6.2.4 For high stability applications, (FCC Type Accepted unit, etc.), the OV-1 Crystal Oven is used. The base current of a power transistor (used as a heating element) is controlled by a thermistor which senses the temperature at the crystal leads, maintaining the oven temperature at +65°C. The temperature controller is a proportional type which closely and smoothly controls the temperature of the crystal. This results in extremely good frequency stability, even over very wide temperature excursions, superior to that of typical TCXOs.

6.2.5 UHF UNIT: Initial FM signal generation is accomplished in the Q202 Crystal Oscillator circuit. Referring to the Transmitter Schematic, Q202 is the oscillator which is operated in the Clapp configuration in the 17 to 21 MHz range. U202 is a precision temperature controller which maintains the oven temperature at 65°C. Q201 is a power transistor which is used as an effective heating element for the oven. The temperature controller is of the proportional type which smoothly controls the temperature of the crystal and all of the oscillator components. FM modulation is accomplished by applying the audio output from the transmitter audio stages to CR204 a varactor diode in series with the crystal. The oscillator and oven circuitry runs continuously for maximum frequency stability.

6.2.6 The output of the oscillator assembly drives Q204, a frequency tripler stage. The output of Q204, in the 57 MHz range is then applied to Q205, a frequency doubler stage. The 114 MHz output from Q205 is again doubled, in Q206, to 228 MHz, and fed to Q207, in the 450 MHz range, and amplified by driver stages Q208, Q209, and Q210 to a level of about 2 watts and is applied to the amplifier stage Q211, where the power level is boosted to about 10 watts. This drives Q212,

the power amplifier stage on the BA-40 board to a nominal 40W output through a triple section low-pass filter composed of L226-228 and C286-289 which greatly attenuates harmonic energy. Heat sinking for the power amplifier stages is more than sufficient for 100% continuous duty cycle.

6.2.7 Audio input to the exciter is amplified by U201A and is applied to the modulation limiter circuit consisting of CR201 and CR202. The output of the limiter circuit is lowpass filtered by R207 through R209 and C205 through C207 (a triple-section filter) in order to remove the harmonic distortion produced by the limiting process. This filter also shapes the overall audio rolloff response of the exciter. The limited, filtered audio is finally applied to U201B where it is amplified to a level of 3-7Vp-p to drive the FM modulation circuit in the Oscillator stage.

6.3 COR/TIMER/CONTROL CIRCUITRY

Referring to the schematic, the COR trigger output from the receiver is connected to J606, Pin 16 on the CAR-7 board. This trigger voltage is in a "high" state with no received signal (squelch closed); and it switches "low" with a received signal (squelch opened). The voltage is dropped to a lower level by resistive voltage divider R319 and R320, and then applied to Pins 5 and 6 of NAND gate of U302B. The output of U302B, then, is a logic "high" in the presence of a signal acquisition.

This logic level is switched by the front panel "COR DISABLE" switch and is used to trigger the "HANG" timer which consists of Q301, and NOR gates U301A and U301C.

The HANG timer works in the following manner: A "COR" activation causes Pin 9 of U301C to go "high" which in turn causes the U301A/U301C flip-flop to be set. Simultaneously, transistor Q301 is turned on, causing the 20 uF capacitor to rapidly discharge. At this point, Pins 3 and 10 of U301 are at logic levels "one" and "zero" respectively, and remain in this state as long as the COR is activated. Upon deactivation of the COR, Pin 9 of U301C goes "low", and transistor Q301 turns off, allowing the 20 uF capacitor to charge through R 309, the "HANG TIME" pot.

When the 20 uF capacitor has charged to the threshold point of U301A, the U301A/U301C flip-flop is reset and returns to the stand-by mode.

The "TIME-OUT" timer operates in the following manner: Upon activation of the COR, and for the duration of COR activation, Pin 3 of U301A will be high, and Pin 10 of U301C, as well as Pin 11 of U301D will be low. The low condition on Pins 10 and 11 of U301 will cause transistor Q303 to be in the off state, and the high condition on Pin 3 will cause the 330 uF capacitor to charge through the "TIME-OUT" pot. When the voltage on the 330 uF capacitor reaches the threshold of U302D, Pin 1 of U302A will go "low", triggering the U302A/U302C flip-flop. At this point the timer is in the "timed-out" state with Pins 3 and 10 of U302 at logic "one" and "zero" respectively. The timer remains in this state until a negative transition appears at board terminal E302, at which time the U302A/U302C flip-flop will be reset. Depending on which jumper wire configuration is selected (term. E301 and E302, or term E302 and E303) time-out reset will occur either upon COR deactivation (removal of RCVR signal) or upon "HANG" timer reset (transmitter drop).

The normally low output from the time-out timer and the active low output from the hang timer are summed at Pin 5 of NOR gate U302B. On Pin 6 of this gate are the PTT terminal on the local mike jatk, Pin 4 of J601 (the rear panel jack) and the transmit position of the front panel switch. Grounding any of these points forces Pin 6 of U301 B low. When both inputs are low, the output of U301B is high which turns on the transmitter PTT driver Q302.

A 5 volt regulator (U303) supplies the 5VDC for the CAR-7, The ID-77, and pin 7 of J601.

6.3 COR/TIMER/CONTROL CIRCUITRY

Referring to the schematic, the COR trigger output from the receiver is connected to J606, Pin 16 on the CAR-7 board. This trigger voltage is in a "high" state with no received signal (squelch closed); and it switches "low" with a received signal (squelch opened). The voltage is dropped to a lower level by resistive voltage divider R319 and R320, and then applied to Pins 5 and 6 of NAND gate of U302B. The output of U302B, then, is a logic "high" in the presence of a signal acquisition.

This logic level is switched by the front panel "COR DISABLE" switch and is used to trigger the "HANG" timer which consists of Q301, and NOR gates U301A and U301C.

The HANG timer works in the following manner: A "COR" activation causes Pin 9 of U301C to go "high" which in turn causes the U301A/U301C flip-flop to be set. Simultaneously, transistor Q301 is turned on, causing the 20 uF capacitor to rapidly discharge. At this point, Pins 3 and 10 of U301 are at logic levels "one" and "zero" respectively, and remain in this state as long as the COR is activated. Upon deactivation of the COR, Pin 9 of U301C goes "low", and transistor Q301 turns off, allowing the 20 uF capacitor to charge through R 309, the "HANG TIME" pot.

When the 20 uF capacitor has charged to the threshold point of U301A, the U301A/U301C flip-flop is reset and returns to the stand-by mode.

The "TIME-OUT" timer operates in the following manner: Upon activation of the COR, and for the duration of COR activation, Pin 3 of U301A will be high, and Pin 10 of U301C, as well as Pin 11 of U301D will be low. The low condition on Pins 10 and 11 of U301 will cause transistor Q303 to be in the off state, and the high condition on Pin 3 will cause the 330 uF capacitor to charge through the "TIME-OUT" pot. When the voltage on the 330 uF capacitor reaches the threshold of U302D, Pin 1 of U302A will go "low", triggering the U302A/U302C flip-flop. At this point the timer is in the "timed-out" state with Pins 3 and 10 of U302 at logic "one" and "zero" respectively. The timer remains in this state until a negative transition appears at board terminal E302, at which time the U302A/U302C flip-flop will be reset. Depending on which jumper wire configuration is selected (term. E301 and E302, or term E302 and E303) time-out reset will occur either upon COR deactivation (removal of RCVR signal) or upon "HANG" timer reset (transmitter drop).

The normally low output from the time-out timer and the active low output from the hang timer are summed at Pin 5 of NOR gate U302B. On Pin 6 of this gate are the PTT terminal on the local mike jack, Pin 4 of J601 (the rear panel jack) and the transmit position of the front panel switch. Grounding any of these points forces Pin 6 of U301 B low. When both inputs are low, the output of U301B is high which turns on the transmitter PTT driver Q302.

A 5 volt regulator (U303) supplies the 5VDC for the CAR-7, The ID-77, and pin 7 of J601.

6.3.1 AUDIO MIXER AND MICROPHONE PREAMPLIFIER

U305B on the CAR-7 board functions as a four input audio mixer. It combines the repeat audio (from the receiver), the C.W. ID tone (from the optional ID-77 board), the auxiliary audio input (from the accessory connector J601) and the audio from the microphone preamplifier. U305B operates as an inverting summing amplifier.

U305A is used as a high gain preamplifier for the optional front panel microphone. Diodes CR302 and CR306 in the feedback circuit provide clipping on voice peaks, increasing the average output to provide better voice modulation characteristics.

6.4 CW ID BOARD ID-77 (OPTIONAL)

NOTE: Unless otherwise noted, in the following discussion, reference to a "high" logic state shall be defined as a voltage of *At least 70%* of the positive power supply voltage (3.5 V in the case of a 5V supply), and a "low" logic state shall be a voltage of *no more than 20%* of the positive supply (1 V in the case of a 5 V supply). These levels will *typically* be full positive supply and zero volts respectively.

Referring to the schematic diagram, assuming that the trigger input has been activated for some time, transistor Q406 will be held in the off state, allowing C413 to charge through R423. If the trigger input remains inactive long enough (approximately 1½ minutes), C413 will charge up to the threshold point of the U407 flip-flop, causing Pin 4 of U407 to go high and Pin 3 of U407 to go low. The high state on Pin 4 of U407 causes the ID timer clock U407 to stop, and simultaneously resets the ID clock counter, U403, to its zero state. The unit is now in the standby condition, and will be activated immediately upon the next trigger input.

When a trigger signal arrives, it will cause Pin 5 of U407 to go high which causes the U407 flip-flop to be set, and also causes Q406 to keep C413 discharged as long as there is input activity at intervals of less than 1½ minutes. As soon as the U407 flip-flop is set, the high level on Pin 3 is converted by C414 and R428 into a short positive going spike which passes through CR406 and sets the trigger flip-flop,U405, causing an ID to be generated immediately. (Details of the ID generation sequence will follow later). As long as the activity timer detects input activity, Pin 4 of U7 will remain low and the ID clock U407 will be allowed to run, producing positive pulses at its 13 Hz (nominal) rate. These pulses trigger U406, a binary divider which divides the 13 Hz clock by 8192. Thus, as long as the ID clock, U407 is running, the output of U406(Pin 3) will go high every 606 seconds (approximately10 minutes), and will trigger the U405 flip-flop, causing an ID sequence to be generated. Note that the output pulse on Pin 3 of U406 is also routed, via diode CR404, back to the U406 reset input, resetting the divider to its zero state, and allowing another timing cycle to start.

Triggering of the ID sequence generator can come from either of two sources which will set the trigger flip-flop, U405. These sources are: 1) an initial triggering input after inactivity, through CR406; or 2) a regularly scheduled ID during activity, through CR405. When the U405 flip-flop has been set, Pin 3 will go high and Pin 4 will go low. The high on Pin 3 causes Q403 to turn on, clamping the transmitter hold output to ground for the duration of the ID cycle.

The low-on Pin 4 of U405 causes binary counter, U3 to be released from its reset state (a high on the reset input keeps the counter from toggling). When Pin 4 of U405 is low, Pin 3 will be high, turning on Q403 and Q401, and enabling the 5 VDC supply to prom U2. Output pulses from the code speed oscillator, U404, causes U3 to count up in a binary sequence, and the binary outputs are applied to the address inputs of U2, a PROM organized in a 256 bit long configuration. Each of the 256 possible binary outputs from U403 corresponds to a unique "word" which appears at Pin 12 of U2. The contents of each "word" have been programmed at the factory so that the sequence of 1's and 0's represents the morse code message. (A dot is a "1" in 1 bit location, while a dash consists of a "1" in three consecutive bit locations.)

As long as code pulses appear at the output of U402, transistor Q402 will keep discharging C404 at regular intervals. If code output from U402 ceases long enough for C404 to charge up to the threshold level of U1 (a quad NAND gate with schmitt trigger outputs), Pin 3 of U1 will go low, and Pin 4 of U1 will switch high. This positive going pulse is differentiated by C402 and R402, and is applied as a reset pulse to Pin 1 of the U403 flip-flop. When U405 is reset, Pin 4 will go high, resetting U1 to zero and preventing any further counting. Pin 3 of U405 will go low, turning Q403 and Q401 off, thus removing the 5 VDC supply to PROM U2. (Removing the 5 VDC supply from U2 during standby saves about 80 mA of current consumption, and results in a standby current draw of about 5 mA.

The output of the tone oscillator, a harmonic rich square wave, is filtered by the L1/C407, C408 tank circuit, and is finally buffered by emitter follower stage Q405. The ID level may be adjusted with potentiometer R425.

I.D. MEMORY: If it is desired to *change the ID* (Call Letters) in the memory, contact Spectrum Communications Corporation. The factory can normally program and ship a new PROM memory chip within a few days. Note that it takes special factory equipment to program the PROM IC - it is *NOT* field programmable. (Simply take the PROM out of its socket, and plug in the new PROM.)

