



DESIGNS DEPARTMENT

DESIGNS DEPARTMENT HANDBOOK

NO. 7.212(75)

Tester Magnetic Recorder Reproducer

TE1/26

BRITISH BROADCASTING CORPORATION  
ENGINEERING DIVISION

47011012

DESIGNS DEPARTMENT HANDBOOK

NO. 7.212(75)

Tester Magnetic Recorder Reproducer

TE1/26

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for Head of Designs Department

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D.D. Handbook No. 7.212(75)  
Title Sheet

DESIGNS DEPARTMENT HANDBOOK

NO. 7.212(75)

Tester Magnetic Recorder Reproducer TE1/26

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DESIGNS DEPARTMENT HANDBOOK NO. 7.212(75)

Tester Magnetic Recorder Reproducer TE1/26

1. INTRODUCTION

The TE1/26 enables routine frequency response measurements to be made on magnetic recording equipment.

The reproducing response is measured by using a special multitone test film instead of the normal frequency calibration tape. Five frequencies (125Hz, 1kHz, 5kHz, 10kHz, 14kHz) are recorded simultaneously on the multitone tape and each frequency can be selected in turn by operating the appropriate push button.

The overall response can also be measured. This is achieved by turning each selective amplifier into an oscillator to provide the frequencies to be recorded. It is possible to measure the output from the reproducing amplifier whilst recording because the meter is connected via a wide band amplifier to the input sockets.

2. OPERATION

2.1 Reproducing Response Measurement

- 2.1.1 Place the multitone tape on the machine and connect the reproducing amplifier output(s) to the input terminal(s) of the tester. If the machine is connected to a desk or console do not terminate the input.
- 2.1.2 Select 1kHz, check that REP/REC button is in the REP mode. Select appropriate channel button A or B then set the reproducing gain control on the machine so that the meter reads 0.
- 2.1.3 Select the remaining frequencies in turn and note frequency response.

2.2 Overall Response Measurement

- 2.2.1 Replace the multitone tape with a blank tape.
- 2.2.2 Release the REP/REC button so that the tester is in the recording mode.
- 2.2.3 Connect the output(s) of the tester to the recording machine input(s). If the machine is connected to a desk or a console do not terminate output(s).
- 2.2.4 Select 1kHz and the appropriate channel button (A or B), then set the recording gain control on the machine so that the meter reads 0.
- 2.2.5 Select the remaining frequencies in turn and note frequency response.

## 2.3 Measurement of Phase Difference Between Channels

Providing the machine has a balanced output the phase difference between channels of a stereophonic machine can be measured as follows.

2.3.1 With the recording machine and the tester in the condition noted in 2 above select 10kHz. Operate  $\frac{1}{2}$  (A + B) push button and note reading then operate  $\frac{1}{2}$  (A - B) push button and note reading. If reading is below -15dB phase error is less than 20 degrees.

## 3. CIRCUIT DESCRIPTION

The heart of the meter is an active selective filter (see Fig. 1) using a bridged-T feedback network whose design equations are:

$$a = \frac{D}{2A}$$

$$f = \frac{1}{2\pi} \sqrt{\frac{1}{C^2 D (A + B)}}$$

$$Q = \sqrt{\frac{D}{4 (A + B)}}$$

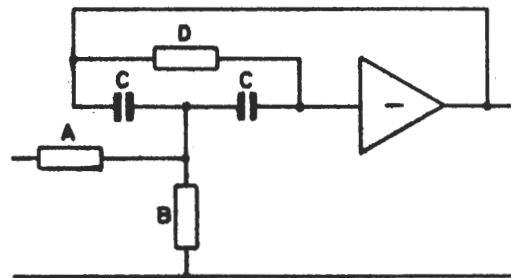


FIG. 1

The values chosen for the meter are gain (a) = 1,  $f = 125\text{Hz}$ , 1, 5, 10 and 14kHz and  $Q = 10$ . This value of  $Q$  is high enough to keep errors due to break through of adjacent frequencies less than 0.2dB. It is also low enough to keep errors due to a frequency (speed) error of  $\pm 1\%$  due to the recording machine also below 0.2dB. The resistors A and B are made partly variable so as to permit trimming of gain and frequency. Because of the values chosen their mutual effect is very slight though the frequency trimmer (B) does also affect the  $Q$  of the circuit to some degree. This is unimportant because of the limited range of adjustment.

