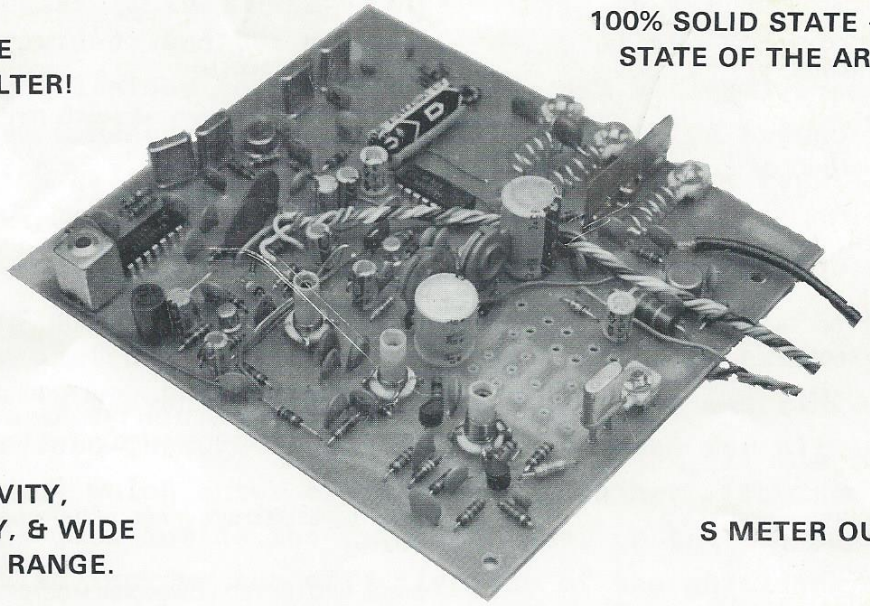
SCR 100
RECEIVER BOARD

8 or 10 POLE CRYSTAL FILTER!

100% SOLID STATE — STATE OF THE ART DESIGN!



HIGH SENSITIVITY, SELECTIVITY, & WIDE DYNAMIC RANGE.

S METER OUTPUT

INTRODUCTION

THE SPECTRUM COMMUNICATIONS SCR100 RECEIVER BOARD IS 100% SOLID STATE AND UTILIZES A "STATE OF THE ART DESIGN" WITH A MAXIMUM OF IC'S FOR OPTIMUM PERFORMANCE AND CIRCUIT SIMPLICITY. ITS VERY WIDE DYNAMIC RANGE, TOGETHER WITH IT S EXCELLENT SENSITIVITY AND SELECTIVITY, MAKE IT IDEAL FOR REPEATER RECEIVER, MONITOR, TRANSCEIVER OR OTHER SPECIAL PURPOSE APPLICATION.

CIRCUIT DESCRIPTION

THE HEART OF THE RECEIVER FRONT END IS THE "SCHOTTKY" HOT CARRIER DIODE BALANCED MIXER, WHICH DOES NOT COMPRESS (SATURATE) 1dB UNTIL ITS INPUT LEVEL REACHES ABOUT 225,000uV! THIS IS COMBINED WITH A DUALGATE MOSFET RF AMP WHICH PROVIDES HIGH GAIN COMBINED WITH A LOW NOISE FIGURE FOR MAXIMUM RECEIVER SENSITIVITY. THESE TWO STAGES PROVIDE THE VERY WIDE DYNAMIC RANGE THAT IS "UNHEARD-OF" IN AMATEUR EQUIPMENT, AND IS NORMALLY FOUND ONLY IN VERY EXPENSIVE MILITARY RECEIVERS! BECAUSE OF THIS, THE RECEIVER HAS UNUSUALLY SUPERIOR PERFORMANCE CHARACTERISTICS WITH RESPECT TO "DESENSE", OVERLOAD AND INTERMOD PRODUCTS.

THE LOCAL OSCILLATOR CONSISTS OF A THIRD OVERTONE OSCILLATOR, FOLLOWED BY A TRIPLER STAGE. LINK COUPLING AND A DOUBLE-TUNED OUTPUT FILTER ARE USED TO KEEP SPURIOUS L.O. PRODUCTS TO A MINIMUM. THE TRIPLER STAGE SUPPLIES THE RELATIVELY HIGH LEVEL OF L.O. DRIVE REQUIRED BY THE H.C.D. MIXER.

THE H.C.D. MIXER IS IMMEDIATELY FOLLOWED BY A 4 POLE MONOLITHIC CRYSTAL FILTER. THIS EFFECTIVELY FILTERS OUT STRONG OFF-CHANNEL SIGNALS **BEFORE** THEY REACH THE FIRST IF AMP (IC101) WHICH PROVIDES OVER 70dB OF GAIN IN 1 CHIP THIS IS FOLLOWED BY A 4 POLE CRYSTAL FILTER WHICH SHARPENS THE IF SKIRT SELECTIVITY. NOTE THAT THESE CRYSTAL FILTERS HAVE MUCH HIGHER Q'S THAN THE COMMONLY USED CERAMIC FILTERS AND THEREFORE HAVE MUCH SHARPER SELECTIVITY PER POLE. ALSO, THESE FILTERS HAVE A NEARLY **RECTANGULAR** RESPONSE CURVE AS OPPOSED TO THE "ROUNDED" RESPONSE OF CERAMIC RESONATORS —WHICH LEADS TO DISTORTION ON WEAK SIGNALS. THE NEXT IC (102) ADDS ABOUT 60dB OF IF GAIN AND "HARD LIMITING", (FOR MAXIMUM AM NOISE REJECTION), AND ALSO INCLUDES THE FM QUADRATURE DETECTOR AND AUDIO PRE-AMP. THE DETECTED AUDIO IS VERY LOW IN DISTORTION.

THE NOISE OPERATED SQUELCH CIRCUITRY AMPLIFIES AND DETECTS HIGH FREQUENCY NOISE. A DC VOLTAGE IS DEVELOPED WHICH IS USED TO GATE THE AUDIO AMP IC (103) ON OR OFF DIRECTLY. THE SQUELCH IS DESIGNED TO BE VERY FAST OPERATING, SO THAT THERE IS NO "LONG BLAST OF NOISE" AS A RECEIVED CARRIER DROPS. THE A.F. AMP WILL SUPPLY 1-2 WATTS OF VERY LOW DISTORTION AUDIO OUTPUT. THE AUDIO QUALITY AND FIDELITY ARE BOTH UNUSUALLY GOOD. AN "S METER" CIRCUIT IS ALSO PROVIDED ON BOARD. IT IS DESIGNED TO READ "TRUE QUIETING" OF THE FM RECEIVER IN THE RANGE OF "VERY NOISEY" TO "FULL QUIETING".

