
**RADIO TEST SET
MAINTENANCE MANUAL**

**2965, 2965A,
2966A,
2967 & 2968**

Volume Two

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Printed in the UK

Manual part no. 46882-168

Issue 6

21-Apr-99

Chapter 7

SERVICING DIAGRAMS

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Circuit notes

Component values

Resistors : R = ohms, k = kilohms, M = megohms.
 Capacitor : μ = microfarads, n = nanofarads, p = picofarads.
 Inductors : μ = microhenries, m = millihenries.
 SIC : value selected during test, nominal value shown. In some instances, no component may be fitted.

Symbols

Symbols are to IEC617 (BS 3939) with the following additions :



Static sensitive component



Test point



Unit identification

Interconnections AE

1. +PL? - REVERSIBLE CONNECTORS
2. AE8 BOARD IS FITTED FOR OPTION 9 (SSB), AND/OR OPTION 21 (GSM).
3. IF AE8 IS FITTED, CABLE PREVIOUSLY ON AE7/PLJ IS FITTED TO AE8/PLJ.
4. NOTE CIRCUIT REFERENCES AE5 AND AE5/1 ARE INTERCHANGEABLE.

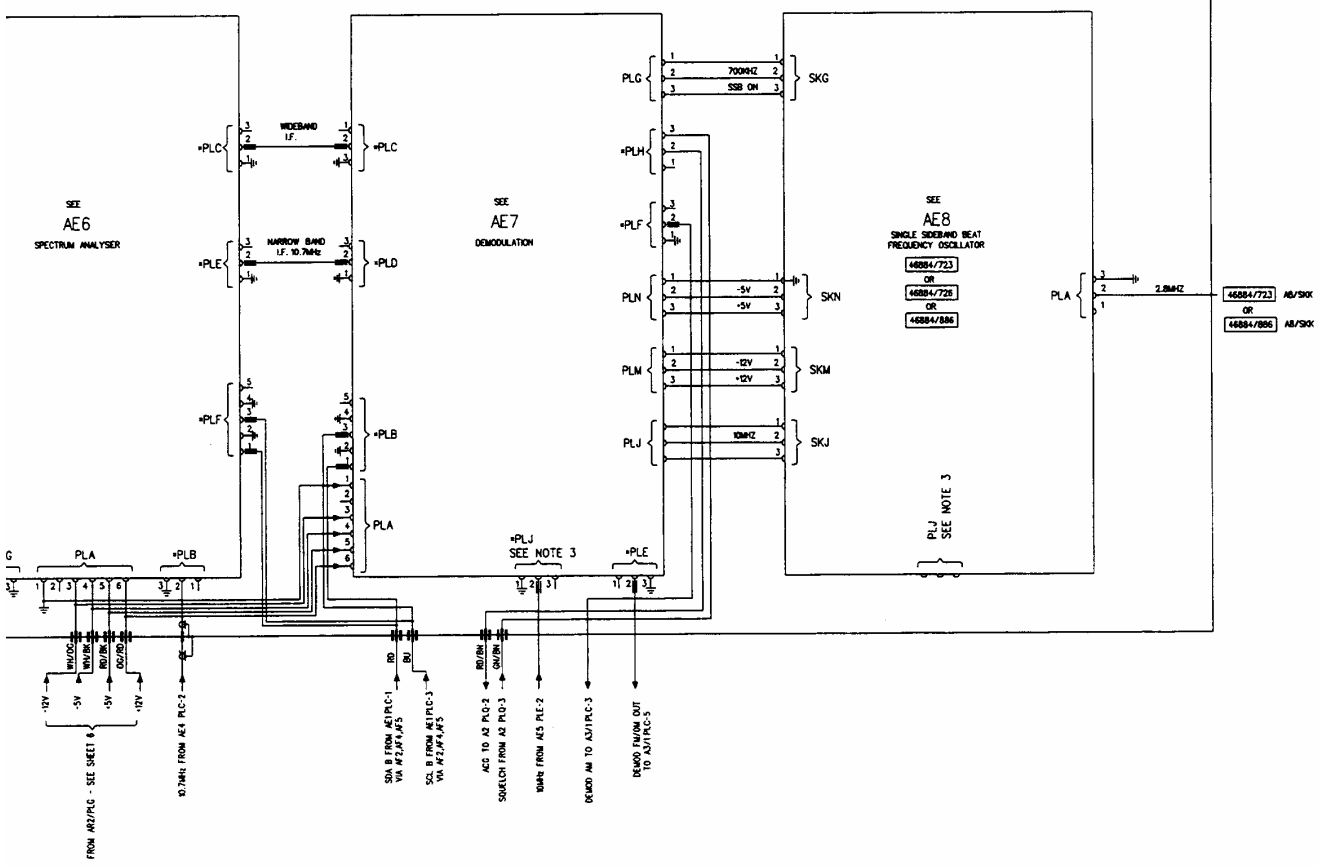
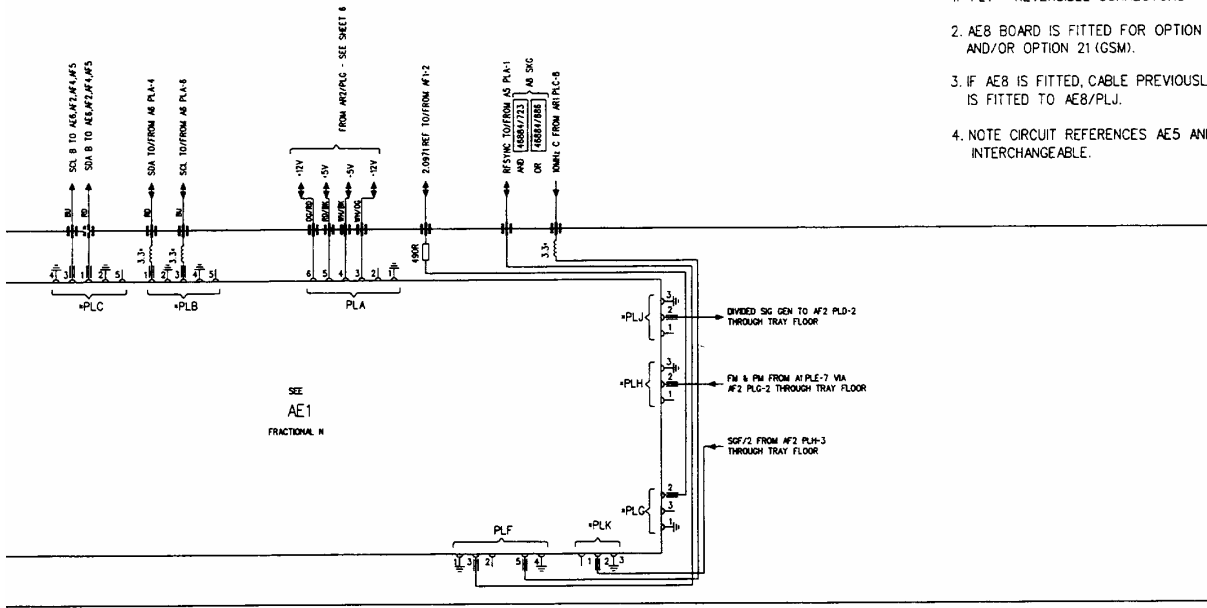
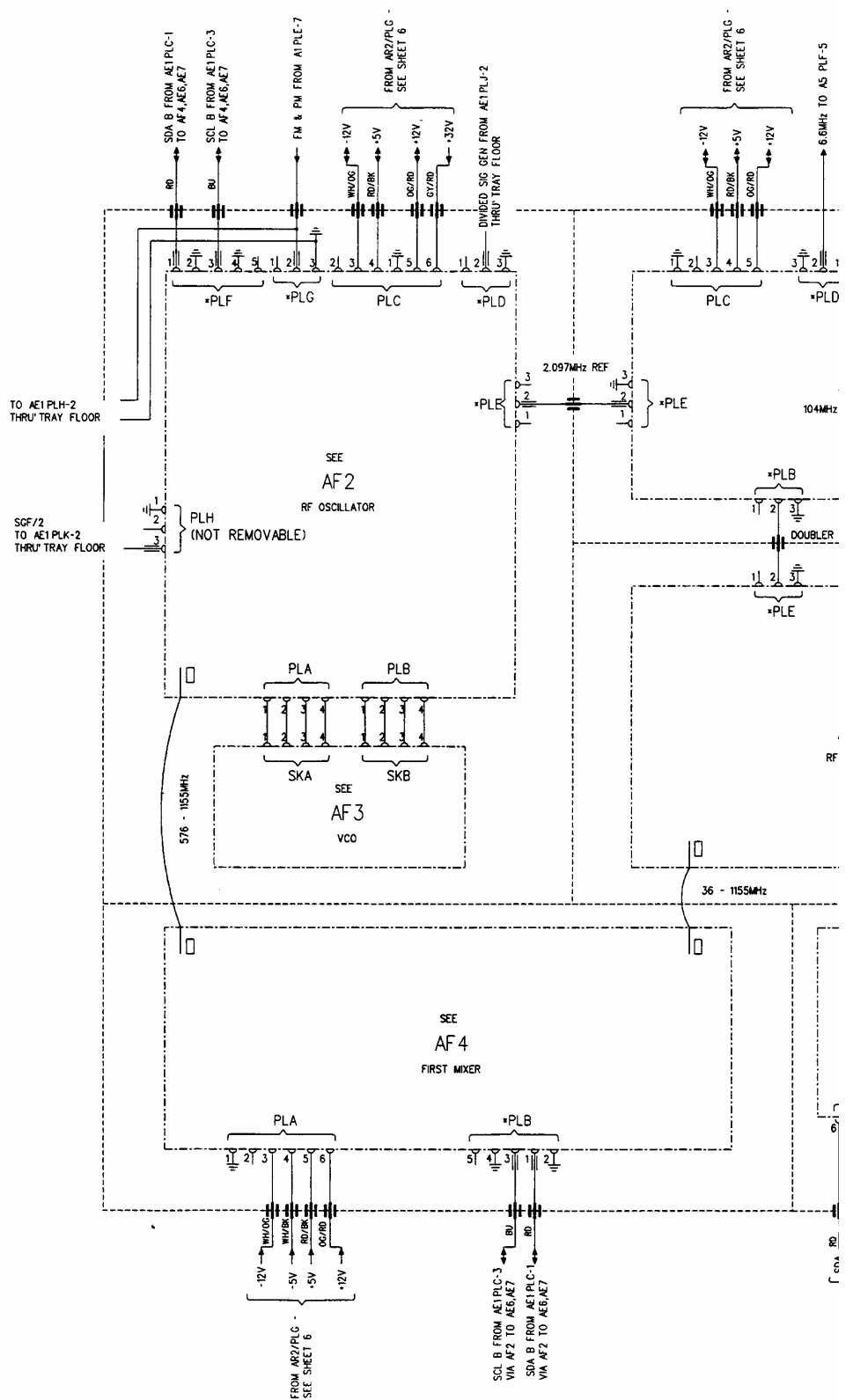
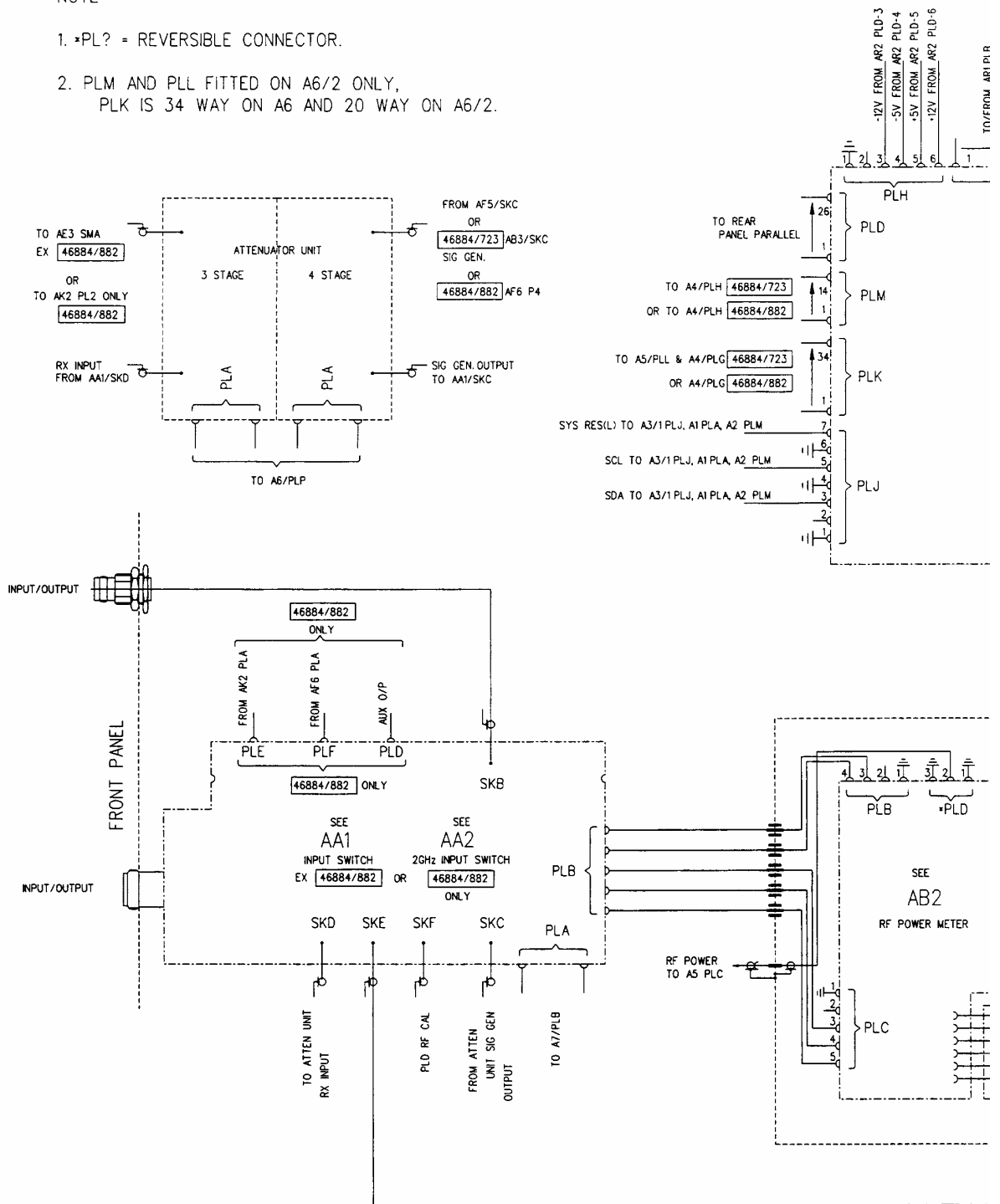


Fig. 7-1 RF tray - interconnections AE



NOTE:

1. *PL? = REVERSIBLE CONNECTOR.
2. PLM AND PLL FITTED ON A6/2 ONLY,
PLK IS 34 WAY ON A6 AND 20 WAY ON A6/2.



Interconnections A6, A7, AB2, AA1, AA2

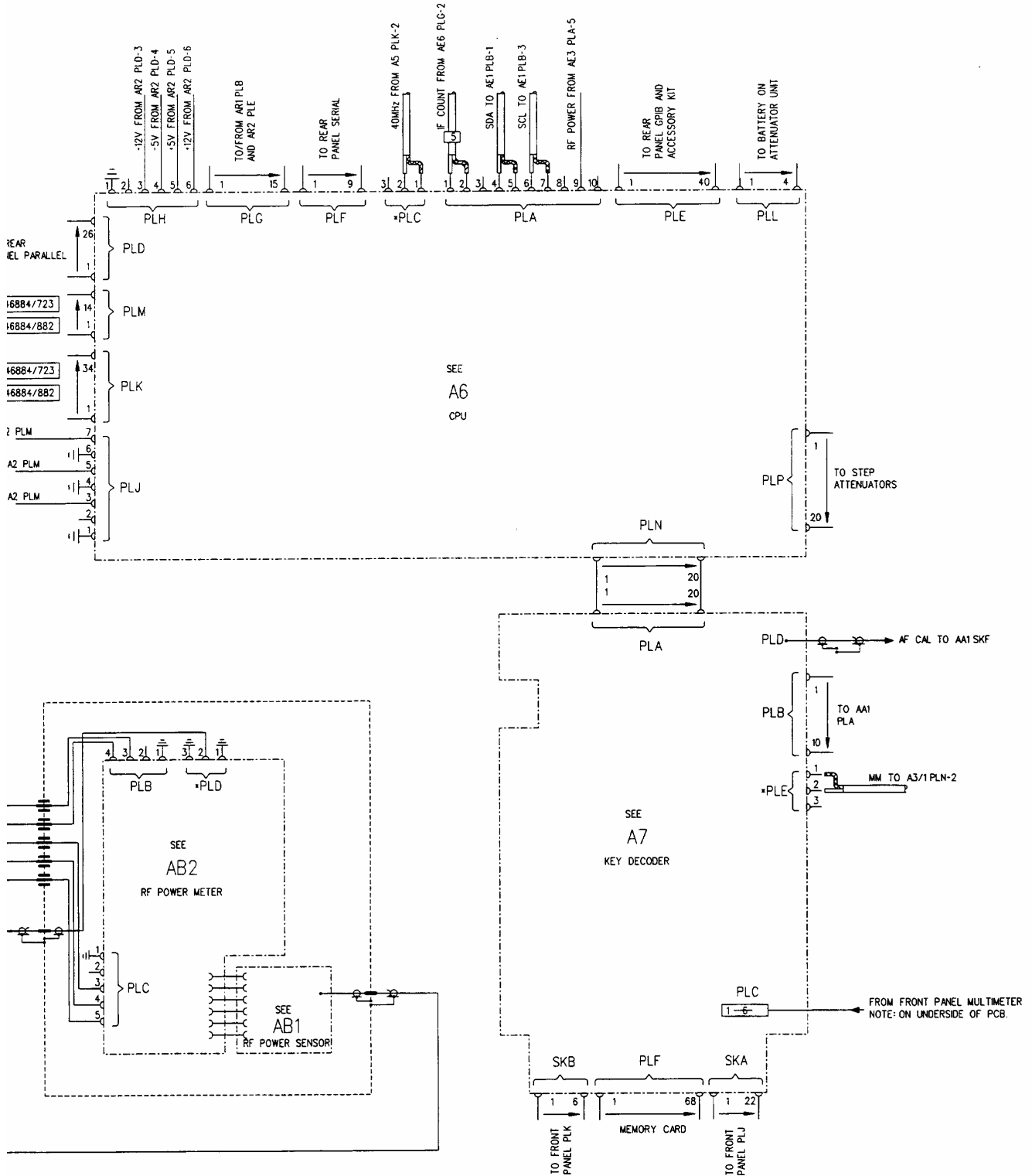
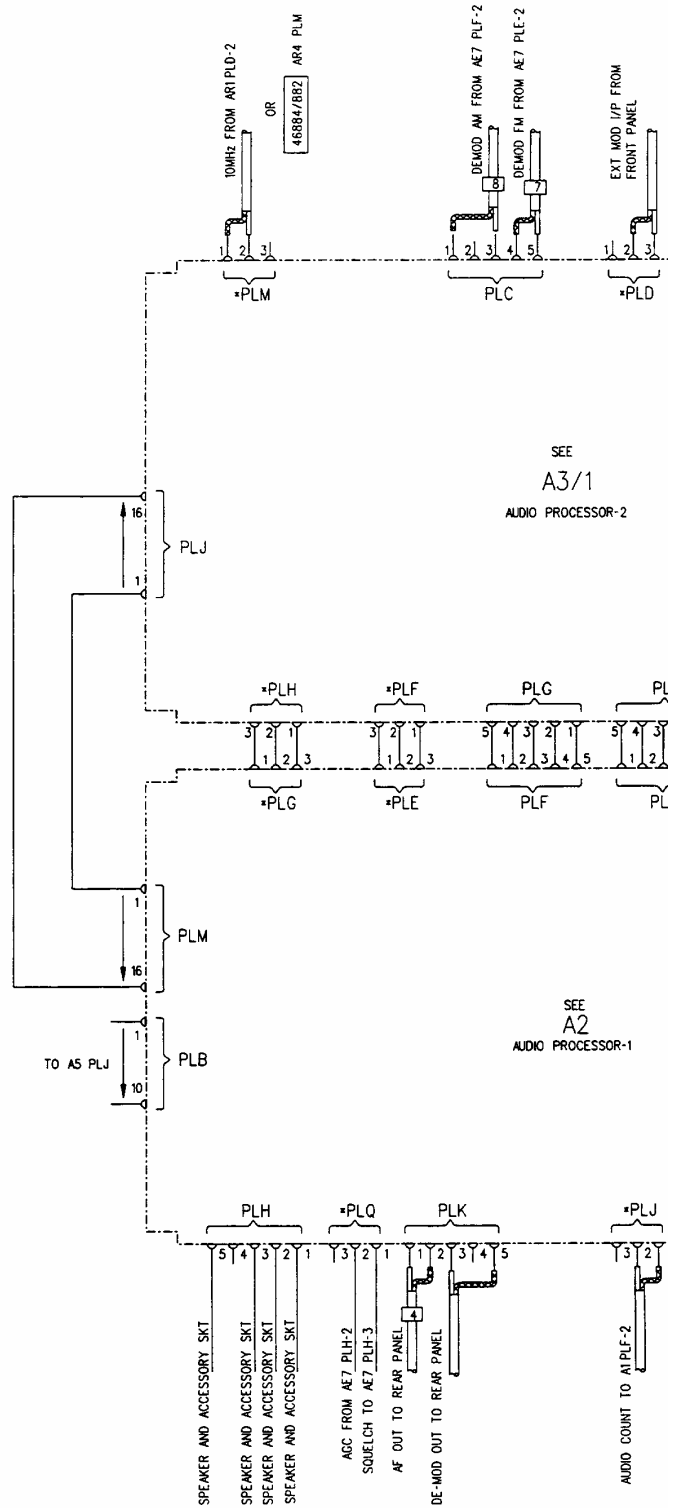
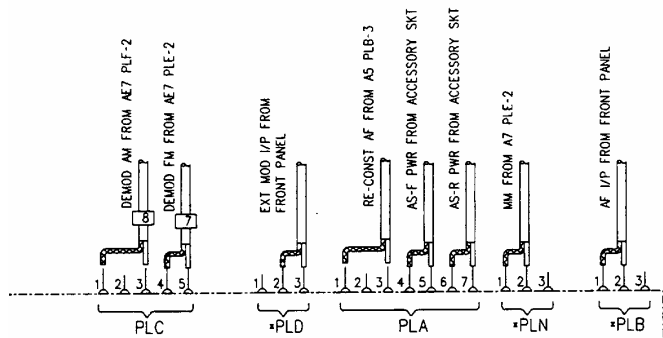


Fig. 7-3 Interconnections A6, A7, AB2, AA1, AA2



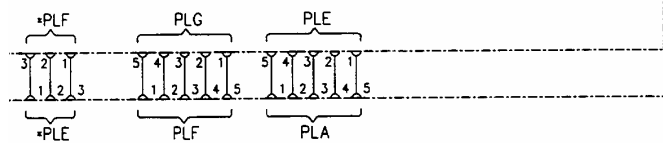
Interconnections A2, A3/1



NOTES:

1. *PL? = REVERSIBLE CONNECTORS

SEE
A3/1
AUDIO PROCESSOR-2



SEE
A2
AUDIO PROCESSOR-1

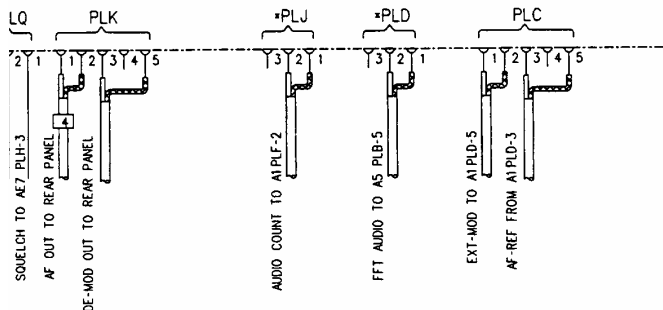
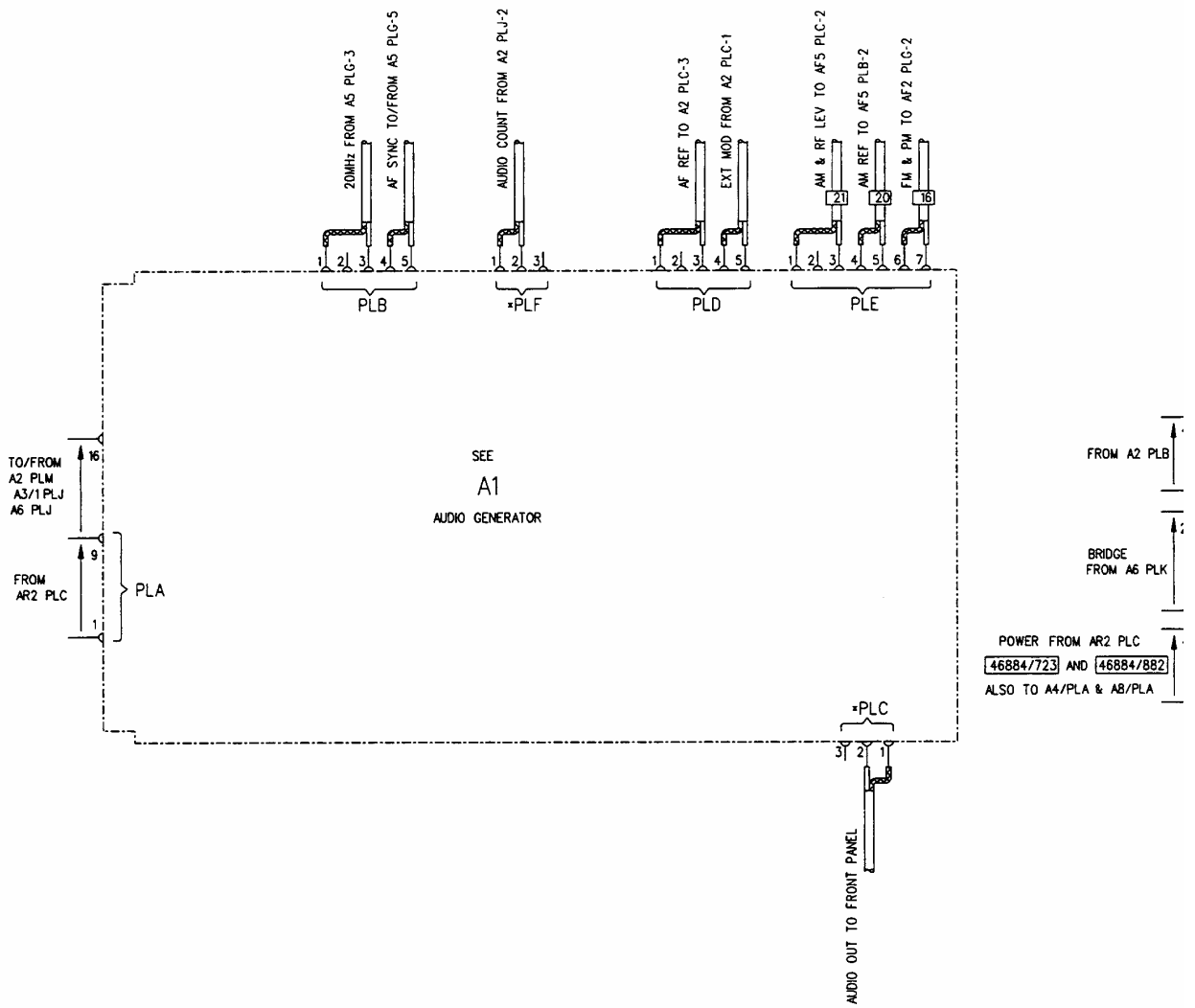


Fig. 7-4 Interconnections A2, A3/1



Interconnections A1, A5

NOTE:

- 1. *PL? = REVERSIBLE CONNECTORS

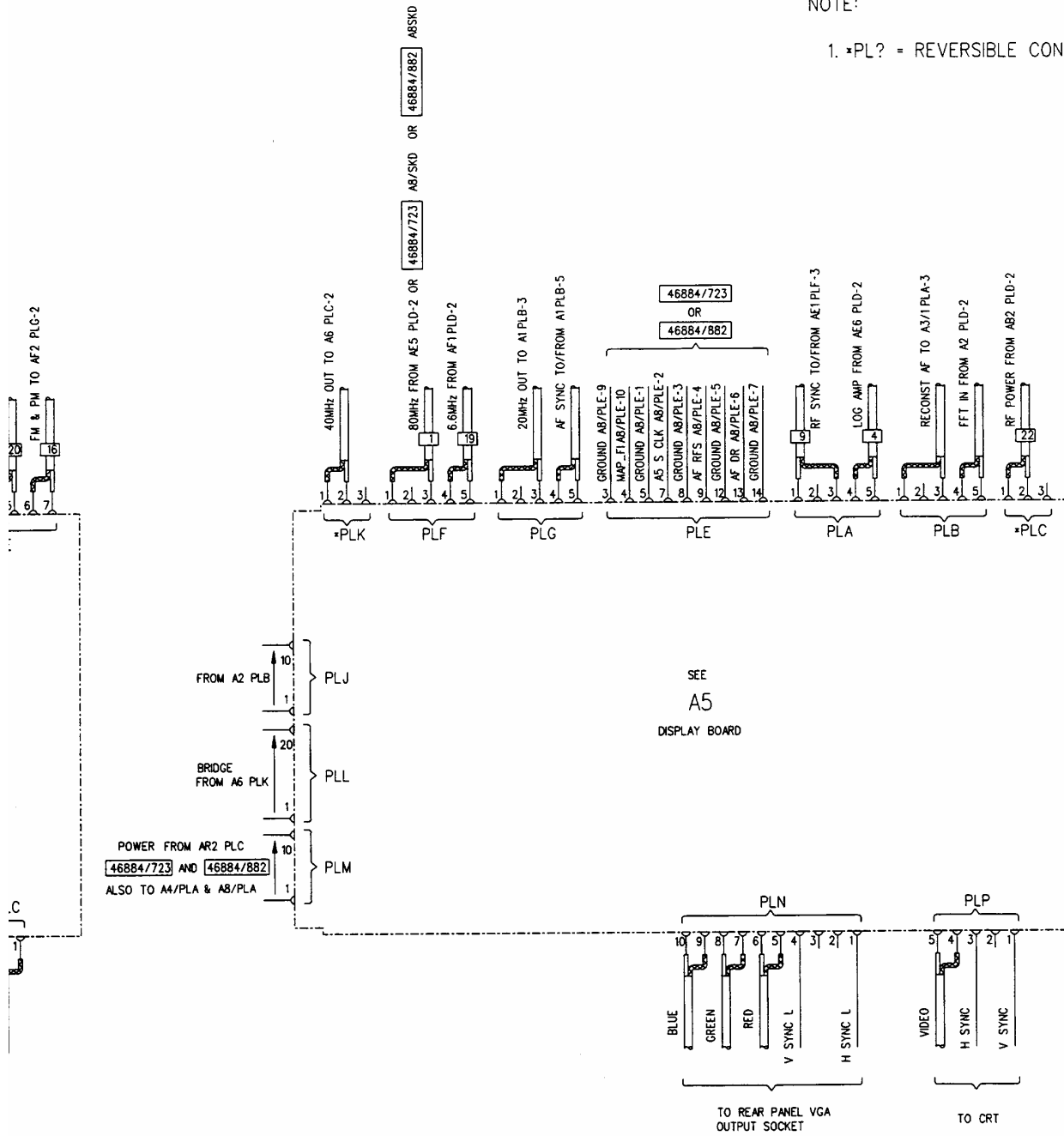
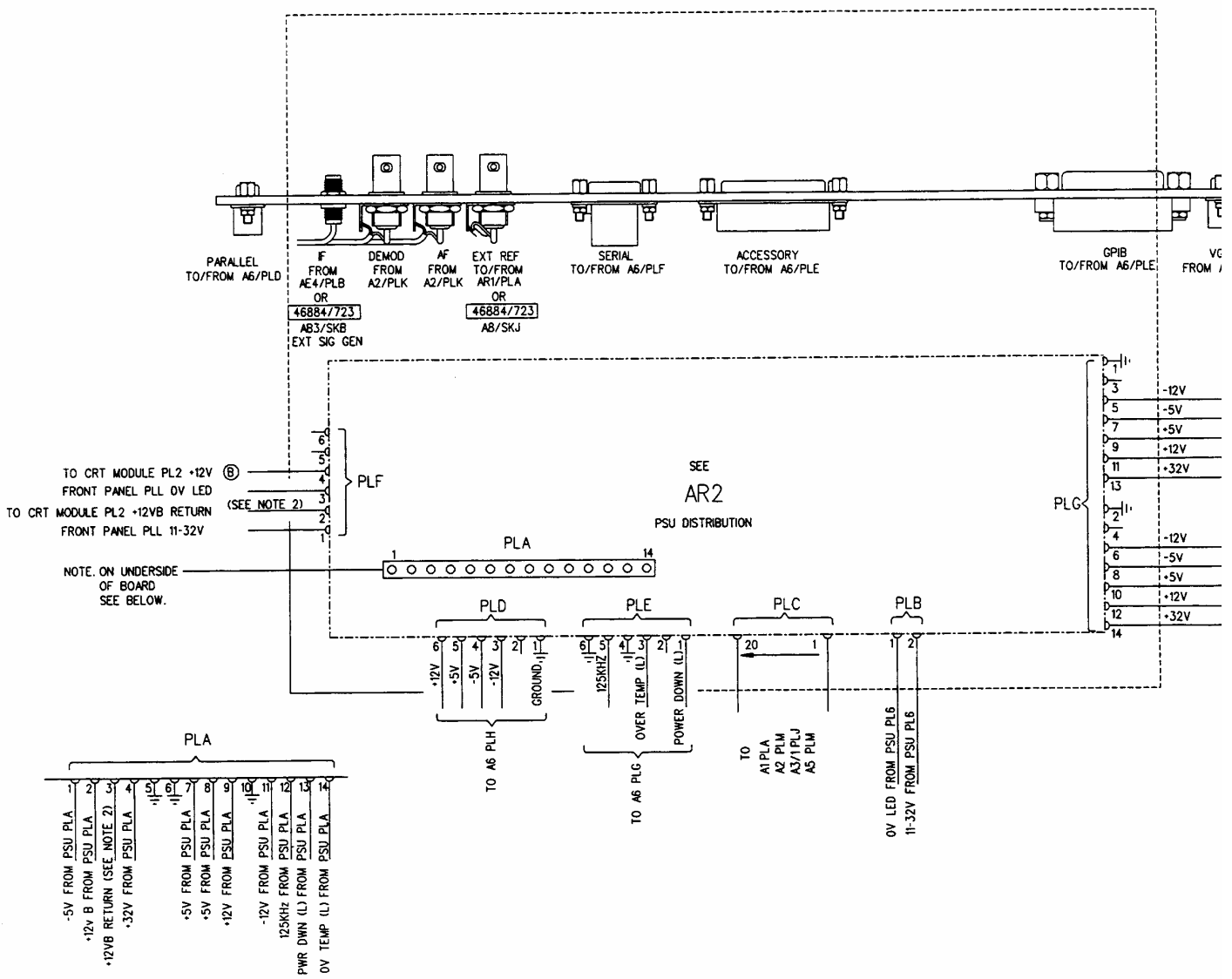


Fig. 7-5 Interconnections A1, A5



Interconnections AR1, AR2

NOTES:

1. *PL? = REVERSIBLE CONNECTORS
 ** = ON EARLY INSTRUMENTS ATTENTION MUST BE PAID TO CORRECT ORIENTATION OF THIS CONNECTOR.
2. +12VB RETURN ISOLATED FROM SYSTEM CHASSIS & EARTH.

