VIRTUALITY HARDWARE



WINCHESTER™

TOTAL RECOIL VR SYSTEM

for

OLIN CORPORATION

ICAL MANUAL

VIRTUALITY

VIRTUALITY®

Total Recoil VR System

TECHNICAL MANUAL



Virtuality Ltd.

TOTAL RECOIL
VR SYSTEM

SYSTEM 2000

COMPRESSED GAS WARNING LABEL

IMPORTANT SAFETY INFORMATION - READ CAREFULLY AND RETAIN

Dear Total Recoil User,

This letter relates to Virtuality 'Total Recoil' systems which contain cannisters of pressurized CO_2 gas. While CO_2 is fairly inert (making combustion explosions improbable), and pressure explosions are unlikely for cannisters in fair condition under normal handling, the law lays down some requirements if the systems are to be moved.

If you wish to transport the system to alternative locations with the gas cylinder inside the system or its packaging, then you **MUST** display the green compressed gas labels provided with the system. In certain countries it is essential that you take this action in order to comply with the UK 'Chemicals (Hazard Information & Packaging for Supply) Regulations 1994'. In other countries similar requirements will usually apply.

These labels must be displayed on the cylinder containing the gas and on each layer of packaging; ie: each layer that is likely to be outermost during the transportation or use of the gas, unless that layer clearly permits the particulars of the under layer to be seen.

Virtuality will not accept any responsibility for your failure to comply with these clear instructions. You are also advised to check local legislation for related requirements - it is your responsibility to comply with such requirements.

Yours sincerely,

Dr. P.F. Sheppard

Senior Engineering Manager: Virtuality Limited

The aim of this manual is to ensure that you get the best reliability and performance from your Olin VR System. Should a problem occur, you will be able to diagnose and rectify the fault as soon as possible with the minimum of down time.

Although every unit manufactured by Virtuality Ltd is of a very high quality and undergoes a pre-delivery inspection, run-up and is tested for a minimum of 48 hours, faults can occur whilst machines are in transit or operated for great lengths of time without any preventative maintenance carried out by qualified personnel.

This is your master copy for which amendments will be provided. These are accompanied by instructions, and you will be required to fill in the amendment sheet on the following page. Signing and returning the amendment sheet entitles you to the updates, **and constitutes acceptance by YOUR COMPANY of the terms set out below.** (You should check you can sign for your company before doing so.)

Whilst every care is taken to ensure that information in this manual is correct, no liability can be accepted by the author or publisher for loss, damage or injury caused by any errors in, or omissions from, the information given (except to the extent if any that applicable law requires V.L. to bear any such liability – i.e. your statutory rights are not affected).

Information in this manual is subject to change without notice and does not represent a commitment on the part of Virtuality Ltd.

COPYRIGHT ©1995 VIRTUALITY LTD. ALL RIGHTS RESERVED.
THIS DOCUMENT MAY NOT, IN WHOLE OR IN PART, BE COPIED, PHOTOCOPIED, REPRODUCED, OR REDUCED TO ANY ELECTRONIC MEDIUM OR MACHINE READABLE FORM WITHOUT PRIOR CONSENT IN WRITING FROM VIRTUALITY LTD. THIS MANUAL MAY ONLY BE USED FOR TECHNICAL REFERENCE ON VIRTUALITY® MACHINES MANUFACTURED BY VIRTUALITY LTD. OR ONE OF THEIR NAMED BRANCHES.

WARNING – READ THIS

THIS MANUAL CONTAINS CONFIDENTIAL AND COMMERCIALLY VALUABLE INFORMATION BELONGING TO Virtuality Ltd ("VL"), AND IS THEREFORE SUPPLIED TO YOUR COMPANY ("YOU") ON CONDITION THAT:

1. YOU CAN USE THIS INFORMATION ONLY TO SERVICE EQUIPMENT SUPPLIED BY VL UNDER IT'S "VIRTUALITY"® TRADEMARK. ONLY EMPLOYEES WHO NEED TO DO THIS CAN ACCESS THE MANUAL.
2. THE MANUAL MUST BE KEPT SAFE AND NOT SHOWN TO OTHER PEOPLE OR LEFT WHERE OTHERS CAN ACCESS IT.
3. THE CONTENTS MUST NOT BE DISCLOSED TO OTHERS VERBALLY OR IN WRITING.
4. VL OWNS ALL COPYRIGHT IN THIS MANUAL, AND YOU ARE NOT ALLOWED TO COPY ANY OF IT (INCLUDING BY SENDING OR STORING IT ELECTRONICALLY).
5. IF THIS MANUAL IS LOST, YOU MUST INFORM VL. IF YOU NO LONGER NEED THE MANUAL FOR THE PURPOSE OF SERVICING "VIRTUALITY®" BRAND EQUIPMENT, YOU MUST INFORM VL AND THEN EITHER DESTROY IT OR RETURN IT (AS VL REQUESTS).

CONTENTS

SECTION 1	PC RACK SYSTEM
SECTION 2	MMD BOARD
SECTION 3	PIX 2000E CARD
SECTION 4	HI-RES VISETTE®
SECTION 5	TRACKING SYSTEM
SECTION 6	FSS GUN ASSY
SECTION 7	VGA - NTSC CONVERTER
SECTION 8	ETS MANUAL
SECTION 9	APPENDIX

PAGE

1.1 Equipment Overview
1.4 PCB Jumper Settings
1.5 Tower Card Layout
1.6 Pentium Processor Board
1.7 Pentium Board Jumper Settings
1.8 MMC Multimedia Adapter Card

1. PIX 2000E Card – The PIX2000E card has been designed to provide dual-channel high performance 3D graphics displays where each channel comprises a Power PC 603 processor with local DRAM and 3D graphics accelerator.

   A special feature of the card is its ability to input real-time digital video and to present this as animated texture information to the 3D graphics accelerator.

   For higher performance configurations the dual channels can be combined together forming a single display with increased rendering speed. A local video expansion bus allows other PIX2000 cards to be added increasing performance even further.

3. Tracker Card – This is the realtime position tracker board which provides the absolute position and angle data on where the headset is located in space.

4. The MMC and its companion product the MMD provides an innovative solution to MPEG and live Video augmentation of the PIX 2000E high performance computer graphics system. In addition, the MMC provides a five stereo input audio mixer and output lines for supplementary Audio and 3D spatial location of audio. This dual channel compact ISA PC sub-system provides a multitude of configurable facilities essential for complex multi-media and VR applications.

5. MMD Card – This card is external to the PC system (it is housed below the Credit Module) and acts as an integrator for all the connectivity required to the peripherals.

6. Network Card – This card enables you to connect to a network configuration.

Inspection

Before connecting power to the PC Rack, a careful examination should be made of the casing, particularly the front panel where the media has to be loaded. All plugs and sockets should be examined for damage and foreign bodies e.g. solder splashes or swarf.

Power plugs and sockets should be examined for damage and replaced if any are found damaged.

Power cables should be examined for damage.

Fuses should be checked for the correct rating. These are 5amp anti-surge type and are located in the power supply box below the credit module.

Power Inputs and Fuses

Power to the unit is by a power lead through a plug and socket on the rear panel. The power cable should be protected at the sending end by a 2amp fuse. There are no user serviceable internal fuses within the tower.

Switch Positions

The unit is switched on using the ON/OFF switch on the front panel

Floppy Disk Unit

The floppy disk drive is located to the right of the front panel. This is used for loading programs and data into the computer, or on to the hard disk.

Hard Disk Unit

The hard disk drive is situated below the floppy disk drive. The unit is a 120 Megabyte hard drive configured as a single default C partition. The operational software and some diagnostics are stored on the hard disk and read into the computer as required.

CD Rom Unit

The CD ROM drive is located underneath the floppy disk drive. The CD can contain more than 600MB (1MB equals 1048576 bytes) of information. This drive is capable of reading multi-session, extended architecture (XA) discs, such as the Kodak photo CD.

Access to the Black Rack PCBs

Access to the PCBs within the computer case is obtained by removing the top cover of the Modulo PC. The unit should be disconnected from the mains supply before removing the cover because there are live mains terminals inside and therefore a risk of electric shock.

Removal of PCBs

NOTE: Anti-static precautions **MUST** be taken at all times when handling PCBs. **Use an earthing strap.**

Care should be taken when handling the PCBs soon after the machine has been in use because the components can be very hot.

Removal of drive units

In a black rack system, the floppy disk drive unit and the CD-ROM drive(s) are situated in the drive bay at the front right of the computer case and the hard drive is mounted vertically next to the drive bay chassis. To remove any of the units contained in the drive bay, turn off all power, use anti-static precautions and the appropriate unit can then be removed.

Removal of Floppy Disk Drive

To remove the floppy disk drive, the chassis containing the CD Rom player and the floppy disk unit must be taken out as above. The floppy disk unit is held in a sub-frame which also holds the hard drive unit sub-frame. The four retaining screws at the sides of the chassis can then be removed and the floppy disk unit removed from the chassis.

Removal of the CD Drive

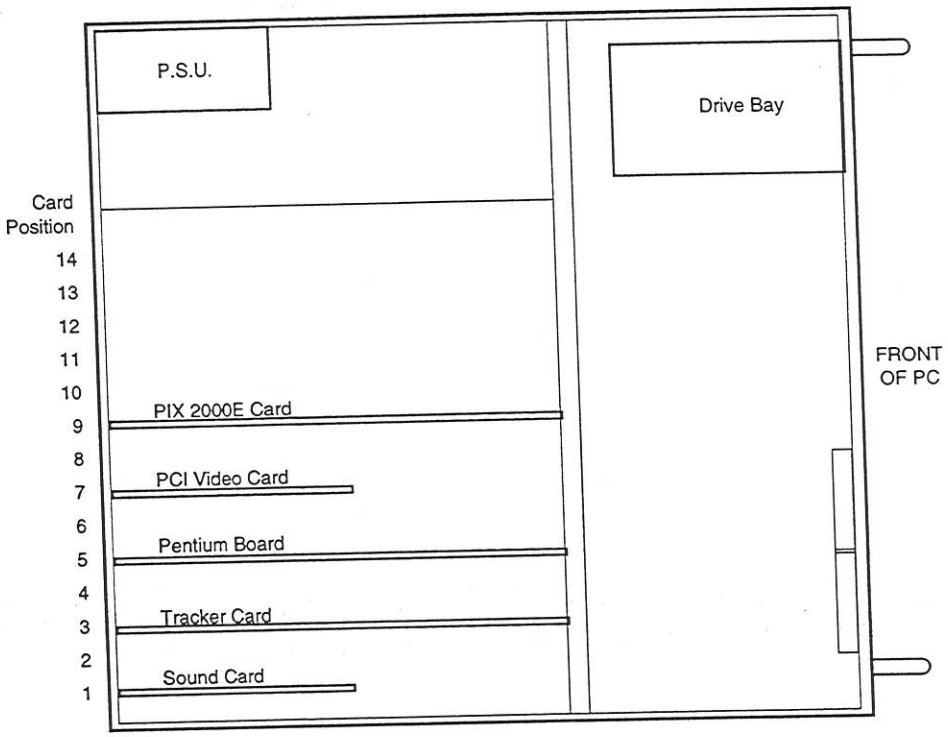
The CD drives are mounted on the subframe which also contains the floppy disk drive. Undo the four retaining screws at the side of the chassis and the CD ROM drive can be carefully removed.

Removal of the Hard Disk

The hard drive can be removed by undoing the retaining thumbscrews and lifting the unit vertically.

InsideTRAK Player 1 Jumper and Switch Settings

TOP VIEW OF PC RACK SYSTEM



Specifications

SYSTEM

- **CPU:** Intel Pentuim P54C 75/90/100/120/133/150
- **Bus Interface:** PCI and ISA
- **Data Bus:** 32-Bit
- **DMA Channels:** 7
- **Interrupt Levels:** 15

MEMORY

- **RAM memory:** 2MB to 256MB
- **Second Cache Memory:** 255kB to 1MB

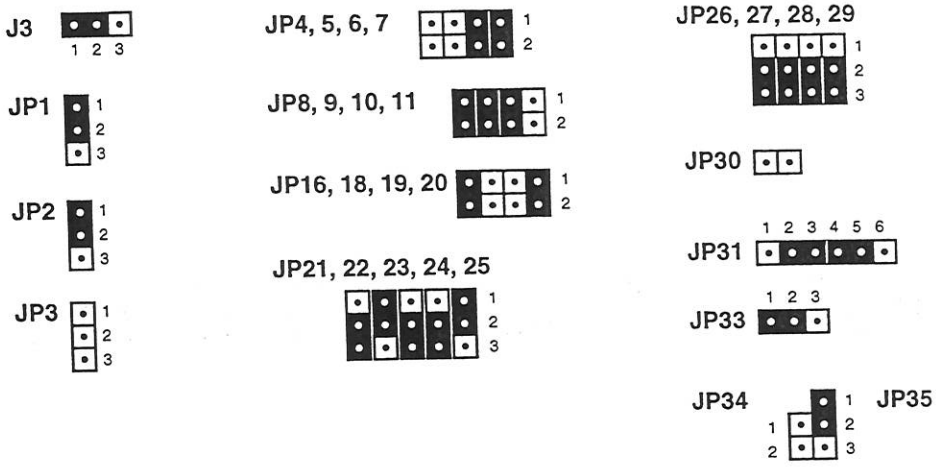
Input/Output

- **Hard Disk:** Supports upto 4 IDE Hard disk drive – can be disabled by BIOS setup
- **Floppy Disk:** Support upto 2 x floppy drives – 720K, 1.2Mb, 1.44Mb, 2.88Mb – can be disabled by BIOS Setup.
- **Serial Ports:** Support 2 x High Speed serial ports, Data transfer rate programmable up to 50K baud independently.
- **PS/2 mouse port connector**
- **Parallel Ports:** Supports one ECP/EPP bi-directional parallel port.

FOR MORE INFORMATION ON THE PENTIUM BOARD, PLEASE REFER TO THE ICP REFERENCE MANUAL, SUPPLIED WITH YOUR SYSTEM.

JUMPER SETTINGS

Shown below are the correct jumper settings for the pentium board supplied in your system. **For more details on jumper settings and the relative positions of the jumper pins on the board, please refer to the Pentium Board Users' Manual supplied with your machine.**



JUMPER SETTINGS FOR PENTIUM BOARD

Outline:

The MMC provides audio and video functions for the PIX2000 graphics card. The main function is to gather video data from either MPEG or PAL/NTSC source and to communicate this to the PIX2000 for use as video texture information in 3D graphics sub-system. The Audio facilities provide MPEG audio decoding and flexible audio mixer system for integration of multi-channel stereo audio system.

Specification for MMC

The MMC contains two identical subsystems, each providing audio mixing and MPEG/Video decoders. The two sub-systems are referred to as channel A and B.

Each Channel comprises of :-

1. **C-Cube CL480 MPEG decoder**
   The MPEG data is transferred over the ISA bus. The CL480 is I/O mapped onto the bus. The address registers are mapped as 8 bit accesses and the data register is mapped as a 16 bit register. This doubles the possible transfer rate to the C-Cube device.
   The decompressed video data is transferred to a video scaler which sizes the incoming video stream before outputting the scaled image to the video port connector.

2. **Philips video decoder and scaler.**
   The decoder/scaler inputs video data from either a PAL/NTSC source or from the MPEG decoder. The video is then scaled to the required size and transferred to the PIX2000 graphics card via 80way ribbon connection. The decoder/scaler is programmed via I2c bus.

3. **MPEG Stereo audio A./D converter.**
   The A/D converter inputs digital stereo audio from the MPEG decoder. The digital stream is then converted to analog stereo. The audio is then routed to an analog stereo mixer which mixers the MPEG audio with and auxiliary stereo input. The aux input and mixed output are terminated via two 4 pin connectors.

4. **Stereo Audio Mixer.**
   The mixer circuitry provides 4 stereo inputs and one mono input. The mixer is controlled via ISA bus interface. The mono input and two of the stereo inputs are also buffered and re-output off card.

In addition the MMC also contains a single 87C520 micro controller with two RS232 serial interfaces. The micro is accessed via the ISA bus. PC communications is achieved by a 16 bit transfer address register and an 8 bit data register. The PC writes a 16 bit value to the TAD register followed by a read or write to the data register. This action causes an interrupt to be generated to the micro which then fetches the data in the TAD register and follows with a read or write access to the data register. This read or write access completes the PC bus cycle, which is wait stated until completion.