SECTION 7 ALIGNMENT

7.1 RECEIVER ALIGNMENT

Receiver alignment should not be required unless an RF transistor, Q103, or the receive frequency is changed. Even in this case, only a slight "touch up" should be required.

7.1.1 FRONT-END ALIGNMENT

Connect a good quality FM signal generator to the receiver antenna jack and an AC voltmeter (or "Sinnader" Meter) from the speaker feedthrough cap E1104 to ground. With the signal generator set for minimum (0) output, note the average AC voltmeter reading. (Squelch full CCW). Increase the generator's output level and tune it for best receiver quieting, (or best SINAD with 5 KHz deviation). Alternately tune the 8 RF Amp trimmer caps (C102, 109, 110, 112, and also C104, C116, 117, 119) for best quieting (or SINAD), keeping the generator set for about 10dB of quieting (or 10-12dB SINAD). With the generator tuned for the best quieting point in the receiver passband, it should be possible to achieve 0.4uV or less for 20dB of quieting (1/10 the original noise reading). Typical 12dB SINAD point is 0.25uV.

7.1.2 OSCILLATOR/MULTIPLIER ALIGNMENT

Apply a modulated test signal to the antenna jack (about 10uV). Using a standard hex alignment tool, tune the L110 oscillator slug in (CW) until the oscillator stops oscillating. (Received signal disappears.) Slowly turn the slug out about 3 turns past this point. If the oscillator does not stop, tune the coil for max L.O. output, or best SINAD as mentioned below. The multiplier coils L111 through 114 may be roughly tuned for best reception of an extremely weak signal; but for optimum alignment, a sensitive RF detector (RF voltmeter, Spectrum Analyzer, -10dBm power meter, etc.) should be connected to the L.O. output Test Point TP-1. The above coils should then be peaked for maximum output.

7.1.3 21.4 MHz IF ADJUSTMENT

Adjust coil L120 for best SINAD on a very weak signal, (appx. 0.25uV). Note that this adjustment is very broad in tuning, and noncritical.

7.1.4 QUADRATURE COIL ADJUSTMENT

Use the same setup as in 7.1.1 above, except inject a strong signal (appx. 100uV) into the receiver. Be sure the signal is "on frequency" and has 4-5 KHz deviation. Tune the Quad Coil L122 for maximum AF output voltage as read by the AC voltmeter. Then apply a small drop of cement to the coil slug.

7.1.5 CRYSTAL FREQUENCY ADJUSTMENT

Connect an accurate and sensitive frequency counter to TP1, and adjust the crystal trimmer cap (C122) for the correct frequency. The LO output frequency will be 21.400 MHz above the desired receive frequency for 136 to 151.00 MHz (&220 MHz) Receive Frequencies; and 21.400 MHz below the desired receive frequency for 151.001 to 174 MHz and UHf Receive Frequencies.

As a better alternative, if you are using a synthesized signal generator known to be very accurate in frequency (±200Hz), simply set the generator on the desired receive frequency, and tune C122 for best SINAD on a very weak signal with ±5KHz deviation (appx. 0.25uV). Likewise tune the 2nd L.O. crystal trim cap (C171) for best SINAD on the same weak signal.

7.2 TRANSMITTER ALIGNMENT

As noted with the receiver, the transmitter should not require alignment unless an Rf transistor is changed. Factory tune-up of these circuits is done with elaborate equipment, including a spectrum analyzer. Subsequent adjustment should not be performed unless absolutely necessary, as improper alignment could result in undesirable spurious emissions. If alignment is necessary, perform only the applicable steps below.

7.2.1 Connect a current meter (about 5A full scale) in series with the 13.8V lead, (outside the transmitter housing). Observe the Exciter Current with the Crystal Removed. (For units with the xtal oscillator/oven, with point E231 shorted to ground.) The unit should draw 225-400 mA in the transmit mode (including osc./oven current). Check operation of the audio processing stages by connecting an oscilloscope probe to the top of the deviation pot. With an input at E201 from an external audio generator, the waveform should be a clean sinewave, turning into a square wave as the input audio level is increased. Adjustment of the deviation control should produce up to 7 or 8 volts of peak to peak audio at this point.

Install the crystal (or remove the short from E231 to ground) and key the transmitter. Set the deviation control at its mid-point and check for the modulated signal on a deviation meter (or a nearby receiver). The indicated current consumption should be noticeably higher, about 1.5-2.2A @ 10W out. Units with 30W Amp will draw an additional 3-4A. An RF power meter connected to the antenna connector should now indicate some RF output. If a Spectrum Analyzer is available, tune all adjustments for maximum output *consistent with minimum spurious*. *Always* tune the final stage for maximum output efficiency (i.e. max. output/min. current), and minimum spurious. Don't hesitate to lose a few watts of output if a large current savings or spurious reduction can be obtained. The reduced current will result in increased long-term reliability.

Tuning the system duplexer while the transmitter is activated can cause very high VSWR conditions to be presented to the final amplifier stage. Keep transmissions *short* when VSWR conditions are high.

7.2.2 VHF UNIT

REPLACING TRANSMIT CRYSTAL: If the crystal is replaced and it cannot be zeroed on frequency, change the value of C269 on the terminals near the crystal. If the TX frequency is too high, increase the value of C269. If it is too low, decrease the value of C269. (Typical range: 30 to 100pF).

UHF UNIT

REPLACING TRANSMIT CRYSTAL ON UHF EXCITER BOARD: The crystal must be replaced in exactly the same fashion as it is found. (i.e. a small amount of thermal grease under the crystal body, and a wire strap to hold the crystal tightly to the board.) If the crystal will not pull on frequency with trim cap. C222, then C220 or C221 may be changed. If you with to *lower* the frequency, *increase* the value of C220 by a few pF. If you wish to raise the frequency, remove C220; and if necessary, decrease the value of C221 by a few pF. Transmitter Deviation should always be reset *after* changing a transmit crystal.

7.2.3 SETTING TRANSMITTER DEVIATION:

Apply a strong signal to the receiver input (100uV min.) modulated ±5KHz with a 1KHz tone. Set the DEVIATION Adj. pot (R212) for the desired max. deviation. Typically 5KHz Maximum. Set the generator dev. for ±4KHz, and set the A.F. Input Level pot (R218) for 4KHz transmitter deviation. Repeat these adjustments several times.

7.3 CW ID BOARD ADJUSTMENTS (OPTIONAL BOARD)

See Chassis Layout (Fig 5), and ID Board Layout dwg. and schematic. As shown on the drawings, trim-pots are provided to adjust ID Code Speed, CW Tone, ID Timing Interval and ID Audio Output level.

"Code Speed" and "ID Time" may be set as desired. ID level is normally set for about 2KHz deviation max. The "CW Tone" pot is adjusted for a pleasing tone pitch. If it is desired to change the "sound" or character of the CW note, the value of C408 may be changed on the board. (See Dwg. No. 2200127 and the schematic). For higher pitch notes, remove a 0.1uF cap.

7.4 CAR-7 BOARD ADJUSTMENTS

The adjustments for transmitter hang time and timeout and the audio level adjustments for the microphone and auxiliary audio are located on the CAR-7 board in the receiver shielded housing. HANG TIME is set with trimmer R308 and TIME OUT with trimmer R309. They may be set as desired.

Trimmer R343 sets the Auxiliary Input Level and trimmer R331 sets the Microphone Level.

SECTION 8 TROUBLESHOOTING

8.1 RECEIVER TROUBLESHOOTING CHART

SYMPTON	CHECK	REMEDY
No audio output	U104-Pin 4 DC Voltage with Squelch Open	Replace if less than 4V.
Rcvr. completely dead	9V Test Point, E114. 13.5V TP, E104.	If 13.5V is OK, but 9V is 0, check Q111. (9 volt line was shorted)
Squelch must be advanced somewhat in very hot or cold ambient temp.	Setting of R154	Readjust R154 Normal in Extreme temp. conditions.
Audio Output low and/or distorted; poor squelch performance	Tuning of L122	Peak for max. Af output on strong tone modulated signal
Poor or no sensitivity	Q101,Q103,Q104, Q105,Q106,Q102. Tuning of Front End trim caps. L.O. Tuning: L110, L111,L112,L113, L114, and trim caps. Collector Voltage on Q101 or Q102 properly operating should be about 6-7 volts.	Replace if doubtful, (If Q101 is damaged, most likely it was due to high transmitter power entering Rcvr. Ant. Jack, nearby lightning, etc. Check Duplexer cables, antenna, etc. for intermittents.

NOTE: *Be sure* power is disconnected from the unit when a board is being moved. Also, be sure that no short circuits occur during servicing, as certain semiconductors could be instantly damaged. The ID (ID77), COR and AF Mixer Boards include "plug-in" wiring connections so that the bds. may be very quickly removed for service or replacement.

NOTE: Tubular Cap Color Code - Receiver & Transmitter Boards.

1) First two color bands - same as standard resistor color code.
2) Third band - White = X0.1; Gray = X.01
3) Fourth band - Gold = 5% tolerance.
4) EXAMPLE: Blue-Gray-White-Gold = 6.8pF, 5%

8.2 TRANSMITTER TROUBLESHOOTING CHART

SYMPTOM	CHECK	REMEDY
No Power Output (Low Final Current) (Less than 3A on 30W or 40W units.)	1) Power Supply Voltage	Replace bad part
	2) Damaged Final Transistor	"
	3) Power Output of Exciter	Retune Exciter or replace damaged part(s)
Low Power Output (High Final Current) (Greater than 4A on 30W Unit., or 6A on 40W units.)	1) Detuned Final	Retune
	2) High VSWR	Tune or replace Antenna
	3) Shorted or Open Component in P.A. Output Circuit (Check Capacitors & Coax.)	Replace Damaged a "
	4) Damaged Final Transistor	
Distorted Modulation	1) Excessive Audio Drive	Adjust R218
	2) Off Frequency	Adjust Xtal Trim cap.
	3) U201 with scope for distortion. (Or IC201).	Replace defective component(s)
No Modulation	1) U201(Pins 12 &10) with scope for distortion.(Inject 1 KHz Tone into E201).	Replace Defectiv component(s)
Crystal can't be set to proper frequency.	1) Off-Frequency Crystal	Replace
	2) Incorrect value of C269 (VHF Unit)	Change C269(30-2 pF). (VHF Unit). (See Para. 7.2.2)
Excessive White Noise or Spurious	1) Exciter and/or final amp tuning. (Use of a Spectrum Analyzer is highly recommended)	Tune for min. no or spurious consis tent w/max. pwr ou

8.0 REPLACEMENT PARTS/FACTORY REPAIR SERVICE

The factory normally stocks a complete line of replacement parts. Write or call the factory for a quote or for a C.O.D. shipment, etc. If the unit is under warranty and the customer is certain of a defective part, a replacement may be sent at no cost subject to warranty provisions. The factory may request that defective parts be returned.

Units out of warranty: *Always* contact the factory or your dealer *first* before returning any equipment for repair. Be sure to give *full details*. (A simple fix may be possible in the field.) If notified to return the unit, pack it *very carefully & tightly with at least 3" of packing material on all sides, top and bottom,* and ship U.P.S. or Air Freight Insured. The unit will be repaired as quickly as possible. Units in the U.S. are normally returned via U.P.S. - C.O.D. unless your firm has established open account with Spectrum. (If you wish to know the repair costs, please call our factory Service Department after the unit's arrival.)

Units in warranty: See the Warranty in this manual.

SPECTRUM COMMUNICATIONS CORPORATION

LIMITED WARRANTY

Spectrum Communications warrants its equipment to be free from defective material or factory workmanship and agrees to remedy any defect which causes the unit to fail to meet published specifications by repair or replacement at the company's option, which in the company's judgement is a fault of its manufacturing, for a period of 180 days for "rack mount" equipment or 100 days for P.C. "boards", subassemblies, or transceivers, measured from date of original receipt by the original purchaser; provided that the equipment is returned to the factory intact and with all transportation charges prepaid. If a malfunction is suspected, call or write IN DETAIL to our service department for suggestions concerning the operation, repair or return of the unit if this should prove necessary. Do Not return equipment to the factory without authorization. 6 mo. Warranty on Parts purchased seperately.

NOTE THAT THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT ONLY. WE DO NOT OFFER A MONEY-BACK GUARANTEE.

WHEN IT IS NECESSARY TO RETURN A UNIT FOR FACTORY REPAIR (AT NO CHARGE UNDER WARRANTY), BE SURE TO RETURN IT BEFORE THE WARRANTY PERIOD EXPIRES. UNITS RETURNED FOR REPAIR AFTER THAT TIME PERIOD ARE OF COURSE SUBJECT TO OUR NORMAL PARTS AND LABOR CHARGES.

For units to be shipped within the continental 48 U.S. states, return freight from the factory to the customer via U.P.S. Surface will be prepaid by Spectrum. For units to be shipped outside of the 48 states, or where a customer desires some premium method of shipment such as Airfreight, the customer must pay the full amount of the freight.

