KONIX MULTI SYSTEM

REV 1.1 Development System

Reference Guide

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INTRODUCTION

The Konix Multi System Software Development System (KMS SDS) is designed to maximize game quality, and minimize development effort. It consists of three parts - the Konix development hardware, the PDS assembler/monitor package, and the sound and graphics packages from ATD.

Each part of the development software has comprehensive documentation to ensure ease of use, and these should be read in conjunction with this manual. In addition, a telephone hotline (phone) will be available to advise on software, hardware, or just straight problems!

HARDWARE REQUIREMENTS

To use all the elements of the Konix Software Development System the following additional hardware is required.

Minimum configuration for program and sound development:-

RGB monitor with SCART input (Philips CM8833 recommended)

100% IBM PC compatible computer with:

An EGA adaptor with at least 64k RAM and a compatible Monitor

A two button mouse and suitable mouse driver (eg.Microsoft Mouse)

512k RAM (640k recommended)

Minimum configuration for program, sound and graphics development:-

RGB monitor with SCART input (Philips CM8833 recommended)

100% IBM PC compatible computer with:

VGA graphics and suitable monitor (a multisync monitor is recommended)

640K RAM

A two button mouse and suitable mouse driver (eg.Microsoft Mouse)

Note : It is strongly recommended that both machines are fitted with hard disk drives to improve performance. If 80286/386 machines are used a ram disk using extended RAM should be considered.

USING THE SOFTWARE DEVELOPMENT SYSTEM

After unpacking the KMS SDS, you should have the following :

A KMS SDS system box

A KMS SDS development cartridge

A KMS control emulator (a modified joystick)

Two Konix Speedking Joysticks (Sega Version)

A KMS SDS Monitor lead (Scart to 9 way 'D')

The KMS Technical Reference Guide

The KMS Rev 1.1 Development System Reference Guide

A PDS PC interface card

A PDS to KMS SDS interface cable (16 pin to 25 way 'D')

A PDS 2 development software disc and dongle

A PDS 2 reference manual

The KMS development software disc and dongle

The KMS Art Package manual

The KMS Music Package manual

To set up the system first make sure everything is turned off, plug the PDS PC card into the PC expansion slot, plug the KMS SDS development cartridge into the system box (component side to the left as seen from the front). Connect the PDS interface cable into the top socket on the PDS PC card and into the bottom socket on the development cartridge. The KMS control emulator, joysticks and video output cable plug into the sockets on the front of the system box. The recommended monitor also contains stereo speakers for sound output.

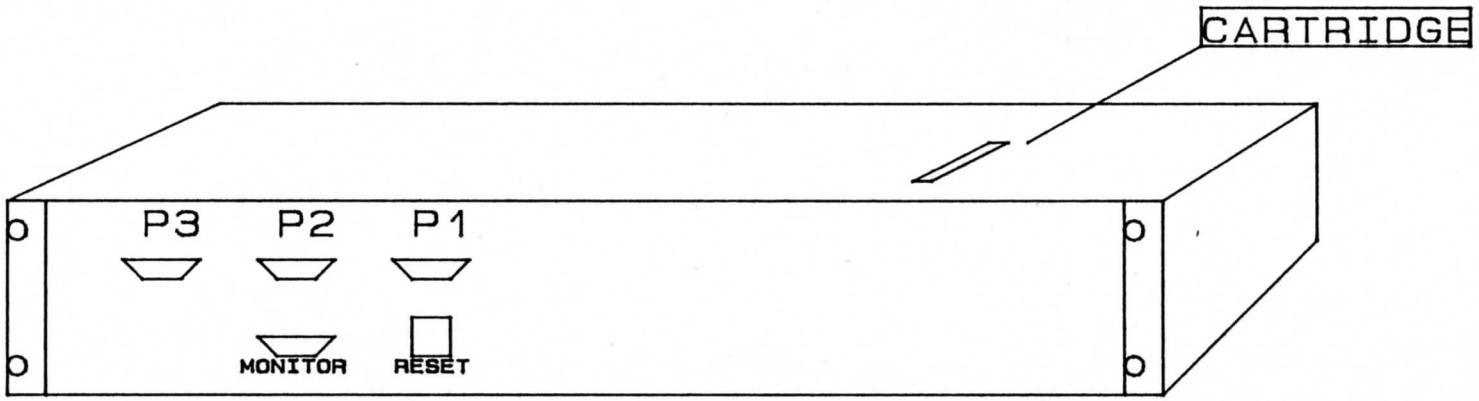
The software development system is now ready for use as described in the relevant manuals.

