

# NOVA-300

## Embedded 386SX SBC

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# 1

## Introduction

Welcome to the NOVA-300 Embedded 386SX SBC. The NOVA-300 is an with PC/104 form factor board, which comes equipped with ALI 6117 (includes 386SX CPU) and advanced high-performance multi-mode I/O, designed for the system manufacturers, integrators, or VARs that want to provide all the performance, reliability, and quality at a reasonable price.

An advanced high performance super AT I/O chip Windbond W83877F and SMC FDC37C669 are used in the JUKI-730 board. Both on-chip UARTs are compatible with the NS16C550. And one COM port can be set in RS232,RS422,or RS485. The parallel port and IDE interface are compatible with IBM PC/AT and XT architecture's, as well as EPP and ECP.

The LCD/CRT controller is HMC HM86508 which can provide the LCD and CRT display at the same time. The LCD interface connector is a 44-pin 2.0mm pitch type.

The most outstanding feature in the NOVA-300 is built-in PC/104 expansion bus. Based on the PC/104 bus, you could easily install over thousands of PC/104 modules from hundreds' vendors in the world. The NOVA-300 has external power connector that could let it connects with power supply directly. It is more suitable for your standalone applications.

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### 1.1 Specifications :

The NOVA-300 Embedded 386SX SBC provides the following specification:

.. **System :**

- **CPU :** ALI 6117, includes 386SX CPU
- **DMA channels :** 7
- **Interrupt levels :** 15
- **Real-time clock/calendar :** backup by lithium battery for over 10 years of data retention.

.. **Memory :**

- **RAM memory :** 512KB to 32MB, only support single side 16-bit SIMM.
- **Shadow RAM memory :**  
System BIOS : 0F0000h ~ 0FFFFFFh

.. **LCD/CRT Interface :**

- **Chipset :** HM86508
- **Resolution :** Support up to 800 x 600 resolution for STN and TFT LCD Flat Panel. And Support 1024x768 256 colors for CRT display.
- **Display Memory :** 1MB on board.

.. **Input/Output :**

- **IDE hard disk drive interface :** Supports up to two IDE hard disk drives. Can be disabled by BIOS Setup.
- **Floppy disk drive interface :** Supports two 2.88 MB, 1.44MB, 1.2MB, 720KB, or 360KB floppy disk drives. Can be disabled by BIOS Setup.
- **Two high speed Series ports :** NS16C550 compatible UARTs with send/receive 16-byte FIFOs, data rates are independently programmable from 115.2K baud down to 50 baud. Modem control circuitry.

- **Multi-mode Parallel Port :**

Standard mode - IBM PC/XT, PC/AT, PS/2 compatible bi-directional parallel port.

Enhanced mode - Enhanced parallel port ( EPP) compatible with IEEE 1284 specification.

High speed mode - Microsoft and Hewlett Packard extended capabilities port ( ECP), compatible with IEEE 1248 specification.

- .. **Industrial features :**

- **Watch-dog timer :** can be set by 1,2,10,20,110,or 220 seconds period. Reset or NMI was generated when CPU did not periodically trigger the timer. Your program use hex 043 and 443 to control the watch-dog and generate a system reset.

- **PC/104 expansion bus :** A 64-pin and 40-pin, industrial embedded-PC bus standard.

- **External power connector :** 8-pin male connector ( Molex 26-60-4080 or equivalent one)

- **Keyboard connector :** A 5-pin header on board

- .. **General :**

- **Power Consumption :** +5V @ 1.53A ( 40MHz,8MB RAM)

- **Operating Temperature :** 0° ~ 55° C

- **Humidity :** 5% ~ 95%, non-condense

- **Dimension:** 180mm(W) x 122mm(L), standard AT form factor

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## 1.2 What You Have

In addition to this *User's Manual*, the NOVA-300 package includes the following items:

- NOVA-300 Embedded 386SX SBC

# 2

## Installation

This chapter describes how to install the NOVA-300. At first, the layout of NOVA-300 is shown, and the unpacking information that you should be careful is described. The jumpers and switches setting for the NOVA-300's configuration, such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port, are also included.

