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MOUSEPACKET DESIGNS COLOUR VDU CARD

FOR MICROTAN SYSTEMS

MOUSEPACKET DESIGNS  
7 CEDAR CLOSE  
GRAFHAM  
HUNTINGDON  
CAMBRIDGESHIRE  
PE18 0DZ

## FEATURES

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STABLE, FLICKER FREE 64 CHARACTER BY 25 LINE DISPLAY

TELETEXT CHARACTER SET

FLASH, INVERSE VIDEO, 6 COLOURS + BLACK & WHITE

128 BY 75 PIXEL COLOUR GRAPHICS

PROGRAMMABLE CURSOR FORMAT & POSITION

OUTPUTS FOR MONOCHROME AND RGB COLOUR MONITORS

OPTIONAL PAL ENCODER & UHF MODULATOR

SOFTWARE SWITCH TO OLD SCREEN FORMAT, IF REQUIRED

PLUGS INTO SYSTEM MOTHERBOARD

COMPATIBLE WITH TANDOS

ALL PREVIOUS FACILITIES RETAINED, INCLUDING BASIC EDITING

ONBOARD VIDEO MIXER FOR HI-RES GRAPHICS, ETC.

COLOUR INFORMATION GIVES GREY SCALE WITH MONOCHROME MONITORS AND T.V RECEIVERS

TOOLKIT EPROM AVAILABLE WITH MANY USEFUL FACILITIES, INCLUDING BASIC GRAPHICS COMMANDS

MEMORY MAPPED

(A000-A63F, DISPLAY. A7FE-A7FF, CRT CONTROLLER.)

SYNCHRONISATION SIGNALS PROVIDED FOR EXTERNAL VIDEO SOURCES

96 ALPHANUMERIC (INCLUDING UPPER & LOWER CASE) CHARACTERS,  
+ 64 GRAPHICS CHARACTERS

## 64 x 25 COLOUR VDU CARD

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### INTRODUCTION

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THE MOUSEPACKET DESIGNS COLOUR VDU CARD (HEREINAFTER CALLED "THE CARD") IS AN ADD ON CARD WHICH PLUGS INTO THE MICROTAN SYSTEM MOTHERBOARD, AND PROVIDES A 64 CHARACTER BY 25 LINE DISPLAY, WITH COMPREHENSIVE ALPHANUMERIC AND GRAPHIC FACILITIES.

IT IS SUPPLIED WITH TWO 2Kx8 EPROMS, ONE OF WHICH REPLACES TANBUG, THE OTHER REPLACING THE TOP 2K OF THE BASIC INTERPRETER. NO SETTING UP ADJUSTMENTS OR SPECIAL COMMANDS ARE REQUIRED, AND COMPATIBILITY HAS BEEN PRESERVED WITH SOFTWARE WRITTEN USING TANBUGS 1, 2 AND 3, WITH THE EXCEPTION OF ROUTINES USING THE HEX KEYPAD.

### INSTALLATION

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PLUG THE CARD INTO ONE OF THE NUMBERED SLOTS ON THE SYSTEM MOTHERBOARD, AND CONNECT A MONITOR OR TV RECEIVER TO THE APPROPRIATE SOCKET. REMOVE TANBUG FROM THE MICROTAN 65 BOARD, AND REPLACE IT WITH THE EPROM MARKED TANBUG V3A. SIMILARLY, REPLACE THE TOP 2K OF THE BASIC INTERPRETER (SOCKET D3 ON TANEX) WITH THE EPROM MARKED BASH/C.

THE COMPUTER CAN NOW BE SWITCHED ON. THE MESSAGE TANBUG V3A SHOULD APPEAR AT THE BOTTOM OF A GARBAGE-FILLED SCREEN, WITH A FLASHING UNDERLINE CURSOR IMMEDIATELY BELOW. IT MAY BE NECESSARY TO DEPRESS RESET IN ORDER TO OBTAIN A DISPLAY.

(NOTE) ALTHOUGH THE CARD CAN BE SUPPLIED IN A FORM WHICH CAN DRIVE A TV RECEIVER, THE USER SHOULD BE AWARE THAT RESULTS OBTAINED ON A MONITOR WILL BE FAR SUPERIOR. THIS IS NOT DUE TO ANY DEFECT IN THE CARD, BUT TO THE NECESSARY BANDWIDTH LIMITATIONS OF A CONVENTIONAL BROADCAST RECEIVER.

