hardware manual

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PAPER TAPE READER

PTR 500
02/10273
Reference Manual

Keywords : PTR 500, Paper Tape Reader

Abstract : This manual contains information about principles of operation, specifications, installation, operation and maintenance. Diagrams and spare parts lists are also included.

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CONTENTS

1. INTRODUCTION

The PTR 500 is a photoelectric paper tape reader which is able to read standard 1 inch, 8-channel perforated tape at an average speed of up to 500 characters per second.

The PTR 500 may be devided into two parts, the basic reader module and the interface as shown in figure 1.1. The interface is placed in the reader and provides adaption to systems with different requirements to signal levels, parity, etc. This manual comprices the basic reader module. Interfaces are described seperately.

1.1. Principles of Operation.

The basic elements of the PTR 500 is shown on figure 1.1. Sensing of data, as presence or absence of holes, is accomplished by means of arrays of light emitting diodes and phototransistors with one pair of diodes and transistors per track including the feed hole track.

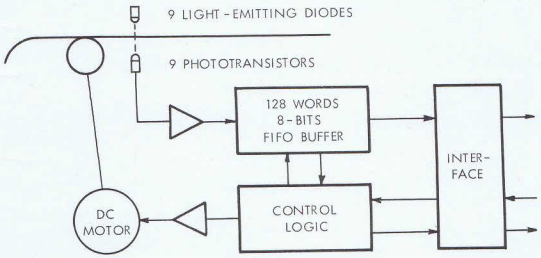


Figure 1.1. PTR 500 principles of operation.

The heart of the reader electronics is a First-In First-Out (FIFO) buffer of 128 8-bits words which is used as a buffer for characters read from the tape. The buffer makes it possible to use a simple and reliable tape transport system without abrupt starts and stops of the tape. The tape is driven by a DC motor with rubber capstan. The tape speed is determined by the number of characters stored in the buffer. When the number of characters in the buffer is less than 64 the motor accelerates until maximum speed is reached, and when the number of characters in the buffer exceeds 64 the motor deaccelerates. If no characters are removed from the buffer there is approximately 80 characters in the buffer when the motor is completely stopped. The buffer permits characters to be accessed at speeds greater than the actual reading speed. Blocks of up to approximately 80 characters may be transferred from the reader with speeds of up to 400 000 characters per second. However, the maximum average speed is 500 characters per second.

1.2. References

1. ISO RECOMMENDATION R 1154, Dimensions for Punched Paper Tape for Data Interchange.
2. STANDARD ECMA-10 for Data Interchange on Punched Tape.

2. SPECIFICATIONS

2.1. General.

Tape width	8 track, 25.4 $\pm$ 0.1 mm (1 inch)
Dimension and position of holes	According to ISO or ECMA standard, see figure 2.1.
Inter-character spacing	Nominal: 2.54 mm Minimum: 2.15 mm Maximum: no limit
Tape material	Any suitable opaque material, e.g. paper, oiled paper, plastic, mylar, and metalised mylar.
Transmissitivity of tape	Up to 60%. Measured according to ECMA standard.
Thickness of tape	Up to 0.3 mm, including tape splice.
Length of tape leader	Min. 250 mm.

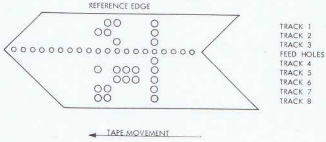


Figure 2.1. 8 track tape

Tape movement	Undirectional
Reading speed	0 to 500 characters per second average speed. Blocks up to approximately 80 characters may be transferred from the reader width up to 400 000 characters per second.

2.2. Power.

Mains voltage	220 VAC ± 10%, single phase, 3-wire. Chassis connected to ground. Other voltages on request.
Mains frequency	48 to 63 Hz.
Current consumption	Max. 0.5 A at 220 VAC.
Power dissipation	Max. 100 W.
Fuse	0.63 A slow blow.

2.3. Environment

Ambient temperature	Operating, +5 to +45 deg.C. Storage, -40 to +80 deg.C.
Relative humidity	20% to 80% without condensation.

2.4. Physical.

Dimensions	Width 440 mm, table top model. 483 mm (19 inches), rack model. Depth 315 mm. Height 140 mm. See installation drawing, figure 3.3. and 3.3. for detailed dimensions.
Weight	9 kg.

2.5. Internal interface.

This description comprices the interface between the basic reader and the interface circuit board.

2.5.1. Power.

The following dc voltages are available on the interface circuit board.

+5V ± 5%, 1 A.

+12V ± 5%, 0.25 A.

-12V ± 5%, 0.25 A.

2.5.2. Signal levels.

The signal levels are standard series 74 TTL levels. Fan-out and load are specified as unit loads. For specification of signal levels and unit load is referred to data sheets of series 74 circuit. The following logical representation is used in the description.

Logic 1 is approximately +3V.

Logic 0 is approximately 0V.

2.5.3. Signal description.

In this description:

Logic 0 is written 0.

Logic 1 is written 1.

Negation is indicated by -,.

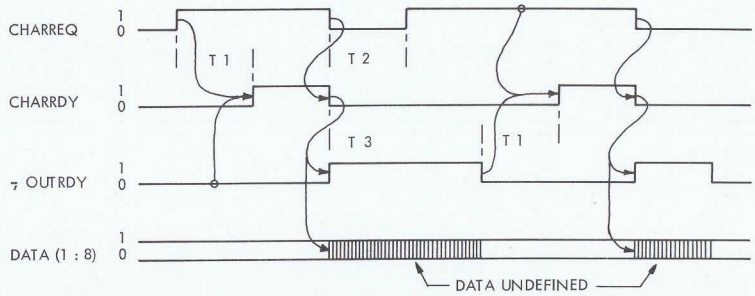
Data are tranferred to the interface character by character in parallel under control of signals CHARREQ (charracter request) and CHARRDY (character ready) as shown on figure 2.2.

DATA(1) through DATA(8)

Direction: from PTR500

Fan-out: 10 unit loads

Output data from the FIFO buffer. DATA(1) corresponds to channel 1 on the tape.



T1 : min. 0.4 microsec

T2 : min. 0.8 microsec

T3 : min. 0.17 microsec, max. depends on reading speed.

Fig. 2.2. Output timing diagram

CHARREQ

Direction: to PTR 500

Load: 3 unit loads

A shift from 0 to 1 indicates that the interface requests a character from PTR 500. A shift from 1 to 0 indicates that the character has been accepted and that data may change. See figure 2.2. for timing information.

CHARRDY

Direction: from PTR 500

Fan-out: 10 unit loads

A 1 indicates that DATA (1:8) are valid. A 0 indicates that DATA (1:8) are not valid.

-,OUTRDY

Direction: from PTR 500

Fan-out: 9 unit loads

A status signal from the FIFO buffer. A 0 indicates that a character is available at the output of the buffer. The signal is 1 during the time it takes to shift a new character to the output. If the buffer has been emptied -,OUTRDY will stay 1. It may therefore be used to generate a buffer empty status in the interface.

