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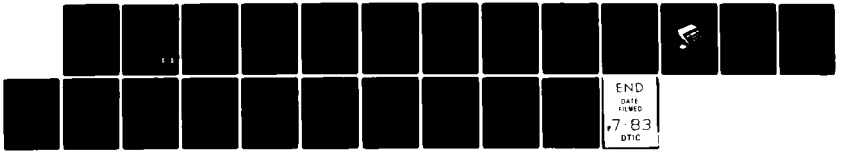

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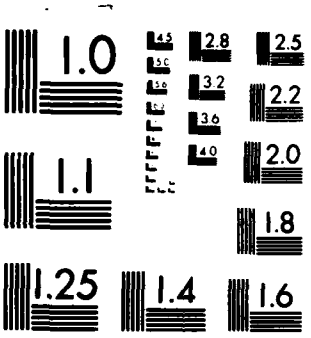

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ROYAL AIRCRAFT ESTABLISHMENT

A REMOTE CONTROL FACILITY FOR A 'UMATIC' VIDEO CASSETTE RECORDER

by

J. A. C. Beattie

P. Bromwich

October 1982

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Technical Memorandum Space 313

Received for printing 11 October 1982

A REMOTE CONTROL FACILITY FOR A 'UMATIC' VIDEO CASSETTE RECORDER

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J. A. C. Beattie

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SUMMARY

This Technical Memorandum describes a remote control unit with a SEARCH and REPEAT facility for use with a 'UMATIC' VCR, allowing a specified portion of tape to be automatically searched for and played, without any extra control recordings being required.

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* Vacation student Summer 1982 from Birmingham University.

LIST OF CONTENTS

1 INTRODUCTION

In analysing trials data recorded on a video cassette recorder (VCR), repeated viewing of a scene of interest or return to some other part of the tape an be an inconvenient and awkward operation, particularly if the VCR has to be situated some distance from the viewing station.

The unit described in this Memorandum takes advantage of the editing remote control capability of the VCR, to servo control the tape position from the remote viewing station. The tape position counter is displayed at the remote control unit and compared with demands entered via thumbwheel switches to control the position of the tape.

2 GENERAL DESCRIPTION OF FACILITIES

Two sets of thumbwheel switches are provided to demand the start and finish times of the section of tape required to be played, to a resolution of one second. Under the SEARCH command, the tape fast forwards or rewinds to the start of the required section and plays to the end of the section. If REPEAT is also selected the unit automatically rewinds to the start of the section and plays to the end of the selected section in a continuous cycle.

The remote unit has override controls of all VCR functions (RW, FF, PLAY and STOP), but STOP must be pressed before a function can be demanded.

LEDs indicate the operating mode of the VCR, as well as the presence of power (the red LED on the STOP button) and lock on the video head servo phase lock loop (the green LED on the RESET button).

The sequence of operations is summarised in Table 4.

3 DETAILED DESCRIPTION OF CIRCUIT DESIGN

3.1 Interfacing

The particular VCR for which the unit was designed is a National Panasonic NV9240. Control of the recorder operation is achieved by the standard method of earthing the pin relevant to the function required.

The signals provided by the recorder are:

(a) Indication of the function in operation by the earthing of a pin relevant to the function (all have internal pull up resistors, except the 'play' function; this is provided in the remote unit).

(b) A 12V power rail of capacity in excess of 700 mW.

(c) A negative going pulse train of frequency proportional to tape speed.

3.2 Functions included on board No.1

3.2.1 Frequency divider and counter

The 12V negative going pulse train has a frequency of 25 Hz during play, and which rises in frequency during fast forward and rewind comensurate with tape speed.

The signal is reduced in amplitude via a potential divider, and then frequency divided by two ICs (type 4017 and an IC type 4013) by a factor of 25. The pulses are then counted by four ICs type 4510, connected to count in binary coded decimal. The count is gated to count in minutes and seconds.

The counter up-down control is provided from the rewind signal from the VTR.

3.2.2 Phase oscillator

The board also contains a 100Hz free running astable IC type 4047 to provide the clocking phase signal for the liquid crystal display.

3.3 Functions included on board No.2

3.3.1 Display driver

The binary coded decimal tape count and phase oscillator signals are converted to seven segment drive signals for the liquid crystal display by four ICs type 4543.

3.3.2 Switch debounce

The control signals from the switches on the remote unit are debounced and inverted to the correct polarity by ICs type 14490 and 4069.

3.3.3 Power regulation

The regulation of the 12V power rail to 5 V required by the display and the logic circuitry is achieved using a 2N4911 series pass transistor and zener diode reference. To avoid a slow rise time a series reed relay, energised directly by the power regulator, is included in the regulated rail.

3.4 Functions included on board No.3

3.4.1 Comparators

Two sets of thumbwheel switches set the start and finish demand in minutes and seconds, and are directly compared with the tape position counter using two sets of four ICs type 4585. The 'less than', 'equal to' and 'greater than' signals from the comparators are used to derive the control signals to control the VTR.

3.4.2 LED drivers

Transistor BC108 drivers interface the indicating LEDs with the signals from the VTR.

3.5 Functions included on board No.4

3.5.1 Control logic

Each function request from the remote units switches sets an IC type 4013 flip flop. The output grounds the tape recorder control pin via an IC type 4016 switch. The flip flop is reset by the signal from the VCR of function in operation. The flip flop associated with the STOP button is reset by the setting of any other flip flop.

The auto-control of the VCR operates the 4016 switches via logic gates, not via the flip flops. The auto-STOP control operates through an RC pulse network to prevent further control signals being locked out.

A reset on switch-on is provided by an RC pulse network based on IC type 4081 (chip F on board 4).

4 CONCLUSION

A remote control for a UMATIC video cassette recorder has been constructed that has proved extremely useful in the analysis of trials data.

Table 1

MODE		OPERATIONS	
1	Any	Turn on VCR (automatically turning on the remote unit).	
		Load cassette	
		Rewind to start	
		Zero tape count	(press STOP and RESET simultaneously).
2	Normal	Fast forward Play Rewind Stop	Press buttons as required. LED will indicate which function the VCR is currently operating (if auto has been used STOP must be pressed before any of the functions can be demanded).
3	Auto-search	Set 'play from'	Set time of start position on thumbwheel switches. Demand must not exceed 79 minutes 59 seconds.
		Set 'play to'	Set time of finish position on thumbwheel switches. Must exceed 'Play from' by more than 5 seconds.
		Search	Press search. Tape will automatically move quickly to the start and play to the finish and stop. LEDs indicate the current function of the VCR.
4	Repeat	Repeat	Press REPEAT after pressing SEARCH but before the tape has reached 'Play to'. The tape will continually cycle between the two limits with fast 'rewind' and 'play' functions.