Electrical Specification

Audio inputs:	Line level input with max 3v p-p. Input impedance 10k ohms
Audio Outputs	Unity Gain Frequency response 20 - 20kHz -1dB Distortion 0.5 % (MAX) Signal to noise ratio 85dB Channel cross talk -60dB
Video Inputs	0 - 1 volt PAL or NTSC 75 ohm terminated

Power Requirements (Estimated).

+5v	at 1.5 AMPS
+12v	at 200mAMPS
-12v	at 40mAMPS
Total Power	**8 Watts**

PCB Specification

AT plug-in adapter (16bit) IO mapped only

PCB Size:	340mm x 100mm
No of Layers:	6
Slots Dependancy:	Single

Inter-Card Connections

Each channel provides AUX stereo input to be mixed with MPEG audio and mono channel 1b.

The Aux input is via a 4 pin molex connector. The MPEG mixer output is via a second 4 pin molex.

Aux input Pin-out:-

Pin	Signal
1	Audio left i/p
2	GND
3	GND
4	Audio right i/p

MPEG mixer output pin-out:-

Pin	Signal
1	Audio left o/p
2	GND
3	GND
4	Audio right o/p

The Video scaler outputs are terminated via two high density 80 way ribbon header. These headers are pin to pin with the PIX2000 video port connectors.

Jumper Links

The MMC contains various jumper links for selecting card base address and interrupt channel:-

LK6	LK7	LK8	Card Base Address
F	F	F	300 Hex
R	F	F	320 Hex
F	R	F	340 Hex
R	R	F	360 Hex

LK1	LK2	LK3	LK4	LK5	Interrupt Channel
F	R	R	R	R	Select IRQ 9
R	F	R	R	R	Select IRQ 10
R	R	F	R	R	Select IRQ 11
R	R	R	F	R	Select IRQ 14
R	R	R	R	F	Select IRQ 15

F = Fit Link

R = Remove Link

SECTION 2
MMD BOARD

PAGE

2.1 MMD Board Layout

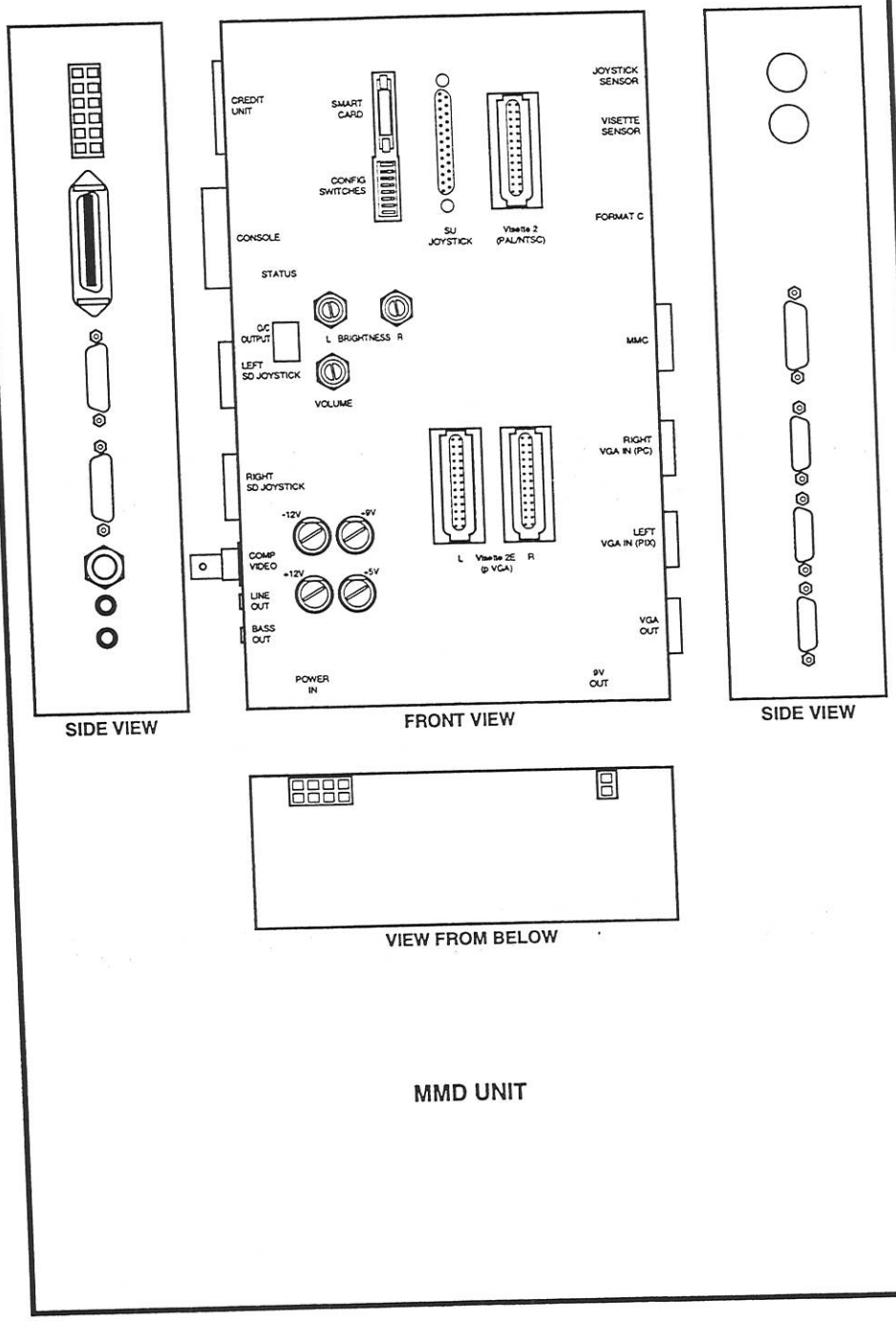
2.2 MMD Unit Layout

2.3 MMD Descrption

2.4 Connector Details

TOTAL RECOIL
VR SYSTEM
MMD Board Layout

TOTAL RECOIL
VR SYSTEM
Multi-Media Distribution Board



MMD UNIT

Introduction

This document gives a detailed description of the Virtuality Multi-MediaMMD card. It aims to provide the information necessary to understand the architecture and its testing requirements, and for the embedded software to be enhanced by a third party wishing to utilise the new I/O features of the card. It does not attempt to describe the embedded software as currently implemented by NMI, or the command/control interface to the Format C/MMC.

Access to relevant IC manufacturer's data sheets is assumed. A copy of the Multi-Media Format D (MMD) circuits is essential for understanding this document. Familiarity with the design and operation of the Visette 2000 and VGA HMD is also assumed.

Firstly the document gives an overview of the MMD, and then a description of the functionality of each circuit block is given. The port address and connector pin assignments are included towards the end of the document.

This release of the hardware technical reference applies to the MMD PCB Revisions C and D, NMI part number 10-196-11, Virtuality part number MMD252-008-1.

Hardware Overview

The MMD is designed to operate in tandem with the existing Format C card, or the envisaged Multi-Media Format C card (MMC). The MMD receives commands from and reports status to the Format C/MMC, and converts these into the required I/O operations which activate the various external ports. The on-board microprocessor provides all of the necessary intelligence for this, as well as various 'automatic' functions according to what hardware is connected to the MMD.

The MMD receives audio signals from the Format C/MMC, video signals in VGA, PAL, or NTSC formats from various sources, and feeds through, or generates as appropriate, the signals required for driving PAL or NTSC Visette 2000's or the new VGA HMD. The name 'Multi-Media' Format D reflects the card's ability to interface with this variety of external equipment.

Wherever possible, signals to/from the Format C and the MMC are simply wired together by the MMD, so that the MMD is not aware of which is connected, and in fact does not need to be.

The MMD contains a number of diverse functional blocks:

* Power supply functions for itself, Visettes, and external interfaces.
* Audio processing circuitry.
* Video processing circuitry.
* Input and Output interfaces.

Connector Pin Assignments

In numerical order, the connector details are given below.

Format C Connector

Designation: PL1 Type 17W2 mixed contact male D, R/A PCB mount. (15signal+2coax pins)

A1	Left Video 50R Coax to Visette	A2	Right Video 50R Coax to Visette
1	Audio Return	2	Microphone Return
3	Overall Screen	4	Security (to Format C)
5	n/c	6	Serial and Power Return
7	Line Audio Return	8	Audio Left to Visette
9	Audio Right to Visette	10	Microphone from Visette
11	Right Backlight Adjust	12	Left Backlight Adjust
13	Rx Serial Control to MMD	14	Tx Serial Control from MMD
15	Mono Line Audio to MMD Power and Bass Amps		

Visette Sensor Output

Designation: PL2 Type 6 pin female MiniDIN.

1	Coil 1 Start	2	Coil 1 Finish
3	Coil 2 Start	4	Coil 3 Start
5	Coil 2 Finish	6	Coil 3 Finish
Shell	Coil Screen		

MultiMedia Format C connector

Designation: PL3 Type 15 way male D, R/A PCB mounting.

1	Audio Left to Visette	2	Audio Right to Visette
3	Microphone from Visette	4	Security (to Format C)
5	Rx Serial Control to MMD (was n/c)n/c	6	Tx Serial Control from MMD
7	Left Line Audio External (was RxD)	8	Right Line Audio External to MMD
9	Audio Return	10	Microphone Return
11	Overall Screen	12	Serial and Power Return
13	Serial and Power Return	14	n/c
15	Line Audio Return		

Composite Visette output connector

Designation: PL4

Type 26 way SIC connector with 8+8mm pins. Raised above PCB on spacers.

1	Left eye video	2	Left eye video screen
3	Coil 1 start	4	Coil 1 return
5	Coil 2 start	6	Coil 2 return
7	Coil 3 start	8	Coil 3 return
9	Left audio	10	Left audio screen
11	+9V power	12	0V power
13	Coil outer screen	14	Overall screen
15	+9V power	16	0V power
17	Right audio	18	Right audio screen
19	Left backlight adjust	20	Right backlight adjust
21	Microphone	22	Visette security
23	0V power	24	+9V power
25	Right eye video	26	Right eye video screen

Glove/Joystick Connector

Designation: PL5

Type: 25 way female D, with wire wrap pins. Raised above PCB to level of box lid.

1	Coil 1 start	14	Coil 1 finish
2	Coil 2 start	15	Coil 2 finish
3	Coil 3 start	16	Coil 3 finish
4	Coil Screen	17	Switch Screen
5	Switch 1 (Shared with Joystick 2)	18	Switch 1 & 2 return
6	Switch 2 (Shared with Joystick 2)	19	Switch 3 (Shared with Joystick 2)
7	Switch 3 & 4 return	20	Switch 4 (Shared with Joystick 2)
8	Security	21	Security 0V
9	Input 6 (Also joystick 2X)	22	Input 5 (Also joystick 2Y)
10	Input 4	23	Input 3
11	Input 2	24	Input 1
12	Glove +9V @ 150mA	25	Glove 0V
13	Glove Screen		

Joystick Connectors

Designations: PL7+6,
(Joysticks 1+2)

Type: 15 way female D, R/A PCB mount

1	+ve drive to X axis pot	9	Switch 1 (Trigger)
2	n/c	10	Switch return
3	-ve drive to X axis pot	11	Switch 2 (Top)
4	sense from X axis pot (Inputs 1&3)	12	Switch 3
5	+ve drive to Y axis pot	13	Switch return
6	n/c	14	Switch 4
7	-ve drive to Y axis pot	15	Screen
8	sense from Y axis pot (Inputs 2&4)		

Glove Sensor Output

Designation: PL8

This connector is identical to the Visette sensor output, PL2

Power Input Connector

Designation: PL9 Type: 8 way R/A PCB mounting Molex MiniFit JR.

1	+5V	2	+12V
3	+12V	4	-12V
5	0V	6	0V
7	0V	8	Frame Ground

Console Output Connector

Designation: PL11 Type: 24 way R/A PCB mount female Centronics.

1	LED +	13	LED -
2	Speaker +	14	Speaker -
3	Siren -	15	Siren +
4	Screen	16	Screen
5	Lamp 4	17	Lamp 4 return
6	Switch 4	18	Switch 4 return
7	Lamp 3	19	Lamp 3 return
8	Switch 3	20	Switch 3 return
9	Lamp 2	21	Lamp 2 return
10	Switch 2	22	Switch 2 return
11	Lamp 1	23	Lamp 1 return
12	Switch 1	24	Switch 1 return
Shell	Screen		

Smart Card Connector

Designation: PL12

Type: 10 way shrouded header, wire wrap pins, Mounted on spacers off the PCB.

1	0V	2	SW1 input
3	+5V power	4	0V
5	Reset output	6	n/c
7	CLK output	8	Data I/O
9	n/c	10	n/c

Expansion Bus Connector

Designation: PL13

Type: 26 way shrouded header, on reverse side. Not fitted in standard build.

1	0V	2	+5V power
3	LCD contrast voltage	4	LCD register select
5	LCD R/W signal	6	LCD enable signal
7	D0	8	D1
9	D2	10	D3
11	D4	12	D5
13	D6	14	D7
15	n/c	16	A0
17	A1	18	A2
19	A3	20	Expansion space chip select
21	n/c	22	80C198 ~WR signal
23	80C198 ~RD signal	24	+5V power
25	0V	26	0V

NB There is no noise filtering on the expansion bus connector.
Pins 1-14 are compatible with most standard LCD character modules

Coin Mechanism Connector

Designation: PL14

Type: 12 way R/A PCB mount Molex MiniFit JR.

1	+12V power	7	Input 1
2	O/C output 1	8	Input 2
3	O/C output 2	9	Input 3
4	O/C output 3	10	Input 4
5	O/C output 4	11	Input 5
6	0V	12	Input 6

9V Visette Power Supply OutputBass Shaker Speaker Connector

Designation: PL15 Type: 2 way R/A PCB mount Molex MiniFit JR.

1	9V outputBass shaker + +	2	0VBass shaker -

Bass Shaker Line Out Connector

Designation: PL16 Type: 3.5mm R/A PCB mount stereo jack socket.

Tip Bass line out

Shield Bass line out return

Line Out Connector

Designation: PL17 Type: 3.5mm R/A PCB mount stereo jack socket.

Tip Line out LeftLine out

Ring Line out Right

Shield Line out return

VGA Visette (Left) Connector

Designation: PL18 Type: 26 way SIC connector. 8+8mm pins, mounted on spacers, accessed through box lid.

1	n/c	2	n/c
3	Coil 1 start	4	Coil 1 return
5	Coil 1 screen	6	Coil 2 screen
7	Coil 2 start	8	Coil 2 return
9	Coil 3 start	10	Coil 3 return
11	Coil 3 screen	12	System outer screen (was HSYNC)HSYNC
13	VSYNC	14	Backlight adjust
15	Red video	16	Red return
17	Green video	18	Green return
19	Blue video	20	Blue return
21	n/c	22	System outer screen
23	HSYNC (was n/c)n/c	24	n/c
25	n/c	26	n/c

VGA Visette (Right) Connector

Designation: PL19 Type: 26 way SIC connector. 8+8mm pins, mounted on spacers, accessed through box lid.

1	n/c	2	n/c
3	+9V power	4	+9V power

5	0V power	6	0V power
7	Left audio	8	Right audio
9	Microphone	10	VGA visette security
11	Microphone return	12	System outer screen (was HSYNC)HSYNC
13	VSYNC	14	Backlight adjust
15	Red video	16	Red return
17	Green video	18	Green return
19	Blue video	20	Blue return
21	n/c	22	System outer screen
23	HSYNC (was n/c)n/c	24	n/c
25	n/c	26	n/c

VGA Monitor Output Connector

Designation: PL20 Type: 15 way female R/A PCB mount hi-density D.

1	Red	2	Green
3	Blue	4	ID2 no connect
5	Digital Ground	6	Red Screen
7	Blue Screen	8	Green Screen
9	n/c	10	Sync Ground
11	ID0 no connect	12	ID1 no connect
13	Horz Sync	14	Vert Sync
15	n/c	Case	Frame Ground

Composite Monitor Output Connector

Designation: PL21 Type: Male R/A PCB mount BNC.

