80386SX-16/20/25 Motherboard

Installation Guide
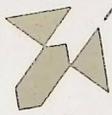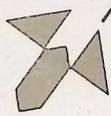
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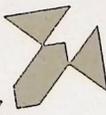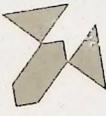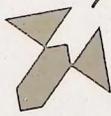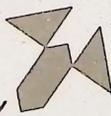
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Chapter 1

80386SX Motherboard
Overview

The 80386SX motherboard is a high performance system board that is fully compatible with the IBM AT board but which uses an 80386SX microprocessor, a 32-bit CPU, a 16-bit external data bus, and a 24-bit external address bus. These, and other features, give you the performance of 32-bit programming architecture with the cost savings of 16-bit hardware systems.

Features of the 80386SX Motherboard

The major features of the 80386SX motherboard are:
* 80386SX control logic to support CPU speeds of up to 25MHz
* Socket for the 80387SX math coprocessor
* ROM BIOS functionally compatible with the IBM AT BIOS
* 4 memory banks with 8 SIMM sockets
* Mix 256K, 1M and 4M SIMMs allowing max. 16MB memory on system board
* Fast page mode, 2/4-way interleaved DRAM controller
* Supports shadow RAM function
* Supports LIM EMS4.0 and 3.2 compatible function
* Surface mount device chipset ASICs and CPU
* Fast gate A20 and fast reset supports
* Real time clock with battery backed CMOS memory
* Six 16-bit expansion slots

* Speaker driver
* Keyboard interface compatible with the IBM AT
* Power Good circuit on-board
* Power-On Self Test function on board
* I/O speed fixed at 8MHz for compatibility with most interface cards

80386SX motherboard specifications

Dimensions: 22.0 cm (8.7 in.) x 23.0 cm (9.05 in.)
Power requirement:

Voltage and tolerance	Nominal Current	Watts
+5V, +/-5%	1.2A	6.0
+12V, +/-10%	0.0A	0.0
-12V, +/-10%	0.0A	0.0
Total	1.2A	6.0

Environment:
Operation Temperature: 10 to 40 degrees Celsius.
Airflow: 50 linear feet per minute
Storage Temperature: -40 to 70 degrees Celsius.
Altitude: 0 to 10,000 feet

Chapter 2

Connecting and Configuring the 80386SX Motherboard

Figure 2.1 shows the location and purpose of all the jumper switches on the 80386SX motherboard.

JP1: Monitor Type Selection

JP1 is a 3-pin jumper for selecting a color or monochrome monitor. Jumper cap on pin 1 & 2, the color/EGA/VGA monitor selected. Jumper cap on pin 2 & 3 (**Default**), the monochrome monitor selected.

JP2: INT/EXT Battery Selection

JP2 is a 3-pin jumper to select either an internal or external battery. Jumper cap on pin 1 & 2 (Default), internal battery is selected. Jumper cap on pin 2 & 3, external battery is selected.

J4: Sub-keyboard Connector

J4 is a 5-pin connector for the IBM AT or AT compatible keyboard. The pin assignments are shown below.

Pin#	Description
1	key clock
2	key data
3	NC
4	Ground
5	+5V

Table 2.1: Pin-out specs for the Sub-keyboard connector.
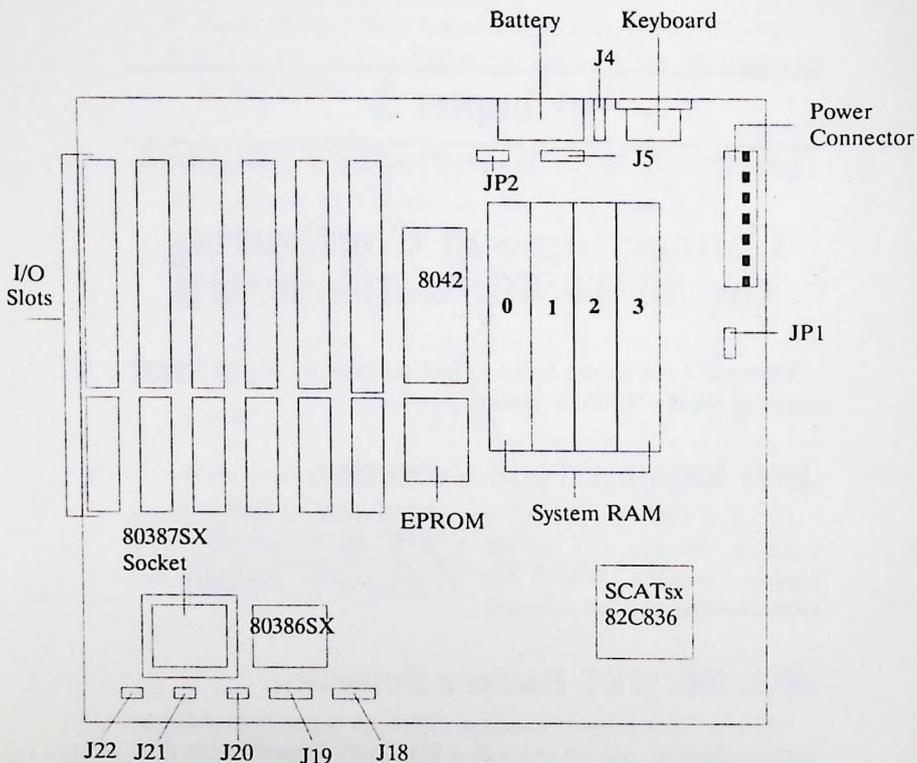
Figure 2.1: Location of the jumpers and connectors.

