GSI Model 21

ENHANCED IDE, FLOPPY &

TAPE ACCELERATOR ADAPTER

Installation Instructions

BEFORE CALLING GSI TECHNICAL SUPPORT, PLEASE READ THE INSTALLATION SECTION OF THIS MANUAL (PAGES 2-4) *COMPLETELY* AND HAVE ALL INFORMATION ON PAGE 31 READY!

This manual applies to all revisions of the Model 21 controller and BIOS version 3.06 and later.

IMPORTANT - READ THIS FIRST
Installation and Support of your GSI Product

Thank you for purchasing a GSI controller. GSI is constantly striving to make our products easy and quick to install. Due to the vast variations in motherboards, disk drives and operating systems it is impossible to test every combination, thus every installation is unique. Please take the time to **read the Installation Section (Page 2) and Basic Troubleshooting Section (Page 28) carefully** - *before calling for technical support.*

After reading the installation and basic troublshooting sections, if you are still having problems with installation, please follow the below steps:

1. Have your serial number ready. The serial number is a six digit number located on the back of the board. It also comes up onscreen during the boot process in the GSI banner. **The part number (1533-21-XX-X) is NOT the serial number.**

2. Please fill in as much information on page 31 as possible and after doing so, call GSI support at 714-261-9744.

GSI requires the above two steps to be completed to provide accurate technical support in a timely manner. **Remember, without the GSI serial number, GSI cannot provide technical support!**

The following section summaries will help you identify the sections you need to read. For best results, however, we recommend that you read the entire manual before installing and using your GSI Model 21.

Conventions Used
This section explains both text and graphics usage in this manual.

Product Overview
Explains the features and functions of the GSI Model 21 Accelerator Board.

Installing the GSI Model 21
This section is intended to provide a quick reference for installation and using the GSI Model 21.

Appendices
The Appendices in this manual further explain items quickly referenced in the Quick Installation Reference.

Appendix H - Basic Troubleshooting
This important section provides basic troubleshooting should you experience difficulties during the installation process.

Installation Notes
During installation, you should take down specific notes regarding the GSI Model 21 and your system. These notes will help should you need to troubleshoot your installation.

This section explains both text and graphics usage in this manual.

Bold Type
Bold Type usually indicates a section heading. If bold type is used outside a heading, it is used to highlight a term of importance.

`Courier Type`
`Courier Type` is used to show responses from the computer, or commands to the computer.

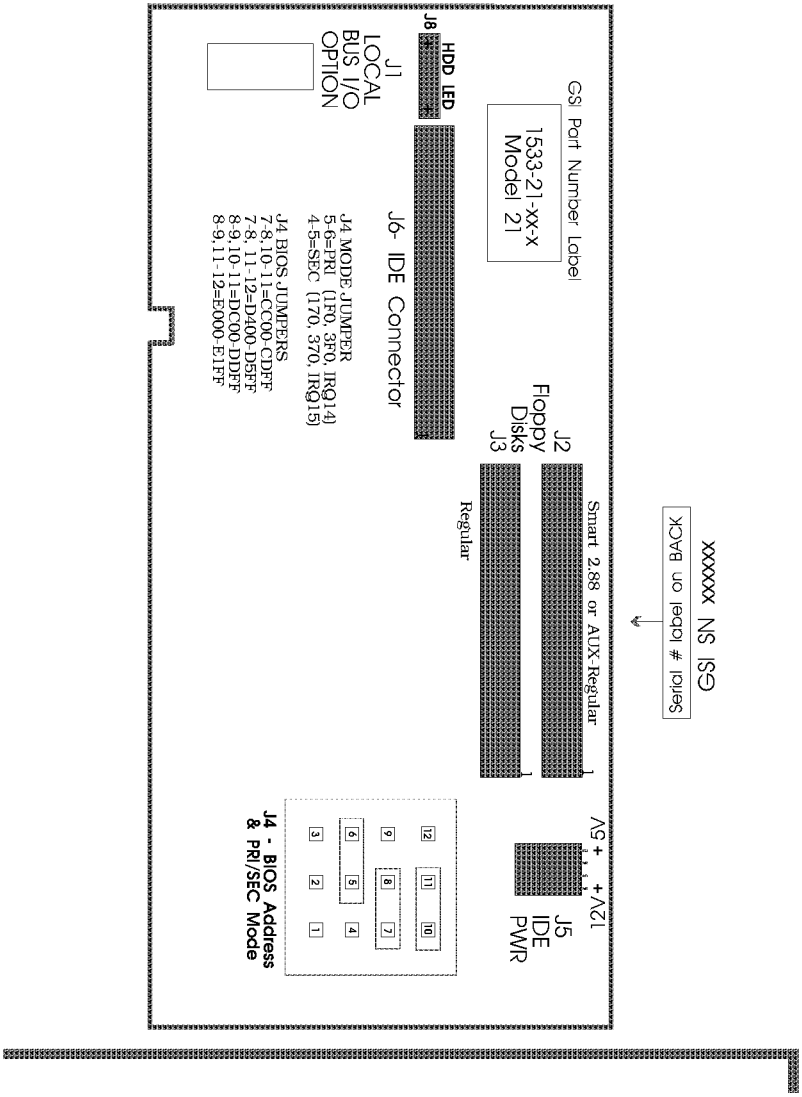
<Bracketed Items>
Keys on the keyboard are enclosed in "brackets", e.g., <Del> represents the Delete key, <A> represents the capital letter "A", etc. Combination keystrokes run together without spaces, i.e., <Ctrl><Alt><Del>.

Graphics
A few graphics are used to call attention to items:

Indicates a special note on a related subject.

Indicates an area where caution should be used.

Indicates where damage could occur.



Board layout- GSI Model 21 (1533-21-09-1)
(J4 Jumper Block is shown enlarged. Jumpers shown are factory default. See Appendix A.3.1)

1.0 PRODUCT OVERVIEW

The Model 21 is an Enhanced IDE, Floppy & Tape Accelerator for ISA systems. It is a 16-bit ISA-bus controller that supports Enhanced IDE hard drives & ATAPI CD-ROMs, floppy drives, and (E)IDE or floppy-interface tape drives. The Model 21 uses a 8kB *Flash* BIOS to make installation quick and easy. This ***Flash*** BIOS also eliminates the need for *any* special drivers or system CMOS support.

The Model 21 is a 16-bit ISA-bus controller and provides features compliant with the ANSI ATA-2 standard and it's industry extensions: Enhanced IDE and Fast ATA. These features are:

- Supports high-capacity (E)IDE drives
- Increases (E)IDE hard drive data transfer rates (using Read/Write Multiple)
- Supports primary or secondary mode of operation for adding (E)IDE drives

Enhanced IDE Support

- ***ISA Acceleration***: Uses the IDE Read/Write Multiple commands to provide data transfer rate acceleration for most (E)IDE hard drives, compared to standard ISA passive IDE adapters
- ***VESA Acceleration***: The Model 21 can be upgraded, using the GSI VESA Extender Module, to support full PIO Mode 3 & Mode 4 data transfer rates. The VESA Extender is simply an add-on module that converts the GSI Model 21 into a VESA controller. (See Appendix G)
- ***"Auto-Senses" Hard Drive:*** The Model 21's flash BIOS automatically reads the drive's information, no drivers or system CMOS support required
- ***Large-Drive Support:*** Handles high-capacity EIDE hard drives, allowing a single DOS partitions (drive letter) larger than 528MB
- ***Compatibility:*** DOS, Windows® 3.xx, Windows NT™, Windows® 95, Novell NetWare 3.x & 4.x, and OS/2 Warp & 2.x
- ***EIDE CD-ROM:*** Supports an EIDE-interface (ATAPI) CD-ROM drive — either as Slave to an (E)IDE hard drive or by itself

Enhanced Floppy Drive and Floppy-Interface Tape Drive Support

- Supports any mix of up to four floppy drives (system limit)
- Doubles the speed of QIC-80 & QIC-3010 tape drives, transferring data at 1 Megabit per second — twice the standard floppy-interface tape speed.
- Allows the user to assign floppy drive letters from the keyboard, selecting any floppy drive as A: (the Boot Drive), or as B:, or 3:, or 4:. (DOS & Windows® 3.x environments only)
- Boots from any type of 3.5"/5.25" diskette, including 2.88MB diskettes

2.0 INSTALLING THE GSI MODEL 21

This section of the manual should allow you to quickly install the Model 21 in your computer. Each step has, if needed, a bracketed [ ] reference to other sections in this manual that discuss that particular step in more detail. Should you have problems or questions regarding an INSTALLATION step, please read carefully the reference sections.

2.1 PHYSICAL INSTALLATION

(1) With power OFF, open the computer case.

CAUTION! Let disk drives stop before working on the computer. All electronic equipment is sensitive to **static electricity** at levels far below those that humans notice. To protect your system, take care to touch the metal case parts *before* touching the electronics.

(2) Check the jumpers on the (E)IDE devices [E.1.2]
The hard, tape or CD-ROM drive jumper settings should be kept at the factory default setting when you have only one drive on the Model 21 (usually Standalone or Master). If there are two (E)IDE devices connected to the GSI Model 21, you must set one as the Master and the other as the Slave.

Note: Master/Slave jumper settings are for drives that share a cable. If you have another IDE controller in the system that has only one hard drive on it and the Model 21 (running in secondary mode) has only one drive attached to it, both drives should be set as Standalone (or Master if there is no standalone option). Only when drives share the same cable (or run off the same controller) should one be set as Master and the other as Slave. Master or Slave can be at *either* cable position.

(3) Attach the IDE ribbon cable (wider, 40-pin non-twisted cable) [A.2.2]
Connect the ribbon cable from **J6** to the (E)IDE Drives. Note that the **colored** band found on one edge of the IDE ribbon cable indicates the **Pin-1** edge. Match this Pin-1 to the drive and controller's Pin-1 markings.

(4) Check the floppy drive and floppy-based tape drive jumpers [D.3]
Leave these jumpers at factory settings, except for 2.88MB floppies.

(5) Attach floppy cables (narrower, 34-pin twisted cables) [A.1.3]
Connect the ribbon cables from **J3/J2** to the floppy and tape drives. The **colored** band found on one edge of each floppy cable indicates the **Pin-1** edge. Match this Pin-1 to the drive and controller's Pin-1 markings.

(6) Check the Model 21's GSI BIOS Address Jumpers [A.3.1]
In most cases skip this step, as the factory BIOS-Address setting should work fine.

(7) Check the Model 21's Primary/Secondary Mode Jumper [A.3.1]
Try factory-default Primary (PRI) Mode. For SEC Mode, see A.3.1.