Core Composite Video (75R) Shield Composite Video Return

VGA Input Connectors

Designations: PL22 left, PL23 right Type: 15 way female R/A PCB mount hi-density D.

1	Red	2	Green
3	Blue	4	ID2 no connect
5	Digital Ground	6	Red Screen
7	Blue Screen	8	Green Screen
9	n/c	10	Sync Ground

11	ID0, connected to ground	12	ID1 no connect
13	Horz Sync	14	Vert Sync
15	n/c Case	Frame Ground	

Cable to Potentiometer Board (Rev C)

Designations: PL24 (MMD end) Type: 16w vertical polarised shrouded header

Pot board end Type: 16w IDC transition header (0.1" spacing).

(The pot board is connected to the MMD by a 70mm length of 16 way ribbon cable)

1	n/c	2	Negative reference voltage
3	Right brightness pot wiper	4	Left brightness pot wiper
5	Positive reference voltage	6	0V
7	Audio ground	8	Volume control wiper
9	Audio output	10	Audio ground
12-16	n/c		

Cable to Potentiometer Board (Rev D)

Designations: PL24 (MMD end) Type: 16w vertical polarised shrouded header

Pot board end Type: 16w IDC transition header (0.1" spacing).

(The pot board is connected to the MMD by a 70mm length of 16 way ribbon cable)

1	n/c	2	Negative reference voltage
3	Right brightness pot wiper	4	Left brightness pot wiper
5	Positive reference voltage	6	0V
7	Audio ground	8	Volume control wiper
9	Audio output	10	Audio ground
11	Headphone volume left pot wiper	12	Audio ground
13	Headphone volume right pot wiper	14	Audio ground
15	Left headphone output	16	Right headphone output

Miscellaneous Open Collector Outputs Connector

Designation: PL26 Type: 5 way 0.1" pitch Molex 'KK' header (with friction lock)

1	+12V	2	Misc O/C 1
3	Misc O/C 2	4	Misc O/C 3
5	0V.		

Reset Input

Designation: JP1 Type: 2 way 2mm vertical header

A reset switch can be connected across the pins of JP1.

PAL/NTSC Mode Selection Jumpers

Designation: JP2-8 Type: 3 way 2mm vertical headers

JP9 Type: 2 way 2mm vertical header

To select PAL mode for the on board composite encoders, set JP2-8 to 2-3 and remove JP9.

To select NTSC mode, set JP2-8 to 1-2 and fit JP9.

Audio/Video Breakout board

This is an extension board for the MMD which allows it to be used with a standard ëbrickí power supply fitted with a 5 pin DIN connector. The breakout board contains electronic switching to allow the three power rails to be controlled by a single rocker switch. It is designed to fit alongside the MMD in a specially elongated case, power being carried between the two by flying leads mounted on the breakout board.

Secondly the A/V breakout board provides passive signal distribution for signals to/from the MMC audio/video connector.

The PCB panel containing the A/V breakout also contains 6 spacers as required on the MMD visette connectors, and 2 of the pot boards.

Connector Assignments

Composite Video input 1

Designation: PL1 Type: RCA phono jack

Centre: Video input 1 Shield Video input 1 ground

Composite Video input 2

Designation: PL2 Type: RCA phono jack

Centre: Video input 2 Shield Video input 2 ground

Line Audio 1

Designation: PL3 Type: 3.5mm R/A PCB mount stereo jack socket.

Tip Line audio 1 left Shield Line audio left ground

Ring Line audio 1 right

Line Audio 2

Designation: PL4 Type: 3.5mm R/A PCB mount stereo jack socket.

Tip Line audio 2 left Shield Line audio left ground

Ring Line audio 2 right

Pot board connector

Designation: PL5 Type: 2x8 way IDC transition.

See MMD section for pin out

9V Visette Power Supply Output Connector

This connector is exactly the same as the one fitted to the MMD itself.

Designation: PL6 Type: 2 way R/A PCB mount Molex MiniFit JR.

1	9V output +	2	0V

Power Supply Input Connector

Designation: PL7 Type: 5 pin 180 degree DIN R/A PCB mount female.

1	5V	2	0V
3	0V	4	12V
5	-12V	Case	Frame ground.

MMD Audio/Video connector

Designation: PL8 Type: 15 way D female R/A PCB mount..

1	Video input 1	9	Video input 1 ground
2	Video input 2	10	Video input 2 ground
3	n/c	11	n/c
4	n/c	12	n/c
5	Left line audio 1	13	Line audio 1 ground
6	Right line audio 1	14	n/c
7	Left line audio 2	15	Line audio 2 ground
8	Right line audio 2		

Power Supply Output

Power from breakout to MMD

Designation: JP1 Type: Flying leads to 8 way Molex MiniFit JR plug.

1	5V	2	12V
3	12V	4	-12V
5	0V	6	0V
7	0V	8	Frame ground

9V Visette Power Supply Input Connector

9V output from MMD

Designation: JP2 Type: Flying leads to 2 way Molex MiniFit JR plug.

1	9V	2	0V

SECTION 3
PIX 2000E CARD

PAGE

3.1 PIX 2000E Introduction

3.1 Circuit Outline

3.2 Technical Specifications

3.4 PIX 2000E Architecture

Introduction

The PIX2000E card has been designed to provide dual-channel high performance 3D graphics displays where each channel comprises a Power PC 603 processor with local DRAM and 3D graphics accelerator.

A special feature of the card is its ability to input real-time digital video and to present this as animated texture information to the 3D graphics accelerator.

For higher performance configurations the dual channels can be combined together forming a single display with increased rendering speed. A local video expansion bus allows other PIX2000 cards to be added increasing performance even further.

Circuit Outline

The PIX2000E adapter card interfaces directly to any standard PCI bus as a slave device. An on card FPGA performs the PCI interface. This device generates a secondary PCI bus which interfaces to two PCI/Memory controllers (MPC105).

Each MPC105 contains a PCI controller and DRAM/Flash memory controller for the local 603 processor. The secondary PCI bus enables the host PCI bus to access the full address space of each 603 processor.
The 603 processors each have direct access to their own GiGi graphics processor where a 22V10 PLD performs the function of interfacing between the 603 processor bus and the GiGi. This interface maps the GiGi into 603 memory over two address ranges providing access to GiGi registers and display/texture memory.

Each GiGi has local VRAM and DRAM used as display and texture memory. This memory can also be accessed directly by a Video Port Controller FPGA. The VPC inputs digital video via a video input port and then writes the incoming raster into GiGi memory. The 603 processors have direct control over the associated VPC. GiGi also provides video timings for controlling the video output from local VRAM. The VRAM outputs are interfaced to a RAMDAC (BT485A) for convertion to RGB video signals, each video output is then terminated via 15way D connector.

A single PLD EPM7064 controls the shift clocks and output enables for the VRAM's of both GiGi processors. This PLD also contains all control logic for multi-channel configurations and master slave operation.

Printed Circuit Board Details

Dimensions	Full size PCI adapter (312mm L x 106mm H)
Layers	12 layers
PCB Spec.	TBD

Power Requirements (Estimated)

+5 volts	2 amps
+3 volts	4 amps
+12 volts	10 mA
Total Power	20 watts

Cooling

The card requires forced air cooling. The maximum Ambient Temp is from 5 to 30∞C

Product Details

The PIX2000 provides dual channel graphics displays. Each channel comprises :-

1. PC 603E RISC processor operating at 100MHz
   Local 603 memory via two SODIMM memory modules with possible configurations of:

8 Mbytes	using 2 x 1M x 32 SODIMM
16 Mbytes	using 2 x 2M x 32 SODIMM
32 Mbytes	using 2 x 4M x 32 SODIMM
64 Mbytes	using 2 x 8M x 32 SODIMM

NB: For smaller memory configurations a 256k and 512k x 32 SODIMM could be designed giving total memory of 2 Mbytes or 4 Mbytes.

2. GiGi 3D graphics accelerator operating at 50 MHz configured with:

Operating Speed	50MHz
VRAM	2 Mbytes
DRAM	4 or 8 Mbytes

3. Video Port Controller (VPC) for input of digital video.

Operating speed	33 MHz
Max video input rate	33 Mpixels/sec
Video input bus.	32 bits wide (2 pixels)
Video format	5:5:5 RGB + alpha (chroma key)

4. Video output.

RGB output:	0 - 1 volt analog RGB
Sync output:	Hsync or Composite sync. Vsync TTL drive
Max video output rate	32 MHz in multi-channel mode (MCM) 66 MHz in single channel mode (SCM)
Max Display Resolutions:	640 x 480 72Hz refresh (MCM) 1024 x 768 70Hz refresh (SCM)

5. Flash boot ROM for 603 processor.
Flash programming voltage applied via bridge control register.

Other on-card Functions

1. PCI to PCI bridge. Interfacing Host to 603 processors

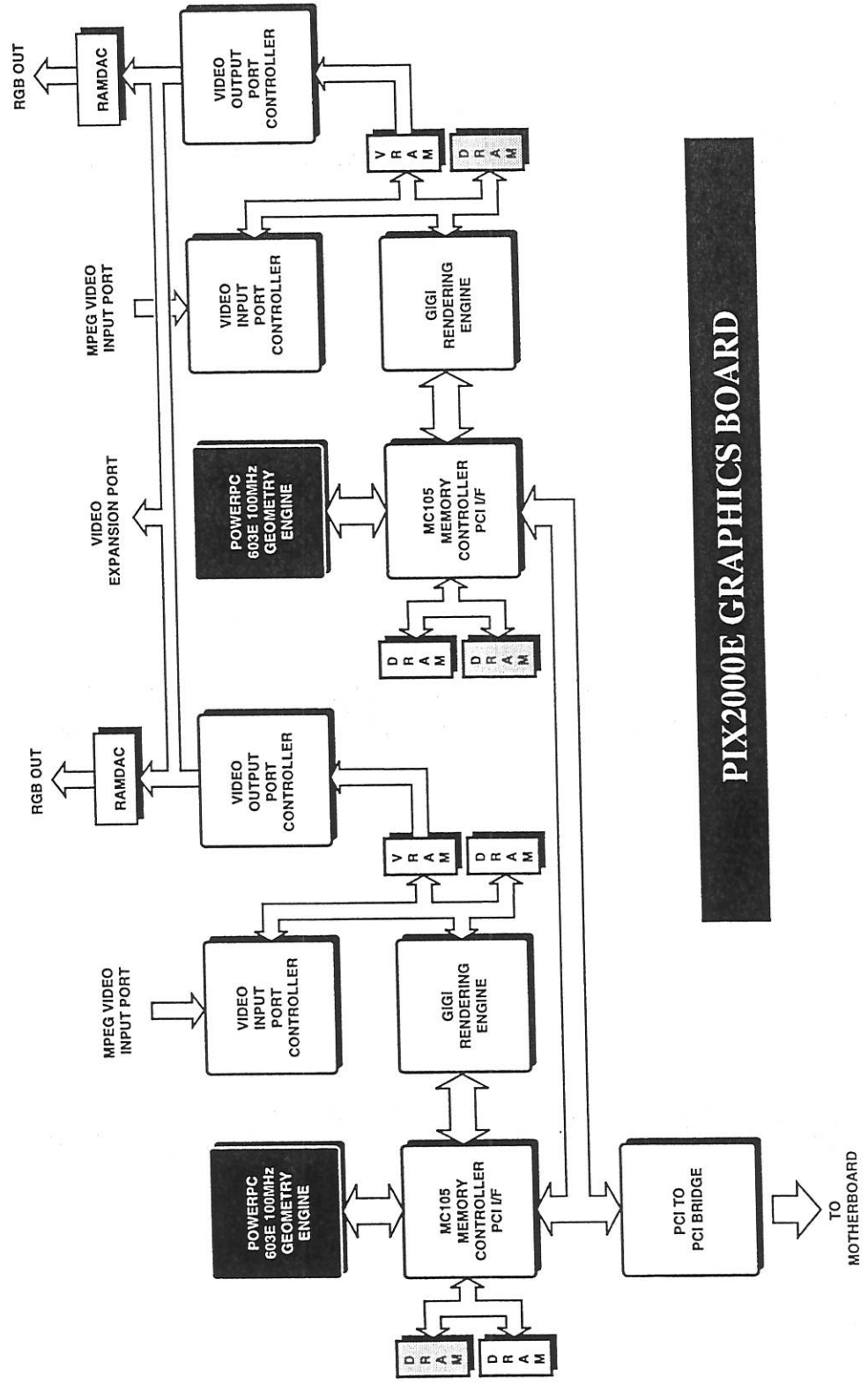
PCI 32bit slave device	
Max PCI clock rate	33Mhz
Memory mapped into two areas of 64Mbytes and 4kbytes	
Vendor ID	1172 Hex (Altera Vendor No)
Device ID	5601 Hex (Special to Virtuality V1)
Revision	0000 Hex (May alter on future devices)
Class code	0380 Hex (Other display adapter)
Max data transfer rate	40 Mbytes / sec (Read or write)

2. Programmable clock generator for video clock rate.
Frequency range 1MHz to 66MHz in 0.2% steps
(The clock synth generates video clock for both display channels.)

3. Multi-channel/card configurations. (Each card contains 2 channels, identified as Channel A and Channel B).

a.	Single card	Dual displays 2 channels stand-alone
b.	Single card	Single display 2 channels combined
c.	Two cards	Single display 4 channels combined
d.	Three cards	Single display 6 channels combined
e	Four cards	Single display 8 channels combined

Multi-card configurations allow any of the B channels to be operated in stand-alone mode for generation of further single channel displays.


PIX2000E GRAPHICS BOARD
RGB OUT
RAMDAC
VIDEO OUTPUT PORT CONTROLLER
VRAM
DRAM
MPEG VIDEO INPUT PORT
VIDEO INPUT PORT CONTROLLER
GIGI RENDERING ENGINE
VIDEO EXPANSION PORT
POWERPC 603E 100MHz GEOMETRY ENGINE
MC105 MEMORY CONTROLLER PCI I/F
PCI TO PCI BRIDGE
TO MOTHERBOARD

PAGE

4.1 Hi-Res Visette Introduction
4.1 Hi-Res Visette Specification
4.2 Hi-Res Visette Parts List
4.5 Hi-Res Visette Format Specification
4.6 Hi-Res Visette Format Board Details

INTRODUCTION

The Hi-Res Visette® features twin active matrix LCDs and is available in NTSC, PAL or pseudo VGA formats. Designed using high impact polymer moulded components, the Visette2® series include high quality, adjustable stereo earphones, a built-in omnidirectional microphone and, focus and inter-ocular adjustment switches.