NOTE : There are 4 ROM sockets on the development cartridge. One is used for the communications software, the others are spare.

HOTLINE

The Konix Hotline has been set up specifically to ensure that you get the support essential to the production of superior software. It will offer information and advice on all aspects of developing software for the Konix Multi system. The Konix Hotline will be manned every working weekday from 10am to 6pm , with an answerphone available outside these hours.

The Hotline Number is: (021) 633 4550



DEVELOPMENT SYSTEM CONNECTOR LAYOUT

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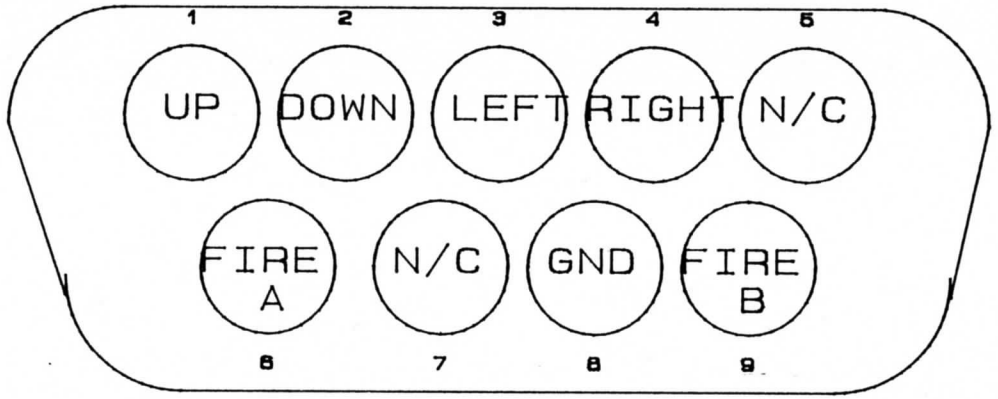

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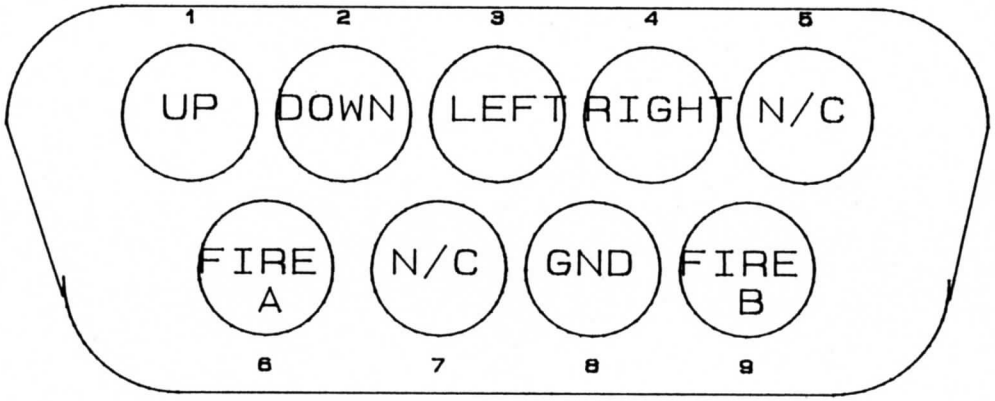
JOYSTICK 1



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JOYSTICK 2

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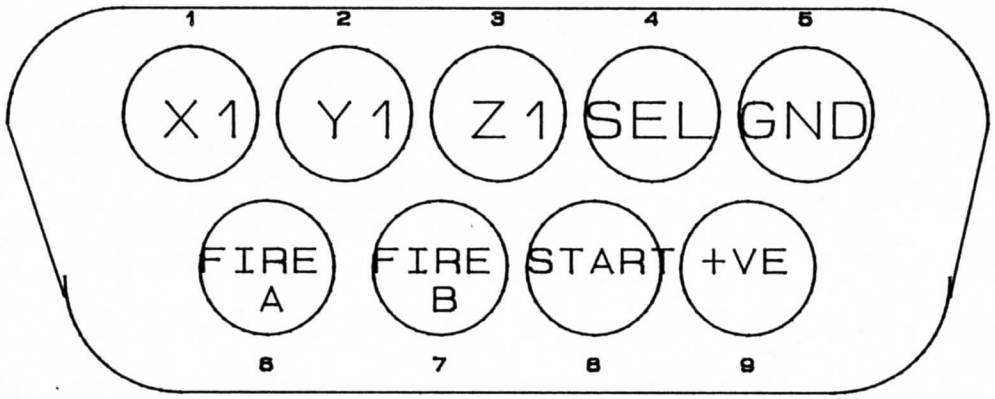