(8) Install the Model 21 into an ISA bus slot and Power ON [A.3.2]

2.2 SYSTEM CMOS / BIOS SETUP

(1) For Hard Drives – Select "`Type 1`" for GSI Auto-Install [B.1.2]

a) **Primary Mode (default)**: Select "`Type 1`" for each hard drive on the Model 21. There is no system CMOS setting for CD-ROM and tape drives, either (E)IDE or floppy-interface.

b) Secondary Mode (see Step 7 above): Do **not** declare drives attached to the Model 21 in CMOS when running in secondary mode.

Note: The system CMOS/BIOS "`Type`" should reflect a 10MB hard drive setting. If your system's "`Type 1`" setting **does not** select a 10MB hard drive capacity, you can use the user-definable "`Type 47`" and enter the parameters for a 10MB hard drive (306 cylinders, 4 heads and 17 sectors). If your system does not have a user-definable option you can also try "`Type 23`", which should also select a 10MB hard drive.

(2) Floppy Drives – Select "`None`" or "`Not Installed`" [B.1]

Note: In *rare* cases, you must declare **PRI** Mode floppy drives (B.1).

(3) Tape Drives – Do nothing! (Not declared during setup) [E.5]

(4) Advanced CMOS Setup – Turn OFF BIOS shadowing [B.3]
Many 386 or faster PCs have *Advanced* System CMOS Setup procedures that offer shadowing of an adapter BIOS' memory region, like the Model 21's. A *shadowed* BIOS is executed from a high-speed RAM copy of the BIOS, usually enhancing performance. Shadowing of the GSI BIOS address area should be **OFF** until you complete your installation, but **ON** for normal operation. The Model 21 will ask you to **temporarily** "*`Turn OFF shadowing!`*" if it cannot write to the *Flash* BIOS chip when it needs to. Section B.3 discusses various methods of providing *shadowed* execution of your BIOS.

2.3 GSI MODEL 21 FLASH BIOS SETUP

(1) Reboot your system and watch for the GSI Banner [B.2]
The GSI Banner should appear on-screen after your system BIOS's boot-time banner. For the AMI BIOS, look for it just beneath the AMI Configuration Report. If your Model 21 has never been installed in a PC since factory test, look for "`Configuration not set up. Press any key...`" on your display. Press any key.

(2) Run GSI BIOS Setup, saving your desired configuration [B.2.2]
Follow the setup directions to select the drive letter and type of each floppy drive. Once you save the floppy settings, the Model 21 will "Auto-Sense" the (E)IDE drives attached. Your floppy configuration entries and the information reported to the Model 21 by the (E)IDE drives will be saved to the Model 21's *Flash* BIOS. Verify, on reboot, that the GSI Banner properly reports your hard drive and floppy drive configuration, for those drives that are *connected to the Model 21*. If not, reboot your system and press <INSERT> when prompted, to re-enter the GSI BIOS setup.

CAUTION! - Do not use any other hard drive partitioning software (like Disk Manager, EZ-DRIVE, Max-Blast, etc.) in conjunction with the Model 21. If the hard drive has already been formatted and partitioned using a software package (like Disk Manager), you MUST back up the data and delete the partitions from the drive. *The Model 21 will NOT work with a drive partitioned using Disk Manager, EZ Drive, Drive Pro or SuperStor!*

(3) Install DOS, if needed, using DOS' install procedure
You may now boot from a DOS floppy and use DOS' `FDISK` and `FORMAT` to make full use of the hard drives.

2.4 CHECK FOR PROPER DRIVE OPERATION

(1) Test each hard, floppy and/or tape drive for proper operation

Note: Take a moment here to write down the Serial Number of the GSI controller on your product registration card. Please remember to send in this registration card to GSI. **GSI cannot register your product without the Serial Number!! The GSI Serial Number is a six digit number that appears in the boot-time banner.**

Your Model 21 controller should now be up and running. The following appendices provide more detailed information and there is a Basic Trouble-shooting Section [Appendix H], should you encounter installation difficulties.

APPENDIX A — PHYSICAL INSTALLATION

General Precautions: Turn system power **OFF** and let disk drives **stop** before working on the computer. Remove the case cover to gain access to the connectors (slots) on the computer's main board (motherboard). All electronic equipment is sensitive to ***static electricity*** at levels below those that humans notice.Take care to **touch the metal case** parts **before** touching the electronics.

A.1 FLOPPY DRIVE INSTALLATION

A.1.1 Avoid Certain Cable-to-Drive Adapters! — for 2.88MB Floppy Drives

Do **not** use **pre**-2.88MB pin-header to card-edge **adapters** on **2.88MB** drives! Doing so makes the drive report the wrong diskette type to the controller. Use cables with **pin-header** connectors, which are designed to plug **directly** into 3.5" drives. (See also Appendix D.4)

A.1.2 Setting the Drive-Select Jumpers on the Floppy Drives

All floppy drives should be set to **Drive Select 1** (**DS1** of DS0-DS3), the normal factory setting for drives intended for use in PCs, with standard two-drive *twisted* cables.

Note: For *combo* 1.2/1.44 two-in-one floppy drivess, a possible exception to this rule, see Appendix F.2.

A.1.3 Floppy Cable Attachment

It is usually easier to attach cables to the Model 21 **before** inserting the controller into the computer. Regular floppy drives and 2.88MB floppy drives require separate but identical cables due to a slight difference in their interface. Two floppy cable attachment headers are provided on the GSI Model 21 for the 2.88 and REGular (standard *twisted* PC-type *2*-drive) cables:

Floppy Connector	Connector Used For:
J3 (**REG**)	This is the primary floppy connector for use with **Regular** 5.25" 1.2MB and 360kB floppy drives, as well as 3.5" 720kB and 1.44MB floppy drives.
J2 (**2.88 / Aux-REG**)	This is the secondary floppy connector for use with 2.88MB drives or **additional Regular** drives. If you do not have a 2.88MB floppy drive, you can use standard floppy drives from this connector.

Connect each floppy drive to J3 or J2 as indicated above. Be careful to connect the **Pin-1** color-marked side of the **cable** to the Pin-1 side of its **header** (Read the card markings) and of the floppy **drive.** The *slot-cut* in 5.25" floppy-drive edge connectors is toward the Pin-1 side.

When putting only one floppy drive on a cable, it is PC-standard usage to put it on the *end* connector, although the Model 21 will work normally with it at the center. If the system will be running Windows95, OS/2 or UNIX operating systems, see Appendix C.5. If a 2.88MB and a non-2.88MB (floppy or tape) drive must **share** a cable, the 2.88MB **must** be declared as a GSI Type **7** (See D.4).

Note: Model 21's shipped in GSI *VAR* Packs (Part #1533-21-**V**x-x) include one general purpose floppy cable, Part #1117-04-01-0. This cable connects two floppy drives, one at the End Position and one at the Center, and offers a *choice* of 3.5" or 5.25" connector at each position. For four floppy drives a second floppy cable is required.

A.2 HARD DRIVE INSTALLATION

A.2.1 Setting the (E)IDE Drive Mode Jumpers

(E)IDE (AT-bus) drives usually have one or two jumpers to set the drive to operate as either *Standalone* (the only (E)IDE drive), *Master* (of a Master/Slave pair) or *Slave* (of a Master/Slave pair). Set these jumpers appropriately, per the drive manufacturers' instructions.

If you use drives from two different manufacturers, you run a greater risk that the drives will not work together satisfactorily. For Master/Slave problems, contact the manufacturers' Technical Support Dept. for help.

A.2.2 Hard Drive Cable Attachment

Use a standard straight 40-pin cable for connection of one or two (E)IDE drives. Observe Pin-1 markings, as with floppy drives. Model 21 boards shipped in Retail boxes (GSI *VAR* Packs that have colorful retail sleeve on a GSI white box: Part #1533-21-**V**x-x) include a cable (Part #1548-02-01-9) suitable for one or two (E)IDE drives.

A.3 CONTROLLER INSTALLATION

A.3.1 Setting the GSI BIOS Start Address & PRI/SEC Mode Jumpers

Jumper block J4 allows you to alter the Model 21's operation in two respects, by choosing:

1) the GSI BIOS Start Address (any of four choices), for the 8kB GSI ***Flash*** BIOS

2) either Primary or Secondary Mode (I/O-Port Start Address: 1F0 or 170 & IRQ: 14 or 15).

Confirm the **actual** current GSI BIOS address (**hhhh**) by reading it from the GSI BIOS Banner, on-screen at boot time (**see Appendix B.2 for the GSI banner example**).

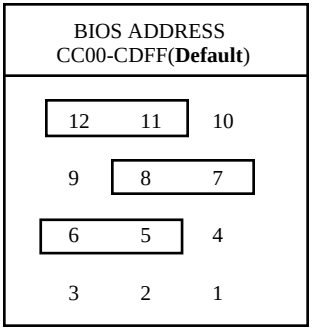
Changing the GSI BIOS address will usually have no effect **unless** another controller board (e.g. SCSI or sound card) is using the same memory address and conflicting with the Model 21's BIOS. In some cases VGA cards cause conflicts. In such cases, trying the **E000** GSI BIOS address may escape this conflict.

Choice of Primary or Secondary Mode will probably have no effect unless there is another drive controller (with BIOS) in your system. See Section 1.0 and Appendix H.

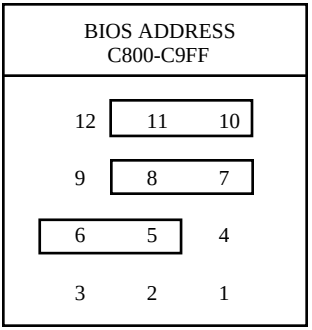
This manual applies to various revisions of the GSI Model 21. On the following page starts the settings for the BIOS address and mode of operation jumpers. Check your GSI Model 21's Part number to confirm you are setting the jumpers properly for the board revision you have. The Part number is on a white label on the front of the controller.

