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GXTRA

Hardware Installation

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A	Changes made to reflect *GXTRA* PROM revision 2.2	10/30/92
B	Added resolutions *GXTRA/1* , timing *GXTRA/2 DB*, *GXTRA/3 Stereo* and *GXTRA/4 CFP*	07/21/93
C	Update timing parameters and figures, add *GXTRA/3 Color Stereo*	05/16/94
D	*GXTRA/1 Turbo* replaces *GXTRA/1*	09/07/94
E	*GXTRA/2 Turbo* replaces *GXTRA/2* *GXTRA/3 Turbo* replaces *GXTRA/3*	09/11/97

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PREFACE

This publication documents the installation of the Tech-Source *GXTRA* X Terminal on an SBus card.

This manual is intended for system designers who incorporate the Tech-Source card(s) into their SPARCstations. It contains the procedures necessary for installation into such a system.

This is **not** a guide to the installation of the software. All systems vary to a degree. A knowledge of the features of your system is helpful during the installation process.

REFERENCE DOCUMENTS

The following documents apply to the *GXTRA* Installation, and may be of interest to its user.

- ❒ *GXTRA* X Servers for Solaris 1.X Software Installation Manual
- ❒ *GXTRA* X Servers for Solaris 2.X Software Installation Manual
- ❒ Tech-Source X11R5 Installation Manual
- ❒ Tech-Source X11R4 Installation Manual
- ❒ Tech-Source *GXTRA* IGT Software Installation and Reference Manual
- ❒ Sun's Desktop SPARC Hardware Owner's Guide

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WARRANTY

SBus boards are warranted for **ONE OR TWO YEARS** from date of shipment (see detailed price list for specific board warranty). During the warranty period, Tech-Source will, at its option, repair or replace a defective system component at its expense. Freight charges associated with the repair or replacement of said components under warranty are to be shared by Tech-Source Inc. and customer. US customer bears freight charges of product being returned to Tech-Source Inc., and Tech-Source Inc. shall bear freight charges for product being shipped to customer. International customer bears freight charges of product being returned to Tech-Source Inc., and Tech-Source Inc. shall bear freight charges up to $16.00 USD per product being shipped to customer ($16.00 USD is equivalent to shipping charges within the United States). Customer bears remaining freight charges over $16.00 USD per product being shipped back to customer.

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Installation of any Tech-Source Inc. hardware or software product is the sole responsibility of the customer.

Customer will have unlimited access to Tech-Source Inc. support personnel (via telephone/fax/modem) for two (2) years from date of shipment.

Tech-Source Inc. offers a continuing hardware/software support program that provides telephone consultation, software upgrades, and any required hardware repair after the expiration of the warranty period. This is a billable annual Maintenance contract. Contact Tech-Source Inc. for the available maintenance plans.

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Chapter 1

Introduction

1.1 Overview

This manual provides detailed information about the *GXTRA* "X Terminal on an SBus card".

When you have completed reading the manual, you will be able to install a *GXTRA* SBus card into various SBus system configurations.

1.2 Using This Manual

The following sections provide information that will help you use this manual.

1.3 Audience

The audience of this manual includes computer hardware engineers, system programmers, computer technicians, and others interested in using the *GXTRA* SBus cards in a SPARC system. All readers should have an understanding of electronic hardware, operating system software interfacing with hardware, and related computer concepts.

An understanding of the required communications standards and concepts between cards and with peripheral devices is also required. Given the defined audience background, the various SPARC User's Manuals from Sun will provide the necessary information needed to incorporate the *GXTRA* graphics accelerator cards into many Sun configurations.

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1.4 FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

WARNING

Changes or modifications made to the *GXTRA*, without the expressed approval of Tech-Source Inc., which may affect FCC Compliance, could void the user's warranty. This is applicable to the special accessories provided with the *GXTRA* such as the shielded cables and specific connectors that are provided with the product. The use of non-shielded cables, other than those provided by Tech-Source, are in violation of FCC regulations.

1.5 Organization

This manual first describes how to unpack the *GXTRA* card, then describes the card and its features in detail. For information regarding software installation refer to the *GXTRA* software installation manual(s) provided. The software installation manuals will vary upon the configuration ordered.

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Chapter 2

Unpacking and Installing the *GXTRA* Card

2.1 Unpackaging and Handling

The *GXTRA* card is delivered in a protective box. The box contains the *GXTRA* SBus card wrapped in an anti-static envelope, a one-time use electrostatic discharge (ESD) protection kit, appropriate software, cable(s), and documentation (depending on the configuration ordered).

NOTE

DO NOT INSTALL THE *GXTRA* UNTIL THIS ENTIRE CHAPTER HAS BEEN READ.

WARNING

Always wear the wrist grounding strap (or one-time use ESD kit as supplied with the *GXTRA*) while working on electrical components. This component is vulnerable to damage from electrostatic shock.

1. Open the box. Remove the card which is in an anti-static envelope and the ESD kit. We recommend that you save the box and packing material for future use.

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2. If a wrist grounding strap is not available, open the ESD kit and follow the instructions supplied to attach the ESD device once the workstation is open.

3. Remove the card from the anti-static envelope just before you are ready to install or work on the card. Do not remove the card from the anti-static envelope until Steps 1 and 2 are completed.

Always store the *GXTRA* card in the static envelope if it is not installed in a chassis or an anti-static work area.

2.2 Precautions

In order to reduce the risk of damage to board components from electrostatic discharge follow the guidelines below.

1. Handle the *GXTRA* card only by its non-conducting edges.

2. Always wear a ground strap when working inside a workstation or handling the *GXTRA* card. If a ground strap is not available, place the workstation on a rubber mat.

3. Do not remove the *GXTRA* card from its anti-static envelope until you are ready to install it in the workstation. If you must open the envelope early, do not leave the card exposed for any length of time, and if you must put the card down during installation, place it on the anti-static envelope or on a rubber mat.

4. Do not unplug your workstation as electrostatic damage could occur. Any time you remove or install boards, the power should be off, but the power cord must remain plugged into a grounded electrical outlet.

5. Be careful to keep your hands, clothing or jewelry away from all internal components of the workstation.

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2.3 Shut Down and Power Off the SPARCstation

Ensure that all users save their work and log off before the workstation is shut down.

Shut down the workstation by entering the following commands:

```
prompt%  /bin/su
password:enter root password if required
prompt#  /etc/halt
```

The screen should display the message:

```
Syncing file systems ... done
Halted
Type b(boot), c(continue), n(new command mode)
>
```

Turn the power off in the following order:

1. Monitor
2. External drives and peripherals
3. SPARC system unit

2.4 Opening the Workstation

Reference the documentation provided with your workstation for specific instructions. General information for a SPARCstation 1+, 2, IPC, IPX and SPARCclassic follow.

