



# **9087 Supplement Schematics for LF and Reference Generator and Comb Loop**

19-1226, 19-1234, 19-1047, 19-1150

Courtesy of:-

tmichaels@towers-sites.com

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GORSQ

29<sup>th</sup> December 2017

Not for commercial use.

REFERENCE SHTS 2,6	REFERENCE SHTS 3,7	REFERENCE SHTS 4,8	REFERENCE SHTS 5,9	PART N°	TYR TYPE N°
	D7,8	D14,27,38,49,56	D70,72	22-1029	1N4149
		D22,33,44,55,61	D74,81	22-1045	HFO180
D9		D13,26,37,48	D64,68	22-1052	ZC 826
		D10-12,15,17,18,23-25,28,30,31,34-36,39,41,42,45-47,50,52,53,58,59	D62,63,65-67,69,71,73,76,77,83,84,88,89	22-1066	ZC2811
		D16,19-21,23,32,40,43,51,54,57,60	D75,78,79,80,82,85,86,87	22-1110	SELECTED 88 405B
IC 55	IC 9-14			22-4222	74180EC
IC 8				22-4225	TLO 81
IC 3-7				22-4240	TLO 82
	IC 89			22-4243	TLO 84
IC 2				22-4247	78L05
IC 1				22-4290	2N4888B
	IC 85			22-4290	NE 5532
	IC 25			22-4505	74500
	IC 19,21,26	IC 29,33,37,41,43,44	IC 49,51	22-4531	74LS00
		IC 30,34,38,42	IC 50,52	22-4534	74LS74
	IC 20,24	IC 28,31,35,39,45	IC 47,48	22-4536	74LS90
		IC 27,32,36,40,46	IC 53,54	22-4670	SP8655B
	IC 22			22-4679	545196
	IC 15			22-4735	HBF4027B
	IC 16,18			22-4748	HEF4017B
	IC 17			22-4751	HEF4518B
Q26		Q40,41,57,58,73,74,89,90	Q126,127,134,135	22-6007	2N3904
Q25,27		Q39,56,72,88	Q125,133	22-6008	2N3906
Q9		Q44-47,61-63,77-79,93-95,97-99	Q139-146	22-6039	BFY 90
Q147	Q3-7,10-17,23,24	Q31-34,42,43,48-51,59,60,64-67,75,76,80-83,91,92,96	Q102-110,113-122,128-130,136-138	22-6079	ZTX313
	Q18,19	Q35,36,52,53,68,69,84,85	Q100,101,111,112	22-6088	2N5109
	Q21,148	Q37,54,70,86	Q123,131,151,152	22-6112	ZTX 450
	Q8,20,149	Q150	Q124,132	22-6113	ZTX 550
	Q1,2,22,28	Q38,55,71,87		22-6122	ZTX 109
	Q29,30			22-6133	MPS A12
				22-6147	BFR 96

COMPONENT REFERENCE SHTS 2,6

R1-17,30-42,116,669,670	PL41,42
C1-16	SK 47
IC1-8	
TP1-16	
Q147	

COMPONENT REFERENCE SHTS 3,7

R43-115,117-210,212-223,671	
C17-202,204,760	
D7-5	
IC9-26,55,56	
Q1-30,148,149	
L1-26,152	
FX1-37,121,122	
LK1	SK48,50-55

