Issue 1
23.8.72

DESIGNS DEPARTMENT SPECIFICATION

No. 5.226(72)

OS3/503 Oscillator Variable Frequency

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for Head of Designs Department

Written by: M.T. Ellen

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D.D. Spec. No. 5.226(72)
Title Sheet

BBC

/SPA4

DESIGNS DEPARTMENT SPECIFICATION NO. 5.226(72)

OS3/503 Oscillator Variable Frequency

This unit is capable of producing stable frequencies in the range 24MHz to 352MHz at intervals of 8MHz, with an output power of +7dBm.

The various output frequencies are synthesised from a highly stable 5MHz oven controlled crystal oscillator and the required output frequency is selected by the position of 7 'U'-links and a coaxial plug. A lamp on the front panel indicates when the unit is operating normally.

The unit is housed in a CH1/46A and does not include power supplies.

Power supplies	+6V 300mA -6V 150mA -24V 150mA (400mA when unit is cold)
Output power	+7dBm ± 2dB
Output frequencies	24MHz to 352MHz at intervals of 8MHz
Fine frequency adjustment	> 2 parts in 10^5
Output socket	TNC on front panel
Frequency stability	
Long term	Better than ± 5 parts in 10^8 for an ambient temperature between -10°C and +40°C and supply voltages ± 5% of nominal.
Short term	Peak frequency deviation better than -60dB with respect to 50kHz deviation with 50uS pre-emphasis.
Noise spectrum	Better than -60dB in 1kHz B/W 20kHz from centre frequency.
Spurious outputs	
Sidebands at ± 0.5MHz ± 1MHz ± 1.5MHz	Better than -60dB relative to centre frequency.
Other components within ± 10MHz of centre frequency	Better than -60dB relative to centre frequency.
Harmonics of centre frequency.	Better than -10dB relative to centre frequency.
Sub harmonics of centre frequency	Better than -50dB relative to centre frequency.
All other spurious outputs	Better than -40dB relative to centre frequency.

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CS3/503 Oscillator Variable Frequency

PRODUCTION TEST SCHEDULE

Equipment required:

1. Current limited variable power supplies to supply:

   +6V 300mA
   -6V 150mA
   -24V 400mA

2. Dual trace oscilloscope and two high impedance probes (Tektronix type 585 with type 82 plug-in, or equivalent)

   Band width - $\geqslant$ 30MHz
   Sensitivity - $\leqslant$ 100mV/cm

3. High frequency oscilloscope and high impedance probe. (Hewlett-Packard type 183 with plug-in types 1841A and 1830A or equivalent)

   Band width - $\geqslant$ 350MHz
   Sensitivity - $\leqslant$ 500mV/cm

   (A lower frequency oscilloscope could be used if an appropriate correction factor is applied to the amplitude of high frequency measurements).

4. Frequency counter which will display frequencies up to 360MHz. (Hewlett-Packard type 5245L with plug-in type 5253B or equivalent).

5. Signal generator
   (Marconi type TF 801 or equivalent)

   Range - 10MHz to 25MHz
   Output - 10mW in 50 ohms

6. Pulse generator
   (Calne Electronics type PG 101 or equivalent).

   Range - 250KHz to 500KHz
   Output - Square wave 5V p-p

7. Spectrum Analyser
   (Hewlett-Packard type 8554L and 8552B or equivalent)

   Frequency range - 0 to 1GHz
   Band width - 1KHz to 100KHz
   Sweep per division - 10KHz to 100MHz
   Dynamic range - $\geqslant$ 65dB

8. AVO 8

Check that the unit has been manufactured in accordance with the drawings.

Connect the power supplies to the following pins, Earth (0V) Pin 3, +6V Pin 10, -6V Pin 12 and -24V Pin 13 but set all the power supplies to zero volts.

From the block diagram D 31880 A4 it can be seen that the unit consists of a voltage controlled oscillator which is locked to a crystal oscillator by a phase lock loop. Each part of the loop should be tested separately, as follows:

Reference Oscillator

Gradually increase the voltage on pin 13 to -24 volts, the current drawn should be 400mA, this will drop to about 150mA after a few minutes when the crystals oven temperature has stabilised. Increase the voltage on pin 3 to +6 volts, the current drawn should be 300mA ± 50mA.

Use an oscilloscope to check the waveform at the following points:-

TR4 base	- 5MHz, > 0.5V p-p
TR4 Collector	- 5MHz, > 3V p-p
IC9 Pin 12	- 500KHz, > 3V p-p
IC11 Pin 13	- 500KHz, 40nS negative going pulse, >3V p-p

Check the frequency of the reference oscillator and, if necessary, adjust it to 5 MHz ± 1Hz using C1.

Programmable Divider

The division ratio of the programmable divider is set by connecting 'U'-links in positions 2, 4, 6, 8, 10 and 12; positions 1, 3, 5, 7, 9 and 11 are rest positions.

'U'-link in position	division ratio
2	1
4	2
6	4
8	8
10	16
12	32

Other division ratios may be obtained by using more than one 'U'-link. e.g. links in positions 4 and 8 corresponds to a division ratio of 2+8, that is, a division ratio of 10.

Unplug PL'D' and connect it to a signal generator set to produce 1V p-p at 10MHz. Connect the Y_1 input of dual trace oscilloscope to pin 11 of IC2 and connect the Y_2 input to pin 10 of IC11. Trigger the timebase from Y_2.

Set the 'U'-links to positions 2, 4, 6, 8, 10 and 11, that is, a division ratio of 31. By observing the number of input pulses per output pulse check that the divider operates correctly with input frequencies from 10MHz to 23MHz. The waveform displayed on the Y_2 trace should be a negative going pulse with an amplitude of at least 3 volts and a duration of about 30nS.

Now set the 'U'-links to positions 1, 3, 5, 7, 9 and 12 (division ratio of 32) and carry out the same check.

If the counter is faulty unplug all the 'U'-links, the circuit should then operate as a fixed asynchronous divider and it should divide by 64.

If the circuit is faulty connect 'U' links in positions 1, 3, 5, 7, 9 and 11, the circuit should now divide by 64. Pin 5 of IC8a is the output for this test. If it does divide by 64 then the fault must be in the feedback path, that it IC6 and the 'U' links. If it does not divide by 64 then the basic counter must be faulty, that is IC1, IC2, IC3, IC4, IC5, IC7, IC8 or their interconnections on the printed circuit board.

The counter must be capable of operating with an input frequency up to 22MHz. A simple "ripple through" counter will not operate at 22MHz when feedback is applied, therefore a "synchronous" counter has been used. In this type of counter the input signal is applied to the clock inputs of all the bistables, however, only the bistables with a logic 1 on their J and K inputs change state.

Consider the following circuit:-

This is a simplified circuit of the first three stages of the counter. Pins 1 and 13 are clock inputs, Pins 12 and 13 are "J" and "K" inputs respectively and pins 5 and 9 are "Q" outputs. If all the outputs are initially at logic 0 then the negative going edge of the first clock pulse will change the Q output of IC1a to logic 1 but it will not affect the state of IC1b or IC3b because their J and K inputs were at logic 0 (a clock input only changes the state of a bistable if its J and K inputs are at logic 1). The next clock pulse will change the Q output of IC1a to logic 0 and the Q output of IC1b to logic 1. The third clock pulse changes the Q output of IC1a to logic 1 but does not affect the output of IC1b or IC3b. The J and K inputs of IC1b will now be at logic 1 and also, due to the action of gates IC2c and IC2b, the J and K inputs of IC3b will be at logic 1, so the fourth clock pulse will change the state of all three bistables. The fifth clock pulse will set the Q output of IC1a, IC1b and IC3b to 1, 0, 1 respectively and the sixth and seventh pulses will set their outputs to 0, 1, 1 and 1,1,1, respectively. When all the outputs are at logic 1, all the J and K inputs will be at logic 1 so the next clock pulse sets all the Q outputs back to logic 0. Hence the circuit forms a binary counter that divides by 8.

The counter in the OS3/503 operates in the above manner but three more binary stages have been added. In order to find a fault check that the frequency at the Q output of IC1a is half the clock frequency and that the outputs of all the subsequent bistables are $\frac{1}{4}$, $\frac{1}{8}$, 1/16, 1/32 and 1/64 of the clock frequency (check then from left to right on the circuit). If the Q output of one of the bistables is producing the wrong frequency, check that

its J and K inputs are at logic 1 for a period equal to one cycle of the clock frequency, and also check that the frequency is equal to that at the Q output of the previous bistable. If the J and K inputs are correct the fault is probably in the bistable or associated printed circuit board wiring, but if the J and K inputs are incorrect the fault is probably in the gates which drive the J and K inputs or the associated printed board wiring.

Loop Amplifier and Filter

Set the pulse generator to produce a 5V p-p 500kHz square wave and connect it, in place of the coaxial lead, to C202 (tag on BRD 2) and earth. Check that the waveform on the emitter of TR202 is a 20V p-p square wave, and that the voltage on the yellow wire from R208 is about -11 volts with no AC component. Reduce the input frequency to 250kHz and check that the waveform at R208 has a peak-to-peak voltage of between 10 and 22 volts.

The filter has a cut off frequency of 300kHz approximately and very high attenuation at 0.5MHz, 1MHz, and 1.5MHz. The tuned circuits L202/C206 and L205/C212 resonate at 0.5MHz, L204/C210 resonates at 1MHz and L203/C208 resonates at 1.5MHz. The characteristic impedance of the filter is 1000 ohms but it is terminated at its output in a high impedance so that the output of the filter can vary between 0 and -24 volts as the mark space ratio of the input signal is varied. (If it was terminated in 1000 ohms the output would only vary between 0 and -12 volts). Reconnect the coaxial lead to C202 and PL'D' to SK'D'.

Circuits on board 2

The circuits on board 2 (voltage controlled oscillator, high frequency divider and output amplifier) may be tested before the board is mounted in the CH1/57B. Where socket numbers are quoted the relevant pin number is shown in brackets, and coaxial sockets (BNC or SMB as convenient) may be soldered between the earth plane and the pin on the printed circuit board.

Voltage Controlled Oscillator

1. Testing the board outside the CH1/57B.

Connect a variable power supply PSU1 (adjustable between 0 volts and -24 volts) between the earth plane (0 volts) and pin G (0 to -24 volts), also connect pin G to C132. Connect a power supply between the earth plane and pin E (-ve), and connect another power supply between the earth plane and pin F (+ve). Increase the voltage on pin E to -6 volts, the current drawn should be 150mA ± 30mA and increase the voltage on pin F to +6V the current drawn should be mA ± mA.

2. Testing the board inside the CH1/57B and mounted in the CH1/46A.

Disconnect the yellow wire from R208 and connect it to R123 (pin on side of CH1/57B). Connect a 100K ohms variable resistor in the position for R7 and place a 'U' link in position 13.

Increase the voltage on pin 12 to -6 volts, the current drawn should be 150mA ± 30mA.

Connect a frequency counter to SK'J' and check that the oscillator can be tuned over the range 176MHz to 352MHz by adjusting R7 (PSU 1). If the output signal from SK'J' (Pin A) is not high enough to operate the counter, then a pick up loop consisting of two turns (diameter about 0.5 inch) of 16 SWG wire connected to a BNC socket type GE35007H can be used. Connect the pick up loop to a frequency counter and hold the loop near L111, but do not hold it closer than necessary to operate the counter as it will load the VCO and reduce its frequency range.

If the oscillator does not cover the correct range unsolder L111 and adjust its length to make the oscillator cover the right range. The parameters of the transistors and diodes will vary between units and in some cases the oscillator may not cover the required range. If the frequency range is too small reduce the value of C131 and if the circuit stops oscillating at the end of its range increase the value of C131.

High Frequency Divider

Using a high frequency oscilloscope with a high impedance probe check that each divide by two circuit operates correctly over the full frequency range of the VCO. The divider outputs are connected to SK'H' (pin B), SK'G' (pin C), SK'F' (Pin D) and SK'D' (track on corner of board) respectively. The first two divide-by-two circuits (IC101 and IC102) are AC coupled, emitter-coupled-logic and their outputs should be greater than 400mV peak-to-peak. The second two divide-by-two circuits are DC coupled, emitter-coupled-logic with logic levels of -0.7 volts (logic 1) and -1.7 volts (logic 0) relative to earth. The mean level at the junction of R104 and R105 should be -1.2 volts relative to earth.

When PL'D' is connected to SK'D' the voltage at SK'D' should be between 0.5V p-p and 1V p-p and the frequency at SK'D' should cover the range 11MHz to 22MHz.

Output Amplifier

Connect a power meter to SK'C' (track on corner of board near SK'K') and link SK'E' (track on side of board near SK'E') to SK'F' (pin D), SK'G' (pin C), SK'H' (pin B) and SK'J' (pin A) in turn and check that the output power is between +5dBm and +9dBm over the full range of the VCO. If necessary adjust R112 in order to obtain the correct output power over the full frequency range (that is, for all settings of R7 or PSU 1).

Connect an oscilloscope to SK'D' and check that the frequency at this point varies smoothly as R7 is adjusted from minimum to maximum resistance, when SK'E' is linked to SK'F', SK'G', SK'H' and SK'J' in turn. This test ensures that the high frequency dividers operate correctly when they are loaded by the output amplifier.

If board 2 was tested outside the CH1/57B mount it inside the CH1/57B and connect it up as shown in the drawings, then repeat the above tests, referring to (2) under the heading "voltage controlled oscillator".

Reconnect the yellow wire from D103 to R208.

Phase Lock Lamp Circuit

Put 'U' links in positions 1, 3, 5, 7, 9, and 12, connect a oscilloscope to C202 (pin on board 3) and adjust R7 until a 500kHz rectangular waveform is displayed. The rectangular waveform indicates that the loop is in phase lock and the phase lock lamp should now be on.

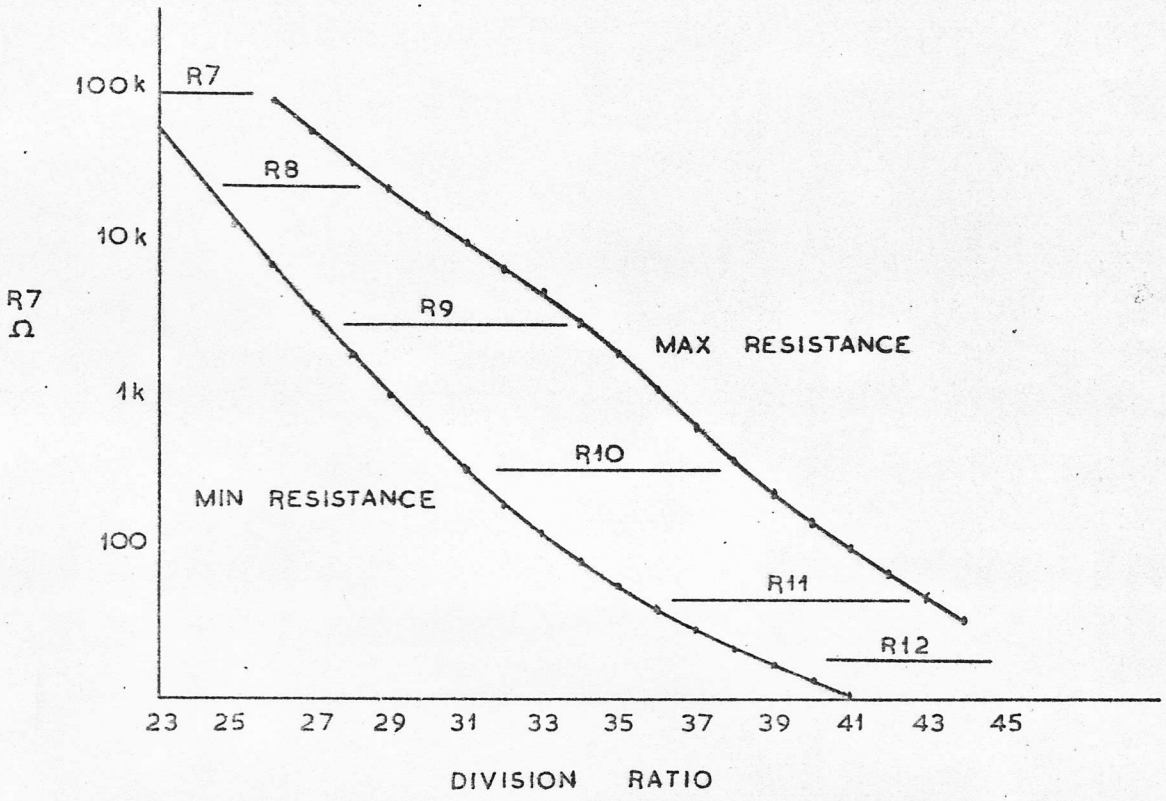
If there is no signal at C202 then the fault is probably in IC11 or its associated wiring, assuming all the other parts of the oscillator have been tested and are satisfactory. In order to test IC11 connect pin 10 to ground and pin 13 to +5 volts (it is necessary to disconnect the normal inputs to these pins), the voltage at pin 8 should be +0.5 volts (logic 0). Now connect pin 10 to +5 volts and pin 13 to ground, the voltage at pin 8 should be +2.4 volts (logic 1). Pins 10 and 13 are the preset and clear inputs respectively.