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NORRISTOWN, PA. 19401
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SPECIFICATIONS

FREQUENCY RANGE	136-174MHz. 220-225MHz.
SENSITIVITY	0.35μV/20dB QT. 0.3μV/12dB SINAD. (TYPICAL), 0.5μV (MAX.)
SQUELCH THRESHOLD	0.15μV (TYP), 0.25μV (MAX.)
SELECTIVITY (TYP) 8 POLE FILTER	-6dB @ ±6.5KHz: (20dB QT. METHOD) −75dB @ ±15KHz, −100dB min. @ ±30KHz
OPTIONAL 10 POLE FILTER	−6dB @ ± 6KHz, −90dB typ. @ ± 15KHz, −110dB min. @ ±30KHz.
SPURIOUS RESPONSE*	-70dB (MIN.)
IMAGE RESPONSE*	-45dB (TYP), (136-174MHz). -35dB (MIN.) (220MHz). "HIGH SIDE" L.O. INJECTION IS USED ON THE 220MHz RCVR., IN ORDER TO PLACE THE IMAGE RESPONSE IN THE UNOCCUPIED 250MHz RANGE.
DE-SENSE POINT (w/ 1μV DESIRED SIG.)	WITH UNDESIRED SIG. @ APX. ±600KHz, DESENSE BEGINS AT APX. 50,000μV.
FRONT END	DIODE PROTECTED LOW-NOISE MOSFET, W/BALANCED HOT CARRIER DIODE MIXER FOR EXTREMELY LOW I.M.
I.F.	10.7MHz. SINGLE CONVERSION FOR MINIMUM SPURIOUS RESPONSE.
SQUELCH	FAST ATTACK; NOISE OPERATED.
AUDIO OUTPUT (NOMINAL)	1.25W TO 8 ohm LOAD; 1.8W TO 4 ohm LOAD.
A.F. DE-EMPHASIS	-6dB OCTAVE PER EIA SPECIFICATIONS
OPERATING VOLTAGE	13VDC (NOM.) 11V MIN, 14V MAX.
CURRENT DRAW-SQUELCHED NORMAL AF OUTPUT MAXIMUM	85mA (NOM.) 100-120mA 300mA
SIZE	5.4" x 4.9"
MINIMUM RECOMMENDED SHIELDED HOUSING SIZE	6½" L x 6" W x 2" H (INSIDE)
CONTROLS REQUIRED — SQUELCH — AF OUTPUT RECOMMENDED "S METER" (IF USED) CRYSTAL INFORMATION (136-174MHz RCVR.) (220MHz RCVR.)	 10K ohm (LINEAR TAPER) 50K ohm (LINEAR TAPER) 1mA DC. 1KΩ INTERNAL RESISTANCE. (Meter Optional.) Xtal $F_O = \frac{\text{RCV Freq} - 10.7\text{MHz}}{3}$ Xtal $F_O = \frac{\text{RCV Freq} + 10.7\text{MHz}}{4}$ THIRD OVERTONE, PARALLEL RESONANT, 30pF LOAD CAPACITY. HC-25/U CASE. 30 ohms OR LESS AT RESONANCE. TOLERANCE (-20 TO +60° C) ±0.001% OR BETTER.
RECOMMENDED HOUSING	SPECTRUM COMMUNICATIONS CUSTOM SCR1000 RX HOUSING

SOLD FACTORY DIRECT. (ASSEMBLED & TESTED.) AS USED IN THE SCR1000.
SUPPLIED W/1 PRECISION COMMERCIAL GRADE 0.0005% CRYSTAL.

* NOTE: THE OPTIONAL FL-6 PRESELECTOR IS HIGHLY RECOMMENDED FOR USE WITH THE SCR100 WHEREVER THERE ARE NEARBY VHF TRANSMITTERS. IT WILL IMPROVE "OUT OF BAND" REJECTION (> 5MHz) BY AT LEAST 60dB!

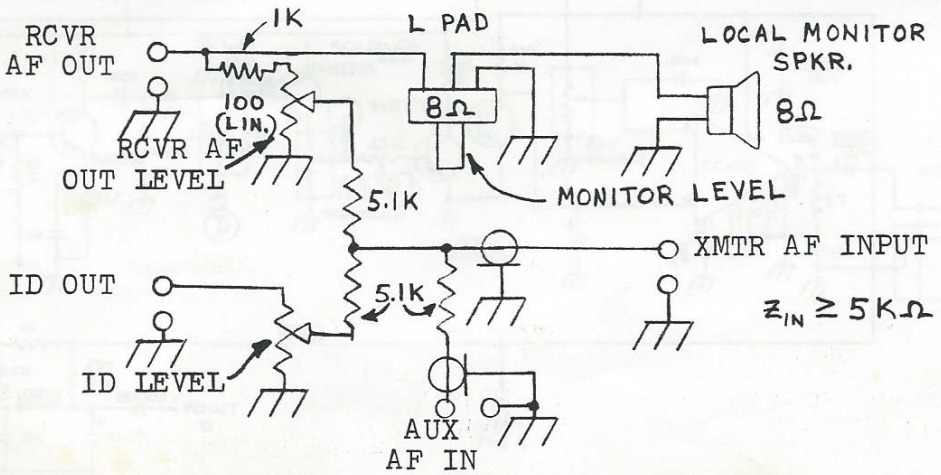
IV. Installation

It is absolutely essential that the board be mounted on the 7/8" standoffs provided, and use a housing which allows at least ½" of clearance on all sides (around the board) and at least 1" above the board. This is necessary to prevent stray coupling around the extremely high gain IF stages. Poor performance may result if these precautions are not followed.

For proper operation as a repeater receiver, the SCR100 receiver board must be mounted in a tightly shielded housing of at least the minimum size listed in section III. The box should have tightly sealed seams to prevent stray transmitter RF from entering. 1000 pF or larger feed-through capacitors must be used for all leads (except ground) which enter or leave the housing. (The use of ferrite beads just inside the feed-throughs, or the use of "Filter-cons" will also improve the effectiveness of the shielding/filtering.) A BNC connector is recommended for RF Input. Double shielded coax cable is highly recommended for use throughout all single-site repeater systems.

See Figure 1 for audio output connections for repeater service. (For other applications, the speaker may be connected directly to the AF Output leads.) The resistive AF mixing network should be wired with short leads and preferably mounted in a shielded box. Be sure to use shielded wire for all high impedance lines as shown. The normal receiver "Volume" control (wired to the board) should be used as a "Master Receiver AF Output Level" control. This should be a 'set and forget' control, and would normally be set at 1/2 to 3/4 of maximum audio output.