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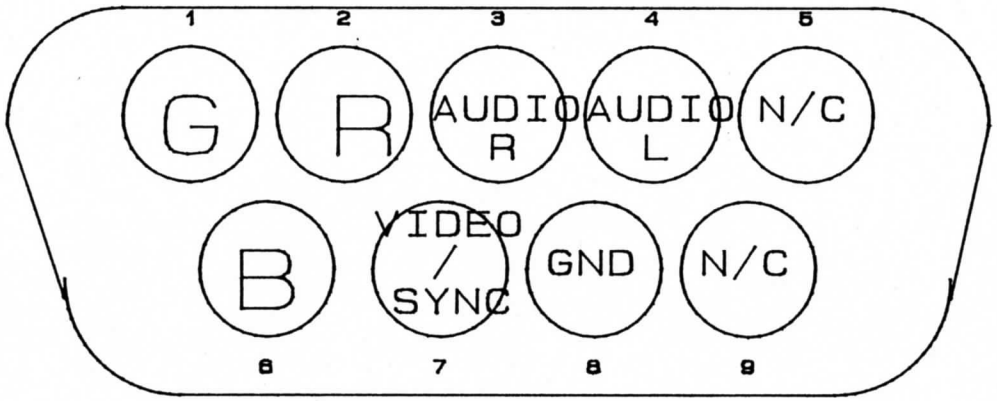
MULTI SYSTEM CONTROL EMULATOR



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MONITOR

AN INTRODUCTION TO THE KONIX MULTI-SYSTEM

Rev 2 FEB 1989 C F GREEN

NOTE The specifications shown in this document refer to the production version of the unit. Specifications relevant to the Rev.1 development systems are shown in brackets{ }.

The Konix Multi System (KMS) is a highly advanced computer game console with highly advanced features normally found only on arcade machines. Its innovative mechanical design allows full user control. Its advanced electronic circuitry gives performance to match both in its speed and the quality of its graphic display and sound output.

MECHANICAL

The KMS unit comprises a horshoe shaped base 370mm L X 390mm W X 75mm H. (1 Fig 1). Mounted inside this base is the electronic circuitry and the disc drive used for program loading.

Pivoted to this base is a column 220mm H X 190mm W. (2).

Pivoted near the top of this column is a W shaped control yoke 290 mm W X 125mm H. (3,4,5) The handlegrips of this yoke (5) can be rotated 180 deg to form a pair of handlebars. In the yoke position a detachable rim may fixed over it to form a steering wheel. (17 Fig2)

The handlegrips vibrate under control of a solenoid and spring to enable realistic feedback.

The column may be pivoted from horizontal (0 deg) to vertical (100 deg). The control yoke may be pivoted +/- 65 deg. from a horizontal position.

Mounted on the right hand base pedestal is a control lever (throttle/gear shift) which may be pivoted +/- 45 deg. from vertical.

Mounted next to the left hand column pivot is a lever which is used to lock the column or allow free movement. The column may be locked at :-

0 deg.	Transport or helicopter mode
20 deg.	Motorcycle mode
60 deg.	Driver mode
Free to move 0 - 100 deg	Flight mode

In flight mode friction damping is provided on the column pivots to give a realistic feel and to prevent a sudden collapse if the column is let go. A rubber bumper provides a stop in the transport mode to prevent the column hitting the base.

A detachable Foot Pedal unit is mounted between the base

pedestals. This is fitted with independent Left and Right pedals which can be moved up and down from a rest position.

CONTROLS

Movement of the column, steering yoke and throttle lever drives three seperate potentiometers which provide control signals to the electronics unit. (POTX1, POTY1, POTZ1). The readings from these potentiometers is scaled so that the minimum is around 50 mid-scale 125 and maximum 200. The unit can also read a second set of potentiometer inputs (POTX2, POTY2, POTZ2) which are input via the joystick port JOY1. This allows two player games with a slave KMS or input from optional peripherals (e.g. helicopter stick).