Check that the phase lock lamp is extinguished when
(a) the collector of TR4 is shorted to earth
(b) PL'D' is unplugged
(c) R7 is set to its maximum resistance.

Complete Phase Lock Loop

Set the programmable divider to each division ratio between 23 and 44 in turn and for each division ratio plot the minimum and maximum value of R7 which will maintain phase lock. Now select six resistors, as shown in the graph below which will enable the circuit to phase lock over its entire range. Solder these resistors in positions R7 to R12.

Connect a spectrum analyser to PL'C' and check that the spurious outputs are within the specification for all output frequencies, care should be taken not to overload the spectrum analyser.



Write the 'U'-link position required for each division ratio on the paster (D 31881 A4) e.g. referring to the above diagram, for a division ratio of 33 (i.e. 'U'-links in position 2, 3, 5, 7, 9 and 12) R9 must be in circuit therefore a 'U'-link must be in position 15 (see D 31863 A1). Hence "15" should be written on the paster.

Fine Frequency Adjustment

Set the unit to a high frequency, say 304MHz and connect a frequency counter to PL'C'. Now adjust the frequency to 304MHz ± 10Hz using R16 (N.B. this adjustment should be made when the unit has been on for at least one hour).

D31864A4 sheet 1 of 10 sheets.

OS3/503 OSCILLATOR, VARIABLE FREQUENCY - PARTS LIST

CHANGE	ISS.
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ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		DRAWING NUMBERS.		
		Block Diagram D31880A4		
		Circuit D31863A1		
		Parts List D31864A4		
		Assembly & Wiring D31865A2		
		Details 1-6 D31866A2		
		Detail 7 D31867A4		
		P.B.Wiring Brd.1 D31868A2		
		P.B. Wiring Brd.1 (Comp.Side) D31869A2		
		P.B. Comp.Loc. Brd.1 D31870A4		
		P.B.Drillings Brd.1 D31871A4		
		P.Bwiring Brd.2 D31872A2		
		P.B.Wiring Brd.2 (Comp.Side) D31873A2		
		P.B.Comp.Loc. Brd.2 D31874A3		
		P.B. Drilling Brd.2 D31875A4		
		P.B.Wiring Brd.3 D31876A3		
		P.B. Wiring Brd.3(Comp.Side) D31877A3		
		P.B. Comp.Loc Brd.3 D31878A4		
		P.B. Drilling Brd.3 D31879A4		
		Freq. Selection Chart (Paster) D31881A4		
		Detail 8 D31890A3.		
		FURTHER INFORMATION REQUIRED FOR MANUFACTURE.		
		Unit Assembly Information EA10484		
		Unit Wiring Information EA10137		
		Unit Wiring Information EA10140		
		Unit Wiring Information EA10139		
		Inductor Information EA10127A4		
		Inductor L/12017, L/12018		
		14B/147, 14B/148, 14B/149, 14B/150		
		D31867A4		
		D26951A4. D32105A4. D32106A4.		
		D31477A4-CP		
1	1	Chassis CH1/46A Constructed & Modified		
		By Contractors as follows:-		
		Escutcheon drilled and engraved to:-		D31866A2, Det.1
		Front Bracket drilled to:-		" Det.2
		Rear Bracket drilled to:-		" Det.3
		R/H Cover Plate Drilled to:-		" Det.4
2	2	Bracket		D31866A2, Det.5
3	2	Block		D31866A2, Det.6
4				
5				
6				
7	1	Chassis, CH1/57B Constructed & Modified		
		by contractors as follows:-		D31890A3, Det.8
8				
9				

BBC

DS/PLA4

OS3/503
OSCILLATOR, VARIABLE FREQUENCY
Parts list

DRN.	G.M.W.
TPD.	
CKD.	M.T.E.
APPD.	

DESIGNS DEPARTMENT

D31864A4.

sheet 1 of 10 sheets

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ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
10	1	Oven Control Crystal Oscillator HCD70	XL	
		HCD Research Ltd. (24V,5.0 MHz)		
//	/	Socket, Fixed 8 Way Mc.Murdo XS8	SK'B'	
12	1	Light Emitting Diode MV5023 with	D3	
		MTG Clip 'Monsanto'		
13	1	Bulkhead Jack GE35830C22'GreenPar' T.N.C.	SK'C'	
14	1	Plug 15 Pole (Printed Wiring)	PL'A'	1-25086-315
15	1	Solder Tag 6 B.A. S/Ended.		
16				
17				
18				
19				
20				
		ITEMS 21-113 ARE FITTED ON P/BRD. NO.1		
21	1	Printed Board		D31868A2, D31869A2
				D31870A4, D31871A4
22	25	Terminal Pin No.11034 Vero		
23	63	Tag No.A0013620 Sealectro		
24	30	Jack Printed Circuit Cambion 450-3388-1-03		
25	7	Plug, shorting Cambion 461-281-1-0312 (red)	LK1-LK7	
26	2	Cable, Receptacle right angle	PL'L' &	
		55-021-0000 Sealectro	PL'M'	
28				
29				
30				
		TRANSISTORS.		
31	1	BSX 20 Mullard	TR1	
32	1	BC 108 "	TR2	
33	1	BC 108 "	TR3	
34	1	BC 108 "	TR4	
35				
36				
37				
		DIODES.		
38	1	OA 202 Mullard	D1	
39	1	OA 202 "	D4	
40	1	OA 202 "	D5	
41	1	OA 202 "	D6	
42	1	OA 202 "	D7	
43	1	HP 82-2800 Hewlett Packard	D2	
44				
45				
		INTEGRATED CIRCUITS.		
47	1	SN 74S112N	IC1	
48	1	SN 74S112N	IC3	
49	1	SN 74S112N	IC8	
50	1	SN 73S00N	IC2	
51	1	SN 74S00N	IC4	
52	1	SN 74S20N	IC5	
53				
54				

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OS3/503 - PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		INTEGRATED CIRCUITS (VALVE SECTION)		
55	1	DIC 74H30N	IC6	
56	1	DIC 74H30N	IC7	
57	1	DIC 7490N	IC9	
58	1	DIC 7474N	IC11	
59	1	DIC 9601N	IC10	
60				
61				
62				
		INDUCTORS.		
63	1	L/12017	L1	
64	1	L/12017	L2	
65	1	L/12017	L3	
66	1	L/12017	L4	
67	1	L/12017	L5	
68				
69				
		CAPACITORS, CERAMIC DISC (TRANSCAP)		
70	1	100nF, 30V D.C.	C1	1-20614-406
71	1	100nF, 30V.D.C.	C2	1-20614-406
72	1	100nF, 30V.D.C.	C4	1-20614-406
73	1	100nF, 30V.D.C.	C5	1-20614-406
74	1	100nF, 30V.D.C.	C13	1-20614-406
75				
76				
		CAPACITORS, CERAMIC DISC.		
77	1	1nF, 500V D.C.	C9	1-20615-276
78	1	1nF, 500V.D.C.	C10	1-20615-276
79	1	1nF, 500V.D.C.	C11	1-20615-276
80				
81				
82				
		CAPACITORS, ELECTROLYTIC.		
83	1	50µF 6.4V	C3	1-20713-482
84	1	100µF 6.4V	C6	1-20713-497
85	1	100µF, 6.4V	C8	1-20713-497
86	1	50µF, 25V	C7	1-20714-482
87	1	80µF, 25V	C12	1-20714-491
88				
89				
90				
		RESISTORS, METAL FILM 0.4W		
91	1	150Ω, ± 2%	R3	1-26877-308
92	1	160Ω ± 2%	R2	1-26877-310
93	1	200Ω ± 2%	R4	1-26877-318
94	1	470Ω ± 2%	R15	1-26877-345
95	1	1kΩ ± 2%	R1	1-26877-398
96	1	1kΩ ± 2%	R5	1-26877-398
97	1	1kΩ ± 2%	R13	1-26877-398
98	1	6.8kΩ ± 2%	R14	1-26877-466
99	1	27kΩ ± 2%	R6	1-26877-525
100	1	1.8kΩ ± 2%	R17	1-26877-414

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ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		RESISTOR METAL FILM 0.4W		
101	1	A.O.T.	R7	See Spec.
102	1	A.O.T.	R8	" "
103	1	A.O.T.	R9	" "
104	1	A.O.T.	R10	" "
105	1	A.O.T.	R11	" "
106	1	A.O.T.	R12	" "
107				
108				
109				
		RESISTOR, VARIABLE.		
110	1	10kΩ ± 10%, 1/2W	R16	1-27262-108
111				
112				
113				
		ITEM 114-244 ARE FITTED ON P/BRD. NO.2		
114	1	Printed Board		D31872A2, D31873A2
				D31874A3, D31875 A4
115	10	Terminal Pin No.11034 Vero		
116	3	Tag No.A0013620 Sealectro		
117	4	Tag Lead-Thro		1-28652-002
118	4	Plug Free Right Angle	PL'J'-PL'F'	
		No.51-011-0000 "Sealectro" CONHEX	PL'K'	
119	7	Bulkhead Receptacle	SK'D'-SK'H'	
		No.51-046-0000 "Sealectro" CONHEX	SKJ, SK'K'	
120				
121				
122				
123				
124				
		TRANSISTORS.		
125	1	BFY 90 Mullard	TR101	
126	1	BFY 90 "	TR105	
127	1	BC 108 "	TR102	
128	1	BFW 30 "	TR103	
129	1	BFW 92 "	TR106	
130	1	BFX 11 S.G.S.	TR104	
131	1	HP21-35821E Hewlett Packard	TR107	
132				
133				
		DIODES.		
134	1	OA 202 Mullard	D101	
135	1	HP 82-2800 Hewlett Packard	D102	
136	1	BB142 I.T.T.	D103	
137	1	BB142 I.T.T.	D104	
138	1	BB142 I.T.T.	D105	
139		OA202 Mullard	D106	
		INTEGRATED CIRCUIT.		
140	1	SP 603 Plessey	IC101	
141	1	SP 604 Plessey	IC102	
142	1	MC 1027P Motorola	IC103	

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ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		INTEGRATED CIRCUIT.		
145	1	MC 1027P Motorola	IC104	
146				
147				
148				
149				
150				
		INDUCTORS		
151	1	L/12018	L101	
152	1	L/12018	L102	
153	1	L/12018	L103	
154	1	L/12017	L104	
155	1	L/12017	L105	
156	1	L/12017	L106	
157	1	L/12017	L107	
158	1	L/12017	L108	
159	1	L/12017	L109	
160	1	L/12017	L110	
161	1	L/12017	L114	
162	1	L/12017	L112	
163	1	L/12017	L113	
164	1	D31867A4	L111	
165				
		CAPACITORS CERAMIC 250V.D.C. (LEADLESS)		
166	1	15pF Eire LD 19-20/N330	C108	
167	1	220pF Erie LD 19-20/K120051	C106	
168	1	470pF Erie LD 19-25/K2600	C132	
169	1	470pF Erie LD 19-25/K2600	C133	
170	1	1nF Erie LD 25-20/K350081	C111	
171	1	1nF Erie LD 25-20/K350081	C128	
172	1	1nF Erie LD 25-20/K350081	C130	
173	1	1nF Erie LD 25-20/K350081	C138	
174				
175				
176				
177				
		CAPACITORS, ELECTROLYTIC.		
178	1	100µF 6.4V D.C.	C103	1-20713-497
179	1	100µF, 6.4V D.C.	C124	1-20713-497
180	1	25µF 25V D.C.	C135	1-20714-472
181				
182				
183				
184				
		CAPACITORS CERAMIC DISC.		
185	1	1nF, 500V D.C.	C102	1-20615-276
186	1	1nF, 500V D.C.	C105	1-20615-276
187	1	1nF 500V.D.C.	C109	1-20615-276
188	1	1nF 500V.D.C.	C110	1-20615-276
189	1	1nF 500V.D.C.	C112	1-20615-276
190	1	1nF 500V.D.C.	C113	1-20615-276
191	1	1nF 500V.D.C.	C114	1-20615-276

BBC

DS/PLA4

DRN.	G.W.W
TPD.	
CKD.	M.T.E
APPD.	

DESIGNS DEPARTMENT

D31864A4.

sheet 5 of 10 sheets.

CHANGE / ISS.

OS3/503 - PARTS LIST

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		CAPACITORS, CERAMIC DISC.		
192	1	1nF, 500V D.C.	C115	1-20615-276
193	1	1nF, 500V D.C.	C116	1-20615-276
194	1	1nF, 500V D.C.	C117	1-20615-276
195	1	1nF, 500V.D.C.	C118	1-20615-276
196	1	1nF, 500V D.C.	C119	1-20615-276
197	1	1nF, 500V D.C.	C120	1-20615-276
198	1	1nF, 500V D.C.	C121	1-20615-276
199	1	1nF, 500V D.C.	C122	1-20615-276
200	1	1nF, 500V D.C.	C123	1-20615-276
201	1	1nF, 500V D.C.	C125	1-20615-276
202	1	1nF, 500V D.C.	C126	1-20615-276
203	1	1nF, 500V D.C.	C127	1-20615-276
204	1	1nF, 500V D.C.	C134	1-20615-276
205	1	1nF 500V. D.C.	C136	1-20615-276
206	1	1nF 500V D.C.	C137	1-20615-276
207				
208				
209				
210				
		CAPACITORS, CERAMIC TUBULAR.		
211	1	12pF 750V D.C.	C131	1-20671-048
212	1	1.5pF 750V D.C.	C129	1-20671-014
213	1	15pF 750V D.C.	C104	1-20671-051
214				
215				
		CAPACITORS, CERAMIC DISC (TRANSCAP)		
216	1	100nF, 30V D.C.	C101	1-20614-406
217	1	100nF, 30V D.C.	C107	1-20614-406
218				
219				
220				
221				
222				
		RESISTORS, METAL FILM 0.4W		
223	1	20Ω ± 2%	R116	1-26877-138
224	1	75Ω ± 2%	R121	1-26877-248
225	1	100Ω ± 2%	R103	1-26877-298
226	1	100Ω ± 2%	R108	1-26877-298
227	1	100Ω ± 2%	R117	1-26877-298
228	1	200Ω ± 2%	R115	1-26877-318
229	1	200Ω ± 2%	R123	1-26877-318
230	1	360Ω ± 2%	R102	1-26877-334
231	1	390Ω ± 2%	R110	1-26877-337
232	1	470Ω ± 2%	R118	1-26877-345
233	1	470Ω ± 2%	R120	1-26877-345
234	1	510Ω ± 2%	R101	1-26877-349
235	1	510Ω ± 2%	R107	1-26877-349
236	1	910Ω ± 2%	R104	1-26877-389
237	1	1kΩ ± 2%	R112	1-26877-398
238	1	1.5kΩ ± 2%	R109	1-26877-408
239	1	4.3kΩ ± 2%	R105	1-26877-441

CHANGE	ISS.
/	
/	

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		RESISTORS, METAL FILM 0.4W		
240	1	5.1kΩ ± 2%	R122	1-26877-449
241	1	5.1kΩ ± 2%	R113	1-26877-449
242	1	12kΩ ± 2%	R119	1-26877-502
243	1	15kΩ ± 2%	R114	1-26877-508
244	1	27kΩ ± 2%	R111	1-26877-525
245	1	47Ω ± 2%	R106	1-26877-192
246				
247				
248				
249				
250				
251				
252				
253				
254				
255				
256				
257				
258				
259				
		ITEMS 260-348 ARE FITTED ON PRINTED BOARD No.3		
260	1	Printed Board		D31876A3, D31877A3 D31878A4, D31879A4
261	5	Terminal Pin No.11034 Vero		
262				
263				
264				
265				
266				
		TRANSISTORS.		
267	1	BC108 Mullard	TR201	
268	1	BC108 "	TR203	
269	1	BCY 71 "	TR202	
270	1	BFX30 "	TR204	
271				
272				
273				
274				
275				
		DIODES.		
276	1	OA 202 Mullard	D201	
277	1	OA 202 "	D202	
278	1	OA 202 "	D203	
279				
280				
		INDUCTORS.		
281	1	L/12017	L201	
282	1	L/12017	L206	
283	1	L/12017	L207	
284	1			