This warranty shall be invalid in the event of (a) unauthorized repair, detuning, tampering, modification, or alteration of any kind, (b) misuse, abuse, negligence or accident, (c) connection, installation, or operation in a manner at variance with the instruction manual, (d) alteration, disfigurement or removal of the serial number, or (e) use with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange will be remedied or exchanged by Spectrum Communications Corp. without charge to the buyer. Spectrum is liable only for the repair or replacement of defective equipment during the warranty period. No other remedy (including, without limitation, incidental or consequential damages for lost labor expenses or profits, lost sales, injury to persons or property or any other incidental or consequential loss) shall be available to buyer.

SPECTRUM COMMUNICATIONS CORP. reserves the right to make any improvements/changes to designs or specifications of its products without notice, and without assuming any obligation to install such changes in its previously manufactured products.

This warranty is in lieu of all other warranties expressed or implied, including without limitation, any implied warranty of merchantability or fitness for a particular purpose, and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

SPECTRUM COMMUNICATIONS CORP.

S-7R TERMINAL NO's.

Accessory Jack, J601 - Table I

Pin 1 = Aux. Af input
2 = RX AF Output (fixed level)
3 = Aux. COR switch (goes low, 0.1 V, with incoming signal). (Open collector.) Can sink 100 mA max.
4 = Aux. PTT input. (GND = Transmit) Will not time out. Must be allowed to "float high" to +13 VDC during Standby.
5 = Remote COR Disable. (GND = COR Disable/Inhibit)
6 = Receiver COR out. (High Z)
7 = +5 VDC @ 100 mA max.
8 = +13.8 VDC @ 500 mA max.
9 = Ground
10 = CTCSS Tone Input
11 = CTCSS Trigger
12 = CTCSS RX Tone Output

Banana Jacks - DC Power Input

Red J608, Pin 1 = +12 VDC In, for Emergency Battery Power.

Black J608, Pin 2 = Ground

Local Mike Jack J603

Pin 1 = Mike AF In
Pin 2 = Local Mike PTT. (GND = Transmit)
Pin 3 = Ground

Transmitter & Receiver Feed-Thru Cap No's. - Table II

Receiver

1101 = +5 VDC Output
1102 = COR Disable. (GND = Disable)
1103 = COR Out. (High Z)
1104 = Speaker AF out
1105 = CTCSS AF Out
1106 = Mic AF In
1107 = Aux. PTT In
1108 = Aux. AF In
1109 = +13.8 VDC Input
1110 = COR Switch Out
1111 = Receive Audio Out, (Fixed level)
1112 = CTCSS Trigger

Transmitter

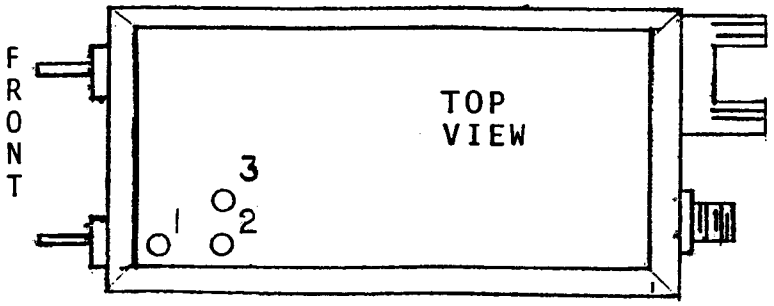
1201 = CTCSS Tone Input
1202 = DC Input 13.8VDC
1203 = PTT (GND = Transmit)

Between Receiver & Transmitter Boxes

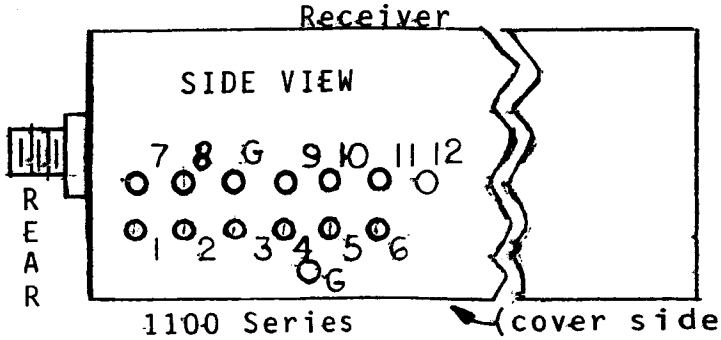
1301 = CTCSS Encode Tone Out (Optional)
1302 = TX PTT
1303 = TX Audio

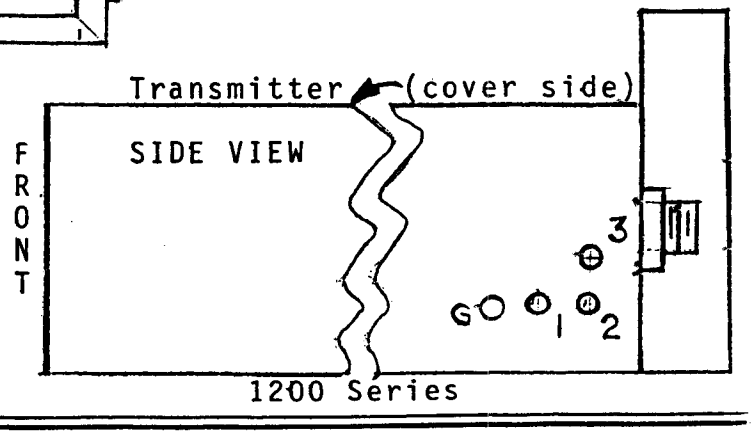
HOUSING CONFIGURATION - 1300 SERIES

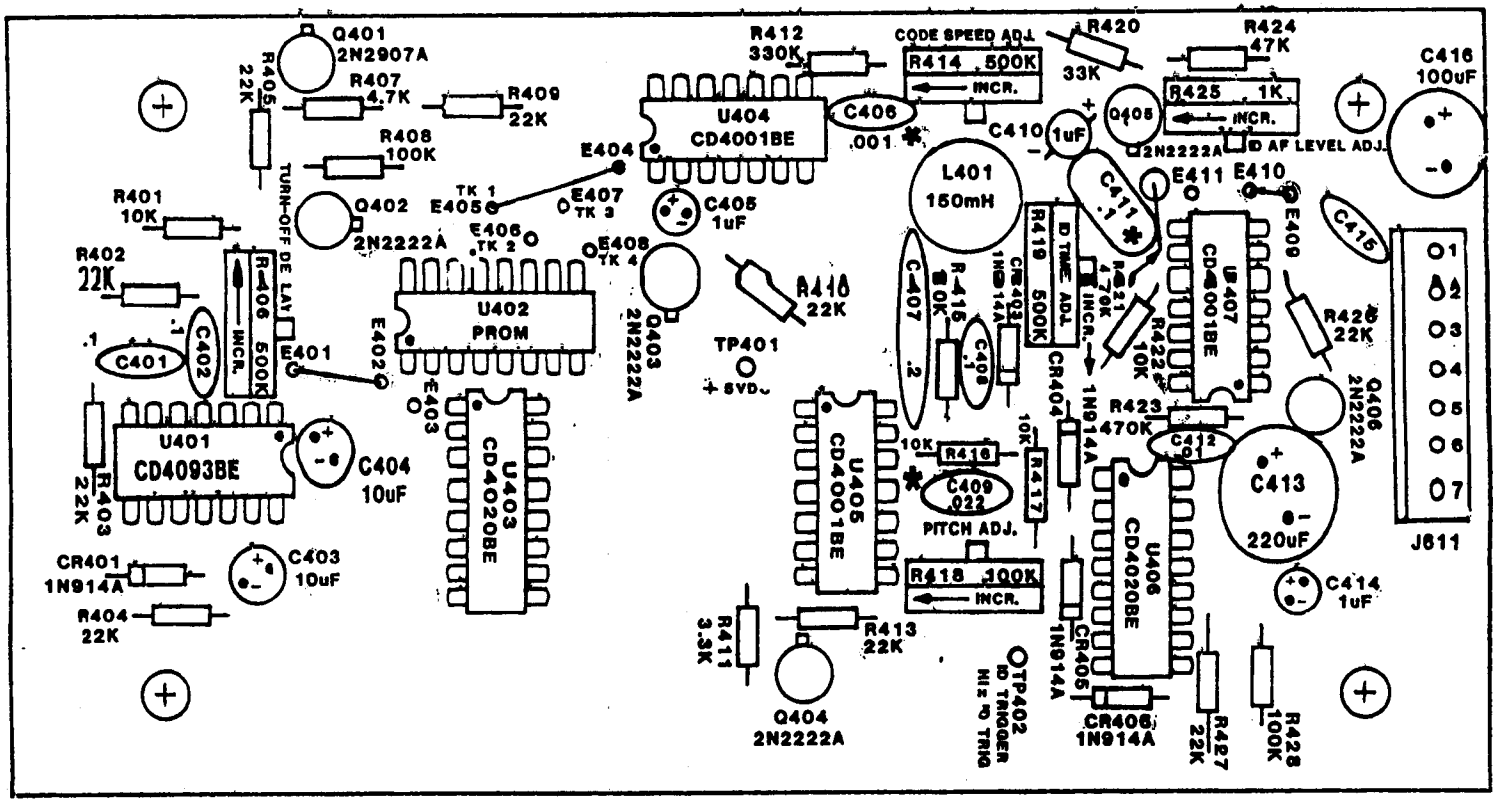
Feedthroughs between Receiver & Transmitter Housings



(View showing Transmitter cover off)







NOTES:

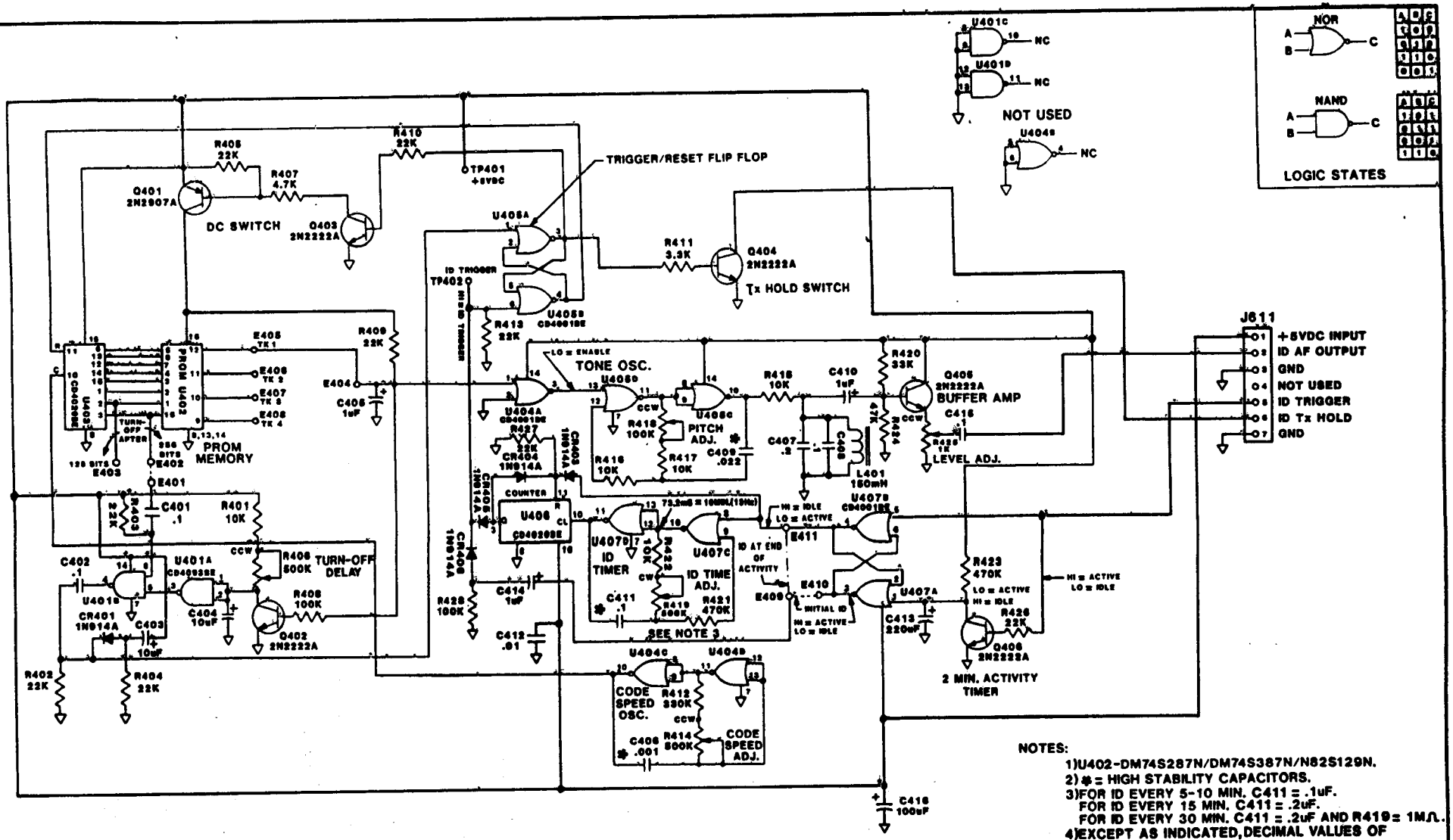
1)U402-DM74S287N/DM74S387N/N82S129N.
2)* = HIGH STABILITY CAPACITORS.
3)E401 WILL TURN-OFF PROM AFTER 128 BITS WHEN CONNECTED TO E403.
4)E401 WILL TURN-OFF PROM AFTER 256 BITS WHEN CONNECTED TO E402. (FACTORY CONNECTED)
5)EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF); OTHERS ARE IN PICOFARADS (pF).