Mounted on the end of the handlegrips and on the steering wheel spokes are left and right firebuttons (FIREA1, FIREB1). Buttons are also provided in the wheel rim to allow the handlegrip firebuttons to be pressed.

Mounted in the right hand base pedestal are two control buttons START and SELECT and a Power On indicator lamp. Pressing both buttons together causes the unit to reset.

There is no seperate volume control for the sound output. If the SELECT button is held down for 2 to 3 seconds software should recognize this and the throttle control should now control the sound volume (while the SELECT button is still held down)..

PORTS

Mounted in the left hand base pedestal is a proprietary dual joystick port which allows connection of two independent digital joysticks (Up, Down, Left, Right, FA, FB for ports 1 and 2).

Mounted at the rear of the base are connectors for
1) 9V AC Power Input (3.5 mm)
2) Expansion Port (8 way DIN)
3) Cartridge Port (56 way PCB)
4) Video In/Out (13 way DIN)
5) Audio Out (3.5 mm stereo).

The video port gives outputs of
1) RGB Analog
2) PAL/NTSC composite video
3) PAL/NTSC UHF.

The unit can be configured as 50Hz PAL or 60 Hz NTSC during manufacture. This cannot be altered by the user.

It will accept external RGB and sync. and will overlay internal video on to this (Gen. Lock). External composite video input requires an external converter.

EXPANSION PERIPHERALS

The following peripherals are planned.

1) An arcade style moving chair which will carry the KMS unit and a monitor and plugs into the expansion port.

2) A light gun with a realistic recoil action which can be converted to a machine gun and plugs into the expansion port.

3) For games which require extra keys a suction mounted 12 key pad may be plugged into the joystick port.

4) A helicopter style control stick may be screwed into the column (in transport mode) and plugged into the joystick port. This has three potentiometer controls for Left/Right, Back/Forward and Rotate. The Throttle control on the base unit can still be used in this mode.

5) For two player games a second KMS unit (unpowered) may be plugged into a joystick port. The main unit can then read the potentiometers and fire buttons of the slave unit.

ELECTRONIC UNIT

Mounted at the rear of the base unit is a PCB containing the electronic circuitry. Power is obtained from an external plug mounted transformer with a rectifier and regulator supplied on the PCB.

The PCB contains an 8086 {8088} microprocessor running at 6 MHZ and a custom ASIC running at 12 MHz.

The ASIC provides the following functions :-

1) A video processor which provides screen display modes of

256 X 200 pixels. 8 bits per pixel. Any of 256 colors from 4096
256 X 200 pixels. 4 bits per pixel. Any of 16 colors from 4096
512 X 200 pixels. 4 bits per pixel. Any of 16 colors from 4096

In addition there are 4 hardware sprite priority planes available with reduced color availability (64 colors in 8 bit mode, 4 colors in 4 bit mode from a palette of 4096). Sprite generation is done by software.

2) A digital signal processor (DSP) with a 16 X 16 multiplier /accumulator. This provides high speed arithmetic capability (12 MIPS burst rate) for calculating vector graphics and synthesised sound. It has on chip cache RAM, 16 bits wide, seperate for program (128 words) and data (256 words) to allow maximum speed of operation. It also has 256 words of ROM programmed with a sine wave lookup table which is used during sound synthesis.

3) A memory Block Transfer Unit (Blitter) which is used to rapidly move images in screen memory. It can also draw lines, fill polygons and perform collision detection.

The memory bandwidth available to the Blitter is 12 MBytes/sec when it has exclusive use of the video RAM and 6 MBytes/sec when it shares access with the screen updating. This gives an average bandwidth of 9MBytes/sec.

This allows line drawing at 9M pixels/sec, Block moves at 4.5M pixels/sec, polygon fill and Sprite moves with collision detection at 3M pixels/sec. Even the slowest Blitter operation allows complete updating of the screen within 1 TV frame period (1/25 sec).

If complicated vector graphic calculations are also required for screen updating then the frame update rate will be reduced. The actual frame update rate will depend on the screen mode in use, the complexity and number of vector shapes on the screen and other functions being performed at the same time (e.g. sound synthesis) so a typical rate cannot be quoted.