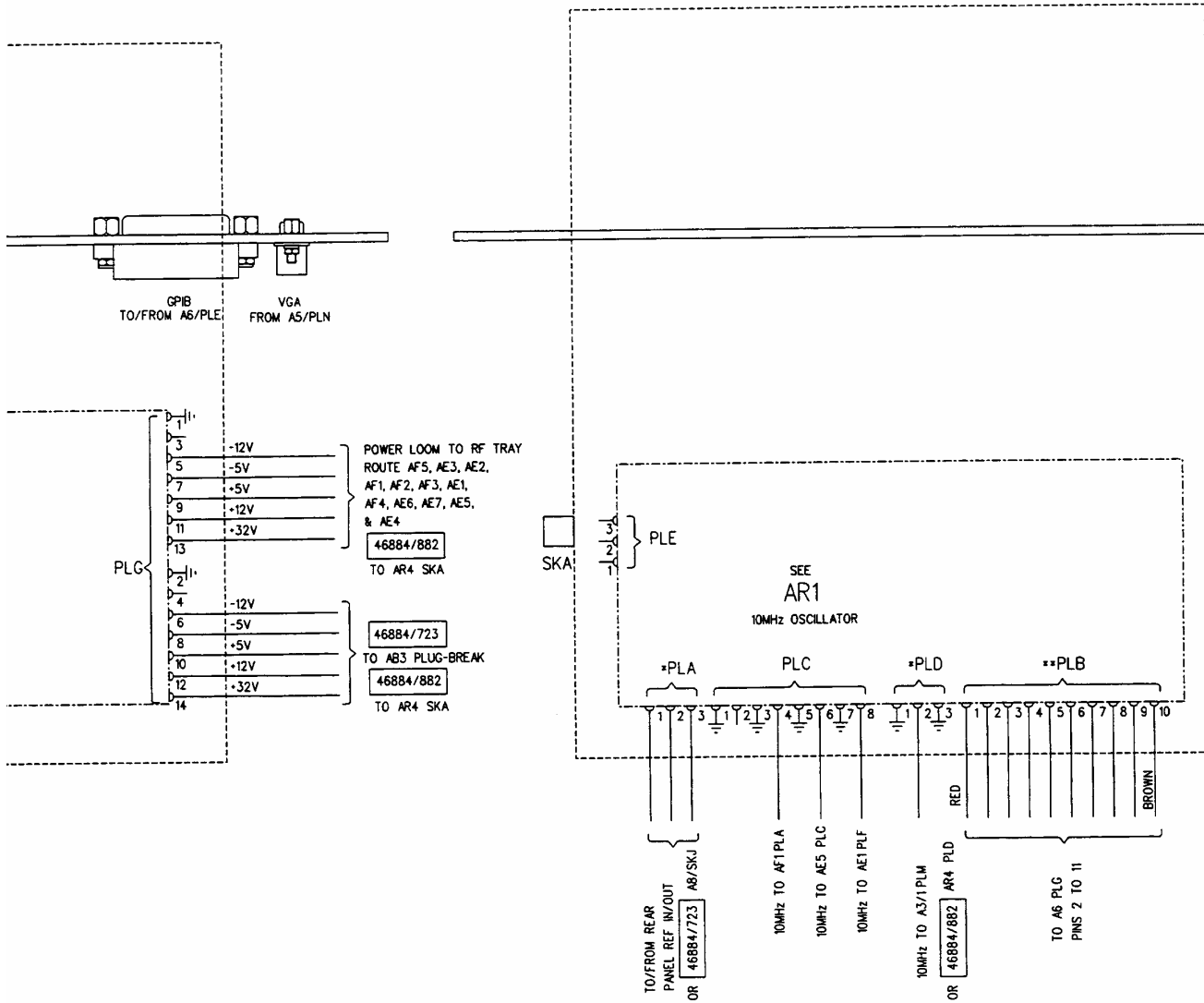
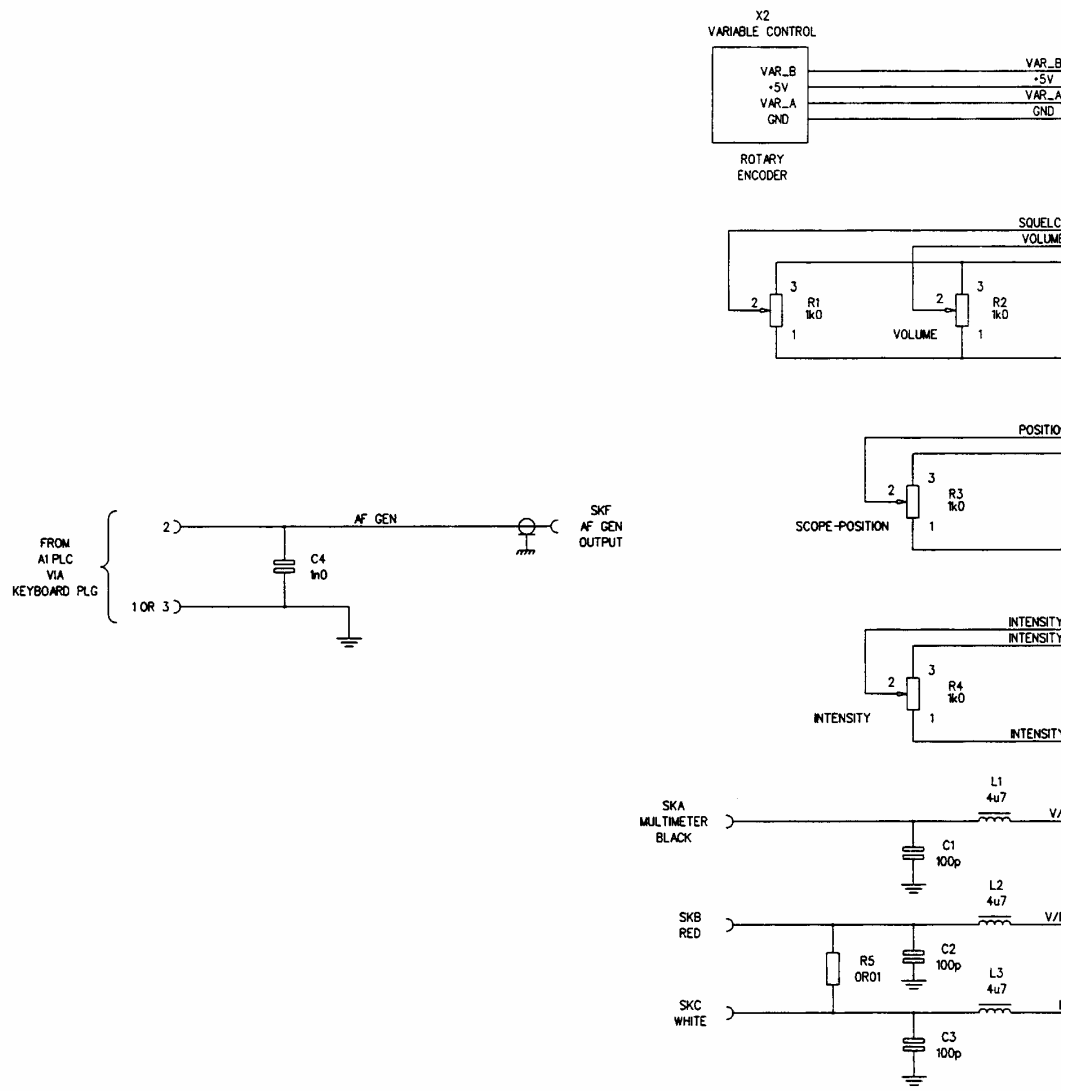


Fig. 7-6 Interconnections AR1, AR2



Interconnections - front panel

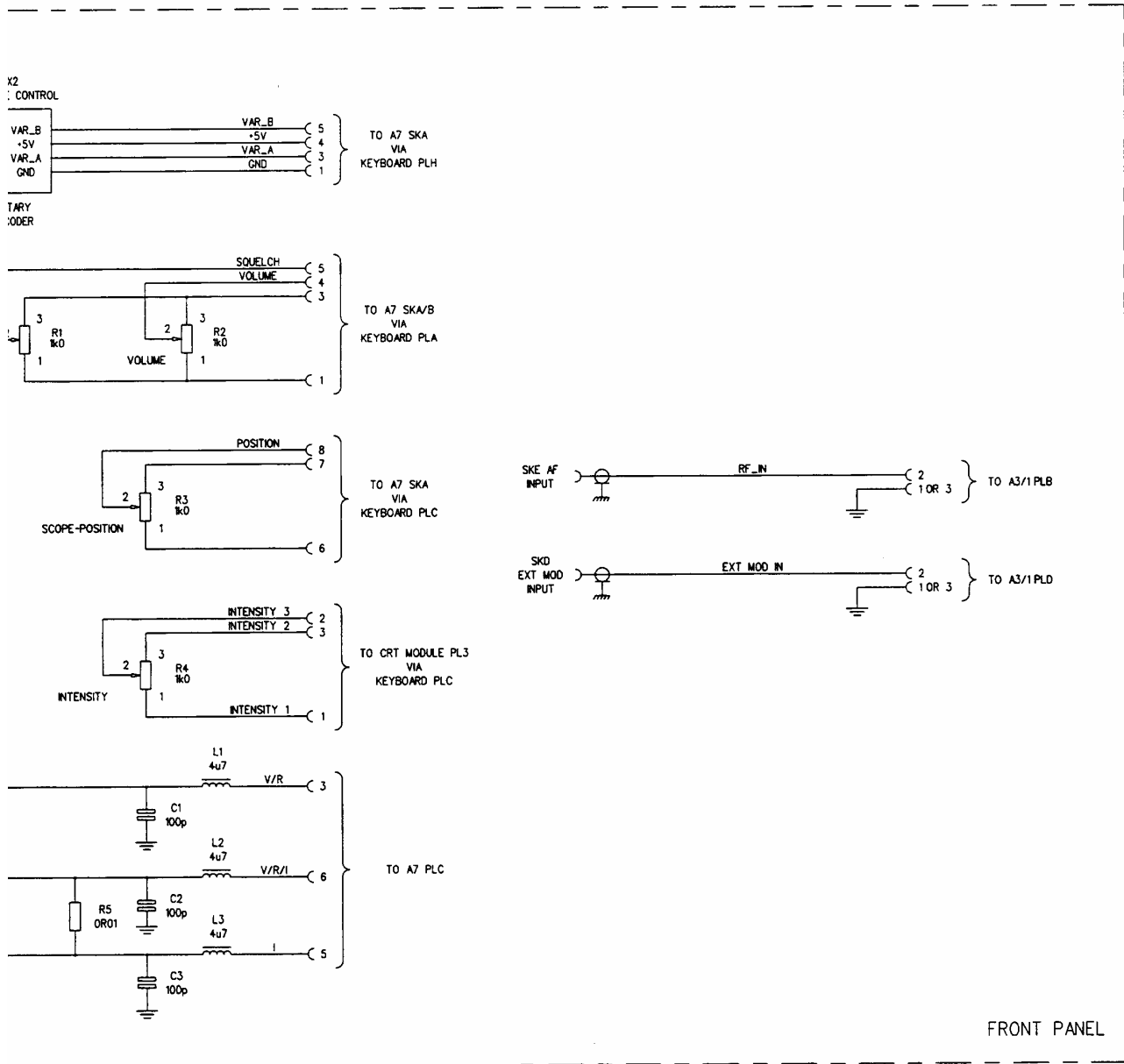
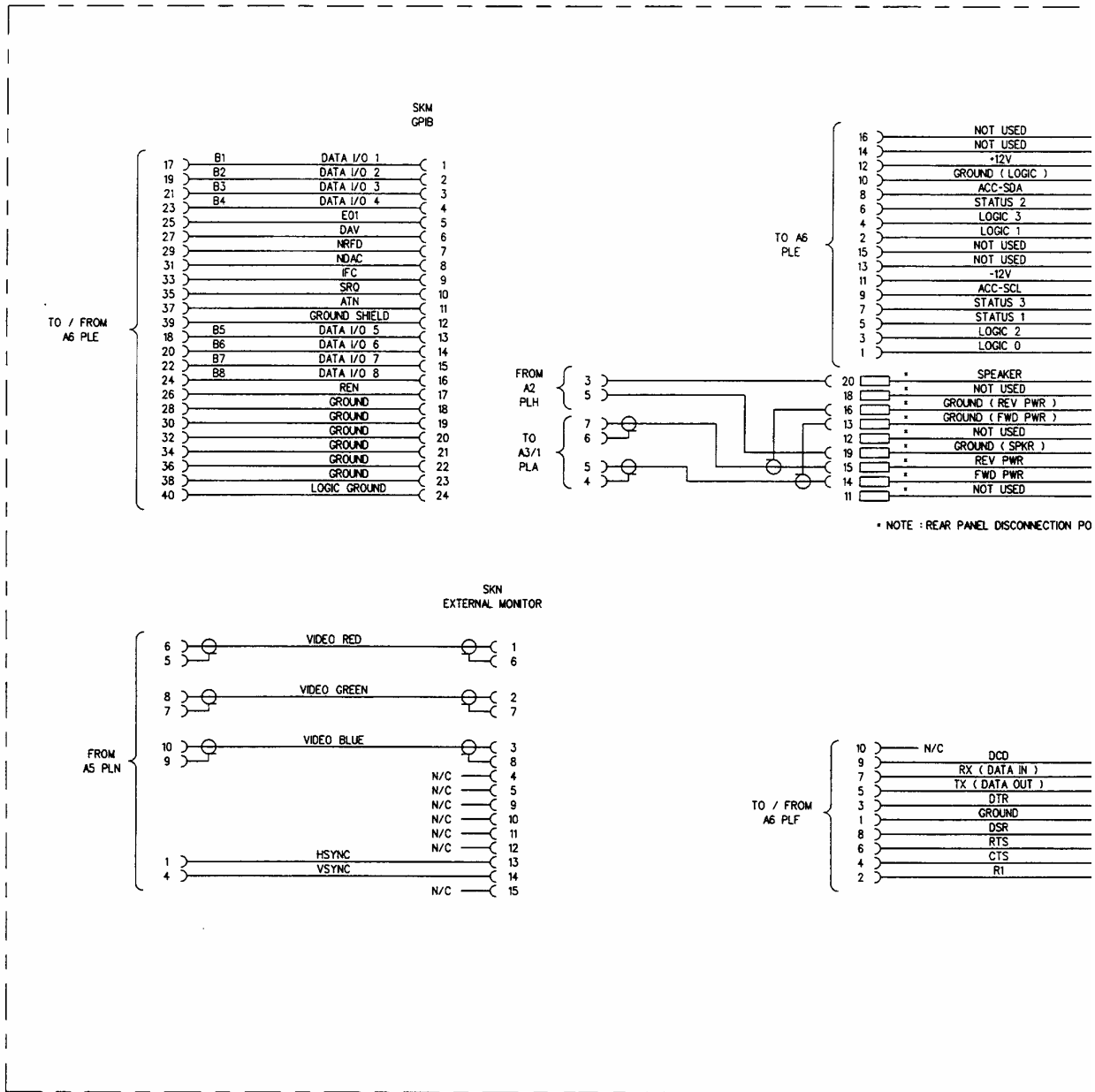


Fig. 7-7 Interconnections - front panel



Interconnections - rear panel

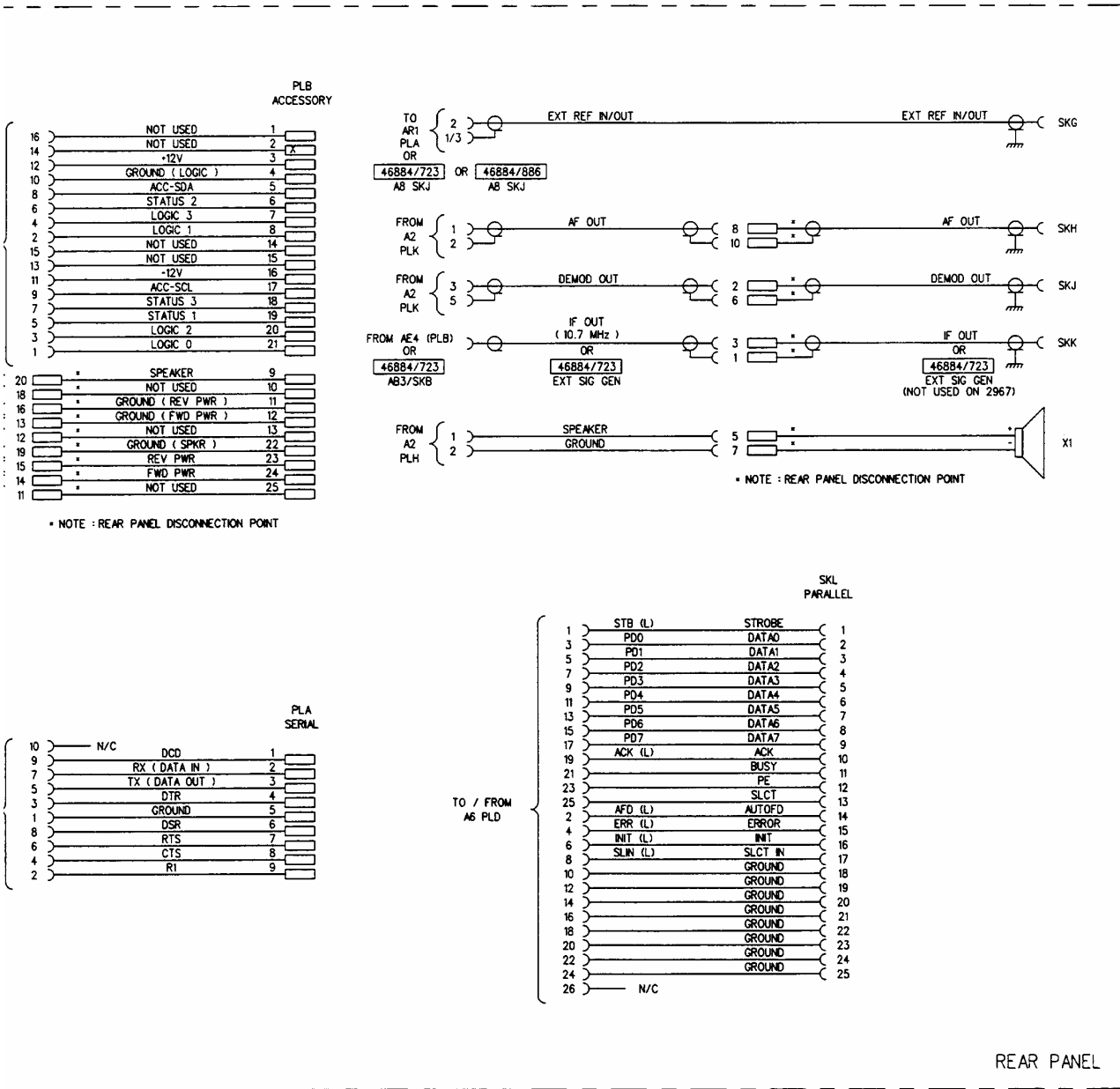
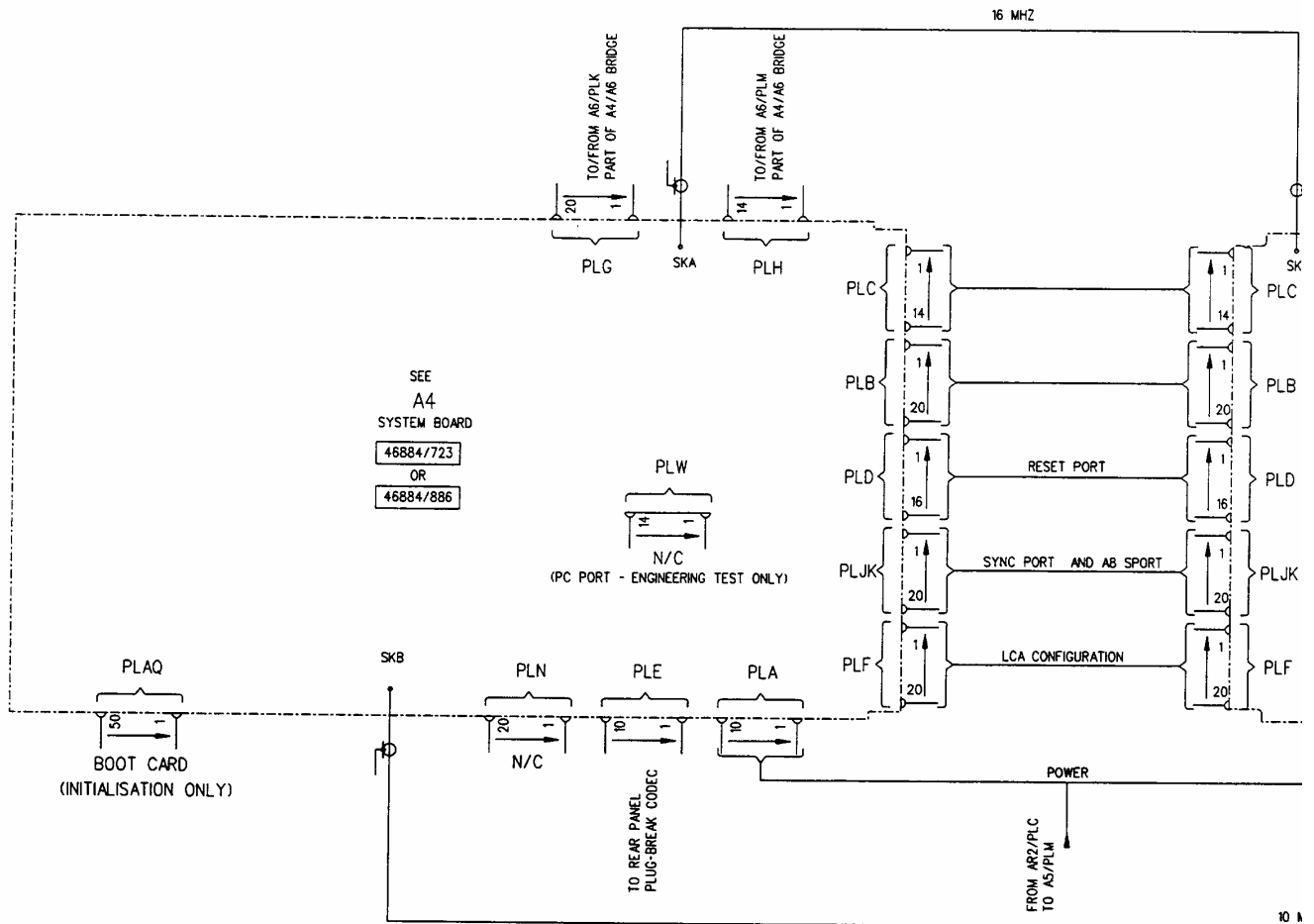
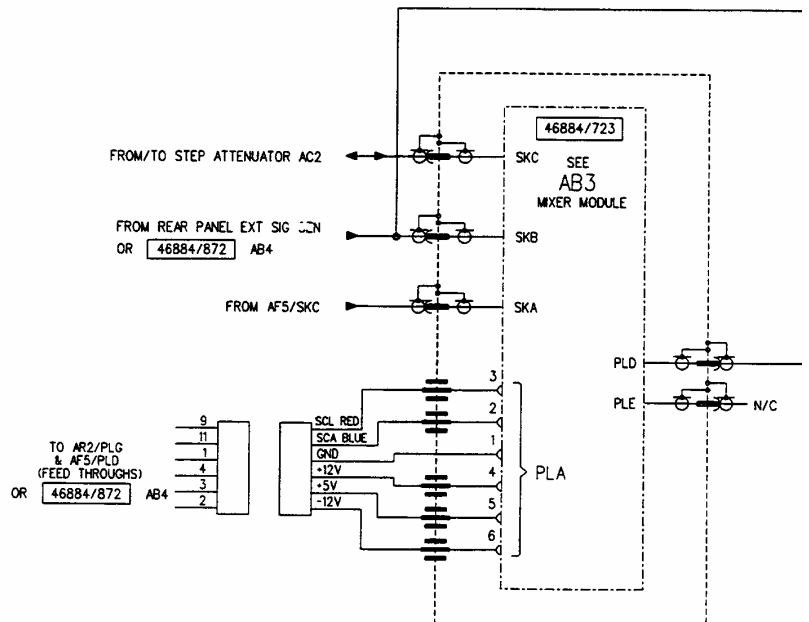


Fig. 7-8 Interconnections - rear panel



NOTES.

- ON 2967 INSTRUMENTS BOTH 46884/882 AND 46884/886 ARE FITTED.
- IF WARPING OPTION 46884/872 IS FITTED, THEN EITHER 46884/723 OR BOTH 46884/882 AND 46884/886 IS REQUIRED.



Interconnections A4, A8, AB3, AB4

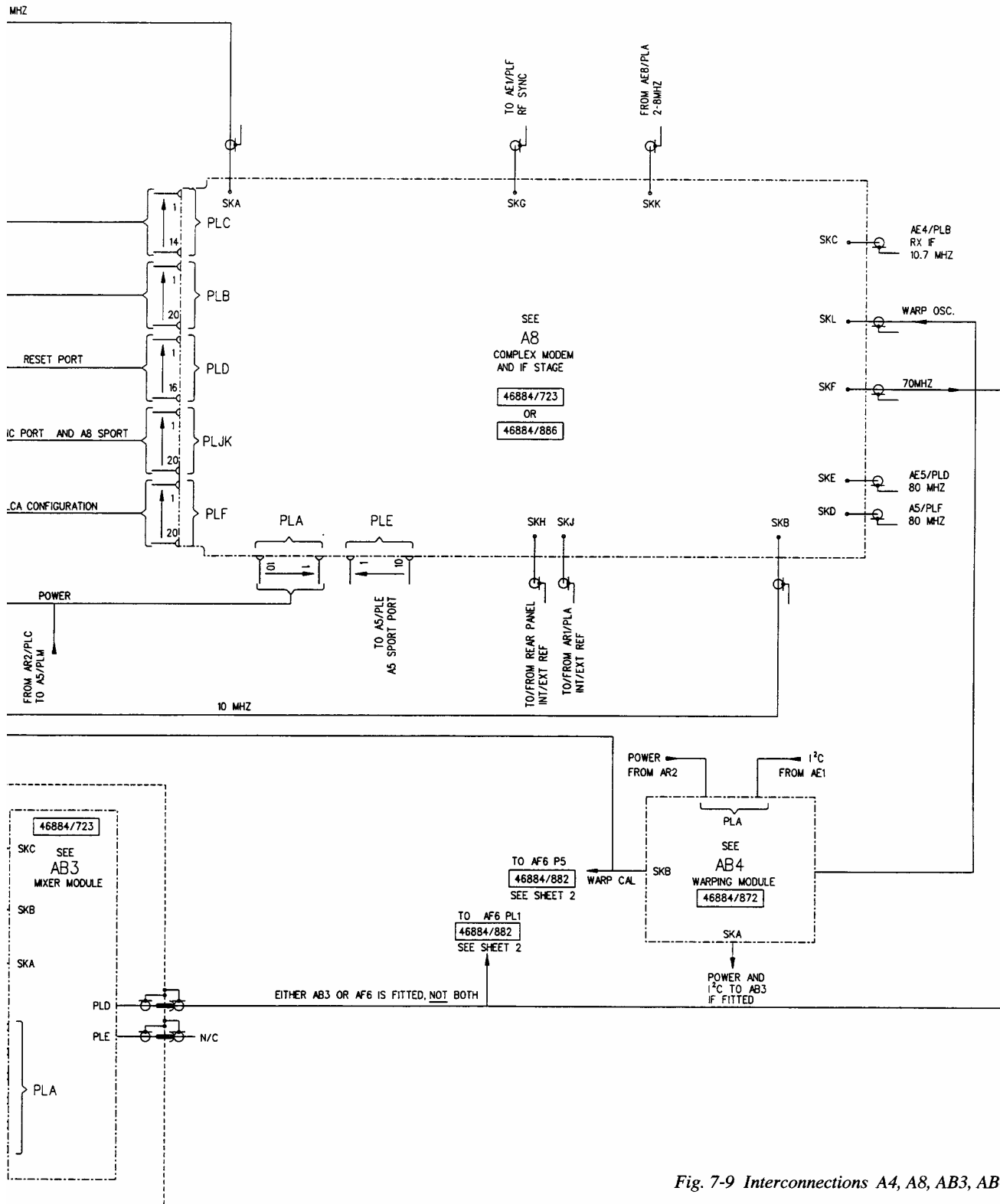
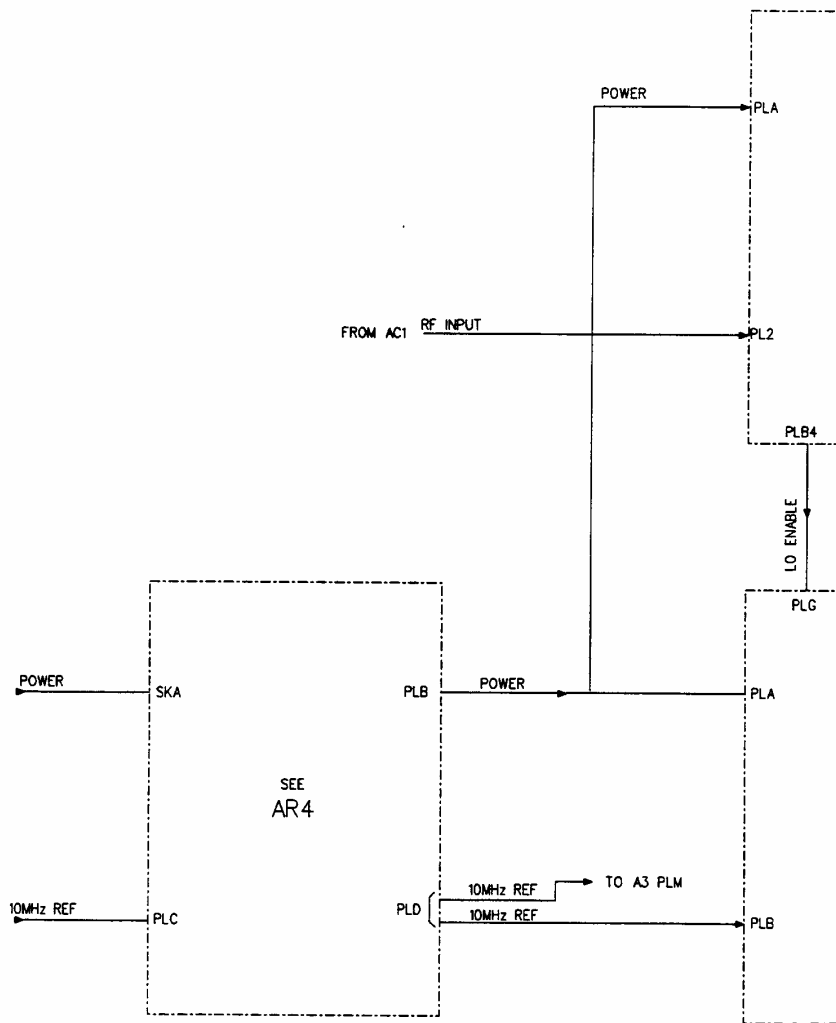


Fig. 7-9 Interconnections A4, A8, AB3, AB4



Interconnections AK1, AK2, AR4

NOTE.

1. AR4, AK1 AND AK2 ARE USED ONLY IN 46884/882

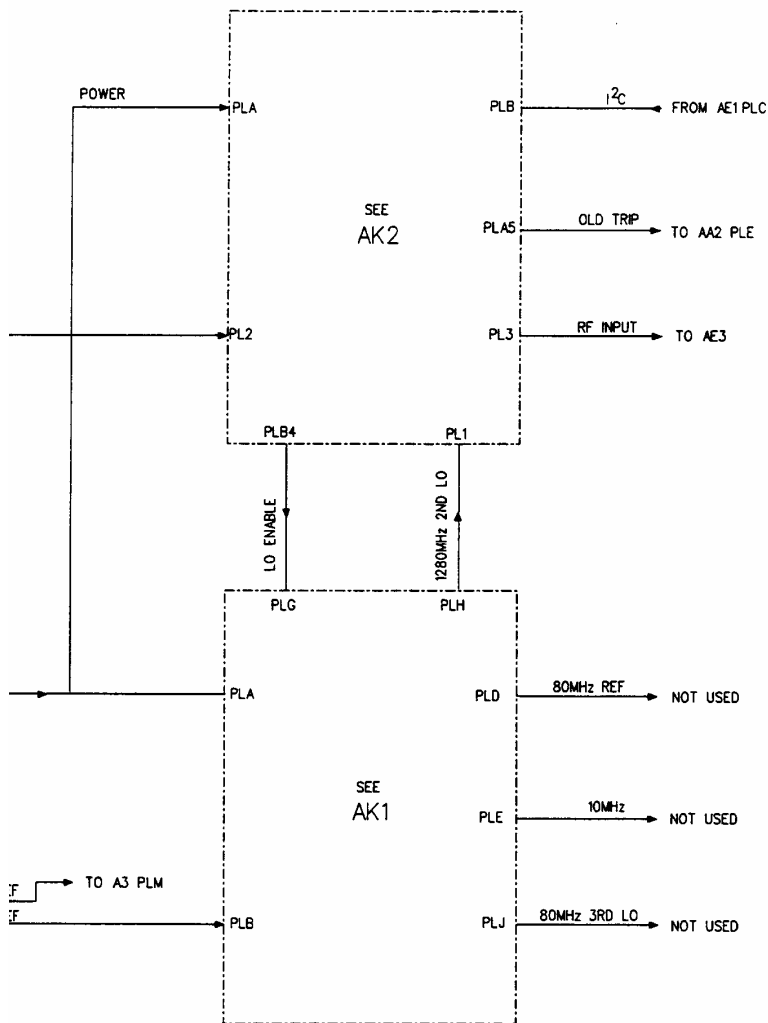
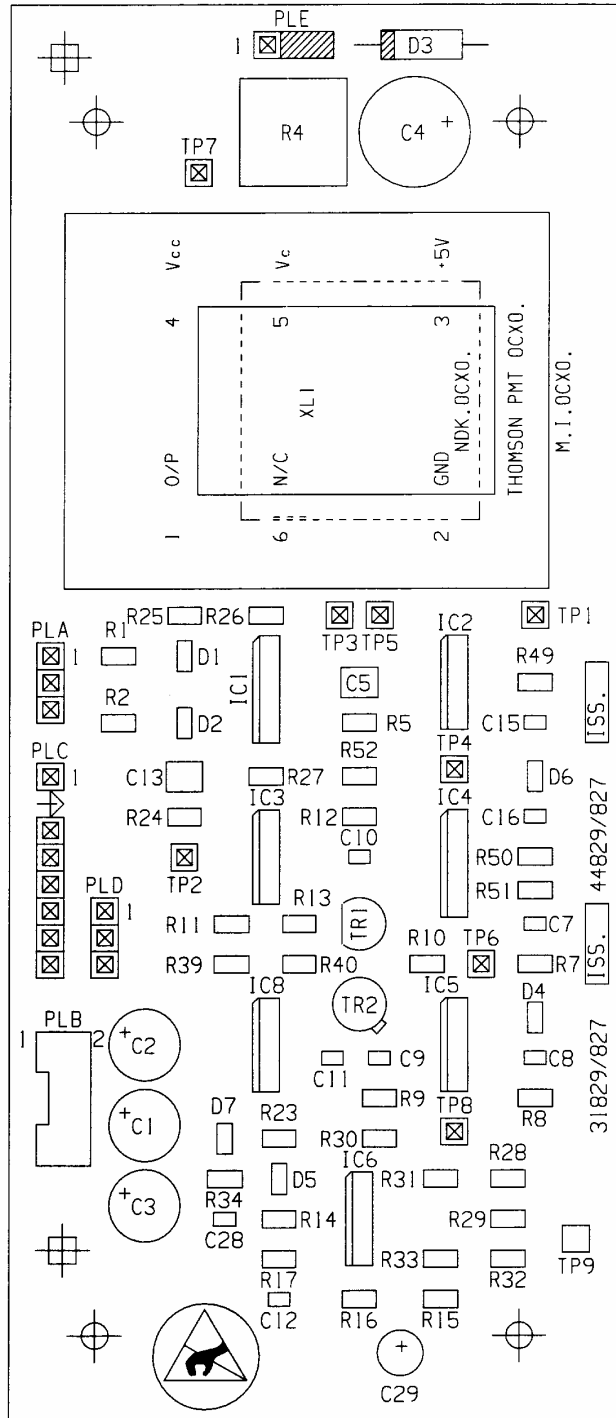


Fig. 7-10 Interconnections AK1, AK2, AR4

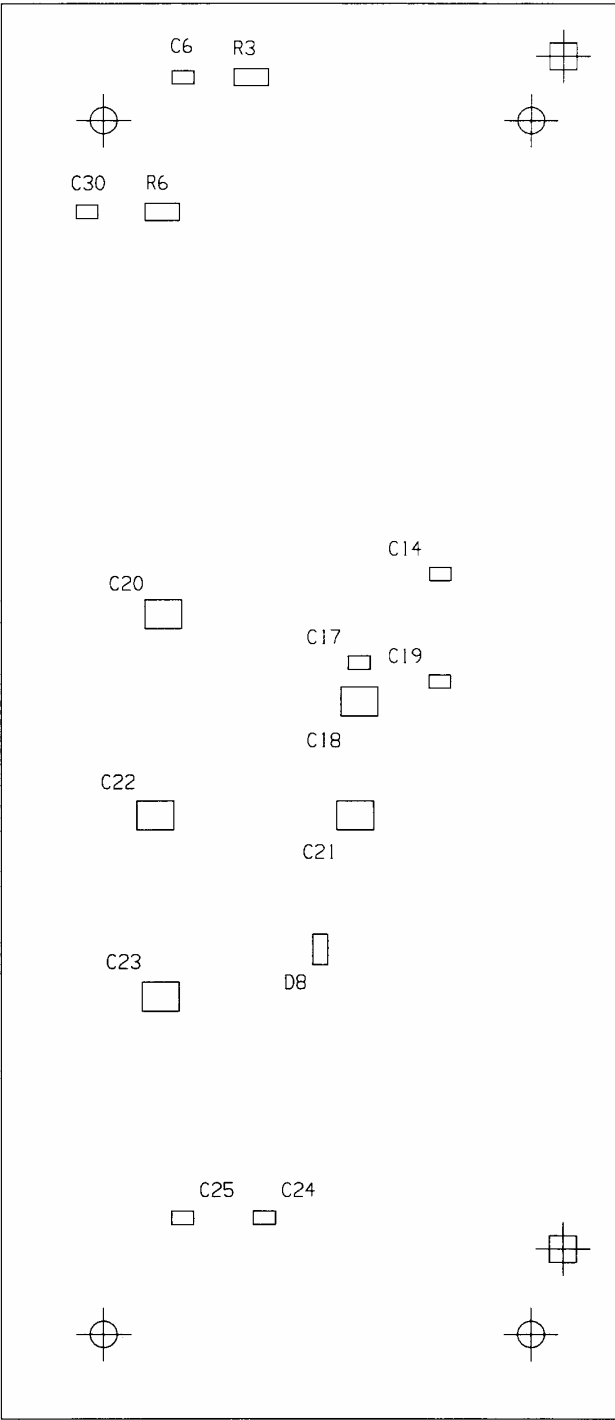
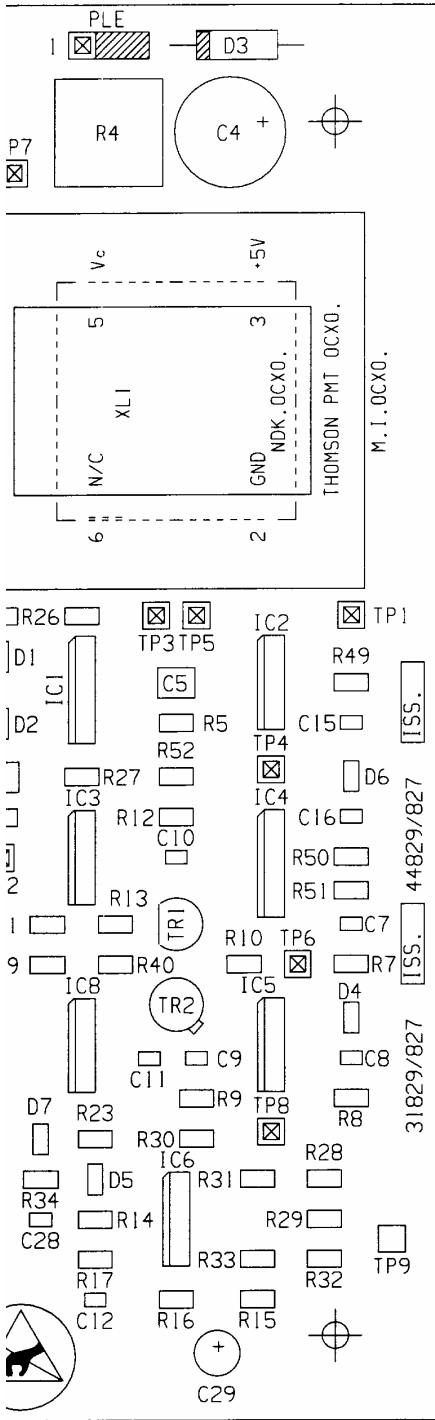
SERVICING DIAGRAMS



Interconnections AK1, AK2, AR4

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Component layout AR1



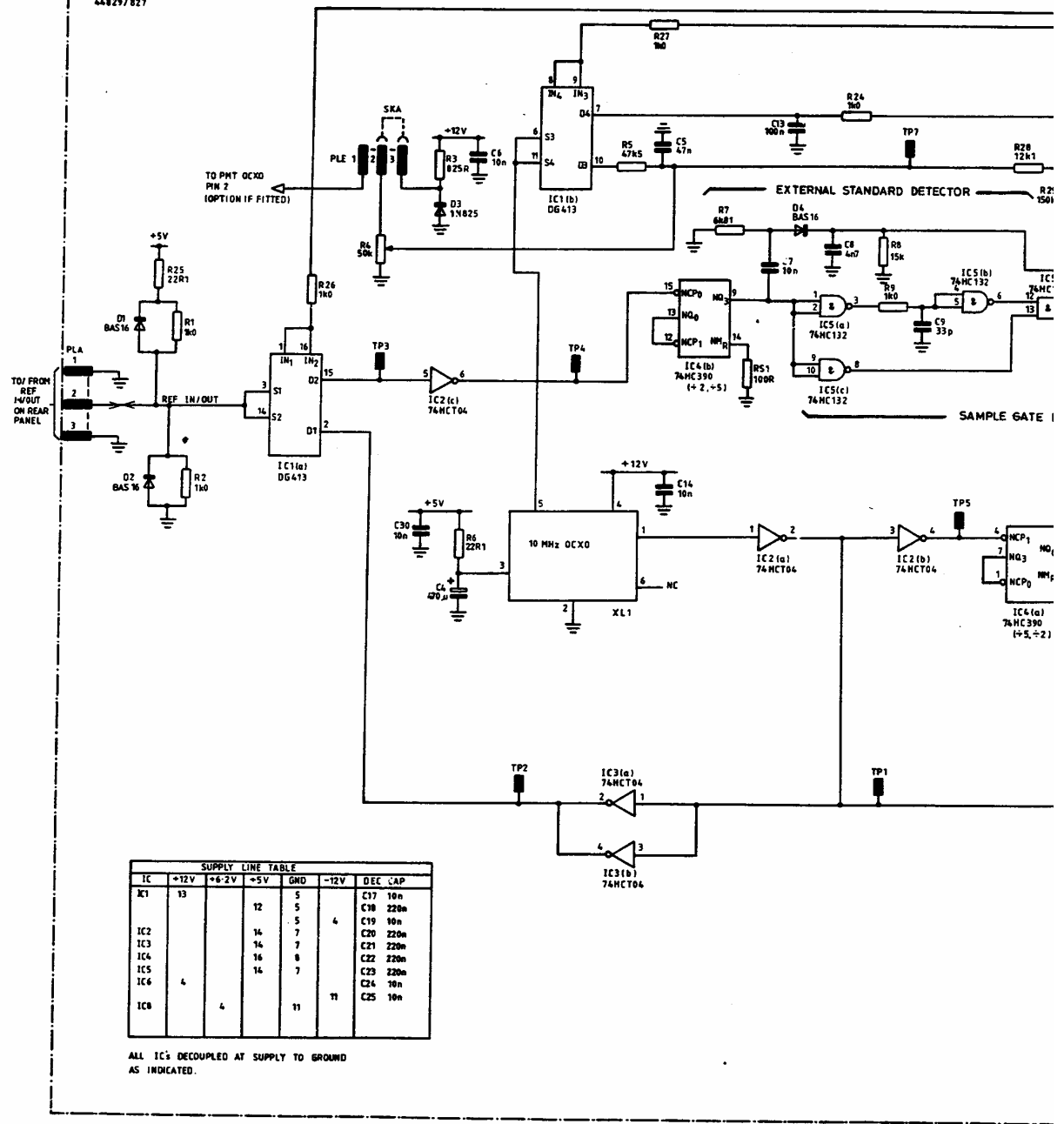
R4

Drq. No. 44829/827 Sheet 1 of 1 Issue 4

Fig. 7-11 AR1 10 MHz OCXO - component layout

AR1
44829/827

INTERNAL / EXTERNAL STANDARD SELECTION



SUPPLY LINE TABLE

IC	+12V	+6-2V	+5V	GND	-12V	DEC. CAP
IC1	13		12	5		C17 10n C18 220n C19 10n
IC2			14	7	4	C20 220n C21 220n
IC3			14	7		C22 220n
IC4			16	8		C23 220n
IC5			14	7		C24 10n C25 10n
IC6	4					
IC8		4		11	11	

ALL ICs DECOUPLED AT SUPPLY TO GROUND AS INDICATED.