2.4.1 SPARCstations 1+ and 2

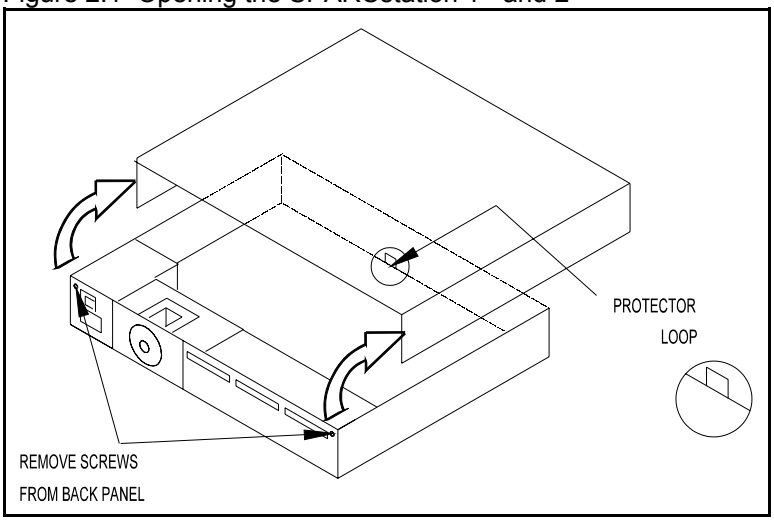
1. Place the workstation system on a stable flat surface with enough room to place both top and bottom on the surface.

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2. Remove all cables (except the power cord) from the back of the SPARCstation 1+ and 2.

3. Remove the two Phillips screws from the back panel (reference Figure 2.1).

Figure 2.1 Opening the SPARCstation 1+ and 2



4. Firmly grasp the left and right sides of the cover and tilt the cover up and forward until the protector loop clears the chassis.

5. Carefully push the cover forward so that the tabs which secure the cover to the front of the chassis are clear.

6. Carefully lift the cover vertically to remove it.

2.4.2 SPARCstation IPC, IPX and SPARCclassic

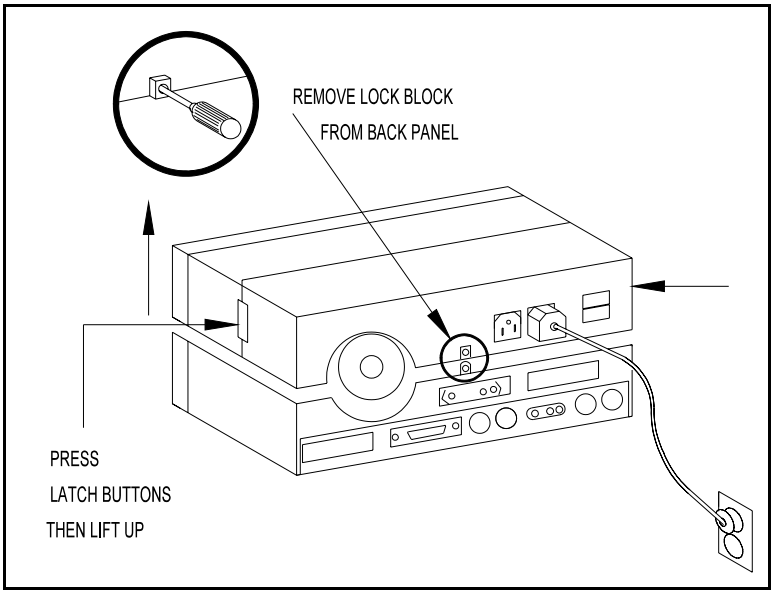
1. Place the workstation system on a stable flat surface with enough room to place both the top and bottom of the system on the work surface.

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2. Remove all cables (except the power cord) from the back of the unit.

3. Loosen the Phillips head screw in the middle of the rear panel (reference Figure 2.2).

Figure 2.2 Opening the SPARCstation IPC, IPX and SPARCclassic



4. Secure the workstation top by placing your index fingers on the latches on each side (refer to Figure 2.2). Squeeze the latches while pressing down on the top cover.

5. Carefully raise the top cover up and towards the front panel. The top and bottom are connected with cables, so gently place the top cover flat on the work surface.

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CAUTION

> Attach a wrist grounding strap (or the supplied ESD device) at this time. Do not proceed without properly grounding yourself to the workstation.

2.5 Installing the *GXTRA*

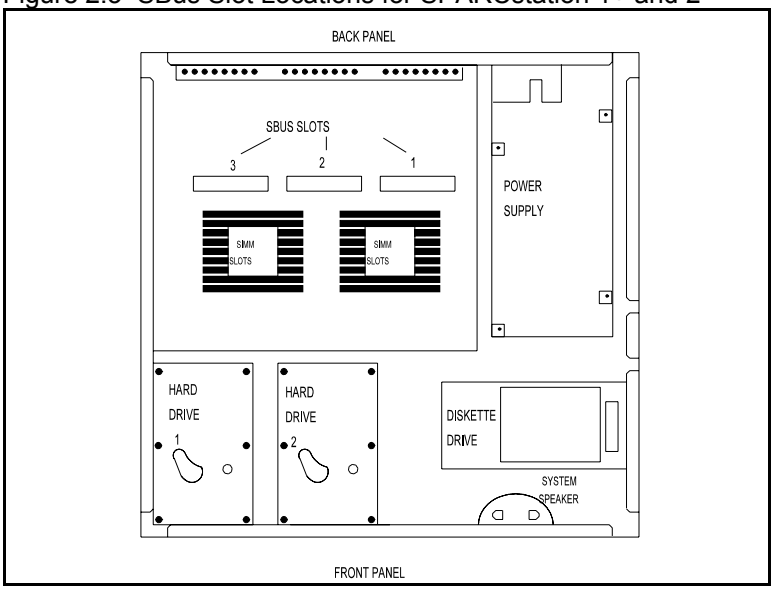
Reference the documentation provided with your workstation for specific details on card installation. For installing SBus cards in a SPARCstation 10 and SPARCstation LX, reference the Desktop SPARC Hardware Owner's Guide Appendix H and I. General information for a SPARCstation 1+, 2, IPX, IPC, and SPARCclassic follows.

2.5.1 SPARCstation 1+ and 2

The SPARCstation 1+ and 2 have three (3) SBus slots. You may install the *GXTRA* in any slot. Reference Figure 2.3 for the SBus slot locations.

