YOKE-301 286 MAIN BOARD
USER REFERENCE MANUAL

YOKE-301, 80286 MAIN BOARD USER REFERENCE MANUAL

Written by: David Delmonaco
Technical Support by: Jack In & Jay Eatinger
Edited by: Tony Fu
Edited for U.S.A. by: Ed G. Paniagua
                        & Jay Eatinger

The 80286 chip series are registered trademarks of Intel
Corporation.

Technical guidance on 2.1 through 2.1.5 provided by Sun
Electronics Corporation

IBM   PC/AT   and   XT   are   registered   trademarks   of
International Business Machines Incorporated.

Table of Contents

1.0   Specifications and features

* 80286 16 bit Micro-Processor.
* 5 RAM sizes; 512KB, 640KB, 1 Megabyte,
  2 Megabyte and 4 Mega Byte
* Extended or Expansion (EMS) Selectable over 640KB
* 32KB ROM On Board. Can use 64KB
* Dual CPU Speeds, switchable from 8MHz to 12MHz.
* Zero or One Wait State Selectable (only   the
  memory on mother board will run at zero wait state)
* Battery backed CMOS RAM to Maintain on board Real
  Time Clock and system configuration.
* 7 DMA channels
* 16 interrupt levels
* 3 Programable Timers
* Keyboard Connector
* Speaker Connector
* Power On L.E.D. and Keylock Connector
* External Battery Connector
* 8 I/O expansion slots; five 16-bit, three 8-bit
* Turbo Speed Announcement L.E.D.
* 80287 Co-Processor Socket
* Auxiliary oscillator socket
* Runs the Norton (version 4.00) system
  index test as follows:

2.0   Hardware Description

2.1   System Board Block Diagram

The YOKE   301   Board consists   of the
following VLSI chips:

```
ST62BC001-B  System Controller
ST62BC002-B  High Address Bus Decoder
ST62BC003-B  Low Address Bus Controller
ST62BC004-B  Data Bus Controller
ST62C005-B   DMA Page Address Register
ST62C006     I/O Controller

80286        Microprocessor
8742         Keyboard Controller
80287        Math Coprocessor (Socket Only)
```

System Board Block Diagram
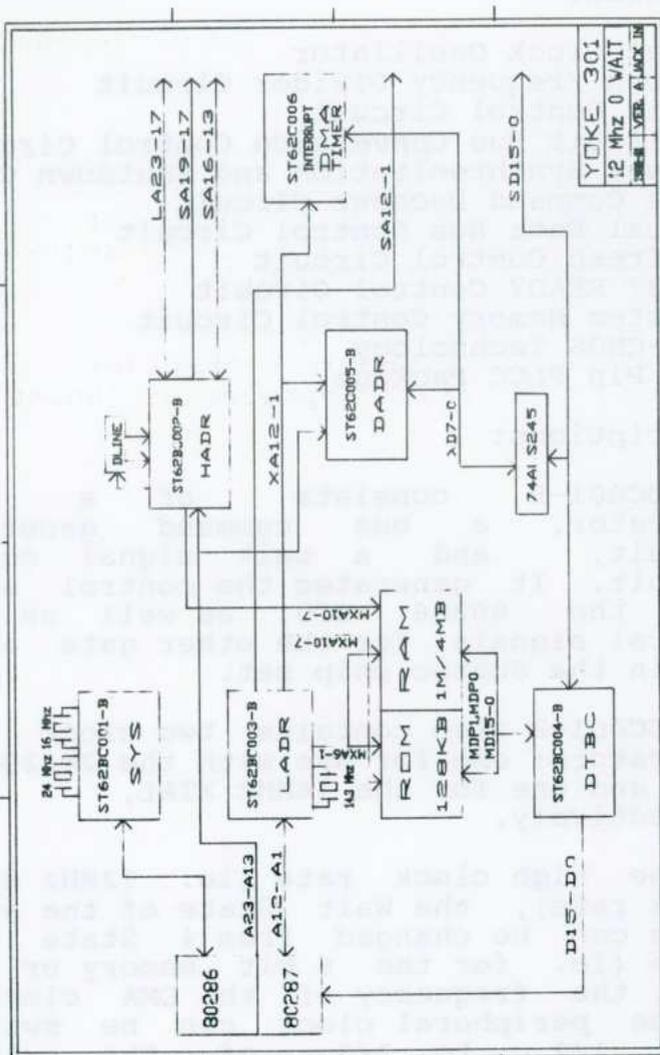
2.1.1 ST62BC001-B System Controller

Features:

* Dual Clock Oscillator
* Clock Frequency Divider Circuit
* Wait Control Circuit
* 8/16 Bit Bus Conversion Control Circuit
* Reset Synchronization and Shutdown Circuit
* Bus Command Decoder Circuit
* Local Data Bus Control Circuit
* Refresh Control Circuit
* 8237 READY Control Circuit
* System Memory Control Circuit
* Bi-CMOS Technology
* 68 Pin PLCC Package

Descriptions:

ST62BC001-B consists of a clock generator, a bus command generation circuit, and a wait signal control circuit. It generates the control signal for the 80286 CPU, as well as the control signals for the other gate arrays within the Suntac chip set.

ST62BC001-B also contains two clock generators; one for use with the 24/20MHz XTAL and one for the 16MHz XTAL, respectively.

In the high clock rate (ie. 12MHz system clock rate), the Wait State of the access cycle can be changed from 4 State to 6 State (ie. for the 8 bit memory or I/O). Also, the frequency of the DMA clock and of the peripheral clock can be switched from 1/2 to 1/3 of the original frequencies.

ST62BC001-B also has the capability to select either 0 or 1 Wait access delay to the system memory. This enables reliable operation of the system at 12MHz, 0 or 1 Wait State; or 8MHz, 0 or 1 Wait State. It generates a timing signal exclusively for the memory address bus and an exclusive write signal for the DRAM.

2.1.2 ST62BC002-B High Address Bus Decoder

Features:

* High Address Bus Driver Circuit
* ROM Address Decode Circuit
* DRAM Address Decode Circuit
* RAS, CAS Control Circuit
* Hold Request Register Circuit
* EMS Control Circuit
* Bi-CMOS Technology
* 68 Pin PLCC Package

Description:

ST62BC002-B is composed of a high address bus driver circuitry for the 80286 CPU, a decode circuit for system memories (ROM, RAM), and a control circuit for the RAS and CAS signals (memory refresh).

Two types of EPROMS, 128KB and 256KB, can be used for BIOS-ROM; and three types of memory, 64KB, 256KB, and 1MB, can be used for DRAM/system memory.

Using DRAM decode, five memory sizes are possible: 512KB, 640KB, 1MB, 2MB and 4MB. Each can be selected via an external control circuit if so desired.

The RAS and CAS (DRAM control signals), are also generated from this chip. They are generated according to the delay timing supplied from the external delay line (100ns) circuit. The DRAM is refreshed with the RAS and CAS signals, and is controlled through the MEMWE signal from the ST62BC001-B chip.

EMS driver specifications

1. After system power is turned on, and before the DRAM begins it's refresh cycle, an initial value needs to be written to the EMS Register, RO. This is usually accomplished through code within the BIOS.

These initial values can be either:

(1) 9DH when I/O port address is E8H.
(2) 93H when I/O port address is 98H.

2. When data is written to EMS Registers RO thru R7, Bit 7 (in the RO) must be read to confirm that the Register contents have been transferred from DADR to HADA:

Thus,
   a) When Bit 7 in RO is 1, it means that the transfer has yet to be achieved.

   b) When Bit 7 in RO is 0, it means that the transfer is completed.

6

3. The system memory size in the EMS
Register can not be set to any value larger
than 640KB (A0H).

4. The segment start address in EMS
Register R3, can not be set to any value
smaller than the system memory size (R2).

5. When setting page numbers for banks 0-
3 in the EMS Registers R4 thru R7,
the number entered should be the same as
the number of pages counted from DRAM
address 0000:0000H, by 16KB units.

For example: If EMS had a usable memory
size of 640KB and the usable page header
was set to: 640/16 = 40 (28H), 28H is
set as the page header.

NOTE: A physical page can be released by
setting its corresponding bank to 0.

6. The banks 0-3 in EMS Registers R4 thru
R7 always correspondend to physical pages
0-3.

7. When the system memory size is 1MB
(as shown in the Memory Address Setting 3
in an attached Table), the setting of the
EMS page number at 40H will result in the
production of an image from memory
location 0000:0000H.

8. A system memory size of 4MB will give a
maximum of 216 pages of memory.

NOTE: The maximum memory size that can
be used with DOS is 640KB.

2.1.3 ST62BC003-B Low Address Bus Controller

Features:

* Low Address Bus Latch Driver Circuit
* Memory Address Bus Latch Driver Circuit
* Refresh Counter Circuit
* Bi-CMOS Technology
* 68 Pin PLCC Package

Descriptions:

ST62BC003-B is composed of latch drivers that latch and output the low address bus of 80286 CPU to the system address bus and the memory address bus. It also refreshes the address counter.

Both the system address bus and the memory address bus are controlled by an individual latch timing signal. This signal enables access timing to the system memories, as well as enabling the EPROM (BIOS) and DRAM to accelerate during high clock rate (12MHz) system operation.

The memory address buses are connected to both EPROM and DRAM. This accelerates the access timing not only for DRAM, but also for the EPROM.

2.1.4 ST62BC004-B Data Bus Controller

Features:

* System Data Bus Driver Circuit
* Memory Data Bus Driver Circuit
* Parity Generator Circuit
* Low 8-bit Local Data Bus Latch Circuit
* System Data Bus, High 8-bit/Low 8-bit Data Exchange Circuit
* Bi-CMOS Technology
* 68 Pin PLCC Package

Descriptions:

ST62BC004-B is composed of:

a) A bus driver (central part of the chip) which executes the input/output operations between the data bus of 80286 CPU and the system data bus/memory data bus.

b) A parity generator circuit for system memory (memory expansion cards usually employ thier own parity checking circuitry).

c) Alow 8-bit local data bus latch circuit.

d) A data conversion circuit for high 8-bit/low 8-bit of the system data bus.

MDP0 and MDP1 of the parity generator are input/output terminals (common terminal for input and output for alternate use). These can be connected to the DRAM in a common I/O mode, like other data lines MD15-MD0.

9

The result of the parity error check is bussed to the PARITY terminal on chip ST62C005-B. A non-maskable interrupt would then be generated.