Circuit diagram AR1

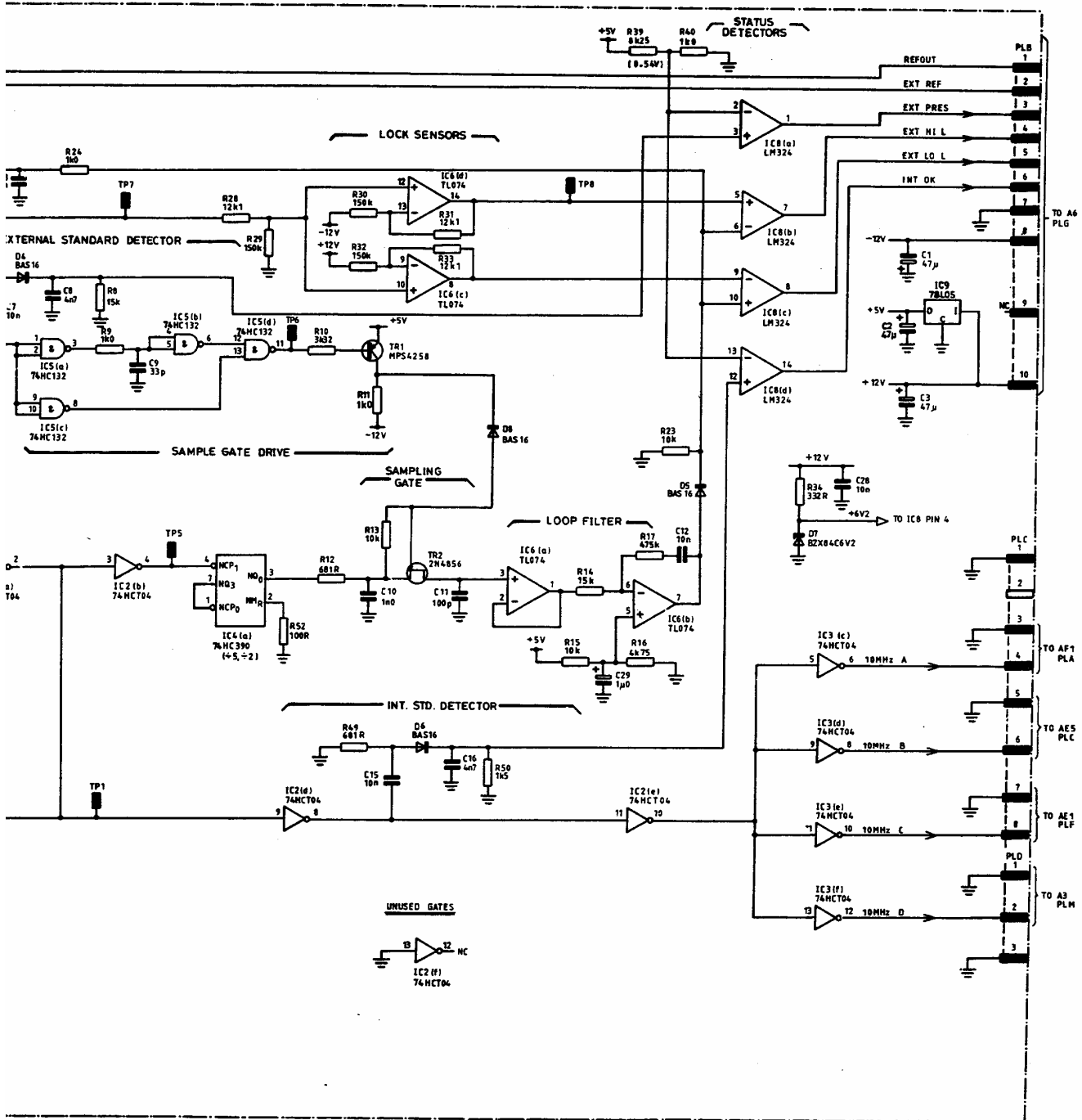
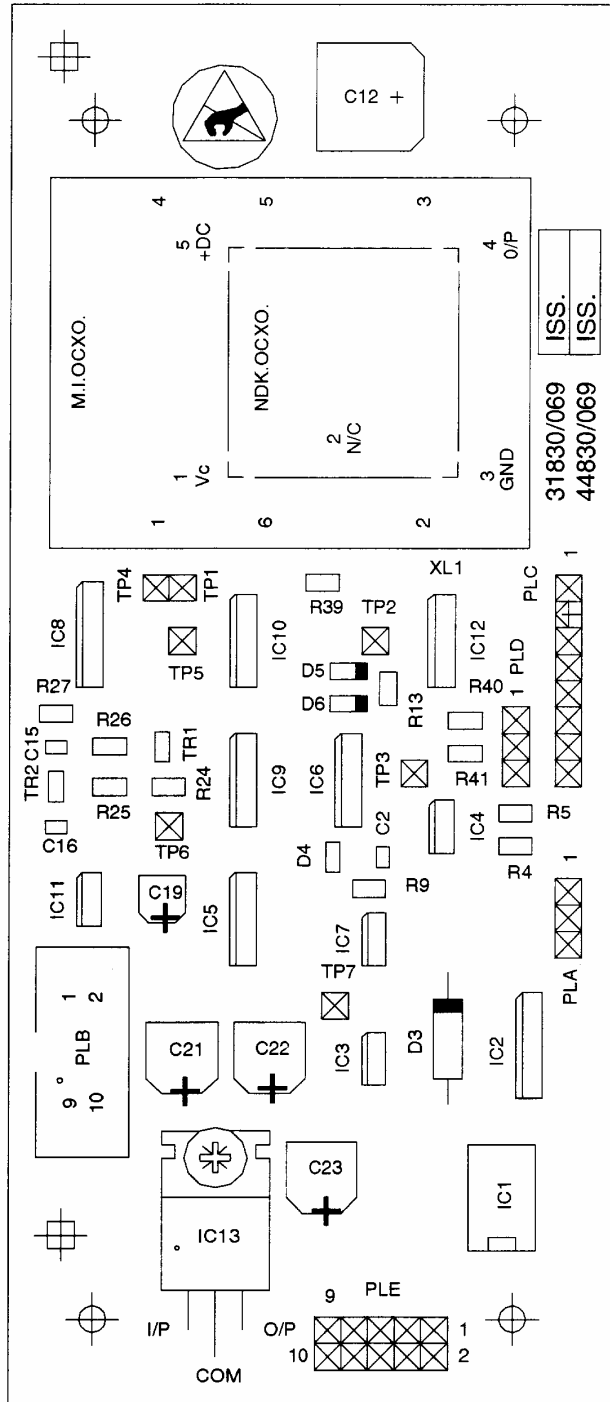


Fig. 7-12 AR1 10 MHz OXO - circuit

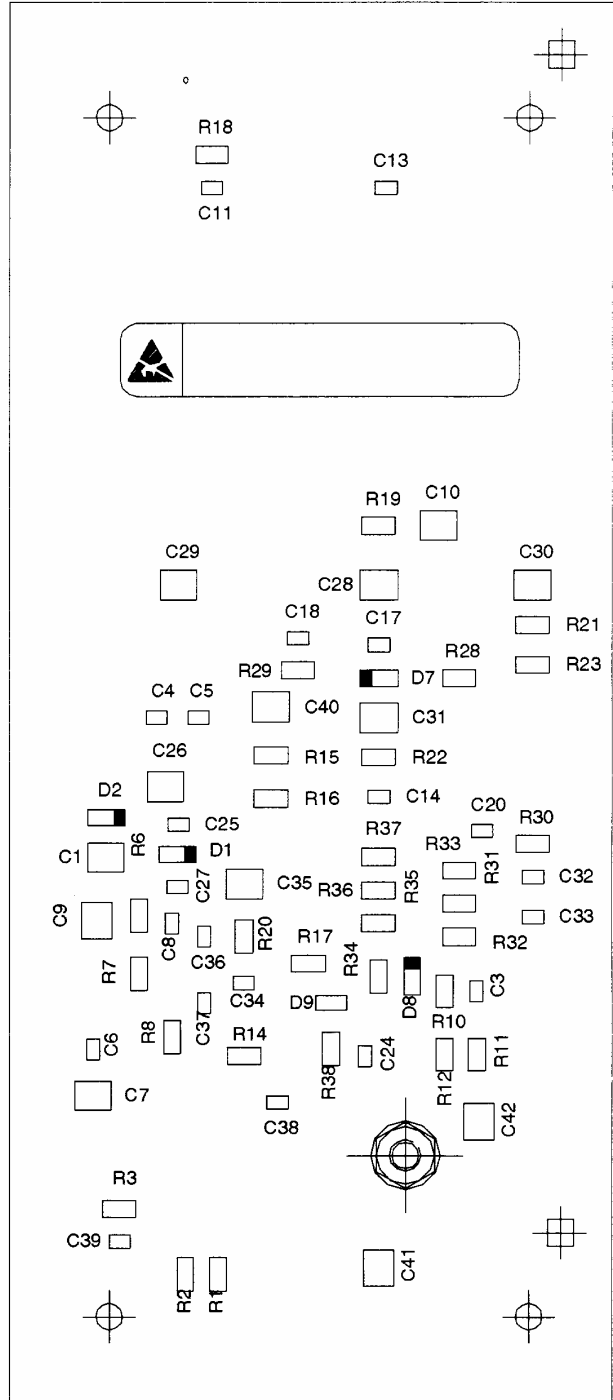
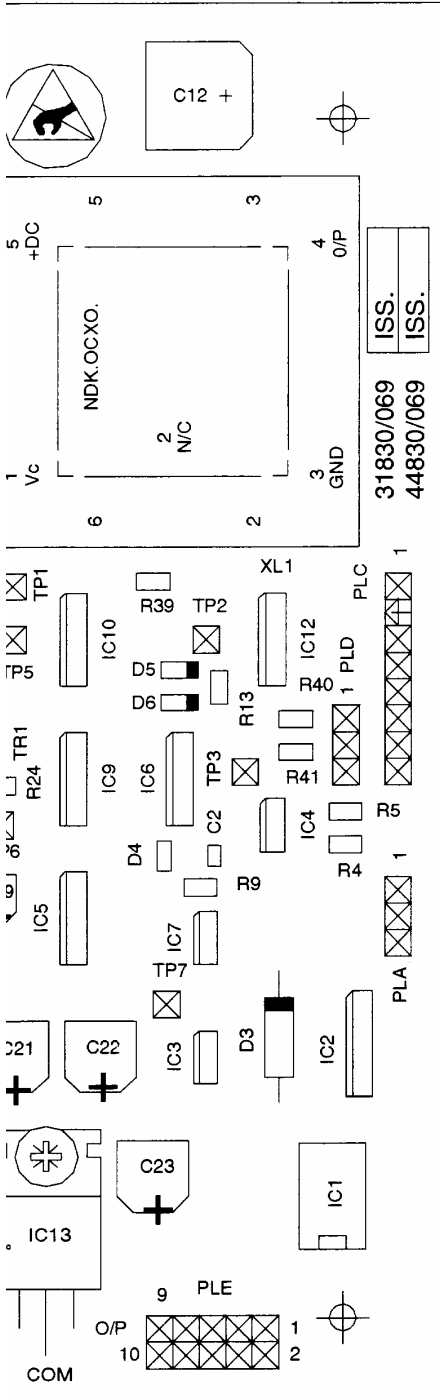
SERVICING DIAGRAMS



10 MHz OCXO AR1

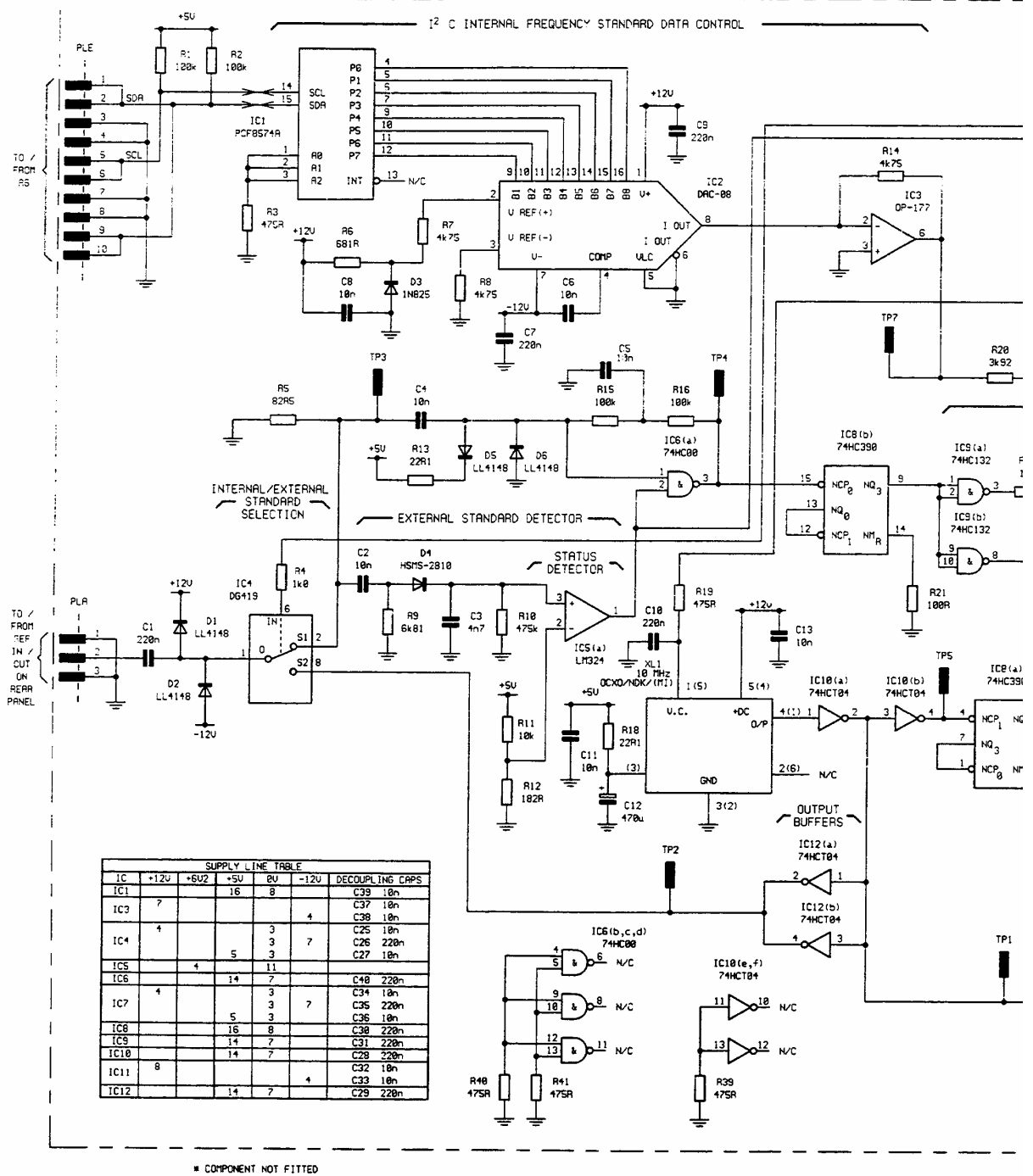
Drg. No. 44830/069 Sheet 1 of 1 Issue 4

Component layout AR1/2



Drg. No. 44830/069 Sheet 1 of 1 Issue 4

Fig. 7-13 AR1/2 10 MHz OCXO - component layout



Circuit diagram AR1/2

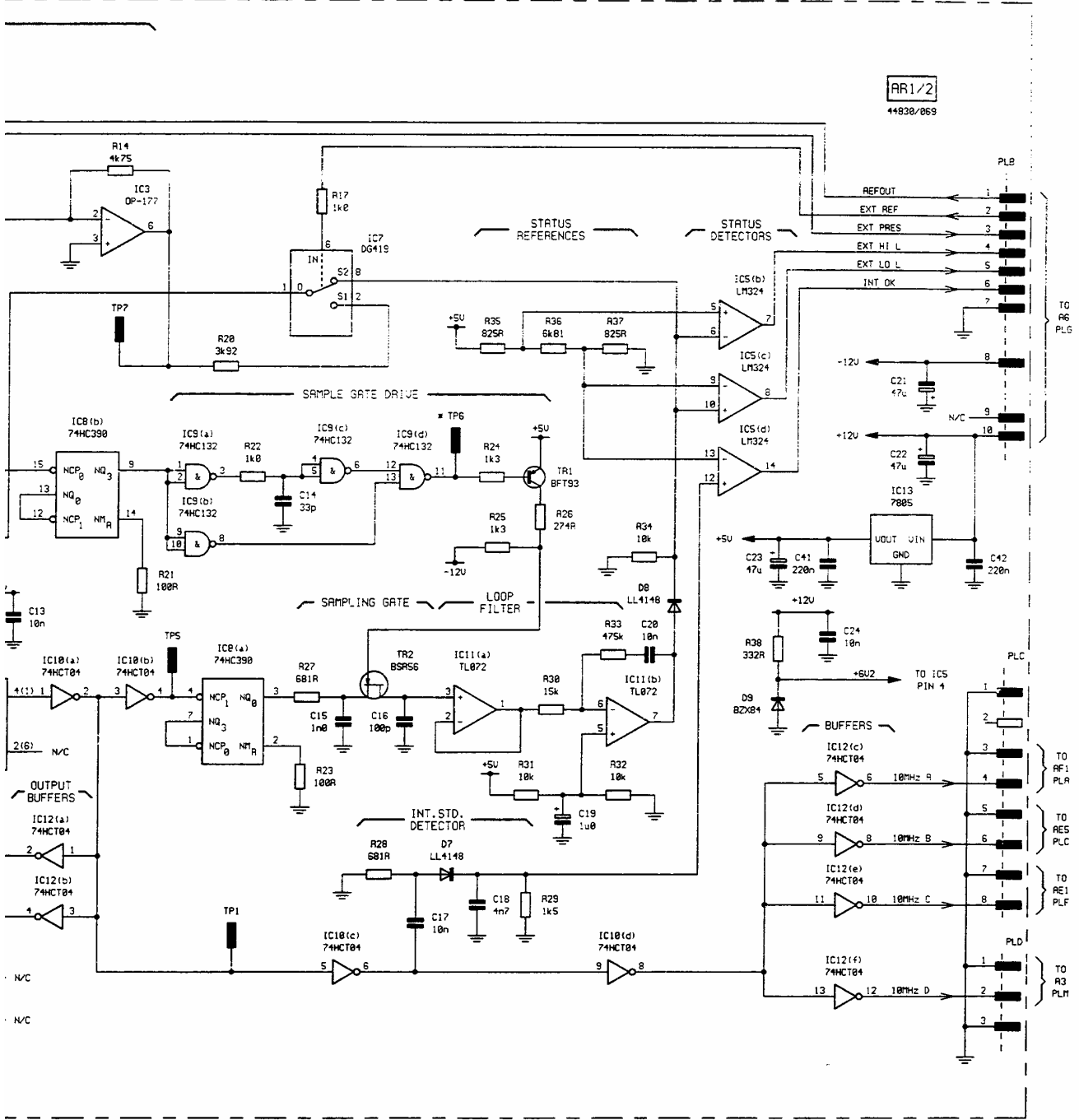
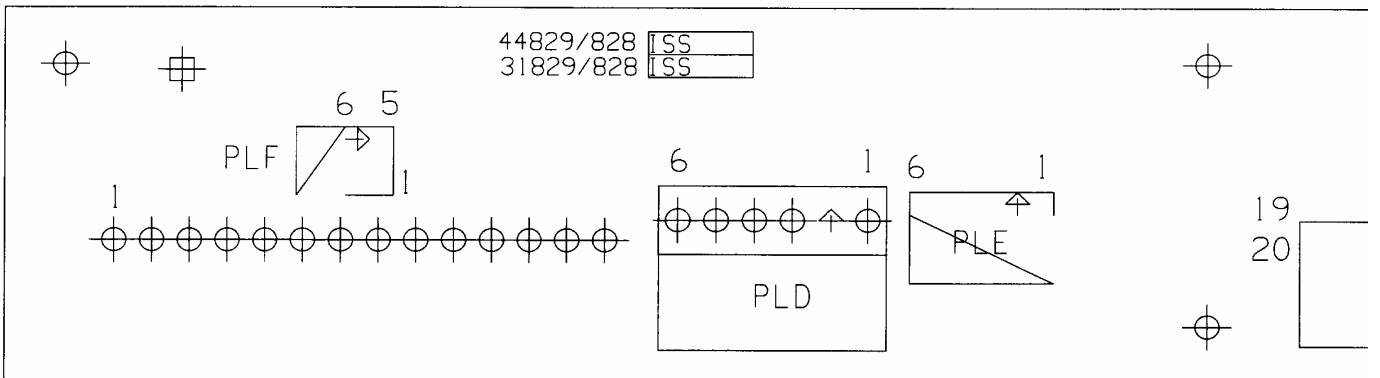


Fig. 7-14 AR1/2 10 MHz OCXO - circuit

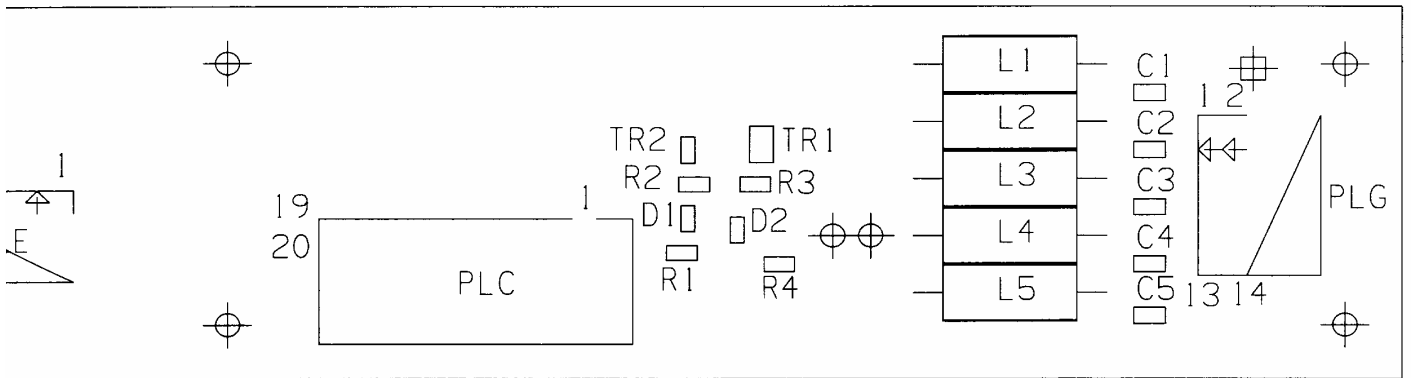
SERVICING DIAGRAMS



10 MHz OCXO AR1/2

Drg. No. 44829/828 Sheet

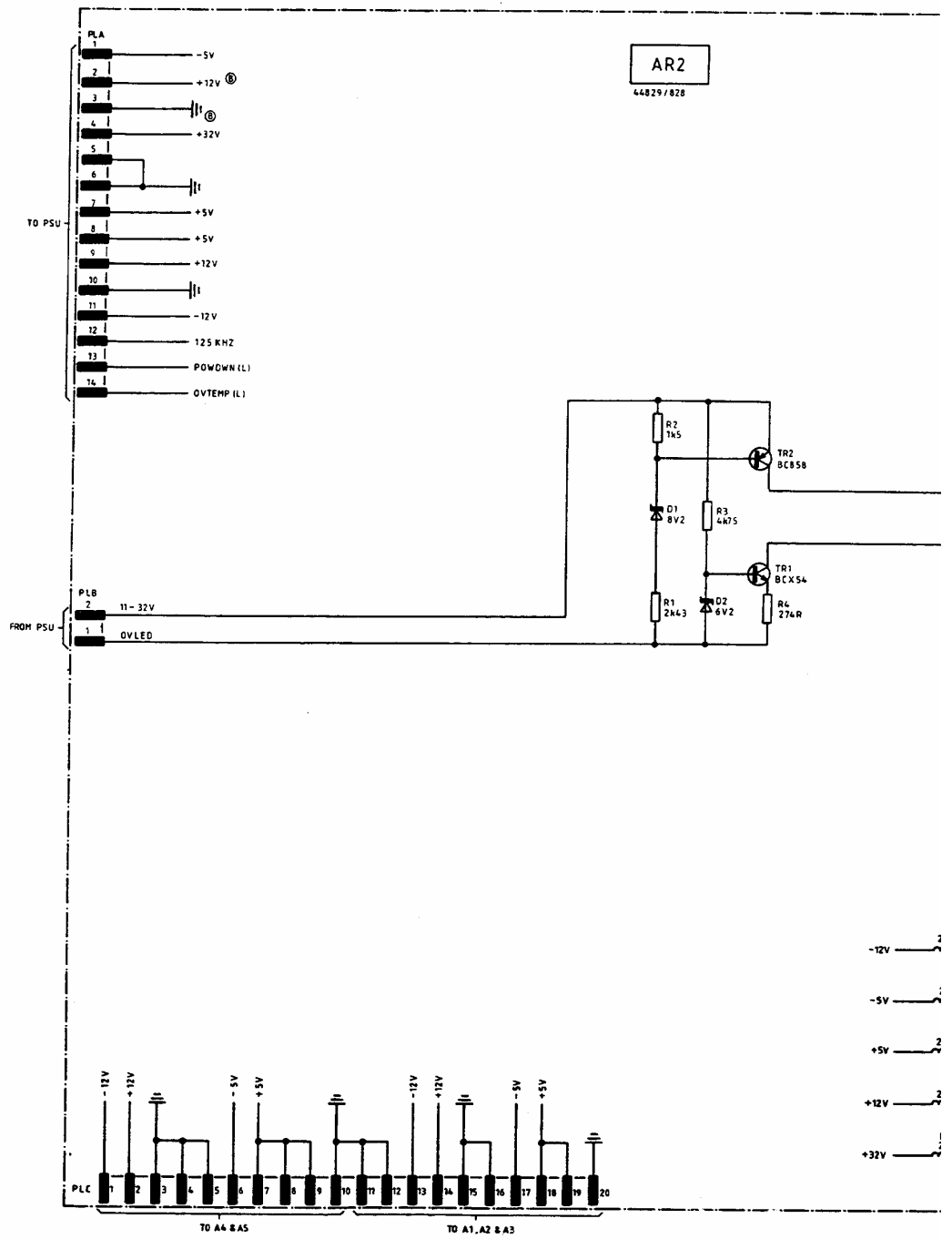
Component layout AR2



R1/2

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Fig. 7-15 AR2 PSU distribution - component layout



Circuit diagram AR2

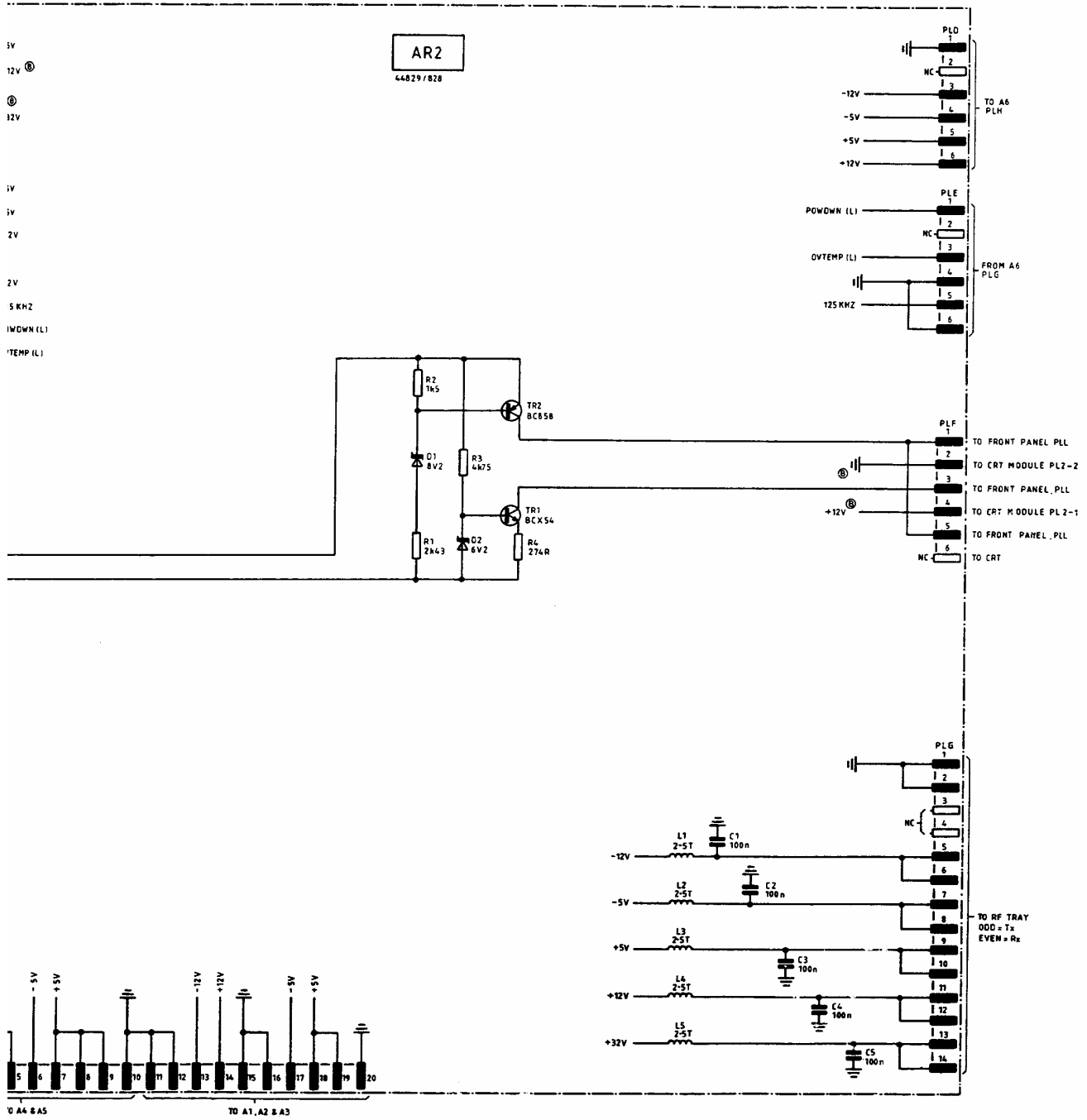
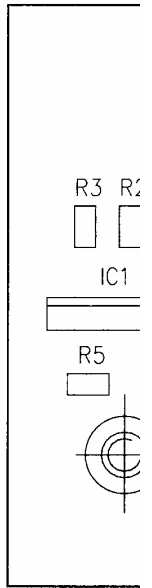
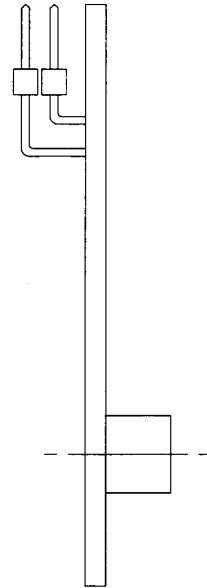
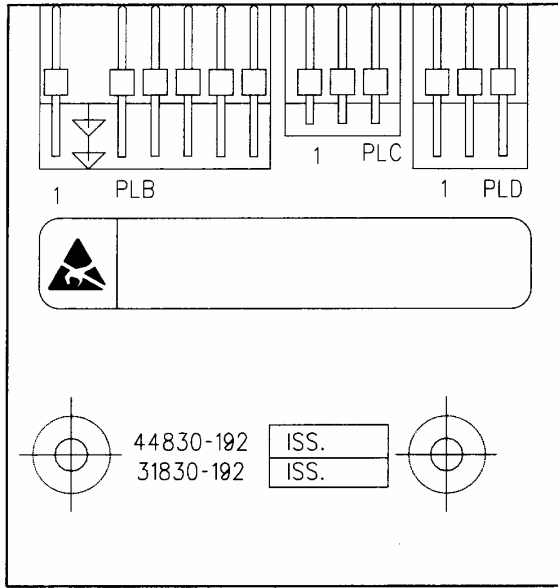


Fig. 7-16 AR2 PSU distribution - circuit

SERVICING DIAGRAMS



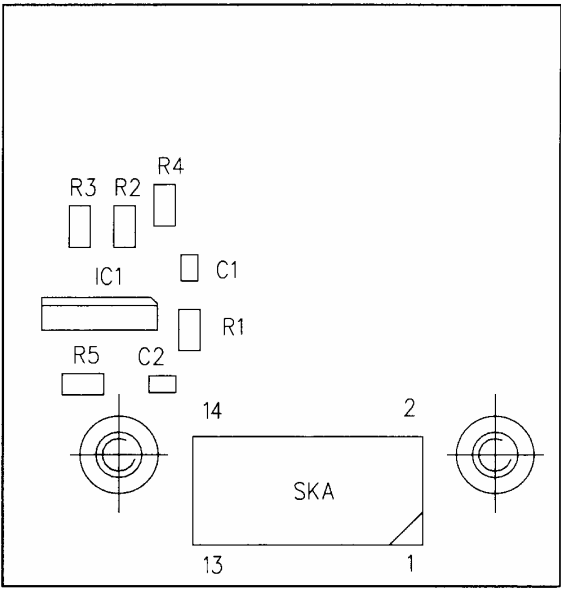
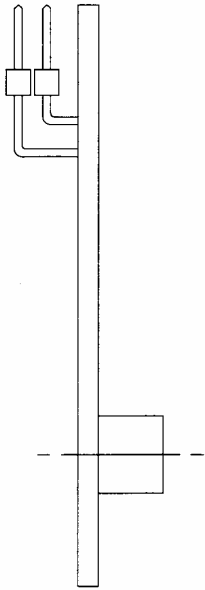
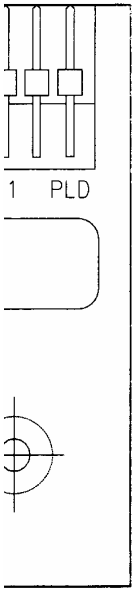
COMPONENT SIDE

PSU distribution AR2

Drg. No. 44830/192 Sheet 1 of 1 Issue 2

Fi

Component layout **AR4**

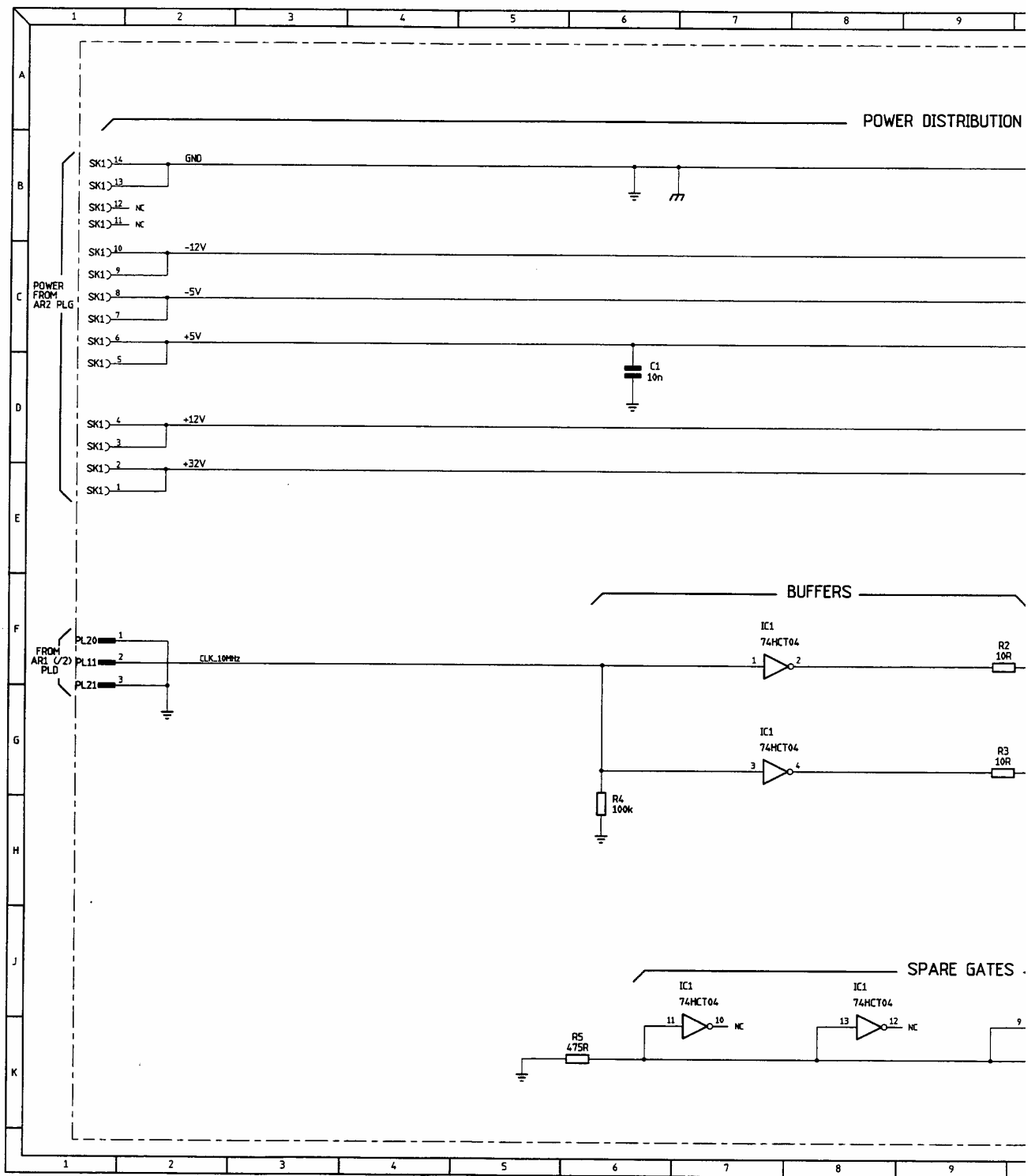


SOLDER SIDE

AR2

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Fig. 7-17 AR4 10 MHz oscillator buffer - component layout