CHANGE	ISS.
/	

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		INDUCTORS VINKOR.		
285	1	14B/147	L202	
286	1	14B/148	L203	
287	1	14B/149	L204	
288	1	14B/150	L205	
289				
290				
291				
292				
293				
		CAPACITORS POLYSTYRENE.		
294	1	20pF ± 2pF	C210	1-21004-056
295	1	130pF ± 2%	C212	1-21004-154
296	1	270pF ± 2%	C206	1-21004-203
297	1	430pF ± 2%	C213	1-21004-219
298	1	750pF ± 2%	C207	1-21004-251
299	1	750pF ± 2%	C211	1-21004-251
300	1	910pF ± 2%	C209	1-21004-267
301				
302				
303				
304				
305				
306				
		CAPACITORS, CERAMIC DISC. (TRANSCAP)		
307	1	100nF, 30V.D.C.	C202	1-20614-406
308	1	100nF, 30V D.C.	C214	1-20614-406
309				
310				
311				
312				
		CAPACITORS, CERAMIC DISC.		
313	1	1nF, 500V D.C.	C205	1-20615-276
314	1	1nF, 500V D.C.	C217	1-20615-276
315	1	10nF, 500V D.C.	C216	1-20615-354
316				
317				
318				
319				
320				
321				
322				
		CAPACITORS, CERAMIC TUBULAR.		
323	1	8.2pF 750V D.C.	C208	1-20671-043
324	1	100pF, 750V D.C.	C203	1-20671-136
325				
326				
327				
328				
329				
330				
331				

ISS.	CHANGE

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
		CAPACITORS ELECTROLYTIC.		
332	1	25µF 25V D.C.	C215	1-20714-472
333	1	50µF 25V D.C.	C201	1-20714-482
334	1	50µF 6.5V D.C.	C204	1-20713-482
335				
336				
337				
338				
339				
340				
		RESISTORS, METAL FILM 0.4W		
341	1	470Ω ± 2%	R206	1-26877-345
342	1	240 ~~470Ω~~ ± 2%	R208	1-26877-345
343	1	1kΩ ± 2%	R202	1-26877-398
344	1	1kΩ ± 2%	R204	1-26877-398
345	1	1kΩ ± 2%	R205	1-26877-398
346	1	5.1kΩ ± 2%	R201	1-26877-449
347	1	5.1kΩ ± 2%	R203	1-26877-449
348	1	10kΩ ± 2%	R207	1-26877-498
349				
350				
351				
352				
353				
354				
		SCREWS FOR FIXING ITEMS.		
355	4	8 B.A. x 3/8" C.S.K.HD.ST.Zn.P 7		
356	28	6B.A. x 1/4" CH.HD.ST.Zn.P 2,3,21,114,260,15		
357	6	6B.A. x 3/8" CH.HD.ST.Zn.P 11,14,		
358				
359				
360				
		WASHERS.		
361	16	6B.A. Plain (Small) ST.Zn.P 21,260		
362	2	6B.A. Shakeproof 14		
363				
364	A/R	Sleeve Type N20 x 1/2 LG (WHITE) Hellerman		
365				
366	A/R	Cable, Flexiable RG174/U Sealectro		
367				
368	A/R	PUF1/3M Red		
369	"	" Blue		
370	"	" Orange		
371	"	" Brown		
372	"	" Black		
373	"	" White		
374	"	" Red - Blue		
375	"	" Red-Orange		
376	"	" Red-Green		
377	"	" Red-Brown		
378	"	" Red-Slate		
379	"	" Red-White		

CHANGE	ISS.
/	
/	

ITEM No.	No. OFF	DESCRIPTION	C'C'T REF.	BBC REF. OR DRG. No.
380				
381				
382	1	Label		D 31477A4-CP DET.3
383	1	"		" " 4
384	1	"		" " 5
385	1	"		" " 6
386	1	"		" " 7
387	1	"		" " 8
388	1	"		" " 9
389				
390				

OS3/502
PARTS LIST

BBC
DS/PLA4

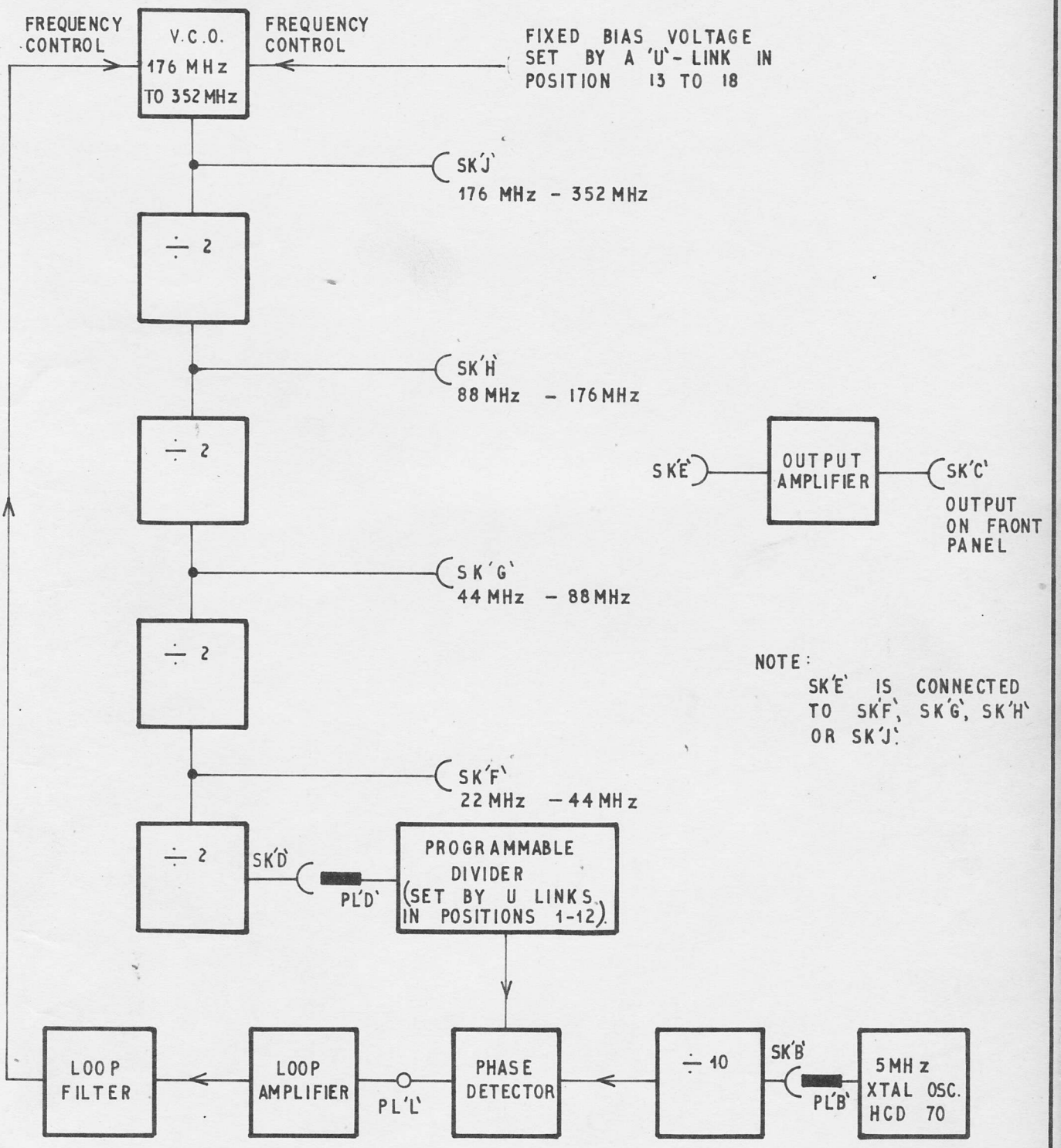
OS3/502
PARTS LIST

DRN.	GWW	DESIGNS DEPARTMENT
TPD.		D31864A4.
CKD.	M.T.F	sheet 10 of 10 sheets
APPD.		

D31880A4

ISS	CHANGE
1	30/6/78

OS3/503
(OSCILLATOR VARIABLE FREQ)
BLOCK DIAGRAM

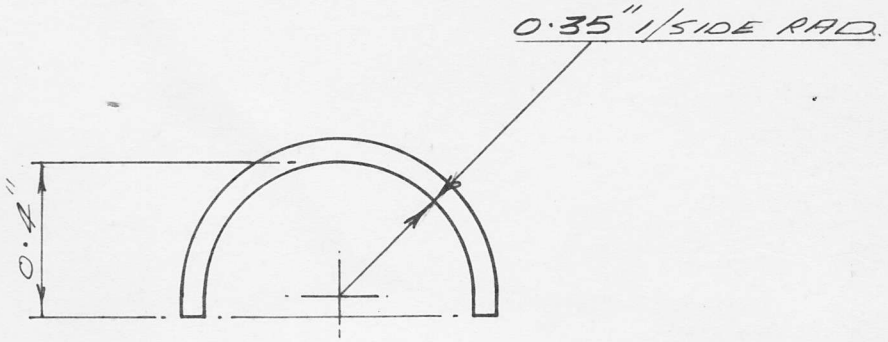


BBC	OS3/503 OSCILLATOR VARIABLE FREQ BLOCK DIAGRAM	DRN. G.W.W.	DESIGNS DEPARTMENT
DS/A4		TCD. B.Y.	D31880A4
		CKD.	
		APPD	

D31867A4

CHANGE	ISS
/	/

OS3/503 DETAIL 7.



DETAIL 7. INDUCTOR.
MATERIAL :- 16 S.W.G. (·064") SILVER PLATED COPPER WIRE.

PARTS LIST :- D31864A4
SCALE :- 2/1.

BBC
DS/A4

OS3/503.
DETAIL 7.

DRN.	G.W.W.	DESIGNS DEPARTMENT.
TCD.		
CKD.	M.J.E.	D31867A4.
APPD	✓	

VM161A4

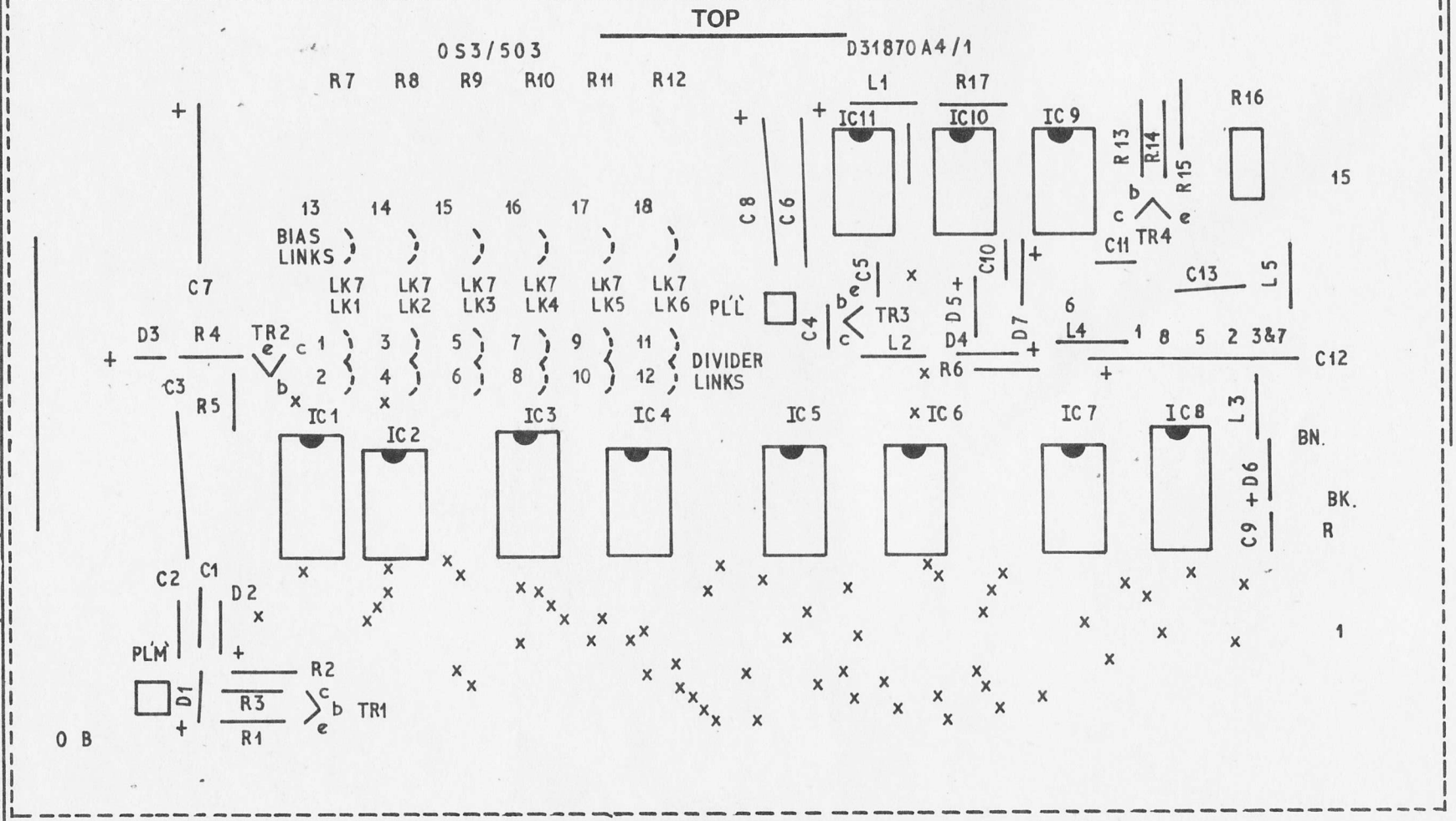
BBC

OS3/503 PRINTED BOARD COMPONENT LOCATION
BOARD 1

D 31870 A 4

CHANGE	ISS
/ /	

MINIMUM SIZE TO CUT NEGATIVE



CHARACTERS AND LINES TO BE PRINTED IN WHITE

PRINTED WIRING ON REVERSE SIDE OF BOARD IS D 318 68 A2

PRINTED WIRING ON COMP SIDE IS D 31869 A 2

SCALE 1:1

OS3/503
PRINTED BOARD
COMPONENT LOCATION
BOARD 1

DRN	G.W.W.	
TCD	B.Y.	
CKD		
APPD		

DESIGNS DEPT

D31870A4

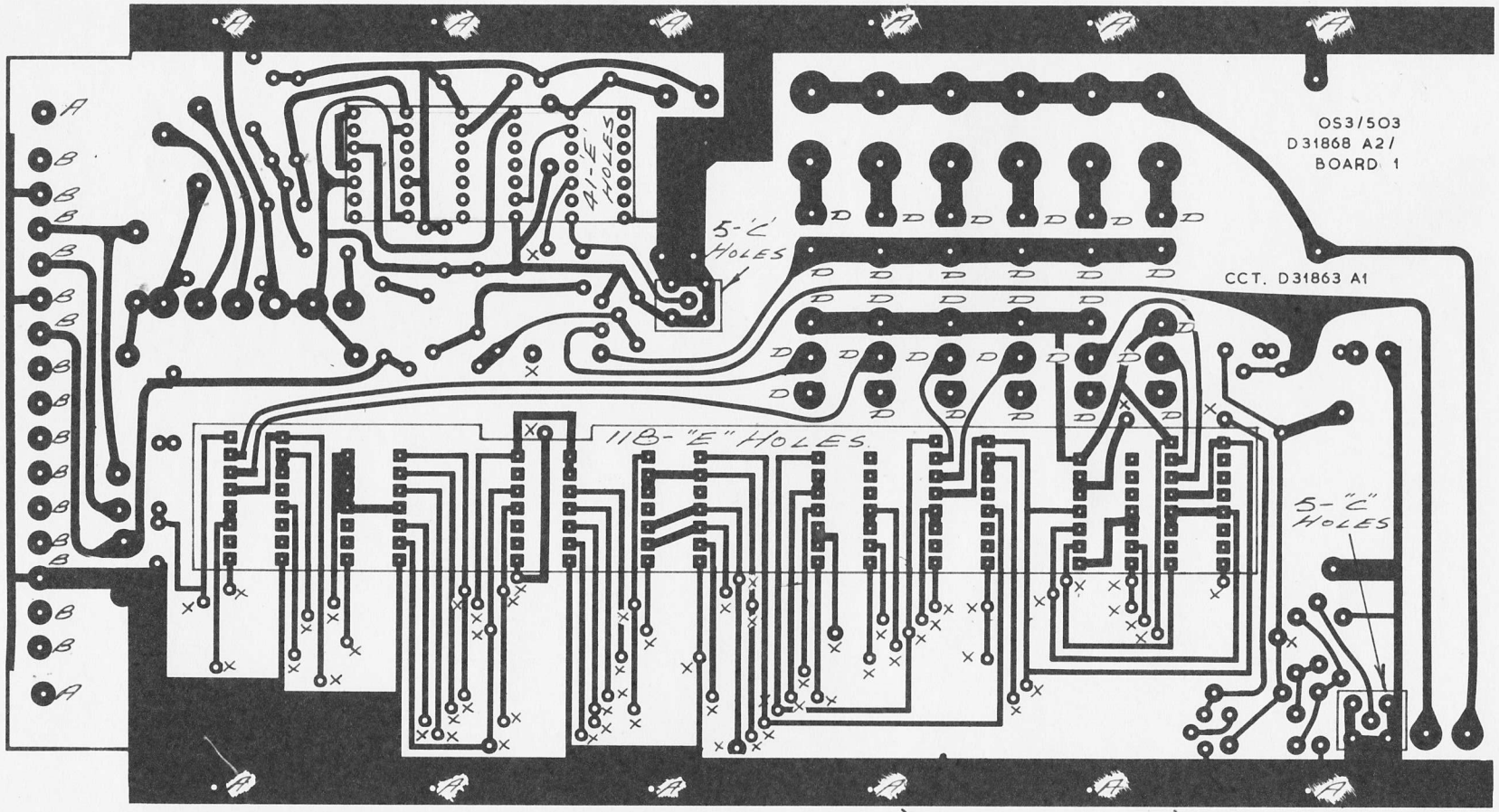
BBC

VM246A4

OS3/503. PRINTED BOARD DRILLING

D31871A4

CHANGE	ISS
/	/



CUT BOARD TO EDGE OF COPPER.

