

ECS 286
USER'S MANUAL

*An Intelligent
16-Bit Microcomputer
Multi-Speed In One*

REV-B

A NOTE TO THE USER

This manual is only for reference. Any further modification will not deliver any notice.

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1.1 THE SYSTEM UNIT

The System Unit is the main part of your personal computer. The system main board, disks drive(s), and switching power supply are all housed in it. It performs all of the processing functions, as well as controls the operations of your system through a set or a series of your instructions called a program.

There are two indicative lights and one key lock on the front panel. When you turn on the power switch, the light marked "POWER" will light up. The other light goes on when the system is using the hard disk. The key lock is used for access security if key lock is turned to the "OFF" position, the cover of the system unit will be locked and the system can not accept any message from keyboard.

The two LED indicators on the front panel of the computer will be lit up when the system is fully powered on. The red LED indicates that the system is powered on. The green LED will be lit when the system accesses the hard disk. If your system is not installed with a hard disk, the green LED will be lit up only when the system unit is first powered on. There are two buttons on the front panel: "Reset Button". When the Button is pushed to the "ON", the system will function as cold start. "TURBO Button" is used for System Speed selection.

Before you power on your system unit, please take a moment to read the following procedures and view the diagrams. Be sure that all power of your system is off.

Open disk drive A by turning the lock of the disk drive counterclockwise, then you may load your diskette.

Please be careful: Do not put a diskette into the disk drive before turn the system power on or off. To load a diskette into the disk drive, place it as shown in the diagram below in clockwise direction.

The power, brightness, and contrast controls should be located on the front of your monitor. If the controls are not located on the front of the monitor, refer to the operating or user's manual controls clockwise, to control the brightness and contrast of the display resolution. Make sure that the power control has been turned on before you begin to adjust the brightness and/or contrast controls on your monitor. The resolution of the display monitor can be adjusted as users like.

Now, you can power on your system unit.

1.2 The Keyboard Unit

The keyboard has 101 (or 83) keys with the tactile feeling. When a key is pressed for longer than half a second, it will repeat automatically at the speed of about 15 characters per second.

The keyboard is divided into the following sections:

- 1) The typewriter key area
- 2) The function keys
- 3) The numeric keypad
- 4) Multi-key commands

There are three status lights on the top right-hand corner of the keyboard to indicate the status of the Caps Lock, Num Lock, and Scroll Lock Keys.

The keyboard internally has a 16 bytes buffer.

While a program is running, you can type up to 16 characters, including the enter key, to be stored in the buffer. When the program has been executed, the characters that you typed in will be immediately displayed on the screen. If you have already pressed the enter key, the command will be executed.

This buffer has several advantages. No matter how fast you type, or when a command is entered, the characters will be stored temporarily in the buffer until the microprocessor is ready for processing, and no characters will be lost. You don't need to wait until the computer system has completed executing a command before typing in the next command.

Typing more than 16 character will cause a beep, which signifies that these characters will not be processed.

+ The Typewriter Key Area +

The typewrite key area is the basic part for data entry. If you press a key while pressing the shift key, the uppercase character of that key will be shown on the screen of your monitor. (Pressing the Caps Lock key first, and then entering a alphabet will produce the same effect.) Pressing the key without using the shift key will "echo" a lowercase character. Pressing the space bar will move the cursor one position to the right.

Special characters and punctuation marks are displayed when used the shift keys with character/punctuation key.

+
Return
+

The enter key is always used for "CONFIRM" or "ENTER". It is equivalent to the carriage return in the typewriter. The cursor will be moved to the beginning of the next line.

+
back
space
+

The backspace key is located on the right topmost row. Pressing this key will move the cursor one position to the left of its current position. But unlike the typewriter, this will also delete the character from the position the cursor has moved into.

+
TAB
+

The Tab key shifts the cursor eight spaces to the right. Pressing the Tab key, while the shift key is held down, the cursor will move eight spaces to the left.

+
Shift
+

The keyboard supports two shift keys performing the same function. This key is used to switch the keys in the typewriter key area and numeric keypad from lowercase to uppercase.

+
Caps
Lock
+

This key is used for entering uppercase alphabets. When press the "Caps Lock" key, which is located on the last row, the light labeled "Caps Lock" on the top right-hand corner of the keyboard will go on. To return to the lowercase mode, press the "Caps Lock" again.

+
Ctrl
+

This key is always used with other key(s) to perform a certain function or command.

+
Alt
+

Different softwares use this key differently. The documentation of the specific programs will instruct you on the usage of this key.

+
Function Key
+

Under MS-DOS, the purpose of the first six function keys are mainly used for editing. A brief description of their functions is given below.

+
F1
+

F1 is used for displaying one character from the template* each time you enter this key. The same results can be achieved by using the right direction arrow key ("6" on the numeric keypad). For example, type "Personal Computer" from the keyboard and press F5 to enter the characters into the template. Press the F1 key 17 times and all the characters, one character at a time, will be displayed.