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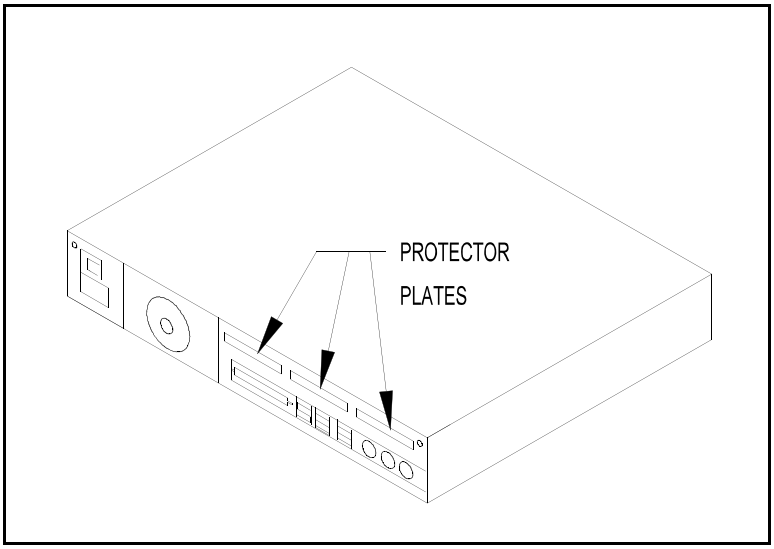
Figure 2.3 SBus Slot Locations for SPARCstation 1+ and 2



1. Remove the rear panel cover for the SBus slot the card will be installed in. To do this press the release pins on the inside of the unit and pull the rear protector plate towards the front panel. Reference Figure 2.4 for the location of the rear panel covers.

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Figure 2.4 Rear Panel Cover and Board Socket Locations for SPARCstation 1+ and 2

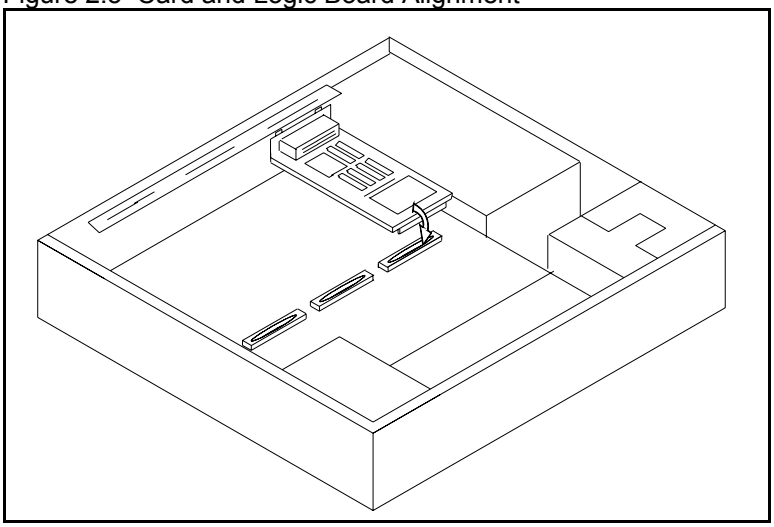


2. With a ground strap (ESD kit) attached, open the anti-static bag and remove the *GXTRA*. Place the card at an angle into the rear panel of the workstation. Ensure that the DB13W3 video connector is facing the rear of the unit and the component side is facing up. Ensure that the card mounting plate hooks into the slot opening on the rear panel.

3. Align the connectors on the bottom of the card with the connector on the main board (reference Figure 2.5). Gently press the connectors into the socket. Press on the corners of the board. Do not press on the plastic retainer bracket.

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Figure 2.5 Card and Logic Board Alignment



CAUTION

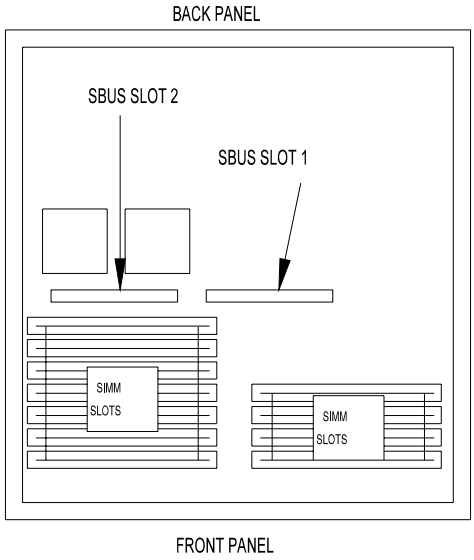
Do not use excessive force or push on the Weitek part as you may break the bracket or damage the pins on the bottom of the board.

2.5.2 SPARCstation IPC, IPX, and SPARCclassic

The SPARCstation IPC, IPX and SPARCclassic have two SBus slots. You may install the *GXTRA* in either slot. Reference Figure 2.6 for the SBus slot locations for the SPARCstation IPC and IPX. Reference the Desktop SPARC Hardware Owner's Guide for the SPARCclassic SBus slot locations.

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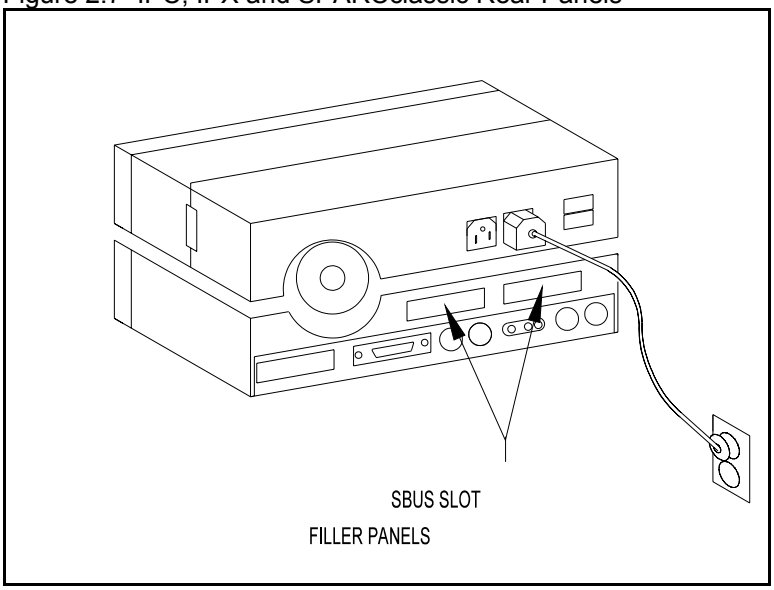
Figure 2.6 IPC and IPX SBus Slot Locations



1. Remove the rear panel cover for the SBus slot the card will be installed in. To do this press the release pins on the inside of the unit and pull the rear protector plate towards the front panel. Reference Figure 2.7 for the location of the rear panel covers.