SPECTRUM COMMUNICATIONS

SCALE:	APPROVED BY:	DRAWN BY R.L.A.
DATE: 2-23-82		REVISED

ID77 CW ID BOARD COMPONENT LAYOUT

DRAWING NUMBER 2200127



NOTES:

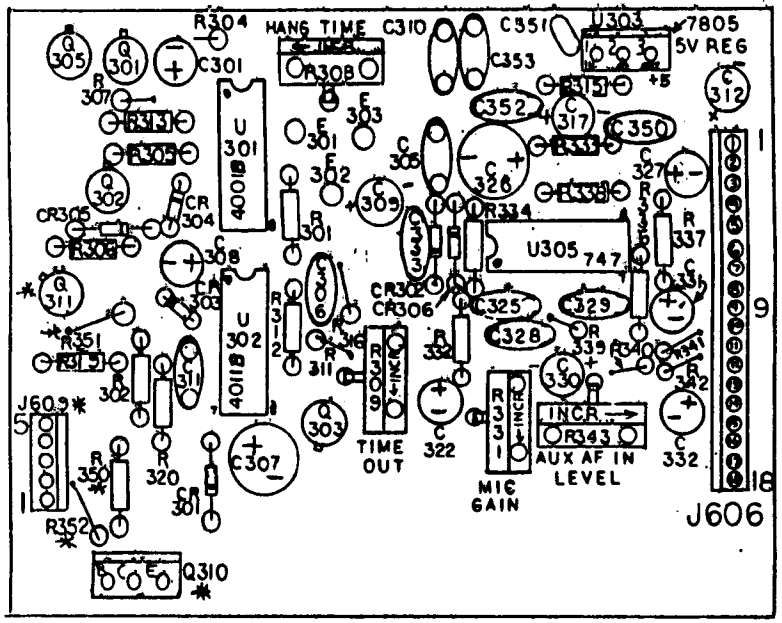
1) U402-DM74S287N/DM74S387N/N82S129N.
2) * = HIGH STABILITY CAPACITORS.
3) FOR ID EVERY 5-10 MIN. C411 = .1uF.
   FOR ID EVERY 15 MIN. C411 = .2uF.
   FOR ID EVERY 30 MIN. C411 = .2uF AND R419 = 1MΩ.
4) EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF); OTHERS ARE IN PICOFARADS (pF).

SPECTRUM COMMUNICATIONS

DRAWN BY		APPROVED BY	
DATE	3-21-82	DATE	4/1/82

ID77 CW ID BOARD
SCHEMATIC

DRAWING NUMBER 3200128



J606

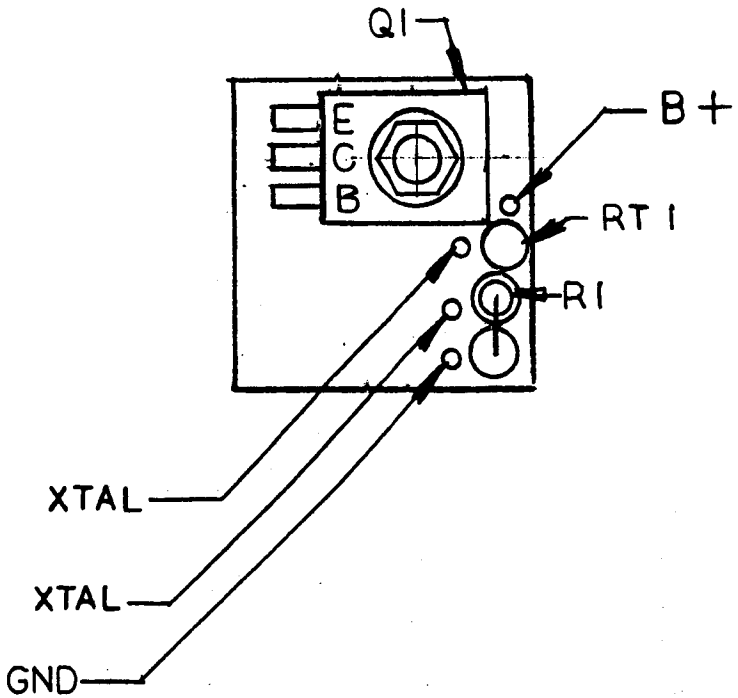
+5VDC OUTPUT TO ID BOARD
+5V OUTPUT TO FEEDTHRU
+13.8 VDC INPUT
AF OUTPUT TO TX
GROUND (SHIELD)
COR SWITCH - AUX
COR DISABLE 1
ID TRIGGER
GROUND
ID AF INPUT
RPT AF INPUT
AUX AF INPUT
LOCAL MIC INPUT
ID TX HOLD
AUX PTT
COR INPUT
COR DISABLE 2
TX PTT

* = USED WITH OPT. ANTENNA RELAY ONLY

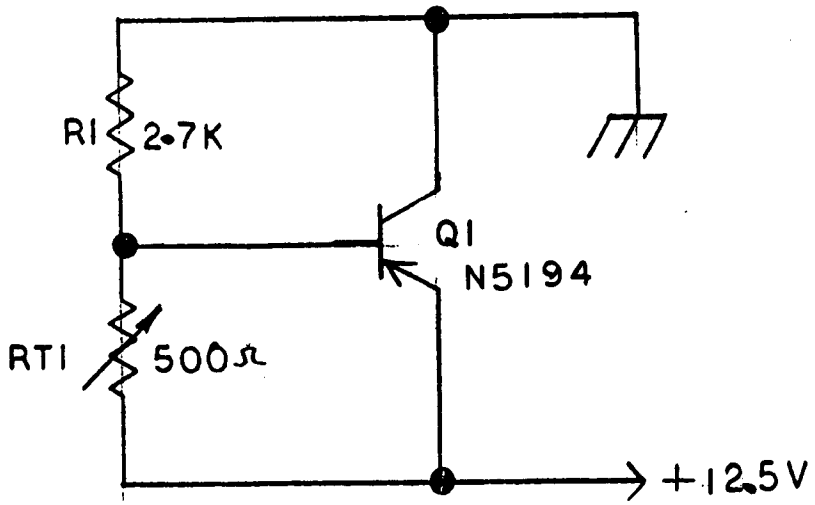
CAR-7 BOARD
USED ON S-7R

SPECTRUM COMMUNICATIONS

SCALE: 2:1 DATE: 6-19-97	APPROVED BY:	DRAWN BY:
COR/AUDIO/REGULATOR		
COMPONENT LAYOUT		DRAWING NUMBER: 3200191



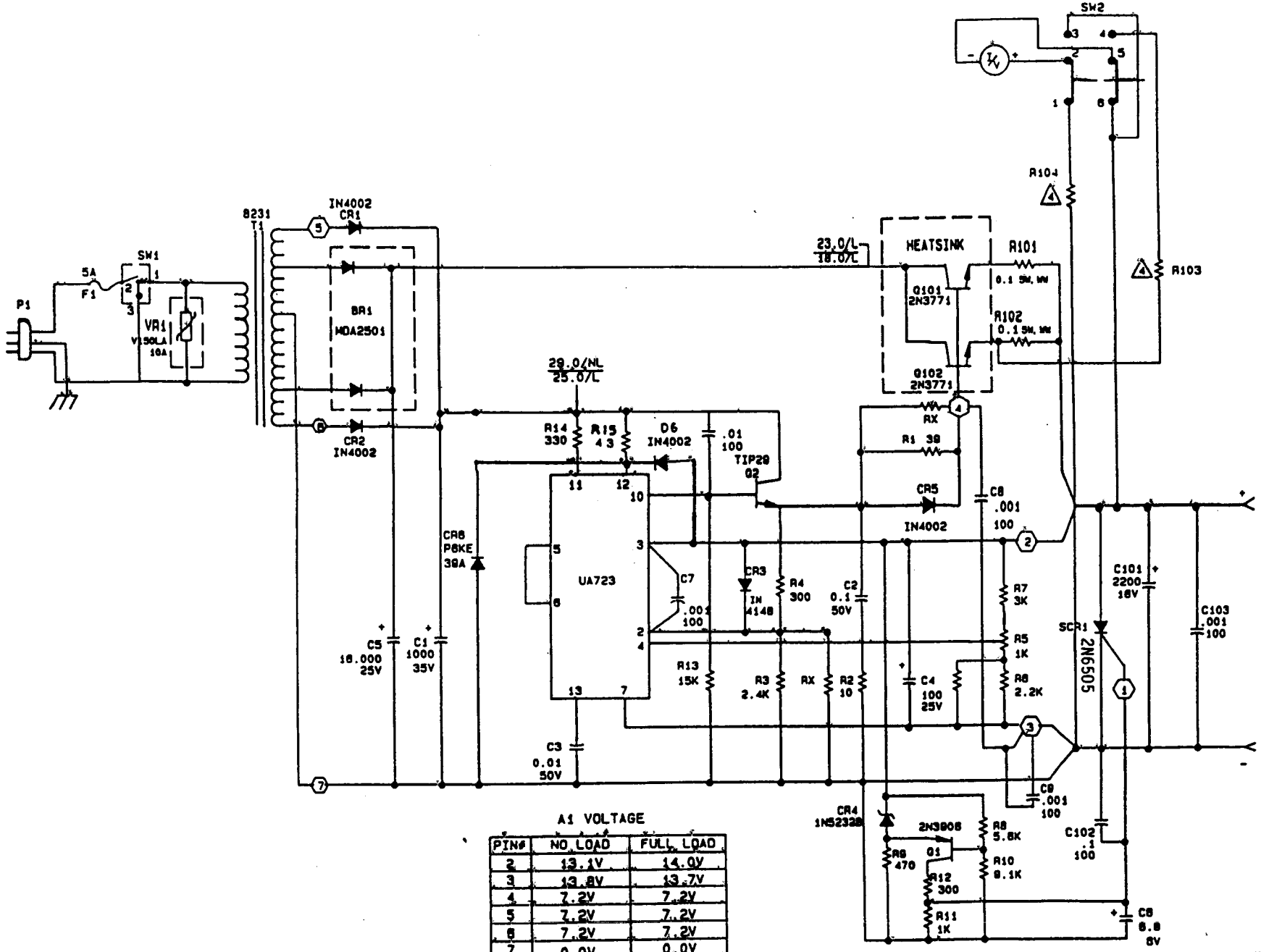
SPECTRUM COMMUNICATIONS			
OV-1 "CRYSTAL OVEN"		SCALE 2:1	DRAWN BY K.K.
			REVISED
COMPONENT VIEW			
DATE 7-26-91	APPROVED BY		DRAWING NUMBER 1200165



SPECTRUM COMMUNICATIONS		
OV 1 "CRYSTAL OVEN"	SCALE: H	DRAWN BY: K.H. / REVISED:
SCHEMATIC		
DATE: 7-26-91	APPROVED BY:	DRAWING NUMBER: 1200166

MADE IN U.S.A.

