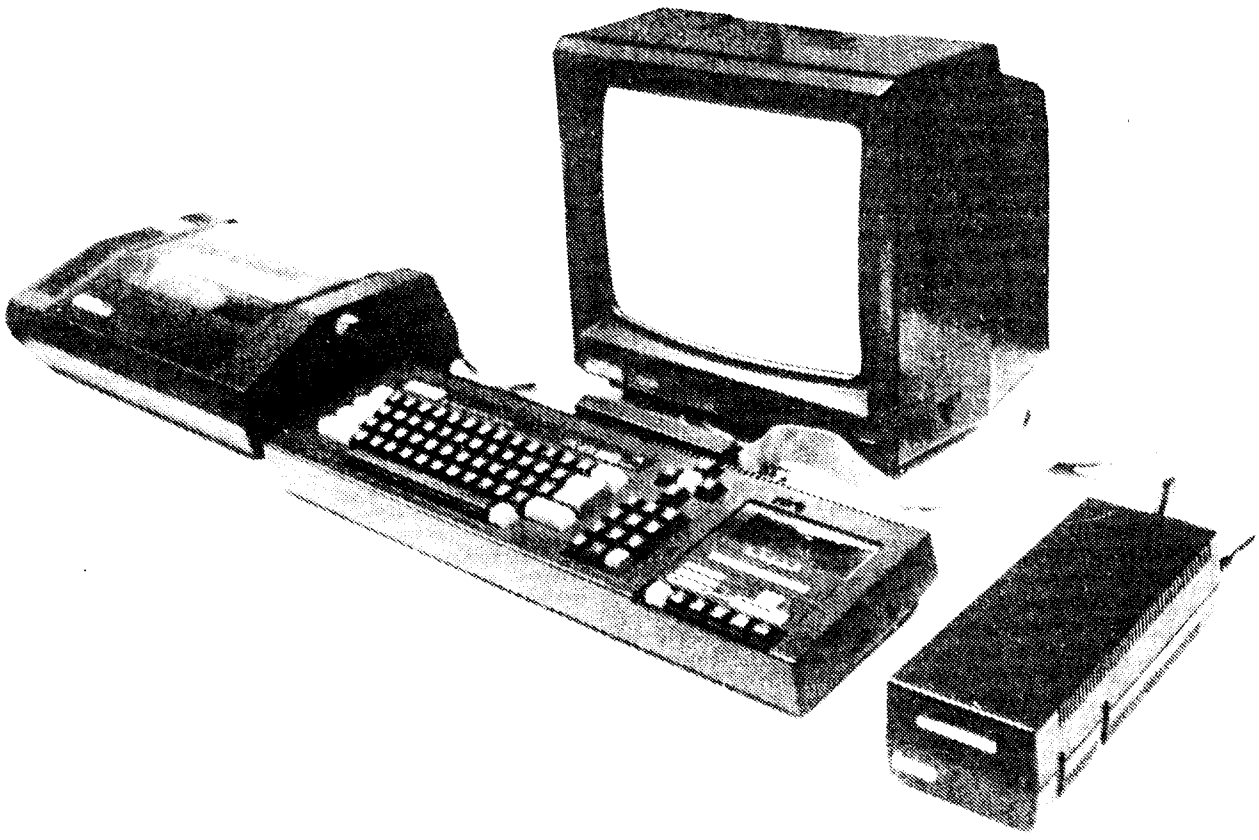
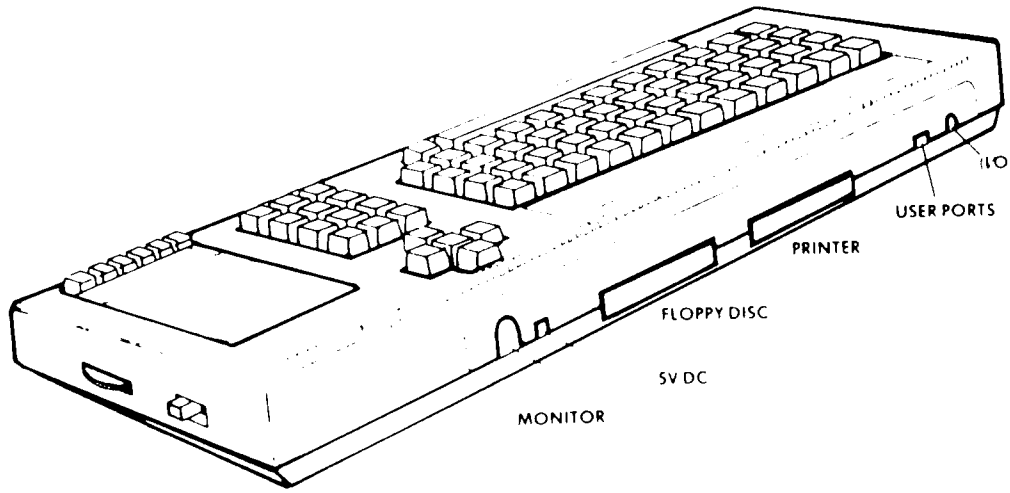


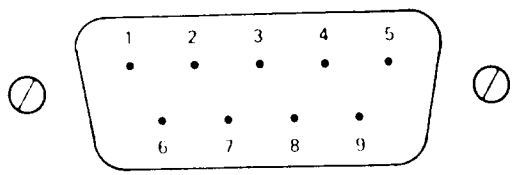
AMSTRAD COMPUTER SYSTEM
FIELD SERVICE
TRAINING AND SERVICE GUIDE

CPC464 IO CONNECTIONS



PADDLE PORT CONNECTOR (9 PIN D)

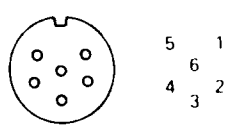
VIEWED FROM REAR



PIN 1	UP	PIN 6	FIRE 2
PIN 2	DOWN	PIN 7	FIRE 1
PIN 3	LEFT	PIN 8	COMMON
PIN 4	RIGHT	PIN 9	COM 2
PIN 5	SPARE		

VIDEO OUTPUT CONNECTOR (6 PIN DIN)

VIEWED FROM REAR

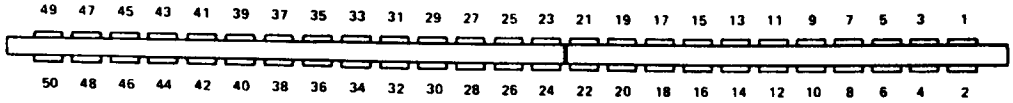


PIN 1	RED	PIN 4	SYNC
PIN 2	GREEN	PIN 5	GND
PIN 3	BLUE	PIN 6	LUM

REAR PANEL AND CONNECTIONS TO CPC-464

EXPANSION PORT 50 WAY 0.1 EDGE CONNECTOR

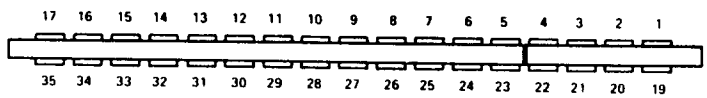
VIEWED FROM REAR



PIN 1	SOUND	PIN 18	A0	PIN 35	$\overline{INT}$
PIN 2	GND	PIN 19	D7	PIN 36	$\overline{NMI}$
PIN 3	A15	PIN 20	D6	PIN 37	$\overline{BUSRD}$
PIN 4	A14	PIN 21	D5	PIN 38	$\overline{BUSAK}$
PIN 5	A13	PIN 22	D4	PIN 39	READY
PIN 6	A12	PIN 23	D3	PIN 40	$\overline{BUS\ RESET}$
PIN 7	A11	PIN 24	D2	PIN 41	$\overline{RESET}$
PIN 8	A10	PIN 25	D1	PIN 42	$\overline{ROMEN}$
PIN 9	A9	PIN 26	D0	PIN 43	ROMDIS
PIN 10	A8	PIN 27	+ 5v	PIN 44	$\overline{RAMRD}$
PIN 11	A7	PIN 28	$\overline{MREQ}$	PIN 45	RAMDIS
PIN 12	A6	PIN 29	$\overline{M1}$	PIN 46	CURSOR
PIN 13	A5	PIN 30	$\overline{RFSH}$	PIN 47	L. PEN
PIN 14	A4	PIN 31	$\overline{IORQ}$	PIN 48	$\overline{EXP}$
PIN 15	A3	PIN 32	$\overline{RD}$	PIN 49	GND
PIN 16	A2	PIN 33	$\overline{WR}$	PIN 50	
PIN 17	A1	PIN 34	$\overline{HALT}$		