+
F2
+

Enter the key F2 and a character will display all characters preceding the specified character. The specified character and the succeeding characters will not be displayed.

For example, press key F2 and then "C" will immediately display "Personal" on the screen. Entering key F3 will redisplay "Computer" after the word "Personal".

* Template is a temporary storage area of the last entered line.

+
F3
+

At one keystroke, F3 will copy all characters from the template to the screen.

+
F4
+

This key will delete all characters preceding a specified character. The specified character and all characters after it will be displayed when this key is pressed.

Let's continue with the above example. Enter key F4 and "C". Nothing seemed to have happened. But don't worry, press the F3 key, "Computer" will be shown on the screen.

+
F5
+

Pressing key F5 will send all characters to the template without sending them into the computer for processing.

For example, from the MS-DOS prompt A>, enter "Personal Computer" and press key F5, a "@" will be displayed at the end of the line and the cursor will move to the beginning of the next line. Now enter the key F3, all the characters that you just typed into the template will be displayed.

+
F6
+

Before closing a file, the F6 is pressed to enter the end-of-file character (^Z) an integral part of the file. For most files, this is not necessary. But should you need to let DOS know that it has reached the end of file, then ^Z is required.

+
Other editing Keys
+

With the six function keys, there are three more keys that are used with the function key for editing. The "Del" and "Ins" keys are at the bottom of the numeric keypad, and the "ESC" key is on the upper row of the numeric keypad.

+
Ins
+

Ins will insert characters anywhere in the line. The "Ins" key is placed at the bottom of the numeric keypad. For example, type in "Personal Computer". Press F5 to enter these characters into the template. Press F1 until "Personal" is displayed on the screen. Enter "Ins" key once, and type in "micro". Now press the "Ins" key again to exit from the insert mode, and when you press F3 "Personal microcomputer" will be put on the screen.

+
Delete or Del
+

Del key will delete character from the template, although the cursor on the screen will not move. "Del" is located at the bottom of the numeric keypad.

Using the above example, press F1 until "Personal" appears on the screen. Enter "Del" key five times before pressing F3. Now "Personal computer" will be put on the screen.

+
Esc
+

The Esc key will cancel the current line. However, the characters in the template remain unchanged. Enter "Personal computer", and press F5 key. Now don't press the return key but enter the "Esc" key. You will see :

A>Personal computer\

The cursor has moved to the next line. Either you can enter new data, and remove the previous data from the template, or you can press key F3 to redisplay "Personal computer".

+
The Numeric Keypad
+

On the right of the keyboard is the numeric keypad. The keys have two specific functions. It's either in the numeric or cursor control mode. The default is for cursor control, i.e., each time when you power on your computer, the numeric keypad is automatically in the cursor control mode.

When you are in the cursor control mode, the cursor can be shifted one space to any one of the four directions as indicated on the key top. To move the cursor more than one space, you are required to either press the key longer than 0.5 second, or release the key and repeat the number of presses as needed.

To enter the numeric mode, press the "Num Lock" key. The "Num Lock" indicator light goes on, indicating you are in the numeric mode. The keys are arranged like a calculator to make them more convenient to use than the keys on the first row of the typewriter key area, when you need to input a great deal of number.

+
PrSc
+

Pressing this key once will print an asterisk (*) on the screen. If you press shift key and this key together, all the data on the screen will be printed on the printer. When used with the "Ctrl" key each line of data will be printed as they are entered from the keyboard.

+
Scroll
Lock
Break
+

This key is used to determine the movements of the text on the screen when the cursor reaches the top line of the screen or the bottom of the screen. Pressing it once will cause the light labeled "Scroll Lock" on the top right-hand corner of the keyboard to go on. To lock it off, press it again.

When this key is locked on, the cursor-up and the cursor-down keys move the text on the screen up or down one line without moving the cursor from its original position.

There is another function key installed on this key. It is the "Break" key, which is generally used with the "Ctrl" key to terminate the execution of a program or command being run. For more detail information of this "Break" key, refer to the manual related to your own application programs or operating system.

+
Sys
Req
+

The function of this key is defined for 3270 application programs or operating system.

+
O
Ins
+

This key is used by application PGM (for example wordstar) to present "insert character(s)" anywhere in a line. When a character is inserted, all the data to the right of the cursor move one position to the right. Under certain software applications, pressing this key once will cause the screen to toggle to the "Insert On" mode. It means that press this key again will get into "Insert Off".

+
Del
+

This key is used by application PGM to erase the character where the cursor is positioned. When a character is deleted from a line, all the characters to the right of the cursor move one position to the left.

+
-
+

This key is used to enter the minus symbol.

+
+
+

This key is used to enter the plus symbol.

Cursor Control Keys in the Numeric Keypad

The cursor control keys as shown in the following figure are used to move the cursor to any part of the screen.

8

This cursor-Up key, moves the cursor up one line at a time.

2

This cursor-Down key, moves the cursor down one line at a time.