Table 2

REMOTE SOCKET CONNECTIONS FOR NV9240

Line function		VCR pin No.	Wire colour
From VCR	Earch	12	Black
	Motion pulses	18	Grey
	Play light	24	Red/yellow
	Fast forward light	25	Pink
	Rewind light	26	Red/blue
	Servo lock light	11	Brown/green
	12 V supply	34	Brown
To VCR	Play signal	2	Red
	Fast forward signal	3	Orange
	Rewind signal	4	Yellow
	Stop	5	Green

Table 3

DISPLAY CONNECTIONS

Counter value	Connection	Display segment						
		a	b	c	d	e	f	g
Seconds	Board backplane pin number	14C	15C	16C	17C	18C	19C	20C
	Display backplane terminal number	21	20	19	18	17	22	23
Tens of seconds	Board backplane pin number	14	18	19	20	21	22	23
	Display backplane terminal number	25	24	15	14	13	26	27
Minutes	Board backplane pin number	24	25	26	3C	4C	5C	6C
	Display backplane terminal number	30	28	11	10	9	31	32
Tens of minutes	Board backplane pin number	21C	22C	23C	24C	25C	28C	29C
	Display backplane terminal number	25	34	7	6	5	36	37

Other display connections: 28 to +5 V; 1, 8, 12, 16 together; 40 to phase oscillations.

Component values for Fig 12

R1	10K
R2	1M
R3	110K
R4	100K
R5	10K
R6, R8	160K
R7, R9	110K
R10	510K
R11	100K
C1	0.022 µF
C2	0.01 µF
C3	ITT 104

D1, D2, D3 - small signal general purpose diodes

Integrated circuits' pin connections

All pins 14 to +5 V

All pins 7 to 0 V

a13 to 0 V

r (8, 9, 12, 13) to 0 V.