THE CARD OCCUPIES MEMORY SPACE BETWEEN A000 & A7FF (HEX) OR 40960 & 43007 (DECIMAL). IT PROVIDES AN INHRAM SIGNAL TO DISABLE TANRAM WHEN THE CPU ADDRESSES THIS SPACE, AND THE MEMORY "COUNT UP" ON ENTERING BASIC IS LIMITED AT 9FFF (HEX) 40959 (DECIMAL), TO PREVENT BASIC FROM USING THE SCREEN MEMORY FOR VARIABLE STORAGE.



## USER OPTIONS

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THE CRT CONTROLLER ON THE CARD CONTAINS A NUMBER OF REGISTERS WHICH MAY BE WRITTEN TO IN ORDER TO MODIFY THE OPERATING CONDITIONS. MOST OF THE REGISTERS ARE CONCERNED WITH THE SCREEN FORMAT AND SYSTEM TIMING, AND SHOULD NOT BE MODIFIED. A FEW, HOWEVER ARE ACCESSIBLE TO THE USER. THESE ARE:-

REGISTER 10	CURSOR START (WRITE ONLY)
11	CURSOR END (WRITE ONLY)
14	CURSOR HIGH (READ/WRITE)
15	CURSOR LOW (READ/WRITE)

THE METHOD OF ADDRESSING THESE REGISTERS IS FIRST TO WRITE THE REGISTER NUMBER TO LOCATION A7FE HEX (43006 DECIMAL), THEN READ OR WRITE DATA FROM/TO LOCATION A7FF HEX (43007 DECIMAL).

THIS MUST BE DONE FROM WITHIN A PROGRAMME, NOT BY A MEMORY MODIFY COMMAND, OR A DIRECT POKE FROM THE KEYBOARD.

IN THIS DESCRIPTION, REFERENCE IS MADE TO THE CRT CONTROLLER ADDRESS SPACE, AS DISTINCT FROM THE COMPUTER ADDRESS SPACE. THE CRT CONTROLLER GENERATES ITS OWN ADDRESSES, FROM 0000 TO 07FF. THESE CORRESPOND TO COMPUTER ADDRESSES FROM A000 TO A7FF.

THE REGISTERS ARE USED AS FOLLOWS:-

R10/R11

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THESE DEFINE THE HEIGHT, POSITION AND BLINK RATE OF THE CURSOR. THE CURSOR OCCUPIES ONE CHARACTER WIDTH, AND CAN CONSIST OF ANY BLOCK OF SCAN LINES WITHIN THE TEN LINE CHARACTER HEIGHT. THE SCAN LINES ARE NUMBERED FROM 0 AT THE TOP TO 9 AT THE BOTTOM. R10 CONTAINS THE LINE NUMBER AT THE TOP OF THE CURSOR, & R11 CONTAINS THE LINE NUMBER AT THE BOTTOM.

IN ADDITION, BITS 5 & 6 OF R10 CONTROL THE BLINK RATE AND DISPLAY STATUS OF THE CURSOR, AS IN THE TABLE BELOW:-

BIT 6	BIT 5	CURSOR DISPLAY
0	0	NON-BLINKING
0	1	NOT DISPLAYED
1	0	FAST BLINK
1	1	SLOW BLINK

ON RESET, R10 CONTAINS 09 HEX & R11 CONTAINS 09. THIS GIVES A SLOWLY BLINKING CURSOR OCCUPYING ONLY THE BOTTOM LINE.

IF R11 IS MODIFIED BY THE USER, THE NEW VALUE WILL REMAIN SET UNTIL THE USER CHANGES IT AGAIN, OR A SYSTEM RESET OCCURS. R10, HOWEVER, IS REGULARLY UPDATED BY THE FIRMWARE, WHICH READS LOCATION A641 HEX AND STORES THE VALUE IN R10. THUS THE USER MAY MODIFY R10 BY WRITING A NEW VALUE TO LOCATION A641 HEX (42561 DECIMAL). A SYSTEM RESET WILL RESTORE THIS TO ITS ORIGINAL VALUE.

