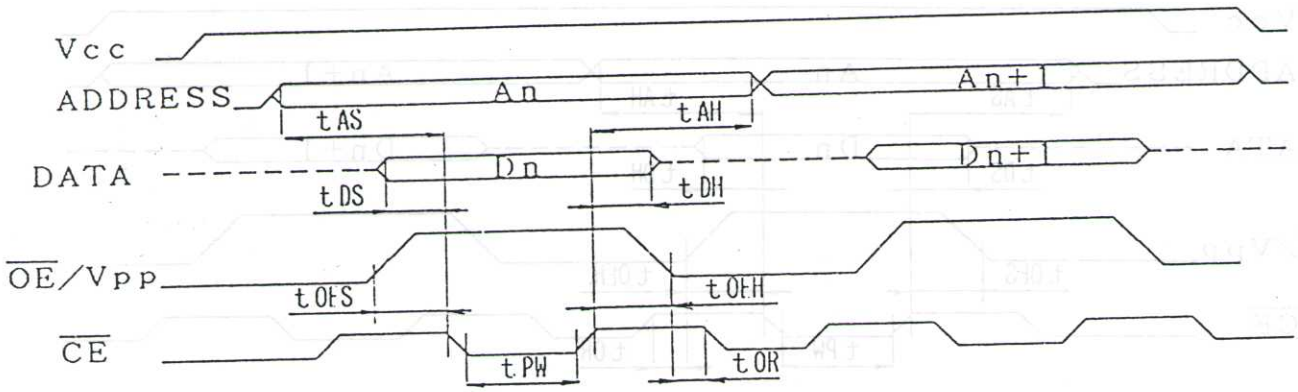
CODE E613 iP27512

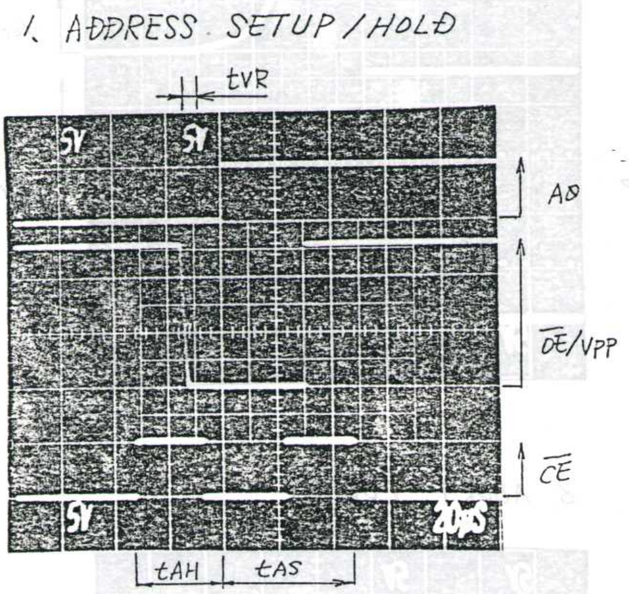
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	6.0	6.25	6.5	6.25	V	11,12
Vpp POWER	Vpp	12.5	12.75	13.0	12.75	V	11,12
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	13
OVER PROGRAM	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		25		25		14

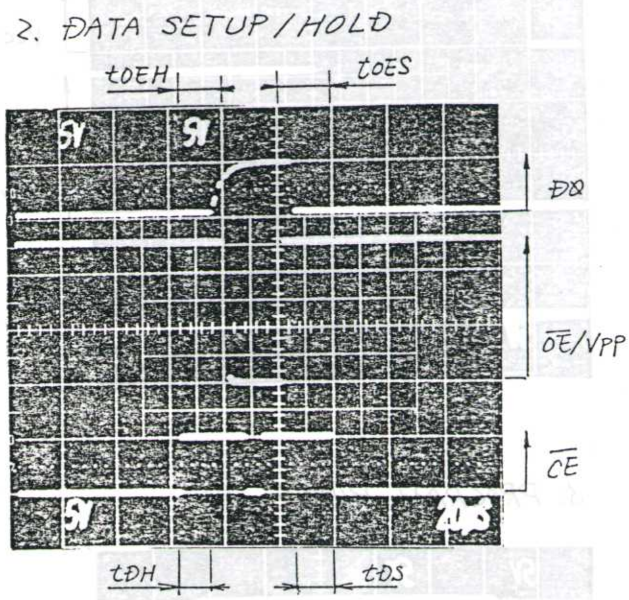
CODE E614 NMC27C512

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	15,16
Vpp POWER	Vpp	12.2	13.0	13.3	13.0	V	15,16
PROGRAM	tPW	0.5	1.0	50	0.5	mS	13
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N		25		25		14

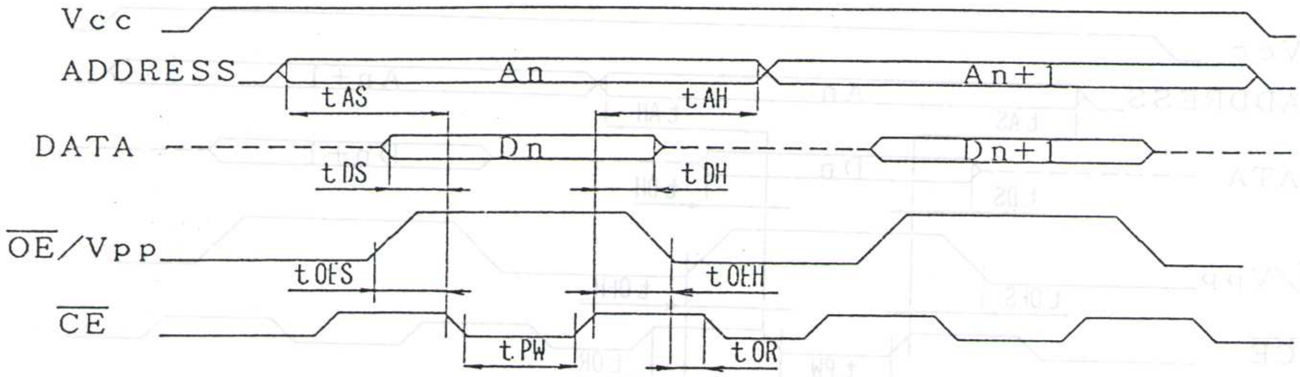
CODE E611 E613 E614



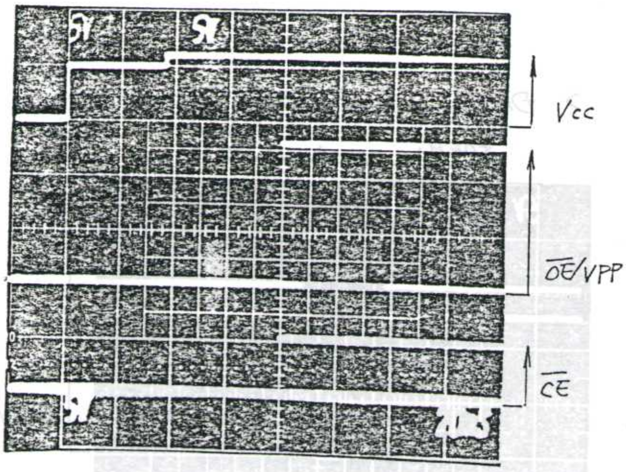




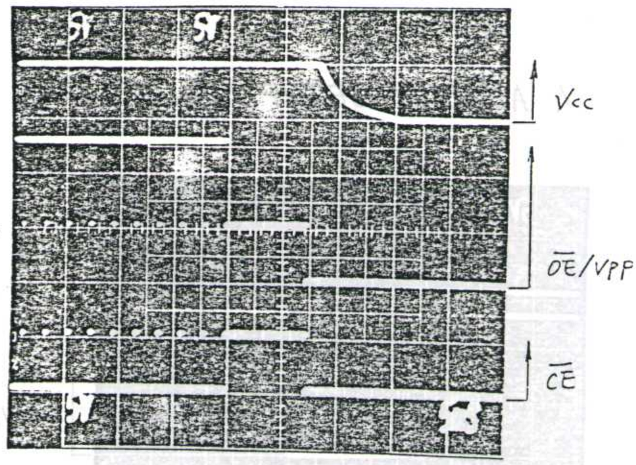
CODE E611



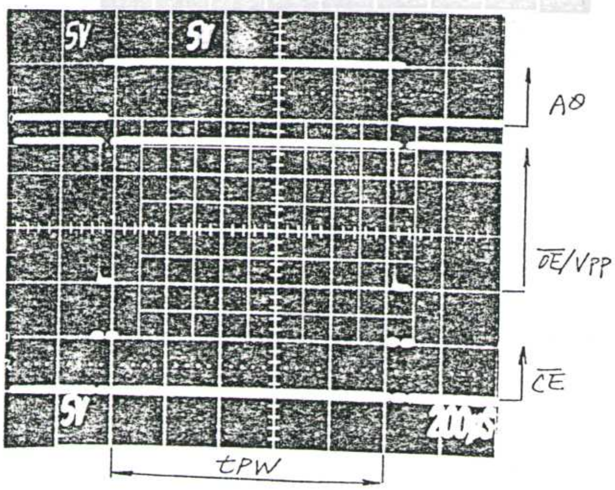
3. POWER ON



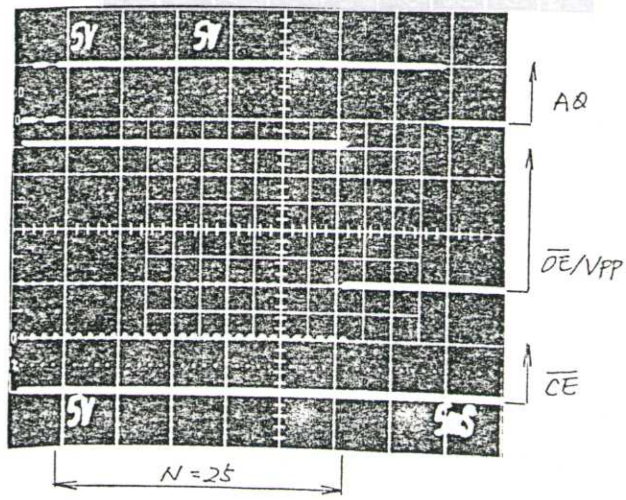
4. POWER OFF



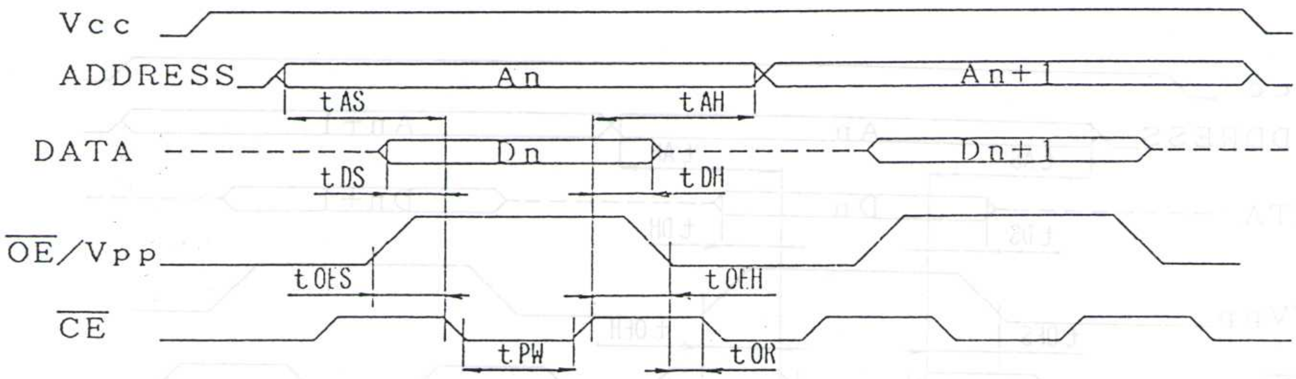
5. PROGRAM PULSE



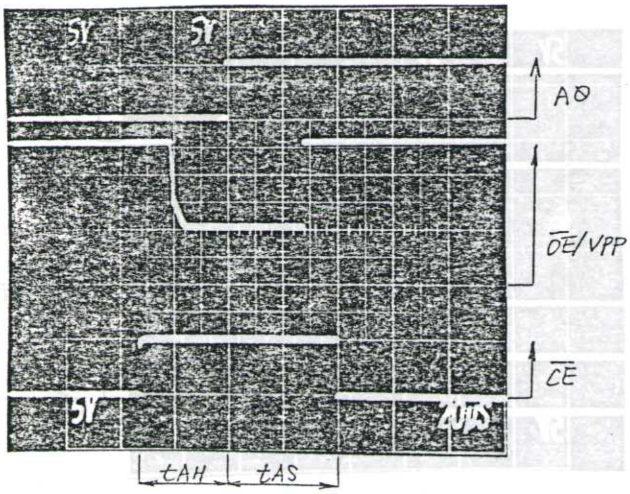
6. ABORT PULSE



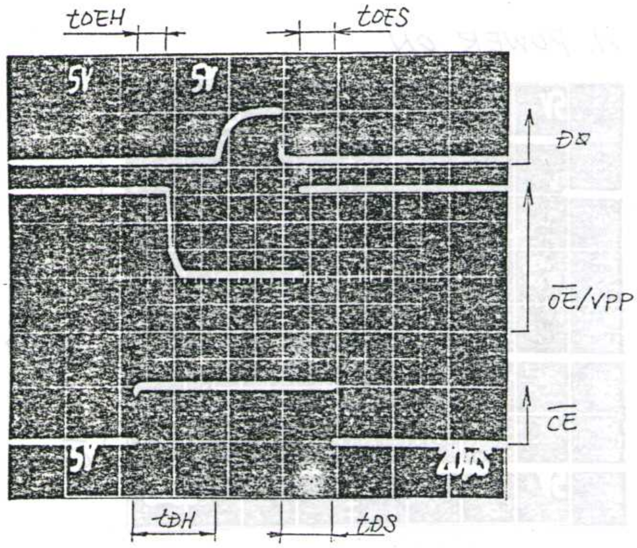
CODE E611



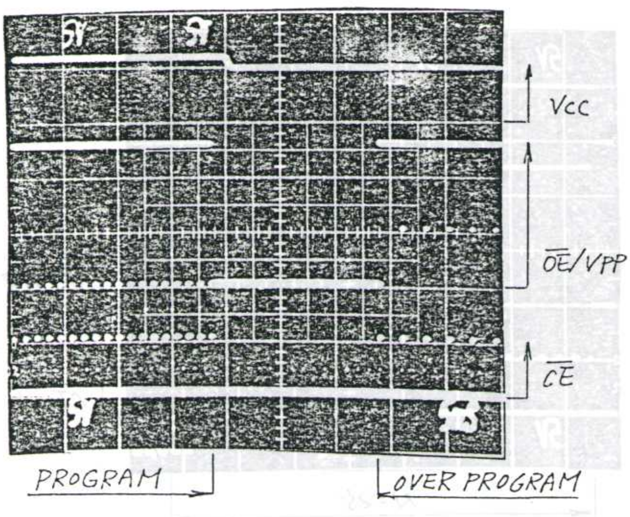
7. ADDRESS SETUP/HOLD



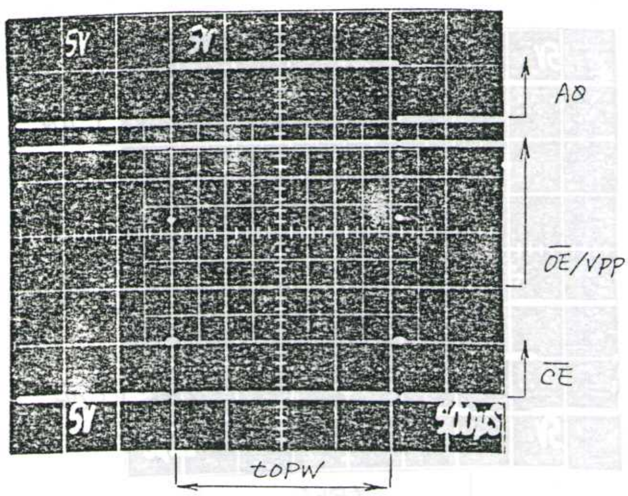
8. DATA SETUP/HOLD



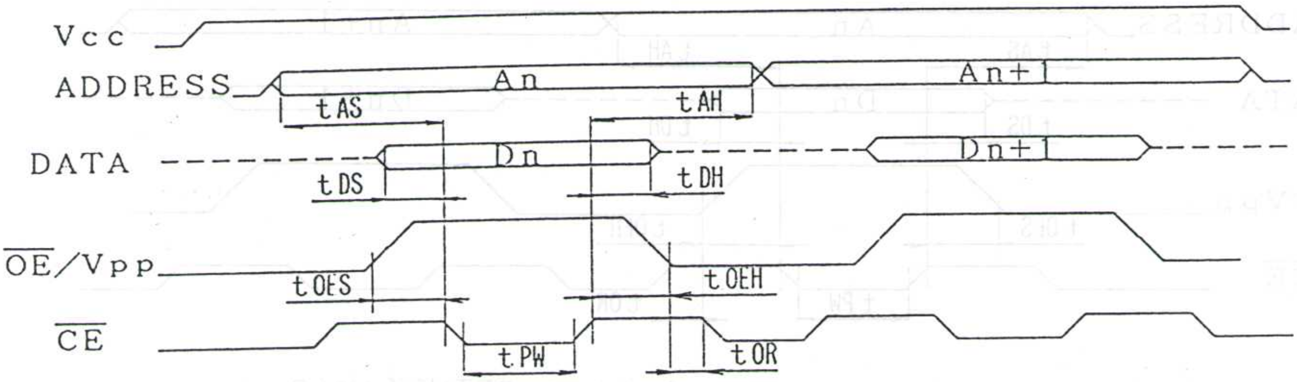
9. PROGRAM ~ OVER PROGRAM



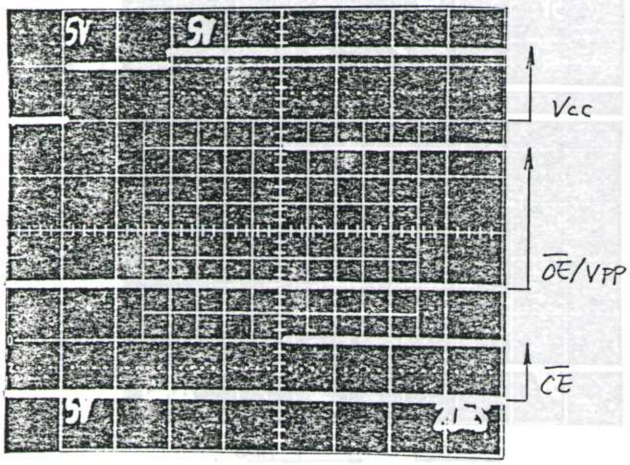
10. OVER PROGRAM PULSE



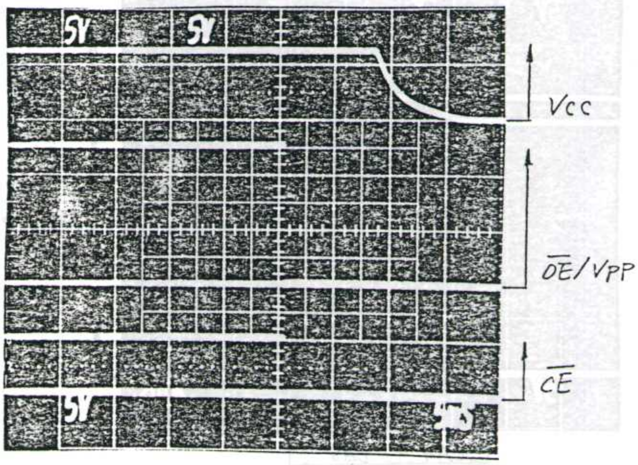
CODE E613



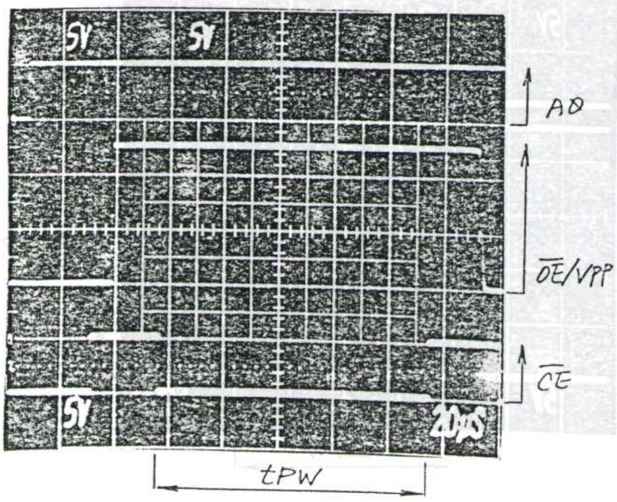
11. POWER ON



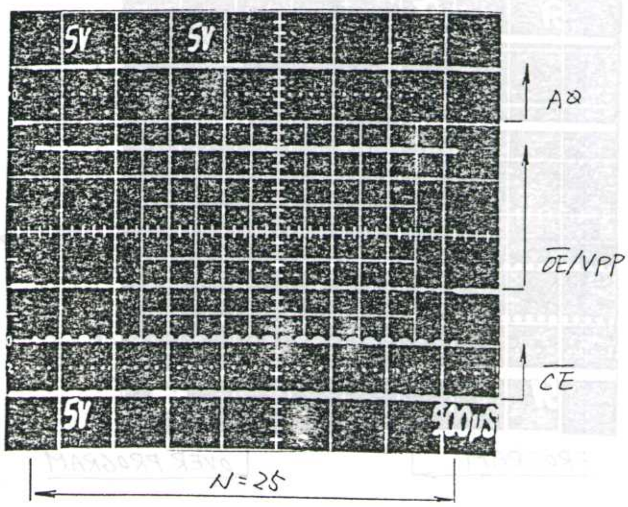
12. POWER OFF



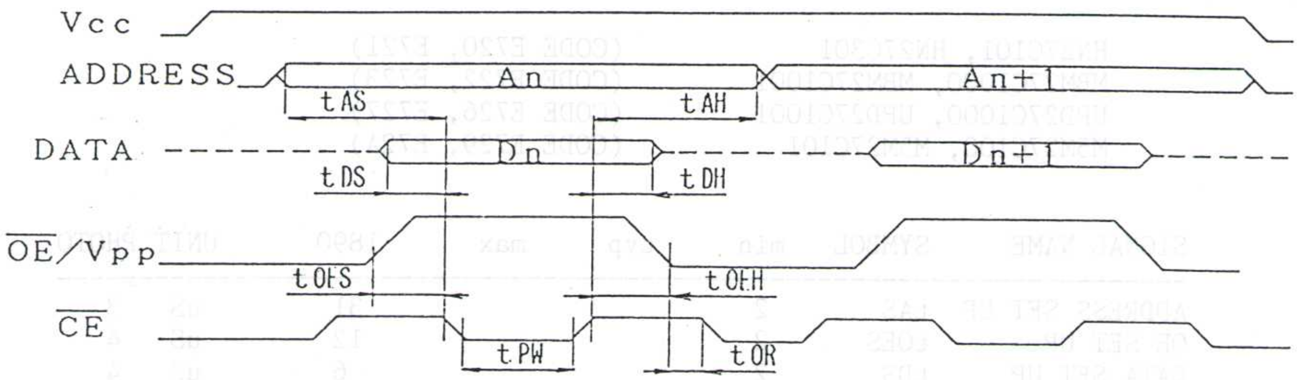
13. PROGRAM PULSE



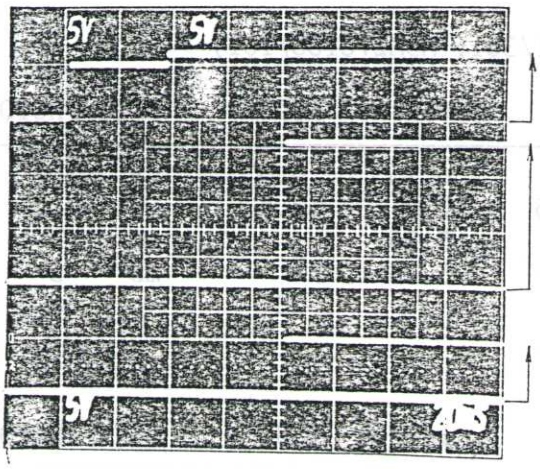
14. ABORT PULSE



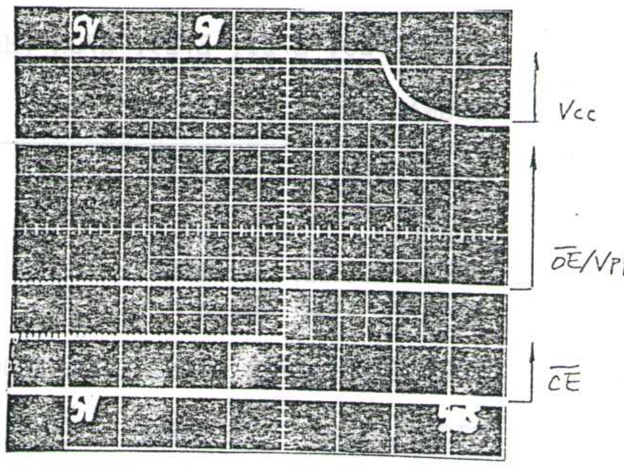
CODE E614



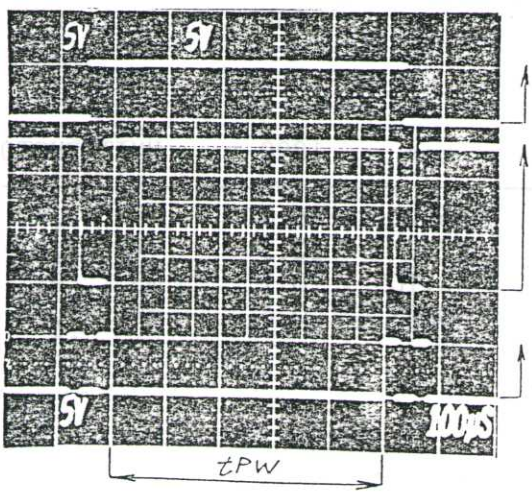
15. POWER ON



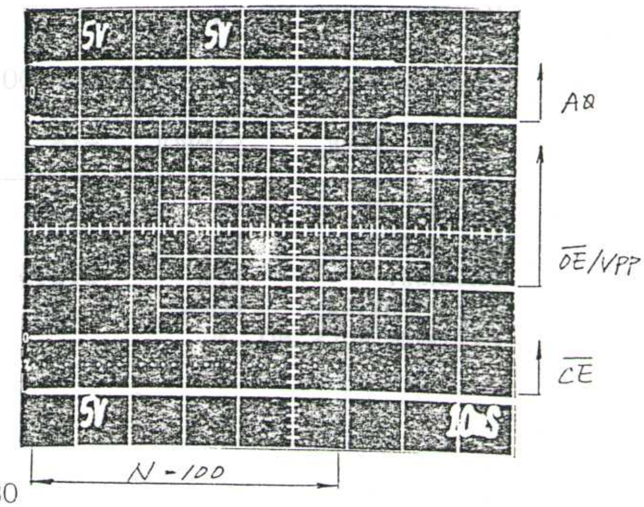
16. POWER OFF



17. PROGRAM PULSE



18. ABORT PULSE



7.5.6 1M Bit EP-ROM

(1) Code E720, E721, E722, E723, E726, E727, E729, E72A

HN27C101, HN27C301	(CODE E720, E721)
MBM27C1000, MBM27C1001	(CODE E722, E723)
UPD27C1000, UPD27C1001	(CODE E726, E727)
M5M27C100, M5M27C101	(CODE E729, E72A)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			31	uS	3
OE SET UP	tOES	2			12	uS	4
DATA SET UP	tDS	2			6	uS	4
ADDRESS HOLD	tAH	0			20	uS	3
DATA HOLD	tDH	2			6	uS	4
Vpp SET UP	tVS	2			40mS	uS	1
Vpp HOLD	tVH				1mS	uS	2
CE SET UP	tCES	2			25	uS	3