6

This cursor-Right key, moves the cursor one position to the right at a time.

4

This cursor-Left key moves the cursor one position to the left at a time.

7 - Home

This Home key moves the cursor to the top left corner of your screen.

1 - End

This key is used by application PGM defined for "end of"

9 - PgUp

This key called the "Page-Up" moves the screen up one page of text defined by application PGM; for example, Wordstar. The size of one screen depends on the definition of the software applications.

3 - PgDn

This key is called the "Page-Down" key which moves the cursor down a distance of one screen. The size of one screen depends on the definition of the software applications.

MULTI-KEY COMMANDS

Ctrl + Alt + Delete

Entering this combination of keys simultaneously will cause a system reset, which is almost the same as turning your computer off and then on again.

Ctrl + Scroll
Lock

Entering this combination of keys will cause the operating system to terminate the program which is running in the computer.

Ctrl + Num
Lock

You can use this command to pause the execution of a program which is running in the system. Because the messages are moving up the screen too fast for reading, you can enter this combination of two keys to meet your needs. Press any key to continue.

1.3 DISKETTES AND FLOPPY DISK DRIVES

A diskette is a magnetic disk contained within a protective plastic jacket. Diskettes are used by your computer to store data. Generally, diskettes that are used for microcomputers are 5-1/4 inches in size. The storage capacity of each diskette will vary depending on the amount and type of data that has been stored and the type of recording medium that is selected for the diskette.

Disk drives are devices that are used for reading, writing, and storing data on disks. There are two kinds of storage devices available for use with your computer: floppy disk drives and hard disk drives.

The system unit supports single or double 1.2M Byte high density diskette drives. This disk drive can read/write 180/360KB diskette and 1.2M diskette, but it is not recommended to use this 1.2M diskette drive to be written under 180/360KB format and to be read under a 180/360KB diskette driver. With 360KB format, after being written by the 1.2MB diskette drive, the 180/360KB diskette can be used with only the 1.2MB drive.

NOTE:

Be sure to use 1.2MB diskette (High capacity) for the 1.2MB format.

Only double-sided/double-density diskettes are to be used for the 360KB format in the 1.2MB drive, even if only one side of the diskette is used.

WRITE-PROTECTION

Write-protection can prevent data and any other information stored on the diskette from being erased. This means that if you place a write-protected tab on the diskette, no information can be added to the diskette until the write-protected tab is removed. Always make sure to place a write-protected tab on a diskette after you have finished copying or storing data on the diskette. If the write-protected tab is placed or before you wish to start storing data on the diskette, an error message will appear on the screen. This message indicates that when the write-protected tab has been placed on the diskette, it is impossible to store any data on the diskette.

OPERATION OF THE FLOPPY DISK DRIVE

1. Rotate the drive mechanism lever on the disk drive in a counterclockwise direction to open the disk drive.
2. Load the diskette into the disk drive by following the arrows on the diskette label. In case there are no arrows on the label, the label of the diskette should be facing up and the write-protected notch should be on the left side. Push the diskette all the way into the disk drive, until there is an audible click to indicate that the diskette is loaded. Now, lock the disk drive by pushing the lever mechanism down in a clockwise direction until there is a click indicating that the drive is locked.
3. A red LED light on the front of the disk drive will come on when the computer is accessing the information that is stored on the diskette or when an operating function involving that disk drive is being performed.
4. To remove a diskette from the disk drive, simply perform the same steps for loading the diskette, but in reverse order. Always make sure that the red LED light is not on before you remove a diskette from the drive. Removing a diskette from a drive when the red LED is on may result in loss or damage to the data stored on the diskette and the disk itself.

FORMATTING DISKETTES

The first function that should be performed with your microcomputer after you have completed the Hardware Installation and Setup is to format your floppy diskettes and hard disk drive. This function can be found in your DOS Users Manual to format floppy diskettes. The default drive prompt will indicate which drive contains your Disk Operating System (DOS) and also that your computer is operating under MS-DOS. For example, if the DOS diskette is loaded in Drive A, the prompt would be A>. To format a floppy diskette, enter the command `FORMAT` after the default prompt, and if necessary, indicate the drive where the floppy diskette is located: either A or B.

A>format a: (Press ENTER)

The system will respond to this command by displaying the message:

Insert new diskette for Drive A: and strike ENTER key when ready (ENTER)

After you have loaded the desired diskette that you want to format into the Disk Drive A, the system will respond with the message: formatting. After the formatting process has been completed, the system will indicate that the diskette has been successfully formatted and request if you want to format another diskette.

1.4 HARD DISK DRIVES

Using a hard disk drive with your computer offers you the capability of storing a much larger amount of information than on floppy diskettes. A hard disk can contain only a certain amount of files for one directory, yet the number of directories that can be stored is far greater than the floppy diskette. Refer to the operation manual for your hard disk or your DOS Operating Guide for further information on hard disk directories.