### 3.1 The Input Circuit

The fixed part of the filter input resistor is provided by two equal resistors which, in the A or B position are both connected to the live side of the relevant input, whose other side is 'earthed'. In the  $\frac{1}{2}$  (A + B) position one resistor goes to the line side of each input; this connection is also used in the  $\frac{1}{2}$  (A - B) position except that the B input is reversed. In the MONO position extra resistors are added to give an attenuation of 4dB whilst keeping the output impedance the same as in the other configuration.

### 3.2 The Meter Amplifier

In the 'record' position the input circuit is directly connected to this circuit which converts the input voltage input to a current in a 3K9 resistor across which is connected a VU meter. The feedback components are selected so that at all frequencies the meter reads '0' for an input of -17dB.

In the 'Replay' mode the amplifier input comes from the Selective Amplifier whose gain (nominally unity) is set so that the meter reads '0' when an input is applied at the selected frequency at a level of -17dB. It should be noted that, in either condition, if 'Mono' is selected the corresponding input is -13dB.

### 3.3 The Oscillator

In order to convert the device into a switchable, single frequency oscillator, the output of the selective amplifier is applied to a Zener controlled clipper amplifier. The constant amplitude square wave from the clipper amplifier is applied, after suitable attenuation and impedance padding, to the input of the selective amplifier, thereby completing the feedback loop. The selective amplifier rejects all but the fundamental so that its output is constant at all selected frequencies and its harmonic ratio is better than -30dB. This is quite adequate for all but distortion measurements.

#### 4. PERFORMANCE SPECIFICATION

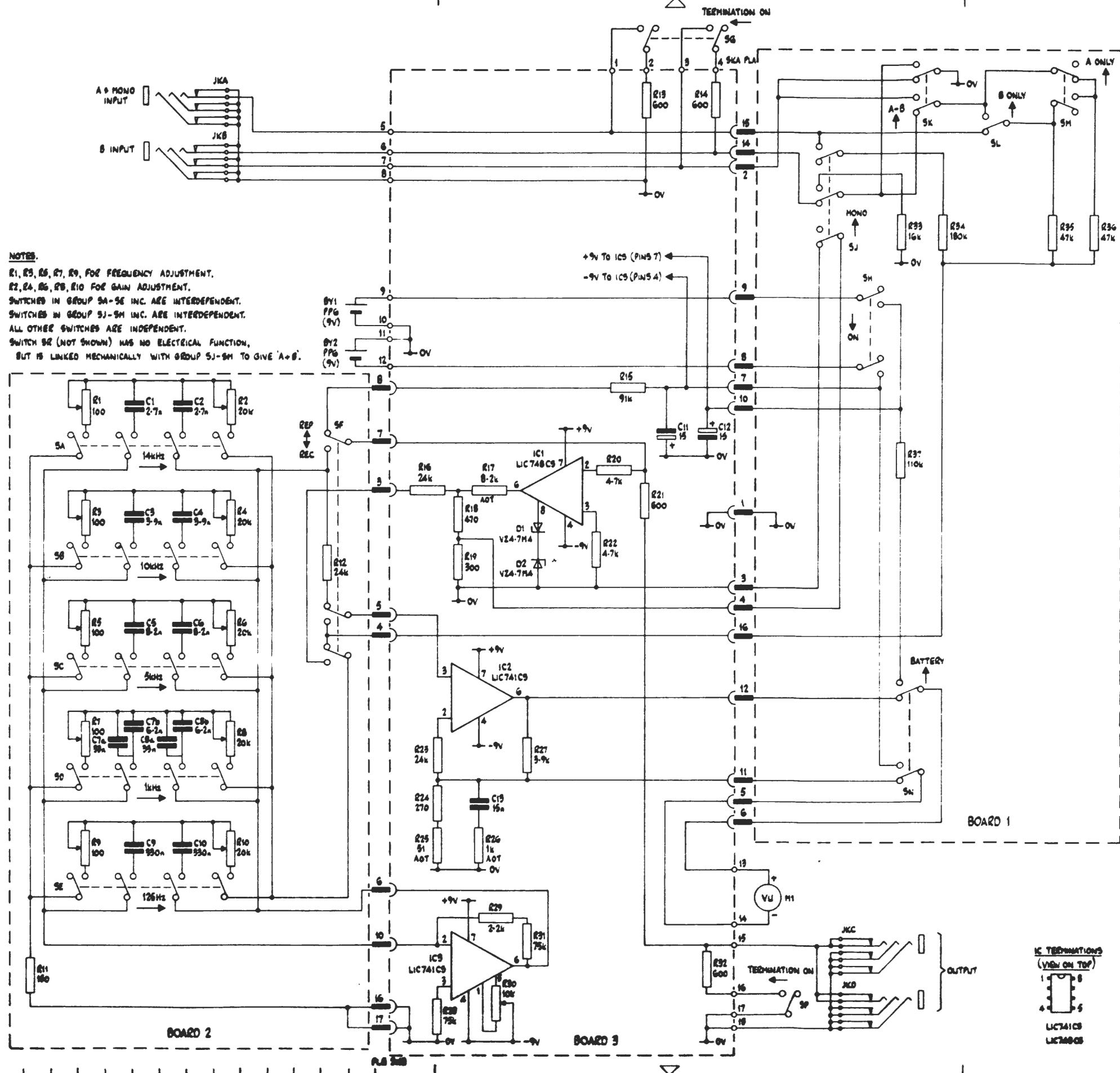
Input Level	-17dB (each tone)
Input Impedance	30K $\Omega$ unbalanced
Test Frequencies	125Hz, 1kHz, 5kHz, 10kHz and 14kHz
Output Level	-17dB (single tone)
Output Impedance	600 $\Omega$ unbalanced