For Model 21's with Part #1533-21-09-1 or later:

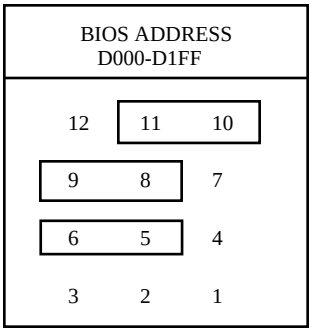
Mode of Operation	Jumper Pins	Selects
Primary Mode (Factory Default)	5 and 6	IRQ14, I/O Address 1F0-1F7
Secondary Mode	4 and 5	IRQ15, I/O Address 170-177



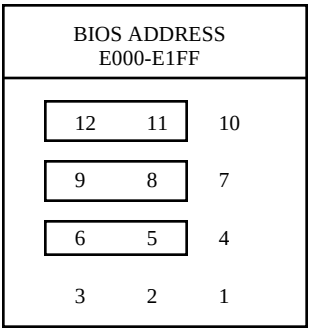
J4



J4



J4

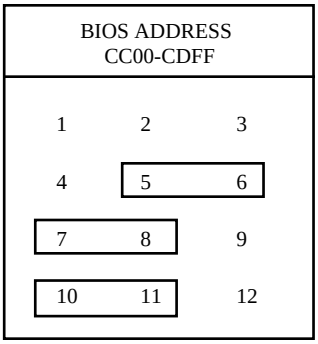


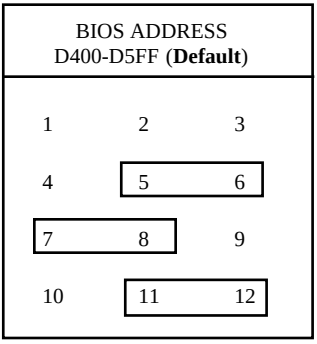
J4

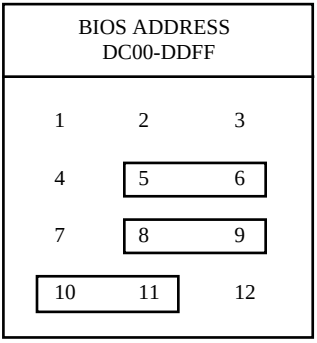
Note: Pins 1, 2, & 3 are **not used**.

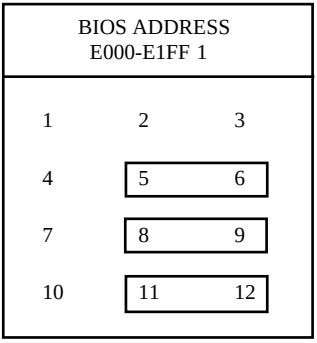
For Model 21's with Part #1533-21-05-0, 1533-21-06-8 & 1533-21-07-5:

Mode of Operation	Jumper Pins	Selects
Primary Mode (Factory Default)	5 and 6	IRQ14, I/O Address 1F0-1F7
Secondary Mode	4 and 5	IRQ15, I/O Address 170-177







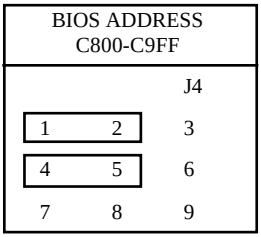


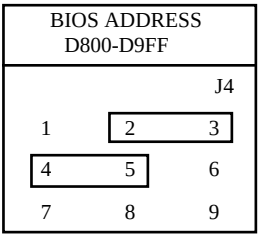
Note: Pins 1, 2, & 3 are **not used**. 1 For Model 21 Part #1533-21-**05**-0, this jumpering selects BIOS Address 'E400-E5FF'.

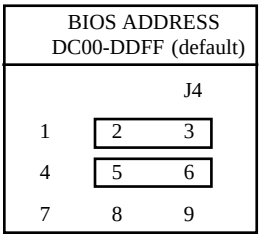
A.3.1 Setting the GSI BIOS Start Address & PRI/SEC Mode Jumpers (cont.)

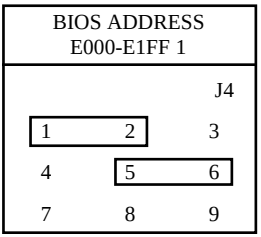
For Model 21 with Part #1533-21-04-3 or earlier:

Model 21's with Part #1533-21-**04**-3 and earlier ***do not support*** secondary mode.









Notes:

Pins 7, 8 & 9 are not used.

The E000 address is provided to allow compatibility with the *few* poorly engineered VGA cards which interfere with 8-bit read/write operations throughout the entire C and D memory pages. (Unfortunately, many non-AMI system BIOSs do not search for a controller BIOS at E000.)

For Model 21 Part #1533-21-**03**-6 and earlier, this selects BIOS Address 'D000-D1FF'.

A.3.2 Inserting the Controller

Choose an open slot in the computer's motherboard and remove the rear-panel blanking plate in line with the slot, saving the screw to anchor the card in place. Gently but firmly press the GSI Model 21 into the slot, fastening it into place with the retaining screw. The case **hard-drive LED** wire-pair goes on **J8**, with the **colored** LED wire going to either positive (+) end pin.

Connector **J5** is a 4-pin power connector like the one found on most 3.5" floppy drives. You can use it to supply 12V and 5V power to your drives. However, if your power supply has an unused power connector, it is safer to connect your drive to that, because a few hard drives, mostly the older full-height drives, exceed the 12V/5V power feed limit of the motherboard and/or the GSI Model 21.

Caution! The 12V and 5V loads attached to the Model 21 **J5** power connector **must not exceed**:

5V LIMIT — 2.0 Amps maximum (= 10 Watts)
12V LIMIT — 1.5 Amps maximum (= 18 Watts)

Exceeding either maximum, *even for a moment*, may **seriously damage** the motherboard or the Model 21 controller.

APPENDIX B — SYSTEM SETUP PROCEDURE

B.1 MOTHERBOARD CMOS SETUP — DRIVE-CONFIGURATION

B.1.1 System CMOS Setup — Floppy Drives & Floppy-based Tape Backup Drives

For floppy drives attached to the Model 21, the CMOS should be set to "`No Floppy Drives`" or "`Not Installed`" for any type of floppy drive. Floppy-based tape backup drives are **not** declared in the system CMOS.

Primary Mode Only — If you have a PC which *insists* on seeing at least one floppy declared in CMOS (a few proprietary brands do), declare **only** floppy drives attached to the J3-REG (Regular) cable. (The system BIOS will *not* find floppy drives attached to the J2-2.88 header). If the floppy drive is of a type not offered as a CMOS choice, declare it as a *1.2MB Drive*.

B.1.2 System CMOS Setup — (E)IDE Hard Drives, CD-ROMs & IDE Tape Drives

There are two modes of operation for the Model 21, each requiring a different setting in the system CMOS.

B.1.2.1 Model 21 Operating in Primary Mode (Factory Default Setting)
You **must** declare the hard drives attached to the Model 21 in the System CMOS Setup, or else the Model 21 will not take any notice of them. Your choice of CMOS Setup Hard Drive Type *may* affect the proper operation of a hard drive. In general, Hard Drive Type usage is as follows:

1) **Choose System CMOS Drive Type 1 for most (E)IDE hard drives.**
CMOS **Type 1** asks the Model 21 to perform **automatic** drive-parameter (#Heads, #Cylinders, and #Sectors) initialization from data *reported to the Model 21 by the drive.*

2) **Any other** CMOS Drive Type asks the Model 21 to accept the #Heads, #Cylinders, and #Sectors parameters as a **manual override** — useful when the automatic Type 1 mode proves unsatisfactory.

Note: A *few* older IDE hard drives *violate* industry standard IDE specifications and **cannot** be used as *Type 1*. If a partition or **partitions already exist** (i.e., the hard drive has been in use or has already been prepared for use), the Model 21 will set up drive parameters consistent with the partition(s), so that the drive can be used and existing files can be read. The GSI Hard Drive Setup screen will tell you *whether* partitions already exist on a hard drive and whether they are *consistent* with the drive's Native parameters or System CMOS parameters. For more details, see Appendix E.

B.1.2.2 Model 21 Operating in Secondary Mode
Do **not** declare (E)IDE hard drives attached to the Model 21 in the System CMOS Setup.

B.1.3 CMOS Setup — System BUS Speed

Some motherboard CMOS Setup procedures allow the modification of the system bus speed. All GSI products are designed to operate at the full ISA-specified bus speed of 8.33MHz. Users are advised that running a motherboard at speeds other than this ISA-specified speed may cause detected or undetected loss of data.

B.2 GSI MODEL 21 FLASH BIOS OPERATION

The Model 21 remembers the hard and floppy drive configuration in ***Flash*** memory. If you install a brand new card or move a card to a different type of system, you will be asked to (re-)run GSI Setup.

B.2.1 GSI Boot-Time Banner (Example)

The GSI Banner appears each time the system is booted. When installed using factory default settings, the banner should appear similar to the following (for BIOS versions 3.06 and later):

GSI BANNER EXAMPLE:

```
GSI Model 21 Drive Controller – with BIOS v3.06 at D400 (c)1992-95 GSI
          GSI Serial# A12345  – in Primary Controller Mode

    Floppy Drives – A: 1.44MB  B: 1.2MB
    Hard Drive 1 (IDE): 1024 Cylinders  16 Heads  63 Sectors –  504MB
    Hard Drive 2 (IDE):  524 Cylinders  64 Heads  63 Sectors – 1031MB

To change your GSI Drive Configuration – Press INSERT key
```

STOP!: MAKE SURE to take note of **YOUR SERIAL NUMBER** from your system's boot-time banner for use in registering your GSI product (using the Product Registration Card) and for future GSI BIOS upgrades. Remember to write this number in the **Installation Notes** section of this manual.

B.2.2 GSI Model 21 Flash BIOS Setup — Floppy Drives

To run the GSI BIOS Setup Utility, simply reboot and watch for the GSI Banner to appear, including '`Press INSERT to change configuration`' and then press the <INSERT> key (either <INSERT> key).

Note: Press the <SPACE> bar to bypass the 4 second wait and boot faster.

GSI Setup begins with the Floppy Drive Setup screen. You will be shown the Current Drive Settings, if any. If you want to make changes (this question is skipped if you haven't saved a previous setup or if the board is new), enter <Y>. You are then asked, in turn, to select drive letters as follows:

"`Choose Drive A:. Is the drive with the light ON your choice?`"
Answering <Y><ENTER> chooses this floppy drive as drive A: and brings the request:

"`Enter type for Drive A:`"
Select a GSI Drive Type using the table on-screen (for 2.88MB floppies, the table in section D.2.)

For each floppy drive letter selection, the Setup Utility lights the LED on the next drive still unassigned until all floppy drives are configured. Answering "<N ><ENTER>" advances the LED-ON indication to the next available drive. Answering "<N> <ENTER>" repeatedly should light **all** floppy LEDs, one at a time, in succession, in cyclic fashion; if not, see Appendix G. (For TEAC Combo drives, see F.2)

After you have assigned all floppy drives, you are asked: "`Want to save?`". Enter <Y><ENTER> to save your configuration to the GSI Model 21 *Flash* BIOS.

