MINI-AT286
G2 MAIN BOARD
## USER'S MANUAL

CONTENT

1 CHAPTER

1 – 1
SYSTEM
OVERVIEW
The GH-286 is a high-performance AT-compatible motherboard that provides high-speed processing while maintaining full compatibility with the IBM* PC/AT*. The 3T-286 motherboard is designed to be mounted in a standard PC/XT*, "baby AT," or PC/AT-type enclosure and uses industry-standard power supply inputs, connectors, expansion board sockets, and so forth; in other words, you can design a new system or upgrade your existing system with no modifications to existing or available components. In fact, your 3T-286 may already have been installed into a complete system by your dealer.

1 – 2
SPECIFICATIONS
Processor and System
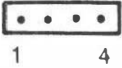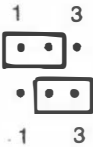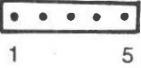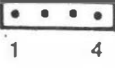
Processor type:	Intel or AMD 80286* rated at 12MHz/10MHz
System speed:	12MHz and 6MHz software, keyboard, and switch selectable
Coprocessor:	8MHz 80287* (optional)
Memory Type:	0 Wait State: 100ns
	1 Wait State: 120ns
Memory Capacity:	1 MB using DIP 44256x8 +41256x4 or SIP 41256x4. 4MB using SIP 411000x4.
Memory configuration:	Memory can be installed/split as follows:
	640KB/384KB
	640KB/0KB
	512KB/0KB
	256KB/0KB
	Entire extended 384KB can be configured as virtual disk.

2 CHAPTER

2 – 1 LAYOUT OF GH-286
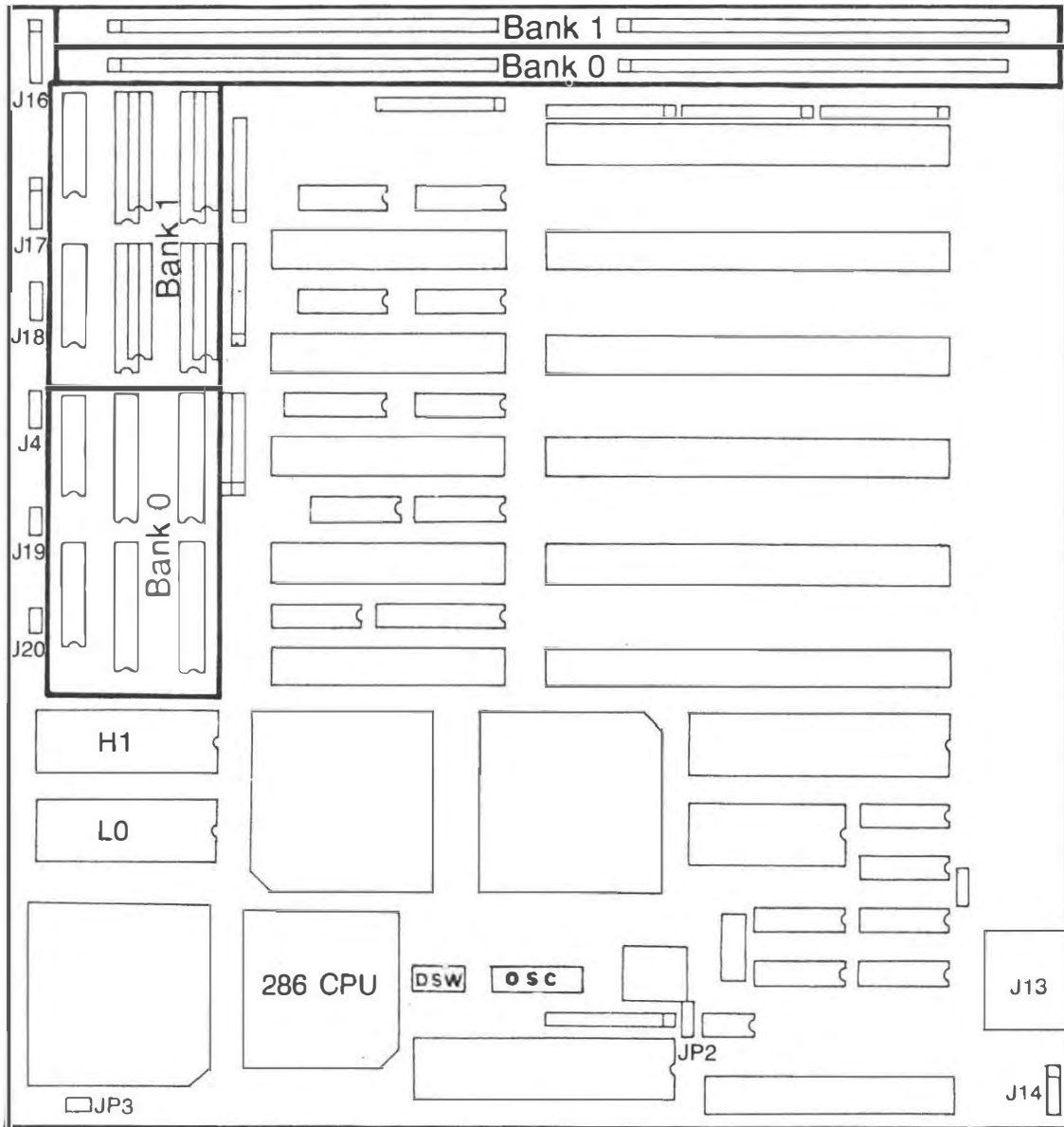
2-2 JUMPER/CONNECTOR DESCRIPTION:

J14 · · · · EXTERNAL BATTERY CONNECTOR
1　　4

J13 KEY BOARD CONNECTOR

JP2 CO-PROCESSOR CLOCK
1　3 25 MHZ
CPU CLOCK
1　3

J18 SELECT WAIT STATE

[CTRL][ALT][0] 0WS (keyboard control)
[CTRL][ALT][1] 1WS (keyboard control)
ZERO WAIT STATE ONLY
OPEN ONE WAIT STATE ONLY
1　3

J19 TURBO LED

J20 RESET

JP4 TURBO SWITCH

[CTRL][ALT][+] H1-SPEED (keyboard control)
[CTRL][ALT][–] L0-SPEED (keyboard control)
1 2 3

HI-SPEED ONLY
2 3

J16 POWER LED/KEYLOCK
1　　5

J17 SPEAKER
1　　4

JP3 ENABLE PARIPY CHECK
DISABLE PARIPY CHECK

— 3 —

J14 Battery Connector

PIN #	Assignments
1	+6V D.C. Battery Input
2	N/C
3	N/C
4	GND

J13 Key Board Connector

PIN #	Assignments
1	Key Board Clock
2	Key Board Data
3	Spare
4	GND
5	+ 5V

J15 Power Connector

PIN # Assignment		PIN # Assignment	
PS1		PS2	
1	Power Good	7	GND
2	+ 5V	8	GND
3	+ 12V	9	− 5V
4	− 12V	10	+ 5
5	GND	11	+ 5V
6	GND	12	+ 5V

J16 Keyboard Lock & power LED

PIN #	Assignments
1	LED Power
2	Spare
3	GND
4	Key Board Lock
5	GND

J17 JP20 Speak Connector

PIN #	Assignments
1	Signal
2	N/C
3	GND
4	+ 5V

2-3 DIP SWITCH FUNCTION DESCRIPTION:

SW1-1   DSW "ON"   COLOR MODE
            DSW "OFF" MONOCHROME MODE

SW2	SW3	SW4	MEMORY	BANK 0	BANK 1
ON	ON	OFF	512K	41256 x 2 44256 x 4	
ON	OFF	ON	640K	41256 x 2 44256 x 4	4164 x 2 4464 x 4
ON	OFF	OFF	1024K	41256 x 2 44256 x 4	41256 x 2 44256 x 4
OFF	OFF	ON	2M	1M RAM MODULE x 2	
OFF	OFF	OFF	4M	1M RAM MODULE x 2	1M RAM MODULE x 2

WARNING:

Machine does not work since installing both SIMM and DIP type of DRAM in Bank Os and Bank 1s at the same time.