#### 5. MAINTENANCE

From time to time it may be necessary to check the frequency of the output tones and their level. After this has been done plug the output of the device to the input A to A, B to B and check that meter reads  $0 \pm 0.2$ dB for each frequency.

D39651 A2

**NOTES.**  
 R1, R3, R5, R7, R9, FOR FREQUENCY ADJUSTMENT.  
 R2, R4, R6, R8, R10 FOR GAIN ADJUSTMENT.  
 SWITCHES IN GROUP SA-SG INC. ARE INTERDEPENDENT.  
 SWITCHES IN GROUP SJ-SM INC. ARE INTERDEPENDENT.  
 ALL OTHER SWITCHES ARE INDEPENDENT.  
 SWITCH SR (NOT SHOWN) HAS NO ELECTRICAL FUNCTION,  
 BUT IS LINKED MECHANICALLY WITH GROUP SJ-SM TO GIVE 'A+B'.



Original Frame Size	<b>BBO</b>
400mm x 574mm	D8/A3
CHANGE	ISS
1-12-75	1

THIRD ANGLE PROJECTION  
 All dimensions in millimetres unless otherwise stated.  
 Normal tolerances  
 no decimal place : 1 mm  
 one decimal place : 0.3mm  
 two decimal places : 0.1mm  
 unless otherwise stated

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**TE1/26**  
**(TESTER, MAGNETIC RECORDER/REPRODUCER) CIRCUIT**

DRN	TCD	CKD	APPD
D.J.A.			C.I.