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### 2.1 NOVA-300's Layout

< reference next page >





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## **2.2 CPU Setting for NOVA-300**

- **CPU SPEED SETTING:**

The system clock is generated by the AV9155C-02, and the different CPU clock frequency can be selected by JP3 and shown as following table:

JP3	1-2	3-4	5-6
8MHz	OPEN	CLOSE	CLOSE
16Mhz	CLOSE	OPEN	CLOSE
20MHz	OPEN	OPEN	CLOSE
25MHz	CLOSE	CLOSE	OPEN
40MHz	CLOSE	OPEN	OPEN

---

## 2.3 System Memory DRAM

The system DRAM on board is divided into two banks, bank 0 and 1. The Bank 0 is the on board optional 4MB DRAM. Bank 1 is the one 72-pin SIMM. Based on the chipset function the 72-pin SIMM only support single side 16-bit DRAM. There have two jumpers for the related setting.

- **JP1/JP2 : 4MB DRAM and 72-pin SIMM selection**

Function	JP1	JP2
On Board 4MB	CLOSE	CLOSE
72-pin SIMM	OPEN	OPEN

---

## 2.4 Watch-Dog Timer

The Watch-Dog Timer is enabled by reading port 443H. It should be triggered before the time-out period ends, otherwise it will assume the program operation is abnormal and will issue a reset signal to start again, or activate NMI to CPU. The Watch-Dog Timer is disable by reading port 043H. The Watch-Dog Timer time-out period can be set 1,2,10,20,110 or 220 sec. by jumper JP16.

- **JP18 : Watch-Dog Active Type Setting**

JP18	DESCRIPTION
2-3	RESET WHEN WDT TIME-OUT
1-2	ACTIVATE NMI TO CPU WHEN WDT TIME-OUT
OPEN	DISABLE WDT

• **JP16 : WDT TIME-OUT PERIOD**

JP16	1-2	3-4	5-6	7-8
1sec	OPEN	OPEN	CLOSE	OPEN
2sec	OPEN	OPEN	CLOSE	CLOSE
10sec	<b>OPEN</b>	<b>CLOSE</b>	<b>OPEN</b>	<b>OPEN</b>
20sec	OPEN	CLOSE	OPEN	CLOSE
110sec	CLOSE	OPEN	OPEN	OPEN
220sec	CLOSE	OPEN	OPEN	CLOSE

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## 2.5 DiskOnChip™Flash Disk

The DiskOnChip™Flash Disk Chip(DOC) is produced by M-Systems. The DOC(MD-2200-xMB) is 32-pin DIP package. Because the DOC is 100% compatible to hard disk and DOS. Customer don't need any extra software utility. It is just "plug and play", easy and reliable.

Right now the DOC is available in 2MB to 72MB capacity.

• **JP19 : DiskOnChip™Memory Address Setting**

Address	1-2	3-4	5-6
CE000	CLOSE	OPEN	OPEN
D6000	<b>OPEN</b>	<b>CLOSE</b>	<b>OPEN</b>
DE000	OPEN	OPEN	CLOSE

---

## 2.6 Clear CMOS Setup

If want to clear the CMOS Setup(for example forgot the password you should clear the setup and then set the password again.),you should close the JP31 pin 3-4 about 3 seconds, then open again. Then take set back to close pin 2-3 for normal

operation mode.

- **JP31 : Clear CMOS Setup (Reserve Function)**

JP31	DESCRIPTION
2-3	Normal Operation
3-4	Clear CMOS Setup

---

## 2.7 Serial Port3(CN1) RS232/422/485 Setting

The Serial Port3 can be set in RS232 or RS422/ RS485 interface

by the Jumper JP20/JP23. If choose RS422/485 then will need the JP21 to set again for RS422 or RS485.