1 / 4" = CRYSTALENE ® 8½x11



A1 VOLTAGE

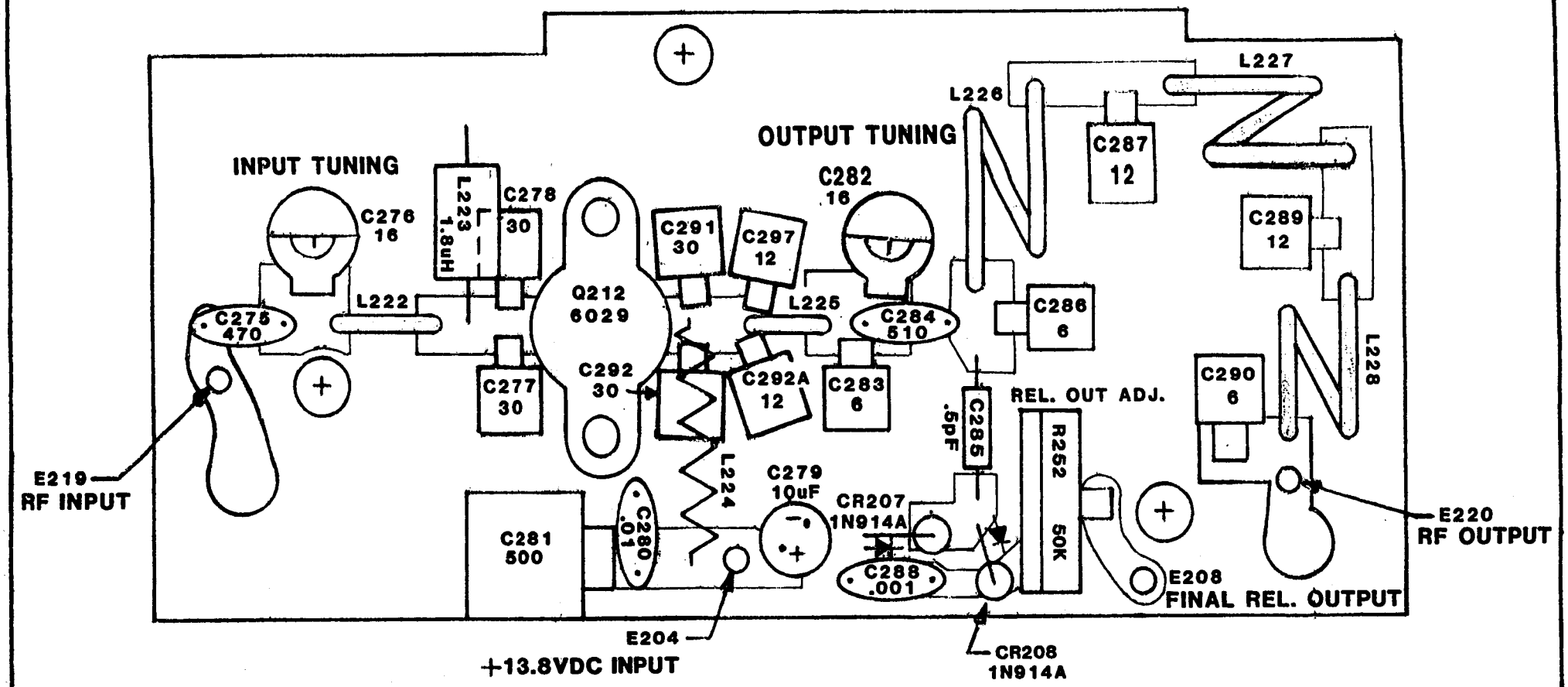
PIN#	NO LOAD	FULL LOAD
2	13.1V	14.0V
3	13.8V	13.7V
4	7.2V	7.2V
5	7.2V	7.2V
6	7.2V	7.2V
7	0.0V	0.0V
10	14.8V	16.5V
11	29.0V	25.0V
12	29.0V	25.0V
13	16.1V	17.8V

UNLESS OTHERWISE NOTED
1. ALL RESISTORS 5%, 0.5W, C.F. IN OHM.
2. ALL CAPACITORS IN MICROFARADS.
3. ○ PRINTED CIRCUIT BOARD.
4. ④ TO BE SELECTED IN TEST.

ASTRON CORP.
IRVINE, CALIFORNIA

RS-12A, RS-12M | DATE: 6/20/88

4 3 2

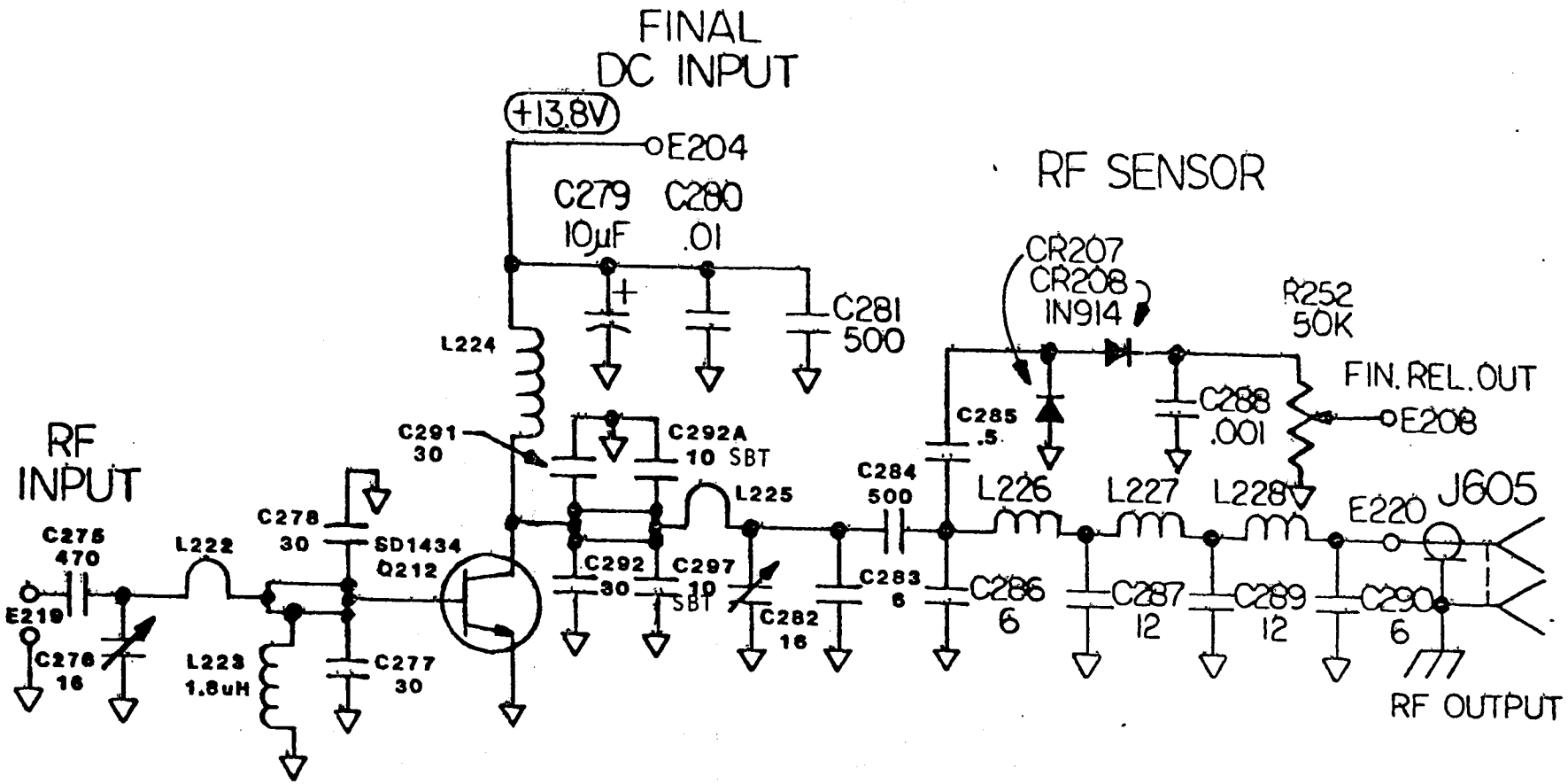


SPECTRUM COMMUNICATIONS

SCALE: ——	APPD. BY	DWN. BY GRM
DATE: 1-25-80		REV. 8-13-84

BA-40 UHF POWER AMPLIFIER

DRAWING NUMBER
1200111



SPECTRUM COMMUNICATIONS

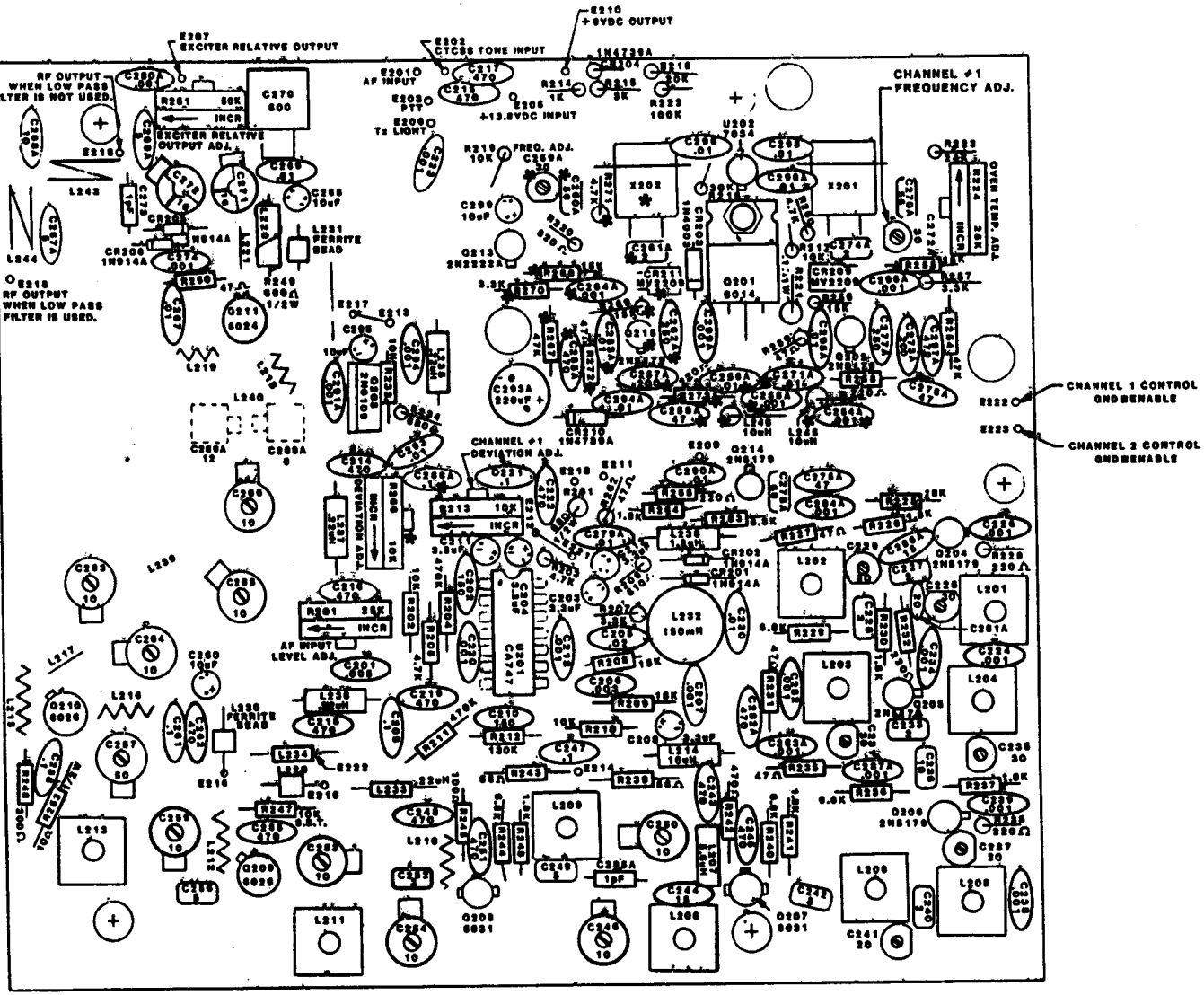
SCALE:	APPROVED BY: WNC JOE 7/17/85	DRAWN BY R.L.A.
DATE: 3-12-84		REVISED

BA-40 POWER AMPLIFIER

SCHEMATIC

DRAWING NUMBER 1200134

LOW PASS FILTER USED ON 10W UNIT ONLY.



NOTES:

1) EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF); OTHERS ARE IN PICOFARADS (pF).
2) # INDICATES PARTS USED FOR MULTI-FREQUENCY OPTION ONLY.

