VIRTUALITY

WARNING

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

SYSTEM 2000

FIRST EDITION

January 1994

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LICENSES AND TRADEMARKS

CONTENTS

SYSTEM 2000

CONTENTS

SYSTEM 2000

VIRTUALITY©

SYSTEM 2000

VIRTUALITY®

The SU 2000 is a second generation Virtual Reality console from Virtuality Entertainment Ltd, providing a single player VR Experience in a standing position.

The SU 2000 system has a smaller footprint, improved graphics capabilities and software, and a new lightweight Visette®.

The Visette® marks a significant step forward in Head Mounted Display technology, featuring much reduced weight and comfort, improved optical performance with adjustable focus. The Visette® also features motorised inter-ocular adjustment to ensure perfect optical alignment. It is plug compatible with all other System 2000 consoles for quick replacement and interchangeability.

The SU 2000 is designed to operate either as a single player console or as two linked consoles offering the choice of single player or two player interactive modes. The two player system is supplied as a master and slave unit (only the master console contains the Modulo PC and the Experience software). In this form, the system is also capable of running as two independent single player consoles, providing both machines are running the same Experience.

The SU 2000 comprises five major component groups:

        1.   The SU 2000 Console
        2.   The Visette 2 HMD Visor
        3.   The Space Joystick 2000
        4.   The Credit Module
        5.   The Modulo PC Computer System

These will be dealt with in separate sections within this manual.

SYSTEM OVERVIEW **VR**

WEIGHT:	130Kgms (single player unit)
	105Kgms (slave unit)
FOOTPRINT:	1200mm x 1450mm (single unit)
	3960mm x 1200mm (master and slave)
HEIGHT:	1340mm (1590 includingVisette® 2000)

ELECTRICAL:

Total Power Consumption:	600W	(master)
	60W	(slave)
	500W	(single)
Voltage:	220V to 240V	
	or 110V (switchable)	

ACCESS:	Optional step, lift up gate
TEMPERATURE RANGE:	10° to 35°C
HUMDITY RANGE:	0% to 85%
AGE RANGE:	10 years upwards
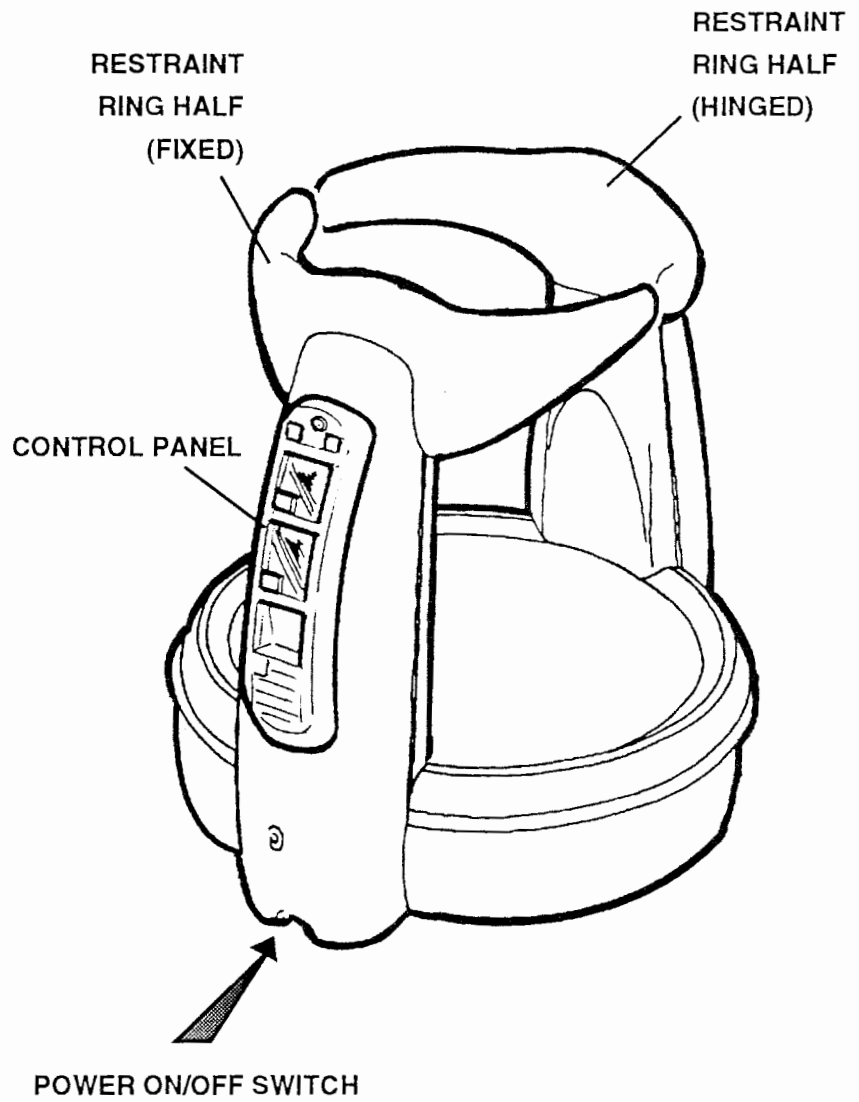
SYSTEM OVERVIEW

SYSTEM 2000

VIRTUALITY®

RESTRAINT
RING HALF
(FIXED)

RESTRAINT
RING HALF
(HINGED)

CONTROL PANEL

POWER ON/OFF SWITCH

SU 2000 CONTROLS
Fig. 1.2.1

SYSTEM OVERVIEW

VR

VIRTUALITY®

VR

SYSTEM 2000

The controls for the SU 2000 are located in the following areas:

A.   FRONT CONTROL PANEL (see Fig. 2.1.1)

FEATURE	FUNCTION
1. Power On Lamp (red)	Indicates power to machine
2. Solo Play Button (green)	Starts game
3. Link Up Start Button (yellow)	Link-up dual game play (to second machine)
4. Game A Lamp (blue)	Shows game A in use
5. Game B Lamp (orange)	Shows game B in use (if installed)
6. Card Reader or V- Key Reader	Enables player credits

Fig. 2.1.1

CONTROLS
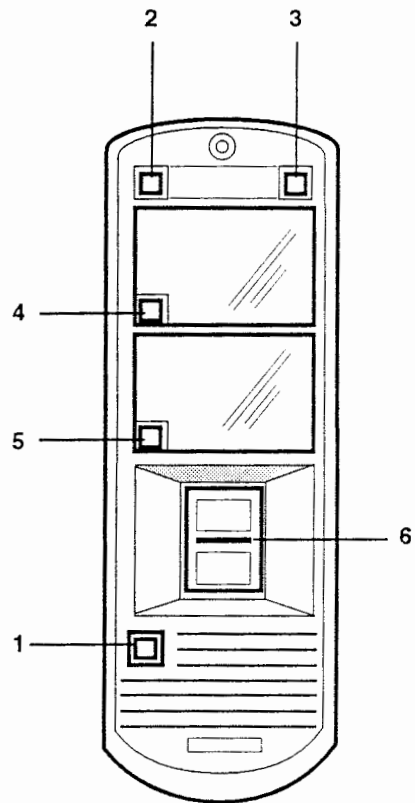
1

B.   VISETTE® (see Fig.)

7. User Head Size Adjustment Knob	Tightens/releases the visor headband to achieve a perfect fit.
8. Inter-occular Adjuster Switch	Rocker type switch to activate motorised adjustment of distance between lenses to suit user's eye spacing.
9. Focus Adjusters	Rotary controls to adjust the left and right focus of the lenses to suit user's with prescriptions.
10. Headphone Adjustment	Turn to rotate position of the headphones to obtain the best audio performance.

Fig. 2.2.1

CONTROLS
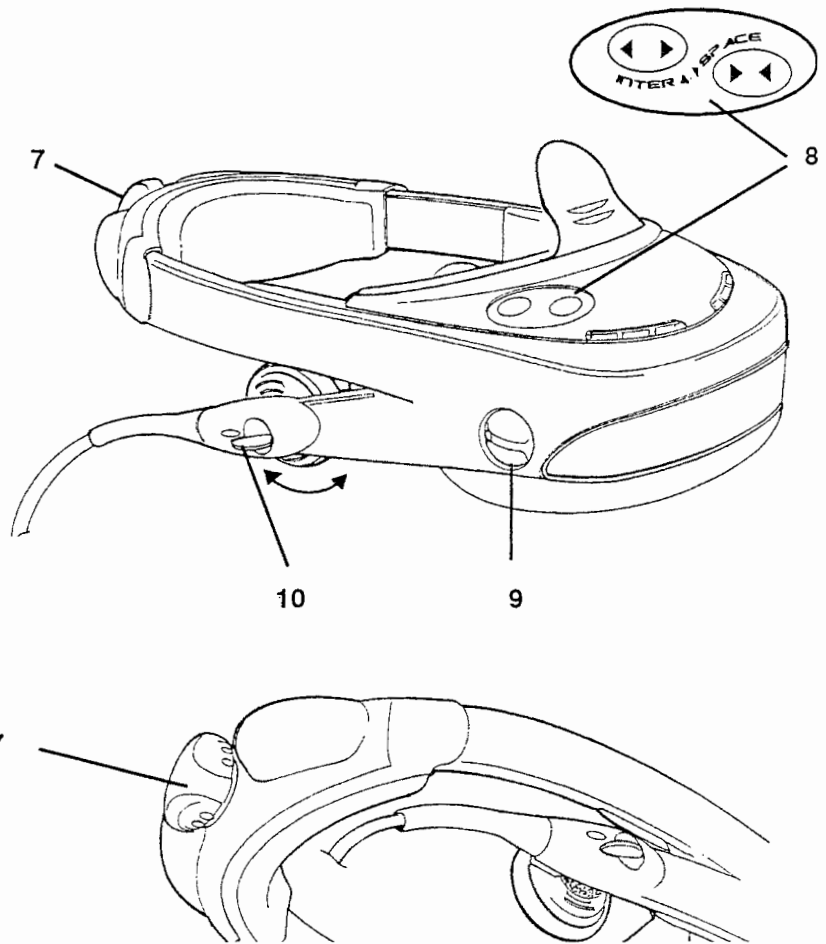
C.   JOYSTICK (see Fig. 2.3.1)

9. Top Button	Depress to move of the player in the direction he is facing with the Visette®.
10. Trigger Button	Used for hand activated functions (dependent on the game selected). i.e. guntrigger, projectile launch or magnetic type pick up action.