SPECIFICATION

Display

Video Format NTSC/PAL/Pseudo VGA

Resolution

PAL	756 (h) x 244 (v)
NTSC	742 (h) x 230 (v)
Pseudo VGA	640(h) x 480 (v)

Pixel Arrangement Delta

Optical

Field of View per Eye
60°(h) x 46.8°(v), 71.5° diagonal

Focus Adjustment ± 4 dioptres

Optional Overlap for Stereo Systems
75% binocular field of view

Head Tracker

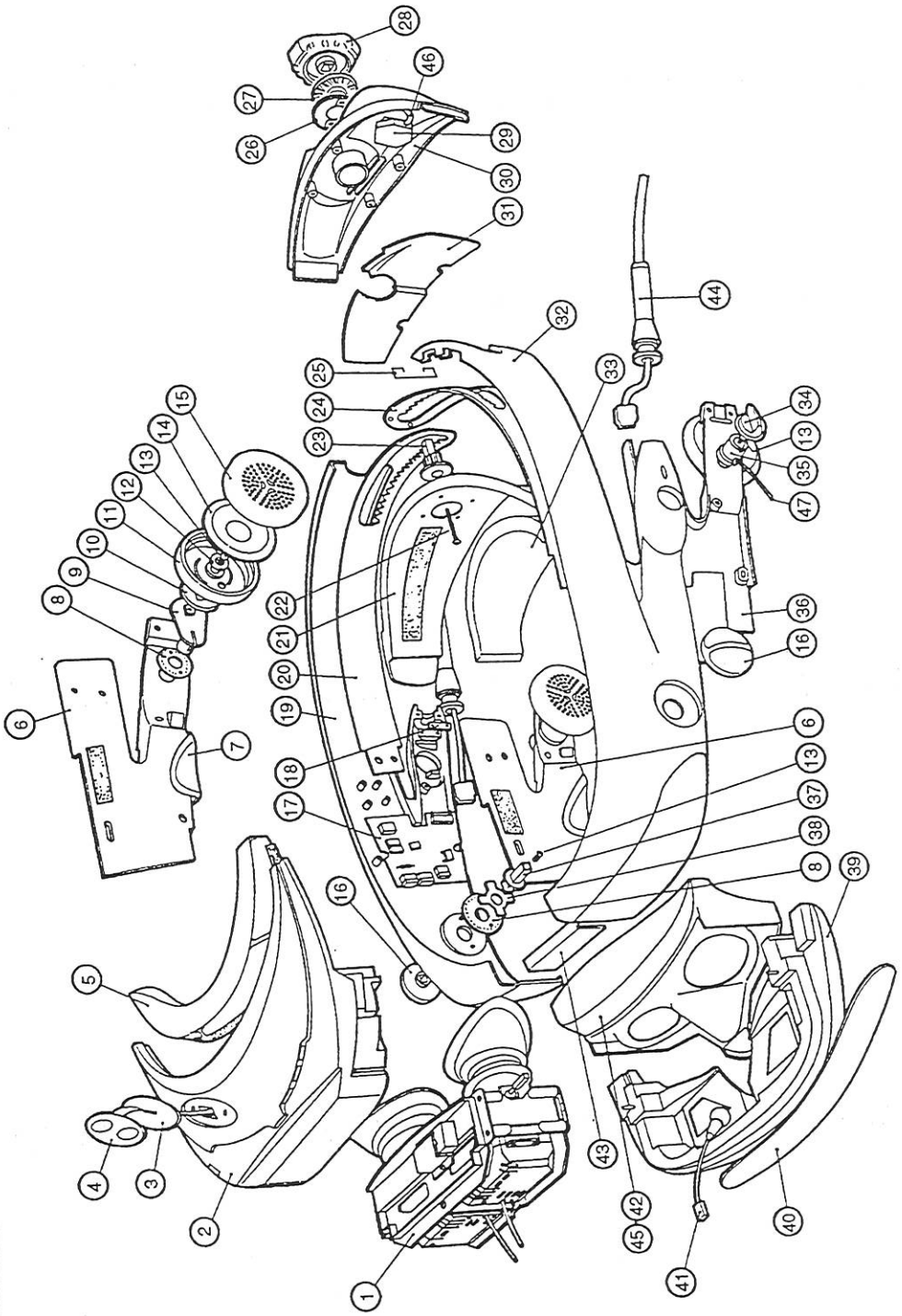
6 Degrees of Freedom
60 Hz Update Rate
12 milliseconds Latency

Micnet System

Omnidirectional voice-activated microphone
50Hz to 18Khz fequency response
-68DB sensitivity
Electret pressure transducer

Ergonomic

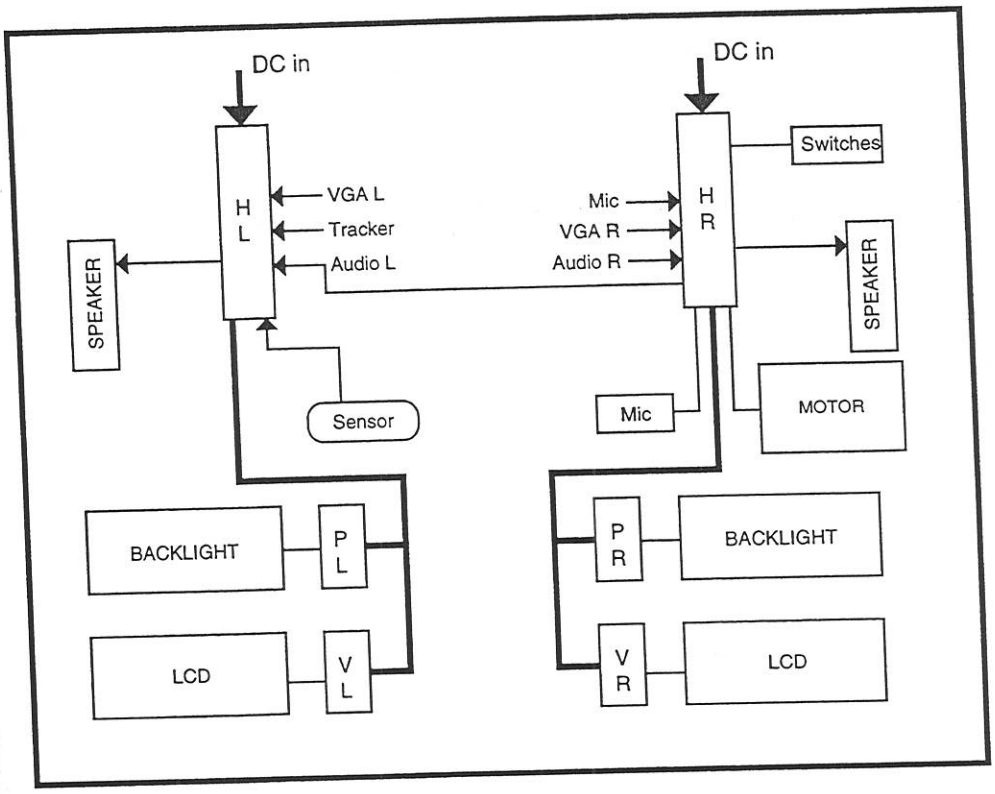
High impact nylon66 ZYTEL ST801 polymer moulded components
Single twist knob head size adjustment
Hygienic closed cell replaceable EVA comfort pads
Motorised inter-pupillary distance adjustments (58 mm - 70 mm
Independent left and right eye focus adjustments
Independently positionable headphones


28
46
27
29
26
30
31
44
32
25
33
24
34
15
23
13
14
35
13
47
12
11
10
9
8
22
21
36
20
16
19
6
7
18
6
13
17
37
38
16
8
39
5
43
4
3
42
2
45
40
1
41

SYSTEM 2000

ITEM	DESCRIPTION	QTY	PART No
1	VGA DISPLAY ASSY	1	251-018
1	TOP RUBBER HOUSING	1	230-162
4	MEMBRANE SWITCH	1	230-048
5	FOREHEAD PAD	1	230-164
6	INNER COVER R/H	1	230-245
7	THUMB GRIP R/H	1	230-074
8	FOCUS RATCHET B	4	230-044
9	HEADPHONE ARM	2	230-028
10	HEADPHONE GASKET	2	230-062
11	HEADPHONE CASE	2	230-026
12	HEADPHONE ARM CAP	2	230-030
13	SCREW	43	SCW137
14	HEADPHONE MODULE	2	230-501
15	HEADPHONE COVER	2	230-027
16	FOCUS KNOB	2	230-040
18	CABLE CLAMP	2	230-147
19	BODY SHELL R/H	1	230-243
20	R/H ADJUST STRAP	1	230-105
21	HEADBAND INNER	1	230-247
22	SCREW	1	SCW136
23	ADJUST GEAR	1	230-107
24	L/H ADJUST STRAP	1	230-106
25	WIRE CLIP	1	230-135
26	ADJUST DETENT	1	230-108
27	ADJUST RATCHET	1	230-096
28	ADJUST KNOB	1	230-021
29	INSIDETRAK RECEIVER	1	239-502R
30	HEADBAND OUTER	1	230-248
31	INTERNAL SENSOR COVER	1	230-016
32	L/H BODYSHELL	1	230-244
33	HEADBAND PAD	1	230-050
34	HEADPHONE KNOB	2	230-031
35	HEADPHONE SLEEVE	2	230-029
36	INNER COVER L/H	1	230-246
37	CAM DRIVER	2	230-042

ITEM	DESCRIPTION	QTY	PART No
38	FOCUS CROSS RATCHET 'A'	2	230-043
39	BOTTOM RUBBER HOUSING	1	230-163
40	VIRTUALITY BADGE	1	230-051
41	MICROPHONE CABLE ASSY	1	230-078
42	FACEMASK	1	230-249
43	BODYSHELL LINK PLATE	1	230-061
44	LOOM	1	251-001
45	FACEMASK SCREW	8	SCW153
46	SENSOR INTERNAL CABLE	1	230-072
47	HEADPHONE CABLE	2	230-057
	PARTS FOR OPTIONAL FLOATING HEADPHONE (not illustrated)		
48	EAR FRONT COVER BLK	2	230-252
49	EARPHONE REAR CASE	2	230-253
50	EARPHONE FASTENER BLK	2	230-254
51	EARPHONE BUNG BLK	2	230-256
52	BUNG FASTENER BLK	2	230-257
53	DT411 SPEAKER INSERT	2	230-537



VGA Format VL and VR

- This processes the VGA signal into a form that can be displayed by the TFT LCDs.

VGA Format PL and PR

- Provides power (15v, 12v and 7v) for the backlights and the VGA Format VL and VR.

VGA Format HL

- Main left hand loom VGA connects to this point to be distributed to other parts.

VGA Format HR

- Motor control circuitry on this board, controls the interocular adjustment.
- Microphone pre-amplification.

F401 – 1 AMP SLOW BLOW FUSE
protecting +9v to LCD

PL401 – 16 WAY VGA L/H LOOM

PIN	COLOUR	SIGNAL
1	BLACK	COIL 1A
2	RED	COIL 2A
3	BLUE	COIL 3A
4	SCREEN	COIL SCR
5	GREY	LV SYNC L
6	RED	RED L
7	GREEN	GREEN L
8	BLUE	BLUE L
9	WHITE	COIL 1B
10	BROWN	COLI 2B
11	YELLOW	COIL 3B
12	ORANGE	LH SYNC L
13	PURPLE	L BRIGHT L
14	BLACK	RED RTN L
15	BLACK	GREEN RTN L
16	BLACK	BLUE RTN L

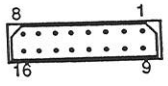
PL402 – 10 WAY SENSOR

PIN	COLOUR	SIGNAL
1		COIL SCR
2	BLACK	COIL 1A
3	RED	COIL 2A
4	BLUE	COIL 3A
5		COIL SCR
6		COIL SCR
7	WHITE	COIL 1B
8	BROWN	COLI 2B
9	YELLOW	COIL 3B
10		COIL SCR

PL403 – 2 WAY AUDIO

PIN	COLOUR	SIGNAL
1	GREY	AUDIO L
2	GREY	AUDIO R

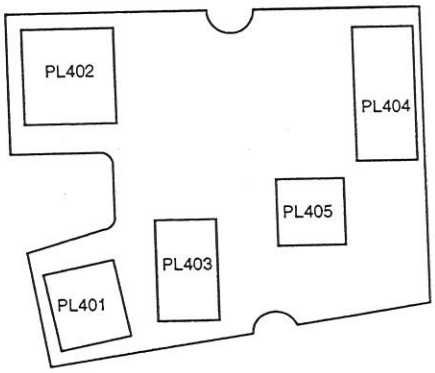
HARWIN DATAMATE HEADER END VIEW



PL404 – 16 WAY LCD

PIN	COLOUR	SIGNAL
1	BROWN	9V L
2	RED	LH SYNC L
3	ORANGE	VCC L
4	YELLOW	RED L
5	GREEN	GREEN L
6	BLUE	BLUE L
7		GND L
8		GND L
9	PURPLE	9V L
10	GREY	LV SYNC L
11	WHITE	VCC L
12	BLACK	GND L
13	PINK	GND L
14	TURQ	L BRIGHT L
15		GND L
16		NC

VGA H.L. BOARD 251 - 002



PL405 – 6 WAY LINK

PIN	COLOUR	SIGNAL
1	BLACK	GND
2	GREEN	GND
3	RED	9V
4	BLUE	AUDIO L
.5		GND
6	YELLOW	9V

F501 – 1 AMP SLOW BLOW FUSE
protecting +9v to LCD

PL501 – 16 WAY VGA R/H LOOM

PIN	COLOUR	SIGNAL
1	BLACK	9V
2	RED	AUDIO L
3	BLUE	MIC
4	SCREEN	GND
5	GREY	LV SYNC R
6	RED	RED R
7	GREEN	GREEN R
8	BLUE	BLUE R
9	WHITE	9V
10	BROWN	AUDIO R
11	YELLOW	SEC
12	ORANGE	LH SYNC R
13	PURPLE	L BRIGHT R
14	BLACK	RED RTN R
15	BLACK	GREEN RTN R
16	BLACK	BLUE RTN R

PL402 – 10 WAY SENSOR

PIN	COLOUR	SIGNAL
1		COIL SCR
2	BLACK	COIL 1A
3	RED	COIL 2A
4	BLUE	COIL 3A
5		COIL SCR
6		COIL SCR
7	WHITE	COIL 1B
8	BROWN	COLI 2B
9	YELLOW	COIL 3B
10		COIL SCR

PL503 – 2 WAY AUDIO

PIN	COLOUR	SIGNAL
1	N/C	N/C
2	GREY	9V
3	GREY	GND

PL504 – 4 WAY TO INTEROCULAR MEMBRANE SWITCH

PIN	SIGNAL
1	SWITCH 1
2	SWITCH 1 RTN
3	SWITCH 2
4	SWITCH 2 RTN

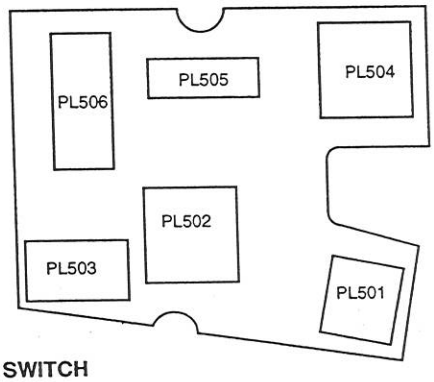
PL505 – 2 WAY FOR MOTOR

PIN	COLOUR	SIGNAL
4	GREY	MOTOR -
2	GREY	MOTOR +

PL506 – 20 WAY LCD CABLE

PIN	COLOUR	SIGNAL
1	BROWN	+9V
2	RED	LH SYNC
3	ORANGE	VCC
4	YELLOW	RED
5	GREEN	GREEN
6	BLUE	BLUE
7		
8		
9	BLACK	0V
10	RED	+9V
11	PURPLE	+9V
12	GREY	LV SYNC
13	WHITE	VCC
14	BLACK	GND
15	PINK	GND
16	TURQ	L BRIGHT
17		
18	BLUE	AUDIO L
19	GREEN	0V
20	YELLOW	+9V

VGA H.R. BOARD 251-003



SECTION 5
TRACKING SYSTEM

PAGE

5.1 Overview and Specification

5.2 Transmitter Frequency Module Colours

5.3 General Description

5.5 T.F.M./Receiver (sensor) Diagrams

5.6 Transmitter (source) Diagram

5.7 InsideTRAK P.C.B.

5.8 Fault Finding Guide

Tracking System Overview

The InsideTRAK™ instrument uses electromagnetic fields to determine the position and orientation of a remote object. The technology is based on generating near field, low frequency, magnetic field vectors from a single assembly of three collocated, stationary antennas called a transmitter, and detecting the field vectors with a single assembly of three collocated, remote sensing antennas called a receiver. The sensed signals are input to a mathematical algorithm that computes the receiver's position and orientation relative to the transmitter.

The InsideTRAK™ instrument consists of a full size, PC (AT) compatible, System Electronics Board (SEB) that plugs into any 16 bit size spare ISA slot within the host PC, a Transmitter Frequency Module (TFM), a single transmitter and up to two (2) receivers. The SEB contains the instrument electronics, I/O address select switch (S1) and connectors to support the Transmitter Frequency Module, Transmitter and Receivers. The instrument is capable of operating at any of eight (8) discrete carrier frequencies to allow operation of up to eight instruments in close proximity to one another or to allow selection of a frequency less susceptible to interference from the operating frequencies of nearby equipment.

Specification

Position Coverage - The instrument will provide the specified accuracy when the receivers are located within a hemisphere with a radius of 30" (76.2 cm) from the transmitter. Operation with separations of up to 60" (152.4 cm) is possible with reduced accuracy.

Angular Coverage - The receivers are all-attitude

Static Accuracy - 0.5" (1.3 cm) RMS for the X, Y, or z receiver position, and 2.0° RMS for receiver orientation.

Resolution - 0.0003 inches/inch of range (0.0003 cms/cm of range), and .03°.

