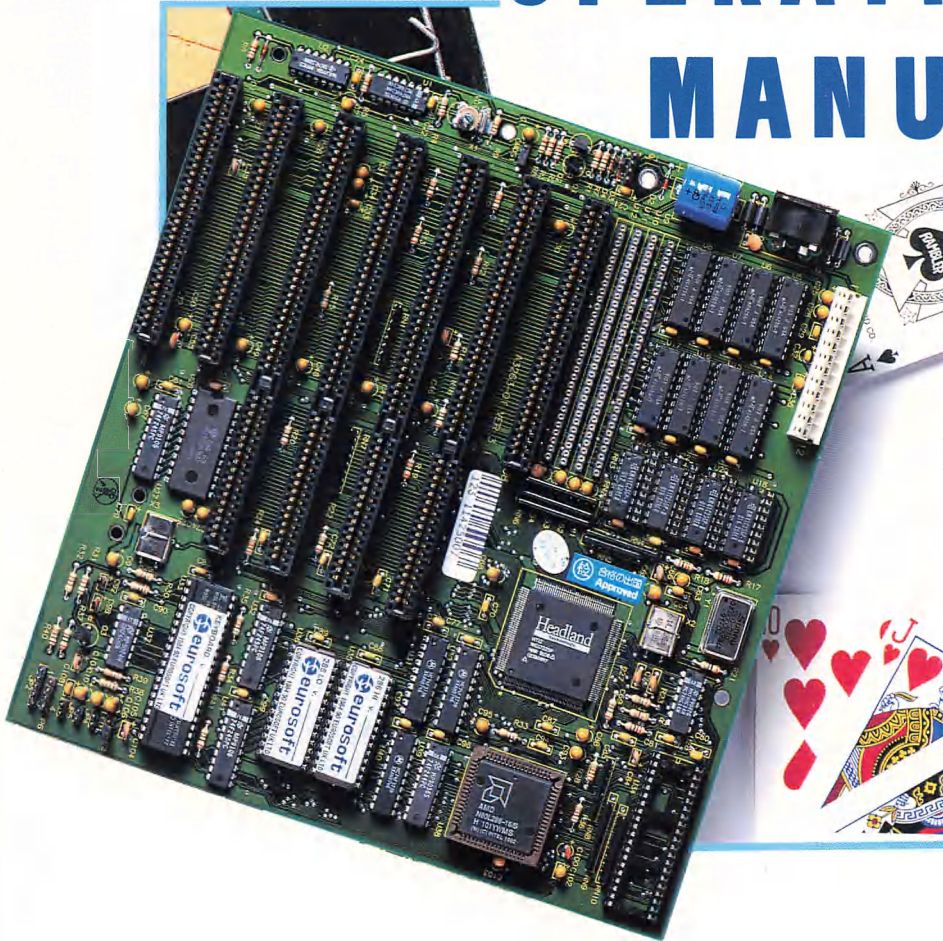# SINGLE CHIP
80286
(A3263)
OPERATION
MANUAL

Please Do Not Bend

Make a backup copy of the diskettes. Put the original diskettes in the provided protective jacket in a safe place and always use the backup copy.

SINGLE CHIP - 80286 MAIN BOARD

(A3263)

OPERATION MANUAL

INSTALLING YOUR MOTHERBOARD

1

INSTALLATION

2

EASY SETUP

3

APPENDIX

4

TABLE OF CONTENTS

NOTE

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Ensure that card mounting screws, attachment connector screws, and ground wires are tightly secured.

- Reorient the receiving antenna.

- Move the computer away from the receiver.

- Plug the computer into a different power outlet so that computer and receiver are on different branch circuits.

- If necessary, the user should consult with the dealer or an experienced radio/television technician for additional suggestions.

Product data and specification information herein are subject to change without prior notice for the sake of technical improvements in performance and reliability, since we are permanently endeavoring to supply the best products possibly.

The manufacturer does not assume responsibility for customer product designs and for the fitness to any particular application, nor for patent rights or other rights of third parties and infringements thereof resulting from the use of this products.

The information furnished by us is believed to be accurate and reliable. However, no responsibility is assumed for inaccuracies that may not have been detected prior to printing, and for those which occur beyond our control.

Electrical Safety

This 80286 system is equipped with a standard 220 watt power supply. Do not replace the power supply with another power supply lower than 220 watt.

This 80286 system uses a three-wire power cable which connects the chassis of the unit to the earth ground when it is connected to a three-wire ground receptacle. This power cable should not be longer than four feet.

CAUTION

Continulty of the ground circuit is vital for safe operation of the unit. Never operate this equipment with the grounding conductor disconnected.

Before you do anything, please check the AC voltage setting of your computer system, display monitor unit etc. The location of these settings should be close to the AC power cable inlet of your system. E.g. on the back panel of the 80286 system.

This manual uses the following trademarks:

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- Novell is a registered trademark of Novell, Inc.

- Xenix & MS DOS are registered trademarks of Microsoft Corp.

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SINGLE CHIP - 80286

**CHAPTER   1   INSTALLING YOUR
                                    MOTHERBOARD**

- **Features**

- **Jumper Setting**

- **Connector Pinouts**

FEATURES

### The Significant Features of 80286 System:

1

- Intel 80286 CPU

- Support Coprocessor (Intel or, AMD 80287-10/12)

- Headland HT12 Chip Set

- Quadtel Expanded Memory Manager (EMS) Version 4.00 (HT12 03.01)

- Support Shadow RAM for System and Video BIOS

- Support mix DRAM types on different banks

- Eurosoft BIOS

- Support 512KB to 4MB on board

- 7 Synchronous expansion slots (four 16-bit & three 8-bit)

- Display Mode supported: 8514/A, VGA, EGA, CGA, MDA, and Hercules

- Operation System supported: MS DOS, OS/2, DR-DOS, & XENIX

- Network supported: Novell, 3Com, and D-Link

The Advanced Features of 80286 System:

- Dual speed selectable via keyboard, software or hardware Turbo Switch

- On-board Real Time Clock/ Calendar with rechargeable battery

- On-board power good logic, active reset circuitries for stable power-on and power-off operations