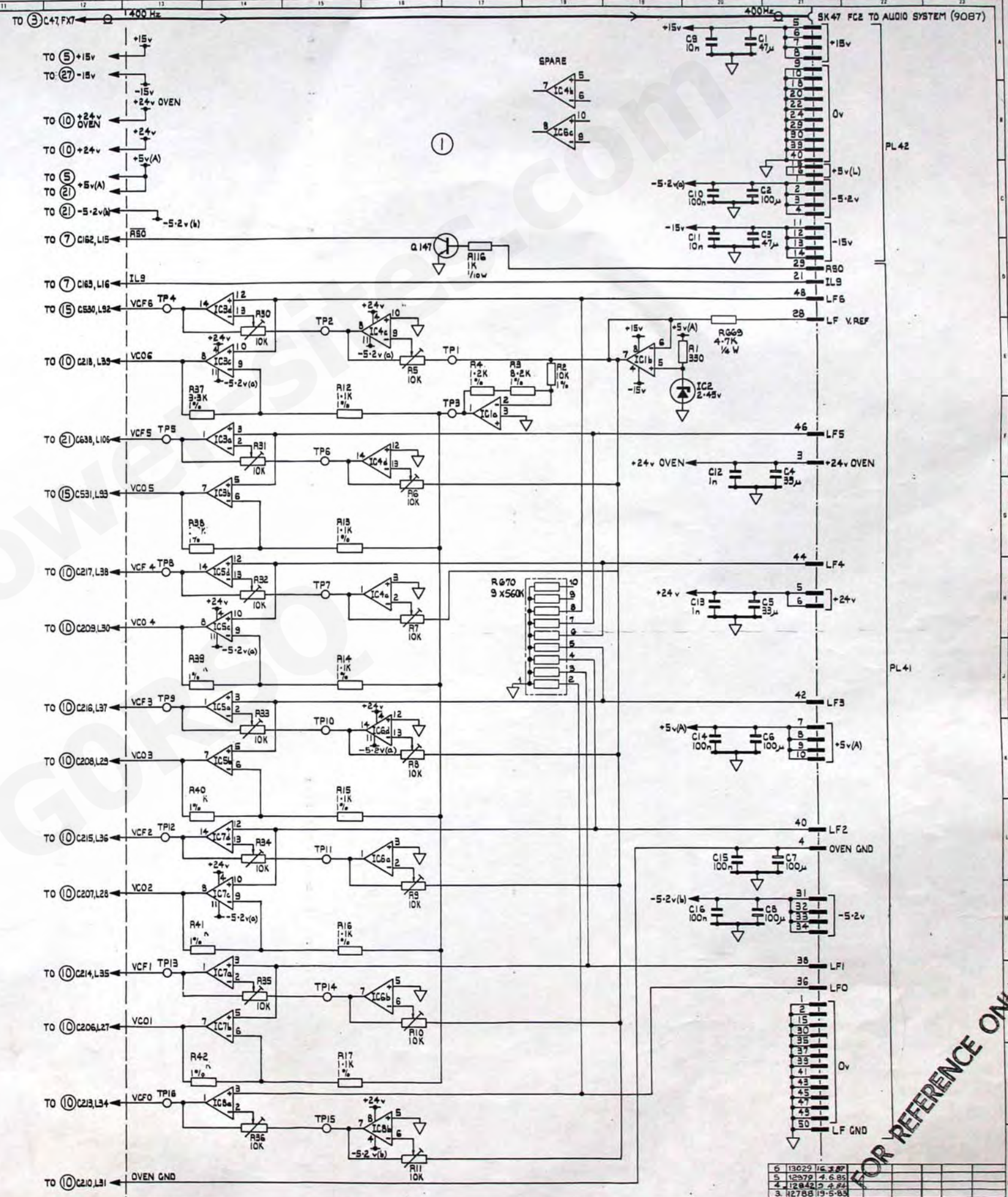
COMPONENT REFERENCE SHTS 4,8

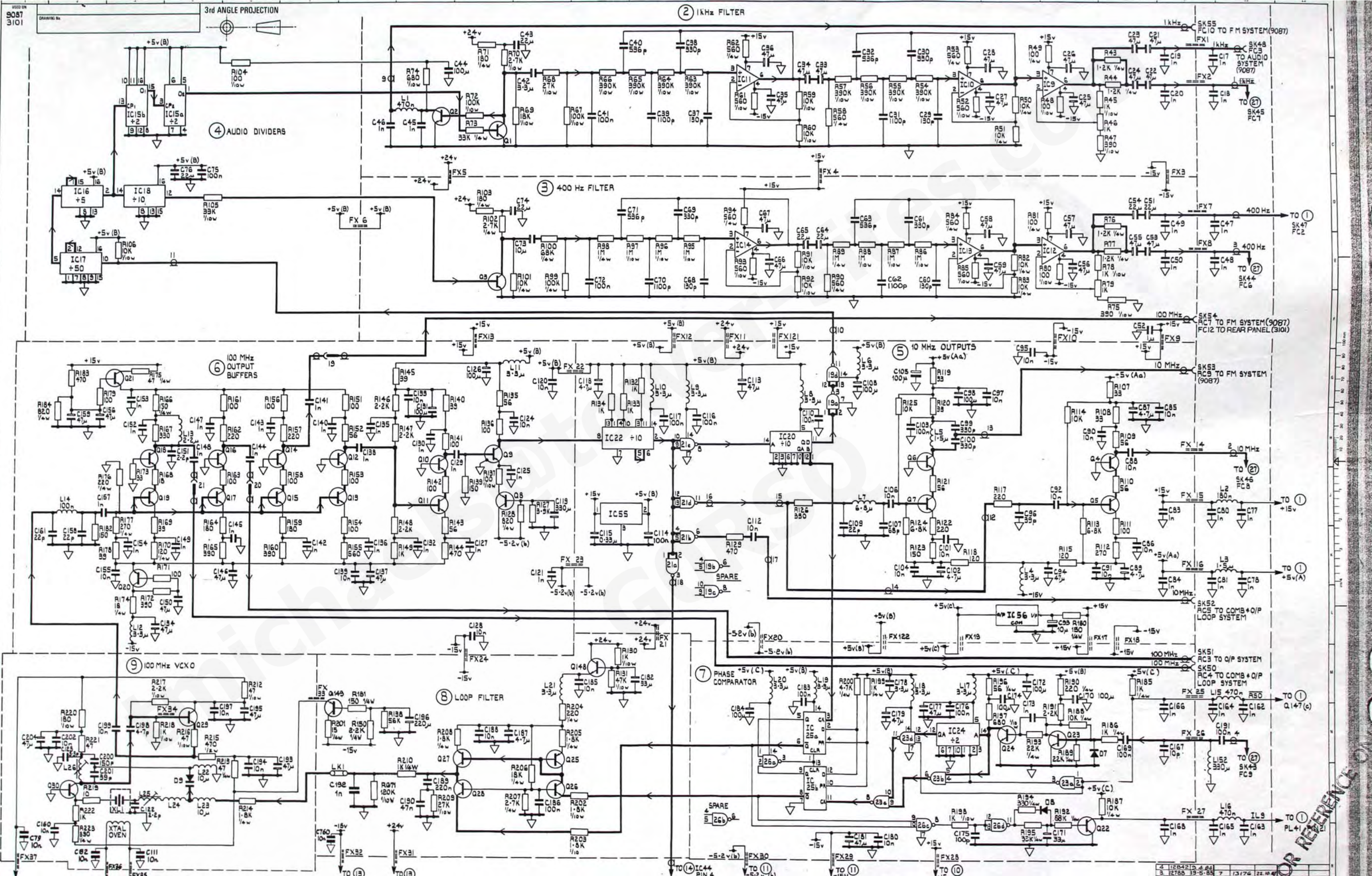
R211,224-477	
C111,203,205-523,843,844,851-856	
D10-61	
IC27-46	
Q31-93,150	
L27-31,153-155	
FX38-76	
X1-4	SK49

COMPONENT REFERENCE SHTS 5,9

R478-609,614-688,672-677	
C530-694,700-752,758,759,761-840,842,845-850	
D62-85	
IC47-54	
Q100-146,151,152	
L32-151	
FX77-120	
X5,6	SK43-46

Capacitors in Farads  
 Resistors in Ohms  
 Inductors in Henries





9087  
3101

3rd ANGLE PROJECTION

② 1kHz FILTER

④ AUDIO DIVIDERS

③ 400 Hz FILTER

⑥ 100 MHz OUTPUT BUFFERS

⑤ 10 MHz OUTPUTS

⑨ 100 MHz VCXO

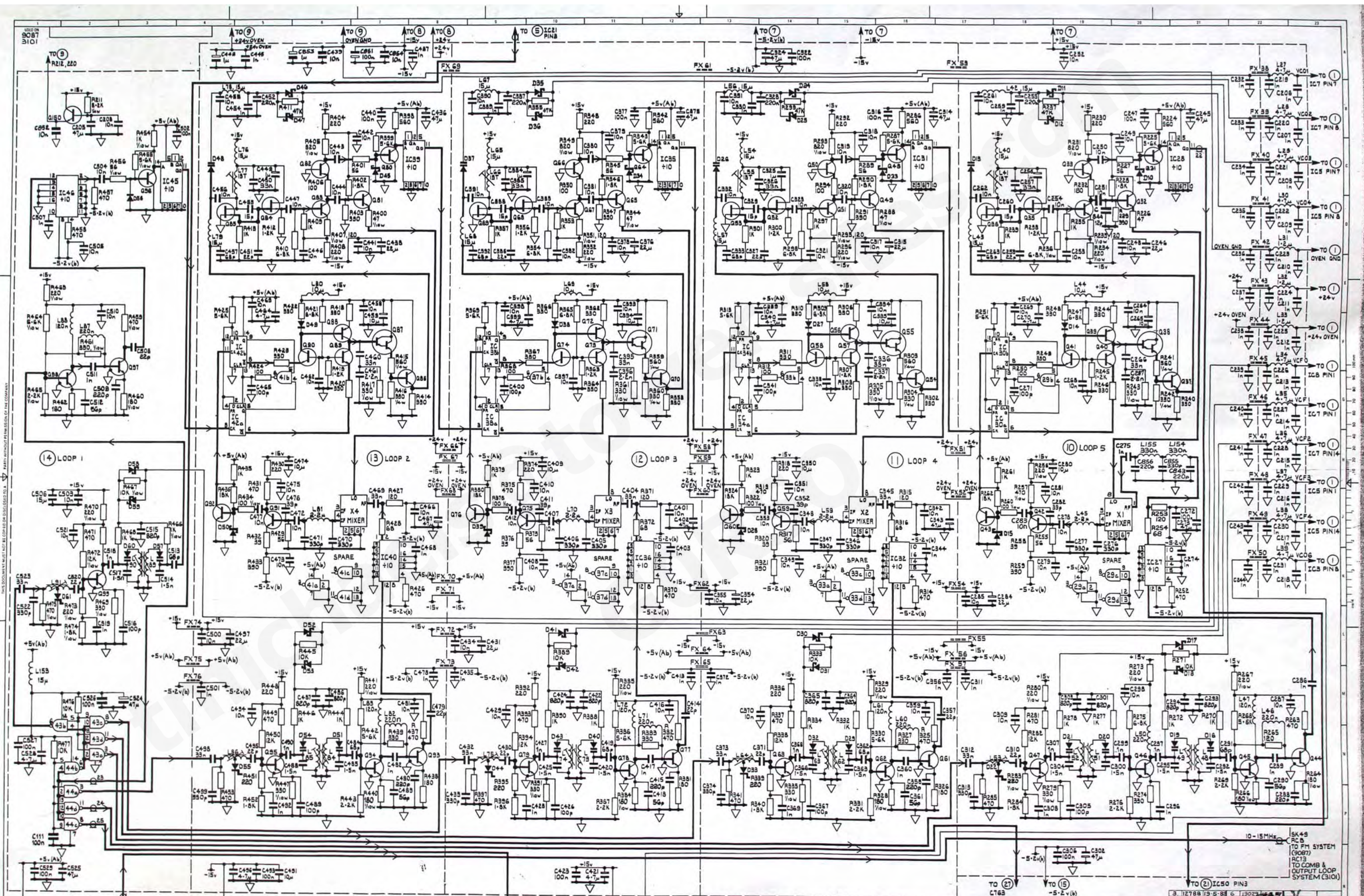
⑧ LOOP FILTER

⑦ PHASE COMPARATOR

Capacitors in Farads  
Resistors in Ohms  
Inductors in Henries

APP. PROJ.	M. J.	MATERIAL		REMOVE ALL SHARP EDGES	ALL DIMENSIONS IN mm	SCALE
CHKD BY	S. S.	FINISH		TOLERANCES, UNLESS OTHERWISE STATED		
DRWNS	T. K.	SPS		GENERAL ± 0.4		
				HOLE CENTRES ± 0.15		
				HOLE SIZES UP TO 6.0 ± 0.1		
				FROM 6 TO 20.0 ± 0.2		
				UP TO 60 ± 0.05		
TITLE			RACAL - DANA INSTRUMENTS LTD			
CIRCUIT DIAGRAM FOR L.F. SYNTHESISER & REFERENCE SOURCE			DRAWING No. 19-1047 SHT 3 OF 9			