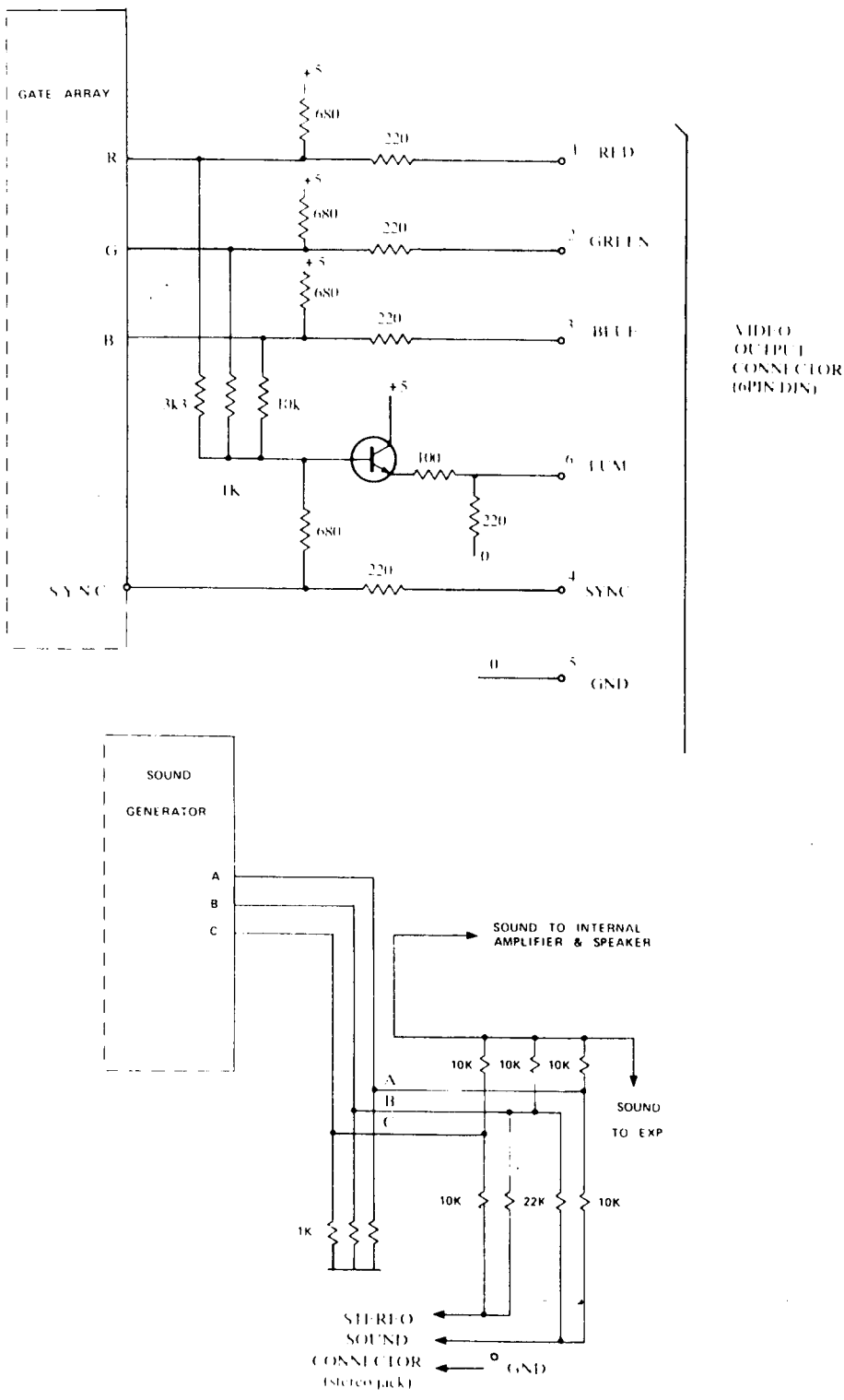
PRINTER PORT 34 WAY 0.1 EDGE CONNECTOR

VIEWED FROM REAR



PIN 1	$\overline{STROBE}$	PIN 19	GND
PIN 2	D0	PIN 20	GND
PIN 3	D1	PIN 21	GND
PIN 4	D2	PIN 22	GND
PIN 5	D3	PIN 23	GND
PIN 6	D4	PIN 24	GND
PIN 7	D5	PIN 25	GND
PIN 8	D6	PIN 26	GND
PIN 9	D7	PIN 27	GND
PIN 11	BUSY	PIN 28	GND
PIN 14	GND	PIN 33	GND
PIN 16	GND	All other pins NC	

REAR PANEL AND CONNECTIONS TO CPC-464



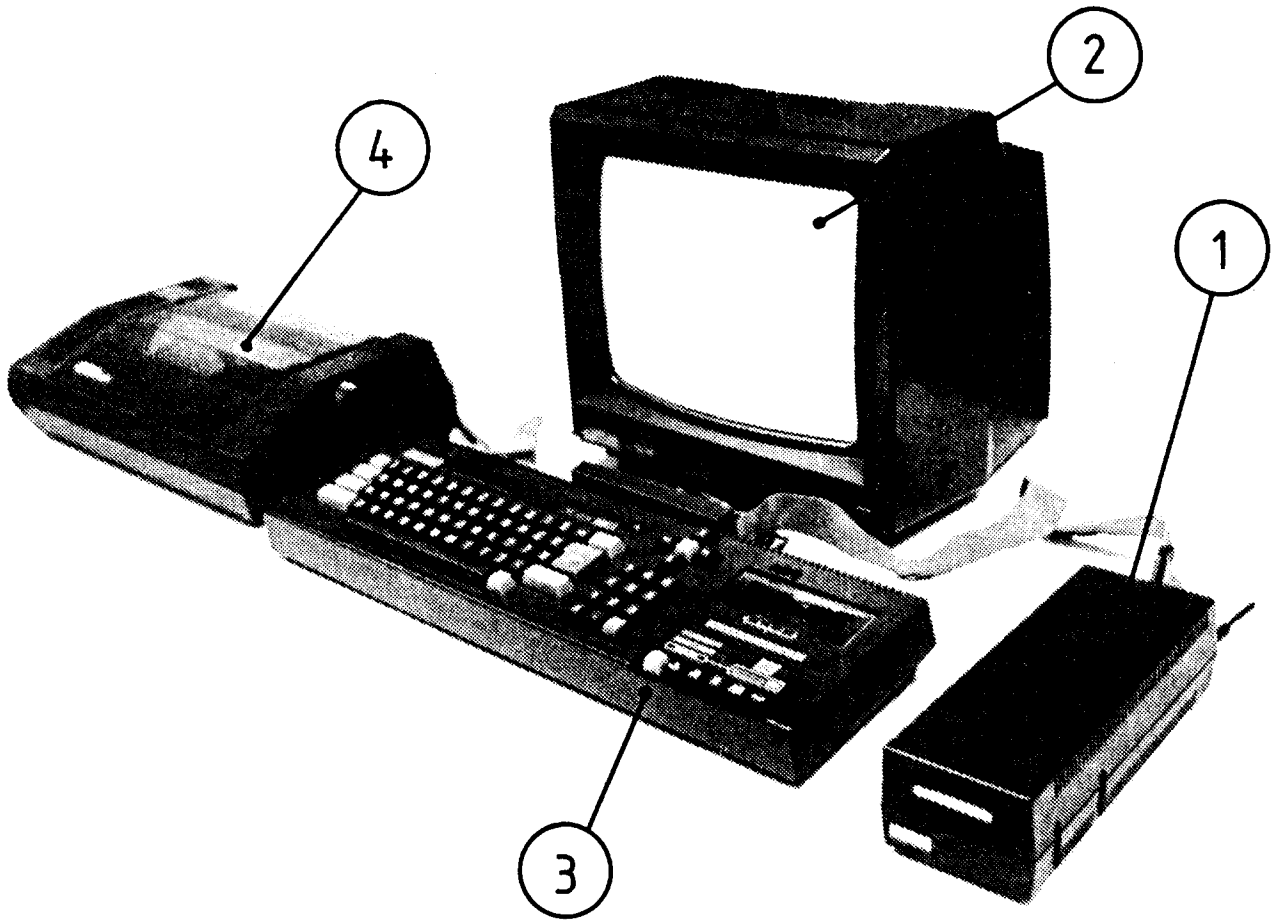
SYSTEM POWER UP SEQUENCE

For correct system operation it is imperative that the peripherals are turned ON in a set order, i.e. If the computer is powered on before the disk drive, any accesses to the disk drive will cause the computer to crash, because the interface has not been correctly initialized.

An indication of the above system fault is by the appearance of Red dots in the top LH corner of the screen, on a monochrome monitor the dots will be slightly brighter than the background.

The correct power up sequence is:-

1. DISK DRIVE
2. MONITOR or MP1
3. COMPUTER
4. PRINTER



SYSTEM SPECIFICATIONS

COMPUTER

Z80A Microprocessor Running at 4 MHz

64K Bytes of RAM (43533 bytes available)

32K Bytes of ROM (contains Basic and Operating System)

6845 Cathode Ray Tube Controller (CRTC)

8255 Parallel IO Port (controlling the keyboard, cassette motor and sound generator chip)

AY-3-8912 3 Voice, 7 Octave Sound Generator IC (also contains an 8 bit IO port which is used to scan the keyboard).

20RAD43 Gate Array (replaces 90% of the TTL logic in the computer)

DATA CASSETTE

4.75cm per second tape speed (1 7/8 ips) standard audio speed DATA STORED in 2Kbyte blocks.

DISK DRIVE

3" Floppy Disk can be reversed to provide data storage on two sides.

40 Tracks per Side

9 Sectors per Track

512 Bytes per Sector

180 Kbytes Total Formatted Storage Space Per Side

Disk Rotational Speed of 300 RPM

SYSTEM SPECIFICATION

PRINTER

Print Method	Impact Dot Matrix
Print Direction	Unidirectional (left to right)
Character Matrix	5(width) x 7(height) + 1(space)
Characters	128 upper/lower case characters, numerals and symbols
Character Code	7 Bit ASCII
Dot Spacing	1/60" (H) x 1/63" (V)
Character Pitch	10 Characters/Inch
Character Columns	80 Columns-Character Mode 480 Dot Columns-Graphics Mode
Print Speed	50 Characters/Second
Line Feed Spacing	6 Lines/Inch-Character Mode 9 Lines/Inch-Graphics Mode
Line Feed Speed	10 Lines/Sec (at 6 lines/inch) 15 Lines/Sec (at 9 lines/inch)
Graphics	Any combination of 7 dots in a vertical column
Multiple Copies	Two Including Original (thickness 0.15mm or less)
Paper Width	4.5 to 10 Inches Acceptable (pin to pin 4 to 9.5 inches)

THE KEYBOARD

The Amstrad keyboard contains some special keys which aid program entry and debugging. Some of these may be familiar to experienced computer users. The following is a list for those who are not familiar with the action of the keys.