SCALE 1:1

HOLE REF	DRILL NO OR SIZE	DIAMETER DEC	DIAMETER MM
A	27	·144"	3.70
B	55	·052"	1.30
C	52	·063"	1.60
D	41	·096"	2.44
E	69	·029"	0.75
X	–	–	0.85
UN-LETTERED	60	·040"	1.0

MATERIAL : 1·5MM THICK BAKELITE XYLONITE LTD. SHEET TYPE H76FR/1/1 CLAD ON ~~ONE~~ / BOTH SIDES WITH COPPER 35 MICRONS THICK.

FINISH : TINNED

MANUFACTURED TO D31868A2, D31869A2, D31870A4

OS3/503.

PRINTED BOARD DRILLING

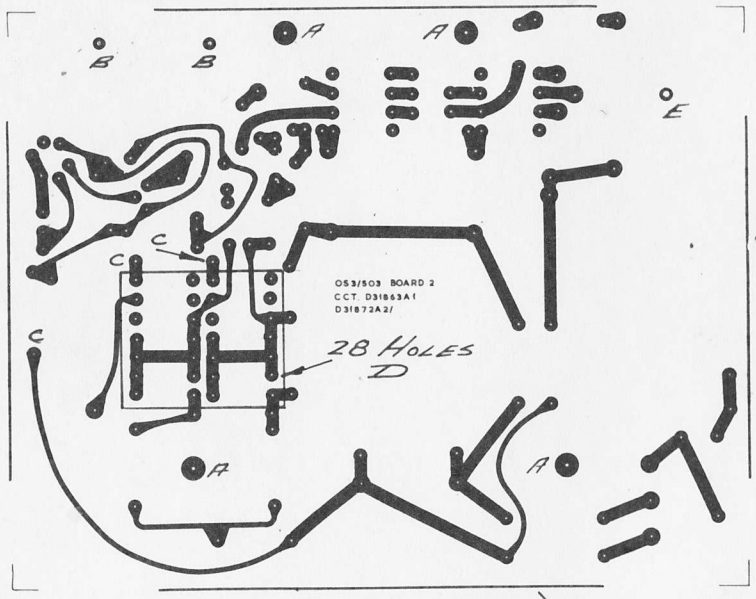
DESIGNS DEPARTMENT

D31871A4.

OS3/503. PRINTED BOARD DRILLING

D31875A4

CHANGE	ISS
/	/



CUT BOARD TO EDGE OF COPPER. SCALE 1:1

HOLE REF	DRILL NO OR SIZE	DIAMETER DEC	DIAMETER MM
A	27	·144"	3·7
B	6	·204"	5·2
C	—	—	0·85
D	69	·029"	0·75
E	12	·189"	4·8
UN-LETTERED	60	·040"	1·0

MATERIAL : 1·5MM THICK BAKELITE XYLONITE LTD. SHEET TYPE H76FR/1/1 CLAD ON ~~ONE~~/ BOTH SIDES WITH COPPER 35 MICRONS THICK.

FINISH : TINNED.

MANUFACTURED TO D31872A2, D31873A2, D31874A3.

BBC

VM246A4

OS3/503. PRINTED BOARD DRILLING

DESIGNS DEPARTMENT

D31875 A4.

OS3/503 PRINTED BOARD COMPONENT LOCATION

BOARD 3

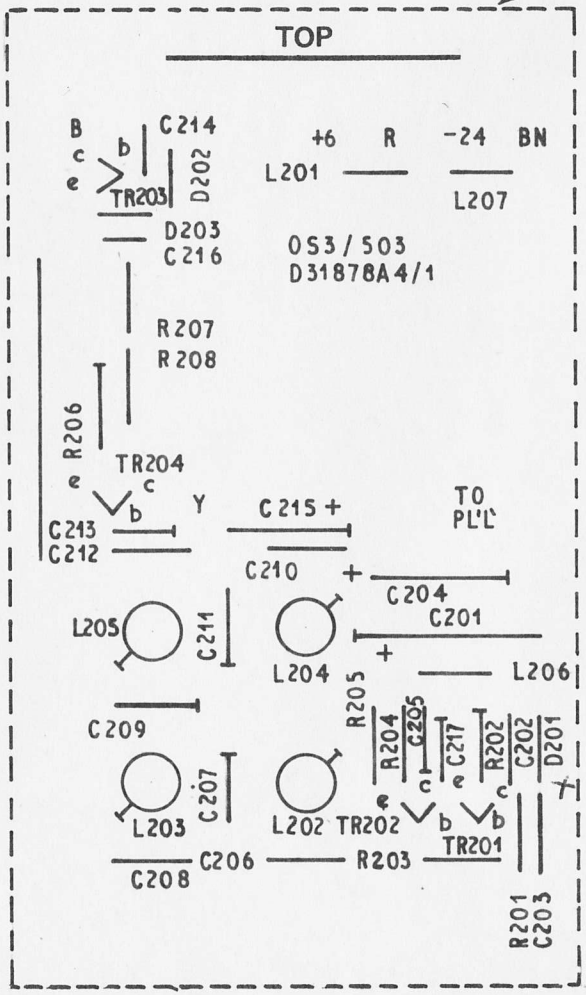
D31878A4

VM161A4

BBC

CHANGE	ISS
/ /	

MINIMUM SIZE TO CUT NEGATIVE



CHARACTERS AND LINES TO BE PRINTED IN BLACK

PRINTED WIRING ON REVERSE SIDE OF BOARD IS D 31876 A3

PRINTED WIRING (COMP SIDE) IS D31877A3

SCALE 1:1

OS3/503 PRINTED BOARD COMPONENT LOCATION BOARD 3

DRN	G.W.W.	
TCD	B.Y.	
CKD		
APPD		

DESIGNS DEPT

D31878 A4

VM246A4

BBC

OS3/503. PRINTED BOARD DRILLING

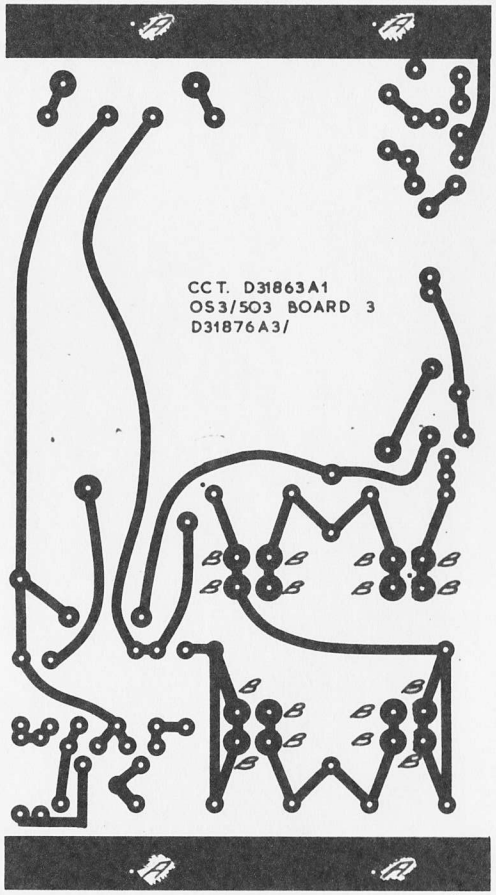
D31879A4

OS3/503.

PRINTED BOARD DRILLING

D31879A4.

CHANGE	
/	/



CUT BOARD TO EDGE OF COPPER

SCALE 1:1

HOLE NUMBER	DRILL No. OR SIZE	DIAMETER DEC.	DIAMETER MM
A	27	·144"	3.7
B	55	·052	1.3
UN-LETTERED	60	·040"	1.0

MATERIAL 1·5MM THICK BAKELITE XYLONITE LTD. SHEET TYPE H76FR/1/1C LAD ON ~~ONE~~/ BOTH SIDES WITH COPPER 35 MICRONS THICK.

FINISH TINNED

MANUFACTURED TO D31876A3, D31877A3, D31878A4.

D31881 A4

OS3/503 (FREQ, SELECTION CHART)
DYE LINE PASTER.

CHANGE	ISS
30/6/78	1

CHANNEL CHANGE		LINK SKT TO SK-	DIVIDER	BIAS LINK POSITION						CHANNEL CHANGE		LINK SKT TO SK -	DIVIDER	BIAS LINK POSITION					
No.	MHz		LINK POSITION							No.	MHz		LINK POSITION						
3	24	F	1	3	5	8	10	11		24	192	J	1	3	5	8	10	11	
4	32	F	1	3	5	7	9	12		25	200	J	2	3	5	8	10	11	
5	40	F	1	3	5	8	9	12		26	208	J	1	4	5	8	10	11	
6	48	G	1	3	5	8	10	11		27	216	J	2	4	5	8	10	11	
7	56	G	1	3	6	8	10	11		28	224	J	1	3	6	8	10	11	
8	64	G	1	3	5	7	9	12		29	232	J	2	3	6	8	10	11	
9	72	G	1	3	6	7	9	12		30	240	J	1	4	6	8	10	11	
10	80	G	1	3	5	8	9	12		31	248	J	2	4	6	8	10	11	
11	88	G	1	3	6	8	9	12		32	256	J	1	3	5	7	9	12	
12	96	H	1	3	5	8	10	11		33	264	J	2	3	5	7	9	12	
13	104	H	1	4	5	8	10	11		34	272	J	1	4	5	7	9	12	
14	112	H	1	3	6	8	10	11		35	280	J	2	4	5	7	9	12	
15	120	H	1	4	6	8	10	11		36	288	J	1	3	6	7	9	12	
16	128	H	1	3	5	7	9	12		37	296	J	2	3	6	7	9	12	
17	136	H	1	4	5	7	9	12		38	304	J	1	4	6	7	9	12	
18	144	H	1	3	6	7	9	12		39	312	J	2	4	6	7	9	12	
19	152	H	1	4	6	7	9	12		40	320	J	1	3	5	8	9	12	
20	160	H	1	3	5	8	9	12		41	328	J	2	3	5	8	9	12	
21	168	H	1	4	5	8	9	12		42	336	J	1	4	5	8	9	12	
22	176	H	1	3	6	8	9	12		43	344	J	2	4	5	8	9	12	
23	184	J	2	4	6	7	10	11		44	352	J	1	3	6	8	9	12	

CUT TO THIS EDGE

SCALE 1:1

BBC

DS/A4

OS3/503
FREQUENCY SELECTION CHART
DYE-LINE PASTER

DRN.	G.W.W.
TCD.	B.Y.
CKD.	M.T.E
APPD	

DESIGNS DEPARTMENT

D31881A4

D31881 A4

ISS	CHANGE
1	30/6/78

OS3/503 (FREQ, SELECTION CHART) DYE LINE PASTER.

CHANNEL CHANGE		LINK SKT TO SK-			DIVIDER	BIAS LINK POSITION		
No.	MHz	LINK POSITION						
3	24	F	1	3	5	8	10	11
4	32	F	1	3	5	7	9	12
5	40	F	1	3	5	8	9	12
6	48	G	1	3	5	8	10	11
7	56	G	1	3	6	8	10	11
8	64	G	1	3	5	7	9	12
9	72	G	1	3	6	7	9	12
10	80	G	1	3	5	8	9	12
11	88	G	1	3	6	8	9	12
12	96	H	1	3	5	8	10	11
13	104	H	1	4	5	8	10	11
14	112	H	1	3	6	8	10	11
15	120	H	1	4	6	8	10	11
16	128	H	1	3	5	7	9	12
17	136	H	1	4	5	7	9	12
18	144	H	1	3	6	7	9	12
19	152	H	1	4	6	7	9	12
20	160	H	1	3	5	8	9	12
21	168	H	1	4	5	8	9	12
22	176	H	1	3	6	8	9	12
23	184	J	2	4	6	7	10	11

CHANNEL CHANGE		LINK SKT TO SK -			DIVIDER	BIAS LINK POSITION		
No.	MHz	LINK POSITION						
24	192	J	1	3	5	8	10	11
25	200	J	2	3	5	8	10	11
26	208	J	1	4	5	8	10	11
27	216	J	2	4	5	8	10	11
28	224	J	1	3	6	8	10	11
29	232	J	2	3	6	8	10	11
30	240	J	1	4	6	8	10	11
31	248	J	2	4	6	8	10	11
32	256	J	1	3	5	7	9	12
33	264	J	2	3	5	7	9	12
34	272	J	1	4	5	7	9	12
35	280	J	2	4	5	7	9	12
36	288	J	1	3	6	7	9	12
37	296	J	2	3	6	7	9	12
38	304	J	1	4	6	7	9	12
39	312	J	2	4	6	7	9	12
40	320	J	1	3	5	8	9	12
41	328	J	2	3	5	8	9	12
42	336	J	1	4	5	8	9	12
43	344	J	2	4	5	8	9	12
44	352	J	1	3	6	8	9	12

CUT TO THIS EDGE

Bias link position taken from graph.

SCALE 1:1

BBC

DS/A4

OS3/503
FREQUENCY SELECTION CHART
DYE-LINE PASTER

DRN.	G.W.W.
TCD.	B.Y.
CKD.	
APPD	

DESIGNS DEPARTMENT

D31881A4

OS3/503

As a result of recent work carried on the frequency synthesiser OS3/503 several modifications to one of the printed boards are required. Details of the modifications are given on change form number 11325 and the reasons for the modifications are as follows:-

1. To increase the frequency range of the voltage controlled oscillator. This parameter was marginal on earlier units but the modification gives the oscillator a frequency range about 20% in excess of that required, thus removing the need for critical adjustment in the test laboratory.

2. To increase the input voltage level to the Plessey high speed divide-by-two integrated circuit SP603. The original transistor produced a level which met the specified input level requirement for the integrated circuit but it was found that a more reliable and 'clearer' output waveform was produced when a high drive was used. The new transistor also produces a high output level at SK'J' and thus reduces the relative level of the sub harmonic output from the synthesiser when it is working in its top range (176-352MHz).

3. To increase the output level of the Plessey divide-by-two integrated circuits SP603 and SP604. The Plessey data sheet does not specify the output level of the first integrated circuit when it is used to drive a second similar integrated circuit and although the O/P level satisfactory on earlier models it was found to be too low on the production models from Equipment Department.

4. To reduce the input loading capacitance of the Motorola MECL II divide-by-two circuits and make them operate more reliably. The printed board was layed out incorrectly, but as earlier units operated satisfactorily the error was not noticed.

5. To reduce the harmonic content of the output signal when the unit is used on the lowest range (24-40MHz).

6. To reduce the level of 0.5MHz sidebands.

In the course of our test it was found that the level of the sub harmonic output over the top frequency range (184-352MHz) did not meet the specified level of < -50dB on all the units. On further investigation it was found that the sub harmonic breakthrough came from several sources which could either add or cancel depending on the exact parameters of several components. The parameter spread of the relevant devices was such that different units produced sub harmonic outputs between -35dB and -70dB. Modifications were devised to reduce the sub harmonic to < -50dB, however they were rather complicated and therefore expensive and they would reduce the reliability of the unit.