Figure 1 - TYPICAL REPEATER AUDIO INTERCONNECTION



V. C.O.R. Interface Circuits - (parts not supplied)

Figure 2- Emitter Follower

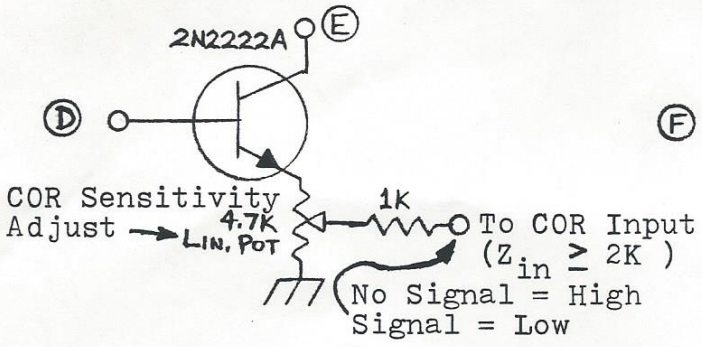
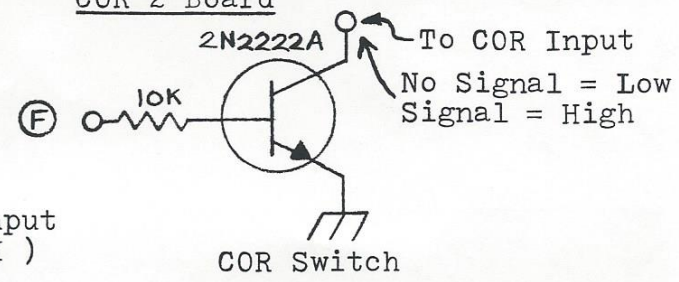
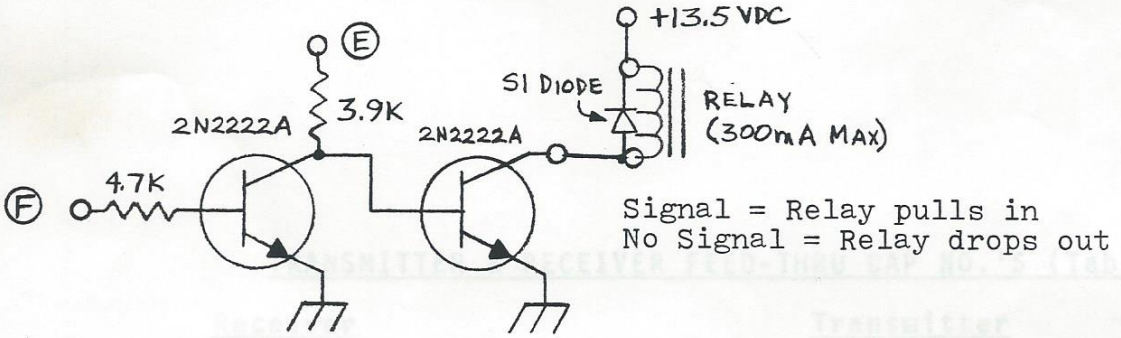


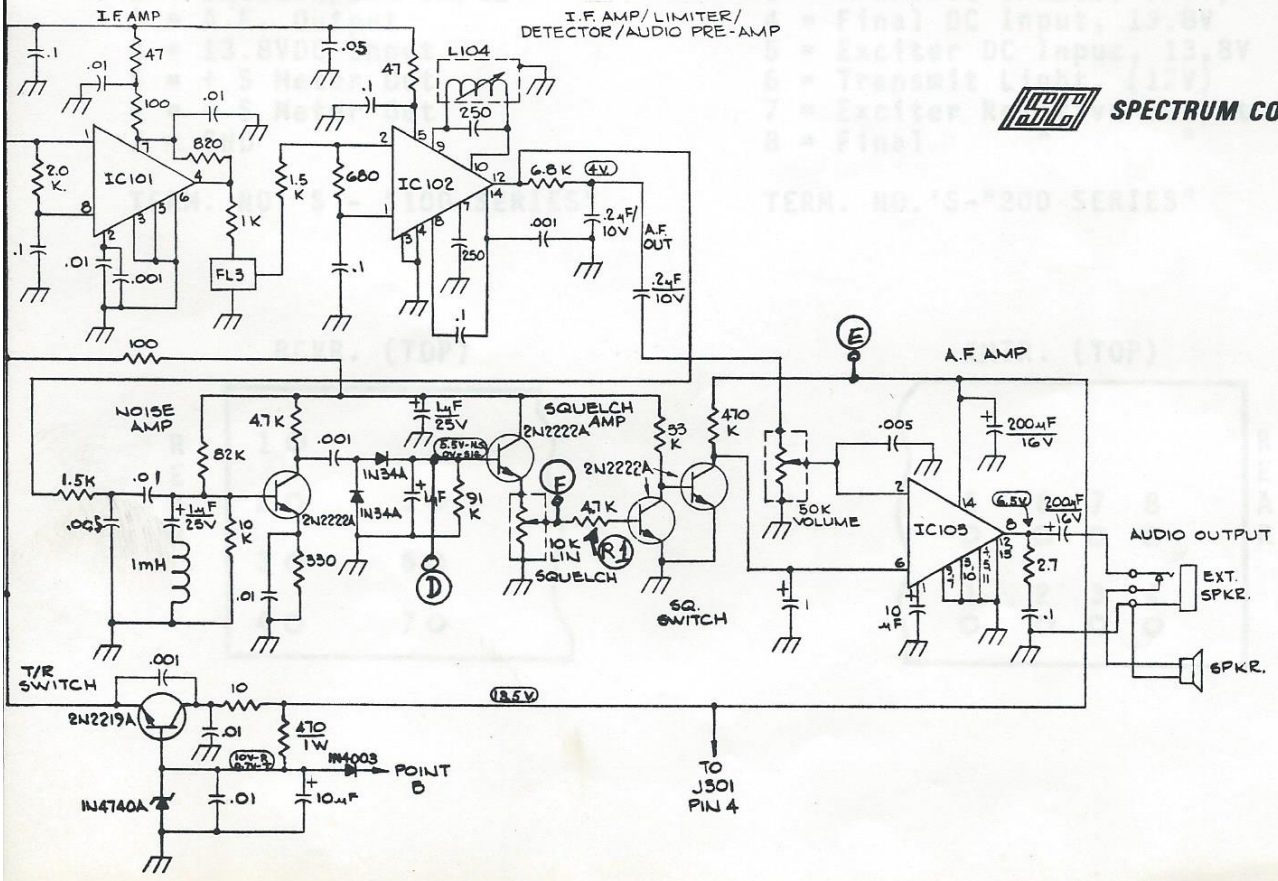
Figure 3 - To Interface w/ VHF Engr. 'COR 2'Board