PTLOAD

Direction: from PTR 500

Fan-out: 8 unit loads

A 1 indicates that the load lever is or has been in the LOAD position. The signal changes to 0 when the RESET or the READ push-button is activated provided that the load lever is in the RUN position. When power is switched on PTLOAD will be set to 1 independent of the position of the load lever.

PTOUT

Direction: from PTR 500

Fan-out: 9 unit loads

PTOUT is set to 1 if there is no tape in the read head when the reader is operating. The signal changes to 0 when the RESET or the READ push-button is activated. The paper out condition arises when the motor is running at full speed, and an all-holes character has been detected continously for approximately 20 millisec.

RST or READ

Direction: from PTR 500

Fan-out: 7 unit loads

Is 1 while the RESET or READ push-button is activated.

-, RDFDHOLE

Direction: to PTR 500

Load: 9 unit loads

If the signal is 0 the feed holes are used to indicate the presence of a character on the tape. When the signal is 1, a character is only detected if there is at least one data hole in the tape. I.e. tape with NULL-characters is skipped.

CONTRCH 6

Direction: to PTR 500

Load: 1 unit load

A special purpose control signal which normally should be 0.

CONTRCH 7

Direction: to PTR 500

Load: 1 unit load

A special purpose control signal which normally should be 0.

CONTRCH 8

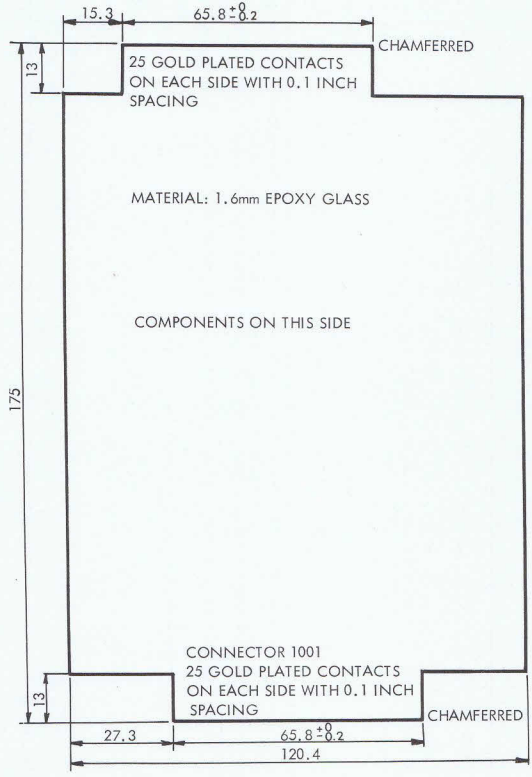
Direction: to PTR 500

Load: 1 unit load

A special purpose control signal which normally should be 0.

CONNECTOR 1001

PIN	SIGNAL	PIN	SIGNAL
A 1	+5 VOLTS	B 1	0 VOLT
A 2	+12 VOLTS	B 2	0 VOLT
A 3	DATA(1)	B 3	0 VOLT
A 4	DATA(2)	B 4	0 VOLT
A 5	DATA(3)	B 5	0 VOLT
A 6	DATA(4)	B 6	0 VOLT
A 7	DATA(5)	B 7	0 VOLT
A 8	DATA(6)	B 8	0 VOLT
A 9	DATA(7)	B 9	0 VOLT
A 10	DATA(8)	B 10	0 VOLT
A 11	CHARREQ	B 11	0 VOLT
A 12	CHARRDY	B 12	0 VOLT
A 13	PTOUT	B 13	0 VOLT
A 14	PTLOAD	B 14	0 VOLT
A 15	-, OUTRDY	B 15	0 VOLT
A 16	-, RDFDHOLE	B 16	0 VOLT
A 17	CONTRCH 6	B 17	0 VOLT
A 18	CONTRCH 7	B 18	0 VOLT
A 19	CONTRCH 8	B 19	0 VOLT
A 20	RST or READ	B 20	0 VOLT
A 21	NOT USED	B 21	0 VOLT
A 22	NOT USED	B 22	0 VOLT
A 23	NOT USED	B 23	0 VOLT
A 24	-12 VOLTS	B 24	0 VOLT
A 25	0 VOLT	B 25	0 VOLT


15.3
65.8 +0 -0.2
CHAMFERRED
13
25 GOLD PLATED CONTACTS
ON EACH SIDE WITH 0.1 INCH
SPACING
MATERIAL: 1.6mm EPOXY GLASS
COMPONENTS ON THIS SIDE
175
CONNECTOR 1001
25 GOLD PLATED CONTACTS
ON EACH SIDE WITH 0.1 INCH
SPACING
13
CHAMFERRED
27.3
65.8 +0 -0.2
120.4

3. INSTALLATION.

3.1 Mechanical.

The PTR 500 may be used either as a table top model or mounted in a standard 19 inch rack. The reader is easily modified from table top model to rack model, or vice versa, by turning two brackets, as shown on the outline drawings, figure 3.2. and 3.3.

It should be noted that tape rolls with an outer diameter greater than approximately 105 millimeters will increase the total height of the reader, when placed in the tape roll bin. A tape roll of maximum size (200 mm) will increase the height as shown on figure 3.1.

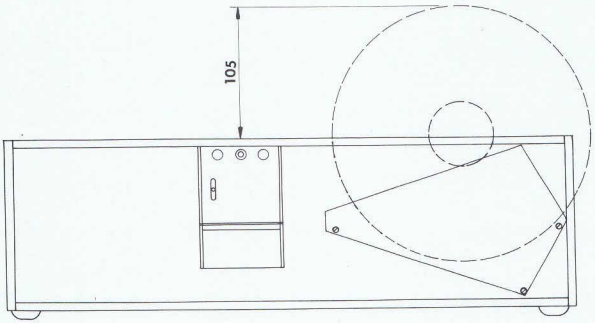


Figure 3.1. Increase of height by maximum tape roll diameter.

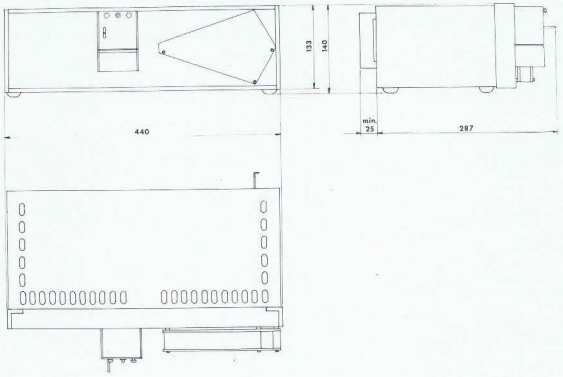


Figure 3.2. Outline drawings for table top version. All measures are in mm.

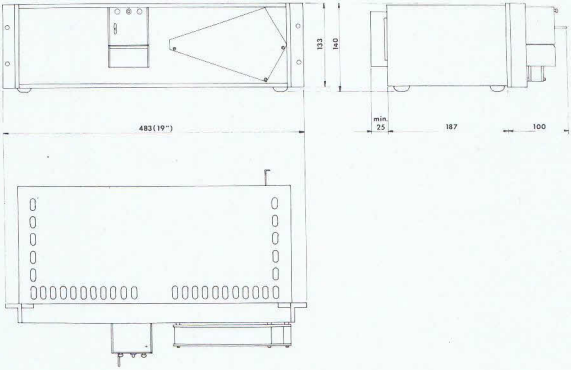


Figure 3.3. Outline drawings for rack version. All measures are in mm.