The sub harmonic output level must be as low as possible when a harmonic of the sub harmonic falls near the intermediate or output channel of the translator. This will occur in the case of Scilly Isles BBC1 (Channel S1 to Channel 21), but it will not occur in the other 36 translators listed on the delivery schedule attached to ED 50284, for which the present batch of synthesisers have been made. Therefore, in order to minimise cost it is proposed that the specification for the sub harmonic output on the top frequency range be reduced to < -35dB, and ~~that~~ the sub harmonic output on the other three ranges be < -45dB. A simple filter will be provided by Designs Department for the Scilly Isles BBC1 translator.

All the problems have been associated with board 2 of the OS3/503, ten of these boards have been modified in accordance with change form number 11325 and five have been fully tested. Three of the fully tested boards have been fitted in synthesisers and the complete units have been fully tested and they meet the specification. Two of the fully tested units have been returned to Equipment Department and one has been sent to Luton for service in the near future.

On four of the ten boards that were tested the Plessey divide-by-two circuits SP603 did not meet their specification. Designs Department will produce a printed circuit board test jig on which suspect integrated circuits may be tested under controlled conditions. In view of the high failure rate all future Plessey high speed divider circuits should be tested before being assembled on printed boards.

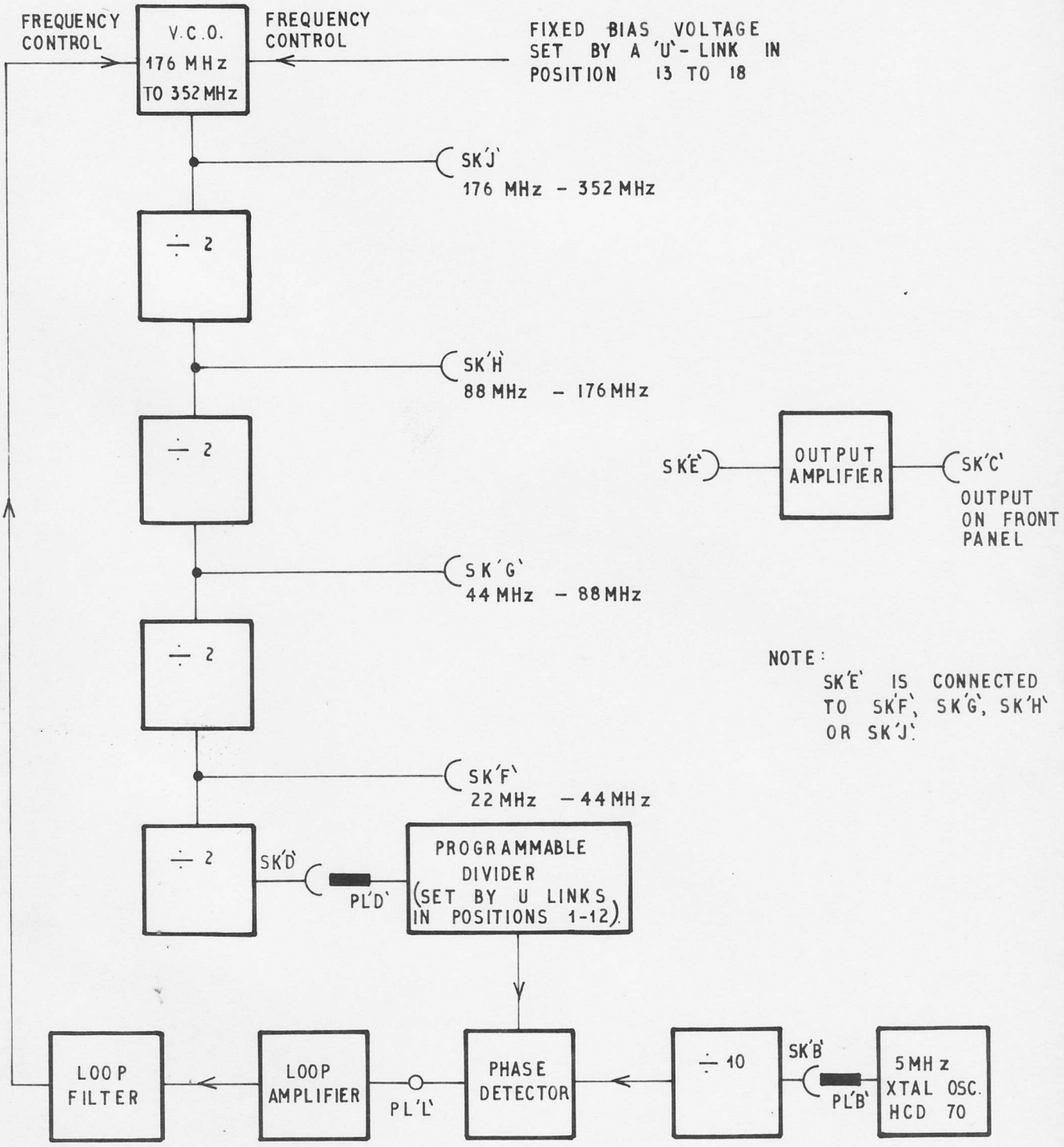
A new printed board to replace board 2 will be designed as soon as possible and no more synthesisers should be made using the existing board. The new printed board will be slightly more complicated and therefore the existing parts list will also be modified.

MTE/SC
20.6.73

D31880A4

ISS	CHANGE
1	30/6/72

OS3/503 (OSCILLATOR VARIABLE FREQ)
BLOCK DIAGRAM



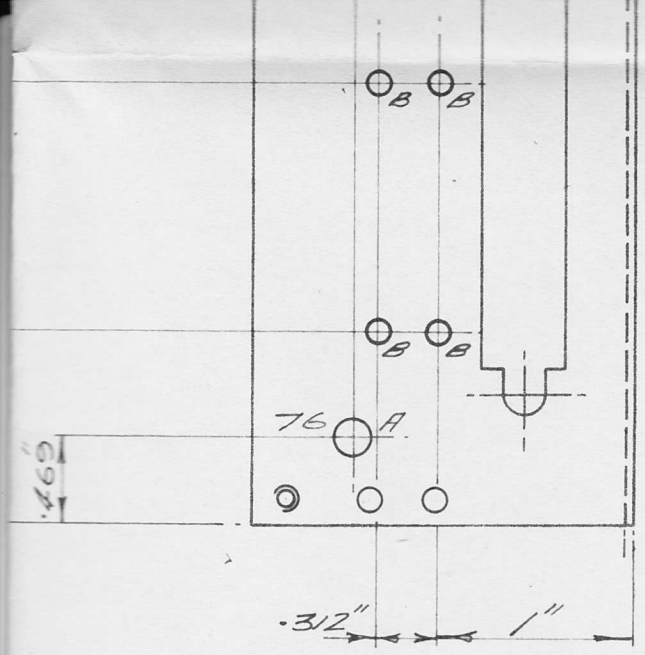
BBC
DS/A4

OS3/503
OSCILLATOR VARIABLE FREQ
BLOCK DIAGRAM

DRN.	G.W.W.
TCD.	B.Y.
CKD.	
APPD	

DESIGNS DEPARTMENT
D31880A4

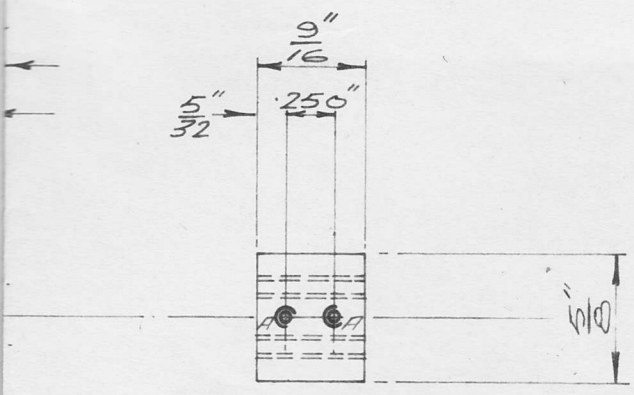
S & H LTD 2285b



DETAIL 3. REAR BRACKET
MATERIAL : PART OF CH1/46A CHASSIS
FINISH : CLEAN

"A" HOLES DR No 12 (·189" DIA)
"B" HOLES DR 1"/8 DIA.

D31866A2



1"/32 x 45° CHAMFER.

"A" HOLES DR No 43 (·089" DIA) TAPPED 6B.A.

TAIL G. BLOCK.
TL ÷ ALUM ALLOY BS1476-NEA
ISH ÷ CLEAN.

D31866A2.

NOTES.

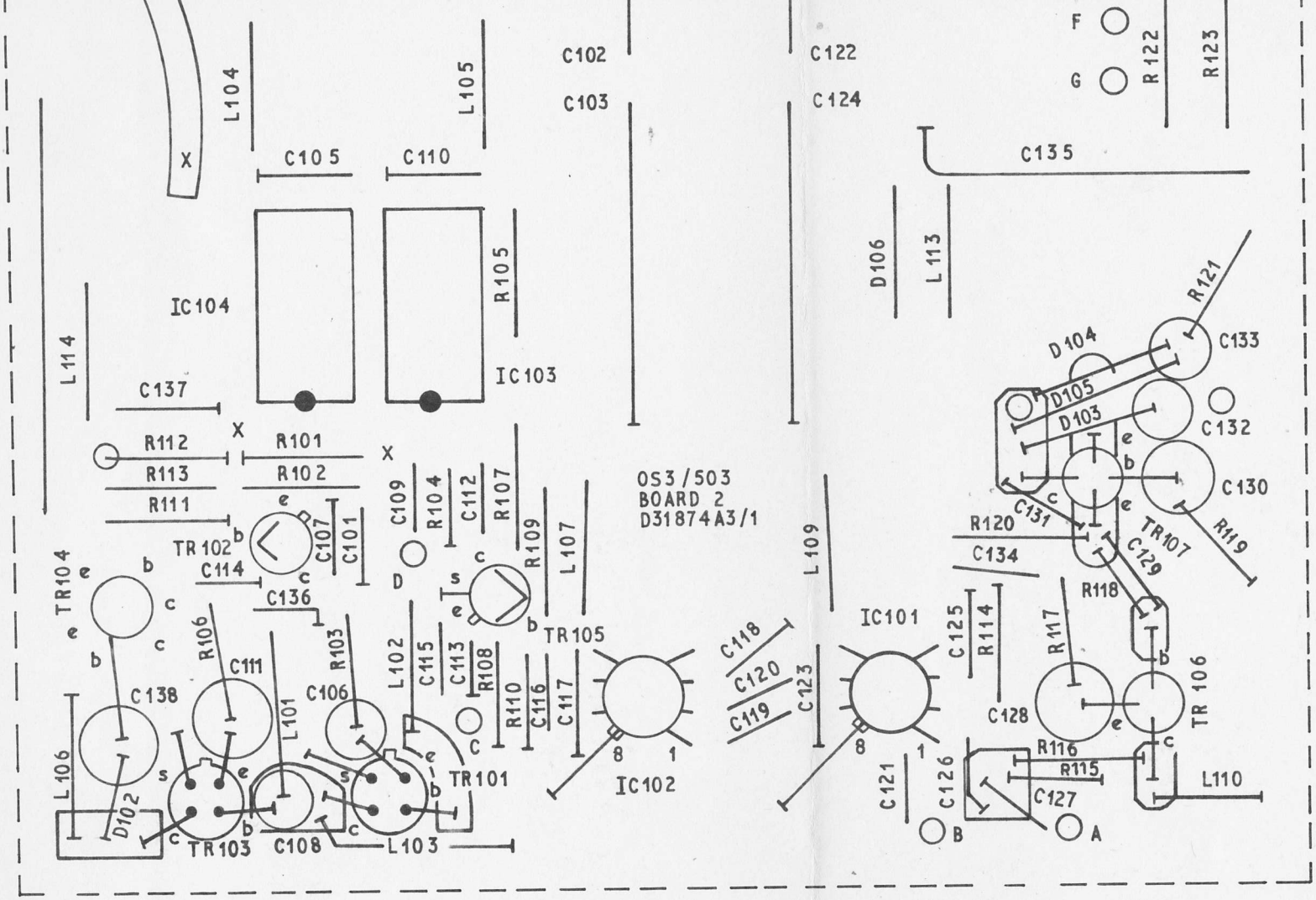
1. REMOVE ALL BURRS & BREAK ALL CORNERS.
2. KEEP ALL INSIDE BEND RADS TO A MINIMUM.

TOLERANCES :—
FRACTION DIMENSIONS ±·010"
DECIMAL DIMENSIONS ±·005"
EXCEPT WHERE STATED OTHERWISE

PARTS LIST D 31864A4

SCALE 1:1 EXCEPT WHERE OTHERWISE STATED.

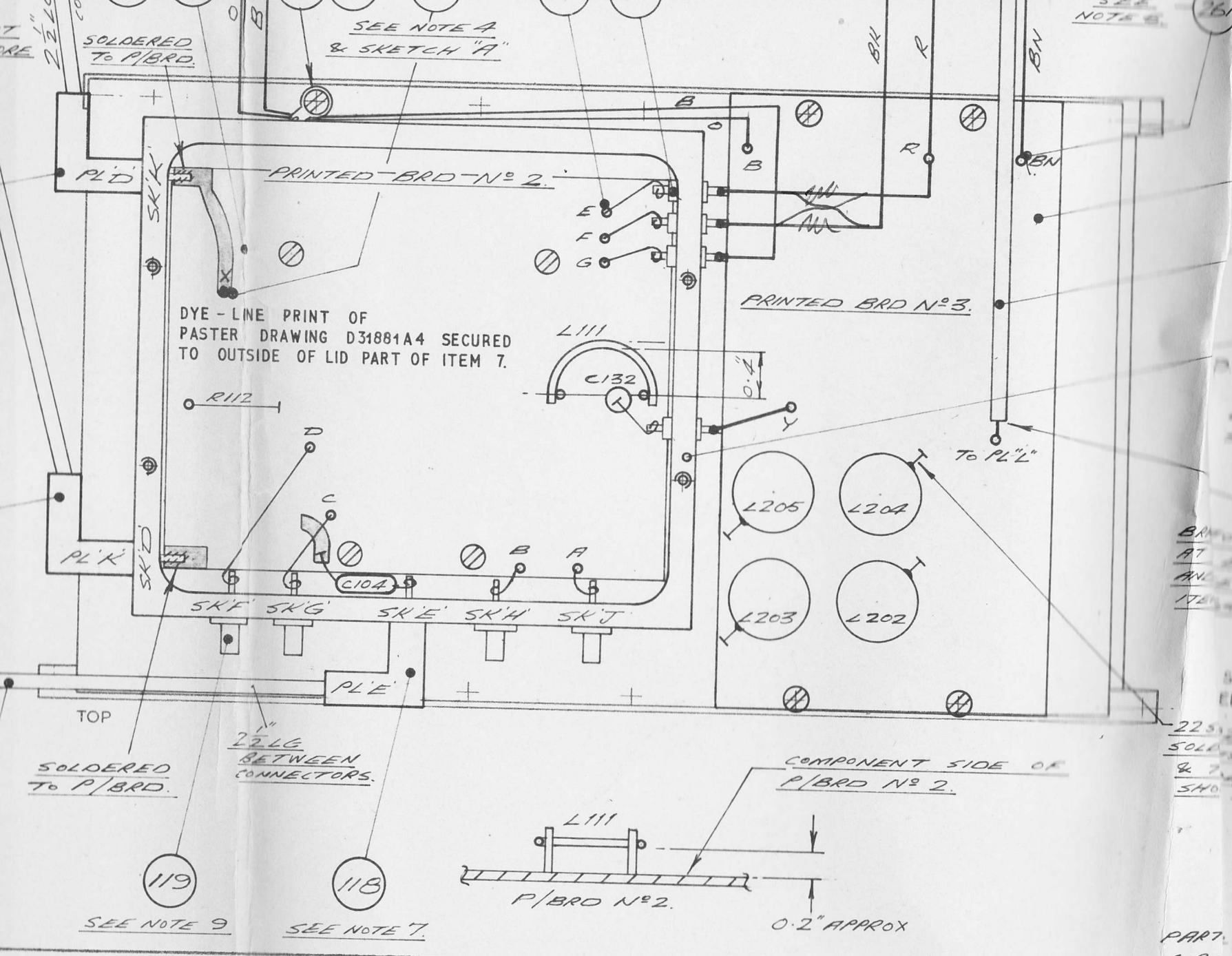
DRN	G.W.W	DESIGNS DEPARTMENT
TCD		D31866 A2.
CKD	M.T.E	
APPD		



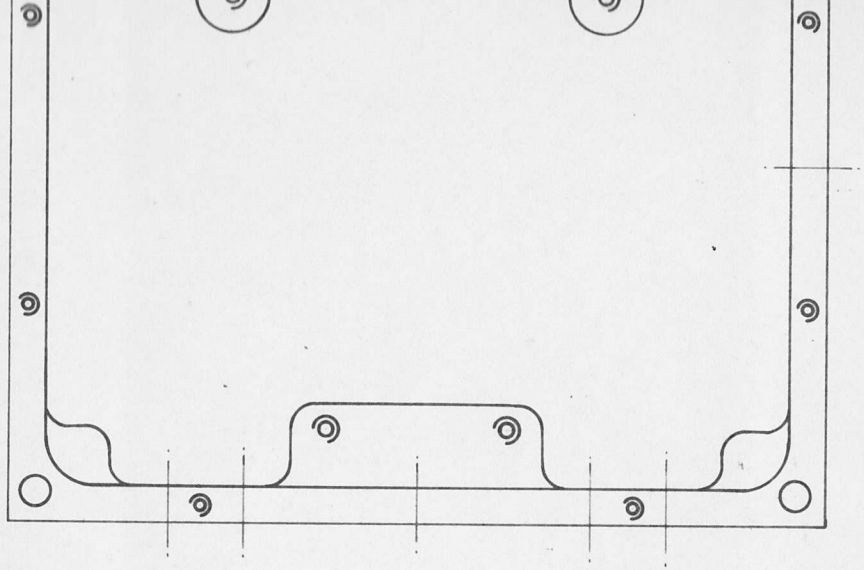
CHARACTERS AND LINES TO BE PRINTED IN BLACK
PRINTED WIRING ON REVERSE SIDE OF BOARD IS D31872A2.
PRINTED WIRING (COMP SIDE) IS D31873A2.