B.2.3 GSI Model 21 Flash BIOS Setup — (E)IDE Hard and CD-ROM Drives

After you save your Floppy Setup (or if you answer <N> to "`Do you want to change...?`"), you will be shown a non-interactive Hard Drive Setup screen for the first hard drive on the Model 21. This screen should show information from the IDE drive (Model, Serial Number, Firmware revision and any other information received from the drive) from the IDENTIFY DRIVE command the Model 21 has issued.

If a setting in the system's CMOS (other than Type 1) disagrees with the partition information shown (head, cylinder and sector numbers), the Model 21 will caution you that the two do not match. If a second drive is attached, you will be prompted to "`Press a key to continue`", which moves on to the next drive. If there is only one drive attached, this prompt is "`Press a key to reboot`", which ends the Hard Drive Setup and reboots the system, saving the hard drive information.

B.2.4 An Overview of DOS Drive Letter Assignments

DOS itself assigns drive letters (A:, B:, etc.) in the following sequence:

1) Floppy drives *A:* & *B:* — if at least one floppy drive exists

2) All hard drive partitions known to DOS before boot-time CONFIG.SYS file processing
   a) First, all hard drive **primary** partitions (C:, D:, etc., one letter per primary partition)
   b) Then, all *logical drives* (one letter to each) defined within HD **extended** partitions

3) Floppy drives *3:* & *4:*, if known to DOS *before* boot-time CONFIG.SYS file processing (that is, if supported by BIOS rather than by device driver via CONFIG.SYS)

4) Any hard drives, floppy drives, and other drive types (e.g., RAM drives or CD-ROMs) made known to DOS by processing of the CONFIG.SYS file —in the *order of appearance* in CONFIG.SYS.

Example —
Note that any drive that is initialized (made known to DOS) via a device driver in CONFIG.SYS will be assigned a drive letter *later* than those of all drives known before CONFIG.SYS processing. Thus a PC with DOS 5.0/6.0, four floppy drives, two IDE HDs, and a SCSI HD and CD-ROM *might* boot with:

A: & B: = Floppy drives #1 & #2 (selected via INT13 Drive #0 & Drive #1)

C: & D: = IDE hard drives #1 & #2

E: = CD-ROM drive supported via a BIOS on the SCSI controller

F: & G: = Floppy drives #3 & #4 (selected via INT13 Drive #2 & Drive #3)

H: = SCSI hard drive supported via a driver invoked in CONFIG.SYS

Note the possibility that hard drive letters *may not be contiguous* (other drive types may be in between).

B.3 SHADOWING THE GSI BIOS - VERY IMPORTANT

Shadowing the GSI BIOS address region is a **must** for performance, affecting both hard and floppy drives. Most 386 or 486 System Setups offer *shadowing* of controller card BIOSs like GSI's in their Advanced System Setup options. Shadowing can also be done using a memory manager software utility. You may shadow the GSI BIOS using **either** of these methods. The primary difference between the two methods is that memory manager software-shadowing allows you to rerun GSI BIOS Setup whenever you want, without worrying about going back into your system's CMOS and disabling, then re-enabling, shadowing each time.

To ENABLE shadowing of the GSI BIOS with DOS 6.x's EMM386.EXE memory manager, make sure the following line is in your CONFIG.SYS:

```
device = EMM386.EXE ROM=AddressRange
```

where *AddressRange* is the GSI BIOS's 8kB address range (e.g., D400-D5FF).

System BIOSs for most 486 and some 386 systems allow you to turn ON shadowing (in the C, D, and E pages of memory) in 16kB, 32kB, or 64kB blocks. Any of these block sizes will totally contain the Model 21's **8kB** BIOS. Note your GSI BIOS Start Address as shown in your GSI Bootup Banner and request shadowing, in your Advanced CMOS System Setup, as follows:

GSI BIOS Address (HEX)	In System Setup Shadowing, Choose: If 16kB Block	If 32kB Block	If 64kB Block
C800-C9FF	C800-CBFF	C800-CFFF	C000-CFFF
CC00-CDFF	CC00-CFFF	C800-CFFF	C000-CFFF
D000-D1FF	D000-D3FF	D000-D7FF	D000-DFFF
D400-D5FF	D400-D7FF	D000-D7FF	D000-DFFF
D800-D9FF	D800-DBFF	D800-DFFF	D000-DFFF
DC00-DDFF	DC00-DFFF	D800-DFFF	D000-DFFF
E000-E1FF	E000-E3FF	E000-E7FF	E000-EFFF
E400-E5FF	E400-E7FF	E000-E7FF	E000-EFFF

B.4 FLOPPY DRIVE TYPES SUPPORTED — GSI-SETUP TYPES

The Model 21 accommodates all 3.5"/5.25" floppy drive types which are standard in the IBM-compatible marketplace. GSI Drive Types shown in the GSI BIOS Setup screen are:

GSI Type #	Floppy Type Description	GSI Type #	Floppy Type Description
0	No floppy drives attached	4	3.5" 1.44MB
1	5.25" 360kB	5	3.5" 2.88MB ED-H
2	5.25" 1.2MB	6	3.5" 2.88MB ED-L
3	3.5" 720kB	7	3.5" 2.88MB ED-N

Note: GSI BIOS Drive Types 5 and 6 accommodate most of the 2.88MB drive variants which have been produced to this time. GSI BIOS Type 7 is provided to deal with any case where the drive's media type reporting should be ignored. See D.2 for a list of recommended GSI BIOS Drive Types for 2.88MB floppy drives by make and model.

C.1 FORMATTING DISKS IN A 2.88MB DRIVE

Use the DOS FORMAT command to format 3.5" diskettes in the 2.88MB drive. See the following table, which describes the necessary switch settings for FORMAT for each diskette type, 2.88MB floppy drive Type (as determined by the GSI BIOS Setup) and operating system:

Diskette Capacity	Operating System	GSI SETUP Type 5 or 6 Floppy Disk Drive	GSI SETUP Type 7 Floppy Disk Drive
2.88MB	DOS 6.x/5.0	`FORMAT A:`	`FORMAT A:`
	DOS 3.30/4.01	`FORMAT A: /t:80 /n:36`	`FORMAT A: /t:80 /n:36`
	DRDOS 6.0	`FORMAT A: /f:2.88`	`FORMAT A: /f:2.88`
1.44MB	DOS 6.x/5.0	`FORMAT A:`	`FORMAT A: /f:1.44`
	DOS 3.30/4.01	`FORMAT A: /t:80 /n:18`	`FORMAT A: /t:80 /n:18`
	DRDOS 6.0	`FORMAT A: /f:1.44`	`FORMAT A: /f:1.44`
720kB	DOS 6.x/5.0	`FORMAT A:`	`FORMAT A: /f:720`
	DOS 3.30/4.01	`FORMAT A: /t:80 /n:9`	`FORMAT A: /t:80 /n:9`
	DRDOS 6.0	`FORMAT A: /f:720`	`FORMAT A: /f:720`

*When using the FORMAT command, substitute the appropriate drive designation for "`A:`".

Important Note: DOS 6.x/5.0 FORMAT finds out from the GSI Model 21 which type of diskette is in the drive waiting to be formatted. Therefore a whole mixed stack of 3.5" diskettes of any type (720/1.44/2.88) can be DOS-FORMATTED **without returning to the DOS prompt every time that you change diskette types**. Just say <Y> when DOS asks: '`Format another?`'

C.2 USING MEMORY MANAGER SOFTWARE

If you use memory manager software, such as DOS' EMM386, QEMM, 386MAX, or Netroom, you may experience faulty handling of some diskette types — for example, a 720kB disk in a 1.44MB drive. Try **excluding** the memory region of the **GSI BIOS** from the memory manager's optimization process.

Example:
In the CONFIG.SYS file add the **exclude** option for a Model 21 whose BIOS is at the **CC00** address:

Memory Manager	Exclusion Statement
DOS' EMM386	`Device = X:\DOS\EMM386.SYS X=CC00-CDFF`
QEMM	`Device = X:\QEMM\QEMM.SYS X=CC00-CDFF`
386MAX	`Device = X:\386MAX\386MAX.SYS exclude=CC00-CFFF`

If the above does not work for your memory manager, check the software's documentation on how to exclude a memory region and follow those instructions.

C.2 USING MEMORY MANAGER SOFTWARE *(CONT.)*

If you are using a different GSI BIOS address (confirm BIOS address from GSI Banner), the following table shows which regions should be excluded accordingly:

GSI BIOS Address	Exclude Region	GSI BIOS Address	Exclude Region
C800	C800-C9FF	D800	D800-D9FF
CC00	CC00-CDFF	DC00	DC00-DDFF
D000	D000-D1FF	E000	E000-E1FF
D400	D400-D5FF	E400	E400-E5FF

If you use *both* 2.88MB **disks** and DOS **5.0's** extended-memory driver **EMM386.EXE**, add the switch **`D=18`** to the CONFIG.SYS line, as follows:

```
device=EMM386.EXE  D=18
```

Note: Memory managers cause 386, 486 & Pentiums to run in **Virtual Mode**, which can ***slow*** hard and floppy I/O. Using a memory manager to shadow the Model 21's BIOS may result in lower data transfer rates than using the system CMOS to shadow the BIOS region.

C.3 DOS, DRDOS, AND DOS-BASED APPLICATIONS SOFTWARE

Normal DOS software usage rules apply to systems using the GSI Model 21 card. Considerable effort has been made to ensure compatibility with the most commonly used DOSs (See Sections B.2.2 and C.1 if using a DOS versions other than DOS 6.x/5.0). Common DOS commands like Chkdsk, Copy, Xcopy, Diskcopy and Format should work fine.

Properly programmed DOS applications should be expected to run normally with all floppy drive and diskette types. You may find that a *few* maintenance utilities, tape-backup programs, or copy-protected diskettes (especially older ones) make *unwarranted assumptions* about drive letter assignments or about total system floppy drive count (which *may be 3* or *4*, instead of the usual 2).

C.4 OPERATING WITH THREE OR FOUR FLOPPY DRIVES

Unfortunately, some commercial software products, even very well known ones, have not been thoroughly tested for proper operation with more than two floppy drives. For this reason, GSI advises caution when running drive related *maintenance* or *setup* software with more than two floppy drives known to the system (that is, declared in GSI Floppy Setup). Such products include: DOS' FDISK; defragmentation software; compression software; file manager utilities; hard drive support installable device drivers; SCSI installation and maintenance software.