Latency - 12.0 milliseconds unfiltered from centre of receiver measurement period to beginning of transfer from output port.

Output - Software selectable including extended precision. Cartesian coordinates of position and Euler orientation angles are standard. Direction cosines and quaternions are selectable. English or metric units are also selectable.

Update Rate

One receiver : 60 updates/second/receiver

Two receivers : 30 updates/second/receiver

Carrier Frequency - The InsideTRAK™ may be configured with any one of eight discrete carrier frequencies to allow simultaneous operation of up to eight instruments in close proximity. Carrier frequencies are selected via colour coded Transmitter Frequency Modules (TFM). These frequencies are:

Reference	Frequency	Colour Code
1	8013 Hz (Standard)	Black
2	10016 Hz	Red
3	12019 Hz	Yellow
4	14022 Hz	Blue
5	18027 Hz	Orange
6	20032 Hz	White
7	24039 Hz	Green
8	26042 Hz	Pink

The colour dot can be found on the TFM in several locations.

Interfaces - ISA Bus. 16 bit wide FIFO for output and 8 bit wide FIFO for input.

Operating Environment - Low metallic ceilings or large metallic objects, such as desks or cabinets, located near the transmitter or receivers may adversely affect the performance of the instrument. Other devices employing frequencies near InsideTRAK's operating frequency should be kept away from the area of operation.

Operating Temperature - 10°C to 40°C at a relative humidity of 10% to 95%, non-condensing.

Physical Characteristics SEB - height 4.2" (10.7 cm) including ISA bus connections, length 13.3" (33.8 cm), maximum component height 0.625" (1.6 cm), weight 2.5 1b (1.13 Kg).

Transmitter Frequency Module - width 2.5" (6.4 cm), length 3.0" (7.6 cm), height 1.0" (2.54 cm), weight 3.7oz (105.0 gm) including attached cable. The TFM may be purchased for any of eight (8) distinct carrier frequencies.

Transmitter - Width 2.1" (5.3 cm), length 2.1" (5.3cm), height 2.3" (5.8 cm), weight 0.6 lb (0.27 Kg) excluding attached cable.

Receiver - Width 1.1" (2.79 cm), length 0.90" (2.29 cm), height 0.60" (1.52 cm), weight 0.6 oz (17.0 gm) excluding attached cable.

Power Consumption - 15 Watts continuous total from host PC's +5 VDC at 2.2 Amperes max and -5 VDC at 20 milliamperes max.

Sync Cable Module

The Sync Cable module (SCM) comprises a 9 pin, male "D" connector mounted on a PC Panel Bracket with a 9 wire, 6 inch long ribbon cable connected to a 26 pin header connector. The pinouts for the 9 pin "D" connector are as follows:

Pin	Function
6	SYNC IN POSITIVE
1	SYNC IN NEGATIVE
7	SYNC OUT POSITIVE
2	SYNC OUT NEGATIVE
3	SYSTEM GROUND

Transmitter Frequency Module

The Transmitter Frequency Module (TFM) is a separate unit that provides the unique carrier frequency for the InsideTRAK™ instrument. The TFM plugs directly into the P1 port on the SEB via a 9 pin male "D" connector (Figure 5.5.1) located at the end of a 1 foot attached cable. The opposite side of the TFM package has a 15 pin "D" connector that accepts the Transmitter connector.

CAUTION! DO NOT CHANGE TFM MODULES WITH POWER ON!

Receiver(s)

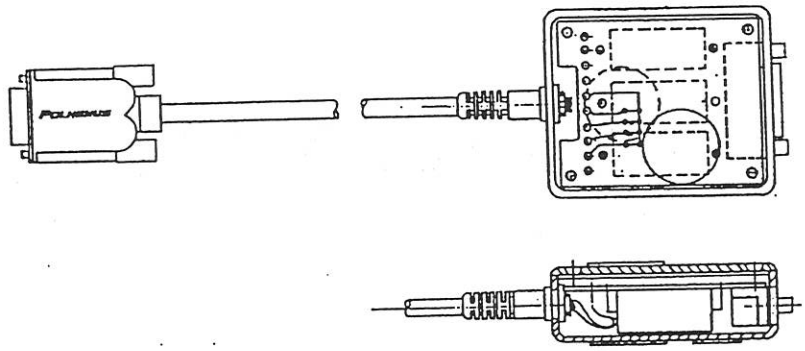
The Receiver is physically shown in Figure 5.5.2. The Receiver package provides 2 mounting holes for #4 screws (supplied) in the event that Receiver mounting is required. In this case, the supplied nylon hardware is required.

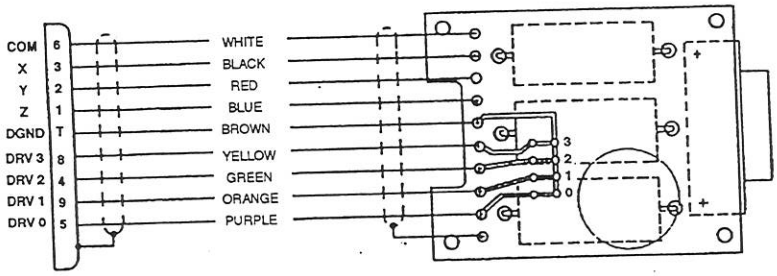
Transmitter

The transmitter is dimensionally shown in Figure 5.6.1 including the position of the electrical centre. There are 4, 1/4" - 20 NC tapped holes provided on the bottom surface for mounting. Nylon hardware (supplied) should be used when locating the Transmitter in a fixed position.

TRANSMITTER CONNECTION INTO FREQUENCY MODULE

15 PIN D-TYPE SOCKET				
METER READING	PIN No.	COLOUR	SIGNAL	COMMENTS
2.3Ω	2	BLACK	SIGNAL	COIL1
	10	WHITE	RETURN	
2.3Ω	3	RED	SIGNAL	COIL 2
	11	BROWN	RETURN	
2.3Ω	4	BLUE	SIGNAL	COIL 3
	12	YELLOW	RETURN	



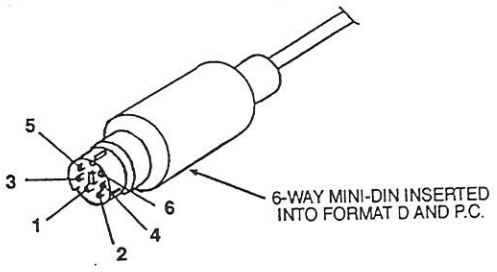


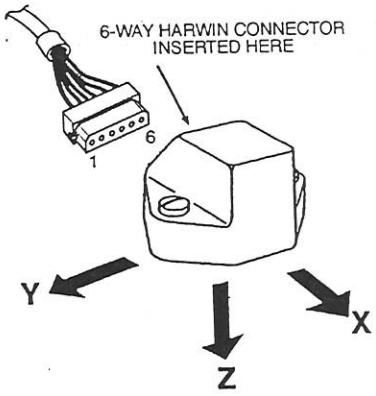
WIRING DIAGRAM

TRANSMITTER FREQUENCY MODULE

Fig. 5.5.1

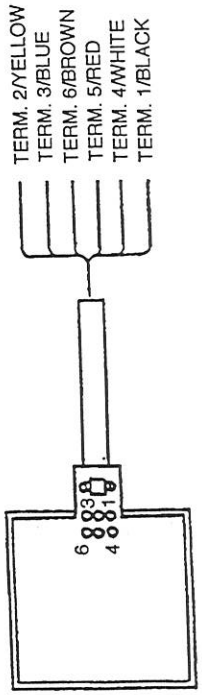
6-WAY MINI-DIN FOR VISETTE® RECEIVER			
METER READING	PIN No.	COLOUR	COMMENTS.
93Ω	1	BLACK	COIL1
	2	WHITE	
93Ω	3	RED	COIL2
	5	BROWN	
93Ω	4	BLUE	COIL 3
	6	YELLOW	
		GREEN	CUT BACK
		SCREEN	

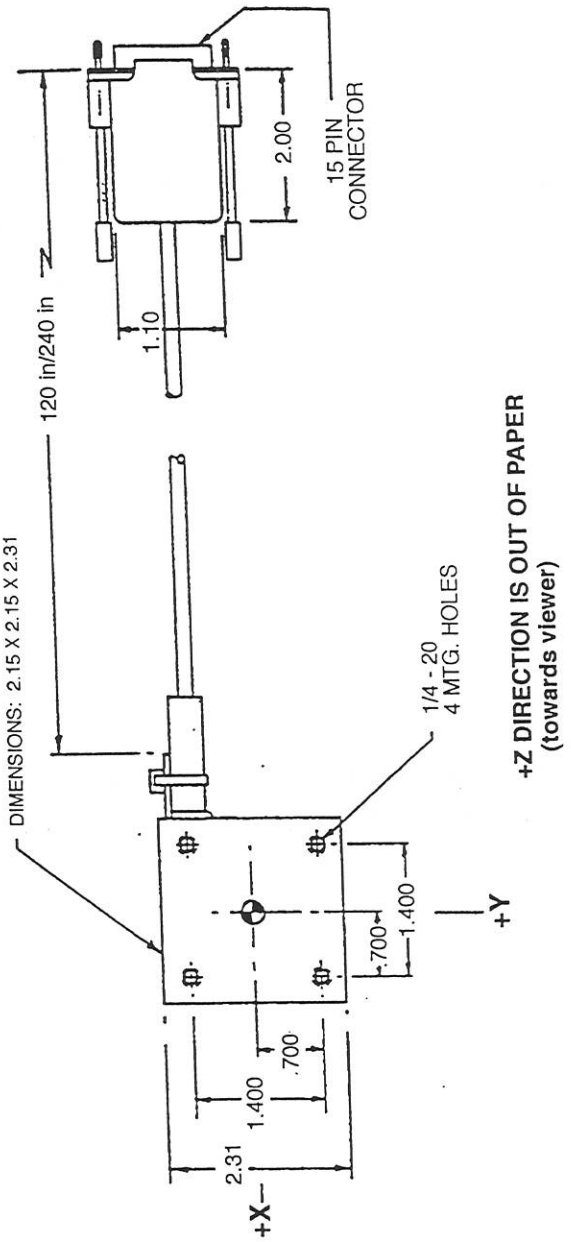




RECEIVER

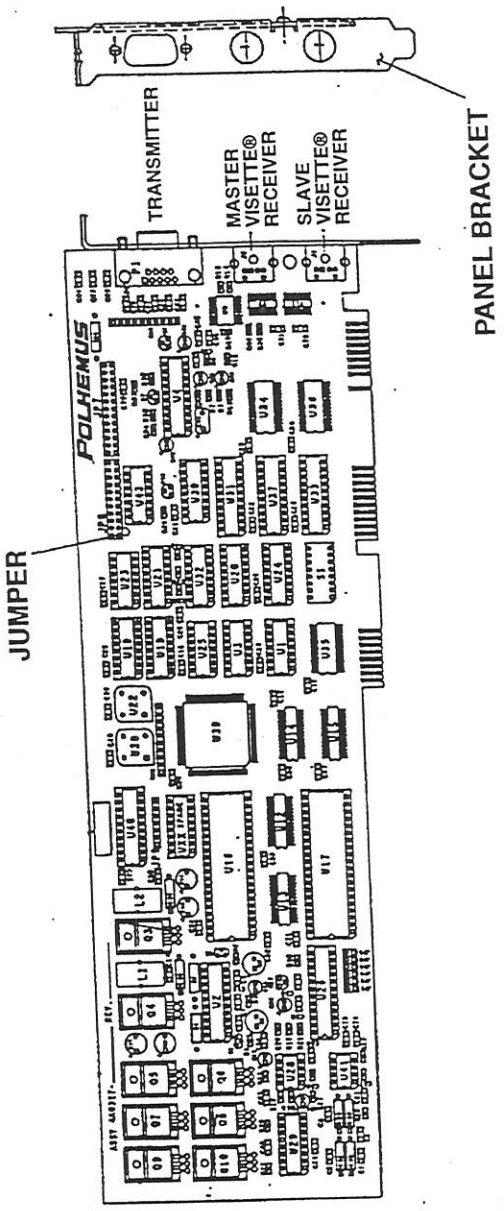
Fig. 5.5.2





TRANSMITTER

Fig. 5.6.1



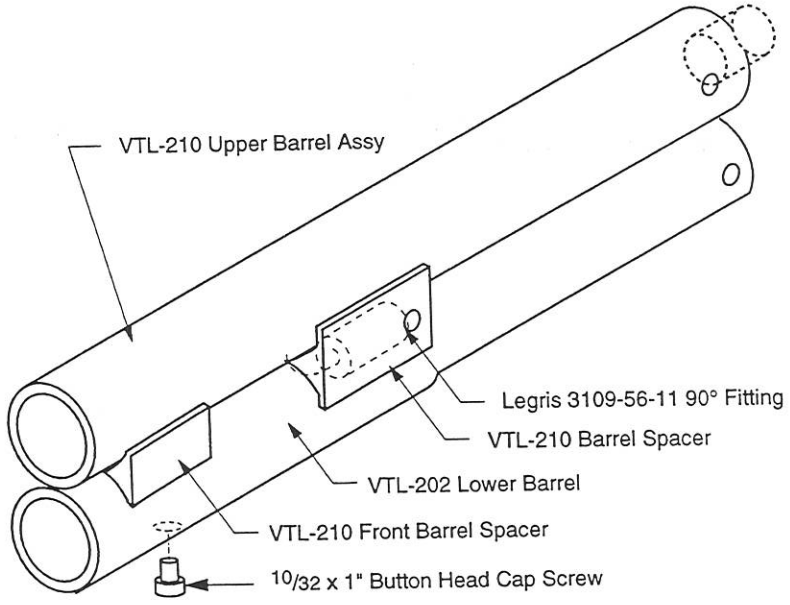
SYSTEM ELECTRONICS BOARD
Fig. 5.7.1

SYMPTOM	POSSIBLE CAUSE	TEST	TEST FAILS	SEE PAGE
Tracker jitter	1. Outside interference (metalwork, motors, monitors, power lines, fluorescent lights etc.)	Re-locate unit		
	2. Dislodged tracker mini-din	Visually inspect associated cables; check sensor continuity	Re-seat offending plugs	5.5
	3. Source connectors	Visually inspect connectors and cables; check continuity	Re-seat plugs	5.4
	4. Tracker PCB	Replace frequency MOD	Replace Tracker PCB	5.7
Inverted Tracker/wrong angles	1. Outside interference (metalwork, motors, monitors, power lines, fluorescent lights etc.)	Re-locate unit		
	2. Dislodged tracker mini-din	Visually inspect associated cables; check continuity	Re-seat offending plugs	5.5
	3. Source connectors	Visually inspect connectors and cables	Re-seat plugs	5.4
	4. Incorrect offsets	Run ETS - Tracker Offsets	Follow re-calibrate offsets procedure	
	5. Source connectors	Visually inspect connectors and cables; check continuity	Re-seat plugs	5.4
	6. Tracker PCB	Replace frequency MOD	Replace Tracker PCB	5.7

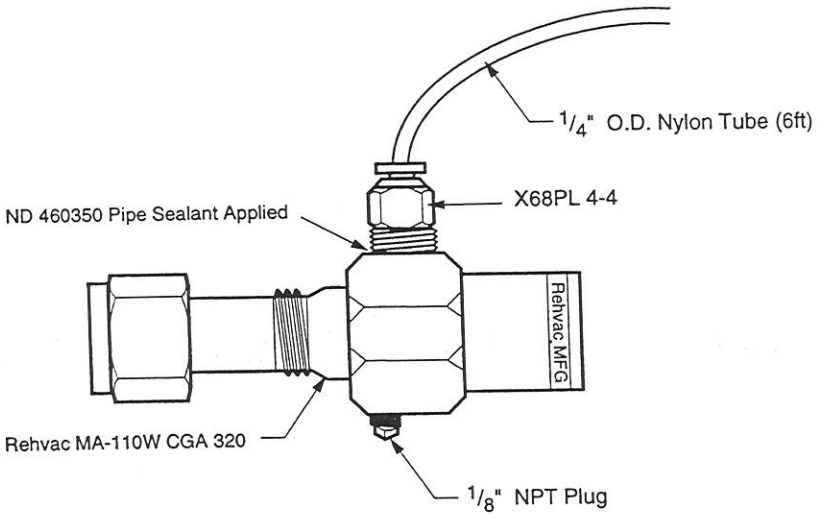
PAGE

6.1 Shotgun Assy
6.2 Main Barrel Assy
6.2 Regulator Assy
6.3 Upper Barrel Assy
6.4 Umbilical Cable Assy
6.5 Interface Panel Assy
6.5 Polhemus/Sensor Board Cable Pinouts
6.6 Changing the CO2 Cylinder
6.8 Transportation and Safe Use of Gas Cylinders.