FOR REFERENCE



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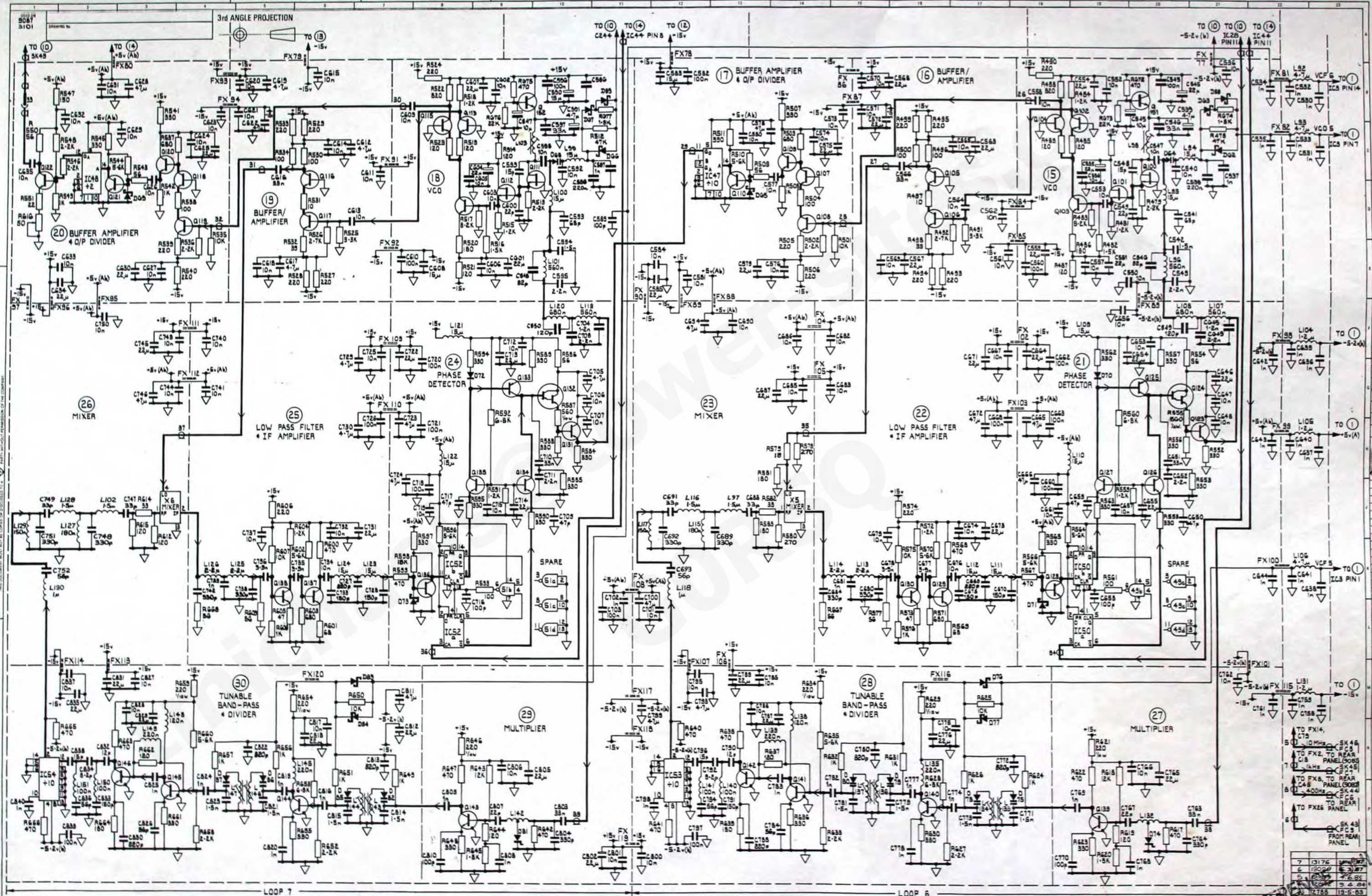
Capacitors in Farads  
Resistors in Ohms  
Inductors in Henries

APP. PROJ. MATERIAL  
CHECKED BY  
DESIGN T.K.  
DATE

REMOVE ALL SHARP EDGES  
TOLERANCES, UNLESS OTHERWISE STATED  
GENERAL ± 0.4  
HOLE CENTRES ± 0.15  
HOLE SIZES  
UP TO Ø8 -0.1 FROM Ø8 TO 20Ø -0.2  
-0.05

ALL DIMENSIONS IN MM SCALE  
RACAL - DANA INSTRUMENTS LTD  
TITLE  
CIRCUIT DIAGRAM FOR L.F. SYNTHESISER & REFERENCE SOURCE  
DRAWING NO. 19-1047 SHT 4 OF 9

FOR REFERENCE



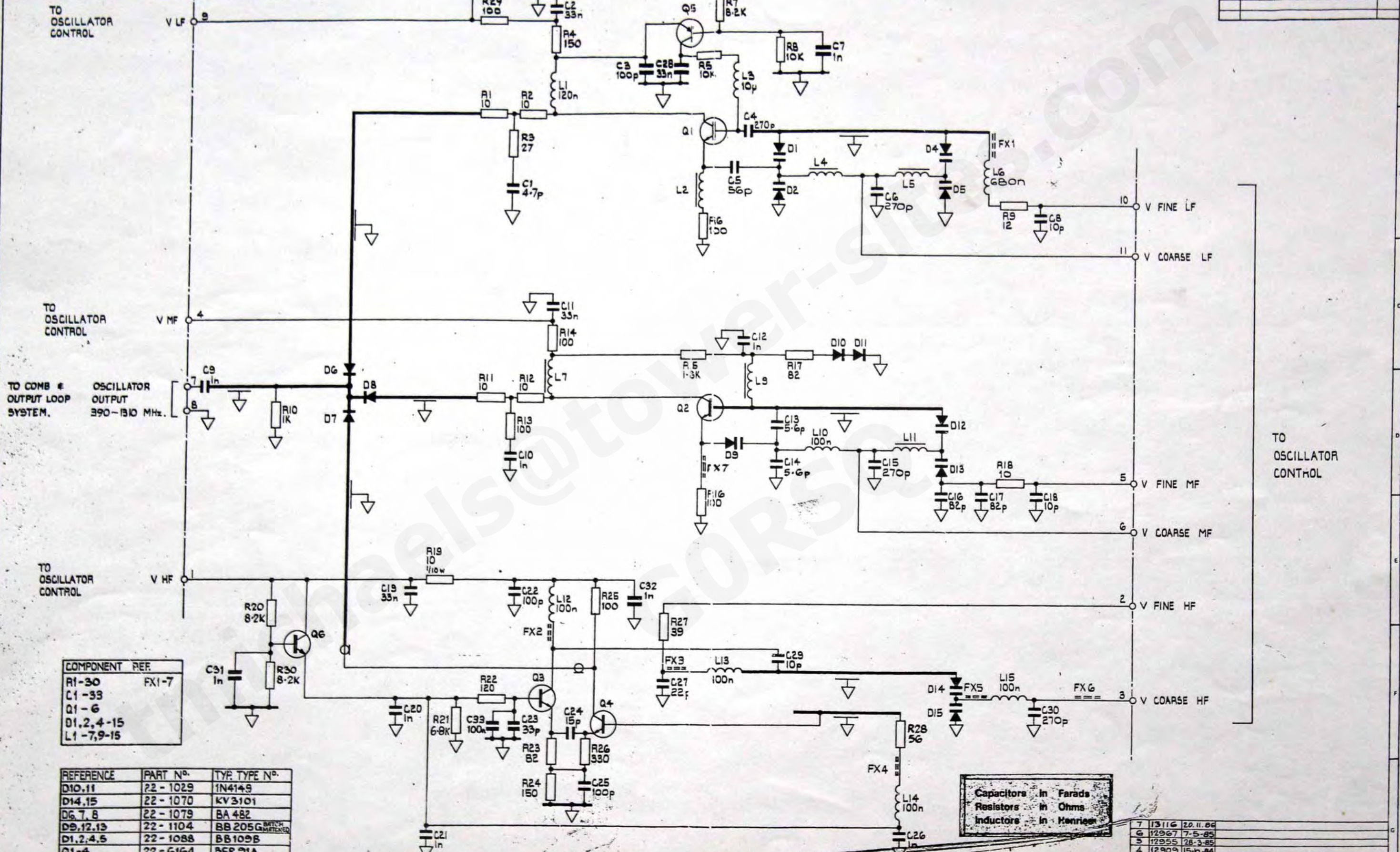
Capacitors in Farads  
Resistors in Ohms  
Inductors in Henries

AIR MAIL MATERIAL CHECKED BY: [Signature] DRAWN BY: T. K.	REMOVE ALL SHARP EDGES TOLERANCES, UNLESS OTHERWISE STATED: GENERAL: ± 0.4 HOLE CENTRES: ± 0.15 HOLE SIZES: UP TO 80: +0.1 FROM 8 TO 200: ± 0.2 -0.05	ALL DIMENSIONS IN mm SCALE: 1:1 RACAL - DANA INSTRUMENTS LTD THE CIRCUIT DIAGRAM FOR L.F. SYNTHESISER & REFERENCE SOURCE	7 13176 C 10000 R 10000 D 10000 1047 SHT 5 OF 9 DATE: 9.8.69
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FOR REFERENCE

USED ON 9087, 3101

HOLE DATA		
REF.	SIZE	No. OFF



TO OSCILLATOR CONTROL  
 TO COMB # OUTPUT LOOP SYSTEM.  
 OSCILLATOR OUTPUT 390-1310 MHz.