JUMPER SETTINGS

Jumper Settings Diagram for 80286 System
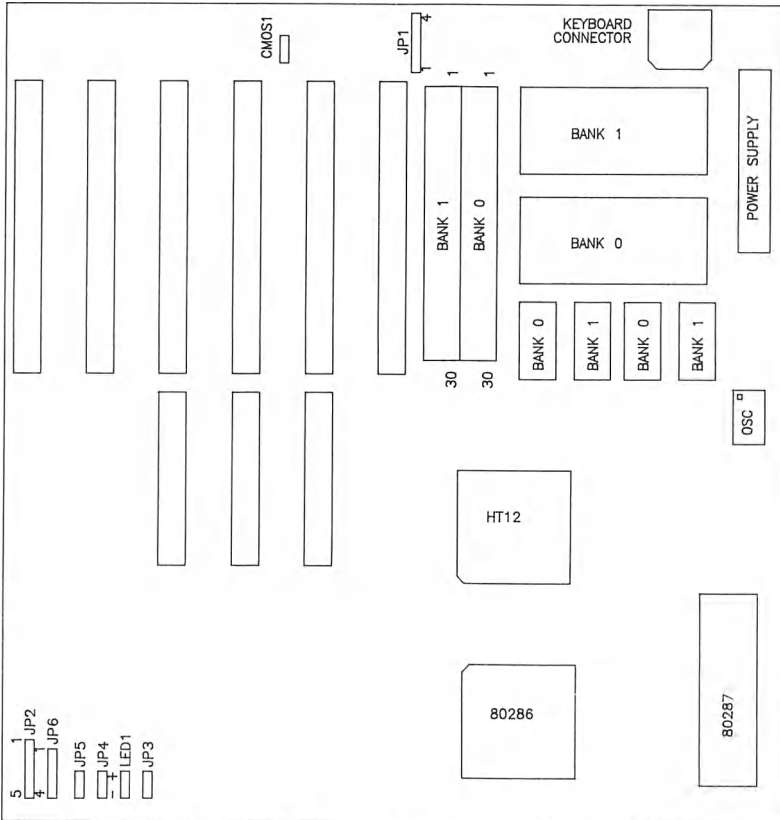
JP1 EXTERNAL BATTERY	JP5 RESET SWITCH
JP2 KEYLOCK / POWER LED	JP6 SPEAKER
JP3 DISPLAY SHORT — COLOR OPEN — MONO	LED1 TURBO LED

JP4 TURBO SWITCH
       SHORT — NORMAL
       OPEN — TURBO
	CMOS1 RESET CMOS
	        SHORT — RESET
	        OPEN — NORMAL

6

CONNECTOR PINOUTS

Power Supply Connector (P1)

Pin	Description
1	Power Good
2	+5 Vdc
3	+12 Vdc
4	-12 Vdc
5	Ground
6	Ground
7	Ground
8	Ground
9	-5 Vdc
10	+5 Vdc
11	+5 Vdc
12	+5 Vdc

Keyboard Connector (J1)

They keyboard cable connects to the system board through a 5-pin din connector. The following table lists the connector pins and their signal names.

Pin	Description
1	Keyboard Clock
2	Keyboard Data
3	Not used
4	Ground
5	+5 Vdc

Speaker Connector (JP6)

This is a 4-pin header.

Pin	Description
1	Speaker Signal
2	Not used
3	Ground
4	+ 5 Vdc

1

Keylock and Front Panel Power LED Connector (JP2)

This is a 5-pin header.

Pin	Description
1	LED Power
2	Not used
3	Ground
4	Keyboard inhibit
5	Ground

External Battery Connector (JP1)

This is a 4-pin header.

Pin	Description
1	+ 6 Vdc
2	Not used
3	Ground
4	Ground

SINGLE CHIP - 80286

CHAPTER 2 INSTALLATION

- **External Features**

- **Installing**

- **Maths Coprocessor**

2

EXTERNAL FEATURES
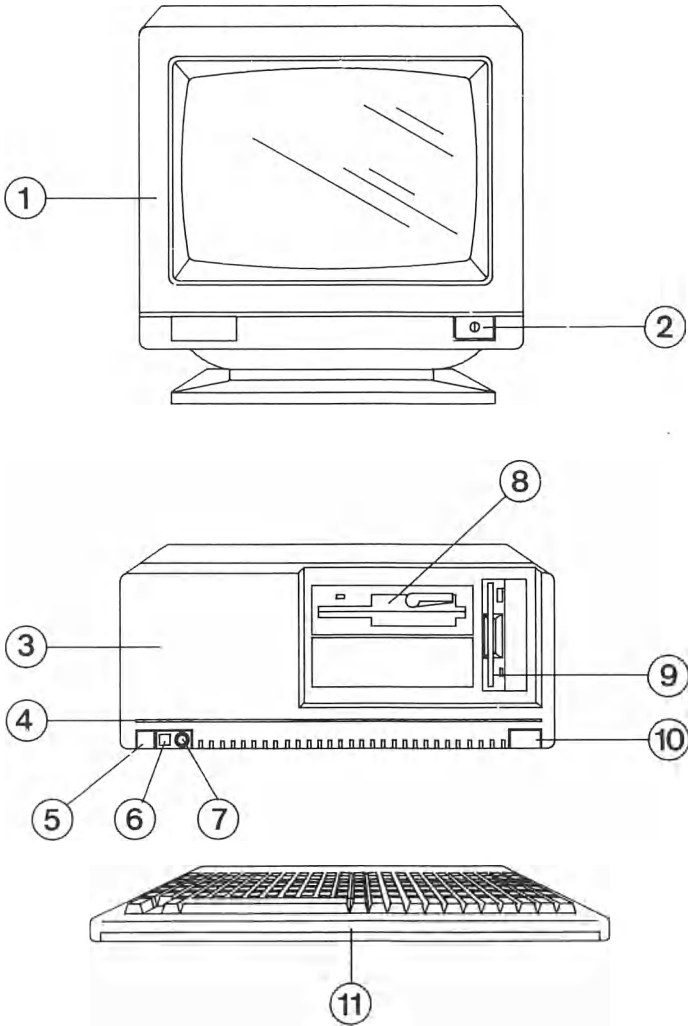
Descriptions are shown in next page.

1. The Display Monitor
   It is used to display data and the status of the computer.

2. The Power Switch
   It is used to turn the screen on and off.

3. The Case
   The main unit contains the system board, power supply, one or two floppy-disk drive(s), hard-disk, display board (e.g. color graphic adapter, monochrome display adapter, enhanced or professional graphic adapter), a whole range of memory expansion board and Input/Output interface board etc. It depends on user's requirement.

4. Indicator Lights
   For harddisk, power, & turbo.

5. Turbo Switch
   It is for dual speed system. Turbo light turns on when the system runs at high speed, otherwise the light turns off.

6. The Reset Button
   It is used to reset/reboot the system.

7. The Keyboard Lock
   It is used to lock the keyboard avoiding from being accidentally pressed.

8. The 5 1/4" Floppy-disk Drive
   It is used to read the data from or write the data to a 360KB/1.2MB formatted diskette.

9. The 3 1/2" Floppy-disk Drive
   It is used to read the data from or write the data to a 720KB/1.44MB formatted diskette.

10. The Power Switch
    It is used to turn the system on and off.

11. The Keyboard
    It is the primary input device and connected to the computer via a connector at the back of the main unit.

2

THE TOWER CASE

(Some cases may be different, so there are another two cases for your reference.)