ENTER

There are two **ENTER** keys. Either of these keys enter the information that you have typed into the computer. After the **ENTER** key is pressed, a new line is started on the screen. Each instruction that you type in to the computer should be followed by pressing the **ENTER** key.

DEL

This key is used to delete a character to the left of the cursor on the screen (for example a letter or a number) which is not required.

Type a b c d and you will see that the letter d is positioned to the left of the cursor. If you decide that you do not want the letter d, press **DEL** once and you will see the d removed. If you press **DEL** and continue to hold it down, the letters a b c will also be removed.

SHIFT

There are two **SHIFT** keys. If you press either of these and hold it down whilst typing a character, a capital letter or upper case symbol will appear on the screen.

Type in the letter a then hold down the **SHIFT** key and type in the letter a again. On the screen you will see:

aA

Now type in a few spaces by holding down the space bar. Try the following using the number keys which are on the top line of the keyboard, above the letter keys. Type in the number 2, then hold down the **SHIFT** key and type in the number 2 again. On the screen you will see:

2"

You can now see what happens when the **SHIFT** key is held down whilst pressing a character key. Experiment by typing any of the character keys, either on their own, or together with the **SHIFT** key.

CAPS LOCK

This has a similar operation to **SHIFT** except that you only have to press it once. From then on each letter that you type in will be in capitals, although the number keys will not be shifted. Press **CAPS LOCK** once, then type in:

abcdef123456

On the screen you will notice that although all the letters are shifted to capitals, the numbers have not been shifted to symbols. If you wish to type in a shifted symbol while **CAPS LOCK** is in operation, simply hold down the **SHIFT** key before pressing a character key, Press the following keys while holding down the **SHIFT** key:

ABCDEF123456

On the screen you will see:

ABCDEF!"#$%&

If you wish to return to small (lower case) characters again, press **CAPS LOCK** key once again.

If you wish to type in capital letters and shifted upper case symbols without having to constantly hold down the **SHIFT** key, this can be carried out by holding down the **CTRL** key, then pressing **CAPS LOCK** key once. Now type in:

abcdef123456

On the screen you will see:

ABCDEF!"#$%&

It is still possible to type in numbers while **CTRL** and **CAPS LOCK** are in operation, by using the number keys to the right of the main keyboard.

Holding down the **CTRL** key and pressing **CAPS LOCK** once will return you to the mode that you were previously in - CAPS LOCK or lower case. If you have returned to the CAPS LOCK mode, simply press **CAPS LOCK** once again to return to the lower case mode.

CLR

This key is used to clear a character within the cursor.

Type in ABCDEFGH. The cursor will be positioned to the right of the last letter typed (H). Now press the cursor left key ← four times. The cursor will have moved four places to the left, superimposed over the top of the letter E.

Notice how the letter E is still visible within the cursor. Press the **CLR** key once and you will see that the letter E has been cleared and the letters FGH have each moved one space to the left with the letter F now appearing within the cursor. Now press the **CLR** key again and hold it down. You will see how the letter F is cleared followed by the letter G and H.

ESC

This key is used to **ESC**ape from a function that the computer is in the process of carrying out. Pressing the **ESC** key once will cause the computer to temporarily pause in its function, and will continue again if any other key is pressed.

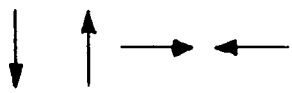
Pressing the **ESC** key twice will cause the computer to completely **ESC**ape from the function which it is carrying out. The computer is then ready for you to type in some more instructions.

Now press the **ESC** key twice.

IMPORTANT

When you reach the right hand edge of the display by entering more than 40 characters on the screen, the next character will automatically appear on the next line at the left edge of the screen. This means that you should **NOT** press **ENTER** as those of you accustomed to typewriters might press a carriage return towards the right edge of a page.

The computer does this automatically for you, and will react to an unwanted **ENTER** by printing an error message - usually a Syntax error, either there and then, or when the program is run.



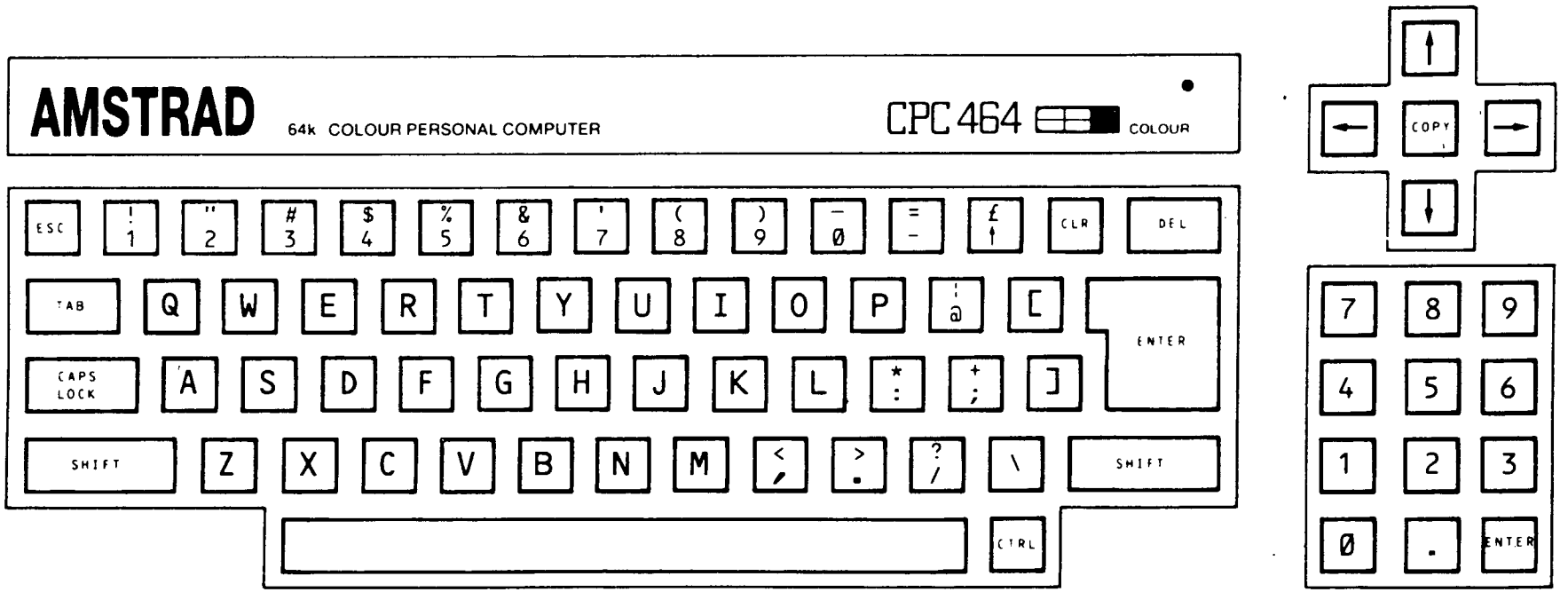
The above key symbols represent the four cursor control keys, they have two different functions.

1. By depressing any one of the keys the cursor will move in the direction indicated.

2. By holding down the shift key whilst pressing one of the cursor keys the computer will enter the edit mode (two cursors on the screen). In this mode program lines may be edited or corrected.

COPY

This key is used in conjunction with the cursor control keys (in edit mode), by depressing the **COPY** key program lines may be copied and edited, this facility is mainly used to correct mistakes in program lines.



KEYBOARD AND NUMERIC PAD LAYOUT

THE DATA CASSETTE

When the program has been typed in, and corrected, it will have to be stored, otherwise when the computer is turned off the program will be erased from memory.

The CPC464's inbuilt cassette deck provides a cheap storage medium. This deck uses standard audio tapes of up to C90 in length, never use cheap tapes as these tend to lose their oxide easily resulting in corrupt data (it only takes one corrupt bit of data to stop a program from loading).

The programs are saved in blocks, each block can be up to 2000 bytes in length, the computer can be programmed to save data to the cassette at two different speeds, the tape speed stays the same (4.75cm per second or 1 7/8 IPS), the frequency at which the data is written is changed. The commands are;

SPEED WRITE 0

Data is saved at 1000 bits per second, this represents the data speed selected when the computer is turned on.

SPEED WRITE 1

The data rate is doubled up to 2000 bits per second, as some of the safety margins are sacrificed when using this option, it is important that high quality tapes are used, also differences in azimuth between machines may affect the loading if the program is loaded on a different machine to the one it was saved on. The computer automatically sets itself to read the data rate at which the tape was recorded.

Special commands are used to control the cassette deck. The most common ones are shown:-

Press **CTRL** and the small **BLUE ENTER** keys together to load the first program off cassette.

LOAD "Program Title" loads a named program into memory from the cassette.

SAVE "Program Title" saves a program from memory to the cassette tape (Program Title cannot be more than 16 character in length).

CAT This command catalogues the programs on the cassette tape, an ok at the end of the file name indicates that the file is readable.

TYPICAL SYSTEM FAULTS

Normal System - Yellow characters on blue background.

System Faults - No power, LED extinguished.

LED illuminated but No video.

No characters on the screen except a border.

Rubbish on screen.

No vertical or horizontal sync.

CPC464 powers up okay, but will not load cassette programs.

CPC464 powers up and loads program but they 'crash' when run (may be solid or intermittent fault).

Keyboard faulty.

In the following fault finding description, if the computer is at fault it must be uplifted and sent to the workshop for repair.

The Amstrad computer system requires both on/off switches to be turned on before it will operate, an indication as to whether power has reached the computer is the illumination of the **RED LED.**

The 5 volt DC power rail for the computer originates from the monitor. The monitor HT rail has to be working correctly before the computers 5v rail is established. This 5v rail contains an over current protection circuit, so a short circuit in the computer will turn off the 5 volts.

The 5 volts can be measured by removing the DC plug to the computer and measuring from inner to outer.