TO OSCILLATOR CONTROL

COMPONENT	REF.
R1-30	FX1-7
C1-33	
Q1-6	
D1,2,4-15	
L1-7,9-15	

REFERENCE	PART NO.	TYF. TYPE NO.
D10,11	22-1029	1N4149
D14,15	22-1070	KV3101
D6,7,8	22-1079	BA 482
D9,12,13	22-1104	BB 205G
D1,2,4,5	22-1088	BB109B
Q1-4	22-6164	BFR 91A
Q6	22-6179	BSR 17
Q5	22-6209	BCF 30

Capacitors in Farads  
 Resistors in Ohms  
 Inductors in Henries

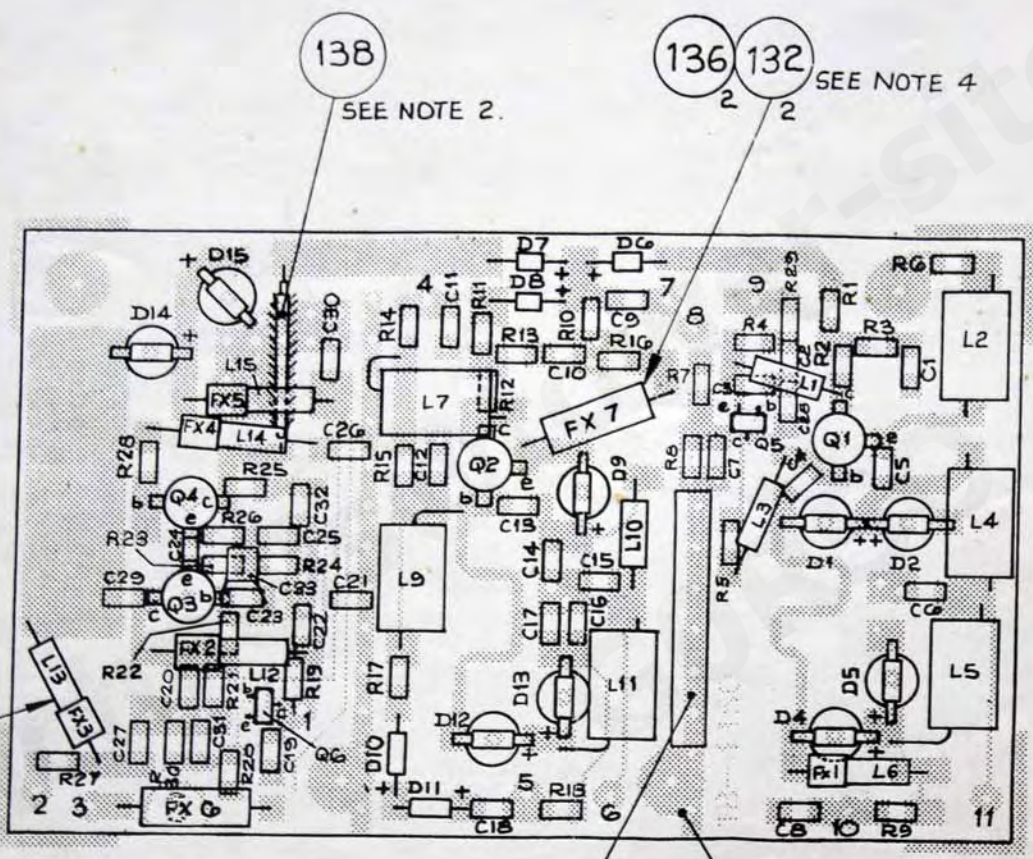
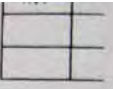
REV.	DATE	DESCRIPTION
7	13-11-64	20.11.64
6	12-9-67	7-5-85
5	12-9-55	28-3-85
4	12-9-59	15-6-84
3	12-8-67	24-7-84
2	12-8-62	1-2-84
1		21-8-83

APP. PROD.	MATERIAL
CHECKED	BS
FINISH	
DRAWN	R.P.S.
T. King	

TOLERANCES, UNLESS OTHERWISE STATED  
 GENERAL ± 0.4  
 HOLE CENTRES ± 0.15  
 HOLE SIZES:  
 UP TO 1/8 +0.1 -0.05 FROM 6 TO 208 +0.2 -0.05

ALL DIMENSIONS IN mm SCALE  
**RACAL - DANA INSTRUMENTS LTD**  
 TITLE: CIRCUIT DIAGRAM FOR OSCILLATORS ASSY. **COMB.**

RACAL DRG. No. 19-1150 SHT 2 OF 2  
 DRAWING No. A 1



138  
SEE NOTE 2.

136 132  
2 2 SEE NOTE 4

140  
SEE NOTE 3

- NOTES:-
1. FIT ALL COMPONENTS TO
  2. FIT SEMI-RIGID COAX ITE SHOWN. SOLDER COAX ON WHERE SHOWN THIS ///
  3. FX 1/L6 , FX 2/L12 , FX 3/L13  
FX 5/L15 TO BE COVERED SLEEVING ITEM 140
  4. SECURE FX6,7 TO P.C.B. 1 DROP OF ADHESIVE ITE.
  5. D9, 12 & 13 ARE BATCH MA
  6. C33 TO BE SOLDERED ACROSS C TO BE AS SHORT AS POSSIBLE