1. CPU speed
    It shows the running speed of the Central Processing Unit.

2. The 3 1/2" Floppy-disk Drive
    It is used to read the data from or write the data to a 720KB/1.44MB formatted diskette.

3. The 5 1/4" Floppy-disk Drive
    It is used to read the data from or write the data to a 360KB/1.2MB formatted diskette.

4. The Power Switch
    It is used to turn the system on and off.

5. The Keyboard Lock
    It is used to lock the keyboard avoiding from being accidentally pressed.

6. The Reset Button
    It is used to reset/reboot the system.

7. The Turbo Switch
    It is for dual speed system. The Turbo light turns on when the system runs at high speed, otherwise the Turbo light turns off.

8. The Indicator Light
   For Harddisk & Turbo

2
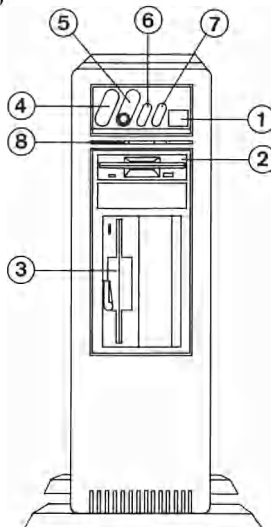
THE SLIM CASE

1. The 3 1/2" Floppy-disk Drive
    It is used to read the data from or write the data to a 720KB/1.44MB
    formatted diskette.

2. The 5 1/4" Floppy-disk Drive
    It is used to read the data from or write the data to a 360KB/1.2MB formatted
    diskette.

3. Power Switch
    It is used to turn the system on and off.

4. Indicator Light
    For Power, Turbo, & Harddisk.

5. The Reset Button
    It is used to reset/reboot the system.

6. The Keyboard Lock
    It is used to lock the keyboard avoiding from being accidentally pressed.

2

13
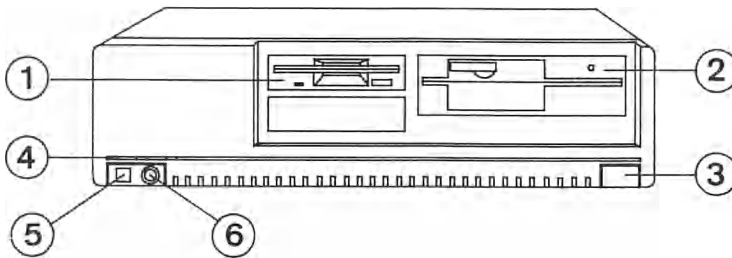
INSTALLING

Step 1: Before starting the installation, please make sure the power is off. Remove the cover mounting screws at the rear of the unit and retain all the screws for use later.
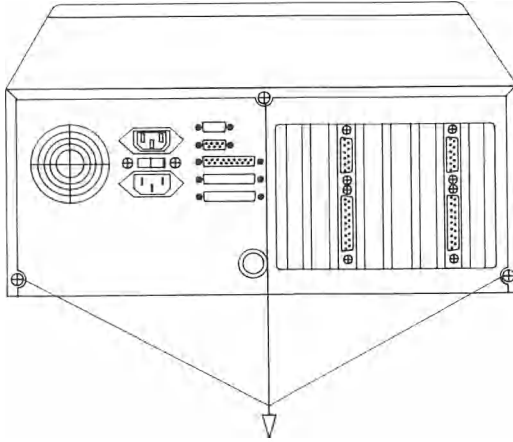
Step 2: Slide cover toward front, then up and away from chassis as figure shown.

14
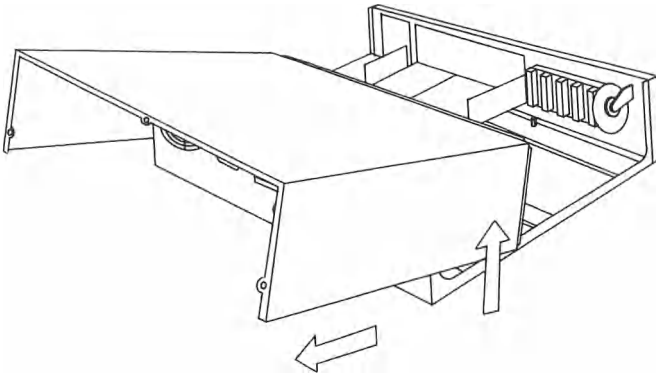
Step 3: Grasp the motherboard in both hands and slide it into the the chassis, then fasten with screws as figure shown.

2
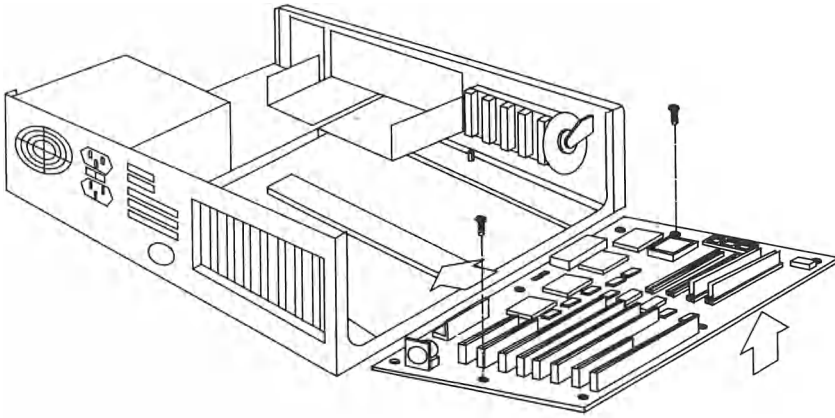
Step 4: Locate the vacant expansion slots and remove the slot covers as figure shown.
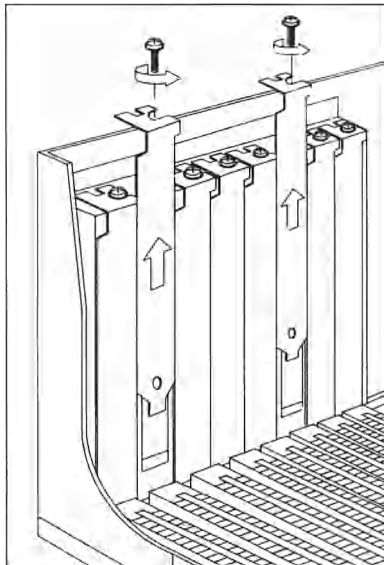
Step 5: Plug the Add-on Card vertically into expansion slot, then fasten it with retained screw.