2.1.5 ST62C005-B DMA Page Address Register

Features:

* DMA Page Address Register Circuit
* DMA High Address Latch Circuit
* I/O Address Decoder Circuit
* B-PORT Circuit
* Non-mask Interuption Register Circuit
* 80287 Control Circuit
* Bi-CMOS Technology
* 84 Pin PLCC Package

Description:

ST62C005-B is composed of:

a) DMA page address register which is the central part of the chip and is formed into an 8 X 16 byte structure.

b) Address latch circuit of DMA high addresses, which are outputted to XD7-XD0 by DMA controller 8237 during DMA.

c) I/O address decoder which makes the chip select signal for the peripheral, I/Os, i.e., 8237 x 2, 8254, 8259 x 2, 8742 and 146818.

d) A port (PORT B) forchecking and controlling the refresh signal, speaker oscillator circuit, and parity check circuit.

e) Non-maskable iterrupt register for control of parity errors.

f) 80287 control circuit.

2.1.6 ST62C006 I/O Controller

Features:

* DMA Controller 82C37 x 2
* Intrerrupt Controller 82C59 x2
* Timer Controller 82C54 x 1
* C-MOS Technology
* 100 Pin Flat Package

2.2 80286 CPU

The 80286 is a high performance microprocessor. It supports a 16 bit data bus, 24 bit memory addressing, memory management, an extended instruction set, DMA and interrupt support, a hardware fixed-point multiply and divide circuit, and 1 giga byte of virtual address space.

A more detailed description of the 80286 can be found in the data book from it's manufacturer.

2.3 Memory Map

Address	Function
0k - 640k	Base Memory
640k-768k	Video RAM for Display
768k-896k	ROM on I/O Adpters
896k-1M	BIOS ROM on System Board
1M - 16M	Extended Memory

2.4 I/O Port Address Map

2.4.1 Devices on System Board

Address	Device
000-01F	1st DMA Chip
020-03F	1st Interrupt Controller Chip
040-05F	Timer
060-06F	Keyboard Controller
070-07F	Real Time Clock
080-09F	DMA Page Register
0A0-0BF	2nd Interrupt Controller Chip
0C0-0DF	2nd DMA Chip
0F0	Clear 80287
0F1	Reset 80287
0F8-0FF	80287

13

2.4.2 Devices on I/O Slots

Address	Device
1F0-1F8	Fixed Disk
200-207	Game Port
278-27F	Parallel Printer Port(Lpt2)
2F8-2FF	Serial Port (COM 2)
300-31F	Prototype Card
360-36F	Reserved
378-37F	Parallel Print Port 1 (lpt1)
380-38F	SDLC 2
3A0-3AF	SDLC 1
3B0-3BF	MDA Video Card
3C0-3CF	EGA Video Card
3D0-3DF	CGA Video Card
3F0-3F7	Floppy Disk Controller
3F8-3FF	Serial Port 1 (COM 1)

2.5 System Timer

The system timer has 3 channels of
time/counter in the ST62C006 chip which is
Intel 8254-2 compatible. The first
channel generates time base for the system
timer; the second channel generates
memory refresh timing; and the third
channel generates pulses to create a tone
for the speaker.

Channel	Function
0	System Timer
1	Memory Refresh Request
2	Tone Generator for Speaker

2.6 DMA Channels

The ST62C006 chip is the equivalent of two
8237A DMA controllers (providing seven
DMA channels).

Controller 1 , 2 Function

0	Reserved
1	SDLC
2	Floppy Disk Controller
3 ←	Reserved
4	Cascade for DMA Controller
5	Reserved
6	Reserved
7	Reserved

15

2.7 Interrupt Request

The 80286 NMI and ST62C006 contain the equivalent of two 8259A interrupt controllers, providing 16 levels of system interrupts. Any or all of these interrupts may be masked.

Lever	Function
NMI	RAM Parrity Check
IRQ0	System Timer Output
IRQ1	Keyboard Buffer Full
IRQ2 ←	Interrupt Cascade
IRQ8	Real Time Clock
IRQ9	Software Redirected to int 0AH
IRQ10	Reserved
IRQ11	Reserved
IRQ12	Reserved
IRQ13	80287
IRQ14	Fixed Disk Controller
IRQ15	Reserved
IRQ3	Serial Port 2
IRQ4	Serial Port 1
IRQ5	Parallel Port 2
IRQ6	Floppy Disk Controll
IRQ7	Parallel Port 1

16

2.8 EMS Port Address Table

EMS98/E8	Location	Description
'L'	E8H	Acess to 80287 is impossible at E8 – EFH.
'H'	98H	Acess to 74 LS 612 is impossible at 98 – 9FH.

2.9 EPROM (BIOS) Location Address Table

Memory type	ROM 0 , ROM 2 Location address	ROM 1 , ROM 3 Location address
128 K bits (16 K byte)	0E0000 – 0E7FFF	0E8000 – 0EFFFF
	0F0000 – 0F7FFF	0F8000 – 0FFFFF
	FE0000 – FE7FFF	BE8000 – FEFFFF
	FF0000 – FF7FFF	FF8000 – FFFFFF
256 K bits (32 K byte)	0E0000 – 0EFFFF	FE8000 – FEFFFF
	FE0000 – FEFFFF	FF0000 – FFFFFF

2.10 EMS Registers Table

		D7	D6	D5	D4	D3	D2	D1	D0	DESCRIPTION
R0	VARIABLE PORT ADDRESS TRANSFER FLAG (READ) R0 READ ENABLE (WRITE)	T/R FLAG	VARIABLE PORT ADDRESS							T/R FLAG READ 1:TRANSFER YET TO BE DONE 0:TRANSFER DONE WRITE 1:READ POSSIBLE 0:READ IMPOSIBLE
			A9	A8	A7	A6	A5	A4	A3	
R1	RESERVED									
R2	SYSTEM MEMORY SIZE	A19	A18	A17	A16	A15	A14	FIXED 0		READ IMPOSIBLE (A0H:00000~9FFFFH)
R3	SEGMENT START ADDRESS	A19	A18	A17	A16	A15	A14	FIXED 0		READ IMPOSIBLE (C0H:SEGMENTC000H)
R4	BANK0	P7	P6	P5	P4	P3	P2	P1	P0	READ IMPOSIBLE
R5	BANK1	P17	P16	P15	P14	P13	P12	P11	P10	READ IMPOSIBLE
R6	BANK2	P27	P26	P25	P24	P23	P22	P21	P20	READ IMPOSIBLE
R7	BANK3	P37	P36	P35	P34	P33	P32	P31	P30	READ IMPOSIBLE

2.11 DRAM Size, Location Address Table

NO	DIP Switch setting			Memory type		Memory size	Memory Location	
	S6	S7	S8	BANK1	BANK0			
0	ON	ON	ON	NONE	41256	512K	0 ~ 7FFFF	
1	ON	ON	OFF	4164	41256	640K	0 ~ 9FFFF	
2	ON	OFF	ON	41256	41256	640KB + 384KB	0 ~ 9FFFF 100000~15FFFF	
3	ON	OFF	OFF	41256	41256	640KB + EMS (16KB x 24 pages)	0 ~ 9FFFF	
4	OFF	ON	ON	NONE	411000	640KB + 1408KB	0 ~ 9FFFF 100000~25FFFF	2MB
5	OFF	ON	OFF	NONE	411000	640KB + EMS (16KB x 88 pages)	0 ~ 9FFFF	2MB
6	OFF	OFF	ON	411000	411000	640KB + 3456KB	0 ~ 9FFFF 100000~5FFFF	4MB
7	OFF	OFF	OFF	411000	411000	640KB + EMS (16KB x 216 pages)	0 ~ 9FFFF	4MB

2.12   External Battery Connection Table

PIN	DESCRIPTION
1	BATTERY + 6V DC
2	KEY
3	GROUND
4	GROUND

2.13   Keyboard Connector Table

PIN	DESCRIPTION
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	SPARE
4	KEYBOARD GROUND
5	+ 5V DC

2.14 Turbo Light Announcement Connector Table

PIN	DESCRIPTION
1	+ ANODE
2	− CATHODE

2.15 Reset Connector Table

PIN	DESCRIPTION
1	RESET IN
2	GROUND

2.16 Speaker Connector Table

PIN	DESCRIPTION
1	SPEAKER DATA OUT
2	KEY
3	GROUND
4	+ 5V DC

2.17 Power Input Connector Table (P8)

PIN	DESCRIPTION	COLOR
1	POWER GOOD	ORANGE
2	+ 5V DC	RED
3	+ 12V DC	YELLOW
4	- 12V DC	BLUE
5	GROUND	BLACK
6	GROUND	BLACK
7	GROUND	BLACK
8	GROUND	BLACK
9	- 5V DC	WHITE
10	+ 5V DC	RED
11	+ 5V DC	RED
12	+ 5V DC	RED