3 CHAPTER

3 – 1
FIRST TIME
STARTUP

The first time you start your system, you'll need to follow some special procedures to specify your system configuration, initialize and format your hard disk, and install system software. This chapter explains these special procedures. Do not proceed until you are certain your system has been properly installed and connected to an appropriate power suource.

In this chapter, you'll:

- Turn on system power
- Run the setup program to specify various
- system configuration parameters.
- Initialize and format your hard disk

3-2
TURNING ON
THE POWER

Turn on system power by first turning on the video display power switch, then turning on the power switch on the side or back of the system unit. The system will go through its automatic power on self test (POST) and then attempt to boot (that is, to load the operating system from a disk drive).

Since your disks are not formatted. and since the system doesn't yet know what type of disks your system has, you'll get an error message when POST completes.

You're now ready to run the SETUP program.

The way in which your setup program operates depends on whether your computer has the AMI 286 BIOS or the Award Modular BIOS. If it has an AMI 286 BIOS, read the following section and skip the subsequent section. If it has an Award Modular BIOS, skip the following section and read the subsequent section.

3—3 AMI 286 SETUP The SETUP program lets you specify your system's configuration of diskette drives, hard disk drives, video display, memory, and date and time. The SETUP program is built-in BIOS—Diskette is not necessary for the SETUP.

NOTE
The following procedures assume your system has the AMI 286 BIOS installed. If your system has had a different BIOS installed, these procedures will not work.

To run SETUP, do the following:

1. Simultaneously press the CTRL, ALT, and DEL keys to reboot the system (or turn the power on if the system is off). In a moment, the following message will appear on your screen:
    Press (DEL) key to run SETUP utiltiy

2. Press the DEL key (the one that shares the decimal point at the bottom of the numeric keypad). In a moment, the following message appears:
    WANT TO RUN SETUP UTILITY (Y/N)

3. Press Y to proceed. If you don't want to run the SETUP program at this time, press N. If you choose Y, the SETUP program displays the following.

Follow the instructions below to perform the SETUP procedure:

CMOS SETUP

Current date is: xx-xx-xxxx
Enter new date (MM-DD-YYYY)?

4. If the date displayed is not the current date, enter the correct date by typing a two-digit year, separated by dashes. If the date displayed is correct, press Enter without making an entry to leave the date unchanged. The screen now displays:

Current time is: xx:xx:xx
Enter new time (HH:MM:SS)?

5. If the time displayed is not the current time, enter the correct time in 24-hour format by typing a two-digit hour, minute, and second, separated by colons as shown. Seconds is optional; if you do not enter seconds, 00 is assumed. If the time displayed is correct, press Enter without making an entry to leave the time unchanged. The system now determines the type of display connected and reports it as follows:

Primary display is:x
Current screen width is:xx Columns

This report is followed by the current disk and memory configuration:

Fixed disk drive C type:x
Fixed disk drive D type:x
Diskette drive A is:x
Diskette drive B is:x
Base Memory Size is:xxx KB
Expansion Memory Size is:xxx KB

Are these opotions correct (Y/N)?

6. If all of the displayed options are correct, press Y and then press Enter. If the options need to be changed, note the currently displayed hard disk type(s) (if any), then press N followed by Enter. You'll then see the following message:

   ****WARNING****
   Entering the wrong disk drive TYPE causes improper operation of the disk.
   If disk not installed press <ESC>
   Enter disk drive C type (1-47)?