DESIGNED BY: **D39651**

NETS LIST: 009602 A4

CHANGE  
1-12-75

TE1/26  
TESTER, MAGNETIC RECORDER/ REPRODUCER.  
PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	C'T REF.	BBC REF. OR DRG. No.
<b>DRAWING NUMBERS</b>				
		CIRCUIT	D39651 A2	
		PARTS LIST	D39652 A4	
		ASSEMBLY & WIRING	D39653 A1	
		DETAILS 1-6	D39654 A2	
		DETAILS 7+B	D39655 A2	
		P. B. WIRING (BOARD 1)	D39656 A3	
		P. B. COMP. LOC. (BOARD 1)	D39657 A4	
		P. B. DRILLING (BOARD 1)	D39658 A4	
		P. B. WIRING (BOARD 2)	D39659 A3	
		P. B. COMP. LOC. (BOARD 2)	D39660 A4	
		P. B. DRILLING (BOARD 2)	D39661 A4	
		P. B. WIRING (BOARD 3)	D39662 A2	
		P. B. COMP. LOC. (BOARD 3)	D39663 A4	
		P. B. DRILLING (BOARD 3)	D39664 A4	
		SWITCH ASSEMBLY 'A'	D39665 A3	
		SWITCH ASSEMBLY 'B'	D39666 A3	
		BATTERY COVER LEGEND	D39667 A4	
		TOP PLATE LEGEND	D39668 A2	
<b>FURTHER INFORMATION REQUIRED FOR MANUFACTURE</b>				
		ASSEMBLY INFORMATION	EA10A04	
		WIRING INFORMATION	EA10197, EA10140	
1	1	CASE - TOPPER CASES (HUNTINGDON) LTD. TYPE '80C 7' INSTRUMENT CASE. EXTERNAL REF. DIMS. 7 1/8" x 7 1/8" x 4" MODIFIED BY CONTRACTOR TO		D39655 A2 DET. 7
2	1	BATTERY COVER		D39655 A2 DET. 8 & D39667 A4
3	1	TOP PLATE		D39654 A2 DET. 1 & D39660 A2
4	1	BATTERY BOX		D39664 A2 DET. 2
5	1	LIPPED PLATE		3
6	4	MOUNTING PILLAR		4
7	4	SWITCH SPACER		5
8	1	SWITCH ACTUATOR		6
9				
10				
11	1	RUBBER PAD - 55mm x 20mm x 3.2mm (1/8") THICK 'RUBAZOTE'		
12				
13				
14				
15				

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CHANGE  
1-12-75

TE1/26  
PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	C'CT REF.	BBC REF. OR DRG. No.
<b>ITEMS 17-20 INC. FITTED ON PRINTED BOARD 1</b>				
16	1	PRINTED BOARD 1		D39656 A3, D39657 A4, & D39658 A4.
17	1	SWITCH ASSEMBLY 'A'		D39659 A3
18	1	PLUG, FIXED, 17 POLE	PLA	1-25087-017
19				
20				
<b>RESISTORS 0.4W ± 2%</b>				
21	1	16kΩ	R93	1-26877-518
22	1	47kΩ	R95	----- -545
23	1	47kΩ	R96	----- -545
24	1	110kΩ	R97	----- -600
25	1	100kΩ	R94	----- -614
26				
27				
28	2	SCREW, M3, PAN HD. x 6 LB. ST. ZN. P.		
29	2	NUT, M3, FULL, ST. ZN. P.		
30	6	WASHER, M3, NORMAL, PLAIN, ST. ZN. P.		
31				
32				
33				
<b>ITEMS 35-38 INC. FITTED ON PRINTED BOARD 2</b>				
34	1	PRINTED BOARD 2		D39659 A3, D39660 A4, & D39661 A4.
35	1	SWITCH ASSEMBLY 'B'		D39666 A3
36	1	PLUG, FIXED, 17 POLE	PLB	1-25087-017
37				
38				
<b>RESISTORS 0.4W ± 2%</b>				
39	1	150Ω	R11	1-26877-908
40	1	24kΩ	R12	----- -522
41				
42				
<b>RESISTORS, VARIABLE, LINEAR, 0.5W ± 10%</b>				
43	1	100Ω	R1	1-27110-298
44	1	100Ω	R3	-----
45	1	100Ω	R5	-----
46	1	100Ω	R7	-----
47	1	100Ω	R9	-----
48	1	20kΩ	R2	----- -518
49	1	20kΩ	R4	-----
50	1	20kΩ	R6	-----
51	1	20kΩ	R8	-----
52	1	20kΩ	R10	-----
53				
54				
<b>CAPACITORS, POLYESTER, ± 10%</b>				
55	1	33nF, 250V	C7a	1-21034-372
56	1	33nF, 250V	C8a	-----
57	1	330nF, 100V	C9	----- -419
58	1	330nF, 100V	C10	-----
59				