CODE E720, E721, E729, E72A (HN27C101/301, M5M27C100/101)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.19		5.25		mS	5
OVER PROGRAM	tOPW	0.19		5.25		mS	5
MAXIMUM PULS NO.	N		25		25		6

CODE E722, E723 (MBM27C1000/1001)

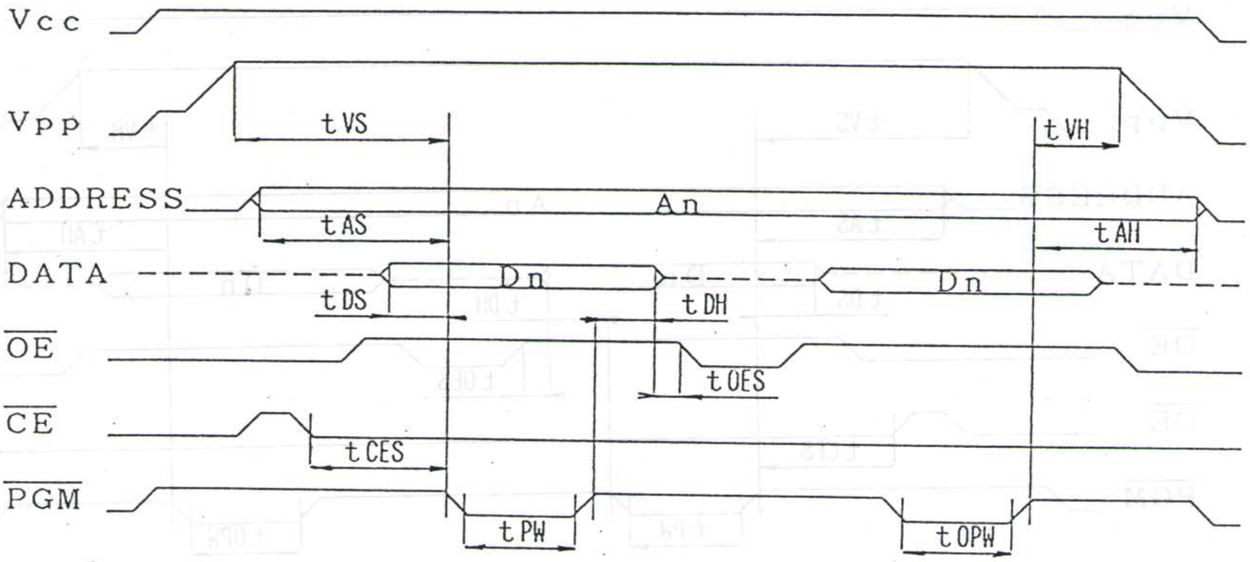
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.475	0.5	0.525	0.5	mS	7
OVER PROGRAM	tOPW	1.4		39.4		mS	7
MAXIMUM PULS NO.	N		25		25		8

CODE E726, E727 (UPD27C1000/1001)

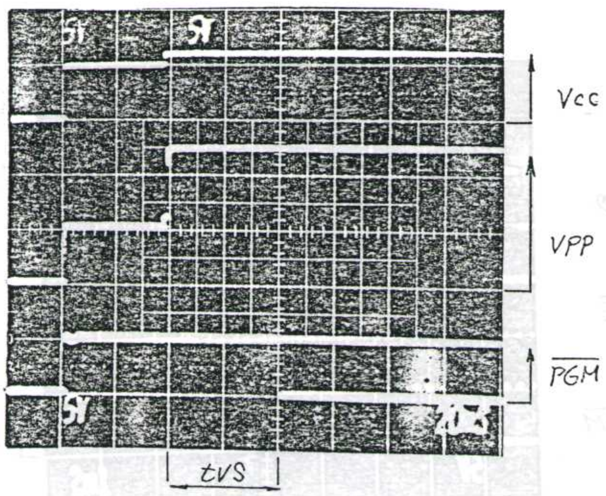
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	9
OVER PROGRAM	tOPW	0.38		0.42	0.4	mS	9,10
MAXIMUM PULS NO.	N		10				10

CODE E720 E721 E722 E723

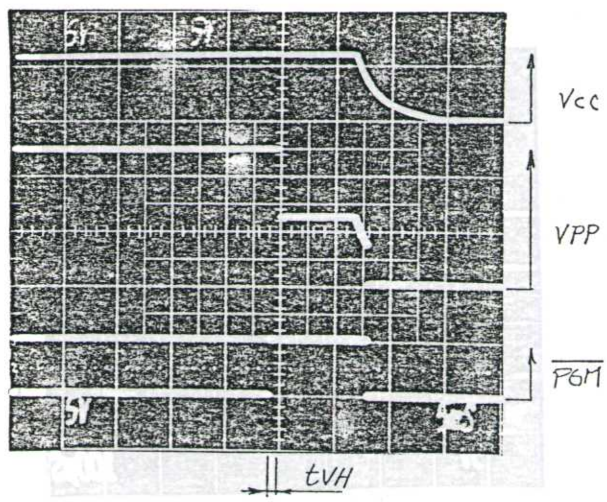
E726 E727 E729 E72A



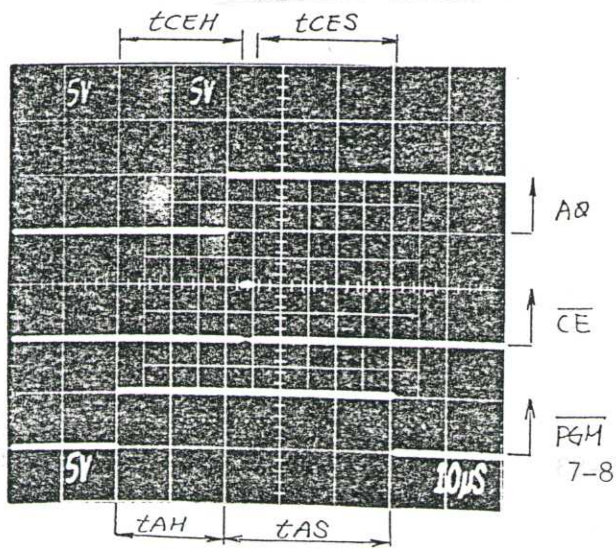
1. POWER ON



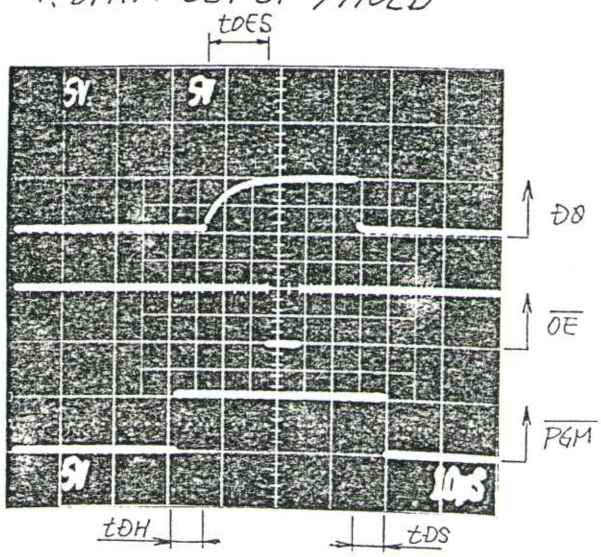
2. POWER OFF



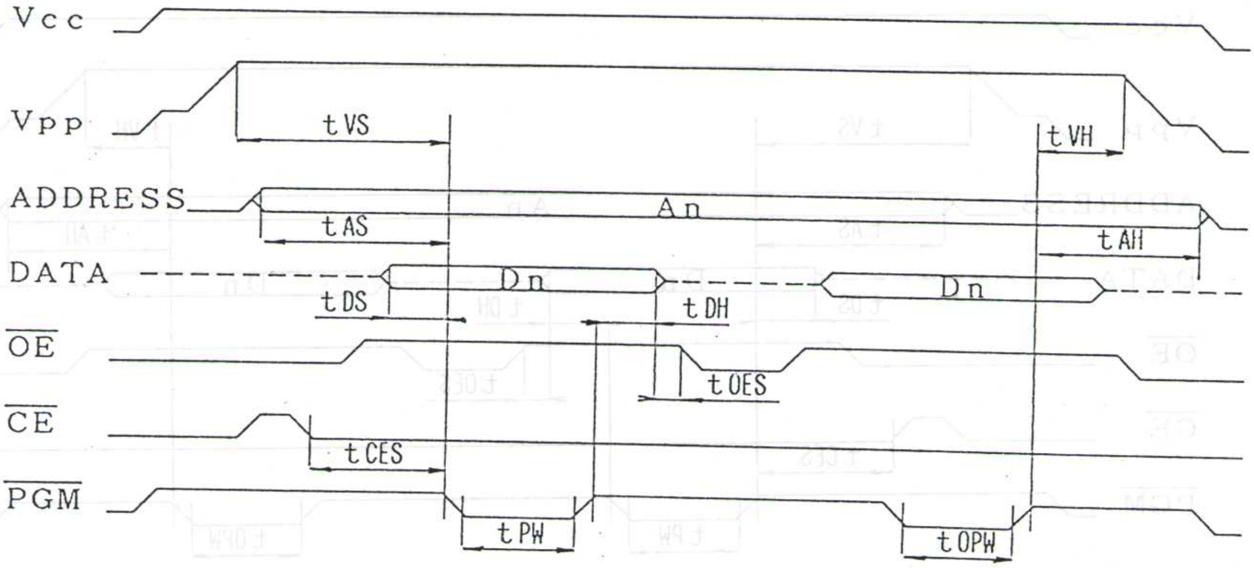
3. ADDRESS SETUP/ HOLD



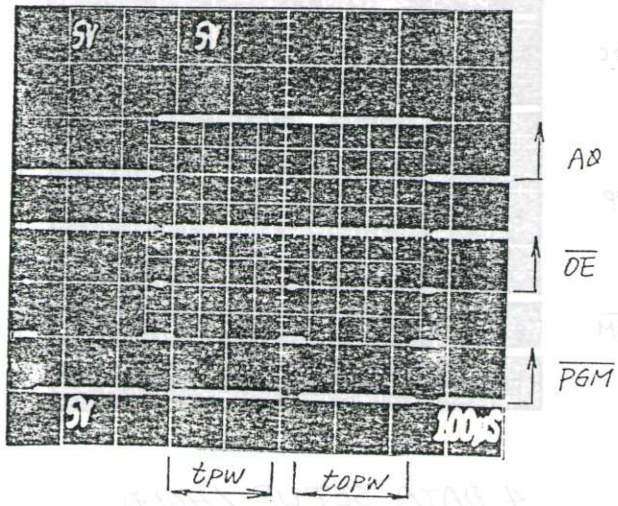
4. DATA SETUP / HOLD



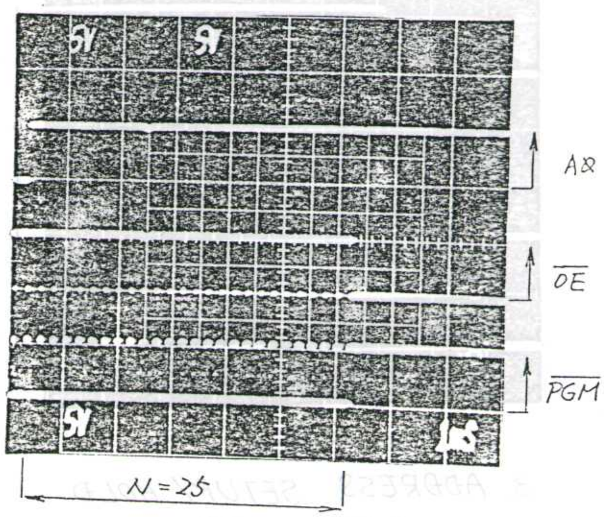
CODE E720 E721 E729 E72A



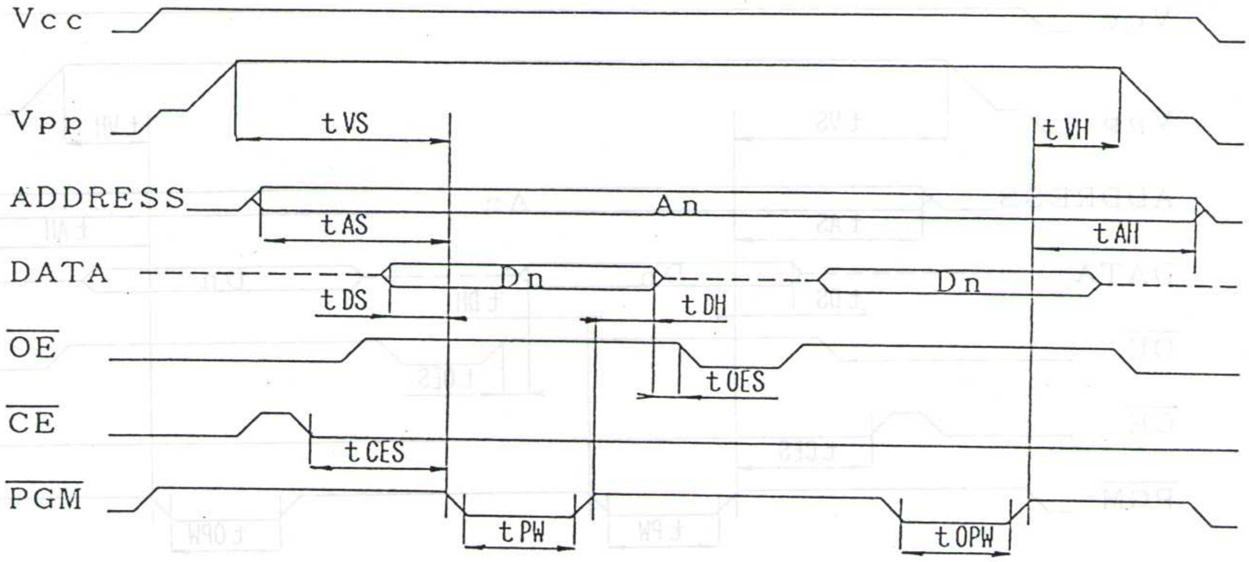
5. PROGRAM PULSE



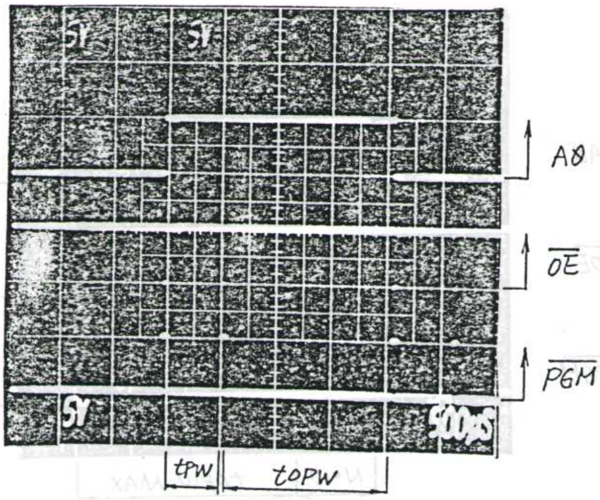
6. ABORT PULSE



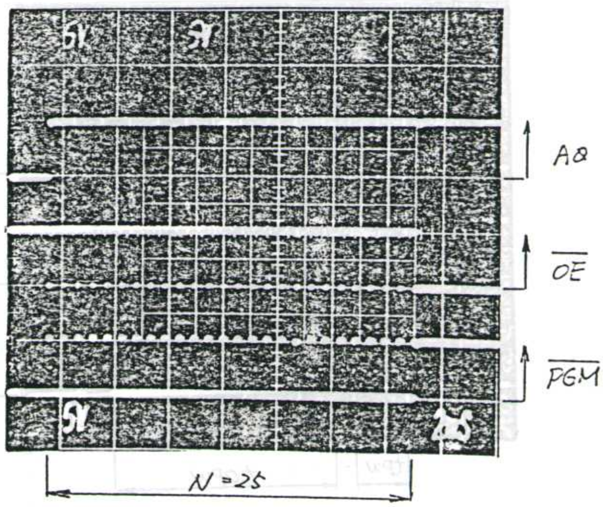
CODE E722 E723



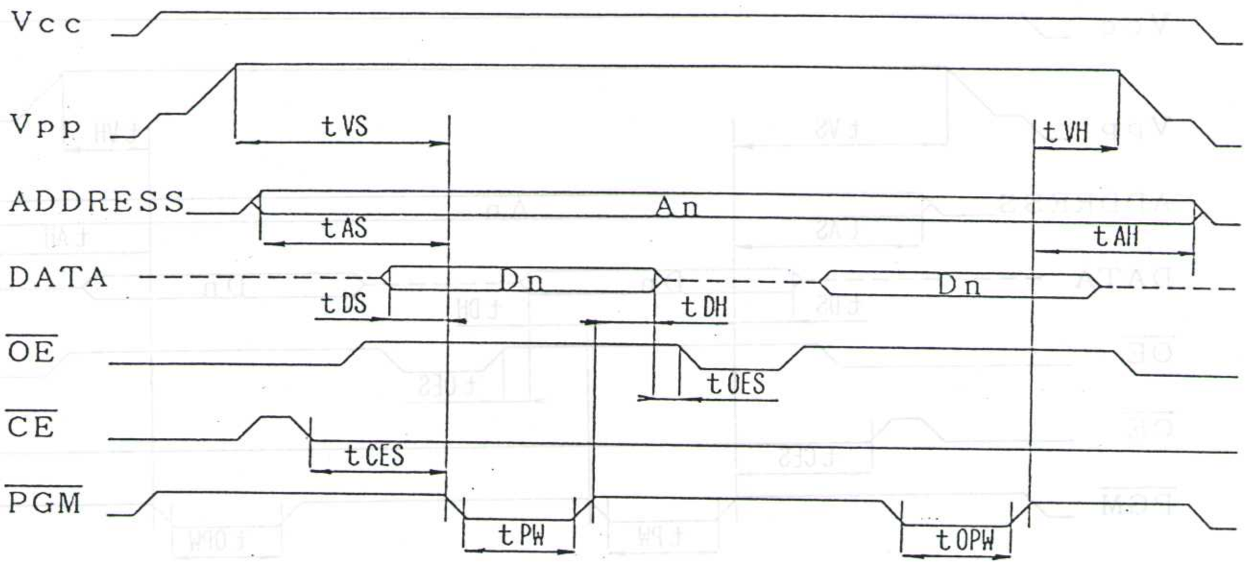
7. PROGRAM PULSE



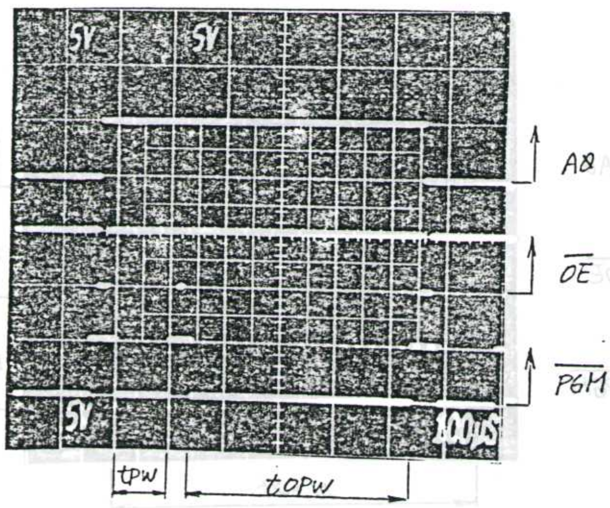
8. ABORT PULSE



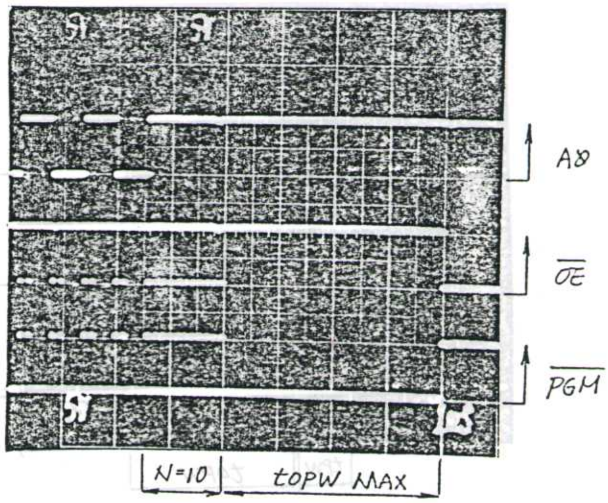
CODE E726 E727



9. PROGRAM PULSE



10. ABORT PULSE



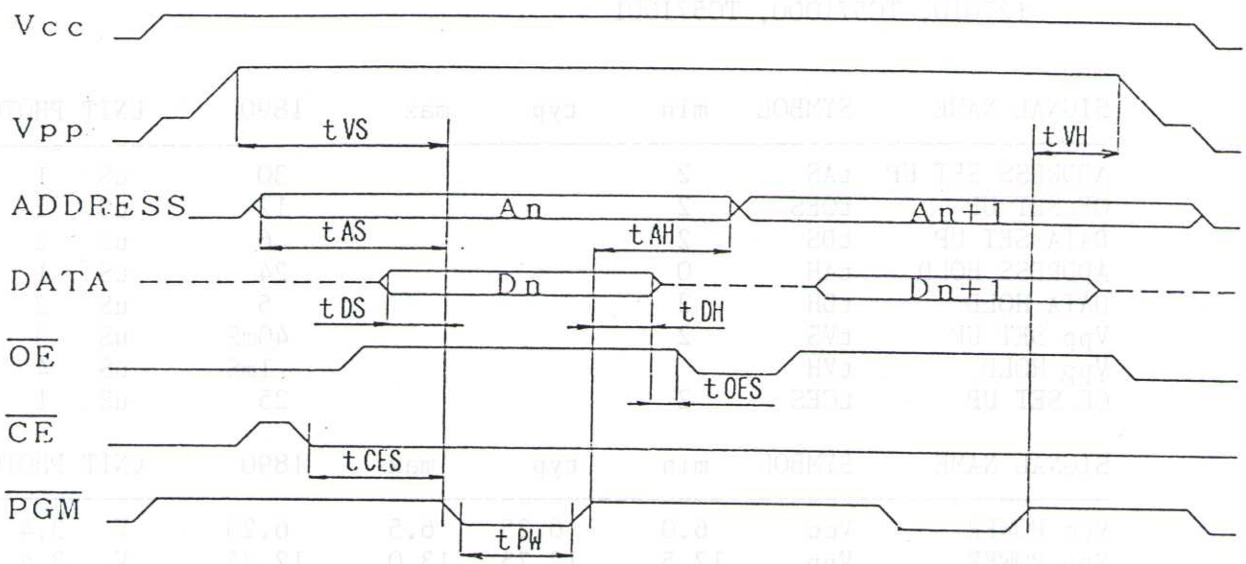
(2) Code E724, E725, E728

i27010, TC571000, TC571001

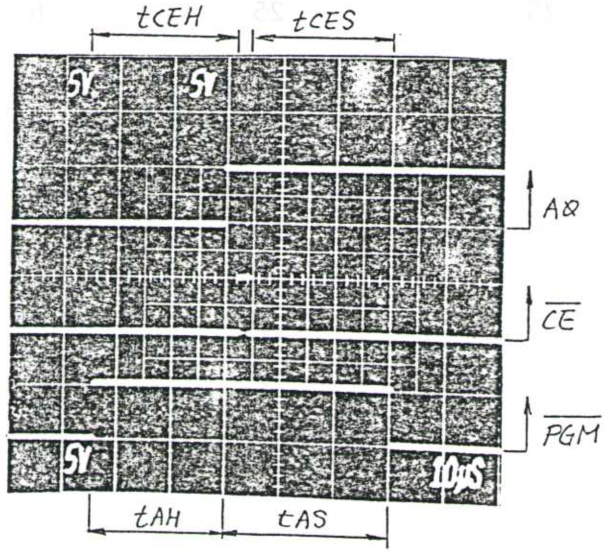
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			30	uS	1
OE SET UP	tOES	2			12	uS	2
DATA SET UP	tDS	2			6	uS	2
ADDRESS HOLD	tAH	0			24	uS	1
DATA HOLD	tDH	2			5	uS	2
Vpp SET UP	tVS	2			40mS	uS	3
Vpp HOLD	tVH				1mS	uS	4
CE SET UP	tCES	2			25	uS	1