Colour palette changes can be performed by an interrupt at the beginning of any scan line. These can be processed fast enough to allow all 4096 colours on screen at the same time. The speed of interrupt processing does limit the position of these colours on the screen. This is not a serious limitation in practice since it is not useful to have very large numbers of colours in small areas of the screen.

4) Two 14 bit D/A convertors to provide stereo sound with Compact Disc quality. If the full DSP performance is dedicated to sound synthesis approximately 40 channels can be generated. However this leaves no time for screen updates so a more sensible limit would be 8 channels split 4 Left and 4 Right.

5) A Memory Management Unit which can control a maximum of four blocks of memory which may be ROM, Dynamic RAM, Static RAM or Pseudo Static RAM and a maximum size of 256KBytes each. The blocks are allocated as follows :-

		Memory size fitted	
1)	Internal cache RAM	384 Bytes	
2)	Video SRAM/Program RAM	128KBytes	{64K Video SRAM 64K Program RAM}
3)	Operating System ROM	256Bytes	{In ROM cartridge}
4)	Cartridge Expansion RAM	512KBytes	{256KBytes}

RAM runs at 6MHz and is 16 bits wide to allow sufficient memory bandwidth for simultaneous Screen and Blitter accesses. It uses four 32K x 8 PS RAM chips (64KBytes). { Two chips 64 KBytes}.

{The program RAM is 8 bits wide and runs at 4MHz. It uses two 64K x 4 dynamic RAM chips (64 KBytes).}

The cartridge port can support up to 512KBytes of DRAM. It is 16 bits wide and runs at 4MHz.

{The Rev.1 cartridge port can support up to 256KByte of ROM (512KByte with bank switching) and 256KByte of program RAM expansion. Its data bus is 8 bits wide and runs at 4 MHz.}

The PCB also contains small amounts of TTL logic to provide Input/Output ports. There is a 6 channel A/D converter with 7 bit resolution used to read the potentiometer inputs. A power driver for the vibration solenoid is provided. There is discrete component circuitry to convert RGB analog signals to PAL or NTSC composite video and a UHF modulator for TV output (with sound).A low power stereo amplifier is also provided to drive a headphone socket.