The reader is cooled by natural ventilation, and care should be taken not to cover the cooling vents or in any way prevent the ventilation. When the reader is mounted in a rack a minimum clearance of 10 millimeters is required below and above the reader.

3.2 Power.

The reader is supplied with 5 meter 3-wire power cable. The colour code of the wires is as shown below.

Brown:	Phase
Blue:	Neutral
Green/yellow:	Ground

4. OPERATION.

The tape is loaded in the following way (see figure 4.2.)

1. Move the load lever up to LOAD position.
2. Insert the tape into the tape guide with the reference edge (see figure 4.1.) nearest the panel.
3. Move the load lever down to RUN position.
4. Activate the RESET or the READ push-button.

RESET clears the FIFO buffer before the reading is initiated. When the RESET push-button is released approximately 80 characters will be stored in the buffer before the tape is stopped.

READ initiates the reading without clearing the contents of the buffer.

Activation of the RESET and READ push-buttons and load lever during the read operation may cause reading errors.

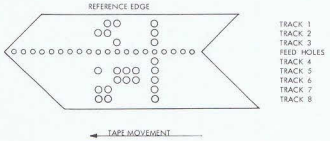


Figure 4.1. 8 track tape

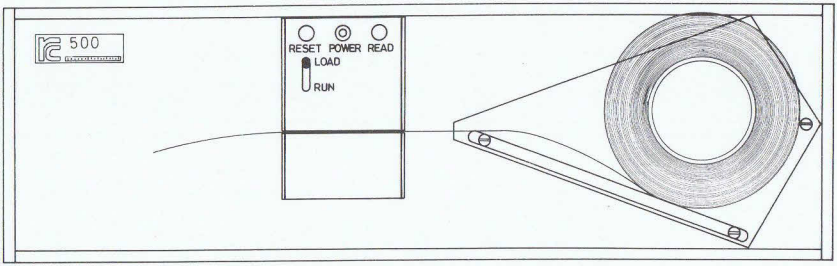
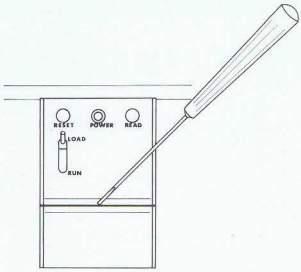


Figure 4.2. Front of PTR 500

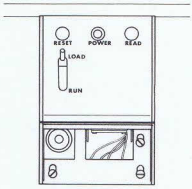
5. MAINTENANCE.

The only regular maintenance to be performed by the user, is cleaning of the read head. All other maintenance must be performed by a trained service engineer.

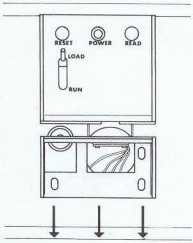
Normally the read head is self cleaning. If however the glasses covering the phototransistors and the light emitting diodes become greasy the dust will stick to them and probably cause reading errors. In this case it is necessary to remove the lover part of the read head assembly as shown on figure 5.1. The dust should be removed with a soft brush and the glasses cleaned with a lint-free cloth and Propanol.



Remove the cover of the lower part of the read head by prying it loose with a screwdriver.



Remove the 3 screws that attaches the lower part of the panel.



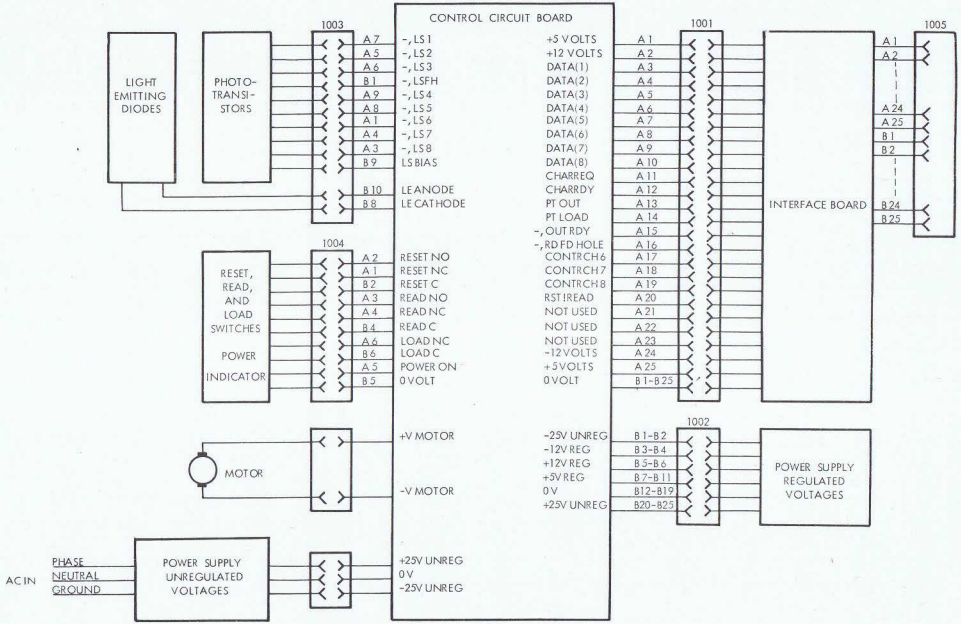
Gently pull the lower part downwards untill it is clear of the guide pins.

Figure 5.1. How to disassemble the read head for cleaning.

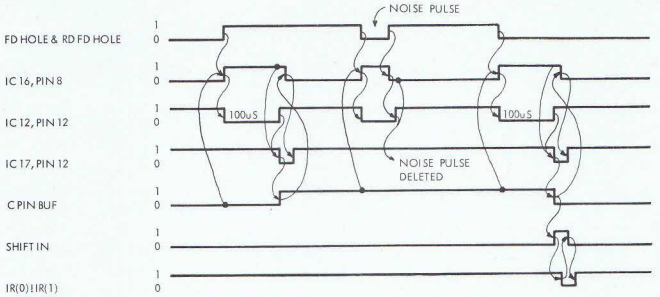
6. DIAGRAMS.