HARD DISK DRIVE COMPATIBILITY TABLE

The following table lists the type of hard disk drives that can be used with your computer:

<u>TYPE</u>	<u>CYLINDER</u>	<u>HEAD</u>	<u>STARTING CYLINDER OF WRITE PRECOMPENSATION</u>	
1	306	4	128	
2	615	4	300	
3	615	6	300	
4	940	8	512	
5	940	6	512	
6	615	4		NOT APPLICABLE
7	462	8	256	
8	733	5		NOT APPLICABLE
9	900	15		NOT APPLICABLE
10	820	3		NOT APPLICABLE
11	855	5		NOT APPLICABLE
12	855	7		NOT APPLICABLE
13	306	8	128	
14	733	7		NOT APPLICABLE
16	612	4		NOT APPLICABLE
17	977	5	300	
18	977	7		NOT APPLICABLE
19	1024	7	512	
20	733	5	300	
21	733	7	300	
22	733	5	300	
23	306	4		NOT APPLICABLE
37	830	10		NOT APPLICABLE
38	823	10	256	
39	615	4	128	
40	615	8	128	
41	917	15		NOT APPLICABLE
42	1023	15		NOT APPLICABLE

FORMATTING HARD DISKS

Formatting your hard disk is an entirely different process because you must be sure that you have the required hard disk format files loaded in your system.

1. PREFORMAT

You should PREFORMAT the hard disk before it can be used to store information.

2. FDISK UTILITY

This utility will set up a partition table on the hard disk.

3. FORMAT UTILITY

This utility will verify the entire hard disk drive. this function can also be used to transfer portions of the operating system to the hard disk. By entering the following command, your hard disk will be capable of storing information.

```
A>FORMAT C:[/S] (or D)
```

1.5 VIDEO DISPLAY

MONOCHROME DISPLAY

Always be sure to check the video and power cables for your monitor to make sure they are connected correctly to the system unit and plugged into a working power source before you turn on the power switch.

The contrast control can be used to increase or decrease the quality and intensity of the resolution on your display screen.

The Brightness control can be used to increase or decrease the brightness of the entire display screen.

COLOR DISPLAY

When the power control on the color monitor is turned clockwise, power will be applied to the monitor. Turning the power control counterclockwise will turn your color monitor power off. This procedure may vary depending on the type of color monitor that you are using. If the power on procedure for your monitor differs from the one mentioned here, refer to your color monitor's operating manual before proceeding any further.

Instructions on using the brightness and contrast controls for your color monitor are the same as for the monochrome monitor. Again, if there is any difference, please refer to your color monitor's operating manual for further information.

2. SETTING UP YOUR SYSTEM

2.1. Internal check of your system.

This chapter introduces the step of how to set up and turn on your system unit.

1. This computer unit accepts two levels of voltages. At the back of the unit and just above the on/off switch, there is a selector switch to set the voltage to 115V or 220V. Before turning on the computer, check that the switch is set for the correct voltage. Remove the magnetic head protection sheet from the diskette drive.

2. Open the lock

Insert the key into the lock and turn it to the "ON" position, then the cover is in the unlocked status, and you can go on to the next step

3. Remove the cover

Remove the screws and remove the cover.

4. Check the card in the system unit and make sure that every card is firmly inserted in the edge connector. If the card is laid outside the edge, insert the card again into the edge connector deeply.

5. Recover

After checking the card insertion, put the cover back on the system unit and screw the cover as it was before.

2.2 Procedures to connect the display monitor, keyboard and Printer.

1. Turn all the equipments to the off status. Upon connecting your system while the power is on will damage your computer system or peripheral devices.
2. Connect the system unit to your monitor. Before connecting your monitor, recognize your display card type.

If your system is installed color graphic adaptor, there are three connectors on that adaptor.

A) Color composite signal phone jack:

This phone jack connects to the video monitor which receives color composite signal input. The highest possible resolution that can be obtained when the video monitor displays color graphics is 320 X 200 dots.

B) B/W composite signal phone jack:

This phone jack connects to the video monitor which receives B/W composite signal input. The highest possible resolution is 640 X 200 dots.

C) Color direct drive 9-pin D connector:

If your system is equipped with a monochrome graphic adaptor, this connector will support color monitor up to 1570 Hz horizontal frequency in the direct drive mode, and the monitor will have better resolution than the composite color monitor.

There is a D type 9 pin connector and it should be connected to a monochrome display monitor of frequency 18.4 KHz. Plug the monitor's signal cable into the type connector of display card and tighten the two screws.

3. Connect the keyboard to the system unit. Plug the keyboard into the round keyboard socket at the rear panel.
4. Connect the Printer if you have Printer, otherwise, go to the next step before making the connection, and study your printer manual. Other serial (RS-232) devices such as modem, terminal or a host computer can also be connected to the serial (RS-232) connector.
5. Connect the power cord to the system unit. One end of the power cord is connected to the system unit, and the other end to a grounded wall outlet.
6. Connect the power of display monitor (except the monochrome display monitor) to a grounded wall outlet.
7. Connect the power cord of the printer. One end of the power cable is connected to the printer, and the other end is connected to a grounded wall outlet.