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	6.0	6.25	6.5	6.25	V	3,4
Vpp POWER	Vpp	12.5	12.75	13.0	12.75	V	3,4
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	5
OVER PROGRAME	tOPW	-	-	-		mS	
MAXIMUM PULS NO.	N		25		25		6

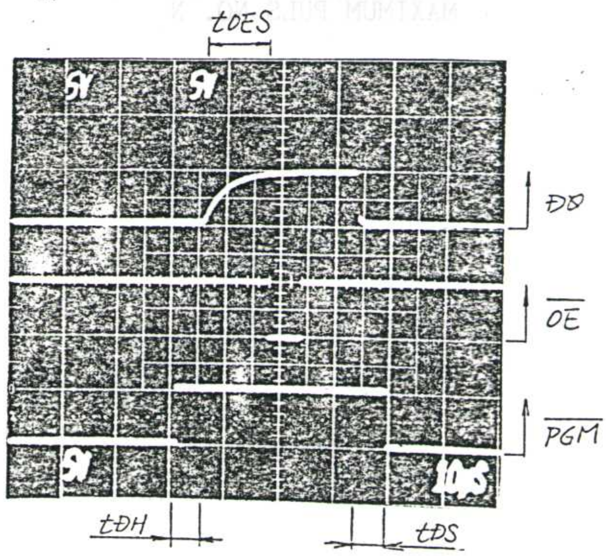
CODE E724 E725 E728



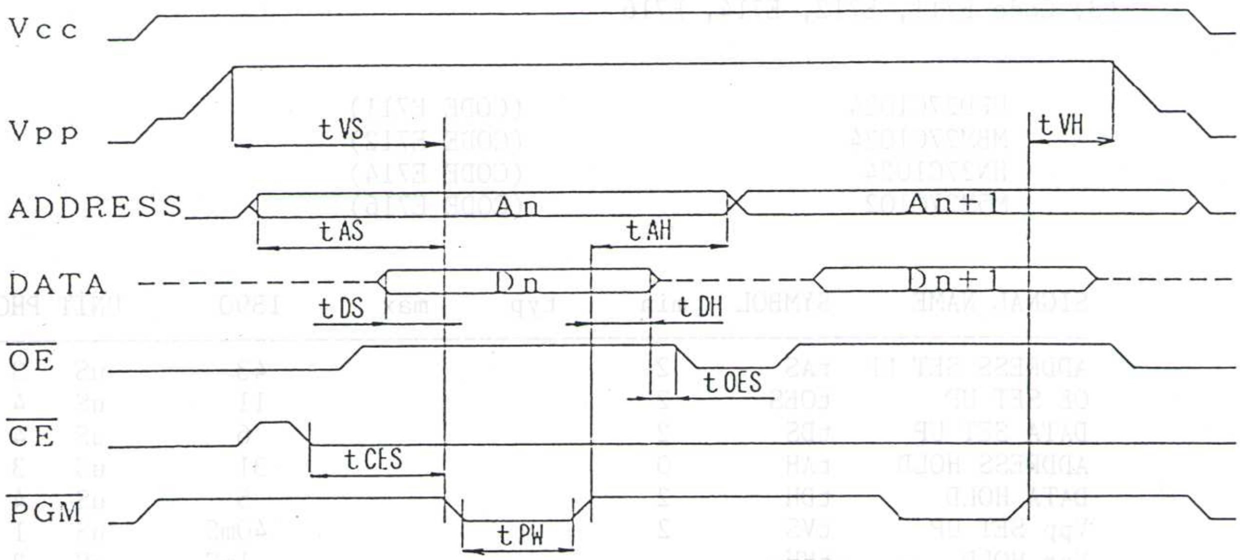
1. ADDRESS SETUP/HOLD



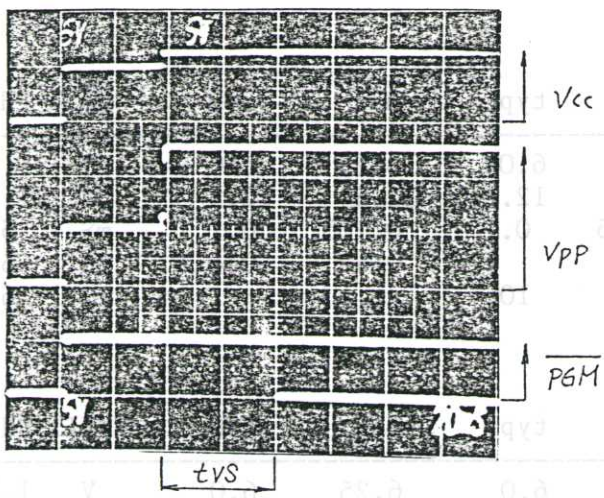
2. DATA SETUP/HOLD



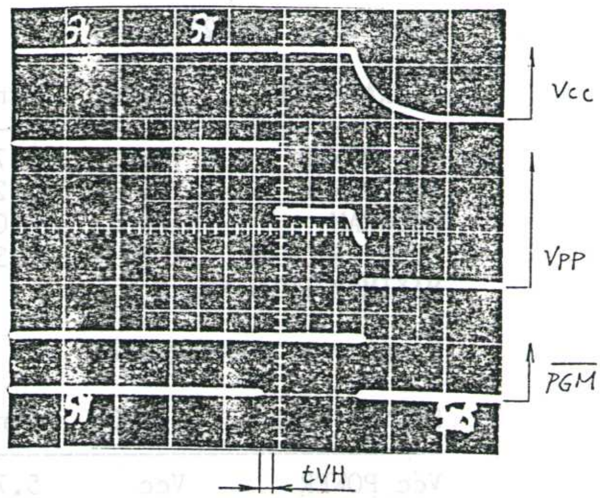
CODE E724 E725 E728



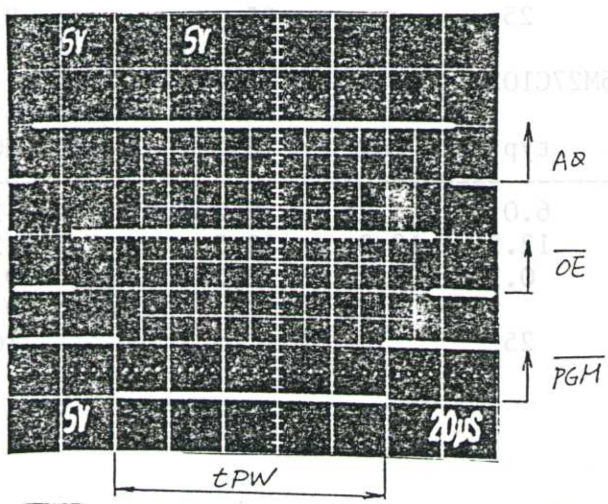
3. POWER ON



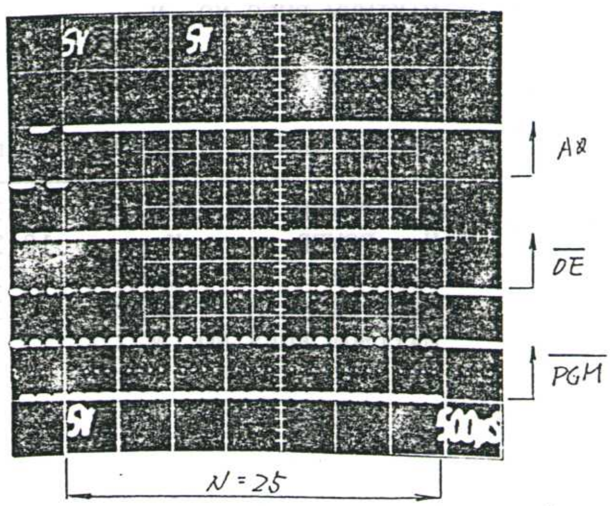
4. POWER OFF



5. PROGRAM PULSE



6. ABORT PULSE



(3) Code E711, E712, E714, E716

UPD27C1024	(CODE E711)
MBM27C1024	(CODE E712)
HN27C1024	(CODE E714)
M5M27C102	(CODE E716)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			43	uS	3
OE SET UP	tOES	2			11	uS	4
DATA SET UP	tDS	2			6	uS	4
ADDRESS HOLD	tAH	0			31	uS	3
DATA HOLD	tDH	2			5	uS	4
Vpp SET UP	tVS	2			40mS	uS	1
Vpp HOLD	tVH				1mS	uS	2
CE SET UP	tCES	2			38	uS	3

CODE E711 (UPD27C1024)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	5
OVER PROGRAM	tOPW	0.38		0.42	0.4	mS	5,6
MAXIMUM PULS NO.	N		10				6

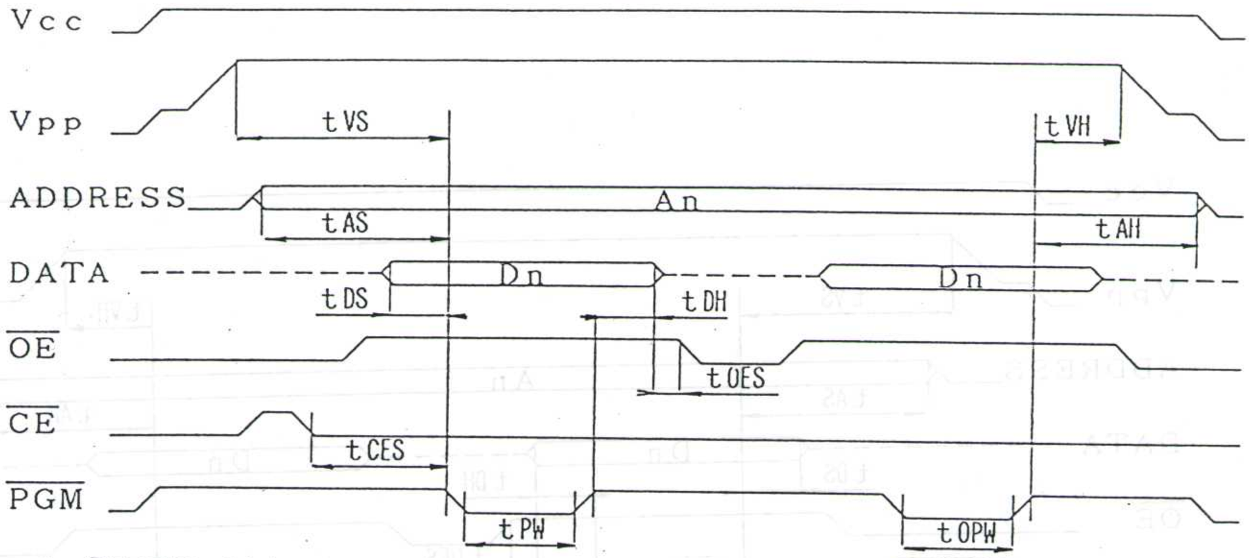
CODE E712 (MBM27C1024)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.475	0.5	0.525	0.5	mS	7
OVER PROGRAM	tOPW	1.4		39.4	0.4	mS	5,6
MAXIMUM PULS NO.	N		25		25		8

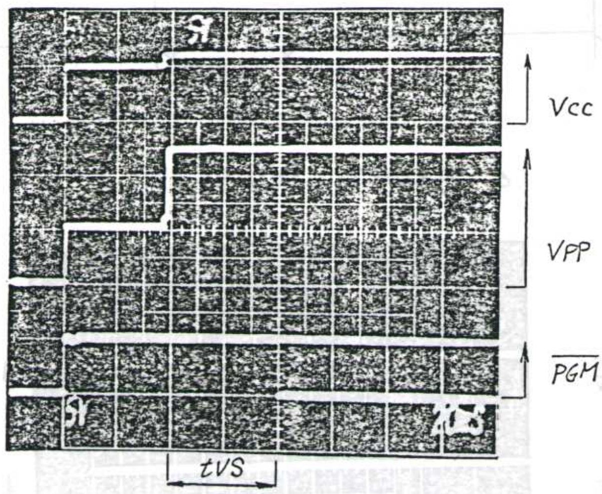
CODE E714, E716 (HN27C1024, M5M27C102)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	1,2
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	1,2
PROGRAM	tPW	0.19	0.20	0.21	0.2	mS	9
OVER PROGRAM	tOPW	0.19		5.25		mS	9
MAXIMUM PULS NO.	N		25				10

