

Procedure to modify FRS-C from 10 MHz TTL output to sine wave output.

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Caveat: I did not actually follow this procedure. I doped it out from the manual, but in the end used an external board to keep one TTL output and add three sine outputs. The schematic for the external board is at the end of this document. It is not necessarily the best solution, but it fit in a small space. Use these instructions at your own risk!

The modification is made to two boards inside the FRS-C unit, the Power Supply board, and the Oscillator board. The changes are summarized in Table 1. Values labeled **NOM** can be adjusted to meet level and distortion specs.

Table 1. Modification of FRS-C from TTL to sine

Power supply board

Item #	Component	TTL version	Sine version
1	C9	.47 uF	6.8 nF NOM
2	R16	100 ohm	910 ohm NOM
3	R17	270 ohm	1 k NOM
4	C8	shorted	47 pF NOM
5	L1	open	6.8 uH
6	A-B wire	open	shorted
7	L2/R23	130 ohm	15 uH
8	C16	shorted	0.1 uF
9	R18	open	1 k
10	C17	open	240 pF NOM between P1 center pin and pad E

Oscillator Board

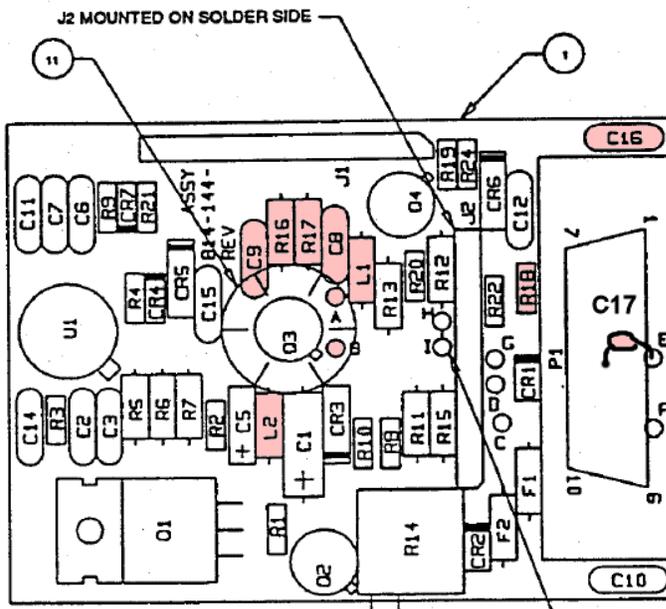
1	R7	shorted	100 ohm
2	L4	open	10 uH
3	C17	open	100 pF NPO

Referring to the following layouts and photographs of the two boards, replace the TTL components with the Sine components. Annotated schematics are included also.

Good luck!

Power Supply board layout. Components to be added are indicated in pink.
C17 is added to the back of the board

TABULATION CHART		
COMPONENT VALUES FOR RF OUTPUT		COMPONENT VALUES FOR TTL OUTPUT
ASSEMBLY 814-144-2 10 MHz SINE	ASSEMBLY 814-144-4 5 MHz SINE	ASSEMBLY 814-144-3 10 MHz TTL
L1- 8.2uH 6.8 uH L2- 18uH 15 uH R16- 910 OHM NOM 910 R17- 1.0K NOM 1k R18- 1.0K 1k C8- 47PF NOM 47 pF C9- 6800PF NOM 6800 pF C16- 0.1uF C17- 240PF NOM NPO 240 pF nom BETWEEN P1 CENTER & PAD E	L1- 18uH L2- 47uH R16- 910 OHM NOM R17- 1.0K NOM R18- 1.0K C8- 82PF NOM C9- 8600PF NOM C16- 0.1uF C17- 240PF NOM NPO	L1- OMIT OMIT L2- REPLACE WITH R23 R23 130 1 W 130 OHM 1W, HW/PB1 R16- 100 OHM NOM 100 OHM NOM R17- 270 OHM NOM 270 OHM NOM 1/4 W R18- OMIT OMIT C8- JUMPER JUMPER C9- 0.47uF NOM .47 uF NOM C16- JUMPER JUMPER C17- OMIT OMIT INSTALL JUMPER A-B INSTALL JUMPER A-B INSTALL HEATSINK (ITEM 11) ON C9