The 5 volts is again switched by the computers own on/off switch, once this is in the ON position and the 5 volts is established, the Red power LED should illuminate.

If the **LED DOES NOT ILLUMINATE** then check the 5v DC going to the computer, if there is 5v DC going into the computer measure the resistance of the 5v DC computer rail at the internal connections of the DC socket, on the 2 K Ohms diode range the circuits resistance should be around 400 Ohms. A reading lower than 300 Ohms will indicate a short, an open circuit will indicate a faulty on/off switch or cassette plug connection.

If there is no 5v DC present, the fault lies in the mains plug, the monitor, or the 5v DC coiled lead. Check the existance of the monitors HT rails for if these are not correct, the 5v DC rails will not function. Normal fault finding principles apply to the mono and colour monitors.

TYPICAL SYSTEM FAULTS

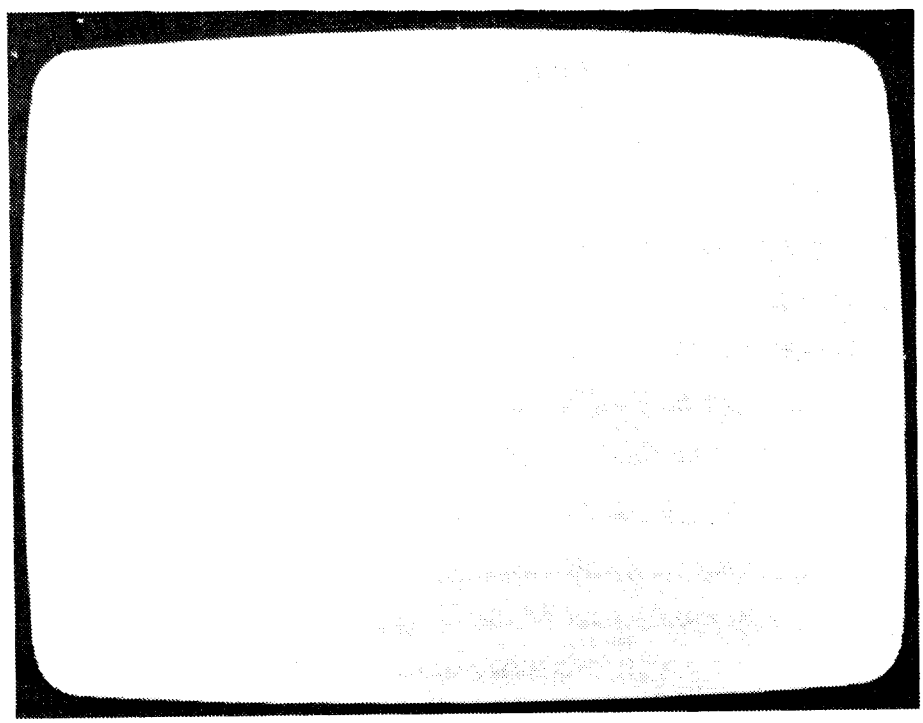
If the **LED DOES illuminate** check for video on the monitor. The normal display is yellow characters on a blue background. If the display is correct, run the field diagnostic tape.

If no video is present, then check the output voltages of the video socket, the correct DC voltages are shown below.

Faults causing **NO SYNC** or lack of either vertical or horizontal sync may be associated with the computer or monitors. Check the sync amp transistor Q601 in the mono monitor. Memory faults with the computer can cause some strange and varying sync faults.

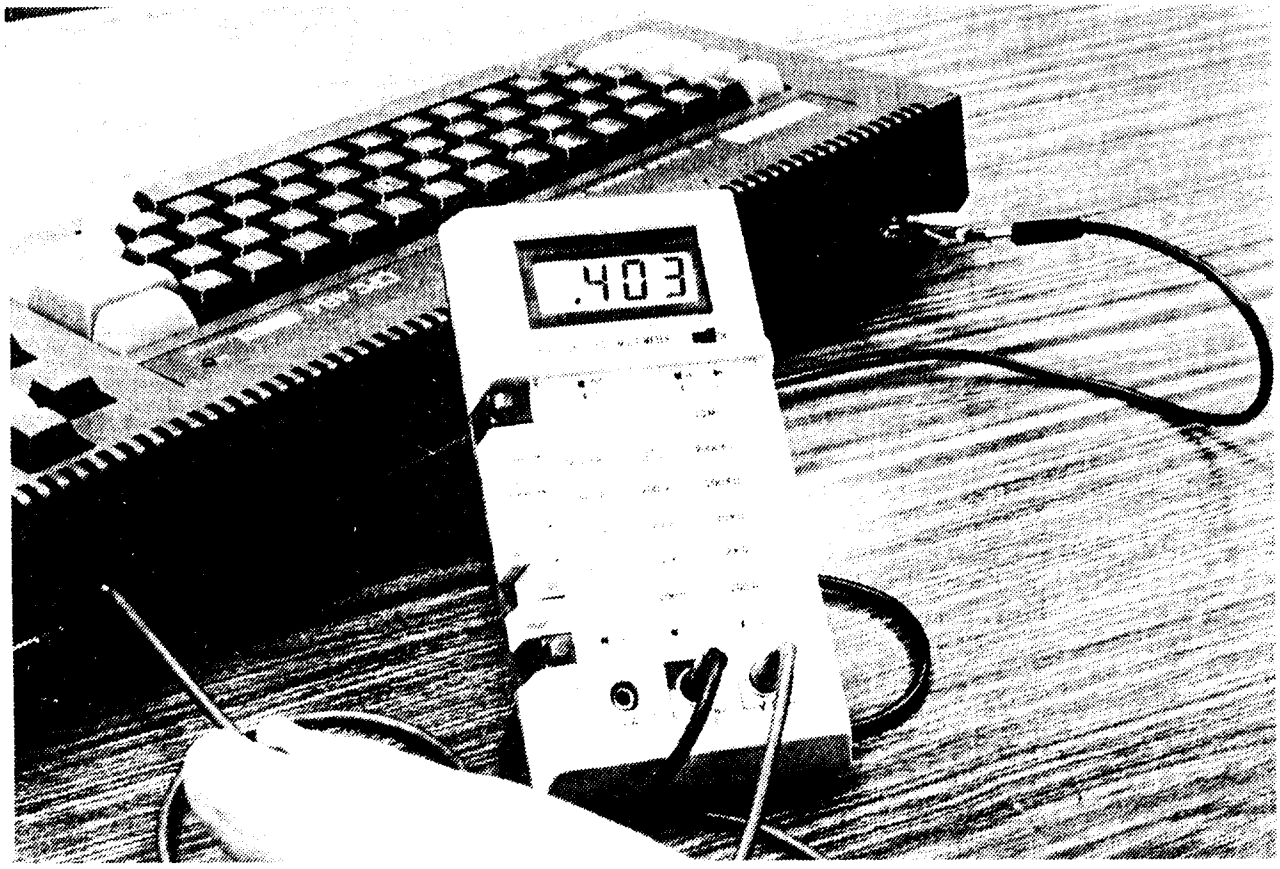
Cassette will not load if the motor is turning, clean the record/play head, load the field diagnostic tape. If it stops between blocks or fails to load you may have a RAM fault.

The field diagnostic will automatically run when loaded. If it does not run correctly or displays FAULT FOUND, the computer is at fault. Allow the program to cycle through before declaring the computer operational. The keyboard and data cassette can be tested by running the programs on the other side of the cassette.