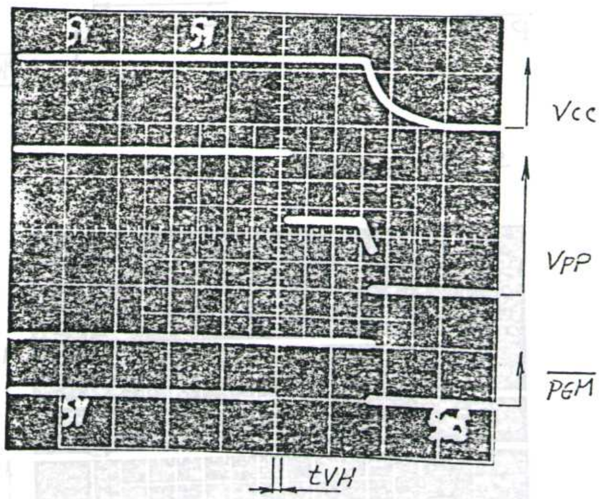
CODE E711 E712 E714 E716



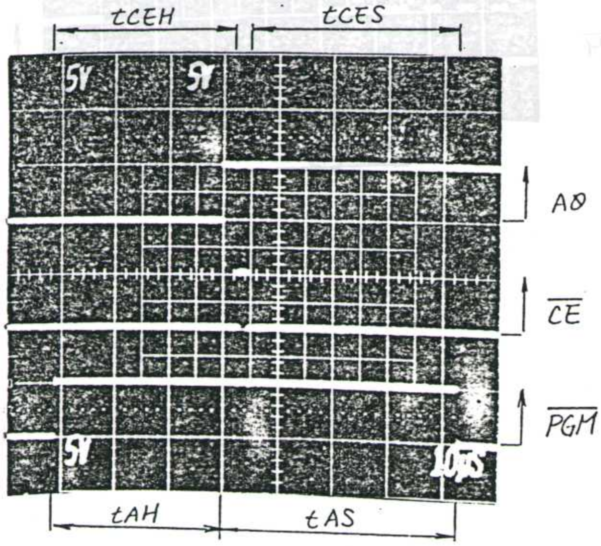
1. POWER ON



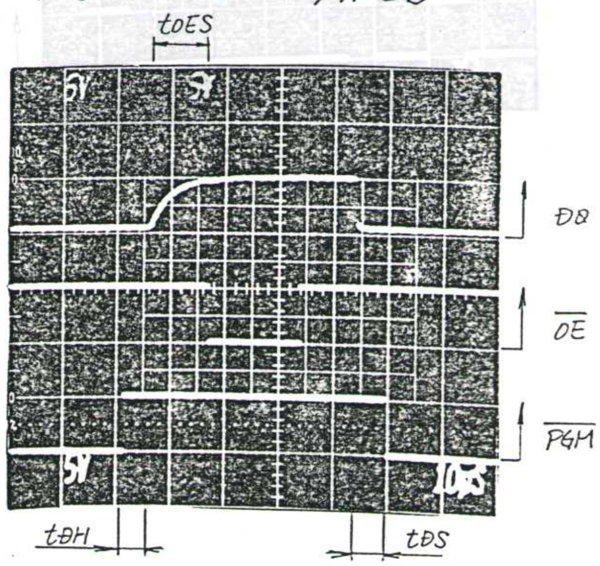
2. POWER OFF

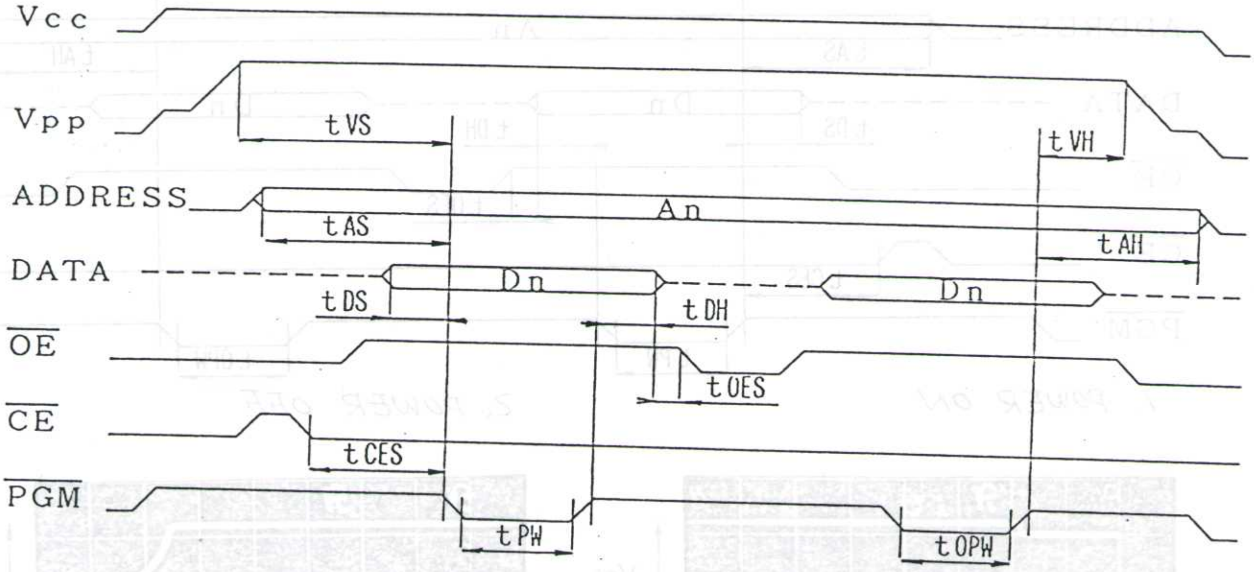


3. ADDRESS SETUP / HOLD

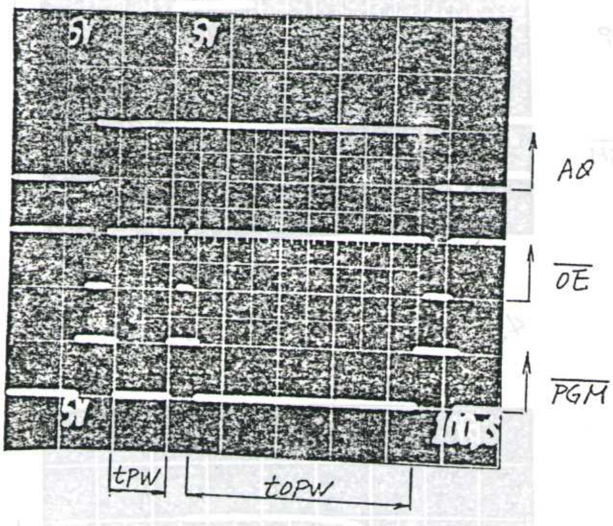


4. DATA SETUP / HOLD

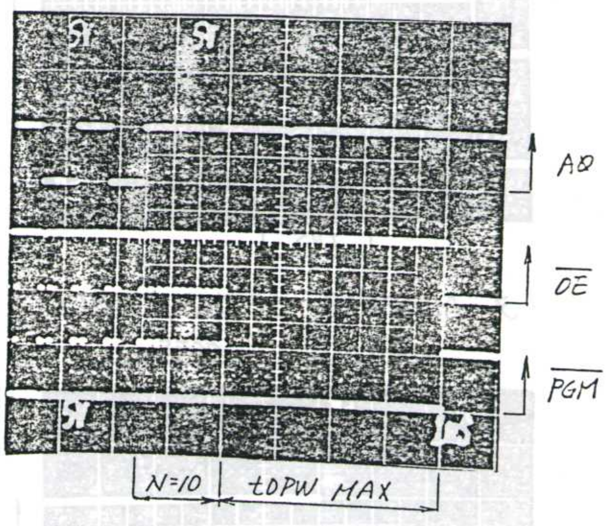




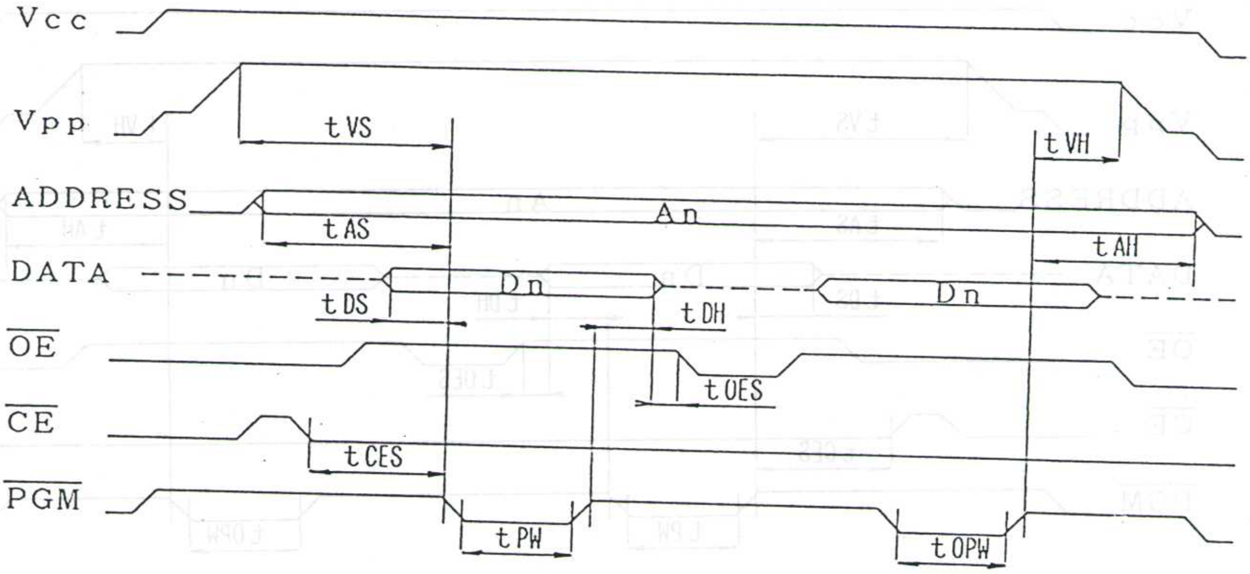
5. PROGRAM PULSE



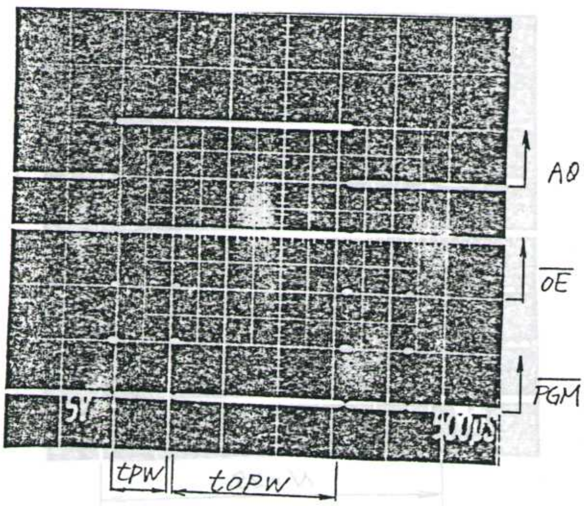
6. ABORT PULSE



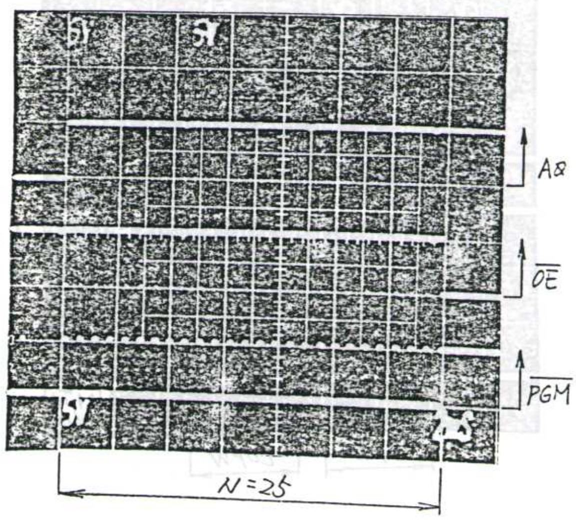
CODE E712



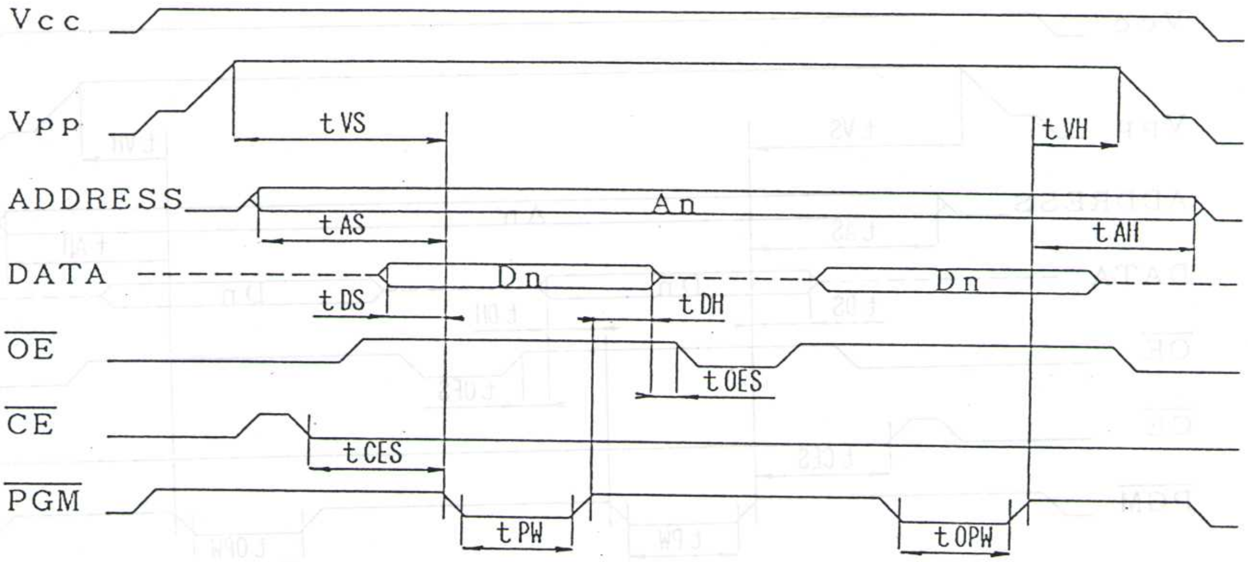
7. PROGRAM PULSE



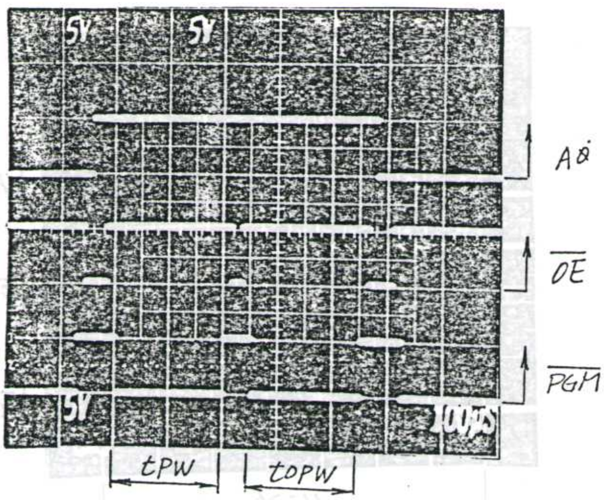
8. ABORT PULSE



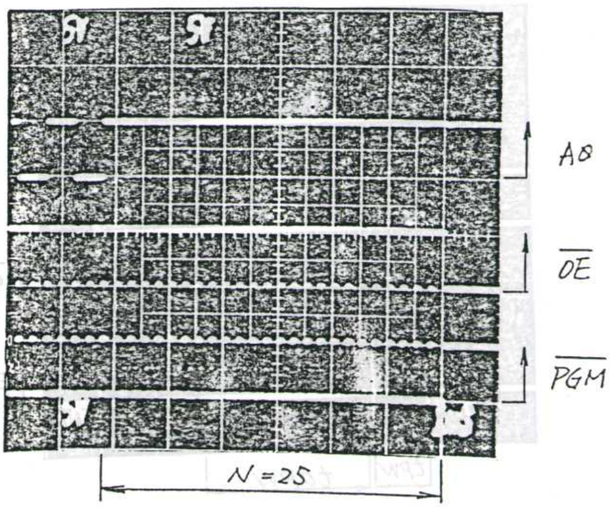
CODE E714 E716



9. PROGRAM PULSE



10. ABORT PULSE



(4) Code E710, E713, E715, E717

Am27C1024	(CODE E710)
TC571024	(CODE E713)
i27210	(CODE E715)
NMC27C1024	(CODE E717)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			43(15)	uS	1(7)
OE SET UP	tOES	2			10(-)	uS	2
DATA SET UP	tDS	2			5(7)	uS	2(8)
ADDRESS HOLD	tAH	2			35(4)	uS	1(7)
DATA HOLD	tDH	2			5(5)	uS	2(8)
Vpp SET UP	tVS	2			40mS	uS	
3,11,15							
Vpp HOLD	tVH				1mS	uS	
4,12,16							
CE SET UP	tCES	2			38	uS	

CODE E710 (Am27C1024)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	3,4,9
Vpp POWER	Vpp	12.2	12.5	12.75	12.5	V	3,4
PROGRAM	tPW	0.4	0.5	1.05	0.5	mS	5
OVER PROGRAM	tOPW	0.95		10.5	1.0	mS	10
MAXIMUM PULS NO.	N		25		25		6

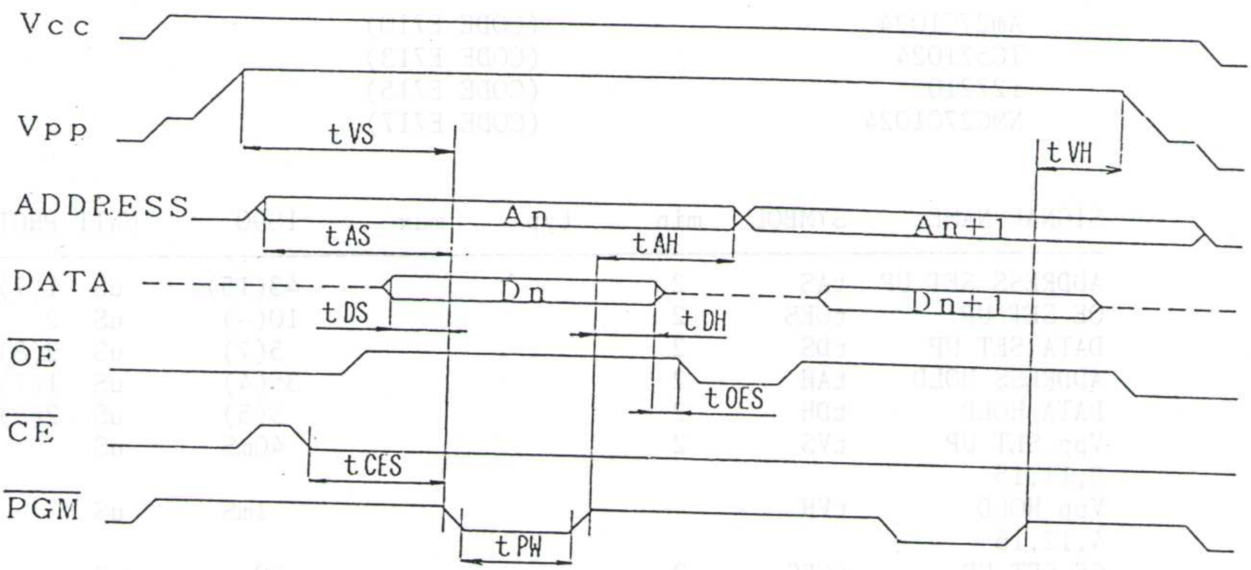
CODE E713, E715 (TC571024, i27210)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	6.0	6.25	6.5	6.25	V	11,12
Vpp POWER	Vpp	12.5	12.75	13.0	12.75	V	11,12
PROGRAM	tPW	0.095	0.1	0.105	0.1	mS	13
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N		25		25		14

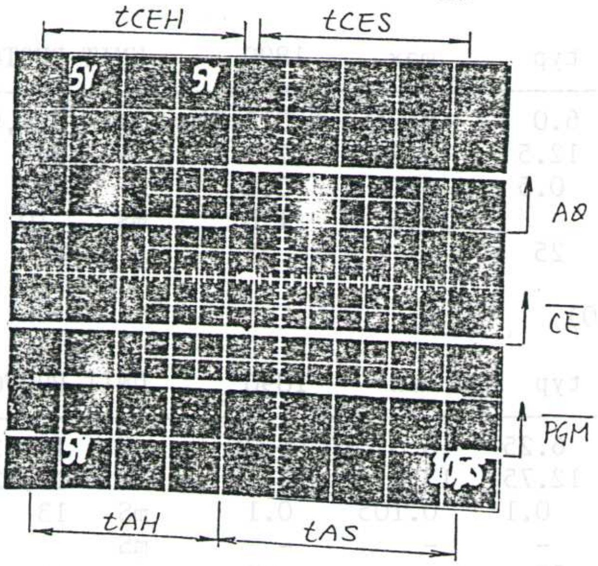
CODE E7171 (NMC27C1024)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0(5.0)	V	15,16
Vpp POWER	Vpp	11.2	11.5	11.75	11.5	V	15,16
PROGRAM	tPW	0.5	0.5	10	0.5	mS	17
OVER PROGRAM	tOPW	-	-	-	-	mS	
MAXIMUM PULS NO.	N		25		25		18