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Figure 2.7 IPC, IPX and SPARCclassic Rear Panels

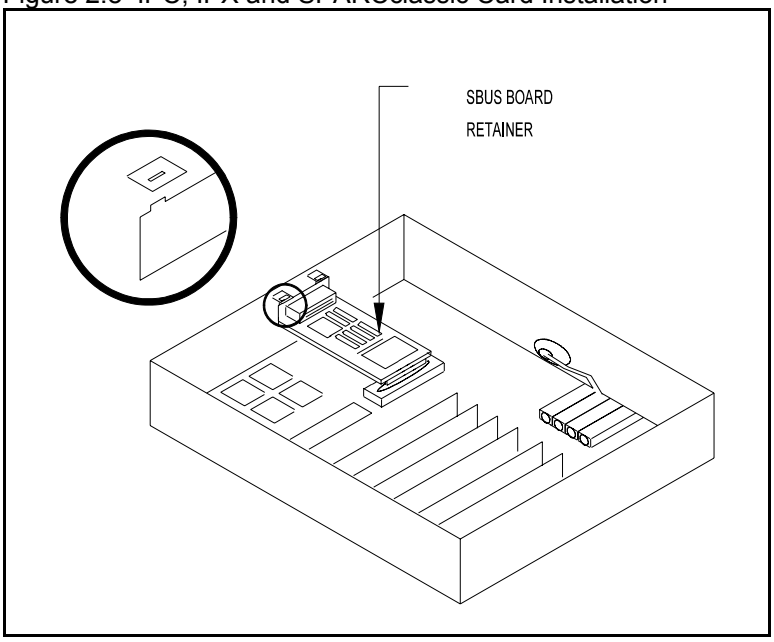


2. With a ground strap (ESD kit) attached to the workstation, open the anti-static bag and remove the *GXTRA*. Place the card at an angle into the rear panel of the workstation. Ensure that the DB13W3 video connector is facing the rear of the unit. Make certain that the cards mounting plate hooks into the slot opening on the rear panel.

3. Align the connector on the bottom of the card with the connector on the main board (reference Figure 2.8). Gently press the connector into the socket. Press on the corners of the board. Do not press on the plastic retainer bracket or Weitek part.

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Figure 2.8 IPC, IPX and SPARCclassic Card Installation



CAUTION

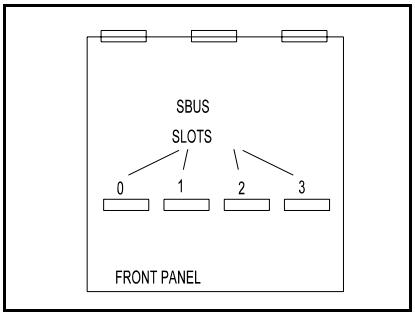
Do not use excessive force or push on the Weitek part as you may break the bracket or damage the pins on the bottom of the board.

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2.6 SPARCstation 600MP and SPARCstation 10

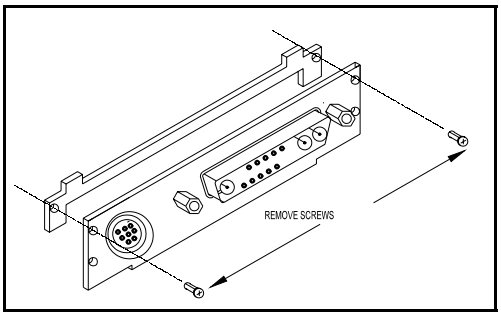
The SPARCstation and SPARCserver 600MP has four SBus slots mounted on the CPU board. To install the *GXTRA*, the CPU card must be pulled from its VME slot. Figure 2.9 shows the locations of the SBus slots on the CPU card.

Figure 2.9 600MP CPU Board



In order to fit the *GXTRA* into the 600MP CPU or the SPARCstation 10, it is necessary to remove the top portion of the *GXTRA*'s two piece face plate. To remove the top portion of the face plate simply remove the two screws shown in Figure 2.10.

Figure 2.10 *GXTRA* Two Piece Face Plate

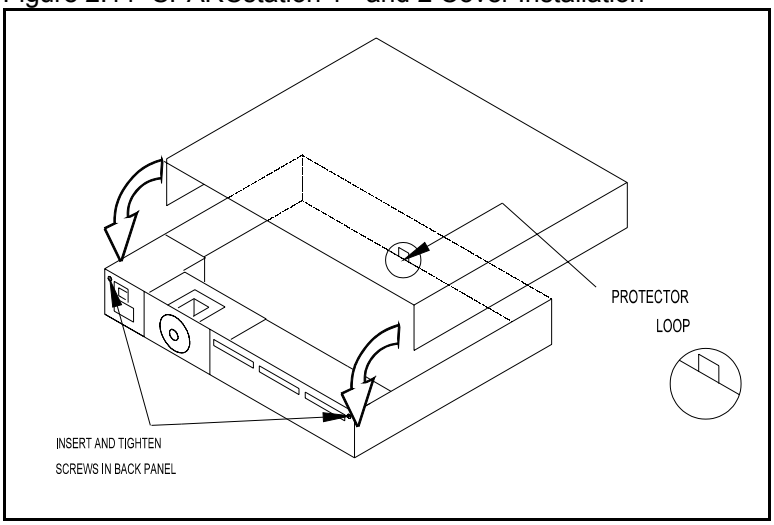


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2.7 Replacing the Workstation Cover

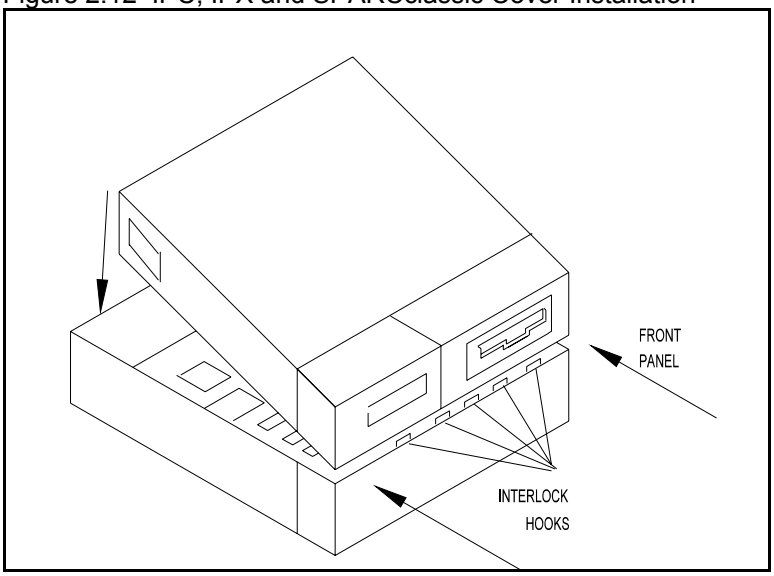
Replace the cover by reversing the instructions given in Sections 2.4.1 or 2.4.2. Do not hold the cover at too drastic an angle, and slowly lower the top cover onto the chassis. Ensure that the protector loop on the cover is properly seated in the loop slot on the bottom of the workstation. Replace the screw(s) in the rear panel.