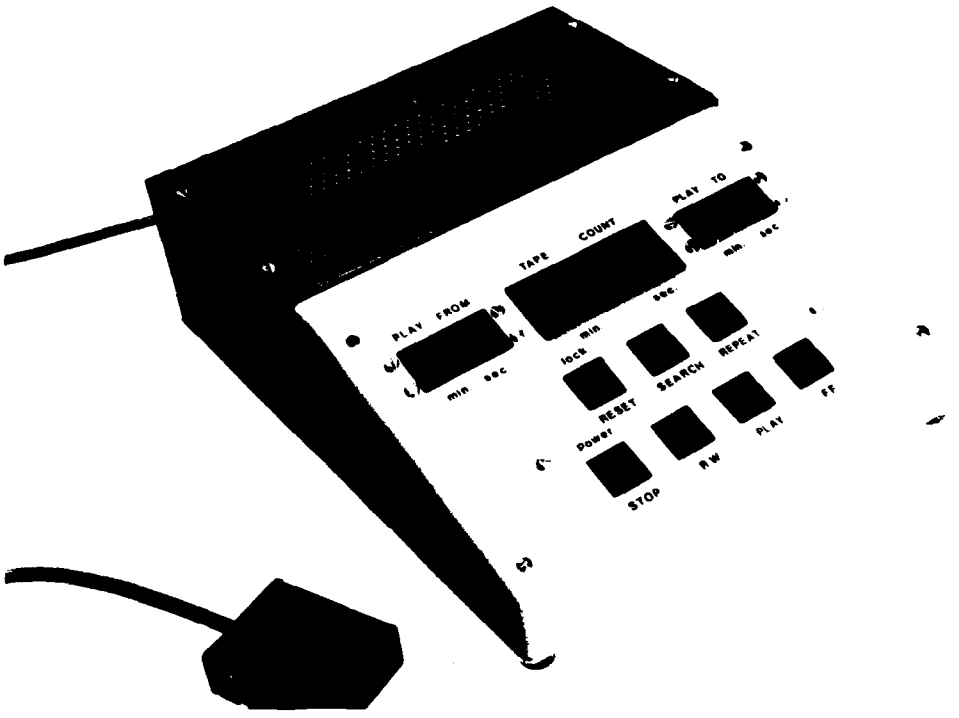

Fig 1 General view of the controller

Fig 2

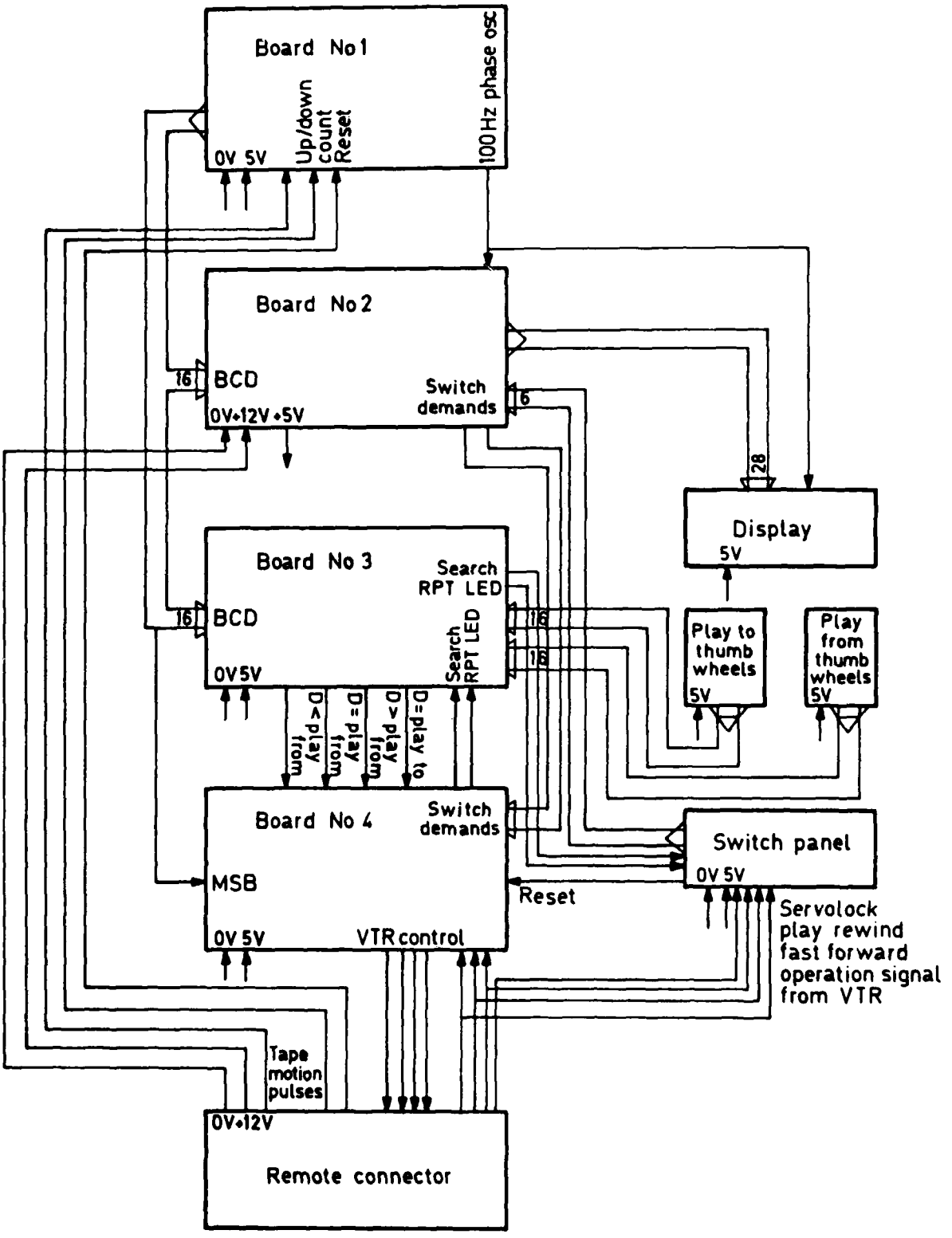