Circuit diagram AR4

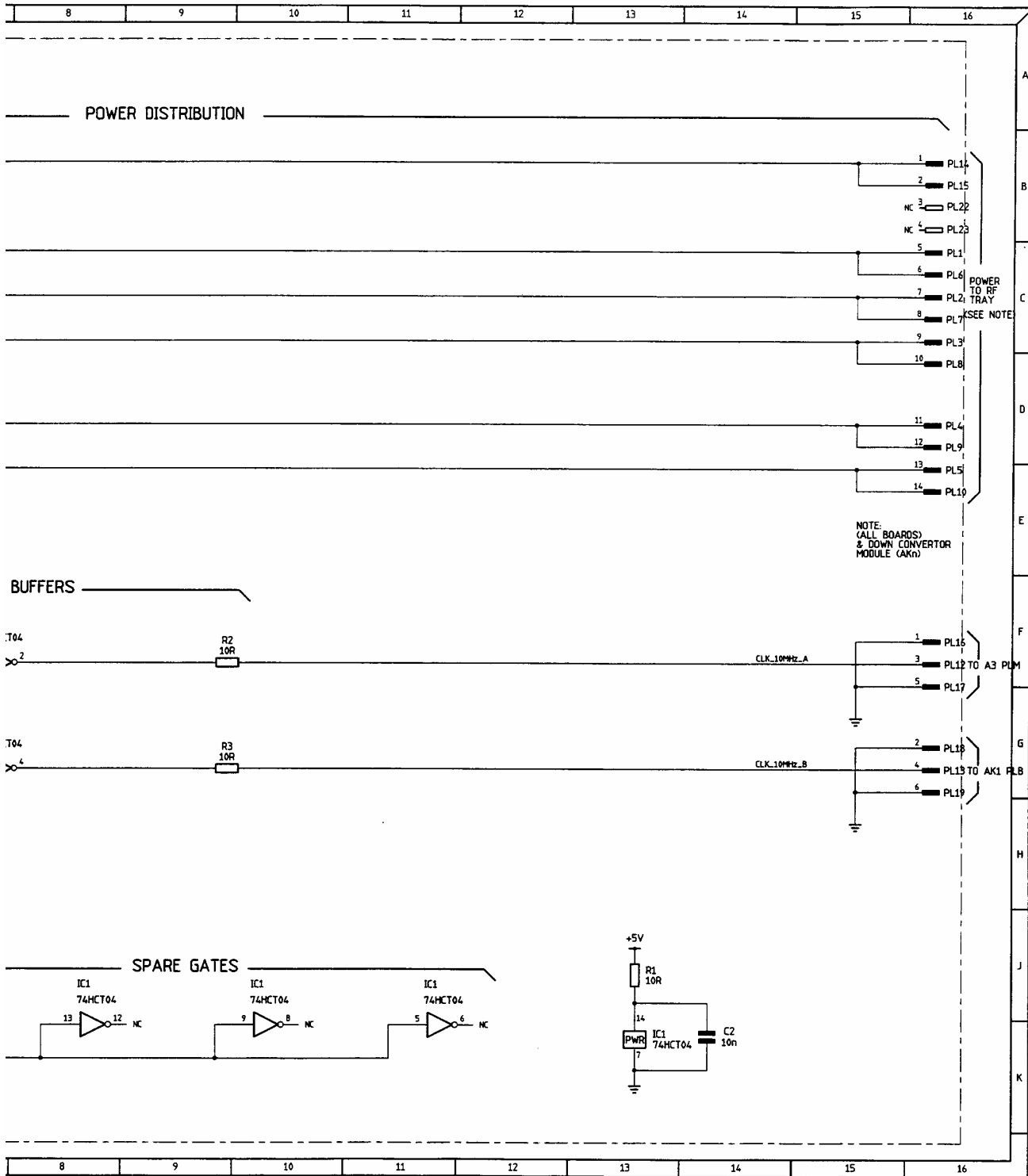
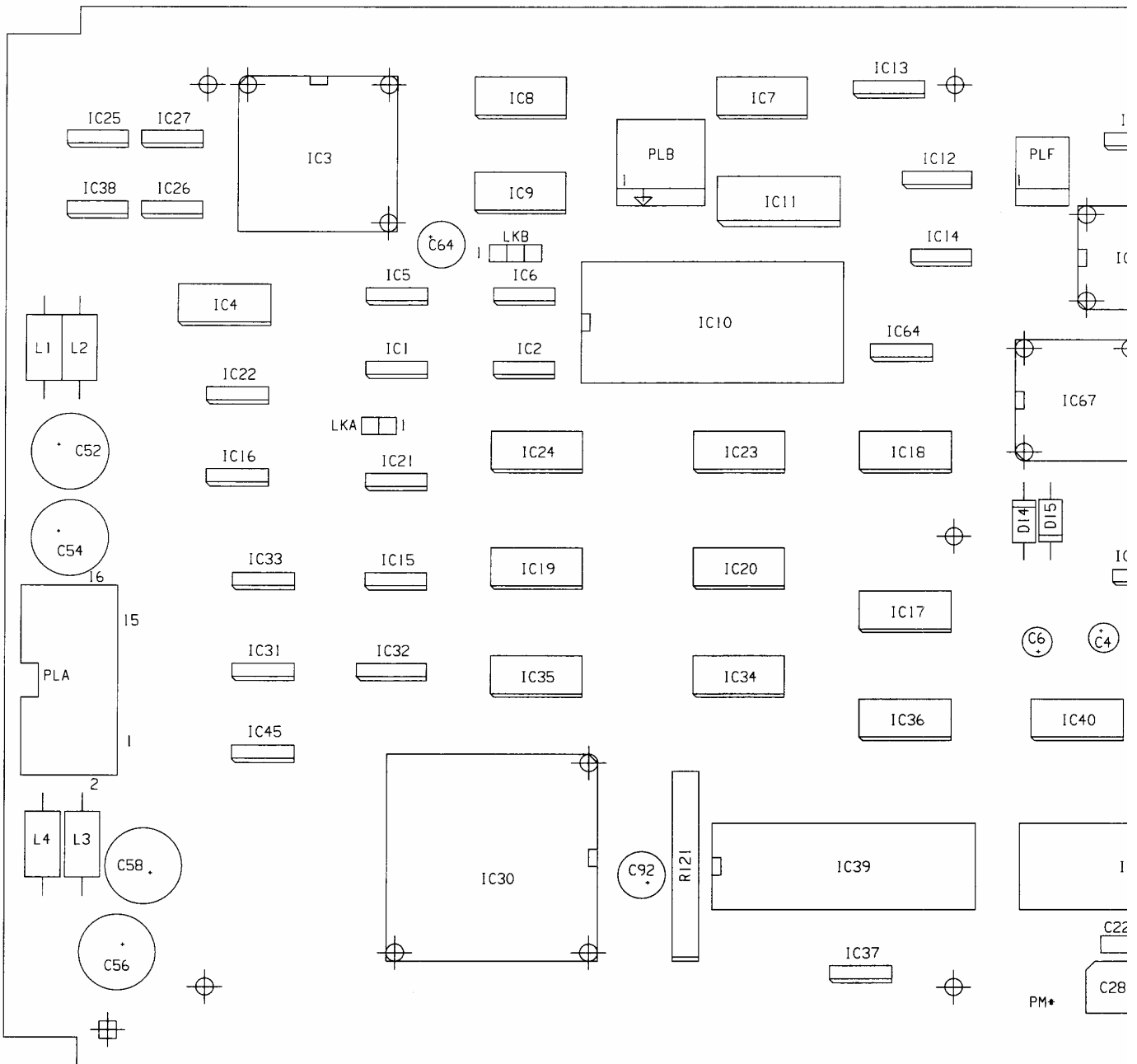


Fig. 7-18 AR4 10 MHz oscillator buffer - circuit

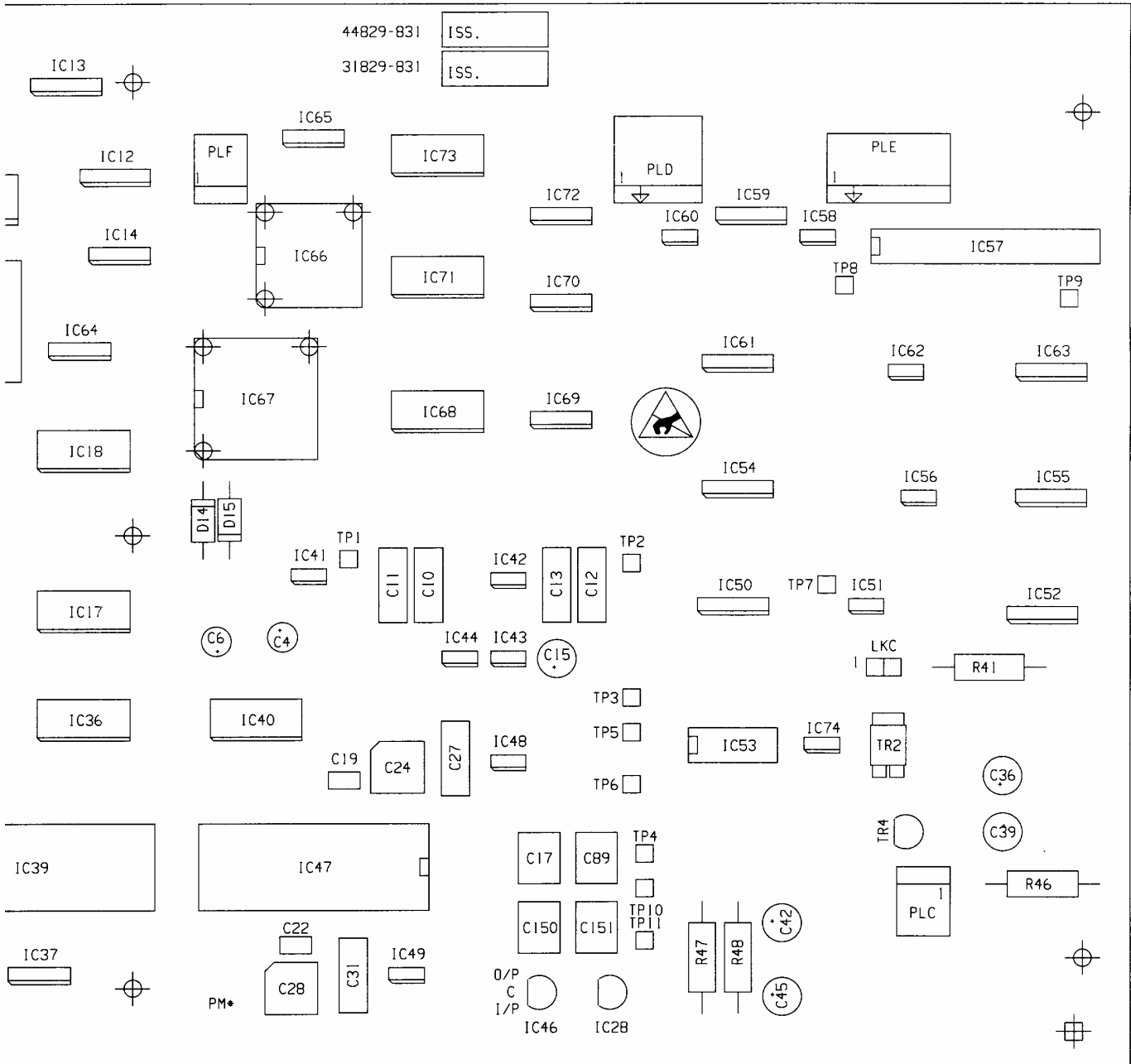
SERVICING DIAGRAMS

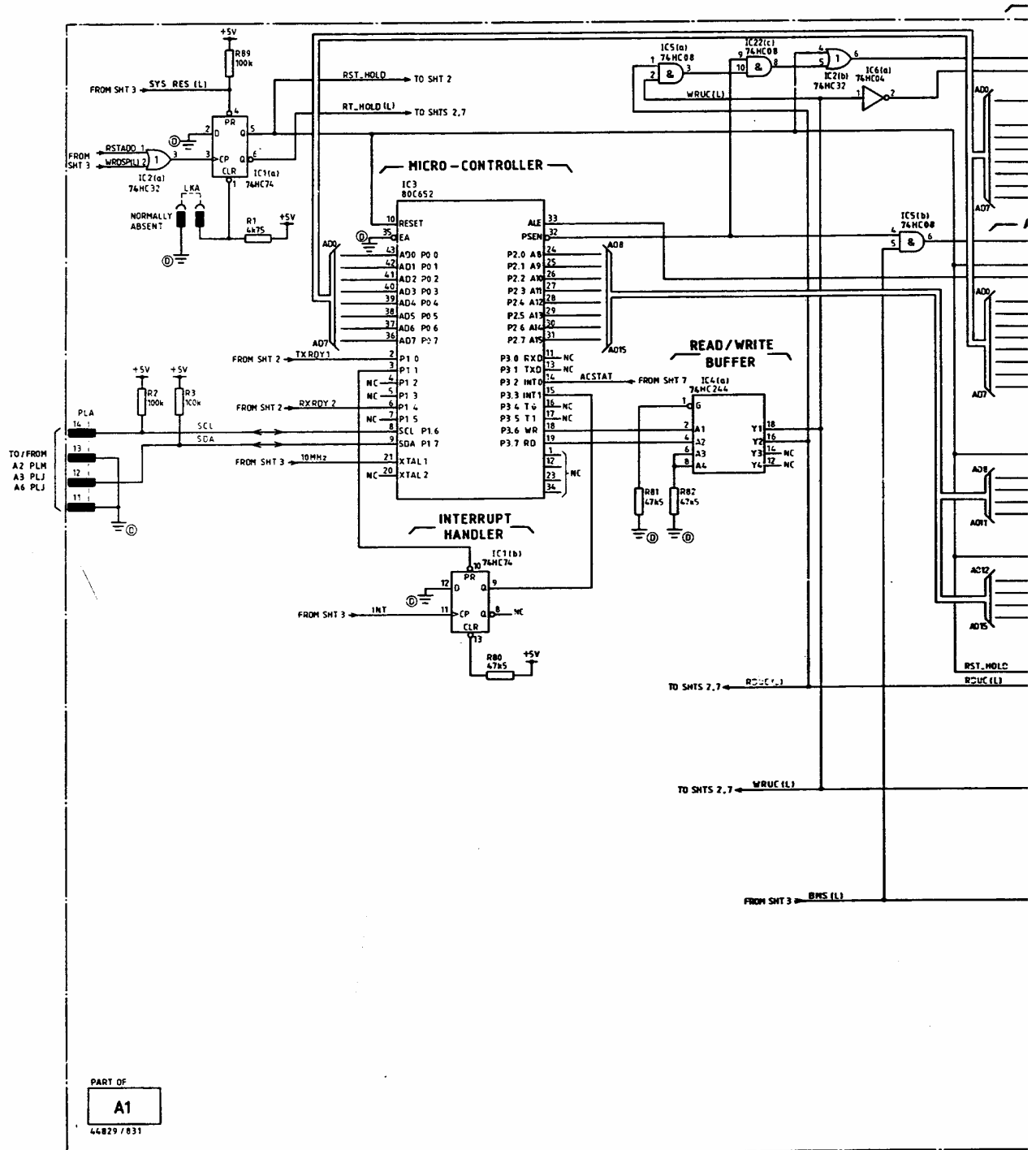


10 MHz oscillator buffer AR4

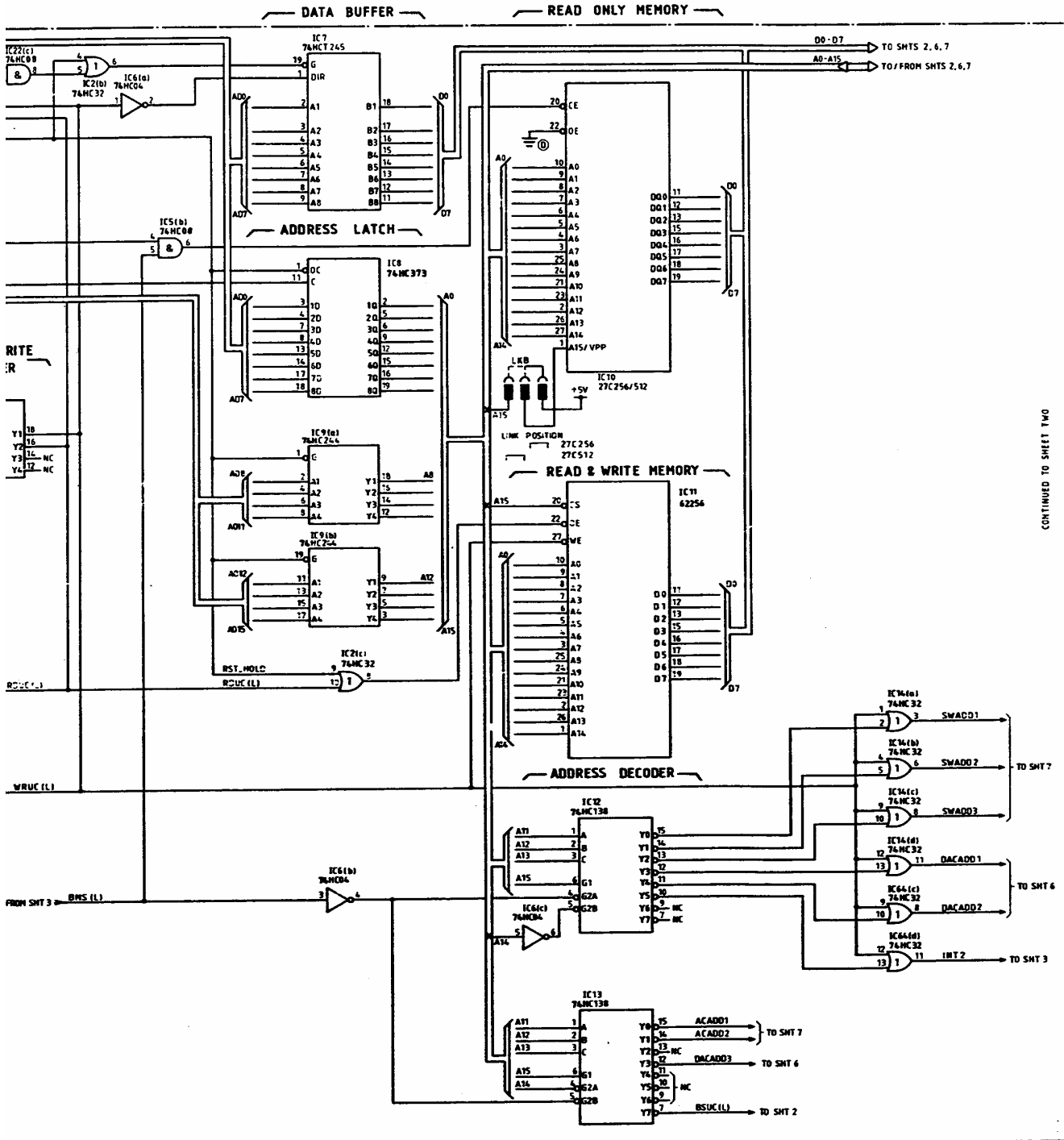
Drg. No. 44829/831 Sh

Component layout A1





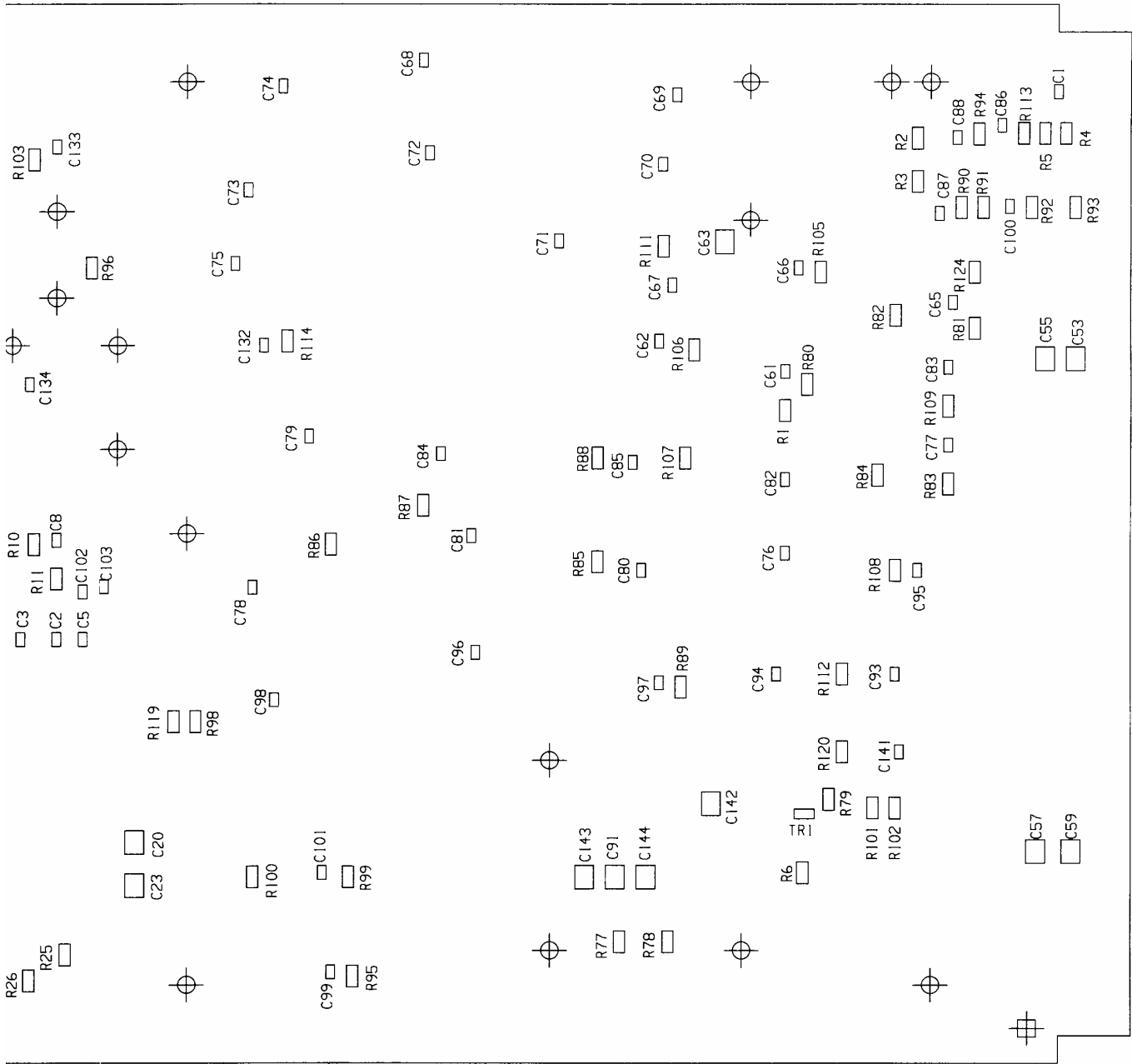
Circuit diagrams A1



CONTINUED TO SHEET TWO

Fig. 7-20 A1 Microprocessor memory and addressing - circuit

Component layout A1



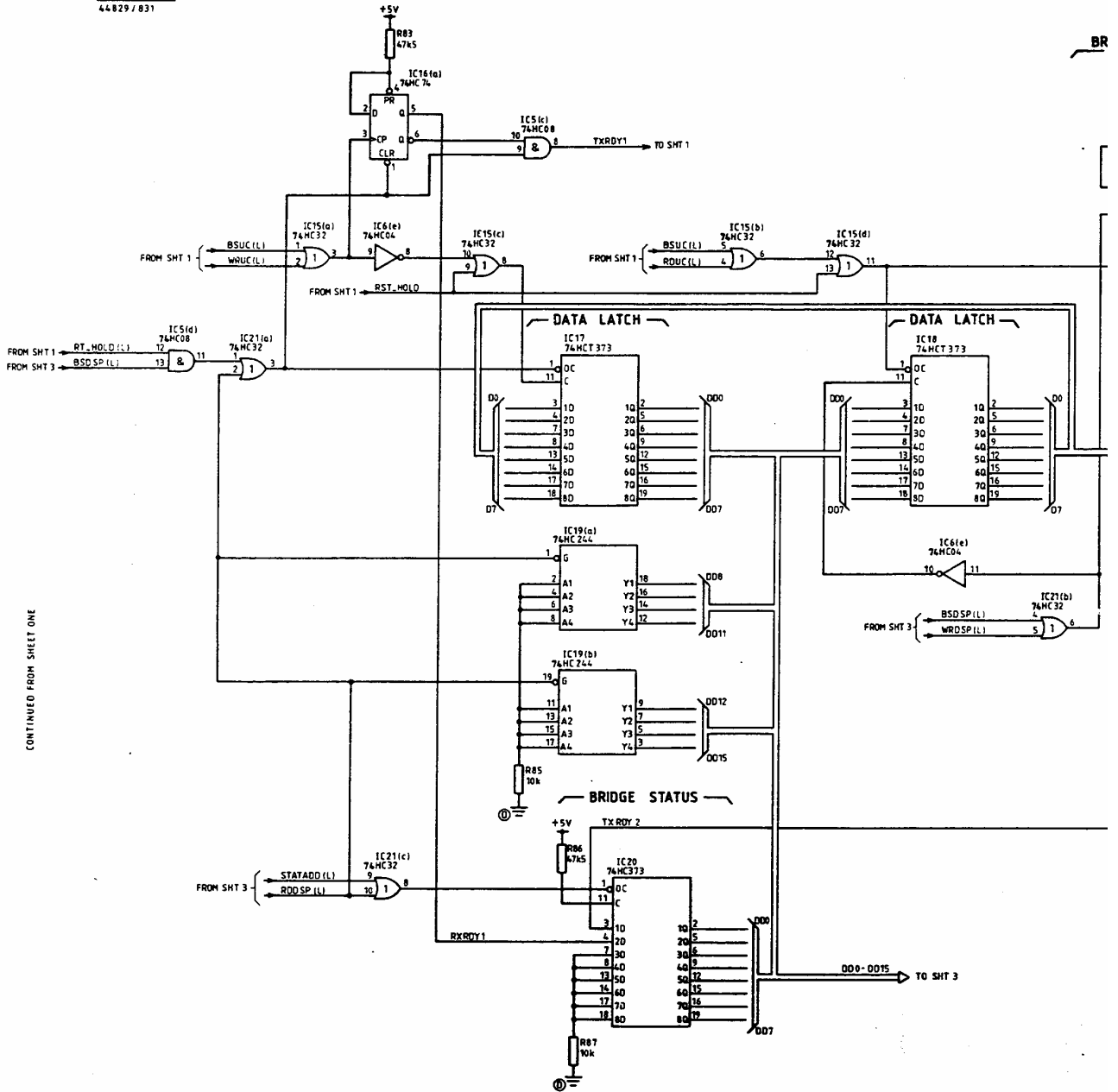
A1

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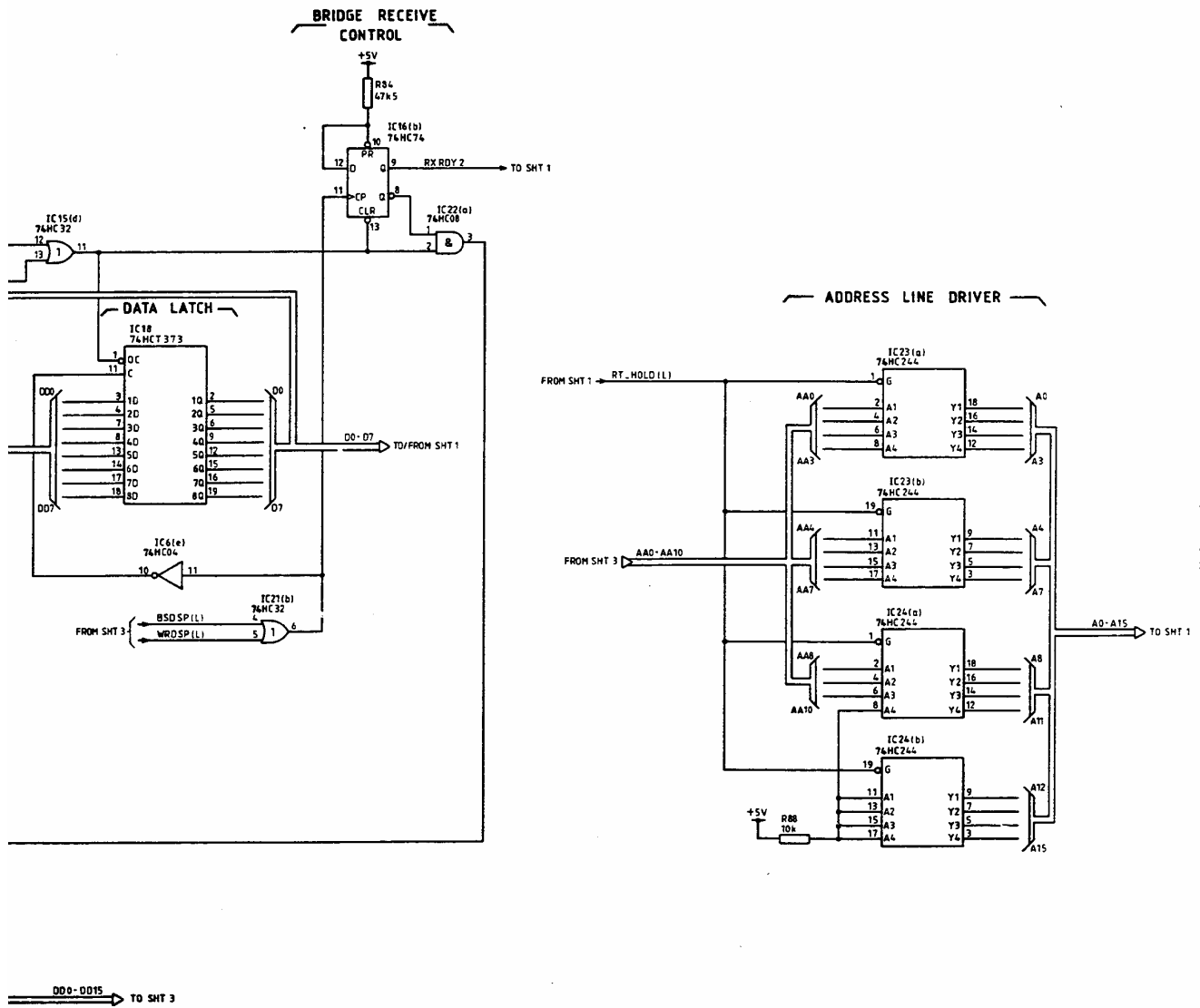
Fig. 7-21 A1 Audio generator - component layout, solder side

-PART OF
A1
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BRIDGE TRANSMIT CONTROL