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1-12-75

TE1/26  
PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	CIT REF.	BBC REF. OR DRG. No.
<b>CAPACITORS, POLYSTYRENE, 50V ± 2%</b>				
60	1	2.7nF	C1	1-21003-293
61	1	2.7nF	C2	-----
62	1	3.9nF	C3	----- -304
63	1	3.9nF	C4	----- 0
64	1	6.2nF	C7b	----- -320
65	1	6.2nF	C8	-----
66	1	0.2nF	C5	----- -340
67	1	0.2nF	C6	-----
68				
69				
70	A/R	WIRE, 22 SWG, B.T.C.		
71	2	SCREW, M3, PAN HD. H 6 LO. ST. ZA. P.		
72	2	NUT, M3, FULL, ST. ZA. P.		
73	6	WASHER, M3, NORMAL, PLAIN, ST. ZA. P.		
74				
75				
76				
<b>ITEMS 70-122 INC. FITTED ON PRINTED BOARD 3</b>				
77	1	PRINTED BOARD 3		D39662 A2, D39663 A4 + D39664 A4
78	2	SOCKET, FIXED, 17 POLE	9KA, B	1-27807-017
79				
80				
<b>RESISTORS 0.5W ± 2%</b>				
81	1	51Ω A.O.T.	R25	1-26077-200
82	1	270Ω	R24	----- -325
83	1	300Ω	R19	----- -320
84	1	470Ω	R10	----- -345
85	1	600Ω	R13	----- -393
86	1	600Ω	R14	-----
87	1	600Ω	R21	-----
88	1	600Ω	R12	-----
89	1	1kΩ A.O.T.	R26	----- -398
90	1	2.2kΩ	R29	----- -420
91	1	3.9kΩ	R27	----- -437
92	1	4.7kΩ	R20	----- -445
93	1	4.7kΩ	R22	-----
94	1	0.2kΩ A.O.T.	R17	----- -400
95	1	24kΩ	R16	----- -522
96	1	24kΩ	R23	-----
97	1	75kΩ	R28	----- -573
98	1	75kΩ	R31	-----
99	1	91kΩ	R15	----- -589
100				
101				
102				
103	1	RESISTOR, 10kΩ, VARIABLE, LINEAR, 0.5W ± 10%	R30	1-27110-498
104				
105				
106	1	CAPACITOR, 15μF, 10V, TANTALUM,	C11	1-21122-463
107	1	----- 15μF	C12	-----

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BBC  
DS/PLA4

TE1/26  
PARTS LIST

DRN. D. J. A.  
TPD.  
CKD.  
APPD. C. H.

DESIGNS DEPARTMENT  
**D39652**  
SHEET 3 OF 5 SHEETS

**A4**

CHANGE

1-12-75

TE1/26  
PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	CIT REF.	BBC REF. OR DRG. No.
100	1	CAPACITOR, 15nF, POLYESTER, 250V ± 10%	C13	1-21034-369
109				
110				
111	1	ZENER DIODE VZ4-7M4	D1	
112	1	-----, VZ4-7M4	D2	
113				
114				
115	1	INTEGRATED CIRCUIT LIC741C3	IC2	
116	1	----- LIC741C3	IC3	
117	1	----- LIC740C3	IC1	
118				
119				
120	24	TERMINAL PIN, SEALECTRO TYPE 19619		
121	A/R	WIRE, 22 SWG, B.T.C.		
122	A/R	SLEEVING, 0.5mm BORE, WHITE		1-19775-006
123				
124				
125	4	JACK, 6 POINT	JKA-D	1-23163-301
126	2	SWITCH, TOGGLE, D.P.C.O.	90 SP	1-28160-002
127				
128	2	BATTERY, EVER READY TYPE PP6	BY1+2	
129	1	VW MOTOR, SEW TYPE VR62P. (AVAILABLE FROM IY ELECTRONIC SERVICES - STOCK NO. 260XB9900)	M1	
130	2	BATTERY CONNECTOR, 89 COMPONENTS TYPE 400-094		
131	2	SPACER, HD TAPPED x 3 LB.		1-58209-306
132				
133				
134				
		<u>REPAIRS</u>	<u>FOR FIXING ITEMS</u>	
135	4	HD PAN HD. x 10 LB. St. Zn. P.	6	
136				
137	4	HD INST. HD. x 10 LB. M.S. Cr. P.	8	
138				
139				0
140	4	HD PAN HD. x 10 LB. St. Zn. P.	4, 5	
141	5	HD PAN HD. x 6 LB. St. Zn. P.	6, 191, 4, 5	
142				
143	4	HD INST. HD. x 20 LB. M.S. Cr. P.	7	
144	2	HD INST. HD. x 16 LB. M.S. Cr. P.	2	
145				
146				
147	10	NUT, HD, FULL, St. Zn. P.	4, 5, 7	
148				
149	17	WASHER, HD, NORMAL, PLAIN, St. Zn. P.	4, 5, 8	
150	12	WASHER, HD, SHAKESPEARE, St. Zn. P.	4, 5, 7, 191	
151				
152				
153				
154	A/R	WIRE, 22 SWG, B.T.C.		
155				
156				