4

14

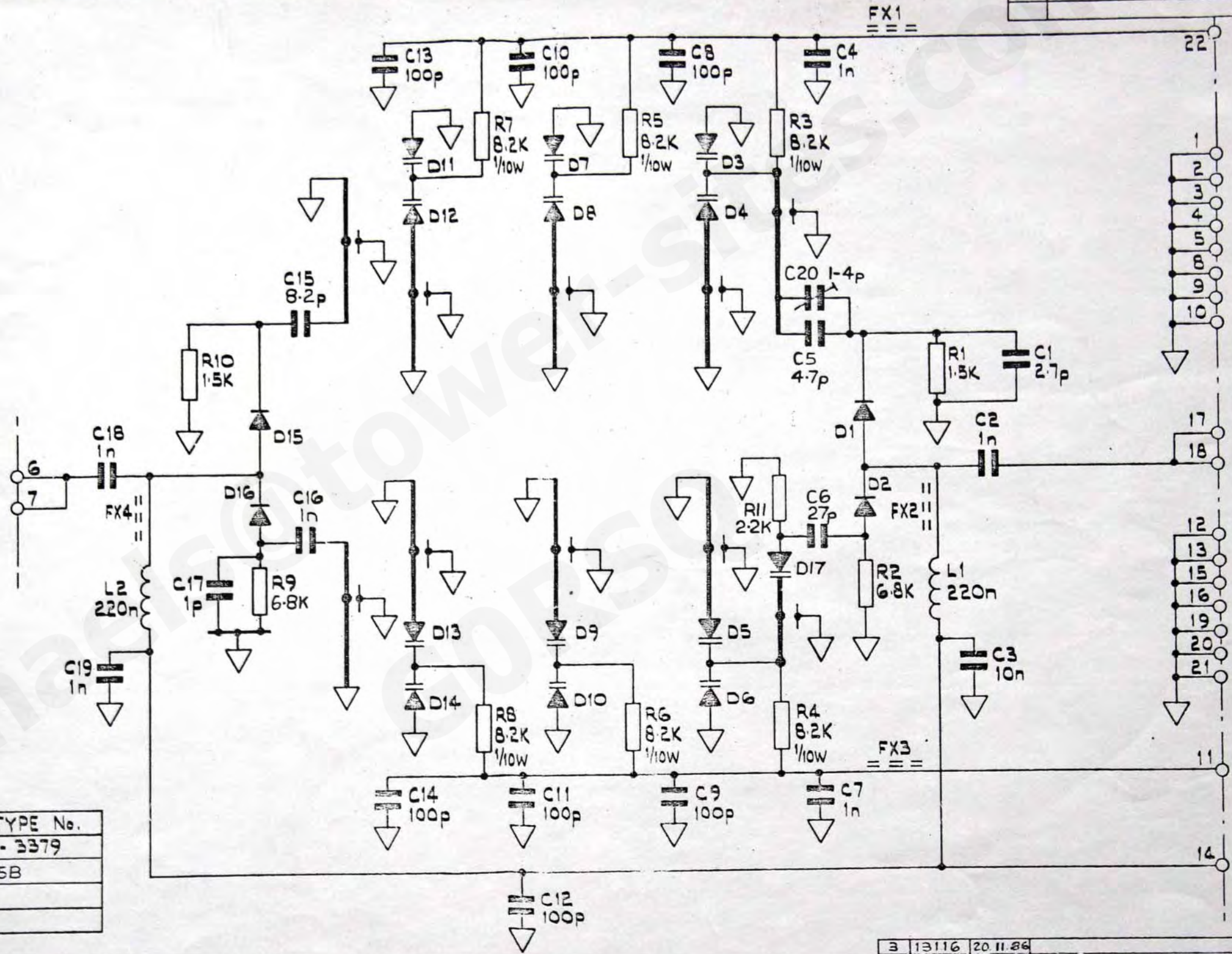
19-1150  
COMB OSC.

USED ON 9087, 3101

3RD ANGLE PROJECTION

HOLE DATA

REF	SIZE	Nm



COMPONENT REF
R1-11
C1-20
D1-17
L1-2
FX1-4

REFERENCE No	PART No.	TYP. TYPE No.
D1, 2, 15, 16	22-1058	5082 - 3379
D3-14, 17	22-1101	BB405B

ISS	C.N.	DATE	BRIEF DESCRIPTION
3	13116	20.11.86	
2	12909	15.10.84	
1		6-7-84	

APP PROD P.D.	MATERIAL BS	REMOVE ALL SHARP EDGES	ALL DIMENSIONS IN mm	SCALE
CHECKED RS	FINISH	TOLERANCES, UNLESS OTHERWISE STATED GENERAL — 0.4 HOLE CENTRES — 0.15 HOLE SIZES — UP TO 60 ± 0.1 FROM 6 TO 200 ± 0.2 0.05	RACAL - DANA INSTRUMENTS LTD	
DRAWN L.M.	RPS		TITLE CIRCUIT DIAGRAM FOR TUNABLE BAND PASS FILTER <i>COMB</i>	

RACAL DRG No		19-1226 SHT. 2 of 2	
DRAWING No			

DO NOT SCALE

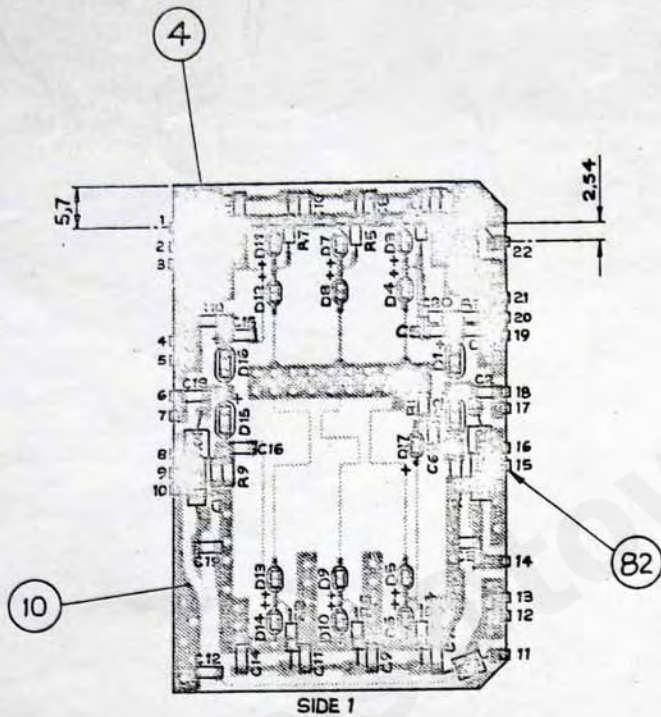
11-1702



9087,3101

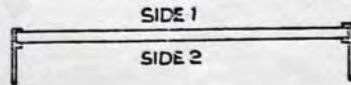
3RD ANGLE PROJECTION

HOLE DATA	
REF	SIZE



NOTES

1. ALL COMPONENTS ARE SURFACE MOUNTED ON SIDE 1 AS SHOWN.
2. PINS ITEM B2 TO BE FITTED AS SHOWN IN SIDE VIEW.  
PINS TO BE SOLDERED TO PADS ON BOTH SIDES OF BOARD  
PINS TO BE SPACED AT MULTIPLES OF 2.54 PITCH ALONG EACH EDGE OF BOARD WHERE SHOWN.
3. D3-14,17 TO BE FROM THE SAME MATCHED BATCH.



DESIGNED BY M.J.P.	MATERIAL BS RPS	GENERAL: ALL SQUARE EDGES DIMENSIONS: UNLESS OTHERWISE STATED HOLE CENTRES: 0.15 HOLE SIZES: 0.1 UP TO 0.8 0.05 FROM 0.1 TO 2.0 0.05	ALL DIMENSIONS IN mm SCALE 2:1
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RACAL - DANA INSTRUMENTS LTD  
**COMPONENT LAYOUT FOR TUNABLE BAND PASS FILTER COMB.**

3	19116	20-11-85	
2	12209	15-10-84	
1		5-7-84	
ISS	EN	DATE	BRIEF DESCRIPTION
RACAL DRG No			
DRAWING No 19-1226 SHT 10F2			

DO NOT SCALE

COMPONENT REFERENCE SHT.3, 8

R1-37,61-64
C1-37, 39, 40, 77, 78, 93, 473, 600
D1B-22, 47-49
IC1-7, 9-18
Q1, 2, 24
PL 39, 40
TP1, 20, 23, 24
LK1, 2
H1, 2
(POB N 1-10)

COMPONENT REFERENCE SHT.4, 9

R38-60, 65, 88-94, 130-133, 526-549
C38, 41-59, 61-76, 88, 89, 636-654, 656-663
D1-3, 6-17
Q3-12, 22, 23, 25
L1, 2, 4, 7, 52, 53
FX1-3
X3
(POB N 11-15)

COMPONENT REFERENCE SHT.5, 10

R75-87, 95-126, 137
C94-175, 177-201, 207-209, 474-489
D25
IC19-25
Q13-16, 27-32
L8-19, 21-27, 29-32, 64, 65
FX5-21, 57, 60-72
TP2-5, 17, 19, 25-27
T1
LK3, 5, 6
5K35, 36
X1
H3-13
(POB N 19-41, 91, 92)