- **JP23 : COM3 RS-232 or RS-422/485 setting**

Description	JP23	JP20
RS-232	1-9 close 3-10 close 5-11 close 7-12 close	2-3
RS-422 or RS-485	1-2 close 3-4 close 5-6 close 7-8 close	1-2

- **JP21 : COM3 RS-422 or RS-485 setting**

JP21	DESCRIPTION
2-3	RS-422
1-2	RS-485

---

## 2.8 BIOS Flash Chip Vpp Setting

There have two type of Flash chip are possible to be installed, one is 5V Vpp and another one is 12V Vpp. The Vpp is supplied when do the programming function.

Function	JP24
5V Vpp	2-3
12V Vpp	1-2

---

## 2.9 Serial Port3/Port4 RI Pin Setting

The Port3 and Port4 can supply +5V or +12V power to the serial devices via RI pin(Pin 9) of the COM port connector. The max. current is 1A with fuse protection for the total two connector' s 5V/12V output..

- **JP9/JP29 : Port3(CN1),Pin 9**  
RI signal or 5V/12V output selection

Function	JP9	JP29
RI Signal	2-3	1-2
5V	1-2	1-2
12V	1-2	2-3

- **JP8/JP10 : Port4(CN2),Pin 9**  
RI signal or 5V/12V output selection

Function	JP8	JP10
RI Signal	2-3	1-2
5V	1-2	1-2
12V	1-2	2-3



# Connection

This chapter describes how to connect peripherals, switches and indicators to the NOVA-300 board. You can access most of the connectors from the top of the board while it is installed in the chassis.

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## 3.1 Floppy Disk Drive Connector

NOVA-300 board comes equipped with a 34-pin daisy-chain driver connector cable. The detailed pin assignment of the connector is specified as following table:

### • CN5 : FDC CONNECTOR

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GROUND	2	REDUCE WRITE CURRENT#
3	GROUND	4	N/C
5	GROUND	6	N/C
7	GROUND	8	INDEX#
9	GROUND	10	MOTOR ENABLE A#
11	GROUND	12	DRIVE SELECT B#
13	GROUND	14	DRIVE SELECT A#
15	GROUND	16	MOTOR ENABLE B#
17	GROUND	18	DIRECTION#
19	GROUND	20	STEP#
21	GROUND	22	WRITE DATA#
23	GROUND	24	WRITE GATE#
25	GROUND	26	TRACK 0#
27	GROUND	28	WRITE PROTECT#
29	GROUND	30	READ DATA#
31	GROUND	32	SIDE 1 SELECT#
33	GROUND	34	DISK CHANGE#

---

## 3.2 IDE Disk Drive Connector

You can attach two IDE( Integrated Device Electronics) hard disk drives to the NOVA-300 internal controller. The board comes equipped with a 40-pin flat-cable connector. The detailed pin assignment of the connector is specified as following table:

**• CN4: IDE Interface Connector**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	RESET#	2	GROUND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	GROUND	20	N/C
21	N/C	22	GROUND
23	IOW#	24	GROUND
25	IOR#	26	GROUND
27	N/C	28	BALE - DEFAULT
29	N/C	30	GROUND - DEFAULT
31	INTERRUPT	32	IOCS16#-DEFAULT
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GROUND

---

### 3.3 Parallel Port

This port is usually connected to a printer, The NOVA-300 includes an on-board parallel port, accessed through a 26-pin flat-cable connector CN12. The detailed pin assignment of the connector is specified as following table:

**• CN12 : Parallel Port Connector**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	STROBE#	2	DATA 0
3	DATA 1	4	DATA 2
5	DATA 3	6	DATA 4
7	DATA 5	8	DATA 6
9	DATA 7	10	ACKNOWLEDGE

11	BUSY	12	PAPER EMPTY
13	PRINTER SELECT	14	AUTO FORM FEED #
15	ERROR#	16	INITIALIZE
17	PRINTER SELECT LN#	18	GROUND
19	GROUND	20	GROUND
21	GROUND	22	GROUND
23	IOW#	24	GROUND
25	GROUND		