## R14/R15

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THESE REGISTERS ARE REGULARLY UPDATED BY THE FIRMWARE, AND CONTAIN THE HIGH & LOW BYTE RESPECTIVELY OF THE CURSOR ADDRESS, WITHIN THE CRT CONTROLLER ADDRESS SPACE. IF THE USER WISHES TO POSITION THE CURSOR AT THE TOP LEFT HAND CORNER OF THE SCREEN; FOR INSTANCE, WRITING 00 TO BOTH R14 & R15 WILL DO THIS. NOTE THAT THIS HAS NO EFFECT ON POSITION OF CHARACTERS OUTPUT TO THE SCREEN, WHICH WILL BE POSITIONED ACCORDING TO PARAMETERS SET BY THE FIRMWARE. ALSO, THE NEXT TIME A CHARACTER IS OUTPUT, THE CURSOR WILL RETURN TO ITS NORMAL POSITION ON THE SCREEN. IF IT IS DESIRED TO OUTPUT CHARACTERS AT A DIFFERENT POSITION, THIS CAN BE ACHIEVED BY SETTING THE SCREEN POINTERS (0A & 0B) IN ZERO PAGE, LOW BYTE IN 0A, HIGH BYTE IN 0B. STORE THE START OF THE DESIRED SCREEN ROW IN 0A & 0B, & THE POSITION ALONG THE ROW IN 03. THE CURSOR WILL AUTOMATICALLY BE MOVED TO THE NEW POSITION BY THE FIRMWARE. FOR EXAMPLE:-

100 POKE 10,0: POKE 11,163: POKE 3,28: PRINT "MIDDLE"

WILL PRINT MIDDLE APPROXIMATELY IN THE CENTRE OF THE SCREEN.

THE CURRENT POSITION OF THE CURSOR CAN BE READ FROM R14 & R15.

## NOTES ON TAPE INPUT/OUTPUT ROUTINES.

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WHEN USING THE OLD SCREEN, ALL TAPE I/O ROUTINES WORK NORMALLY. REMEMBER THAT THE CURSOR MUST BE AT THE BOTTOM OF THE SCREEN; AS BOTH XBUG & BASIC READ THE BOTTOM LINE FOR USER RESPONSES; & WHEN LOADING FROM TAPE, THE RECORDED FILENAME IS EXAMINED ON THE BOTTOM LINE.

WHEN USING THE NEW SCREEN, BASIC & MACHINE CODE PROGRAMMES CAN BE DUMPED & LOADED UNCONDITIONALLY.

## XBUG TRANSLATOR AND DISASSEMBLER

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THE TRANSLATOR AND DISASSEMBLER WORK IN THE NORMAL MANNER IN THE NEW SCREEN, EXCEPT THAT THE ASCII EQUIVALENTS OF THE CODE ARE NOT DISPLAYED. THE FLASHING CURSOR IS NOT SUPPRESSED, AND APPEARS UNDER THE EXCLAMATION MARK PROMPT. WITH XBUG VERSION 1 THE TRANSLATOR GIVES A SLIGHTLY ODD DISPLAY, IN THAT THE FLASHING CURSOR INITIALLY APPEARS IN THE WRONG PLACE ON THE LINE. THIS, HOWEVER, HAS NO EFFECT ON THE OPERATION OF THE TRANSLATOR; & THE FIRST KEY PRESS MOVES IT TO THE CORRECT PLACE. IT IS CAUSED BY THE WAY XBUG HANDLES THE VDU INDEX, AN EFFECT WHICH ALSO LEADS TO INCORRECT FORMATTING WITH A PRINTER. WITH XBUG VERSION 2 THIS EFFECT IS CORRECTED.