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. WORKMANSHIP SHALL BE PER MIL-STD-883C REQUIREMENT 5. (NO CERTIFICATIONS REQUIRED)
 2. ALL SOLDERING, WIRING AND COMPONENT MOUNTING SHALL MEET THE REQUIREMENTS OF IPC-6013 CLASS B.
 3. LEADS SHOULD BE PARTIALLY CLINCHED OR SWAGED FOR PART RETENTION PRIOR TO SOLDERING. (FOR REF. ONLY SEE MIL-P-48648B TYPE B OR TYPE B1)
 4. AFTER SOLDERING, CLEAN ASSEMBLY TO REMOVE ALL FLUX RESIDUE.
 5. IDENTIFY WITH ASSY DASH No. AND PARTS LIST REV. LETTER.
 6. LEAD PROJECTION BELOW BOARD SURFACE SHALL BE .020 MIN. .060 MAX.
 7. FOR SCHEMATIC DIAGRAM SEE DRAWING NUMBER 814-142

INSTALL LEAD OF R12 IN PAD H FOR + COMPENSATION
 INSTALL LEAD OF R12 IN PAD I FOR - COMPENSATION

Power Supply schematic. Components to be changed are marked with 7, and the sequence number from Table 1 in pink. The components indicated are the sine version components. Broken lines are jumpers used in the TTL version that must be removed to add the sine components.

LAST USER	DATE	REVISION
U1	8/24	1
U2	8/24	2
U3	8/24	3
U4	8/24	4
U5	8/24	5
U6	8/24	6
U7	8/24	7

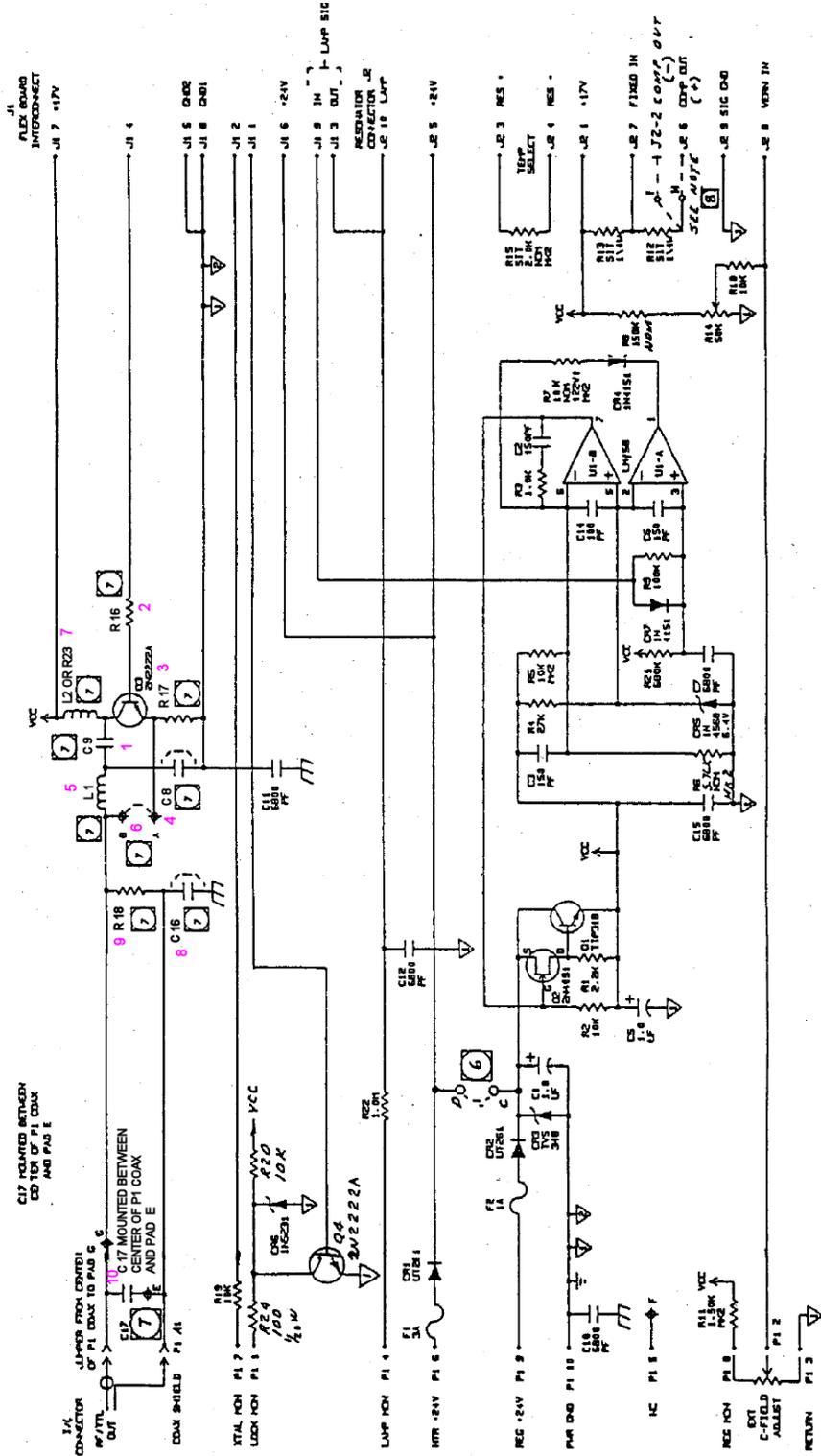
POWER CHART	DATE	BY	REV
U1	8/24	U1	1
U2	8/24	U2	1
U3	8/24	U3	1
U4	8/24	U4	1
U5	8/24	U5	1
U6	8/24	U6	1
U7	8/24	U7	1