Add-on Card
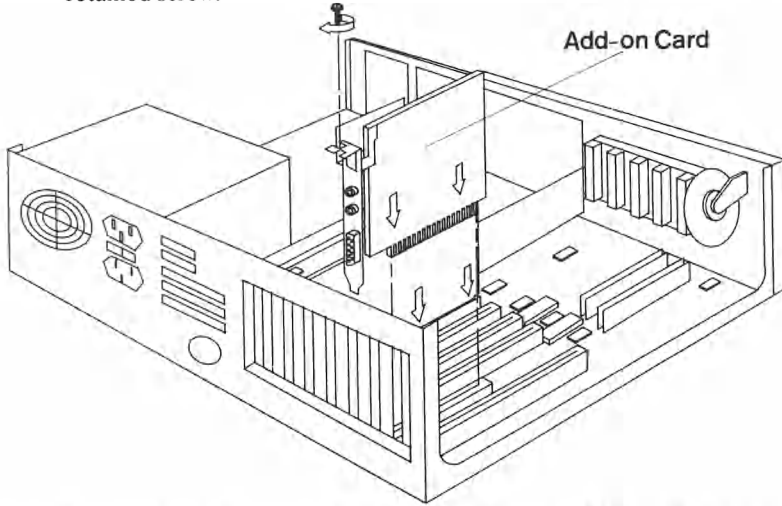
Step 6: You need a Philips screw-driver, a flat-head screw-driver, and some spare screws to install the drives (Floppy-disk Drive and Hard-disk Drive).

Slide the Floppy-disk Drive(s) you want to install into the slots as arrow A & B shown in the figure below.

Plug the Hard-disk vertically into the slot as arrow C shown in the figure below.
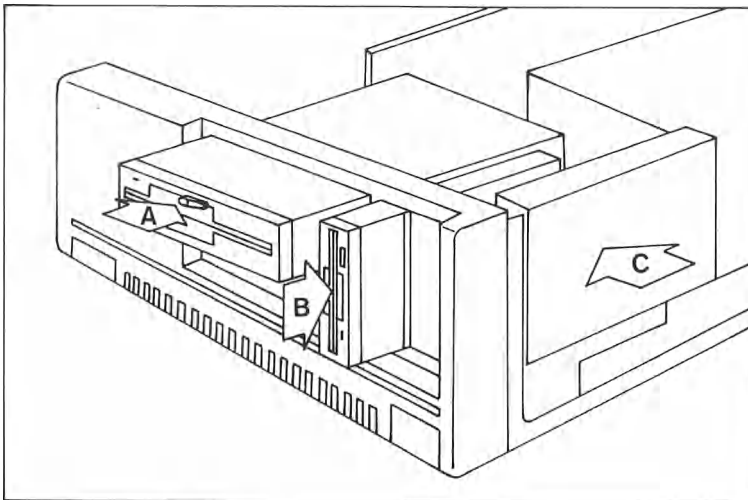
NOTE: Some casing may accommodate Floppy-disk drives and Hard-disk drive differently. It does not affect the performance of your computer if cable connections have been done correctly as figure in step 7 shown.

Step 7: Connect the 40-pin connector to the 40-pin edge connector of the Hard-disk Drive. (Align connector pin 1 to pin 1 of edge connector)

Connect the power cable to the edge connector of the Hard-disk Drive. Connect the 34-pin connector to the 34-pin edge connector of the Floppy-disk Drive.

Connect the power cable to the edge connector of the Floppy-disk Drive.

Connect the serial ports with 9-pin & 25-pin connectors from I/O card to back panel.

Finally, secure the Hard-disk Drive and Floppy-disk Drive in position with mounting screws and clips.

2

Hard-disk Drive

Floppy-disk Drive

P: Power Cable

Floppy-disk Drive
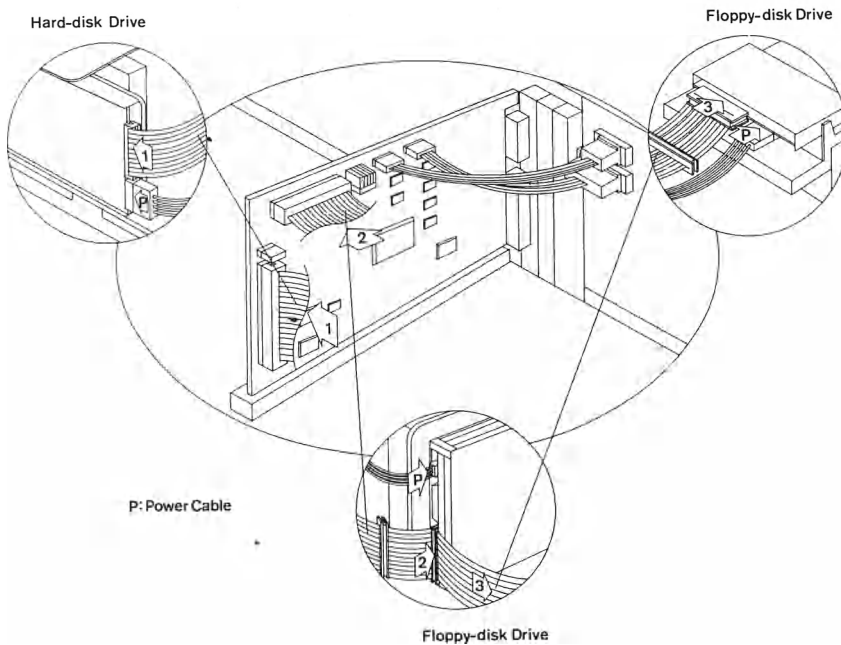
NOTE: Universal Floppy-disk Cable is highly recommended.

Step 8:   Plug the power cable into the rear of the display monitor and the other end into the back panel of the system unit as part (A) shown.

Plug the video signal cable into the rear of the display monitor and the other end into the back panel of the system unit, then screw the connector down securely with a screw-driver as part (B) shown.

To connect the power cable of the system unit, plug one end into the back panel and the other end into the electric outlet as part (C) shown.

Plug the keyboard connector cable into the back panel of the system unit as part (D) shown.