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BBC  
DS/PLA4

TE1/26  
PARTS LIST

DRN.	D. J. A.	DESIGNS DEPARTMENT	
TPD.		D39652	A4
CKD.			
APPD.	C. H.		



D39657 A4

TE1/26 PRINTED BOARD COMPONENT LOCATION 1

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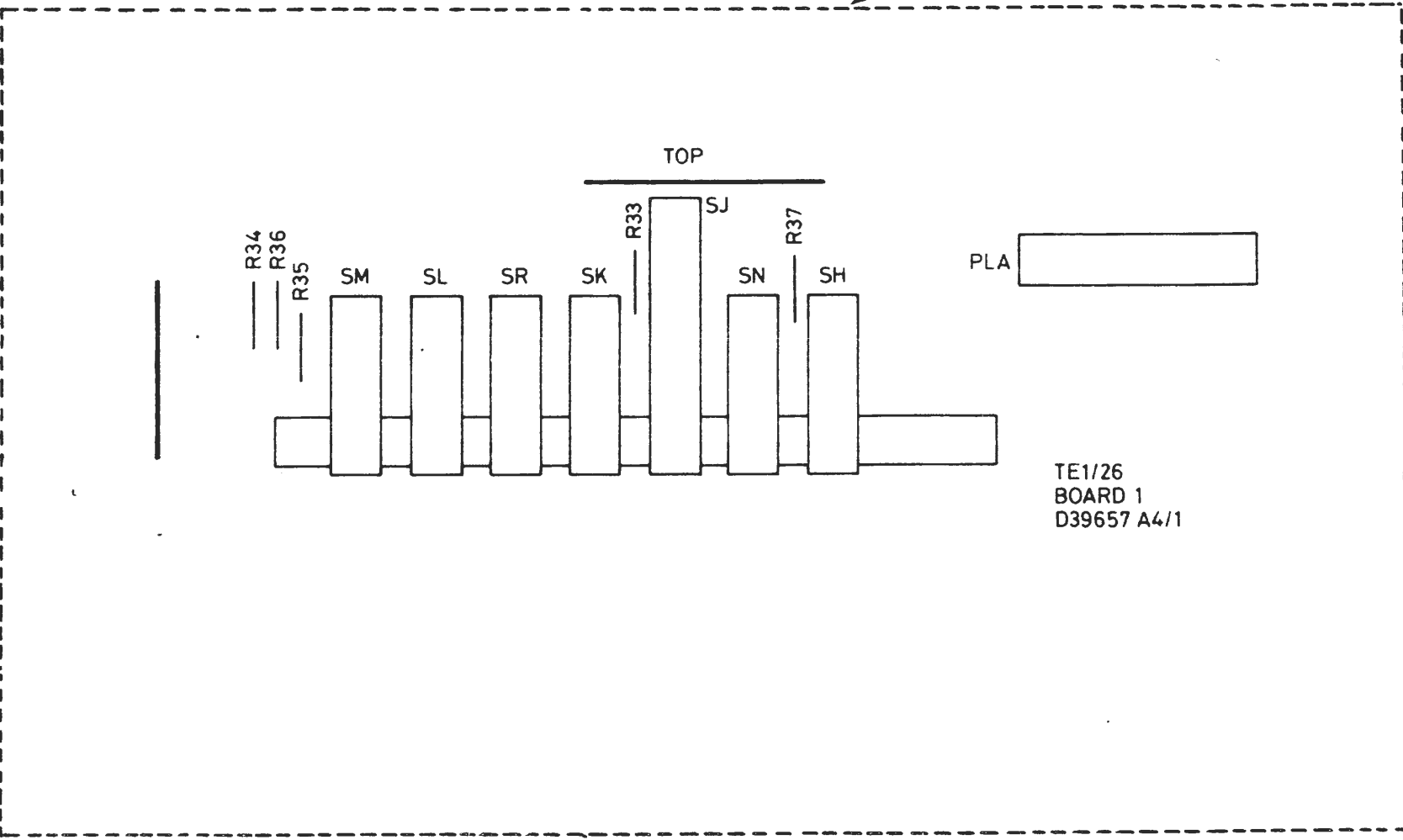
CHANGE