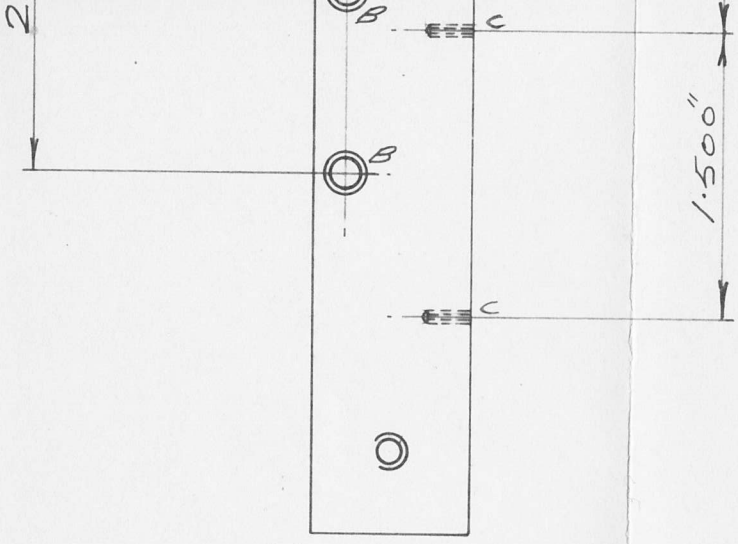
OS3/503
PRINTED BOARD COMPONENT LOCATION
BOARD 2

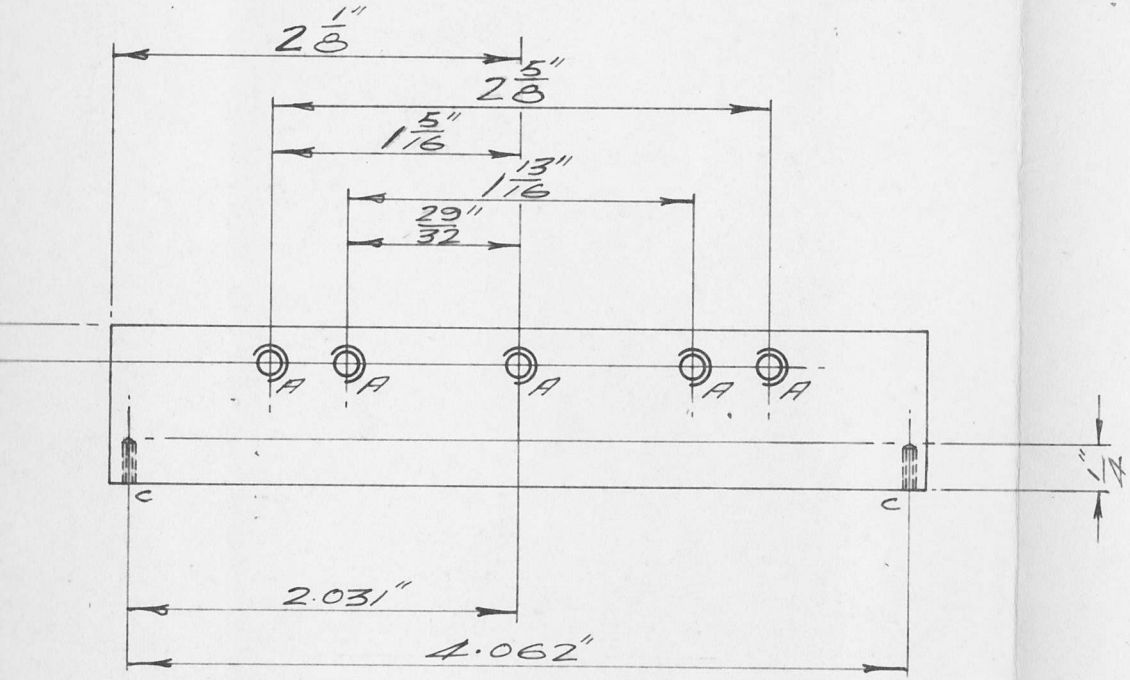
DRN.	G.W
TCD.	B.Y
CKD.	M.T
APPD	



DS3/503. ASSEMBLY & WIRING.







5-"A" HOLES DR Nº 21 (·159" DIA)
& TAP 10-32 U.N.F. CLASS 2B
4-"B" HOLES DR 5/32" DIA. & C'BORE
DR 7/32" DIA X 1/16" DEEP
4-"C" HOLES DR 50 (·070" DIA)
& TAP 8 B.A X FULL THREAD.

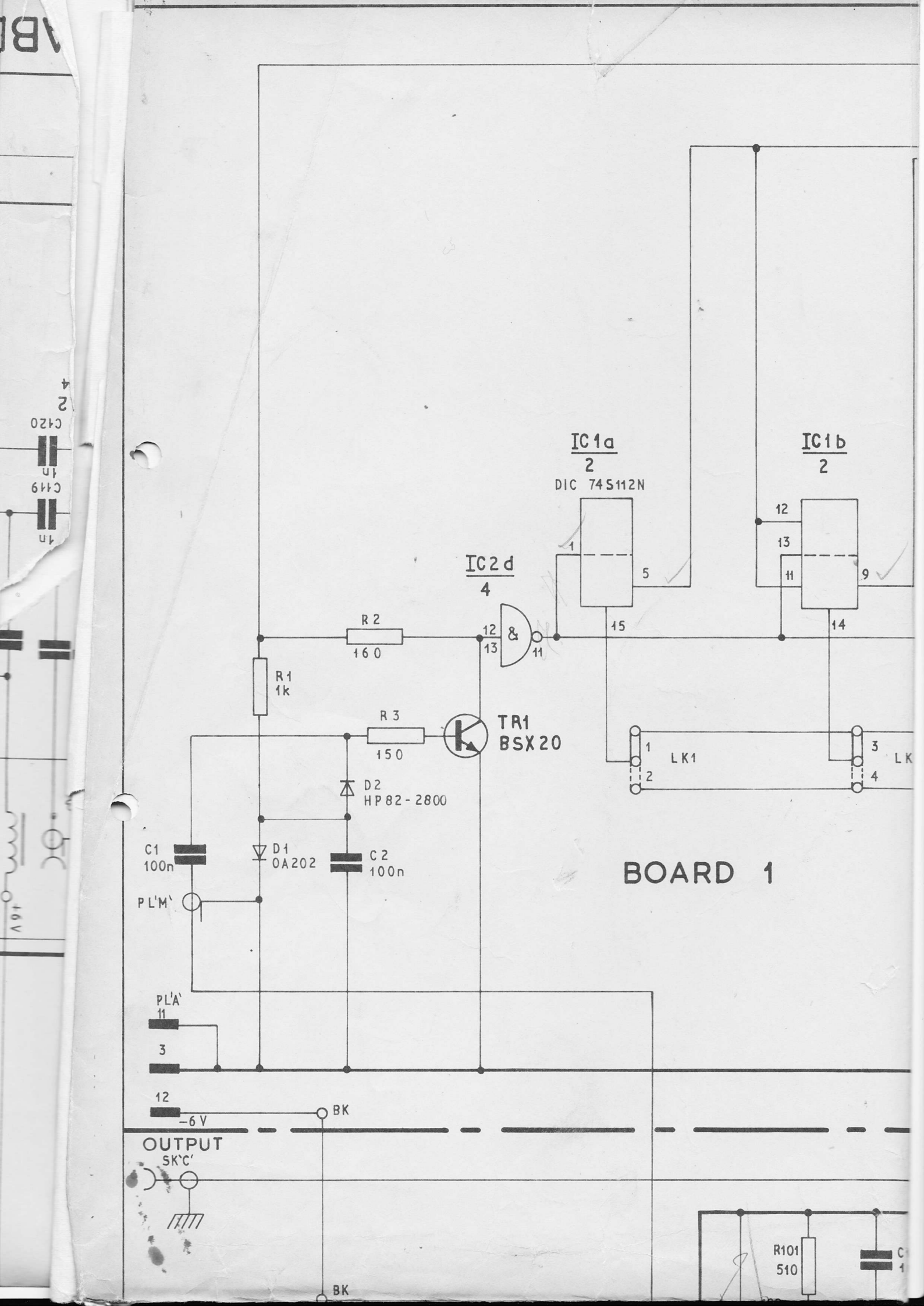
DETAIL 8. BOX
MATERIAL :- PART OF CH1/57B CHASSIS U.H.F.
FINISH :- CLEAN.

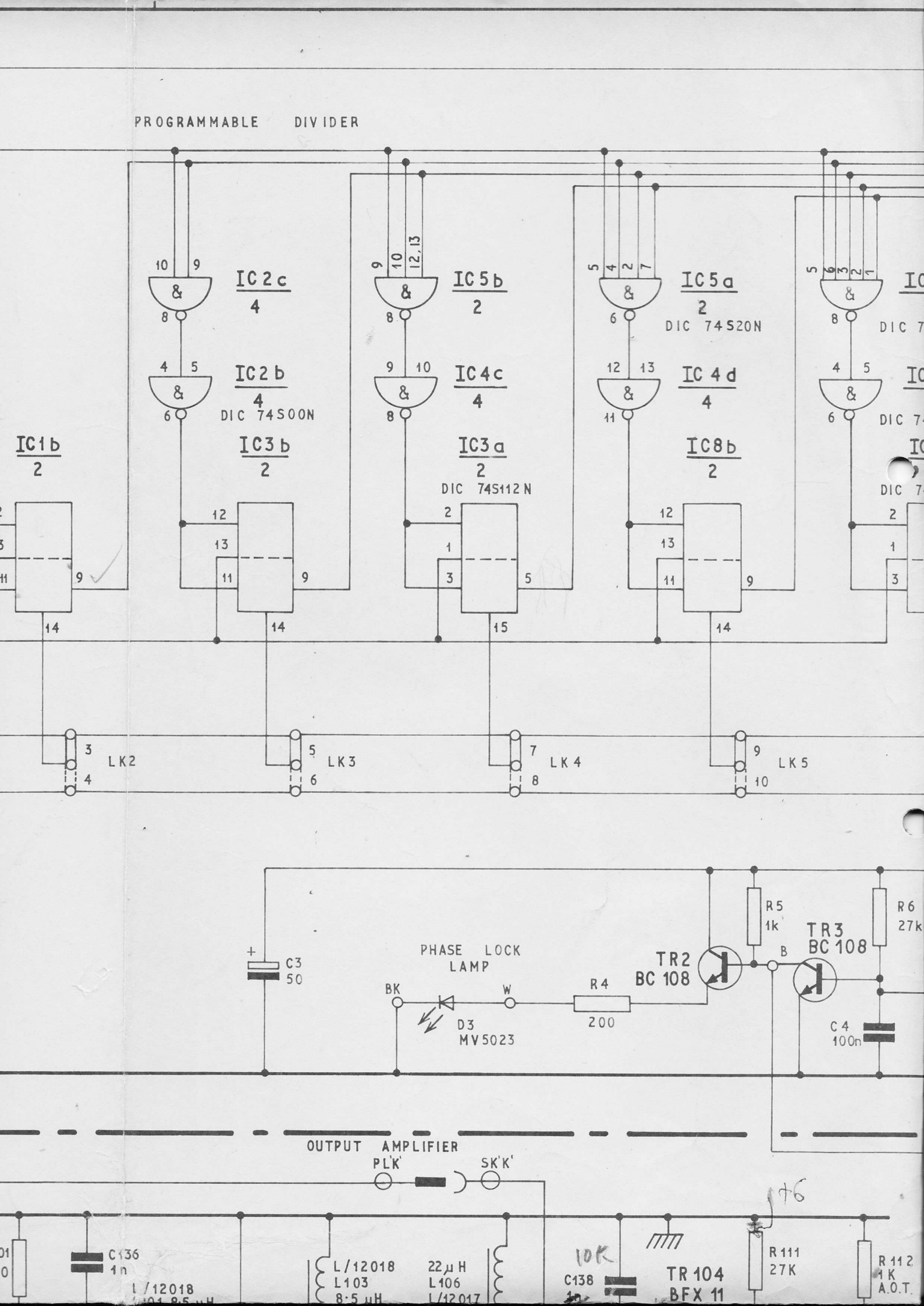
NOTES
1. REMOVE BURRS
2. TOLERANCES :- FRACTION ±·010"
DECIMALS ±·005"

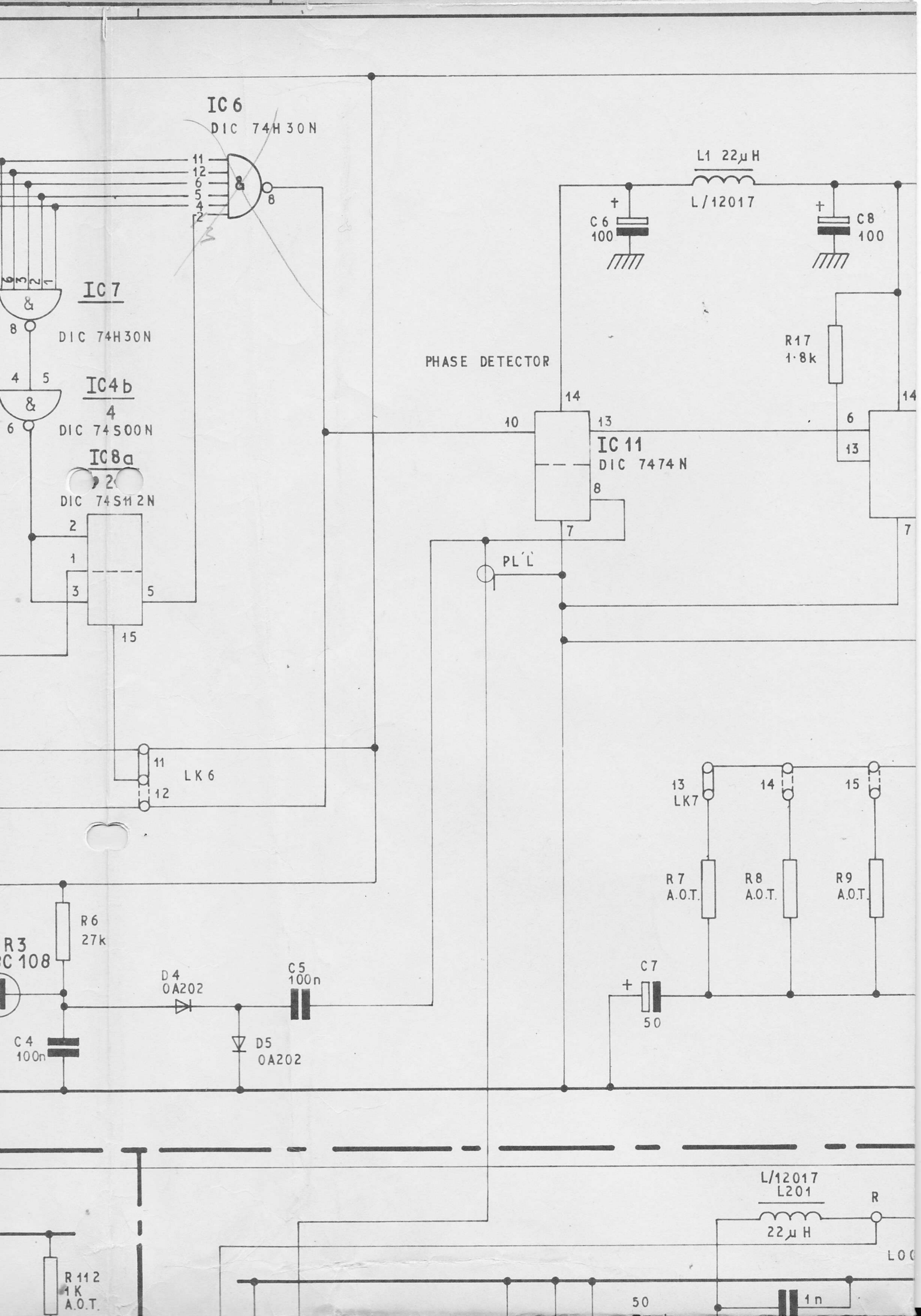
PARTS LIST
SCALE :- 1.