CABLE
PROTECTION
GLAND

SOFT HAND
PROTECTOR

LOOM CONNECTION
ACCESS PLATE
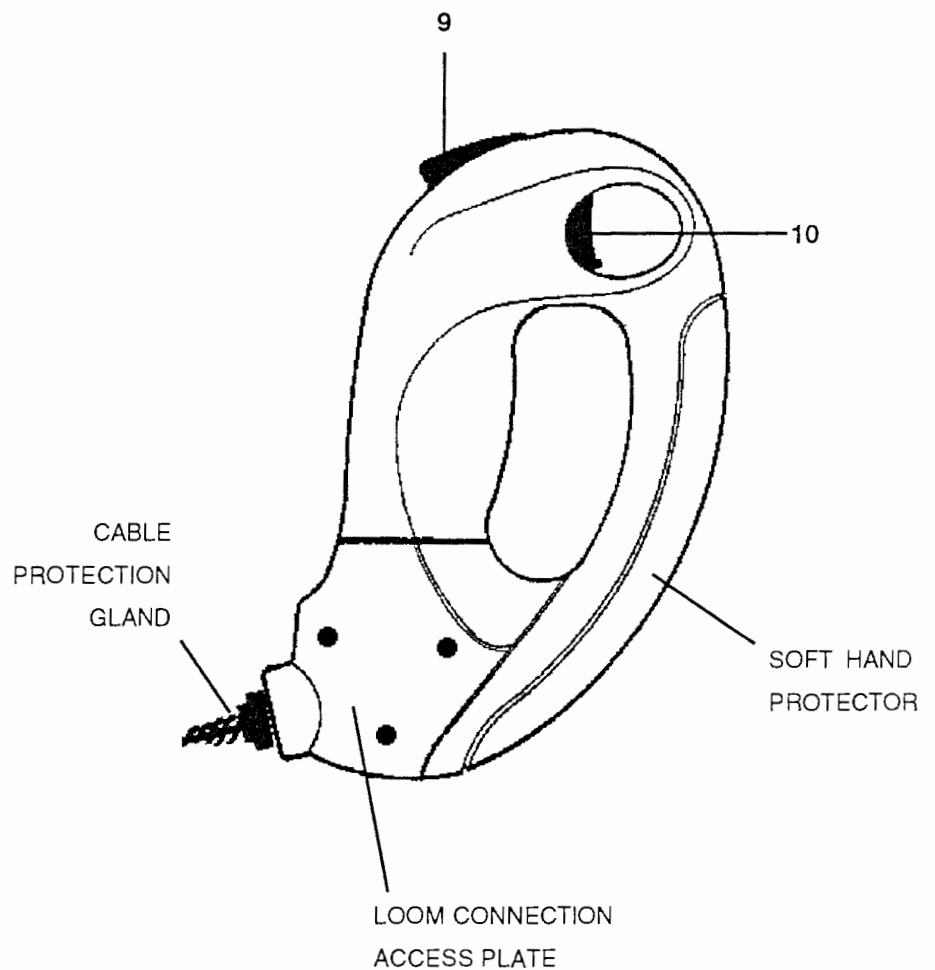
Fig. 2.3.1

CONTROLS

The following controls are located in the Credit Module and are accessed by removing the front control panel with the special key provided: (see Fig. 2.4.1)

VOLUME CONTROL

Sets the volume level for the external speaker

NOTE: The headphone volume level is software controlled

VISETTE® BRIGHTNESS
LEFT AND RIGHT

Sets the brightness level in the left and right Visette® monitors

VOLUME
CONTROL

VISETTE®
BRIGHTNESS L & R

Fig. 2.4.1

CONTROLS

SECTION 3   **PAGE**

Switching on the machine

The SU 2000 is supplied with a mains lead terminating in a standard mains plug. To power up the machine, first make sure it there is power from the mains and switch on the POWER ON/OFF switch under the control console side panel (see Fig. 3.1.1). All startup functions run automatically and after approximately 4 minutes the attract mode music will begin to play. The machine is now in stand-by mode, ready to accept credit from the first player.

Switching off the machine

To power down the machine, simply switch off at the POWER ON/OFF switch under the control console panel and disconnect the power at the mains.

NOTE: for two player systems, both machines are power switched in unison.

Audible warning security device

Each CS 2000 is fitted with an audible warning security device. This is activated whenever the machine is switched on and the Visette® or the joystick are disconnected from the console. To silence the warning device, the connector on the lead of the joystick or Visette® must be plugged back in to it's correct socket. **IT IS IMPORTANT NOT TO CONNECT OR DISCONNECT THE VISETTE® WITH THE POWER ON.** If the cable has been severed, the machine should be powered down and the joystick/Visette® assembly will need to be either repaired or replaced before the machine can be operated again.

SIDE PANEL
(control panel side)

ON/OFF SWITCH SITUATED HERE

Fig. 3.1.1

1

OPERATING INSTRUCTIONS

SYSTEM 2000

VIRTUALITY®

The sequence for operating the SU 2000 in a single player mode is as follows:

1. The player is credited either by inserting a Vituality® V-Card (magnetic credit card) into the the card reader slot on the front control panel (see Fig. 2.1.1), or by inserting a 'V-KEY' into the appropriate slot on the control panel (see Fig.2.1.1) – depending on which credit option is fitted to the machine. For further details, see CREDIT SYSTEMS.

2. The player or operator should now press the green SOLO PLAY button (2) on the front control panel.

3. The player lifts up the gas assisted pivoting restraint ring half to it's vertical stop position, steps into the console, and lowers the restraint to the horizontal stop position.

4. The player then takes the Visette® from it's stowage point, releases the rear knob, places it on his or her head as shown (see Fig. 2.2.1), and adjusts it to fit using the rotating knob at the rear of the visor.

5. The player can then adjust the inter-occular distance if required, using the the rocker switch at the front right of the Visette® (see Fig. 2.2.1).

6. Focus can be adjusted using the two rotating dials on either side of the Visette® (see Fig. 2.2.1), until the optimum picture sharpness is obtained for each eye. A focus screen image is provided at the start of each Experience for this purpose.

7. The player should now remove the joystick from it's holster at the front of the console (see Fig.1.2.1), and is now ready to play the Experience.

8. The Experience will now begin as soon as the player presses either joystick button.

9. After the Experience has finished, the joystick should be returned to it's holster and the Visette® removed and placed in it's location ready for the next player.

10. Lifting the hinged ring half, the player can now step out and exit the console.

OPERATING INSTRUCTIONS   VR
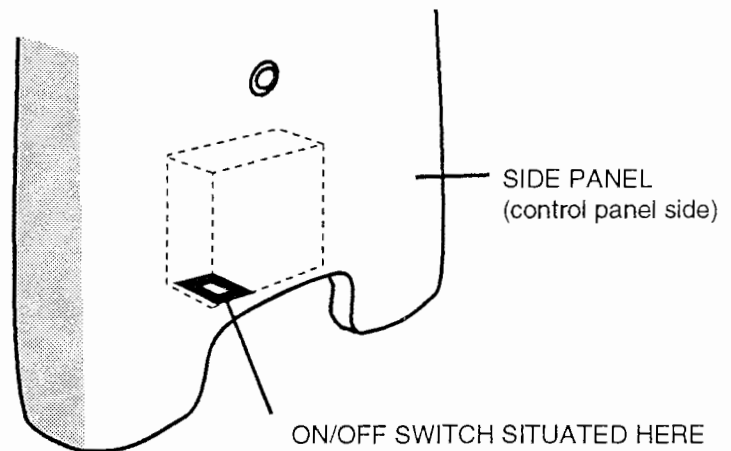
The sequence for operating the SU 2000 in a two player mode is as follows:

1. The players are credited either by inserting a credit card into the the card reader slot on the front control panel (see Fig. 2.1.1), or by inserting a 'V-KEY' into the appropriate slot on the control panel of either machine (see Fig. 2.1.1) -- depending on which credit option is fitted to the machines.

2. The players enter the consoles, put on the Visettes® and pick up the joysticks (see single player mode for a full description).

3. The operator or one of the players should now press the yellow LINK UP button (3) on either front control panel to select a two player interactive game. **Note:** If the green SOLO PLAY Button is pressed, then both players will play a single player game against the computer.

4. Both players should now adjust their Visettes® for comfort and focus – see Single Player Instructions.

5. The Experience begins for each player when he or she has pressed either joystick button. After the first player has begun to play, the second player has approximately 20 seconds to press his or her button, after which time the game will begin automatically for this player, regardless of whether or he or she has pressed the joystick button.

6. After the Experience has finished, the joysticks should be returned to their holsters and the Visettes® removed and placed in their location ready for the next players.

7. Lifting the hinged ring halves, the players can now leave the consoles.

OPERATING INSTRUCTIONS

SYSTEM 2000

To load a new experience on the SU 2000 machine or to change from one game to another, follow the instructions below using the Smart Disk and Compact Disk supplied with each software package.

1.   Switch on the computer.

2.   Open the CD ROM drawer by pressing gently on the front panel until it clicks to unlatch the drive. Pull the drawer forward to it's fullest extent (do not use excessive force) and open by grasping both sides of the top cover and lifting so that it pivots upwards.

3.   Remove the existing CD and repace it with the new CD. NOTE: CD ROM Disks should be inserted with the playing surface underneath i.e. with the label side face up.

3.   Close the the top cover and push the drawer back in to the drive bay until it latches with a click.

4.   Insert the Smart Disk into the floppy disk drive.

5.   There will now be short delay while the new Experience is selected.

The SU 2000 is now ready to run the selected software package and will remember this each time it is switched off until a new experience is selected using the procedure described above.

The operation of each software is different and detailed instructions are provided with each software package. It is recommended that the software manual provided be read and understood by all operators and attendants, prior to operating the software for public use.

Installing new software

The SU 2000 console is capable of holding multiple software packages on the internal hard drive. Installation of new software is achieved by using the floppy disk drive and CD ROM drive on the front of the computer. For detailed instructions on installing the new software, please refer to the manual supplied with the software package.

OPERATING INSTRUCTIONS

SYSTEM 2000

It is recommended that all software packages are stored in a safe place to prevent loss or damage to the CD and Smart Disk as the software will not run without the the CD having the correct serial number.

Whenever a software package is not in use, it is recommended that the CD and Smart Disk be returned immediately to the box and folder provided.

NOTE: Do NOT store the package near any source of electromagnetic radiation (e.g. TV monitors, Loudspeakers, etc.) as this will damage the information on the Smart Disk.

OPERATING INSTRUCTIONS

Access to the front of the Expality® computer is via one of the bottom side panels (depending on site conditions – see Fig. 3.5.1). The panel can be removed by inserting the special key provided into each of the securing locks, turning anti-clockwise to release the securing latch and lifting the panel clear of the supporting framework. The front panel of the computer is now revealed and the floppy disk disk drive and CD ROM player are visible behind a hinged, drop-down perspex flap. Insert the special key to unlock and open the flap to gain access to these components.

PANEL ACCESS KEY
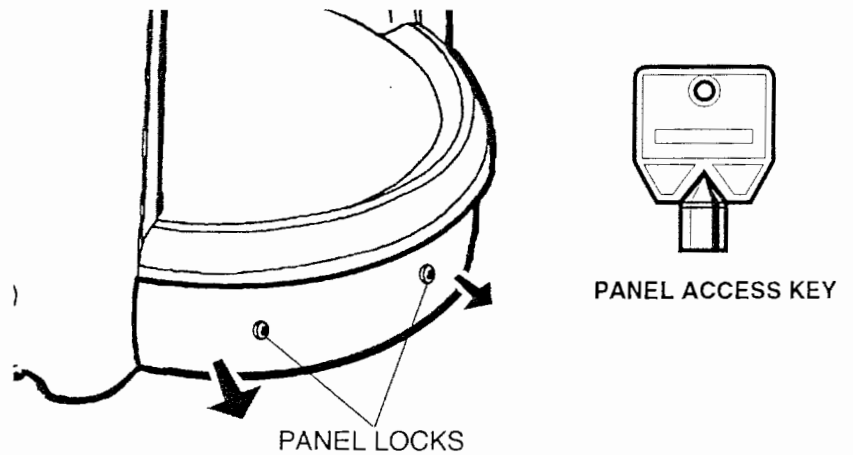
PANEL LOCKS

Fig. 3.5.1

To replace the panel, offer it up to the machine, making sure the bottom of the panel is located on the special locating flanges of the framework (see Fig. 3.5.2), insert the special key into each of the locks, and turn clockwise to tighten and fasten the panel in position.