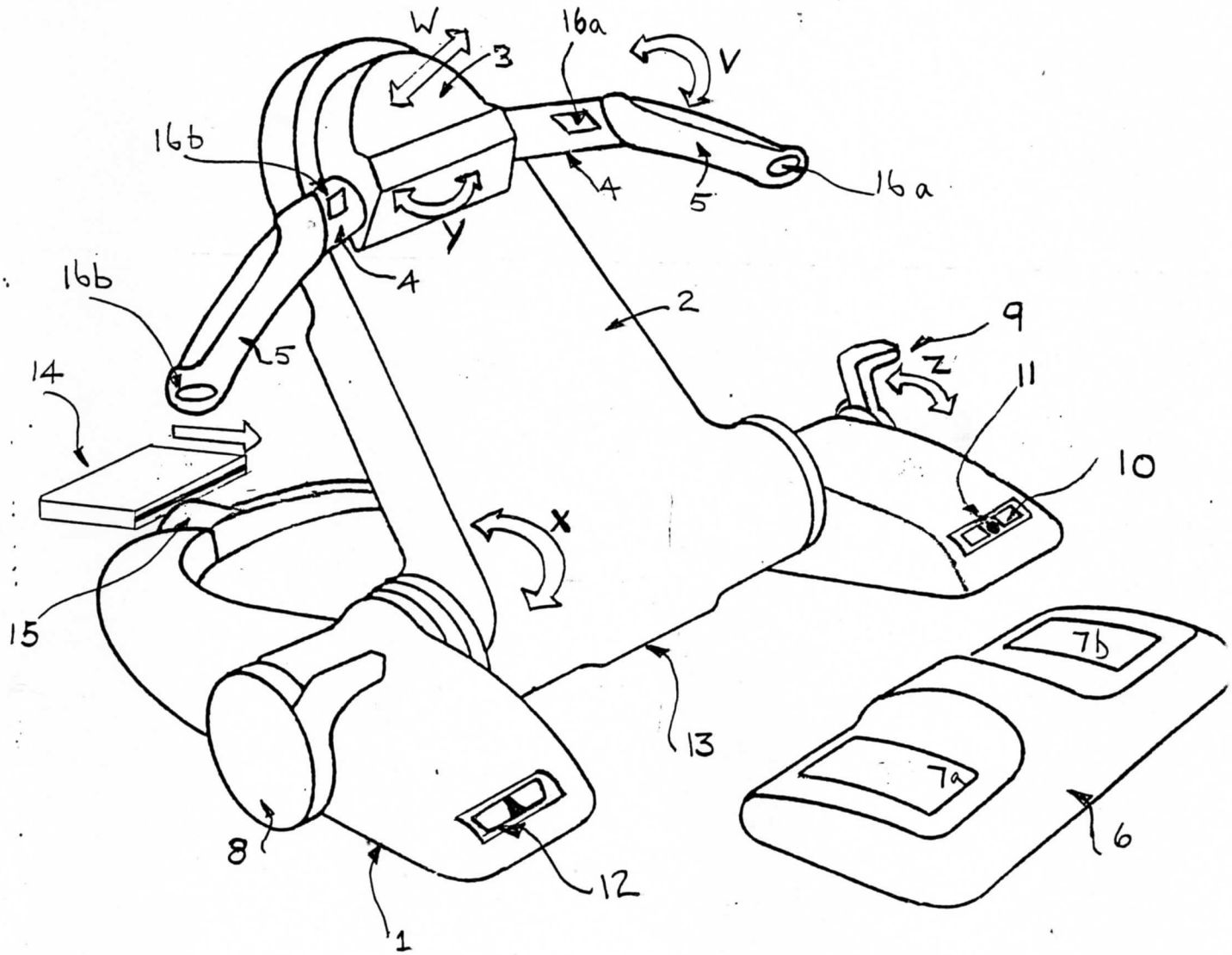


Fig. 1

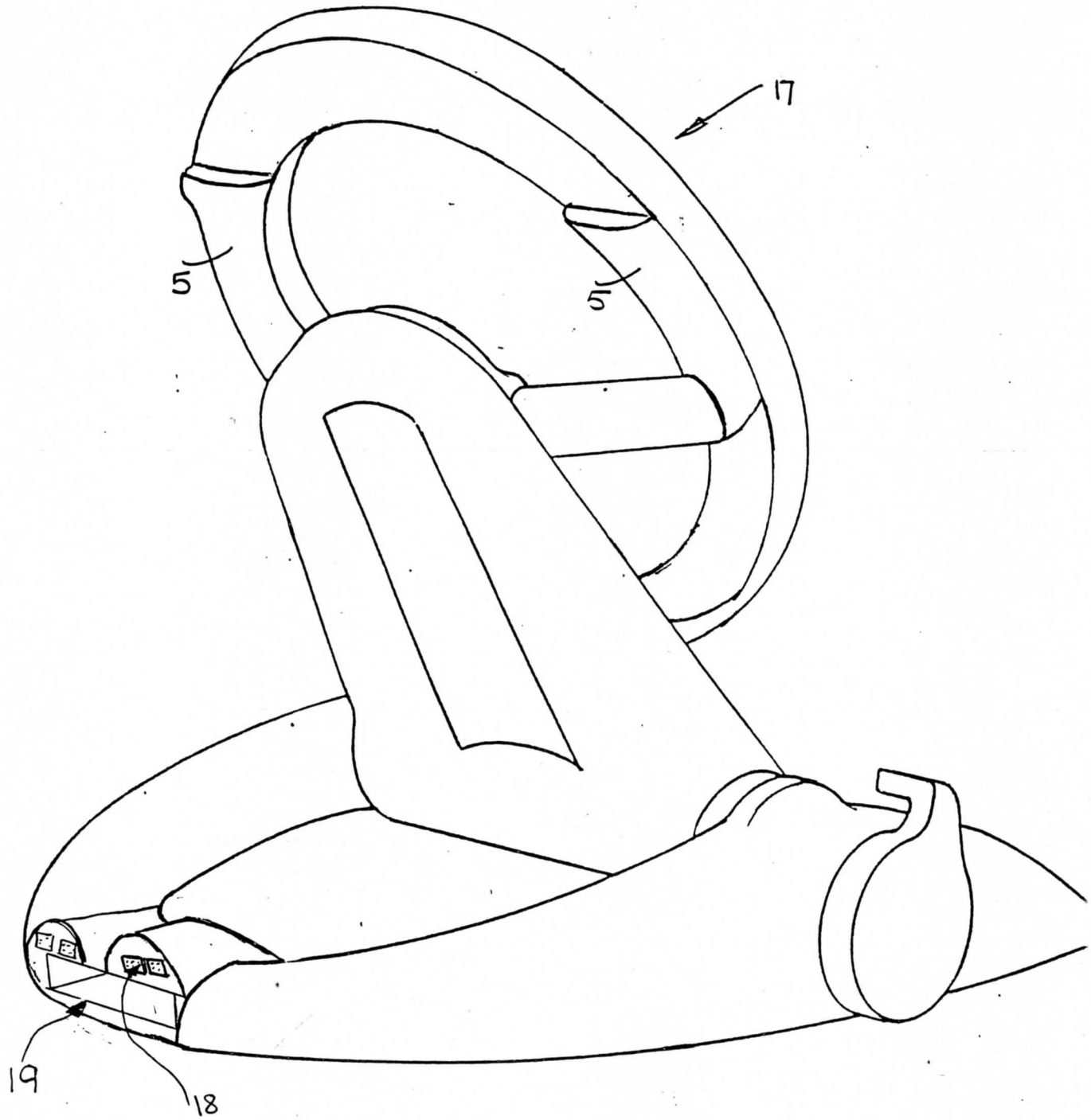
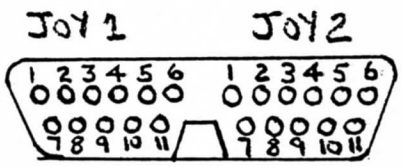