Circuit diagrams A1



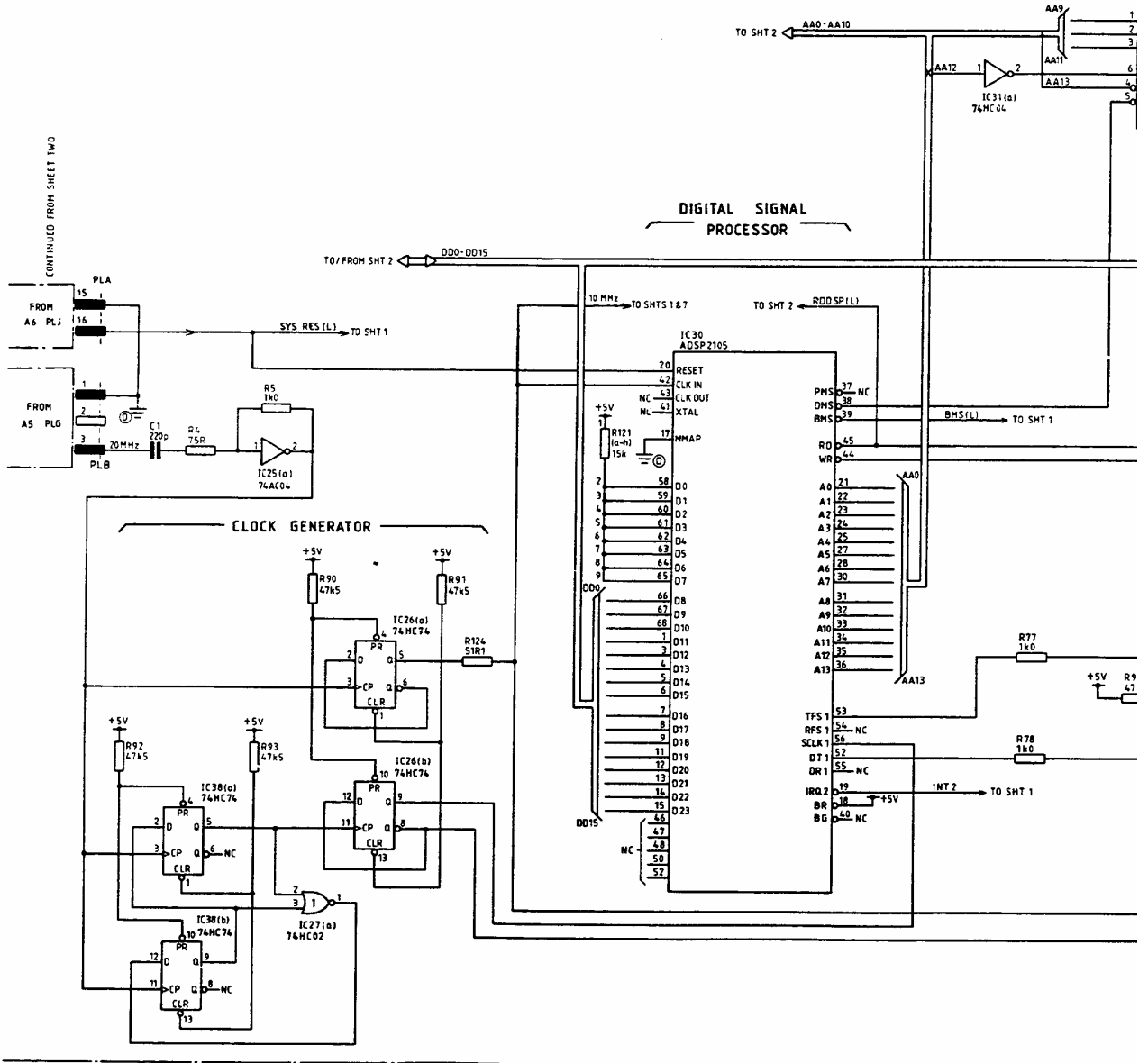
CONTINUED TO SHEET THREE

Fig. 7-22 A1 Bridge and boot addressing - circuit

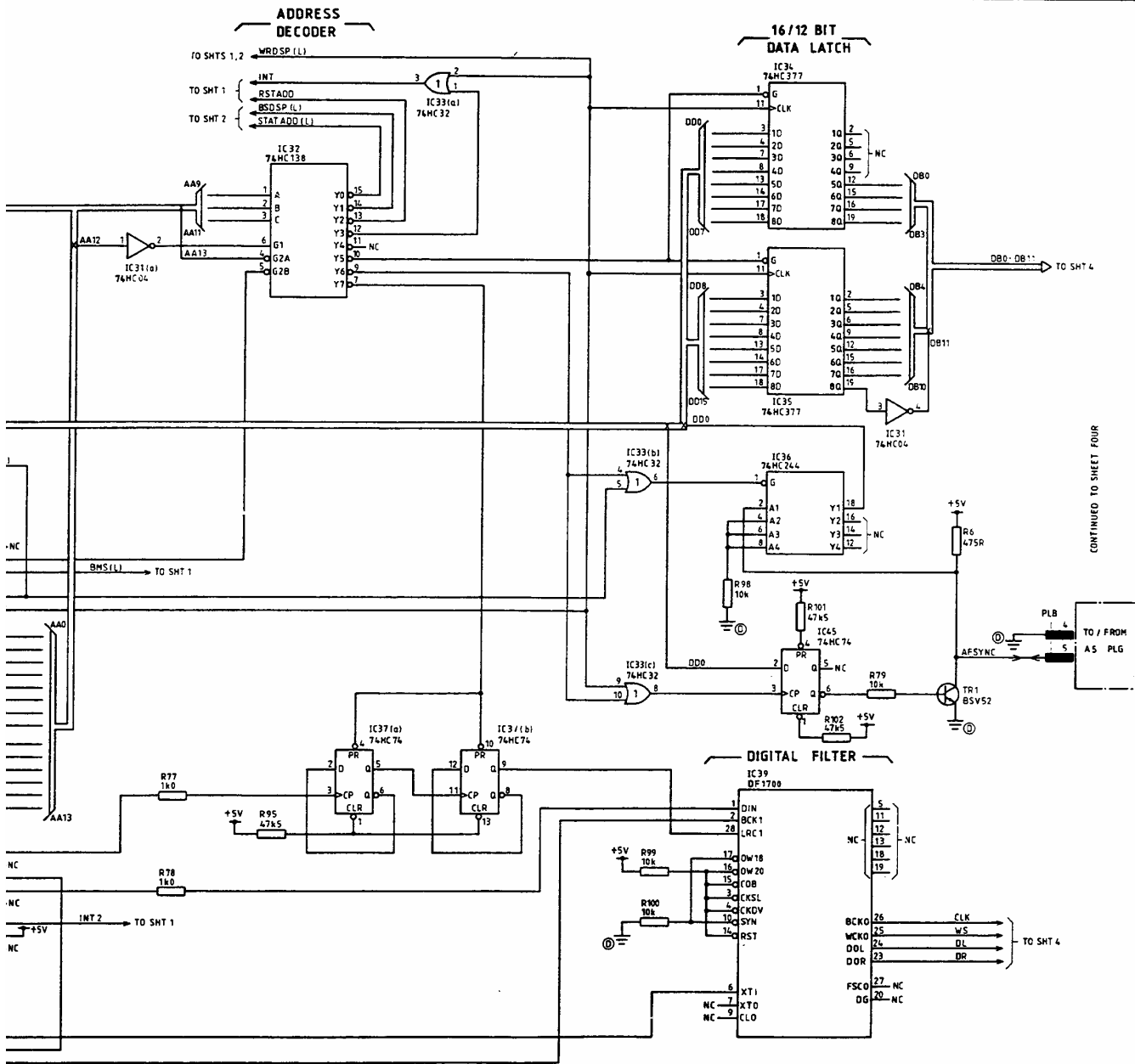
PART OF
A1
 44829 / 831

TO SHTS 1,2
 TO SHT 1
 TO SHT 2

7



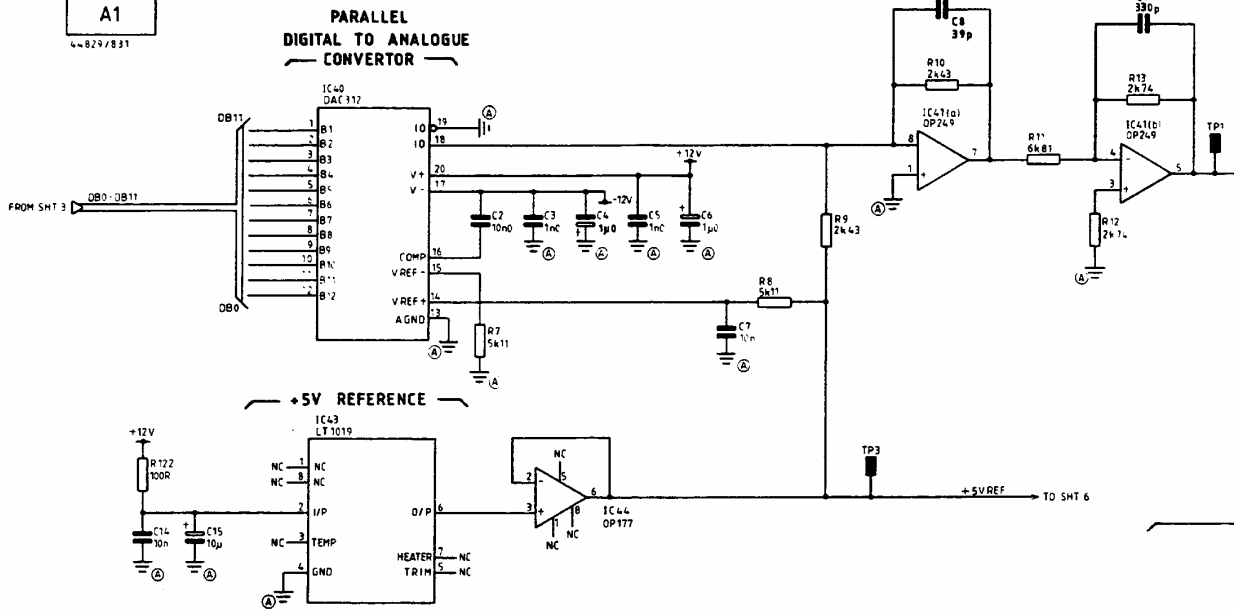
Circuit diagrams A1



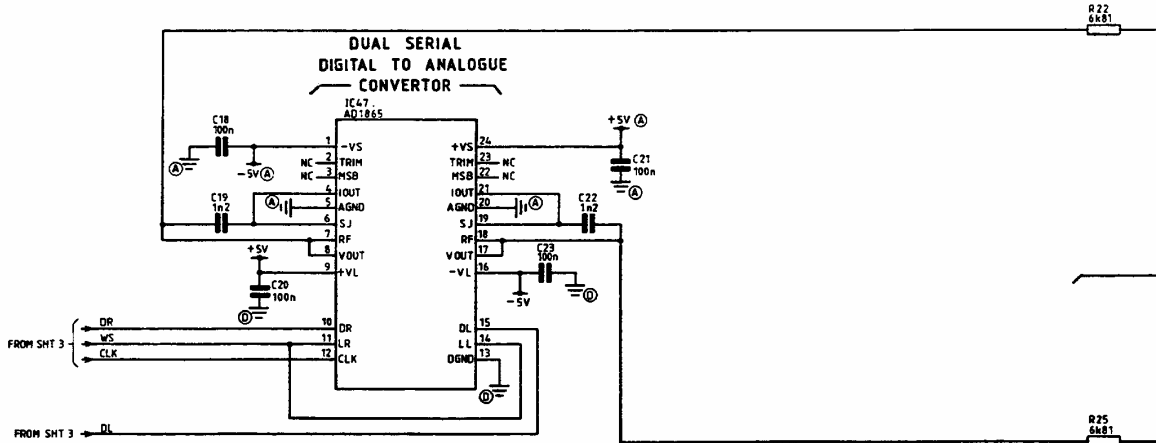
CONTINUED TO SHEET FOUR

Fig. 7-23 A1 DSP, dividers, and oversampling - circuit

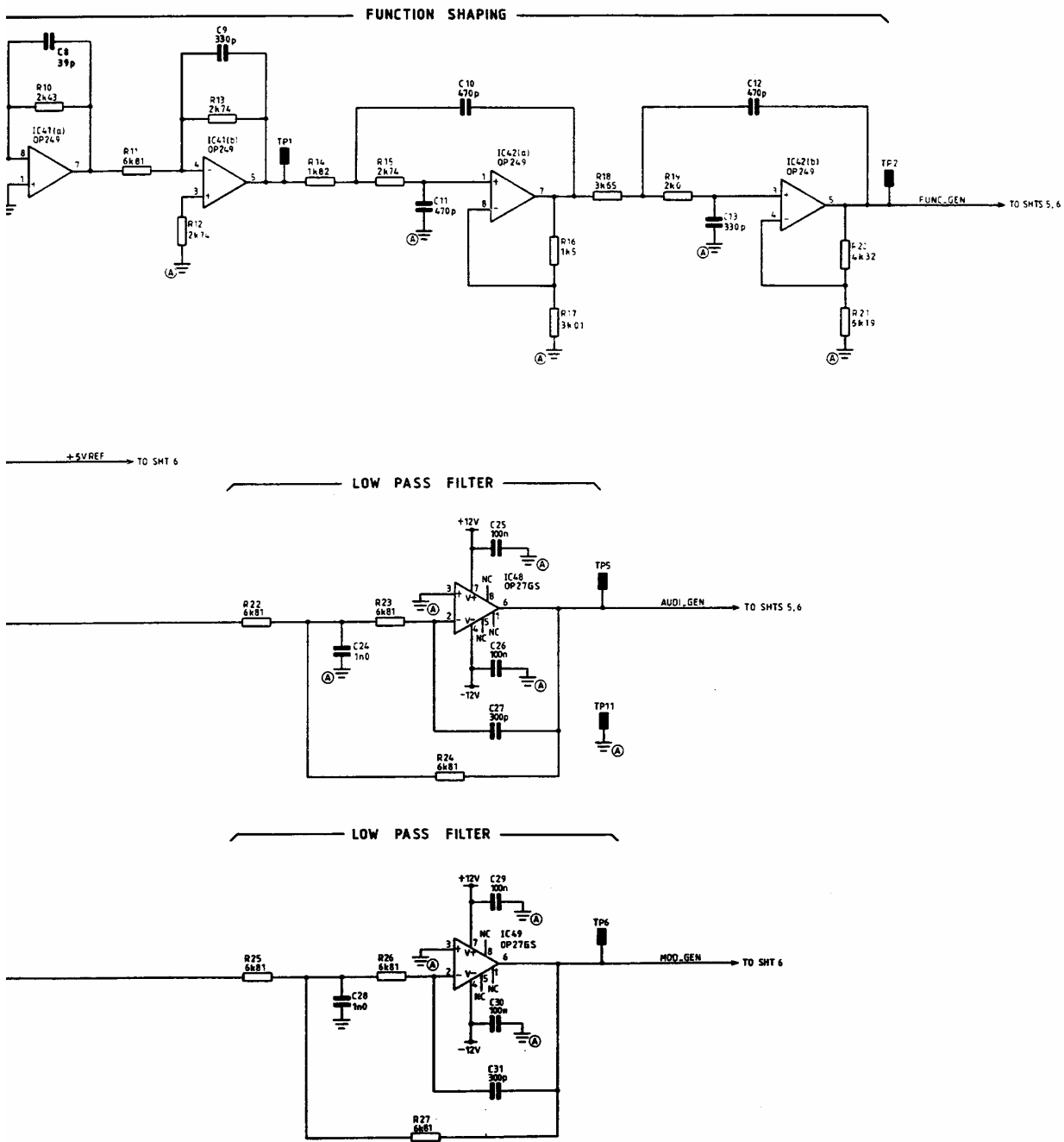
PART OF
A1
44829/831



CONTINUED FROM SHEET THREE



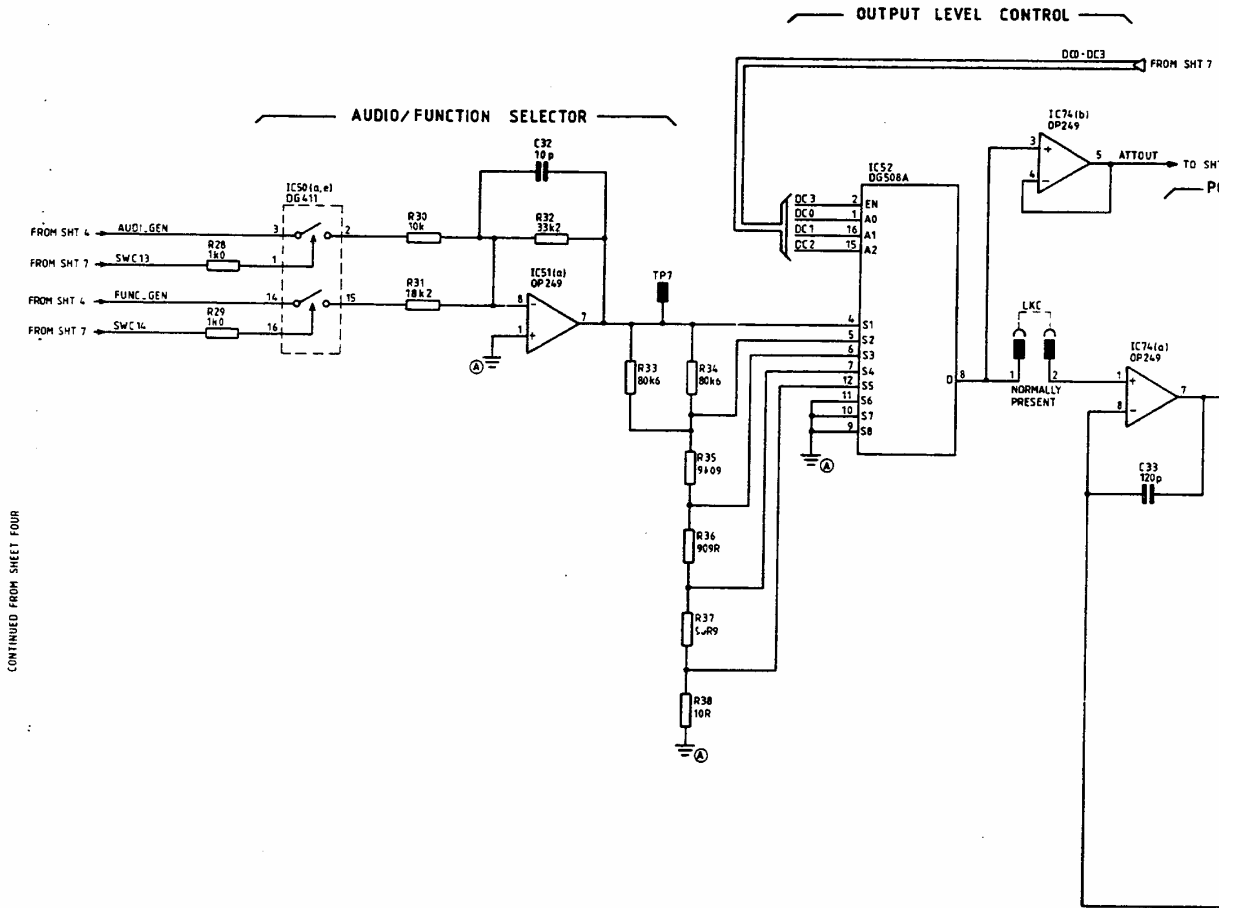
Circuit diagrams A1



CONTINUED TO SHEET FIVE

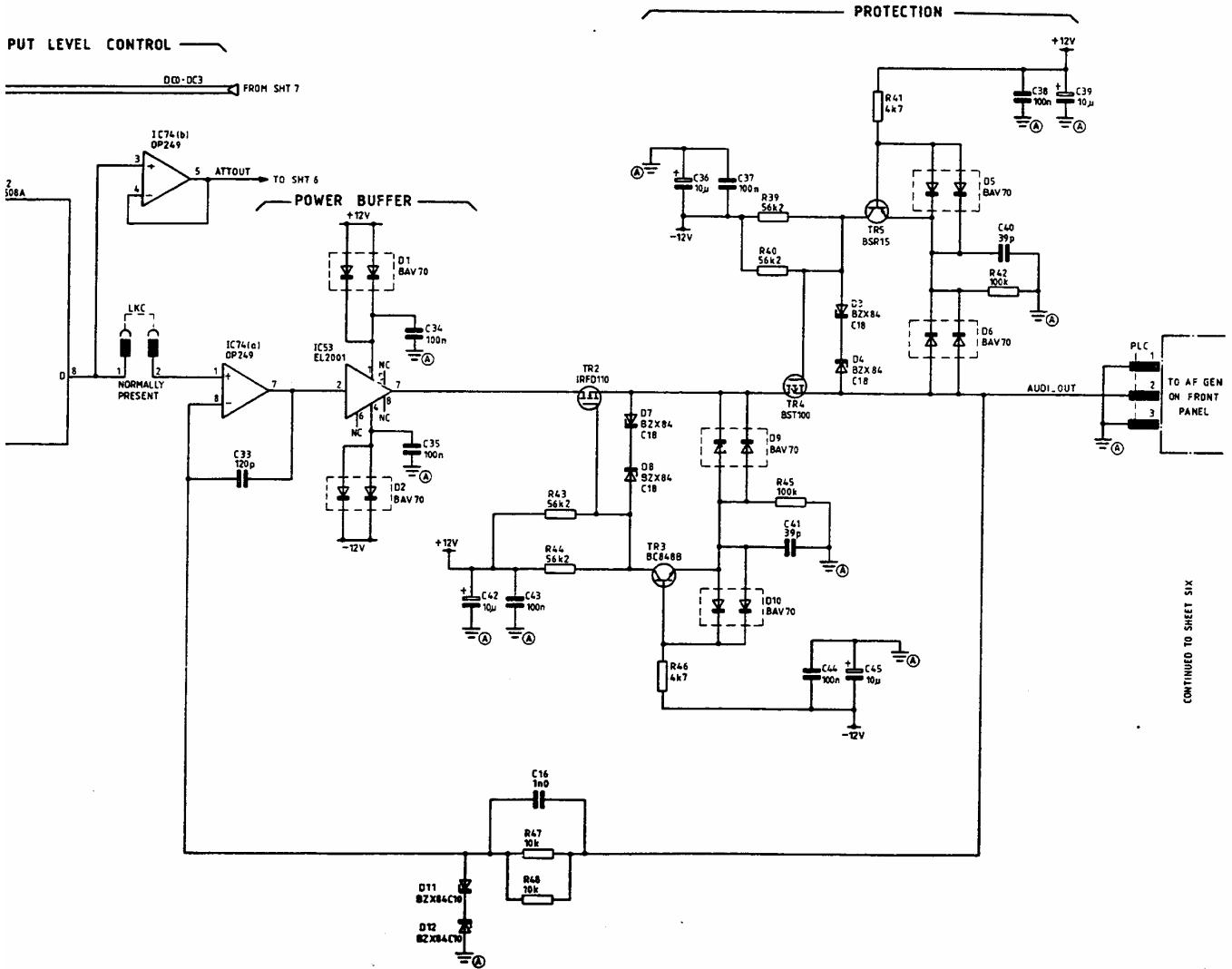
Fig. 7-24 A1 DACs and analogue filters - circuit

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A1
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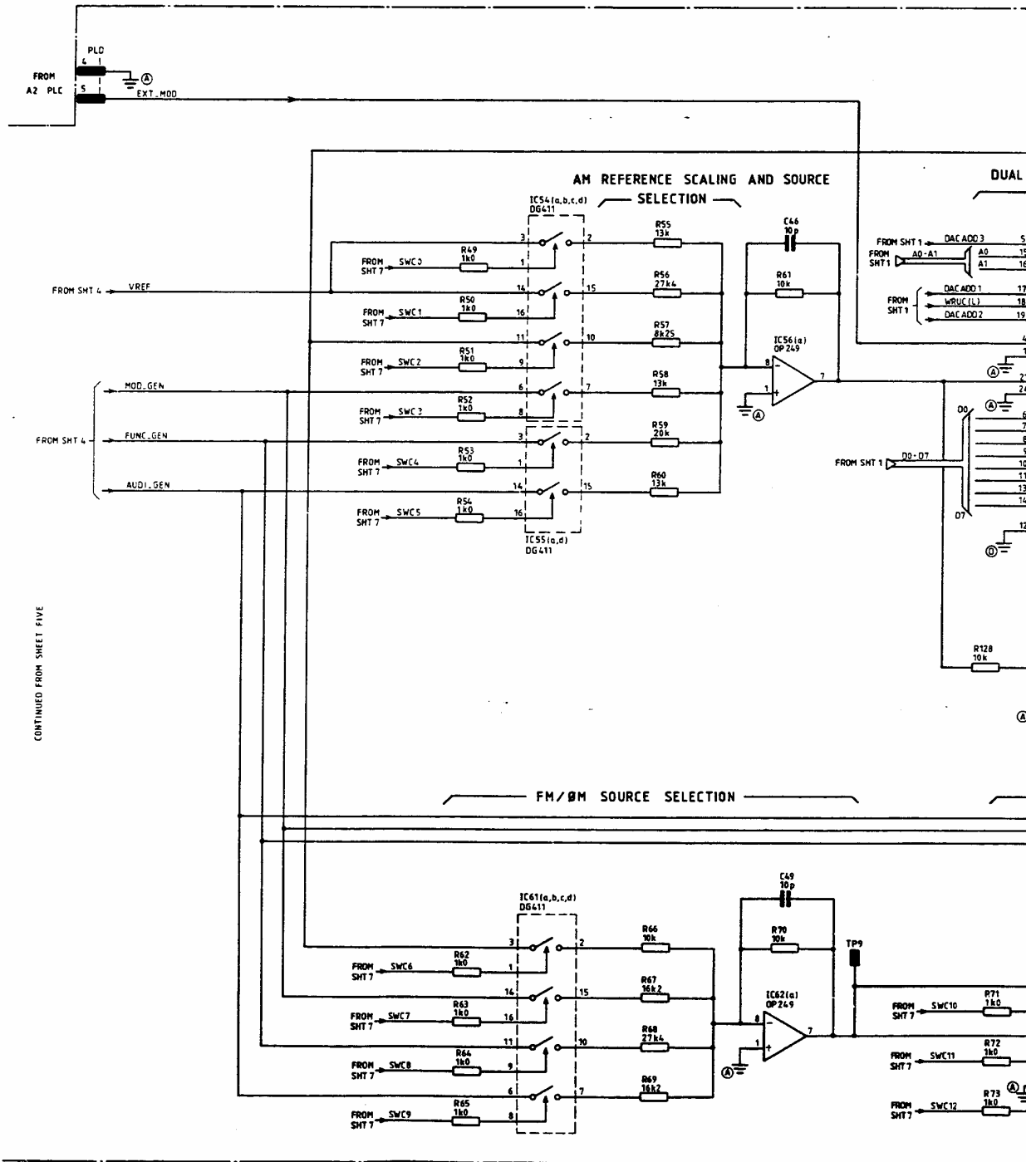
CONTINUED FROM SHEET FOUR

Circuit diagrams A1



CONTINUED TO SHEET SIX

Fig. 7-25 A1 Audio output path - circuit



Circuit diagrams A1

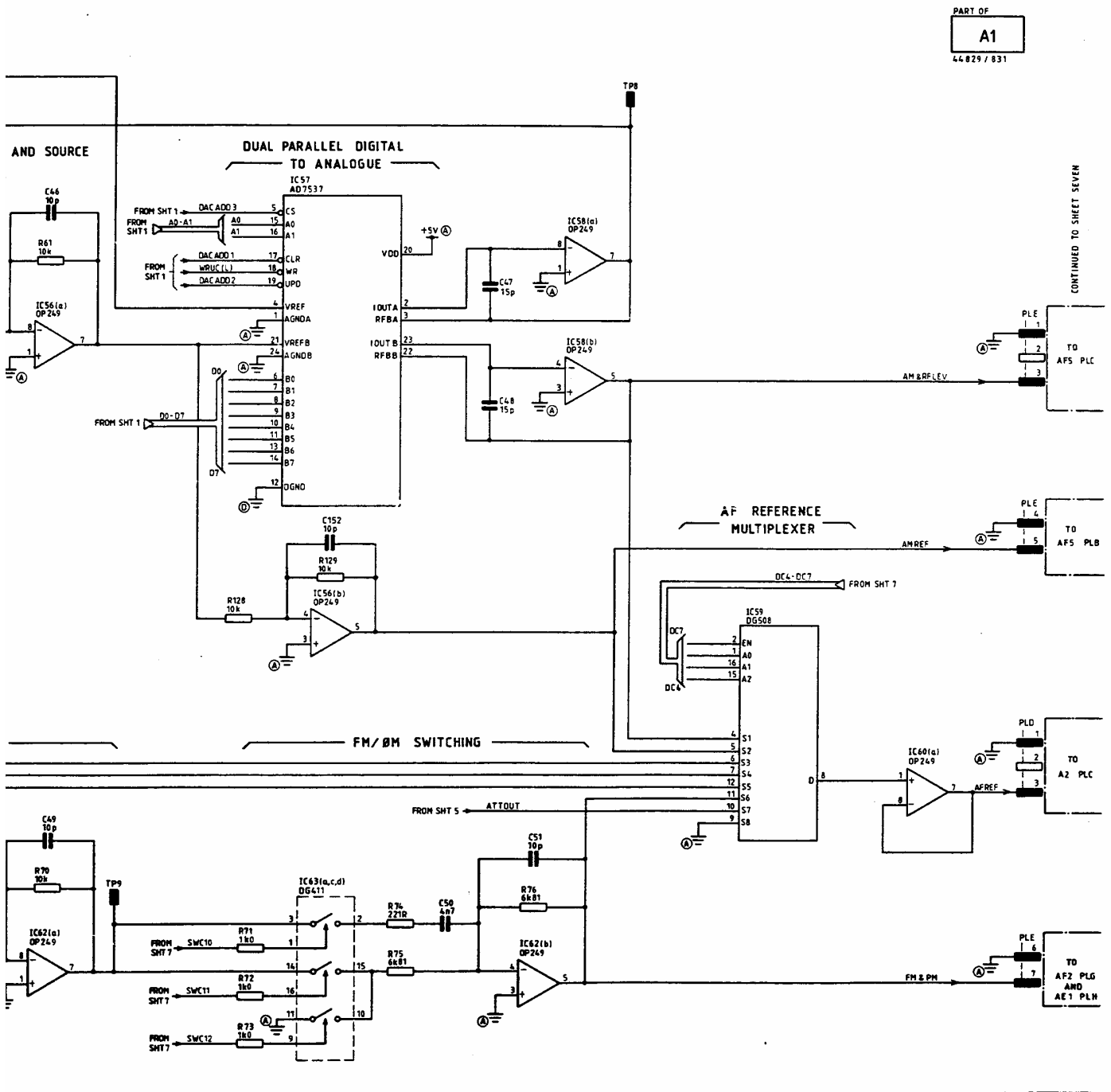
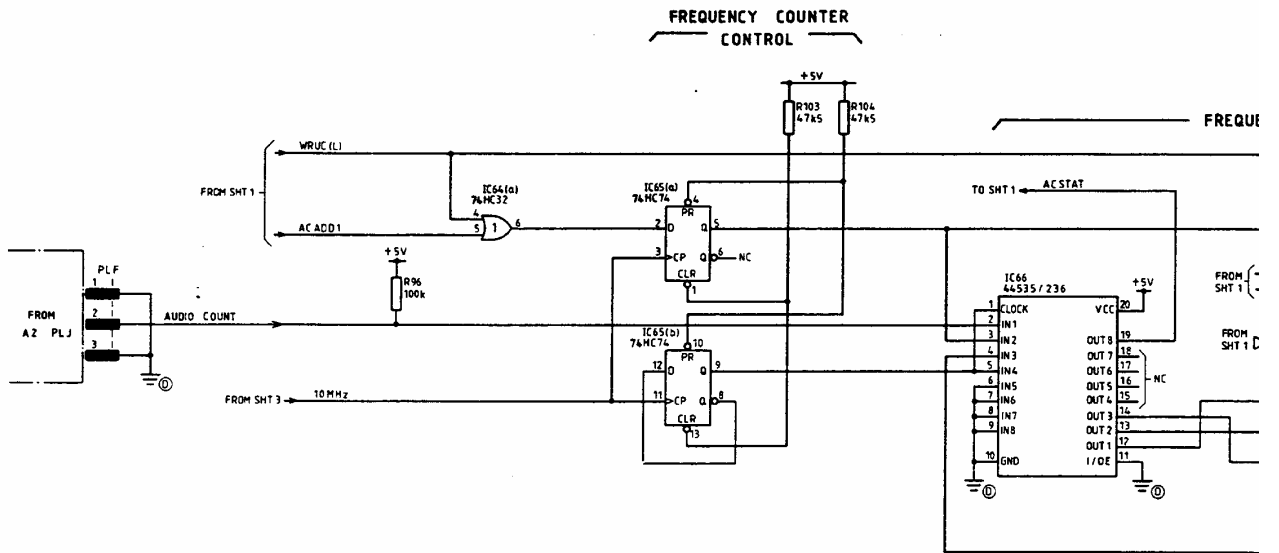
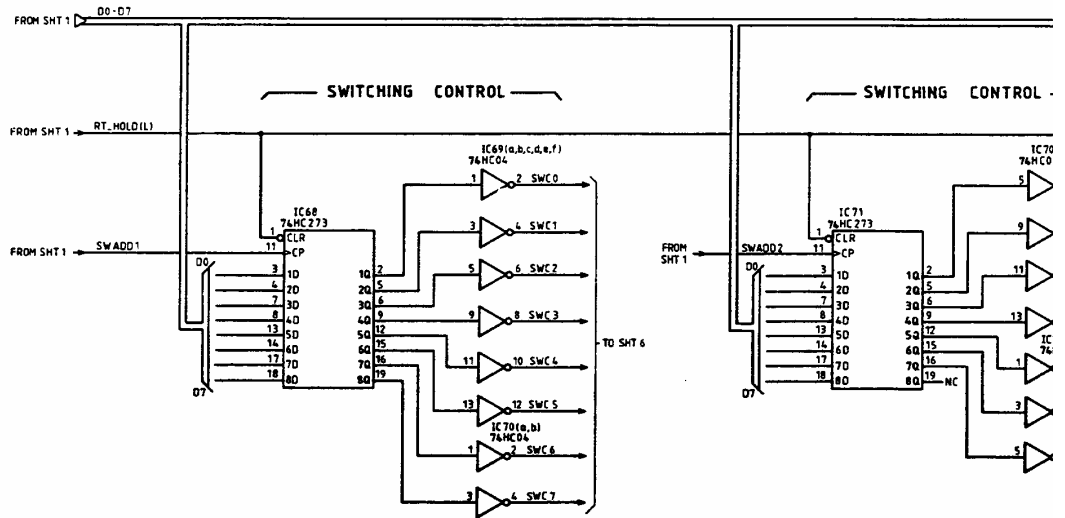


Fig. 7-26 A1 Modulation and calibration paths - circuit

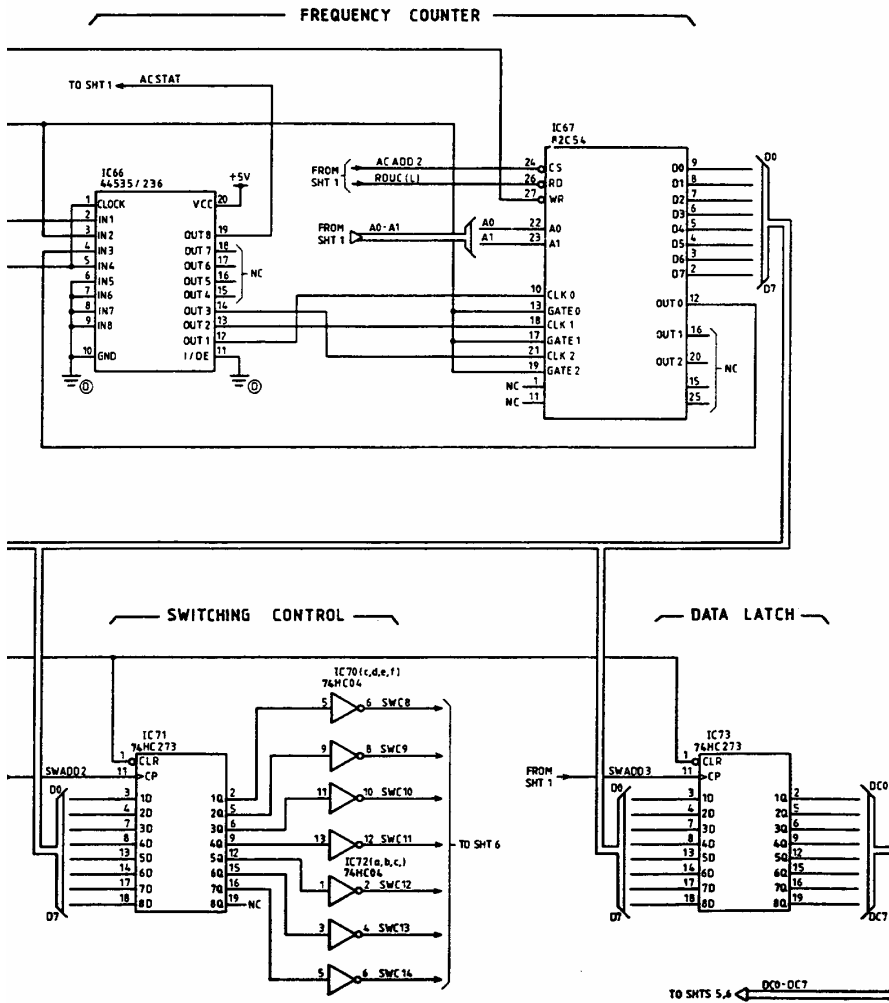
PART OF
A1
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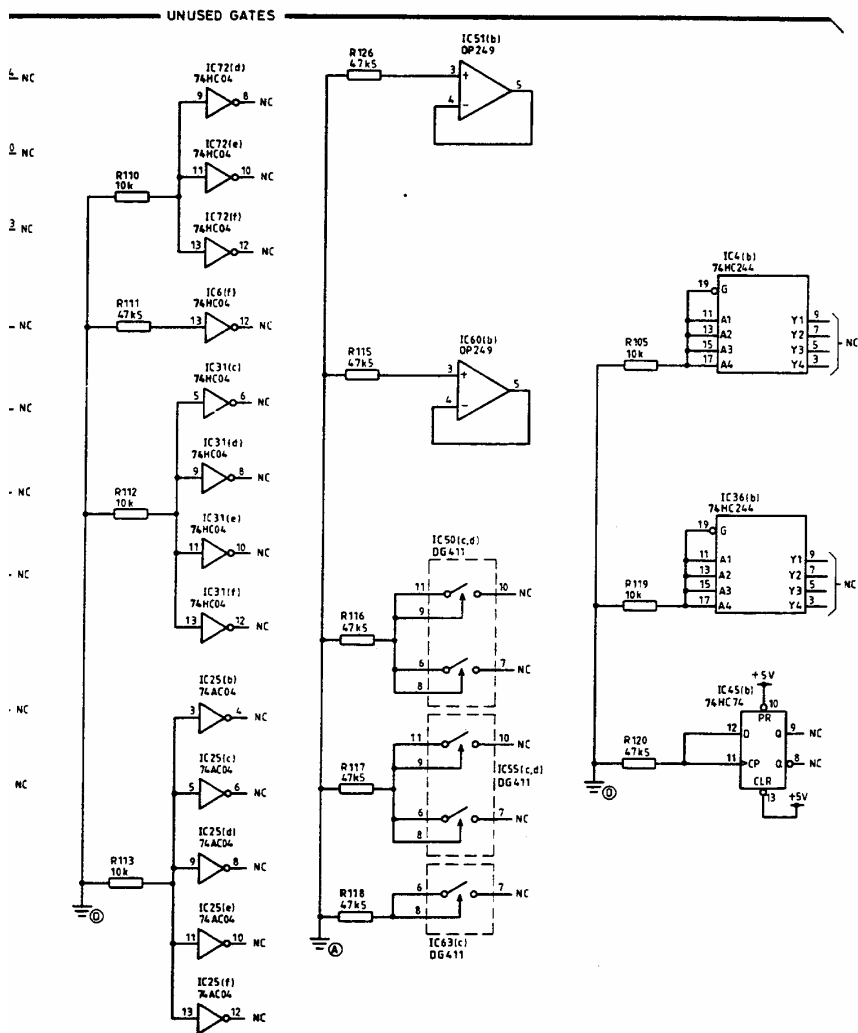
Circuit diagrams A1



CONTINUED TO SHEET EIGHT

Fig. 7-27 A1 Audio counter and switch control - circuit

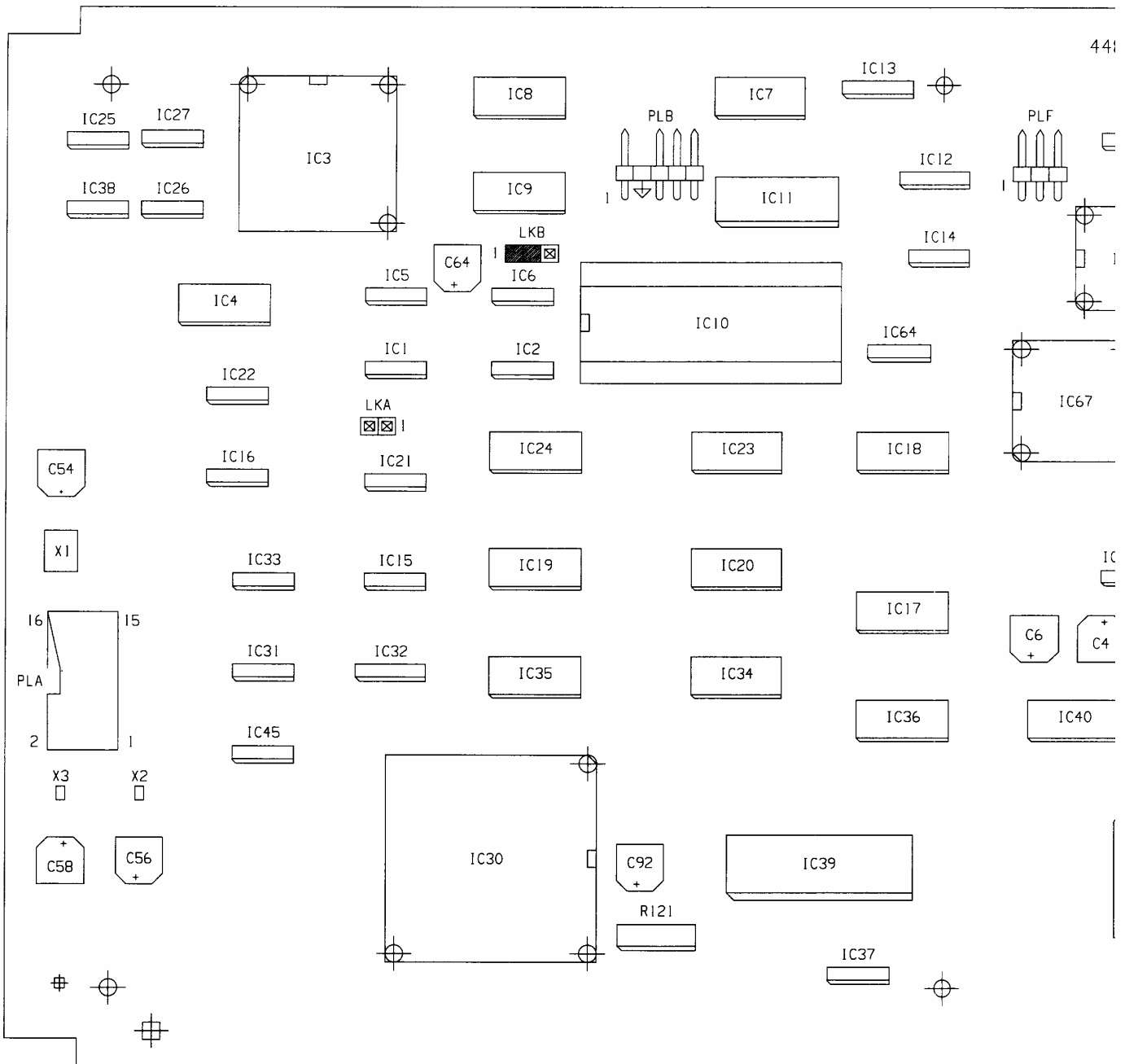
Circuit diagrams A1



SUPPLY LINE TABLE								
IC	+12V	+5V	+5VA	GND A	GND D	-5V	-12V	DEC CAP
1		14			7			C61 10n
2		14			7			C62 10n
3		44			22			C63 47n
4		20			10			C64 100µ
5		14			7			C65 10n
6		14			7			C66 10n
7		20			10			C67 10n
8		20			10			C68 10n
9		20			10			C69 10n
10		28			14			C70 10n
11		28			14			C71 10n
12		16			8			C72 10n
13		16			8			C73 10n
14		14			7			C74 10n
15		14			7			C75 10n
16		14			7			C76 10n
17		20			10			C77 10n
18		20			10			C78 10n
19		20			10			C79 10n
20		20			10			C80 10n
21		14			7			C81 10n
22		14			7			C82 10n
23		20			10			C83 10n
24		20			10			C84 10n
25		14			7			C85 10n
26		14			7			C86 10n
27		14			7			C87 10n
30		16,26,57			2,10,29,49			C88 10n C91 47n C142 47n C143 47n C144 47n C92 100µ
31		14			7			C93 10n
32		16			8			C94 10n
33		14			7			C95 10n
34		20			10			C96 10n
35		20			10			C97 10n
36		20			10			C98 10n
37		14			7			C99 10n
38		14			7			C100 10n
39		22			8,21			C101 10n
41	6						2	C102 10n
42	6						2	C103 10n C104 10n
44	7						4	C105 10n C106 10n C107 10n C141 10n
50	13	14	12	5	7		4	C108 10n C109 10n
51	6						2	C110 10n
52	13			14			3	C111 10n C112 10n
54	13			12	5		4	C113 10n C114 10n C115 10n
55	13			12	5		4	C116 10n C117 10n
56	6						2	C118 10n C119 10n
58	6						2	C120 10n
59	13			14			3	C121 10n C122 10n C123 10n
60	6						2	C124 10n C125 10n
61	13			12	5		4	C126 10n C127 10n
62	6						2	C128 10n C129 10n
63	13			12	5		4	C130 10n C131 10n C132 10n C133 10n
64		14			7			C134 10n
65		14			7			C135 10n
67		28			14			C136 10n
68		20			10			C137 10n
69		14			7			C138 10n
70		14			7			C139 10n
71		20			10			C140 10n
72		14			7			C145 10n
73		20			10			C146 10n
74	6						2	C147 10n

ALL IC'S DECOUPLED AT SUPPLY TO GROUND AS INDICATED

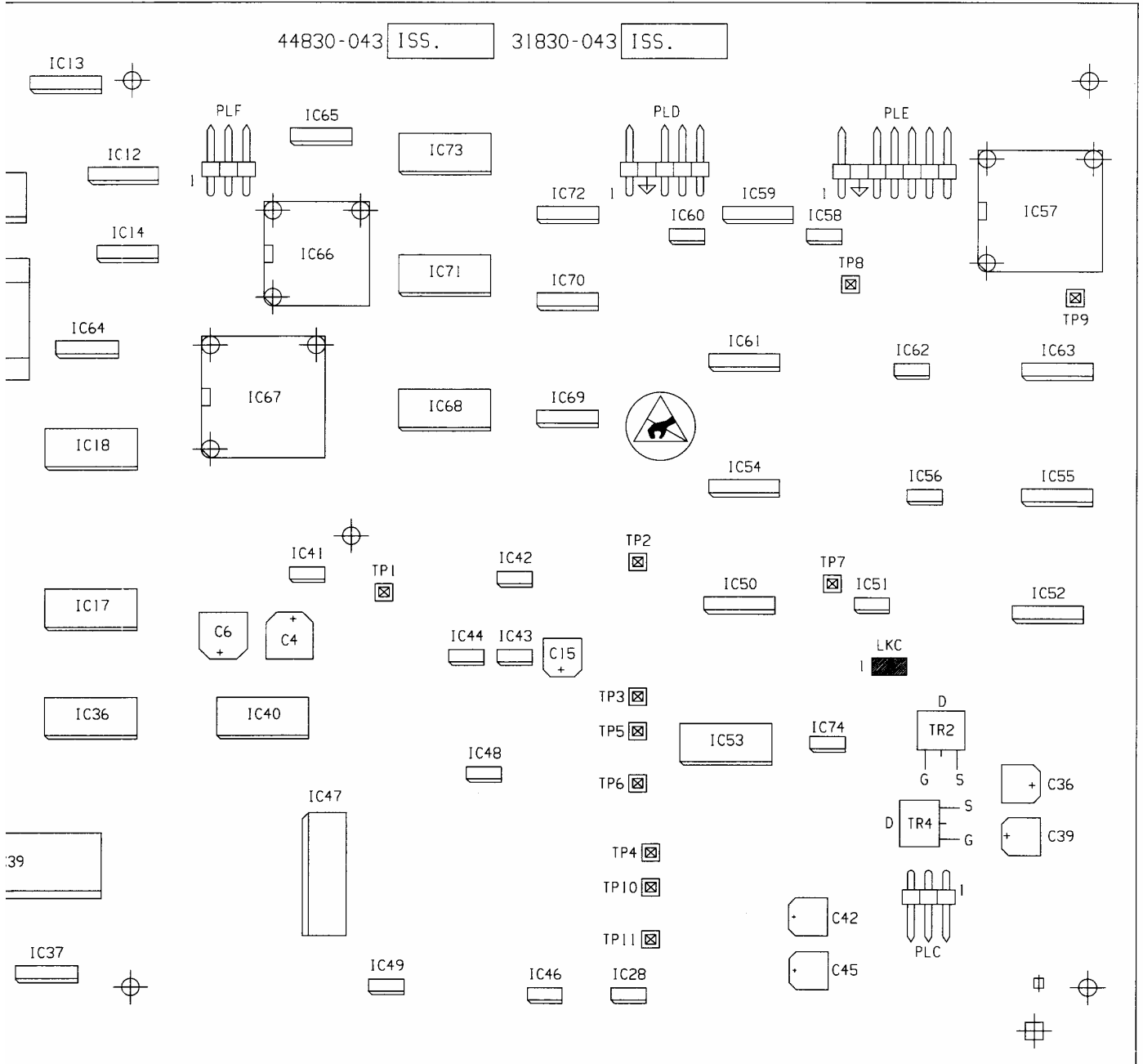
Fig. 7-28 A1 Power supplies - circuit



Power supplies A1

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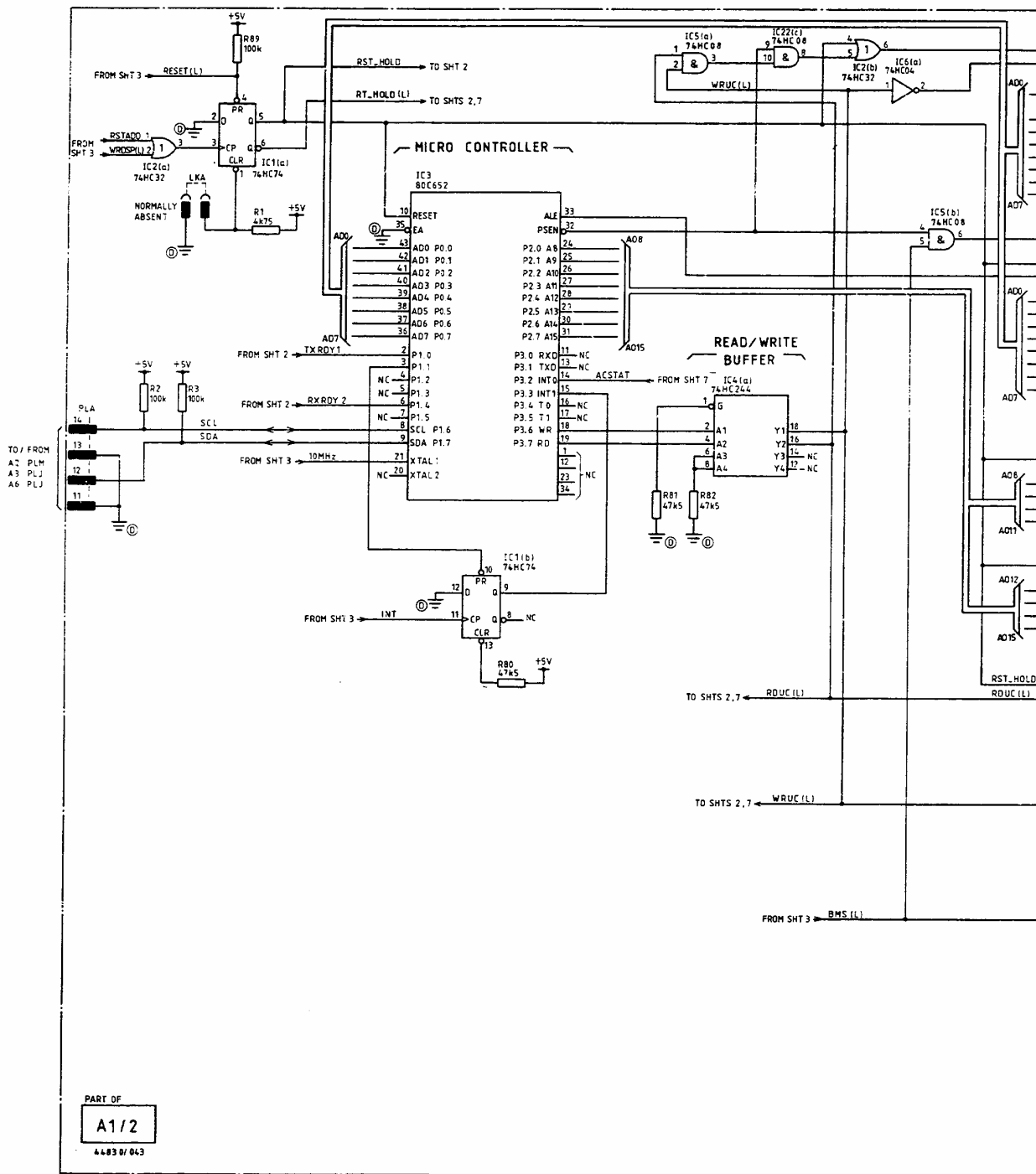
Component layout A1/2