BASE FRAME

LOCATING FLANGES FOR GRP PANELS

Fig. 3.5.2

OPERATING INSTRUCTIONS

SYSTEM 2000
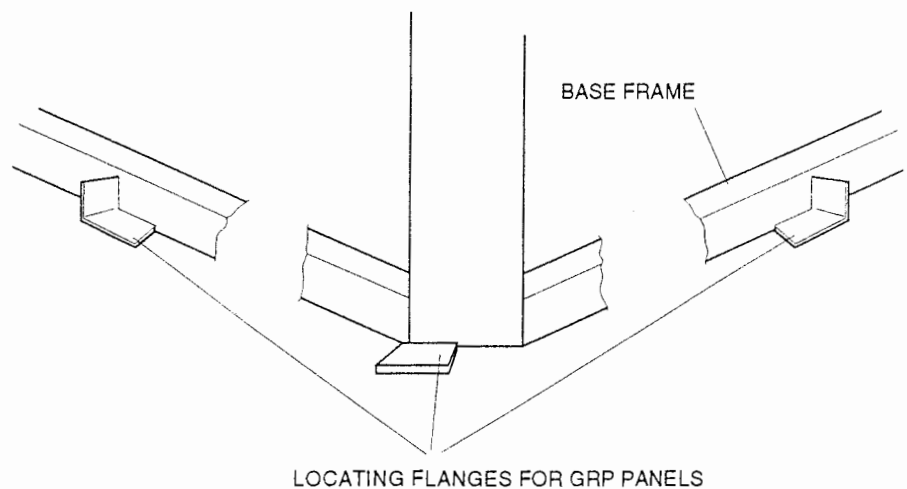
The owner or controller of the equipment should ensure that all the operators and attendants have received suitable training to ensure the maximum enjoyment and safety of all users.

The minimum training should include the following:

❏   Installation and transportation requirements.

❏   Correct method of hardware and software installation.

❏   Daily inspection list.

❏   Regular inspection and equipment cleaning.

❏   User limitations and the medical disclaimer notice.

❏   Emergency evacuation procedures.

❏   Procedures in the event of user illness.

❏   The correct use of fire fighting equipment.

❏   Service and maintenance procedures.

❏   Reporting of any faults or equipment damage immediately.

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OPERATING INSTRUCTIONS

SYSTEM 2000

SECTION 4   PAGE

SYSTEM 2000

VIRTUALITX

INSTALLATION SPECIFICATIONS

Power consumption	500W Max.
Temperature	10° to 35°C
Humidity	0% to 85%
Voltage	220V to 240V or 110V (switchable)
Footprint	1450mm x 1200mm (single machine)
	3960mm x 1200mm (twin player set up)
Console height	1340mm
Maximum height	1590mm (including Visette® 2000)
Weight	130 kg (single unit)
	105kg (slave unit)

Initial inspection

A thorough inspection of the equipment should be carried out before the machine is powered up. The console should be carefully examined for cracks or other damage. The machine is normally packed for shipping intact with just the mains lead, Visette® and joystick disconnected and packed separately. To reconnect these items, see page 5 of this section. In the case of a machine that has been stripped down further for shipping, i.e. with the side pillars, credit module and all panels removed, please refer to the separate assembly instructions supplied with the machine.

Location of equipment

The SU 2000 console requires approximately 2 metres square of solid flat surface for safe operation. This area must be clean and dry with a recommended ceiling height of at least 3 metres to enable correct operation of the tracker system. If the ceiling contains large areas of metal, a ceiling height of at least 4 metres is recommended to avoid tracker interference.

The console should not be stored or operated out of doors unless there is sufficient weather protection to prevent the ingress of water from rain or condensation into any part of the console. The console should not be located in direct sunlight as this could cause overheating of the Visette® and Modulo PC computer resulting in damage to the internal components.

1

INSTALLATION VR

To prevent interference of the tracker system by external equipment, ensure that a radius of 2 metres around the console does not contain large metal objects or equipment emitting electromagnetic radiation (e.g. monitors, lighting equipment, large speakers etc.) Closer positioning of equipment may result in impairment of the tracker system performance, with subsequent distortion to the graphics depicting the virtual world.

If other Virtuality® equipment is being used, ensure that they are located at least 1.3m apart to prevent interference of the tracker systems.

Electrical

It is recommended that the SU 2000 console be connected to an electrical supply with sufficiently sensitive overload current protection, and an earth loop impedance sufficiently low, that the supply will be disconnected in the event of a short circuit or an earth fault within the equipment.

Clearance

Adequate clearance should be provided and maintained in the immediate vicinity of the device. The proximity to other fixed or mobile structures and services should be considered and it is recommended that there should be a space of at least 1.1 metres between fixed parts of adjacent devices if members of the public are allowed access between them.

Access and egress

The routes forming access to or egress from the Virtuality® SU 2000 should be kept clear of obstruction at all times when members of the public are permitted to be present and the layout arrangements should ensure, so far as is reasonably practicable, that there is an easy and prompt access to a means of escape.

INSTALLATION

If two consoles are supplied as a two player system, they will be as a MASTER console containing the Modulo PC computer system and a SLAVE unit as the second console (see Fig. 4.6.1). The dimensions for this system are as follows:-

Maximum height	1400mm (including joystick)
Footprint	3960mm x 1200mm

The two units are joined just above floor level by a rigid, totally enclosed cable duct. This provides safe routing for the various cabling required and maintains a minimum operating distance for the two units.

FIG. 4.6.1

INSTALLATION
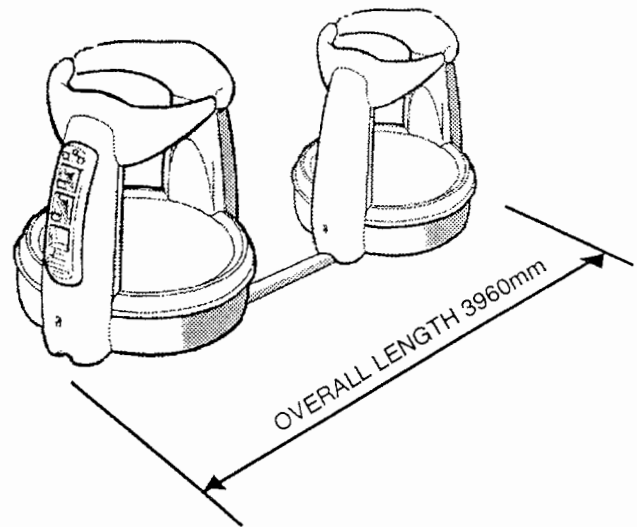
Moving the Console

The SU 2000 console is fitted with adjustable feet for levelling the machine and care should be taken not to damage these when moving the console. Before moving the SU 2000, it is recommended that the Visette® and Joystick be removed or secured to the machine to prevent damage.

The internal components of the SU2000 console are sensitive to high levels of vibration and shock, so care must be always taken when moving and transporting the console.

Transportation

Prior to any transportation ensure that :

- All external access panels are secured.
- All external cables and connectors are removed.
- Check that the lid on the modulo PC computer is secured.
- Remove the CD from the CD ROM drive.
- The Visette® and Space Joystick should be removed from their holders, packed and secured to prevent damage from vibration and movement during transporting.

Prior to connecting power and operating the SU 2000 console after any transportation, it is recommended that all the connectors on the back of the Modulo PC computer and the console should be checked to ensure they are connected correctly. The console, Visette®, Space Joystick and connecting cabling should be inspected for any damage that may effect the safe operation of the Virtuality® SU 2000 console.

Any fault or damage should be reported immediately to enable repairs or adjustments to be made prior to any public use, If repairs or further adjustments are required contact the authorised service agent or your local authorised service agent by phone or fax using the fault report form which may be freely copied.

INSTALLATION **VR**

Assembly

The following instructions represent the assembly procedure for a system packed in it's most complete form requiring only the mains lead, joystick and Visette® to be connected. If for any reason the unit(s) has been stripped down and flat-packed, please refer to the separate comprehensive assembly instructions supplied with the machine.

Each SU 2000 single player machine should comprise the following components:

> 1 SU 2000 console
> 1 Visette® 2000 HMD visor
> 1 Space joystick 2000
> 1 mains power lead

Please check to ensure these components are present and inform Virtuality Entertainment Ltd if any are missing or damaged.

Connecting the joystick

To connect the joystick:

1. Using the special key provided, undo the two panel locks and remove the outer GRP pillar from the joystick pillar assembly (the pillar with the lift-up ring-half).

2. Lift up the ring-half to access and remove the cable clamp cover – held in place by 2 screws.

3. Loosen the 2 bolts and slacken off the cable clamp bar.

4. Feed the joystick cable through the clamp bar and connect the plug on the end of the joystick cable into the socket in the pillar assembly.

5. Tighten the cable clamp bar to grip the joystick cable.

6. Replace the cable clamp cover and tighten the retaining bolts.

7. Return the ring-half to it's horizontal position and replace the side pillar outer GRP panel and lock into position.

Connecting the Visette®

IMPORTANT: DO NOT CONNECT OR DISCONNECT THE VISETTE® WITH THE POWER ON.

To connect the Visette®:

1. Using the special key provided, undo the two panel locks and remove the outer GRP pillar from the joystick pillar assembly (the pillar with the lift-up ring-half).

INSTALLATION **VR**

2.   Remove the locating bolt in the ring-half hinge mechanism (see Fig. 4.8.1), and lift the ring-half into the vertical position. Remove the cable bar cover (held in place by 2 screws).

3.   Loosen the 2 bolts and slacken off the cable clamp bar.

4.   Feed the Visette® cable through the clamp bar and connect the socket on the end of the Visette® cable into the plug in the pillar assembly.

5.   Tighten the cable clamp bar to grip the cable.

6.   Replace the cable clamp cover and tighten the retaining bolts.

7.   Lower the ring-half into the horizontal position and replace the locating bolt and nut.

8.   Replace the side pillar outer GRP panel and lock into position.

Fig. 4.8.1
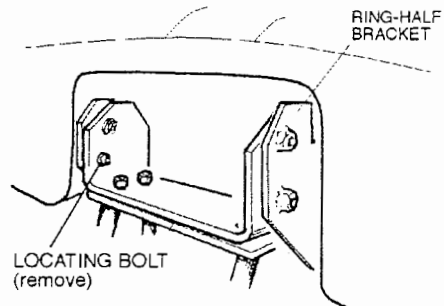
Connecting the mains lead

Connect the mains lead to the main power supply unit situated below the credit module on the side pillar containing the control panel. The lead plugs in on the bottom of the PSU, next to the ON/OFF switch See fig. 4.8.2. The machine is now ready to be switched on - see Section 2 *CONTROLS* and Section 3 *OPERATING INSTRUCTIONS*.
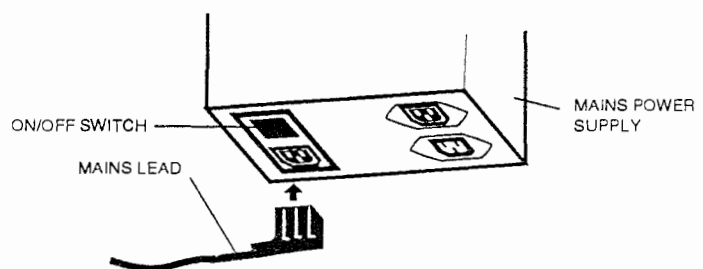
Fig. 4.8.2

INSTALLATION

In the case of a twin console master and slave set up, the enclosed cable duct will need to be fitted;

1   Place the two consoles in position with both control panel sides facing away from each other and with a distance of 1060mm between them as shown.

2   Attach the bottom part of the duct to the bottom flange of the side frames (See Fig. 4.8.3) and secure with the bolts provided.

3   After all cables are connected and correctly routed, the top part of the cable duct can be attached as shown by pressing down into position.