7. If your system already has been configured for the correct drive type, enter the number previously displayed to maintain the same configuration. Otherwise, press the ESC key to see a list of drive types. See Table 3-1 for a printed list of these drive types. Type the number corresponding to the correct drive type for drive C, then press Enter. If no drive is installed, press Enter without making an entry. The screen now displays:

   Enter disk drive D type (1-47)?

8. Repeat step 4 for drive D. When you complete this step, the system attempts to determined what type of diskette drive(s) are installed. If it finds that the A drive has 80 tracks, it asks:

   Diskette drive A is 3 1/2'' (Y/N)?

9. If the above question appears, enter Y if you have a 3-1/2'' drive installed as drive A, or N if you have a 5-1/4'' high-capacity drive installed. If the above question does not appear, the system has determined that you have a 40-track, 5-1/4'' diskette drive installed. Now, if the system detects a B diskette drive, steps 5 and 6 repeat to determine what type of drive is installed.

After determining the types of disk drives installed, the system automatically determines your computer's memory configuration and displays it on the screen:

Base memory Size is: XXX KB
Expansion Memory Size is: XXX KB
Are these options correct (Y/N)?

10. If you have entered the correct responses to all of the SETUP questions, press Y followed by Enter. Otherwise, enter N to return to the beginning of the SETUP procedure.

After answering Y, the screen displays:

Standby while the system reboots

The computer now performs a cold boot (equivalent to turn the power off and back on again), performs the memory test, and then tries to boot from the disk drive. If your hard disk has not been initialized yet, be sure that you have a bootable DOS diskette in the A drive.

3—4 AWARD 286 SETUP The SETUP program lets you specify your system's configuration of diskette drives, hard disk drives, video display, memory, and date and time. The SETUP program is built-in BIOS—you don't need a diskette to do the SETUP.

NOTE

The following procedures assume your system has the Award 286 Modular bios installed. If your system has had a different BIOS installed, these procedures will not work.

The run SETUP, simultaneously press the CTRL, ALT, and ESC keys. The SETUP screen appears on your display:

```
             AWARD SOFTWARE CMOS SETUP

DATE (MM/DD/YY)    6/15/88
TIME (HH:MM:SS)    11:08:14
DISKETTE 1          1.2M
DISKETTE 2          360K
                          CYLS   HEADS   SECTORS   PRECOME
DISK1               22    733     5         17        300
DISK2               NOTE
VIDEO               EGA
BASE MEMORY         512
E X T E N D E D      0
MEMORY
ERROR HALT          NO DISK ERROR HALT
SPEED SELECT        NO CHANAGE
↑  ↓     moves between items,  —  — selects values
F10 records changes, F1 exits, F2 for color toggle
```

3 – 5
SETTING
THE DATE
Select the DATA field at the top of the SETUP screen. If the date is not correct, enter the correct date in the format mm/dd/yy, where mm is the month, dd is the day, and yy is the year, separated by ''/'' characters. You need not enter leading zeros. If you make a mistake, use the Backspace key to erase your entries and make corrections. The system assumes that the year is in the 20th century.

3 – 6
SETTING
THE TIME
Select the TIME field. If the time is not correct, enter the correct time in the format of hh:mm:ss, where hh is the hour in 24-hour format (1:00 pm is 13:00), mm is the minute, and ss is the second, separated by '':'' characters. You need not enter leading zeros or seconds. If you make a mistake, use the Backspace key to erase your entries and make corrections.

3 – 7 Select the DISKETTE 1 field to establish the
SETTING THE Drive A configuration. Press the left arrow and
DISKETTE DRIVE right arrow keys to cycle through the available
CONFIGURATION settings:

- NONE (no drive installed)
- 360K (5-1/4'' standard drive)
- 1.2M (5-1/4'' high-density drive)
- 720K (3-1/2'' standard drive)
- 1.4M (3-1/2'' high-density drive)

Once you've set the correct Drive A configuration, perform the same steps to specify the Drive B configuration. If your system does not have a Drive B, be certain to specify NONE.