A

B

C

D

2
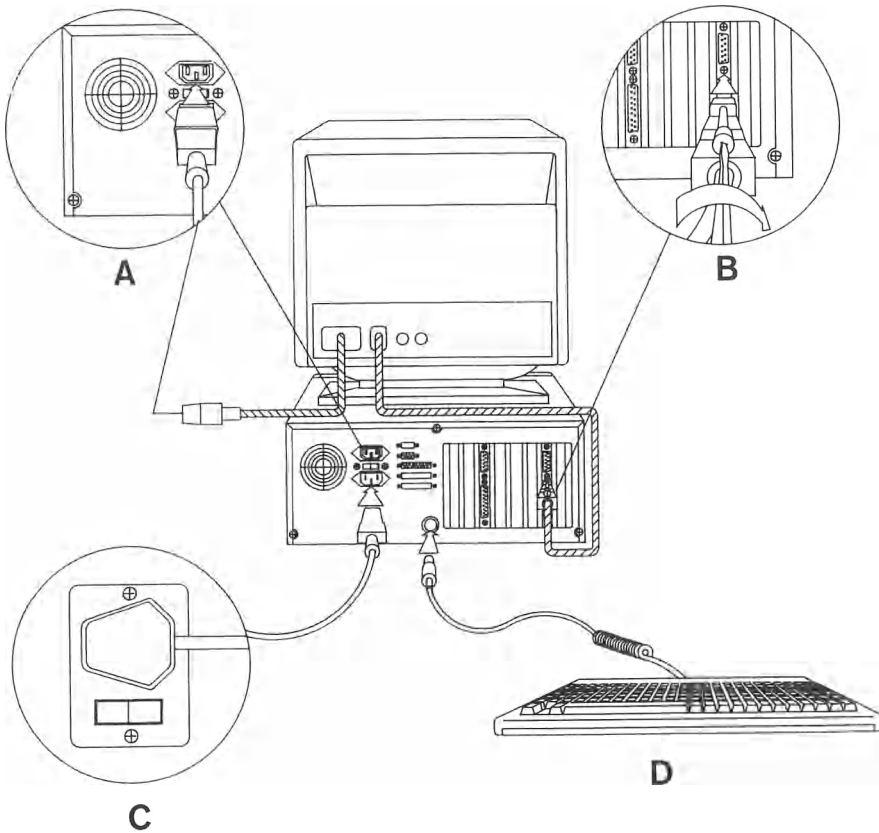
MATHS CO-PROCESSOR

System in Synchronous Mode

Switch off the system, plug the math co-processor (Intel or AMD 80287) into socket left for it. (Make sure the coprocessor is in the correct orientation and all pins are inserted into the socket properly).

Diagram for Maths Co-processor

80287 SOCKET
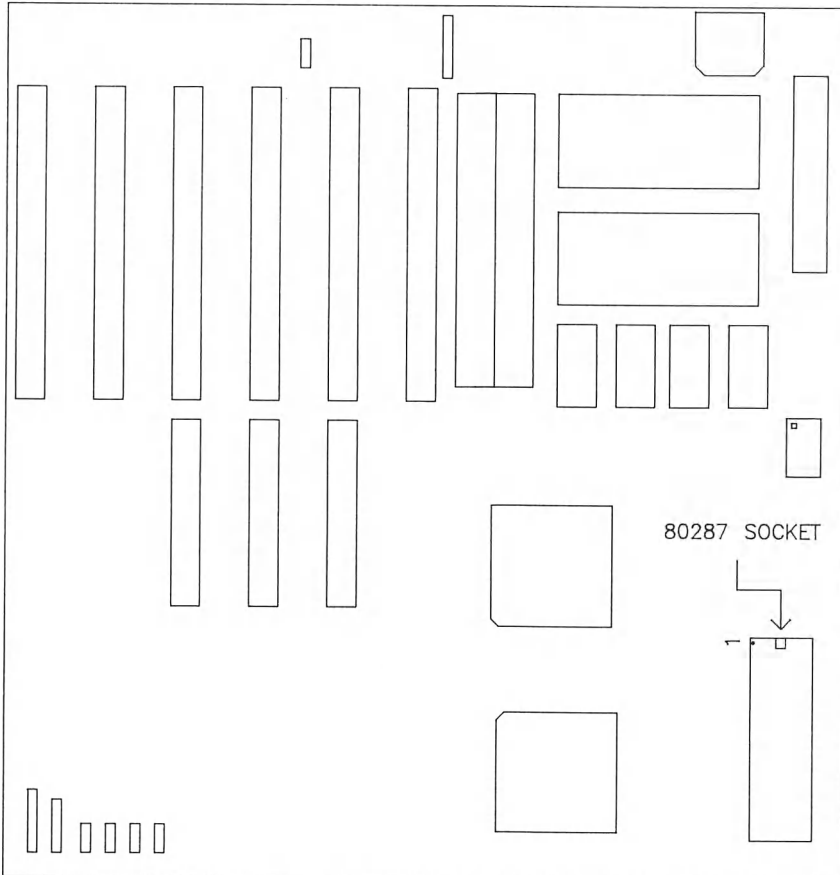
SINGLE CHIP - 80286

CHAPTER   3   **EASY SETUP**

- **Setup of 80286 System**

- **Power on the System**

3

EASY SETUP

Memory Configuration

DIP RAM		SIP RAM		
Bank 0	Bank 1	Bank 0	Bank 1	Total
256Kx4	0	0	0	512KB
0	0	256Kx9	0	512KB
256Kx4	256Kx4	0	0	1.0MB
256Kx4	0	0	256Kx9	1.0MB
0	256Kx4	256Kx9	0	1.0MB
0	0	256Kx9	256Kx9	1.0MB
1Mx4	0	0	0	2.0MB
0	0	1Mx9	0	2.0MB
256Kx4	1Mx4	0	0	2.5MB
245Kx4	0	0	1Mx9	2.5MB
0	1Mx4	256Kx9	0	2.5MB
0	0	256Kx9	1Mx9	2.5MB
1Mx4	1Mx4	0	0	4.0MB
1Mx4	0	0	1Mx9	4.0MB
0	1Mx4	1Mx9	0	4.0MB
0	0	1Mx9	1Mx9	4.0MB

NOTE: 1Mx4 = 441000 DIP RAM
256Kx4 = 44256 DIP RAM
256Kx9 = 256KB SIP RAM Module
1Mx9 = 1MB SIP RAM Module

3

Setup

Power on the system, it will have a self test. During the memory test, you will get the prompt below:

> Press any key to skip memory test

Then you will get the following prompt on the screen:

> <CTRL> <ALT> <ESC> to run SETUP

NOTE: Do not hold the above keys unless you want to modify your system configurations.

You can make use of the Up(↑) or Down(↓) arrow keys to highlight your options and press < ENTER > to get into the individual column on the screen shown below:

```
──────────────── Euro BIOS System Setup ────────────────

        Time (HH:MM:SS)          16:15:08
        Date (DD/MM/YYYY)        28/01/1991
        Diskette Drive 1         5  1/4" 1.2M
        Diskette Drive 2         None
        Diskette Drive 3         None
        Diskette Drive 4         None
        Fixed Disk Drive 1       Custom
        Fixed Disk Drive 2       None
        Fixed Disk Drive 3       None
        Fixed Disk Drive 4       None
        Primary Display          EGA or VGA
        CPU Clock Speed          High
        Maths Coprocessor        None
        Base Memory              640K
        Extended Memory          1344K
        BIOS Shadow Memory       80K
        EMS Memory               1728K
        Chip Set Features        HT12

    Press (↑) or (↓) to select parameter, (↵ ) to change parameter.
               Press ESC to resume system boot

─────────────── Copyright (C) Eurosoft 1983-90 ───────────────
```

3

22

Each column with different instructions will tell you how to make use of the key conventions such as:
Left(←), Right(→), Up(↑), Down(↓), PgUp, PgDn, and < ENTER > for Setup.