- NOTES: VALUES UNLESS OTHERWISE SPECIFIED
- RESISTORS ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED. VALUES ARE IN OHMS.
 - CONNECTIONS ARE AS SHOWN. UNLESS OTHERWISE SPECIFIED, VALUES ARE IN OHMS.
 - USE 1/4W OR 1/2W RESISTORS FOR 1/4W AND 1/2W RESISTORS.
 - USE 50PF OR 100PF CAPACITORS FOR 50PF AND 100PF CAPACITORS.

P.C.B. LAYOUT FOR THIS PART BE USED FOR ALL RESISTORS

COMPONENT VALUE	FOR THE BOARD	COMPONENT VALUE FOR THE BOARD
R10	10K	10K
R11	10K	10K
R12	10K	10K
R13	10K	10K
R14	10K	10K
R15	10K	10K
R16	10K	10K
R17	10K	10K
R18	10K	10K
R19	10K	10K
R20	10K	10K
R21	10K	10K
R22	10K	10K
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R97	10K	10K
R98	10K	10K
R99	10K	10K
R100	10K	10K

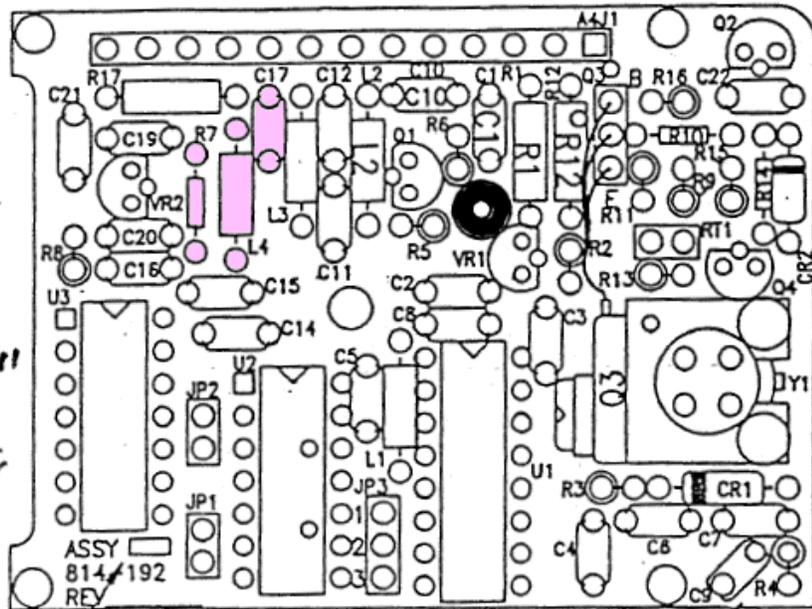
NUMBERS IN THIS COLOR REFER TO CHANGE TABLE



Oscillator board layout. Components to be added are in pink.

FRS

C11 ADJ.
SCH. P. A9
ABOVE "VR1"
THIS PAGE



3.

LOCATE C9 & R4 AS SHOWN.

5.

TABULATION		
PRODUCTION ASSY NO	RF OUTPUT	BOARD MODIFICATION
814-192-1	10 MHz SINE	AS SHOWN, NO JUMPERS
814-192-2	10 MHz TTL	REPLACE R7 WITH JUMPER, DO NOT INSTALL L4 OR C17
814-192-3	2.048 MHz TTL	CUT AT U2-11 JUMPER U2-9 TO R7 JP3-1 TO JP3-3 CUT AT U2-10 JUMPER U2-9 TO U3-9 JP1 CUT AT U2-4 JUMPER U2-3 TO U3-10 JP2 REPLACE R7 WITH JUMPER
814-192-4	5 MHz SINE	CUT AT U2-11 JUMPER U2-10 TO R7 JP3-1 TO JP3-2 REPLACE R7 WITH JUMPER, DO NOT INSTALL L4 OR C17