Fig. 4.8.3

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INSTALLATION

SYSTEM 2000

VIRTUALITY®

LEFT SIDE PANEL

- V-KEY READER INPUT
- VISETTE® TRACKER
- JOYSTICK TRACKER
- FORMAT C CONNECTOR
- TO TRACKER BOARD
- TO TRACKER SOURCE
- POWER IN

SLAVE MACHINE

REAR PANEL

- VISETTE CONNECTOR
- JOYSTICK CONNECTOR

RIGHT SIDE PANEL

- DIGICARD READER INPUT
- CONNECTOR FOR CONTROL PANEL BUTTONS ETC.
- JOYSTICK PORTS L & R (SD MACHINES ONLY)
- AUDIO MUTE JACK PLUG SOCKET
- OUTPUT TO EXTERNAL COMPOSITE MONITOR

FORMAT D CONNECTIONS

INSTALLATION   VR

SYSTEM 2000

The rear panel of the Modulo PC has the following input output connections:-

A   **Mains Power Lead**

B   **Power Lead** – computer to monitor

C   **9-way D-type Socket** – video card

D   **9-way D-type Socket** – video card

E   **BNC Video Socket 50 ohms** – network card

F   **9-way D-type Socket** – VGA card

G   **Keyboard Socket** (Either – depending on computer motherboard type)

H   **25-way D-type Socket** – Format C card; player 1

I   **25-way D-type Socket** – Format C card; player 2 (if applicable)

J   **8-Way Mini-din socket** – Format C card; player 1

K   **8-Way Mini-din socket** – Format C card; player 2 (if applicable)

L   **Stereo Jack Plug** – not normally connected

M   **6-way Mini-din Socket** – Tracker Card; player 1

N   **6-way Mini-din Socket** – Tracker Card; player 1

O   **6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)

P   **6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)

Q   **9-way D-type Socket** – Tracker Card; player 1

R   **9-way D-type Socket** – Tracker Card; player 2 (if applicable)