JP1: Monitor Type
JP2: INT/EXT Battery Selection
J4 : Sub-keyboard Connector
J5 : Ext. Battery Connector
J18: Keylock and Power-On LED
    Connector

J19: Speaker Connector
J20: Turbo LED Connector
J21: Turbo Switch Connector
J22: Reset Switch Connector

J5: Ext. Battery Connector

J5 is a 4-pin connector that allows you to connect an external battery to the motherboard.

J18: Keylock & Power-On LED Connector

J18 is a 5-pin connector that allows you to connect an electrical switch, such as a key-activated switch, so that the keyboard can be locked out. This header also contains the signal for a power-on LED.

J19: Speaker Connector

J19 is a 4-pin connector for a speaker.

J20: Turbo LED Connector

J20 is a 2-pin connector for the turbo LED.

J21: Turbo Switch Connector

J21 is a 3-pin connector for a turbo switch. Jumper cap on pin 1 & 2 the "de-turbo" mode selected. Jumper cap on pin 2 &3(Default), the 80386SX normally runs at a 16/20/25 MHz clock speed.

J22: Reset Switch Connector

J22 is a 2-pin connector for a system hardware reset switch.

Installing SIMMs

The 80386SX motherboard has 4 memory banks which can hold up to 16M of 4M SIMMs. With a smart BIOS, it can determine the actual memory in each DRAM bank. The whole memory configurations are shown below:

Mode	Memory Bank				Memory Available
	0	1	2	3	
1	256K				512K
2	256K	256K			640K + 384K
3	256K	256K	256K		1.5M
4	256K	256K	256K	256K	2M
5	256K	256K	1M		3M
6	256K	256K	1M	1M	5M
7	1M				2M
8	1M	1M			4M
9	1M	1M	1M		6M
10	1M	1M	1M	1M	8M
11	256K	256K	4M		9M
12	1M	4M			10M
13	4M	4M			16M

Table 2.1: DRAM Memory Configurations

If any two banks in a pair are of the same size, but the other pair is empty or has only one bank populated, then two-way page interleaving access is automatically performed in the two same-size memory banks. The banks are paired as follows: 0 and 1, 2 and 3. In this mode, the hardware has better performance.

In addition to memory, four-way page interleaving is automatically performed in bank 0-3, whenever they all contain the same size DRAM, In this mode, the hardware has the best performance.

Installing the Math Coprocessor

The 80386SX Motherboard has an 80387SX PLCC socket. To install an 80387SX math coprocessor, line up pin #1 of the math coprocessor chip with pin #1 of the socket. Then gently press the 80387SX into the socket.

Chapter 3

Running the Set up Program

When the system is powered on, the BIOS will enter the Power-On Self Test (POST) routines. These routines are devided into two phases:

System Test and Initialization (test and initialize system board for normal operations) and

System Configurations Verification (compare defined configurations with actual hardware installation).

If the error occurs before the display device is initialized, POST error code will show on POST LEDs and a series of beeps will be transmitted. If the error occurs after the display device is initialized, the screen will display the error message.

Setup Program

After the POST routines are completed, the Following message appears:

"Hit < DEL > if you want to run SETUP"

Press the < DEL > key, the screen in figure 3.1 will be displayed.