FIG. 2



FRONT VIEW

	JOY 1	JOY 2		JOY 1	JOY 2
1	U1/UR	U2	7	L1/UL	L2
2	D1/DR	D2	8	R1/DL	R2
3	POTX I/O	OP1	9	FA1/FIREA	FA2
4	POTY I/O	OP2	10	FB1/FIREB	FB2
5	POTZ I/O	OP3	11	0V	0V
6	+5V	+5V			

Joystick Plug

Fig 3

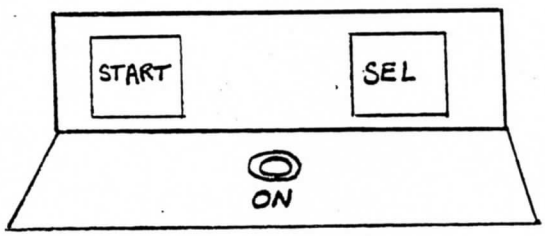
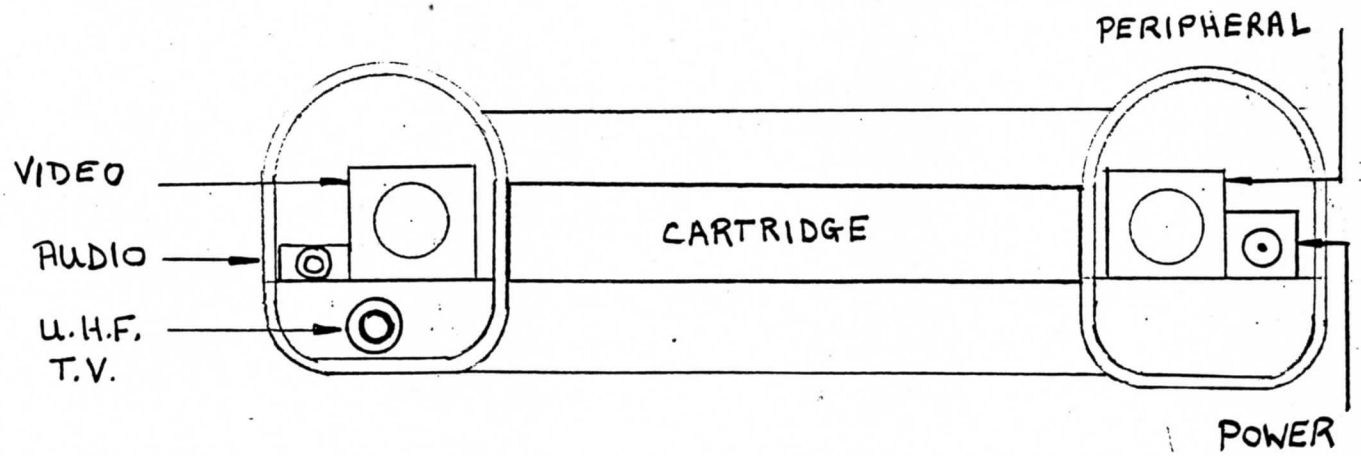
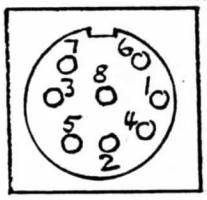