2.18 Keyboard Lock and Power On Indicator Table

PIN	DESCRIPTION
1	LED POWER
2	KEY
3	GROUND
4	KEYBOARD INHIBITOR
5	GROUND

3.0 Diagrams for Jumpler Setting

Enlarged Diagram of Jumper Locations Board

BANK0 BANK0 BANK0 B
BANK0 BANK0 BANK0 B
BANK0 BANK0 BANK0 B
BANK0 BANK0 BANK0 B
BANK0 BANK0 BANK0 B
BANK0 BANK0 BANK0 B

J20   JP9   IC22 ROM0

J19   JP8 JP1 JP2
DSP1 JP3
ON
1 2 3 4 5 6 7 8
TR1

LOW
EVEN

80287

LOW
EVEN

JP6   ROM1
                IC23
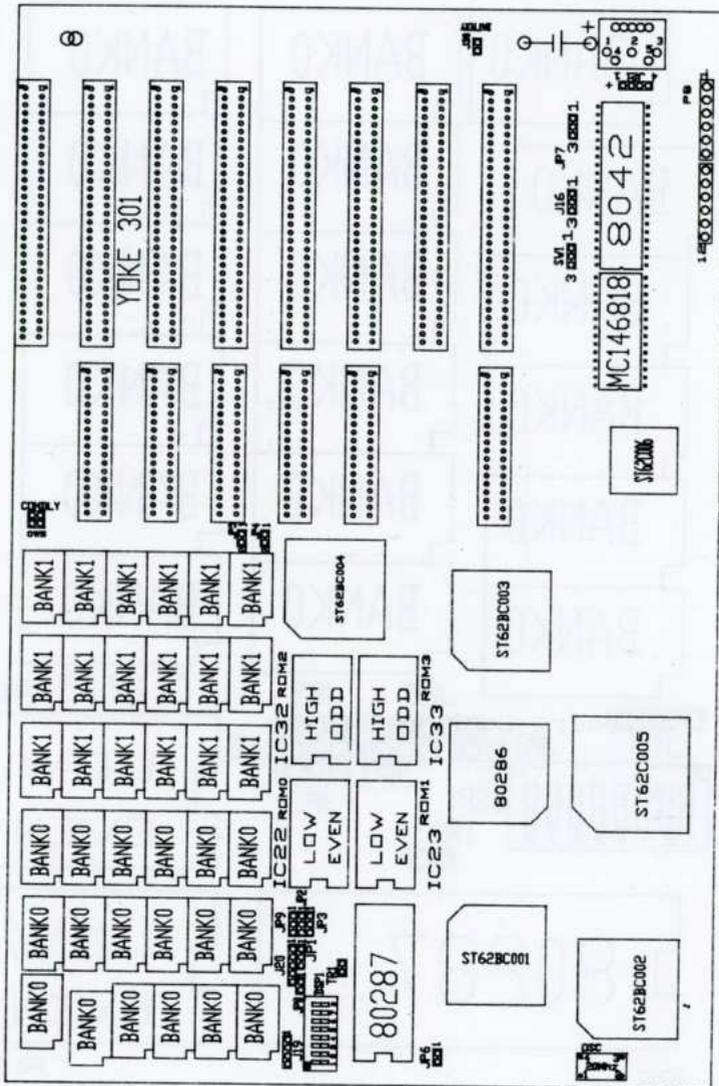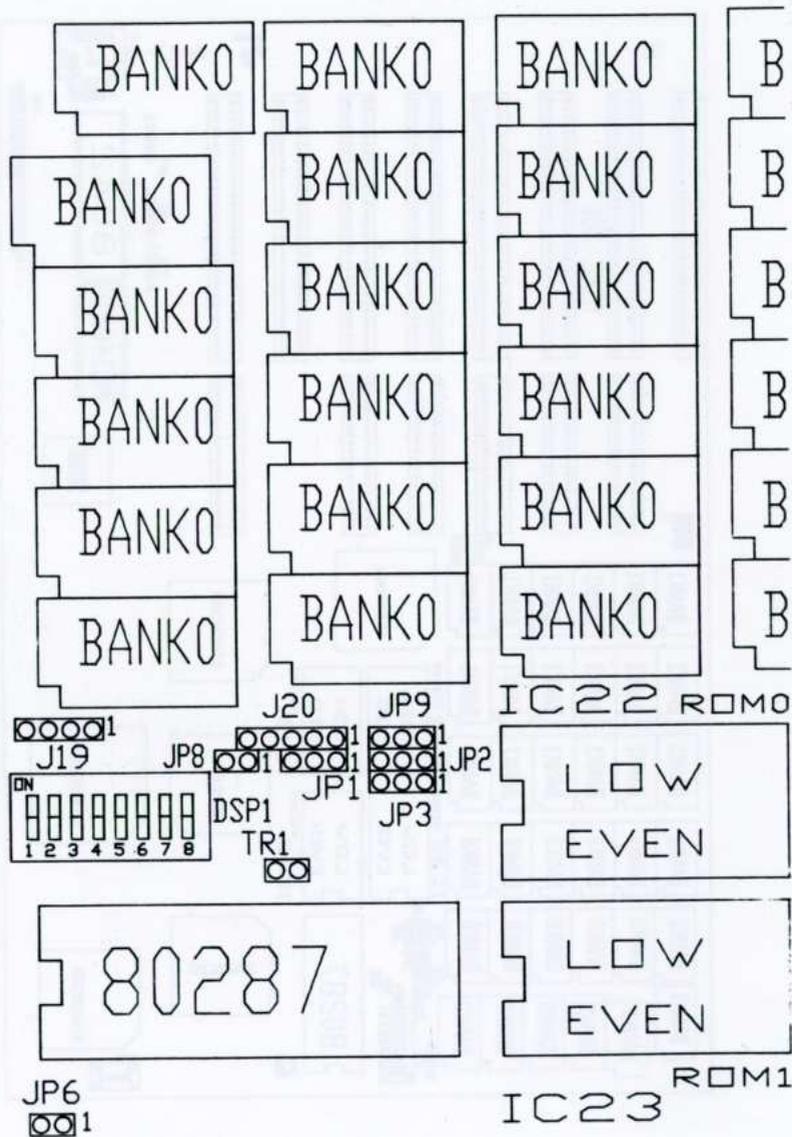
Enlarged Diagram of Jumper Locations Board
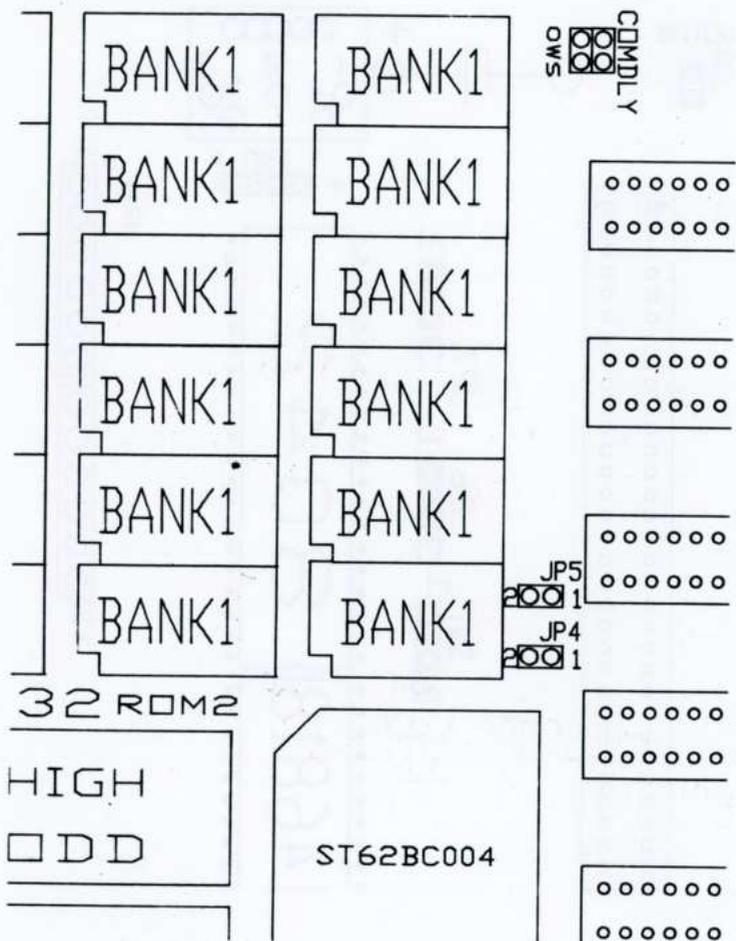
Enlarged Diagram of Jumper Locations on Board
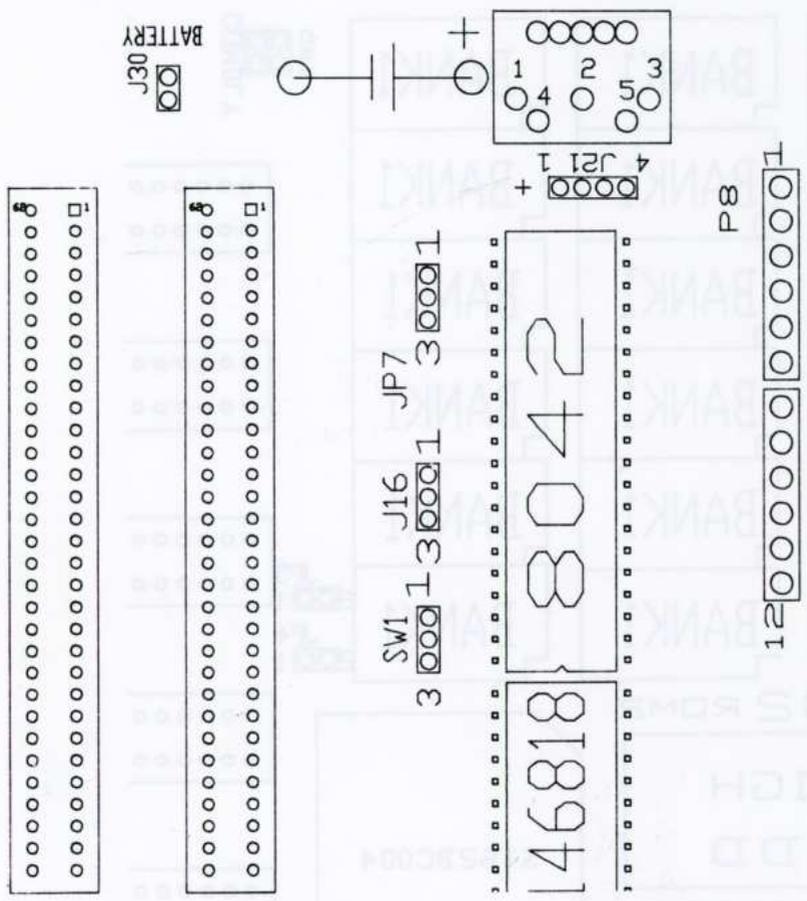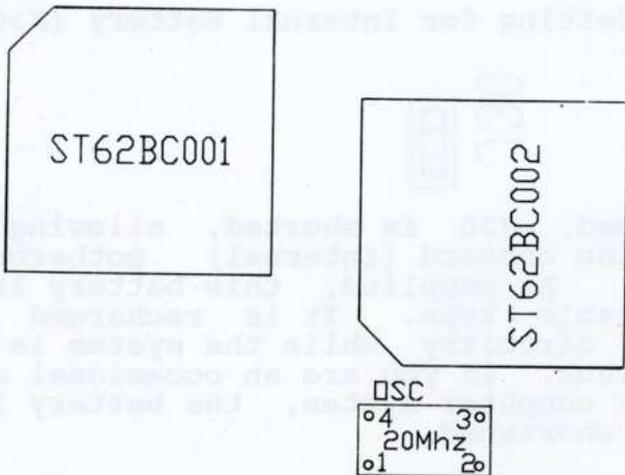
3.1 Battery backup system

3.1.1 Setting for Internal Battery (J30)
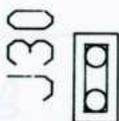
As shipped, J30 is shorted, allowing the use of the onboard (internal) motherboard battery. As supplied, this battery is a rechargeable type. It is recharged via onboard circuitry while the system is in use. Thus, if you are an occasional user of your computer system, the battery life will be shortened.