Figure 2.11 SPARCstation 1+ and 2 Cover Installation



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Figure 2.12 IPC, IPX and SPARCclassic Cover Installation



2.8 Powering Up The Workstation

Connect all the cables originally removed from the back of the workstation. Connect the supplied video cable to the *GXTRA* monitor connector at the rear of the *GXTRA* and the other end to the monitor. If this is the only display controller, plug the keyboard into the motherboard keyboard slot. Otherwise, plug the cable for the additional keyboard into the keyboard port on the back of the *GXTRA* card.

Turn the power on in the following sequence:

1. Monitor

2. External device and peripherals

3. SPARCstation system unit.

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Chapter 3

Bringing Up the *GXTRA* Card for the First Time

3.1 Overview

This chapter provides the instructions and considerations for powering up your new *GXTRA* card for the first time. This is basic information and is meant for you to verify that your *GXTRA* card is operational and ready for further activities. **The configurations included in this section are only for first-time power-up** and are not an exhaustive explanation of the various configurations that can be achieved with the SPARCstation family.

3.2 Mounting on the SPARC CPU

The *GXTRA* card mounts on the SBus CPU card via one 96-pin SBus connector. The *GXTRA* card's 96-pin male SBus connector, located on the solder side of the board, plugs into the 96-pin female SBus connector, located on the component side of the CPU card. The SBus connector is keyed to prohibit mounting the board the wrong way.

3.3 Setting the Display Resolution

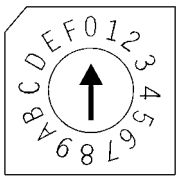
The *GXTRA* has a programmable display resolution capability which allows it to drive virtually any monitor available today. The default display resolution can be set using a rotary switch located on the top side of the card.

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3.3.1 Rotary Switch Settings

The *GXTRA* has a rotary switch which selects the correct resolution for your display. The switch is shown in Figure 3.1. There are specific resolutions preprogrammed for each *GXTRA* card which are described in detail in the tables below.

Figure 3.1 Resolution Switch



The switch can be changed with a small screw driver. As shipped the board is normally set to switch position 0 which is Sun monitor compatible mode. In this position the board will read the sense bits from the Sun monitor in order to determine the appropriate resolution.

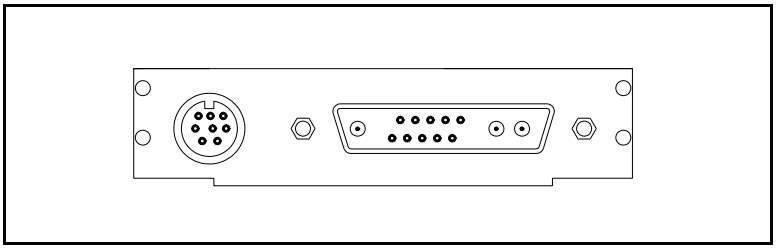
Table 3-1 through Table 3-6 shows the various switch settings.

Table 3-1 Standard Switch Settings

Switch	Resolution	*GXTRA/2 Turbo*	*GXTRA/3 Turbo*
0	Sense bits; default 1152 x 900 @ 66 Hz	X	X
1	640 x 480 @ 60 Hz	X	X
2	1024 x 768 @ 60 Hz	X	X
3	1152 x 900 @ 66 Hz	X	X
4	1152 x 900 @ 76 Hz	X	X
5	1280 x 1024 @ 60 Hz	X	X
6	1280 x 1024 @ 67 Hz	X	X
7	1280 x 1024 @ 72 Hz	X	X
8	1280 x 1024 @ 76 Hz	X	X
9	1536 x 1152 @ 66 Hz	X	X
A	1600 x 1280 @ 60 Hz	X	X
B	1600 x 1280 @ 76 Hz	X	X
C	1024 x 768 @ 70 Hz	X	X
D	1024 x 768 @ 76 Hz	X	X
E	Reserved		
F	Reserved		

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Figure 3.2 *GXTRA* Face Plate



3.4 Connecting the Cables

There are two connectors on the *GXTRA* face plate, one for video and one for an optional keyboard and mouse.

3.4.1 Video Cable

The *GXTRA* card's DB-13-W3 style connector connects via a cable to a color monitor.

3.4.2 Keyboard/Mouse Cable

The *GXTRA* card's 8-pin Mini-Din connector, located next to the video connector, can be used to connect a second keyboard and mouse to the system. The primary keyboard and mouse connector on the SPARC CPU are always used for console input. The *GXTRA* provides this connector to support extra users from a single workstation.

3.5 Power Up

Once the *GXTRA* card is inserted into the SBus and the proper cables are connected, power can be applied by turning on the power source. The system will probe each of the SBus slots at which point the Tech-Source Inc. banner will be displayed. If the card is the system console, the monitor will then display the regular Sun banner and print the results of the CPU's initialization tests and finish with a user prompt.

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3.6 Selecting System Console With Multiple Frame Buffers

By default, the system will boot and display messages on the system console. The system console is automatically configured as the first display device probed in the system. If there is only one display device in the system, that will be the system console.

When there is more than one frame buffer in the system such as the case with multiple *GXTRA* cards or when adding a *GXTRA* to a system with a SunGX or other Sun frame buffer, the system will probe the cards in order according to the Open Boot variable **sbus-probe-list**.

By default, the **sbus-probe-list** is set to 0123 which indicates the SBus slots will be probed in logical order. It is possible to override this default behavior by changing the variable **sbus-probe-list**.

For example, the SunGX is normally found at SBus slot 3. If a *GXTRA* card was placed in SBus slot 1, it would automatically become the system console since SBus slot 1 will be probed before SBus slot 3. If it is desirable to boot up on the SunGX and have the *GXTRA* as a secondary display, then it will be necessary to either swap the cards around in the system or change the **sbus-probe-list**.