2.3. Turn on the Power

- Make sure that the power of the system unit is off.
- Check that the shipping insert is removed from the diskette drive(s).
- If you have two diskette drives, insert the DOS system diskette in the upper drive, which is called drive A. The lower drive is called drive B.

Turn the lever downwards to close the drive door.

- Turn on the power of the video display.
- Turn on the power of your system unit.
- After a few seconds, you will see the following message.

Note:

The message: "CMOS RAM ERROR" is displayed only when a new system unit has not yet been configured; or when it has been incorrectly configured.

2.4. Booting

- Press the function key F1
- The system unit will boot the operating system into memory. The following message is displayed:

```
Current date is tue 1-04-1980
Enter new date (mm-dd-yy):__
```

If you do not wish to enter the date, just press the Return or Enter key.

To enter the current date, type the month first, date second, and year last. Press the Return key.

For example: 7-11-86

The message will display:

```
Current time is 0:00:55.28
Enter new time: _
```

If you need to enter the time, the format is

hour: minute: second: hundredth of a second

Note that your computer also keeps military time.

So 2.30 p.m. is 14:30:00.0.

Just press Return, if you don't want to enter time.

The version number of the operating system and other messages are displayed. Finally, you will see the DOS prompt:

```
A>_
```

2.5. Configure your System

The system has CMOS RAM with battery to back up, so, if you have set up your configurations after power off and power on, again, the configurations which have been set will recall automatically. There is also a real time clock backed up by the battery.

The setup utility is different from each BIOS vendor. For example: the setup utility of AWARD BIOS above Ver 2.07 is supported setup function by press "CTRL" + "ALT" + "ESC" and you will see the screen display those message:

```
1. DATE:      01/01/1980
2. TIME:      00:00:00
3. FLOPPY DRIVE A:  NOT PRESENT
4. FLOPPY DRIVE B:  NOT PRESENT
5. FIXED DISK 1:   NOT PRESENT
6. FIXED DISK 2:   NOT PRESENT
7. PRIMARY DISPLAY: MONOCHROME
8. MEMORY BELOW 1 MEG.: 00512K
9. MEMORY ABOVE 1 MEG.: 00000K
```

```
A. UPDATE ALL ITEM
E. END AND REBOOT
```

SELECT WHICH ITEM ?

Then you can configure the system unit about the type and number of diskette and hard disk drives, the type of display, and the amount of installed memory.

The first line asks you to fill in the date and time. To set the real time clock, type the current date and time. Thereafter, as long as the batteries are well connected, the real time clock will keep date and time accurately in the system.

You can follow the instructions given at the bottom of the screen to configure your system.

After setting the date and time, you don't need to enter them again each time you turn on the system unit. When you see the operating system asking for the date and time, just press the Return key twice, and the current date and time will be automatically entered from the real time clock.

The item 3 and 4 is to configure FLOPPY DRIVE. For example, if you want to set Floppy Drive A to 1.2M Floppy Drive, you just need to press 3 and ENTER key.

```
1. DATE: 01/01/1980
2. TIME: 00:00:00
3. FLOPPY DRIVE A: NOT PRESENT
4. FLOPPY DRIVE B: NOT PRESENT
5. FIXED DISK 1: NOT PRESENT
6. FIXED DISK 2: NOT PRESENT
7. PRIMARY DISPLAY: MONOCHROME
8. MEMORY BELOW 1 MEG.: 00512K
9. MEMORY ABOVE 1 MEG.: 00000K
```

```
A. UPDATE ALL ITEM
E. END AND REBOOT
```

SELECT WHICH ITEM ? 3

```
FLOPPY DRIVE A: NOT PRESENT
1. NOT PRESENT
2. 360K FLOPPY DRIVE
3. 1.2M FLOPPY DRIVE
? 3
```

The final setup screen looks like this:

```
1. DATE: 03/05/1987
2. TIME: 08:30:00
3. FLOPPY DRIVE A: 1.2M FLOPPY DRIVE
4. FLOPPY DRIVE B: NOT PRESENT
5. FIXED DISK 1: TYPE 002
6. FIXED DISK 2: NOT PRESENT
7. PRIMARY DISPLAY: MONOCHROME
8. MEMORY BELOW 1 MEG.: 00640K
9. MEMORY ABOVE 1 MEG.: 00384K
```

```
A. UPDATE ALL ITEM
E. END AND REBOOT
```

SELECT WHICH ITEM ?

Then choose item E to reboot your system.

Unless the batteries run up, you don't need to reconfigure the system. Press the same multi-keys to change the configure when you want to modify your system configuration.

III. THE SYSTEM BOARD

3.1 Introduction

This chapter is intended to provide the user with a technical overview of your system board.