Under normal computer operating conditions (computer is used at least 5-6 times a week and left on for an extended period of time during each use), the rechargeable battery system should give a service life of 1 to 2 years.

The first indication that it may be low will be when you begin to lose your system configuration data (CMOS). Usually this will be noticed when you first turn your system on. Normally, the system will then indicate loss of configuration data.

If you use your computer system on a less than regular basis, we recommend the use of an external battery system which does not require recharging via motherboard circuitry.

3.1.2 Using an External Battery (J30)

J30
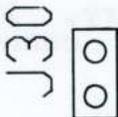
If the rechargeable battery provided on the motherboard fails or you feel a non-rechargeable battery system would be more reliable in your situation, an external battery may be substituted for the internal battery.

Any external battery pack type may be used as long as the total voltage is 6V DC. An excellent choice is the long lasting lithium or alkaline battery packs that are offered by your dealer or at most computer and software supply stores.

3.1.3 Setting Motherboard for External Battery use.

If position J30 is shorted with a shunt (commonly referred to as a jumper) it must be removed prior to installation of the external battery (as described following):

3.1.4 External Battery Connector (J21)

When using an external battery, it must be connected to the four pin connector at position J21.

The pin out is as follows:
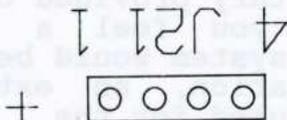
3.2 Power-on Indicator and Keyboard Lock Circuit (J20)

As a matter of convenience, a colored light set in the front of some computer panels glow whenever the power is turned on. It can be determined that the computer is receiving power. A keyboard inhibit circuit is also provided, inhibiting others from using your system.

Utilization of these two circuits requires connection to be made at connector J20. Most cabinet manufacturers provide a pre-wired, 5-pin connector facilitating easy connection of these circuits.

Power-on Indicator Circuit:

Current to drive the power "on" (green front panel L.E.D.) is supplied on pin number 1. Pin 3 is ground.

Keyboard Inhibit Circuit:

The keyboard inhibit circuit is controlled by pin number 4. Pin number 5 is ground and and pin number 2 is a key (some 5-pin connectors will have an obstruction inserted in the mating hole #2, prohibiting improper connection).

```
        J20
  ┌─────────────┐
  │ O O O O O │
  └─────────────┘
    5 4 3 2 1
```

3.3 Speaker Connector (J19)

```
           4 3 2 1
        ┌───────────┐
        │ O O O O │
        └───────────┘
           J19
```

A speaker may be connected to connector J19, providing audio warning through programs and through the on-board BIOS.

Pin number 1 of J19 is the output line. Pin number 3 is ground (unused in most circumstances) and pin number 4 is a +5v output (used to drive the speaker coil). Pin number 2 is normally used as a key. Connect the speaker between pins 1 and 4 with a four pin connector (normally provided by your cabinet manufacturer).

NOTE: Only use a speaker rated at 250mW, 8 ohms.

WARNING: Do not place a 2 pin speaker connector between pins number 3 and 4, otherwise the power supply will not function, the speaker might burn out, AND THERE IS THE POSSIBILITY OF FIRE.

3.4 Turbo ON/OFF Indicator (JP5)
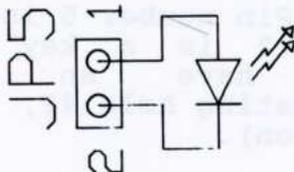
Another front panel function that is very useful is the Turbo ON/OFF indicator. When the L.E.D. is illuminated, the system is currently in the high speed mode. After you have toggled into the lower speed mode, the L.E.D. will go off, indicating the low speed mode.

Pin number one must be connected to the L.E.D. s Anode (+), while pin number two must be connected to the L.E.D.'s Cathode (-). If you are unsure of which terminal on the L.E.D. is which, simply try connecting it both ways (with the system in the high speed mode of course) until the L.E.D. illuminates. You cannot harm the L.E.D. by connecting it the wrong way momentarily.

3.5 Power Supply Connector (P8)

Please reference the table under section 2.17 on page 22. Be very careful installing the power supply connectors as you may damage the motherboard, the power supply or both if installed incorrectly.

3.6   System Reset Connector (JP6)
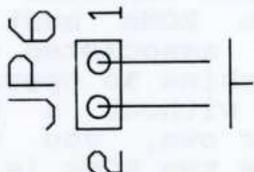
During computer operation, it will sometimes be necessary to initiate a system reset as some programs will force a condition commonly called "freezing up". Shorting JP6 will cause the equivalent of a cold system boot.

Pin 1 is connected to the reset circuit while pin 2 is ground.

3.7   Keyboard Connector (J22)

Pin 1 connects to the keyboard clock line, while pin 2 connects to the keyboard data line. Pin 4 is keyboard ground and pin number 5 is +5V DC. Pin number 3 is a spare.

NOTE: Please reference (Page 20) Section 2.13: Keyboard Connector Table.

3.8   BIOS ROM installation

All 80286 based machines operate using two BIOS ROMs (since the 80286 utilizes 16-bit data transfers, two 8-bit EPROMs must be used together).

33

One ROM contains all the LOW bytes of a 16-bit word while the other ROM contains the HIGH bytes. These two ROMs must be inserted into the proper associated ROM socket in order for the machine to operate. If your motherboard came without a BIOS and you are installing your own, you must first identify which of the two ROMs is LOW and which is HIGH. Then install them as follows:

Insert the LOW byte BIOS into the ROM socket marked ROM1 (IC23)

Insert the HIGH byte BIOS into the ROM socket marked ROM3 (IC33)

Something else that should be considered is the ROM speed rating. Minimum speed is 150ns. Anything faster will work, but never use anything slower (such as 200ns EPROMs).

3.8.1   16KB (27128) ROM (JP9 and SW1)
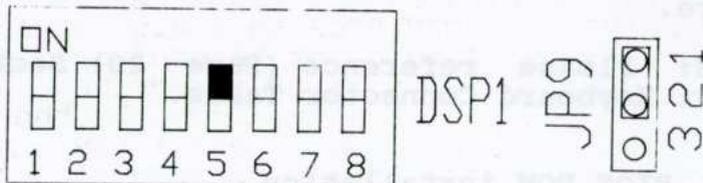
When using ROM type 27128 (16K x 8 bit), jumper JP9 must be set to the 1-2 side and position number 5 of SW1 be set to the ON position.

3.8.2 32K Byte (27256) ROM (JP9 and SW1)
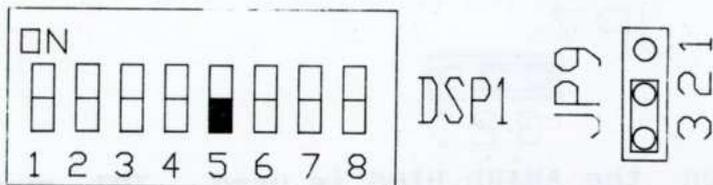
When using ROM type 27256 (32K x 8 bit), jumper JP9 must be set to the 3-2 side and position 5 of SW1 be set to the OFF position.

3.9 BIOS TYPE Setting (JP7)

Certain BIOS manufacturers utilize a different pin on the 8742 keyboard controller chip. A feature is provided on the motherboard to facilitate switching between pins 23 and 32 on the 8742 chip.

Most BIOS (Like Wisetek, Phoenix, Erso)will use the setting as described under 3.9.2. The AWARD and EDEN BIOS sets are completely different and should not be confused. You must use the setting as described under 3.9.1. The pins, 23 and 32, by the way, are simply different auxillary ports controlling the speed change function through BIOS code. Some BIOS use the port at pin 23 and others use the port at pin 32.

3.9.1 AWARD BIOS Setting (JP7)
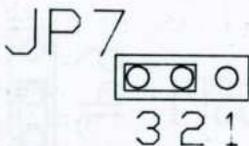
When the AWARD BIOS is used, JP7 must be set to the 2-3 side. This will utilize pin 23 of the 8742 keyboard controller chip.

3.9.2 PHOENIX BIOS Setting (JP7)
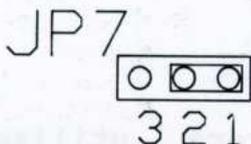
When the PHOENIX BIOS is used, JP7 must be set to the 1-2 side. This will utilize pin 32 of the 8742 keyboard controller chip.

3.10 Installing DRAM On the motherboard

This motherboard offers the ability to use either 16 or 18 pin chips for DRAM. A total of five different RAM size configurations are available as well as the ability to utilize extended and expanded memory.

If you are not familiar with the distinction between base, extended and expanded memory, refer to the following explanations.

Base memory - memory from the 0 byte memory address up to the 640K limit imposed by DOS (00000H-9FFFFFH).
This memory area is usable by DOS for programs and temporary data storage.

36

Extended memory - memory from 1 to 16 megabyte memory address (100000H-FFFFFFH). This area can be used by the IBM AT or AT compatibles to store programs and temporary data storage. DOS does not recognize this memory space, but certain programs can use this memory space (notably the VDISK.SYS virtual disk utility included on the DOS version 3.00 and higher system disk and the new OS/2 DOS)

Expanded memory - memory that can be accessed by specially-modified software to overcome the DOS-imposed 0k-640k memory address limit for program data. The specifications were developed as a joint project of Lotus, Intel and Microsoft.

The following nine sections will describe how to set the motherboard switches and jumpers to each of the five different size configurations for base only, and base with extended or expanded memory.

A mechanical switch can be installed on JP8 when you have memory of more than 640KB. This switch allows RAM size settings to be switched externally.

NOTE: With one exception, if expansion (EMS) memory is desired, JP8 must be open. Otherwise J8 should be shorted.