9

INSTALLATION

SYSTEM 2000

The Distribution Box is situated on the base frame of a master or single player console and has the following input and output connections:
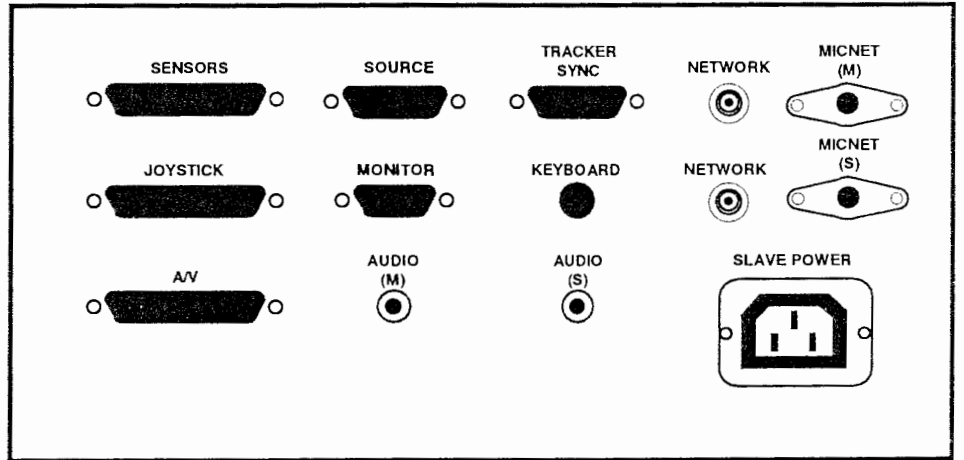
```
┌─────────────────────────────────────────────────────────────┐
│                                          TRACKER              MICNET │
│         SENSORS          SOURCE           SYNC    NETWORK      (M)    │
│      o ▭▭▭▭ o     o ▭▭ o     o ▭▭ o      ◎     ◁ ● ▷ │
│                                                               MICNET │
│         JOYSTICK         MONITOR        KEYBOARD  NETWORK      (S)    │
│      o ▭▭▭ o     o ▭▭ o      ●          ◎     ◁ ● ▷ │
│                           AUDIO          AUDIO   SLAVE POWER          │
│              A/V           (M)            (S)                         │
│      o ▭▭▭▭ o      ◉          ◉       ┌──────┐        │
│                                                 │  ⊔   │        │
│                                                 └──────┘        │
└─────────────────────────────────────────────────────────────┘
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DISTRIBUTION BOX

INSTALLATION   VR

SU 2000
CONSOLE
Overview

The SU 2000 is a second generation VR console from Virtuality Entertainment Ltd, providing a single player VR experience in a standing position.

The SU 2000 has smaller physical dimensions compared to it's predecessor and reduce weight, as well as a new Modulo PC computer system with improved graphics capabilities.

It also features improved accessibility with the Modulo PC computer being housed in a swing out shelf, with all GRP panels easily removable using the special key provided.

Both the series 2000 Vlsette® and Joystick have a single plug-in fitting and the Vlsette® is interchangeable with other consoles in the System 2000 range.

Player containment within in the unit is provided by two padded ring halves (fail-safe on entry), hinged for access into the console. An optional step can be provided as an accessory.

The console is designed to be used for persons of 10 years old upwards and is fully electrically insulated for player safety. The unit has been designed and tested to provide optimum comfort and safety to persons between the height of 50" (1270mm) min. and 72" (1880mm) maximum. The recommended upper weight limit for players is 15st. (210lbs) (95 kgs). Anyone who is above or below these max. and min. figures is advised to take extra care when using the equipment.

It is possible for disabled people to use the console from wheelchair in a position adjacent to the console, subject to the usual siting restrictions regarding the tracker system and possible sources of interference - see Section 4 Installation, *Location of equipment.*

It is recommended that this equipment sholud not be used by anyone suffering from any of the following medical complaints or conditions:

> PHOTOSENSITIVE EPILEPSY
> SUPERFICIAL SKIN COMPLAINTS
> PREGNANCY (more advanced stages)
> HEART CONDITIONS

SYSTEM 2000

No.	DESCRIPTION	PART No.	QTY
1	SPACE JOYSTICK 2000		1
2	CABLE COVER UPPER	238-139-01	2
3	CABLE MANAGER	238-133-01	2
4	CABLE COVER LOWER	238-140-01	2
5	INNER PANEL UPPER	238-020-04	2
6	FINGER GUARD	238-141-01	2
7	HINGE	238-050-03	2
8	VISETTE® 2000		1
9	VISETTE® HOLSTER BAND	238-028-03	1
10	RING-HALF	238-005-02	2
11	HINGE ADJUSTER	238-051-02	2
12	CREDIT PANEL	238-045-02	1
13	BEZEL	238-012-02	1
14	CREDIT MODULE		1
15	PSU COVER	238-059-04	1
16	PSU BASE	238-058-05	1
17	PSU	238-507	1
18	MODULO PC COMPUTER		1
19	TOWER	238-006-08	2
20	COMPUTER TRAY	238-008-03	1
21	INFILL PANEL	238-024-02	2
22	LOCK		
23	OUTER PANEL (PLAIN)	238-021-02	1
24	LOWER FRAME	238-007-04	1
25	INNER PANEL LOWER	238-039-01	2
26	PANEL EXTRUSION	238-032-02	6M
27	GAS STRUT	238-510	1
28	INSIDETRAK TRANSMITTER	239-502T	1
29	JOYSTICK HOLSTER	238-029-03	1

VIRTUALITY®

3

VR

SYSTEM 2000

SECTION 6   PAGE

The Space Joystick 2000 is a custom designed universal hand control interface for the Virtuality® 2000 systems.

It is made of a high impact polymer construction and is ergonomically designed to give a user-friendly comfortable grip.

It features two control buttons – one as an index finger operated trigger and the other a thumb operated switch on top of the unit.

It also features a knuckle bumper pad for fist protection and is designed to be suitable for anyone of 10 years old and above.

1

Parts list

VIRTUALITY
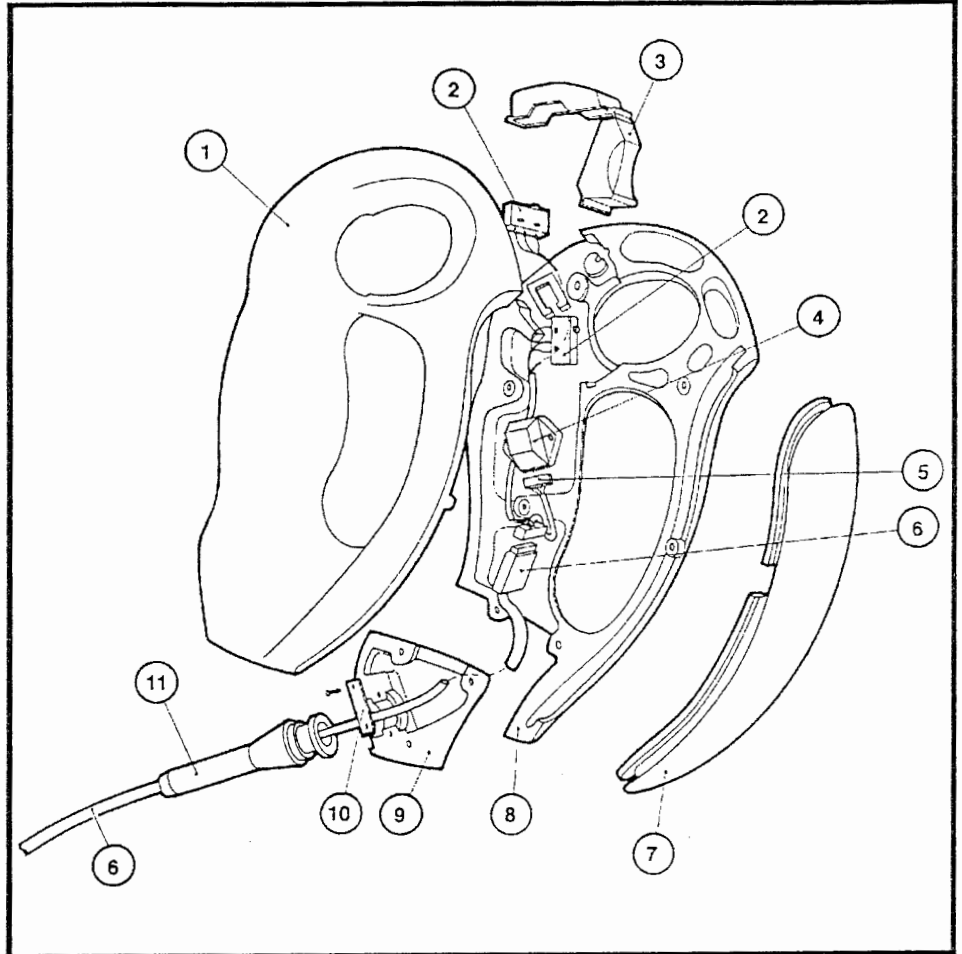
No.	DESCRIPTION	PART No.	QTY
1	HANDLE R/H	241-003-02	1
2	MICROSWITCH	209-022	2
3	BUTTON MOULDING	209-012-03	1
4	INSIDETRAK RECEIVER	239-502R	1
5	INTERNAL LOOM	241-001-03	1
6	JOYSTICK CABLE	238-119-01	1
7	BUMPER	241-005-02	1
8	HANDLE L/H	241-002-02	1
9	CONNECTOR COVER	241-004-02	1
10	ANCHOR	241-006-01	1
11	STRAIN RELIEF	241-500	1

Specifications

PARAMETER	ATTRIBUTE
Virtual Navigation	Polhemus 6-DOF magnetic tracker Dual push button interface controls Sensing options – X,Y,axis, azimuth, elevation and roll NOTE: Tracker performance is impaired by operation in the presence of large metallic objects and/or electromagnetic fields.
System Interface	Format D – Modulo PC Communication Protocol – RS232
Service System	Fast plug in design module for minimum down time service. Removable EPROM free plug connect sensor.
General	Universal hand control interface for Virtuality® systems.
Physical	Weight – 626gms (including cable) Max Size – 50mm x 200mm x 110mm Thumb activated switch. Index finger activated trigger.
Ergonomic	Soft knuckle bumper pad fist protection. Ergonomically correct grip. Easy to use button controls.
Electrical	VN4 series sub-miniature micro-switches. SIC-type connection to main loom. Flying loom disconnection point on joystick foot (tamper proof yet easy servicing)
Environmental	Normal Operating Temp. Range 5° - 50° C Humidity – 20% - 80% Non Condensing. Storage Temp. – 0°C to 65°C Impact Test – 1.5M drop test.

VIRTUALITY®

SPACE JOYSTICK 2000

SYSTEM 2000

SECTION 7 PAGE

SYSTEM 2000

MODULO PC SYSTEM
Equipment Overview

Modulo PC is a multi-processor computer system developed by Virtuality Entertainment Ltd as a low cost, high performance engine to provide Computer Generated Images and multi-channel sound and motion outputs for the Virtuality® System 2000. Mass storage is provided using CD ROM and hard disk to enable the use of large data bases for the experiences provided. This fully integrated computer system is used by the VPC simulation software to generate the Virtuality® experiences and contains a local area network facility to enable groups of Virtuality® systems to be connected for multi-user participation.

Access to the Modulo PC unit

The Modulo PC unit is located in the base of the console, seated in a special frame which swings out to provided access to the computer once the side GRP panel has been removed. For more details – see the User Guide Section 3.5, *Accessing the Modulo PC*

Installation Specifications

Power requirements	150 w
Temperature	10°C to 35°C
Humidity	15% to 95% no condensation
Voltage	220 – 240V or 110V AC
Size	480mm x 470mm x 175mm
Weight	25Kg (55lb)

The Virtuality® SU 2000 system has been designed with modularity in mind and is based on the PC ISA bus. For a single player machine, the following expansion cards are required:

1. Graphics Card – The heart of this PCB consists of two Motorola MC88110 RISC graphics processors. These processors provide the 200 MIPs performance that is required for the geometric transformations and rendering algorithms necessary for real time 3D graphics animation. The processor board is scaleable and several cards can be linked together in parallel to give improved performance or multiple player options.

2. Video Card – This card provides broadcast quality timings for converting the incoming video data from the processor board into screen data for the Visettes® for a single or dual player game. The video data is processed to insert the overlay needed for head up display information before converting the 24 bit true colour information into analogue signals.

MODULO PC SYSTEM

MODULO PC SYSTEM

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

4. Format C Card – This card incorporates all the electronics for the CD ROM interface, FM synthesis, audio sampling and audio mixing for all signals, including the headset and microphones. The card also converts the video data into a composite format suitable for the Visette® and provides the timing for the control signal necessary for back-lighting to the Visette®.

5. Format D 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.

A two player SU 2000 system using the above PC cards would also require:

1 additional Graphics Processor card
1 additional Tracker card
1 additional Format C card

Inspection

Before connecting power to the Modolo PC computer 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 servicable internal fuses within the Modulo PC cabinet.

MODULO PC SYSTEM

MODULO PC SYSTEM

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 unit is located above the floppy disk drive and is loaded with a CD through a panel on the front of Modulo PC. The CD ROM and floppy disk units are covered by a transparent door to keep dust and dirt away from the playing surfaces. The CD has 533 Megabytes of storage available which can be used for music, sounds, spoken instructions, bitmaps or computer programs.

NOTE: If the console is a MASTER system - used with a SLAVE unit to run a two player system, a second CD ROM player is present. The CDs must be left in place for the system to run, but should be removed for shipping purposes.
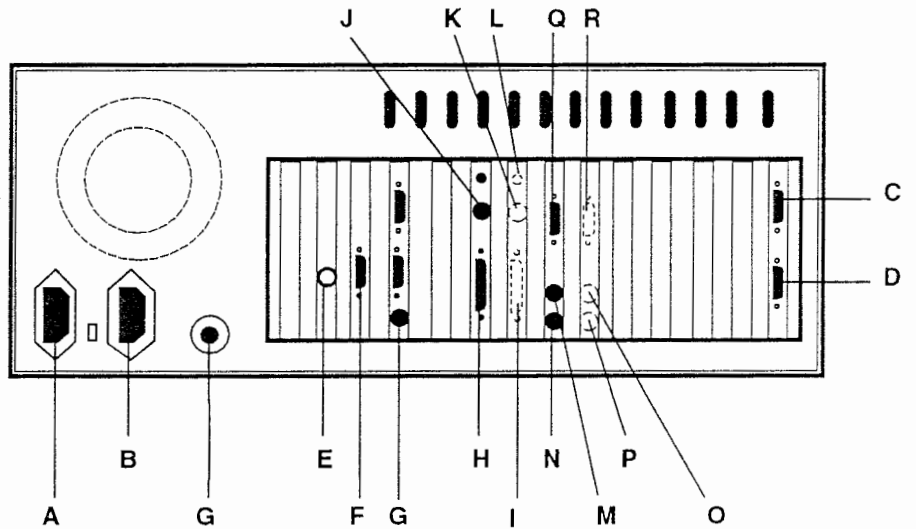
VIRTUALITY®

MODULO PC SYSTEM

MODULO PC SYSTEM
Input/Output
Connections

The rear panel of the Modulo PC has the following input output connections:-

A **Mains Power Lead**

B **Power Lead** – computer to monitor

C **9-way D-type Socket** – video card

D **9-way D-type Socket** – video card