3.2 The System Board

The system board fits horizontally in the base of the system unit and is approximately 8.6 by 13 inches. It is a 4-layer printed circuit board (PCB). The DC power and signal from the switching power supply enter the system board through two 6-pin connectors. Other connectors on the board are for attaching the keyboard, speaker, keylock, battery, H/W speed switch and re-set button.

- * Intel 80286-12 (8,10) microprocessor supports memory management and virtual memory function and multispeed (6-8-10-12 MHz or other speed configure between 6, 8, 10 and 12 MHz).
- * 16 megabytes physical memory range (24-bit address bus).
- * Fully 1 MB on-board DRAM, with 640/384 KB.
- * Eight I/O expansion slots (for 8-bit and 16-bit peripherals)
- * Seven DMA channels.
- * 15 interrupt levels.
- * Three programmable timers.
- * System clock/calendar and system configurations are set up by CMOS RAM with battery to back up.
- * Bi-directional keyboard interface.
- * Buzzer for sound system and LED for power-on indicator.
- * Socket for 80287 mathematical co-processor.

3.3 System Speed

The operating speed of the system board is switchable between 12 MHz, 10 MHz, 8 MHz and 6 MHz. Depend on your system board speed configuration, the speed configuration may be 6-8 MHz, 6-8-10 MHz, 6-8-10-12 MHz, or other speed configuration between 6, 8, 10, and 12, depend on system board Model.

The system board is provided three ways to change speed :

1. H/W PUSH BUTTON
2. S/W Utility Switch
3. Keyboard Switch

3.3.1 H/W PUSH BUTTON

H/W PUSH BUTTON for system speed JP2

JP2:
0 0
2 1

For any two pin ON/OFF push button to satisfy system speed switching.

3/3.2 S/W Utility Switch

The ECS 286 system board provides special utility for S/W speed switch.

When you see "A>" on your screen, type "switch xx (ENTER)" (xx means 6, 8, 10, or 12.). Then the speed of the system will be changed to any speed as you specified.

Usage: switch <speed>
speed : 6 | 8 | 10 | 12

For example:

If you want to set the system speed to 10 Mhz, the switch utility would be with parameter 10: " switch 10 "

A>switch 10

Waiting.....

Switch system speed to 10 MHz

3.3.3 Keyboard Switch

Type "CTRL" + "ALT" + "-" and "CTRL" + "ALT" + "+" to change the system speed if you are using AWARD BIOS. Those keys combination acts as a toggle switch. It can switch the current system speed to the alternative.

Type "CTRL" + "ALT" + "+" and "CTRL" + "ALT" + "-" to change the system speed if you are using AMI BIOS.

3.4 Direct Memory Access (DMA)

The DMA controller is for quick data transfer between the disk drive, adaptor cards, and memory by transferring a block of 64/128k bytes at one time, thus free the microprocessor for other tasks.

When power on the 80286, it will initialize the DMA controller. The DMA controllers support seven channels. Each of the seven channels is assigned unique I/O addresses as follow:

CHANNEL	I/O ADDRESS(HEX)	FUNCTION
0	0087	Spare
1	0083	SDLC
2	0081	Diskette
3	0082	Spare
4	Cascading	Cascade
5	0088	Spare
6	0089	Spare
7	008A	Spare

The controllers allow both byte and word transfers to the entire 16M bytes address space at the I/O rate of 4M bytes per second.

Controller 1 can transfer both byte and word between memory and I/O adapters in 64K bytes blocks.

However, controller 2 can transfer only words in 128k bytes blocks in even-byte boundaries. These channels are to be used with only 16-bit devices.

DMA controller registers is listed as follows:

Hex Address	Command Codes
OC0	CH0 base and current address
OC2	CH0 base and current word count
OC4	CH1 base and current address
OC6	CH1 base and current word count
OC8	CH2 base and current address
OCA	CH2 base and current word count
OCC	CH3 base and current address
OCE	CH3 base and current word count
OD0	Read Status Reg./Write Command Reg.
OD2	Write Request Reg.
OD4	Write Single Mask Register Bit
OD6	Write Mode Register
OD8	Clear Byte Pointer Flip-Flop
ODA	Read Temporary Reg./Write Master Clear
ODC	Clear Mask Register
ODE	Write All Mask Reg. Bits

3.5 READ ONLY MEMORY (ROM)

The Read Only Memory (ROM) is where a permanent program for booting up the computer to be stored. After power-up, the processor looks for the ROM to see what to be done first. The program that is stored in ROM is called the BIOS.

There are 2 IC sockets on the system board -> U17(even), U24(odd). Either 27128 or 27256 can be inserted into the two sockets. But only the same type of IC can be used at one time.

ROM access time - 200 ns maximum

JP3: ROM Select

```

1   2   3
|___|___|

```

```

1--2   for 27128
2--3   for 27256

```

3.6 Random Access Memory (RAM)

Random Access Memory (RAM) is the part of the memory that is not reserved for a resident operating system. It is given to the user to do with as he desires. This means that you can write into, read from, and change the contents of it. Any programs that you run will be read into RAM and then executed.