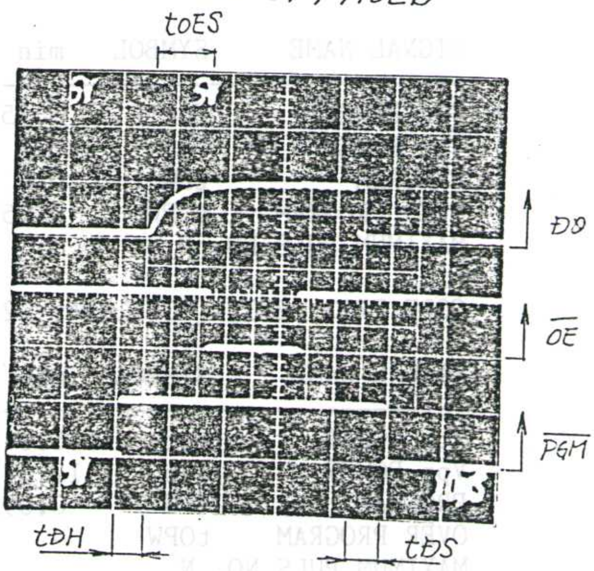
CODE E710 E713 E715 E717



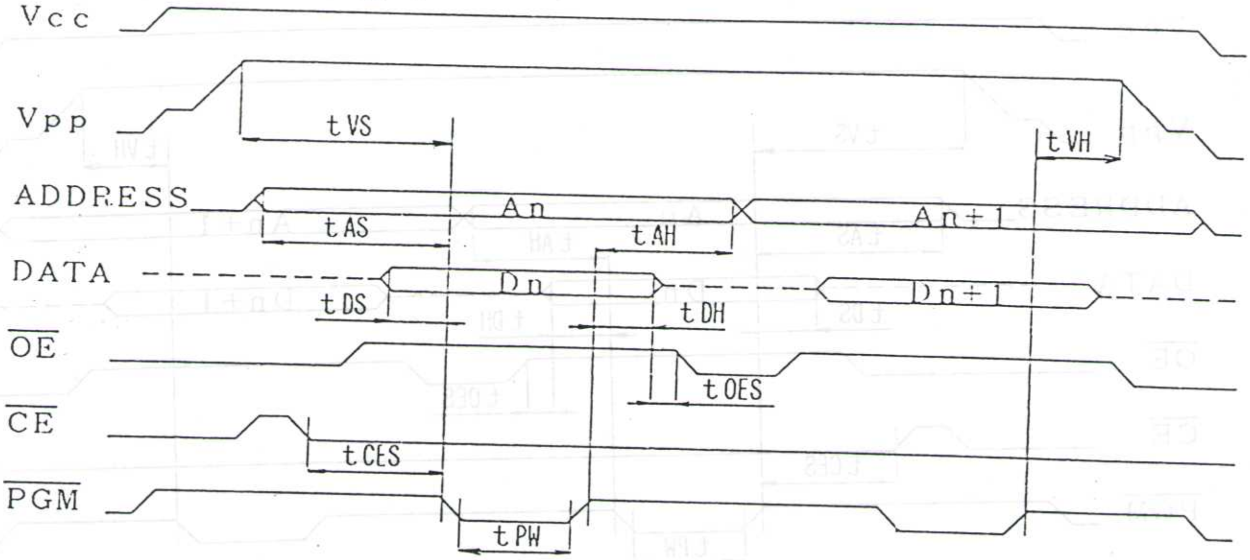
1. ADDRESS SETUP/HOLD



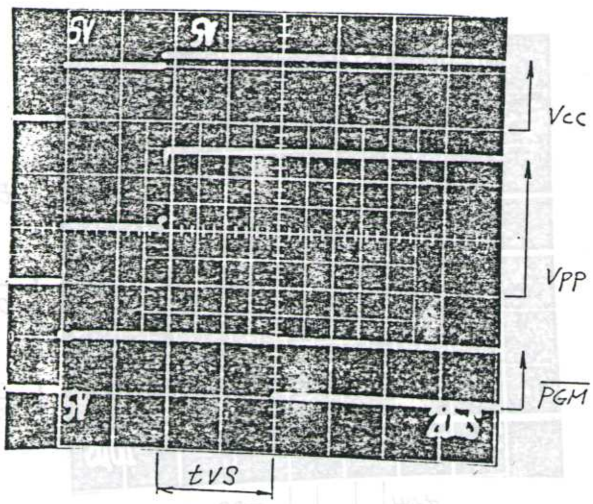
2. DATA SETUP/HOLD



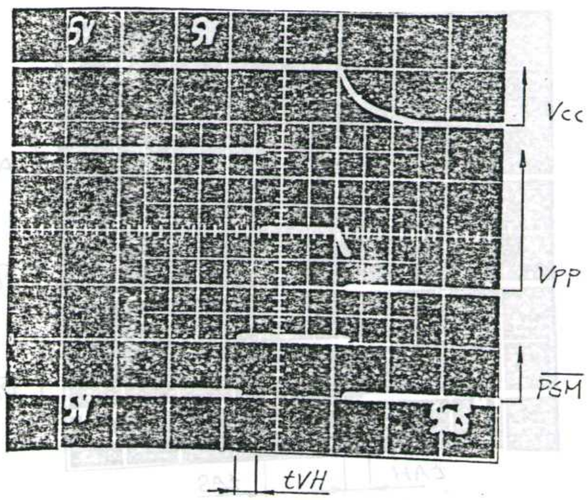
CODE E710



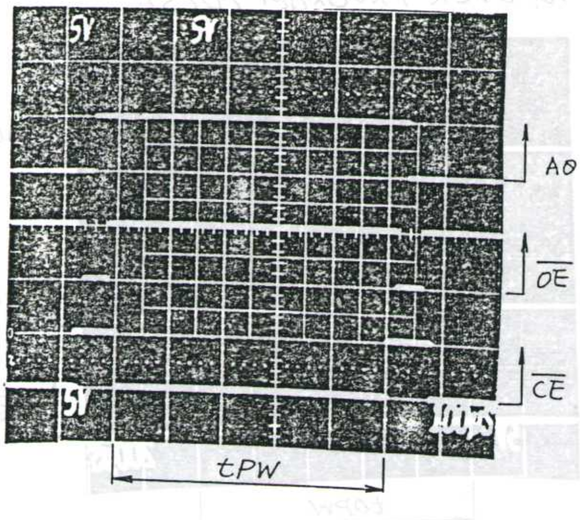
3. POWER ON



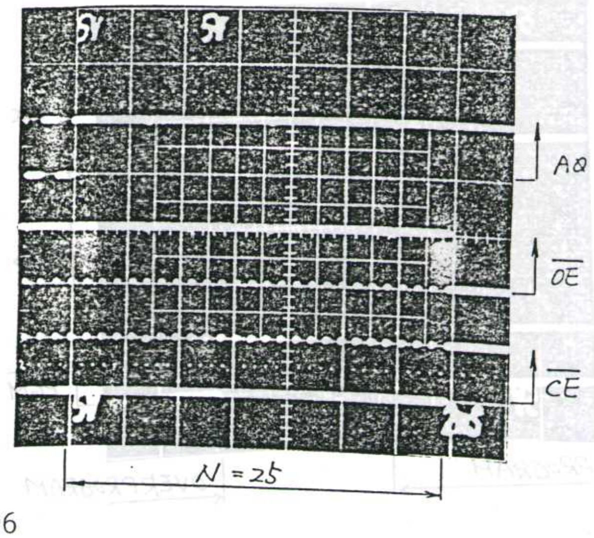
4. POWER OFF



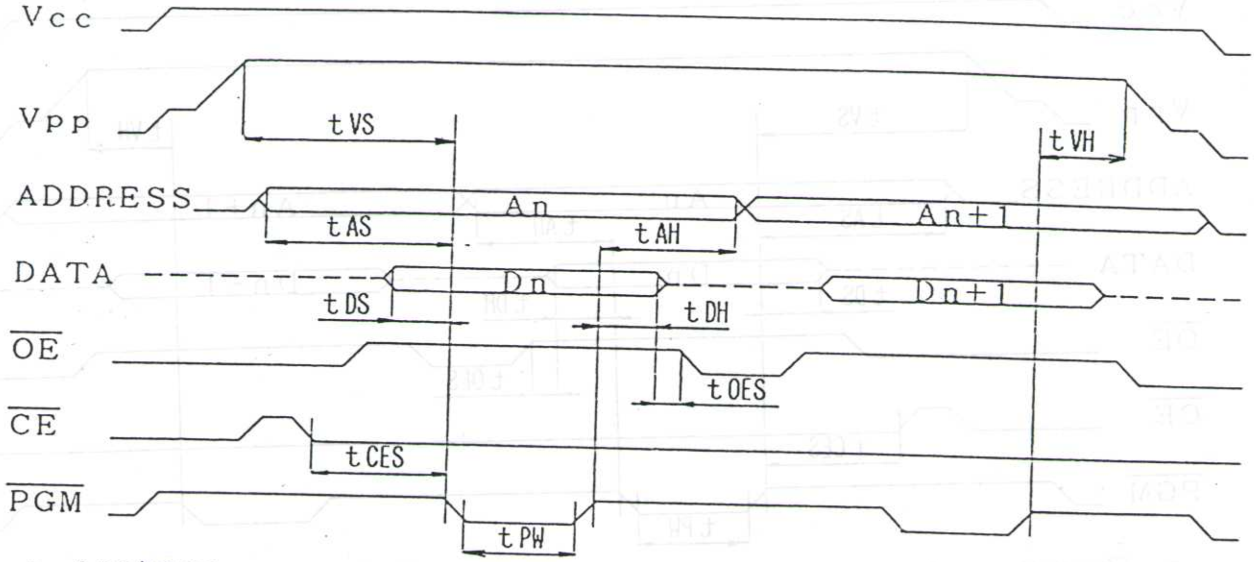
5. PROGRAM PULSE



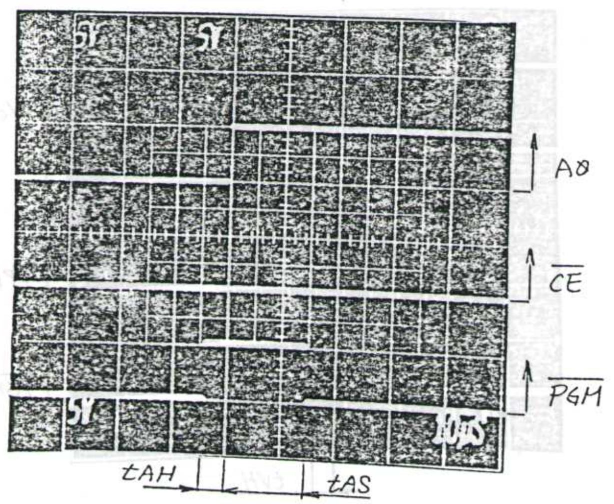
6. ABORT PULSE



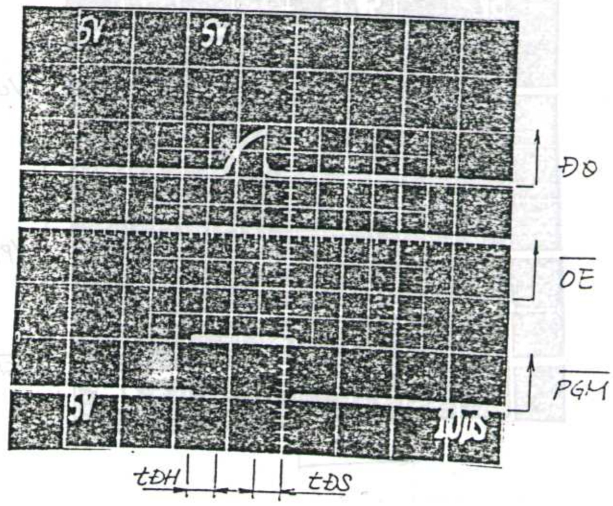
CODE E710



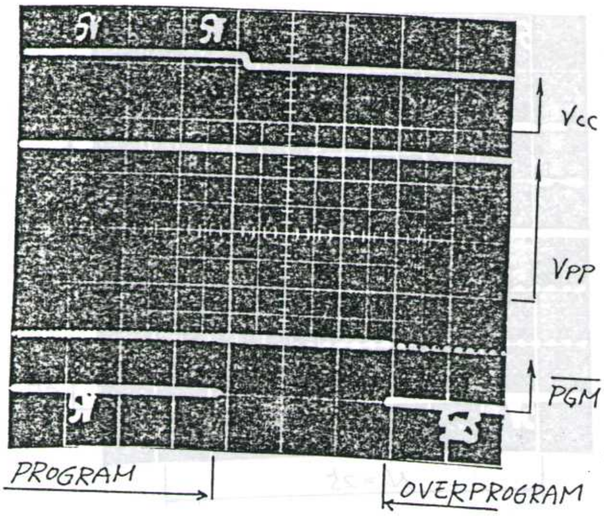
7. ADDRESS SETUP/HOLD



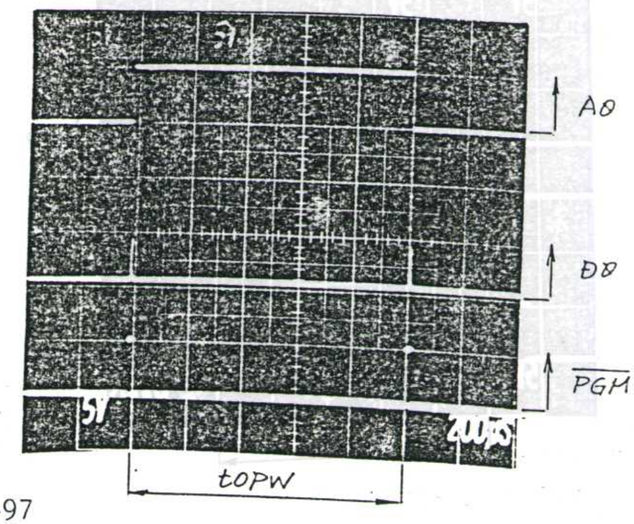
8. DATA SETUP/HOLD



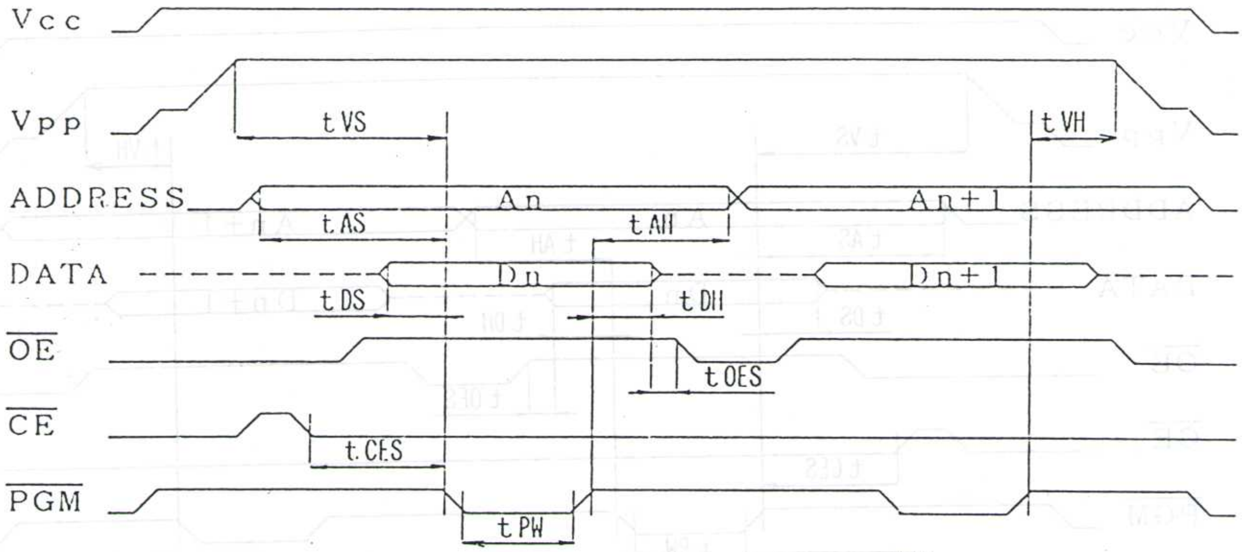
9. PROGRAM ~ OVERPROGRAM



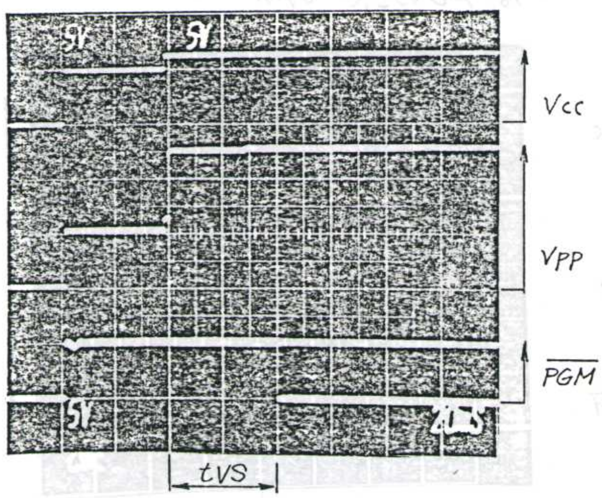
10. OVER PROGRAM PULSE



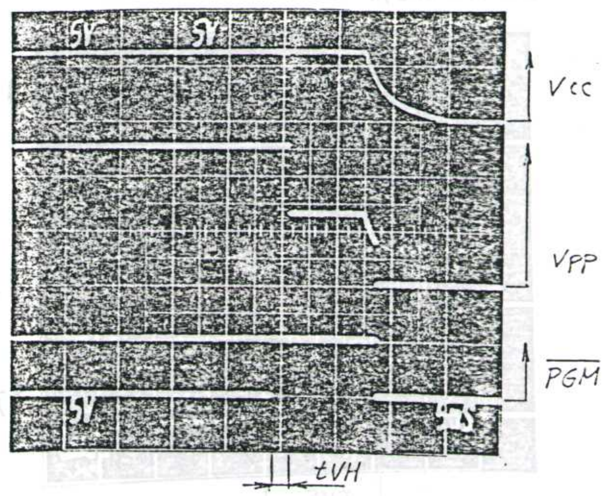
CODE E713 E715



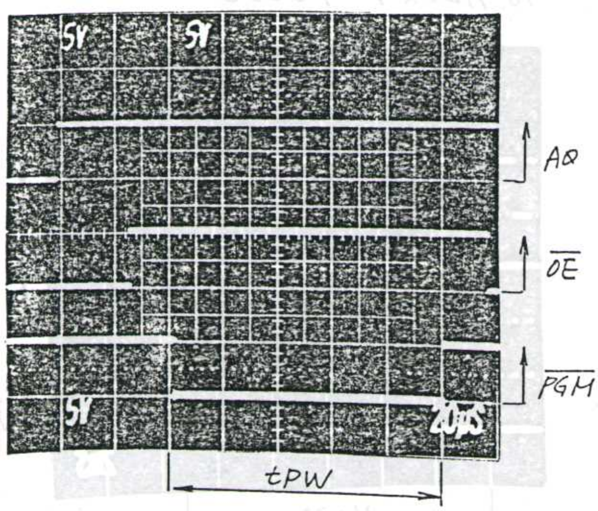
11. POWER ON



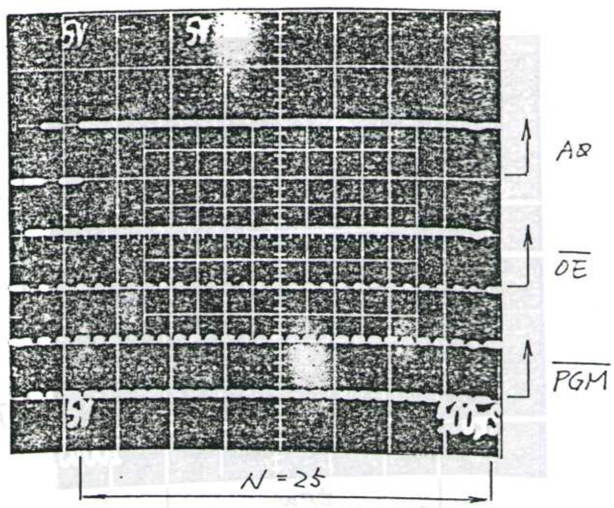
12. POWER OFF



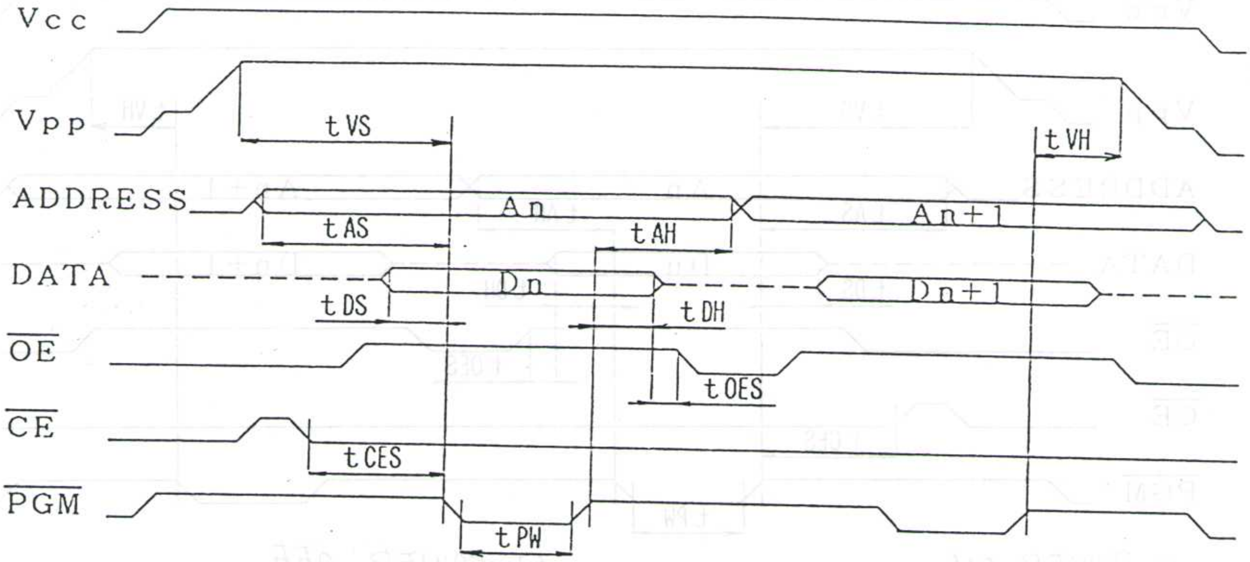
13. PROGRAM PULSE



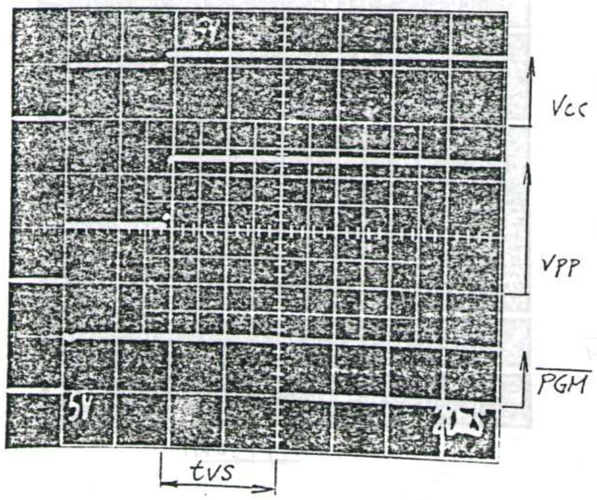
14 ABORT PULSE



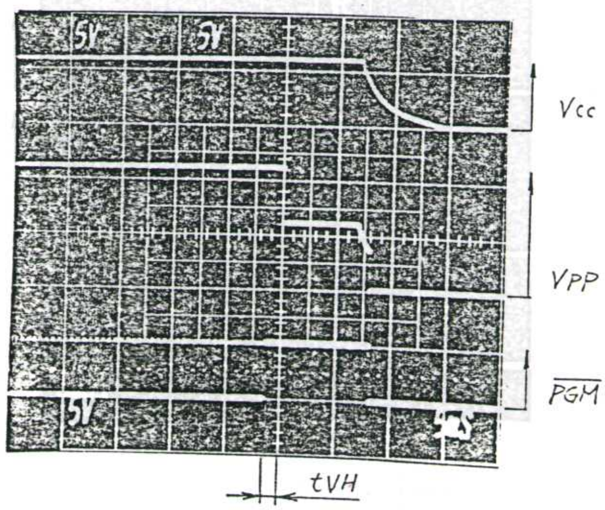
CODE E717



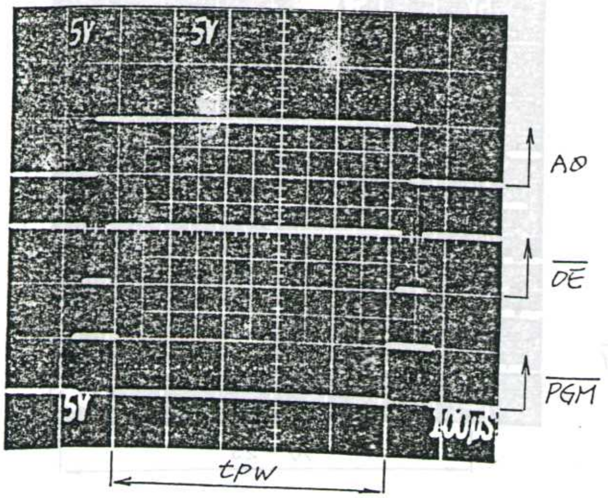
15. POWER ON



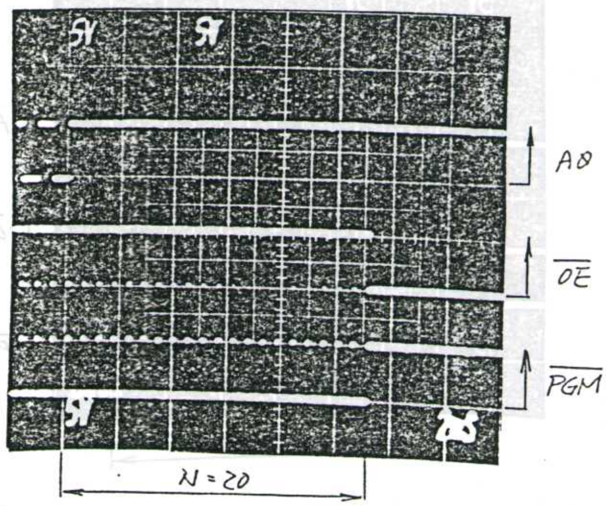
16. POWER OFF



17. PROGRAM PULSE



18. ABORT PULSE



(5) Code E740

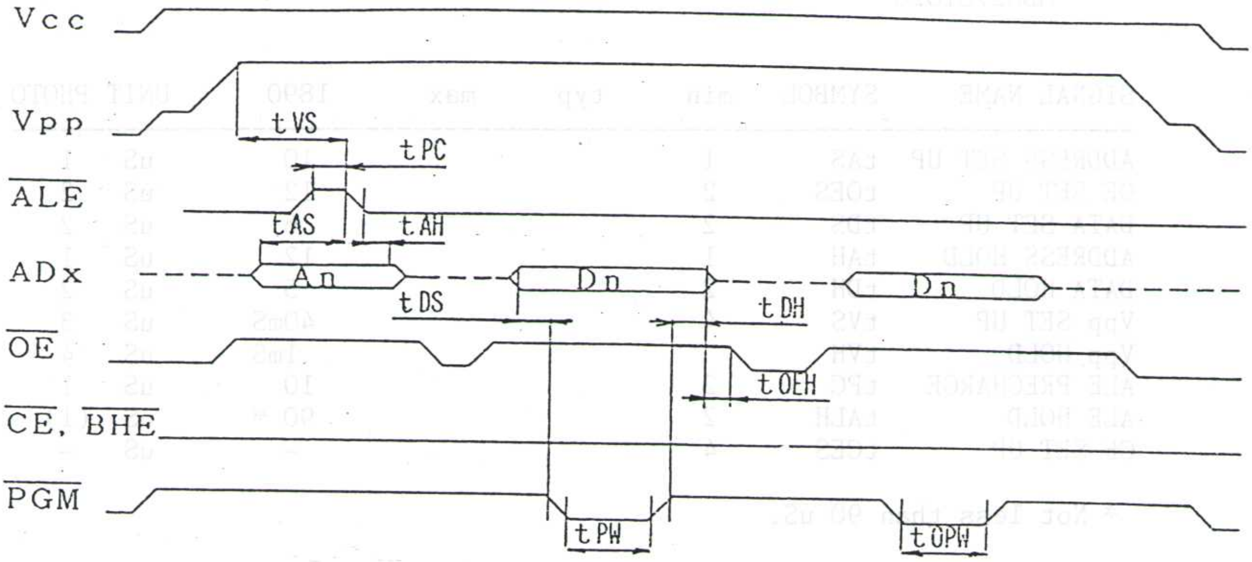
MBM27C1028

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	1			10	uS	1
OE SET UP	tOES	2			12	uS	2
DATA SET UP	tDS	2			6	uS	2
ADDRESS HOLD	tAH	1			12	uS	1
DATA HOLD	tDH	2			5	uS	2
Vpp SET UP	tVS	4			40mS	uS	3
Vpp HOLD	tVH				1mS	uS	4
ALE PRECHARGE	tPC	2			10	uS	1
ALE HOLD	tALH	2			90 *	uS	(1)
CE SET UP	tCES	4			-	uS	-

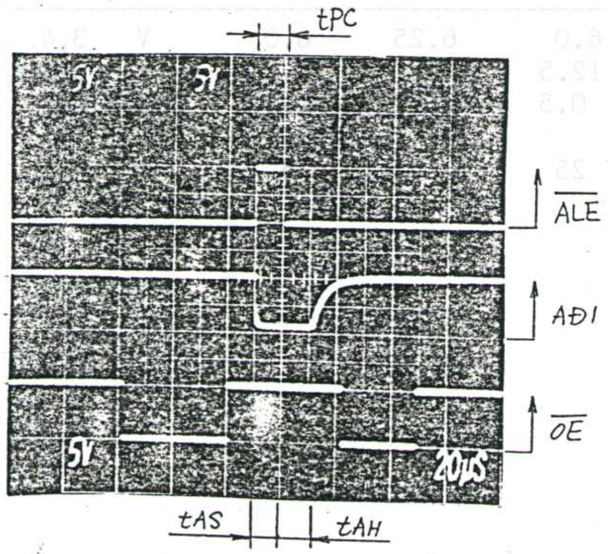
* Not less than 90 uS.

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	5.75	6.0	6.25	6.0	V	3,4
Vpp POWER	Vpp	12.2	12.5	12.8	12.5	V	3,4
PROGRAM	tPW	0.475	0.5	0.525	0.5	mS	5
OVER PROGRAM	tOPW	1.4		39.4	0.4	mS	5
MAXIMUM PULS NO.	N		25		25		6

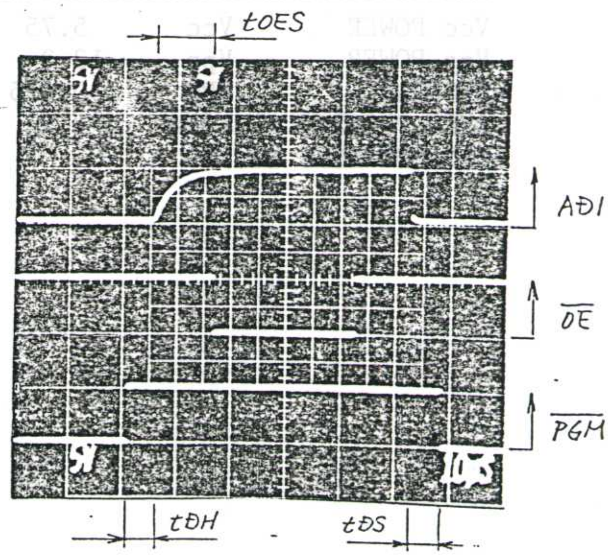
CODE E740



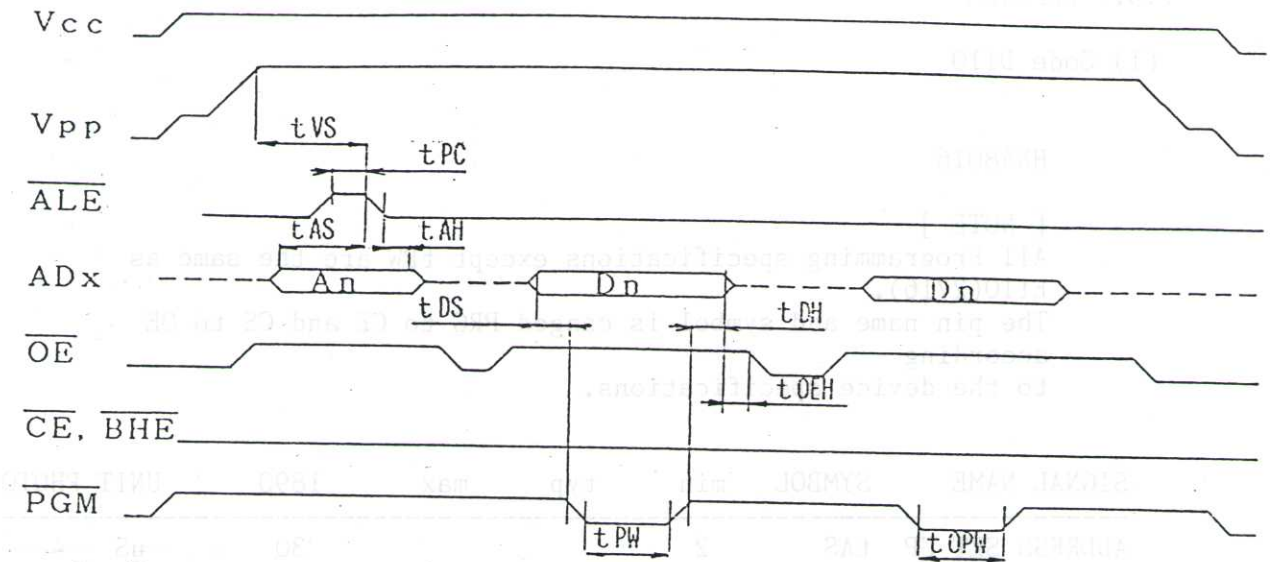
1. ADDRESS SETUP/HOLD



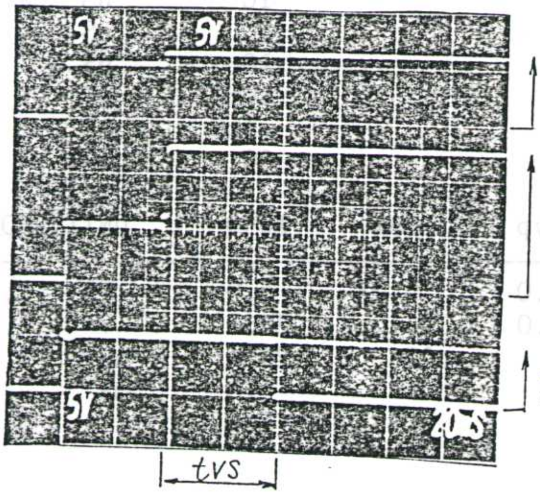
2. DATA SETUP/HOLD



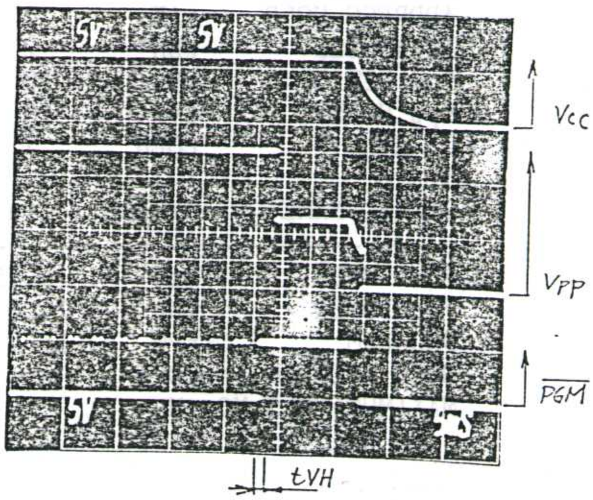
CODE E740



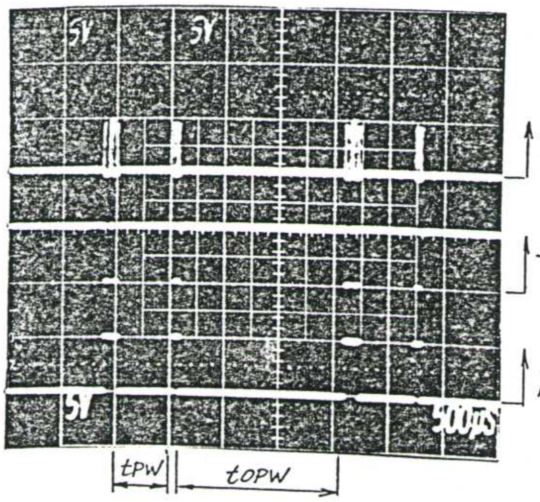
3. POWER ON



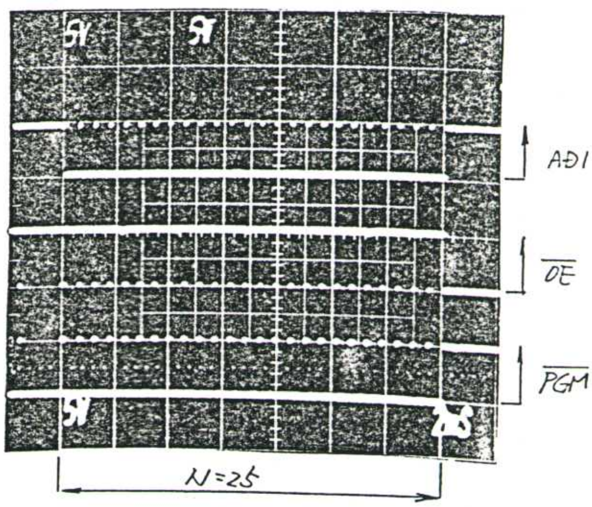
4. POWER OFF



5. PROGRAM PULSE



6. ABORT PULSE



7.5.7 EEP-ROM

(1) Code D110

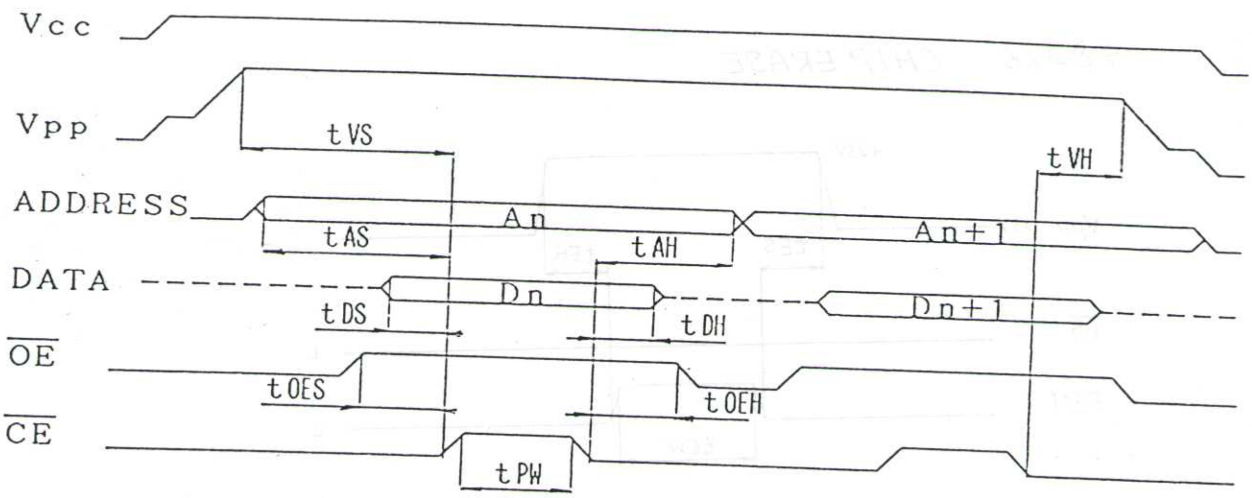
HN48016

[NOTE]
All Programming specifications except tPW are the same as E110(2716).
The pin name and symbol is canged PRG to CE and CS to OE according
to the device specifications.