Standard CMOS Setup

The Standard CMOS Setup utility is used to configure the following features:

* Date
* Time
* Daylight Savings: Disabled or Enabled

The daylight saving allows two special updates for date and time. At the last Sunday on April, the time will be increased from 1:59:59AM to 3:00:00AM. At the last· Sunday on October, the time will be decreased from 1:59:59AM to 1:00:00AM. These special updates don't occur when the Daylight saving is Disabled.

```
┌─────────────────────────────────────────────────────────────┐
│     BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES           │
│   (C) 1990 American Megatrends, Inc., All Right Reserved    │
├─────────────────────────────────────────────────────────────┤
│                                                             │
│              ┌─────────────────────┐                        │
│              │ STANDARD CMOS SETUP │                        │
│               ADVANCED CMOS SETUP                           │
│              ADVANCED CHIPSET SETUP                          │
│        AUTO CONFIGURATION WITH BIOS DEFAULTS                │
│      AUTO CONFIGURATION WITH POWER-ON DEFAULTS              │
│                 CHANGE PASSWORD                             │
│                HARD DISK UTILITY                           │
│              WRITE TO CMOS AND EXIT                        │
│            DO NOT WRITE TO CMOS AND EXIT                   │
│                                                             │
│                                                             │
│                                                             │
│   Standard CMOS Setup for Changing Time, Date, Hard Disk Type, etc. │
│                                                             │
│      ESC:Exit  arrowkey:Sel  F2/F3:Color  F10:Save & Exit  │
└─────────────────────────────────────────────────────────────┘
```

Figure 3.1: BIOS Setup Menu

* Hard Disk Type C: D: From type 1 to type 46 are stand-
  ard ones; type 47 is user definable. A list of hard disk
  types is shown at table 3.1.
* Floppy Driver: The options are 360KB 51/4", 1.2MB
  51/4", 720KB 31/2", 1.44MB 31/2", and not installed.
* Primary Display: Options are Monochrome, Color 40*25,
  VGA/PGA/EGA, Color 80*25 and Not installed.
* Keyboard: Options are installed or not installed.
* Base memory & Ext. memory: The smart BIOS will test
  all the SIMMs that you installed on motherboard and set
  both of them automatically.

You must finish all the configurations according to your sys-
tem environment or you will see some error massages on the
screen at POST.

Type	Cyln	Head	WPcom	LZone	Sect	Size
1	306	4	128	305	17	10MB
2	615	4	300	615	17	20MB
3	615	6	300	615	17	31MB
4	940	8	512	940	17	62MB
5	940	6	512	940	17	47MB
6	615	4	65535	615	17	20MB
7	462	8	256	511	17	31MB
8	733	5	65535	733	17	30MB
9	900	15	65535	981	17	112MB
10	820	3	65535	820	17	20MB
11	855	5	65535	855	17	35MB
12	855	7	65535	855	17	50MB
13	306	8	128	319	17	20MB
14	733	7	65535	733	17	43MB
16	612	4	0	663	17	20MB
17	977	5	300	977	17	41MB
18	977	7	65535	977	17	57MB
19	1024	7	512	1023	17	60MB
20	733	5	300	732	17	30MB
21	733	7	300	732	17	43MB
22	733	5	300	733	17	30MB
23	306	4	0	336	17	10MB
24	925	7	0	925	17	54MB
25	925	9	65535	925	17	69MB
26	754	7	754	754	17	44MB
27	754	11	65535	754	17	69MB
28	699	7	256	699	17	41MB
29	823	10	65535	823	17	68MB
30	918	7	918	918	17	53MB
31	1024	11	65535	1024	17	94MB
32	1024	15	65535	1024	17	128MB
33	1024	5	1024	1024	17	43MB
34	612	2	128	612	17	10MB
35	1024	9	65535	1024	17	77MB
36	1024	8	512	1024	17	68MB
37	615	8	128	615	17	41MB
38	987	3	987	987	17	25MB
39	987	7	987	987	17	57MB

Table 3.1: Hard Disk Types.

Type	Cyln	Head	WPcom	LZone	Sect	Size
40	820	6	820	820	17	41MB
41	977	5	977	977	17	41MB
42	981	5	981	981	17	41MB
43	830	7	512	830	17	48MB
44	830	10	65535	830	17	69MB
45	917	15	65535	918	17	114MB
46	1224	15	65535	1223	17	152MB
47	0	0	0	0	0	0

Table 3.1: Hard Disk Types, cont'd.