3.10.1 Installing 64K x 8 DRAM or 256K x 8 DRAM

When 64K or 256K DRAM is used, insert the I.C. into the 16-pin side of the staggered I.C. socket as shown in the following diagram:

```
 o o o o o o o o o
 o o o o o o o o o
o  4164/41256-80 o
 o o o o o o o o o
```
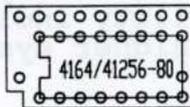
3.10.2 Installing the 1-megabit DRAM

If using the 411000-0 1MB DRAM chips, insert each chip into the 18-pin side as shown:

```
 o o o o o o o o o
 o o o o o o o o o
   411000-80
 o o o o o o o o o
 o o o o o o o o o
```
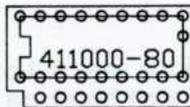
NOTE: When running at 12MHz in the zero wait state mode, it is highly recommended that 80ns or faster DRAM chips be used. We have seen 100ns chips work fine in the zero wait state mode, but certain programs that rely on heavy usage of memory I/O such as Autocad, Pagemaker or Ventura Publisher will begin to exhibit memory parity errors during operation.

3.10.3   Installing 512K of RAM (using 41256K DRAM devices).
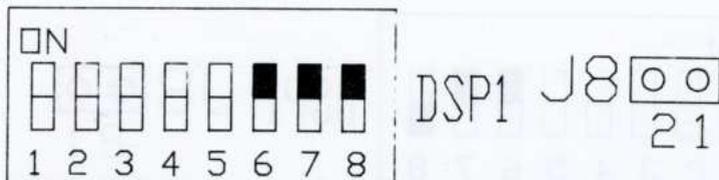
INSERT INTO BANK 0 :   18 pieces of 41256K DRAM
INSERT INTO BANK 1 :
BASE MEMORY   :   512KB
EXTENDED MEMORY   :   0KB
EXPANDED MEMORY   :   0KB

JUMPER JP8: Does not matter.

Install a total of 18   DRAMs (41256-xx) into BANK 0. Then set DIP switch positions 6, 7, and 8 to ON,ON,ON respectively.

A base memory of 512KB will reside in the system memory map from location 00000 to location 7FFFFH.

3.10.4 Installing 640K of RAM (using 41256K and 4164K DRAM devices)


```
INSERT INTO BANK 0 :   18 pieces of 41256K DRAM
INSERT INTO BANK 1 :   18 pieces of 4164K DRAM
BASE MEMORY        :   640KB
EXTENDED MEMORY    :   0KB
EXPANDED MEMORY    :   0KB
JUMPER JP8:  Must be open (This is the one
exception)
```

Install a total of 18 DRAMs (41256-xx) into BANK 0. Then insert a total of 18 DRAMs into BANK 1. Then set DIP switch positions 6, 7 and 8 to ON, ON, OFF respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to location 9FFFFH.

3.10.5 Installing 1 MB of RAM utilizing EXTENDED Memory (using 41256K DRAM devices)


```
INSERT INTO BANK 0 :   18 pieces of 41256K DRAM
INSERT INTO BANK 1 :   18 pieces of 41256K DRAM
BASE MEMORY        :   640KB
EXTENDED MEMORY    :   384KB
EXPANDED MEMORY    :   0KB
JUMPER JP8:  Must be shorted
```

Install a total of 18 DRAMs (41256-xx) into BANK 0. Then insert a total of 18 DRAMs into BANK 1. Then set DIP switch positions 6, 7 and 8 to ON, OFF, ON respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to 9FFFFH. The portion of extended memory will reside in the system memory map from location 100000H to location 15FFFFH.

3.10.6   Installing 1 MB of RAM utilizing
EXPANDED memory and special driver (using
41256K DRAM devices)

```
□N
┌─┬─┬─┬─┬─┬─┬─┬─┐
│ │ │ │ │ │ │█│ │      DSP1 J8 ┌──┬──┐
│ │ │ │ │ │ │ │█│           │ ○│ ○│
└─┴─┴─┴─┴─┴─┴─┴─┘           └──┴──┘
 1 2 3 4 5 6 7 8               2  1
```

INSERT INTO BANK 0 :   18 pieces of 41256K DRAM
INSERT INTO BANK 1 :   18 pieces of 41256K DRAM
BASE MEMORY   :   640KB
EXTENDED MEMORY   :   0KB
EXPANDED MEMORY   :   Twenty-four 16KB pages
JUMPER JP8:   Must be open

Install a total of 18   DRAMs (41256-xx)
into   BANK 0. Then insert a total of   18
DRAMs into BANK 1.   Then set DIP switch
positions 6,   7 and 8 to ON,   OFF,   OFF
respectively.

A base memory of 640KB will reside in   the
system memory map from location 00000   to
location 9FFFFH.

The   expansion memory will consist   of
exactly   twenty-four 16KB pages.   See
section   3.21   on how to utilize the   EMS
driver   (SEMS.SYS) provided   with   your
motherboard or system purchase.

3.10.7 Installing 2 MB of RAM utilizing EXTENDED Memory (using 1 MB DRAM devices)
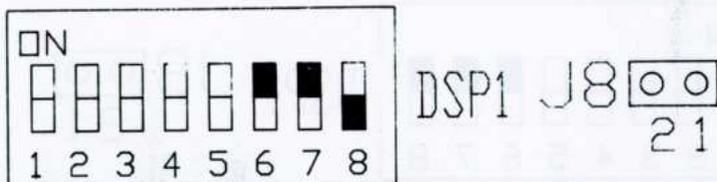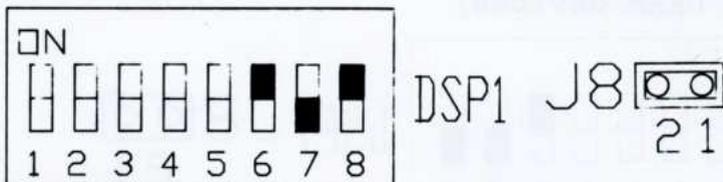

DSP1 J8 2 1

INSERT INTO BANK 0 :   18 pieces of 411000 DRAM
INSERT INTO BANK 1 :
BASE MEMORY   :   640KB
EXTENDED MEMORY   :   1408KB
EXPANDED MEMORY   :   0KB
JUMPER JP8: Must be shorted

Install a total of 18 DRAMs (411000-xx) into BANK 0. Then set DIP switch positions 6, 7 and 8 to OFF, ON, ON respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to 9FFFFH. The portion of extended memory will reside in the system memory map from location 100000H to location 25FFFFH.

3.10.8 Installing 2 MB of RAM utilizing EXPANDED memory and special driver (using 411000K DRAM devices)
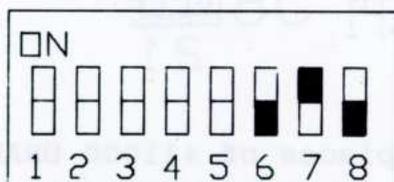

```
INSERT INTO BANK 0 :  18 pieces of 411000K DRAM
INSERT INTO BANK 1 :
BASE MEMORY          :  640KB
EXPANDED MEMORY      :  Eighty-eight 16KB pages
EXTENDED MEMORY      :  0KB
JUMPER JP8:  Must be open
```

Install a total of 18 DRAMs (411000-xx) into BANK 0. Then set DIP switch positions 6, 7 and 8 to OFF, ON, OFF, respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to location 9FFFFH.

The expansion memory will consist of exactly eighty-eight 16KB pages. See section 3.21 on how to utilize the EMS driver (SEMS.SYS) provided with your motherboard or system purchase.

3.10.9 Installing 4 MB of RAM utilizing EXTENDED Memory (using 1 MB DRAM devices)
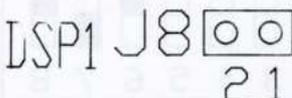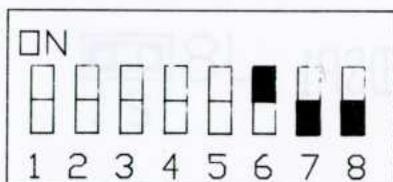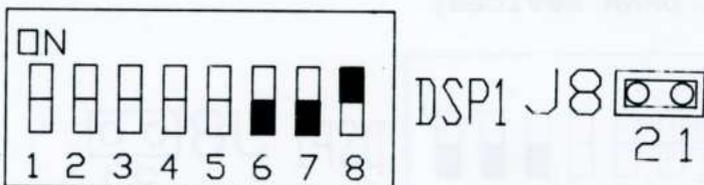


```
INSERT INTO BANK 0 :   18 pieces of 411000-10 DRAM
INSERT INTO BANK 1 :   18 pieces of 411000-10 DRAM
BASE MEMORY        :   640KB
EXTENDED MEMORY    :   3,456KB
EXPANDED MEMORY    :   0KB
JUMPER JP8:  Must be shorted
```

Install a total of 18 DRAMs (411000-xx) into BANK 0 and a total of 18 DRAMs (41100-xx) into BANK 1. Then set DIP switch positions 6, 7 and 8 to OFF, OFF, ON, respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to 9FFFFH. The portion of extended memory will reside in the system memory map from location 100000H to location 45FFFFH.

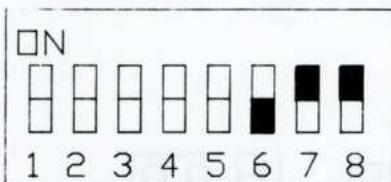## 3.10.10 Installing 4 MB of RAM utilizing EXPANDED memory and special driver (using 411000K DRAM devices)
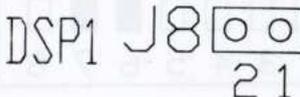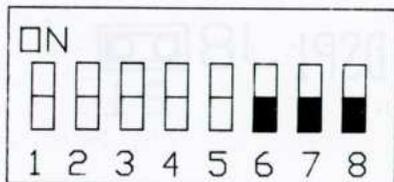

```
INSERT INTO BANK 0 :   18 pieces of 411000K DRAM
INSERT INTO BANK 1 :
BASE MEMORY        :   640KB
EXPANDED MEMORY    :   Two-hundred, sixteen 16KB pages
EXTENDED MEMORY    :   0KB
JUMPER JP8:  Must be open
```

Install a total of 18 DRAMs (411000-xx) into BANK 0 and a total of 18 DRAMs (41100-xx) into BANK 1. Then set DIP switch positions 6, 7 and 8 to OFF, OFF, OFF, respectively.

A base memory of 640KB will reside in the system memory map from location 00000 to location 9FFFFH.

The expansion memory will consist of exactly two-hundred, sixteen 16KB pages. See section 3.21 on how to utilize the EMS driver (SEMS.SYS) provided with your motherboard or system purchase.