3 – 8 Select the DISK 1 field to establish the Drive
SETTING THE C configuration. Press the left arrow and right
HARD DISK arrow keys to cycle through the available
DRIVE settings, as shown in Table 3-2. Consult your
CONFIGURATION disk drive specifications for the required information, if necessary. If your disk drive is not covered by one of the available selections, contact your dealer for information about obtaining a new drive table ROM. Drive types 41-47 are reserved for future use.

Once you've set the correct Drive C configuration, perform the same steps to specify the Drive D configuration. If your system does not have a Drive D, be certain to specify NONE.

Table 3 – 2 Supported hard disk drives

Type	Cylinders	Heads	Write Precomp	Landing Zone	Specific Disk
0	306	4	128	305	
1	615	4	300	615	Seagate 225
2	615	6	300	615	
3	940	8	512	940	
4	940	6	512	940	
5	615	4	0	615	
6	462	8	256	511	
7	733	5	0	733	Seagate 4038
8	900	15	0	901	
9	820	3	0	820	
10	855	5	0	855	
11	855	7	0	855	
12	855	7	0	855	
13	306	8	128	319	Seagate 225
14	733	7	0	733	
15	Reserved				
16	612	4	0	663	
17	997	5	300	997	
18	997	7	0	997	
19	1024	7	512	1023	
20	733	5	300	732	
21	733	7	300	732	
22	733	5	300	733	Seagate 4038
23	306	4	0	336	
24	Reserved				
25	1024	9	0	1023	Seagate 4096
26	1224	7	0	1223	Maxtor 2085
27	1224	11	0	1223	Maxtor 2140
28	1224	15	0	1223	Maxtor 2190
29	1024	8	0	1023	Maxtor 1085
30	1024	11	0	1023	Maxtor 1105

Table 3 – 2 (Continue)

Type	Cylinders	Heads	Write Precomp	Landing Zone	Specific Disk
31	918	11	0	1023	Maxtor 1170
32	925	9	0	926	CDC9415
33	1024	10	0	1023	Generic 10hd
34	1024	12	0	1023	Generic 12hd
35	1024	13	0	1023	Generic 13hd
36	1024	14	0	1023	Generic 14hd
37	1024	2	0	1023	Generic 2hd
38	1024	16	0	1023	Generic 16hd
39	918	15	0	1023	Maxtor 1140
41	1024	5	512	1024	Miniscribe 6083
42	988	5	128	988	Core In'tl AT 43
43	1024	5	124	1023	CMS-K40
44	1024	8	512	1024	Miniscribe 6085

4 CHAPTER

4-1 AMI BIOS HARD DISK DRIVE TABLE

TYPE	CYLN	READS	W-PCOMP	L-ZONE	CAPACITY
1	306	4	128	305	10 MB
2	615	4	300	615	20
3	615	6	300	615	31
4	940	8	512	914	62
5	940	6	512	940	47
6	615	4	FFFF	615	20
7	462	8	256	511	31
8	733	5	FFFF	733	30
9	900	15	FFFF	901	112
10	820	3	FFFF	820	20
11	855	5	FFFF	855	35
12	855	7	FFFF	855	50
13	306	8	128	319	20
14	733	7	FFFF	733	43
15	000	0	0000	000	00
16	612	4	0000	663	20
17	977	5	300	977	41
18	977	7	FFFF	977	57
19	1027	7	512	1023	60
20	733	5	300	732	30
21	733	7	300	732	43
22	733	5	300	732	30
23	306	4	0000	336	10
24	925	7	0000	925	54
25	925	9	FFFF	925	69
26	754	7	754	754	44
27	754	11	FFFF	754	69
28	699	7	256	699	41
29	823	10	FFFF	823	68
30	918	7	918	918	53