COMPONENT REFERENCE SHT.6, 11

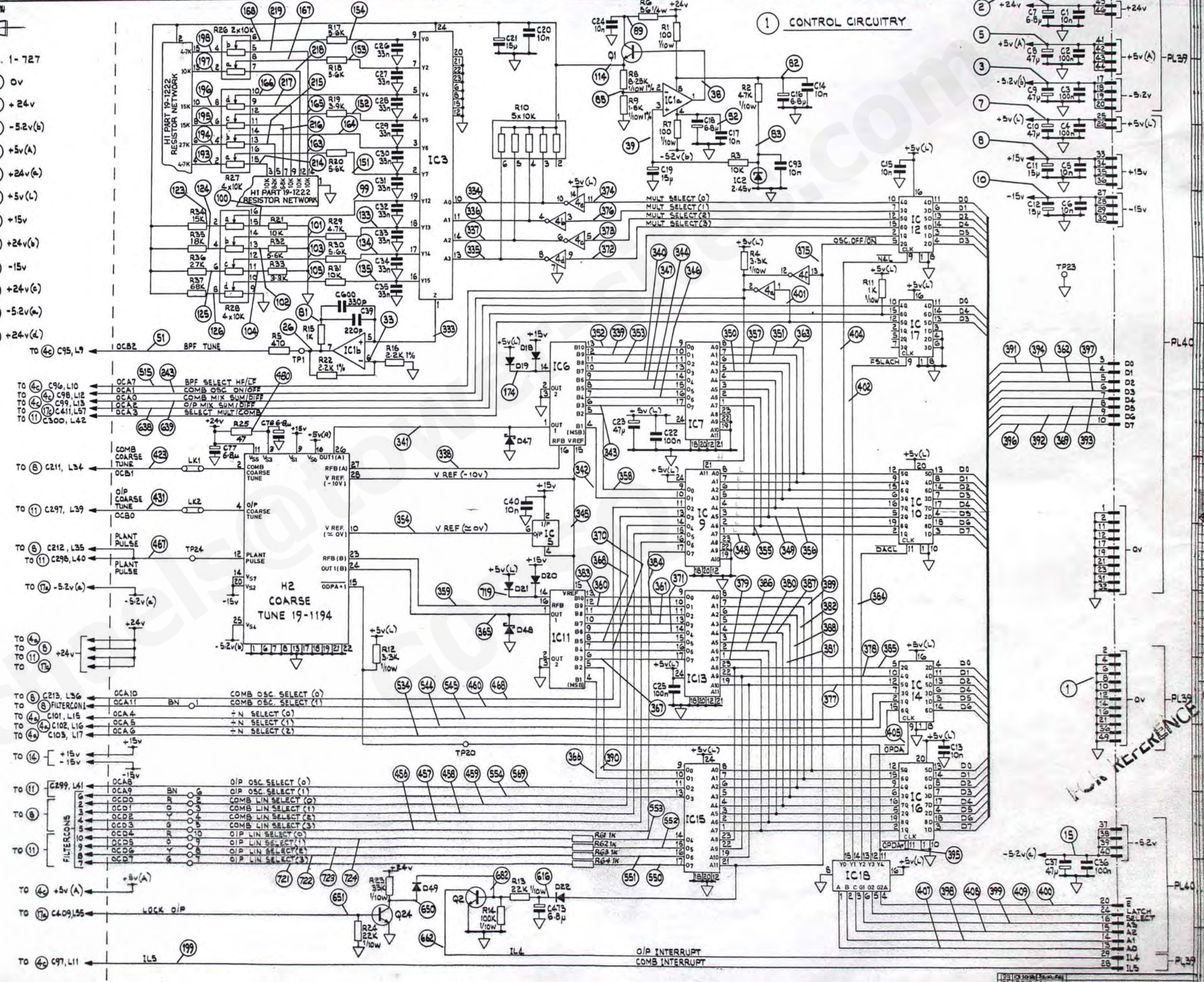
R136, 138-159, 161-198, 200-237, 264-279
C450-458, 466-473, 524, 525, 552, 553
C210-295, 320-333, 513-526, 541-549, 589-598
C630-635, 665-668
D33, 41-45, 54-58
IC26, 27
Q33-46, 53-56, 88
L20, 33-36, 43-48, 66-69, 81-83, 88-90
FX22-36, 58, 86-91
TP6, 10
X4
H14-16, 20
(POB N 42-57, 70-75, 93-96)

COMPONENT REFERENCE SHT.7, 12

R238-263, 280, 281-308, 398-436, 501-523, 550, 551
C296-319, 334-405, 408-423, 527-540, 550-580, 628-668, 6601-608, 607-628
D38-40, 50-53
IC28-33
Q47-52, 60-68, 82-86, 101-109
L38-42, 49-51, 54-58, 62, 63, 71-77, 84-87
FX37-51, 53-56, 59, 73-85
TP7-9, 11-16, 18, 21, 22, 25
LK4
X2, 5
H17-19, 21-25
(POB N 58-69, 76-90, 97, 98)

REFERENCE	PART No.	TYP. TYPE No.
D1B-22, 49	22-1029	1N4149
D47, 48	22-1066	ZC2B11
IC4	22-4062	7406
IC2	22-4250	2N455B
IC5	22-4272	REF 01ET
IC1	22-4289	NE5532A
IC18	22-4587	74LS138
IC10, 16	22-4658	74LS377
IC12, 14, 17	22-4669	74LS378
IC3	22-4762	4097
IC6, 11	22-4768	7553
Q1	22-6112	ZTX450
Q2, 24	22-6113	ZTX550
IC7	22-8549	ROM
IC9	22-8550	ROM
IC13	22-8551	ROM
IC15	22-8552	ROM

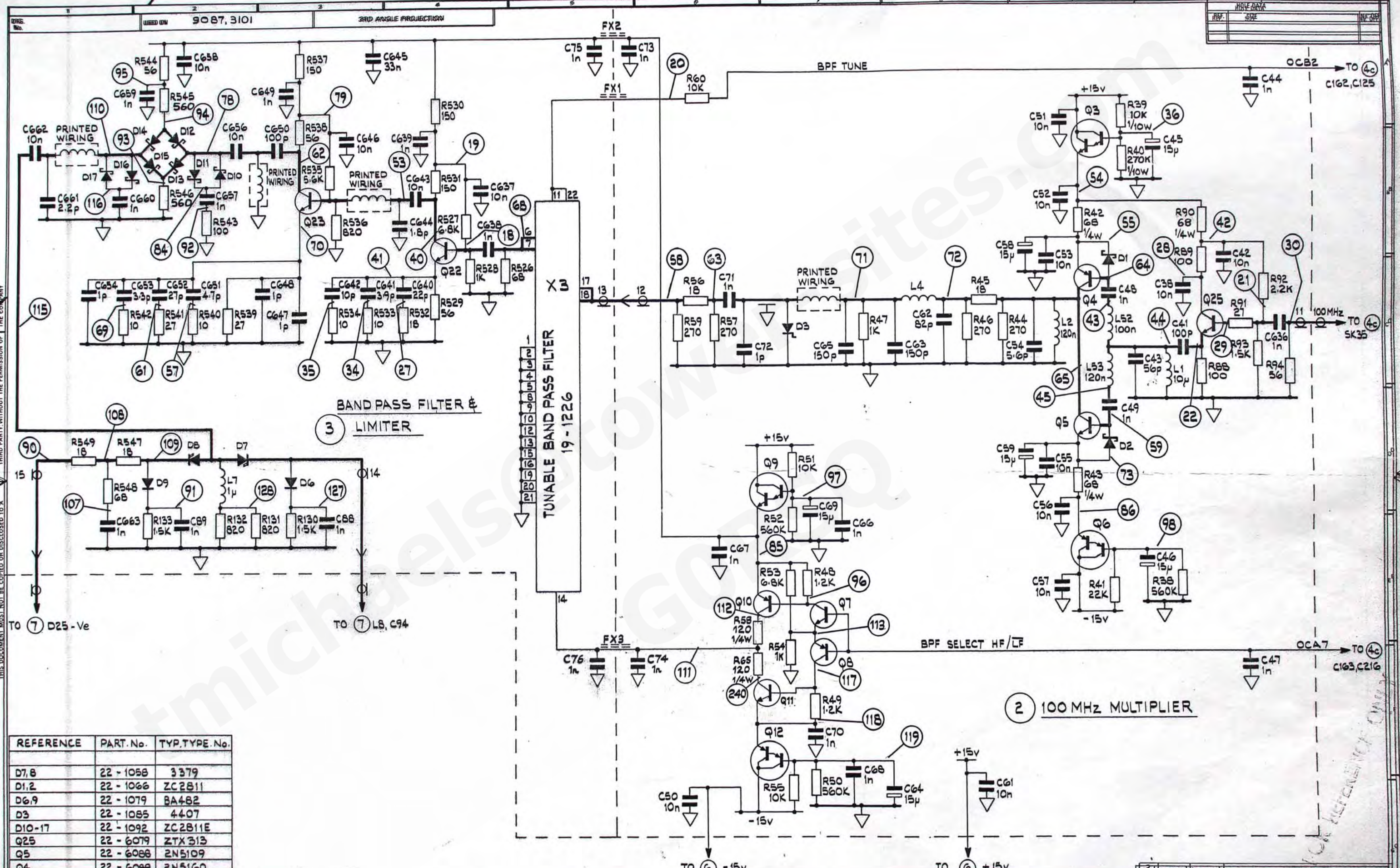
- A.T.E. No. 1-727
- 1 0v
  - 2 +24v
  - 3 -5.2v(b)
  - 4 & 5 +5v(A)
  - 6 +24v(c)
  - 7 +5v(L)
  - 8 & 12 +15v
  - 9 +24v(b)
  - 10 & 13 -15v
  - 11 +24v(c)
  - 14 & 15 -5.2v(a)
  - 16 +24v(d)