### 3.4 Serial Ports

The NOVA-300 offers four high speed NS16C550 compatible UARTs with Read/Receive 16 byte FIFO serial ports. These ports let you connect to serial devices or a communication network. One DB-9 connector and three 10-pin headers are provided by the NOVA-300. The detailed pin assignment of the connectors are specified as following tables:

• **Port1(CN17) : 2x5-pin Header**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	N/C

• **Port2(CN14) : 2x5-pin Header at RS-232 mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	N/C

• **Port3(CN1) : 2x5-pin Header at RS-422/485 mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	TX-	6	RX+
2	TX+	7	RX-
3		8	
4		9	
5		10	



• **Port3(CN1) and Port4(CN2) : 2x5-pin Header**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI or 5V/12V
5	GND	10	N/C

---

### 3.5 IrDA Infrared Interface Port

The NOVA-300 built-in IrDA port which support Serial Infrared(IR) or Amplitude Shift Keyed IR(ASKIR) interface. When use the IrDA port have to set SIR or ASKIR model in the BIOS' s Port2 setup. Then the normal RS-232 Port2 will be disabled.

• **CN6 : IrDA Connector**

PIN NO.	DESCRIPTION
1	5V
2	N/C
3	IR-RX
4	GND
5	IR-TX

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### 3.6 Keyboard/Mouse Connector

The NOVA-300 provides keyboard and mouse connectors, both are 5-pin heard connector.

• **CN18 : 5-pin Header Keyboard Connector**

PIN NO.	DESCRIPTION
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	N/C
4	GROUND
5	+5V

• **CN16 : 5-pin Header Mouse Connector**

PIN NO.	DESCRIPTION
1	MOUSE CLOCK
2	MOUSE DATA
3	N/C
4	GROUND
5	+5V

---

### 3.7 External Switches and Indicators

There are many external switches and indicators for monitoring and controlling your CPU board. These features are completely optional install them if you need them. The detailed pin assignment of the connectors is specified as following table:

• **CN7 : RESET BUTTON**

PIN NO.	DESCRIPTION
1	EXTERNAL RESET
2	GROUND

• **CN11 : IDE LED connector**

PIN-NO	DESCRIPTION
1	+5V
2	HDD ACTIVE#

• **CN8 : POWER LED & KEYLOCK**

PIN NO.	DESCRIPTION
1	POWER LED ANODE
2	KEY
3	GROUND
4	KEYLOCK
5	GROUND

---

### 3.8 External Power Connector

The NOVA-300 has an on-board external power connector CN21. The CN21 is compatible to EBX form factor board's power connector. The power connector type is Molex 26-60-4080 or equivalent one. The max, rating for each pin is 7A.

• **CN21 : EXTERNAL POWER CONNECTOR**

PIN NO.	DESCRIPTION
1	+5V
2	Ground
3	Ground
4	+12V
5	N/C
6	Ground
7	+5V
8	-12V

---

### 3.9 External Speaker

The NOVA-300 has its own buzzer, you also can connect to the external speaker through the connector CN3.:

- **CN3 : SPEAKER**

PIN NO.	DESCRIPTION
1	+5V
2	SPEAKER SIGNAL

---

### 3.10 PC/104 Connection Bus

The NOVA-300's PC/104 expansion bus let you attach any kind of PC/104 modules. The PC/104 bus is already become the industrial embedded PC bus standard, so you could easily install over thousands of PC/104 modules from hundreds of venders in the world.

**NOTE : NOVA-300 allows directly plug in PC/104 module, don't need PC/104 Connection Kit.**

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### 3.11 LCD Interface Connector

The NOVA-300 provides a 2x22-pin connector for the LCD flat panel interface.