Change R1 to 47KΩ

Figure 4 - To Pull In COR Relay



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TRANSMITTER & RECEIVER FEED-THRU CAP NO.'S (Table 3)

Receiver

1 = Squelch/COR Pot, (high side)
2 = Squelch/COR Input
3 = A.F. Output
4 = 13.8VDC Input
5 = + S Meter Out
6 = - S Meter Out
7 = GND

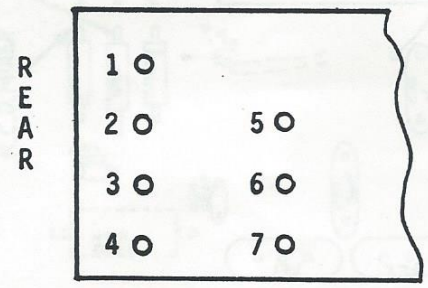
TERM. NO.'S - "100 SERIES"

Transmitter

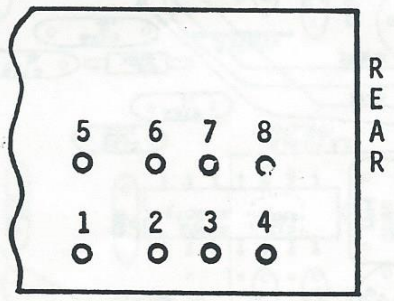
1 = A.F. Input
2 = Ground
3 = Transmit Enable, (PTT)
4 = Final DC Input, 13.8V
5 = Exciter DC Input, 13.8V
6 = Transmit Light, (12V)
7 = Exciter Relative Output
8 = Final " "

TERM. NO.'S-"200 SERIES"

RCVR. (TOP)



XMTR. (TOP)