A typical problem is that some of a program's attempts to read or write on a hard drive will incorrectly reference a floppy drive instead. Watch drive LEDs to spot clearly incorrect references, such as a floppy LED coming ON when FDISK is run from a hard drive. Please report any such findings to the software publisher and also to GSI's Technical Support Deptartment.

C.4.1 Operating With Floppy Drives *Re-Mapped* Via GSI Floppy Setup

You may also experience faulty operation with a few commercial software products if you are using GSI's floppy drive-letter remapping feature. A few commercial programs *bypass* BIOS calls and talk *directly* to the floppy controller hardware. Such products include *some*: floppy diskette duplicating utilities; software package installation shells and some system hardware/software configuration checkers.

C.4.1.1 Workaround
You can avoid this software deficiency by redoing your GSI Floppy Setup process (see B.2.1) and always accepting the floppy drive offered to you with LED ON — as Drive A:, then B:, etc.

C.4.2 SOME Software May Not *Yet* Support 2.88MB Floppy drives

Although they have been around since 1990, you may occasionally encounter commercial software which does not support 2.88MB floppy drives. If you are unfortunate enough to have been inconvenienced by this problem, voice your complaints to the appropriate software Support Depts.

C.4.3 Tape Backup Software Use for Secondary Mode

Your system configuration may dictate use of the Model 21 in Secondary-Address Mode (see A.3.2). A few well-known backup software programs do not bother to check whether there is a tape unit attached to a floppy controller operating at the Secondary (alternate) I/O Address. If you are having problems in this configuration, check with the backup **software vendor's** Tech Support.

C.4.4 Backup Software May Cause Errors in Floppy Operations

A few cases have been reported where well known backup software utilities have modified BIOS workspace parameters and caused errors in floppy operations. You may experience unexpected floppy errors *after* using your backup software. Experiment to see whether your error disappears after rebooting and re-trying your floppy operations. If so, contact your backup software company's Tech Support Dept., report the error, and request their latest software version.

C.5 NOVELL NETWORKS

C.5.1 Installing a Novell Partition (NetWare 3.11 or later)

To prepare an (E)IDE hard drive for a Novell Partition, do the following:

1) Run System CMOS Setup and declare the Novell hard drive as Drive Type 1 in CMOS
(For *Secondary Mode*, do not declare a Drive Type in CMOS for drives attached to the Model 21)

2) On reboot, press <INSERT> to enter GSI Setup. Confirm that the GSI Hard Drive Setup screen for the Novell hard drive has the proper information in it. Specifically, check that:
   a) No odd characters appear in the hard drive descriptive text (if they do, there are hard drive read errors.)
   b) Native Parameters match the drive-maker's data sheet (do not continue if they don't)
   c) Correct partition information appears (Partition Found or Not Found)

3) Partition Status: If necessary, use the DOS' FDISK to delete partitions or create a DOS partition. If you delete all partitions, turn your PC power OFF (wait five seconds), then ON. On reboot, press <INSERT> to run GSI Setup again, so that Native Parameters are set up for the Novell drive. If you create a DOS partition, run DOS' FORMAT (for FORMAT parameters see DOS manual) to format the partition.

C.5.1 Installing a Novell Partition (NetWare 3.11 or later, cont.)

4) Run Novell's SERVER.EXE task and:
   a) Issue LOAD IDE.DSK /L (see note below concerning IDE.DSK versions)
      Set I/O Address and IRQ to 1F0 and E (=14), or for Secondary Mode: 170 and F (=15).
   b) Issue LOAD INSTALL.NLM to run the Novell Install and then:
      1.)Do not choose the FORMAT Option (IDE drives come factory formatted)
      2.)Create a Novell Partition. Check that Novell reports a cylinder found consistent with the hard drive's default Native Parameters.
      3.)Run Novell's Surface Test on each Novell Partition.

To use the Model 21 with Novell 3.xx, you must have NetWare 3.11 or later. You can call the Novell BBS (or contact your Novell office) to get the current version of Novell's IDE.DSK. Make sure the version of that driver is June of 1994 or later.

C.5.2 Novell NetWare 2.15

For NetWare 2.15, do the following:
1) Declare *Hard Drive Type 1* in System CMOS Setup
2) Operate the Model 21 in Primary Mode **only**.
3) Use the Novell standard hard-disk driver (not the more modern IDE.DSK)
4) Drives over 528MB are not supported in this version of Novell NetWare.

C.6 WINDOWS® 3.1 AND WINDOWS® APPLICATIONS SOFTWARE

The GSI Model 21 is compatible with Windows® 3.x in all Windows® modes and for all floppy services. You should check your Windows® SYSTEM.INI file, [386enh] section, to see that you have the following line:

`DMABUFFERSIZE=18` (or higher)

Properly programmed Windows® applications should be expected to work normally with all floppy drive and diskette types.

Note: Windows® **3.0** will work with the Model 21, but Windows® **3.0** does not fully support 2.88MB **drives** — only "low density" and" high density". You cannot specify "1.44MB disk in 2.88MB drive".

C.6.1 Windows® 32-bit Disk Access Mode (also known as Fastdisk)

In order to run in 32-Bit Disk Access Mode, Windows® 3.1 must be dealing with IDE hardware (IDE controller plus (E)IDE Hard Drive) which is 100% compatible with the historic WD1003 IBM/AT hard drive controller. The Model 21 (running in **primary mode**), when used with IDE drives conforming to the ANSI ATA (IDE) standard, **is fully WD-1003 compatible**. The Windows® 32-bit disk access driver does not support controllers running in *secondary mode.*

C.6.1.1 High-Capacity (E)IDE Hard Drives
The Microsoft Windows® 3.1 32-bit disk access (and Windows® for Workgroups 3.11 32-bit disk access) drivers were not written to accommodate large (E)IDE drives. Because of this, most (E)IDE drives larger than 528MB will not work with the 32-bit disk access function. At the time of this printing, Western Digital and Seagate have an updated driver for *their drives* that will work with the Model 21. Other drive manufacturers may provide similar driver replacements.

The Model 21's flash BIOS **does support** the Enhanced Drive Parameter Table (EDPT) used by WD. **Without** an updated driver for your (E)IDE hard drive (from the drive vendor or Microsoft), you can not use the the 32-bit disk access.

C.7 OS/2 WARP & 2.X

The GSI Model 21 is compatible with OS/2 Warp and 2.x.. However, GSI's *floppy drive letter remapping* feature is **not** available under OS/2. Further, OS/2 will want to see floppy drives added in the order shown in the table below. **If you skip** a floppy cable position, OS/2 will **ignore** all later-lettered floppies! If, due to this limitation, you must put a *normally* GSI BIOS Type 5 (or Type 6) **2.88MB** drive on the **REG** cable, remember to declare it as a **Type 7** in GSI Floppy Setup. Consequently, plan your floppy letter assignments and cable-connect the drives accordingly:

Drive	Cable/Header	Position on Cable
A:	J3 (REG):	END
B:	J3 (REG):	CENTER
3:	J2 (2.88/REG):	END
4:	J2 (2.88/REG):	CENTER

When GSI Setup asks, for each drive letter,

"`Choose Drive X:. Is the drive with the light ON your choice?`" answer '<**Y**> <**ENTER**>'.

As shipped, OS/2 **2.0** is limited to **three** floppy drives. However, an updated IBM1FLPY.ADD driver is available through IBM OS/2 Technical Support to provide support for **four** floppy drives.

C.8 MICROSOFT WINDOWS® 95

At the time of this printing, the Model 21 has been tested with Windows® 95. The only problem encountered has been the floppy drive letter remapping (similar to OS/2). The floppy drive letter remapping feature is not available; therefore, floppy drive installation is the same as with OS/2 (see above, C.7).

One important note with Windows® 95 is when making any changes (like adding a hard drive, or the first installation) make sure to run the installation wizard in Windows® 95. This is done by double-clicking on the "Add New Hardware" icon in the Control Panel.

C.9 MICROSOFT WINDOWS NT™

The Model 21 is compatible with Windows NT™, but there are considerations. The floppy drive letter remapping feature is not available; therefore, floppy drive installation is the same as with OS/2 (see above, C.7). The other significant limitation of Windows NT™ is high-capacity (E)IDE support. At the time of this printing, the Windows NT™ driver did not support (E)IDE partitions greater than 528MB or (E)IDE drives with more than 1024 cylinders.

APPENDIX D — 2.88 FLOPPY DRIVES AND DISKETTES

D.1 2.88MB DISKETTE AND DRIVE BASICS

Some basic facts you should know about 2.88MB diskettes and drives are the following:

- 2.88MB drives are fully read/write/format compatible with 720/1.44 diskettes
- 2.88MB diskettes are marked 'ED' and have a barium ferrite (**not** iron oxide) coating
- 2.88MB disks do **not** have the HD (1.44MB) jacket hole but **do** have an ED (2.88MB) hole (like the HD hole, but just *behind* the HD hole position)
- 2.88MB disks must be used with a 2.88MB format (Note: all 3.5" disks **must** be formatted **per jacket holes** — 720kB/1.44MB/2.88MB) — (standard PC usage)
- 2.88MB diskettes have **36** sectors, whereas 1.44s have 18 and 720s have 9
- 2.88MB drives have a dual hole sensor and they report diskette type to the Model 21
- The GSI Model 21 tells DOS 6.x/5.0 and Windows® 3.1 what the current diskette type is
- 2.88MB drives often come with IBM *PS/2-mode* jumpering. For desired PC/XT/AT/386/486 standard operation, you **must** use jumpering as shown in Section **D.3** of this manual.

D.2 TABLE OF 2.88MB FLOPPY DRIVES, BY MANUFACTURER

2.88MB Floppy Drive Make	Model #	Use GSI Setup Drive Type #	2.88MB Floppy Drive Make	Model #	Use GSI Setup Drive Type #
Chinon	FZ-358	5	TEAC	FD-235J-5631-5637	5[2]
Citizen	OSDF	5	TEAC	FD-235J-363**n**[2]	5
Epson	SMD-1060	5	TEAC	FD-235J-365**n**[2]	5
Mitsubishi	MF356C-752	6[1]	Toshiba	ND3571	7
Mitsumi	D352T2	5	Y-E Data	YD-742	5
Sony	MP-F40W-15	6[1]	Alps	DRF823	7

[1] **Note:** Use Type 7 for Model 21 with Part #1533-21-**04**-3 or **earlier** (for Part #, see the product label on the card)

[2] **Note: n** in the TEAC Model #s is a bezel color digit.

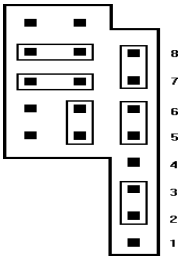
Using two 2.88MB floppy drives which have different GSI BIOS Drive Types is **not** recommended. If you must do this, you may need to assign both drives the GSI BIOS Drive **Type 7** during GSI setup sequence.