Advanced CMOS Setup

The AMI BIOS is designed to provide maximun flexibility in configuring the system by offering various options which may be selected for end-user requirements. If you do not know each of them, load "Auto configuration with BIOS defaults". the BIOS will set all of them for you.

* **Typematic Rate Programming:** By enabling this option, the user can adjust the rate at which a keystroke is repeated. the options "Typematic Rate Delay" and "Typematic Rate" affect this rate. When a key is pressed and held down, the character appears on the screen and after a delay set by the Typematic Rate Delay, it keeps on repeating at a rate set by the Typematic Rate value.

* **Above 1MB Memory Test:** This feature, when enabled, will invoke the POST memory routines on the RAM above 1MB. If disable, the BIOS will only check the first 1MB of RAM.

* **Memory Test Tick Sound:** This option will enable or disable the "ticking" sound during the memory test.

* **Hit <DEL> Message Display:** Disabling this option, will prevent this message:
    "Hit <DEL> if you want to run SETUP"
from appearing on the screen when the system boots-up.

* **Hard Disk Type 47 RAM Area:** The AMI BIOS SETUP features two user-definable hard disk types. Normally, the data for these disk types are stored at 0:300 in lower system RAM. If a problem occurs with other software, this data can be located at the upper limit of the DOS shell (640KB). If the option is set to "DOS 1 KB". the DOS shell is shortened to 639KB, and the top 1KB is used for the hard disk data storage.
* **Wait for F1 if Any Error:** Before the system boots-up, the BIOS will execute the POST routines, a series of system diagnostic routines. If any of these test fail, but a non-fatal error has occurred and the system can still function, the BIOS will respond with an appropriate error message followed by the following statement:
"Press <F1> to continue."
If this option is disabled, any non-fatal error which occurs will not generate the above statement.
* **System Boot Up Num Lock:** The user may turn off/on the "Num-Lock" option on his enhanced keyboard when the system is powered on.
* **Numeric Processor:** This option allows the user to mark the numeric processor as present or absent.
* **Floppy Drive Seek At Boot:** This option is "Disabled" to allow a fast boot and to decrease the possibility of damage to the heads.
* **System Boot Up Sequence:** If the option is set to "C:, A:," the system will attempt to boot from the hard drive C:, and then A:. If the option is set to "A:, C:," the sequence is reversed.
* **System Boot Up CPU Speed:** The speed which the system will boot up is determined with this option. Choices for this option are "high" or "low".
* **Fast Gate A20:** This option uses the fast gate A20 line to access any memory above 1MB. Using this option will make the access faster than the normal method.
* **Password Check Option:** The option in the BIOS SETUP only allows the user to enable the password check option every time the system boots or upon entering SETUP only. If the option "Disabled." The prompt for the password will not appear when the system is re-booted.

* **Main & Vedio Shadow Option:** Turning either the main and video shadow on or turning both of them on requires 128KB of memory, and that you need at least 1M of memory to use any shadow RAM option.

Auto Configuration with BIOS Default

The BIOS setup default values are those which should provide optimun performance for the system. They are the best case default values. If you wish to use the BIOS defaults, change the prompt to < Y > and press < ENTER >.

Auto Configuration with Power-on Default

The Power-on defaults, which are the worst case defaults, are the stable values for the system. They are to be used if the system is performing erratically because of hardware problems. If you with to use the power-on defaults, change the prompt to < Y > and press < ENTER >.

Change Password

This section of the manual deals with changing the user password. The password check function is enabled or disabled in Advanced CMOS Setup. The password, which will be stored in the CMOS, connot exceed 6 characters in length. A default password, to be used if the CMOS is corrupted, is stored in the ROM. The default passsword is "AMI".

The first time you select this option, enter the default password "AMI", then press < ENTER > to complete your selection. The screen will not display the characters entered. After the current password has been correctly entered, the screen prompt you for the new password. When the new password confirmation is entered without error, the screen will appear "New Password Installed", press < ESC > to return main setup menu.

NOTE: when the password is changed and the user forgets or loses the new password, the default password stored in the ROM cannot be used unless the CMOS is disabled. A relatively safe way to do this would be to disconnect the CMOS batteries.

Hard Disk Utility

The **Hard Disk Format** option preform a "low level" format of the hard drive. The user should check with the hard drive manufacturer to determine if this option should be taken.

NOTE: These routines are not valid for a SCSI disk drive.

Write to CMOS and Exit

The features selected and configured in the Standard Setup, Advanced CMOS Setup, Advanced Chip Set Setup, and the New Password Setup will be stored in the CMOS when this option is taken.