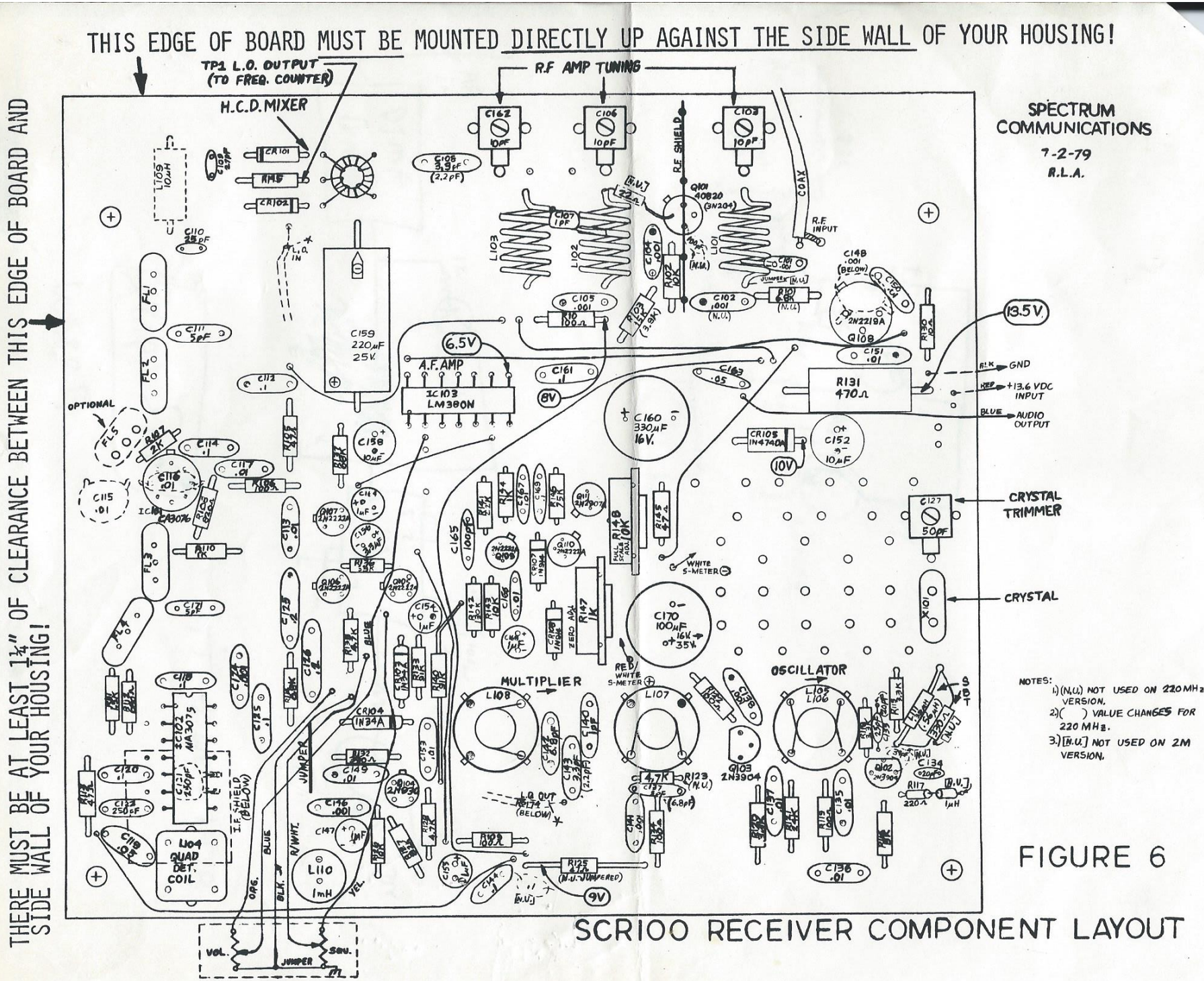
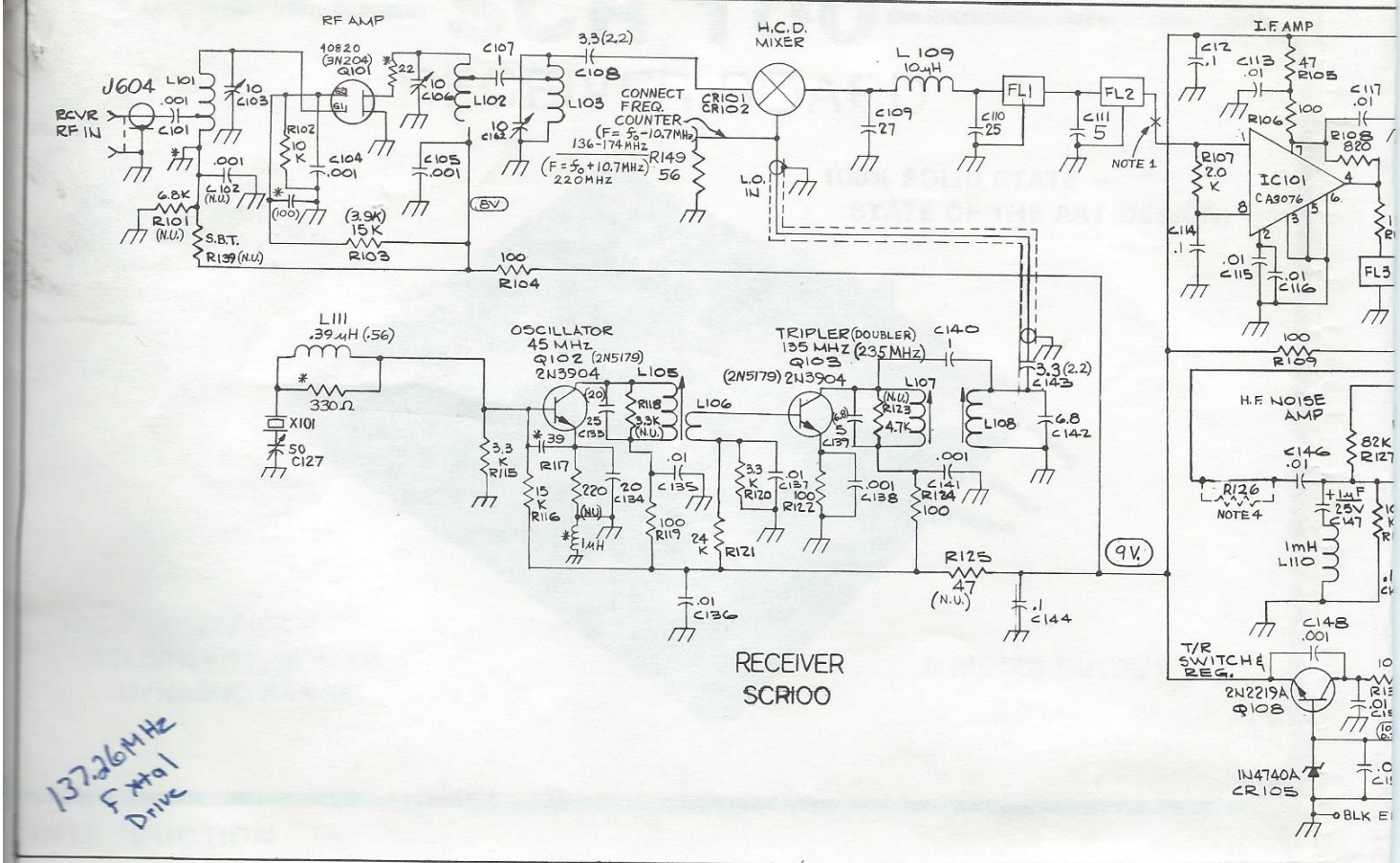
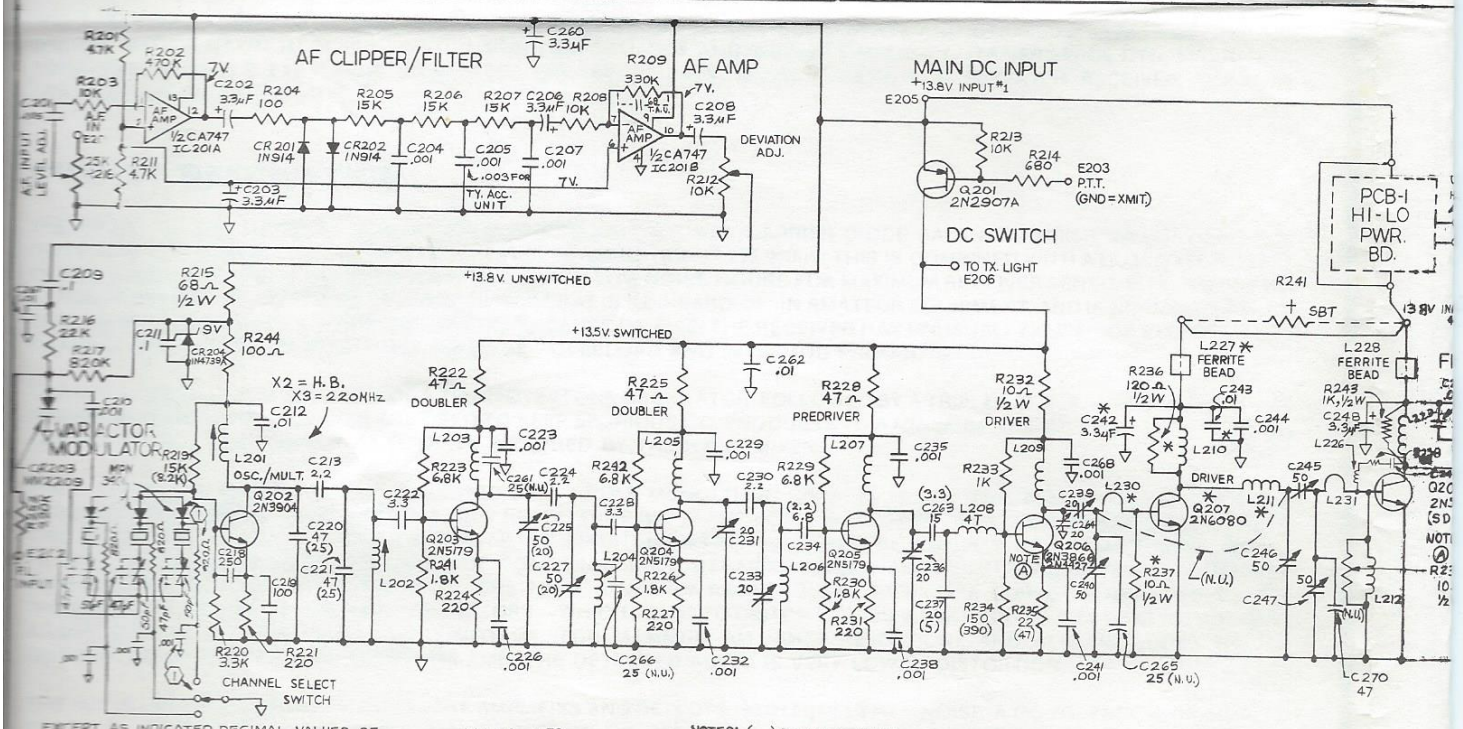


FIGURE 6

SCR100 RECEIVER COMPONENT LAYOUT



13.26MHz Xtal Drive



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF); RESISTANCES ARE IN OHMS, K=1000

LAST R 252
LAST C 299B
LAST CR 212
LAST IC 201
LAST Q 210
LAST L 237
CAN USE R248, C259, CR209, CR210

NOTES: ( ) DENOTES VALUE CHANGES FOR 220MHz VERSION
* DENOTES EXTRA PARTS USED ON 220 MHz VERSION ONLY,
(N.U.) DENOTES-NOT USED ON 220MHz VERSION,
+RESISTOR USED FOR LOW POWER OPTION ONLY,
Ⓘ EXTRA PARTS INSTALLED FOR MULTI-FREQ ONLY,
Ⓐ FOR 10-12W. HI BAND UNIT, Q209 IS A SD1133.