The make and model information provided above is for the convenience of installers. Check with drive manufacturers for current accuracy.

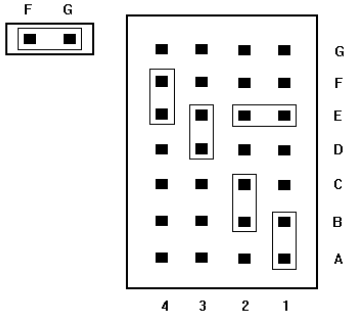
D.3 2.88MB FLOPPY DRIVE JUMPER INFORMATION

For 2.88MB drives with jumper blocks shown below, you **must** set the jumpers as shown, to ensure proper PC/XT/AT/386/486-compatible operation. This information is included here for installers' convenience. Check carefully that your drive's model name matches *exactly*, because some manufacturers make *special* 2.88MB drive models for *non-standard proprietary* PCs.

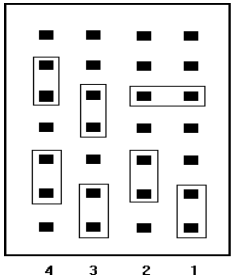
Epson Model SMD-1060



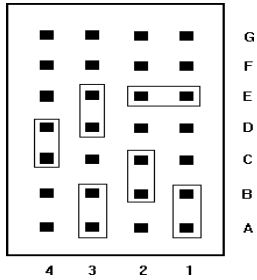
TEAC FD-235J-5631 or TEAC FD-235J-5631



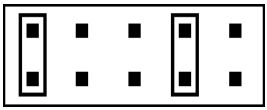
TEAC Model FD-235J-36**3n**



TEAC Model FD-235J-36**5n**



Sony Model MP-F40W-15



D.4 FLOPPY DRIVE MIX POSSIBILITIES

The Model 21 floppy interface can accommodate **any** mix of up to four 5.25"/3.5" floppy drives. What restrictions there are relate mostly to 2.88MB drives. If you have a **smart** 2.88MB GSI BIOS Type-5/6 drive (one which reports to the FDC what type of diskette is currently in the drive) and you want **automatic** disk-type reporting to DOS, you should observe the following rules:

1) Do **not** use an old style pre-2.88MB adapter (that is, one with all odd pins grounded — normally used with 720kB/1.44MB floppy drives) to connect the 2.88MB drive to its cable

2) Do **not** connect any other type of drive (i.e., Tape, 360kB/720kB/1.2MB/1.44MB, or **non**-reporting 2.88 drive) on the same cable as a Type-5/6 media-reporting 2.88 drive attached to the 2.88M header.

3) If you are installing three or four 2.88MB FDs, declare 'Type 7' for those on the REG cable

When you break either of these rules, the 2.88MB drive will **always** report that it contains either: a '720kB diskette' or 'no diskette'. **If** you must break **either** of these two rules, you should declare your media reporting drive as a **non**-reporting **Type-7** drive during GSI Floppy Setup. In this case, some floppy processes may take *slightly* longer than usual, because the controller must perform special tests to determine the type of diskette which is currently loaded.

APPENDIX E — (E)IDE DRIVES: SETUP & OPERATION

E.1 (E)IDE HARD DRIVE SETUP

(E)IDE hard drives are an evolutionary outgrowth of the older ST506 class MFM and RLL drives. Most of the electronic functions of the MFM & RLL controllers have been miniaturized and incorporated on the drive's own circuit board. Today's (E)IDE adapter simply performs the necessary signal buffering to extend motherboard AT bus signals onto a flexible cable and to the hard drive.

Note: A **primary address** (E)IDE adapter (like the GSI Model 21 in Primary Mode) plus (E)IDE drive is an **alternative** to the older MFM or RLL controller plus drive. The two cannot be used together in the same system. However, a *secondary* address (E)IDE card (like the GSI Model 21 in Secondary Mode) **can** be used to add an (E)IDE hard drive so that it can **co-exist** with an MFM or RLL hard drive.

E.1.1 (E)IDE Drive Cables

Most (E)IDE drive cables can connect two (E)IDE hard drives (or (E)IDE hard drive plus tape drive), one at the End Position and one at the Center. The (E)IDE (CAM-ATA) Interface Specification specifies a **maximum** cable length of **18"**. GSI ships the Model 21 in two ways (with and without an (E)IDE cable), see Appendix F for product versions.

E.1.2 (E)IDE Master, Slave, and Standalone Jumpers

(E)IDE hard drives, (E)IDE (ATAPI) CD-ROM drives *and IDE tape drives* usually have jumpers (shunts) to allow operation in one of three modes: Standalone, Master or Slave. These settings relate only to drive operation on a single controller. It is possible that a situation may arise where you have two controllers, each running only a single drive. In that scenario, both drives would be set in Master or Standalone operation — as they are the only drive on each controller!

Standalone
This mode is for running only one hard drive **on the Model 21**. Many hard drives come factory default in this mode. If your hard drive does not have a Standalone mode, it can be set to Master.

Master
The Master mode can be used for two situations. If you have only one hard drive (or other IDE device) attached to the Model 21, it can be set as Master **or** Standalone. If you are running two drives **on the Model 21**, one should be set as Master and the other as Slave.

Slave
When you are running two (E)IDE drives together, ON THE SAME CONTROLLER, one must be set as Master and the other as Slave. This mode is usually the factory default setting for (E)IDE (ATAPI) CD-ROM drives and (E)IDE tape backup drives.

Note: In setting the Standalone, Master & Slave jumpers for IDE hard drives (and IDE CD-ROM and tape drives), ignore all other drives that are attached to any other controller (even IDE) in the system. These settings relate to drives that SHARE THE SAME CABLE.

Some (E)IDE drives *may* not work as master (or slave) with drives from other makers — sometimes even with other drive models from the *same* maker! Consult drive makers about such problems.

E.1.3 System CMOS Setting for (E)IDE HARD Drives

When the Model 21 is operating in Primary Mode, hard drives must be declared in CMOS. Do **not** declare IDE Tape and CD-ROM drives in the system CMOS. Also, when operating in Secondary Mode, you do **not** declare hard drives in the system CMOS. For each IDE *hard drive*, two cases will be discussed here:

1) Partition(s) exists on hard drive
2) No partition exists

E.1.3.1 Partition Exists
If your (E)IDE hard drive has a **valid partition** (has already been prepared for use), the Model 21 will **analyze** this existing partition, and **will support it**, by setting up proper Heads, Cylinders, and Sectors-per-Track description parameters for the drive. In some cases this will make more space available for a new partition.

E.1.3.2 No Partition Exists
If your hard drive is not yet prepared with a partition, the Hard Drive Type which you choose in your System CMOS Setup routine controls the Model 21's hard drive parameter treatment, as follows:

a) **Type 1** — The Model 21 automatically sets up the hard drive's parameters, based on the drive's *Identify Drive* report, such that DOS' FDISK will have full use of the drive's capacity. The '**Type 1**' designation is standard PC usage to indicate presence of a *smart* controller.

b) **Any other CMOS HD Type** — The Model 21 treats your System CMOS hard drive parameters (Heads, Cylinders, and Sectors-per-Track) as **manual override** values to be used **regardless** of the parameters reported in the HD's Identify Drive report. This feature allows:

1) choice of an old style partition, compatible with some standard system BIOS HDD type
2) coping with a HD which *mis-respresents* its Hds/Cyls./Sctrs parameters. (Some do!)

Note: If you want to **abandon** existing partitions on your hard drive, use DOS' **FDISK** to delete them. If your choice of Hard Drive Type, in System Setup, declares a drive capacity that *exceeds* the actual drive's capacity, the hard drive will usually declare an error — reported as `'HD controller [!] failure'` — when the System BIOS first tries to initialize it — *before* the GSI BIOS is even made active.

E.2 MODEL 21 IDENTIFY DRIVE SUPPORT

E.2.1 Model 21's *Auto-Sense* Feature

The Model 21 BIOS uses the IDE Identify Drive command to *Auto-Sense* (E)IDE drives. This allows the Model 21 to *Auto-Sense* virtually any IDE hard drive which has already been in use with DOS and has **DOS-standard** partitions (like those created using DOS' FDISK utitlity). This ability is useful for when there is no User Definable Drive Type option (like AMI Type 47), when the drive parameters are unknown or for installing high-capacity (E)IDE drives that exceed the system BIOS' capability.

The Model 21 uses the *recommended* mode for operating your hard drive(s). This is the drive's *Native Mode* (or default Translation Mode) because it usually gives maximum performance and storage capacity. The ANSI Standard for IDE drives provides an optional-to-manufacturer (and usually implemented) Identify Drive Command, which allows GSI Intelligent controllers to interrogate the drive as to the Heads, Cylinders, and Sectors counts (as well as other technical parameters). The Model 21 uses this feature to provide Native Mode operation for a new HD which has *not yet been prepared* for use.

E.2.2 (E)IDE Hard Drives Not Formatted to Full Capacity

The Model 21 uses existing partition information on a formatted drive to establish the drive's operational parameters. If a user is connecting the Model 21 to a drive which has been set up using CMOS parameters that **do not use the whole HD's capacity**, it is recommended that he back up the drive data to other media (e.g., tape or floppies) and reformat the drive to run in its Native Mode. However, the user may have a drive which contains valuable data and therefore may wish to use the drive in its present configuration.

In the above case *where the full capacity of the drive is not being used*, the Model 21 will use the partition information placed on the drive by the old controller. Data saving **cannot be guaranteed** but the user may want to take advantage of this capability.

E.3 GSI ENHANCED IDE LARGE-DRIVE SUPPORT

New Enhanced IDE hard drives that are larger than 528MB are supported by the Model 21 — without the need for special drivers or system BIOS support. When the GSI Model 21 is connected to such a drive, it *automatically* uses a special setup strategy to handle this problem effortlessly for the installer.

The GSI Model 21 provides BIOS-level support for (E)IDE hard drives, up to **8GB's** in capacity! The large hard drive can be treated as one drive volume and will be reported to DOS as having up to 8GB capacity. No device drivers are needed! It is transparent to the user that there is anything unusual about his GigaByte-plus hard drive. You can also use DOS's FDISK to configure various partitions.