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Fig 2 Block diagram

Fig 3

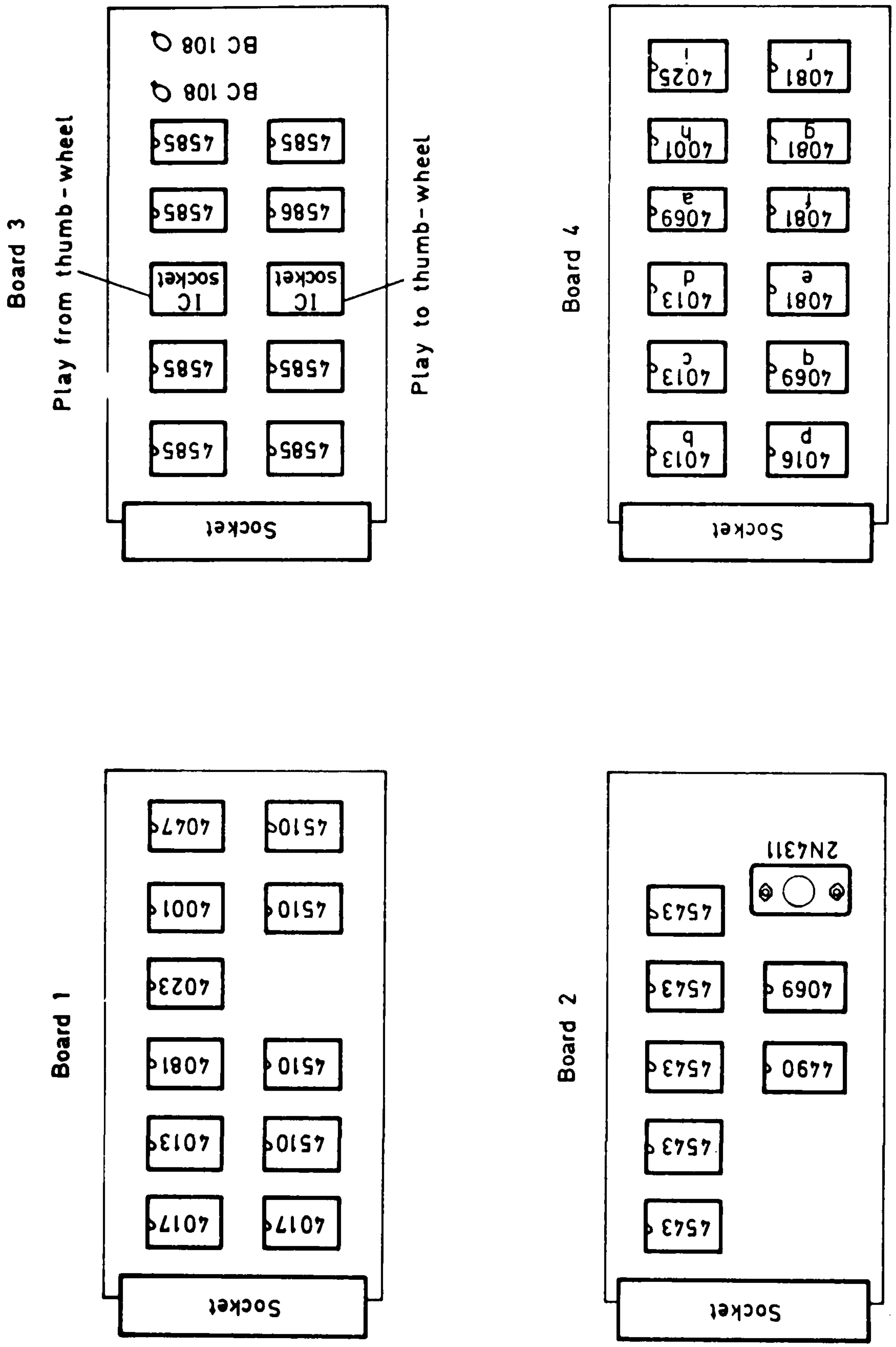