TYPE	CYLN	READS	W-PCOMP	L-ZONE	CAPACITY
31	1024	11	FFFF	1024	94
32	1024	15	FFFF	1024	18
33	1024	5	1024	1024	43
34	612	2	128	612	10
35	1024	9	FFFF	1024	77
36	1024	8	512	1024	68
37	615	8	128	615	41
38	987	3	987	987	25
39	987	7	987	987	57
40	820	6	820	820	41
41	977	5	977	977	41
42	981	5	981	981	41
43	830	7	512	830	48
44	830	10	FFFF	830	69
45	917	15	FFFF	918	114
46	1244	15	FFFF	1223	152
47	USER TYPE				

5 CHAPTER

I/O CHANNEL CONNECTORS AND ADDRESS MAP
I/O ADDRESS MAP

Hex Range	Device
000-01F	DMA controller 1,8237A-5
020-03F	Interrupt controller 1,8259A, Master
040-05F	Timer, 8254
060-06F	8024 (keyboard)
070-07F	Real-time clock, non-maskable interrupt (NMI) mask
080-09F	DMA page register, 74LS612
0A0-0BF	Interrupt controller 2, 8259A
0C0-0DF	DMA controller 2, 8237A-5
0F0	Clear Math Coprocessor Busy
0F1	Reset Math Coprocessor
0F8-0FF	Math Coprocessor
1F0-1F8	Fixed disk
200-207	Game I/O
278-27F	Parallel printer port 2
2F8-2FF	Serial port 2
300-31F	Prototype card
360-36F	Reserved
378-37F	Parallel printer port 1
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 2
3B0-3BF	Monochrome display and printer adapter
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1

I/O CHANNEL
A Side, (SLOT J1 ~ J6)

I/O Pin	Signal Name	Input Output
A1	− I/O CH CK	Input
A2	SD7	Input/Output
A3	SD6	Input/Output
A4	SD5	Input/Output
A5	SD4	Input/Output
A6	SD3	Input/Output
A7	SD2	Input/Output
A8	SD1	Input/Output
A9	SD0	Input/Output
A10	− I/O CH RDY	Input
A11	AEN	Output
A12	SA19	Input/Output
A13	SA18	Input/Output
A14	SA17	Input/Output
A15	SA16	Input/Output
A16	SA15	Input/Output
A17	SA14	Input/Output
A18	SA13	Input/Output
A19	SA12	Input/Output
A20	SA11	Input/Output
A21	SA10	Input/Output
A22	SA9	Input/Output
A23	SA8	Input/Output
A24	SA7	Input/Output
A25	SA6	Input/Output
A26	SA5	Input/Output
A27	SA4	Input/Output
A28	SA3	Input/Output
A29	SA2	Input/Output
A30	SA1	Input/Output
A31	SA0	Input/Output

B Side, (SLOT J1 ~ J6)

I/O Pin	Signal Name	Input Output
B1	GND	Ground
B2	RESET DRV	Output
B3	+ 5 Vdc	Power
B4	IRQ9	Input
B5	– 5 Vdc	Power
B6	DRQ2	Input
B7	– 12 Vdc	Power
B8	OWS	Input
B9	+ 12 Vdc	Power
B10	GND	Ground
B11	– SMEMW	Output
B12	– SMEMR	Output
B13	– IOW	Input/Output
B14	– IOR	Input/Output
B15	– DACK3	Output
B16	DRQ3	Input
B17	– DACK1	Output
B18	DRQ1	Input
B19	– REFRESH	Input/Output
B20	CLK	Output
B21	IRQ7	Input
B22	IRQ6	Input
B23	IRQ5	Input
B24	IRQ4	Input
B25	IRQ3	Input
B26	– DACK2	Output
B27	T/C	Output
B28	BALE	Output
B29	+ 5 Vdc	Power
B30	OSC	Output
B31	GND	Ground

C Side, (SLOT J8 ~ J12)