CAUTION!: Do not use the GSI Model 21 in conjunction with any special disk partitioning software like **OnTrack's *Disk Manager* or *EZ Drive***. This software is **not** needed when using a GSI controller. Removing a disk partition software package, like Disk Manager, **can be difficult**. Contact the manufacturer of the software to find out how to completely remove the partitioning software ***before*** *using the hard drive with a GSI controller!*

E.5 INTEGRATING (E)IDE (ATAPI) CD-ROM AND TAPE DRIVES

An (E)IDE (ATAPI) CD-ROM and/or tape backup drive can be operated on the Model 21 in either Slave Mode (where there is also a hard drive in *Master Mode* on the Model 21) or in Standalone Mode (where there is no other IDE drive on the Model 21).

In either case, the (E)IDE (ATAPI) CD-ROM or tape drive should **not** be declared in the System CMOS Setup procedure. Both the Mountain and the Summit IDE (non-ATAPI, but compatible) tape drives are shipped set up for Slave Mode but they also provide jumpers which allow setup for Standalone Mode. Follow the drive manufacturer's installation and user manual information.

APPENDIX F — OTHER SYSTEM INTEGRATION TOPICS

F.1 INTEGRATING FLOPPY-INTERFACE TAPE UNITS

The GSI Model 21 can control **one** QIC-3010, QIC-80 or QIC-40 tape unit — along with up to four floppy drives. In fact, the Model 21 operates the QIC-80 & QIC-3010 tape units at their faster, *double-speed*, transfer rate (1Mbit/sec), saving you the cost of a separate high speed tape-only controller.

For tape unit installation, follow the tape drive maker's user manual **if and only if**: 1) you have, at most, two floppy drives **and** 2) you install **all** floppy and tape drives on the **same cable**.

Note: If you have any **2.88MB** drives on this cable, you must declare them as GSI BIOS **Type 7, not** 5 or 6, in the GSI Setup, per Appendix D.4. For all other cases, read the rest of this section.

F.1.1 Which Floppy-Cable Position to Use for Tape Backup Drives

Connect your floppy-based tape unit at the **Center** position of the **J3**, **REG**, floppy cable.

F.1.2 Background on Floppy Interface (QIC) Tape Units

Floppy interface QIC tape units are designed to operate on the *same cable* as one or two floppy drives. To do this, the tape units use various techniques to **sense** the presence of the floppy drives. If the tape unit receives a command sequence but sees that a **floppy** drive is *currently selected* (by checking the cable's Drive Select signals), the tape unit then **ignores** the commands. Otherwise, the tape unit decides that they are tape commands and processes them. This mode of operation is often called 'Transparent Mode'.

Most tape units are factory set to operate in this mode, although most of them can be jumpered to use a Drive Select signal, just as floppy drives do. However, do not presume that all tape units' Transparent Modes will work with a two-cable, four-floppy controller. Many will not, for they will interfere with any floppy drives which **do not share a cable** with them. The Colorado Jumbo tape units, which do not provide a Drive Select Mode, appear to work fine with up to four floppy drives coexisting with them.

F.1.2.1 Case 1: Tape Unit Shares Cable with All of the Floppy Drives (2 drives maximum)
When the tape unit can share a cable with **all** of the floppy drives (by definition, **one** or **two** drives), connection of a tape unit is straightforward. This is essentially like using a standard 2-floppy-only controller. In this case you can use the typical manufacturer supplied add-on tape drive cable and can operate the tape unit in Transparent Mode. (This cable provides a connector which is the equivalent of a **second** Center-Position connector on the basic floppy cable. In fact, if, after installing your floppy drives, you still have a spare Center-Position connector available on your floppy cable, you can attach the tape unit to that spare connector and not even use the add-on tape unit cable.)

F.1.2.2 Case 2: Both J2 and J3 Cables Are In Use & a Tape Unit Is Present
When both of the Model 21 floppy cable headers (J3/REG and J2/2.88) are used to connect floppy drives and a tape drive, by definition there is **at least one** floppy drive which is ***not*** on the same cable as the tape drive. As discussed in F.1.1, *some* tape units are factory set to a Transparent Mode which will not work properly in this environment. Operate these tape units in Drive Select Mode (You will then be able to use a maximum of three floppy drives.) See F.5 for floppy drive select usage.

F.2 COMBINATION (TWO-IN-ONE) FLOPPY DRIVES

For two-in-one floppy drives (for example, TEAC Combo or Canon 5.25" ½-ht 1.2MB+1.44MB), follow these guidelines:

- A combo drive **cannot share** its floppy cable with any other **floppy** drive, but can with a **tape** unit **if** the tape unit is operating in **Transparent Mode** (where no Drive Select signal is used)
- Treat the 1.2MB and 1.44MB drive sections **as if they were two separate floppy drives**: that is, identify the 1.2MB section as a GSI Setup '`Type 2`' and the 1.44MB as a '`Type 4`'

Note: For the **TEAC** Combo disk drive, you **must put diskettes in** to see its **LED**s light during GSI Setup.

F.3 CO-EXISTING WITH A SCSI OR ESDI CONTROLLER

The Model 21 has been designed to be able to co-exist with SCSI or ESDI controllers. Unfortunately, many SCSI and ESDI controller BIOSs are *ill-behaved*. That is, they have been written on the assumption that there would never be any **other drive controller** with a **BIOS** co-residing in the system with them. If you do **not** even see a GSI Banner at boot time, and **if** you have situated the GSI BIOS at a *lower address* than the SCSI/ESDI BIOS, try putting the **GSI BIOS** at a **higher address —** or vice versa. (See Section A.3.1)

Note: Some SCSI controllers use an installable device driver when they see that two other hard drives are already known to the system. *Removable* SCSI hard drives, like the QUANTUM PASSPORT XL, can co-exist with a Model 21 with GSI BIOS v2.05 or later — as long as the removable drive is **not** used as the Boot Drive.

F.4 THE MODEL 21 IN AN EISA BUS MOTHERBOARD

EISA bus motherboards have a built-in system configuration protocol that is intended to provide automatic setup of add-on cards. This automated procedure deals with the add-on cards one at a time, working its way from one side of the computer to the other. The sequence in which two add-on cards get scanned for EISA bus setup *may* affect proper card operation for one or both cards. Try interchanging slot positions of the Model 21 and other cards with BIOS.

F.5 MODEL 21 DRIVE-SELECT USAGE FOR FLOPPY DRIVES

As seen from the Model 21's floppy controller **chip** connections, the Drive-Select to cable-position correspondence is as follows:

Drive Select	GSI Connector	Cable Position
DS0	J3 - Regular Header	End Position
DS1	J3 - Regular Header	Center Position
DS2	J2 - 2.88 Header	End Position
DS3	J2 - 2.88 Header	Center Position

During Floppy Setup, the Model 21 searches for drive presence in the order DS0, DS1, DS2, DS3.

Note: Because the Model 21 uses standard PC **twisted** cables, jumper **all floppy drives** as '**DS1**' for **any** cable position, except for TEAC Combo drives (See TEAC manual).

F.6 MODEL 21 INTERRUPT, DMA, AND I/O ADDRESS USAGE

Interrupt, DMA Channel and I/O Control/Status Port Addresses used by the GSI Model 21 are as follows:

PRIMARY MODE OPERATION:

HARD DRIVES			FLOPPY DRIVES		
IRQ	**DMA**	**I/O Addresses**	**IRQ**	**DMA**	**I/O Addresses**
14	none	1F0-1F7 (& 3F6-3F7)	6	2	3F0-3F7

SECONDARY MODE OPERATION:

HARD DRIVES			FLOPPY DRIVES		
IRQ	**DMA**	**I/O Addresses**	**IRQ**	**DMA**	**I/O Addresses**
15	none	170-177 (& 376-377)	6	2	370-377

These are absolutely standard usages for PCs and should pose no incompatibility issues.

F.7 PRODUCT SPECIFICATIONS

The GSI Model 21 Intelligent IDE Accelerator Board uses the Part #: 1533-21-xx-x, where xx-x is the board revision number. It is distributed two ways: in bulk (where GSI supplies the board, manual and registration card) and in VAR packs (1533-21-**V**x-x) where GSI supplies one floppy disk drive cable, one IDE hard drive cable, manual and product registration card.

Board Dimensions:
2.80" x 5.96"
Bus Slot Requirements:
16-bit ISA — conforming to IEEE-P996-ISA specifications
Power Consumption:
5 watts (Model 21 itself, without J8 drive-power load considered — See Section A.2.2)
IDE Drive Compatibility:
Supports IDE drives conforming to ANSI specification X3T9.2-791D
Western Digital (WD) Enhanced IDE Guidelines:
Supports Enhanced Drive Parameter Table (EDPT) to handle drives up to 8.4GB in capacity
Floppy Drive Connector Definition:
REG (J3): 34-pin industry standard floppy drive connector
2.88 (J2): 34-pin industry standard floppy drive connector — **Except:**
Pins 17 & 27 (for GSI BIOS Drive Type 6 2.88MB drive)
Pins 29 & 33 (for GSI BIOS Drive Type 5 2.88MB drive)
are used for diskette-type media-sense signals.

APPENDIX G — VESA LOCAL BUS OPTION

G.1 VESA LOCAL BUS EXTENDER MODULE(S)

The GSI Model 21 Enhanced IDE controller can be upgraded to support the VESA local bus. GSI has two VESA Extender Modules available to convert the GSI ISA Enhanced IDE controllers. One VESA Extender (GSI Part #: 1645-V1-xx-x) supports only a single IDE channel (or two drives). The other VESA Extender (GSI Part #: 1645-V2-xx-x) supports two channels (or four drives) — provided your system has two channels. The two channel VESA Extender cannot add a second channel to the GSI Model 21, your system must have two GSI ISA channels already (i.e. a GSI Model 21 in primary mode and the GSI Model 18 in secondary mode).

Both old and new GSI Model 21's can be upgraded with the VESA Extender Module. The new GSI Model 21's (with GSI Part #1533-21-09-1 or later) have a Local Bus I/O Option header. Older versions of the Model 21 (with Part #1533-21-07-5 and earlier) do not have this header, but can be upgraded using a special Local Bus I/O Option adapter-interface that comes with the VESA Modules.

G.2 VESA EXTENDER MODULE FEATURES

The GSI 1645-V1 and 1645-V2 VESA Extender Modules eliminate the ISA-bus performance limitation by providing full PIO Mode 3 and PIO Mode 4 data transfers. The GSI VESA Modules simply extend any GSI ISA Accelerator board to the VESA local bus. Using the VESA local bus with new Enhanced IDE and Fast ATA (or Fast ATA-2) hard drives, the GSI VESA Modules can allow these drives to achieve their maximum data transfer rates. Using an advanced engineering process the GSI VESA Modules have the unique ability to Mix & Match various Modes of drives without performance loss! GSI VESA Modules can run Mode 4 drives on the same cable as Mode 1 drives while maximizing the performance of each!