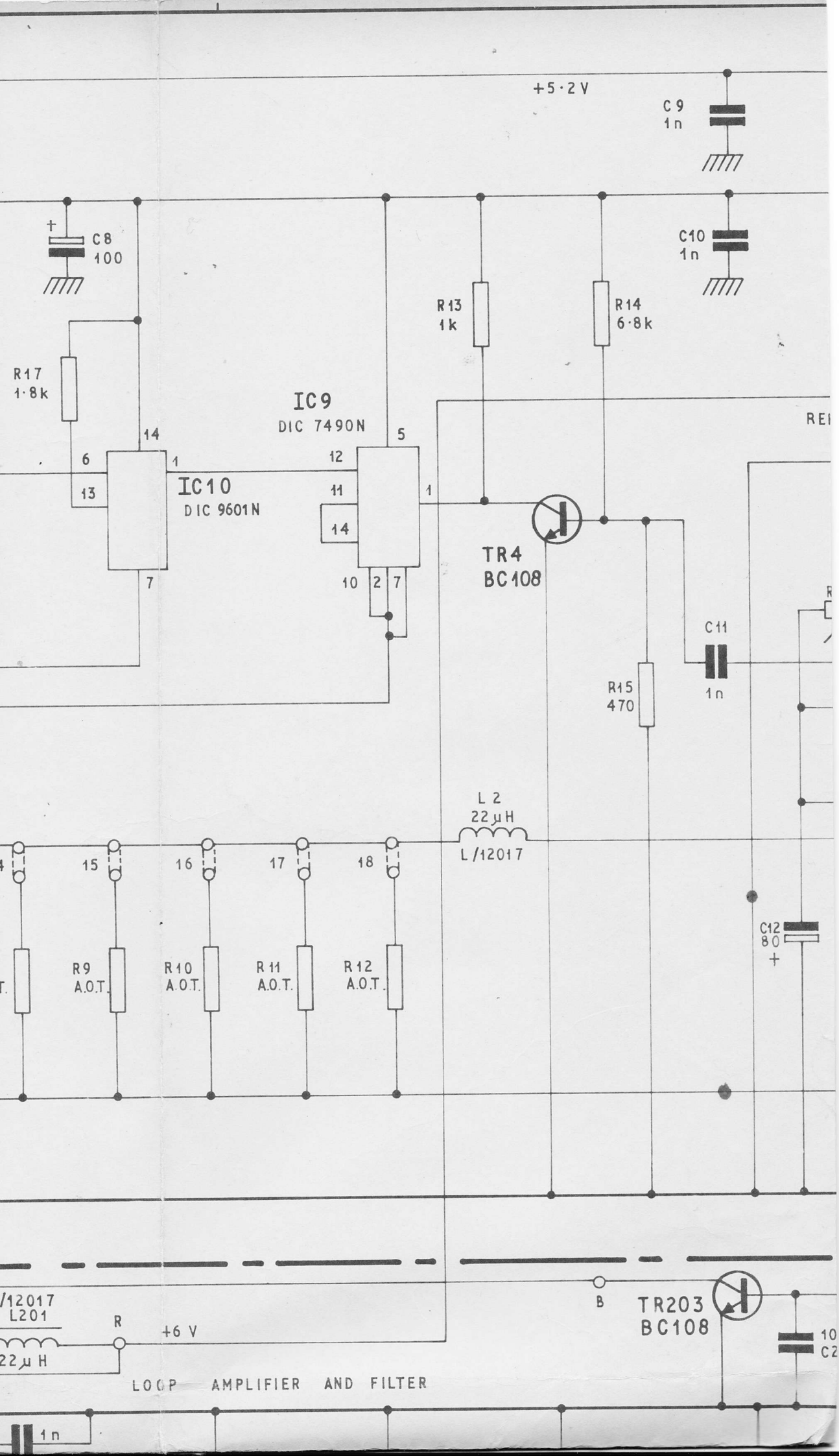
DRN	G.W.W.	DESIGN
TCD		
CKD	M.T.E.	D318
APPD		

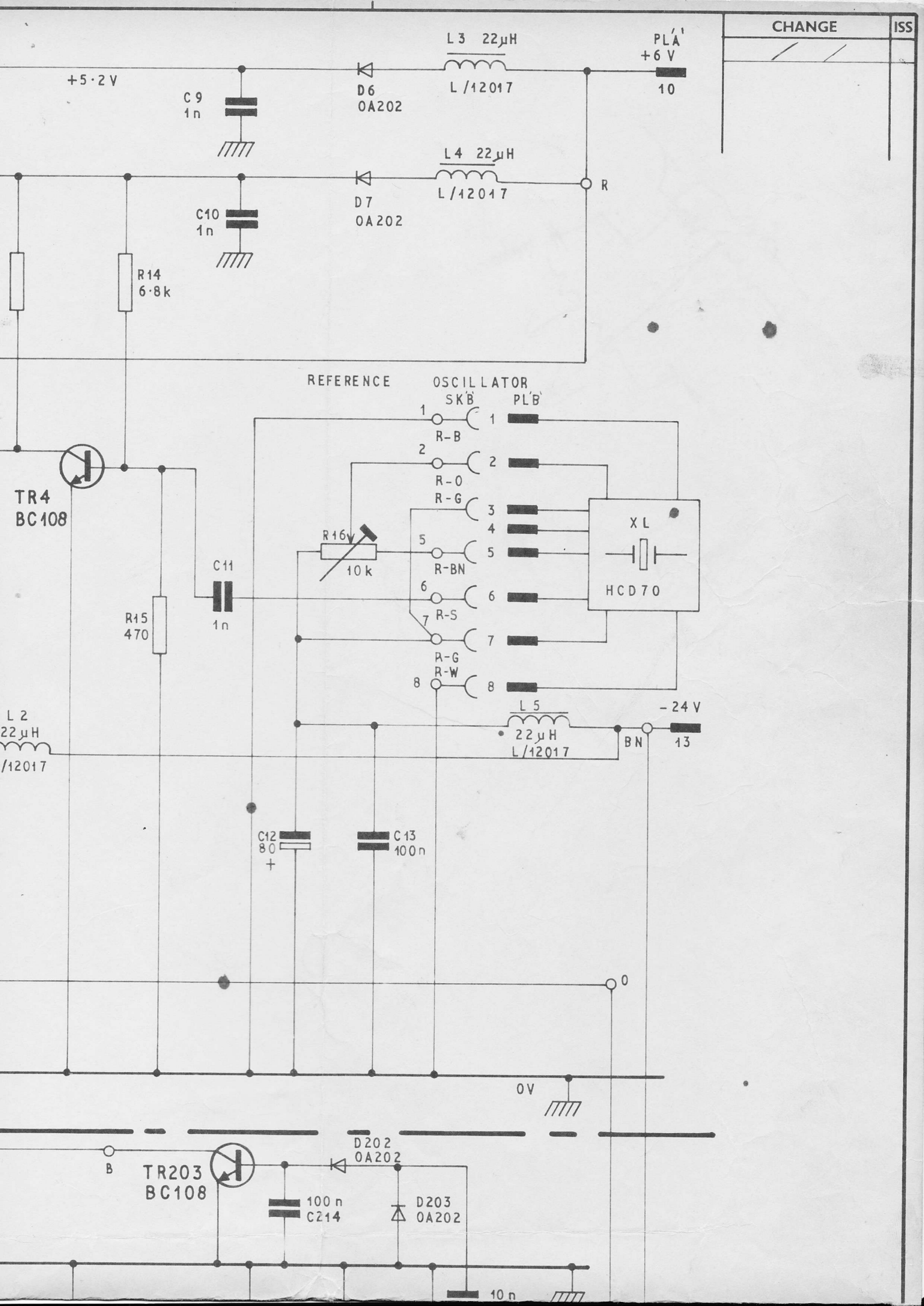
OS3/503. DETAIL 8.


IC1a
2
DIC 74S112N
IC1b
2
IC2d
4
R2
160
R1
1k
R3
150
TR1
BSX20
D2
HP82-2800
C1
100n
D1
0A202
C2
100n
PL'M'
PL'A'
11
3
12
-6 V
BK
OUTPUT
SK'C'
LK1
LK
R101
510
BOARD 1


PROGRAMMABLE DIVIDER
IC 2c
4
IC 5b
2
IC 5a
2
DIC 74S20N
IC 2b
4
DIC 74S00N
IC 4c
4
IC 4d
4
IC1b
2
IC3b
2
IC3a
2
DIC 74S112N
IC8b
2
LK2
LK3
LK4
LK5
C3
50
PHASE LOCK
LAMP
BK
W
D3
MV5023
R4
200
TR2
BC 108
R5
1k
TR3
BC 108
R6
27k
C4
100n
OUTPUT AMPLIFIER
PL'K'
SK'K'
C136
1n
L/12018
L103
8·5 µH
22µH
L106
L/12017
C138
10K
TR 104
BFX 11
R111
27K
R112
1K
A.O.T.

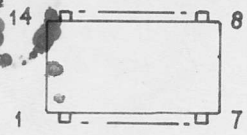

IC 6
DIC 74H30N
11
12
6
5
4
2
8
IC 7
DIC 74H30N
IC4b
4
DIC 74S00N
IC8a
DIC 74S112N
L1 22µH
L/12017
C6
100
C8
100
PHASE DETECTOR
R17
1·8k
IC 11
DIC 7474N
PL'L
LK6
LK7
R7
A.O.T.
R8
A.O.T.
R9
A.O.T.
R6
27k
C7
50
D4
0A202
C5
100n
C4
100n
D5
0A202
L/12017
L201
22µH
R
R112
1K
A.O.T.
50
1n

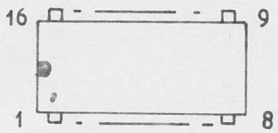

+5·2 V
C9
1n
C8
100
C10
1n
R13
1k
R14
6·8k
R17
1·8k
IC9
DIC 7490N
IC10
DIC 9601N
TR4
BC108
C11
1n
R15
470
L 2
22 µH
L/12017
R9
A.O.T.
R10
A.O.T.
R11
A.O.T.
R12
A.O.T.
C12
80
+
/12017
L201
22 µH
R
+6 V
B
TR203
BC108
LOOP AMPLIFIER AND FILTER
1n


CHANGE
ISS
+5·2V
C9
1n
L3 22µH
D6
OA202
L/12017
PL'A'
+6V
10
L4 22µH
D7
OA202
L/12017
R
C10
1n
R14
6·8k
REFERENCE OSCILLATOR
SK'B'
PL'B'
1
R-B
2
R-O
R-G
3
4
5
R-BN
6
R-S
7
R-G
R-W
8
XL
HCD70
R16
10k
C11
1n
R15
470
TR4
BC108
L2
22µH
/12017
L5
22µH
L/12017
-24V
13
BN
C12
80
+
C13
100n
0
0V
B
TR203
BC108
D202
OA202
100n
C214
D203
OA202
10n

-6V

IC TERMINATIONS
VIEW ON TOP

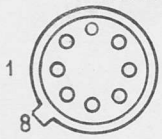




DIC 74S112N

DIC 74S00N
DIC 74S20N
DIC 74H30N
DIC 7490N
DIC 7474N
DIC 9601N
MC 1027p

IC TERMINATIONS
VIEW ON LEADS



SP603
SP604

SECTIONS OF IC'S NOT USED

IC4a 4 IC2a 4

PINS OF IC'S CONNECTED TO SUPPLIERS:

IC	+ 5·2V	- 5·2V	0V
1,3,8	16		8
2,4,5,6,7,10,11	14		7
9	5		10
101, 102	5		8
103, 104		7	14

UNUSED PINS OF IC'S

IC'S	PIN NUMBERS
1	2,3,4,6,7,10
2,4	1,2,3,
3 8	4,6,7,10
5	3,11
6	1,3,9,10,13
7	4,9,10,11,12,13
9	3,4,6,8,9,13.
10	2,3,4,5,8,9,10,11,12.
11	1,2,3,4,5,6,9,11,12.
101,102	4
103,104	1,2,12

C101

L102 8·5µH

L/12018

C104 15p

R102 360

SK'E'

L114 L/12017 22µH

1n C137

SK'D'

PL'D'