Fig 3 Board layout

Fig 4

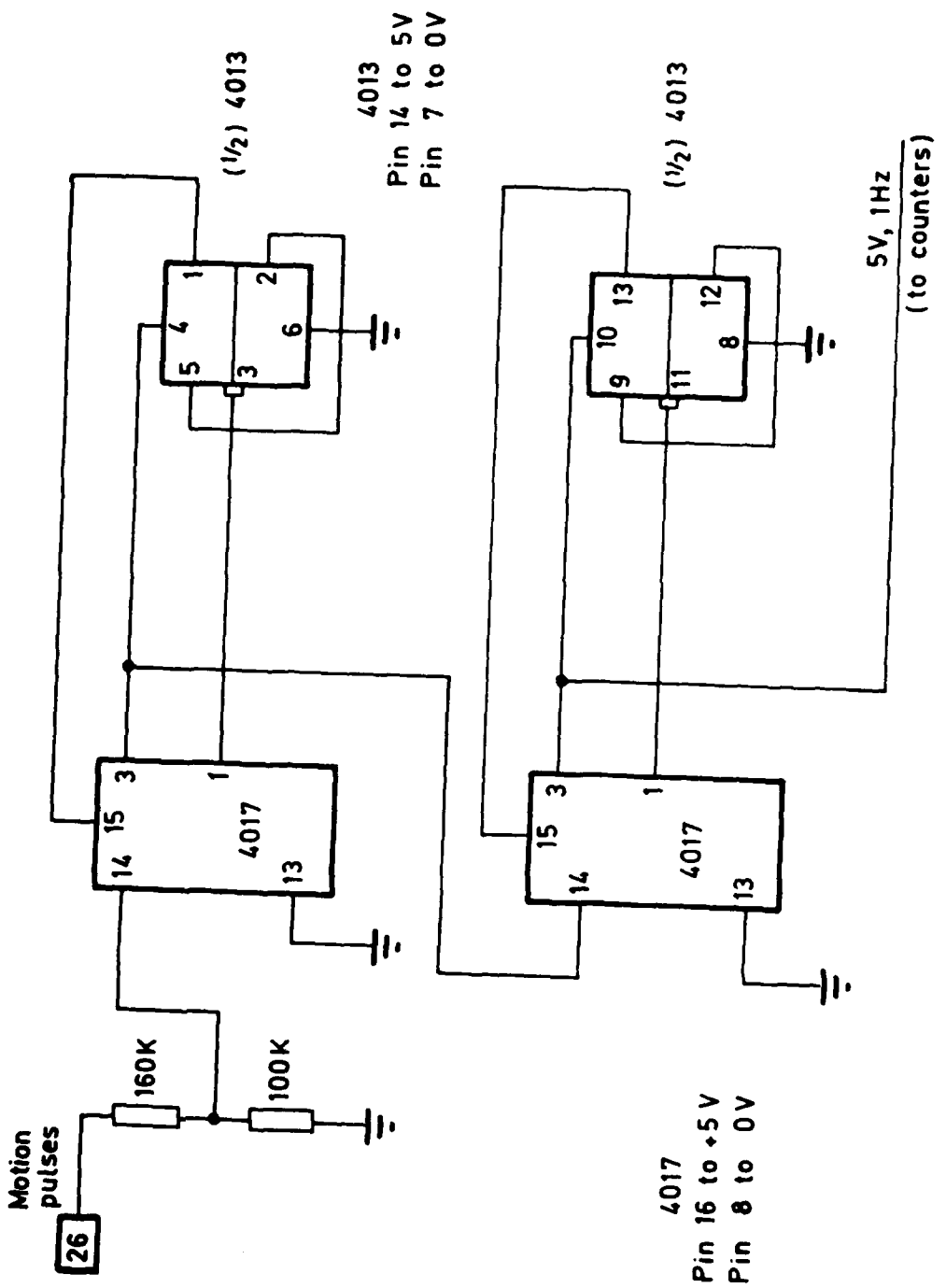


Fig 4 Frequency divider

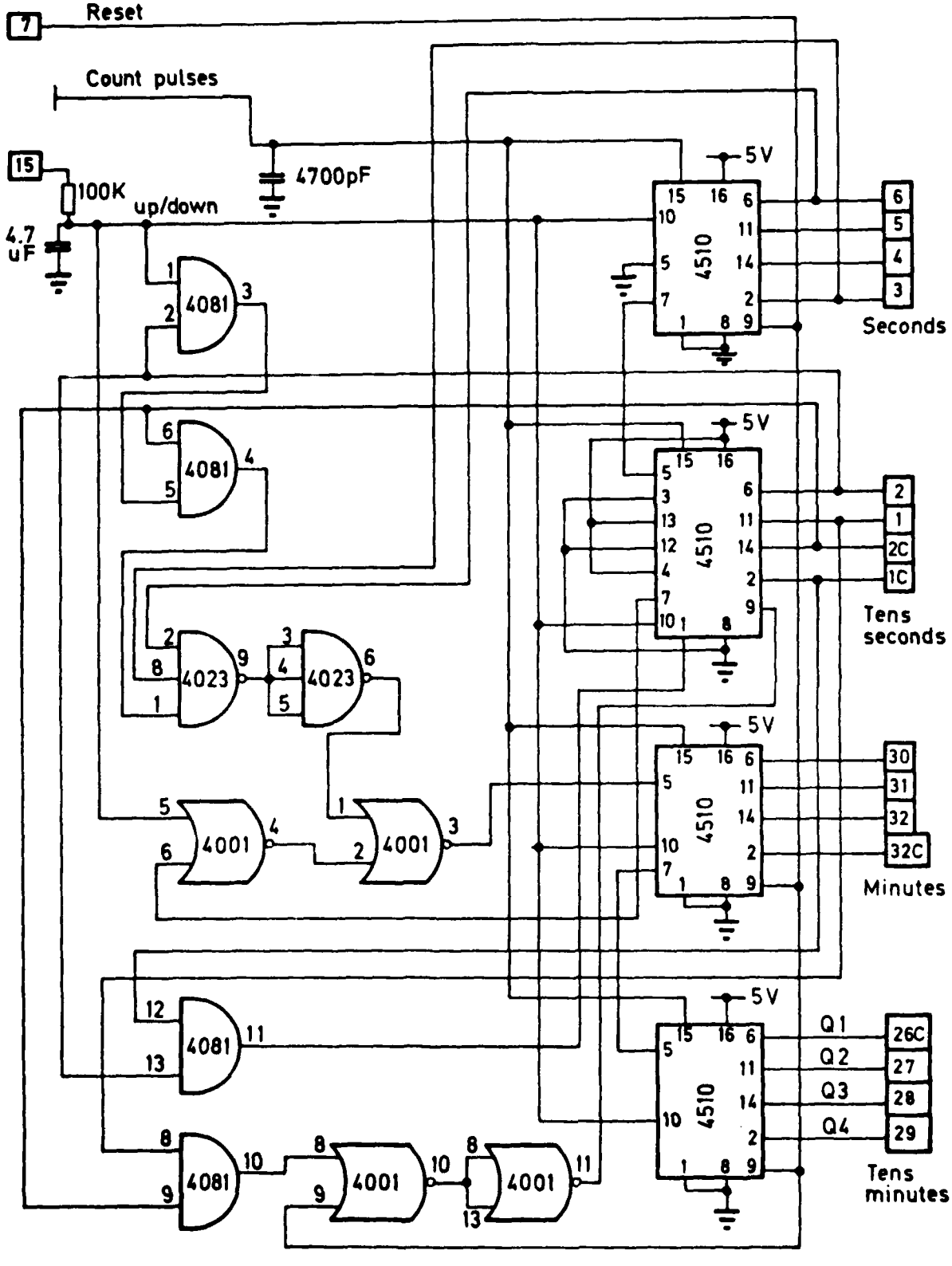