If you are convinced at this stage that all the information you have modified upto this point is right, you can finally press < ESC > to finish this Setup procedure.

To Install EMS

1)Set the desirable EMS memory size.

2)Load the EMS driver HT12EMS.SYS from the utility disk and add the following device driver into the CONFIG.SYS file:
          device = HT12EMS.SYS

Where HT12EMS.SYS is the EMS driver and must be placed into the bootup disk drive.

BIOS Shadowing and Memory Relocation

The HT12 supports BIOS shadowing in 16K blocks in the range of C0000 to FFFFF. In the case that 1M of memory is installed, the HT12 also supports relocation of memory in 64K blocks from address A0000 to address FFFFF that are not used in shadowing to above 1M.

Shadow Range	Reloc Range	Memory Relocated
No shadowing	A0000-FFFFF	384K
C0000-	A0000-BFFFF	128K
D0000-	A0000-CFFFF	192K
E0000-	A0000-DFFFF	256K
F0000-	A0000-EFFFF	320K
C0000-CFFFF,	A0000-BFFFF,	256K
F0000-FFFFF	D0000-EFFFF	

For instance, the Setup table in page 22 shows a 4MB motherboard with 80K shadowed BIOS (system BIOS and EGA BIOS) and 1728K EMS memory.

23

POWER ON THE SYSTEM

Once you turn on the system, the system will go through a self-test routine which checks all of its internal devices. Any error encountered will be reported on the screen.

In the unlikely event that errors are encountered, you might need to troubleshoot your system.

When the self-test is completed, the system will search for the DOS (Disk Operating System) system file in the drive A first. If no system diskette is put in drive A, it will check the fixed disk (if installed).

If no fixed disk is installed or it has not been formatted, the following message will be displayed:

> Diagnostics completed successfully
> Please insert Boot-Disk and press any key...

After you have done so, DOS is loaded and ready.

Note: The system will boot up in drive C (fixed drive), if it is installed and no system disk is found in drive A.

After DOS has been loaded, the following message is displayed:

> Current date is Tue 1-01-1980
> Enter new date (mm-dd-yy):

After you have entered the new date (or strike enter if current date is correct), the screen will display the time:

> Current time is : 01:01:15.47
> Enter new time:

After you have entered the new time (or strike enter if current time is correct), the system will display the DOS prompts.

> A>

Note: If you have loaded DOS from a fixed disk, C is the prompt to be displayed.

3

Now you can use any DOS command contained in your system disk. The following is a list of commands that are useful:

(1)   A > dir < ENTER >
Display the directory in Drive A.

A > dir b: < ENTER >
Display the directory in Drive B.

(2)   A > format b: < ENTER >
Format a 360K double-sided double-density diskette in Drive B.
(Drive B must be a 360K double side diskette).

NOTE: Use a format b:/s if you want the formatted diskette be a system diskette.

```
                    CAUTION
```

All previous data on the diskette will be destroyed by the above operation.

(3)   A > copy b:*.* < ENTER >
Copy all the files contained in diskette B into the diskette of drive A.

(4)   A > del filename.xxx < ENTER >
Delete the file named filename.xxx in drive A.

(5)   A > type filename < ENTER >
Display a document file on the screen.

3

Remember to press the < ENTER > key every time you type in a command. For more details, please refer to the MS-DOS/PC-DOS user's manual.

The system is default to run in high speed, but the speed can also be changed. E.g. you can run your computer in turbo speed by holding the "Ctrl", "Alt" and "+" key on the numeric pad altogether. The turbo LED light will light up to show your computer is now in high speed mode. Conversely, you can change the computer to low speed mode by holding the "Ctrl", "Alt" and "-" key on the numeric pad altogether.

In addition, you can also use the hardware turbo switch (if there is such switch in your case) to change the speed of the system.
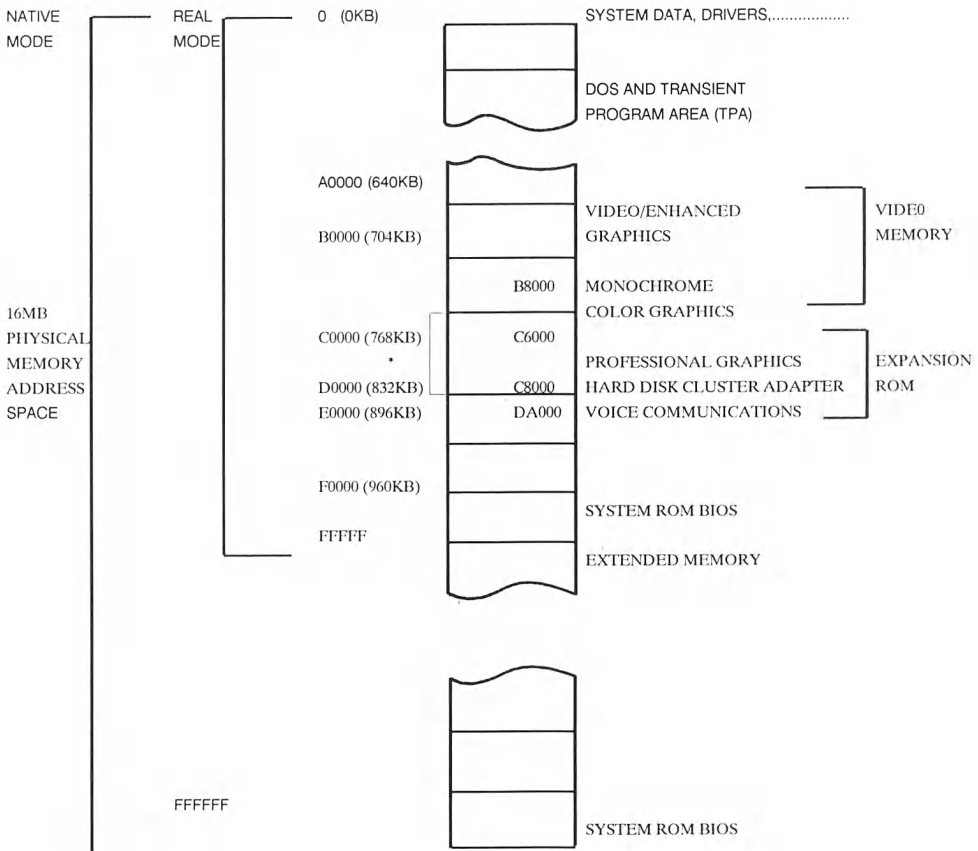
SINGLE CHIP - 80286