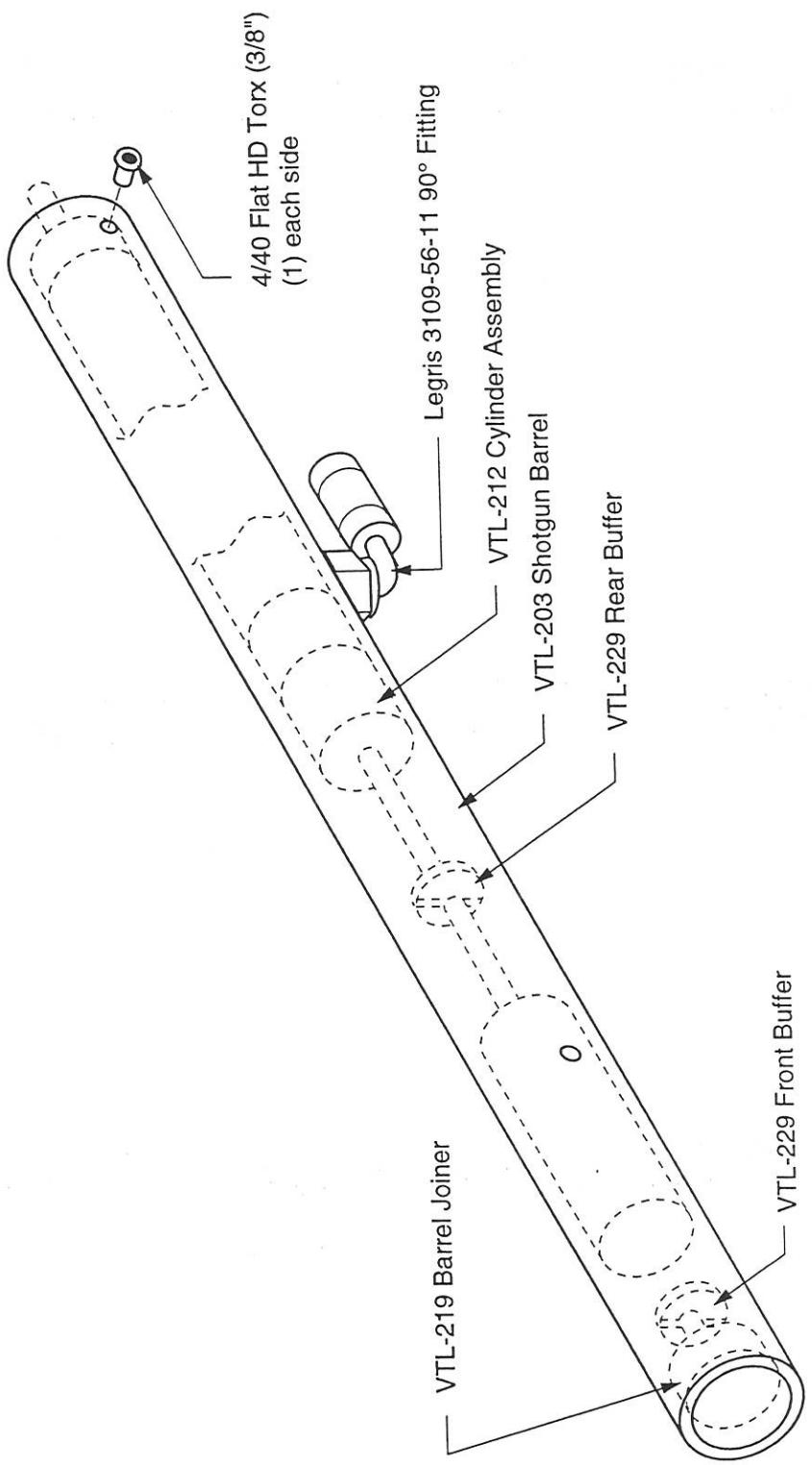
SHOTGUN ASSY VTL-200



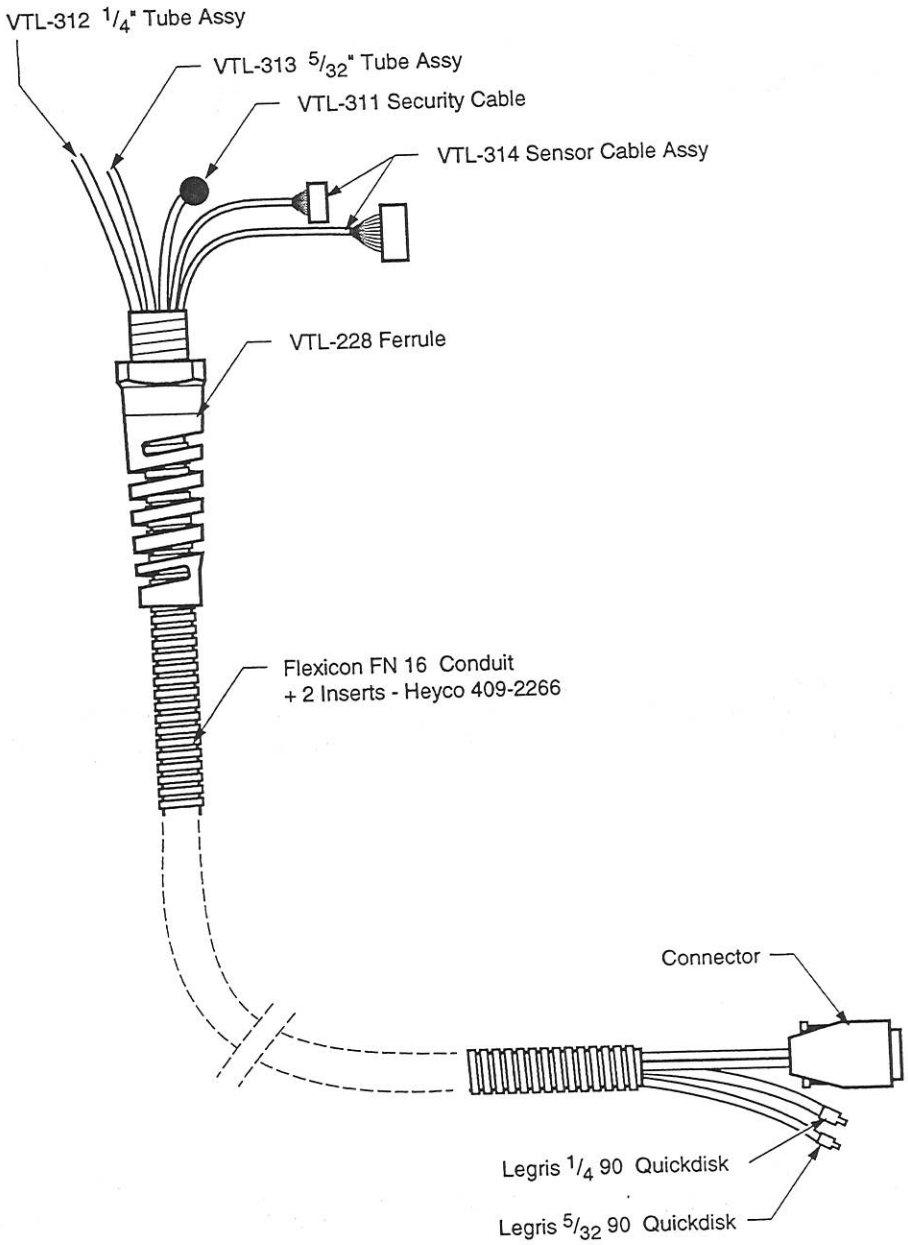
MAIN BARREL ASSY VTL-210



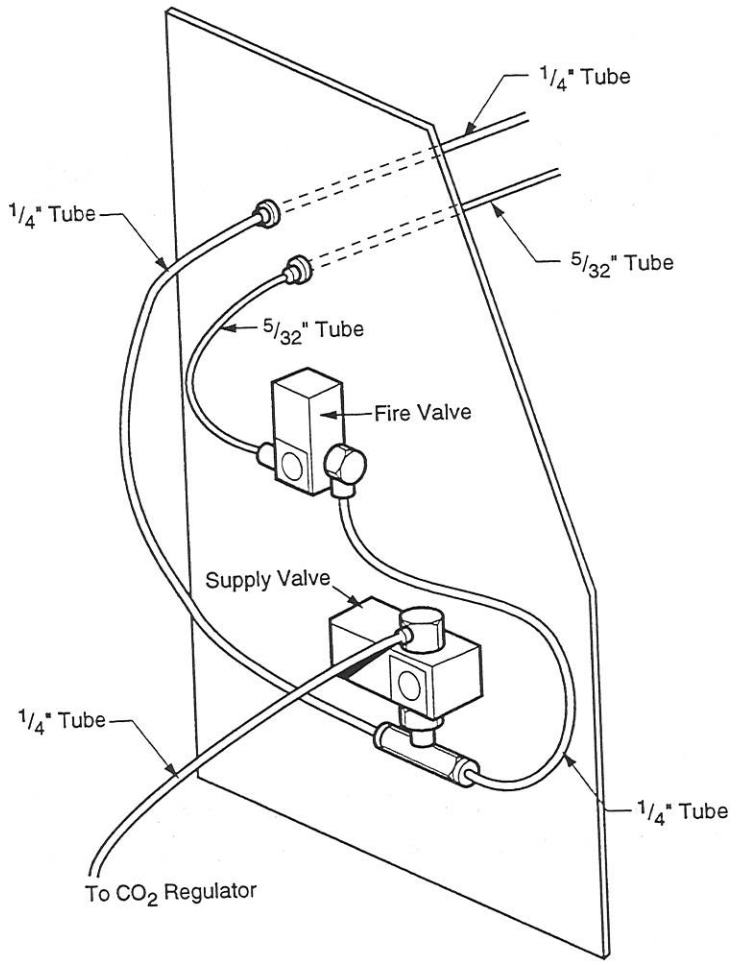
REGULATOR ASSY VTL-500



UPPER BARREL ASSY VTL-201



UMBILICAL CABLE ASSY VTL-300



INTERFACE PANEL ASSY VTL-100

Sensor BD. Conn. (8 pin)		DB 15 Conn. (Ref.)
Pin #	8 Conductor Wire Colour	Pin #
1	BRW	15
2	RED	6
3	YEL	7
4	GRN	14
5	BLU	13
6	WHT	12
7	BLK	5
8	ORG	8
Polhemus Conn. (6 Pin)		
Pin #	6 Conductor Wire Colour	
1	BLK	1
2	WHT	9
3	BRN	10
4	RED	2
5	YEL	11
6	BLU	3

POLHEMUS/SENSOR BOARD CABLE PINOUTS

Bottle Change Procedure.

1. Remove Bottle Enclosure cover from the machine using a 4mm Allen Key.

2 Ensure the gas bottle is switched of before proceeding by turning the bottle valve clockwise until the stop has been reached.

3. Remove the 2 x Safety Chains.

4. Extract the Pneumatic tube from the gas regulator on the bottle.

5. Remove the bottle from the console.

6. Remove regulator from the bottle.

7. Exchange the empty bottle for the replacement full bottle from your local gas bottle supplier or from your own stock.

8. Re-connect the regulator on to the new bottle ensuring that the rubber seal is in the regulator and tighten onto the bottle.

9. Place the bottle back into the console.

10. Do up the safety chain around the bottle ensuring the chains is not too tightly fastened.

11. Replace the pneumatic tube within the new regulator.

12. Slowly open the valve on the bottle by turning the valve Anti-Clockwise so that you can check for leaks along the tubing and pneumatic joins etc.

13. Replace the bottle enclosure GRP.

14. Fire Gun several times until recoil pressure is back to correct operation.

The game is now ready for game use.

Safety Points:-

Always have the bottle chained whilst in the machine to prevent the bottle from falling over etc.

Always ensure the valve is closed whenever shipping/moving the machine.

Avoid direct contact with skin with pressurised gas.

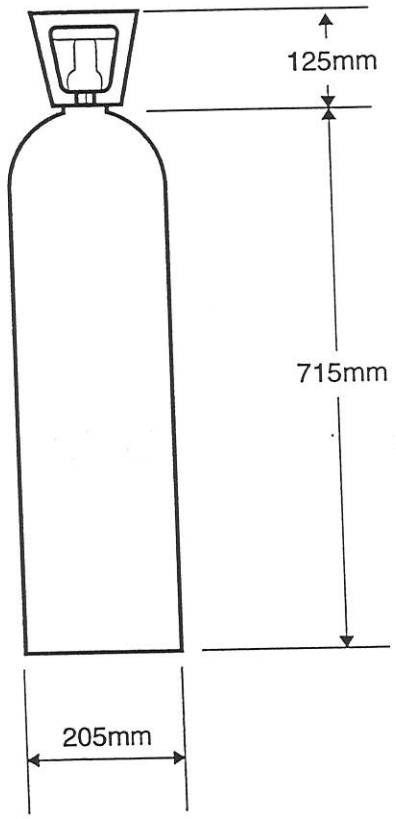
GAS BOTTLE DETAILS

IMPORTANT: UK Specification

The gas bottle required to operate the gun recoil is as follows:-

a. Industrial Style Bottle
b. Size B
c. Bottle to contain vapour CO2

Maximum bottle dimensions are:-



THE TRANSPORT AND USE OF COMPRESSED GAS CYLINDERS

Hazards

Pressurised gas cylinders are very heavy and unstable objects and as such present considerable danger to those handling them. They contain gas which may be toxic, asphyxiating or flammable at high pressure. Apart from the chemical risk from these gases, serious physical damage can be caused by exposure to the full force of escaping gas. Gas cylinder valves are very robust but a broken valve can turn a cylinder into a lethal projectile. Gas pressure regulators are much less robust, and if damaged, may allow the escape of gas.

Precautions

Check that the cylinder you use contains the gas you expect (check the label). Transport the cylinder on an approved trolley by pushing and NOT by pulling (if the trolley is damaged, make sure it is replaced). Make sure the cylinder is firmly secured in an approved location. Cylinders must not by used from the trolley.

CYLINDERS MUST NEVER BE LEFT FREESTANDING

- Check the pressure regulator. Is it designed for the gas you are using? Check the pressure rating. Is it capable of coping with the pressure in the cylinder? Is the regulator marked with a red line to indicate the maximum pressure to be applied to the application?
- Never use oil or grease, especially on an Oxygen cylinder - the result can be catastrophic. Do not use PTFE tape to attempt to seal leaks.
- Turn the regulator to zero before opening the valve at the spindle and when finished, close the valve at the spindle.
- NEVER transport a cylinder with the regulator in place.

Emergency Procedures

- Escape of gas. If the gas escape is large, follow the procedure described in the *School of Chemistry Safety Handbook* for the **escape of toxic materials** – remember, even an inert gas can kill by asphyxiation. For small non-toxic leaks, inform whoever is in charge and ventilate, evacuate, seal and secure the room.
- Falling Cylinder. If a cylinder falls over, NEVER attempt to catch it. It is much too heavy and will cause serious injury. It is also very robust and unlikely to be damaged although it may make a loud noise. Do not attempt to upright it alone; get competent help.

References. See the publication *"Safe Under Pressure" BOC gases* available from the DSA.