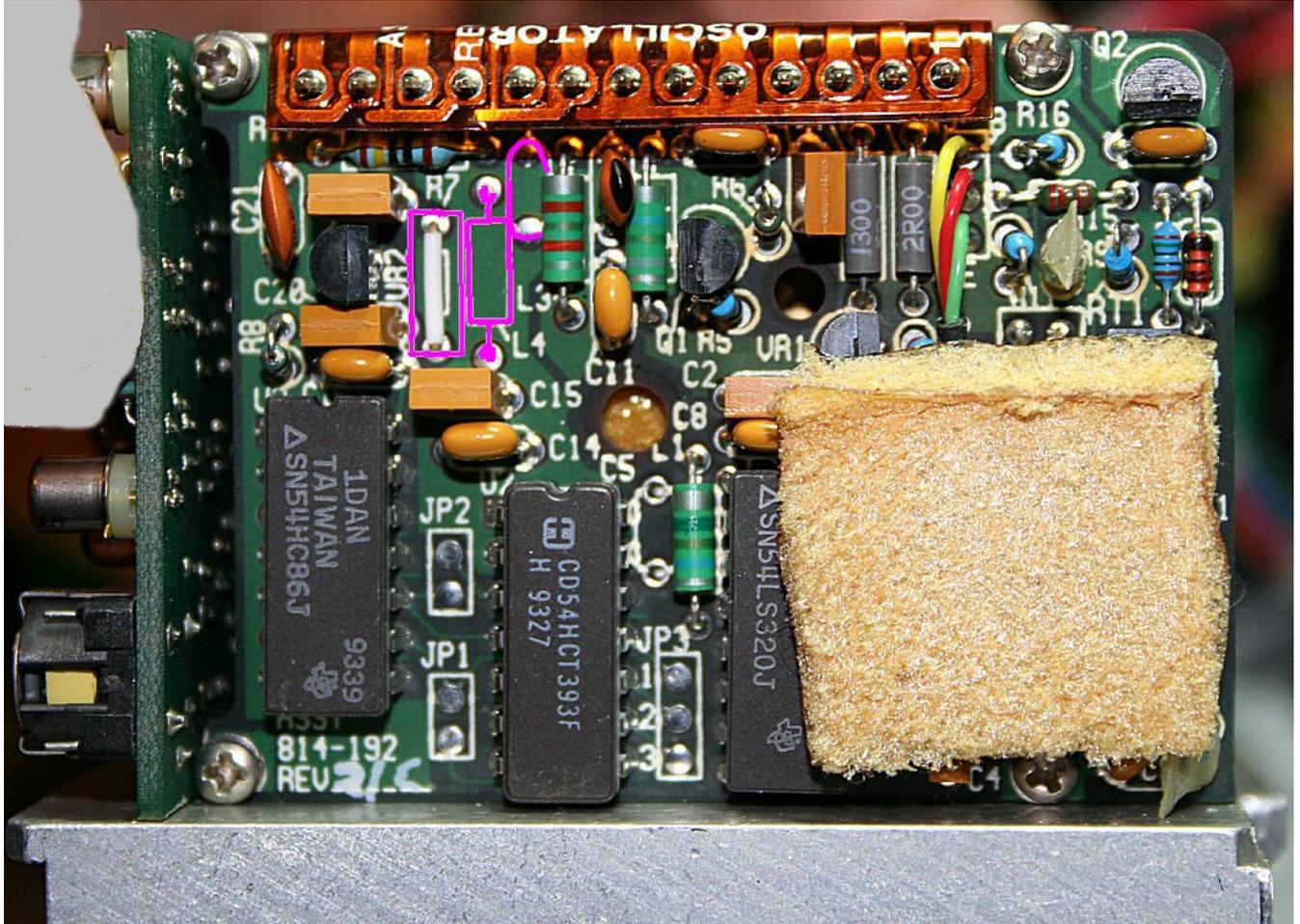
- 5. SLEEVE STAND-UP RESISTORS R3, R4, R9, R13 USING CLEAR HEATSHRINK TUBING (ITEM 43). RESISTORS MUST BE FACED AWAY FROM CRYSTAL ASSEMBLY SOLDERING.
- 4. BOND INSULATOR FOAM (ITEM 41) TO CRYSTAL ASSY (ITEM 2) USING RTV ADHESIVE (ITEM 42) AS SHOWN.
- 3. IDENTIFY WITH ASSEMBLY DASH NUMBER AND REVISION LETTER.