The **sbus-probe-list** can be changed as follows:

```
OK> setenv sbus-probe-list 0321
```

This will change the power up behavior of the system upon reboot. The system will probe SBus slot 0 (on the motherboard) first, then SBus slots 3, 2 and 1, respectively. It is possible to use whatever order is necessary or even leave out a number to eliminate probing a particular slot. Be careful however, you could render your system useless if you eliminate probing all slots since it won't find any cards. Should this happen, the system will boot up on serial line ttya.

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Changing the **sbus-probe-list** does not have any immediate effect, the system must be rebooted or reset in order to actually make it occur.

To make the change effective, reset the system as follows:

```
OK> reset
```

or simply recycle the power.

3.7 Setting the Test Options

The PROM on the *GXTRA* card contains a FORTH code driver. The FORTH code is downloaded to the CPU during the power-up sequence to give an on-board driver for the *GXTRA* card. If a hardware problem is suspected, the user should run the diagnostic routine called "gxtra-banner". The "gxtra-banner" performs a "checksum" on the *GXTRA* firmware:

```
OK> printenv fcode-debug?
```

If the environmental variable is set to "false", it must be set to "true" by entering:

```
OK> setenv fcode-debug? true
OK> reset
```

Upon completion of the **reset**, the "gxtra-banner" will be available for use. Access to this routine is dependent upon the version of the Open Boot PROM that your system has. Generally if you are running on a SPARCstation 2 or higher, you will have version 2.x proms, and others will have version 1.x proms. To check the "ROM Rev." of your system execute the following command:

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```
OK> banner
```

The system will respond with the information. An example follows:

```
ROM Rev. X.X 24 MB Memory Installed, Serial# XXXXXX
```

If you are running Open Boot PROM revision 1.x, proceed to section 3.7.1. If you are using version 2.x, proceed to section 3.7.2.

3.7.1 Open Boot Version 1.x

At the prompt enter:

```
OK> gxtra-banner
```

Some vital product data will be displayed, followed by either a "passed" or a "failed" message. If a "failed" message is displayed, contact Tech-Source Inc. Customer Support. If a "passed" message is displayed, proceed with the installation.

3.7.2 Open Boot Version 2.x

Open Boot version 2.x requires a more complex set of instructions to utilize the "gxtra-banner" routine. First change directories to **/sbus** and get a directory listing as shown below:

```
OK> cd /sbus
OK> ls
```

From the listing determine the location of the desired board, such as "TECH-SOURCE,gxtra@2" for a *GXTRA* in slot 2. At the prompt enter:

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```
OK> " /sbus/TECH-SOURCE,gxtra@2"
OK> " gxtra-banner"
OK> execute-device-method
```

Some vital product data will be displayed, followed by either a "passed" or a "failed" message. If a "failed" message is displayed, contact Tech-Source Inc. Customer Support. If a "passed" message is displayed, proceed with the installation.

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Chapter 4

Theory of Operation

4.1 The SBus Interface

The CPU card communicates with the *GXTRA* card through the SBus interface. The SBus interface is the mechanism for communications between the CPU card and the *GXTRA* card. This interface is fully described in the **SBus Specification B.0** included in the **SBus Developer's kit**. The SBus interface is embodied in a PAL on the *GXTRA* card. The PAL controls all transactions between the SBus and the *GXTRA* card. These transactions include reading and/or writing the various registers within the SBus interface, the *GXTRA*engine and the random access memory digital-to-analog-converter (RAMDAC) as well as the PROM and Video RAM memory. In addition, the *GXTRA*engine generates the video timing and control for the Video RAM's, and the RAMDAC.

The *GXTRA* card must be plugged into the SBus connector of the CPU card.

The *GXTRA* card is an SBus slave device, therefore it may be placed in any of the SBus slots.

4.2 The *GXTRA*engine

The *GXTRA*engine is the heart of the *GXTRA* card architecture. It contains the hardware to do 2D graphic renderings. The rendering hardware can execute three basic types of commands: QUAD, BLIT, and PIXEL1. The *GXTRA*engine uses the Weitek Power 9100 graphics chip.

4.2.1 QUAD Command

The *GXTRA*engine has the capability of drawing quadrilaterals. It contains two Bresenham line drawing engines that calculate

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the end points of a horizontal line which is then drawn by the horizontal draw circuitry. The *GXTRA*engine cannot draw curved objects or draw curves. The *GXTRA*engine can only draw a filled quadrilateral. Depending on whether or not the quadrilateral is degenerate, the *GXTRA*engine is capable of drawing points, lines, triangles, and quadrilaterals (including self-intersecting quadrilaterals such as hourglasses). The *GXTRA*engine cannot handle objects with more than two active vertical edges (such as bow ties, V's or inverted V's).

4.2.2 BLIT Command

The *GXTRA*engine has the capability of doing a Block Image Transfer (BLIT). The software can specify a rectangular area in the frame buffer as the source and another rectangular area in the frame buffer as the destination to which the source will be copied. The source and destination can overlap in any direction and can be non-aligned.

4.2.3 PIXEL1 Command

The *GXTRA*engine allows for the masking of characters and images. These characters and images are written to the frame buffer through the PIXEL1 command.

The *GXTRA*engine hardware configuration registers are used to generate the correct timing for the sync and blank signals which control the monitor.

4.3 RAMDAC

The *GXTRA* card uses either the IBM RGB525 RAMDAC or the IBM RGB640 RAMDAC for the color look-up table and digital-to-analog (D/A) conversion. Refer to the **IBM RGB525 Specification** or the **IBM RGB640 Specification** for details on the device's operation. The RAMDAC also contains a two-plane 64 x 64 pixel programmable hardware cursor. The two planes define three possible colors of the cursor and when the cursor

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should be transparent (ie. allow the 8 color planes to be displayed).

4.4 The FORTH PROM

The on-board PROM contains the FORTH code (Fcode) which initializes the *GXTRA* card. This is a flash-programmable device, which should not be adjusted in any fashion.

4.5 Timing Parameters

The following tables provide the timing parameters for the *GXTRA* card.