## ON SCREEN EDITING IN BASIC

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THE REPLACEMENT BASIC EXTENSION EPROM CONTAINS RE-WRITTEN EDITING ROUTINES TO ALLOW EDITING ON EITHER SCREEN. EXACTLY THE SAME PROTOCOLS HAVE BEEN RETAINED, AND ALL THE USER HAS TO DO IS FOLLOW NORMAL PROCEDURES, WHICHEVER SCREEN IS IN USE. EDITING ACTUALLY TAKES PLACE ON THE OLD SCREEN, BUT THE REVISED ROUTINES REPEATEDLY COPY THE OLD SCREEN ONTO THE MIDDLE OF THE NEW SCREEN. IT WILL BE CLEAR THAT EDITING CORRUPTS THE MEMORY AREAS OF BOTH SCREENS, SO ANY DATA OR MACHINE CODE ROUTINES STORED IN THESE AREAS SHOULD BE SAVED BEFORE EDITING.

## CHARACTER GENERATION

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THE COLOUR CARD USES A TELETXT CHARACTER GENERATOR ROM TO PROVIDE CHARACTERS IN ANY OF 6 COLOURS + WHITE.

THE BACKGROUND CAN BE IN ANY OF THE 6 COLOURS OR BLACK OR WHITE.

IN ADDITION, CHARACTERS CAN BE MADE TO FLASH, OR APPEAR IN INVERSE VIDED (COMPLEMENTARY COLOURS).

AN 8 BIT WORD DEFINES THE CHARACTER, THE LOWER 7 DEFINING THE CHARACTER OR CONTROL CODE, WITH THE HIGHEST ORDER BIT DEFINING NORMAL OR INVERSE VIDED (0=NORMAL, 1=INVERSE).

THE ATTRIBUTES OF THE CHARACTERS ARE DEFINED BY CONTROL CODES, SEE TABLE ON NEXT PAGE.

THESE CONTROL CODES ARE DISPLAYED AS SPACES, AND CONTROL ALL FOLLOWING CHARACTERS ON THE SAME LINE, OR UNTIL ANOTHER CONTROL CODE IS ENCOUNTERED WHICH COUNTERMANDS THE PRECEDING ONE. EACH NEW LINE OF CHARACTERS ASSUMES DEFAULT CONDITIONS AT THE START. THESE ARE:-

WHITE CHARACTERS ON A BLACK BACKGROUND, NOT FLASHING. IF GRAPHICS ARE USED, THEY WILL INITIALLY BE CONTIGUOUS AND NOT HELD.

## GRAPHICS

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GRAPHICS CHARACTERS NORMALLY OCCUPY THE FULL SPACE ALLOCATED TO THE CHARACTER CELL (CONTIGUOUS GRAPHICS). IF THE CONTROL CHARACTER "SEPARATED GRAPHICS" PRECEDES THE CHARACTER CELL, A BLANK BORDER WILL APPEAR AROUND EACH PIXEL IN THE CELL.

CONTROL CODES ARE OUTPUT AS SPACES. HOWEVER, IF THE CONTROL CODE "HOLD GRAPHICS" IS INCLUDED EARLIER IN THE LINE, THE CHARACTER IMMEDIATELY PRECEDING THE CONTROL CHARACTER IS REPEATED TO FILL THE SPACE(S). THE "RELEASE GRAPHICS" CONTROL CHARACTER COUNTERMANDS THIS.

THE CHARACTER CELL CONSISTS OF 6 PIXELS, IN A 3 BY 2 MATRIX.

THE BIT ALLOCATION IS AS FOLLOWS:-

BIT NUMBER		BIT VALUE (DECIMAL)	
0	1	1	2
2	3	4	8
4	5	16	64

IT SHOULD BE NOTED THAT BIT 5 MUST ALWAYS BE A "1" FOR GRAPHICS CHARACTERS. THIS ALLOWS MIXING OF GRAPHICS CHARACTERS WITH UPPER CASE LETTERS, WITHOUT ADDITIONAL CONTROL CODES. THEREFORE, TO ILLUMINATE A GROUP OF PIXELS, ADD THEIR BIT VALUES TOGETHER, ADD 32 TO THE TOTAL, AND POKE THIS VALUE TO THE RELEVANT SCREEN LOCATION.

## INVERSE VIDED

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TO ENABLE INVERSE VIDED, WRITE A NUMBER OTHER THAN ZERO TO LOCATION 0F (HEX), 15 (DECIMAL)

CONTROL CODES.