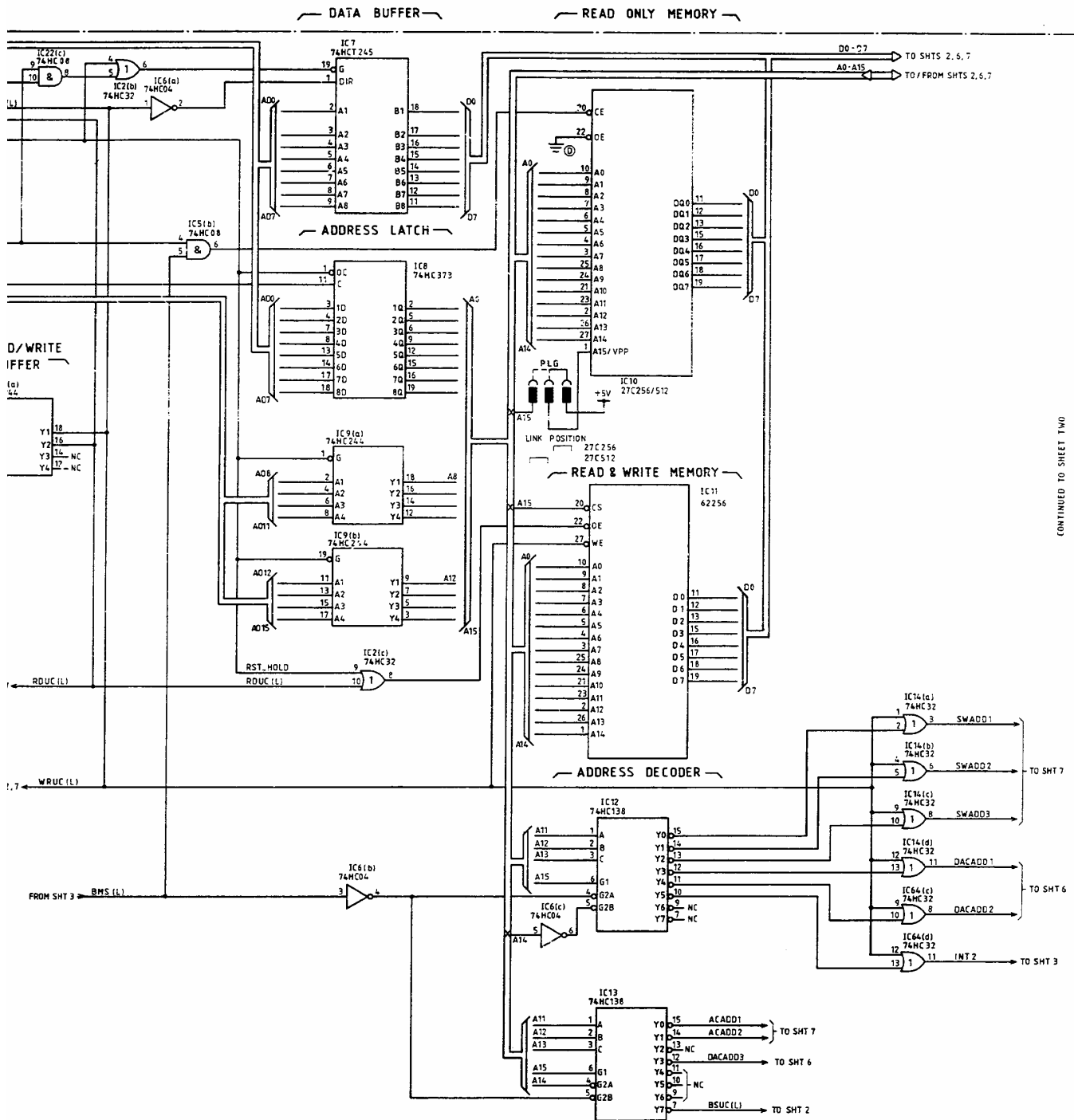
A1

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Fig. 7-29 A1/2 Audio generator - component layout, component side



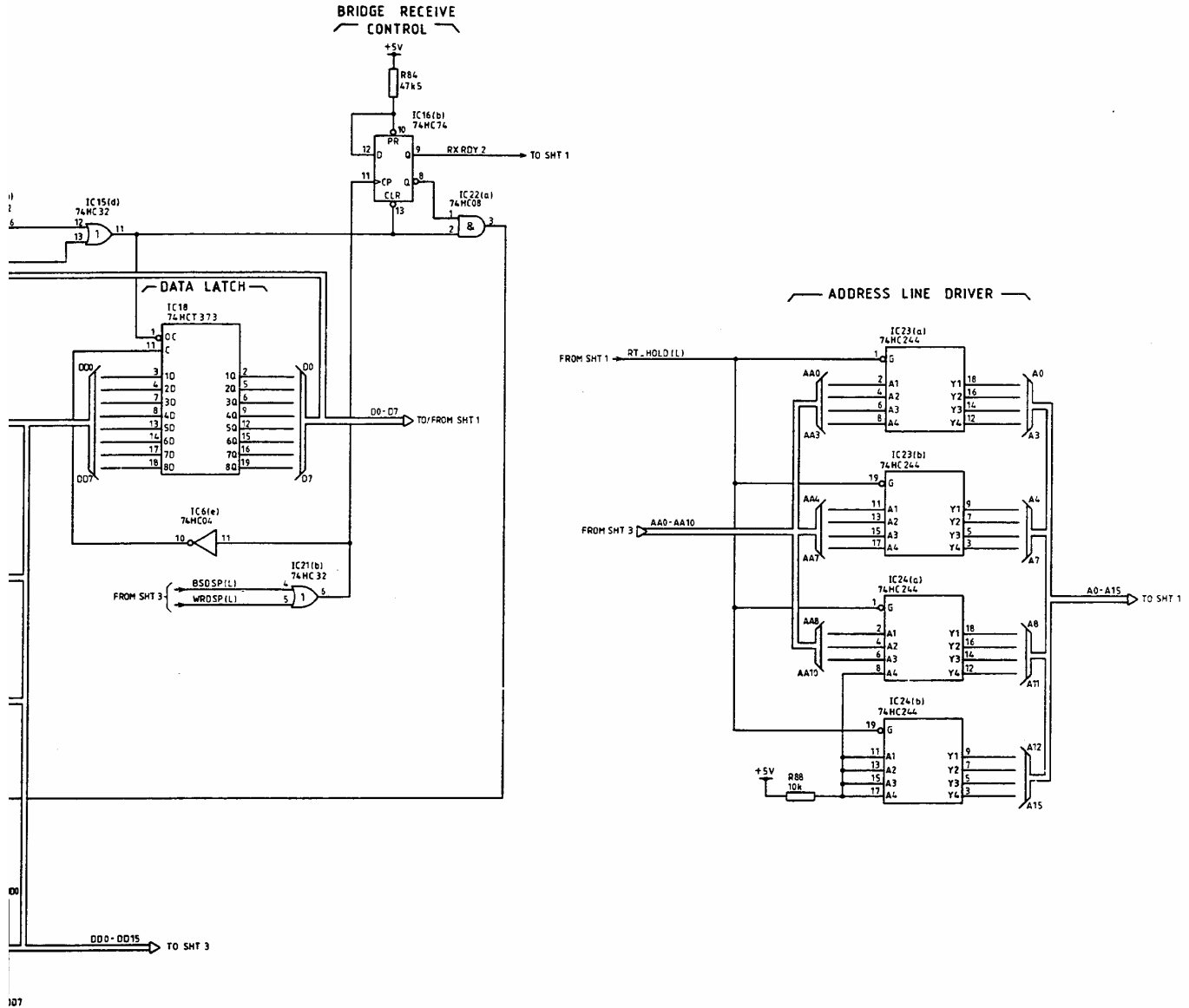
Circuit diagrams A1/2



CONTINUED TO SHEET TWO

Fig. 7-30 A1/2 Microprocessor memory and addressing - circuit

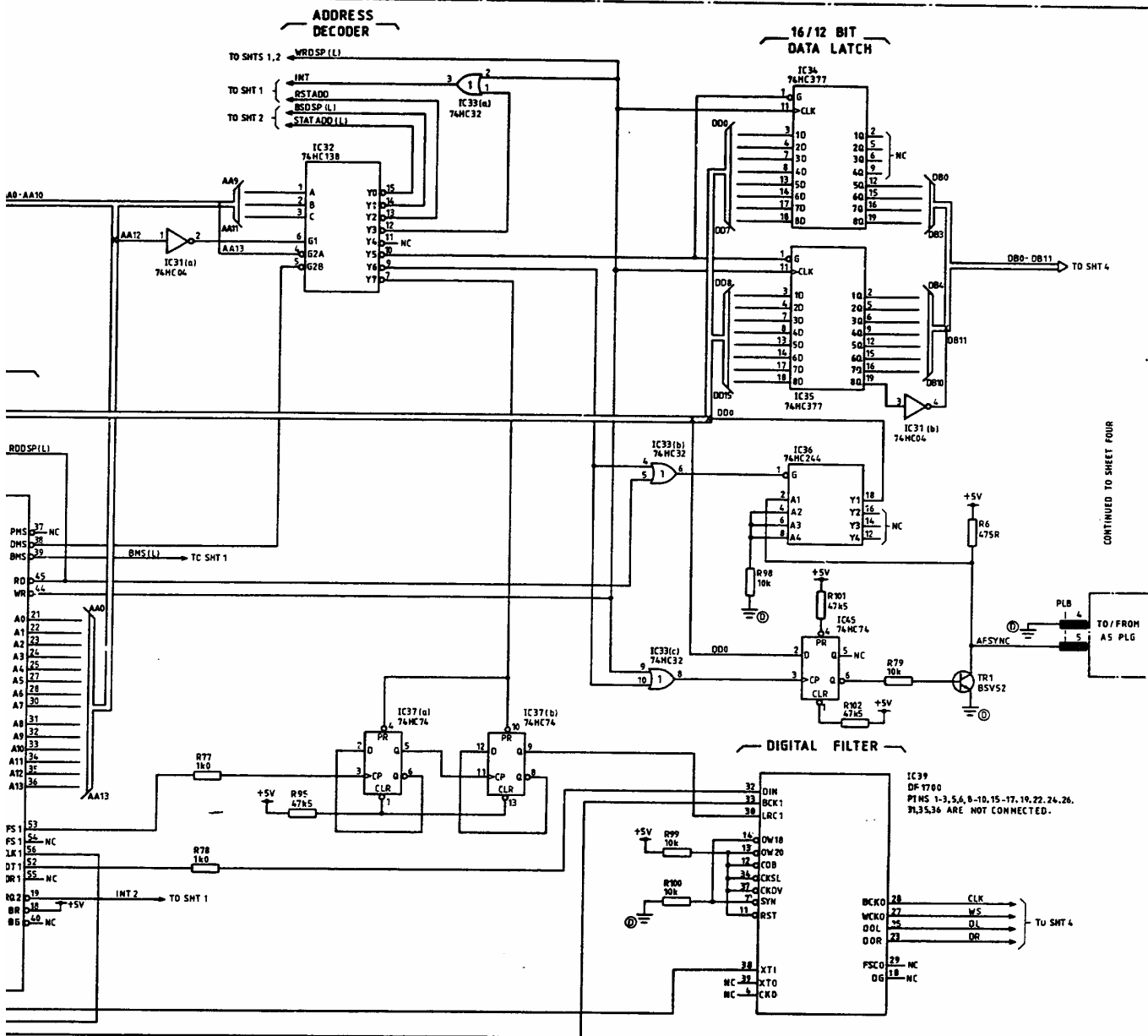
Circuit diagrams A1/2



CONTINUED TO SHEET THREE

Fig. 7-32 A1/2 Bridge and boot addressing - circuit

Circuit diagrams A1/2

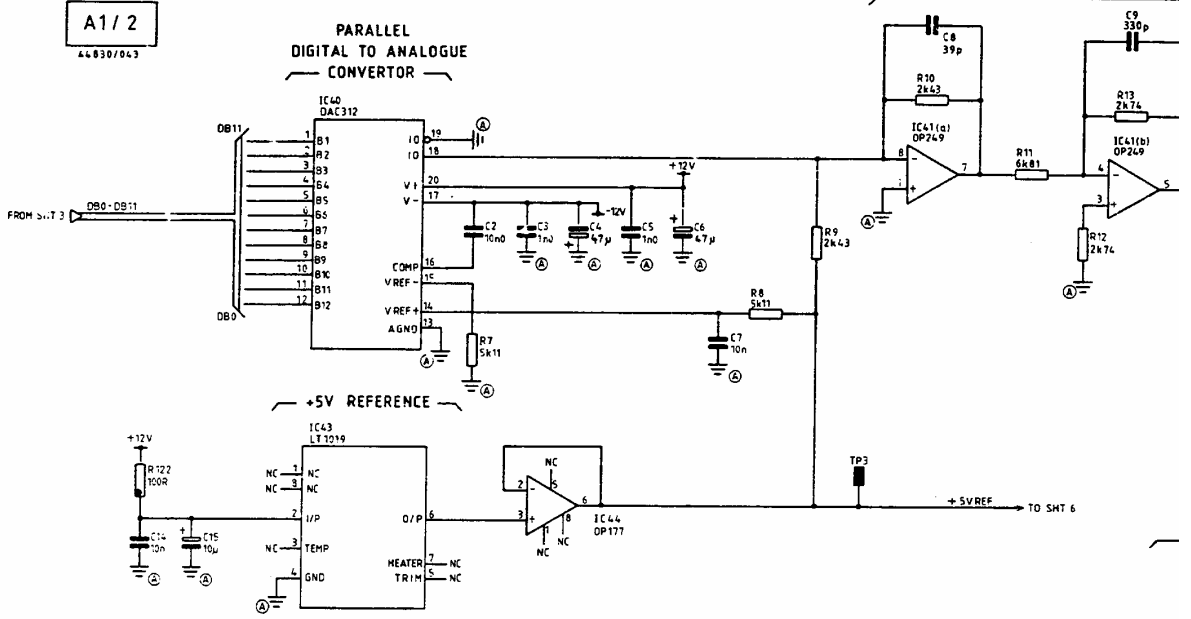


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Fig. 7-33 A1/2 DSP, dividers, and oversampling - circuit

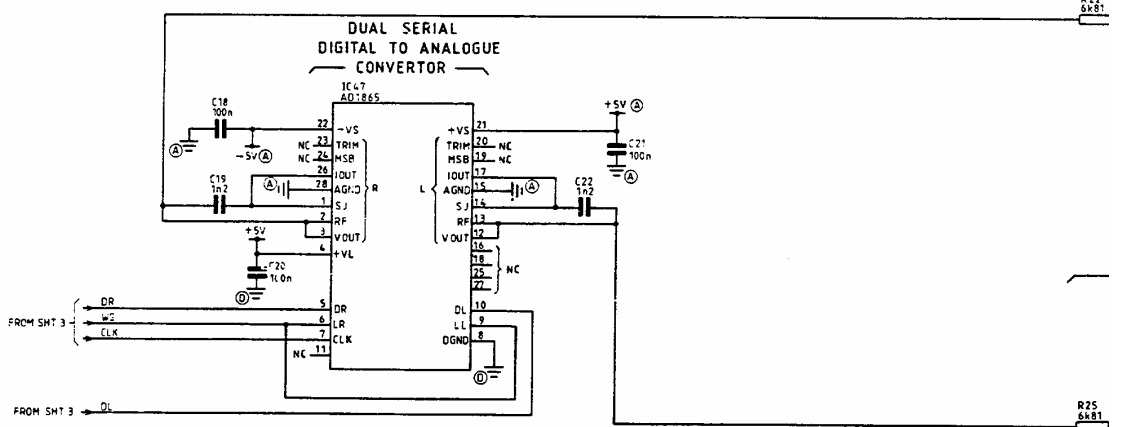
PART OF
A1/2
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**PARALLEL
 DIGITAL TO ANALOGUE
 CONVERTOR**

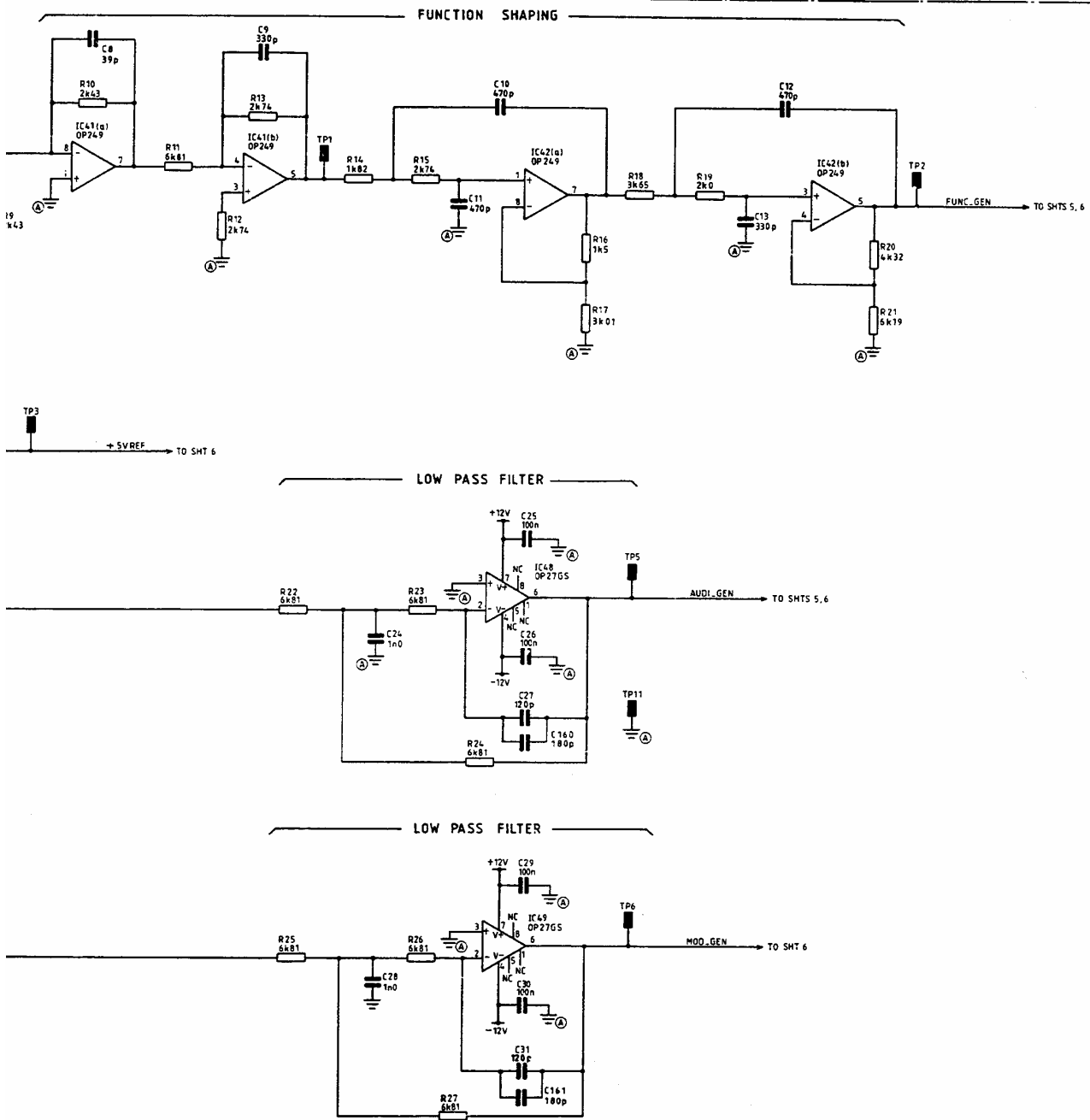


CONTINUED FROM SHEET THREE

**DUAL SERIAL
 DIGITAL TO ANALOGUE
 CONVERTOR**



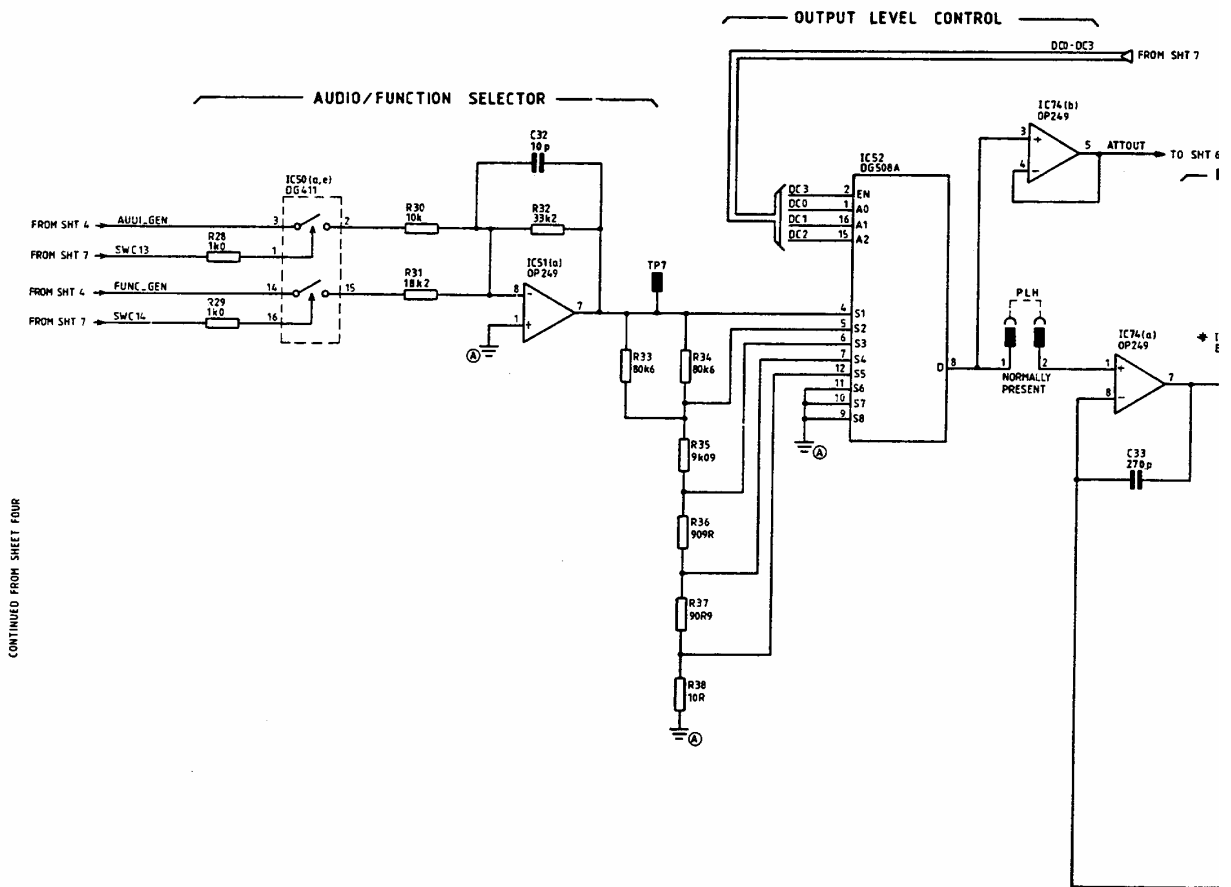
Circuit diagrams A1/2



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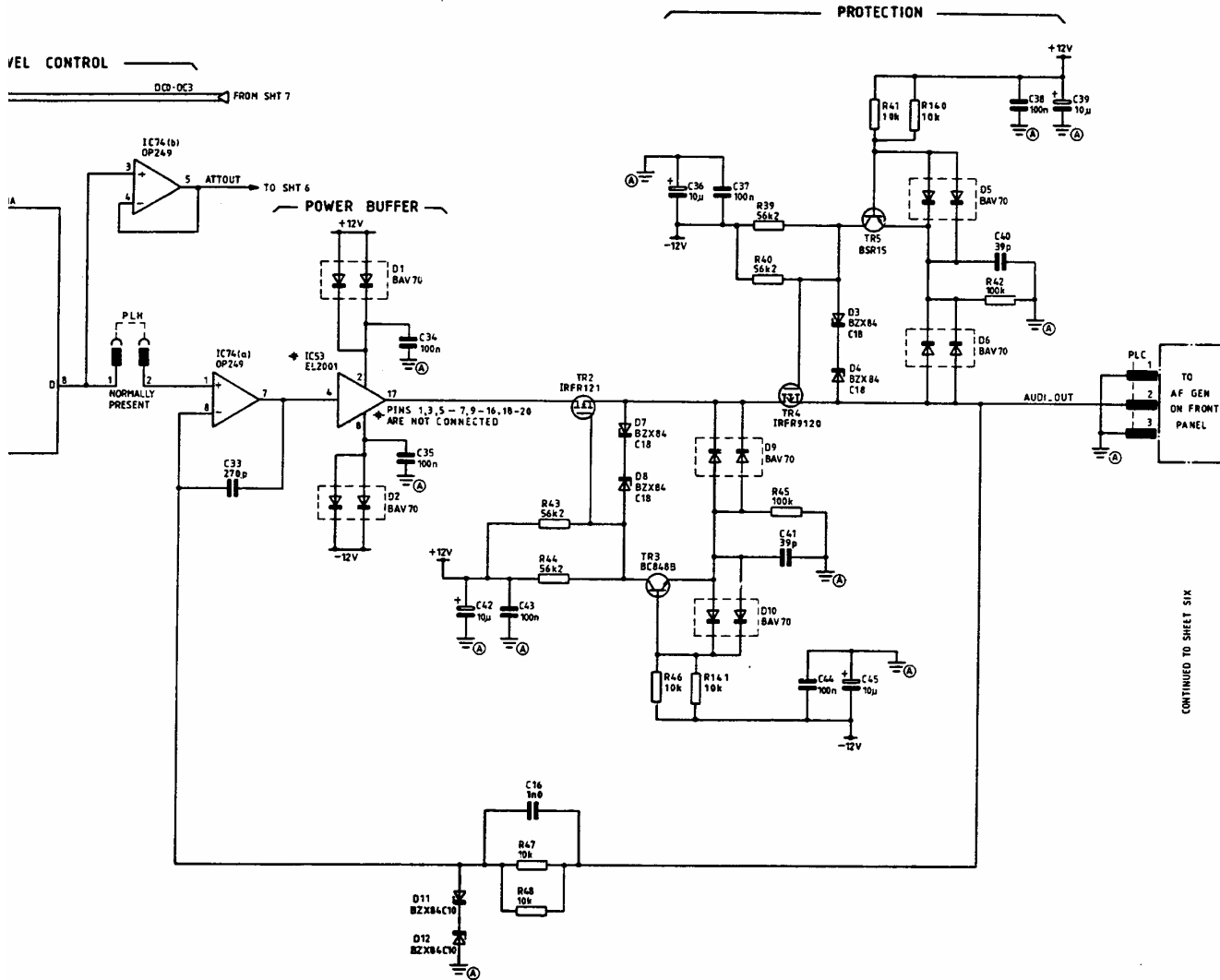
Fig. 7-34 A1/2 DACs and analogue filters - circuit

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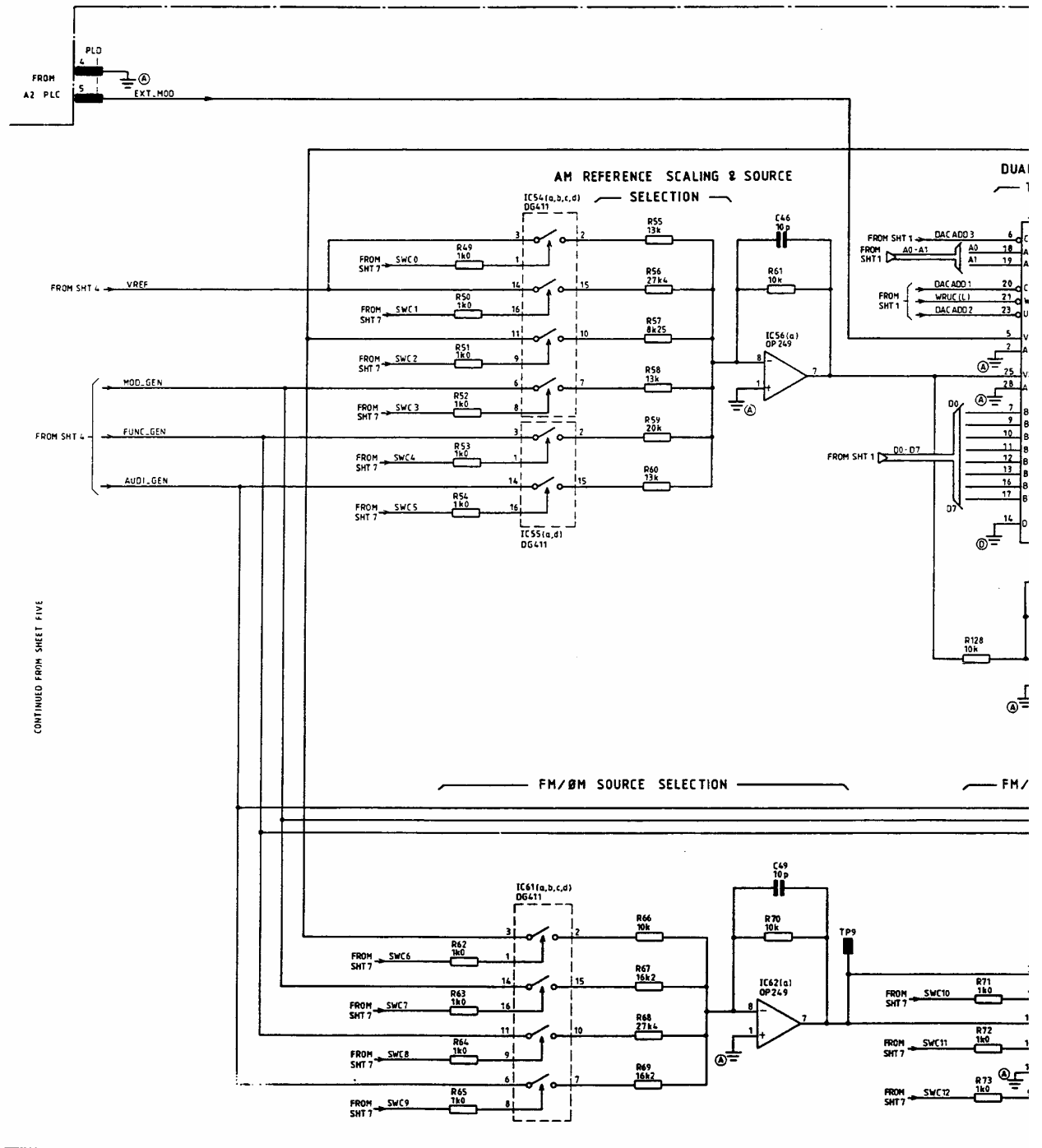
CONTINUED FROM SHEET FOUR

Circuit diagrams A1/2



CONTINUED TO SHEET SIX

Fig. 7-35 A1/2 Audio output path - circuit



CONTINUED FROM SHEET FIVE

Circuit diagrams A1/2

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A1/2
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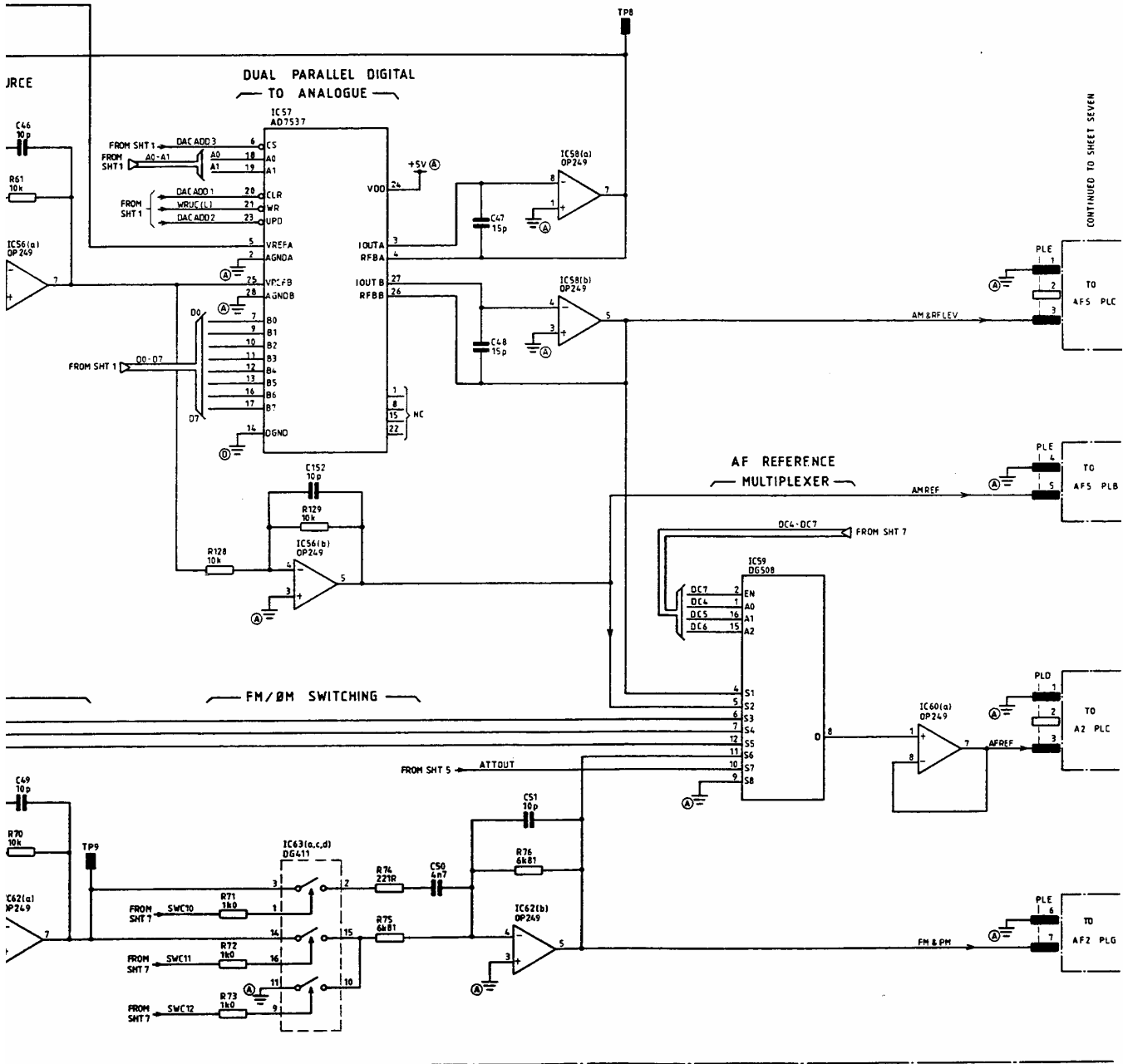
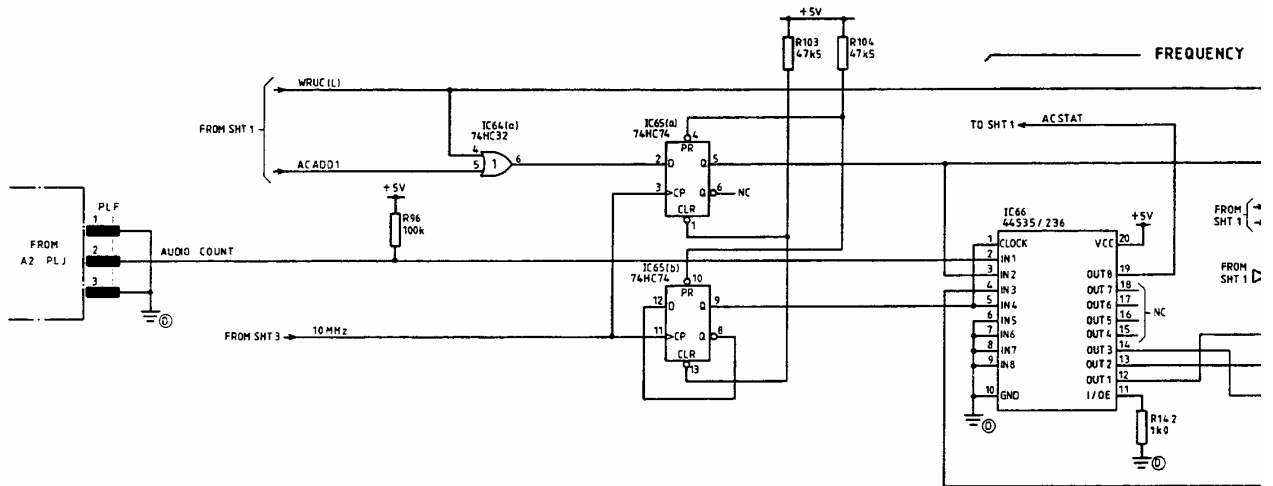