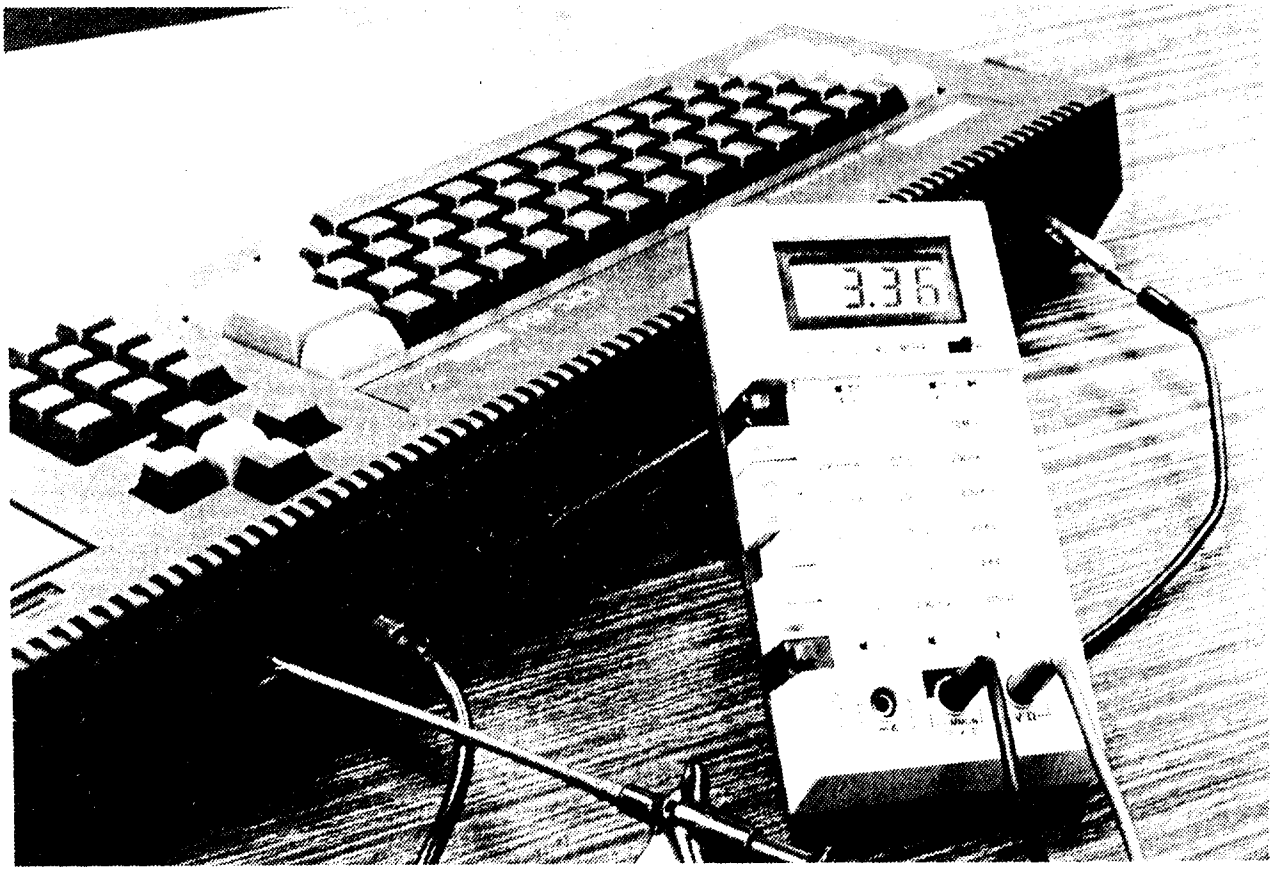


VIDEO DISPLAY AT POWER UP

YELLOW CHARACTERS ON BLUE BACKGROUND

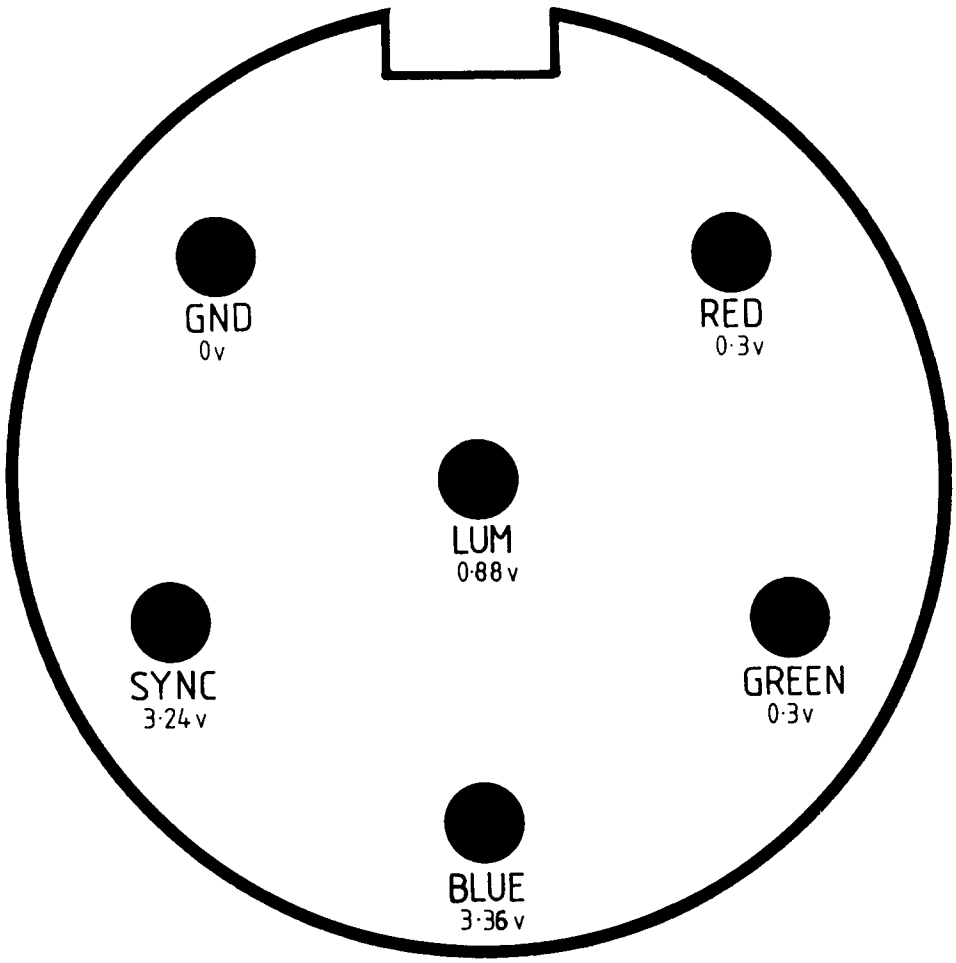


CHECKING THE CPC-464 CIRCUIT RESISTANCE



MEASURING THE CPC-464 MONITOR SOCKET OUTPUT (BLUE)

AMSTRAD CPC464 VIDEO OUTPUT



NORMAL VIDEO OUTPUT AT POWER ON

All voltages are D.C. and measured with respect to chassis (GND).

THE DMP1 PRINTER

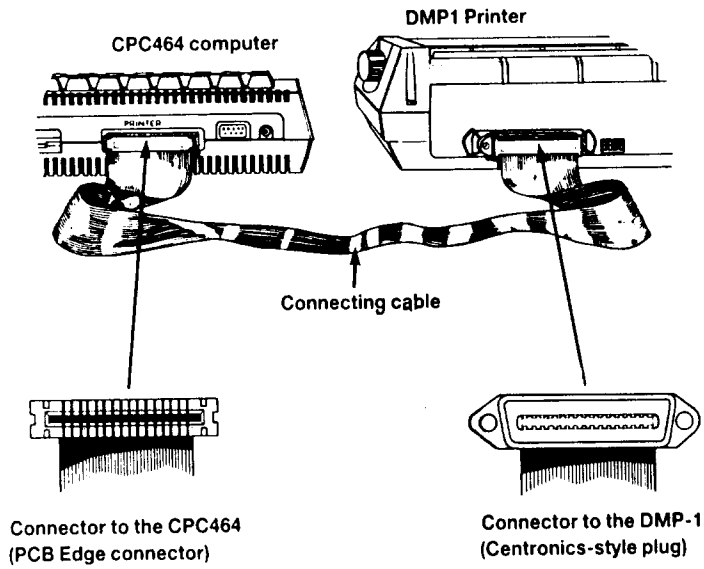
Connecting the printer to the computer.

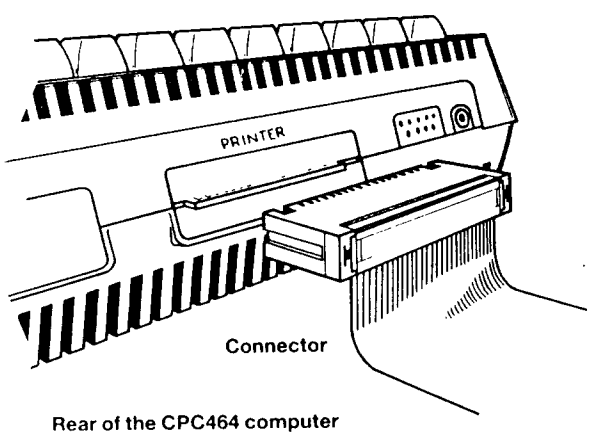
1. Check that both the DMP1 printer and the CPC-464 computer are switched off.

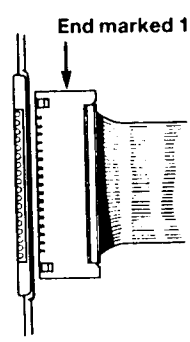
2. The connector at the rear of the DMP1 is a Centronics-style socket, which you should find easily distinguishable from the PCB edge connector used at the rear of the CPC-464.

3. The DMP1 is supplied complete with a cable that allows direct connection to the PRINTER connector at the rear of the CPC-464. The diagram below shows how this cable is to be fitted. Firm pressure will be required to ensure that a good connection is made.

4. After connecting the Centronics-style plug into the rear socket of the DMP1, lock the plug into position by pressing the metal clips either side of the socket into the cut-outs at the side of the plug.







DIP SWITCH SELECTION

You will find the DIP switches on the rear panel of the DMP1, next to the Centronics-style connector socket.

You will receive the DMP1 set by the factory for UK language characters (see table below). This will enable you to use programs which incorporate the £ sign, such as home budgeting and accounting programs.

You should note however, that when listing programs incorporating the # sign, it will be printed as £.

If at any time you wish to print # signs, simply set DIP switch No.3 off (down). It should then be noted, that under this condition, £ signs will be printed as # .

Setting DIP switch No.4 on (up), will result in double line spacing by the printer, as opposed to the normal single line spacing.

DIP switches 1, 2 and 3 are used to select eight different language characters as follows.

Code (HEX) / Country	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E		SW1	SW2	SW3
U.S.A.	#	$	@	[	\	]	^	`	{	¦	}	~		OFF	OFF	OFF
U.K.	£	$	@	[	\	]	^	`	{	¦	}	~		OFF	OFF	ON
GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	β		OFF	ON	OFF
SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	à	ü		OFF	ON	ON
FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨		ON	OFF	OFF
DENMARK	#	$	@	Æ	Ø	Å	^	`	æ	ø	à	~		ON	OFF	ON
ITALY	#	$	@	°	\	é	^	`	à	ò	è	ì		ON	ON	OFF
SPAIN	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~		ON	ON	ON

PRINTER TROUBLESHOOTING GUIDE

Use the table below to diagnose any problems that may occur.