REVISIONS	
NO.	DATE
1	12/22/77
2	12/27/77
3	8/16/79
4	
5	

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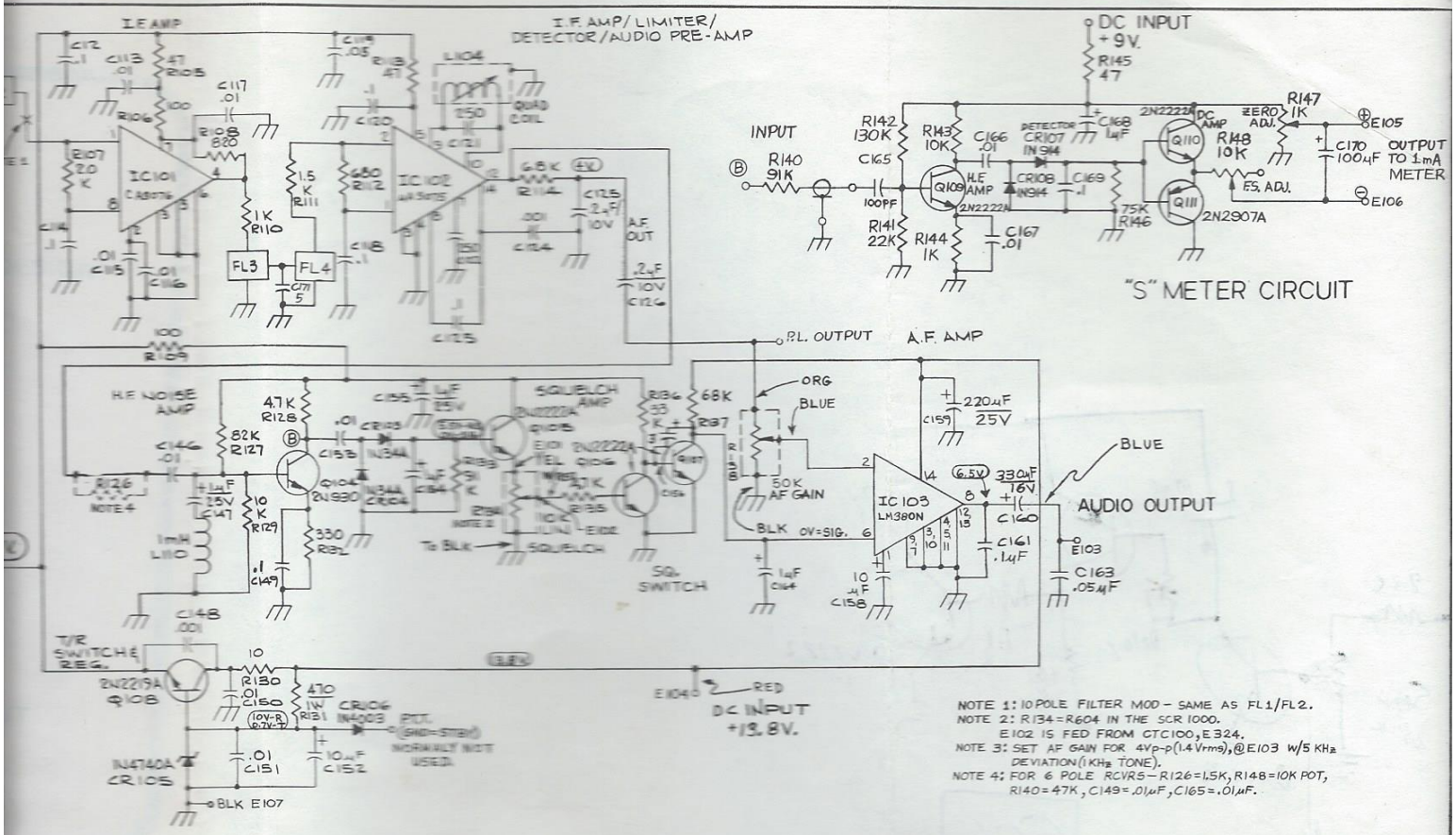
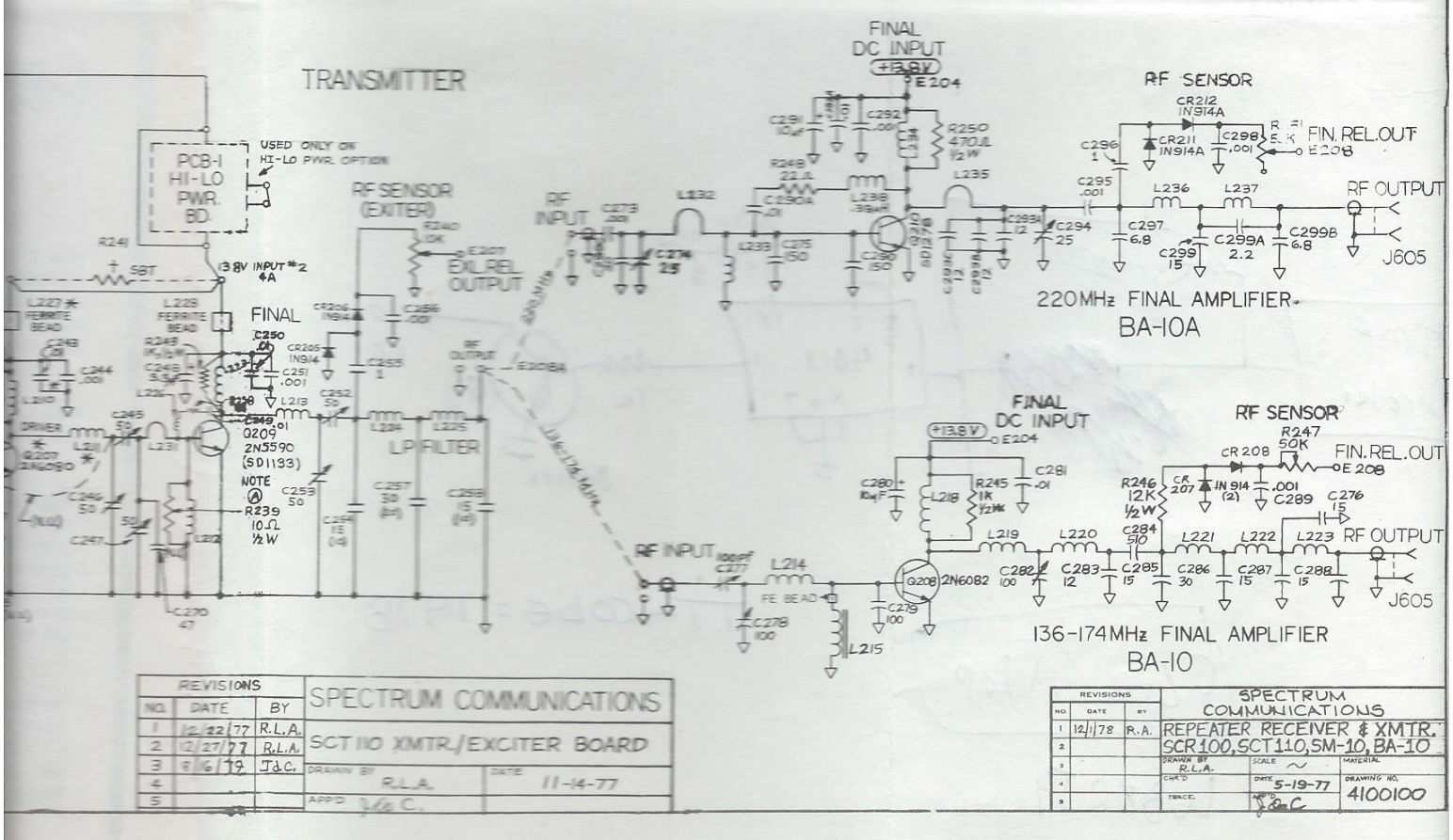
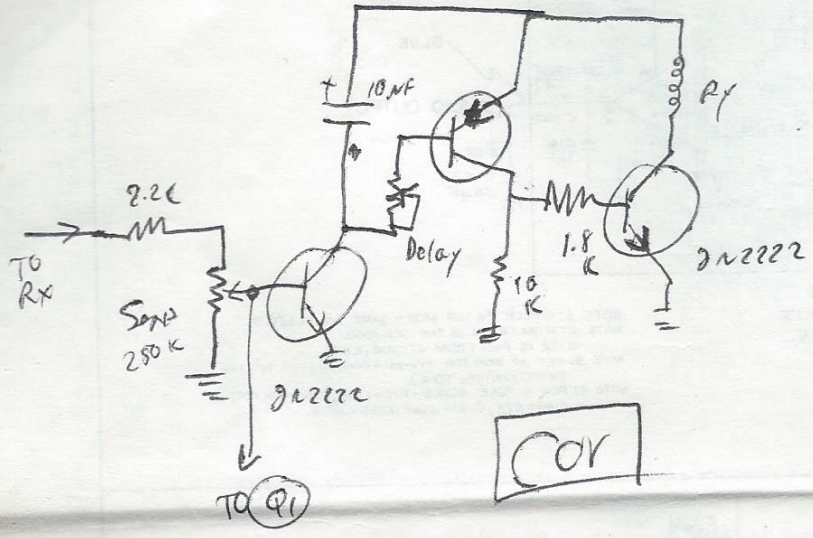
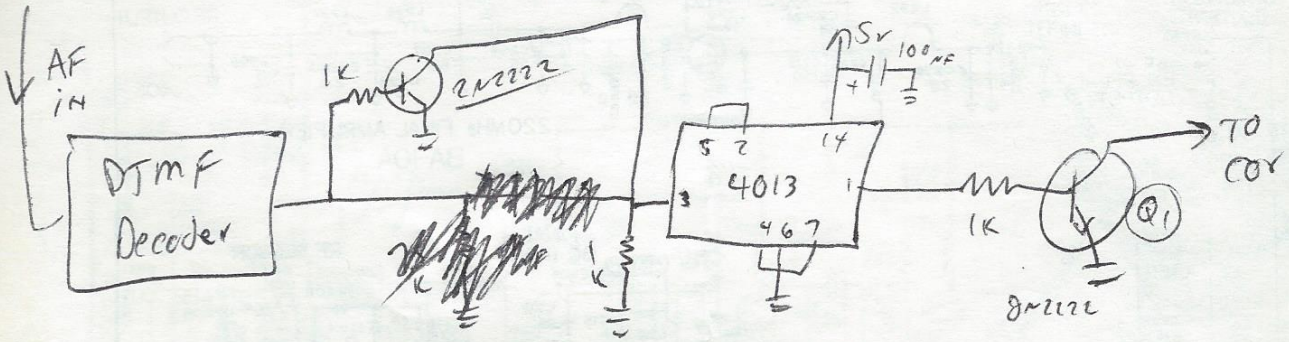