Table 4-1A Switch 1 - 640 x 480 @ 60 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	640	Pixel
Vertical Resolution	480	Pixel
Vertical Frequency	60	Hz
Horizontal Front Porch	0.607	usec
Horizontal Sync Width	3.943	usec
Horizontal Back Porch	3.033	usec
Horizontal Frequency	31.45	Khz
Vertical Front Porch	318.5	usec
Vertical Sync Width	63.7	usec
Vertical Back Porch	1083.0	usec

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Table 4-2A Switch 2 - 1024 x 768 @ 60 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	800	Pixel
Vertical Resolution	600	Pixel
Vertical Frequency	60	Hz
Horizontal Front Porch	0.500	usec
Horizontal Sync Width	1.000	usec
Horizontal Back Porch	2.000	usec
Horizontal Frequency	74.07	Khz
Vertical Front Porch	13.50	usec
Vertical Sync Width	40.50	usec
Vertical Back Porch	189.00	usec

Table 4-3 Switch 3 - 1152 x 900 @ 66 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1152	Pixel
Vertical Resolution	900	Pixel
Vertical Frequency	66	Hz
Horizontal Front Porch	0.26	usec
Horizontal Sync Width	1.38	usec
Horizontal Back Porch	2.15	usec
Horizontal Frequency	61.8	Khz
Vertical Front Porch	32.4	usec
Vertical Sync Width	64.7	usec
Vertical Back Porch	501.7	usec

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Table 4-4 Switch 4 - 1152 x 900 @ 76 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1152	Pixel
Vertical Resolution	900	Pixel
Vertical Frequency	76	Hz
Horizontal Front Porch	Sun Proprietary	
Horizontal Sync Width	Sun Proprietary	
Horizontal Back Porch	Sun Proprietary	
Horizontal Frequency	Sun Proprietary	
Vertical Front Porch	Sun Proprietary	
Vertical Sync Width	Sun Proprietary	
Vertical Back Porch	Sun Proprietary	

Table 4-5A Switch 5 - 1280 x 1024 @ 60 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1280	Pixel
Vertical Resolution	1024	Pixel
Vertical Frequency	60	Hz
Horizontal Front Porch	0.58	usec
Horizontal Sync Width	1.89	usec
Horizontal Back Porch	1.60	usec
Horizontal Frequency	63.7	Khz
Vertical Front Porch	47.1	usec
Vertical Sync Width	47.1	usec
Vertical Back Porch	487.0	usec

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Table 4-6A Switch 6 - 1280 x 1024 @ 67 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1280	Pixel
Vertical Resolution	1024	Pixel
Vertical Frequency	67	Hz
Horizontal Front Porch	Sun Proprietary	
Horizontal Sync Width	Sun Proprietary	
Horizontal Back Porch	Sun Proprietary	
Horizontal Frequency	Sun Proprietary	
Vertical Front Porch	Sun Proprietary	
Vertical Sync Width	Sun Proprietary	
Vertical Back Porch	Sun Proprietary	

Table 4-7 Switch 7 - 1280 x 1024 @ 72 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1280	Pixel
Vertical Resolution	1024	Pixel
Vertical Frequency	72	Hz
Horizontal Front Porch	0.47	usec
Horizontal Sync Width	1.42	usec
Horizontal Back Porch	1.42	usec
Horizontal Frequency	78.1	Khz
Vertical Front Porch	38.4	usec
Vertical Sync Width	38.4	usec
Vertical Back Porch	704.0	usec

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Table 4-8 Switch 8 - 1280 x 1024 @ 76 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1280	Pixel
Vertical Resolution	1024	Pixel
Vertical Frequency	76	Hz
Horizontal Front Porch	0.237	usec
Horizontal Sync Width	0.474	usec
Horizontal Back Porch	2.370	usec
Horizontal Frequency	79.60	Khz
Vertical Front Porch	37.69	usec
Vertical Sync Width	75.38	usec
Vertical Back Porch	175.88	usec

Table 4-9A Switch 9 - 1536 x 1152 @ 66 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1536	Pixel
Vertical Resolution	1152	Pixel
Vertical Frequency	66	Hz
Horizontal Front Porch	0.19	usec
Horizontal Sync Width	1.88	usec
Horizontal Back Porch	1.41	usec
Horizontal Frequency	79.9	Khz
Vertical Front Porch	37.5	usec
Vertical Sync Width	37.5	usec
Vertical Back Porch	550.0	usec

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Table 4-10 Switch A - 1600 x 1280 @ 60 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1600	Pixel
Vertical Resolution	1280	Pixel
Vertical Frequency	60	Hz
Horizontal Front Porch	0.19	usec
Horizontal Sync Width	1.60	usec
Horizontal Back Porch	1.41	usec
Horizontal Frequency	79.3	Khz
Vertical Front Porch	0.0	usec
Vertical Sync Width	25.2	usec
Vertical Back Porch	529.7	usec

Table 4-11 Switch B - 1600 x 1280 @ 76 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1600	Pixel
Vertical Resolution	1280	Pixel
Vertical Frequency	76	Hz
Horizontal Front Porch	0.11	usec
Horizontal Sync Width	1.00	usec
Horizontal Back Porch	1.30	usec
Horizontal Frequency	101.9	Khz
Vertical Front Porch	19.6	usec
Vertical Sync Width	78.5	usec
Vertical Back Porch	490.7	usec

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Table 4-12 Switch C - 1024 x 768 @ 70 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1024	Pixel
Vertical Resolution	768	Pixel
Vertical Frequency	70	Hz
Horizontal Front Porch	0.407	usec
Horizontal Sync Width	1.833	usec
Horizontal Back Porch	2.444	usec
Horizontal Frequency	56.44	Khz
Vertical Front Porch	53.15	usec
Vertical Sync Width	106.30	usec
Vertical Back Porch	513.78	usec

Table 4-13A Switch D - 1024 x 768 @ 76 Hz Timing Parameters

PARAMETER	VALUE	UNIT
Horizontal Resolution	1024	Pixel
Vertical Resolution	768	Pixel
Vertical Frequency	76	Hz
Horizontal Front Porch	0.435	usec
Horizontal Sync Width	1.565	usec
Horizontal Back Porch	3.130	usec
Horizontal Frequency	61.50	Khz
Vertical Front Porch	48.78	usec
Vertical Sync Width	65.04	usec
Vertical Back Porch	487.8	usec

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4.6 *GXTRA* SBus Card Slot Requirements

The *GXTRA* SBus card can be plugged into any SBus slot which has a minimum 4MB address space.

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Chapter 5

Description of the *GXTRA/2 Turbo*

5.1 Main Features

- ❒ Single-wide SBus card (83.82mm x 146.7mm) (3.3" x 5.8")
- ❒ SBus-size two piece front panel
- ❒ Single-slot card
- ❒ PROM conforms to the Open Boot PROM 2.0 Specification
- ❒ Slave-only SBus interface with SPARC CPU
- ❒ 4 MB Address Space Required
- ❒ Drives standard RGB monitors
- ❒ 8-bits per pixel (color & grayscale)
- ❒ 256 colors
- ❒ Accelerated 2-D vectors
- ❒ Accelerated windowing functions, text, and fast raster operations
- ❒ Fast 2-D polygon fill
- ❒ Design optimized for X Windows performance
- ❒ Single connector to video monitor with embedded coax
- ❒ Automatically initialized by the SPARC upon CPU power-up
- ❒ Uses single-chip ASIC video sub-system
- ❒ 8-pin Mini-Din keyboard/mouse connector
- ❒ 3 color hardware cursor

5.2 Card Specifications

The following specifications are applicable to all *GXTRA/2 Turbo* products. Reference section 4.5 for resolution dependent specifications.