Fig. 7-36 A1/2 Modulation and calibration paths - circuit

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A1/2
 44830/043

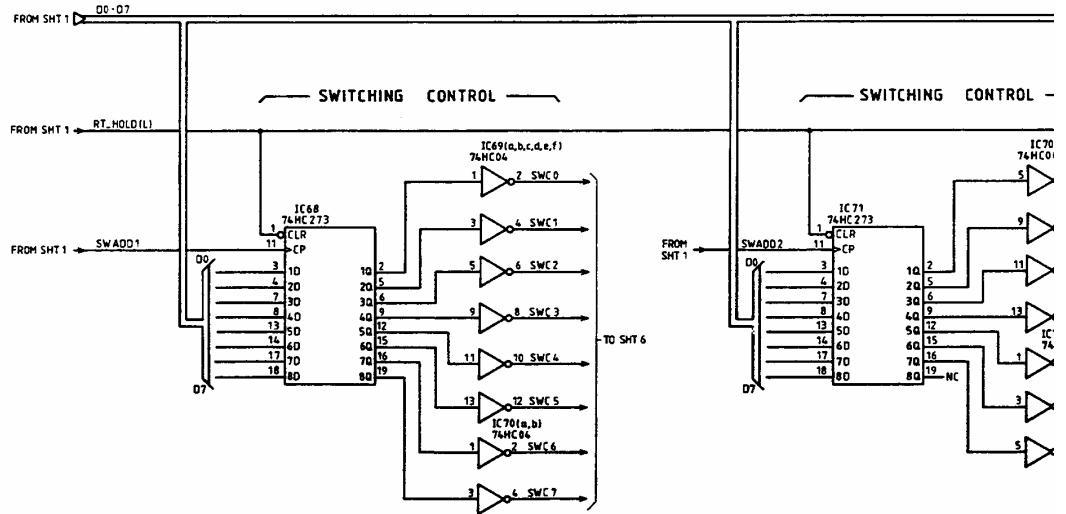
FREQUENCY COUNTER CONTROL



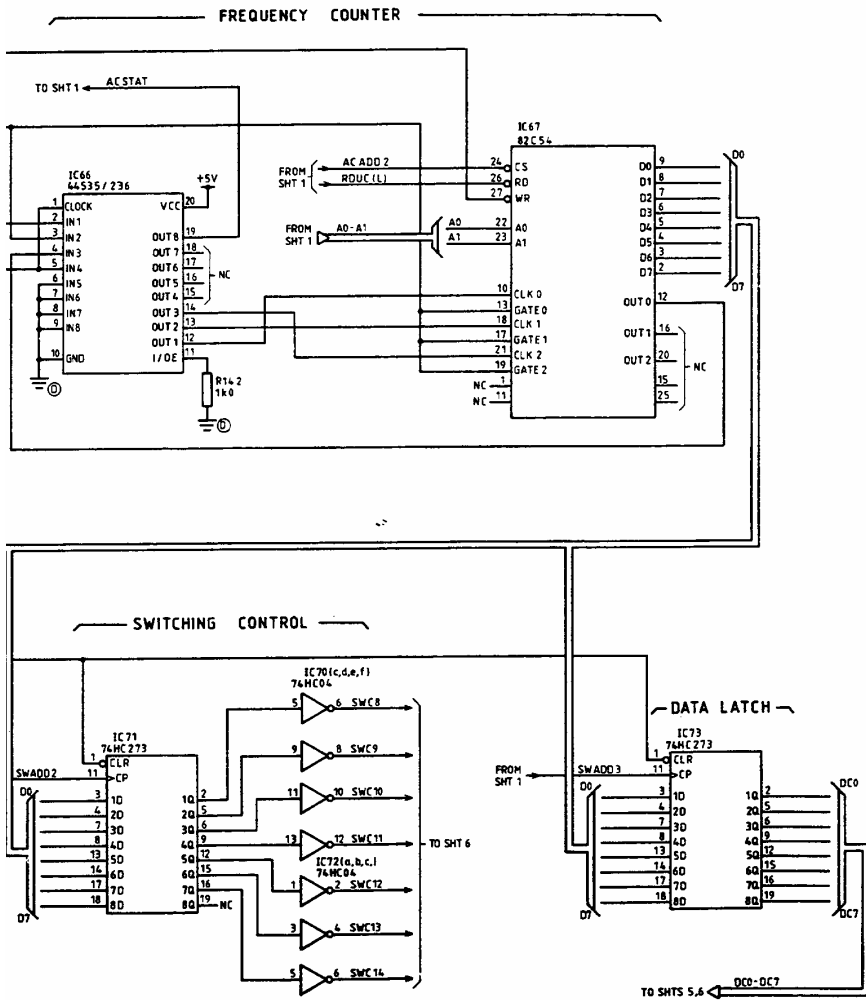
FREQUENCY

CONTINUED FROM SHEET SIX

SWITCHING CONTROL

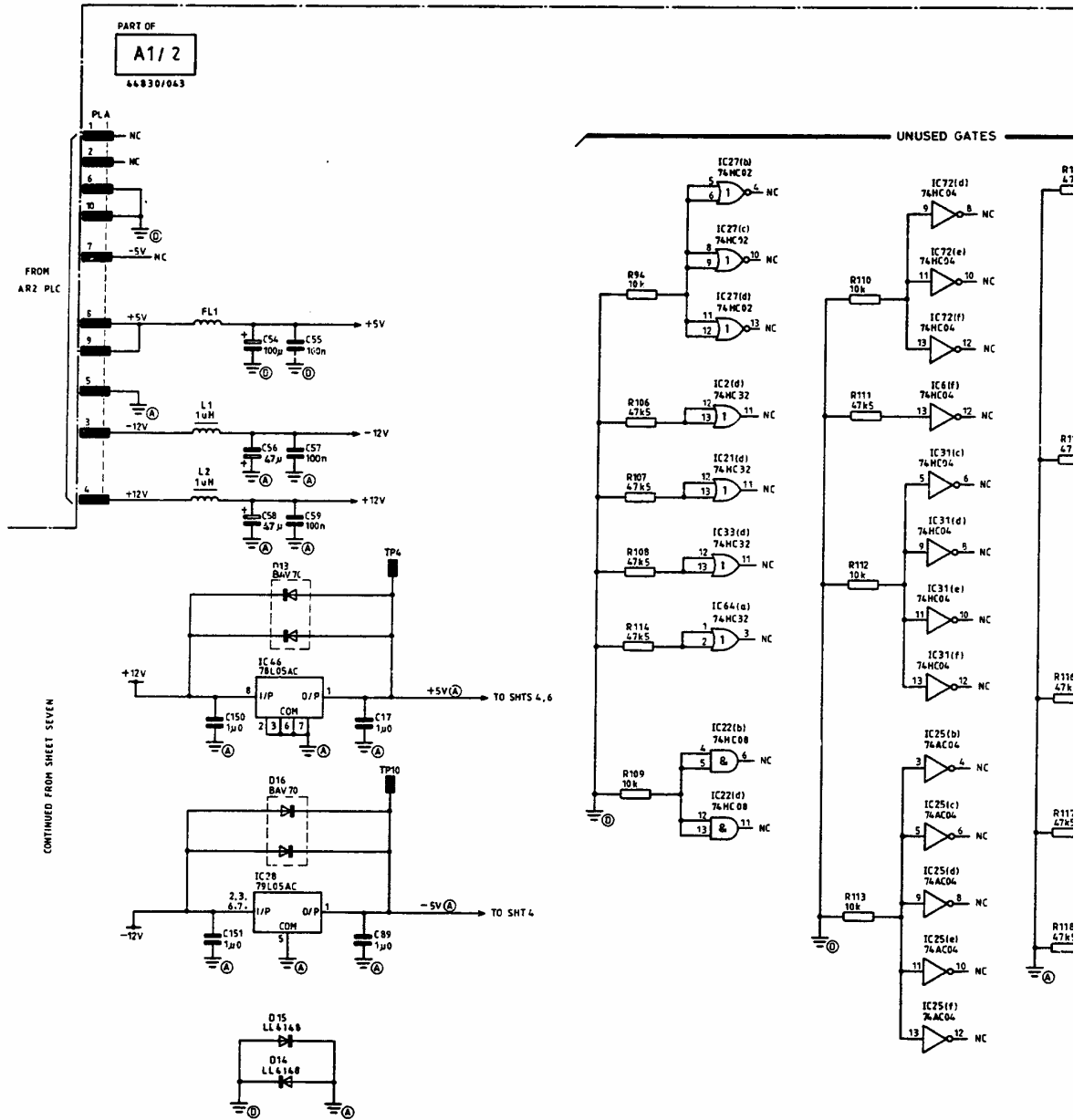


Circuit diagrams A1/2

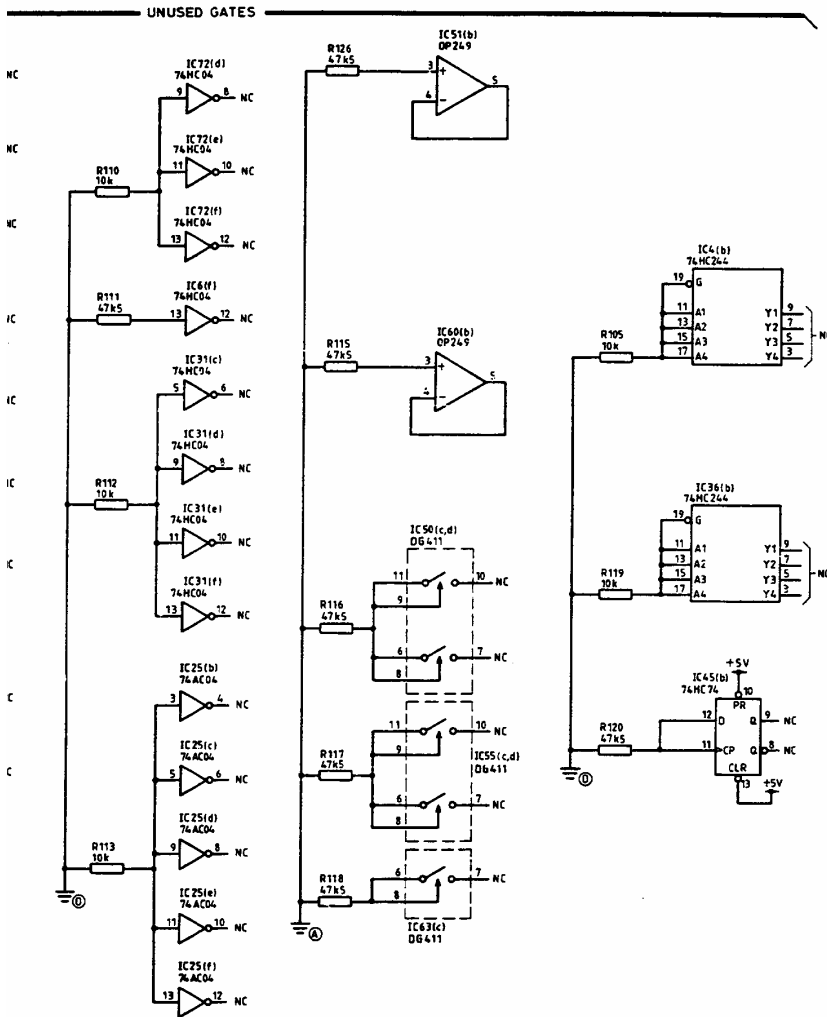


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Fig. 7-37 A1/2 Audio counter and switch control - circuit



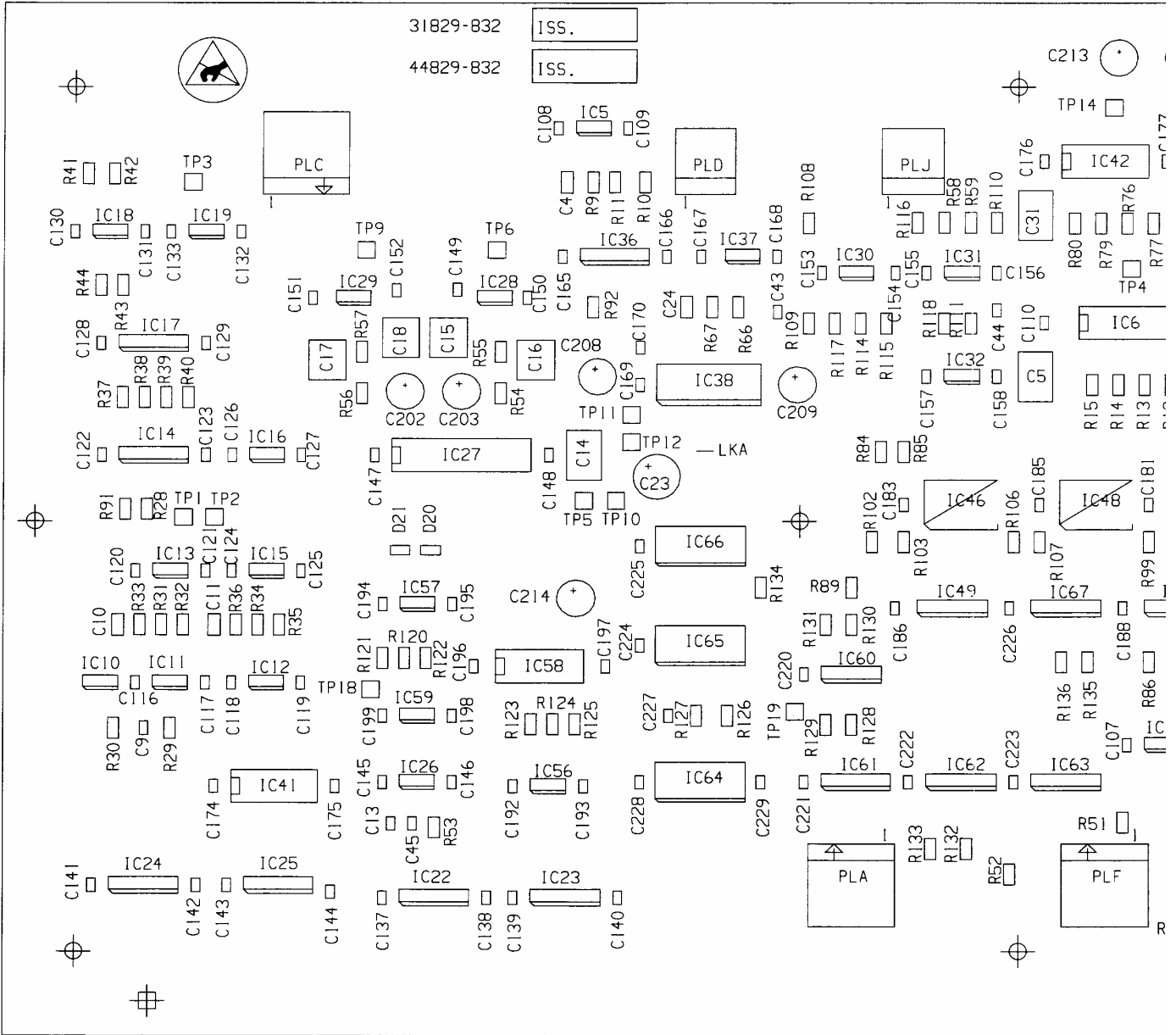
Circuit diagrams A1/2



SUPPLY LINE TABLE									
IC	+12V	+5V	+5VA	GND A	GND D	-5V	-12V	DEC	CAP
1		14			7			C61	10n
2		14			7			C62	10n
3		44			22			C63	47n
4		20			10			C64	100µ
5		14			7			C65	10n
6		14			7			C66	10n
7		20			10			C67	10n
8		20			10			C68	10n
9		20			10			C69	10n
10		28			14			C70	10n
11		28			14			C71	10n
12		16			8			C72	10n
13		16			8			C73	10n
14		14			7			C74	10n
15		14			7			C75	10n
16		14			7			C76	10n
17		20			10			C77	10n
18		20			10			C78	10n
19		20			10			C79	10n
20		20			10			C80	10n
21		14			7			C81	10n
22		14			7			C82	10n
23		20			10			C83	10n
24		20			10			C84	10n
25		14			7			C85	10n
26		14			7			C86	10n
27		14			7			C87	10n
28		16,26			2,10			C88	10n
29		57			29,49			C91	47n
30								C142	47n
31								C143	47n
32								C144	47n
33								C92	100µ
34		14			7			C93	10n
35		16			8			C94	10n
36		14			7			C95	10n
37		20			10			C96	10n
38		20			10			C97	10n
39		21			4,0,20			C98	10n
40								C99	10n
41	6						2	C100	10n
42	6						2	C101	10n
43	6						2	C102	10n
44	7						4	C103	10n
45		14			7			C104	10n
46								C105	10n
47								C106	10n
48								C107	10n
49								C108	10n
50	13		12	5	7		4	C109	10n
51	6						2	C110	10n
52	13		14				3	C111	10n
53	13		12	5			4	C112	10n
54	13		12	5			4	C113	10n
55	13		12	5			4	C114	10n
56	6						2	C115	10n
57	6						2	C116	10n
58	6						2	C117	10n
59	13		14				3	C118	10n
60	6						2	C119	10n
61	13		12	5			4	C120	10n
62	6						2	C121	10n
63	13		12	5			4	C122	10n
64		14			7			C123	10n
65		14			7			C124	10n
66		28			14			C125	10n
67		20			10			C126	10n
68		14			7			C127	10n
69		14			7			C128	10n
70		14			7			C129	10n
71		20			10			C130	10n
72		14			7			C131	10n
73		20			10			C132	10n
74	6						2	C133	10n
								C134	10n
								C135	10n
								C136	10n
								C137	10n
								C138	10n
								C139	10n
								C140	10n
								C141	10n
								C145	10n
								C146	10n

ALL IC'S DECOUPLED AT SUPPLY TO GROUND AS INDICATED

Fig. 7-38 A1/2 Power supplies - circuit



Power supplies A1/2

Drg. No. 44829/832

Component layout A2

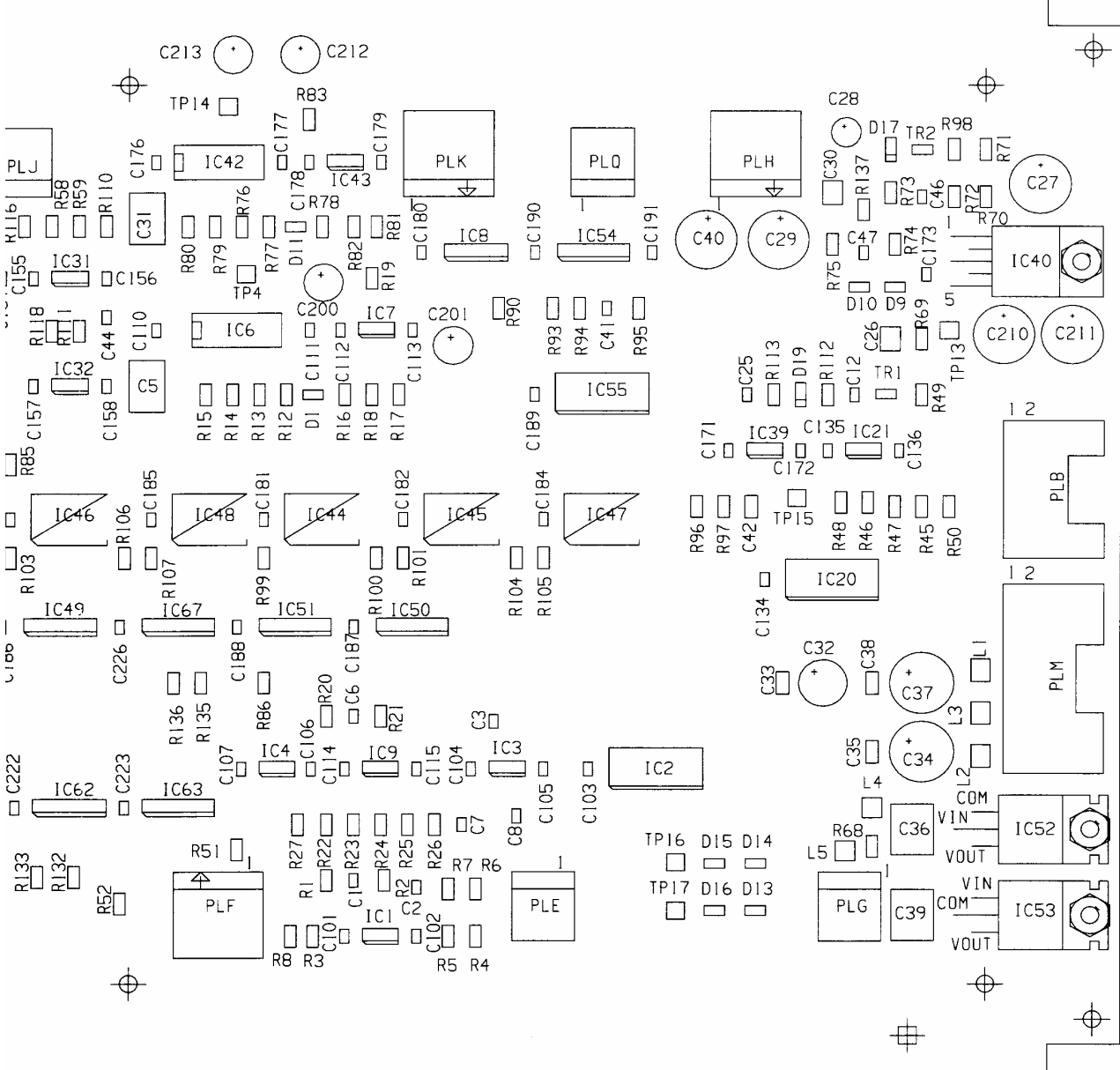
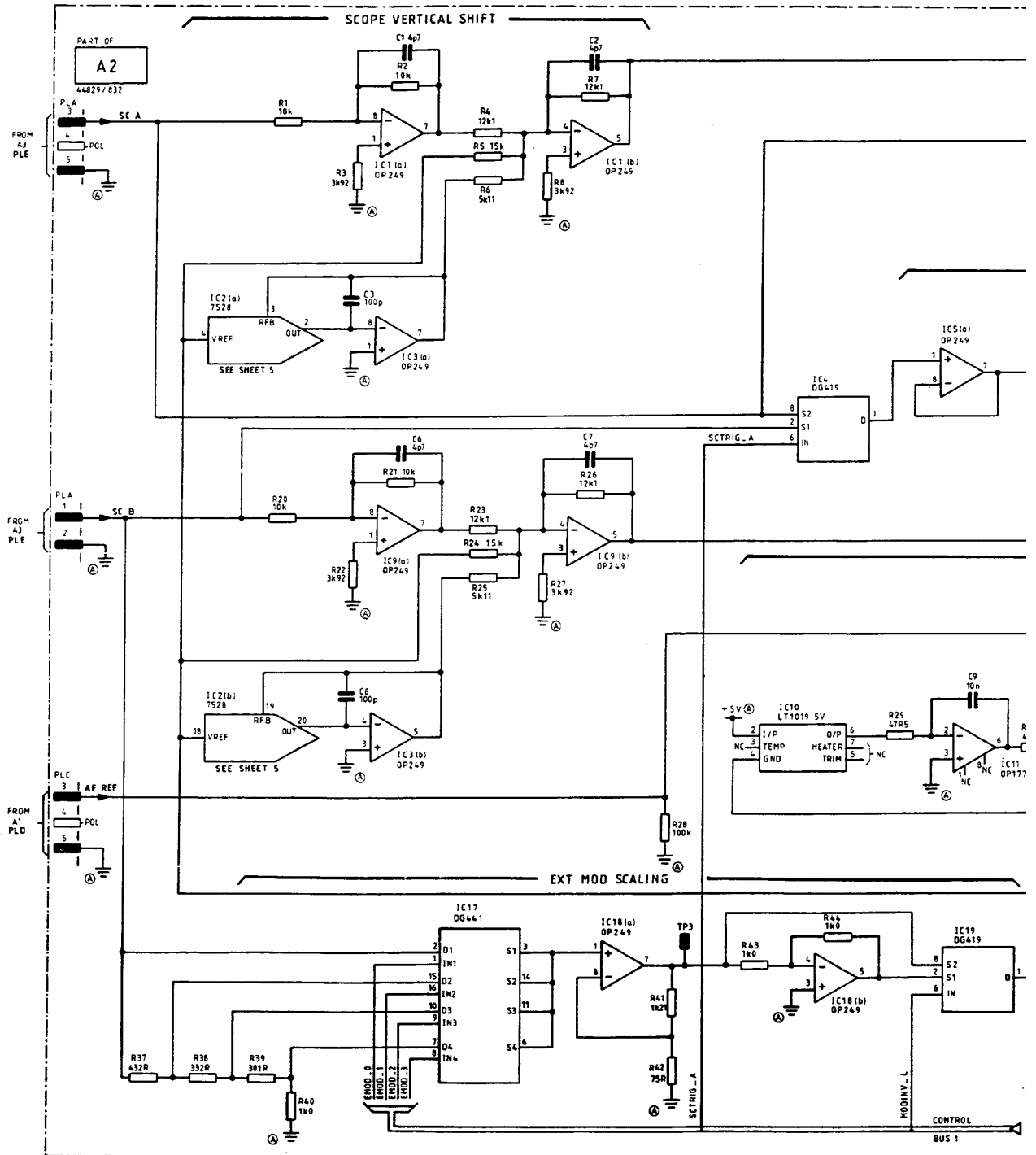


Fig. 7-39 A2 Audio processor 2 - component layout



Circuit diagrams **A2**

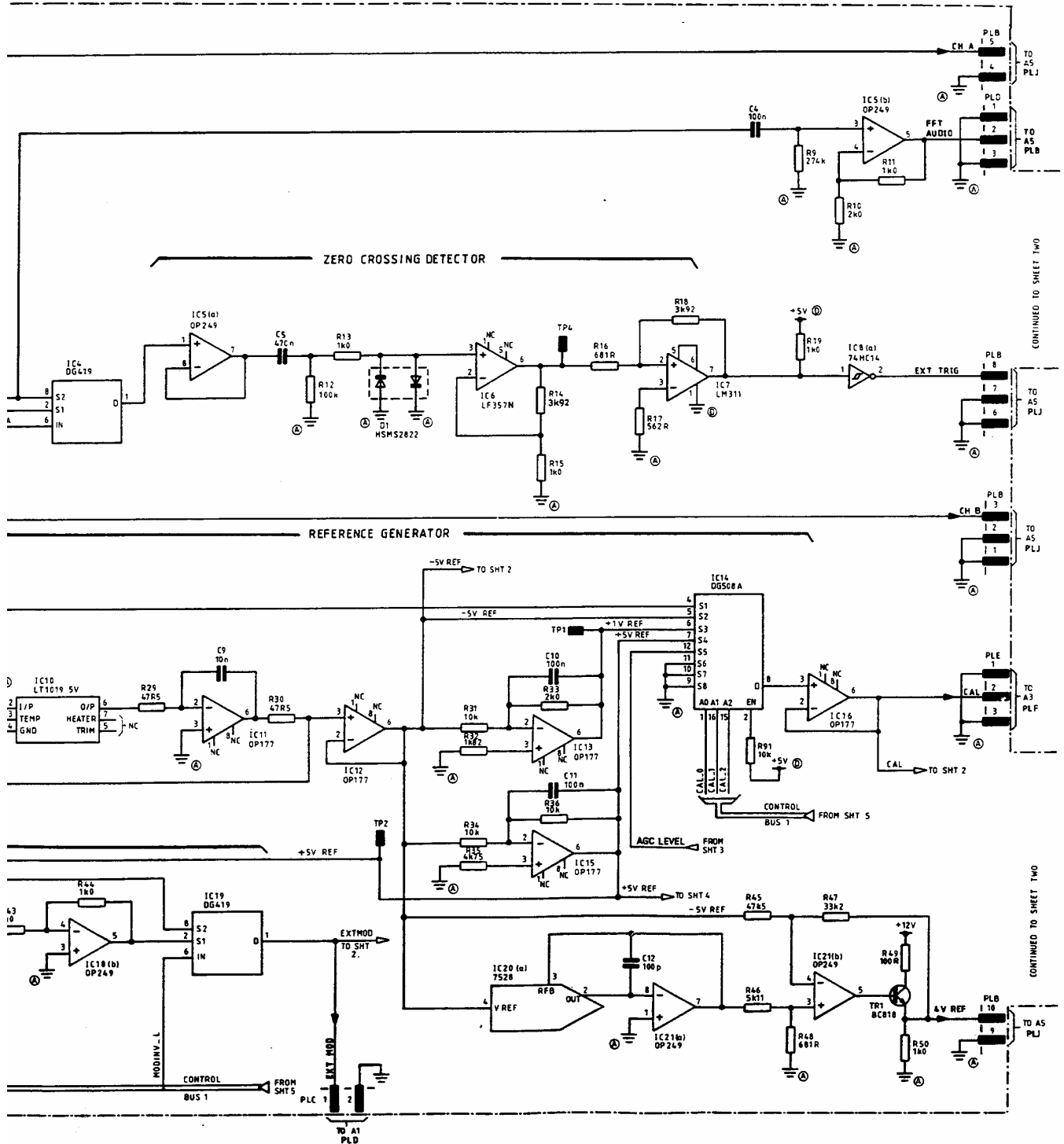
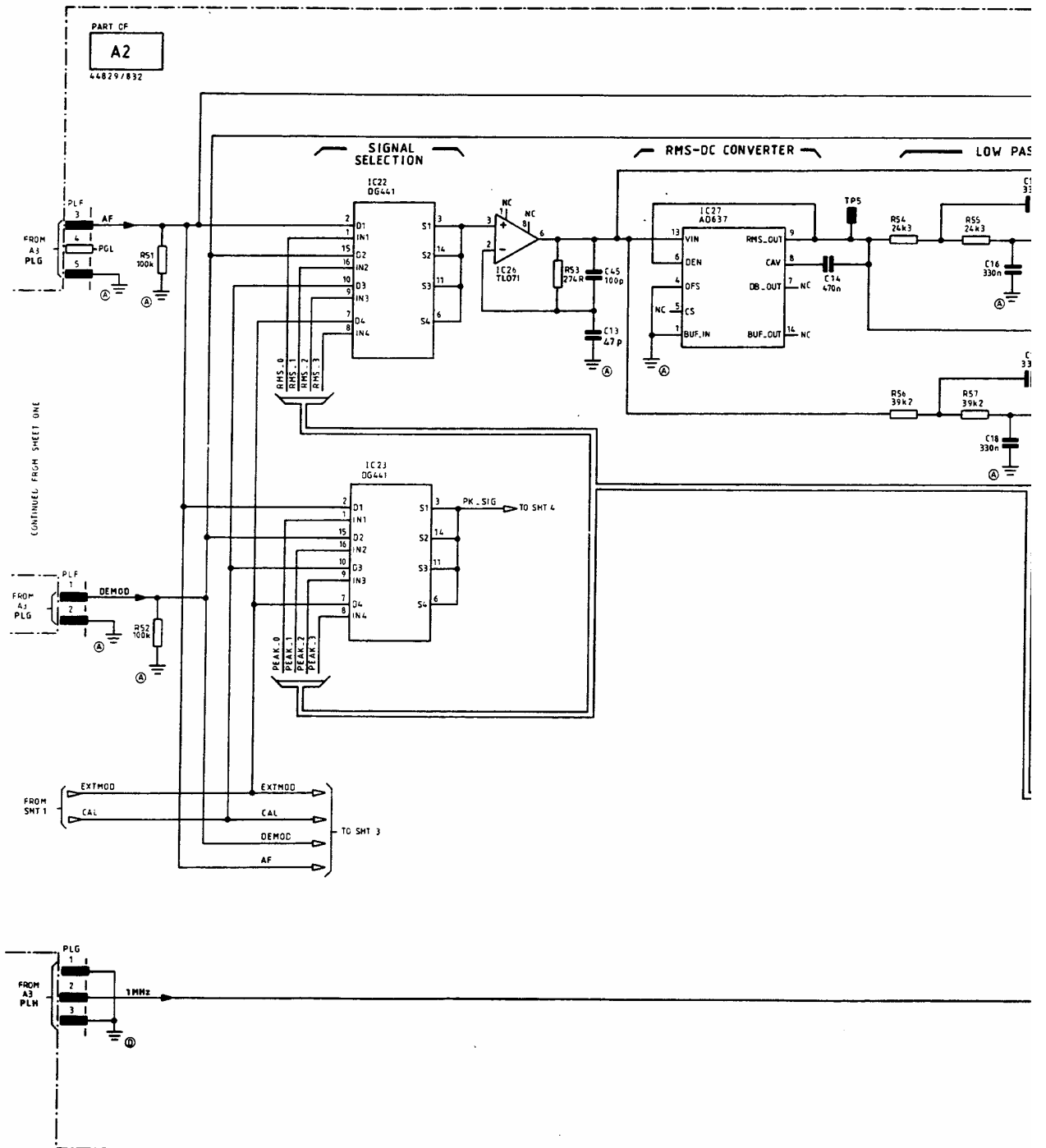
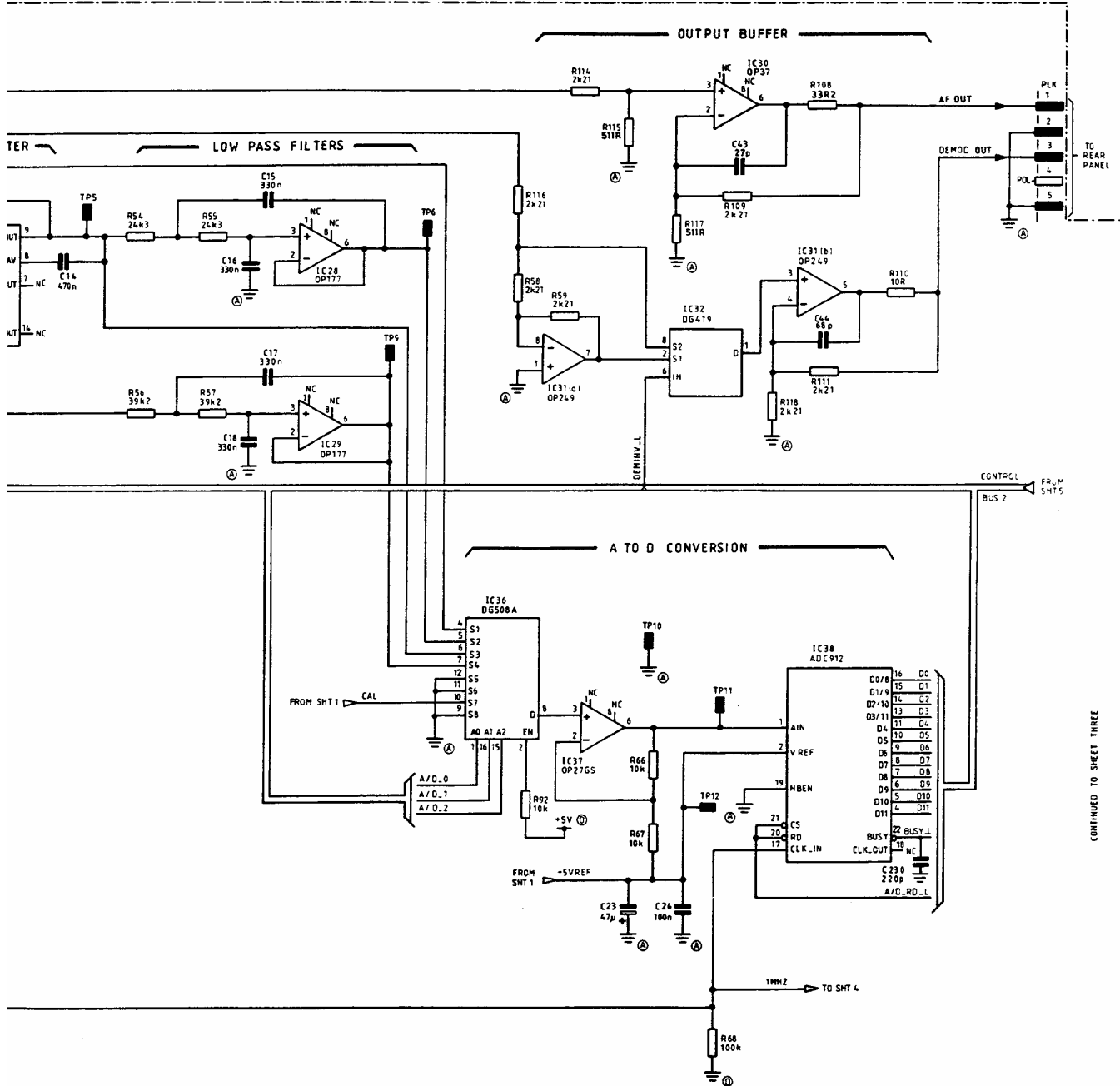


Fig. 7-40 A2 Vertical shift, ext mod scaling, calibration ref gen - circuit

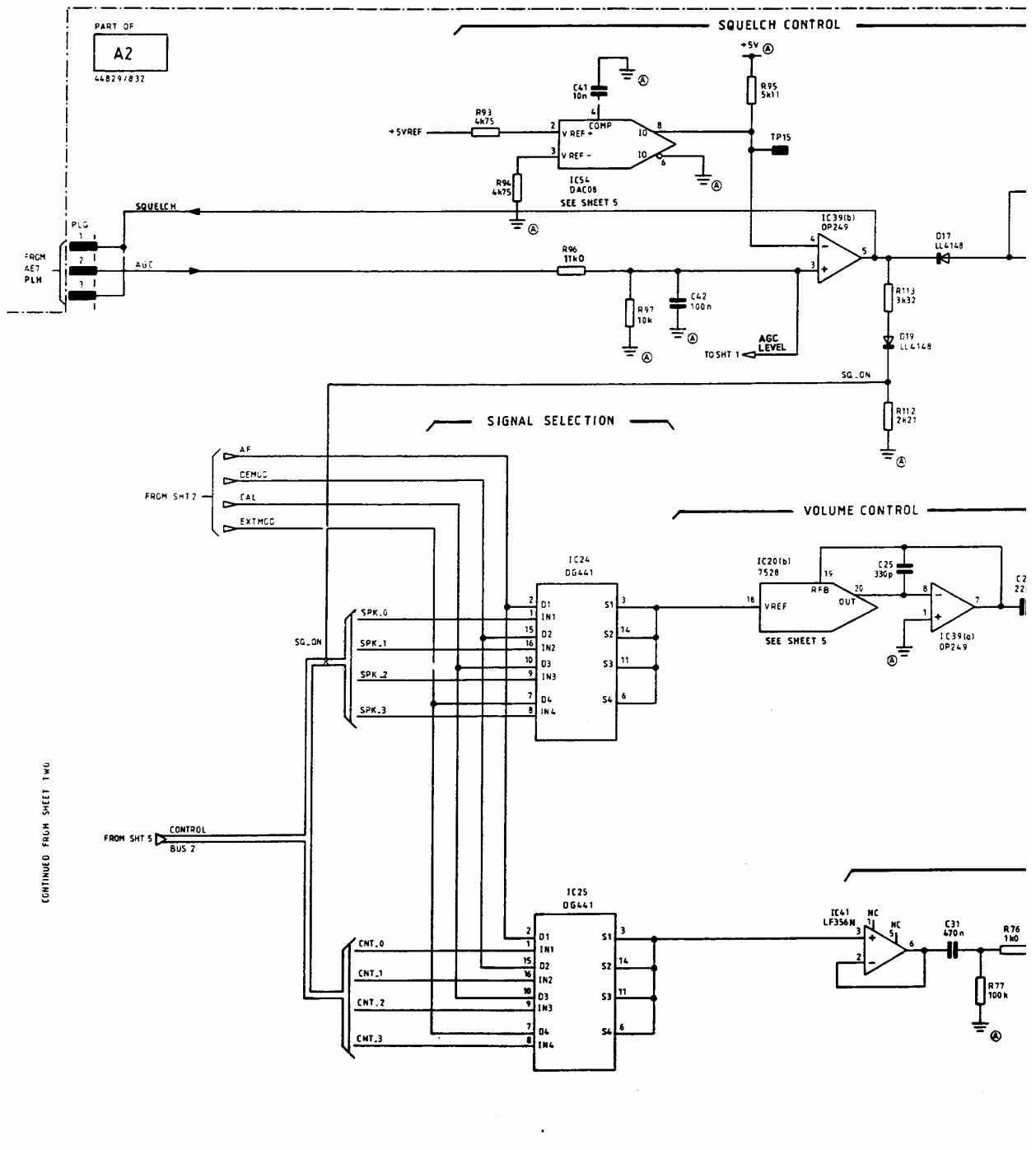


Circuit diagrams A2



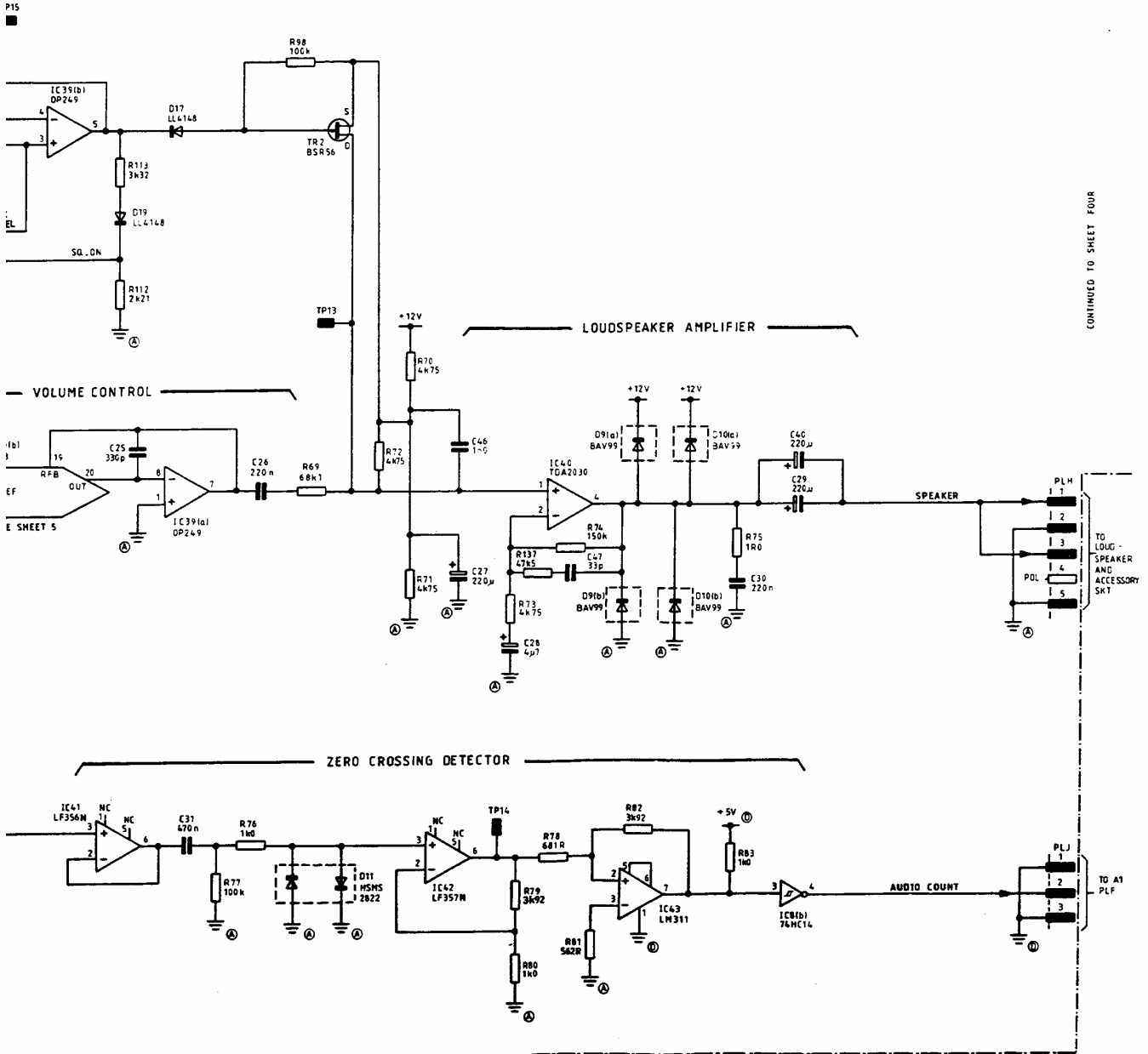
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Fig. 7-41 A2 Signal selection, RMS to DC converter, and ADC - circuit