REVISIONS			SPECTRUM COMMUNICATIONS
NO.	DATE	BY	
1	12/22/77	R.L.A.	SCT 110 XMTR./EXCITER BOARD
2	12/27/77	R.L.A.	
3	6/6/79	J&C.	DRAWN BY R.L.A. DATE 11-14-77
4			APP'D J.&C.
5			

REVISIONS			SPECTRUM COMMUNICATIONS
NO.	DATE	BY	
1	12/1/78	R.A.	REPEATER RECEIVER & XMTR. SCR100, SCT110, SM-10, BA-10
2			
3			DRAWN BY R.L.A. SCALE ~ MATERIAL
4			CHK'D DATE 5-19-77 DRAWING NO. 4100100
5			TRACE. APP'D J.&C.





TT-CODE = 1478

SLIP FLOP

WB8RJY

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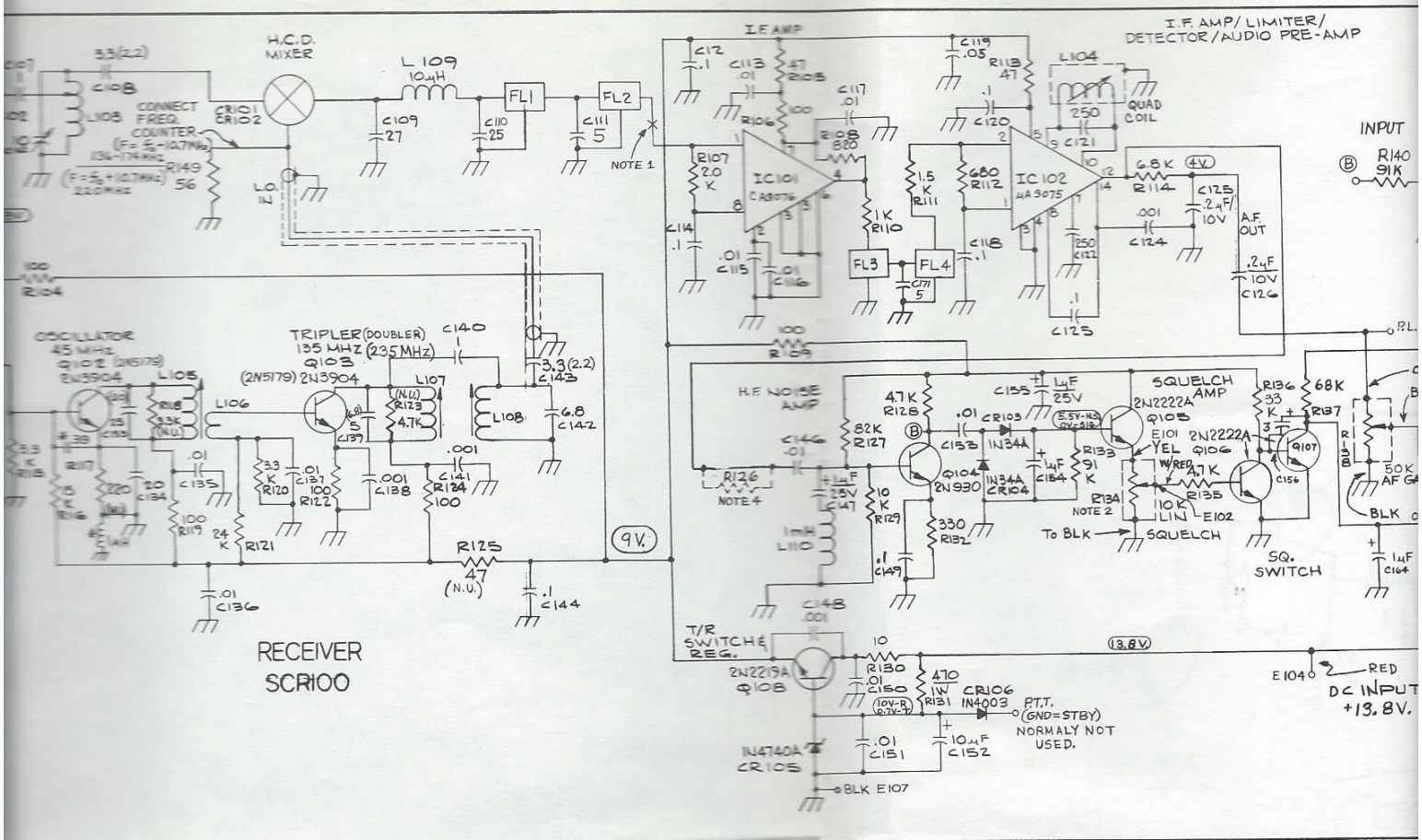

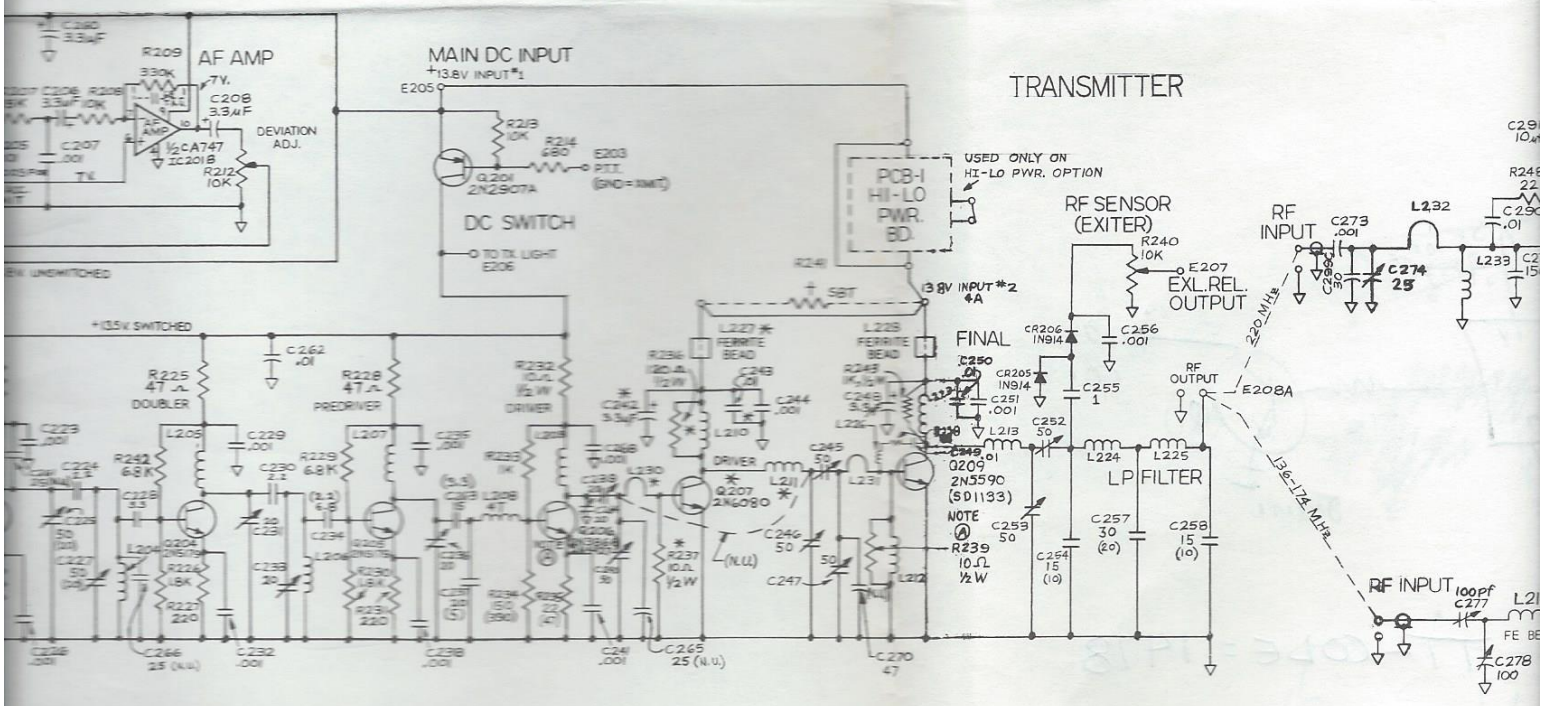

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3	8/6/79	J.d.C.
4		
5		

SPECTRUM COMMUNICATIONS

SCT 110 XMTR./EXCITER BOARD

DRAWN BY R.L.A. DATE 11-14-77

APP'D J.d.C.