SOLDER SIDE
COMPONENT SIDE

SPECTRUM COMMUNICATIONS

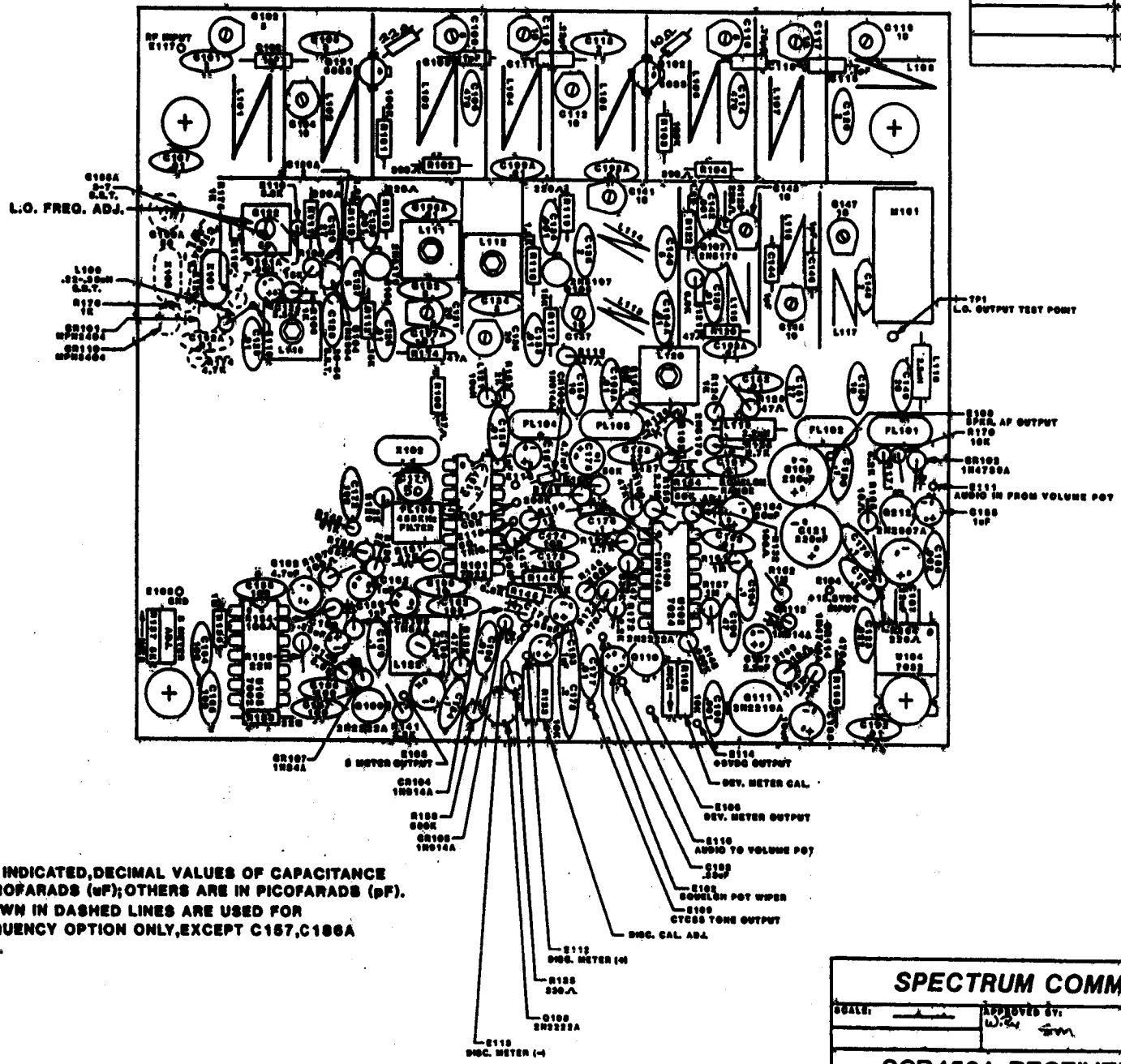
SCALE:	APPROVED BY:	DRAWN BY	
DATE: 6-7-84		REVISED	6-6-85

SCT410B UHF TRANSMITTER LAYOUT

(BOARDS)

DRAWING NUMBER: 3200150

Rx FREQ. RANGE	CAP VALUES					



NOTES:

1)

2) EXCEPT AS INDICATED,DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF);OTHERS ARE IN PICOFARADS (pF).

3) PARTS SHOWN IN DASHED LINES ARE USED FOR MULTI-FREQUENCY OPTION ONLY,EXCEPT C157,C186A AND C185A.

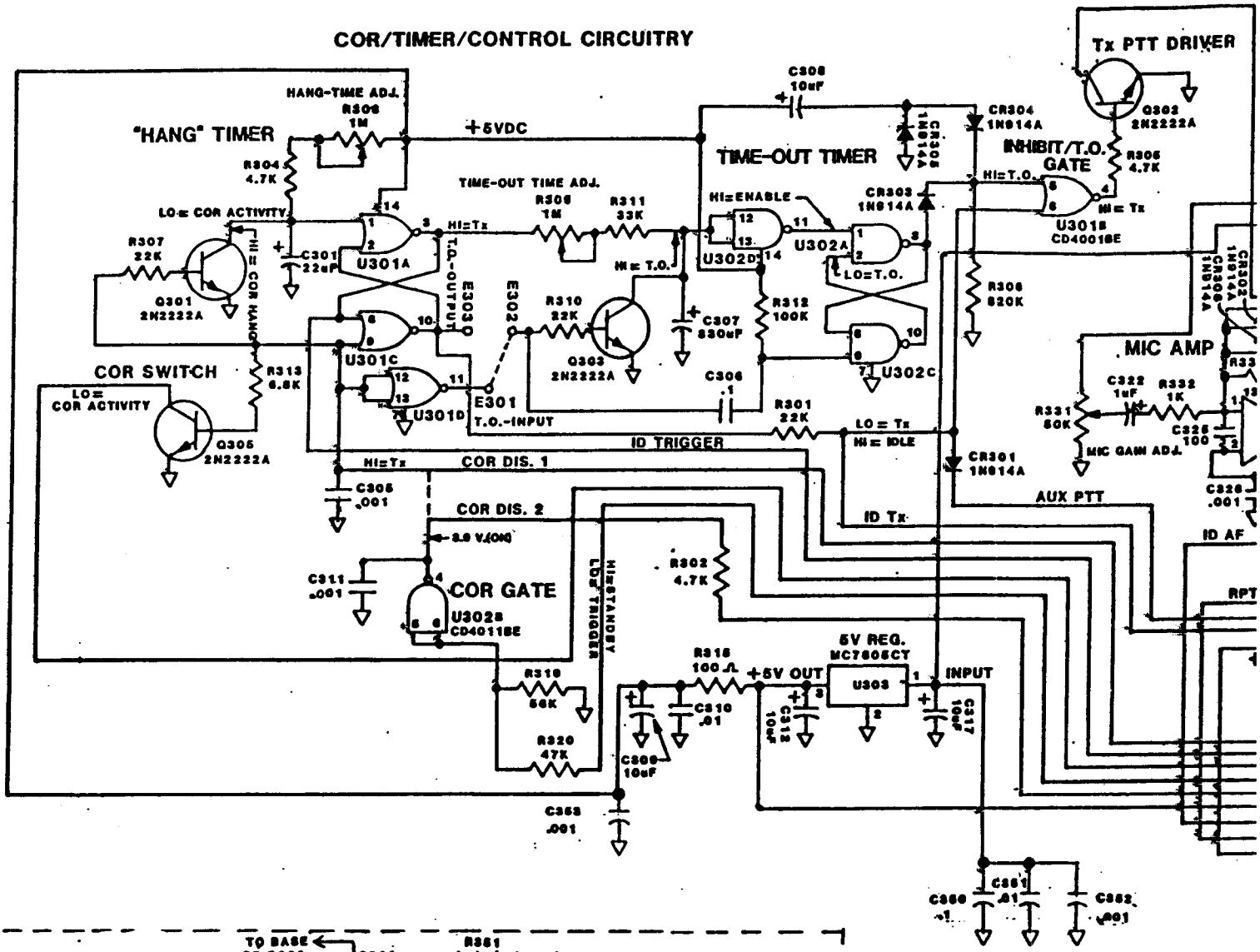
SPECTRUM COMMUNICATIONS

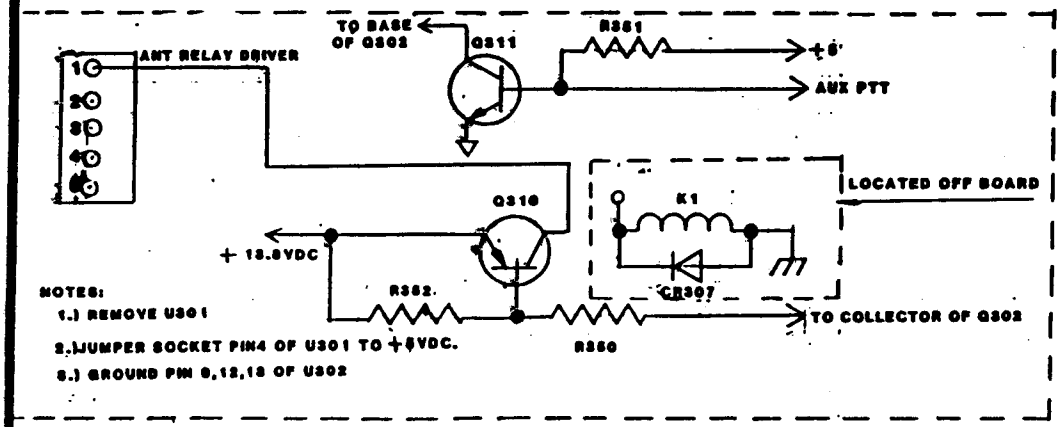
SCALE:	APPROVED BY:	DRAWN BY: R. L. A.
		REVISED: 10/11/94

SCR450A RECEIVER COMPONENT LAYOUT

DRAWING NUMBER: 3200159

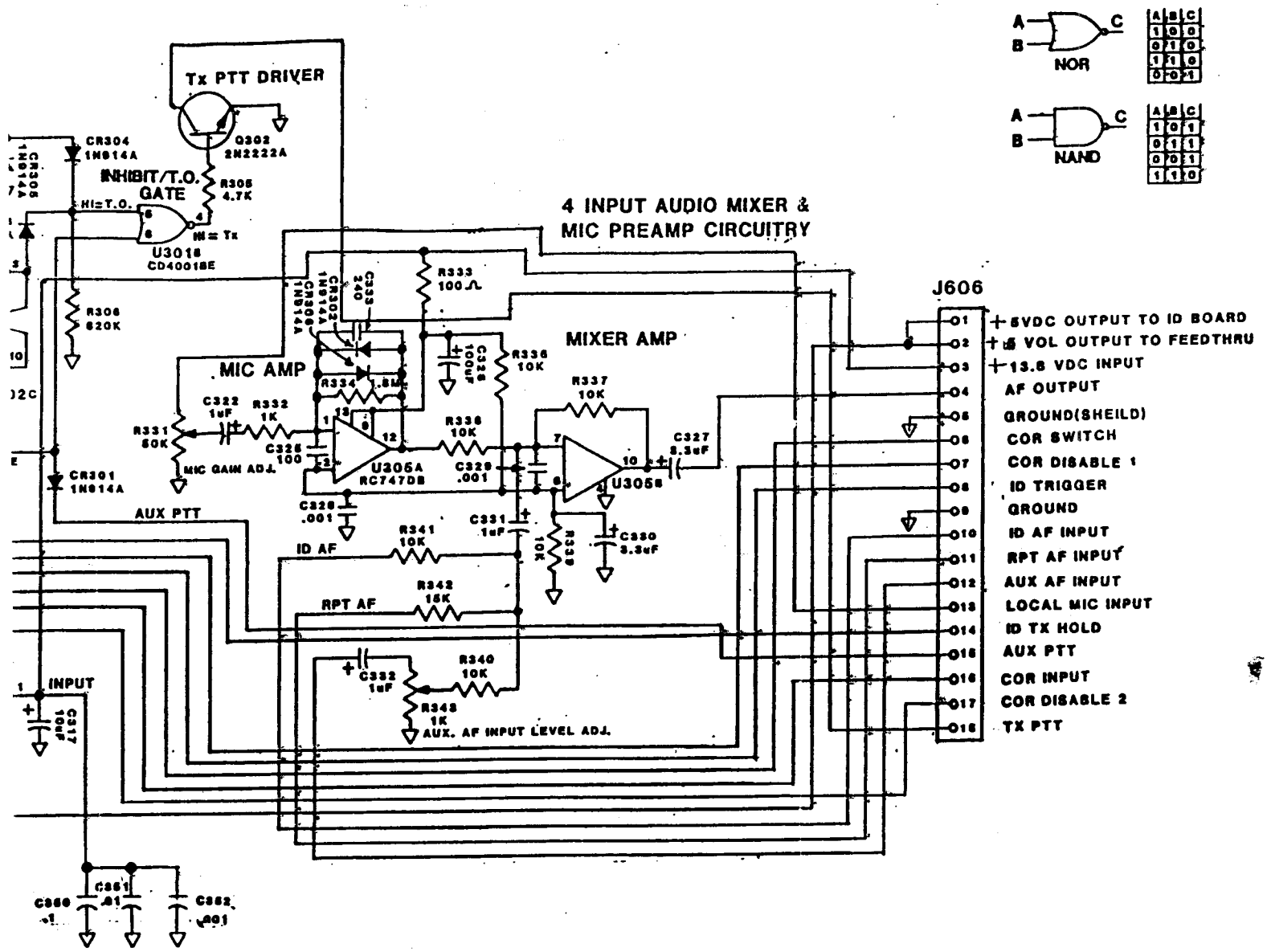
COR/TIMER/CONTROL CIRCUITRY





OPTIONAL ANT RELAY DRIVER CIRCUIT

(REPLACES SOME OF COR CIRCUITRY ABOVE)