REV. 1	DATE	BY	CHKD.	APP. BY

19-1234 SHT. 3 OF 12  
 19-1234 SHT. 8 OF 12

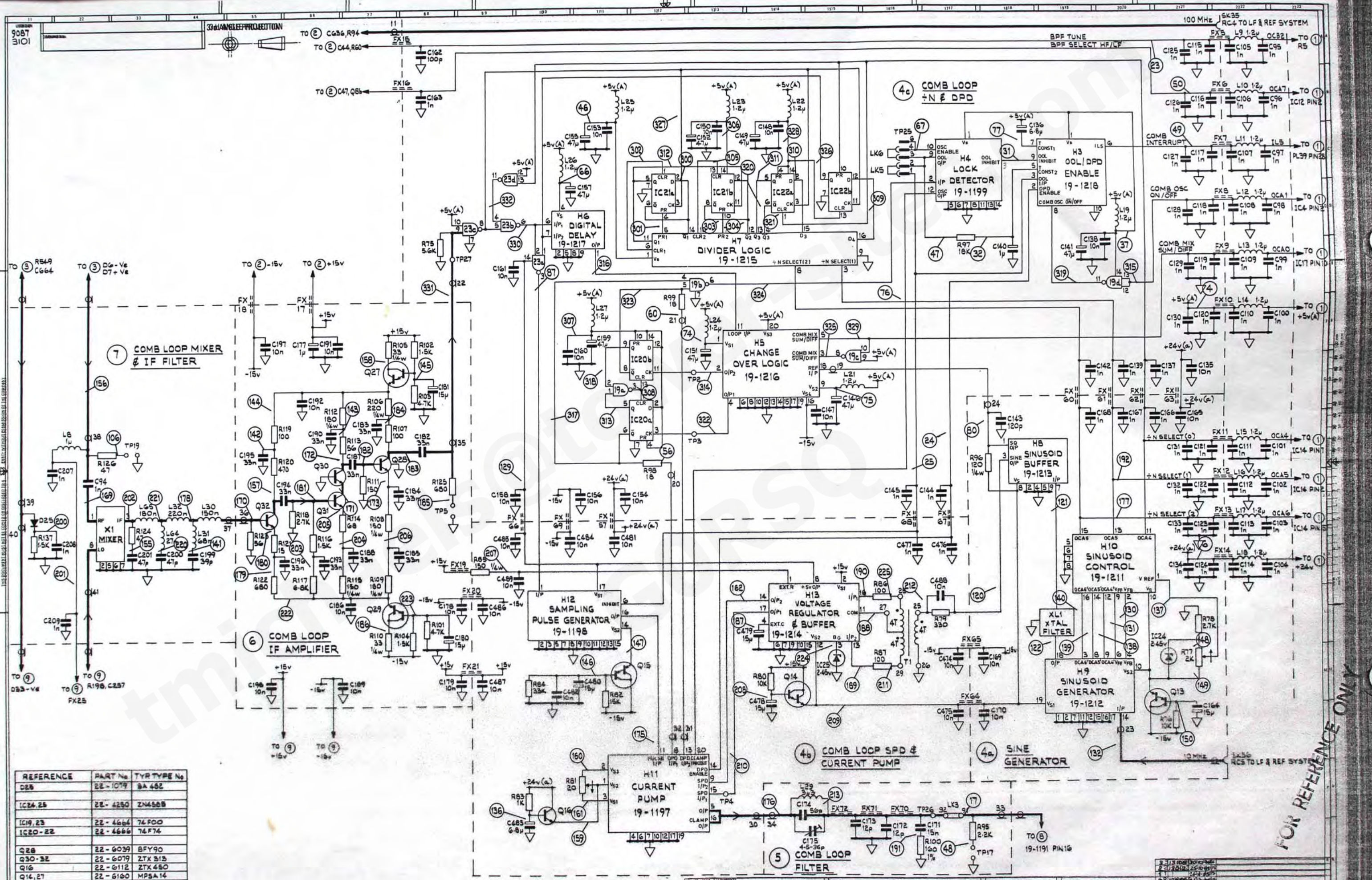
TITLE: CIRCUIT DIAGRAM FOR COMB & OUTPUT LOOP SYSTEM ASSY. ATE.



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REFERENCE	PART. No.	TYP. TYPE. No.
D7,8	22 - 1058	3 379
D1,2	22 - 1066	ZC 2B11
D6,9	22 - 1079	BA482
D3	22 - 1085	4407
D10-17	22 - 1092	ZC 2B11E
Q25	22 - 6079	ZTX 313
Q5	22 - 6088	2N5109
Q4	22 - 6089	2N5160
Q7,11	22 - 6112	ZTX 450
Q8,10	22 - 6113	ZTX 550
Q22,23	22 - 6155	HXTR-3101
Q3,9	22 - 6160	MPSA 14
Q6,12	22 - 6161	MPSA 64

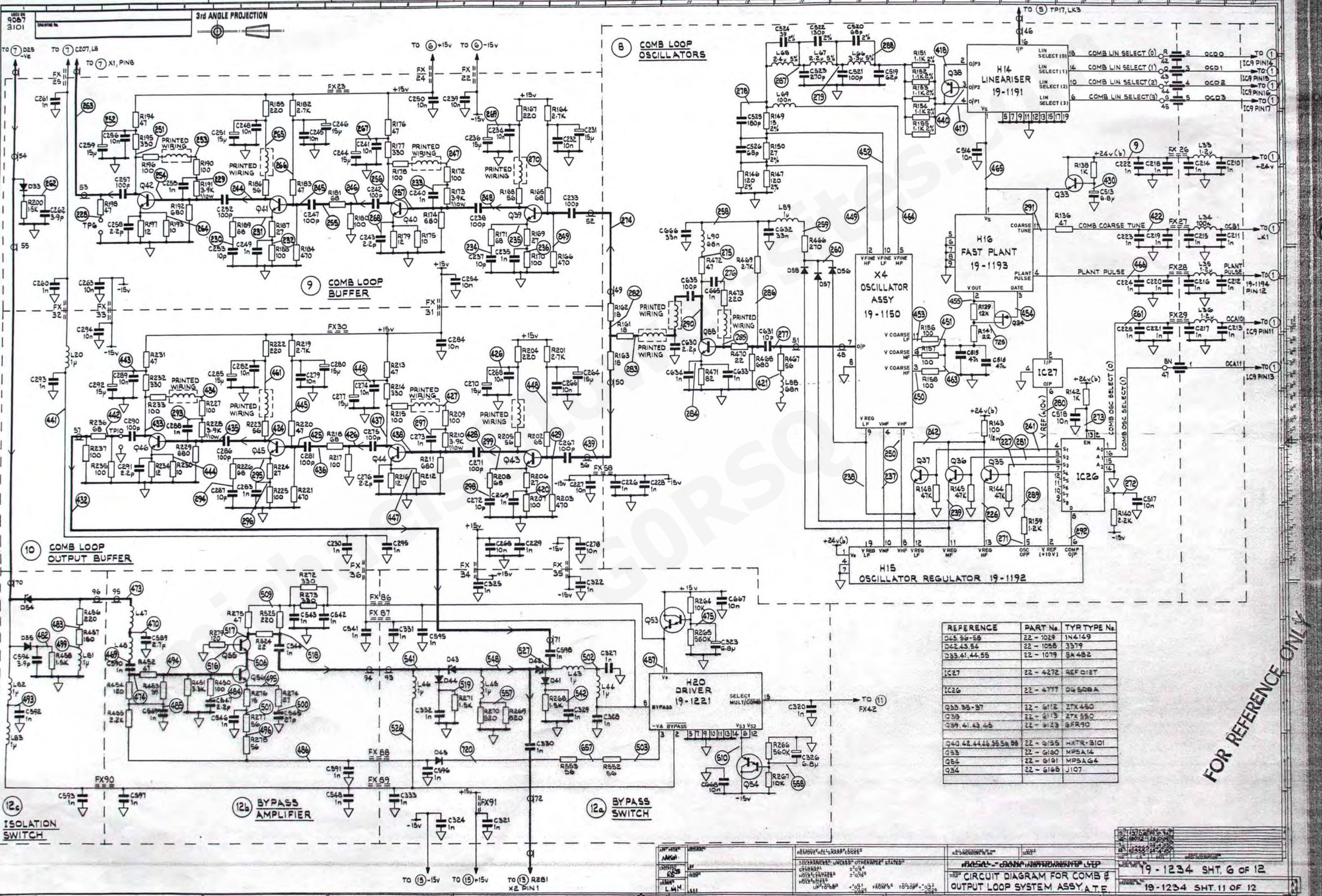
APPROVED <i>[Signature]</i>	MATERIAL GENERAL	REMOVE ALL SHARP EDGES	ALL DIMENSIONS IN "MM"	SCALE	DATE	REV. DESCRIPTION
CHECKED <i>[Signature]</i>	CAD/ESH	TOLERANCES UNLESS OTHERWISE STATED	RASCAL - DANA INSTRUMENTS LTD			
DRAWN L.M.	B.R.S.	HOLE SPACINGS ±0.15	CIRCUIT DIAGRAM FOR COMB & OUTPUT LOOP SYSTEM ASSY. A.T.E.			
		HOLE SIZES ±0.05				
		HOLE TOPS ±0.1				
		HOLE BOTTOMS ±0.05				