CHAPTER 4 APPENDIX

- **System Memory Map**

- **I/O Channel Pin Assignment**

- **I/O Signal Description**

- **Troubleshooting**

- **Keyboard**

4

SYSTEM MEMORY MAP

a) Real-addressing Environment Address Slice of 80286

NATIVE MODE	REAL MODE	0 (0KB)		SYSTEM DATA, DRIVERS,.................
				DOS AND TRANSIENT PROGRAM AREA (TPA)
		A0000 (640KB)		
		B0000 (704KB)		VIDEO/ENHANCED GRAPHICS
			B8000	MONOCHROME COLOR GRAPHICS
16MB PHYSICAL MEMORY ADDRESS SPACE		C0000 (768KB)	C6000	
		*		PROFESSIONAL GRAPHICS
		D0000 (832KB)	C8000	HARD DISK CLUSTER ADAPTER
		E0000 (896KB)	DA000	VOICE COMMUNICATIONS
		F0000 (960KB)		
		FFFFF		SYSTEM ROM BIOS
				EXTENDED MEMORY
	FFFFFF			SYSTEM ROM BIOS

VIDE0 MEMORY

EXPANSION ROM

NOTE: * Video or Enhanced Graphics

b) I/O Address Map

Hex Range	Devices	Usage
000-01F	DMA Controller 1,	System
020-03F	INT Controller 1, Master	System
040-05F	Timer	System
060-06F	8042 (Keyboard)	System
070-07F	Real-Time Clock, NMI Mask	System
080-09F	DMA Page Register	System
0A0-0BF	INT Controller 2	System
0C0-0DF	DMA Controller 2	System
0F0	Clear Math Coprocessor Busy	System
0F1	Reset Coprocessor	System
0F8-0FF	Arithmetic Processor	System
1F0-1F8	Fixed Disk	I/O
200-207	Game I/O	I/O
278-27F	Parallel Printer Port 2	I/O
2F8-2FF	Serial Port 2	I/O
300-31F	Prototype Card	I/O
360-36F	Reserved	I/O
378-37F	Parallel Printer Port 1	I/O
380-38F	SDLC, Bisynchronus 2	I/O
3A0-3AF	Bisynchronus 1	I/O
3B0-3BF	Monochrome Display and Printer Adapter	I/O
3C0-3CF	Reserved	I/O
3D0-3DF	Color/Graphic Monitor Adapter	I/O
3F0-3F7	Floppy Diskette Controller	I/O
3F8-3FF	Serial Port 1	I/O

4

I/O CHANNEL PIN ASSIGNMENT

Pin No	Signal Name	I/O	Pin No.	Signal Name	I/O
A1	-I/O CH CK	I	B1	Ground	
A2	SD7	I/O	B2	Reset Drive	O
A3	SD6	I/O	B3	+5 Vdc	
A4	SD5	I/O	B4	IRQ9	I
A5	SD4	I/O	B5	-5 Vdc	
A6	SD3	I/O	B6	DRQ2	I
A7	SD2	I/O	B7	-12 Vdc	
A8	SD1	I/O	B8	0 WS	I
A9	SD0	I/O	B9	+12 Vdc	
A10	-I/O CH RDY	I	B10	Ground	
A11	AEN	O	B11	-SMEMW	O
A12	SA19	I/O	B12	-SMEMR	O
A13	SA18	I/O	B13	-IOW	I/O
A14	SA17	I/O	B14	-IOR	I/O
A15	SA16	I/O	B15	-DACK3	O
A16	SA15	I/O	B16	DRQ3	I
A17	SA14	I/O	B17	-DACK1	O
A18	SA13	I/O	B18	DRQ1	I
A19	SA12	I/O	B19	-Refresh	I/O
A20	SA11	I/O	B20	CLK	O
A21	SA10	I/O	B21	IRQ7	I
A22	SA9	I/O	B22	IRQ6	I
A23	SA8	I/O	B23	IRQ5	I
A24	SA7	I/O	B24	IRQ4	I
A25	SA6	I/O	B25	IRQ3	I
A26	SA5	I/O	B26	-DACK2	O
A27	SA4	I/O	B27	T/C	O
A28	SA3	I/O	B28	BALE	O
A29	SA2	I/O	B29	+5 Vdc	
A30	SA1	I/O	B30	OSC	O
A31	SA0	I/O	B31	Ground	