Fig 4



Rear Connectors

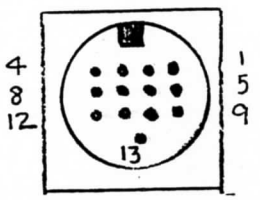
Fig 5



1	9V	5	LIT (Light Sensor)
2	RIGHT	6	UP
3	RECOIL	7	DOWN
4	LTRIG (Trigger)	8	LEFT
		SHELL	OV

Peripheral Connector

Fig 6



U.H.F.

1	RED OUT	5	GREEN OUT	9	BLUE OUT
2	HSYNC IN/OUT	6	VSYNC IN/OUT	10	AUDIO L
3	COMP. VID. OUT	7	+5V (50mA)	11	AUDIO R
4	RED IN	8	GREEN IN	12	BLUE IN
				13	OV

VIDEO CONNECTORS

Fig 7

REV 1 PORT DEFINITIONS

PORT 1 (In)

0	UL1	LTRIG
1	DL1	= BOTH
2	FA1/FIREA2	
3	FB1/FIREB2	
4	L1 /UL2	START
5	R1 /DL2	= BOTH
6	U1 /UR2	SELECT
7	D1 /DR2	= BOTH

PORT 2 (In)

0	UR1/KEY 0
1	DR1/KEY 1
2	FA2/FIREA1
3	FB2/FIREB1
4	L2 /KEY 2
5	R2 /KEY 3
6	U2 /KEY 4
7	D2 /KEY 5

PORT 3 (Out)

0	UP	RECOIL
1	DOWN	= BOTH
2	LEFT	
3	RIGHT	
4	VIBRATOR	
5	OP1	
6	OP2	
7	OP3	

These three ports are multiplexed onto the top 8 bits of the data bus. The input ports are addressed using JOY0 and JOY1 input/output decode. JOY2 decode latches data into port 3.

REV 1 CARTRIDGE CONNECTOR

1	A0	29	A13
2	A1	30	A14
3	A2	31	A15
4	A3	32	A16
5	A4	33	A17
6	A5	34	D0
7	A6	35	D1
8	A7	36	D2
9	A8	37	D3
10	A9	38	D4
11	A10	39	D5
12	A11	40	D6
13	A12	41	D7
14	+5V	42	+5V
15	0V	43	0V
16	9V	44	PWR ON
17	CS0/RAS0	45	CS1/RAS1
18	CS0 OUT	46	CAS
19	WE	47	OE
20	SER IN/OUT	48	COPS CLK
21	COPS RESET	49	DISK DATA
22	GPIO0	50	GPIO1
23	TEST	51	ANA OUT0
24	ANA OUT1	52	ANA OUT2
25	ANA OUT3	53	ANA OUT4
26	INTR	54	PCLK
27	RDL	55	WRL
28	IOM	56	READY

A0-A17 are address lines for Cartridge ROM or RAM
D0-D7 are data lines for Cartridge ROM or RAM
9V is an unregulated power line for disc drive motor etc.
PWR ON is a 0V output which turns on the +5v supply when the cartridge is plugged in.
CS0/RAS0,CS1/RAS1,CAS,WE and OE are ROM or RAM control lines.
CS0 OUT allows main board RAM to be expanded by carridge RAM.
SER IN/OUT, COPS CLK and COPS RESET are "dongle" control lines.
DISK DATA is a bidirectional line for serial disk data.
GPIO0 and GPIO1 are general purpose IO decode lines that allow D0-D7 to be used for other purposes e.g. Disk drive control.
TEST allows the ASIC test facilities to be accessed via the cartridge port.
ANA OUT0-5 allow potentiometer and switch outputs to be accessed to enable use as a "dumb" peripheral on other computers e.g. IBM
INTR, PCLK, RDL, WRL, IOM and READY are 8088 control lines provided for future expansion.