Contents:

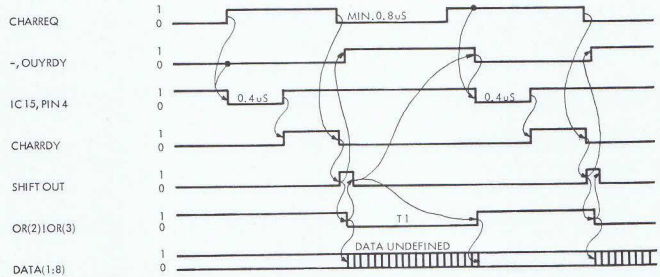
INTERCONNECTION DIAGRAM



INPUT TIMING DIAGRAM



OUTPUT TIMING DIAGRAM

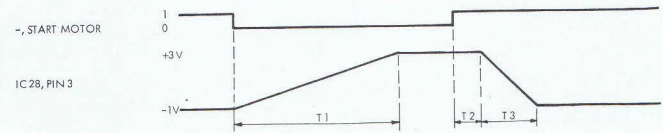


T1: Min. 170nS, max. depends on reading speed

110274 ERC

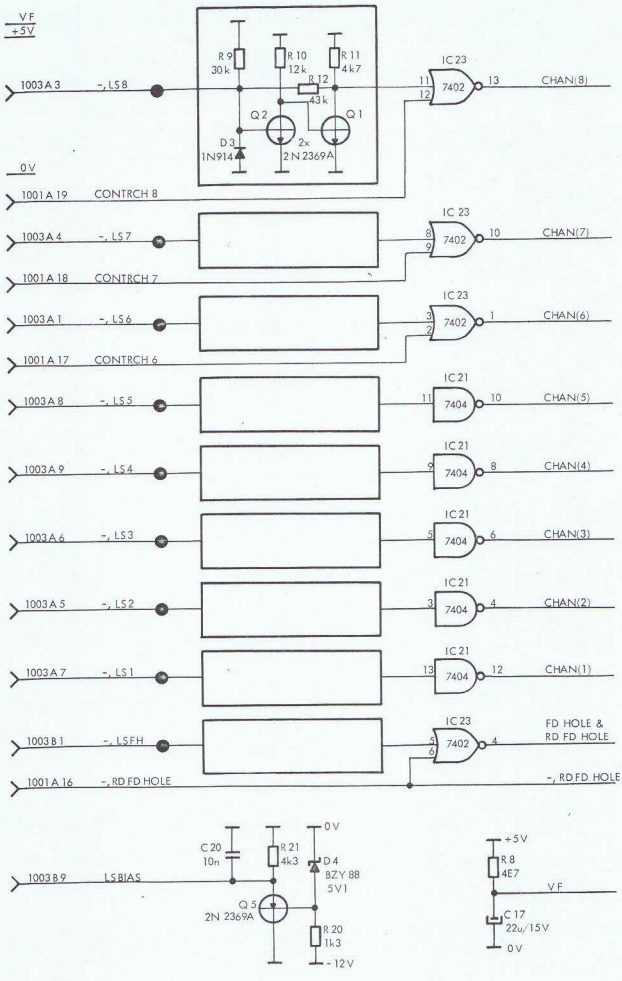
MOTOR SPEED CONTROL

070274 AAJ



T1: App. 200mS T2: App. 30mS T3: App. 70mS

TIMING DIAGRAM



R10589

070273 AAJ 151273 ERC

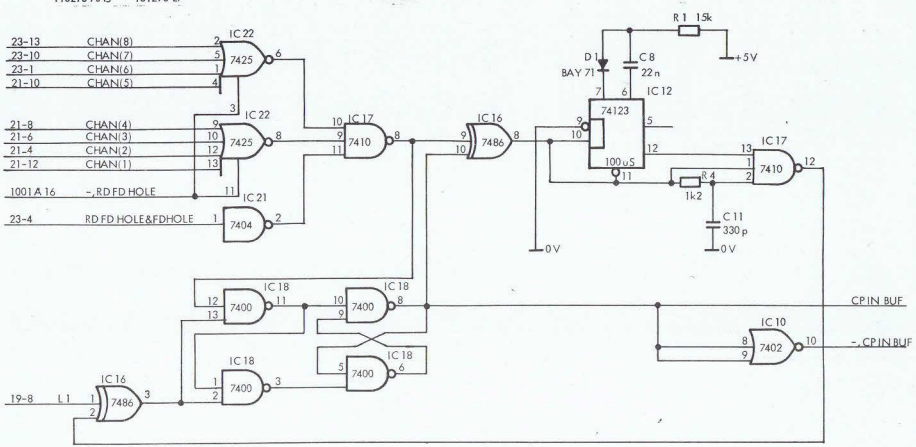
PTR 500

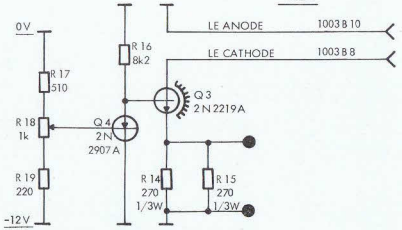
R 10614

SENSE AMPLIFIERS
AND BIAS FOR PHOTOTRANSISTORS

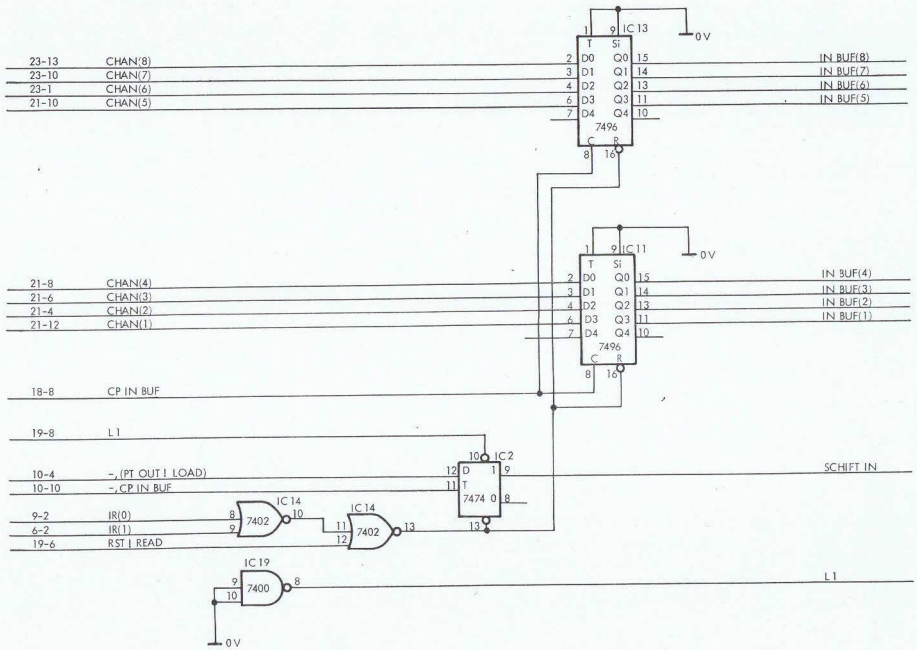
110273 AAJ 151273 ER

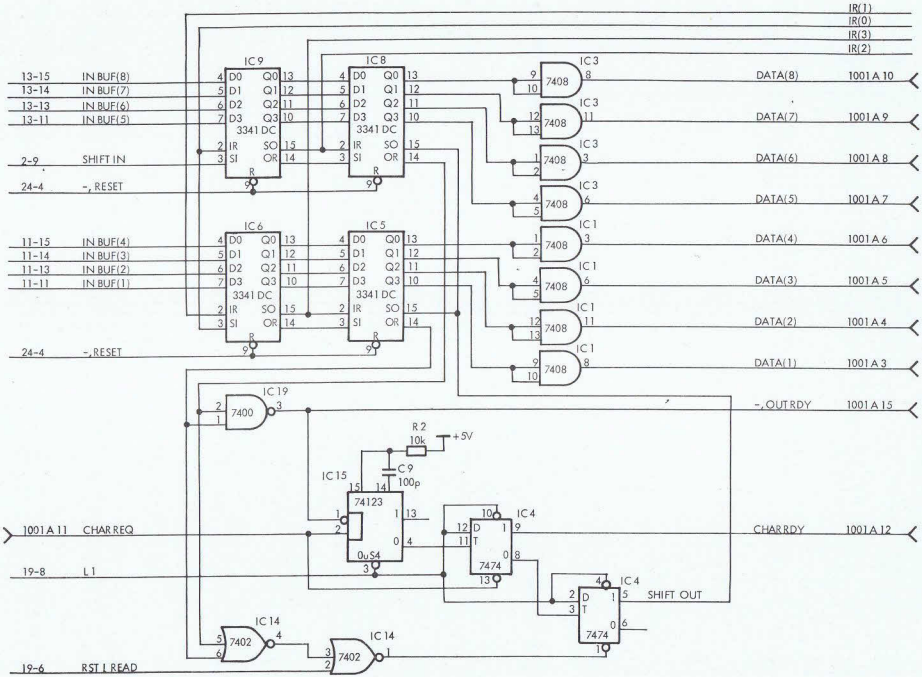