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HEX	DECIMAL	CONTROL FUNCTION
01	1	ALPHANUMERIC RED
02	2	ALPHANUMERIC GREEN
03	3	ALPHANUMERIC YELLOW
04	4	ALPHANUMERIC BLUE
05	5	ALPHANUMERIC MAGENTA
06	6	ALPHANUMERIC CYAN
07	7	ALPHANUMERIC WHITE
08	8	FLASH
09	9	STEADY
0B *	11 *	GRAPHICS RED
12 *	18	GRAPHICS GREEN
13	19	GRAPHICS YELLOW
14	20	GRAPHICS BLUE
15	21	GRAPHICS MAGENTA
16	22	GRAPHICS CYAN
17	23	GRAPHICS WHITE
18	24	CONCEAL DISPLAY
19	25	CONTIGUOUS GRAPHICS
1A	26	SEPARATED GRAPHICS
1C	28	BLACK BACKGROUND
1D	29	NEW BACKGROUND
1E	30	HOLD GRAPHICS
1F	31	RELEASE GRAPHICS

\* USE THESE CODES WHEN USING THE "OUTPUT CHARACTER" ROUTINE, I.E IN A BASIC "PRINT" STATEMENT. WHEN "POKING" DIRECTLY TO THE SCREEN, USE CODE 11 (HEX) OR 17 (DECIMAL).

WHEN IN BASIC, USE IS MADE OF THE CHR\$( ) FUNCTION TO IMPLANT THESE CONTROL CODES WITHIN A PROGRAM.

E.G., CONSIDER THE FOLLOWING BASIC LINE:-

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100 PRINT CHR$(1)CHR$(29)CHR$(3)"YELLOW ON A RED BACKGROUND"
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WHEN RUN WOULD GIVE YOU THE WORDS YELLOW ON A RED BACKGROUND, IN YELLOW, ON A RED BACKGROUND, WHICH CONTINUES TO THE END OF THE LINE. THE BASIC LINE:-

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200 PRINT CHR$(8)"FLASHING"CHR$(9)"STEADY"
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WOULD SHOW THE WORD FLASHING FLASHING, & THE WORD STEADY STEADY, IN WHITE, ON A BLACK BACKGROUND.

THE DEFAULT CONDITIONS, ASSUMED AT THE BEGINNING OF EACH LINE, ARE AS FOLLOWS:-

ALPHANUMERIC WHITE, BLACK BACKGROUND, STEADY, CONTIGUOUS GRAPHICS, RELEASE GRAPHICS.

IT SHOULD BE NOTED THAT CONTROL CHARACTERS ARE SERIAL ATTRIBUTES TO THE DISPLAYED VIDEO, AND ARE DISPLAYED AS SPACES. IT IS NOT THEREFORE POSSIBLE, FOR INSTANCE, TO CHANGE COLOUR MID-WORD, AS THE CONTROL CODE FOR THE NEW COLOUR WOULD BE DISPLAYED AS A SPACE.

IT IS ACCEPTABLE, HOWEVER, TO SUBSTITUTE CONTROL CHARACTERS FOR SPACES, AS IN THE LINE:-

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300 PRINT CHR$(2)"GREEN"CHR$(3)"YELLOW"
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WHEN RUN, THIS WOULD PRINT THE WORDS GREEN AND YELLOW IN THE APPROPRIATE COLOUR, WITH A SPACE BETWEEN.

## HARDWARE OPTIONS

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THERE ARE SEVERAL USER DEFINABLE OPTIONS ON THE MOUSEPACKET VDU CARD, ENABLED BY CUTTING AND/OR MAKING LINKS. THESE ARE AS FOLLOWS:-

### 1) COMPOSITE SYNC. POLARITY.

THE SYNCHRONISATION SIGNALS HAVE BEEN DESIGNED TO BE AS CLOSE AS POSSIBLE TO THE BROADCAST STANDARD, I.E. INTERLACED AT 312.5 LINES PER FRAME OF 20MS. TO PREVENT FLICKER OF THE DISPLAYED TEXT, THE MOUSEPACKET CARD IS SET TO NON-INTERLACED 312 LINES PER 20MS. FRAME.

THE MONOCHROME COMPOSITE SYNC. & VIDEO OUTPUT CONSISTS OF THE E.B.U. STANDARD 700MV POSITIVE VIDEO & 300MV NEGATIVE SYNC. WHEN TERMINATED WITH 75 OHMS. THIS IS NOT ALTERABLE.