- 2. FOR SCHEMATIC SEE 814-201.
- 1. PART ATTACHMENT, WIRING, SOLDERING, CLEANING AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH IPC-5-815 CLASS III.

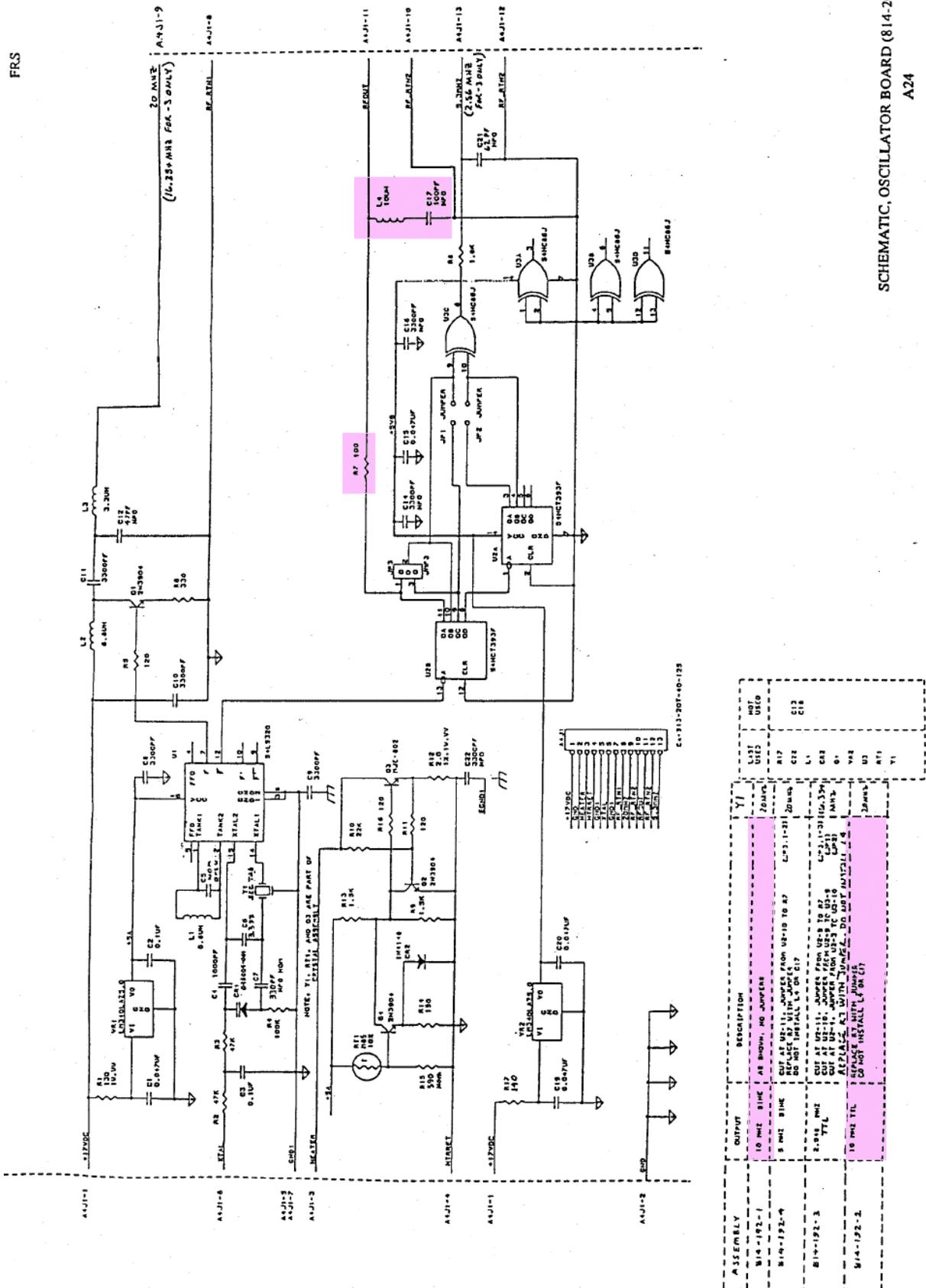
NOTES: UNLESS OTHERWISE SPECIFIED.

ASSEMBLY A4, OSCILLATOR BOARD (814-192/REV T)

Oscillator board photo. Components to be added for sine version are indicated with purple outlines.



Schematic of Oscillator board. Components to add are indicated with purple.



SCHEMATIC, OSCILLATOR BOARD (814-201/REV E A24