R 10590

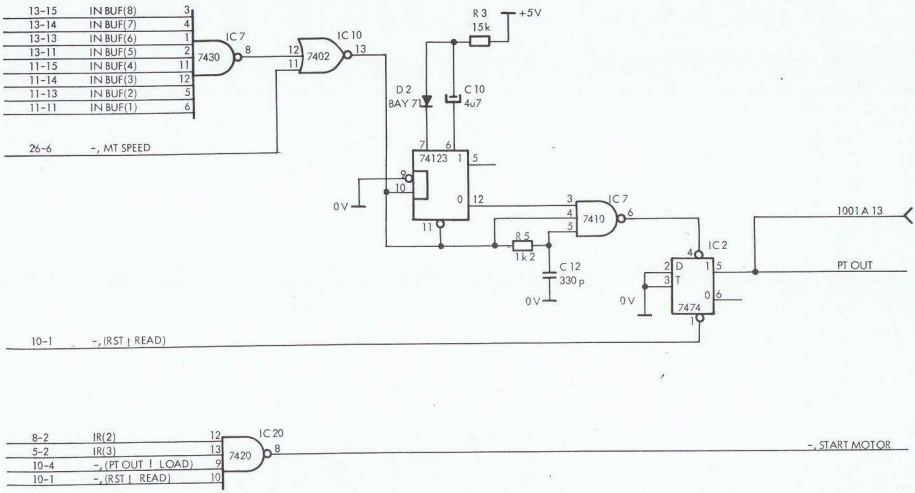


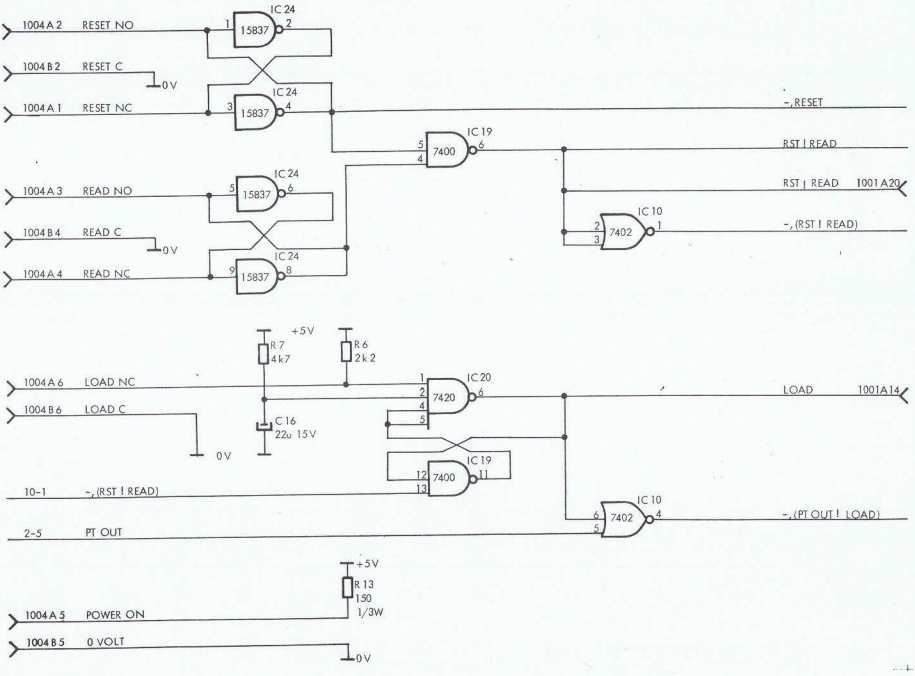


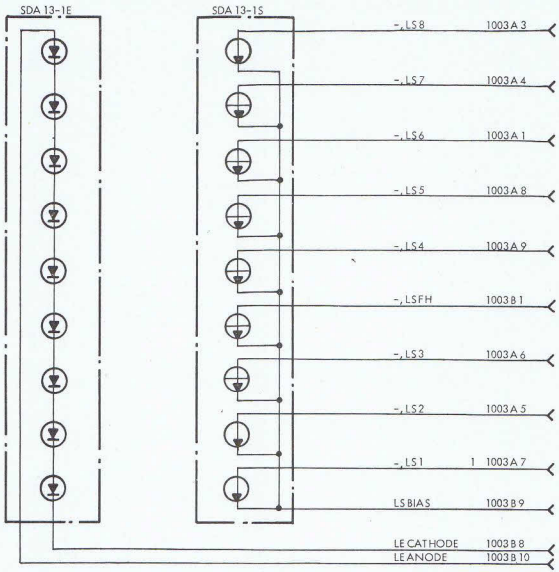
CURRENT SOURCE FOR LED'S AND INPUT BUFFER CONTROL

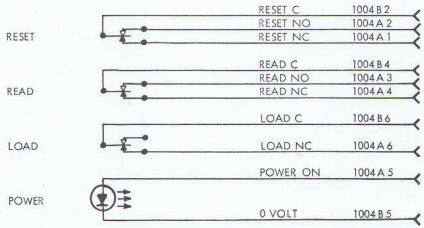

IC 13
7496
0 V
23-13 CHAN(8)
23-10 CHAN(7)
23-1 CHAN(6)
21-10 CHAN(5)
IN BUF(8)
IN BUF(7)
IN BUF(6)
IN BUF(5)
IC 11
7496
0 V
21-8 CHAN(4)
21-6 CHAN(3)
21-4 CHAN(2)
21-12 CHAN(1)
IN BUF(4)
IN BUF(3)
IN BUF(2)
IN BUF(1)
18-8 CP IN BUF
19-8 L1
IC 2
7474
10-4 -, (PT OUT ! LOAD)
10-10 -, CP IN BUF
SCHIFT IN
IC 14
7402
9-2 IR(0)
6-2 IR(1)
19-6 RST ! READ
IC 14
7402
IC 19
7400
0 V
L1