46

3.11 Setting the EMS Port Address

EMS uses I/O ports to set up mapping
information. These I/O ports are
selectable. A number of I/O ports have
been reserved for EMS memory use, but as of
this writing, the YOKE 301 EMS driver can
only use two of these ports, 00E8H and
0098H (the letter "H" represents
hexadecimal notation)

3.11.1 Setting 00E8H as an EMS Port Address
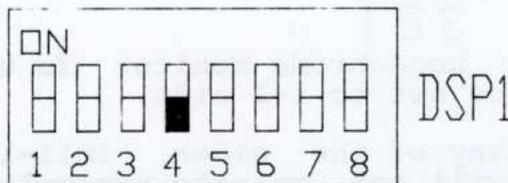
To use 00E8H as an EMS port address, set
DIP SW1 position4 in the OFF position.

3.11.2 Setting 0098H as an EMS Port Address
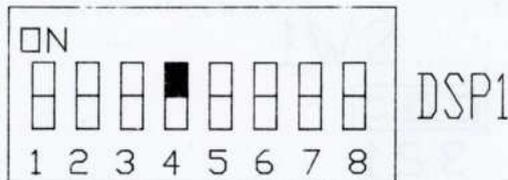
To use 0098H as an EMS port address, set
DIP SW1 position4 in the ON position.

See section 3.21 on how to utilize the EMS
driver (SEMS.SYS) provided with your
motherboard or system purchase.

3.12 Setting motherboard to proper Display/Monitor type (SW1)

A shunt on the motherboard must be set to the display type (Color or MGA) you plan to use. The setting is as follows:

3.12.1 Monochrome Display

SW1

[O [O O]]
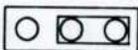
3 2 1

When a monochrome monitor is used, SW1 should be set to 1-2 side.

NOTE: Many of the older, full-length MGA boards will not operate properly with the 301 motherboard. All short length MGA cards we tested operated properly.

3.12.2 Color or Special Display

SW1

[O O] O]
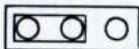
3 2 1

When a color or special (EGA, PGA or VGA) monitor is used, SW1 should be set to 2-3 side.

NOTE: Many of the older, full-length CGA boards will not operate properly with the 301 motherboard. We recommend use of the short CGA boards.

3.13 Setting the Clock Speed

JP1 is used to fix the system speed (8 or 12MHz) upon power up. Once the speed is set by this option, it is fixed. That is, it cannot be changed via keyboard or front panel buttons.

3.13.1 Fixing High Speed (12MHz)
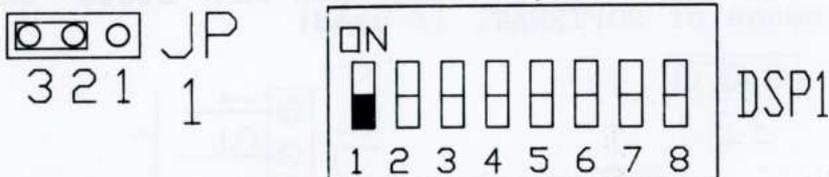
Set JP1 to the 2-3 side, and DIP switch position 1 to OFF. The system speed will be set at 12MHz.

3.13.2 Fixing Low Speed (8MHz)
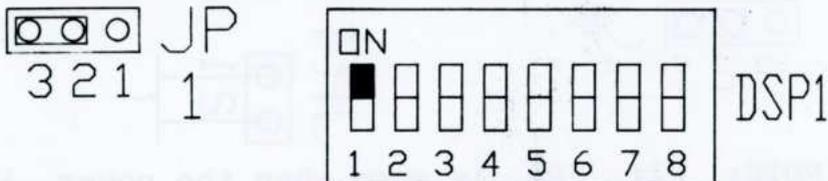
Set JP1 to the 2-3 side, and DIP switch position 1 to ON. The system speed will be set at 8MHz.

3.14 Changing between High and Low Speeds via external Hardware Switch

With jumper JP1 set to the 1-2 side, an external switch (Single pole/Single throw type) can be connected to JP4 to change the system speed.

When the switch is open, the system speed will be low (depending upon the state and usage of SOFTSWAT, if used)

```
 ┌─────────┐
 │ O  O  O │  JP
 └─────────┘         JP4  ┌──┐
  3  2  1    1            │O┤─┐  ─┤
                          │O┤ └  ─┤├
                          └──┘
```

When the switch is closed, the system speed will be high (depending upon the state and usage of SOFTSWAT, if used. SOFTSWAT would have to be run to set speed LOW for the switch to work properly).

```
 ┌─────────┐
 │ O  O  O │  JP
 └─────────┘         JP4  ┌──┐
  3  2  1    1            │O┤─┐  ─┤
                          │O┤ └  ─┤├
                          └──┘
```

NOTE: If JP4 is open when the power is turned on, the speed will automatically be HIGH and keyboard switching will be ENABLED. If a mechanical switch is installed on JP4 and is closed when the power is turned on, the speed will still be high but keyboard switching will be DISABLED. If JP4 is enabled, DO NOT try using the keyboard to switch speeds.

50

3.14.2 Changing Speed Using Hardware Only

To set a low speed, JP1 pins number 2 and 3 should be shorted to the switch; and DIP switch position 1, set to the ON position.

To set a high speed, JP1 pins number 2 and 3 should be open (ie. not shorted to the switch); and DIP switch position 1, set to the ON position.

51

3.15   Changing System Speed via Keyboard
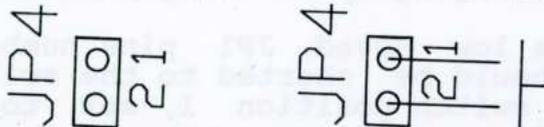
Changing system speed via your keyboard is possible only by BIOS support or usage of the YOKE "SOFTSWAT.COM" program. Also, a shunt must be installed on jumper JP1 on pins 1-2 - PLUS jumper JP4 must be OPEN when the system is first turned on.

Depending upon the BIOS type you are currently using, the usual method of changing speed via keyboard is by pressing the CTRL, ALT and minus (-) or positive (+) keys sequentially, in that order, holding each key down while pressing the next.

For example, using an AWARD BIOS version 3.03, the sequence to change system speed would be as follows:

CTRL, ALT, minus   (-) = HIGH speed (12MHz)
CTRL, ALT, positive (+) = LOW speed (8MHz)

If the BIOS you are using does not change the speed via keyboard (as can be seen through viewing the front panel L.E.D., ON=HIGH speed, OFF=low speed) then see section 3.20, page 58, on using the program SOFTSWAT.

NOTE: If JP4 is shorted when the power is turned on, it will invalidate system speed switching via keyboard. The system will be fixed in HIGH speed.

3.16   Command Delay (COMDLY)

Command delay is a proprietary option that delays the amount of time occurring between the end of ALE signal and the beginning of the COMMAND signal in one cycle. This delay gives the 301 motherboard the ability to run daughterboards (adapters on the motherboard's bus) with greater reliability.

3.16.1   Setting I/O to System Speed (No Command Delay)
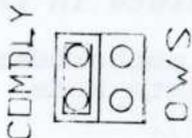
Installing a shunt on the COMDLY jumper will cause the I/O speed to be equal to the CPU speed.

NOTE: Only be concerned with the top section (ie. COMDLY) of the figure to the left.

3.16.2 Setting I/O to utilize Command Delay
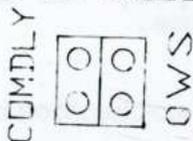
Leave the COMDLY jumper open to enable the Command Delay circuitry (Note that this is the default configuration).

NOTE: Only be concerned with the top section (ie. COMDLY) of the figure to the left.

NOTE: We recommend utilizing the Command Delay feature at all times to insure greater system stability and reliability.

3.17 Zero Wait State Setting

With the YOKE 301 motherboard it is possible to run complete memory read and writes in one cycle without a "wait state" being inserted into the CPU cycle. Please note that only the memory installed on the motherboard will be affected by this feature. Memory on expansion cards installed on the bus will always insert at least one wait state in the CPU cycle.

3.17.1 Setting motherboard to operate in the zero wait state mode
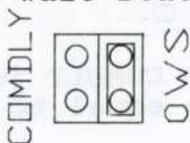
Installing a shunt on the OWS jumper will cause memory read/writes to be performed in one CPU clock cycle (zero wait state).

NOTE: Only be concerned with the bottom section (ie. OWS) of the figure to the left, at this time.

3.17.2 Setting motherboard to operate with one wait state
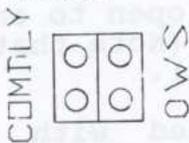
Leave a shunt on the OWS jumper (note that this is the default configuration) to allow memory read/writes to be performed with one wait state inserted in the cycle.

NOTE: Only be concerned with the bottom section (ie. OWS) of the figure to the left, at this time.

NOTE: To insure system reliability running zero wait state mode, it is recommended you use DRAM chips rated at 80ns.

3.18 I/O Wait Selection

I/O Waits are inserted on the bus to insure complete data transfers during CPU clock cycles from adaptors inserted in the bus. The number of waits desired can be selected as described following between four and six waits. Four waits is usually enough when combined with the COMDLY feature, but if system reliability is a problem, try utilizing six waits.

3.18.1 Setting system to four I/O Waits
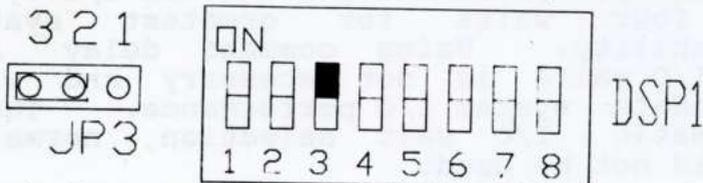
To set four I/O waits, JP3 should be set to the 2-3 side and DIP SW1 position 3 set ON.

3.18.2 Setting system to six I/O Waits
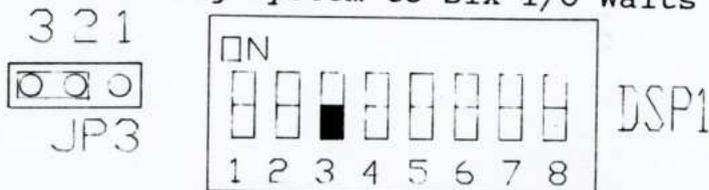
To set six I/O waits, JP3 should be set to 2-3 side and DIP switch position 3 set OFF.

55

3.18.3   Automatic Selection of I/O Wait Cycle in respect to System Speed

3 2 1
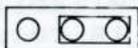
JP3

If you would like automatic selection of the I/O waits, place a shunt on the 1-2 side of jumper JP3.