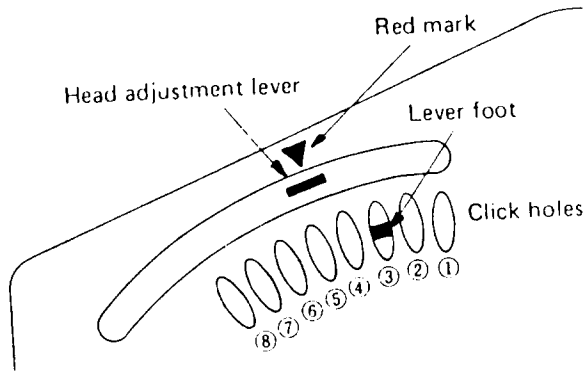
PROBLEM	CAUSE AND REMEDY
The DMP1 does not print	1. Power is not getting to the DMP1 Check the Mains Lead is connected and the ON/OFF switch is ON. 2. The Fuse in the Mains Plug may be blown - Replace it with a 3 Amp Fuse.
The DMP1 does not print. The POWER LED is on.	The connection to the computer is not correct - Check to make sure that the cable between the printer and the computer is correctly connected. The ribbon cassette is not properly installed - Correctly install the ribbon according to the instructions in the book.
The DMP1 is operating correctly but the paper is not feed-properly.	The paper is jammed in the printer - Remove the paper and reload it correctly.
The print is faint or smeared.	The print head position is not correct - Set the head adjustment lever to match the type of paper being used. The ribbon cassette is not properly installed - Correctly install the ribbon according to the instructions in the book.

	The ink ribbon is worn - Replace the ribbon.
The POWER LED is flashing on and off.	An error condition has occurred due to the detection of abnormal timing in a sensor - Switch power off, wait approx. 10 seconds, then switch on again. If the fault persists, send the complete system to the workshops.

SETTING THE HEAD POSITION

The print head position is adjusted using the Head Adjustment lever on the left hand inside wall of the printer.

It should be set according to the thickness of paper being used. The diagram below shows the 8 different setting positions of the lever which are indicated by the position of the lever foot in the click holes.



The settings graduate from position 1 for very thin paper, to position 8 for thicker paper. Position 3, indicated by a red arrow above the Head Adjustment slot, is suitable for general purpose computer paper, including Amsoft Printer Paper.

During insertion or removal of the paper or ribbon cassette, the Head Adjustment lever should be set fully towards the front of the printer (past position 8).

The tinted-perspex printer cover can now be lowered backwards to its closed position, ready for operation. Keeping the cover closed will help reduce noise, and keep the printer mechanism dust free.

THE DATA CASSETTE

The data cassette circuit shown to page 8 of the Amstrad Service Manual consists of four distinct sections

1. Audio output
2. Data cassette read/write and erase
3. +5 volts switching and Power On indication
4. Motor control

Signals going to and from the data cassette enter via plug connector CD001 (shown on page 7). The CP001 connection shown on page 8 is the wired connection to the data cassettes PCB.

Computer generated sound enters the data cassette on CP001(G). IC302 provides impedance buffering and high frequency compensation via C312. The wiper of the volume control (VR301) feeds IC301. IC301 provides amplification to drive the 8 Ohm speaker.

DATA to be written to the cassette enters on CP001(D), Resistor R322 couples this data to pin 2 of IC302, the data is amplified and fed to the Record/Playhead, DC bias is derived within IC302. SW301 (Record Play Switch) connects the appropriate side of the head to chassis.

In the play mode the bottom end of the head is connected to chassis. Voltages induced in the head are amplified by Q301 and IC302, the output signal on IC302 pin 8 will be a 0 or 5 volts signal, dependant upon the logic state of the signal.

The data cassette uses a DC erase system, the erase current being defined by resistor R324 and the internal resistance of the head.

The 5 volts entering the DC socket at the back of the computer is connected directly to PCB Contact CP001(C),SW302 is the computers slide On/Off switch, D302 located on a separate PCB is the Power on LED. The switched 5 volts goes on to power the data cassette, CP001(A) connects the 5 volts to the computers PCB.

The microprocessor within the computer controls the DC motor during the saving and loading of programs via Relay RY301. This control is overridden during Fast Foward and Rewind operations, by leaf switches. Transistor (Q101) on the computers PCB provides the necessary current to latch the relay, its collector is connected to CP001 (H). Q101 turns on when you press a key on the keyboard, during the computers prompt of '...then any key'.

THE GT64 MONOCHROME MONITOR

The circuit of the GT64 monochrome monitor is shown on page 19 of the Amstrad Manual. The mains transformer contains an internal thermal fuse in its primary, it is designed to go open circuit at 130°C. The secondary provides two stepped down voltages, these are full wave rectified and smoothed to provide an 18 volt and 10 volt DC rails. These DC rails are stabilized by series regulators to produce 12 volts and 5 volts respectively. Both circuits work in a similar way, in addition the 5 volt rail incorporates current limiting.

For simplicity the operation of the 12 volt rail will be described. IC502 is a low current voltage regulator. Pin 1 is supplied from the unregulated 18 volt rail, the regulated output voltage is obtained from Pin 3 (the emitter of the internal series pass transistor). This output voltage is adjusted by the potential divider made up of VR502, R503 and R504, unlike standard regulators, IC502 (L78MG) does not work on the Basic principle of a DC reference voltage and DC feedback (ie through VR502, R503). Instead, it works on current. Pin 4 is held at a permanent 5 volts. The comparitor within IC502 compares the current through Pin 4 with a constant current generator connected to the comparitors other input.

If the 12 volt rail increases the current through VR502 and R503 must increase, R504's current will always be constant, the current into Pin 4 will increase, causing the output voltage on Pin 3 to decrease. Q502 provides current amplification as IC502 is not capable of supplying enough current for the monitors circuit. VR502 presets the 12 volt rail.

The 5 volt regulation circuit operates in a similar fashion to the 12 volt circuit, the method of regulation and current amplification being the same. Pin 1 of IC501 is fed from the 18 volt rail via D509, R511 and Q506. If this voltage to Pin 1 disappears the 5 volt regulated rail will fall to zero.

Current being drawn by the computer is monitored by resistor R505. If the current increases excessively, the volt drop across R505 will turn on Q503 , Q504 and Q505. C516 prevents voltage spikes from turning on Q504 and Q505. Q504 and Q505 'latch on' and in doing so turn off Q506, and the 5 volt rail. The 5 volt rail can only be restored by removing the short and turning the monitor OFF then back ON. Faults in the monitor causing fuse F503 to go open circuit will turn off the 5 volt rail, as IC501's voltage is obtained from the 18 volt rail.

Q703 is the line output transistor, D705 being the recovery diode. Diode D704 provides start voltage, voltage top up and 12 volt isolation for the line stage, during normal working conditions its cathode is at 18v DC.

Pin 7 of the Line Output Transformer provides a 103 volt supply for the CRT and the video amplifier Q605.

THE GT64 MONOCHROME MONITOR

The video amplifiers supply is zenered to 48 volts by D601. Zener D603 will protect the CRT from being over biased should D601 go open circuit.

The field scan coils are driven directly from IC701, the IC contains the whole field circuit, oscillator, predriver and output.

The video input connector CD601 is shown on the right of the circuit. Notice that Pins 1, 2 and 3 are terminated by 100 R resistors, this termination ensures the correct matrixing of the RGB signals in the computer, for the creation of the luminance signal.

THE CTM-640 COLOUR MONITOR

The colour monitor circuit on page 30 of the Amstrad Manual includes 5 volt regulation and over protection for the computer. The regulation and over-current circuits function in the same way as the ones in the GT64 Monitor.

The switched mains is full wave rectified by discreet diodes (D501-4). L502 and TH501 constitute the CRT degauss circuit. The rectified mains feed resevoir capacitor C505. The negative side of C505 is used as reference for all power supply primary voltages, the voltage path through the power supply is R501, T501, Pins 14 and 15 of IC501, Pin 11 then R502. IC501 provides voltage regulation and switching via its inbuilt switch mode transistor. DC Bias to the base of the output transistor (Pin 10) is provided by Resistors R506, 7 and Diodes D507 and 8. A common fault is either D507 or D508 going open circuit, causing the switch mode transistor to go short circuit. Q501 provides overload protection by monitoring the voltage from T501. Feedback from T501 enables the power supply to oscillate at 62.5 KHz Pin 6). The components around Pins 2 and3 set the output volts to 104 volts. Feedback from T501 to Pin 4 keeps this voltage constant. The output voltage on the secondary of T501 is rectified by D509 and smoothed by C515 to produce a 104 volt rail. The lower secondary winding produces 10 volts, this supplies the 5 volt regulator circuit. The 5 volt circuit has a slightly different layout from the GT64 Monitor. IC502 regulates the line, Q502 provides the necessary current amplification, R513 is the current sensing resistor. Q503, 506 and 504 provide the latch, and switch off the supply to Pin 1 of IC502 under excessive current conditions. The supply to IC502 is derived from the line output stage, so faults with the line output stage will cause the 5 volt rail to disappear.

In addition to the standard line derived voltages e.g. EHT, focus, CRT Heater, there are:-

1. 18 volts from D406 (line output protection)
2. 19 volts from D404 (general puprose LT)
3. 25 volts from D405 (field ouput)
4. 180 volts from D407 (RGB output)

The rest of the circuit uses an LA7800 IC for sync separator, frame/line osc, and a UPC1378H for field output. This circuit configuration can be found in Triumph CTV 8212/8312 and the equivalent Saisho chassis.