IR(1)
IR(0)
IR(3)
IR(2)
13-15 IN BUF(8)
13-14 IN BUF(7)
13-13 IN BUF(6)
13-11 IN BUF(5)
2-9 SHIFT IN
24-4 -, RESET
11-15 IN BUF(4)
11-14 IN BUF(3)
11-13 IN BUF(2)
11-11 IN BUF(1)
24-4 -, RESET
IC 9
IC 8
IC 6
IC 5
3341 DC
D0 D1 D2 D3
Q0 Q1 Q2 Q3
IR SI
SO OR
IC 3
IC 1
7408
DATA(8) 1001 A 10
DATA(7) 1001 A 9
DATA(6) 1001 A 8
DATA(5) 1001 A 7
DATA(4) 1001 A 6
DATA(3) 1001 A 5
DATA(2) 1001 A 4
DATA(1) 1001 A 3
IC 19
7400
-, OUT RDY 1001 A 15
R 2
10k
+5V
C 9
100p
IC 15
74123
1001 A 11 CHAR REQ
19-8 L1
IC 4
7474
CHAR RDY 1001 A 12
SHIFT OUT
IC 14
7402
19-6 RST I READ

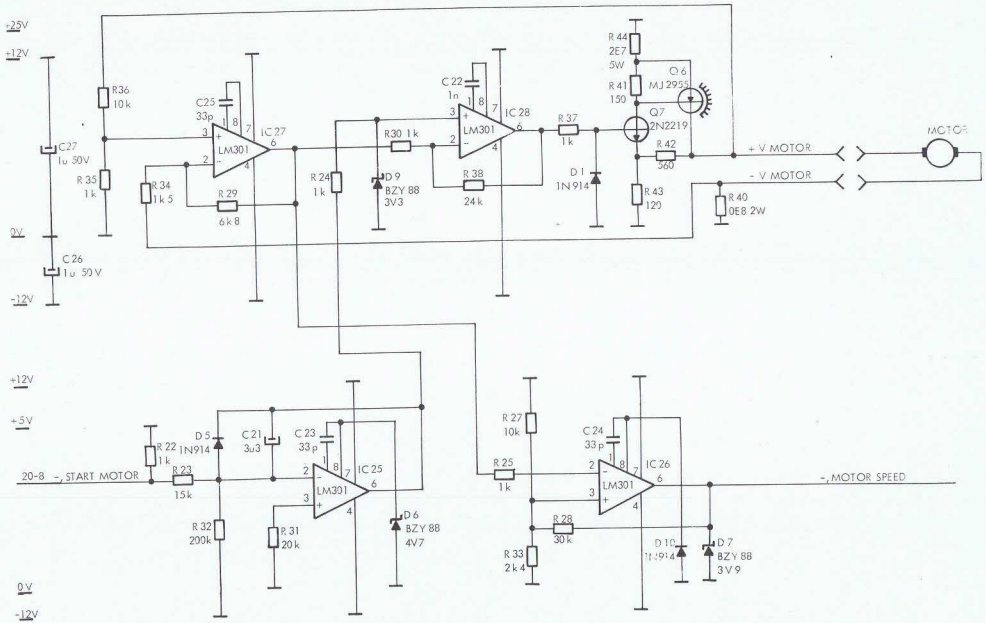

13-15 IN BUF(8) 3
13-14 IN BUF(7) 4
13-13 IN BUF(6) 1
13-11 IN BUF(5) 2
11-15 IN BUF(4) 11
11-14 IN BUF(3) 12
11-13 IN BUF(2) 5
11-11 IN BUF(1) 6
IC 7
7430
8
12
11
IC 10
7402
13
R 3
15k
+5V
D 2
BAY 71
C 10
4u7
26-6 -, MT SPEED
7
6
74123
1
5
8
10
0 V
0
12
11
3
4
5
IC 7
7410
6
1001 A 13
R 5
1k 2
C 12
330 p
0 V
IC 2
4
2 D
3 T
1
5
0
6
7474
1
0 V
PT OUT
10-1 -, (RST ! READ)
8-2 IR(2) 12
5-2 IR(3) 13
10-4 -, (PT OUT ! LOAD) 9
10-1 -, (RST ! READ) 10
IC 20
7420
8
-, START MOTOR

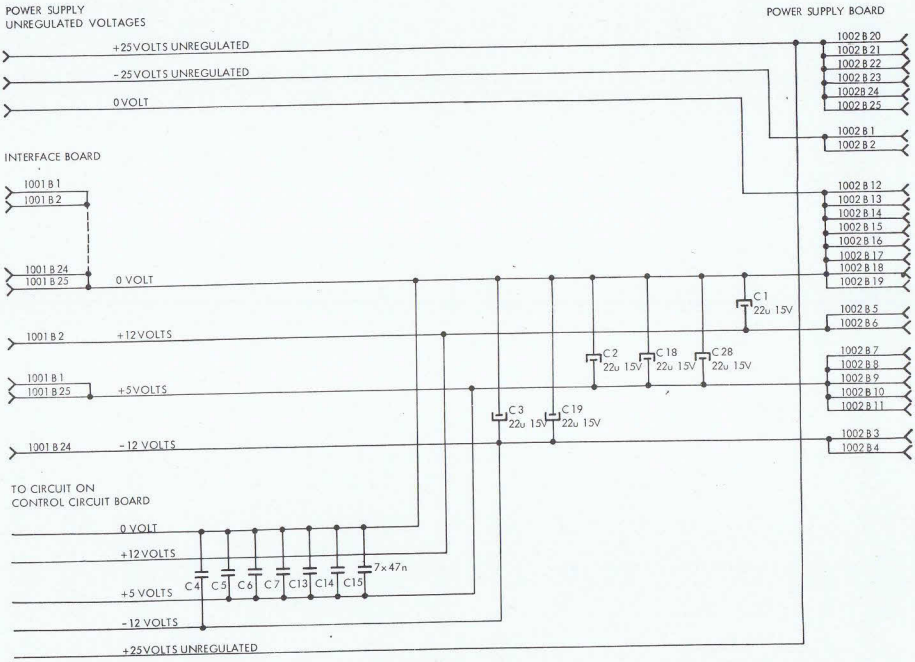

1004 A 2 RESET NO
1004 B 2 RESET C
0 V
1004 A 1 RESET NC
IC 24
15837
IC 19
7400
-, RESET
RST ! READ
1004 A 3 READ NO
1004 B 4 READ C
1004 A 4 READ NC
IC 10
7402
-, (RST ! READ)
+5V
R 7
4k7
R 6
2k 2
1004 A 6 LOAD NC
1004 B 6 LOAD C
C 16
22u 15V
IC 20
7420
LOAD
1001 A 14
10-1 -, (RST ! READ)
2-5 PT OUT
-, (PT OUT ! LOAD)
R 13
150
1/3W
1004 A 5 POWER ON
1004 B 5 0 VOLT