Do Not Write to CMOS and Exit

This option passes control back to BIOS without writing any changes to the CMOS.

Appendix A

Chips BIOS Reference Guide

This appendix describes how to use the CHIPS BIOS. The BIOS will allow you to set the following menus.
    STANDARD SETUP OPTIONS
    ADVANCED FEATURE CONTROL

HOT KEYS

Hot keys are used to control system speed and provide access the setup program supplied with the CHIPS BIOS. These sequences are triggered by holding down the "Ctrl" and "Alt" keys while simultaneously prossing another key.

< Ctrl-Alt-S >   Causes the machine to enter Setup
                     mode. It is only active during the Power-
                     on Self Test process.

< Ctrl-Alt-Plus >   Causes the machine to switch to the
                     next higher speed.

EMBEDDED SETUP

Embedded setup is used to set up the machine configuration. It is termed "embedded" because it is contained in the ROM with the BIOS. It is accessed by entering a < Ctrl-Alt-S > keystroke sequence during the Power On Selt Test (POST) while the SETUP message is being displayed. (Pressing < Ctrl-Alt-S > too early in POST results in a keyboard error. This is harmless.)

Embedded Setup can also be entered after Post encounters an error. When this happens, the following line will be displayed:
        Press < F1 > to resume, < F2 > to Setup

Pressing the < F1 > key will cause the BIOS to continue to boot the system;

Pressing < F2 > will cause Embedded Setup to be invoked.

STANDARD SETUP OPTIONS MENU

Upon entry to Embedded Setup, the display will clear and the Standard Setup Option menu will appear:

```
Chips and Technologies, Inc. System Configuration Utility

─────────── STANDARD SETUP OPTIONS ───────────
Time:                00:25:45
Date:                Jan 01, 1989

Diskette A:          3.5 Inch, 1.44 MB
Diskette B:          Not Installed
                                    Cyl Hd Pre  LZ  Sec Size
Fixed Disk C:        Type 2         615  4 300 615  17  20
Fixed Disk D:        Not Installed
                                    BIOS Found:
Base Memory:         640 KB            640 KB
Extended Memory:     1024 KB           1024 KB

Display:             EGA or VGA

─────────────────────────────────────────────────────
  Select the type of the first diskette drive (Drive A)
─────────────────────────────────────────────────────
Arrow-key to select entries   PgDn for Advanced Feature
+ - to change an entry        Control
ESC to exit without saving    F10 to save then exit
```

This menu is divided into four boxes. The top box shows the title of this menu. The second box contains all the modifiable data fields. The third box shows a help line. The bottom box lists the keys that can be typed.

* Time and Date
* Diskette Drive(s): Be sure to enter the type of diskette drive, and not the type of floppy media being used.
* Fixed Disk(s): Default fixed disk types defined in the standard BIOS are shown at table A.1

Type	Cyln	Head	Pre	LZone	Sect	Size
1	306	4	128	305	17	10MB
2	615	4	300	615	17	20MB
3	615	6	300	615	17	30MB
4	940	8	512	940	17	62MB
5	940	6	512	940	17	46MB
6	615	4	none	615	17	20MB
7	462	8	256	511	17	30MB
8	733	5	none	733	17	30MB
9	900	15	none	901	17	112MB
10	820	3	none	820	17	20MB
11	855	5	none	855	17	35MB
12	855	7	none	855	17	49MB
13	306	8	128	319	17	20MB
14	733	7	none	733	17	42MB
15			--Invalid--			
16	612	4	0	663	17	20MB
17	977	5	300	977	17	40MB
18	977	7	none	977	17	56MB
19	1024	7	512	1023	17	59MB
20	733	5	300	732	17	30MB
21	733	7	300	732	17	42MB
22	733	5	300	733	17	30MB
23	306	4	0	336	17	10MB
24	612	4	305	663	17	20MB
25	612	2	300	612	17	10MB
26	614	4	none	614	17	20MB
27	820	6	none	820	17	40MB
28	977	5	none	977	17	40MB
29	1023	9	none	1023	17	76MB
30	1024	5	none	1024	17	42MB
31	1024	8	none	1024	17	68MB
32	809	6	128	809	17	40MB
33	830	7	none	830	17	48MB
34	830	10	none	830	17	68MB
35	776	8	0	775	33	100MB
36	1024	8	none	1024	17	68MB
37	615	8	128	615	17	40MB
38	615	8	none	615	17	40MB
39	925	9	none	925	17	69MB
40	1024	9	none	1023	17	76
41-47			--Empty--			
48-49	--User	Defined	Drives--			

Table A.1: Fixed Disk Types.