C105 1n

C102 1n

C103 100

D101 OA202

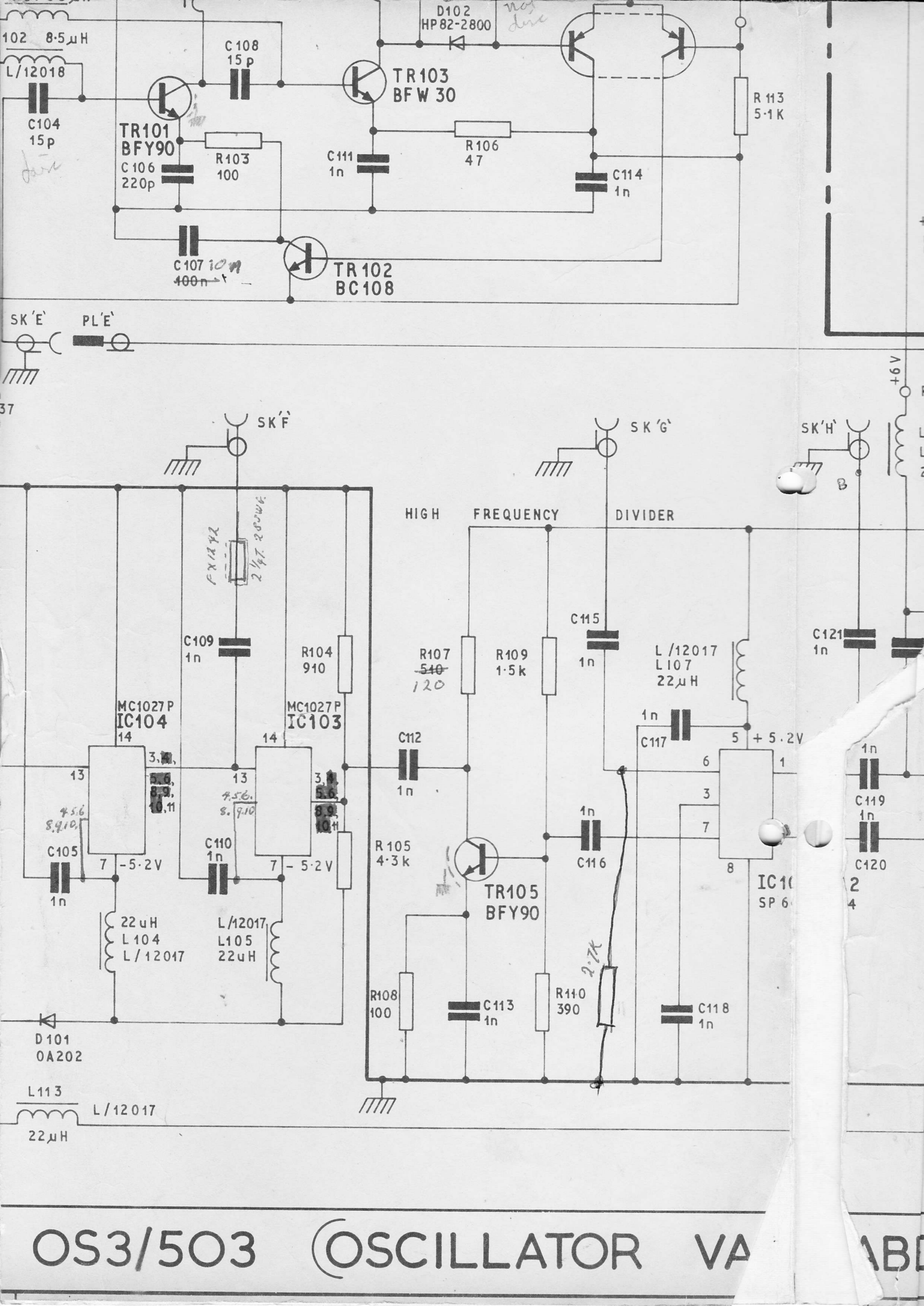
L/12017 L112 22µH

L113 22µH

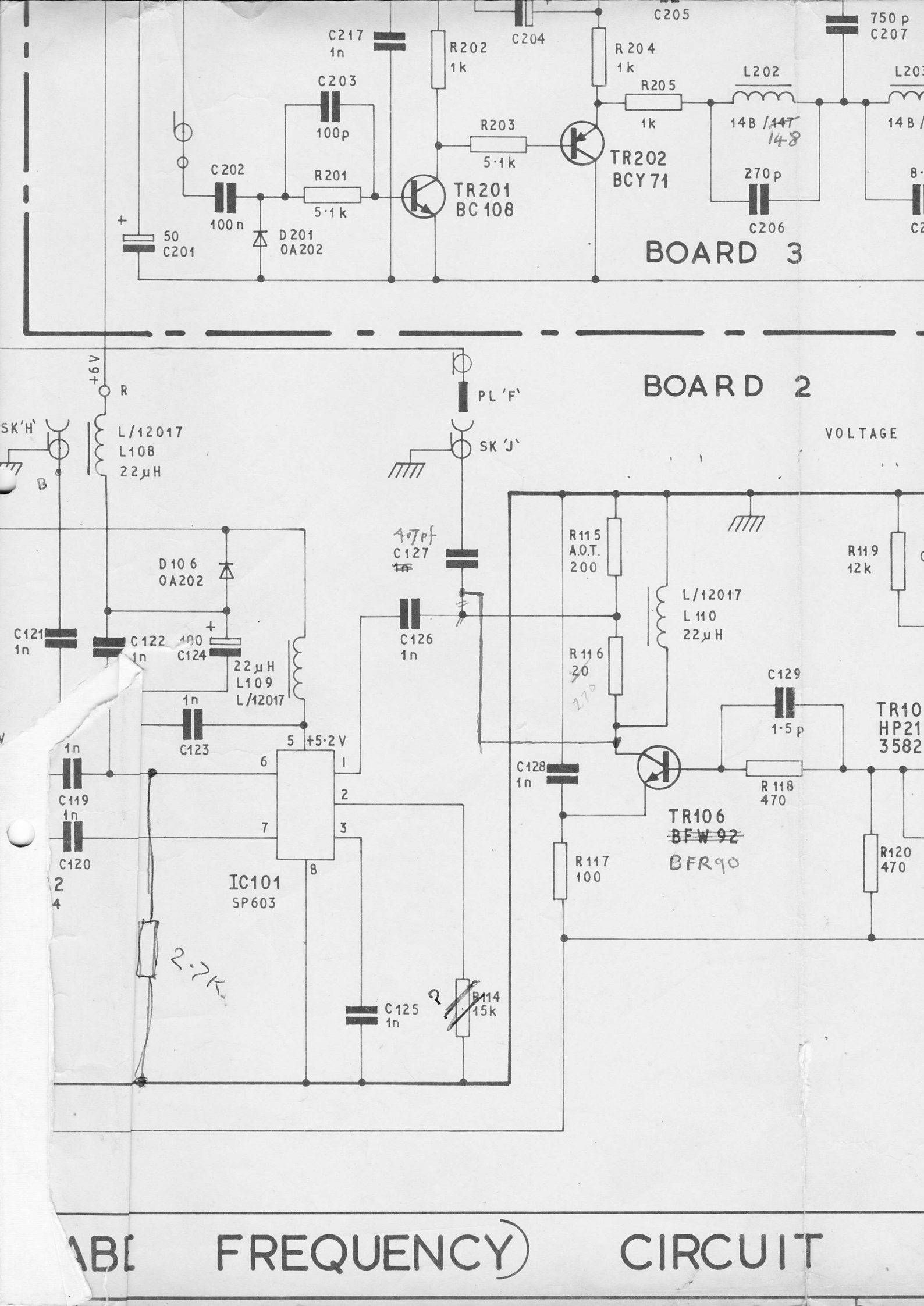
BBC

DS/A1

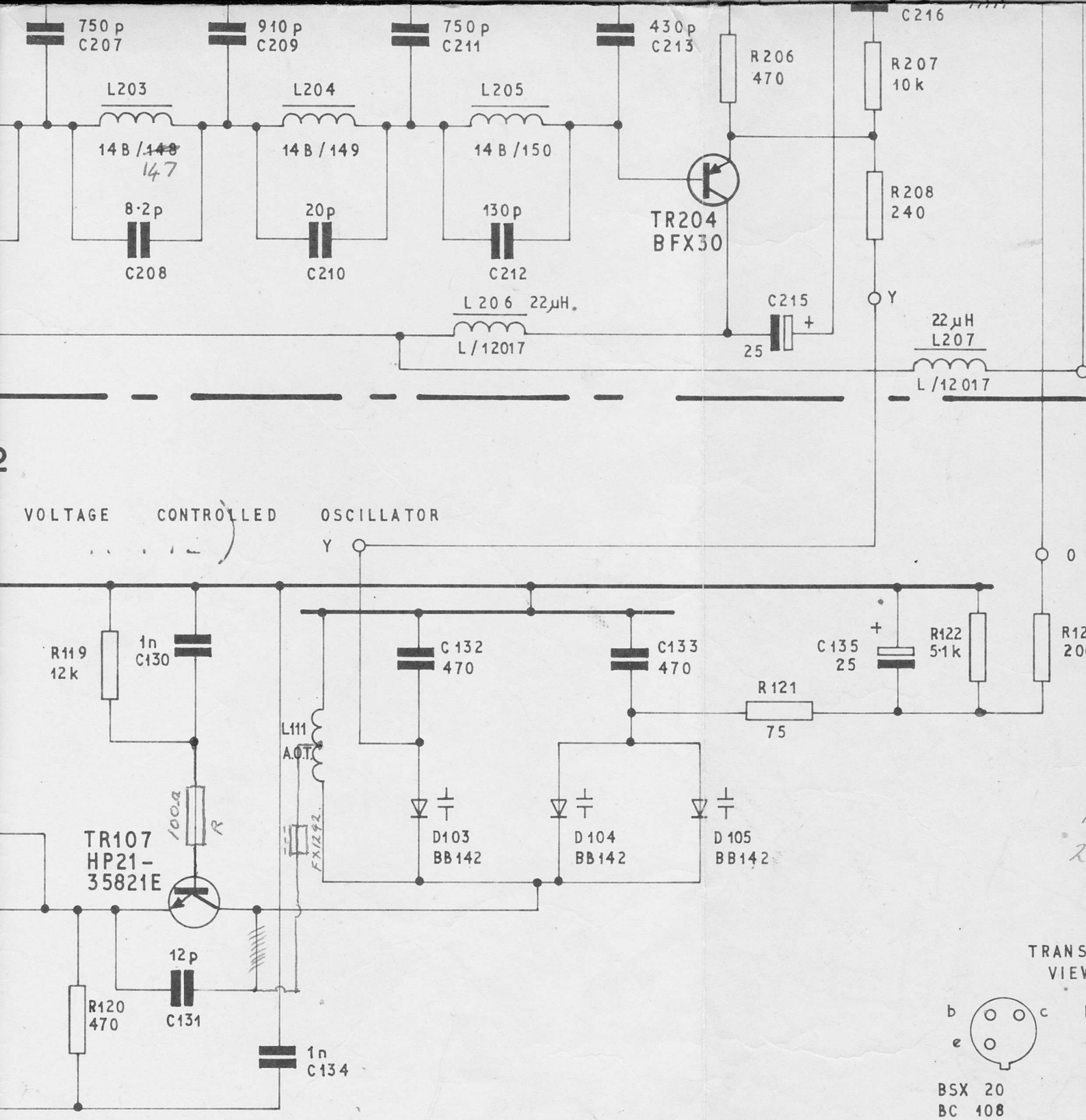
OS

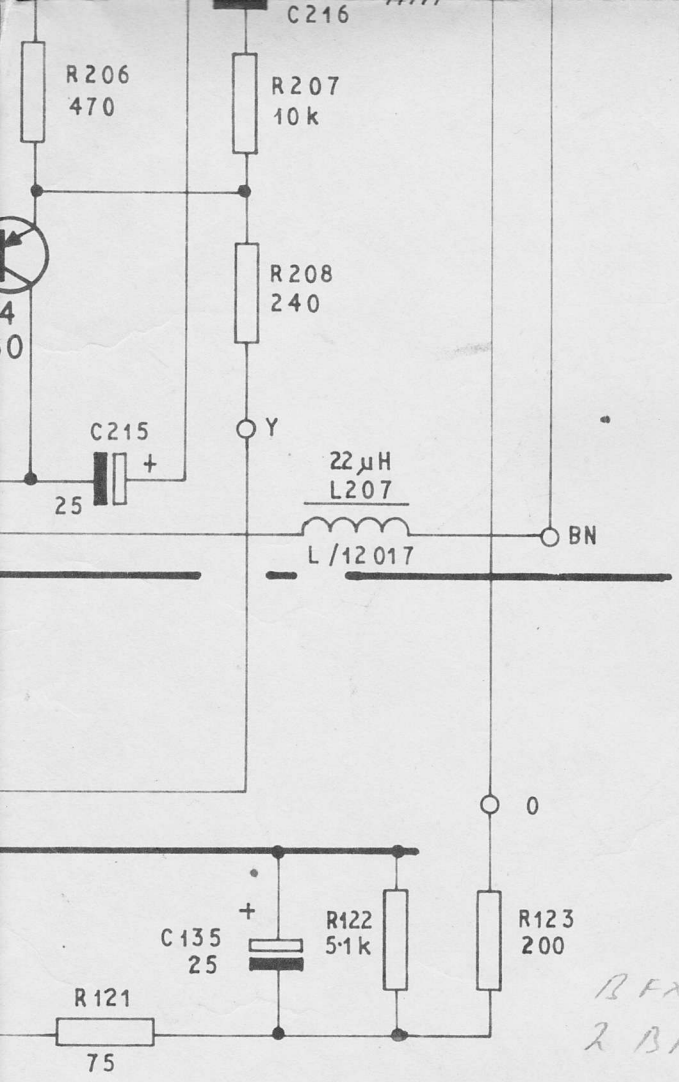


OS3/503 OSCILLATOR VA ABL



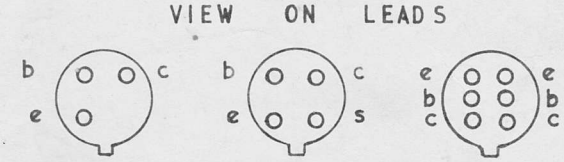
ABL FREQUENCY CIRCUIT


750 p
C207
910 p
C209
750 p
C211
430 p
C213
C216
R206
470
R207
10 k
L203
L204
L205
14 B / ~~148~~ 147
14 B / 149
14 B / 150
R208
240
8·2 p
20 p
130 p
TR204
BFX30
C208
C210
C212
L 206 22 µH
L / 12017
C215
+
25
Y
22 µH
L207
L / 12017
VOLTAGE CONTROLLED OSCILLATOR
Y
0
R119
12 k
1n
C130
C 132
470
C133
470
C135
25
+
R122
5·1 k
R121
75
L111
A.O.T.
D103
BB142
D104
BB142
D105
BB142
TR107
HP21-
35821E
12 p
C131
R120
470
1n
C134
TRANS
VIEW
b
c
e
BSX 20
BC 108
BFX 30
BCY 71
c
e
b
BFW 92
BFR90
PARTS LIST: D31864A4
DRN. G.W.W.
TCD. B.Y.
CKD. M.J.E
APPD
TR101
TR105



BFX
2 BFY 90
BFW 30
BC108
2 MC1027P

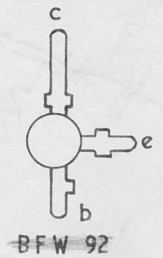
TRANSISTOR TERMINATIONS
VIEW ON LEADS



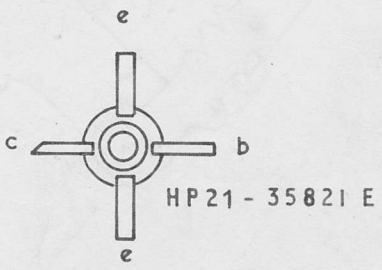
BSX 20
BC 108
BFX 30
BCY 71

BFY 90
BFW 30

BFX 11

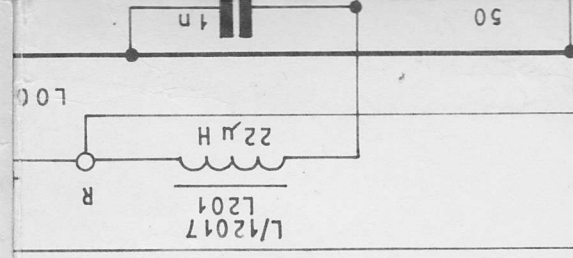


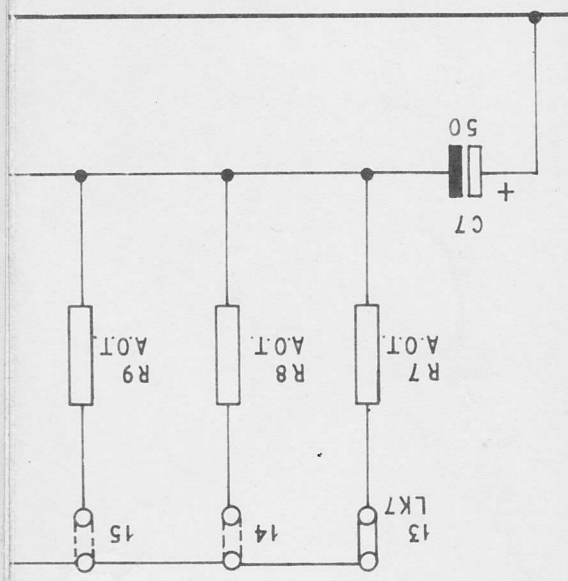
~~BFW 92~~
BFR90

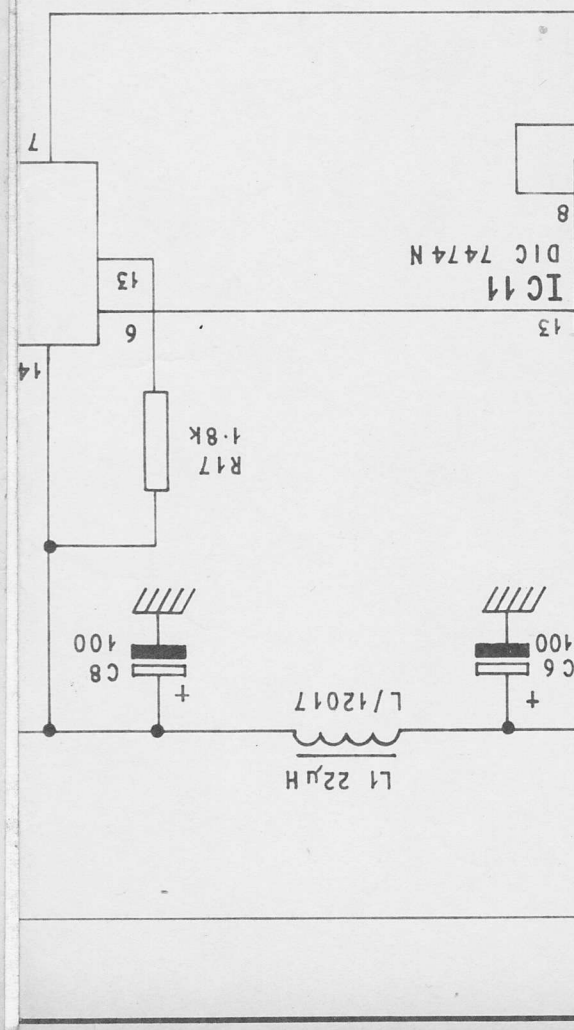


HP21-35821 E

PARTS LIST: D31864A4







DRN.	G.W.W.	DESIGNS DEPARTMENT	
TCD.	B.Y.	D31863A1	
CKD.	M.T.E		
APPD			

TR101
TR105