

JUKI-730 Version 3.0

386SX with LCD/CRT

& 4COM SBC

User Manual

Version 3.1

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1. Introduction

Thank you for choosing JUKI-730 386SX with LCD/CRT/4COM Single Board Computer. The JUKI-730 is an ISA with PC/104 form factor board, which comes equipped with ALI 6117 (386SX CPU included) and an 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 architectures, as well as EPP and ECP.

The LCD/CRT controller is TOPRO TP-6508, which can provide both 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 JUKI-730 is the built-in PC/104 expansion bus. Based on the PC/104 bus, you could easily install over thousands of PC/104 modules manufactured by hundreds of vendors worldwide. Aside from that, the JUKI-730 has an external power connector that allows direct connection to a power supply making it more suitable for your standalone applications.

1.1 Specifications

- **System :**
 - ✓ **CPU:** ALI 6117, includes 386SX CPU
 - ✓ **DMA channels:** 7
 - ✓ **Interrupt levels:** 15
 - ✓ **Real-time clock/calendar:** DS12887/BQ3287 or equivalent chip and quartz oscillator, 128B CMOS memory, powered 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:** C0000h ~ DFFFFh
 - ✓ **System BIOS:** 0E0000h ~ 0FFFFFFh

- **LCD/CRT Interface:**
 - ✓ **Chipset:** TP-6508
 - ✓ **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 through BIOS Setup Menu setting.
- ✓ **Floppy disk drive interface:** Supports two 2.88 MB, 1.44MB, 1.2MB, 720KB, or 360KB floppy disk drives. Can be disabled through BIOS Setup Menu setting.
- ✓ **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. The modem controls the 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 to 1,2,10,20,110,or 220 seconds per 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 6410 series compatible)

- ✓ **Keyboard connector:** A 5-pin header on board and 6-pin mini-DIN keyboard connector is located on the mounting bracket.

 - **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.
-

1.2 Package Contents

In addition to this *User's Manual*, the JUKI-730 package includes the following items:

- One JUKI-730 386SX with LCD/CRT/4COM Single Board Computer
- One RS-232/Printer Cable & RS-232 x 2 Cable
- One FDD/HDD Cable

2. Installation

This chapter describes how to install the JUKI-730. First, the layout of JUKI-730 is shown, and then the unpacking information that you should be careful with is described. After that comes the setting for jumpers and switches for the JUKI-730's configuration, with information such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port and other such settings.

2.1 JUKI-730's Layout

<Please turn to the next page >

2.2 CPU Setting for JUKI-730 Ver. 3.0

- **CPU SPEED SETTING:**

The system clock is generated by the AV9155C-02, and different CPU clock frequency can be selected through JP3 setting in the manner shown in the 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

The system DRAM on board is divided into two banks, bank 0 and 1. Bank 0 is the on board optional 2/4MB DRAM. Bank 1 is a 72-pin SIMM. Based on the chipset function the 72-pin SIMM only supports single side DRAM. There are two jumpers related to this setting.

- **JP1/JP2 : 2/4MB DRAM and 72-pin SIMM selection**

Function	JP1	JP2
On Board 2/4MB	CLOSE	CLOSE
72-pin SIMM	OPEN	OPEN

2.4 Watch-Dog Timer

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

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. As DOC is 100% compatible to hard disk and DOS, users don't need to install any extra software utility. 'Plug and play' function is not only easy to use but also reliable. Currently, DOC is available from 2MB to 72MB in capacity.

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

Address	1-2	3-4	5-6
CE000	CLOSE	OPEN	OPEN
D6000	OPEN	CLOSE	OPEN
DE000	OPEN	OPEN	CLOSE

2.6 BIOS Flash Chip Vpp Setting

There are two types of Flash chips that can be installed unto this board, one is 5V Vpp and the other is 12V Vpp. The Vpp is provided to undergo programming functions.

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

2.7 Clear CMOS Setup

If you want to clear CMOS Setup (for example you forgot the password then you should clear the setting and then reset the password), you should close JP13 for about 3 seconds, then reopen it. To set back to normal operation mode please take

off the jumper. If the RTC Chip is Dallas DS12B887 then you should finish this procedure while the board is in power on mode.

- **JP13 : Clear CMOS Setup (Reserve Function)**

JP13	DESCRIPTION
OPEN	Normal Operation
CLOSE	Clear CMOS Setup

2.8 COM3(CN17) RS232/422/485 Setting

COM3 can be set in RS232 or RS422/ RS485 interface using Jumper JP20/JP23. If you select RS422/485 then you need to reset JP21 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

2.9 COM3/COM4 RI Pin Setting

COM3 and COM4 can supply +5V or +12V power to the serial devices via RI pin (Pin 9) of the COM port connector. The maximum current provided is 1A with fuse protection for total of two connectors' 5V/12V outputs.

- **JP9/JP29 : COM3(CN17),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 : COM4(CN14),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

3. Connection

This chapter describes how to connect peripherals, switches and indicators to the JUKI-730 board. You can access most of the connectors from the top of the board while it is installed inside the chassis.

3.1 Floppy Disk Drive Connector

JUKI-730 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 JUKI-730 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 JUKI-730 includes an on-board parallel port, which is accessed through a 26-pin flat-cable connector CN12. The detailed pin assignment of the connector is specified in the 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 JUKI-730 offers two 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 JUKI-730. The detailed pin assignment of the connectors are specified as following tables:

- **COM1(CN1) : Serial Port Connector**

PIN NO.	DESCRIPTION
1	DATA CARRIER DETECT (DCD)
2	RECEIVE DATA (RXD)
3	TRANSMIT DATA (TXD)
4	DATA TERMINAL READY (DTR)
5	GROUND (GND)
6	DATA SET READY (DSR)
7	REQUEST TO SEND (RTS)
8	CLEAR TO SEND (CTS)
9	RING INDICATOR (RI)

- **COM2(CN21) : 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

- **COM3(CN17) : 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	

- **COM3 (CN17) and COM4(CN14) : 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 JUKI-730 built-in IrDA port which support Serial Infrared (IR) or Amplitude Shift Keyed IR(ASKIR) interface. When you need to use the IrDA port, you will have to configure SIR or ASKIR model in the BIOS's COM2 setup. Then the normal RS-232 COM2 will be disabled.