* Base Memory: Possible Base Memory option are: 256K,512K,640K. It depends on the machine configuration. Select the proper value for your machine.
* Extended Memory: To configue the amount of extended memory, all of which is located above 1 Megabyte in the CPU address space. The value for this option must be entered in multiples of 64KB up to a maximum of 15360KB. The value may also be entered manually followed by a < RETURN >.
* Display: Setting the Primary Adapter tells the BIOS which video adapter will be the main one for the machine.

ADVANCE FEATURE CONTROL MENU

The second Embedded Setup menu is accessed by pressing the < PgDn > key. This menu contains some of the extended AT features of the BIOS.

Chips and Technologies, Inc. System Configuration Utility	
─────── ADVANCED FEATURE CONTROL ───────	
Numlock:	On
CPU Speed:	Fast
RAM Wait States:	0
Shadow System BIOS:	Disabled
Shadow Video BIOS:	Disabled
640K-1024K Relocation:	Disabled
EMS Memory:	Disabled
EMS Memory Size:	512KB
EMS Base I/O Address:	208h/209h
Select the state of the Numlock at start-up	
Arrow-key to select entries	PgUp for Stardard Setup Options
+ - to change an entry	PgDn for Technical Option
ESC to exit without saving	Control

* Numlock: Configuring this option will determine the initial state of the <Numlock> key.
* CPU Speed: This machine supports multiple speed, this option is used to select a default speed. In most cases, you will want to operate at the highest speed.
* RAM Wait States: Wait states allow DRAM memory devices to operate in fast machines. Wait states can be set to 0 or 1.
* Shadow System or Video BIOS: If your machine has at least 1 Megabyte of RAM, you can configure some of it to hold the BIOS. The System and Video BIOS can be shadowed separately. Either can be Enabled or Disabled.
* 640K-1024K Relocation: If the system has exactly 1024 KB(1MB) of memory and the user does not wish to use the Shadow RAM feature, then that region(640KB-1MB) can be remapped so that it appears to the CPU to be 384KB of extended memory starting at the 1MB boundary.
* EMS Memory: If you have more than 1MB of RAM on the system board, setup can allocate a part of this memory as EMS memory. To enable EMS memory on the system board, first set the EMS Memory option to Enable. If EMS Memory is Disabled, then all other EMS options are ignored except the EMS size is deducted from the amount of available extended memory.
* EMS Memory Size: The possible EMS values are determined from the total amount of memory.
* EMS BASE I/O Address: The possible values for Base I/O Address are 208h/209h, 218h/219h. If the default value specifies ports that conflicts with another device, then the value should be modified.

Appendix B

This appendix is a list of the most popular HDD BIOS parameters for user-definable hard disk types.

Mfr.	Model	Size	Cyin	Head	Sect	WPcom	LZon
CONNER	CP-3184	80	832	6	33	0	832
CONNER	CP-3104	100	776	8	33	0	776
CONNER	CP30104	120	762	8	39	0	0
CONNER	CP-3204	200	683	16	38	0	683
MAXTOR	LXT200A	200	815	15	32	0	815
MAXTOR	4380	380	1224	15	40	0	0
NEC	D5126	20	612	4	17	0	0
NEC	5655	150	1224	7	36	0	0
RODIME	3128A	100	868	7	34	0	868
RODIME	3259A	200	976	15	28	0	976
SEAGATE	ST125A	20	615	4	17	0	0
SEAGATE	ST124	20	615	4	17	0	0
SEAGATE	ST225	20	615	4	17	0	0
SEAGATE	ST138	30	615	6	17	0	0
SEAGATE	ST157A	40	560	6	26	0	0
SEAGATE	ST151A	40	977	5	17	0	0
SEAGATE	ST251-1	40	820	6	17	0	0
SEAGATE	ST4096	80	1024	9	26	0	0
SEAGATE	ST296N	80	820	6	34	0	0
SEAGATE	ST1102	89	1024	10	17	0	0
SEAGATE	4144R	120	1024	9	26	0	0
TEAC	SD340	40	1050	2	40	0	1050
TOSHIBA	MK134FA	66	733	7	26	512	733
TOSHIBA	MK234FA	100	845	7	35	0	845
W.D.	95044A	40	782	4	27	0	0
W.D.	280-32M	80	980	10	17	0	0