REFERENCE	PART No	TYR TYPE No
D25	22-1099	8A 482
IC24, 25	22-4250	ZN455B
IC19, 23	22-4664	74FOO
IC20-22	22-4666	74F74
Q28	22-6039	8FY90
Q30-32	22-6079	ZTX 313
Q16	22-6112	ZTX 450
Q14, 27	22-6160	MPSA 14
Q13, 15, 29	22-6161	MPSA 64

19-1234 SHT 5 OF 12  
19-1234 SHT 10 OF 12

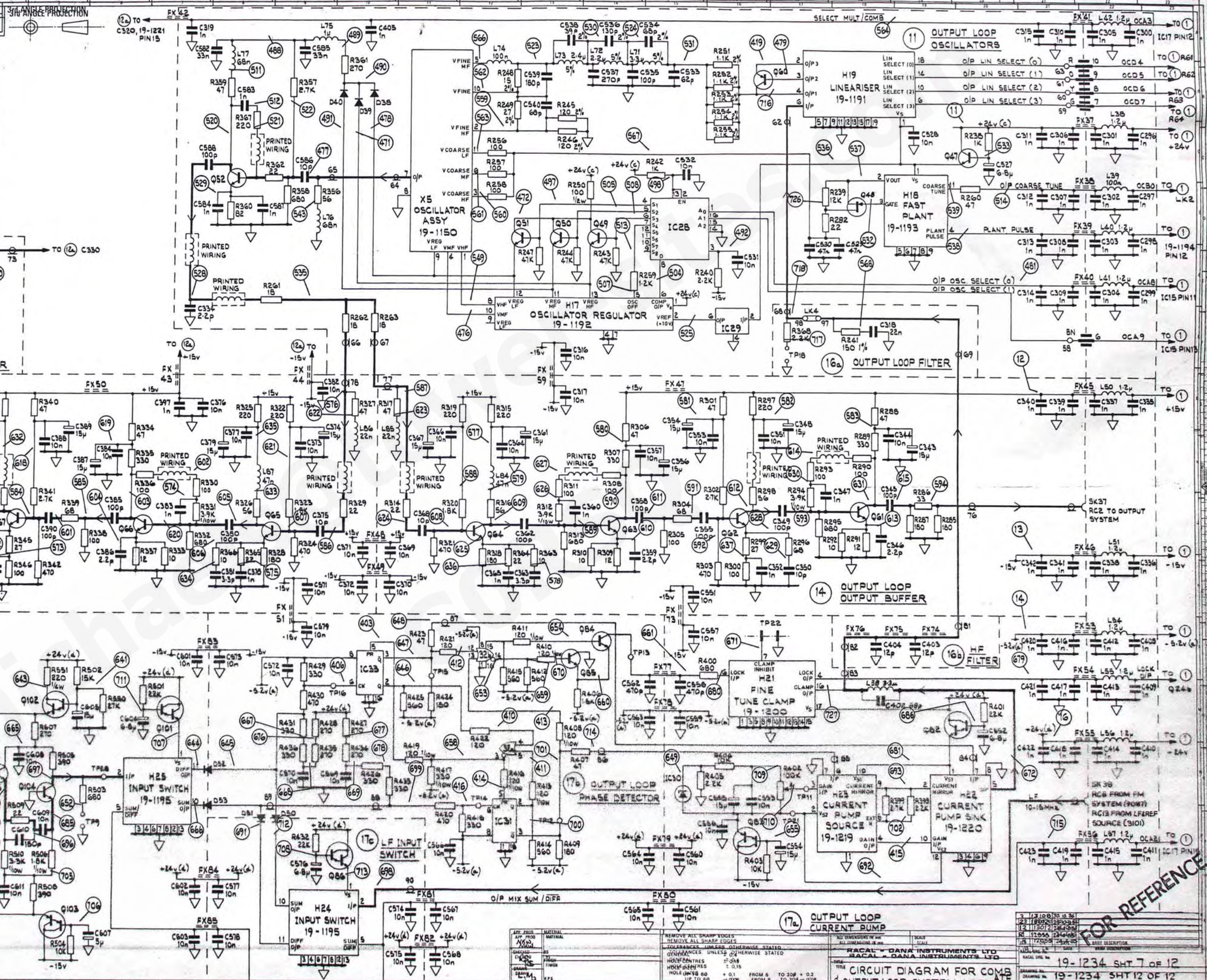
FOR REFERENCE ONLY



REFERENCE	PART No.	TYR TYPE No.
D25 50-55	22-1029	1N4149
D42,43,54	22-1058	3379
D33,41,44,55	22-1079	3A 4B2
IC27	22-4272	REF 018T
IC26	22-4777	04 508A
Q33,35-37	22-612	2TX 450
Q38	22-613	2TX 550
Q39,41,43,45	22-623	3FR 90
Q40,42,44,46,55,58,59	22-6155	HXTR-3101
Q33	22-6160	MPSA 14
Q64	22-6191	MPSA 64
Q34	22-6168	J107

FOR REFERENCE ONLY

REFERENCE	PART No.	TYR. TYPE No.
D38-40	22-1029	1N4149
D50-53	22-1058	3379
IC30	22-4250	2N458B
IC29	22-4272	REF O1ET
IC32	22-4279	MC10H109P
IC31,33	22-4280	MC10H131P
IC28	22-4777	DG 808A
Q84,85	22-6007	2N3904
Q104,109	22-6079	ZTX 313
Q47,49-51	22-6112	ZTX 450
Q60	22-6113	ZTX 550
Q62,67	22-6123	BFR90
Q52,61,63-66,68	22-6155	HXR-3101
Q82,88,101,102	22-6160	MPSA 14
Q83,103	22-6161	MPSA 64
Q48	22-6168	J107



18 OUTPUT LOOP IF AMPLIFIER

17a OUTPUT LOOP CURRENT BUMP

APPROVED	MATERIAL	REMOVE ALL SHARP EDGES	REMOVE ALL SHARP EDGES
DATE	NO.	TOLERANCES UNLESS OTHERWISE STATED	TOLERANCES UNLESS OTHERWISE STATED
DESIGNED BY	APPROVED BY	DIFFERENCES UNLESS OTHERWISE STATED	DIFFERENCES UNLESS OTHERWISE STATED
DRAWN BY	CHECKED BY	NOTES	NOTES
DATE	DATE	1. 0.1	1. 0.1
		2. 0.05	2. 0.05
		3. 0.02	3. 0.02
		4. 0.01	4. 0.01
		5. 0.005	5. 0.005
		6. 0.002	6. 0.002
		7. 0.001	7. 0.001
		8. 0.0005	8. 0.0005
		9. 0.0002	9. 0.0002
		10. 0.0001	10. 0.0001

FOR REFERENCE ONLY