- **CN6 : IrDA Connector**

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

3.6 Keyboard/Mouse Connector

The JUKI-730 provides two keyboard connectors. A 5-pin header connector CN18 supports passive backplane applications. Another one is a 6-pin Mini-DIN connector CN19 on the board mounting bracket for single board computer applications.

· CN18 : 5-pin Header Keyboard Connector

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

· CN19/16 : 6-pin Mini-DIN Keyboard/Mouse Connector

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

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 so please install them if you need them. The detailed pin assignment of the connectors is specified in the 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 JUKI-730 has an on-board external power connector CN13. You can connect power directly to the CPU board for some single-board-computer (without passive backplane) application.

. **CN13 : EXTERNAL POWER CONNECTOR**

PIN NO.	DESCRIPTION
1	+5V
2	+12V
3	-12V
4	GROUND
5	GROUND

6	-5V
7	+12V
8	+5V

3.9 External Speaker

The JUKI-730 has its own buzzer, you can also connect an external speaker through the connector CN3.:

· **CN3 : SPEAKER**

PIN NO.	DESCRIPTION
1	GROUND
2	SPEAKER SIGNAL

3.10 PC/104 Connection Bus

The JUKI-730's PC/104 expansion bus allows you to attach any kind of PC/104 modules onto it. The PC/104 bus has already become the industrial embedded PC bus standard, so you could easily install over thousands of PC/104 modules coming from hundreds of vendors worldwide.

NOTE: JUKI-730 allows direct plug in of PC/104 modules so don't need to use the PC/104 Connection Kit.

3.11 LCD Interface Connector

The JUKI-730 provides a 2x22-pin connector suitable for LCD flat panel interfaces.

• **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 JUKI-730 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 to fit end-users' individual demands. This chapter is written to demonstrate how you can use these features properly.

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, 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 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:

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

All of these features are very commonly seen so we here do not describe in detail.

4.3 Advanced CMOS Setup

After you enter the Advanced CMOS Setup you will see that this Setup program is equipped with a series of help screens, accessed through pressing <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 so they will not be mentioned within this manual. Here, we will focus on some special items that are only found in JUKI-730. These items are specified below:

- On-board IDE Controller : The IDE hard disk drive can be **Enable** or **Disable** through this item. When you do not need the hard disk, the IDE controller can be disabled.
- On-board Floppy Controller : The floppy disk drive can be **Enable** or **Disable** through this item. When you do not need floppy disk, the FDD controller can be disabled.
- Serial Port 1 : The options are **Disable**, **3E8,2F8**, or **3F8**. You can either set the I/O address of the serial port (COMA) or disable it.
- Serial Port 2 : The options are **Disable**, **2E8,3F8**, or **2F8**. You can either set the I/O address of the serial port 1 (COMB) or disable it.
- Parallel Port : The options are **Disable**, **3BC**, **378** or **278**. You can either set the I/O address of the parallel port or disable it.
- Parallel Port Mode : JUKI-730 provides **EPP,ECP,ECP+EPP**, and **Normal Mode**.
- Primary Display : You could set **VGA/EGA**, **CGA40x25**, **CGA80x25**, **Mono** or **Absent**. When configured to **Absent**, JUKI-730 will not check the display adapter while powering on the system.

System Keyboard : You could set **Present** or **Absent**.
When set *Absent*, JUKI-730 board will not check the display adapter while powering on the system.

Appendix A. E² Key™ Function

The JUKI-730 provides an outstanding E2KEY™ function for system integrator. Based on the E2KEY™ you could free to store the ID Code, Pass Word, or Critical Data in the 1Kbit EEPROM. Because the EEPROM is a nonvolatile memory, you don't have to worry about losing very important data.

Basically the E²KEY™ is based on a 1Kbit EEPROM, which is configured to 64 words (from 0 to 63). You could access (read or write) each word anytime.

When you need to use E²KEY™ please find the utility enclosed in the package. The software utility will include the following four files

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

E2KEY.OBJ provides two library function for user to integrate their application using E²KEY™ function. These libraries (**read_e2key** and **write_e2key**) are written and compiled in C format. For easy implementation, please refer to the following statements.

unsigned int read_e2key(unsigned int address)

/* This function will return the E²KEY™ '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 E²KEY™ at address. The address range is from 0 to 63. The data value is from 0 to 0xffff. */

For easy start, please refer to the included EKEYDEMO.C code first.

Please note the E²KEY™ function is based on the working of parallel port. So you should enable the JUKI-730's parallel port, otherwise will not be working.

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 a reset action of the CPU or cause an NMI will occur 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

JUKI-730 supports a wide range flat panels. Different flat panels will need different LCD drive set in the BIOS Setup Menu. The default setting is for Color DSTN flat panel. The available BIOS for different panels are listed below. Please note that all BIOS files already include system BIOS and LCD drive BIOS, so you 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

Appendix D. How to Update the BIOS

1. You can use EPROM Programmer setting to configure the right type of Flash then write the file into the Flash. To apply this method, you should carefully take Flash chip out of socket and then put it back after you finish programming. Most commonly seen flash type is: ATMEL AT29C010A

Or,

2. There is also a utility (**FLASH634.COM**) that can be used to re-program the BIOS directly under DOS environment.

For example:

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