THE FIELD DIAGNOSTICS

The diagnostic programs for first line field servicing are stored on one cassette tape, they are as follows:-

Side A Monitor/Sound Test and Adjust
        Keyboard Contact Test
        Data Cassette Test

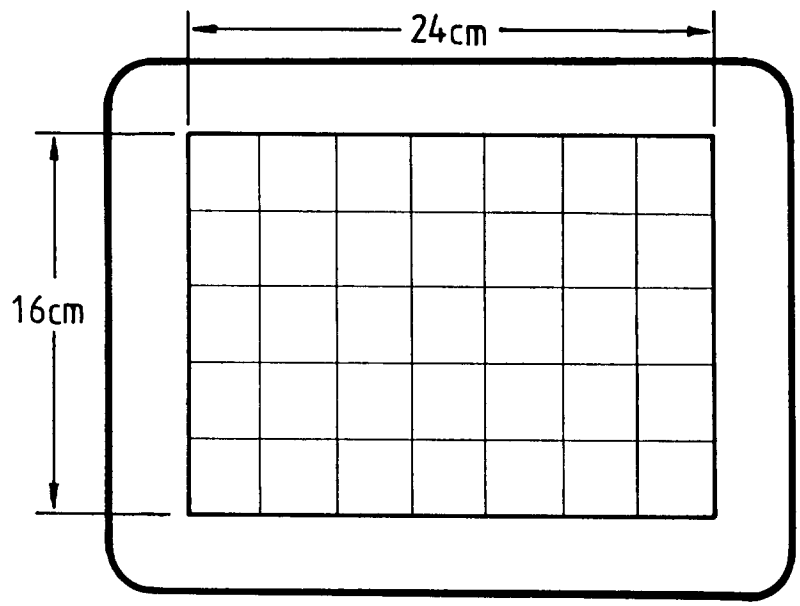
Side B Internal Test of Computers Memory
        Display of all Colours + Names

The Side A programs can be selected from a menu, the menu is loaded in first, by moving either the or keys the individual test programs may be selected.

If you require to run all of the programs on Side A select the monitor display programs first, when loaded in the Monitor Test Selection menu is displayed. When you have finished with the Monitor Tests, eject the tape, turn the computer off, then after a few seconds turn it back on again. Re-insert the cassette, press the CTRL and small blue ENTER keys together, follow the instructions on the screen.

The keyboard test program will now load in, the data cassette test follows, when the testing has finished the screen blanks for 15 seconds then displays a Union Jack.

The test on Side B of the tape carries out a comprehensive test of the RAM and ROM within the CPC464. If a fault is detected the computer displays FAULT FOUND. A demonstration of the 27 available colours follows.



Display Measurements Using the Crosshatch Pattern on the Colour or Monochrome Monitors.

APPENDIX

NOTES

ERROR NUMBERS AND ERROR MESSAGES

When BASIC encounters a program statement, word or variable that it cannot understand or process, it will stop and display an error message. The form of the message will generally indicate what went wrong, and sometimes, if the error is a typographical error during program entry, BASIC will prompt in edit mode, with the line where the incorrect entry was made.

The most popular error to greet the inaccurate typist is the **Syntax Error** (number 2), and BASIC prompts with the line to edit if encountered in program mode. In direct mode, it simply states that an error occured, and assumes that the last line typed is visible to spot the problem.

1 Unexpected NEXT

A NEXT command has been encountered while not in a FOR loop, or the control variable is the NEXT command does not match that in the FOR.

2 Syntax Error

BASIC cannot understand the given line because a construct within it is not legal.

3 Unexpected RETURN

A RETURN command has been encountered when not in a subroutine.

4 DATA Exhausted

A READ command has attempted to read beyond the end of the last DATA.

5 Improper Argument

This is a general purpose error. The value of a function's argument, or a command parameter is invalid in some way.

6 Overflow

The result of an arithmetic operation has overflowed. This may be a floating point overflow, in which case some operation has yielded a value greater than 1.7E-38 (approx.). Alternatively, this may be the result of a failed attempt to change a floating point number to a 16 bit signed integer.

7 Memory Full

The current program or its variable may be simply too big, or the control structure is too deeply nested (nested GOSUBs, WHILEs, or FORs).

A MEMORY command will give this error if an attempt is made to set the top of BASIC's memory too low, or to an impossibly high value. Note that an open cassette file has a buffer allocated to it, and that may restrict the values that MEMORY may use.

8 Line Does Not Exist

The line referenced cannot be found.

9 Subscript Out of Range

One of the subscripts in an array reference is too big or too small.

10 Array Already Dimensioned

One of the arrays in a DIM statement has already been declared.

11 Division by Zero

May occur in Real division, integer division, integer modulus or in exponentiation.

12 Invalid Direct Command

The last command attempted is not valid in Direct Mode.

13 Type Mismatch

A numeric value has been presented where a string value is required, and vice versa, or an invalidly formed number has been found in READ or INPUT.

14 String Space Full

So many strings have been created that there is no further room available, even after 'garbage collection'.

15 String Too Long

String exceeds 255 characters in length. May be generated by adding a number of strings together.

16 String Expression Too Complex

String expressions may generate a number of intermediate string values. When the number of these values exceeds a reasonable limit, BASIC gives up, and this error results.

17 Cannot CONTinue

For one reason or another the current program cannot be restarted using CONT. Note that CONT is intended for restarting after a STOP command (ESC)(ESC) or error, and that any alteration of the program in the meantime makes a restart impossible.

18 Unknown User Function

No EDF FN has been executed for the FN just invoked.

19 RESUME Missing

The end of the program has been encountered while in Error Processing Mode (i.e. in an ON ERROR GOTO routine).

20 Unexpected RESUME

RESUME is only valid while in Error Processing Mode (i.e. in an ON ERROR GOTO routine).

21 Direct Command Found

When loading a program from cassette a line without a line number has been found.

22 Operand Missing

BASIC has encountered an incomplete expression.

23 Line Too Long

A line when converted to BASIC internal form becomes too big.

24 EOF Met

An attempt has been made to read past end of file on the cassette input stream.

25 File Type Error

The cassette file being read is not of a suitable type. OPENIN is only prepared to open ASCII text files. LOAD, RUN etc., are only prepared to deal with the file types produced by SAVE.

26 NEXT Missing

Cannot find a NEXT to match a FOR command.

27 File Already Open

An OPENIN or OPENOUT command has been executed before the previously opened file has been closed.

28 Unknown Command

BASIC cannot find a taker for an external command.

29 WEND Missing

Cannot find a WEND to match a WHILE command.

30 Unexpected WEND

Encountered a WEND when not in a WHILE loop, or a WEND that does not match the current WHILE loop.

CASSETTE ERROR CODES

LOAD ERROR A

DATA read error caused by damaged cassette, worn or dirty heads.

LOAD ERROR B

DATA read error caused by varying speed, check pinch roller, or cassette mechanism for binding.

USEFUL SYSTEM COMMANDS

Press **CTRL** and small blue **ENTER** keys to load first program off the cassette.

SAVE "Program Title" saves a program from memory to the cassette tape. The title cannot be more than 16 characters in length.

LOAD "Program Title" loads a named program into memory from the cassette.

CAT Catalogues the programs on the cassette tape.

Press ESC key once to suspend the operation of a Basic program.

Pressing the ESC key twice will break into a Basic program.

Disk Drive Commands

| CPM* will load the CPM operating system off disk (**|** = shift @).

AMSDOS* will return you to Basic.

| TAPE will direct all load, save and run commands to the data cassette.

| DISC will direct all load, save and run commands to the disk drive.

FORMAT* prepares one side of a disk for storage of data.

DISCCOPY* copies a disk using just one drive.

COPYDISC* copies a disk using two drives.

*These commands require that the master CPM disk is inserted in the drive before the command is entered.

USEFUL PROGRAMS

COLOUR AND SOUND DEMO

```
10 mode 0: ink 0,2:ink 1,24: paper 0 [ENTER]
20 pen 1: for b=0 to 26: border b [ENTER]
30 locate 3,12:print"BORDER COLOUR";B [ENTER]
40 sound 4,(40-b) [ENTER]
50 for t=1 to 600:next t:next b:cls [ENTER]
60 for p=0 to 15:paper p:pen 5:print "paper";
   p:print [ENTER]
70 for n=0 to 15:pen n:print "pen";n [ENTER]
80 sound 1,(n*20+p) [ENTER]
90 for t=1 to 100:next t:next n [ENTER]
100 for t=1 to 1000:next t:cls:next p [ENTER]
110 cls:paper 0: pen 1:locate 7,12:print
    "THE END": for t=1 to 2000: next t [ENTER]
120 mode 1: border 1:ink 0,1:ink 1,24:paper 0:
    pen 1 [ENTER]
```

PLOTTING PROGRAM

```
10 REM DRAW SINE WAVE
15 BORDER 2
20 MODE 2
30 INK 1,2
40 INK 0,20
50 CLS
60 DEG
70 ORIGIN 0,200
80 FOR n=0 TO 720
90 y=SIN(n)
100 PLOT n*640/720,198*y,1
110 NEXT
120 GOTO 50
```

PRINTER CHARACTER DEMO

```
10 PRINT #8 , CHR$(15) : REM normal Printing
20 GOSUB 100
30 PRINT #8 , CHR$(14) : REM double width
40 GOSUB 100
50 PRINT #8 , CHR$(15) : REM back to normal
60 PRINT #8 ,"double strike"+CHR$(20);
70 PRINT #8 ,"double strike"
80 END
100 FOR n = 32 TO 126
110 PRINT # 8 , CHR$(n);
120 NEXT n
130 RETURN
```

COMMON FAULTS

COMPUTER

No Video	-	Q103 o/c no Z80 clock
Programs Crash	-	RAM fault, run diagnostic to find the faulty RAM.
Cassette Motor Will Not Rotate	-	Q101 o/c - No motor on signal
Printer Not Working Or Printer Corrupt Characters	-	IC106 Faulty latches IC110 faulty not providing printer strobe signal.

MONOCHROME MONITOR

Screen Fades	-	Fuse F502 o/c
Blowing Fuses	-	Short circuit scan coils.
No CRT Heaters	-	Check for o/c print near the Q501, 2 heat sink.
Hum Bar	-	Amstrad modification kit - fit mumetal shield over mains transformer.
Poor Contrast	-	Check the software, see if it has the correct luminance value.

COLOUR MONITOR

Dead	-	Fuse F501 o/c caused by degauss TH501 s/c or D507 causing IC501 o/c and D501-4 s/c.
Dead	-	Q405 o/c

PRINTER

Head not returning to LH side	-	Rubber belt not engaging ribbon cog
Head moving from LH - RH, but no characters are being printed.	-	Ribbon broken or not correctly seated.