Video Output Standard	RS-343 75 Ohm Impedance
Video Connector	DB-13-W3

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SBus Connector	96-pin Mini-Din
Size	83.82mm x 146.7mm (3.3" x 5.8")
Drawing Engine	Weitek Power 9100
RAMDAC	IBM RGB525
VideoRAM	2 MB
PROM	On board flash
Keyboard/Mouse SIO	Zilog 85C30 SCC

5.3 Frame Buffer Organization

The *GXTRA/2 Turbo* frame buffer is organized as a single 2 megabyte memory array.

5.4 Electrical Specifications

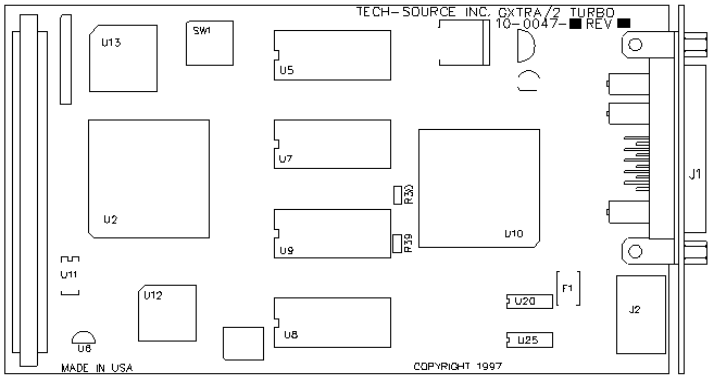
The following table provides the electrical parameters for the *GXTRA/2 Turbo* card.

Table 5-1 *GXTRA/2 Turbo* Electrical Specifications

CONSIDERATION	SPECIFICATION
Conditions	5% tolerance on all power supplies T/A = 10^0 to +50^0C Voltage = 5V
Supply Current	Board 1.1A nom 1.75A max kbd/mouse 0.15A nom .25A max total 1.25A nom 2.0A max

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Figure 5.1 GXTRA/2 Turbo



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Chapter 6

Description of the *GXTRA/3* Turbo

6.1 Main Features

- ❒ Single-wide SBus card (83.82mm x 146.7mm) (3.3" x 5.8")
- ❒ SBus-size two piece front panel
- ❒ Single-slot card
- ❒ PROM conforms to the Open Boot PROM 2.0 Specification
- ❒ Slave-only SBus interface with SPARC CPU
- ❒ 4 Mb Address Space Required
- ❒ Drives standard RGB monitors
- ❒ 8-bits per pixel (color & grayscale), plus 8-bits per pixel overlay
- ❒ 256 colors from palette of over 16 million colors
- ❒ 256 overlay colors from palette of over 16 million colors
- ❒ Accelerated 2-D vectors
- ❒ Accelerated windowing functions, text, and fast raster operations
- ❒ Fast 2-D polygon fill
- ❒ Design optimized for X Windows performance
- ❒ Full Pixrect/Pixwin compatibility
- ❒ Single connector to video monitor with embedded coax
- ❒ Automatically initialized by the SPARC upon CPU power-up
- ❒ Uses single-chip ASIC video sub-system
- ❒ 8-pin Mini-Din keyboard/mouse connector
- ❒ 3 color hardware cursor

6.2 Card Specifications

The following specifications are applicable to all *GXTRA/3* Turbo products. Reference section 4.5 for resolution dependent specifications.

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Video Output Standard	RS-343 75 Ohm Impedance
Video Connector	DB-13-W3
SBus Connector	96-pin Mini-Din
Size	83.82mm x 146.7mm (3.3" x 5.8")
Drawing Engine	Weitek Power 9100
RAMDAC	IBMRGB640
VideoRAM	4 Megabytes
PROM	On board flash
Keyboard/Mouse SIO	Zilog 85C30 SCC

6.3 Frame Buffer Organization

The *GXTRA/3* frame buffer is organized as 2 banks of video memory. The first bank (Bank 0) addresses the 8-bit image frame buffer. The second bank (Bank 1) addresses the 8-bit overlay frame buffer.

6.3.1 Frame Buffer Selection

The frame buffers are selected by writing to the frame buffer select port corresponding to the desired frame buffer. There are two ports on the *GXTRA/3* which map the appropriate frame buffer.

6.4 Electrical Specifications

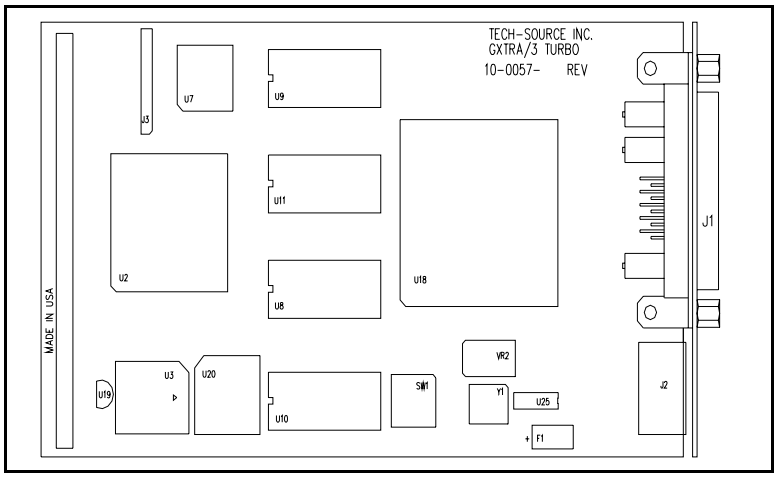
The following table provides the electrical specifications for the *GXTRA/3* Turbo card.

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Table 6-1 *GXTRA/3* Turbo Electrical Specifications

CONSIDERATION	SPECIFICATION
Conditions	5% tolerance on all power supplies T/A = 10^0 to +50^0C Voltage = 5V
Supply Current	Board 1.1A nom 1.75A max kbd/mouse 0.15A nom .25A max total 1.25A nom 2.0A max

Figure 6.3 *GXTRA/3 Turbo* Rev.A



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