GSI 1645-V1 VESA Extender Module Features:

- 32-bit VESA Compliant with new Enhanced IDE and Fast ATA(2) standards
- Provides full PIO **Mode 3** (11.1MB/s) & **Mode 4** (16.6MB/s) performance with I/O Channel Ready
- Simply extends any GSI ISA Accelerator Board to the VESA Localbus
- Supports DMA Multiword Modes 1 & 2
- 25MB per second data transfer rate ready — for future disk drive performance
- **Mix & Match** older Mode 0,1 or 2 drives with new Mode 3 or 4 drives on the same cable — with no performance loss!
- Onboard Flash BIOS provides quick, easy installation, but takes NO memory addressing!
- **No device drivers required** for any operating system or software (totally transparent to the operating system software!)
- Compatible with DOS, Windows® 3.x, Windows® for Workgroups, Windows NT™, OS/2 and Novell
- Designed, manufactured & tested in the U.S.A.

GSI 1645-V2 VESA Extender Module Features:

- Same high performance and easy installation features as 1645-V1 VESA Module
- Supports four (4) IDE drives on two (2) IDE channels

For more information on the GSI VESA Extender Modules, contact GSI at (714) 261-7949.

APPENDIX H — BASIC TROUBLESHOOTING — SYMPTOMS AND CURES

The following are some basic troubleshooting tips you should read if experiencing problems with your installation. Each problem is followed by some suggestions and then references an **Appendix** for more reading. Below, SW=software, HD=hard drive, FD=floppy drive & TD=tape drive

H.1 GSI Banner is Not Seen On The Screen During Bootup:

- Is there a *second* BIOS at the same address as the GSI BIOS? **A.3.1**
- System BIOS *may* not be looking for the GSI BIOS at **E000** address. **A.3.1**
- Ill-behaved VGA card in **16-bit** BIOS mode? (Try it in an ***8****-bit slot.* If this works, configure VGA card to 8-bit BIOS operation.) **A.3.1**
- Ill-behaved **SCSI**/ESDI adapter with BIOS at *higher* address than GSI BIOS? Rejumper to put GSI BIOS at the higher address. **F.3**
- Another card using C000-DFFF memory (LAN, multimedia, scanner, etc.)? Try removing it to establish exactly where the conflict is occuring.

H.2 Floppy Drive-Select and/or LED Indicator Problems

- Are **all** FDs set to **DS1** (by jumpers or switches on the drive)? **A.1.2/F.2**
- Do TEAC *Combo* 1.2/1.44 Drive *LEDs* not turn ON during GSI Setup? Put diskettes in the *Combo*. Call TEAC for *Combo* jumpers. **F.2**
- GSI Floppy Setup not seeing all of the floppy drives. **B.2.2**
- Are cables the wrong type or faulty? Were cables put on with the Pin-1 orientation backwards (drive LED staying permanently ON?)? **A.1.3**
- Do you have two drives at the *same* position (Center/End) on the *same* cable? **A.1.3**
- Are all floppy drive and tape drive *power* cables connected? **2.1**
- Are some of the floppy drives not seen properly by **OS/2**? **C.5**
- Is DOS DIR or a SW Install process unable to see disk change (DC)? 'DC' signal jumpering wrong on FD or cable-to-FD card-edge adapter?

H.3 Various DOS Error Messages During Floppy Use

- Diskette may be faulty and unusable or need reformatting. Replace or reformat diskette.
- Have you assigned an incorrect GSI Drive Type number in GSI FD Setup? Rerun GSI Setup, correcting Drive Type designation. **B.4/D.2**
- Is Memory Manager software in use without the required **"exclude"** of GSI-BIOS area? **C.2**
- Getting a Format or read/write error from a 3.5" diskette whose format *(720kB or 1.44MB or 2.88MB) disagrees with diskette jacket holes*? **D.1**
- Error using copy-protected, diagnostic, configuration checking or other type of utility or special software? **C.3**
- FD error due to QIC-80/40 tape unit on the *other* floppy cable? **F.1.4**
- Has ill-behaved tape backup software altered FD parameters? **E.1.4**

H.4 2.88MB Floppy Drive/Disk Errors

- Are 2.88MB drive's jumpers set **exactly** per Section D.3?
- Was the wrong GSI Drive Type declared in GSI Floppy Setup? **B.4/D.2**
- Card-edge adapter on 2.88MB FD? Is there a non-2.88MB FD on the 2.88MB cable, defeating the 2.88's diskette type reporting? **A.1.1/D.4**
- Does DOS FORMAT say "Unable to write Boot Record" — due to **un**shadowed GSI BIOS? Occasionally seen in 486 systems? **B.3**
- WIN3.x error: No 'DMABUFFERSIZE = 18' in SYSTEM.INI? **C.4**
- DOS error: No EMM386 **d=18** switch in CONFIG.SYS? **C.2**
- 2.88MB diskette bad blocks or *lost data*, from 720/1.44-type diskettes formatted as 2.88MB? **D.1**
- Did a 2.88MB disk formatted by DOS **3.30/4.01** go bad after working OK for a while? Reformat the diskette using DOS 5.0 or 6.x.

H.5 S-l-o-w diskette operation

- Did you forget to turn *shadowing* of GSI BIOS back ON after installation? **B.3**
- Memory Mgr. SW putting PC in Virtual Mode, with its extra CPU burden? **C.2**

H.6 Message: 'SYSTEM ERROR — Turn off SHADOWING during installation'

- If shadowing of GSI BIOS region is already OFF, *another card* is interfering with write/verify to the GSI ***Flash*** BIOS chip. Remove/substitute cards.

H.7 'Hard Drive Controller Error' Message Just after Memory Test

- Power cable or ribbon cable not attached to HD? **2.1**
- User selected CMOS HD Type *exceeds* the hard drive's actual capacity? **E.1.3**
- Check HD's Standalone/Master/Slave *jumpers* vs. maker's tech info. **E.1**
- Ribbon cable Pin 1 orientation wrong? **A.2.2**
- HD may need more time before first command. Enable 'Floppy Seek at Boot' and 'Test Memory beyond 1MB' options, if available, in System Setup.
- HD says 'Ready' but returns an error when System BIOS issues first HD command. Get HD firmware correction from hard drive manufacturer.

Note: The HDD Controller Failure message can appear if there is a timing problem involved in a Master/Slave drive relationship. Try running one of the drives as a standalone (disconnecting the other drive) to ascertain if that is indeed the problem. If it is, contact the HD manufacturer for possible drive firmware correction.

APPENDIX H — BASIC TROUBLESHOOTING — SYMPTOMS AND CURES (CONT.)

H.8 Hard Drive(s) Not Found by GSI Model 21

- Check that HD(s) have been declared in System CMOS Setup. **B.1.2**
- **If your system CMOS does not have a drive Type 1** or the Type 1 in that BIOS is not a 10MB hard drive, you can use the user-definable (usually Type 47) and enter the parameters: 306 for cylinders, 4 for heads and 17 for sectors. If your system does not have a user-definable, Type 23 is usually a 10MB hard drive and can work.

H.9 Hard Drive Read/Write Operations Appear to be Faulty

- *Garbled* data reported at top of GSI HD Setup screen... VGA or drive controller interfering? Remove that controller or substitute another one. **A.3.1**

H.10 IDE HARD DRIVE PERFORMANCE NOT INCREASED

- Does your IDE hard drive support read/write multiple? Ask manufacturer.
- Are you shadowing the GSI BIOS? **B.3**
- Did you remember to exclude the GSI BIOS Address range with your memory manager? **C.2**
- If you have a VESA system, contact GSI about the VESA Extenders. **G.1**

H.11 QIC-80 TAPE BACKUP SPEED NOT INCREASED

- Does your backup software support 1 Megabit per second transfers? Ask the software manufacturer.
- Are you shadowing the GSI BIOS? **B.3**
- Did you remember to exclude the GSI BIOS Address range? **C.2**

H.12 CHANGES TO MODEL 21 BIOS NOT SAVING

- Did you remember to turn OFF shadowing of GSI BIOS while making changes?
- If you changed partitions using FDISK, did you remember to to rerun the GSI BIOS-setup to allow the Model 21 to adapt to the change?
- Did you remember to exclude the GSI BIOS Address range with your memory manager? **C.2**

During installation, you should take down the following information. This information will be useful should you need to contact technical support. GSI's Authorized Distributors can provide you technical support, or you can contact:

GSI Technical Support
PHONE: (714) 261-9744
FAX: (714) 757-1778

When calling either Technical support department, *MAKE SURE TO HAVE THE FOLLOWING INFORMATION READILY AVAILABLE:*

SUPPLIER INFORMATION

Date of Purchase: _____ Invoice #: _____

Product Purchased From: _____

Seller's Tech Support Phone #: _____

GSI PRODUCT INFORMATION

VERY IMPORTANT

GSI Model 21 Serial #: _____

GSI Model 21 Part #: 1533-21-____-__

GSI Model 21 BIOS Version : _____

GSI BIOS Address Used: _____

OTHER INFORMATION

System Information: _____

Disk Drive Information: _____

Other Cards in System: _____

GSI manufactures other disk & I/O products including:

The **GSI Model 12** -- An 8-bit high-speed floppy-tape accelerator adapter capable of supporting data transfer rates up to 2Mb per second. Perfect accelerator for QIC-3010 and QIC-3020 tape backup drives or for adding more floppy drives to any system.

The **GSI Model 18** -- Enhanced IDE for ISA Systems. Supports two EIDE drives & increases data throughput up to 80%. Allows EIDE hard drives to co-exist with MFM, RLL, SCSI, ESDI and other IDE hard drives.

The **GSI Model 2C** -- New Dual-Channel EIDE Accelerator Adapter. Directly supports up to four EIDE drives. Onboard Flash BIOS eliminates need for drivers or CMOS support and upgrades existing IDE to EIDE. Capable of supporting up to eight EIDE drives.

The **GSI Model 32** -- Enhanced IDE, Floppy, Tape & I/O Accelerator Adapter for ISA Systems. The Model 32 has all of the Model 21 features, plus two 16550 high-speed serial ports and one bidirectional parallel port!

The **GSI Model 4C** -- The Model 4C supports EIGHT EIDE hard drives on FOUR separate channels. Perfect for Novell duplexing or mirroring!

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All GSI products are designed, manufactured and tested in the U.S.A.

yes NetWare Tested and Approved

ENHANCED IDE

 Doc. #: 1539-21-14-1