- **CN20: LCD Interface Connector**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	+12V	2	+12V

3	GND	4	GND
5	+5V	6	+5V
7	FPVEE	8	GND
9	P0	10	P1
11	P2	12	P3
13	P4	14	P5
15	P6	16	P7
17	P8	18	P9
19	P10	20	P11
21	P12	22	P13
23	P14	24	P15
25	P16	26	P17
27	P18	28	P19
29	P20	30	P21
31	P22	32	P23
33	GND	34	GND
35	SHFCLK	36	FLM
37	M	38	LP
39	GND	40	ENABLK
41	GND	42	N/C
43	FPVDD	44	5V

4

# AMI BIOS Setup

The NOVA-300 use AMI BIOS for system configuration, and the AMI BIOS setup program is designed to provide maximum flexibility in configuring the system by offering various options which may be selected for end-user requirements. This chapter is written to assist you in the proper usage of these features.

---

## 4.1 Getting Start

When the system is powered on, the BIOS will enter the Power-On-Self-Test routines. These routines will be executed for System Test and Initialization and System Configuration Verification. After the POST routines are completed, the following message appears :

**" Hit < Del>, if you want to run SETUP"**

To access AMI BIOS Setup program, press <Del> key.

---

## 4.2 Standard CMOS Setup

Standard CMOS Setup is the first option on the main menu. The standard CMOS setup utility is used to configure the following features :

- i Date/Time,
- i Hard Disk Type,
- i Floppy Disk Type,

All of these features are almost the same as common, so we do not describe more detailed in here.

---

## 4.3 Advanced CMOS Setup

When you enter the Advanced CMOS Setup, this Setup program is equipped with a series of help screens, accessed by <F1> key, which will display the options available for a particular configuration features.

All the items on the left side of the screen are very common, they will not be mentioned here. Here, we just focus on some special items which are in NOVA-300 board only. These items are specified as following :

- j On-board IDE Controller : The IDE hard disk drive can be **Enable** or **Disable** by this item. When you do not need hard disk, the IDE controller can be disabled.
  - j On-board Floppy Controller : The floppy disk drive can be **Enable** or **Disable** by this item. When you do not need floppy disk, the FDD controller can be disabled.
  - j Serial Port 1 : default at 3E8 and IRQ11.
  - j Serial Port 2 : default at 2E8 and IRQ10 or set as IR function.
  - j Serial Port 3 : default at 3F8 and IRQ4.
  - j Serial Port 4 : default at 2F8 and IRQ3.
  - j Parallel Port : The options are **Disable**, **3BC**, **378** or **278**. You can set the I/O address of the parallel port or disable it.
  - j Parallel Port Mode : NOVA-300 provides **EPP**, **ECP**, **ECP+EPP**, and **Normal Mode**.
- Primary Display : You could set **VGA/EGA**, **CGA40x25**, **CGA80x25**, **Mono** or **Absent**. When set Absent the NOVA-300 will not check the display adapter when power on the system.
- System Keyboard : You could set **Present** or **Absent**. When set Absent the NOVA-300 will not check the display adapter when power on the system.

## Appendix A. E<sup>2</sup> Key™ Function

The NOVA-300 provides an outstanding E<sup>2</sup>KEY™ function for system integrator. Based on the E<sup>2</sup>KEY™ you could free to store

the ID Code, Pass Word, or Critical Data in the 1Kbit EEPROM. Because the EEPROM is nonvolatile memory, you don't have to worry the losing of the very important data.

Basically the E<sup>2</sup>KEY™s based on a 1Kbit EEPROM which is configured to 64 words(from 0 to 63). You could access(read or write) each word at any time.

When you start to use the E<sup>2</sup>KEY™you should have the utility in the package. The software utility will include four files as follows,

**README.DOC**  
**E2KEY.OBJ**  
**EKEYDEMO.C**  
**EKEYDEMO.EXE.**

The E2KEY.OBJ provides two library function for user to integrate their application with E<sup>2</sup>KEY™function. These library (**read\_e2key and write\_e2key**) are written and compiled in C format. Please check the following statement, then you will know how to implement it easily.