AMSTRAD FIELD SERVICE GUIDE

CONTENTS

APPENDIX

INTRODUCTION

This manual is designed to guide the field engineer in learning about, and carrying out first line field servicing on the Amstrad computer system. To date the system includes:-

1. The CPC464 Computer

2. The CTM640 Colour Monitor

3. The GT64 Monochrome Monitor

4. The DMP1 Dot Matrix Printer

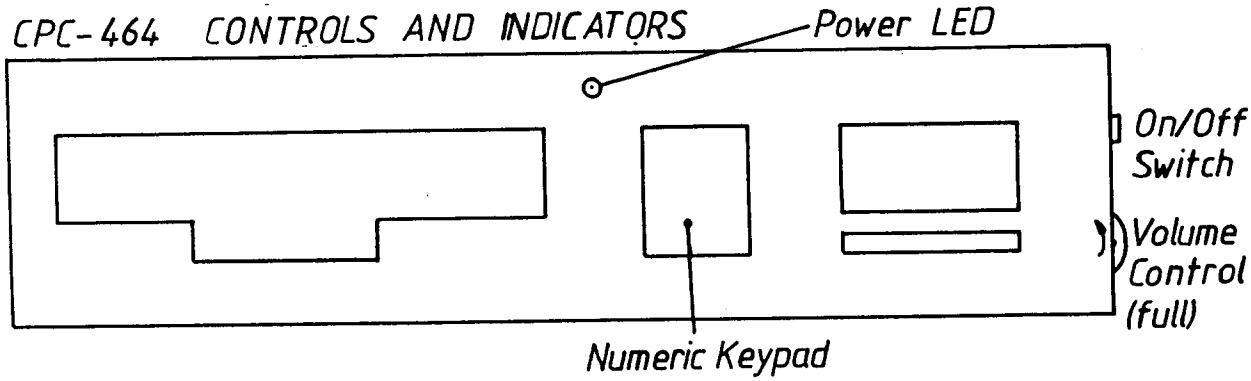
5. The DDI-1 Disk Drive and Interface

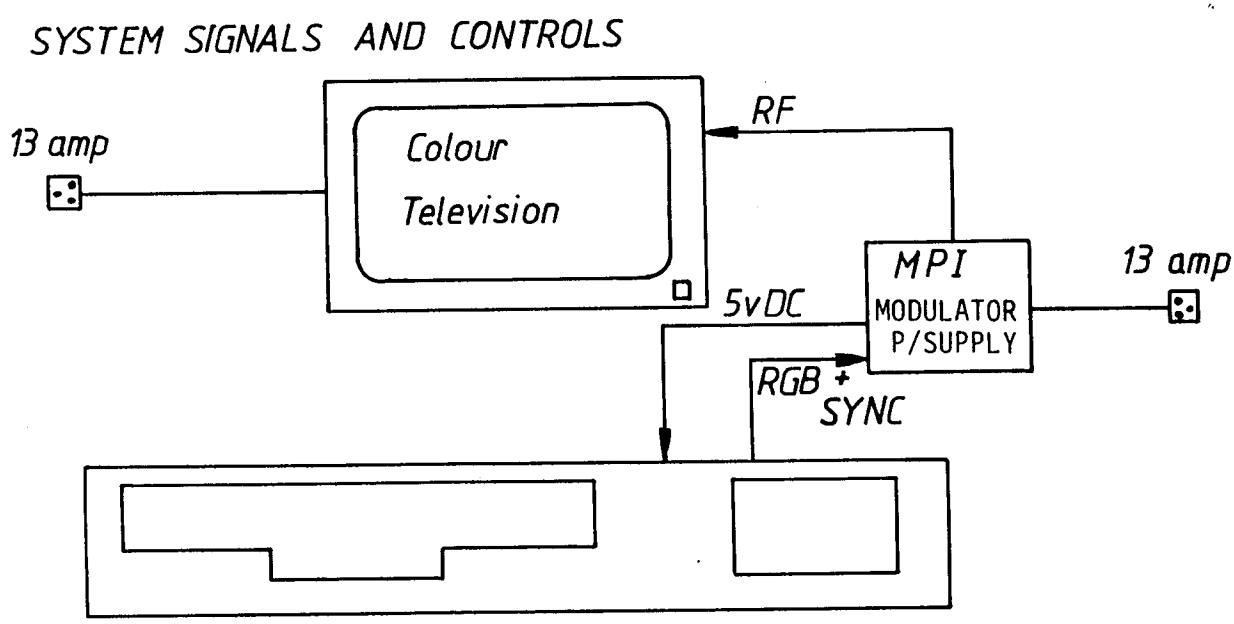
The first line servicing will entail component level fault finding on the monitors, repair of the data cassette and the use of diagnostic software to test the computer and associated peripheral devices.

Faults with the computer, printer and disk drive will require that you uplift the whole system and send it to the workshop for repair.

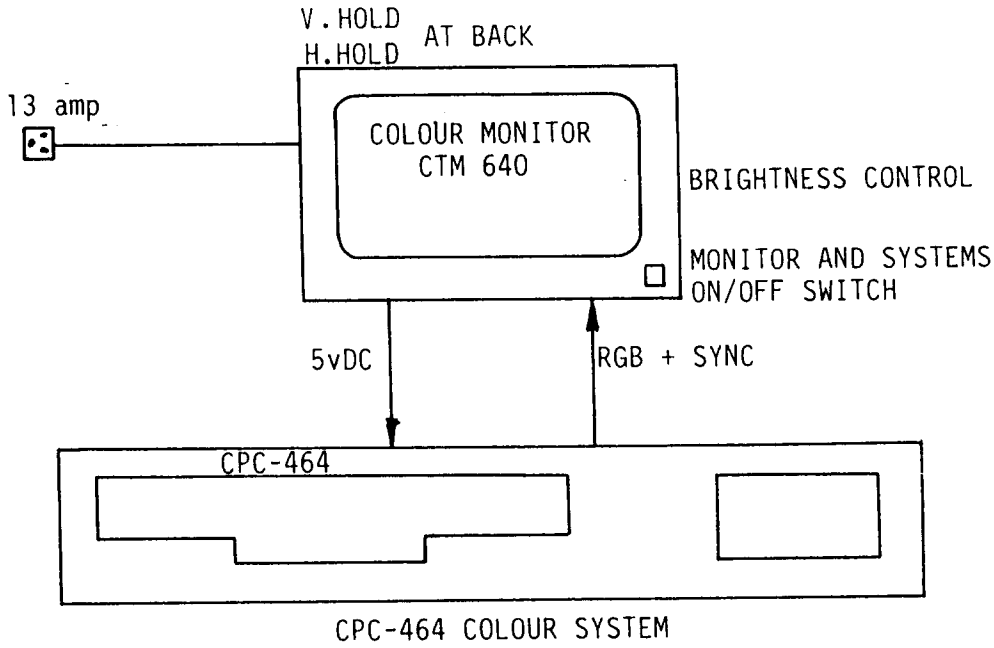
Items such as the joysticks and the MP1 (combined modulator and power supply) are non-serviceable items, these must be returned to Amstrad for repair or replacement.

Various diagrams in this manual have been reproduced with the kind permission of Amstrad Consumer Electronics plc.


CPC-464 CONTROLS AND INDICATORS
Power LED
On/Off Switch
Volume Control (full)
Numeric Keypad

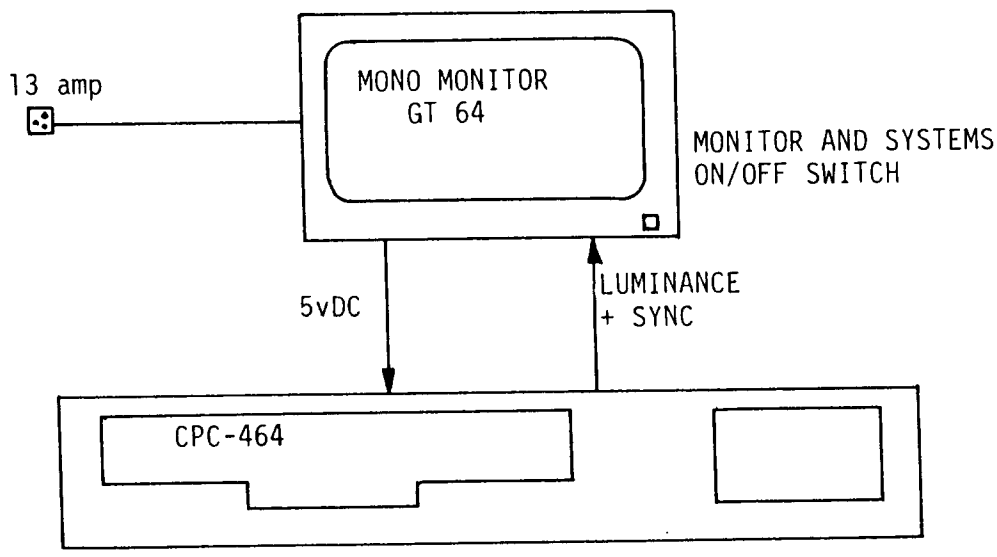

SYSTEM SIGNALS AND CONTROLS
13 amp
Colour Television
RF
MPI
MODULATOR P/SUPPLY
13 amp
5vDC
RGB + SYNC

SYSTEM SIGNALS AND CONTROLS



CPC-464 COLOUR SYSTEM

CPC-464 COLOUR SYSTEM (NO CUSTOMER OR PRESET CONTRAST CONTROL)



CPC-464 MONOCHROME SYSTEM

CPC-464 PERIPHERAL DEVICES AND CONNECTIONS