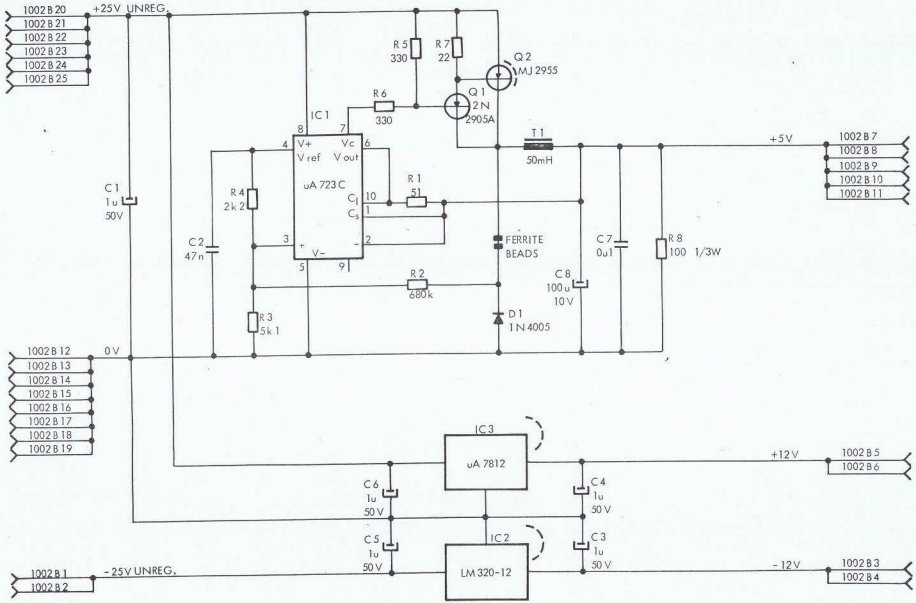
150273 UFL 151273 ERC R 10621 1500

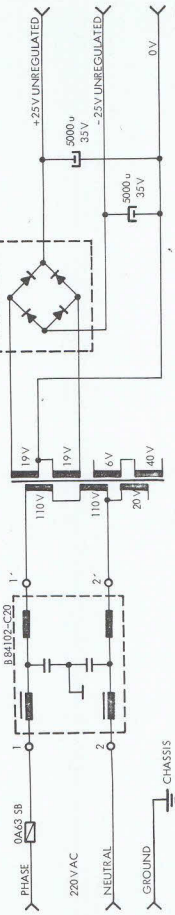



POWER SUPPLY
UNREGULATED VOLTAGES
+25 VOLTS UNREGULATED
-25 VOLTS UNREGULATED
0 VOLT
POWER SUPPLY BOARD
1002 B 20
1002 B 21
1002 B 22
1002 B 23
1002B 24
1002 B 25
1002 B 1
1002 B 2
INTERFACE BOARD
1001 B 1
1001 B 2
1002 B 12
1002 B 13
1002 B 14
1002 B 15
1002 B 16
1002 B 17
1002 B 18
1002 B 19
1001 B 24
1001 B 25
0 VOLT
C1
22u 15V
1002 B 5
1002 B 6
1001 B 2
+12 VOLTS
C2
22u 15V
C18
22u 15V
C28
22u 15V
1002 B 7
1002 B 8
1001 B 1
1001 B 25
+5 VOLTS
1002 B 9
1002 B 10
1002 B 11
C3
22u 15V
C19
22u 15V
1001 B 24
-12 VOLTS
1002 B 3
1002 B 4
TO CIRCUIT ON
CONTROL CIRCUIT BOARD
0 VOLT
+12 VOLTS
+5 VOLTS
-12 VOLTS
+25 VOLTS UNREGULATED
C4
C5
C6
C7
C13
C14
C15
7 x 47n

PTR 900
R 10623

POWER SUPPLY FOR +5V, +12V AND -12V





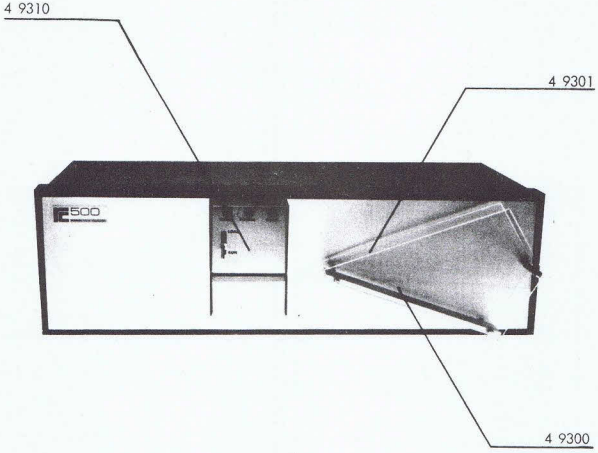
POWER SUPPLY FOR UNREGULATED VOLTAGES

7. SPARE PARTS LIST.

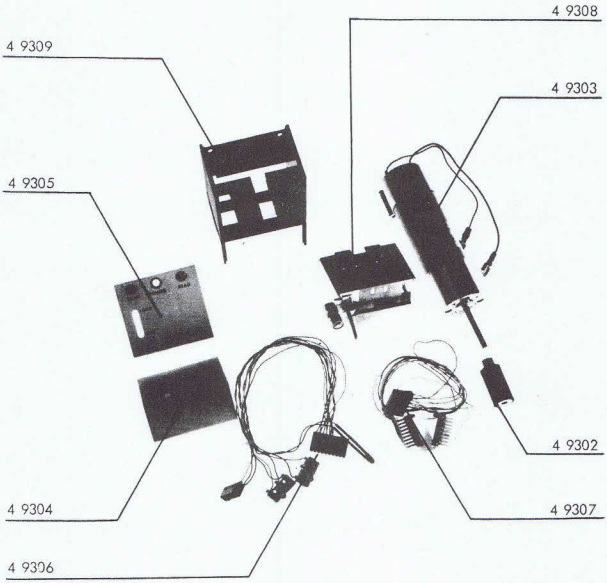
This section lists the component parts of the PTR 500 Paper Tape Reader. The reference number provides a cross reference between the spare parts lists, the diagrams, and the printed circuit board assemblies.