Fig 5 Counter

Fig 6

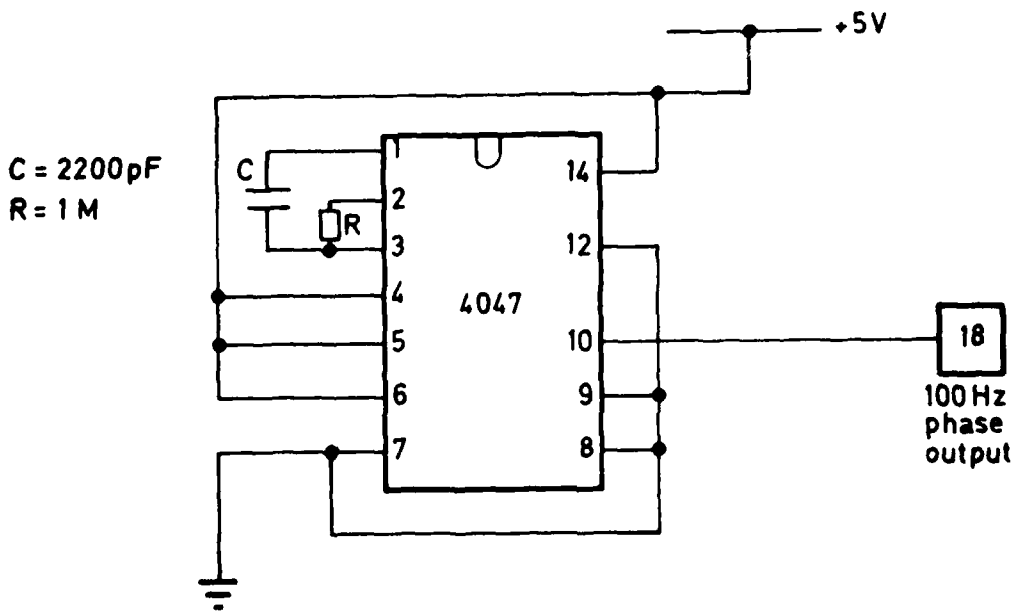
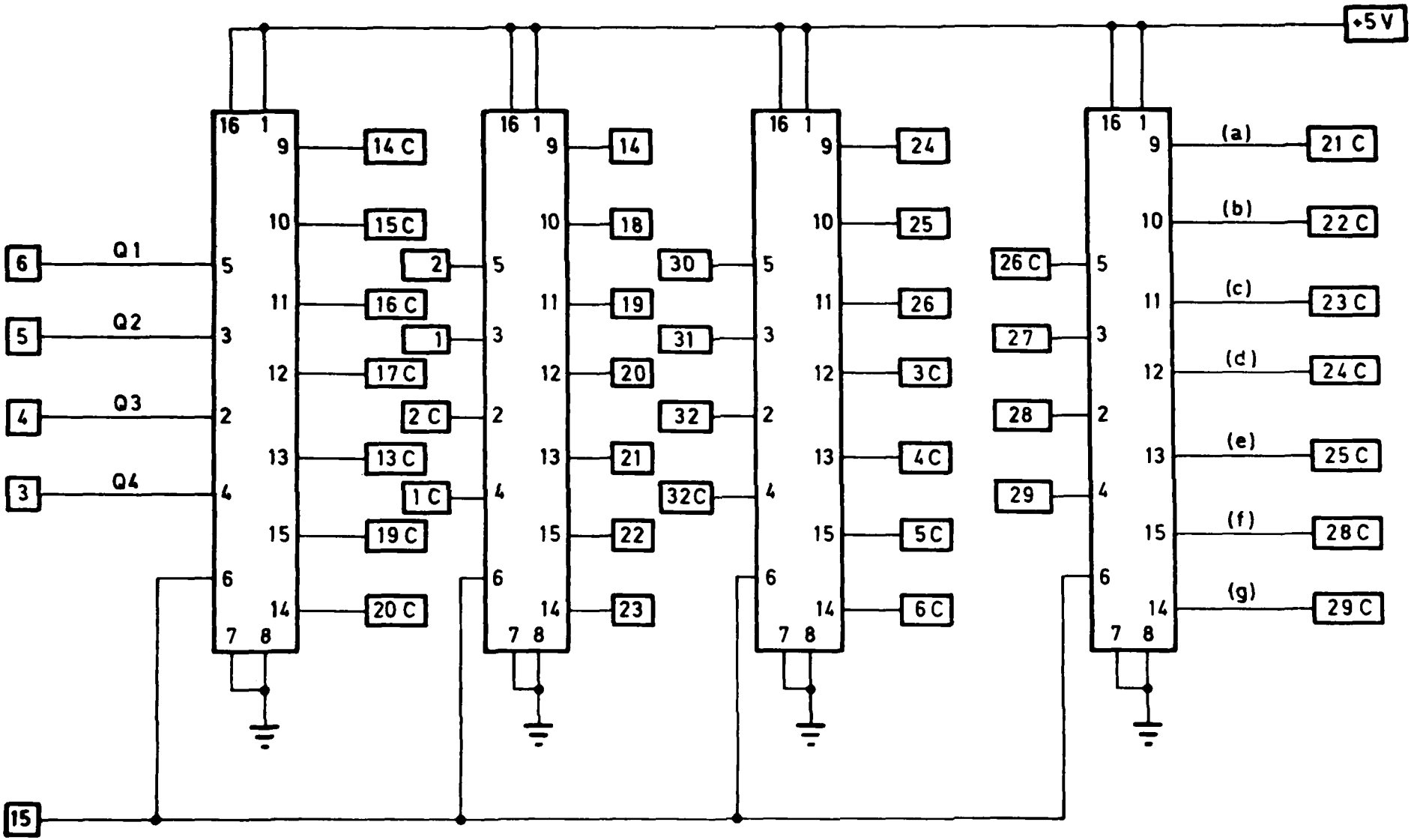