**unsigned int read\_e2key(unsigned int address)**

/\* This function will return the E<sup>2</sup>KEY™s data at address. The address range is from 0 to 63. Return data is one word,16 bits \*/

**void write\_e2key(unsigned int address,unsigned data)**

/\* This function will write the given data to E<sup>2</sup>KEY™at address. The address range is from 0 to 63. The data value is from 0 to 0xffff. \*/

To easy start to use the function, please refer the include EKEYDEMO.C code at first.

Please note the E<sup>2</sup>KEY™function is based on the working of parallel port. So you should enable the NOVA-300's parallel port, otherwise will be not working.

If you need Windows NT or 95 driver, then please download the driver from <ftp.icpacquire.com.tw> server.

## Appendix B. Watch-Dog Timer

The Watch-Dog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that caused the CPU to crash. This condition may have occurred by external EMI or a software bug. When the CPU stops working correctly, hardware on the board will either perform a hardware reset (cold boot) or a non-maskable interrupt (NMI) to bring the system back to a known state.



The Watch-Dog Timer is controlled by two I/O ports.

443 (hex)	Read	Enable the refresh the Watch-Dog Timer.
043 (hex)	Read	Disable the Watch-Dog Timer.

To enable the Watch-Dog Timer, a read from I/O port 443H must be performed. This will enable and activate the countdown timer which will eventually time out and either reset the CPU or cause an NMI depending on the setting of JP18. To ensure that this reset condition does not occur, the Watch-Dog Timer must be periodically refreshed by reading the same I/O port 443H. This must be done within the time out period that is selected by jumper JP16.

A tolerance of at least 30% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time consuming. Therefore if the time out period has been set to 10 seconds, the I/O port 443H must be read within 7 seconds.

---

Note: when exiting a program it is necessary to disable the Watch-Dog Timer, otherwise the system will reset.

---

## Appendix C. Panel Support List

The NOVA-300 supports a wide range flat panels. The different flat panel will need different LCD drive BIOS. The default setting is for Color DSTN flat panel. The available BIOS for different panels are in the following list. Please note all the BIOS files already included the system BIOS and LCD drive

BIOS,customer only need to re-program the BIOS flash chip with the file,then power on again.

**MLCD.ROM – BIOS for MONO DSTN 640x480**

For example : HOSIDEN HLM6667  
HITACHI LMG5160XUFC  
CASIO MD650TS00-01  
OPTREX DMF\_50260NFU-FW-8

**DSTN.ROM – BIOS for Color DSTN 640x480**

For example : SANYO LCM-5331-22NTK  
SHARP LM64C35P

**TFT\_S1.ROM – BIOS for TFT 640x480-SYNC (16-bit)**

**TFT\_S2.ROM – BIOS for TFT 640x480-SYNC (18/24-bit)**

For example : HITACHI TX26D60/TX24D55  
TOSHIBA LTM09C015A  
SHARP LQ10D321

**TFT\_LP1.ROM – BIOS for TFT 640x480-LP(16-bit)**

**TFT\_LP2.ROM – BIOS for TFT 640x480-LP(16/24-bit)**

For example : TOSHIBA LTM09C015A

**TFT86\_S1.ROM – BIOS for TFT 800x600-SYNC(16-bit)**

**TFT86\_S2.ROM – BIOS for TFT 800x600-SYNC(18/24-bit)**

For example : NEC NL8060AC26-05  
NEC NL8060AC26-04  
NEC NL8060BC31-02

**EL.ROM – BIOS for EL 640x480**

For example : PLANAR EL640.480-A

**PLASMA.ROM – BIOS for PLASMA 640x480**

For example : PANASONIC S817

## **How to update the BIOS by yourself ?**

1. Use EPROM Programmer setting the right Flash type and then write the file into the Flash.

To use this method,you should carefully take the Flash chip out of socket and then put it back after finish the programming.

Usually the flash type is : ATMEL AT29C010A

Or,

2. There also have a utility (**FLASH634.COM**) and directly re-program the BIOS under DOS.  
For example :

```
C:>FLASH634 MLCD.ROM
```