E **BNC Video Socket 50 ohms** – network card

F **9-way D-type Socket** – VGA card

G **Keyboard Socket** (Either – depending on computer motherboard type)

H **25-way D-type Socket** – Format C card; player 1

I **25-way D-type Socket** – Format C card; player 2 (if applicable)

J **8-Way Mini-din socket** – Format C card; player 1

K **8-Way Mini-din socket** – Format C card; player 2 (if applicable)

L **Stereo Jack Plug** – not normally connected

M **6-way Mini-din Socket** – Tracker Card; player 1

N **6-way Mini-din Socket** – Tracker Card; player 1

O **6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)

P **6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)

Q **9-way D-type Socket** – Tracker Card; player 1

R **9-way D-type Socket** – Tracker Card; player 2 (if applicable)

REAR PANEL OF MODULO PC

MODULO PC SYSTEM

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MODULO PC SYSTEM
Format D Input/Output
Connections

JOYSTICK
CONNECTOR

VISETTE CONNECTOR

REAR PANEL

DIGICARD READER INPUT

CONNECTOR FOR CONTROL PANEL BUTTONS ETC.

JOYSTICK PORTS L & R (SD MACHINES ONLY)

AUDIO MUTE JACK PLUG SOCKET

OUTPUT TO EXTERNAL COMPOSITE MONITOR

RIGHT SIDE PANEL

V-KEY READER INPUT

VISETTE® TRACKER

JOYSTICK TRACKER

FORMAT C CONNECTOR

TO TRACKER BOARD

TO TRACKER SOURCE

SLAVE MACHINE

POWER IN
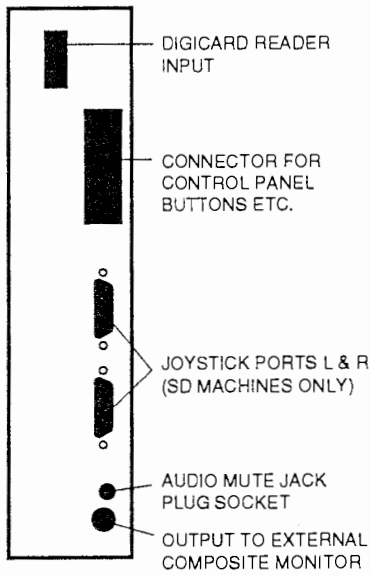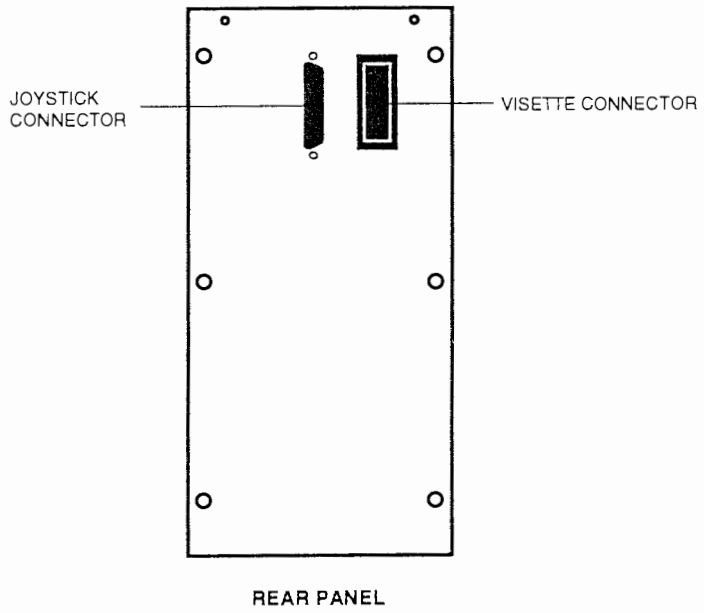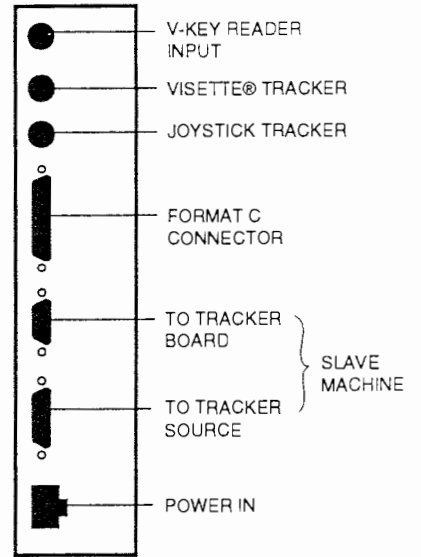
LEFT SIDE PANEL

FORMAT D CONNECTIONS

5

MODULO PC SYSTEM

MODULO PC SYSTEM

Operation of the Computer

After connecting the Modulo PC to the mains power suply the unit is switched on using the ON/OFF switch on the front panel. The switch-on procedure initiates the loading of the software from the hard disk and the program then operates the standby mode ready to run a selected experience

Operating the Bootstrap Loader

Normally the bootstrap loader can be initiated only when the unit is switched on. If a reboot is required while the unit is operating it is switched off and back on again to initiate the bootstrap loader. In the servicing mode when the keyboard is attached the bootstrap loader can be initiated from the keyboard without switching the unit off.

Symptoms

The symptoms of the malfunction can often be used to localise the fault or at least eliminate some areas.

Mechanical Checks

There are many areas where mechanical problems may cause a fault. These include plugs and sockets which can be vibrated apart or contain dirt or dust, or bent pins. Edge connectors for PCB's are sensitive to vibration and dirt in this way, also the plug-in chips which populate may PCB's. Soldered joints can occasionally fail particularly on connections which flex during the shipping operation or maintenance of the equipment.

Soldered and Crimped Joints

Where components are soldered to PCBs it can be very difficult to remove them without damage to the component or the copper track on the PCB. The special tools needed to perform the desoldering of components are often not readily available on site. If possible the whole assembly should be replaced under these conditions and the faulty one returned to the factory workshops for repair.

Crimped joints may be impossible to undo and might need cutting and replacing with new wiring, which should only be done in the factory workshops.

Test and Recalibration

Any new components or replaced sub assemblies should be tested in use and a recalibration procedure performed if necessary.

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MODULO PC SYSTEM

Maintenance

Cleaning

Since the Modulo PC computer is normally inside the controlled environment of the console, it requires very little cleaning. The front panel can be cleaned with a dry cloth and the transparent panel sealing the disk and CD slots should be kept clean to view the lights displayed when necessary.

Cleaning the Fan Filter

The cooling fan filter element situated behind an access flap on the front panel of the PC Modulo PC unit, should be cleaned daily in dirty environments, or at least weekly. See Maintenance Section 10.3, *Cleaning the fan filter*

Anti-static Precautions

NOTE: Before embarking on any work inside the computer case, it is essential that anti-static precautions are taken to avoid the risk of static damage to the delicate components. An earthing strap **MUST** be worn at all times.

Access to Computer PCB's

Access to the format board within the computer case is obtained by removing the top cover which is held on by four screws. The unit should be disconnected from the mains supply before removing the cover because there are live terminals inside and risk of electric shock. The PCBs for the graphics cards, network cards, tracker system etc. are situated in the various card slots within the computer casing. To remove these, the two fans above the cards may need to be removed. To do this, undo the retaining screws on either end of the supporting bar and carefully lift the fan assembly clear.

Removal of PCB's

The format board has five screws holding it in the top of the Modulo PC cabinet. The PCB can be removed when these screws are taken out. Care should be taken when handling the format board soon after it has been in use because the power supply components can be very hot.

To remove the graphics computer boards or the ethernet card, the panel containing the cooling fans is released and hinged upward out of the way and the internal connections to the cards removed. The cards can then be pulled from their edge connectors and slid out along the track which holds them in position. **NOTE:** Special care must be exercised when handling any of these delicate components.

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MODULO PC SYSTEM
Removal of drive units

The hard disk drive, floppy disk drive and CD ROM player(s) are all situated in the drive bay chassis on the right of the computer case at the front. The hard disk drive resides at the bottom, the floppy drive unit is above this and the CD ROM player on the top. In the case of a master Modulo PC unit for a two player set up, an additional CD ROM drive is present and lives above the other units. To remove any of the units contained in the drive bay, the chassis must first be removed by undoing the four retaining bolts securing it to the computer casing. The chassis can then be carefully lifted clear of the casing and the appropriate unit 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 side of the chassis can then be removed and the floppy disk unit removed from the chassis. To separate the hard and floppy drive units, remove the two large retaining bolts which fastener the two sub-frames together.

Removal of the Hard Disk

The hard drive unit can only be removed by first taking out the floppy drive unit and then separating the two drive sub-frames as detailed above.

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.

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MODULO PC SYSTEM
Specifications

CD ROM PLAYER

Dimensions	146 x 41.3 x 203mm

Power Requirements

DC Voltage	+12V 10% 2.0A (max.), 0.3A (average)
	+5V 5% 0.5A (max.), 0.3A (average)
Ripple	+12V 300mV p.p. (maximum)
	+5V 150mV p.p. (maximum)

Disc Diameter	120mm

Capacity	682.0 Mbytes (mode 1)
	777.9 Mbytes (mode 2) 74 minutes per disc

Data Transfer Rate

Sustained	153.6 kbytes/s (mode 1)
	175.2 kbytes/s (mode 2)

Access Time

Average (1/3 stroke)	300 ms (typical)
Full stroke	390 ms (typical)

Output terminal	Headphone out 3.5mm Dia headphone jack

Operating and storage conditions

Temperature	5 – 45ºC (operating)
	0 – 45ºC (non-operating)
Relative humidity	15 – 85%RH (operating)
	(non-condensing)
10 – 90%RH (non-operating)	

MODULO PC SYSTEM   VR

SYSTEM 2000

SECTION 8 PAGE

Overview

The credit module is is situated on the front tower assembly of the SU 2000 console (see Section 1.2 – *Location of Controls*). This unit houses the following items:

- The Format D (distribution) computer – attached to the rear of the credit module.This unit also contains the controls for Visette® brightness (left and right) and the external speaker volume control. (see User guide – Controls)

- The front control panel and push buttons. (see User Guide – Controls)

- The Credit Module – Card Reader or V-key (see Credit Systems)

- The external speaker for the console.

- The audible warning security device.

VIRTUALITY®

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SYSTEM 2000

CREDIT SYSTEMS
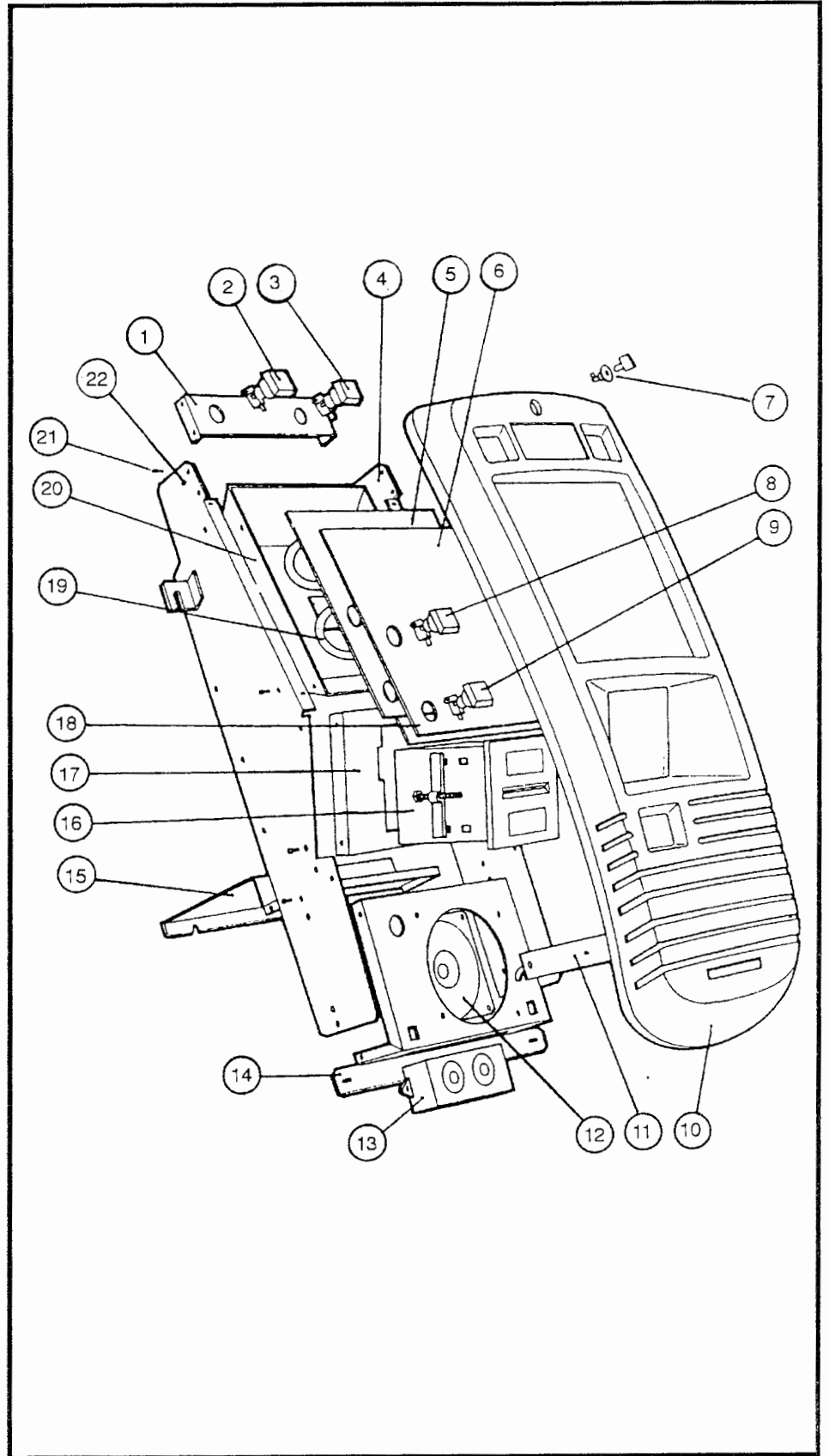
Parts list

No.	DESCRIPTION	QTY	PART No.
1	CROSS BAR	1	238-101-03 *
2	START BUTTON - GREEN	1	238-518G
3	LINK-UP BUTTON - YELLOW	1	238-518Y
4	R/H SIDE PANEL	1	238-101-03 *
5	EXPERIENCE GEL	2	
6	GEL COVER	1	238-016-03
7	LOCK	1	238-501
8	BLUE INDICATOR	1	238-518B
9	ORANGE INDICATOR	1	238-5180
10	BEZEL	1	238-012-02
11	LOWER BRACKET	1	238-056-02
12	LOUDSPEAKER	1	238-500
13	ALARM SIREN	1	238-503
14	SPEAKER MOUNT	1	238-101-03 *
15	CENTRE BRACKET	1	238-101-03 *
16	CARD READER	1	211-523
17	CARD READER PLATE	1	238-101-03 *
18	DIFFUSER	1	238-014-02
19	LAMP 2D	1	238-502
20	LIGHT BOX	1	238-102-02
21	M4 X 12 SCREW	22	SCW 00132
22	L/H SIDE PANEL	1	238-101-03 *

CREDIT SYSTEMS

MAGNETIC CARD READER

The GPRD (General Purpose Reader with LCD) is a magnetic credit card reader system to enable a cashless credit system on the System 2000.

The GPRD consists of a logic board, associated LCD board and power board running at 12v DC.

The GPRD unit uses the GPR 44 bit code system and takes vends off a validated card with correct Header, Major Customer, Site Identification and Value check. The unit is normally without any punch as it takes off vends, indicating the value remaining on the after the bend (unused vends). The provision to enable the punch has, however been left in and is bank selectable. this function must use the bar striped cards for punch placement. The same relay output and blocker control is used on the GRP.