1-12-75

MINIMUM SIZE TO CUT NEGATIVE

BBC  
VM161A4

TE1/26  
PRINTED BOARD 1  
COMPONENT LOCATION



TE1/26  
BOARD 1  
D39657 A4/1

CHARACTERS AND LINES TO BE PRINTED IN WHITE  
PRINTED WIRING ON REVERSE SIDE OF BOARD IS D39656 A3

SCALE 1:1

DRN	D. J. A.
TCD	
CKD	
APPD	C. H.

DESIGNS DEPT  
D39657  
A4

TE1/26 PRINTED BOARD COMPONENT LOCATION 2

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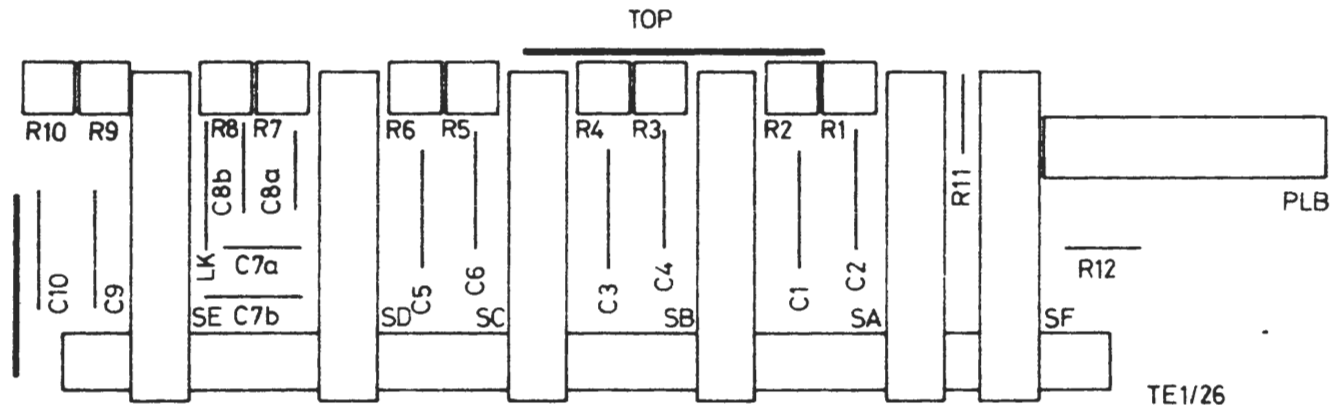
BBC

VM161A4

CHANGE  
1-12-75

MINIMUM SIZE TO CUT NEGATIVE

TE1/26  
PRINTED BOARD 2  
COMPONENT LOCATION



CHARACTERS AND LINES TO BE PRINTED IN WHITE  
PRINTED WIRING ON REVERSE SIDE OF BOARD IS D39659 A3

SCALE 1:1

DRN	D.J.A.
TCD	
CKD	
APPD	C.H.