Circuit diagrams **A2**

CONTROL

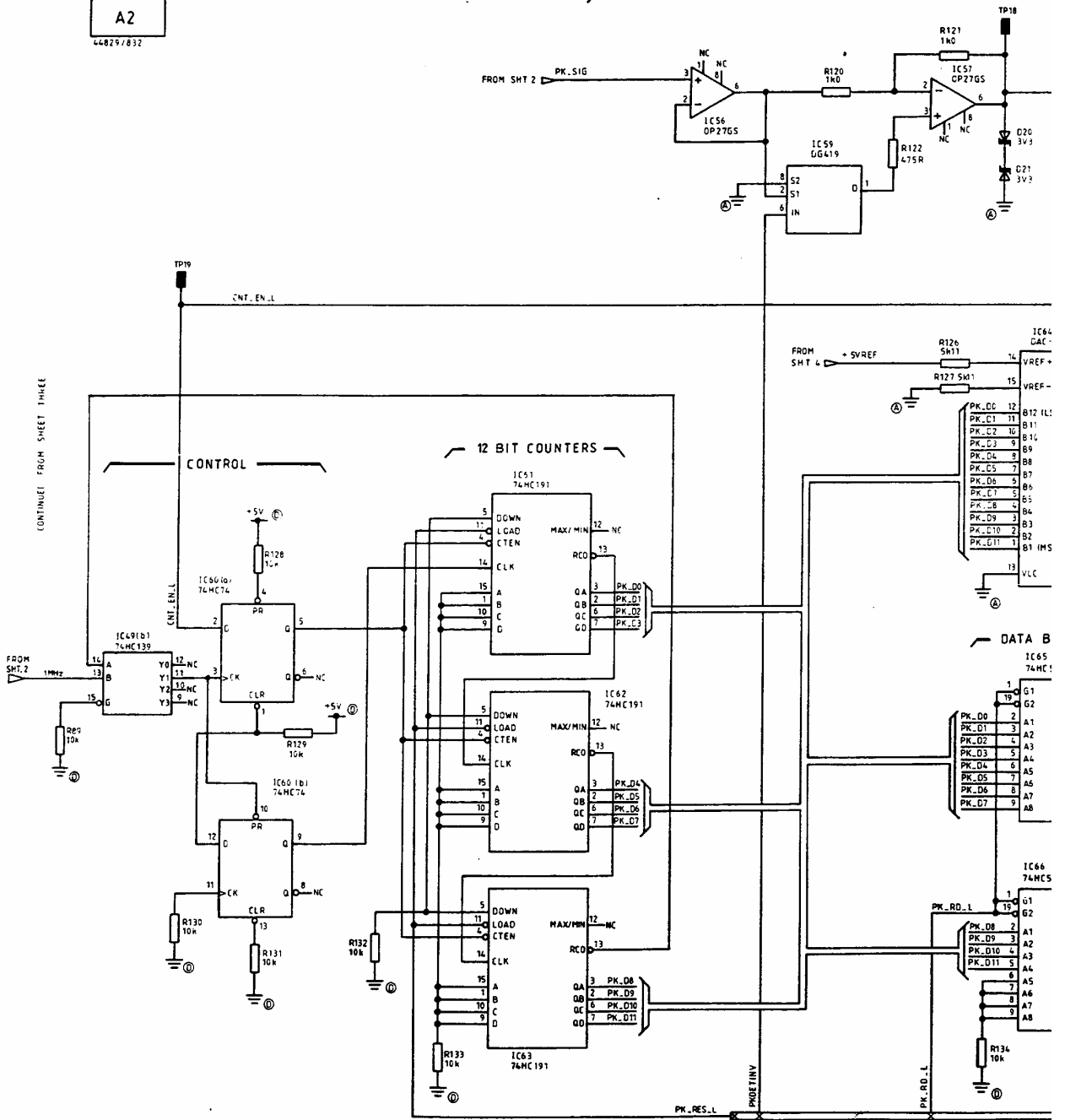


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Fig. 7-42 A2 Squelch control, loudspeaker, and audio count channels - circuit

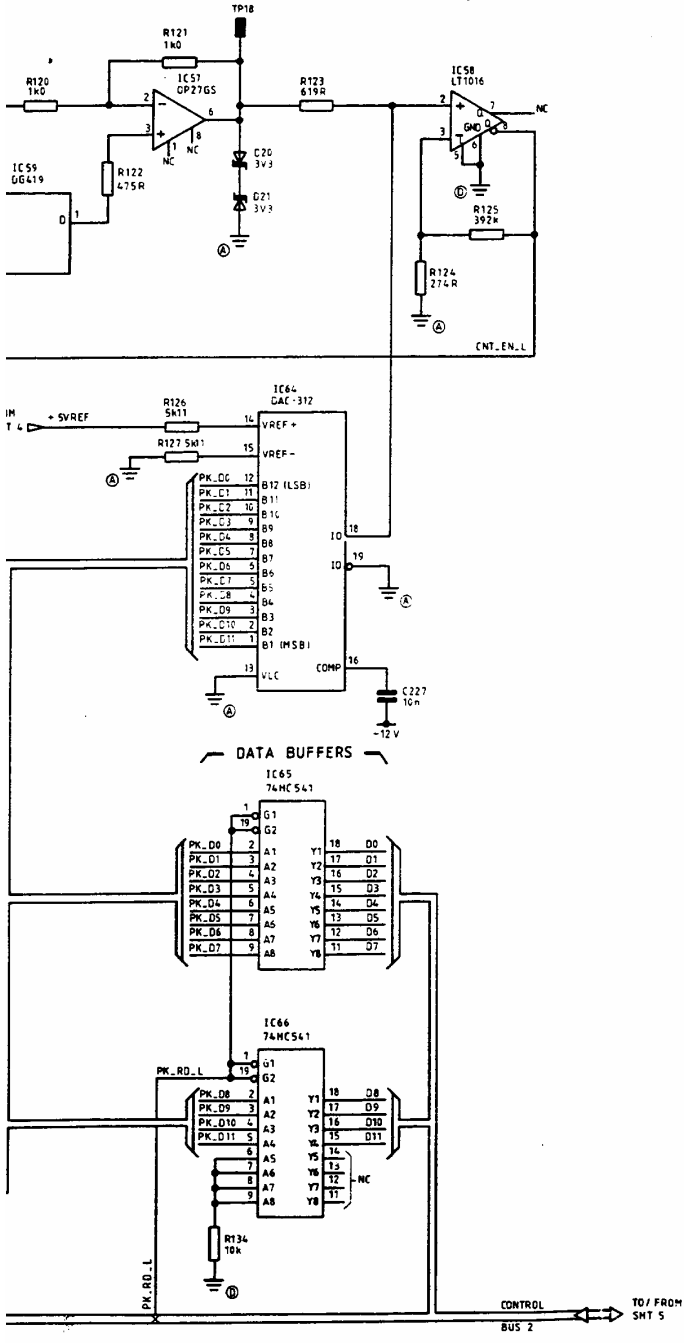
PART OF
A2
 44829/832

PEAK DETECTOR



Circuit diagrams A2

PEAK DETECTOR



SUPPLY LINE TABLE											
IC	TYPE	+12V PIN	-12V PIN	+5VA PIN	-5VA PIN	OVA PIN	OVD PIN	DECOUPLING +12V TO OVA	DECOUPLING -12V TO OVA	DECOUPLING +5VA TO OVA	DECOUPLING -5VA TO OVA
1	OP249	5	2					C101		C102	
2	7528	17				1	5	C103			
3	CP249	6	2					C104		C105	
4	DG419	4	7	5				C106		C107	
5	OP249	5	2			3		C108		C109	
6	LF357			7	4					C110	C111
7	LM311			8	4					C112	C113
9	OP249	5	2					C114		C115	
11	OP177	7	4					C116		C117	
12	OP177	7	4					C118		C119	
13	OP177	7	4			14		C120		C121	
14	DG508A	13	3					C122		C123	
15	OP177	7	4					C124		C125	
16	OP177	7	4					C126		C127	
17	DG441	13	4			5		C128		C129	
18	OP249	5	2					C130		C131	
19	DG419	4	7	5		3		C132		C133	
20	7528	17				1	5	C134			
21	OP249	5	2					C135		C136	
22	DG441	13	4			5		C137		C138	

IC	TYPE	+12V PIN	-12V PIN	+5VA PIN	-5VA PIN	OVA PIN	OVD PIN	DECOUPLING +12V TO OVA	DECOUPLING -12V TO OVA	DECOUPLING +5VA TO OVA	DECOUPLING -5VA TO OVA
23	DG441	13	4			5		C139		C140	
24	DG441	13	4			5		C141		C142	
25	DG441	13	4			5		C143		C144	
26	OP27GS	7	4					C145		C146	
27	AD637	11	10			3		C147		C148	
28	OP177	7	4					C149		C150	
29	OP177	7	4					C151		C152	
30	OP27GS	7	4					C153		C154	
31	OP249	6	2					C155		C156	
32	DG419	4	7	5		3		C157		C158	
36	DG508A	13	3			14		C165		C166	
37	OP27GS	7	4			3	12	C167		C168	
38	AD912	5	23	24						C169	
39	OP249	5	2					C171		C172	
40	2030	5				3		C173			
41	LF356	7	4					C174		C175	
42	LF357			7	4					C176	C177
43	LM311			8	4					C178	C179
54	DAC08	1	7					C190		C191	
56	OP27GS	7	4					C192		C193	
57	OP27GS	7	4					C194		C195	
58	LT1014			1	4					C196	C197
59	DG419	4	7	5		3		C198		C199	
64	DAC312	20	17					C228		C229	

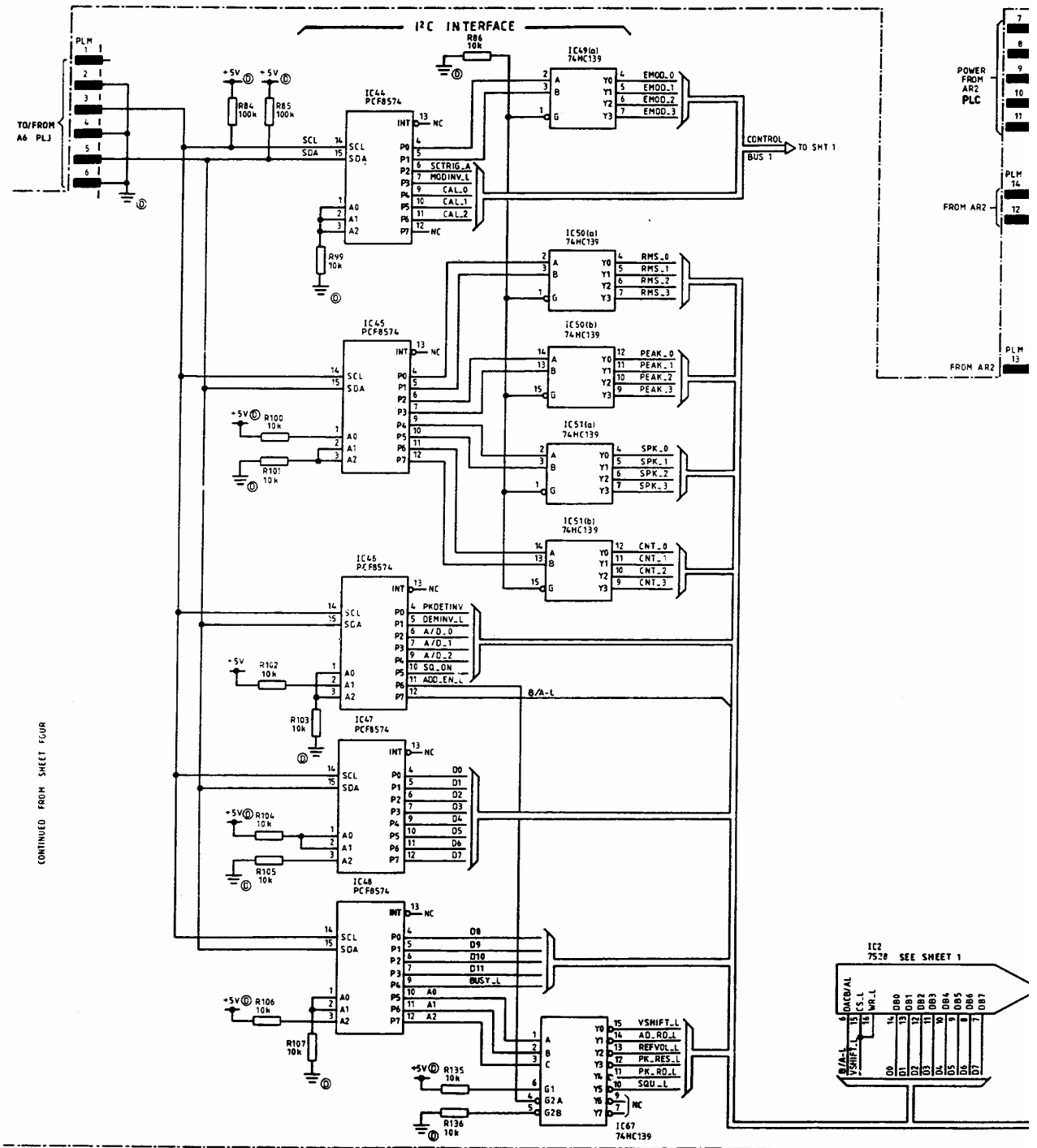
IC	TYPE	+5V0 PIN	OVD PIN	DECOUPLING +5V0 TO OVD
8	HC14	14	7	C180
44	8574	16	8	C181
45	8574	16	8	C182
46	8574	16	8	C183
47	8574	16	8	C184
48	8574	16	8	C185
49	HC139	16	8	C186
50	HC139	16	8	C187
51	HC139	16	8	C188
55	HC374	20	10	C189
60	HC74	14	7	C220
61	HC191	16	8	C221
62	HC191	16	8	C222
63	HC191	16	8	C223
65	HC541	20	10	C224
66	HC541	20	10	C225
67	HC138	16	8	C226

EXTRA ELECTROLYTIC DECOUPLING				
CAP	VALUE	NEAR IC	+VE PIN	-VE PIN
C200	10u	7	+5VA	OVA
C201	10u	7	OVA	-5VA
C202	10u	27	+12V	OVA
C203	10u	27	OVA	-12V
C208	10u	38	+5VA	OVA
C209	10u	38	OVA	-12V
C210	220u	40	+12V	OVA
C211	220u	40	+12V	OVA
C212	10u	43	+5VA	OVA
C213	10u	43	OVA	-5VA
C214	10u	58	+5VA	-5VA

C101 TO C156
C165 TO C199
C220 TO C226
C228 TO C229 } ALL 10n

CONTINUE TO SHEET FIVE

Fig. 7-43 A2 Peak detector - circuit



Circuit diagrams A2

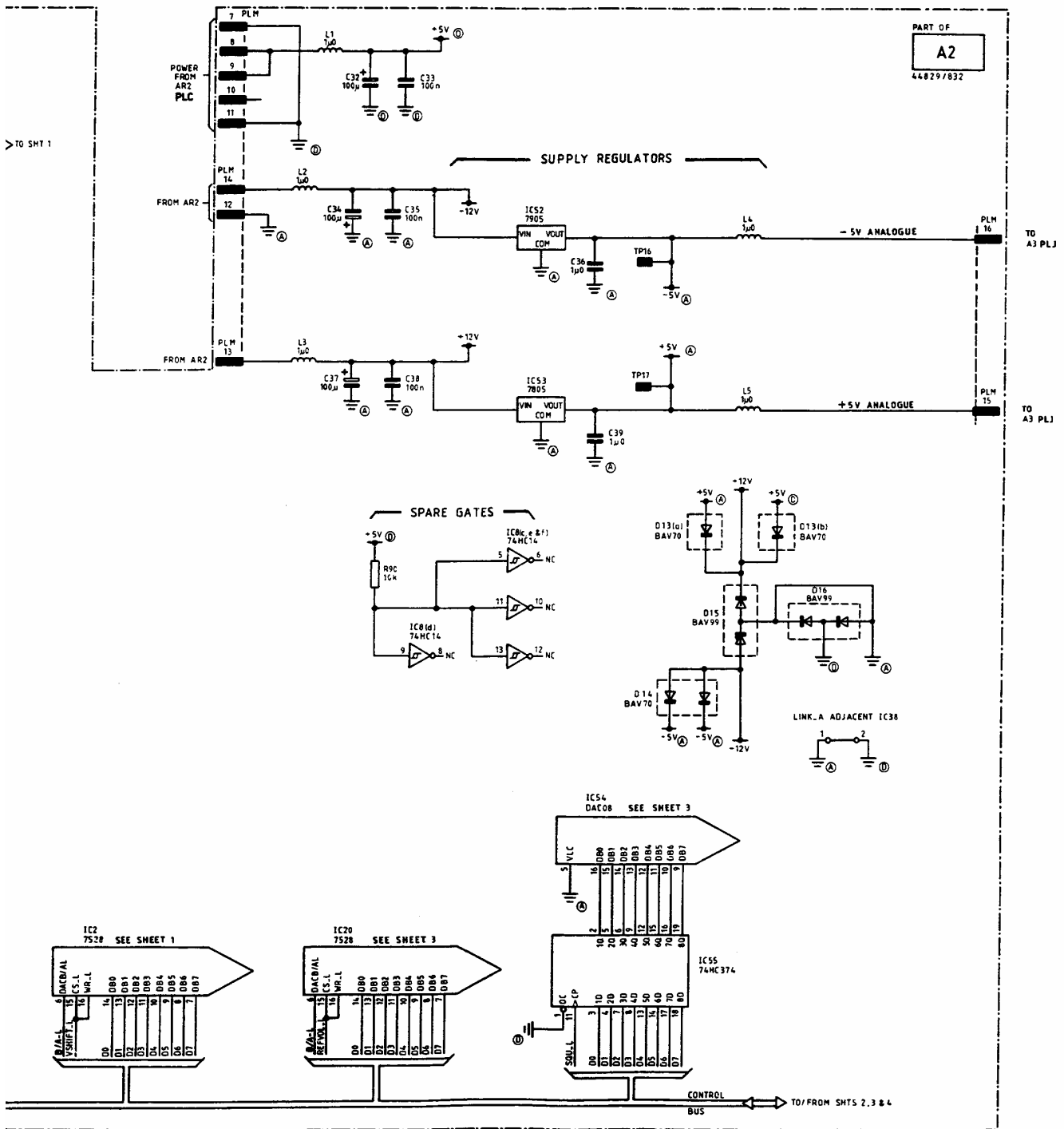
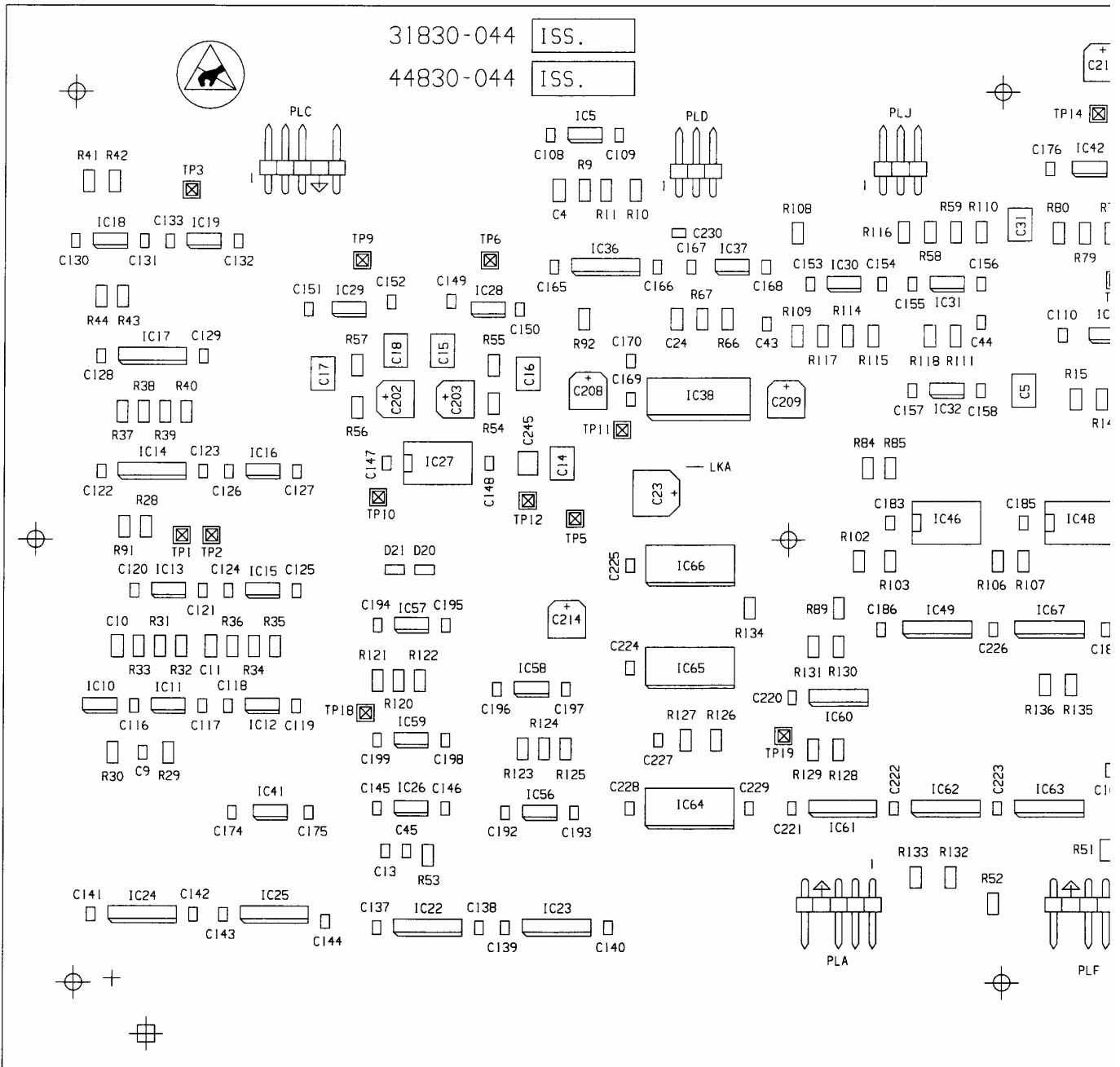


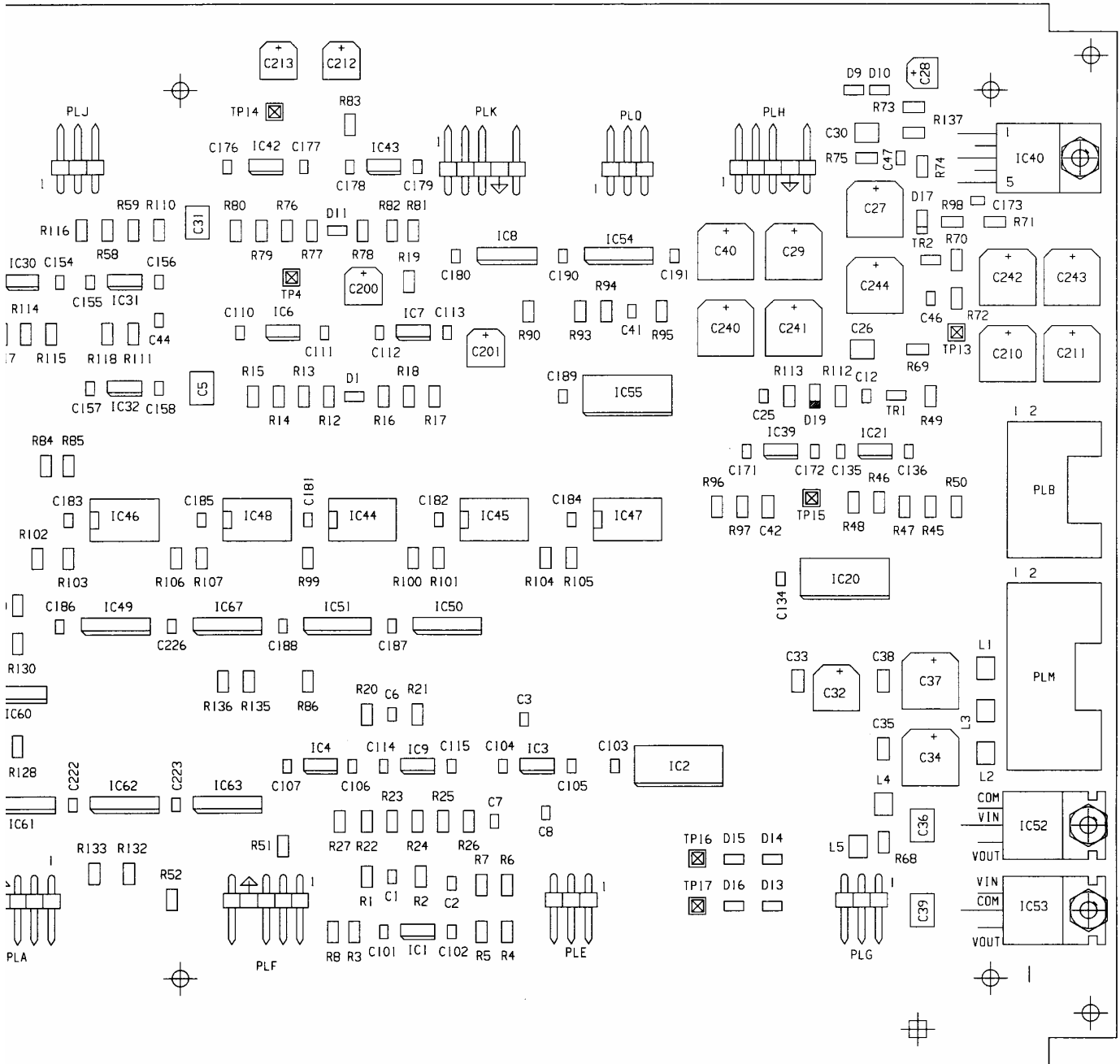
Fig. 7-44 A2 I²C interface, supply regulators - circuit



I²C interface, supply regulators A2

Drg. No. 44830/044

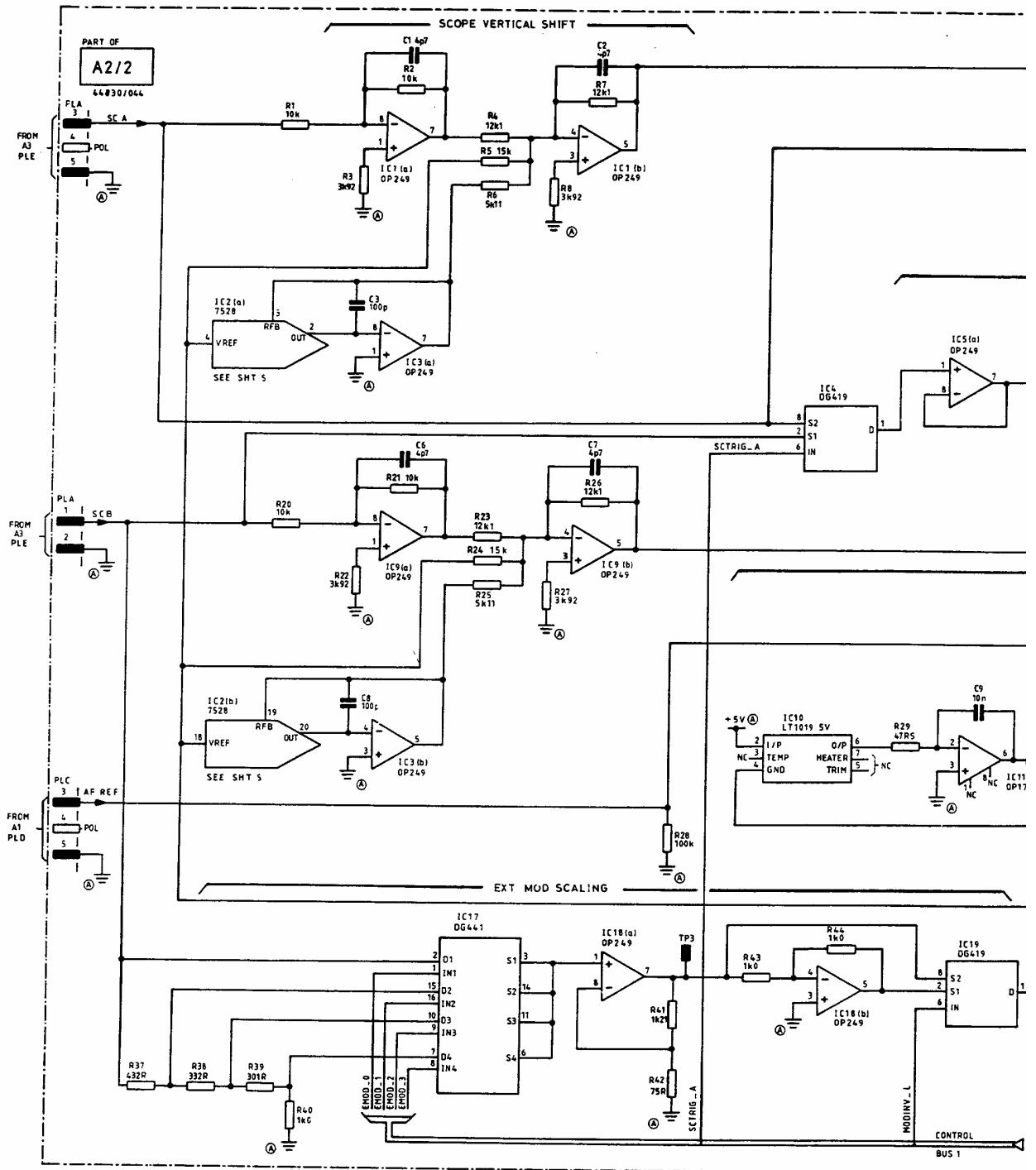
Component layout A2/2



A2

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Fig. 7-45 A2/2 Audio processor 2 - component layout



Circuit diagrams **A2/2**

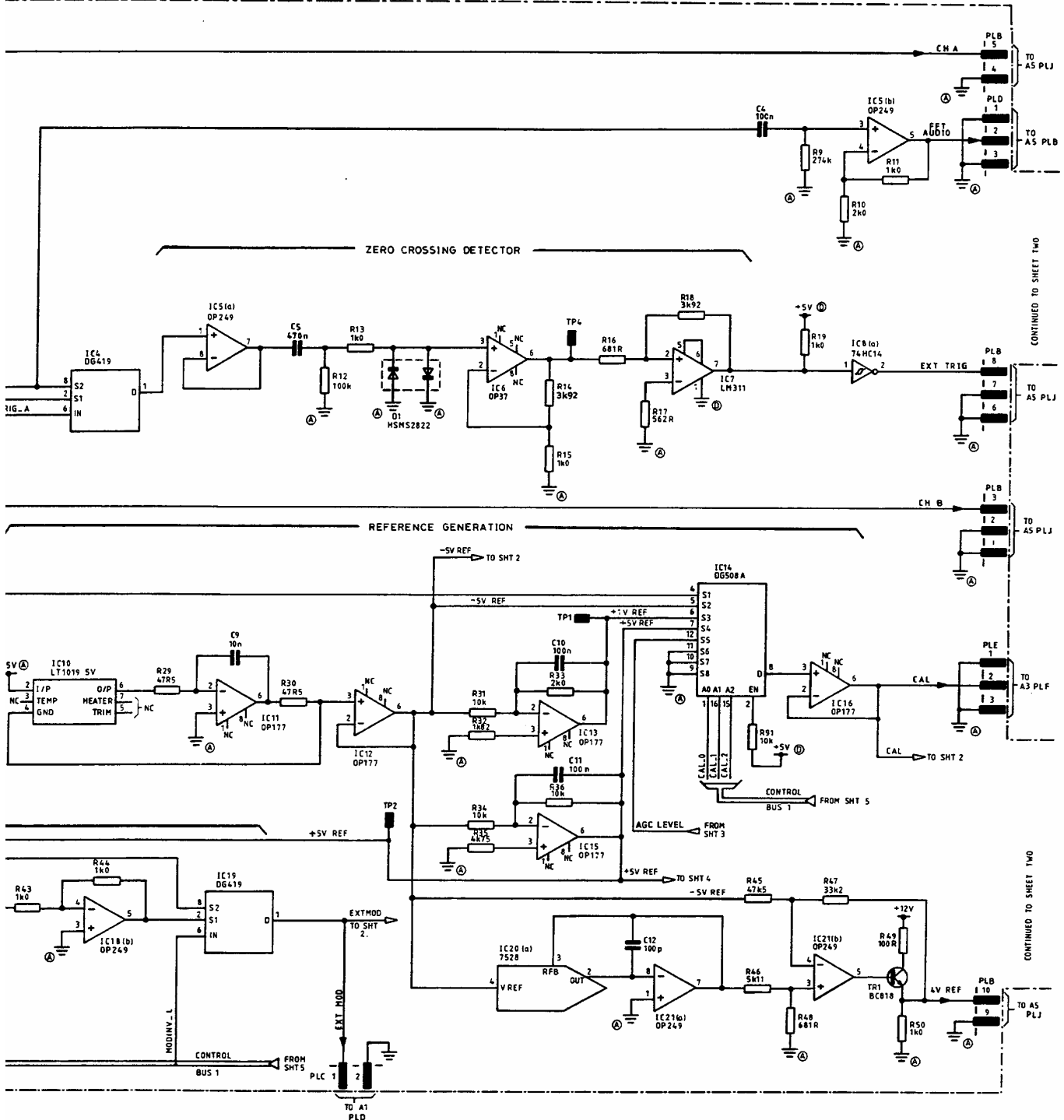
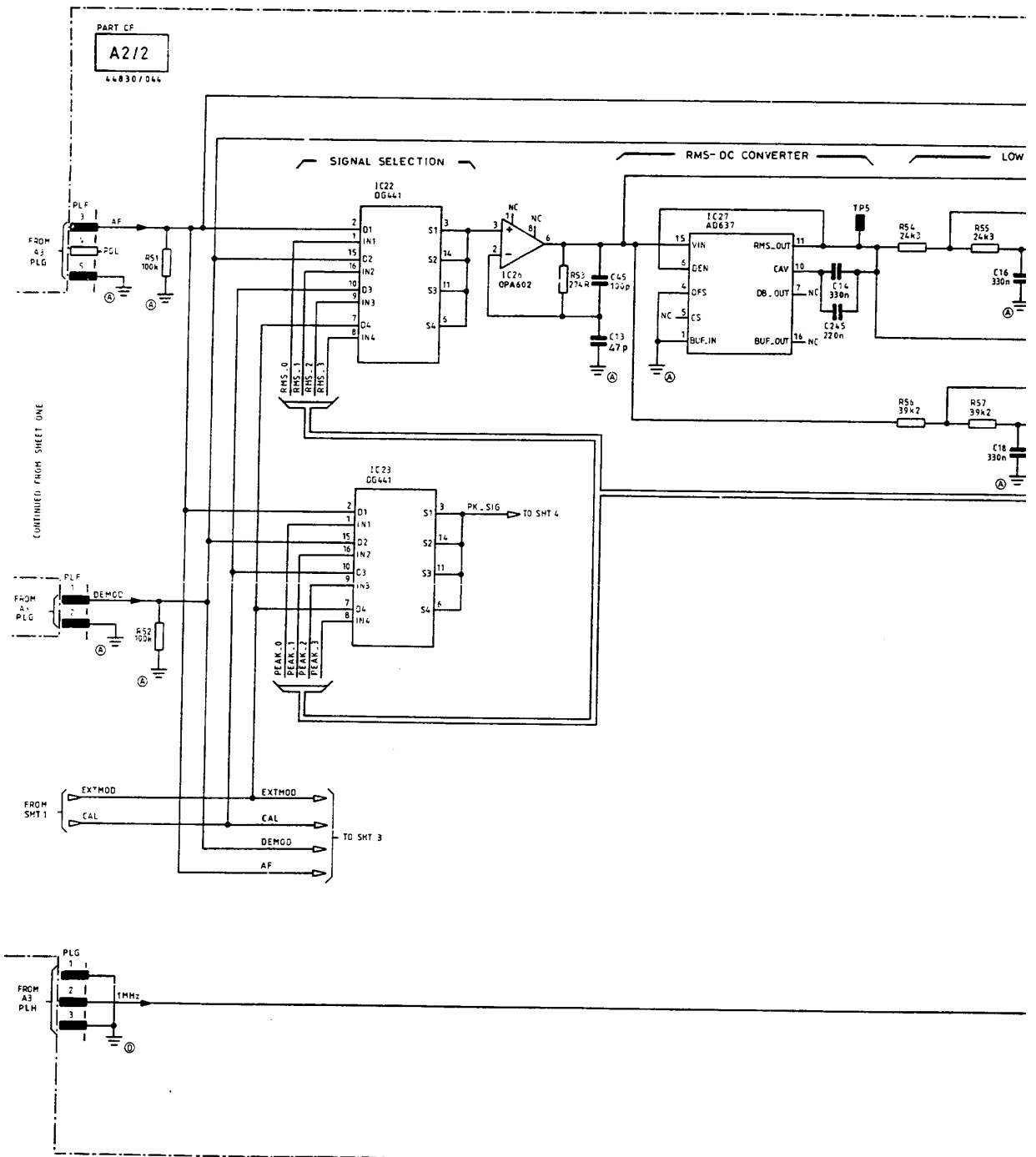
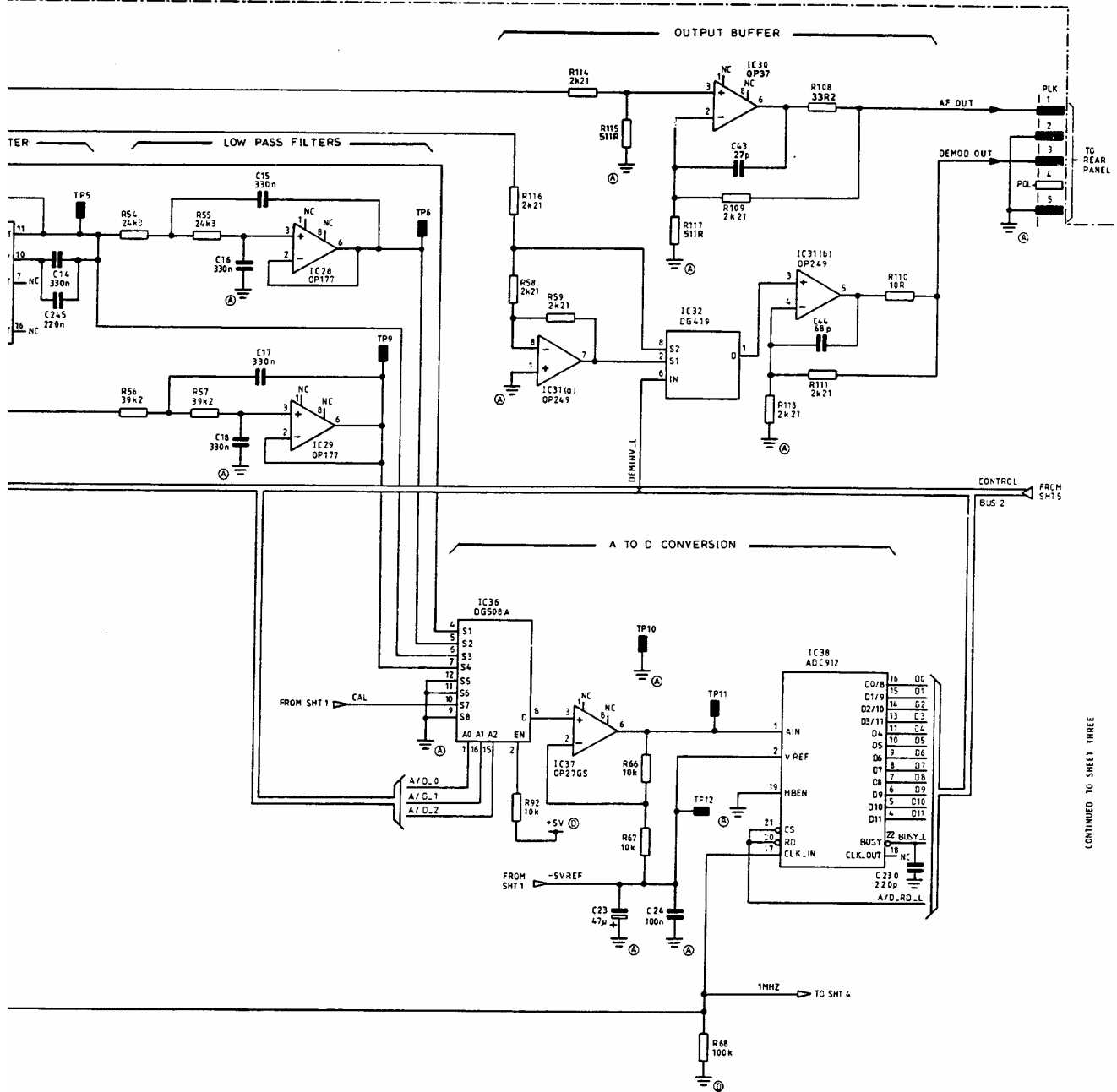


Fig. 7-46 A2/2 Vertical shift, ext mod scaling, calibration ref gen - circuit



Circuit diagrams A2/2



CONTINUED TO SHEET THREE

Fig. 7-47 A2/2 Signal selection, RMS to DC converter and ADC - circuit