The total number of relay pulses is accumulated and can be shown upon the insertion of a special function card.

LCD DISPLAY

CLAMP SCREWS
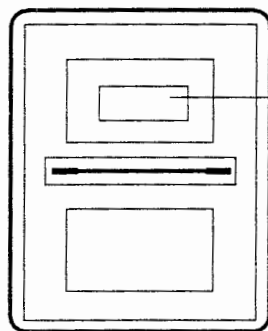
FRONT PANEL
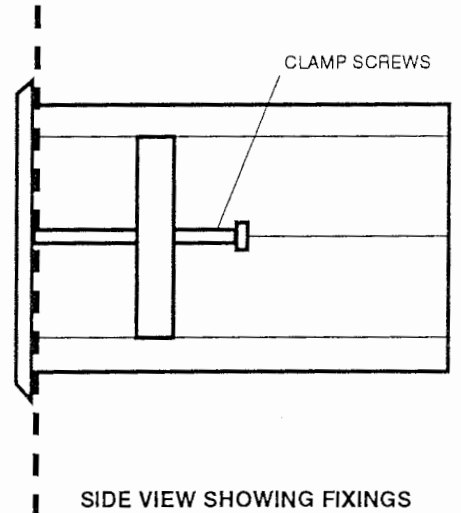
SIDE VIEW SHOWING FIXINGS

V-KEY SYSTEM

The V-Key system is a system for cashless payment, information and security and makes available a solution to problems in a company organisation by utilizing an electronic data reading device.

V-Key is made of high quality plastic and is equipped with a chip for storing the data. The chip, an EPROM, may be read as well as written to. Data is preserved for at least ten years without requiring power back-up. The most various data such as amounts of money, access and identification codes, statistics data, parameters etc. can be stored on the V-Key.

Reading and writing data is done by means of a read/write unit which establishes the connections to the corresponding devices such as vending machines, cash registers, access control - and time registration systems, computers etc.

The V-Key system is a genuine alternative to the large choice of credit card systems. V-Key mainly offers the following advantages:

- Stylish, portable, rugged design
- Large number of read/write cycles and therefore long-time stability (5 years plus at 15 insertions per day!)
- Small dimensions
- Insensitive to magnetic and inductive influences
- Minimum impairment by dirt and humidity.

Advantages of the V-Key system
- The application of V-Key is an operation the user is familiar with. Preferably the V-Key is carried on the personal key ring together with the conventional keys.
- A long service life is reached even with multiple applications.
- Versatily – can be used on a fairly basic level to credit the system, or used in conjunction with the EXPOS® Point of Sale system, it can store information about the player's identity, current game position etc.
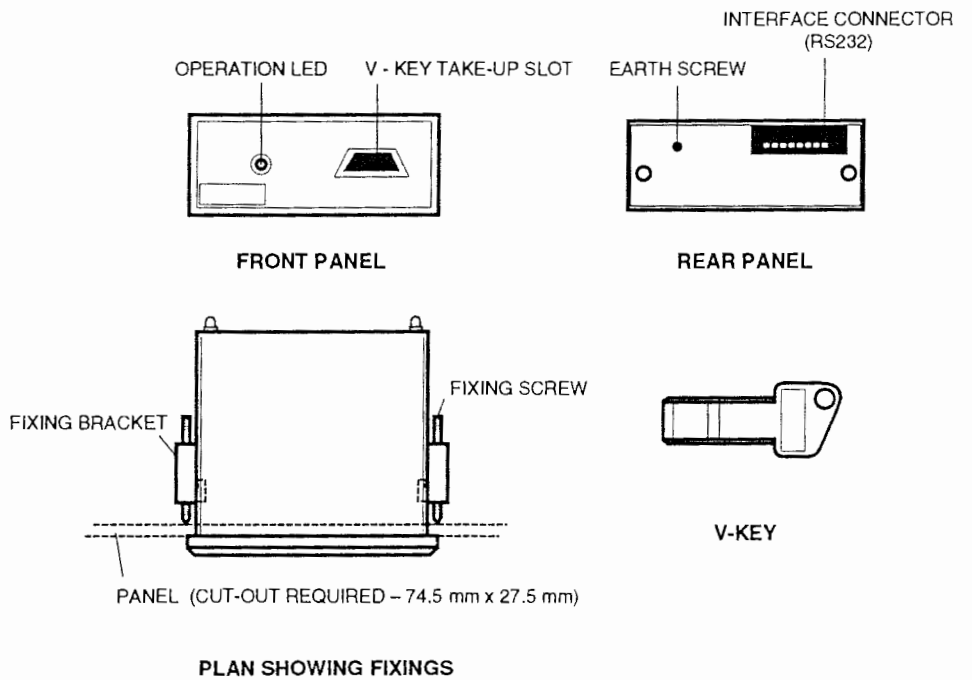
CREDIT SYSTEMS

V-Key Reader
Description

The unit with the designation UR1 is for the reading only of data from the V-Key. This unit is a compact device designed in up-to-date CMOS technology.

The unit essentially consists of the following modules:

- A micro processor controlling all the major functions.

- A watch dog that checks the micro processor for proper functioning.

- An EPROM for storing the unit's parameters.

- A take-up slot with a locking mechanism for the V-Key.

- A two-colour LED (red/green) for displaying the operating state.

- An interface for connecting the card-reader adaptor.

OPERATION LED   V - KEY TAKE-UP SLOT

INTERFACE CONNECTOR
(RS232)
EARTH SCREW

FRONT PANEL

REAR PANEL

FIXING SCREW

FIXING BRACKET

PANEL (CUT-OUT REQUIRED – 74.5 mm x 27.5 mm)

V-KEY

PLAN SHOWING FIXINGS

CREDIT SYSTEMS

V-Key Reader

VIRTUALITY

Specifications

Type:	UR1
Dimensions:	86mm x 35 mm x 75mm O/A
Installation:	In front panel, fastened from the back
Installing attitude:	Any
Weight:	240 grams
Temperature range:	-20°C to +50°C
Humidity:	Max. 90% non condensing
Acceleration:	Max. 6g
Insertion Cycles:	> 500,000
Power supply:	5V DC, 12V DC depending on type of adaptor
Current consumption:	80mA idle; 200mA activated
Interface:	RS232

CREDIT SYSTEMS

VIRTUALITY®

VIRTUALITY®

Overview

The Visette® 2000 is a second generation Head Mounted Display system from Virtuality Entertainment Ltd and is the primary user interface to the virtual world.

The unit contains a binocular full colour viewing system using an advanced Active Matrix Thin Film Transistor Technology twin monitor system providing a 60° horizontal and 46.8° vertical field of view and adjustable eyesight correction to plus or minus 3 dioptres for prescription lens wearers. It also features motorised interoccular adjustment to enable precise centering alignment to the individual player's physical eye dimensions (pupil centres).

The Visette® 2000 also contains a pair of lightweight high quality stereo headphones and a tracking sensor to enable the position and angle of the wearer's head to be continuously monitored providing the high quality view to the VR world.

Adjustment of the visor and is provide by a single ratchet adjustment knob at the rear of the headband, also providing sufficient clearance for donning and removal of the Visette® when open to it's maximum position.

The Visette® backlights will only operate if a correct video signal is fed to them – this is to decrease the possibilty of the backlights burning out. If there is no video signal present, the Visette® brightness is zero and cannot be changed.

Cleaning the Visette®

See also Maintenance Section 10.

Lenses and eyecups should be inspected regularly and cleaned with a soft dry lens cloth as necessary.

The face mask area and Visette® pads should be cleaned using moist medicated wipes, especially areas in contact with the head and face. NOTE: Do not allow medicated wipes to come in contact with the lenses as this can leave a residue.

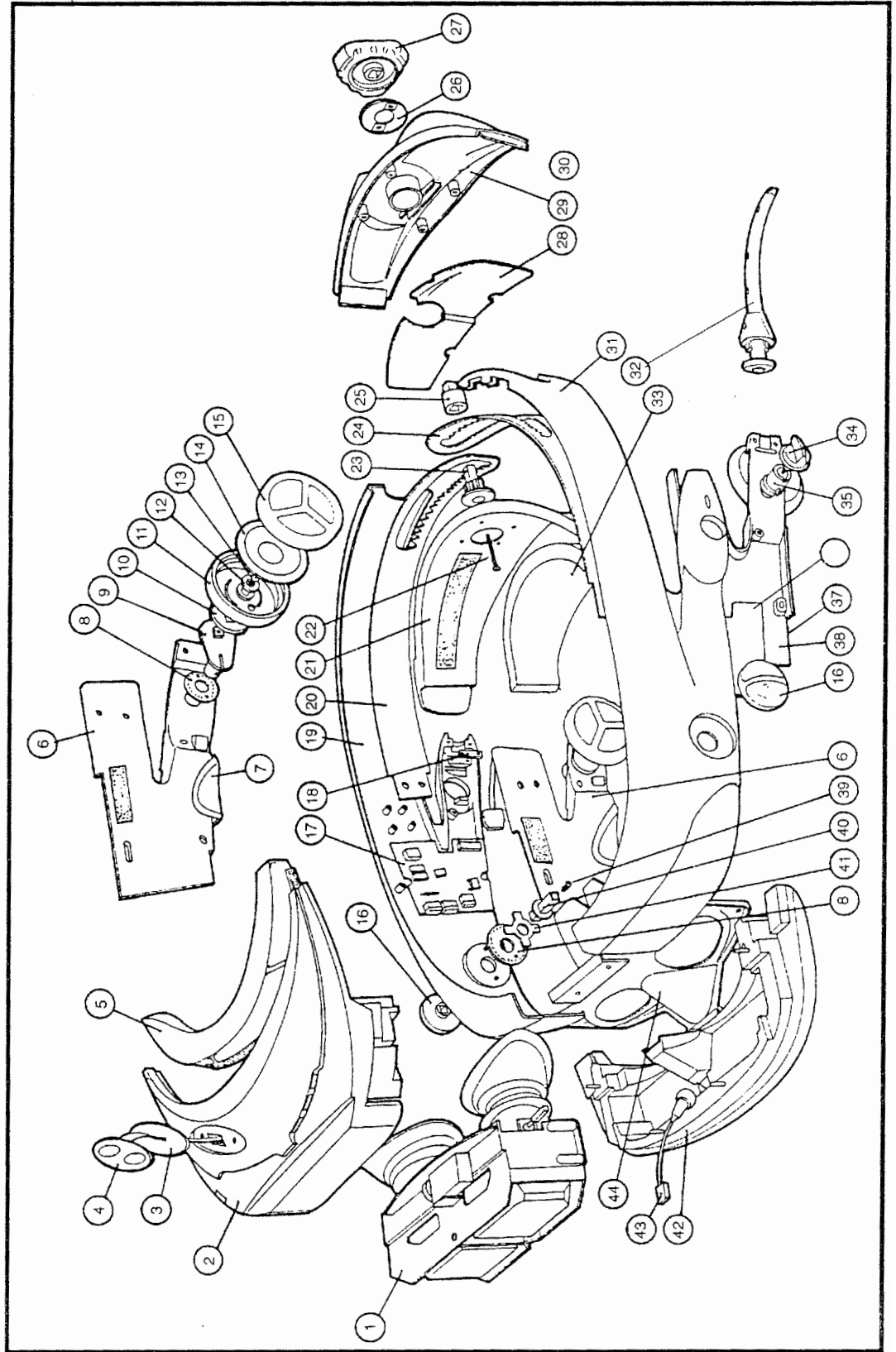Earphones should also be kept clean using moist medicated wipes.

1

SYSTEM 2000

VISETTE® 2000

VR

Parts list

ITEM	DESCRIPTION	QTY	PART No
1	DISPLAY BOX ASSY	1	
1	TOP HOUSING	1	230-012-02
3	SWITCH PLATE	1	230-060-01
4	MEMBRANE SWITCH	1	230-048-01
5	FOREHEAD PAD	1	230-049-02
6	CONNEX PCB COVER R/H	1	230-022-01
7	THUMB GRIP R/H	1	230-074-01
8	RATCHET B	4	230-044-01
9	HEADPHONE ARM	2	230-028-01
10	HEADPHONE FOAM GASKET	2	230-062-01
11	HEADPHONE CASE	2	230-026-01
12	HEADPHONE ARM CAP	2	230-030-01
13	SCREW	2	SCW00
14	HEADPHONE MODULE	2	230-501
15	HEADPHONE COVER	2	230-027-01
16	FOCUS KNOB	2	230-040-02
17	CONNEX PCB R/H	1	230-053-01
18	CABLE CLAMP	2	230-063-02
19	BODY SHELL R/H	1	230-010-03
20	INNER ADJUST STRAP	1	230-018-01
21	HEADBAND INNER	1	230-014-03
22	SCREW	1	SCW
23	ADJUST GEAR	1	230-019-01
24	OUTER ADJUST STRAP	1	230-017-01
25	ADJUST KNOB SPIGOT	1	230-065-01
26	ADJUST DETENT	1	230-020-0127
27	ADJUST KNOB	1	230-021-03
28	INTERNAL SENSOR COVER	1	230-016-01
29	HEADBAND OUTER	1	230-015-03
30	INSIDETRAK RECEIVER	1	239-502R
31	BODY SHELL L/H	1	230-011-03
32	CABLE STRAIN RELIEF	2	230-064-03
33	HEADBAND PAD	1	230-050-02
34	HEADPHONE KNOB	2	230-031-02
35	HEADPHONE SLEEVE	2	230-029-01
36	CONNEX PCB L/H	1	230-054-01
37	THUMB GRIP L/H (NOT SHOWN)	1	230-087-01

3

ITEM	DESCRIPTION	QTY	PART No
38	CONNEX PCB COVER L/H	1	230-023-01
39	SCREW	34	SCW 00137
40	CAM DRIVER	2	230-042-01
41	FOCUS CROSS RATCHET 'A'	2	230-043-01
42	BOTTOM HOUSING	1	230-013-02
43	MICROPHONE CABLE ASSY	1	230-078-01
44	FACEMASK	1	230-024-02

TECHNICAL DATA
Visette®

Field of View:	60°(v) x 47°(h) each eye
Display Format:	244 x 756
Overlap:	100%
Display:	Active matrix colour LCD
Pixel Size (arc min.):	47.6
Pixel Structure:	Delta
Weight:	650gms

Headphones

Transducer Type:	Dynamic
Operating Principle:	Open
Frequency Response:	30Hz – 18Khz
Nominal Impedance:	40 ohms
Total Harmonic Distortion:	<0.4%

VIRTUALITX®

IMAINTENANCE

Hourly Inspections

Hourly inspections should be carried out by the operator on the Visette® Pads and Lenses. Lenses should be wiped clean with a soft dry lens cloth if required. Visette® Pads should be cleaned using moist medicated wipes ensuring you cover all areas in contact with the head and face. Do not use the moist wipes on the lenses as they can leave a residue.
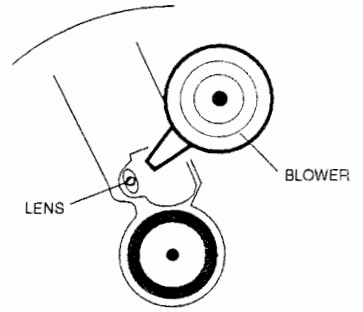
Daily Inspections

Daily inspections should be carried out every day prior to any public use by the trained operator to ensure complete safety of all users and equipment. A detailed daily inspection list has been provide in this manual and may be freely copied to be used by all operators. Any fault or damage should be reported immediately to enable repairs or adjustments to be made prior to public use.

Weekly Inspections

Check all Visette® cable entry plates, ensuring screws are not loose and where necessary, tightened or replaced. Ensure fan filters are checked and cleaned with a vacuum cleaner as required.

Regular Clean

The read lens in the CD ROM player should be cleaned regularly to avoid read errors. Press on the ROM drive front panel to unlatch it and gently pull the drawer out to it's full extent. Carefully lift up the top cover by grasping it at the sides, and remove the disk. Use a blower as shown to gently blow dust off the lens as shown. Never touch the the lens with fingers or any other object as this as may scratch the lens. If necessary fingerprints etc.can be removed by wiping the lens gently with a cotton swab. Replace the CD, close the lid and gently push the drawer back until it latches shut.

Regular Thorough Examination

Thorough examinations should be carried out every 4 months to ensure the reliability of equipment and the safety of users. The person appointed to carry out the thorough inspection should be independent of the owner, controller and operator of the device.
The appointed competent person should have such qualifications, knowledge, experience and supporting resources to enable them to make an assessment of the safety of the device including any associated equipment.

Service and Repairs

Service and repairs should only be carried out by an authorised service agent. Any warranty and maintenance agreement will be void if any other party conducts repairs, service or modifications to the equipment or software without prior authority from the supplier or manufacturer.
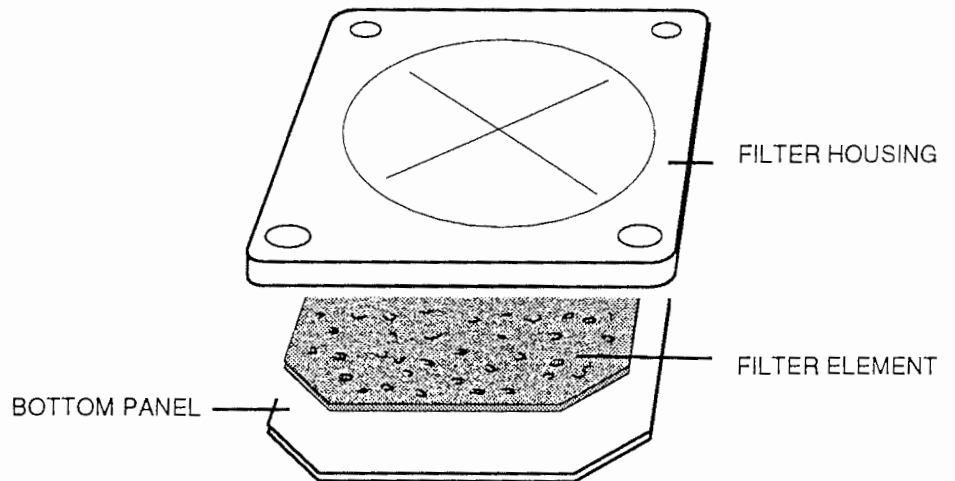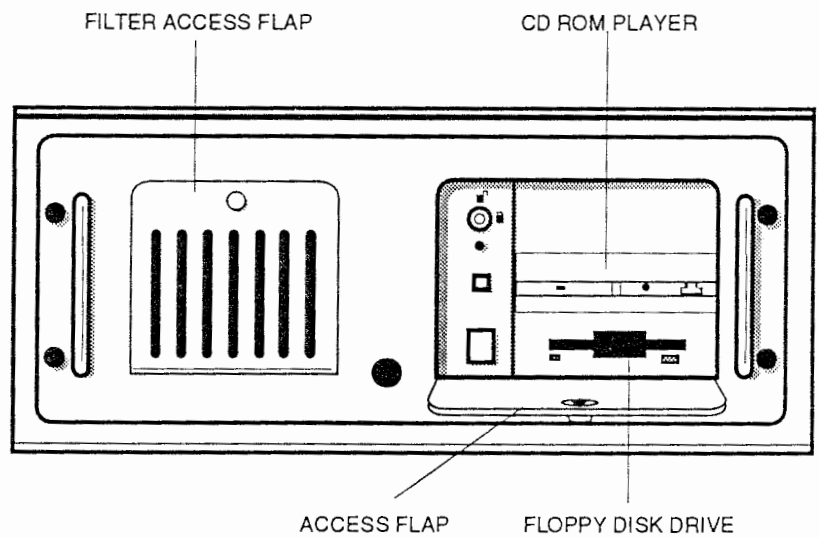
Daily Inspection Guide

1.   The console should be carefully inspected for cracks or other damage.

2.   The exterior surface should be cleaned and where necessary wiped with a damp cloth or a solution of mild detergent on a sponge or cloth. We recommend car bodywork ammonia type cleaning fluids. The surfaces should be wiped dry with a soft dry cloth prior to any public use. Chemical cleaning agents should not be used without prior advice from the manufacturer. Do not allow liquid to enter into any part of the equipment structure.