CAR-7 BOARD

USED ON S-7R

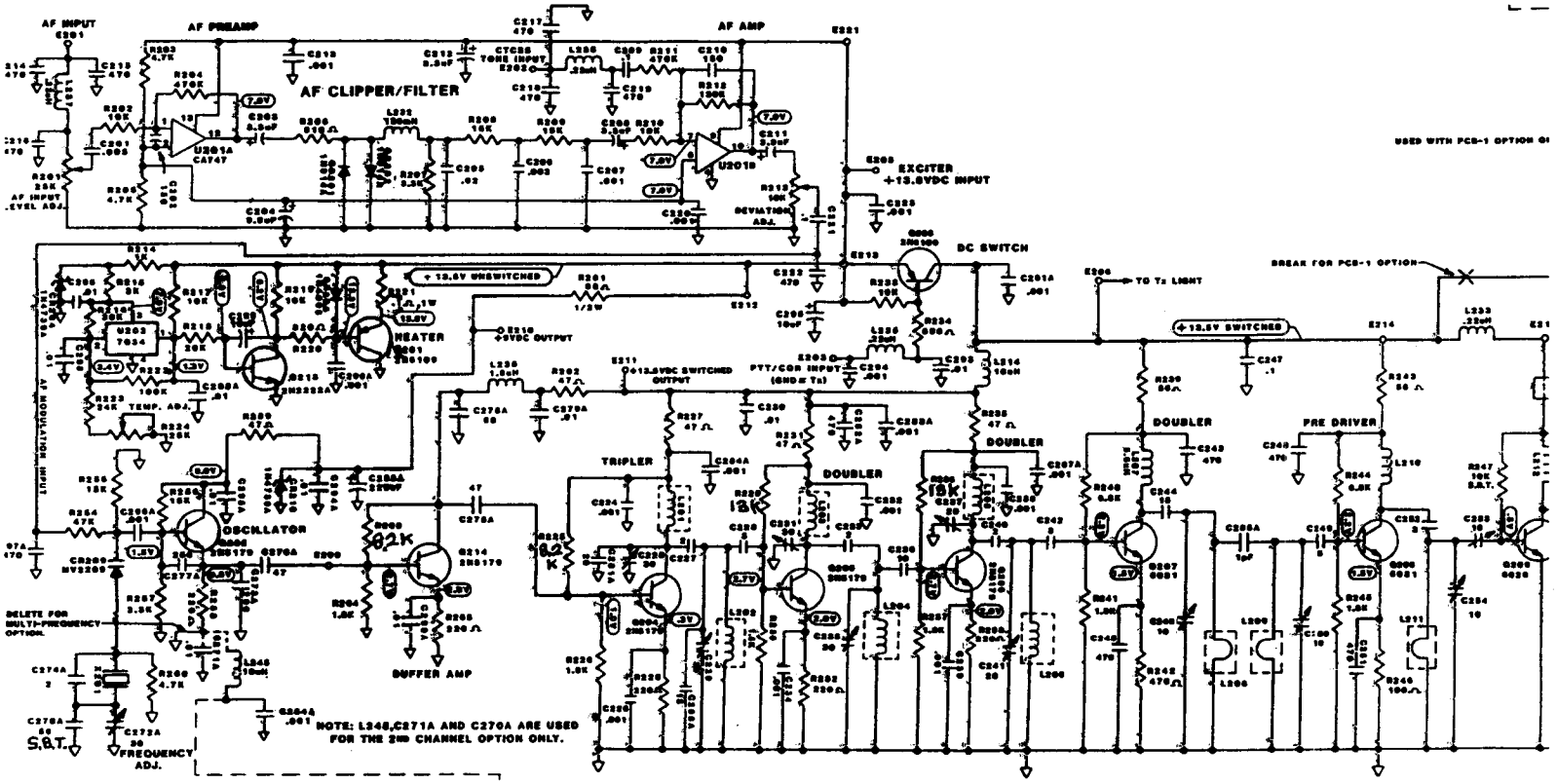
SPECTRUM COMMUNICATIONS

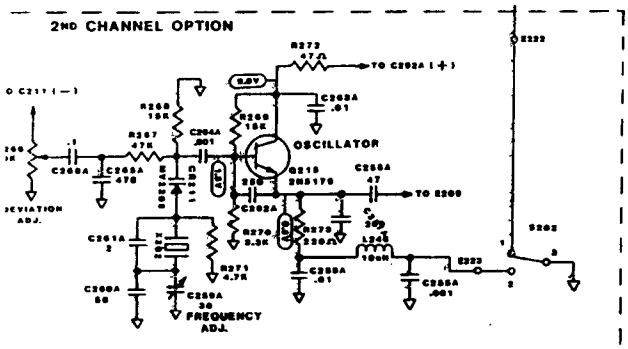
DRAWN BY N.K.
DATE 6-19-91
APPROVED BY 6/26/91

COR/AUDIO/REGULATOR SCHEMATIC

DRAWING NUMBER 3200192

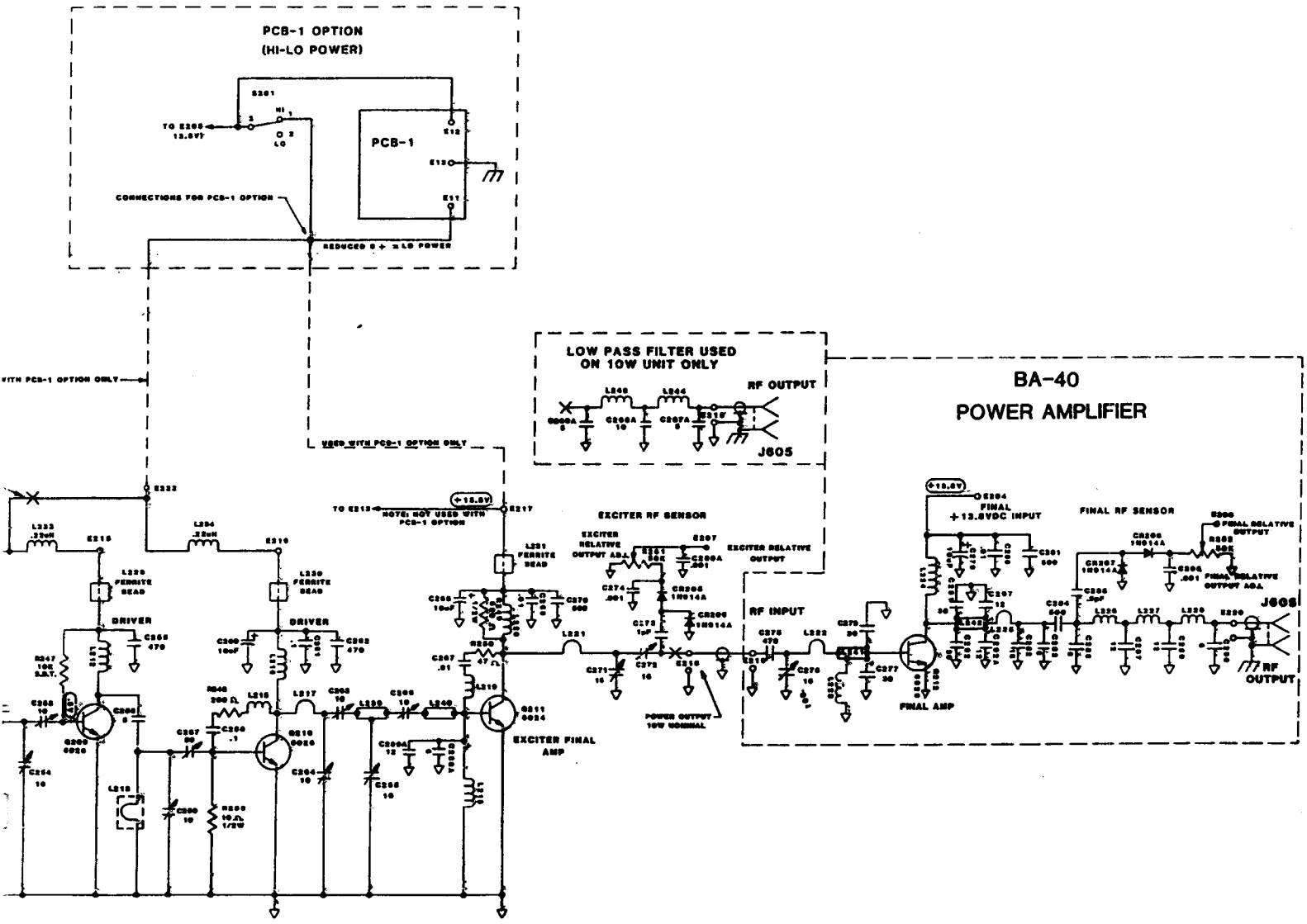
SCT410B TRANSMITTER/ EXCITER





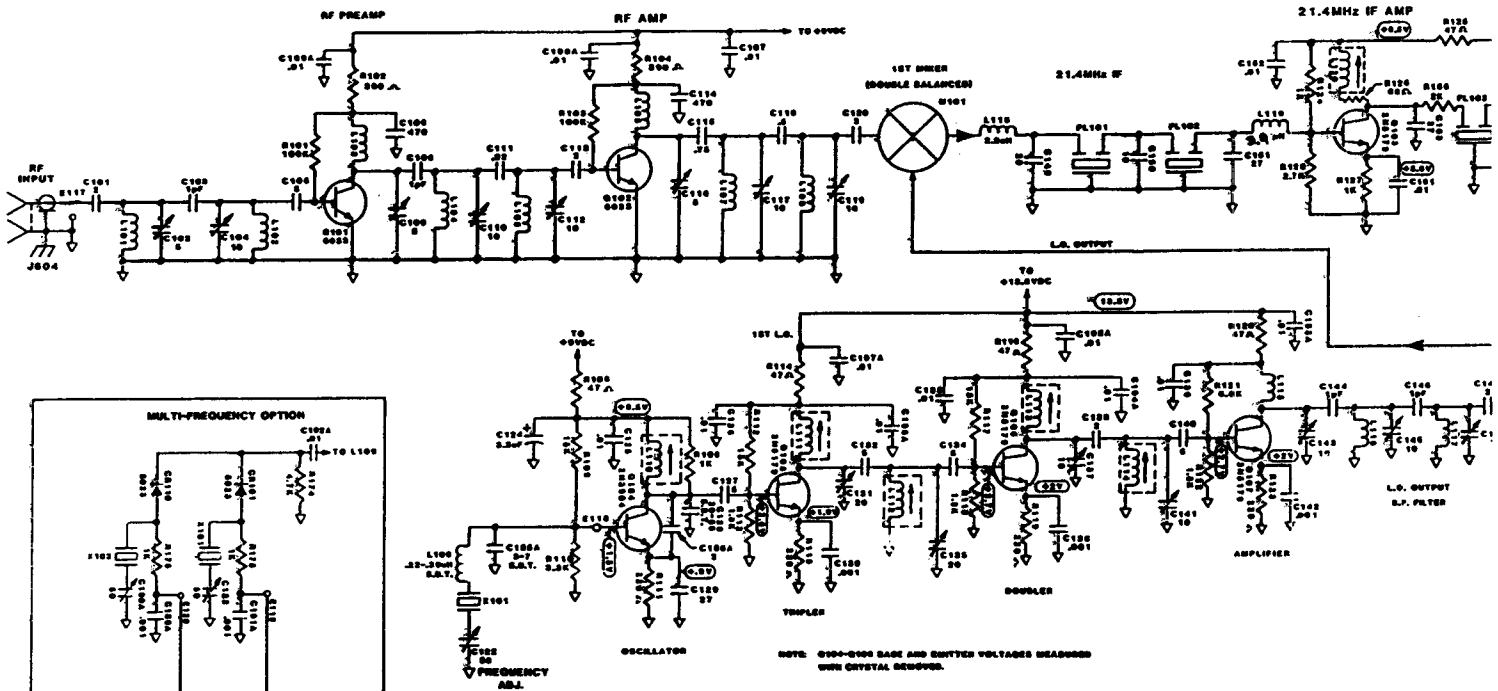
NOTES:

1) EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF); OTHERS ARE IN PICOFARADS (pF).
2) ALL VOLTAGES ARE ±20% AND ARE MEASURED WITH CRYSTAL REMOVED OR E209 GROUNDED.