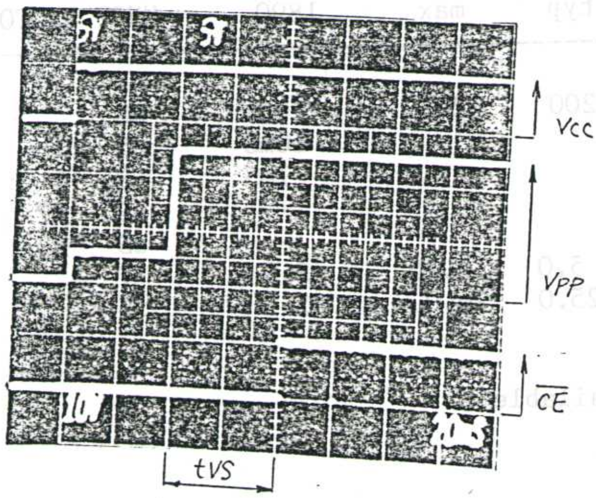
SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	2			30	uS	4
OE SET UP	tOES	2			20	uS	4
DATA SET UP	tDS	2			10	uS	-
ADDRESS HOLD	tAH	2			30	uS	4
DATA HOLD	tDH	2			10	uS	-
Vpp SET UP	tVS	10			40mS	uS	1
Vpp HOLD	tVH	10			1mS	uS	2
OE HOLD	tOEH	7			20	uS	4

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	1,2
PROGRAM	tPW	15	20	25	20	mS	3
OVER PROGRAM	tOPW	-	-	-		mS	-
MAXIMUM PULS NO.	N		1		1		3

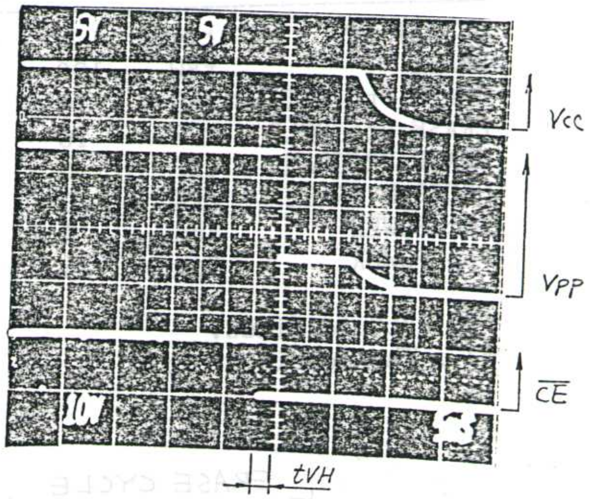
CODE D110



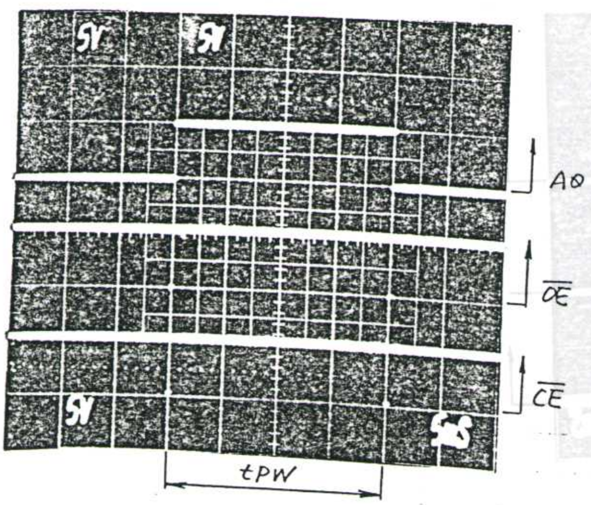
1. POWER ON



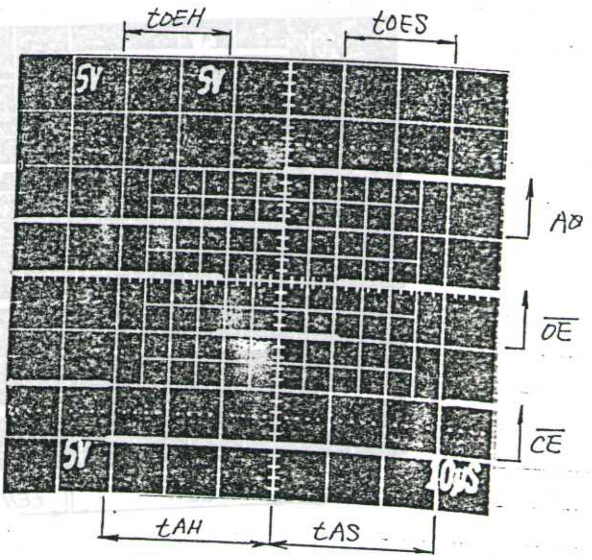
2. POWER OFF



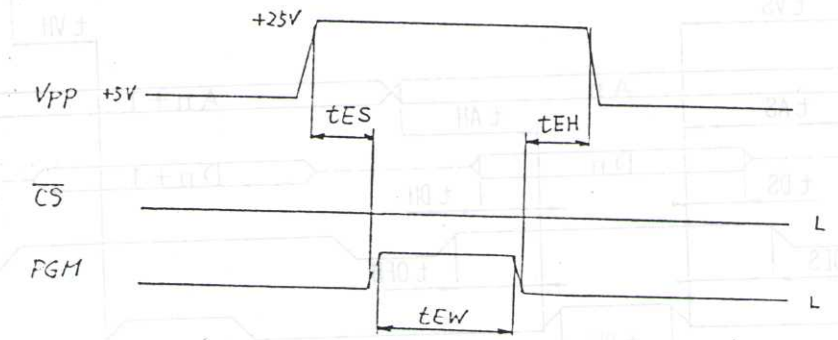
3. PROGRAM PULSE



4. ADDRESS SETUP/HOLD

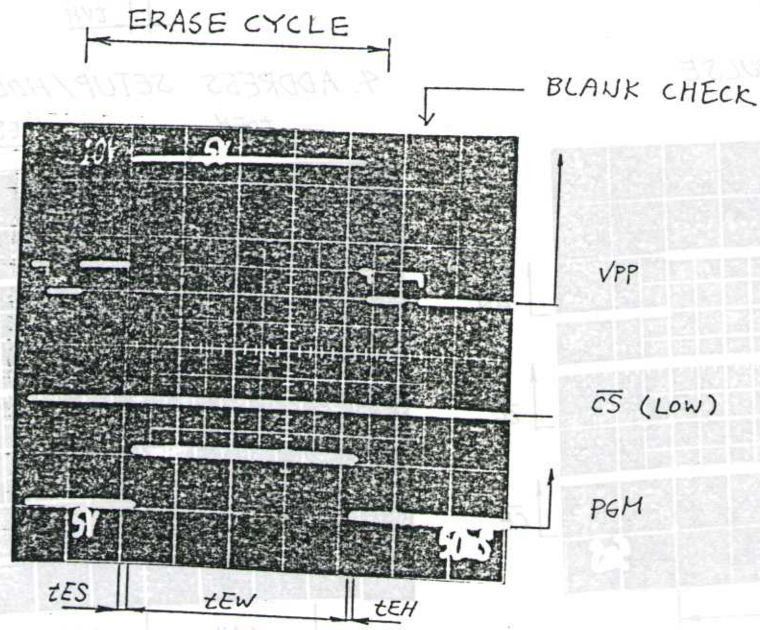


48016 CHIP ERASE



SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
OE SET UP	tECSS	2			-	uS	*1
ERASE	tEW	190	200	210	200	mS	
ERASE Vpp SET UP	tES	10			10mS	uS	1
ERASE Vpp HOLD	tVS	10			1mS	uS	1
ERASE PROGRAM	tEP	10			-	uS	*2
PROGRAM ERASE	tPE	10			-	uS	*2
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	
Vpp POWER	Vpp	24.0	25.0	26.0	25.0	V	

*1 : "L" is fixed.
*2 : The continuos mode is not available.

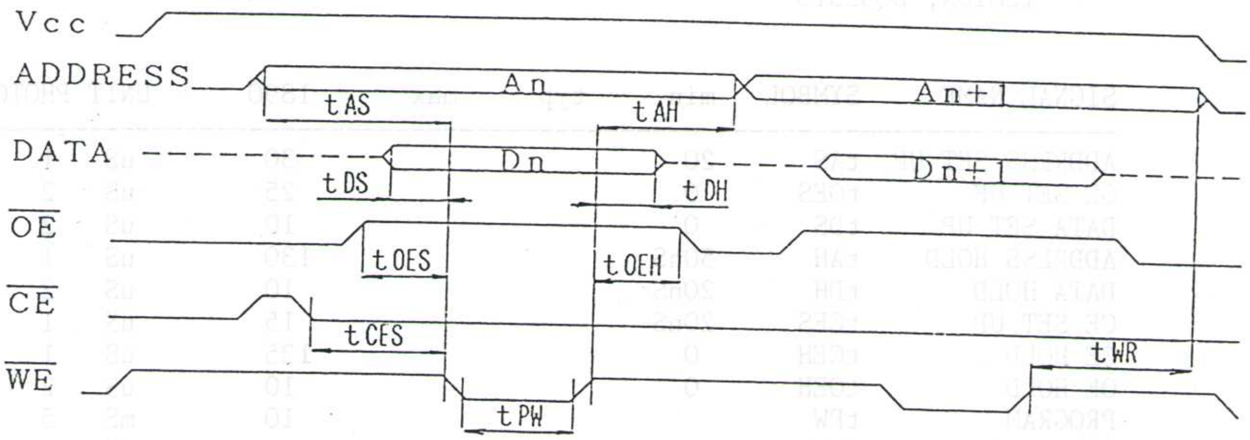


(2) Code D113

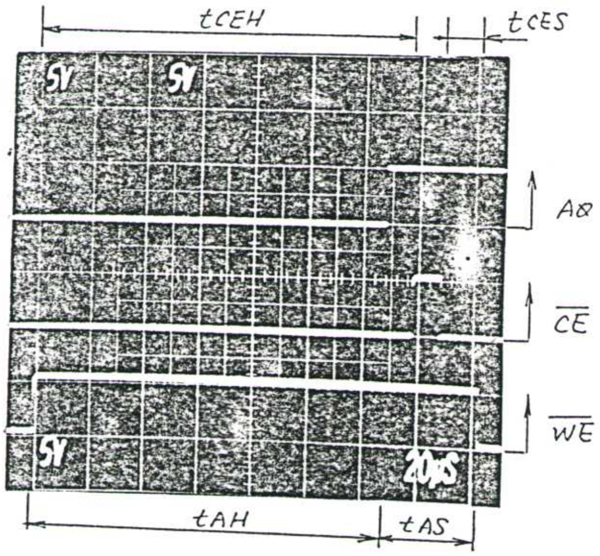
i2816A, DQ52B13

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	20			30	uS	1
OE SET UP	tOES	0			25	uS	2
DATA SET UP	tDS	0			10	uS	2
ADDRESS HOLD	tAH	50nS			130	uS	1
DATA HOLD	tDH	20nS			10	uS	2
CE SET UP	tCES	20nS			15	uS	1
CE HOLD	tCEH	0			135	uS	1
OE HOLD	tOEH	0			10	uS	2
PROGRAM	tPW				10	mS	5
CYCLE	TCYC	-				mS	
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	3,4

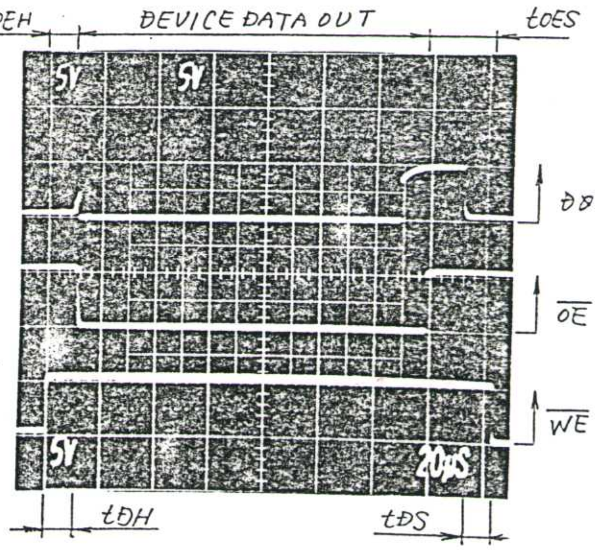
CODE D113



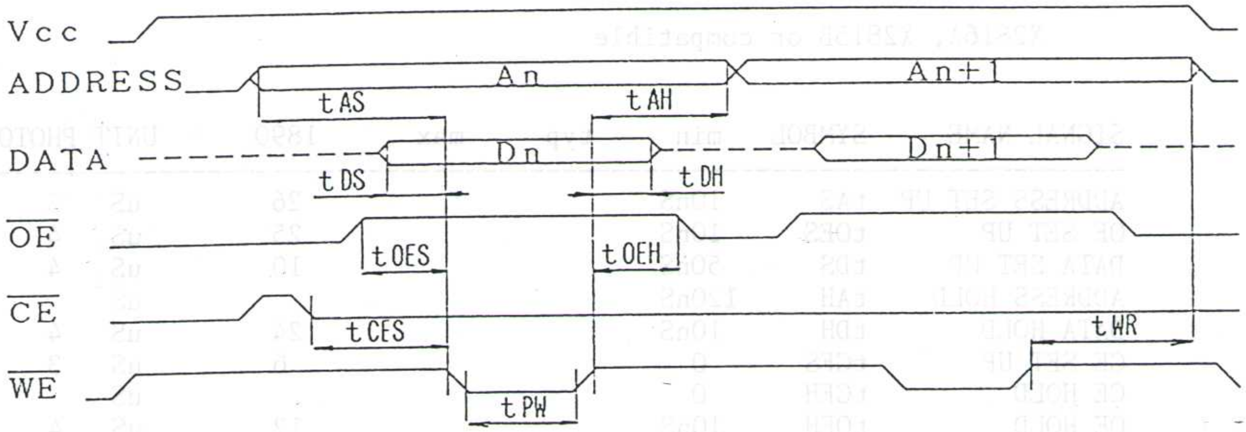
1. ADDRESS SETUP/HOLD



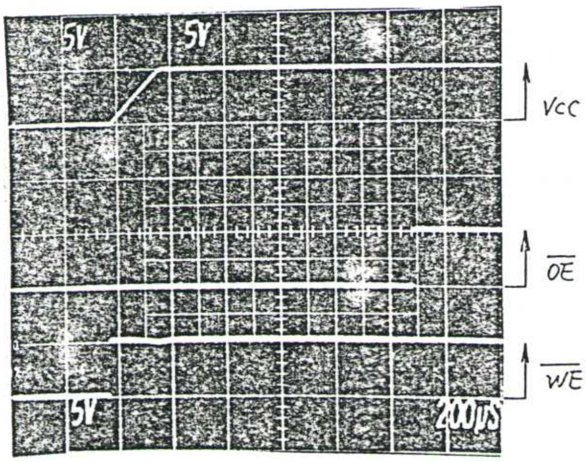
2. DATA SETUP/HOLD



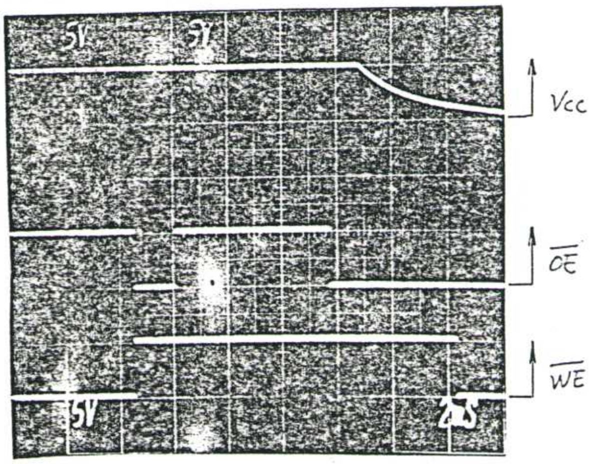
CODE D113



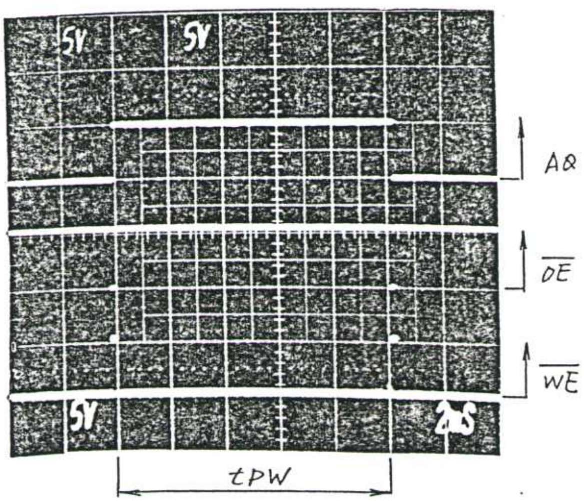
3. POWER ON



4. POWER OFF



5. PROGRAM PULSE

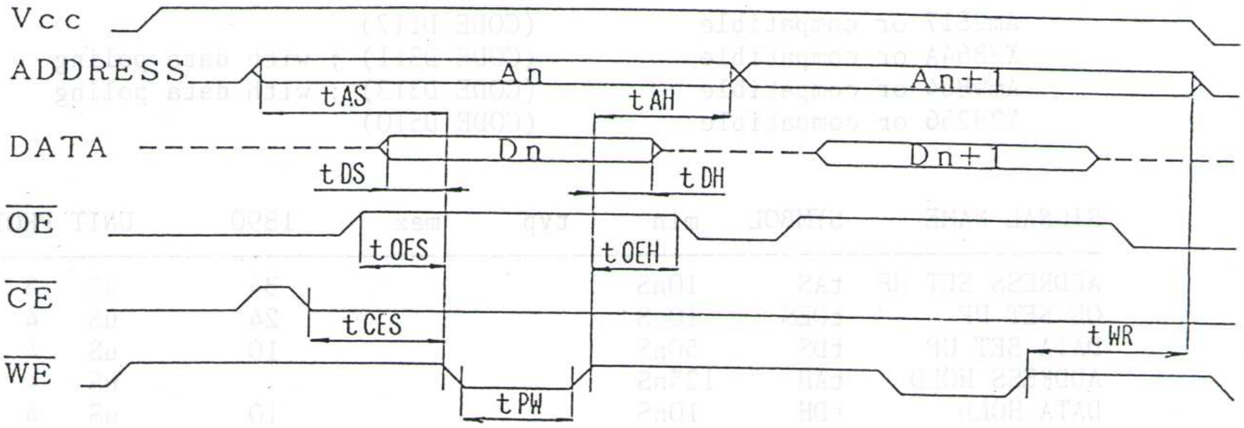


(3) Code D116

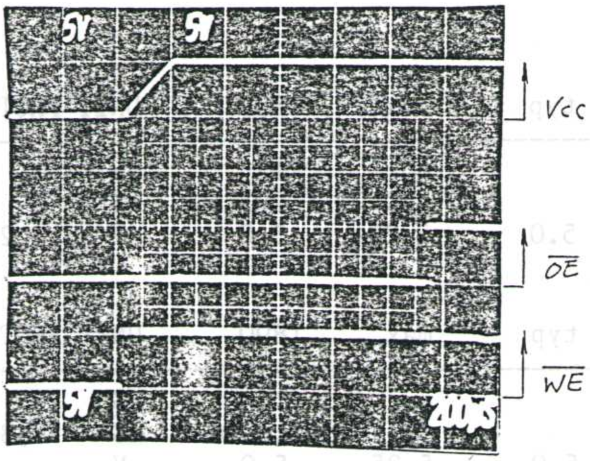
X2816A, X2815B or compatible

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	10nS			26	uS	3
OE SET UP	tOES	10nS			25	uS	4
DATA SET UP	tDS	50nS			10	uS	4
ADDRESS HOLD	tAH	120nS				uS	
DATA HOLD	tDH	10nS			24	uS	4
CE SET UP	tCES	0			6	uS	3
CE HOLD	tCEH	0				uS	
OE HOLD	tOEH	10nS			12	uS	4
PROGRAM	tPW	200nS			10uS	mS	4
CYCLE	TCYC			10	10uS	mS	
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2

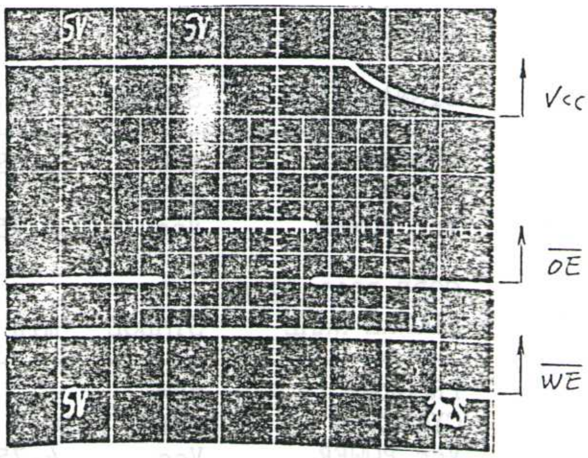
CODE D116



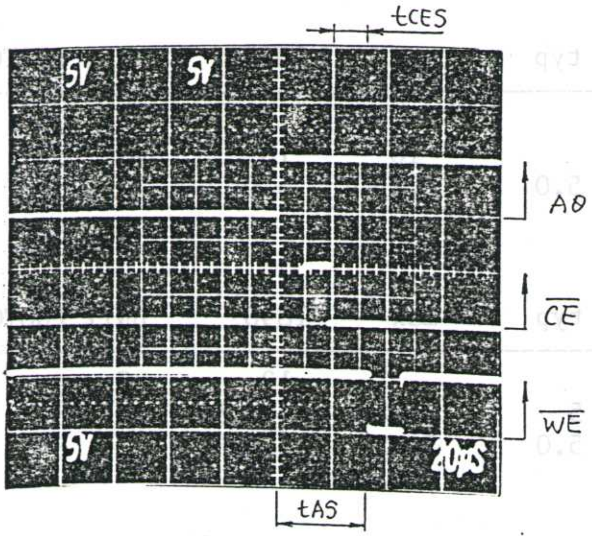
1. POWER ON



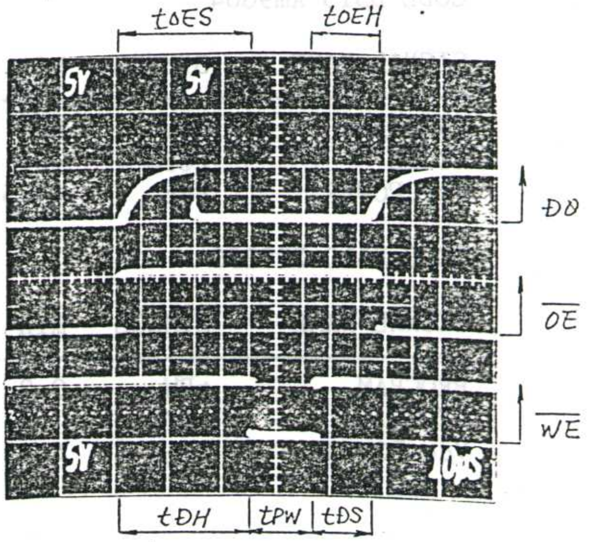
2. POWER OFF



3. ADDRESS SETUP



4. DATA SETUP / HOLD



(4) Code D117, D311, D313, D510

Am2817 or compatible	(CODE D117)	
X2864A or compatible	(CODE D311)	; with data poling
Am9864 or compatible	(CODE D313)	; with data poling
X28256 or compatible	(CODE D510)	

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	10nS			34	uS	3
OE SET UP	tOES	10nS			24	uS	4
DATA SET UP	tDS	50nS			10	uS	4
ADDRESS HOLD	tAH	125nS				uS	–
DATA HOLD	tDH	10nS			10	uS	4
Vpp SET UP	tVS	0			14	uS	3
Vpp HOLD	tVH	0				uS	–
OE HOLD	tOEH	10nS			10	uS	4

CODE D117 Am2817A

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
PROGRAM	tPW	200nS			12	uS	3
CYCLE	tCYC			20	20	mS	6
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	1,2

CODE D311 X2864A

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
PROGRAM	tPW				12	uS	–
CYCLE	tCYC	10 *			5 to 50	mS	7,8
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	–

* : UPD28C64, M5M28C64

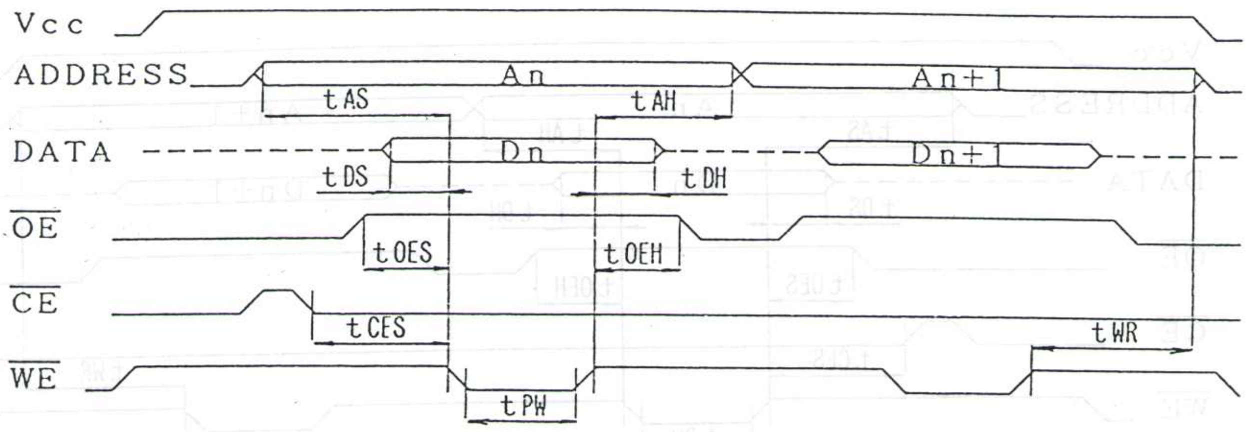
CODE D313 Am9864

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
PROGRAM	tPW	200			12	uS	–
CYCLE	tCYC			10	10	mS	5
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	–

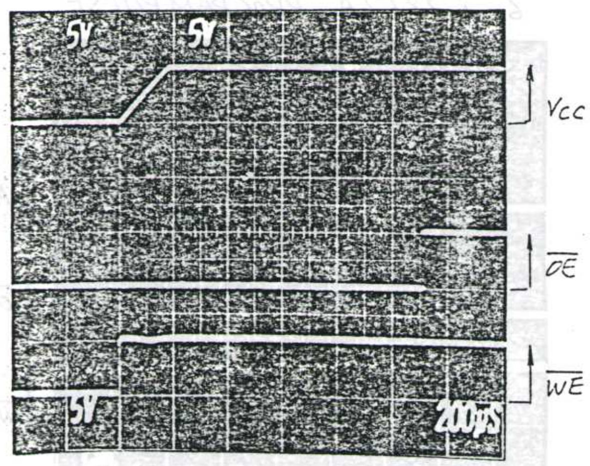
CODE D510 X28256

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
PROGRAM	tPW	0.2			12	uS	–
CYCLE	tCYC		5	10	5 to 50	mS	–
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	–