3.   Check all external cables and connectors for damage and ensure they are secured and do not cause a tripping hazard.

4.   Check all cables to the Visette® and Joystick for any sign of damage. These cables have a polyurethane sheath to protect the communication wires within and it is important that there are no breaks in this protective layer, and they are free from all kinks.

5.   Check that all access panels are correctly secured and keys removed.

6.   Ensure that the disclaimer restriction sign is displayed in a prominent position and legible.

7.   Check the casing and foam pads on the Visette® and Joystick for any damage. Dirty, torn or damaged pads should be replaced to ensure maximum comfort and safety of all users.

8.   Check that the headband adjustment on the Visette® is functioning correctly with no free play in the adjuster.

9.   Check the operation of the Joystick buttons.

10.   Check the external speaker and set the appropriate level to suit the environmental conditions.

11.   Check the Visette® internal headphone level and set to the appropriate comfort level using ETS (see section 12).

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12.   Check the Visette® internal screens are operational. Ensure the alignment is set correctly and the brightness is equally balanced using ETS. (If any misalignment is observed, ensure a qualified engineer is allowed to re-align the system.)

13.   Check correct operation of the Visette® and Joystick tracker systems using ETS or in an Experience. **NOTE:** the tracker does not operate in demo mode.

14.   Ensure that the access and surounding areas of the console are free of obstructions likely to cause a tripping hazard. Check the Visette® and joystick cables are not presenting a tripping hazard.

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SYSTEM 2000

VIRTUALITY®

FILTER ACCESS FLAP   CD ROM PLAYER

ACCESS FLAP   FLOPPY DISK DRIVE

FILTER HOUSING

FILTER ELEMENT

BOTTOM PANEL

To Clean fan filter:

1. Undo access flap thumbscrew and open flap

2. Slide filter holder from locating rails

3. Flex casing slightly to remove bottom panel.

4. Remove filter element and gently vacuum off any dust or fluff.

5. Replace element, press bottom panel firmly into place.

6. Replace filter holder in locating rails, close access flap and tighten thumbscrew.

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SYSTEM 2000

SECTION 11   PAGE

SYSTEM 2000

We hope this manual has been of assistance to you. For service to your machine and for technical help or problem solving, please do not hesitate to call your local Virtualty® Distributor or contact:

VIRTUALITY ENTERTAINMENT LTD U.K.
CUSTOMER SERVICE DEPARTMENT

TEL: 44 (0) 533 548571
FAX: 44 (0) 533 548573

VIRTUALITY ENTERTAINMENT INC U.S.A.

TEL: 1 (0) 314 331 6411
FAX: 1 (0) 314 6431

SERVICE VR

VIRTUALITY®

VR

E.T.S.
– ENGINEERING TEST SYSTEMS

USER MANUAL

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ETS   VR

ETS

Introduction

The Engineering Test System (ETS) allows a ModuloPC 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.

Running ETS

To run ETS from DOS, type **'run ets'**. To run ETS from the Supervisory Program select the **ETS** option from the main menu.

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.

$\leftarrow \uparrow \downarrow \rightarrow$ 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 These keys are found in the block of six keys which is immediately above
PgDn 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**.

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.

General Principles

If possible, ETS should be run with a monitor connected to the graphics output and a monitor connected to the Modulo PC's VGA output. ETS output appears on the VGA screen and also on any monitors connected to the output of the graphics cards. Since

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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 Modulo PC, 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.

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 5).

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:

v	VPC library
p	PIX library
t	TRK library
f	CTRL library
n	NET library
c	CD library
s	SND 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 VPC and CTRL libraries type:

run ets /-* /+vc

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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   Menu 2

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

Menu 2

Menu 2 provides access to more test functions. Press ESC to return to the main menu.

F1   Display library data

F2   Display hardware data

F3   View configuration file

F4   View configuration file errors

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TEST TRACKER

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.

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.

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.

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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.

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 tracker hardware

A Modulo PC 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.

Calculate sensor offset

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

Terminal emulator

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

TEST FORMAT HARDWARE

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

The joystick test screen displays test data for SD and SU space joysticks. SDs 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. An SU is fitted with one space joystick which returns its position via the tracker test functions and is fitted with two buttons. Note that the SU joystick buttons are wired to the right SD joystick buttons.

Sound volumes / switching

PgUP/PgDn	Select the player to be displayed.
← ↑ ↓ →	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 between one channel and both channels. By default, both left and right channels will be affected by volume and switch changes. This key allows the user to toggle into a single channel mode where only one channel will be affected.
F5	Start a CD track playing - the longest audio track on the CD will be repeated.

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F6	Stop the CD from playing.
F7	Start a sound sample playing.
F8	Stop a sound sample playing.

F9 — Toggle the signal to the visette. If the signal is currently switched to the visette, it will be switched off. If the signal is not currently switched to the visette, it will be switched to the visette.

F10 — Toggle the signal to the external speakers. If the signal is currently switched to the external speakers, it will be switched off. If the signal is not currently switched to the external speakers, it will be switched to the external speakers.

+ / - — 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 buttons

It is possible to connect other buttons to the system in addition to the console and joystick buttons. This option allows these extra buttons to be tested.

PgUp / PgDn — Select the player whose buttons are to be displayed.

Display format hardware

A Modulo PC 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 Entertainment Ltd.

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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 8).

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.

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Display networked
machines

Echo test

Display network
hardware

VIRTUALITY

TEST NETWORK

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

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.**

Details of the network card attached to the MODULO PC will be displayed.

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.
+	Increase the visette brightness for the current player.
-	Decrease 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.

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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 is located on the format C card, but is addressed separately to the format hardware.

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 8)

↑ ↓	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. When prompted, enter a channel number in the range 1 - 16 and press **RETURN**.

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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 occured while the library was being opened. Most of the libraries are used to interface to particular pieces of hardware as shown below:

VPC   This does not correspond with any particluar piece of hardware. It contains utility functions that are used by the other libraries.

PIX   Graphics hardware.

TRK   Tracker hardware.

CTRL   Format hardware.

NET   Network hardware.

CD   CD hardware.

SND   Sound 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.

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DISPLAY HARDWARE DATA

The tests available in this menu will list details about the hardware connected to the Modulo PC. 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 Modulo PC 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 hardware

A Modulo PC 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.

PgUp / PgDn   Select the card to be displayed.

Display graphics hardware

The graphics hardware is divided into channels. Each channel has one video card associated with it, and can have several processor cards associated with it.

PgUp / PgDn   Select the channel to be displayed.

↑ ↓   Select the processor card to be displayed.

Display network hardware

Details of the network card attached to the Modulo PC will be displayed.

Display sound hardware

PgUp / PgDn   Select the card to be displayed.

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.

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