THE PAL ENCODED UHF OUTPUT (IF FITTED) ALSO CONFORMS TO THIS STANDARD, & IS ALSO NOT ALTERABLE.

WHEN DRIVING A COLOUR MONITOR, THE SYNC. OUTPUT (AT TTL LEVEL) CAN BE CHANGED TO POSITIVE-GOING BY CUTTING THE LINK ADJACENT TO PIN 1 OF THE 74LS96 I.C., ROUGHLY IN THE MIDDLE OF THE CARD.

2) IF IT IS DESIRED TO MIX IN EXTERNALLY GENERATED VIDEO (I.E FROM THE TANGERINE HI-RES GRAPHICS CARD) THE FOLLOWING PROCEDURE SHOULD BE UNDERTAKEN WITH CARE!:

- a) SWITCH OFF!
- b) REMOVE THE MICROTRAN 65 CPU CARD FROM THE SYSTEM RACK.
- c) VERY CAREFULLY CUT THE TRACKS AT PINS 14B & 18A NEAR THE 64 PIN CONNECTOR. (THESE ARE THE SYNCHRONISATION SIGNALS REQUIRED BY THE GRAPHICS CARD, & WILL BE REPLACED WITH EQUIVALENT SIGNALS DERIVED FROM THE MOUSEPACKET CARD).
- d) SOLDER TWO LINKS ON THE MOUSEPACKET CARD, NEAR THE 64 PIN CONNECTOR, HALF-WAY DOWN, ADJACENT AND PARALLEL TO THE RESISTOR.
- e) FOR COLOUR VIDEO INPUT (TTL LEVEL).

THE FREE 14 PIN SOCKET NEAR THE CORNER OF THE CARD IS USED FOR VIDEO INPUT/OUTPUT.

PIN 1	CSYNC. OUTPUT (-VE)	PIN 2	5 Mhz. CLOCK O/P
PIN 3	HORIZ. BLANKING OUTPUT	PIN 4	RED INPUT
PIN 5	BLUE INPUT	PIN 6	GREEN INPUT
PIN 7	0 VOLTS (SIGNAL GROUND)	PIN 8	BLUE OUTPUT
PIN 9	GREEN OUTPUT	PIN 10	RED OUTPUT

THE THREE LINKS NEAR THIS SOCKET MUST BE CUT WHEN INJECTING EXTERNAL VIDEO.

e) FOR MONOCHROME INPUT, CONNECT PINS 4, 5 & 6 TOGETHER, & USE THIS POINT FOR VIDEO INPUT.

OUTPUT CONNECTIONS

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WITH THE CARD PLUGGED INTO THE SYSTEM RACK, THE OUTPUT SOCKETS ARE AS FOLLOWS, STARTING AT THE TOP:-

1) 14 PIN SOCKET, VIDEO IN/OUT.

PINS:-  
1 COMPOSITE SYNC. OUTPUT  
2 5 MHz. CLOCK OUTPUT.  
3 HORIZONTAL BLANKING OUTPUT.  
4 RED INPUT (TTL)  
5 BLUE INPUT (TTL)  
6 GREEN INPUT (TTL)  
7 SIGNAL GROUND (0V)  
8 BLUE OUTPUT  
9 GREEN OUTPUT  
10 RED OUTPUT

2) DIN SOCKET, RGB & SYNC. OUTPUT.

PIN:-  
1 CSYNC  
4 BLUE (TTL OR 1V 75 OHM)  
2 SIGNAL GROUND  
5 GREEN (TTL OR 1V 75 OHM)  
3 RED (TTL OR 1V 75 OHM)

3) DIN SOCKET, MONOCHROME COMPOSITE VIDEO & SYNC. 1V WHEN TERMINATED WITH 75 OHMS.

PINS:-  
1,4,5,3 VIDEO OUT.  
2 SIGNAL GROUND

4) (IF FITTED) PHONO SOCKET  
PAL ENCODED UHF CHANNEL 36

NOTE:-

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DIN SOCKET PIN NUMBERING, LOOKING AT SOCKETS FROM PLUG SIDE.

1  
4 0  
0  
2 0  
0  
5 0  
3