SECTION 7
VGA TO NTSC CONVERTER

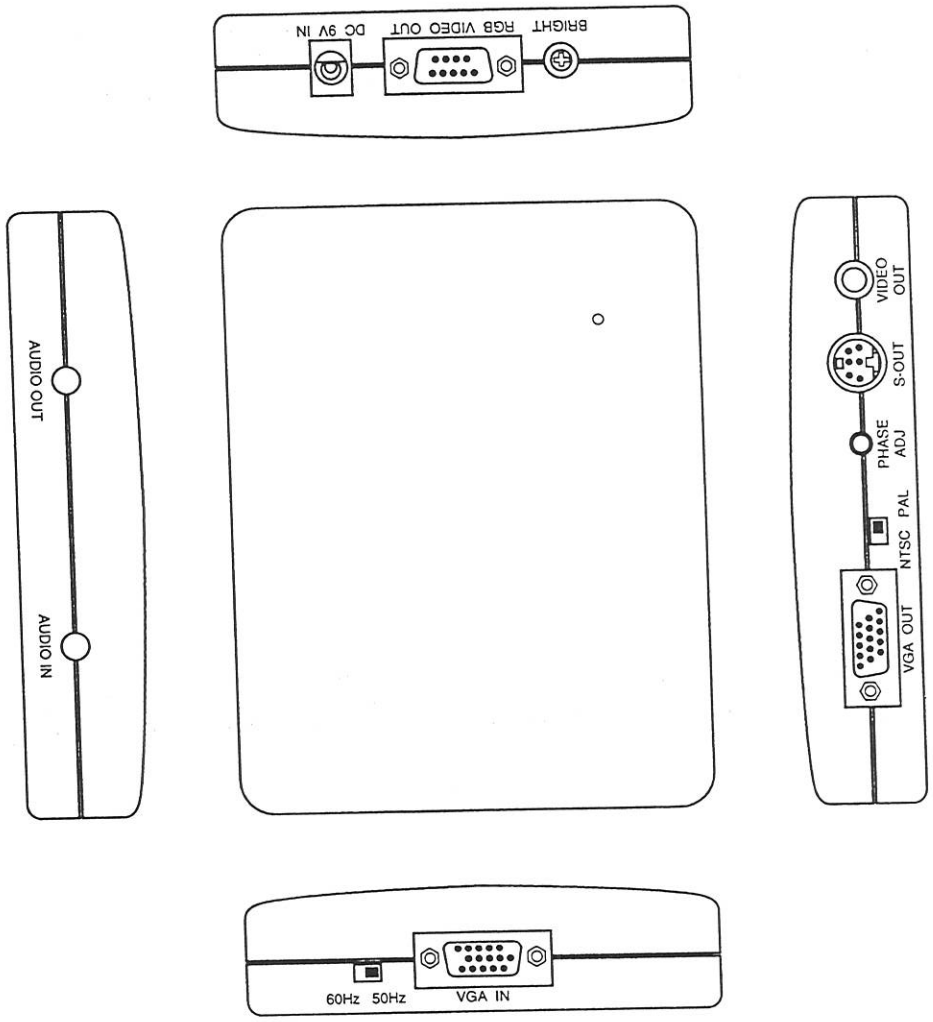
PAGE

7.1 Adaptor Outline Drawing

7.1 Specification and Pinouts

7.4 Connection Layout

Outline of Grand Art Adaptor



Specification

Input:

- VGA Analog input from VGA card or CRT port of Notebook
- Microphone input

Output:

- Composite NTSC (PAL) signal Video
- Separate Y/C NTSC (PAL) (S-Video)
- VGA signal pass-through output
- Analog RGB video
- Audio output

Software:

- GA TSR Utility

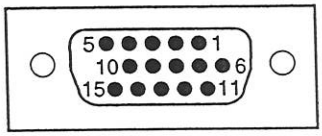
Package Contents:

- Grand Art PC to Video converter
- User's Manual
- S-Video cable
- Video cable
- 15 pin D-Type Male to 15 pin D-Type Male VGA pass-through cable.
- Floppy diskette (GA TSR Utility and program)
- Microphone
- Stereo Audio cable
- Small screwdriver
- Power adaptor

VGA IN Connector:

Analog RGB signal from 15 pin VGA output port of PC or Notebook PC.

Pin No.	Signal Description.
1	Red, 0.7 Vpp, 75 Ω
2	Green, 0.7 Vpp 75 Ω
3	Blue, 0.7 Vpp, 75Ω
4	Monitor ID2, TTL level
5	GND
6	GND
7	GND
8	GND
9	NC
10	GND
11	Monitor ID0, TTL level
12	Monitor ID1, TTL level
13	HSYNC, TTL level
14	VSYNC, TTL level
15	NC



VGA OUT Connector:

VGA OUT connector is 15 pin D-type female connector, pin assignment is the same as VGA IN connector. Connect to VGA monitor.

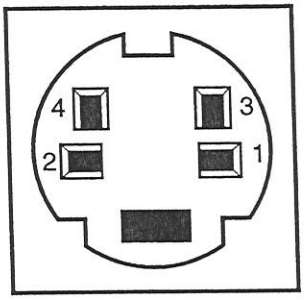
VIDEO OUT Connector:

Compositive video out 1.0V pp +/- 0.2Vpp 75 ohms, negative sync

S-OUT Connector:

S-OUT connector is a 4 pin mini-DIN connector

Pin No.	Signal Description.
1	GND
2	GND
3	Y (Luminance)
	0.7 Vpp ± 0.2 Vpp
	75 Ω, Negative sync
4	C (Chrominance)
	0.3 Vpp ± 0.1 Vpp



RGB Video Conector

RGB Video connector is 9 pin D-type female connector.

Pin No.	Signal Description.
1	GND
2	VCC
3	Red, 0.7 Vpp ± 0.2 Vpp, 75 Ω
4	Green, 0.7 Vpp ± 0.2 Vpp, 75 Ω
5	Blue, 0.7 Vpp ± 0.2 Vpp, 75 Ω
6	Audio Output, 3Vpp (max)
7	Video output, 1V, 75 Ω
8	TV CSYNC, TTL level, negative sync
9	TV CSYNC, 1V, 75 Ω, negative sync

Microphone Input:

Capacitance type microphone

Audio Out:

52dB amplifier with microphone input, maximum output is 3Vpp, connect to TV Audio input.

Power Consumption:

Maximum : 5 watts, exclude DC adaptor

DC Power Adaptor:

Type 1 is used in the USA

Input : AC 120V 60 Hz

Output : DC 9V 650mA

Type 2 is used in the most of Europe

Input : AC 230V 50 Hz

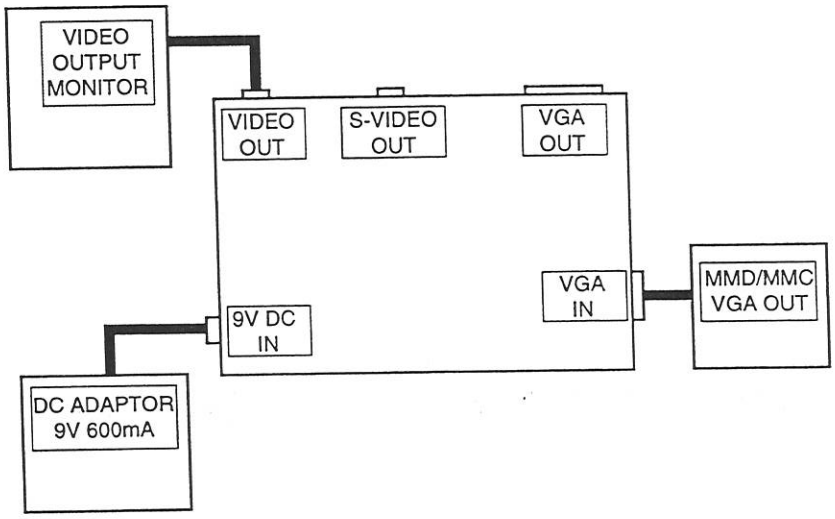
Output: DC 9V 600 mA

Type 3 is used in Japan

Input : AC 100V 50/60 Hz

Output : DC 9V 600 mA

VGA – NTSC Video Converter Connection Layout



PAGE

8.1 ETS Manual

CONTENTS PAGE

INTRODUCTION 3
Running ETS 3
Special Keys 3
General principles 3
Library loading screen 4
Command line options 4
MAIN MENU 5
Test tracker 6
Main sensor screen 6
Jitter test 6
Display hemispheres 7
Display offsets 7
Display sensor map 8
Tracker world 8
Display tracker hardware 8
Calculate sensor offset 8
Test format hardware 9
Console lights / buttons 9
Sit Down Joysticks 9
Stand Up joysticks 9
Flexor 9
Sound volumes / switching 10
Coinop 11
Test security 11
Display format hardware 11
Test registers 11
Test CD 12
Test network 13
Display networked machines 13
Echo test 13
Display network hardware 14
Test network communications 14
Test visette 15
Test sound 15
Test gun recoil 16
Test MPEG 16

MENU 2 17
Display library data 17
Display hardware data 17
Display all hardware 17
Display tracker hardware 18
Display format hardware 18
Display network hardware 18
Display sound hardware 18
Display PCI slot configuration 18
View configuration file 19
View configuration file errors 19
Text memory once 19
Cycle through memory tests 19
TROUBLESHOOTING GUIDE 20
General points 20
Format card 20
Visette® 20
CD 20
INDEX 21

INTRODUCTION

Running ETS

The Engineering Test System (ETS) allows a desktop VR system to be fully tested. Facilities exist to allow each piece of hardware to be tested in isolation, and also in conjunction with other pieces of hardware.

To run ETS from DOS, type **'run ets'**.

Special Keys

There are a number of special keys on the keyboard which are used in ETS:

ESC The escape key is located at the top left of the keyboard and is labelled '**Esc**'. It is used to escape from the current operation or menu and return to the previous menu.

RETURN The return or enter key is the large key at the right of the main group of keys on the keyboard - do not confuse it with the **BACKSPACE** key which is immediately above it or the **SHIFT** key which is immediately below it.

← ↑ ↓ → The four keys marked with arrows to the right of the main group of keys are known as the cursor keys. They are often used to select a value to be changed e.g. when testing console lights and buttons the current light is selected using the cursor keys.

PgUp/PgDn These keys are found in the block of six keys which is immediately above the cursor keys.

SPACE The space bar is the long bar at the bottom of the keyboard. It is used to toggle the visette backlights on or off. If the visette backlights are on the ETS display can be seen in the visette.

F1 - F12 Along the top of the keyboard are the function keys labelled **F1** to **F12**. Mini keyboards however contain only keys **F1** to **F10**. To access **F11** and **F12**, hold down key **Fn** and press **F1** for F11 or **F2** for F12.

General Principles

The ESC key is the universal 'quit' key, it will get you out of almost everything in ETS. The one exception to this is the main menu. Exiting from the main menu will exit the ETS program and is achieved by holding down the **SHIFT** key and pressing **ESC**.

If possible, ETS should be run with a monitor connected to the graphics output and a monitor connected to the system's VGA output. ETS output appears on the VGA screen and also on any monitors connected to the output of the graphics cards. Since the graphics cards are connected to the visette, the ETS output will appear in the visette if the visette backlights are turned on. SPACE can be used to toggle the visette backlights on and off.

The VGA output and the graphics output will usually be the same, however some ETS tests are specifically designed to test the graphics output (e.g. Test Visette, Tracker World) in which case the VGA output and graphics output will be different. If you only have monitors connected to the graphics output of your Virtuality VR system, you will not see the normal ETS text when one of these tests is run. Remember that you can always use ESC to quit from the current test.

ETS has two modes, basic and advanced. By default ETS starts up in basic mode. Basic mode contains the most useful tests; Advanced mode contains some extra tests which are rarely needed. Switching between basic and advanced modes is done by using the left and right arrow keys in the main menu. Any menu options which are not available in basic mode will be shown greyed out and without their selection function key.

Library Loading Screen

When ETS is run, the first screen that appears is the library loading screen. Details of each library are displayed as it is opened. Once ETS is running, this screen can be recalled using the 'Display library data' option from menu 2 (page 14).

Command Line Options

It is possible to run ETS without having to load up all of the libraries. Use the '/-' option to remove a library from the list of libraries to be opened and use '/+' to add a library to the list of libraries to be opened. Library codes are as follows:

m	MISC library	n	NET library
p	PIX library	c	CD library
t	TRK library	s	AWE library
❄	EXP library	f	CTRL library
*	All libraries		

/- and /+ options are interpreted from left to right. E.g. to open all libraries except the tracker library type: **run ets /-t**

To open just the MISC and CTRL libraries type: **run ets /-* /+mf**

On a Virtuality VR system, memory tests will be performed on the format, video and graphics cards following the library loading. Possible problems will be highlighted following each test.. These testscan also be selected from Menu 2.

ETS can be used to display the PCI cards that are currently installed in the system, without entering the main ETS menu. To run this test, use the '/pci' option, E.g type: *run ets /pci.* A screen will appear showing the cards that were detected, along with the slot number in which they reside. Press ESC to exit back to DOS. This test can also be selected from Menu 2, 'Display Hardware Data' within ETS.

MAIN MENU

The main menu is the first screen to be displayed after the libraries have been opened. It provides access to all of the main hardware test functions, and also access to menu 2. The following options are presented:

F1 Test tracker

F2 Test format hardware

F3 Test CD

F4 Test network

F5 Test visette

F6 Test sound

F7 Test gun recoil

F8 Test MPEG

F9 Menu 2

In the top right-hand corner of the screen is a mode indicator. By pressing the cursor left/right arrow keys, the mode can be changed from **Advanced** to **Basic**. In most instances, **Basic** will be the preferred mode as tests are simpler to use. In **Basic** mode, the Test Sound option (F6) will be disabled.

To exit from the main menu (and therefore from ETS), hold down the **SHIFT** key and press **ESC**.

Test tracker

Tracker menu

F1 Main sensor screen

F2 Jitter test

F3 Tracker world

F4 Display hemispheres

F5 Display offsets

F6 Display sensor map

F7 Display tracker hardware

F8 Caculate sensor offset

Main sensor screen

This screen displays the X, Y, Z positions and the azimuth, elevation and roll angles of each active sensor. Also shown are the distance of each sensor from the origin and an axis set (or targ) giving an indication of the orientation of the sensor.

F1	Toggle the display of the homogeneous transformation matrix for each sensor.
PgUp / PgDn	If more than four sensors are active, these keys can be used to select the sensors that are displayed.

Jitter Test

The jitter test is used to determine the amount of interference a particular sensor is experiencing. The sensor should be fixed in position, then the test started. As the test is being run, the maximum and minimum values of the 6 sensor parameters (X, Y, Z positions, azimuth, elevation and roll angles) are monitored and the range of values found is displayed. The greater the range, the more interference the sensor is experiencing. **NOTE:** it is advisable to run the jitter test with the Visette® backlights **ON**.

1) Basic version

F1 Start a 60 second jitter test.

RETURN Stop the test at any time. Can be used if any sensor shows excessive jitter.

PgUp/PgDn If more than four sensors are active, these keys can be used to select the sensors that are displayed.

2) Advanced version

F1 Start a 10 second jitter test.

F2 Start a 20 second jitter test.

F3 Start a 30 second jitter test.

F4 Start a 60 second jitter test.

RETURN Start an indefinitely long jitter test. Whilst any jitter test is in progress, **RETURN** can be used to stop the test.

PgUp / PgDn If more than four sensors are active, these keys can be used to select the sensors that are displayed.

Tracker World

Tracker world is a small grid lined world which tests out the head and hand tracking. The hand is represented by a small axis set (targ). It can be used to confirm that the tracker hardware is operating correctly. A display of the head and hand positions for each player is also given.

Display Hemispheres

Display the current hemisphere for each sensor. Active sensors are shown highlighted.

Display Offsets

Display the current world offset and sensor offset for each sensor. Active sensors are shown highlighted.

PgUp / PgDn Select the sensors to be displayed.

Display Sensor Map

Display the sensor map showing which physical sensors (hardware sensors) are mapped to which software sensor numbers. Active sensors are shown highlighted.

Display Tracker Hardware

Any Virtuality® system can have up to 32 tracker cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Display hardware data' menu.

PgUp / PgDn

Select the card to be displayed.

Caculate Sensor Offset

This option is not for general use. If necessary, instructions for its use can be obtained from Virtuality Ltd.

Test format hardware

Format test menu

F1	Console lights/buttons
F2	Sit down joysticks
F3	Stand up joysticks
F4	Flexor
F5	Sound volumes/switching
F6	Coinop
F7	Test Security
F8	Display format hardware
F9	Test registers

In basic mode, the tests available will depend on the system type e.g. the flexor test will only be available on an Elysium system. In advanced mode, all tests will be available.

Console Lights/Buttons

There are four buttons, each with a light mounted on the console. The state of each button is displayed, and the state of the lights can be changed using the following keys:

←↑↓→	Select the current light.
F1	Set the current light off.
F2	Set the current light on.
F3	Set the current light to flashing.