In this configuration, six I/O waits will occur when operating at high speed and four I/O waits will occur when operating at low speed.

NOTE: The I/O Wait cycle lengths will differ when using the Command Delay feature. We recommend that you enable the command delay feature and set the I/O cycle to four waits for greatest system reliability.   Using command delay AND six I/O waits is not necessary and will degradate system I/O performance.   Thus, automatic I/O wait selection normally should not be used.

56

3.19 Setting Co-Processor 80287 Speed

As shipped, the motherboard will require
installation of an 80287-10 As a 80287
rated at this speed is very expensive, we
have provided a way to install a slower
80287.

An 80287 co-processor rated at 10MHz will
require installation of a 20MHz oscillator,
and an 80287 co-processor rated at 8MHz will
require installation of a 16MHz oscillator.

To change the speed first remove the
shunt from jumper TR1. Then install an
oscillator rated as follows:

An 80287 co-processor rated at 10MHz will
require installation of a 20MHz oscillator,
and an 80287 co-processor rated at 8MHz will
require installation of a 16MHz oscillator.

To reset the speed of the Co-
Processor to the CPU speed, remove the
auxiliary oscillator and re-install a shunt
at jumper position TR1.
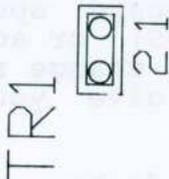
NOTE: Please reference (Page 27)
Section 3.0 Enlarged Diagram of Aux.
Oscillator Location on Board

3.20 IBM Diagnostics Ram size setting (J18)

Early versions of the I.B.M. Advanced Diagnostic program would not work on later versions of 80286 based motherboards equipped with more than 256KB. Jumper J18 allows setting the motherboard too "appear" as if it contains only 256KB, thus, the early version diagnostic program will then work.

3.20.1 Setting motherboard to standard (512KB) configuration (default setting as shipped).

Locate jumper J18 (use the enlarged diagram on page 26 if necessary). The shunt should be on pins 2-3. If not, move the shunt.

3.20.2 Setting motherboard to 256KB

Locate jumper J18 (use the enlarged diagram on page 26 if necessary). The shunt should be on pins 1-2. If not, move the shunt.

3.21 Use of the program SOFTSWAT

If you use a BIOS that either does not support keyboard speed switching (like the I.B.M. BIOS) or accesses the wrong port addresses to change speed, SOFTSWAT can be used to give you keyboard switching ability.

Even if you do have a BIOS that will change processing speed via keyboard, memory resident softswat allows displaying the present system speed as described in the following section 3.20.2.

58

3.21.1   Using SOFTSWAT in the   non-memory
resident mode.

Many   customers,   concerned about excessive
base memory consumption, expressed a desire
for a non-resident SOFTSWAT program.   Thus,
we now offer the ability to load SOFTSWAT
either way: non-resident or resident.

Usage   of   SOFTSWAT in non-memory   resident
mode allows a "one-time" speed change only.
It does not allow displaying of the current
speed   (as   described   in   the   following
section 3.20.2).

To   set   only   the   speed,   enter   the
following at DOS prompt:

SOFTSWAT /n

(Please note that a space must precede   the
forward slash).

Where   n = the desired speed;   Enter   the
numeral   8   for   8Mhz   operation   and   the
numeral 12 for 12MHz operation.

3.21.2   Using   SOFTSWAT   in   the   memory
resident mode

First,   locate   the utility disk   provided
with your system or motherboard and   insert
it   into   your floppy drive.   Access   the
floppy drive   by   typing   the   drive letter
name with a colon   and   pressing   the enter
key.

To use SOFTSWAT in the memory resident mode, type the following at the DOS prompt:

SOFTSWAT /n /r

(Please note that a space must precede each forward slash).

Where n = the desired speed; Enter the numeral 8 for 8Mhz operation and the numeral 12 for 12MHz operation. Use of this parameter is optional since the speed may be changed via keyboard once SOFTSWAT is active.

The switch /R indicates that you wish SOFTSWAT (along with any parameters you specified) to remain memory resident.

To change the speed via keyboard, initiate the following in sequential order, holding down each previous key:

"CTRL", "ALT", "+" = 12MHz
"CTRL", "ALT", "-" = 8MHz

If at any time you would like to display the current system speed, initiate the following:

ALT, F10

The current system speed will be displayed on your video display in the upper right hand corner.

WARNING: If you are using multiple memory resident programs, please use SOFTSWAT as described under 3.20.1 only.

3.22   Using the YOKE 301 EMS Driver

If you have set your system memory (as
described under section 3.10)   to utilize
the Lotus,   Intel, Microsoft (LIM) Expanded
Memory Specification (Version 3.20),   then
the YOKE 301 EMS "driver" program must be
used to enable software recognition of this
expanded   memory.   This EMS memory is a
special   type   of   memory   that   allows
specially-written   software   packages   to
access   program data far larger than the
640KB limit imposed by DOS.

3.22.1   Using the YOKE 301   EMS driver to initialize expansion memory

1. Boot system by using DOS and the system
will prompt you with "A>".

2.   Copy   the   SEMS.SYS file   to the   root
directory of your DOS diskette.

3. At the DOS prompt,   create a CONFIG.SYS
file by typing the following:

```
Copy con config.sys ( press <CR> )
device = sems.sys /M:xxx /P:xxxx /I:xx (press <CR>)
^Z  (or press F6 key, then press <CR> )
```

After the last step,   the CONFIG.SYS file
will be created and copied to the disk.   If
you already have a CONFIG.SYS file on your
disk,   simply edit it using any ASCII text
editor, adding the "device=sems.sys, etc."
line to your file.

The switches /M:xxx, /P:xxxx and /I:xx
represent the following:

M:xxx = Total base memory size.

Default is 640. Note that this switch is
not necessary as 640KB is always the base
memory size when using more than 640KB of
system memory.

P:xxxx = starting page frame address.

If not specified, the driver will default
to C000H. If this page frame is occupied,
the driver will try to look for another
page frame address 64KB higher in ascending
order up to E000H.

I:xxx = EMS I/O Port Address, E8H or 98H.

Note that the "H" (hex) designation is not
needed when specifying this parameter.

4. Now re-boot your system. At some point
during the boot up operation, your screen
will display the following as confirmation
that the EMS driver has been installed:

YOKE301 Chip Set EMS Driver Rev. 1.00
(C)Copyright Youth Keep Co. Ltd.
(C)Copyright SUN ELECTRONICS CORP. 1987
EMS DRIVER INSTALL TOTAL PAGES: xxxx
EMS PAGE SEGMENT: xxxxH
EMS PORT ADDRESS: xxxxH

If the total pages displayed is 0, you have
either set DIP SW1 positions 6,7, and 8
incorrectly; forgot to remove the shunt at
jumper position J8; or you have installed a
EMS I/O port address other than E8H or 98H.

Please reference section 3.10, pages 36-46;
and section 3.11, page 47 to recheck your
settings.

3.22.2   Using the DISKINIT.SYS and
RAMDISK.COM programs to create an
electronic disk drive.

Included on the utility disk included with
your motherboard or system purchase is a
useful program designed to allow creation
of an "electronic disk drive" (generally
called a "RAMDISK") that resides within
your expanded memory area. This program is
appropiately called RAMDISK. Another
program on the disk, called DISKINIT.SYS,
creates the required file allocation
tables, etc., needed to enable use by DOS.
This program must be executed through the
DOS CONFIG.SYS file first before using the
RAMDISK program.

To use the RAMDISK program to create an
electronic disk, follow these steps:

1. First, copy the files RAMDISK.COM and
DISKINIT.SYS to your bootable disk.

2. Now, create a CONFIG.SYS file as
explained in section 3.22.1 If you have
already created the CONFIG.SYS file, simply
edit it using any standard ASCII text
editor or ELDIN.

Add the following line to the CONFIG.SYS file:

Device = diskinit.sys

3. Now re-boot your system. At some point during the boot up operation, your screen will display confirmation that the EMS driver has been installed then will ALSO display a new message as follows:

YOKE RAMDRIVE Version 1.00, Installed!

4. You will now be able to create one to four separate ramdisks, dependent upon amount of expansion memory in system and the amount of memory allocated to each ramdisk. For example, with twenty-four 16KB (384KB) pages of expansion memory installed, you could create one ramdisk with a total size of 393,216 bytes or three ramdisks with 128,000 bytes each. To use the RAMDISK program, simply type the following at the DOS prompt:

RAMDISK X: /m=xxx

Where X = the drive letter desired

Where xxx = the total memory amount (use only 128KB increments)

If the /m parameter is excluded, the program will utilize all useable expanded memory for the specified ramdisk.

5.   If the ramdisk installation has   been
succesful,   the following message will be
displayed on the screen:

RAMDRIVE Version 1.00
RAMDISK Total Space   xxx,xxx bytes

Where   xxx,xxx will be the total number of
bytes as specified under step number 4.

3.23 Troubleshooting

3.23.1   If your system does not operate,
please follow these steps:

1. Check the ROM BIOS Speed to see that it
is 150ns.

2.   Check to see that the BIOS ROM are
inserted into the correct High Byte and Low
Byte sockets (reference section 3.9).

3.   Check RAM Speed. You must use DRAM
rated at 120ns or better.

4. Is the power supply fan turning? If not,
you could have installed the power input
connectors   backwards.   Please   reference
Section   2.17   on   page 22. Also,   the
motherboard's power plane layer could be
shorting to ground   somewhere (sometimes
caused by incorrect installation of   the
motherboard.   If this is suspected, remove
the motherboard,   power supply and one
floppy   drive and test it outside the
system.

5. Insure that the speaker has been installed correctly. Please reference section 3.4 on page 29.

6. Check the Display Mode setting (SW1) Please referance section 3.12

7. Check the BIOS ROM size setting. Please reference section 3.9 Also, check the BIOS ROM type setting. Please reference section 3.9.3 and 3.9.4.

8. Check RAM size setting.

9. Insure that that none of the RAM or ROM pins are bent under or outside each respective socket.

10. Insure that the Reset jumper (JP6) is open, not shorted.

11. Insure that COMDLY is enabled (shunt removed).

12. For testing purposes, use 1 wait state (remove shunt from 0WS).

13. If your system still does not work, install 512KB of DRAM (minimum memory size) and set DIP SW1 as follows:

                    DIP SW1:

                    Position 1 ON
                    Position 2 ON
                    Position 3 OFF
                    Position 4 Does not matter.

```
                    Position 5 OFF
                    Position 6 ON
                    Position 7 ON
                    Position 8 ON

                    JP1 set to side 2-3
                    JP3 set to side 1-2
                    JP9 set to side 1-2
```

The above setting will represent a system configuration as follows: Fixed low system speed, automatic I/O wait state selection, 512KB system memory, and BIOS ROM set to 16KB (27128KB) type.