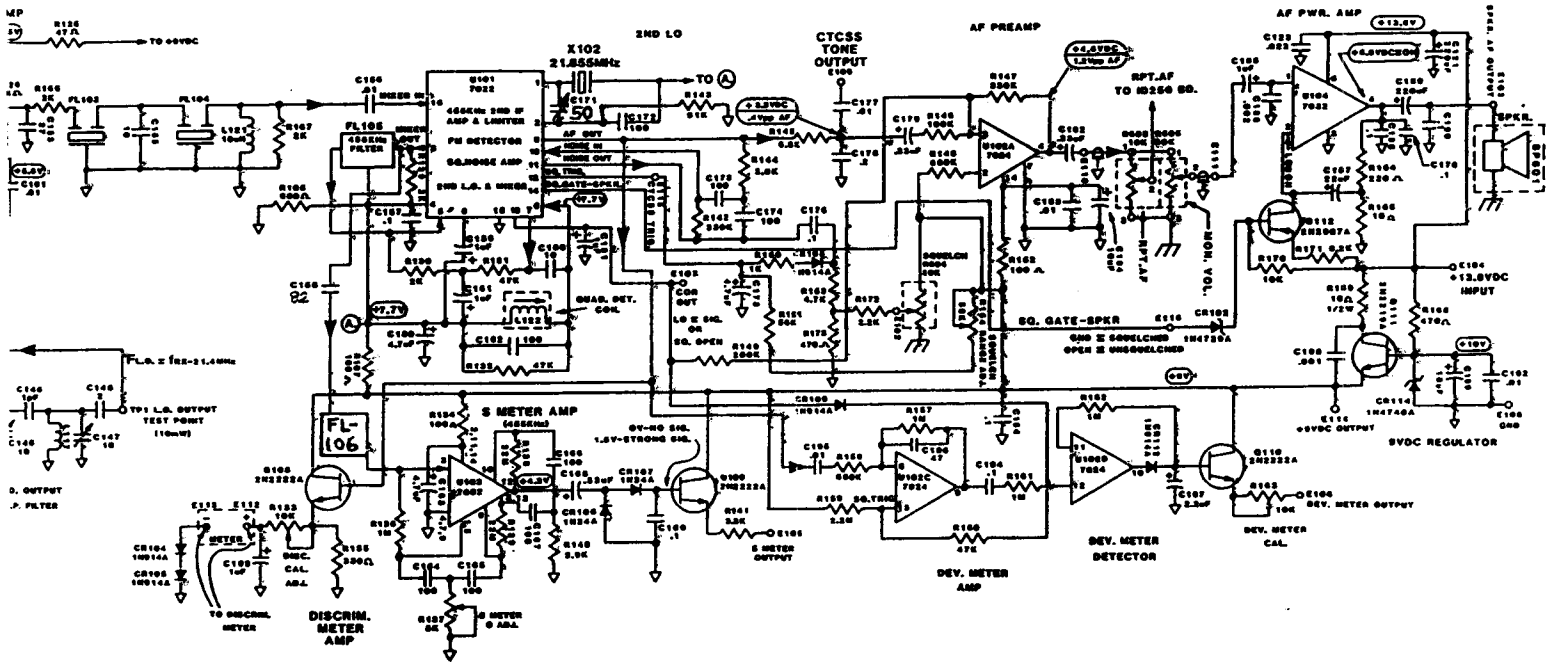
E
)F).
STAL REMOVED,

SPECTRUM COMMUNICATIONS		
SCALE: ——	APPROVED BY: WAS PRL J.L.D.	DRAWN BY P.J.B. REVISED 11-11-94
SCT410B UHF TRANSMITTER		
SCHEMATIC		DRAWING NUMBER 4100119 A

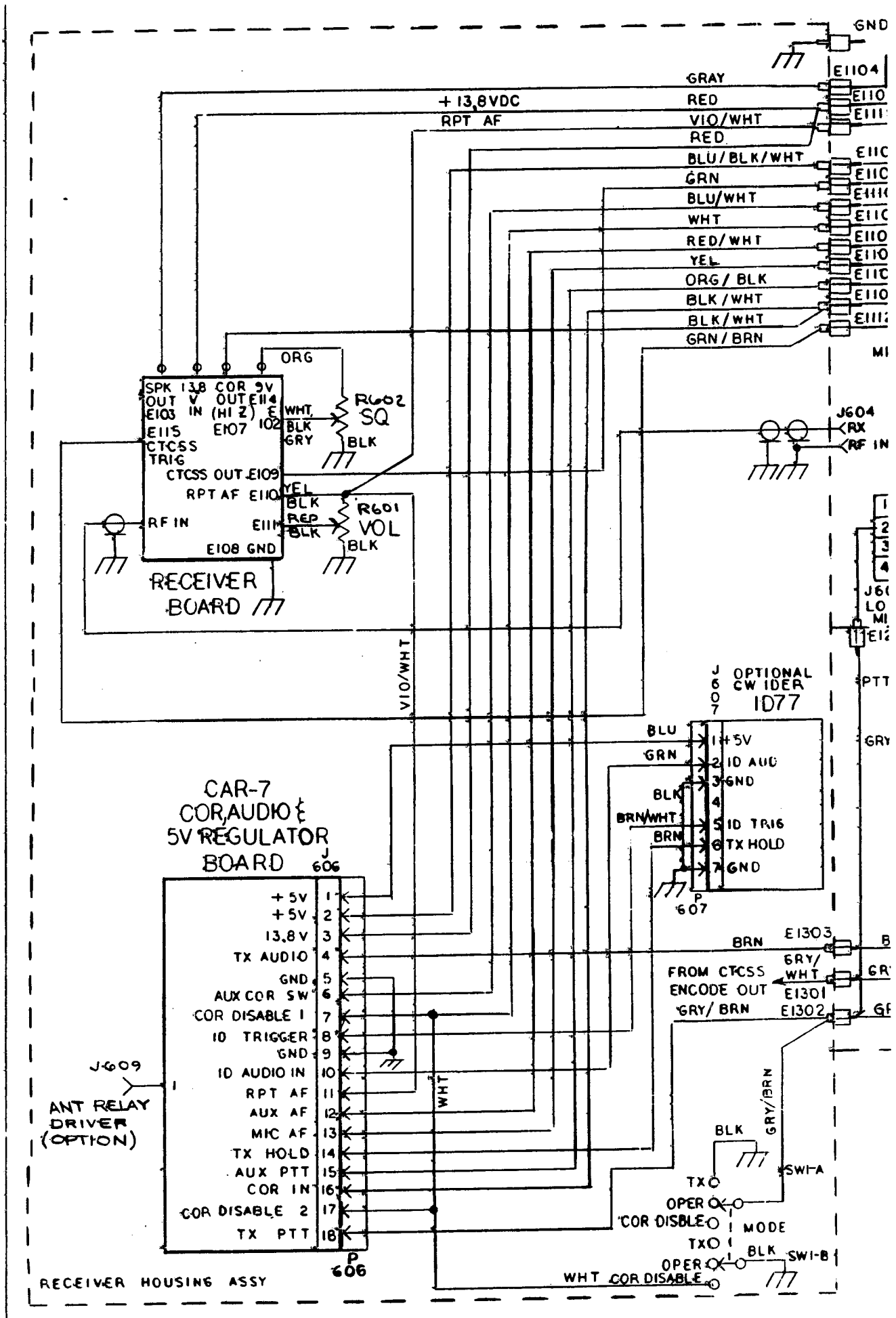


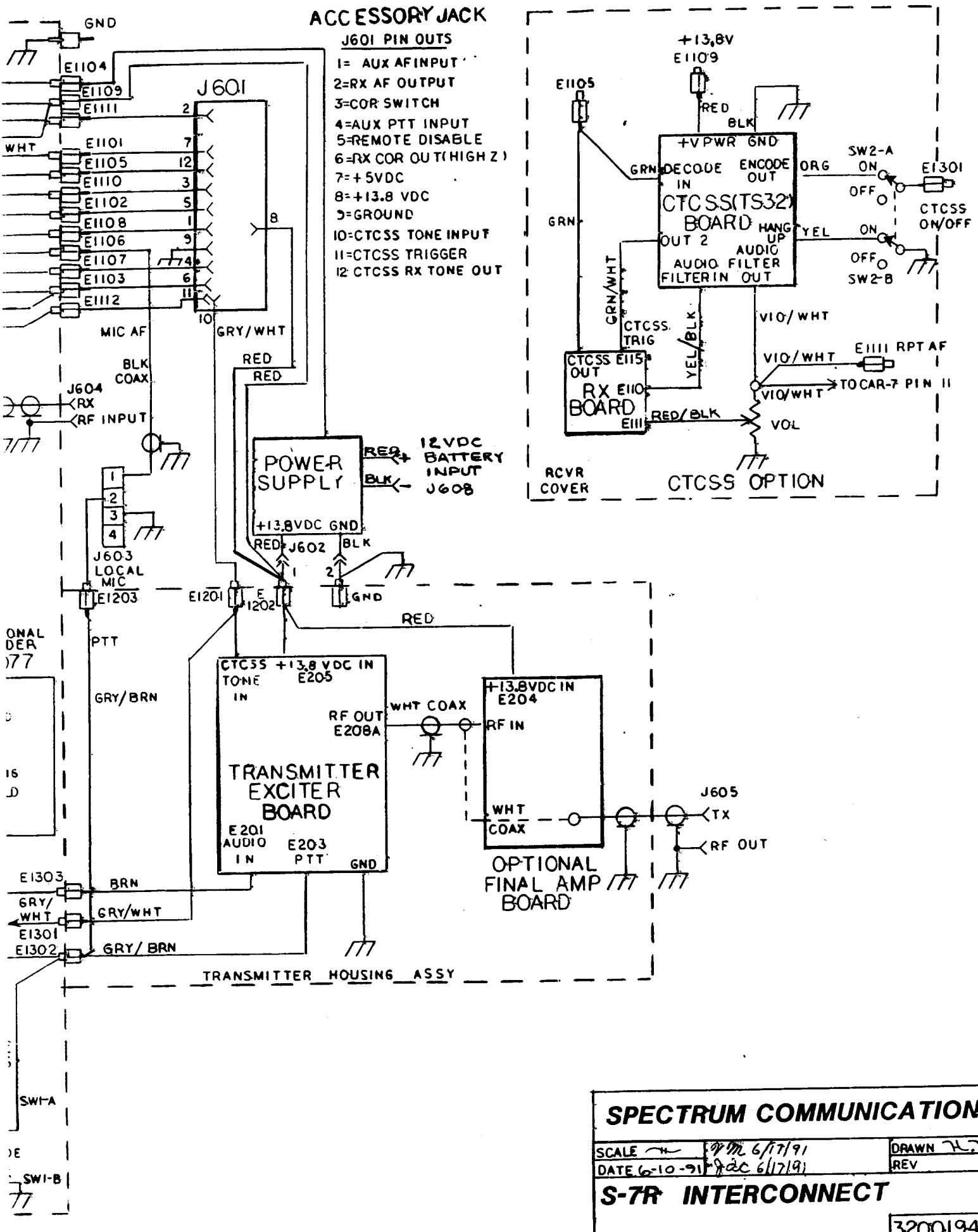
NOTES:

1) COMPONENTS SHOWN IN DASHED LINES (EXCEPT COILS) ARE LOCATED OFF THE BOARD.
2) ARROWS SHOW DIRECTION OF SIGNAL FLOW.
3) EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (uF) ; OTHERS ARE IN PICOFARADS (pF).
4) TYPICAL VOLTAGES ARE SHOWN IN ( ). AF VOLTAGES ARE MEASURED WITH A SCOPE, WITH 5KHz DEV. SIGNAL, (1KHz TONE).



SPECTRUM COMMUNICATIONS		
SCALE: ——	APPROVED BY:	DRAWN BY: P.J.B.
DATE:		REVISED: 10/11/94
SCR450A RECEIVER SCHEMATIC		
	(SCR4000) (BOARDS)	DRAWING NUMBER: 4100121


GND
E1104
GRAY
RED
VIO/WHT
RED
+13.8VDC
RPT AF
BLU/BLK/WHT
GRN
BLU/WHT
WHT
RED/WHT
YEL
ORG/BLK
BLK/WHT
BLK/WHT
GRN/BRN
ORG
SPK OUT E103
13.8 V IN
COR 5V OUT (HI Z) E114
E107
102
E115
CTCSS TRIG
CTCSS OUT E109
RPT AF E110
RF IN
E111
E108 GND
WHT
BLK
GRY
R602
SQ
BLK
YEL
BLK
RED
BLK
R601
VOL
BLK
RECEIVER BOARD
J604
RX
RF IN
VIO/WHT
J OPTIONAL
6 CW IDER
0 ID77
7
BLU
GRN
BLK
BRN/WHT
BRN
1 +5V
2 ID AUD
3 GND
4
5 ID TRIG
6 TX HOLD
7 GND
P 607
CAR-7
COR, AUDIO &
5V REGULATOR
BOARD
J 606
+5V 1
+5V 2
13.8V 3
TX AUDIO 4
GND 5
AUX COR SW 6
COR DISABLE 1 7
ID TRIGGER 8
GND 9
ID AUDIO IN 10
RPT AF 11
AUX AF 12
MIC AF 13
TX HOLD 14
AUX PTT 15
COR IN 16
COR DISABLE 2 17
TX PTT 18
P 606
J-609
ANT RELAY DRIVER (OPTION)
WHT
BRN
E1303
FROM CTCSS ENCODE OUT
GRY/WHT
E1301
GRY/BRN
E1302
GRY/BRN
BLK
SW1-A
TX
OPER
COR DISBLE
MODE
TX
OPER
BLK
SW1-B
WHT COR DISABLE
RECEIVER HOUSING ASSY



SPECTRUM COMMUNICATIONS		
SCALE —	6/17/91	DRAWN
DATE 6-10-91	dc 6/17/91	REV
S-7R INTERCONNECT		
		3200194