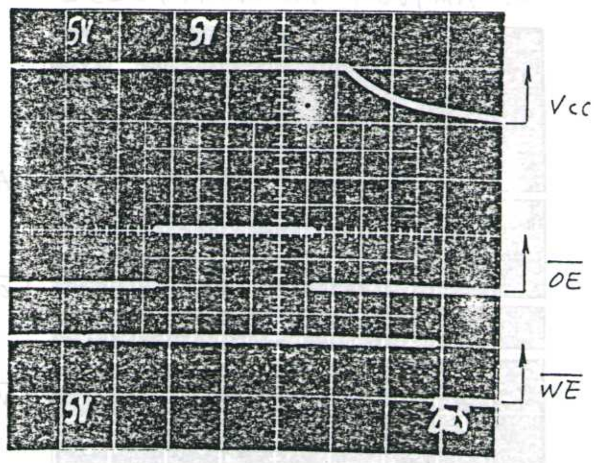
CODE D117 D311 D313 D510



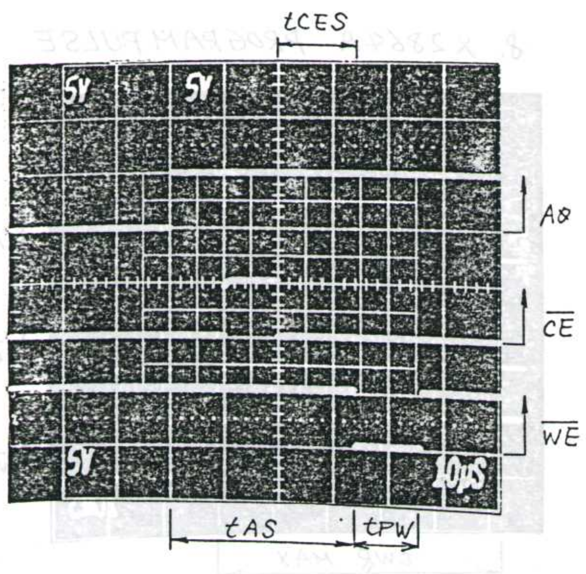
1. POWER ON



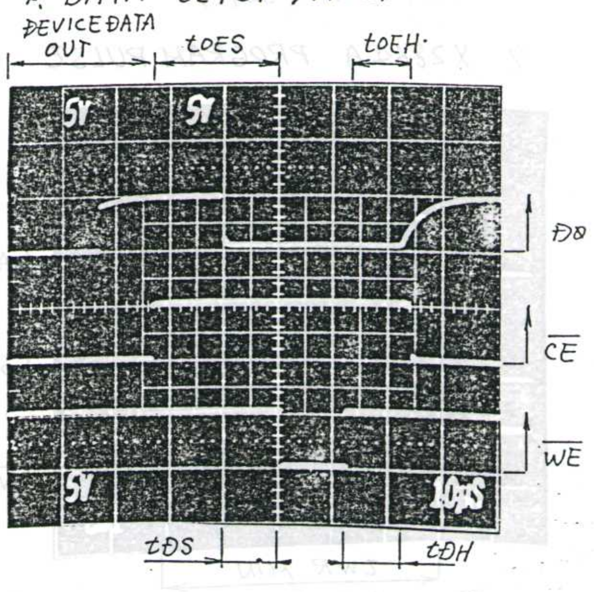
2. POWER OFF



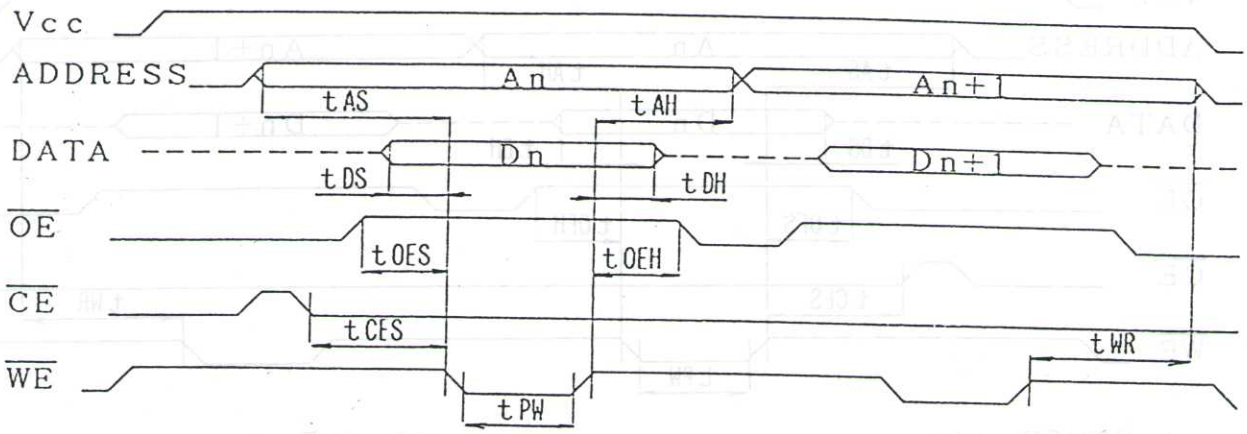
3. ADDRESS SETUP/HOLD



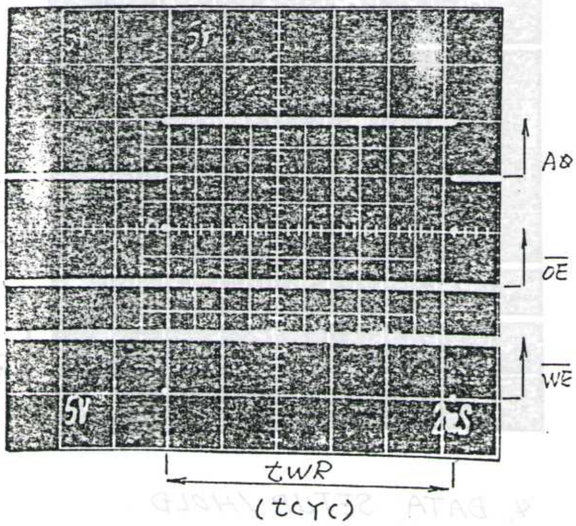
4. DATA SETUP/HOLD



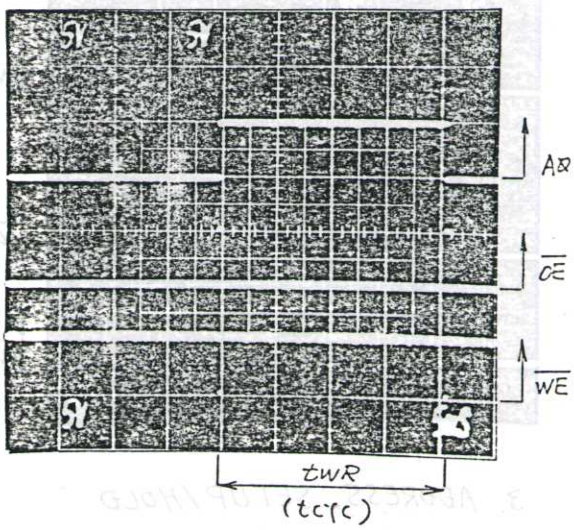
CODE D117 D311 D313 D510



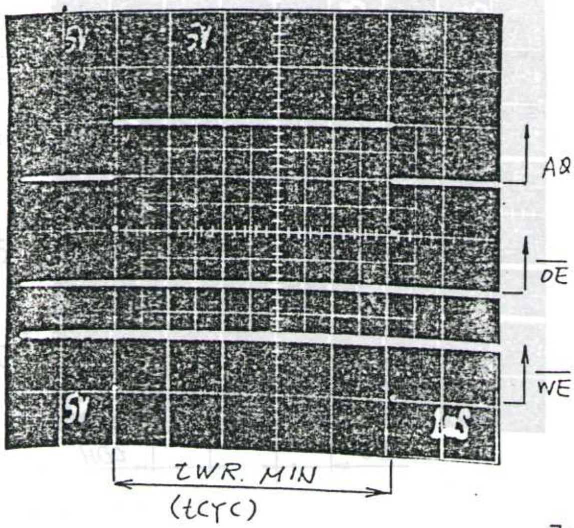
5. Am9864 PROGRAM PULSE



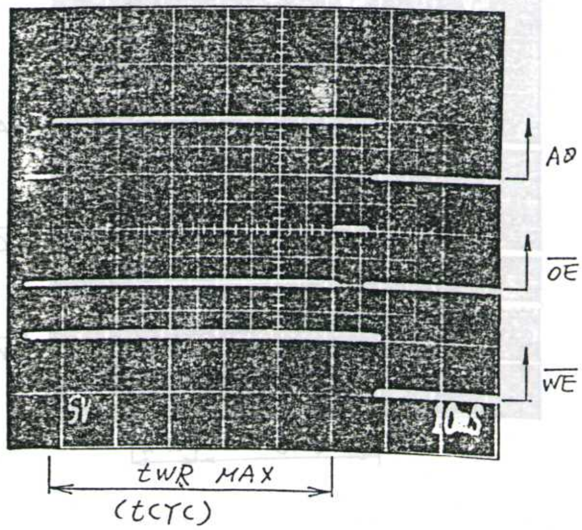
6. i2817A PROGRAM PULSE



7. X2864A PROGRAM PULSE



8. X2864A PROGRAM PULSE



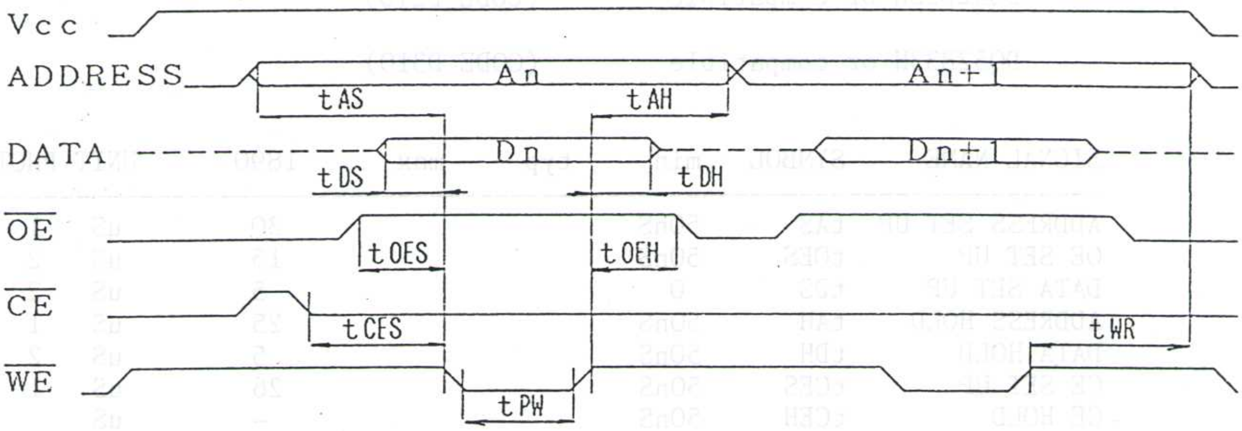
(5) Code D210, D310

DQ52B23H or compatible (CODE D210)

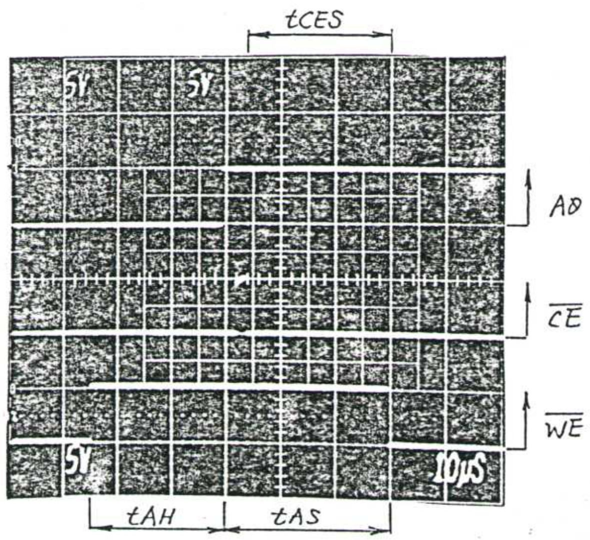
DQ52B33H or compatible (CODE D310)

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	50nS			30	uS	1
OE SET UP	tOES	50nS			15	uS	2
DATA SET UP	tDS	0			5	uS	2
ADDRESS HOLD	tAH	50nS			25	uS	1
DATA HOLD	tDH	50nS			5	uS	2
CE SET UP	tCES	50nS			26	uS	1
CE HOLD	tCEH	50nS			-	uS	
OE HOLD	tOEH	10nS			10	uS	2
PROGRAM	tPW	1			20	mS	5
CYCLE	TCYC	-	-	-	-	mS	
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	3,4

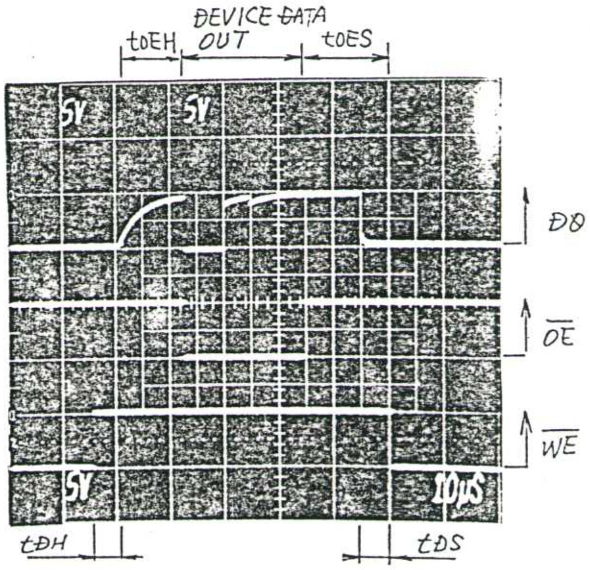
CODE D210 D310



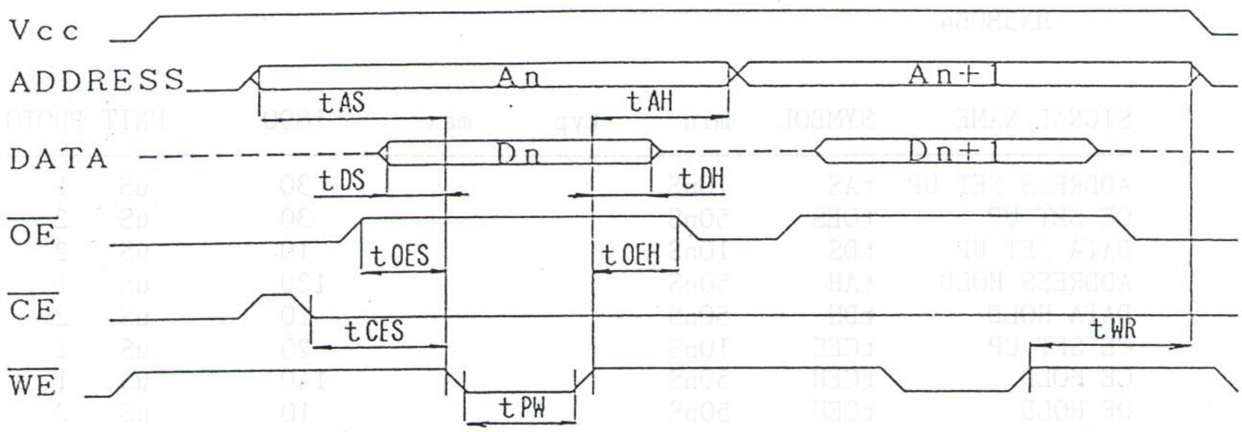
1. ADDRESS SETUP/HOLD



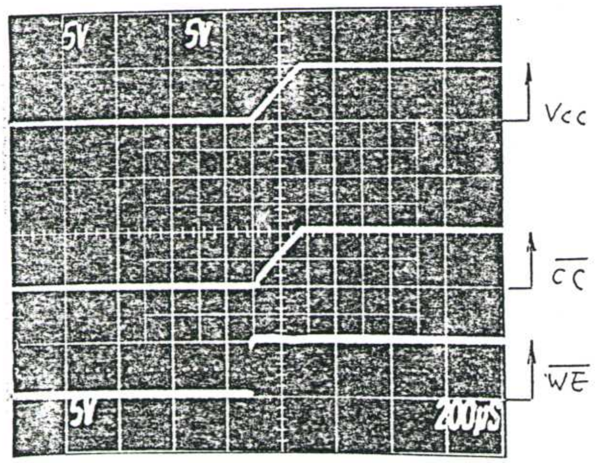
2. DATA SETUP/HOLD



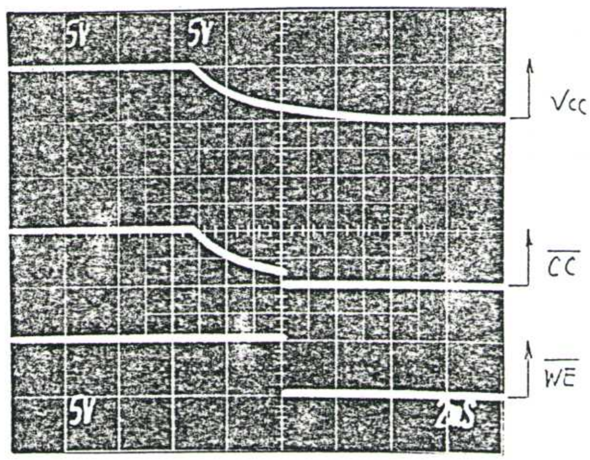
CODE D210 D310



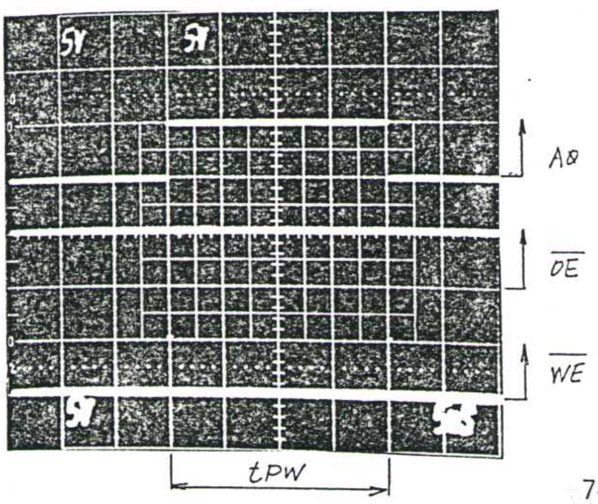
3. POWER ON



4. POWER OFF



5. PROGRAM PULSE

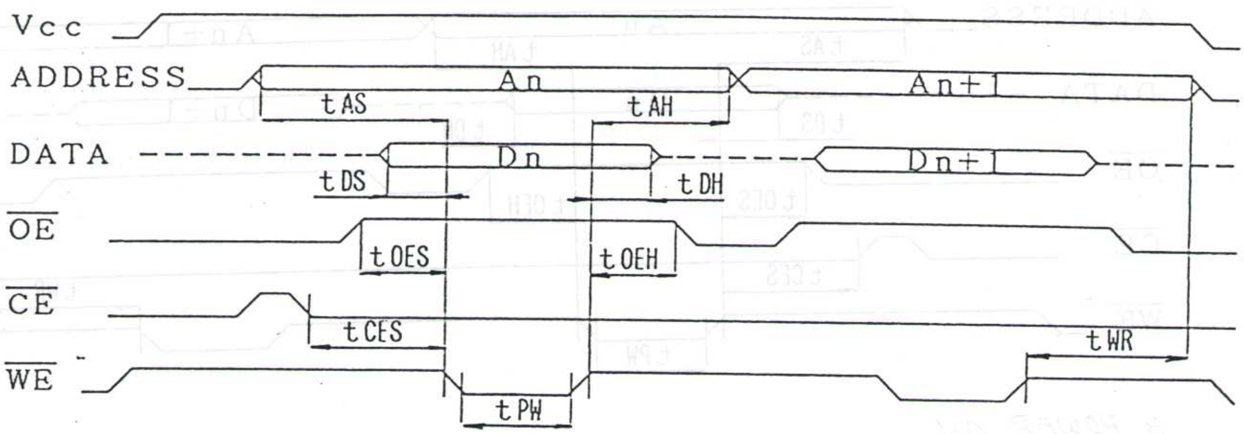


(6) Code D312

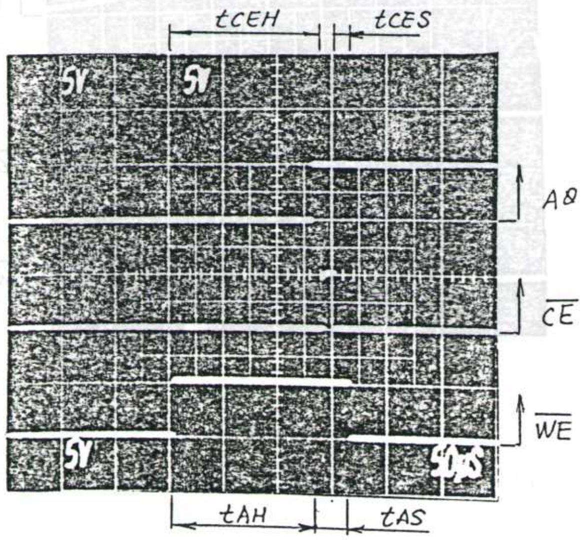
HN58064

SIGNAL NAME	SYMBOL	min	typ	max	1890	UNIT	PHOTO
ADDRESS SET UP	tAS	10nS			30	uS	1
OE SET UP	tOES	50nS			30	uS	2
DATA SET UP	tDS	10nS			10	uS	2
ADDRESS HOLD	tAH	50nS			130	uS	1
DATA HOLD	tDH	50nS			10	uS	2
CE SET UP	tCES	10nS			20	uS	1
CE HOLD	tCEH	50nS			140	uS	1
OE HOLD	tOEH	50nS			10	uS	2
PROGRAM	tPW	8	10	15	10	mS	5
CYCLE	TCYC	-	-	-	-	mS	
Vcc POWER	Vcc	4.75	5.0	5.25	5.0	V	3,4