4
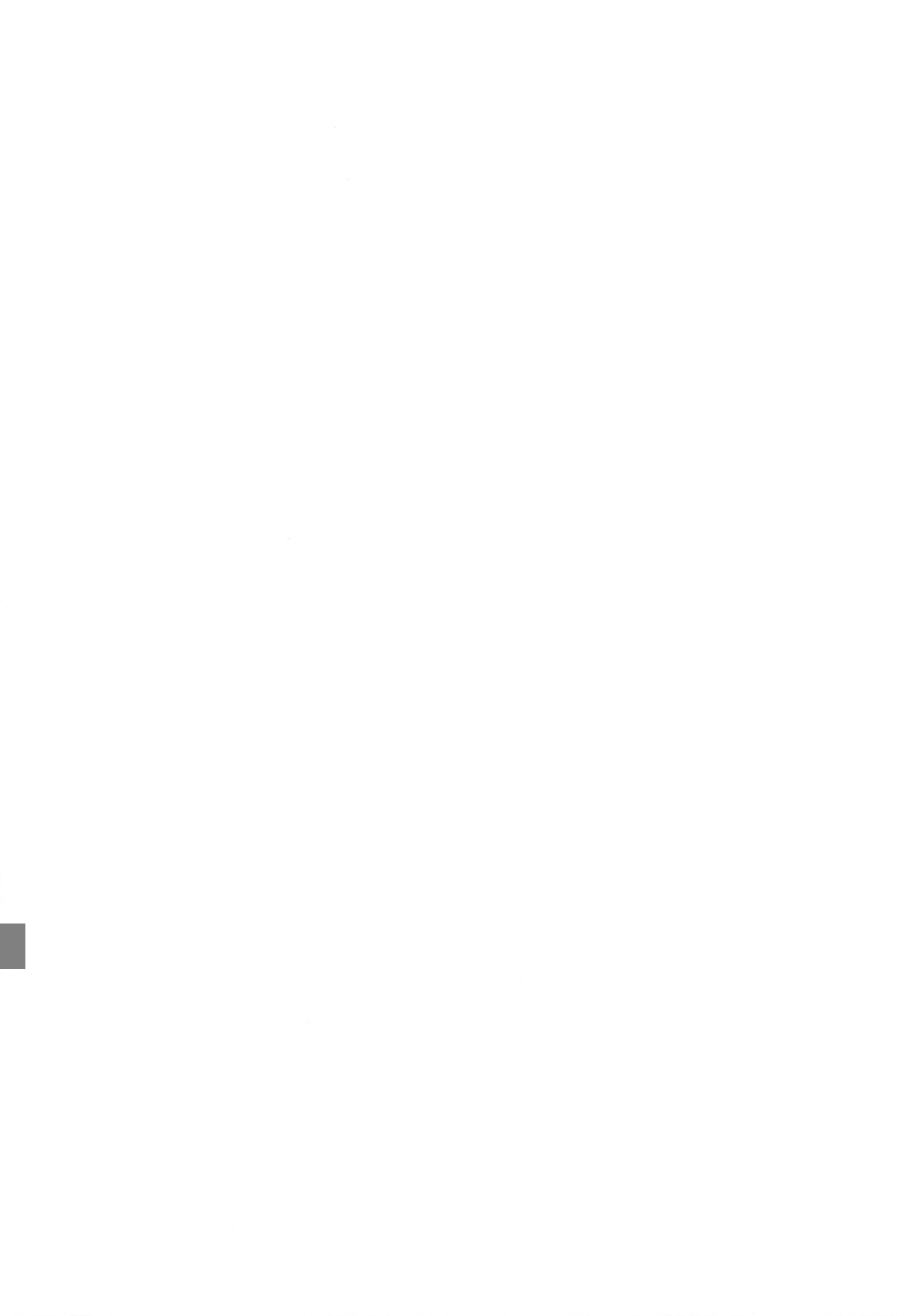
I/O CHANNEL SIGNAL DESCRIPTION

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
C1	SBHE	I/O	D1	-MEM CS16	I
C2	LA23	I/O	D2	-I/O CS16	I
C3	LA22	I/O	D3	IRQ10	I
C4	LA21	I/O	D4	IRQ11	I
C5	LA20	I/O	D5	IRQ12	I
C6	LA19	I/O	D6	IRQ15	I
C7	LA18	I/O	D7	IRQ14	I
C8	LA17	I/O	D8	-DACK0	O
C9	-MEMR	I/O	D9	DRQ0	I
C10	-MEMW	I/O	D10	-DACK5	O
C11	SD8	I/O	D11	DRQ5	I
C12	SD9	I/O	D12	-DACK6	O
C13	SD10	I/O	D13	DRQ6	I
C14	SD11	I/O	D14	-DACK7	O
C15	SD12	I/O	D15	DRQ7	I
C16	SD13	I/O	D16	+5Vdc	
C17	SD14	I/O	D17	-Master	I
C18	SD15	I/O	D18	Ground	

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All signal lines are TTL-compatible with a maximum loading of two low-power (LS) devices.

CLK (Output)
This is the bus clock and synchronous CPU cycle clock, this clock has a 50% duty cycle. This signal should only be used for synchronization, it is not intended for uses requiring a fixed frequency.

RESET DRV (Output)
This signal goes high momentarily during power up, low line-voltage or hardware reset.

SA0-19 (Input/Output)
System address lines bit 0 to 19. These are latched on the falling edge of 'BALE'.

LA17-23 (Input/Output)
Latched address lines from bit 17 to 23.

SD0-15 (Input/Output)
System data bit 0 to 15.

BALE (Output)
Buffered address latch enable is used to latch SA0-19 on the falling edge. This signal is forced high during DMA cycles.

-I/O CH CK (Input)
I/O channel check is an active low signal which indicates a parity error occurred on an I/O board.

I/O CH RDY (Input)
This signal lengthens the I/O or memory read/write cycle. It can be held low for a maximum of 2.5 microseconds.

IRQ3-7, 9-12, 14-15 (Input)
Interrupt request signals indicate I/O service requests.
They are prioritized as following sequences:
Highest IRQ 9,10,11,12;14,15
Lowest IRQ 3,4,5,6,7

-IOR (Input/Output)
-I/O Read signal is an active low signal which instructs I/O device to read data from the data bus.

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-SMEMR (Output)
System Memory Read is low when any memory location is being read.

-SMEMW (Output)
System Memory Write is low when the low 1 megabyte of megabyte of memory is being written.

-MEMW (Input/Output)
Memory Write is low when any memory location is being written.

DRQ0-3, 5-7 (Input)
DMA Request channel 0 to 3 are for 8 bit data transfer.
DMA Request channel 5 to 7 are for 16 bit data transfer.
DMA Request channel 4 is used internally on the system board.
DMA Request should be held high until the corresponding 'DMA Request Acknowledge' (DACK) line goes active.

They are prioritized in the following sequence:

Highest DRQ 0,1,2,3,
Lowest DRQ 5,6,7.

-DACK 0-3, 5-7 (Output)
-DMA Acknowledge 0 to 3, 5 to 7 are the corresponding acknowledge signals for DRQ 0 to 3, 5 to 7. Acknowledge (ACK) goes active low.

AEN (Output)
DMA address enable is high when the DMA controller is driving the address bus. It is low when the 80386 CPU is driving the address bus.

-REFRESH (Input/Output)
This signal indicates a memory refresh cycle in progress.

T/C (Output)
Terminal Count provides a pulse when the terminal count for any DMA channel is reached.

SBHE (Input/Output)
System Bus High Enable indicates the high byte (SD 8-15) is on the data bus.

-MASTER (Input)
Master is pulled low by the I/O processor for controlling the system address, data

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and control lines. It should be held low for a maximum of 15 microseconds, otherwise, system memory may be lost due to a lack of refresh.

-MEM CS16 (Input, Open collector)
I/O Chip Select indicates the present data transfer is a 1 wait state, 16 bit data I/O operation.

OSC (Output)
Oscillator is a 14.31818 MHz signal used for the color graphic board.

0WS (Input, Open collector)
Zero wait state indicates to the microprocessor that the present bus cycle can be completed without inserting any additional wait cycles.

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TROUBLESHOOTING YOUR SYSTEM

Display Problem	Action
"Blank screen " plus no beep	Check to find out if: 1. The system unit power cord is plugged into a working electrical outlet. 2. The cable connected to the system is tight. 3. The system unit and power unit are switched ON.
"Blank screen or distorted display "	Check to find out if: 1. Display power cord is plugged into a working plus 1 beep electrical outlet and the display properly. 2. Display is turned ON and the brightness and contrast controls are turned UP also. 3. Display signal cable is plugged into the correct connection of the system unit. 4. The small slide switch on the Monochrome Graphics/Color Graphics Card is not set Correctly. Set to "MDA" for monochrome TTL monitors, or "CGA" for RGB color monitors.

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KEYBOARD

Keyboard types are used in different types of enhanced keyboard besides the standard 84-key keyboard. They are the 101-key keyboard and the 102-key keyboard.

For countries outside the U.S., the 102-key keyboard should be used.

The following table can be taken as a reference.

Keyboard Type	Keyboard Layout
101-key keyboard	U.S. English
102-key keyboard	Belgian Canadian French Danish Dutch French German Italian Latin American Norwegian Portuguese Spanish Swedish Swiss U.K. English

Templates are used to locate character positions on the keyboard. Different characters can appear in different positions, depending on the country language selected with the KEYB command under DOS3.3. Both 101-key and 102-key keyboards should match with the templates for different keyboard layouts under DOS3.3.

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