NOTE: This mode will also run a 32KB (27256) BIOS ROM type.

14. Insure that a keyboard is plugged into the keyboard connector and that the connection is good.

15. Try plugging the video display board into the very last bus slot to the left. If using an MGA video adapter, it must be the shorter, high bus speed type. Generally, all long MDA, MGA and CGA video display boards will not function properly with the 301 motherboard.

16. Check DRAM for bent pins. Chips may also be inserted backwards or be the wrong type . If using 150ns DRAM, try switching to a faster speed, as it has been found that dependent of manufacturer, some 150ns DRAM WILL NOT WORK. Generally, use 120ns or faster whenever possible, in this configuration.

Turn on the power once more and your
system should be operating properly. If
you get a keyboard error, check the front
panel keylock as it may be in the locked
position. As a last resort, consult with
your supplier.

3.23.2   If your system is not stable,
please follow these steps:

1.   Be sure that all adapter cards
installed into the bus are firmly seated.

2.   Try plugging the video display board
into the very last bus slot to the left.
If using an MGA video adapter, it must be
the shorter, high bus speed type.
Generally, all older MDA, MGA and CGA video
display boards will not function properly
with the 301 motherboard.

3.   Check BIOS ROM Speed. A speed rating
of at least 120ns is mandatory.

4. If the CPU speed is set at 12MHz, 0 Wait
State, ensure that DRAM Speed is 80ns or
better. Some programs like Autocad, Aldus
Pagemaker and Xerox Ventura Publisher will
cause RAM parity errors to occur with DRAMs
slower than 80ns.

5.   If using DRAM rated at 150ns, be aware
that, dependent of manufacturer, in many
cases DRAM rated at this speed or slower
will not work.

6. If you have installed an 80287 and have not installed an auxiliary oscillator, insure that the 80287 is rated at 10MHz (It is presently not possible to purchase 12MHz 80287 co-processors, 1988).

7. Check for a stable power supply voltage (At least +5v, -5v, +12v and -12v).

Please reference Section 2.17: Power Connector Table (P8). (on page 22).

8. If your system regularly looses the configuration information, Make sure the battery voltage is somewhere between +5.5 DC to +6v DC.

4.0   Setting   system   configuration
parameters using the ATSETUP program on the
utility disk

When   IBM's engineers designed the original
AT   system,   they decided that instead   of
requiring the users to flip switches and
place/remove shunts on the motherboard,
they would incorporate a unique design that
stores the system hardware parameters in a
small portion of battery-backed RAM.   They
also provided a time and date function
within   the   same circuit   that   would
automatically update DOS (system time/date)
during initialization (boot).   To change
any of these parameters, special programs
provided by your supplier must be utilized.
The   following will describe how to use
ATSETUP program as provided on your utility
disk.

If you have received the AWARD BIOS   with
your   system   or motherboard,   it   is   also
possible to perform the same procedures as
described,   without using a disk program.
Please refer to section 4.3 "Setting system
configuration   parameters   direct   through
AWARD BIOS", for more information.

To   load   the ATSETUP program from   the
utility disk, follow these steps:

1.   First boot your system with DOS (either
from your hard disk or from a floppy disk).

2.   Then install the utility diskette
included with your motherboard or system in
drive A:

3.   If you have booted DOS from your hard
disk, select drive A: by simply typing A:
at your hard disk DOS prompt.   Then enter
"ATSETUP" and press the carriage return.

4. The ATSETUP program will then load. You
will see a number of fields, each relative
to a configuration parameter.   The next
section will describe in detail how to move
between each of these parameter fields.

4.1 Movement between fields

Three keys will allow movement between the
fields displayed: the UP arrow key,   the
DOWN arrow key and the carriage return key
(generally called the "enter key" or just
<CR>).   Pressing   <CR> will move the
highlight bar down from whichever field is
currently selected. Once the screen bottom
has been reached, the highlight bar will
scroll back to the date field.

NOTE: The highlighted   parameters in the
display mode field represent the currently
selected parameters.

4.2   Changing information in currently
selected (highlighted) field

Changing information in each field must be accomplished by either typing the new data in directly (as is the case in the DATE and TIME fields), or can be accomplished by using the LEFT and RIGHT arrow keys to "scroll" through preset data. The method used will depend upon the field being changed and will be pointed out during the explanation of each field as follows.

While in any field, help is accessed by pressing the "F1" key. A small "window" of information relative to the field will be shown on the screen.

4.2.1 Changing the DATE

If the date needs to be changed, move the highlight bar to this field and type the new date in directly from your keyboard.

The day must be entered in the following format: MONTH/DAY/YEAR, with each number separated by a forward slash. After you have entered the correct date, press the enter key. For example, January 1st, 1988 would be entered as follows: 1/1/88

When entering the numbers, leading zeros are not necessary. Also, only the last two numbers of the year need to be entered since the century is assumed to be the twentieth.

To correct errors, use the LEFT arrow or backspace keys to return to the error. Then simply type the correct data over the incorrect.

4.2.2 Changing the TIME

After you have finished with the date and pressed a <CR>, the highlight bar will automatically move downwards to the TIME field.

If the displayed time is incorrect and needs to be changed, enter it in military format: HOUR:MINUTES:SECONDS.

For example, if the current time is 1 p.m., enter 13:00:00; if the time is 8 p.m., type 20:00:00. As with the date, leading zeros are not necessary. Be sure to include a colon, ":", between the HOUR:MINUTES:SECONDS.

Correct errors using the procedure as described under changing the date.

4.2.3 Selecting floppy drive types

It is possible to select five different drive types through the setup program

These are as follows:

1. 360KB double sided (usually installed as the "B" drive)
2. 1.2M high capacity (usually installed as the "A" drive)
3. 720KB 3.5 inch floppy drive
4. 1.4MB 3.5 inch floppy drive
5. No drive installed

To move between the drive types, simply
press either the RIGHT or LEFT arrow key
until the proper drive type installed as
drive "A" is displayed. Stop, then press
<CR> to move on to selection of a drive
type for drive "B".

NOTE: If you choose 720KB or 1.4M, 3.5
Inch Floppy Drive; please check to see
that your BIOS is capable of supporting
that drive (The AWARD BIOS will).

4.2.4 Selecting the primary hard disk drive
type

After selecting a drive type for drive "B"
press <CR> to move to the hard disk type
selection field.

To select the proper hard disk type use
the RIGHT and LEFT arrow keys. The RIGHT
arrow key will always move to the next
higher number and the LEFT to the next
lower number (until you have reached either
the end or the beginning. Try this yourself
to fully understand our meaning).If you are
unsure of the proper hard disk drive type,
contact your supplier.

You may also enter the fixed disk type
directly through the keyboard's numeric
keys.

If you do not have a fixed disk drive
installed, either select "Not Installed" or
type the numeral "0" directly from your
keyboard.

74

A table of the hard disk drive types supported by your BIOS can be seen by pressing the "F1" or "HELP" Key.

NOTE: It is not possible to edit the number of cylinders, heads, write precompensation, reduce current or shipping zone cylinders. These values are all predetermined by the BIOS. Some BIOS will not support more than 16 drive types. The AWARD BIOS will support 40.

4.2.5 Selecting the secondary hard disk drive type

The procedure for selecting the secondary hard disk type would be the same as described in section 4.2.4

4.2.6 Selecting base memory size

Base memory size refers to the amount of contiguous memory installed below 640KB (DOS addressable). The appropriate amounts (always in 128KB increments) are as follows: 128KB, 256KB, 384KB, 512KB, and 640KB

NOTE: This value should not include any extended, expansion or display memory. Also, please note that the lowest memory amount supported by the 301 motherboard is 512KB.

To select the appropriate value, use the
RIGHT or LEFT ARROW Keys, or use the
keyboard's numeric keys to enter the
value direct. When finished, press <CR>.

When your system is first turned on, the
BIOS will automatically run a test to
determine base memory size. If you enter
a value different than the value the
computer has determined, you will be asked
to confirm your entry. If you are
certain that the value you entered is
correcٮ, press the "Y" key (please note
that this will not increase/decrease the
actual value the BIOS originally found.
If, for example, the BIOS test finds only
512KB of memory, this will be the only
amount accessible by the system). To
restore the original value press the "N"
key.

4.2.7 Selecting extended memory size

Extended Memory Size refers to the
amount of memory a computer has above
640KB. This value should not include any
amount of memory intended for use by the
EMS driver program (Expansion Memory).

To select the amount of memory your
computer contains above the 640KB
boundary, use the RIGHT or LEFT ARROW
Keys, or use the keyboard's numeric
keys to enter the value directly. When
finished, press <CR>.

When your system is first turned on, the
BIOS will automatically run a test to
determine the size of extended memory. If
you enter a value different than the
value the computer has determined, you
will be asked to confirm your entry. If
you are certain that the value you
entered is correct, press the "Y" key
(please note that this will not
increase/decrease the actual value the BIOS
originally found. If, for example, the
BIOS test finds only 384KB of extended
memory, this will be the only amount
useable by the system). To restore the
original value press the "N" key.

4.2.8 Selecting display type

There are four possible display types:
Each type is displayed on the screen when
ATSETUP is run.

They are:

1. Special Display Adapter (EGA, PGA, VGA)
2. Color/Graphics 40 x 25 (CGA and
   monochrome/composite)
3. Color/Graphics 80 x 25 (CGA and
   monochrome/composite)
4. Monochrome/Graphics (MGA)

The type highlighted is currently active.

To select a different display type, use the
RIGHT or LEFT ARROW keys. The RIGHT arrow
key will move UP the list and the LEFT
arrow key will move DOWN the list. When
finished, press <CR>.

4.2.9 System information

Selection of this field will cause a window to be displayed containing the BIOS date and information relative to options currently installed on your motherboard.

For example, if a I/O board was installed on the bus that contained one serial port and one parallel port, then the following might be displayed:

Bios Date Code is 01/15/85
Serial Port 1 Base Address is 03F8h
Parallel Port 1 Base Address is 03BCh
Math Co-processor Is Not Installed