On the system board, RAM is located in four (4) rows or memory banks, directly in front of the I/O sockets. Each of these rows is comprised of nine RAM chips or blank sockets that can be filled with nine RAM chips. Eight of these chips are active memory and the last one is the parity chip for the bank. Each memory bank can be either 64K or 256K in size, depending on the type of chip used. The desired RAM size can be obtained by combining and mixing these chips to obtain a RAM size of anywhere from 256K to 1MB.

RAM access time - 120 ns maximum

3.7 Real Address Mode

Addresses are broken down into two parts; the first part is the segment address and the second is the relative (offset) address. Each of these is 16 bits long. This might lead you to believe that addresses are 20 bits long, with the segment addresses being 20 bits long and the relative address being 16 bits long.

3.8 Protected Mode

Protected mode addresses are like those in the Real Address Mode. The processor, however, places an index into a memory resident table, rather than the relative address. It uses a 24-bit segment address and a 16-bit offset address. The memory resident tables are automatically referenced by the processor whenever a segment register address is loaded and all instructions that load a segment register will refer to the memory based-tables without additional program support. The memory-based tables contain 8-byte values called descriptors.

3.9 Input/Output (I/O) Channels

Input/output (I/O) is a way for the processor to talk to peripheral devices and the only way of obtaining external data.

The I/O channel runs on a system called a data bus. This is a signal that is accessible to all expansion boards. All data that is passed out to the I/O sockets must travel on this bus. Here we must define something. Do not confuse the I/O channel with the DMA (Direct Memory Access) channel. They do ride on the same bus, but at different times.

The data bus takes data out to the I/O devices with one of the device's addresses. All of the devices look for the data bus to see if their address is associated with the data. If it is, then the device accepts it and the rest of the devices wait for their address to come up. This is simplified somewhat, but basically, this is how data is transferred out of the processor. Taking data in from an I/O device is a little different, and a section on its own. We will just say that interrupts are used. If an I/O device has data to give to the processor, it hits the processor with an interrupt, so to speak.

After the interrupt occurs, the processor accepts the data. I/O is more complicated than this, but what we have said so far should have some help.

I/O ADDRESS	FUNCTIONS
000-01F	DMA CONTROLLER 1, 8237A-5
020-03F	INTERRUPT CONTROLLER 1, 8259A, MASTER
040-05F	TIMER, 8254-2
060-06F	KEYBOARD CONTROLLER, 8742
070-07F	REAL TIME CLOCK 146818, NON-MASKABLE INTERRUPT MASK
080-09F	DMA PAGE REGISTER, 74LS612
0A0-0BF	INTERRUPT CONTROLLER 2, 8259 SLAVE
0C0-0DF	DMA CONTROLLER2, 8237A-5
0F0	CLEAR NUMERIC PROCESSOR EXTENSION BUSY
0F1	RESET NUMERIC PROCESSOR EXTENSION
0F8-0FF	NUMERIC PROCESSOR EXTENSION
1F0-1F8	FIXED DISK
200-207	GAME I/O
278-27F	PARALLEL PRINTER PORT 2
2F8-2FF	SERIAL PORT 2
300-31F	PROTOTYPE CARD
360-36F	RESERVED
378-37F	PARALLEL PRINTER PORT 1
380-38F	SDLC BISYNCHRONOUS 2
3A0-3AF	SDLC BISYNCHRONOUS 1
3B0-3BF	MONOCHROME DISPLAY AND PRINTER ADAPTER
3C0-3CF	RESERVED
3D0-3DF	COLOR GRAPHICS DISPLAY ADAPTER
3F0-3F7	DISK DRIVE CONTROLLER
3F8-3FF	SERIAL PORT 1

The following charts summarize pin assignments for the I/O channel connectors:

A-SIDE SLOT 1 THROUGH SLOT 8		
<u>I/O PIN</u>	<u>SIGNAL NAME</u>	<u>INPUT/OUTPUT</u>
A 1	-I/O CH CK	I
A 2	SD7	I/O
A 3	SD6	I/O
A 4	SD5	I/O
A 5	SD4	I/O
A 6	SD3	I/O
A 7	SD2	I/O
A 8	SD1	I/O
A 9	SD0	I/O
A 10	-I/O CH RDY	I
A 11	AEN	O
A 12	SA19	I/O
A 13	SA18	I/O
A 14	SA17	I/O
A 15	SA16	I/O
A 16	SA15	I/O
A 17	SA14	I/O
A 18	SA13	I/O
A 19	SA12	I/O
A 20	SA11	I/O
A 21	SA10	I/O
A 22	SA9	I/O
A 23	SA8	I/O
A 24	SA7	I/O
A 25	SA6	I/O
A 26	SA5	I/O
A 27	SA4	I/O
A 28	SA3	I/O
A 29	SA2	I/O
A 30	SA1	I/O
A 31	SA0	I/O