Fig 6 Phase oscillator



All 4 ICs are 4543

Fig 7 Display driver

Fig 7

Figs 8 & 9

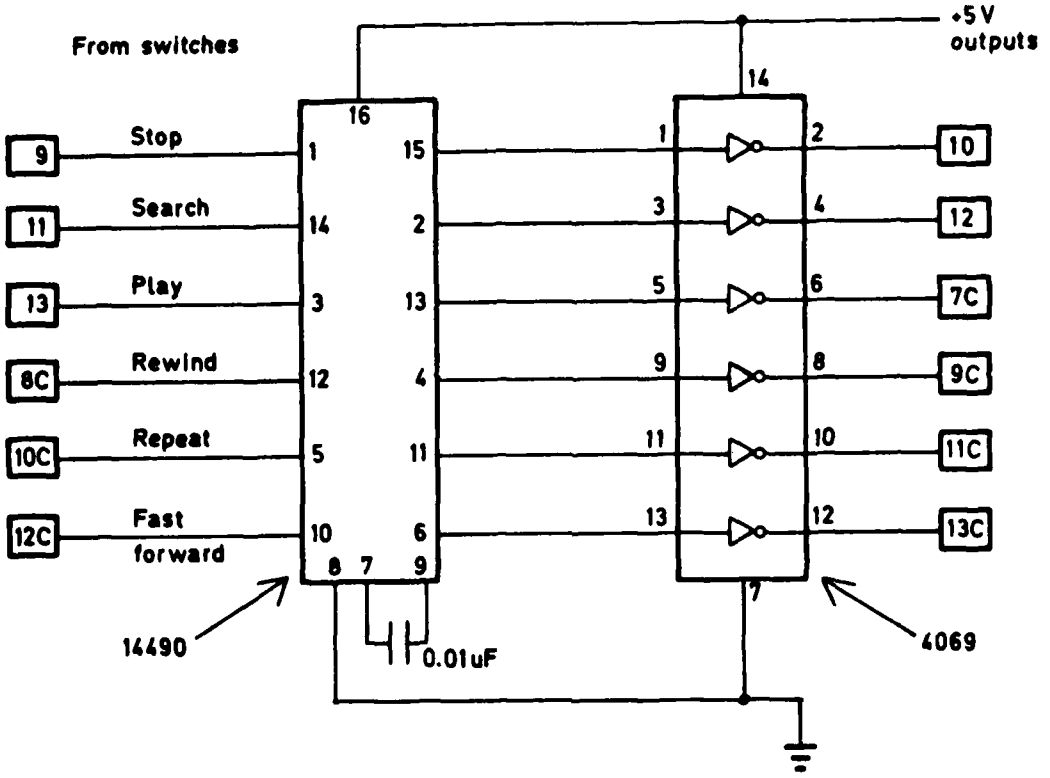


Fig 8 Switch debounce

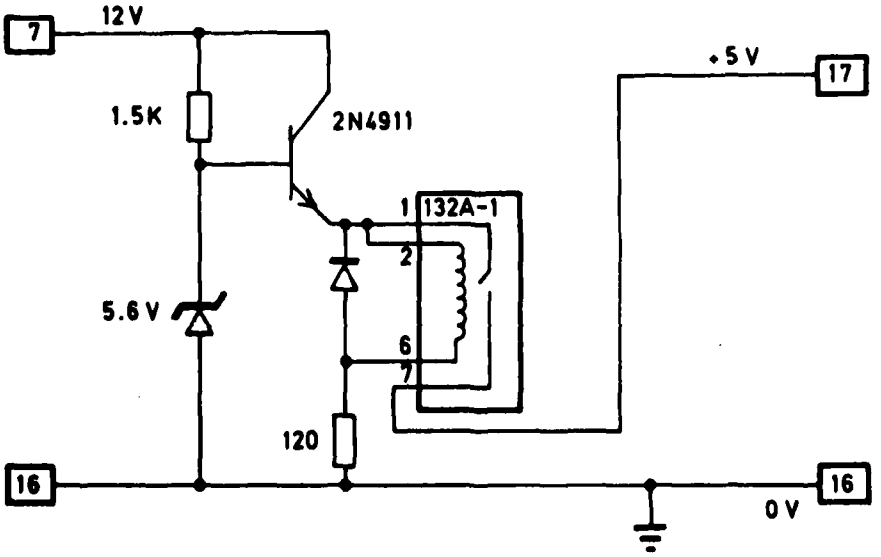
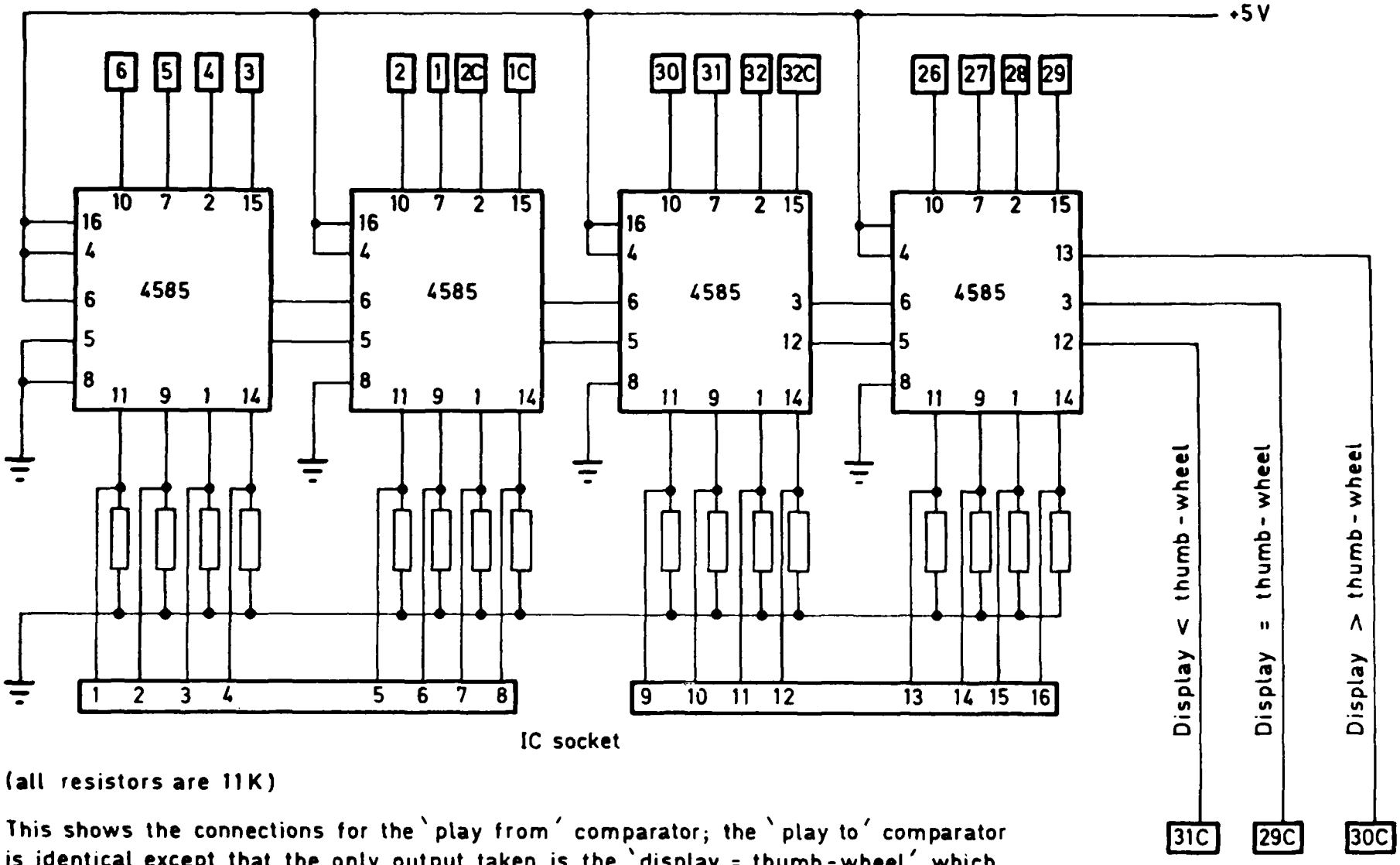