Contents:

PTR 500 PAPER TAPE READER



READ HEAD, MOTOR AND CAPSTAN



Ref. No.	Qty.	Description	RC Part No.	Note
	-	PTR 500 Paper Tape Reader	-	
	1	Read Head compl. consisting of:	4 9310	
	1	Housing	4 9309	
	1	Mechanism	4 9308	
	1	Read Head assy	4 9307	
	1	Switch assy	4 9306	
	1	Upper Cover	4 9305	
	1	Lower Cover	4 9304	
	1	Motor assy	4 9303	
	1	Capstan	4 9302	
	-	Spare Parts for Tape Roll Bin:		
	1	Front Plate	4 9300	
	1	Back Plate incl. 3 Bushings	4 9301	

181273 TL

031273 ERC

CSL 44-RT 202

Ref. No.	Qty.	Description		RC Part No.	Note
-	-	PCB 501		4 6315	
-	2	Connector with wire wrap 2x25 pins		4 6909	
-	47	Pin, wire wrap		4 4913	
IC 1, IC 3	2	Integrated Circuit	SN 7408 N	4 3702	
IC 2, IC 4	2	Integrated Circuit	SN 7474 N	3 5911	
IC 5, IC 6, IC 8, IC 9	4	Integrated Circuit	3341 DC	4 7903	
IC 7	1	Integrated Circuit	SN 7430 N	3 5904	
IC 10, IC 14& IC 23	3	Integrated Circuit	SN 7402 N	3 5915	
IC 11, IC 13	2	Integrated Circuit	SN 7496 N	2 9712	
IC 12, IC 15	2	Integrated Circuit	SN 74123 N	4 2307	
IC 16	1	Integrated Circuit	SN 7486 N	3 9117	
IC 17	1	Integrated Circuit	SN 7410 N	3 5902	
IC 18, IC 19	2	Integrated Circuit	SN 7400 N	3 5900	
IC 20	1	Integrated Circuit	SN 7420 N	3 5903	
IC 21	1	Integrated Circuit	SN 7404 N	2 9711	
IC 22	1	Integrated Circuit	SN 7425 N	4 3710	
IC 24	1	Integrated Circuit	SN 15837 N	4 0810	
IC 25-IC 28	4	Integrated Circuit	LM 301 AN	2 8318	
(1-8, H)Q1& (1-8, H)Q2	18	Transistor	2N 2369A	3 0604	
Q 3, Q 7	2	Transistor	2N 2219A	3 8112	
Q 4, Q 5	2	Transistor	2N 2907 A	3 4114	
Q 6	1	Transistor	MJ 2955	4 7104	

Ref. No.	Qty.	Description	RC Part No.	Note
D1, D2	2	Diode BAY 71	1 2816	
(1-8, H)D3, D5, D8, D10	12	Diode 1N 914	1 1607	
D4	1	Zenerdiode BZY 88 C5V1	3 4908	
D6	1	Zenerdiode BZY 88 C4V7	1 1612	
D7	1	Zenerdiode BZY 88 C3V9	1 1610	
D9	1	Zenerdiode BZY 88 C3V3	1 1604	
C1-C3, C16-C19, C28	8	Capacitor, tantal 22uF 15V	1 1118	
C4-C7, C13-C15	7	Capacitor 47nF	4 3911	
C8	1	Capacitor 22nF	1 1318	
C9	1	Capacitor 100pF	1 1209	
C10	1	Capacitor, tantal 4u7F 10V	1 8919	
C11, C12	2	Capacitor 330pF	1 1218	
C20	1	Capacitor 10nF	1 1315	
C21	1	Capacitor, tantal 3u3F 15V	1 1117	
C22	1	Capacitor 1nF	1 1303	
C23-C25	3	Capacitor 33pF	1 1205	
C26, C27	2	Capacitor, tantal 1uF 50V	1 1115	
R1, R3, R23	3	Resistor 15k ohm 1/8W	1 0708	
R2, R27, R36	3	Resistor 10k ohm 1/8W	1 0704	
R4, R5	2	Resistor 1k2 ohm 1/8W	1 0602	
R6	1	Resistor 2k2 ohm 1/8W	1 0608	
R7, (1-8, H)R11	1.	Resistor 4k7 ohm 1/8W	1 0616	
R8	1	Resistor 4,7 ohm 1/8W	1 4916	

Ref. No.	Qty.	Description			RC Part No.	Note
(1-8, H)R9, R28	10	Resistor	30k ohm	1/8W	1 0715	
(1-8, H)R10	9	Resistor	12k ohm	1/8W	1 0706	
(1-8, H)R12	9	Resistor	43k ohm	1/8W	1 0719	
R 13	1	Resistor	150 ohm	1/3W	1 0311	
R 14, R 15	2	Resistor	270 ohm	1/3W	1 0317	
R 16	1	Resistor	8k2 ohm	1/8W	1 0702	
R 17	1	Resistor	510 ohm	1/8W	1 5201	
R 18	1	Potentiometer	1k		1 9102	
R 19	1	Resistor	220 ohm	1/8W	1 5112	
R 20	1	Resistor	1k3 ohm	1/8W	1 0603	
R21	1	Resistor	4k3 ohm	1/8W	1 0615	
R 22, R 24, R25 R30, R35, R37	6	Resistor	1k ohm	1/8W	1 0600	
R 29	1	Resistor	6k8 ohm	1/8W	1 0700	
R 31	1	Resistor	20k ohm	1/8W	1 0711	
R 32	1	Resistor	200k ohm	1/8W	4 5308	
R 33	1	Resistor	2k4 ohm	1/8W	1 0609	
R 34	1	Resistor	1k5 ohm	1/8W	1 0604	
R 38	1	Resistor	24k ohm	1/8W	1 0713	

1500
R 20908
181273 TL
031273 ERC
CSL 44-RT 202

Ref. No.	Qty.	Description	RC Part No.	Note
R 40	1	Resistor 0,8 ohm 2W	4 5307	
R 41	1	Resistor 150 ohm 1/8W	1 5108	
R 42	1	Resistor 560 ohm 1/8W	1 5202	
R 43	1	Resistor 120 ohm 1/8W	1 5106	
R 44	1	Resistor 2,7 ohm 5W	4 5306	

181273 TL

031273 ERC

RCSL 44-R1202

Ref. No.	Qty.	Description	RC Part No.	Note
-	-	PCB 502	4 6314	
T1	1	Coil compl. 15mH	4 6811	
IC1	1	Integrated Circuit uA 723C	2 8319	
IC2	1	Integrated Circuit LM320-12	4 7904	
IC3	1	Integrated Circuit uA 7812	4 7905	
Q1	1	Transistor 2N 2905A	3 4118	
Q2	1	Transistor MJ 2955	4 7104	
D1	1	Diode 1N 4005	2 1710	
C1, C3-C6	5	Capacitor, tantal 1uF 50V	1 1115	
C2	1	Capacitor 47nF	1 1406	
C7	1	Capacitor 0u1F	1 1101	
C8	1	Capacitor, tantal 100uF 10V	3 0205	
R1	1	Resistor 51 ohm 1/8W	1 5017	
R2	1	Resistor 680k ohm 1/8W	1 0813	
R3	1	Resistor 5k1 ohm 1/8W	1 0617	
R4	1	Resistor 2k2 ohm 1/8W	1 0608	
R5, R6	2	Resistor 330 ohm 1/8W	1 5116	
R7	1	Resistor 22 ohm 1/8W	1 5008	
R8	1	Resistor 100 ohm 1/3W	1 0307	
-	2	Ferrite Beads	4 5414	

181273 TL

031273 ERC

RCSL 44-RT 202

Ref. No.	Qty.	Description	RC Part No.	Note
	-	Power Supply PTR 500-30	4 6316	
	1	Noise Filter 220V/2x0, 5A	4 7901	
	1	Trafo 2x110V+2x10V/38V/2A	4 7616	
	1	Rectifier Bridge 3A/100V	4 7902	
	2	Capacitor 5000uF 35V	3 8002	
	1	Fuseholder	1 2800	
	1	Fuse slow 5x20 630mA	4 4105	

181273 TL

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RCSL 44-RT 202