B-SIDE slot 1 through slot 8

<u>I/O PIN</u>	<u>SIGNAL NAME</u>	<u>INPUT/OUTPUT</u>
B 1	GND	GROUND
B 2	RESET DRV	O
B 3	+5 VDC	POWER
B 4	IRQ9	I
B 5	-5 VDC	POWER
B 6	DRQ 2	I
B 7	-12 VDC	POWER
B 8	OWS	I
B 9	+12	POWER
B 10	GND	POWER
B 11	-SMEMW	O
B 12	-SMEMR	O
B 13	-IOW	I/O
B 14	-IOR	I/O
B 15	-DACK3	O
B 16	DRQ3	I
B 17	-DACK1	O
B 18	DRQ1	O
B 19	-REFRESH	I/O
B 20	CLK	O
B 21	IRQ7	I
B 22	IRQ6	I
B 23	IRQ5	I
B 24	IRQ4	I
B 25	IRQ3	I
B 26	-DACK2	O
B 27	T/C	O
B 28	BALE	O
B 29	+5 VDC	POWER
B 30	OSC	O
B 31	GRD	GROUND

C-SIDE slot 9 through slot 16

D-SIDE slot 9 through slot 16

<u>I/O PIN</u>	<u>SIGNAL NAME</u>	<u>INPUT/OUTPUT</u>
C 1	SBHE	I/O
C 2	LA23	I/O
C 3	LA22	I/O
C 4	LA21	I/O
C 5	LA20	I/O
C 6	LA19	I/O
C 7	LA18	I/O
C 8	LA17	I/O
C 9	-MEMR	I/O
C 10	-MEMW	I/O
C 11	SD08	I/O
C 12	SD09	I/O
C 13	SD10	I/O
C 14	SD11	I/O
C 15	SD12	I/O
C 16	SD13	I/O
C 17	SD14	I/O
C 18	SD15	I/O

<u>I/O PIN</u>	<u>SIGNAL NAME</u>	<u>INPUT/OUTPUT</u>
D 1	-MEMCS 16	I
D 2	-IOCS 16	I
D 3	IRQ 10	I
D 4	IRQ 11	I
D 5	IRQ 12	I
D 6	IRQ 15	I
D 7	IRQ 14	I
D 8	-DACK 0	O
D 9	DRQ 0	I
D 10	-DACK 5	O
D 11	DRQ 5	I
D 12	-DACK 6	O
D 13	DRQ 6	I
D 14	-DACK 7	O
D 15	DRQ 7	I
D 16	+5V	POWER
D 17	-MASTER	I
D 18	GND	GROUND

3.10 Switch and Jumper Setting

- Setting the switch on your system board.
Only one 4-pins dip switch should be setting before turn on your system.

Memory Switch Setting

SW-1	SW-2	SW-4	Bank0	Bank1	Starting Address	Memory Size
ON	ON	OFF	128KB	128KB	000000H-03FFFFH	256KB
OFF	ON	OFF	512KB	-	000000H-07FFFFH	512KB
ON	OFF	OFF	512KB	128KB	000000H-09FFFFH	640KB
OFF	OFF	OFF	512KB	512KB	000000H-07FFFFH	
					100000H-17FFFFH	1024KB(512/512)
ON	OFF	ON	512KB	512KB	000000H-09FFFFH	
					100000H-15FFFFH	1024KB(640/384)

Display Adapter Setting

SW-3	Display Type
ON	Color Graphics
OFF	Monochrome

- Jumper Setting.

** JP1 ** TURBO LED

12	10	8	6
+	.	.	.
-	.	.	.

The TURBO LED indicate the system speed in 6, 8, 10, or 12 MHZ. When system running at 12 MHZ, the 12 LED will light up, if system running at 10 MHZ, the LED 10 will light up, in 8 MHZ condition then 8 LED turn on. If system speed is 6 MHZ. the LED 6 will light.

** JP3: ROM Select

1	2	3
1--2	for 27128	
2--3	for 27256	

3.11 Connectors

The system board comes equipped with the following connectors:

Keyboard Connector

Pinout	Signal Name
1	Keyboard Clock
2	keyboard Data
3	No connection
4	ground
5	+5V

Power Connector

Pinout	assignments
1	Power Good
2	+5V
3	+12V
4	-12V
5	Ground
6	Ground
7	Ground
8	Ground
9	-5V
10	+5V
11	+5V
12	+5V

Reset Connector (J4) [Hardware reset]

Pinout	assignments
1	Power Good
2	Ground

Speaker Connector (J1)

Pinout	Signal Name
1	Speaker out
2	Ground
3	Ground
4	+5V

Keylock Connector (J2)

Pinout	Signal Name
1	LED Power
2	Ground
3	Ground
4	Key Lock
5	Ground

Battery Connector (J3)

The system board already provides Battery backup also the external battery backup connector are provided from J3, there are 3.6-volts battery are required.

The J3 connector are defines as follows:

Pinout	Signal Name
1	VDD (normally 3.6 volts)
2	N. C.
3	Ground
4	Ground

APPENDIX.