Fig 9 Voltage regulator



(all resistors are 11K)

This shows the connections for the `play from' comparator; the `play to' comparator is identical except that the only output taken is the `display = thumb-wheel', which is connected to backplane pin [5C]

Fig 10 Comparator circuits

Fig 10

Fig 11

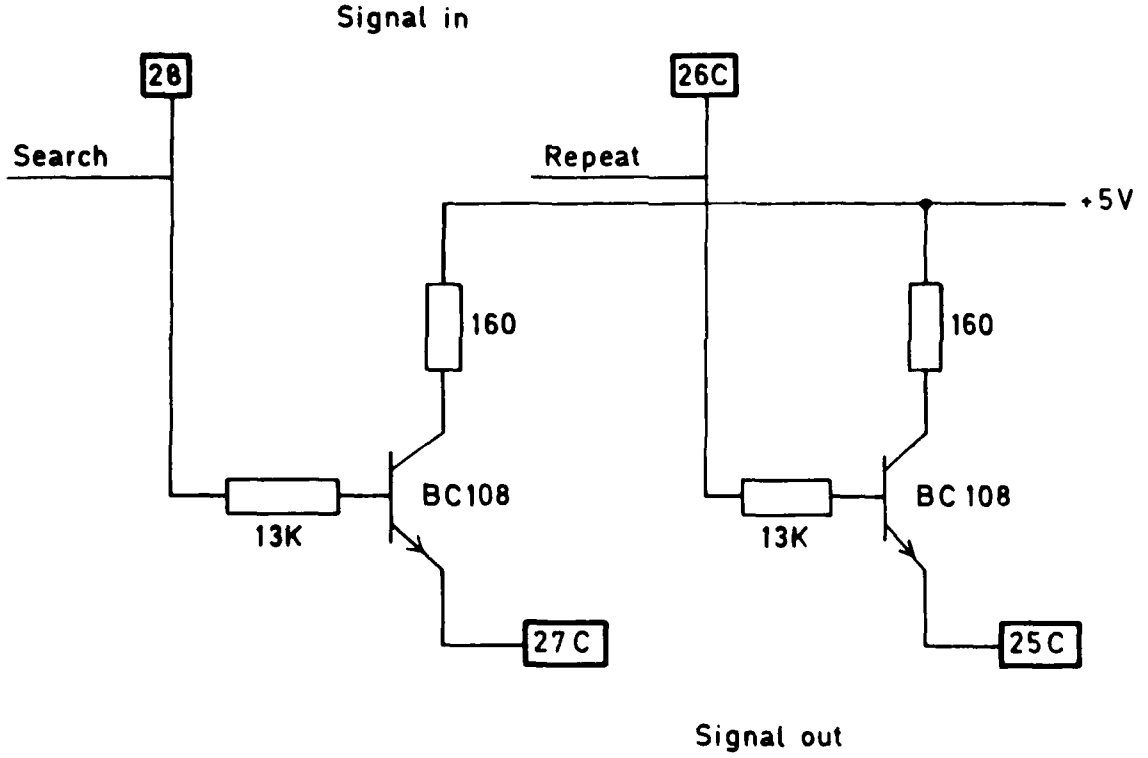


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Fig 11 LED drivers

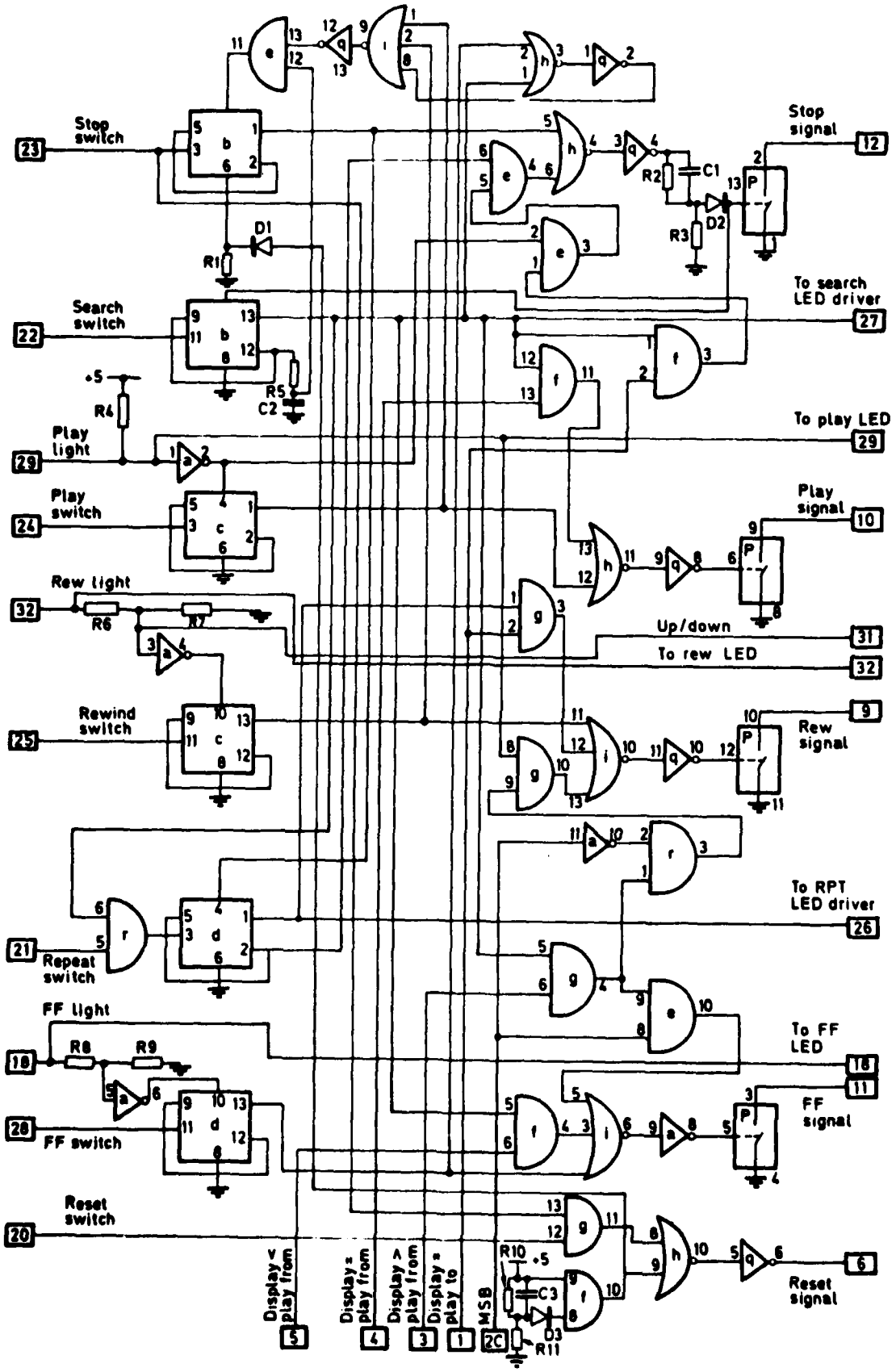

Fig 12 Control logic

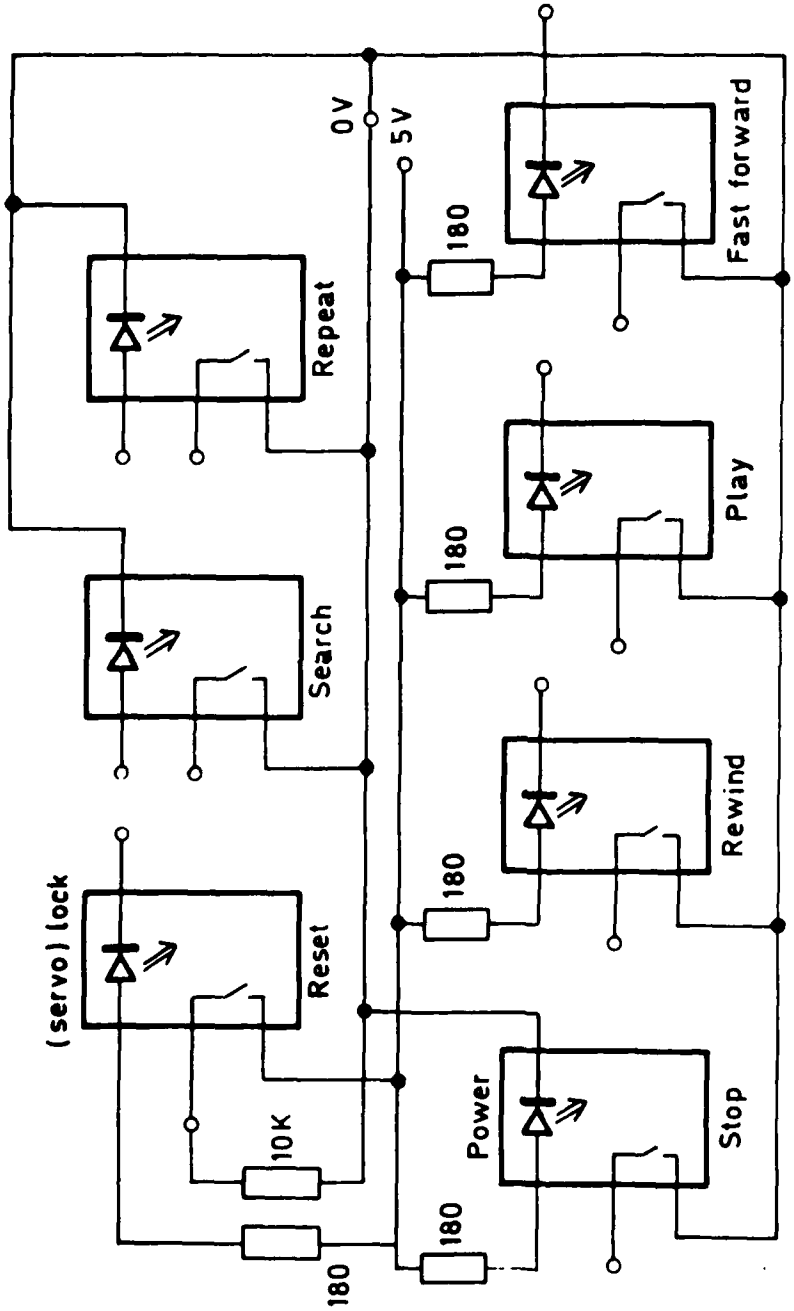

Fig 13 Switchboard, showing internal LEDs and switches

REPORT DOCUMENTATION PAGE

Overall security classification of this page

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UMATIC. Video cassette recorder. VCR. VTR. Remote control.

17. Abstract

This Technical Memorandum describes a remote control unit with a SEARCH and REPEAT facility for use with a 'UMATIC" VCR, allowing a specified portion of tape to be automatically searched for and played, without any extra control recordings being required.


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