Joysticks

Sit down units are fitted with 1 joystick and 1 Tee shift. The SD joystick returns both X, Y position data and data from the two buttons. The T shift simulates a joystick moving in the Y direction only. It has two positions - forward and back. The Y values returned for these positions

correspond to those returned by a joystick in the fully forward or fully back positions respectively. The X value for the T shift should be ignored.

PgUP/PgDn	Select the players to be displayed.

A stand up joystick returns switch data and position and orientation data. The position and orientation data can also be tested from the tracker teest menu.

PgUP/PgDn	Select the players to be displayed.

Flexor

The V-flexor contains 3 buttons and 4 pressure pads. When the pressure pads are fully depressed, the bar should reach the green section.

Sound Volumes/Switching

←↑↓→	Select the current signal to change.
PgUp / PgDn	Select the player to view the sound settings for.
F1	Set full volume for the current signal (255).
F2	Set half volume for the current signal (128).
F3	Set zero volume for the current signal.
F4	Toggle a CD track - Press once to start playing the CD, and then again to stop. The longest audio CD track is played by default.
F5	Toggle an FX track - Press once to start playing an FX track, and then again to stop.
F6	Toggle a sound sample - Press once to play a sound sample, and again to stop.
F7	Toggle an MPEG track - Press once to play an MPEG track, and again to stop.

F8	Toggle MICNET 3&4 - Switches between Micnet and AV input for these two sound sources. If Micnet is selected, the VCR In and Camera Level sliders are greyed out and not selectable. If AV input is selected, the MICNET 3 and MICNET 4 Level sliders are greyed out.
+/-	Change the volume of a signal.

Coinop

The coinop test screen allows the credit system connected to each console to be tested.

↑↓	Select the current player.
RETURN	Remove a credit from the current player.

Test Security

The security feature on the SU2000 and SD2000 sysytems will sound an alarm if a visette or joystick is removed.

↑↓	Select the current player
F1	Start the siren for the current player.
F2	Stop the siren for the current player.
F3	Start the siren if the visette or joystick have been removed.

Display Format Hardware

Any Virtuality® system can have up to 32 format cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Display hardware data' menu.

PgUp / PgDn Select the card to be displayed.

Test Registers

This option is not for general use. If necessary, instructions for its use can be obtained from Virtuality Ltd.

TEST CD

The CD test screen displays details of the CD in the current drive and allows tracks from the CD to be played.

To aid testing, all audio signals except the CD signal are muted and the CD signal is switched to the external speakers. To test the mixing of sounds from several sources see the section on sound volumes and switching (page 9).

1) Basic Version

PgUp / PgDn Select the current drive.

F1 Set the CD output to full volume.

F2 Set the CD output to half volume.

F3 Set the CD output to zero volume.

F7 Pass the current track.

F8 Fail the current track.

+ – Change the CD volume.

RETURN Start the test.

2) **Advanced Version**

PgUp/PgDn	Select the current drive.
↑↓	Select the current track.
F1	Set the CD output to full volume.
F2	Set the CD output to half volume.
F3	Set the CD output to zero volume.
+	Increase the volume of the CD.
-	Decrease the volume of the CD.
RETURN	Play the current track.
F4	Stop playing the current track.
F5	Pause/ resume the current track.

Test network

Display Networked Machines

A list of all machines connected to the network and running ETS is displayed.

Echo Test

This test allows two way communication with all machines on the network to be tested. When a character is typed on the keyboard it is sent to all machines currently running ETS. These machines will then echo the character back to the testing machine where it will be displayed on the screen. Any lost or incorrect characters can be easily spotted. To clear the display, press **RETURN.**

NOTE: This test will only work if the same version of ETS is installed on all networked machines. The Version number can be seen in the top left hand corner of the ETS menu screen when ETS is running.

Display Network Hardware

Details of the network card attached to the desktop VR system will be displayed.

Test network communications

This test allows network communications to be tested by sending packets of data to all machines on the network. Received packets are tested with a known checksum to ensure data integrity.

Test Visette

This option will display a test bitmap in all visettes attached to the system, and allows the visette backlight brightness to be changed.

↑ ↓	Select the current player.
F1	Set full brightness for the current player (255).
F2	Set half brightness for the current player (128).
F3	Set zero brightness for the current player.
+ -	Change the visette brightness for the current player.

To decrease the possibility of the visette backlights burning out, they will only operate if a correct video signal is being supplied to the visette. If there is no video signal present, the visette brightness will also be zero and cannot be changed.

Test sound

Each player on a system has a set of sound hardware which allows sound samples for that player to be loaded and played. The sound hardware consists of a single Creative Labs AWE32 Sound Blaster Card.

To aid testing, all audio signals except the sound effects (FX) signal are muted, and the sound FX signal is switched to the external speakers. To test the mixing of sounds from several sources see the section on sound volumes and switching (page 9)

↑↓	Select the current sample.
PgUp / PgDn	Select the current sound card.
F1	Set the sound FX output to full volume.
F2	Set the sound FX output to half volume.
F3	Set the sound FX output to zero volume.
+	Increase the volume of the sound FX.
-	Decrease the volume of the sound FX.
F4	Load a sample to the sound card. A list of available samples is presented, use ↑ and ↓ to highlight the desired sample, then **RETURN** to load it. You are then given the option of making the sample repeat when it is played. Press **Y** (for yes) to make the sample repeat forever when it is played, press **N** (for no) to make the sample play through once and then stop. Note that this option only loads the sample onto the sound card, **F5** must be used to actually play the sample.
F5	Play the current sample.
F6	Stops all samples from playing. This is useful for stopping samples that repeat continuously.

Test gun recoil

This option allows the gun trigger buttons and recoil system to be tested. The status of the trigger and pull buttons, and the gun held sensor are displayed in the top half of the screen.

F1 Start recoil test. Press this key to test the gun recoil. Once the test is running, hold the gun and pull the trigger switch to activate the recoil. A recoil count is displayed on the screen.

F2 Stop recoil test. This selection becomes available when the test is running. Selecting it will stop the test and prevent any further recoils from being activated.

Test MPEG

This option allows the playback of MPEG files and live video feed to be visually confirmed and tested.

PgUp/PgDn Select the PIX channel to determine where MPEG or video input will be sent. PIX channels available will be determined by the configuration of the system.

F1 Play the currently loaded MPEG file. This option is greyed out and unselectable until an MPEG file is loaded using the F4 key. To stop an MPEG while it is playing, press the ESC key.

F2 Show Live Video from video input one. To exit the display, press the ESC key.

F3 Show Live Video from video input two. To exit the display, press the ESC key

F4 Load an MPEG file. A list of available MPEGs is presented; use the <up arrow> and <down arrow> keys to highlight the desired MPEG, then RETURN to load it. To play the MPEG, use the F1 key.

MENU 2

Display library data

This screen provides information about the libraries used by ETS to interface to the hardware. It is essentially the same as the screen that was displayed while ETS was loading (page 4). Each library is listed along with its version number and any errors that occurred while the library was being opened. Most of the libraries are used to interface to particular pieces of hardware as shown below:

MISC	This contains utility functions that are used by the other libraries.
EXP	This contains functions that are of specific to Experiences.
PIX	Graphics hardware.
TRK	Tracker hardware.
CTRL	Format hardware.
NET	Network hardware.
CD	CD hardware.
SND	AWE sound hardware.
MPEG	MPEG Hardware

By default, ETS tries to open all of the libraries when it is run, however it is possible to disable some of the libraries. This will also prohibit any testing of the associated hardware. See page 4.

Display hardware data

The tests available in this menu will list details about the hardware connected to the desktop VR system. A number of the options are also available from other ETS menus. E.g. the 'Display tracker hardware' option can also be found in the tracker test menu.

Display all Hardware

A summary of all of the hardware in the system is displayed. Each card listed in config.vpc is displayed with details of its IO address and memory address.

Display Tracker Hardware

A desktop VR system can have up to 32 tracker cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Tracker test' menu.

PgUp / PgDn Select the tracker card to be displayed.

Display Format Hard ware

Any Virtuality® system can have up to 32 format cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed.

This option is also found in the 'Test format hardware' menu.

Display Network Hardware

Details of the network card attached to the Virtuality® system will be displayed.

Display Sound Hardware

PgUp / PgDn Select the card to be displayed.

Display PCI Slot Configuration

This option is used to display alist of the PCI cards that are currently installed in the system, along with slot numbers in which they reside.

View configuration file

This option allows you to view the configuration file but not change it. It is useful for checking the contents of the configuration file if a library does not appear to be opening the correct hardware.

←↑↓→ Move around the file one line at a time.

PgUp / PgDn Move around the file a page at a time.

View configuration file errors

Any errors found in the configuration file are logged when the libraries are first opened. This option allows you to view that error log.

↑↓ Scroll through the errors.

FAULT-FINDING PROCEDURES

WARNING

THE VIRTUALITY® SYSTEM **MUST** BE SWITCHED OFF BEFORE ANY HARDWARE ADJUSTMENTS ARE MADE AND ANTI-STATIC PRECAUTIONS MUST BE TAKEN.

Check that:

- all cards are firmly plugged in (unplug and reconnect them to be sure).
- all connections are secure (disconnect and reconnect them to be sure).
- all jumpers on the cards are set correctly.

If the problem only occurs with an experience and disappears when ETS is run, try re-installing the experience.

If the problem is on a two player system, does the problem occur for both players ? If not, try swapping hardware from the good player with hardware from the bad player to isolate the fault.
NOTE: If you swap over PCBs in the PC, remember to change jumper settings as necessary.

Format Card
In order for the software to recognise that a MMC card is present, it must be plugged in to its associated MMD card and the MMD must be switched on.

If the visette® backlights are not working, check that the video signal is connected. The backlights will not operate unless the LCDs are receiving a correct video signal. **The Visette® MUST not be unplugged whilst the system is switched on.**

If a CD error message is displayed as the desktop VR system is starting up, check that the ribbon cable connecting the format card to the CD drive is connected the right way round at the format card end.

Troubleshooting Guide

For further information, please refer to the Virtuality Troubleshooting Guide supplied with the Virtuality VR system.

Index

B
backlights, 3, 4, 6, 14, 20
C
Calculate sensor offset, 8
CD, 12
Coinop, 11
Command line options, 4
configuration file
errors, 19
viewing, 19
connections, 18
Console lights / buttons, 9
Contents, 1
cursor keys, 3

D
Display all hardware, 17
Display format hardware, 18
Display hardware data, 17
Display hemispheres, 8
Display library data, 17
Display network hardware, 13, 18
Display networked machines, 13
Display offsets, 7
Display sensor map, 8
Display sound hardware, 18
Display tracker hardware, 8, 18

E
Echo test, 13
ESC, 3

F
Format, 9
format card, 18
troubleshooting, 20
format hardware, 11
function keys, 3

G
General points, 20
General Principles, 3

H
hardware sensor, 8

I
Index, 21
Introduction, 3

J
Jitter test, 6
Joysticks, 9
jumpers, 20

L
LCD, 20
Library loading screen, 4

M
main menu, 5
MPEG, 16

N
network, 13

P
PgDn, 3, 15, 16
PgUp, 3

R
RETURN, 3
Running ETS, 3

S
sensor offset, 8
software sensor, 8
Sound volumes / switching, 10

Index

SP, 3
SPACE, 3
Special Keys, 3
Supervisory Program, 3

T
Test registers, 11
Test sound, 15
Tracker, 7
Tracker world, 7
troubleshooting, 20
    format card, 20
    general points, 20
    Visette®, 20
troubleshooting Guide, 20

V
VGA, 3
video signal, 20
visette, 14, 20
    troubleshooting, 20

SECTION 9
APPENDIX

PAGE

9.1 System Files

9.3 CMOS Set-up Settings

9.6 Emission Test Certificate

SYSTEM FILES

The system needs a number of files to be installed in the root directory of the hard disk in order for the software to run correctly. The following list show the correct data for these files.

CONFIG.SYS

```
DEVICE=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=C800-CBFF X=E000-E0FF
DOS=HIGH
COUNTRY=044,,C:\DOS\COUNTRY.SYS
DEVICE=C:\DOS\DISPLAY.SYS CON=(EGA,,1)
[COMMON]
LASTDRIVE=Z
DEVICE=C:\cd\idecd.SYS /D:IDECD01
STACKS=9,256
DEVICE=C:\PLUGPLAY\DRIVERS\DOS\DWCFGMG.SYS
FILES=140
```

AUTOEXEC.BAT

```
C:\SB16\DIAGNOSE /S
SET SOUND=C:\SB16
SET BLASTER=A220 I7 D0 H5 P300 E620 T6
SET MIDI=SYNTH:1 MAP:E MODE:0
C:\SB16\AWEUTIL /S
C:\SB16\MIXERSET /P /Q
C:\DOS\MSCDEX.EXE /D:IDECD01 /M:10 /L:F
@ECHO OFF
PROMPT $p$g
PATH C:\DOS;c:\pci;c:\utils;
SET TEMP=C:\DOS
KEYB UK,,C:\DOS\KEYBOARD.SYS
@CALL C:\PCI\SET2000
SET DIRCMD=/ogn
LH DOSKEY /insert

set dos4g=quiet

if not exist c:\vpctemp\nul     mkdir c:\vpctemp
set vpctemp=c:\vpctemp
del c:\vpctemp < y

if exist c:\vpcexec.bat         call c:\vpcexec

vpcgo
```

CONFIG.VPC

```
; VPC Hardware configuration file - 2000E SYSTEM
; Last updated 17th May 1996
; $Revision: $

[TRK]
     CONSOLE_TYPE   SU

     SENSOR1
          SENSOR_OFFSET   -29 95 -236 2 -62 88

     SENSOR2
;    space joystick
;          SENSOR_OFFSET   73 18 -4 -175 28 176
;    gun
          SENSOR_OFFSET   73 18 -4 -171 -47 98

     TRACKER1
          INSIDETRAK
          IO_ADDRESS     0x270
          SENSOR_MAP     12..

[PIX]
     videobus1
          pix1

[CTRL]
     FORMAT1
          MMC
          MMD
          MEM_ADDRESS    0x000
          IO_ADDRESS     0x320
          VISETTE_MONO

[CD]

     cd1
          MSCDEX

[MPEG]
     FORMAT1
          irq          10
          channel1     pix1.A pix1.B
```

OLIN ENHANCED IDE BIOS SETTINGS

When checking or setting up systems, and optimising for maximum speed, using the PIA-645 series card with AWARD software, use the following settings;

Standard CMOS Settings:

Date (mm:dd:yy) : Wed, Apr 24 1996
Time (hh:mm:ss) : 11 : 45 : 49

HARD DISKS	TYPE	SIZE	CYLS	HEAD	PRECOMP	LANDZ	SECTOR	MODS
Primary Master :	*THIS LINE SET USING AUTO-DETECT SOFTWARE OPTION*							
Primary Slave :	None	0	0	0	0	0	0	-------
Secondary Master :	None	0	0	0	0	0	0	-------
Secondary Slave :	None	0	0	0	0	0	0	-------

Drive A : 1.44M, 3.5 in
Drive B : None

Video : EGA/VGA
Halt on : No Errors

Base Memory:	640K
Extended Memory:	7168K
Other Memory:	384K
Total Memory:	8192K

Advanced CMOS Settings

Virus Warning	: Disabled	Video BIOS Shadow	: Enabled
CPU Internal Cache	: Enabled	C8000-CBFFF Shadow	: Disabled
External Cache	: Enabled	CC000-CFFFF Shadow	: Enabled
Quick Power on Self Test	: Disabled	D0000-D3FFF Shadow	: Disabled
Boot Sequence	: C,A	D4000-D7FFF Shadow	: Disabled
Swap Floppy Drive	: Disabled	D8000-DBFFF Shadow	: Disabled
Boot Up Floppy Seek	: Disabled	DC000-DFFFF Shadow	: Disabled
Boot Up NumLock Status	: On		
Boot Up System Speed	: High		
Gate A20 Option	: Normal		
Typematic Rate Setting	: Disabled		
Typematic Rate (Chars/Sec)	: 30		
Typematic Delay (Msec)	: 250		
Security Option	: Setup		
IDE Second Channel Control	: Enabled		