DESIGNS DEPT

D39660 A4

VM161A4

BBC

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# TE1/26 PRINTED BOARD COMPONENT LOCATION 3

D39663 A4

CHANGE

1-12-75

C12 POLARITY REVERSED  
CF12156  
JER 20 5 76

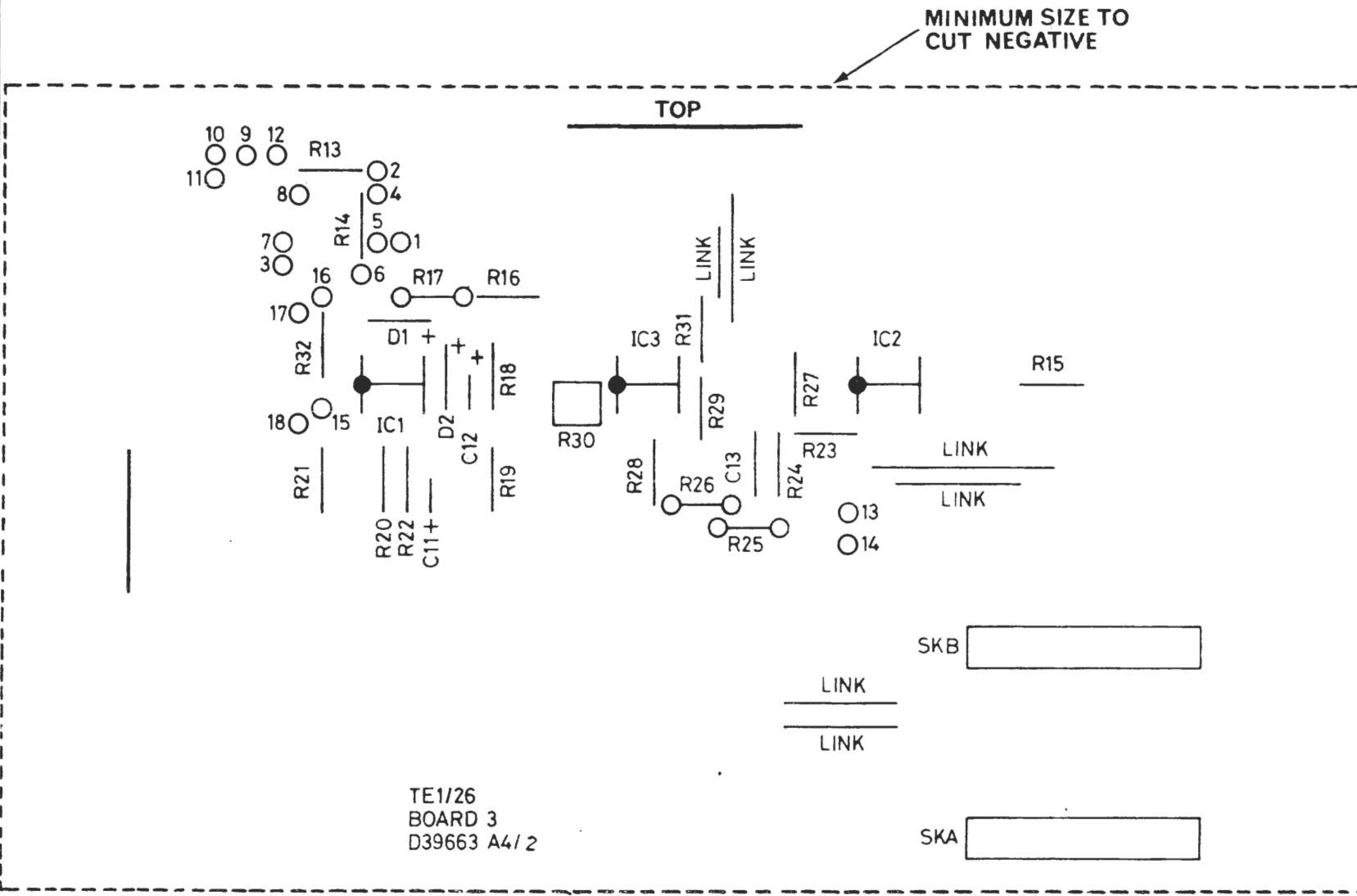
TE1/26  
PRINTED BOARD 3  
COMPONENT LOCATION

DRN	D. J. A.
TCD	
CKD	
APPD	C. H.

D39663

DESIGNS DEPT

A4



TE1/26  
BOARD 3  
D39663 A4/2

CHARACTERS AND LINES TO BE PRINTED IN WHITE  
PRINTED WIRING ON REVERSE SIDE OF BOARD IS D39662 A2.

SCALE 1:1