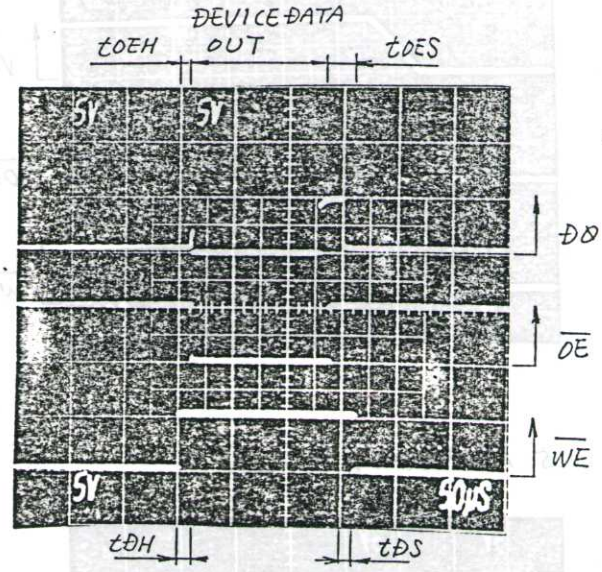
CODE D312



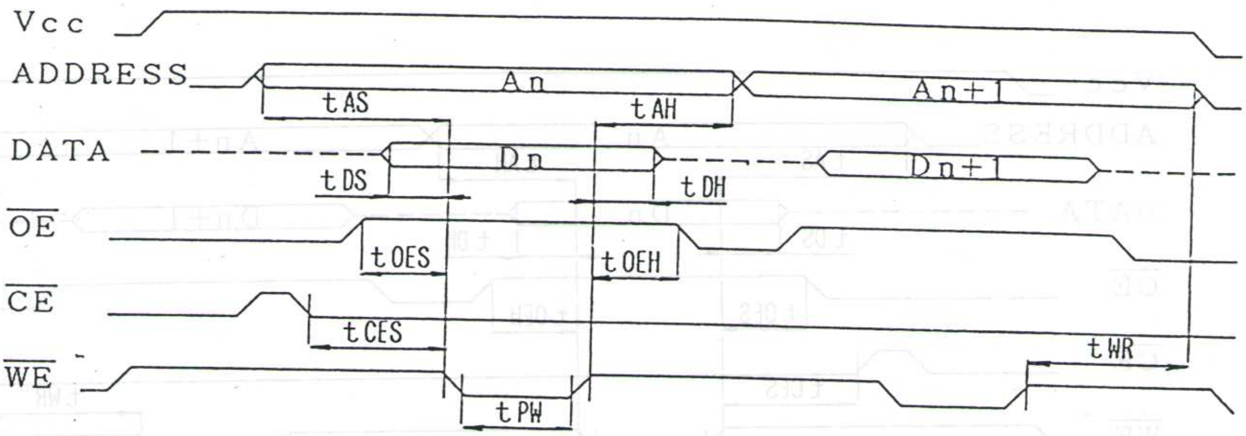
1. ADDRESS SETUP/HOLD



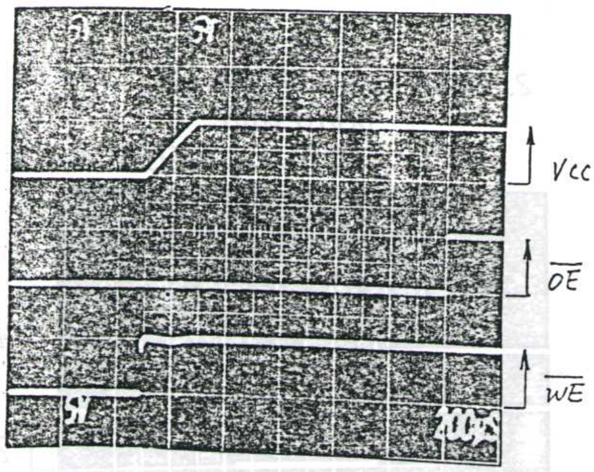
2. DATA SETUP/HOLD



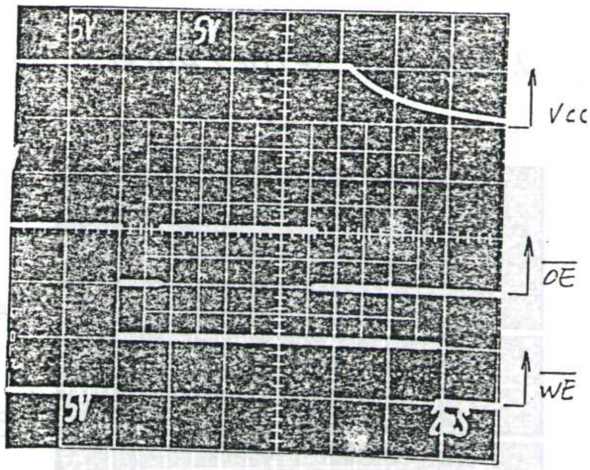
CODE D312



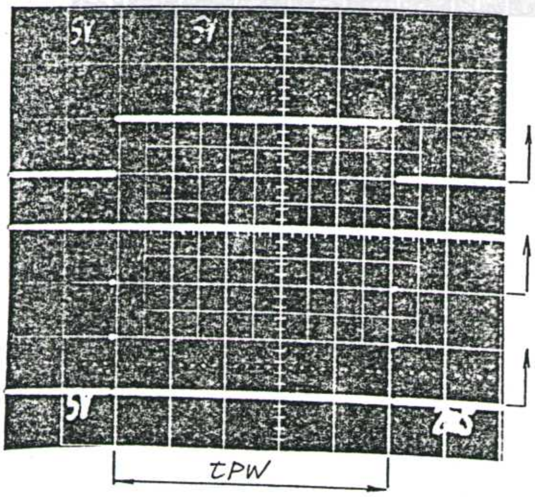
3. POWER ON



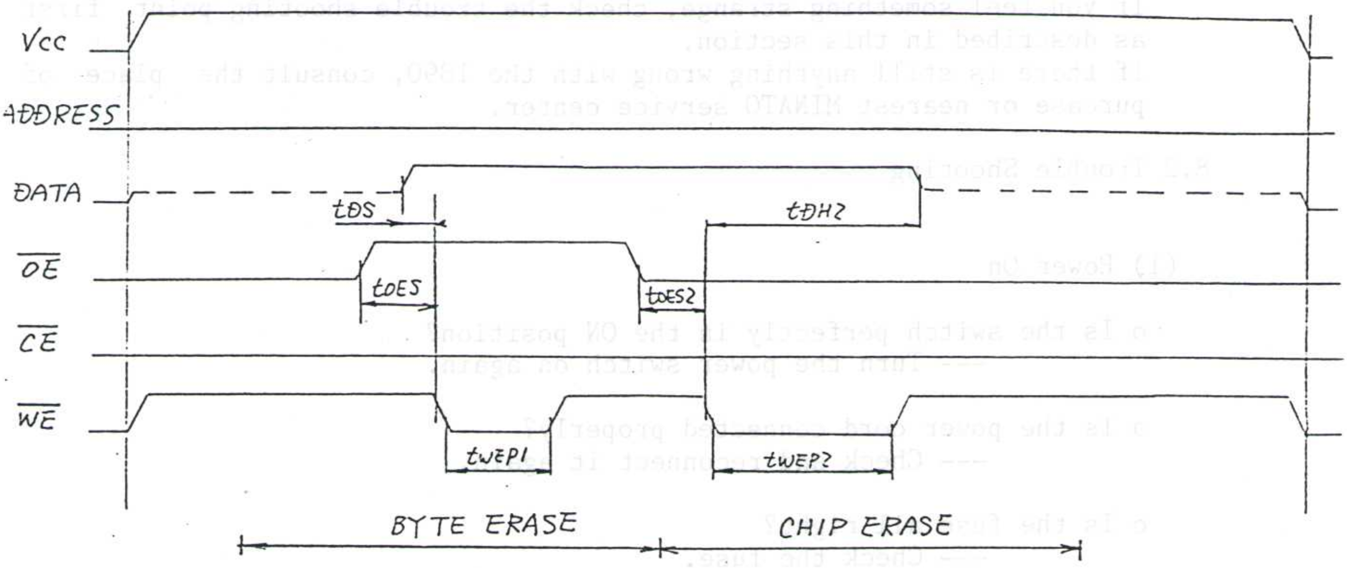
4. POWER OFF

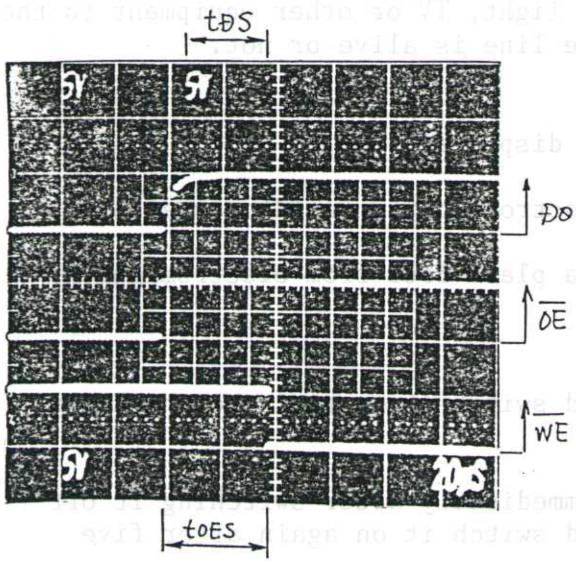


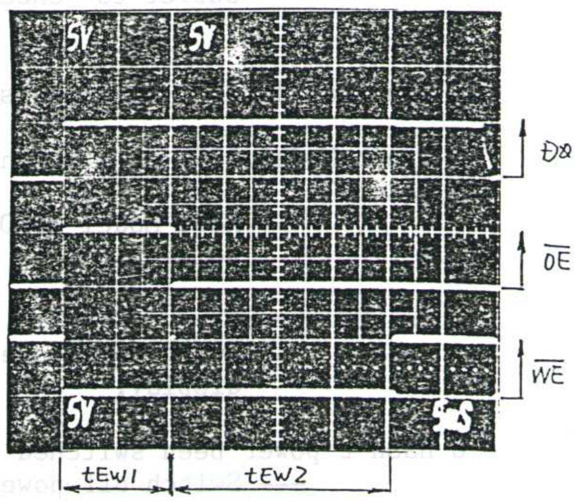
5. PROGRAM PULSE



58064 CHIPERASE







8 TROUBLE SHOOTING

8.1 Introduction

Some of the trouble shooting procedures are described in this section.

If you feel something strange, check the trouble shooting point first as described in this section.
If there is still anything wrong with the 1890, consult the place of purcase or nearest MINATO service center.

8.2 Trouble Shooting

(1) Power On

o Is the switch perfectly in the ON position?
--- Turn the power switch on again.

o Is the power cord connected properly?
--- Check and reconnect it again.

o Is the fuse all right?
--- Check the fuse.

o Is commercial power supplyed?
--- Connect an electric light, TV or other equipment to the outlet to check the line is alive or not.

(2) Abnormal data or charactors are displayed.

o Isn't Model 1890 in a strong electromagnetic field(near a large motor)?
--- Move Model 1890 to a place free from electromagnetic noise.

o Is LCD normal?
--- Switch off power and switch it on again to check the display.

o Hasn't power been switched on immedistely after switching it off ?
--- Switch off power and switch it on again after five seconds.

o Isn't the 1890 placed on static electricity generated?
--- Switch off power and switch it on again.

(3) Device error is displayed frequently.

o Is the socket lever down?
--- Set the device again.

o Have you made sure of the device name?
--- Set the device name and code again.

9 REPLACEABLE PARTS LIST

*** IMPORTANT ***

WE HAVE RECENTLY INTRODUCED NEW TYPE OF CIRCUIT BOARD WHICH USES SURFACE MOUNTING TECHNOLOGY INSTEAD OF OLD P.C. BOARD ARRANGEMENT.
BECAUSE OF THE DIFFICALTIES OF CHECKING AND REPLACING FAULTY COMPONENTS, THE FAULTY BOARD SHOULD BE REPLACED WITH A NEW ONE NOT EACH DEVICE ON THE BOARD.
WE ARE SURE THIS PROCEDURE WILL REDUCE YOUR MAINTENANCE TIME.

9.1 Introduction

This section describes the replaceable parts of the 1890.

Replaceable parts are based on printed circuit board or module, not on each component.

9.2 How to Obtain Parts

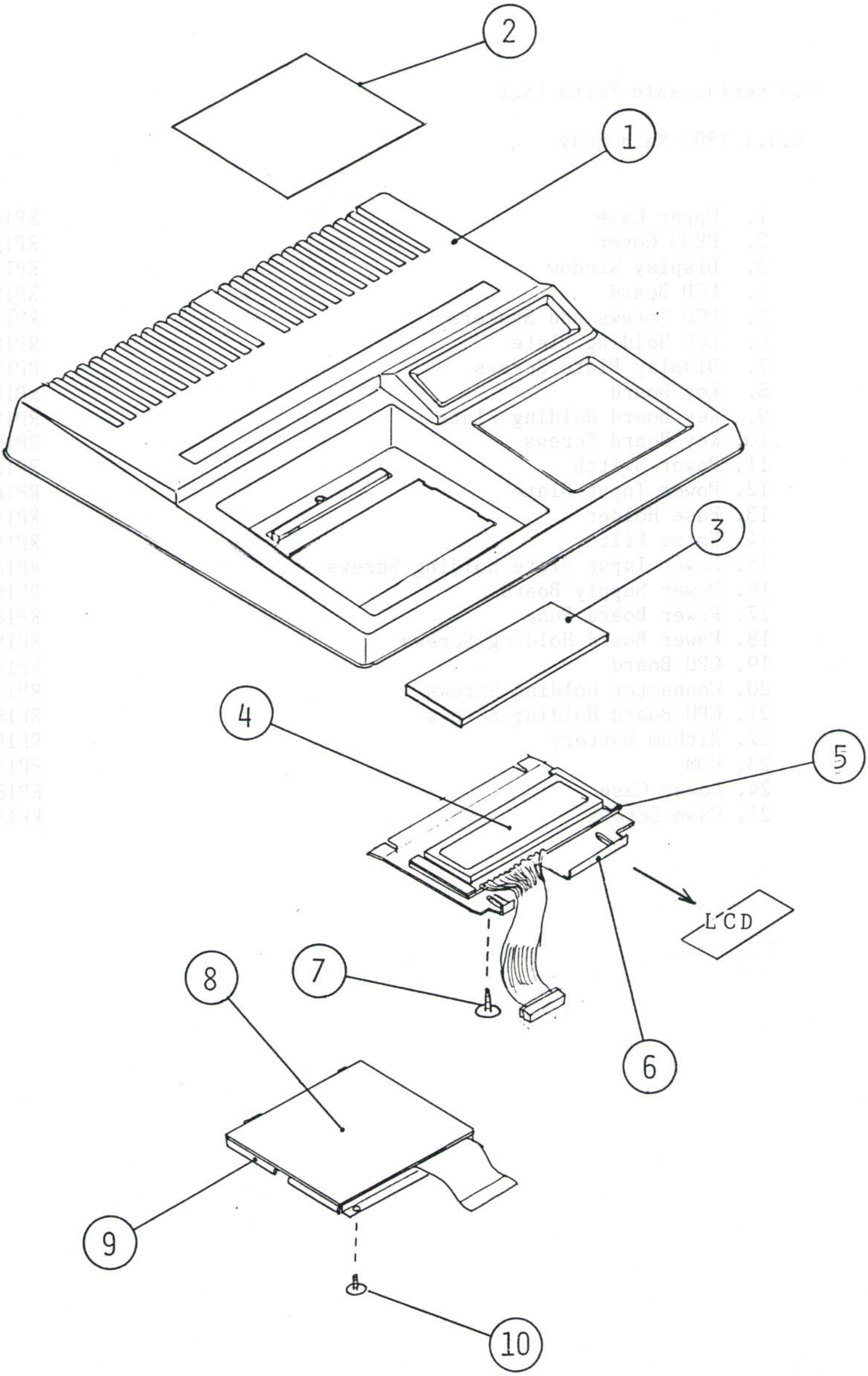
To ensure promt and efficient handling of your order, please include the following information

1. Parts No.
2. Description
3. Quantity
4. Instrument model and serial number

9.3 Replaceable Parts List

9.3.1 1890 Main Body

1.	Upper Case	RP1890-1
2.	PROM Cover	RP1890-2
3.	Display Window	RP1890-3
4.	LCD Board	RP1890-4
5.	LCD Screws and Spacers	RP1890-5
6.	LCD Holding Plate	RP1890-6
7.	Display Plate Screws	RP1890-7
8.	Key Board	RP1890-8
9.	Key Board Holding Plate	RP1890-9
10.	Key Board Screws	RP1890-10
11.	Power Switch	RP1890-11
12.	Power Input Plate	RP1890-12
13.	Fuse Holder	RP1890-13
14.	Noise Filter	RP1890-14
15.	Power Input Plate Holding Screws	RP1890-15
16.	Power Supply Board	RP1890-16
17.	Power Board Fuse	RP1890-17
18.	Power Board Holding Screws	RP1890-18
19.	CPU Board	RP1890-19
20.	Connecter holding Screws	RP1890-20
21.	CPU Board Holding Screws	RP1890-21
22.	Rithum Battery	RP1890-22
23.	ROM	RP1890-23
24.	Lower Case	RP1890-24
25.	Case Screws	RP1890-25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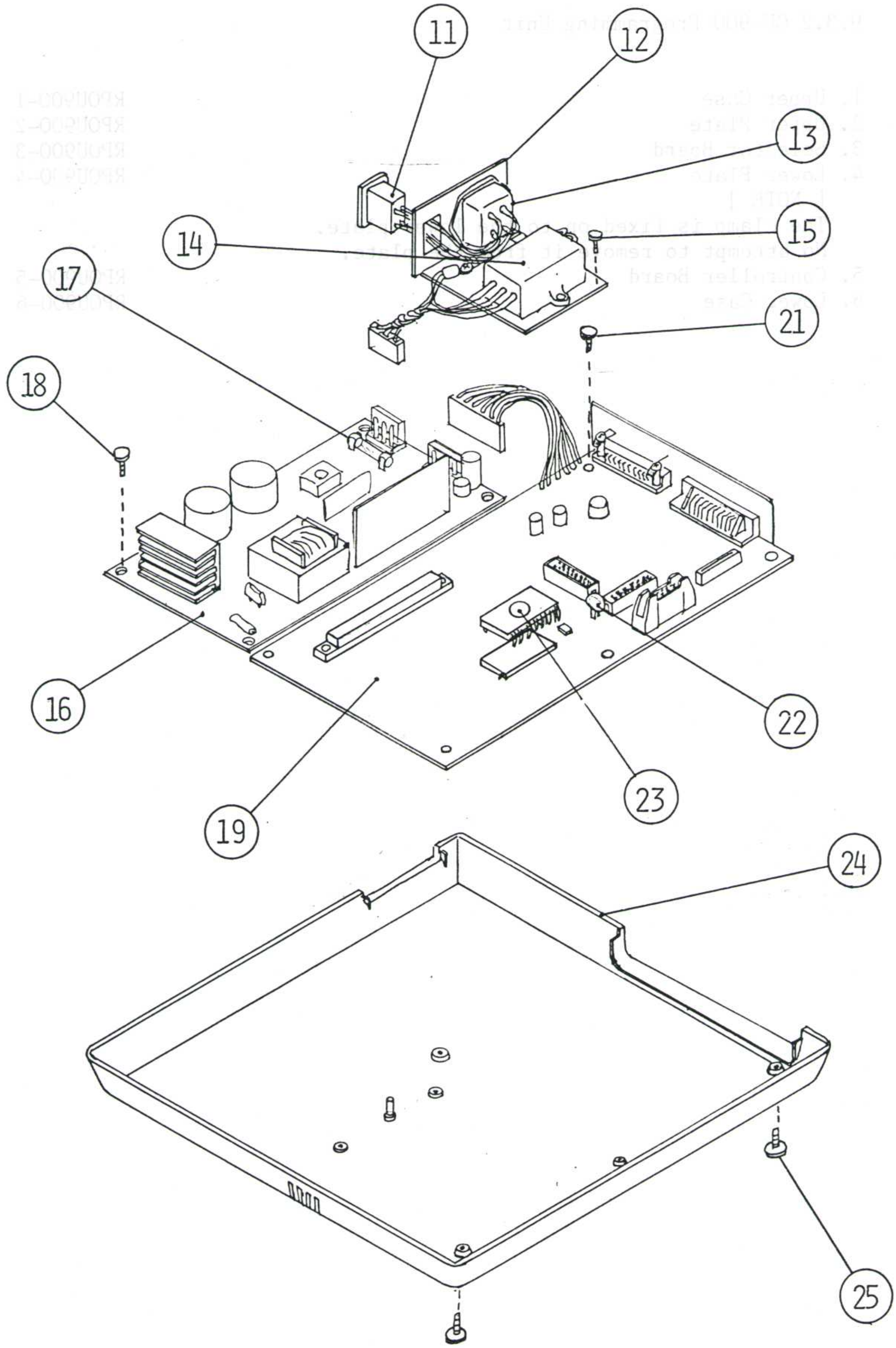
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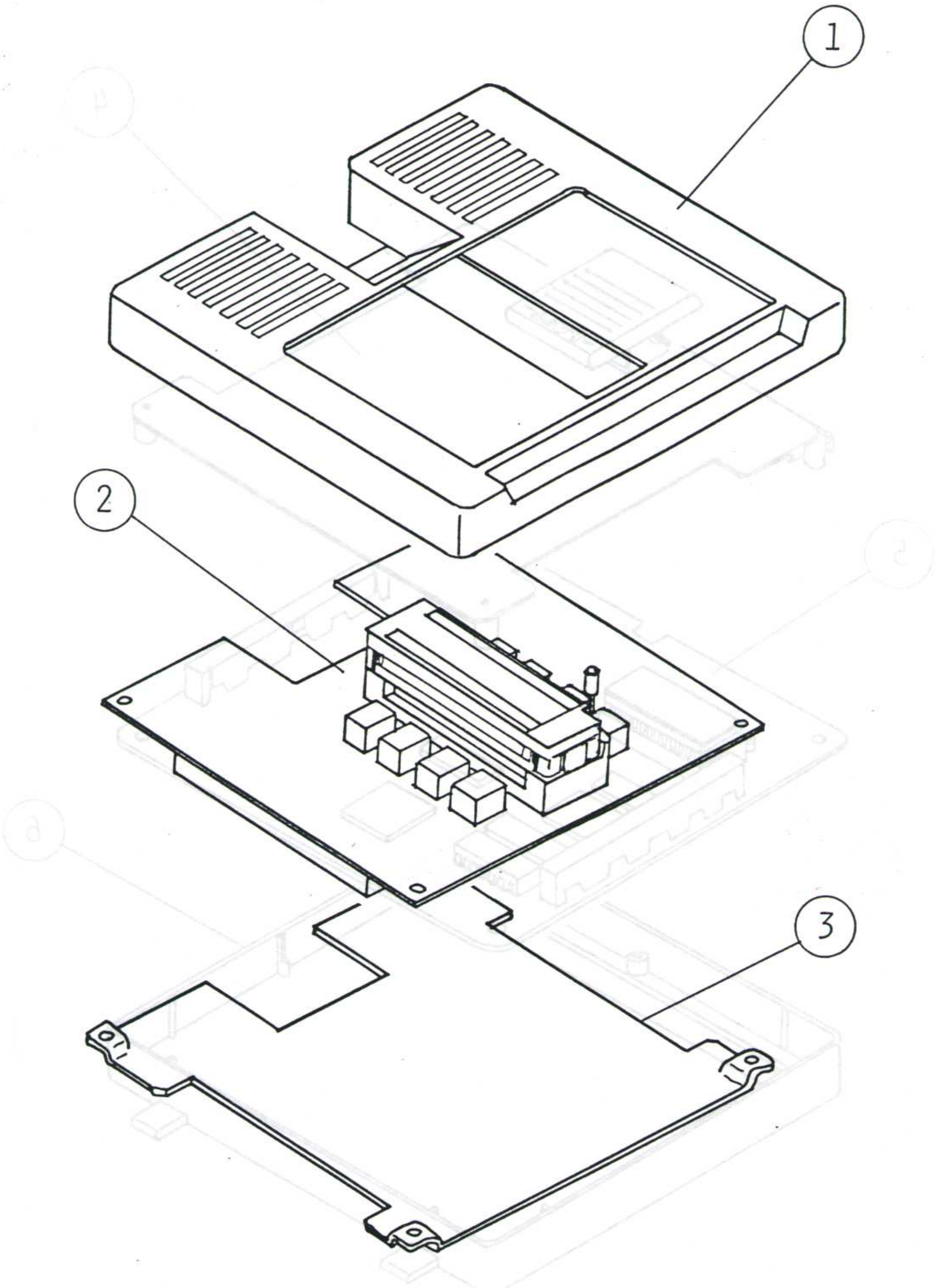
9.3.2 OU-900 Programming Unit

1. Upper Case RPOU900-1
2. Upper Plate RPOU900-2
3. Selector Board RPOU900-3
4. Lower Plate RPOU900-4
   [NOTE]
   The clamp is fixed on to the lower plate.
   No attempt to remove it from the plate.
5. Controller Board RPOU900-5
6. Lower Case RPOU900-6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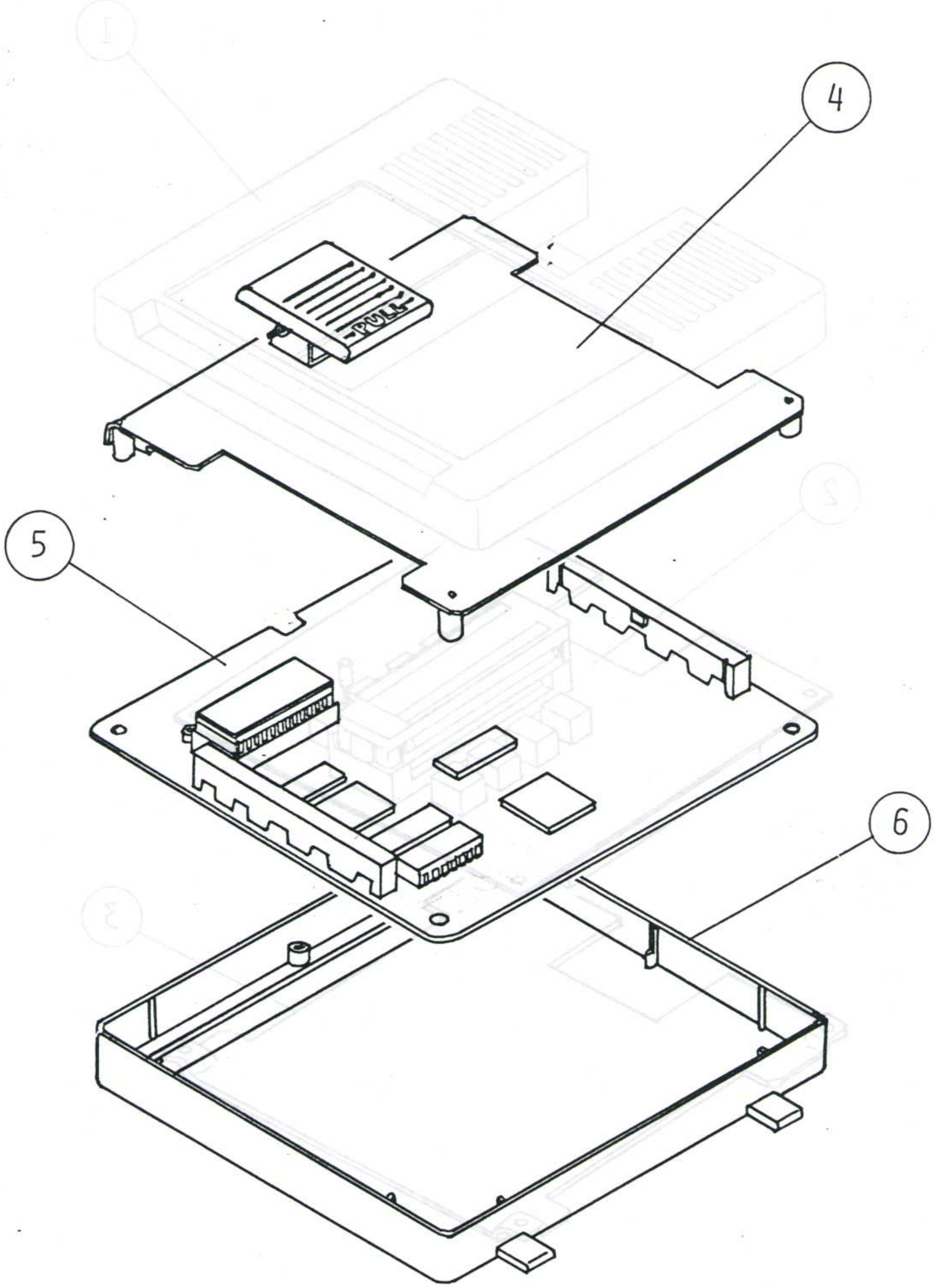
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6
PULL

10 INDEX