I/O Pin	Signal Name	Input Output
C1	SBHE	Input/Output
C2	LA23	Input/Output
C3	LA22	Input/Output
C4	LA21	Input/Output
C5	LA20	Input/Output
C6	LA19	Input/Output
C7	LA18	Input/Output
C8	LA17	Input/Output
C9	– MEMR	Input/Output
C10	– MEMW	Input/Output
C11	SD08	Input/Output
C12	SD09	Input/Output
C13	SD10	Input/Output
C14	SD11	Input/Output
C15	SD12	Input/Output
C16	SD13	Input/Output
C17	SD14	Input/Output
C18	SD15	Input/Output

D Side, (SLOT J8 ~ J12)

I/O Pin	Signal Name	Input Output
D1	– MEM CS16	Input
D2	– I/O CS16	Input
D3	IRQ10	Input
D4	IRQ11	Input
D5	IRQ12	Input
D6	IRQ15	Input
D7	IRQ14	Input
D8	– DACK 0	Output
D9	DRQ 0	Input
D10	– DACK 5	Output
D11	DRQ 5	Input
D12	– DACK 6	Output
D13	DRQ 6	Input
D14	– DACK 7	Output
D15	DRQ 7	Input
D16	+ 5 Vdc	Power
D17	– MASTER	Input
D18	GND	Ground

CMOS RAM Address Map

Addresses	Description
00-0D	*Real-time clock information
0E	*Diagnostic status byte
0F	*Shutdown status byte
10	Diskette drive type byte, drives A and B
11	Reserved
12	Fixed disk type byte, drives C and D
13	Reserved
14	Equipment byte
15	Low base memory byte
16	High base memory byte
17	Low expansion memory byte
18	High expansion memory byte
19-2D	Reserved
2E-2F	2-byte CMOS checksum
30	*Low expansion memory byte
31	*High expansion memory byte
32	*Date century byte
33	*Information flags (set during power on)
34-3F	Reserved

Real – Time Clock Information
(Addresses 00-0D)

Byte	Function	Address
0	Seconds	00
1	Second alarm	01
2	Minutes	02
3	Minute alarm	03
4	Hours	04
5	Hours alarm	05
6	Day of week	06
7	Date of month	07
8	Month	08
9	Year	09
10	Status register A	0A
11	Status register B	0B
12	Status Register C	0C
13	Status register D	0D

6 CHAPTER

DMA CHANNELS, SYSTEM INTERRUPTS, AND SYSTEM TIMES DMA CHANNELS

Channel	Function
0	Spare (8-bit transfer)
1	SDLC (8-bit transfer)
2	Floppy disk (8-bit transfer)
3	Spare (8-bit transfer)
4	Cascade for DMA controller 1
5	Spare (16-bit transfer)
6	Spare (16-bit transfer)
7	Spare (16-bit transfer)

DMA CONTROLLER REGISTERS

Hex Address	Command Codes
0C0	CH0 base and current address
0C2	CH0 base and current word count
0C4	CH1 base and current address
0C6	CH1 base and current word count
0C8	CH2 base and current address
0CA	CH2 base and current word count
0CC	CH3 base and current address
0CE	CH3 base and current word count
0D0	Read status register/Write command register
0D2	Write mode register
0D4	Read temporary register/write command register
0D6	Write mode register
0D8	Clear byte pointer flip-flop
0DA	Read status register/Write command register
0DC	Write mode register
0DE	Write all mask register bits

PAGE REGISTER ADDRESSES

Page Register	I/O Hex Address
DMA Channel 0	0087
DMA Channel 1	0083
DMA Channel 2	0081
DMA Channel 3	0082
DMA Channel 5	008B
DMA Channel 6	0089
DMA Channel 7	008A
Refresh	008F

INTERRUPTS

Level	Function
0	System timer output 0
1	Keyboard output buffer full
2	Interrupt from Controller 2 (levels 8-15)
3	Serial port 2
4	Serial port 1
5	Parallel port 2
6	Diskette controller
7	Parallel port
8	Real-time clock
9	Software redirected to INT 0AH
10	Reserved
11	Reserved
12	Reserved
13	80287
14	Hard disk controller
15	Reserved

Channel	Function
0	System timer
1	Refresh request generator
2	Tone generation for speaker