Racal

Low Frequency converter

RA-337

Operations & maintenance manual

LOW FREQUENCY CONVERTER RA.337

CONTENTS

ILLUSTRATIONS

TECHNICAL SPECIFICATION

Frequency Range:	3 kHz to 980 kHz
Input Impedance:	75 ohms nominal
Input VSWR:	2 : 1 or better
Tuning:	(a) Double tuned circuits in five ranges: 3 - 10 kHz 10 - 30 kHz 30 - 100 kHz 100 - 300 kHz 300 - 980 kHz (b) Two low-pass filter sections with cut-offs at 1 MHz and 500 kHz. In addition to the switched ranges, two wide-band positions are included; wb-500 and wb-980. A range is also provided to cover 300-500 kHz using the 300-980 kHz double tuned circuits with the 500 kHz low-pass filter.
R. F. Attenuator:	A five position attenuator provides up to 40 dB attenuation in 10 dB steps.
Sensitivity:	100 kHz to 980 kHz: bandwidth 3 kHz; 1 microvolt e.m.f. c.w. for 15 dB signal-to-noise ratio. 3 kHz to 100 kHz: bandwidth 200 Hz; 1 microvolt e.m.f. c.w. for 15 dB signal-to-noise ratio.
Noise Figure: (Tuned Mode)	100 kHz to 980 kHz; 10 dB minimum. 3 kHz to 100 kHz; 20 dB minimum.
Gain:	Voltage gain from the antenna (75 ohms) to the output sockets terminated by 2k ohms is 50 dB nominal.
Output Impedance:	200 ohms or less. (Output load approximately 2000 ohms).

3MHz Leakage to Output:	Less than 30 mV under all conditions.
3MHz Leakage to Antenna:	Less than 5 microvolts under all conditions with antenna terminated by 75 ohms.
1MHz Input:	Not less than 100 mV e.m.f. from 75 ohms source.
Power Requirements: (from associated receiver)	-16V d.c. stabilized. 30mA.
Environmental Conditions:	Operating : 0°C to +55°C Storage : -40°C to +70°C
Rear Connections:	Antenna Input 1MHz Input 2-3MHz Output AGC from associated receiver -16V d.c. Ground
Front Panel Controls:	R.F. Attenuator R.F. Range Tuning
Dimensions:	$1\frac{3}{4}$ in. high : 19 in. wide (unit width $5\frac{1}{2}$ in.) 16 in. deep from rear of front panel to rear of chassis (not including rear connectors).
Weight:	5 lbs.

CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1. The low frequency converter RA. 337 is designed for use with the RA. 217, 1217/9 series of receivers to extend the usable frequency range down to 3 kHz. The composite equipment then provides coverage of the frequency range 3 kHz to 30 MHz.

2. With r. f. input signals in the range 3 kHz to 980 kHz the RA. 337 produces an inverted output spectrum (2. 997 MHz to 2. 02 MHz) which is fed to the interpolation section of the receiver.

3. The 1 MHz input signal, a. g. c. signal, and -16V d. c. operating power are taken from the associated receiver to the RA. 337 via a rear panel connector.

BRIEF TECHNICAL DESCRIPTION

4. The block diagram in figure 1 is provided for reference with these notes.

R. F. Amplifier and Filter

5. Signals from the antenna are fed to the r. f. amplifier via an antenna attenuator and a 1 MHz low-pass filter. The 500 kHz low-pass filter can also be switched into the circuit to discriminate against high level signals in the broadcast band. Any of five double tuned input filters covering the range 3 kHz to 980 kHz can also be selected as required.

6. The r. f. amplifier output circuit is a 1 MHz low-pass filter coupling the 3 kHz to 980 kHz spectrum to the balanced mixer.

Harmonic Generator and Filter

7. The 1 MHz input from the receiver's oscillator is fed to a harmonic generator where the amplifier and band-pass filter in the output circuit select the third harmonic which is fed to the balanced mixer.

Balanced Mixer

8. The mixer combines the 3 MHz input with the 3 kHz to 980 kHz signal from the antenna and provides a difference frequency in the range 2. 997 MHz to 2. 02 MHz. This signal is taken via the 2-3 MHz band-pass filter to the output amplifiers and 3 MHz crystal notch filters.

Output Amplifiers

9. The output amplifiers raise the required signal to a level suitable for application to the interpolation section of the receiver; the required signal being selected finally by the kHz control of the receiver.

10. The 3 MHz crystal notch filters serve to reduce the level of any 3 MHz breakthrough from the balanced mixer. This avoids possible overloading of the following receiver stages.

CHAPTER 2

INSTALLATION

INTRODUCTION

1. The only fuse in the RA. 337 is a 500 mA fuse in the antenna input circuit and should be checked.

ANTENNA

2. Connect a suitable antenna to the 'ANT. INPUT' socket on the rear panel of the converter. The input impedance of the unit is 75 ohms nominal.

CONNECTIONS TO RECEIVER (Rear Panels)

3. (a) Coaxial cables:

Receiver (1217 Series)	RA. 337
1 MHz output	1 MHz input
L. F.	2-3 MHz output
	Antenna input

(b) 3 wire cable:

Receiver	RA. 337
-16V d. c. (Switched. See Chap. 4)	-16V (Terminal strip)
AGC	AGC " "
Ground	Ground " "

CHAPTER 3

OPERATING INSTRUCTIONS

1. These instructions should be used in conjunction with the operating instructions for the associated receiver.

2. Details of the filtering arrangements for the tuned ranges and wide-band positions of the 'R. F. RANGE' switch will be found in Chapter 4 'DETAILED CIRCUIT DESCRIPTION'.

R. F. ATTENUATOR

3. This control attenuates the input signal from the antenna. Starting at the 'min' position, 40 dB of attenuation is available in 10 dB steps by rotating the switch counter-clockwise.

4. This facility enables the operator to reduce the level of incoming signals when very strong unwanted signals are present and which cannot be rejected sufficiently by the tuning control. It should also be used if the required signal is causing overloading in the early stages of the associated receiver.

TUNING

5. This control adjusts a ganged variable capacitor and is used to tune the antenna input filters for maximum sensitivity.

6. If maximum sensitivity is not required the tuning control need not be used except when strong unwanted signals are present. The presence of strong signals, anywhere within the spectrum, may cause cross-modulation unless the antenna is tuned. Care should be taken to avoid tuning the input to the interfering signal instead of the signal required.

R. F. RANGE kHz (see Fig. 2)

7. This is an eight position switch which covers the following ranges:

	kHz
Tuned ranges:	3 - 10
	10 - 30
	30 - 100
	100 - 300
	300 - 500 (see Chap. 4 - 5)
	300 - 980
Wideband ranges:	wb 500 (500 kHz low-pass filter)
	wb 980 (980 kHz low-pass filter)

8. The ranges marked in red (10 - 30 and 100 - 300) correspond to the red numbers on the tuning scale.

9. Chapter 4 'DETAILED CIRCUIT DESCRIPTION' - 'Antenna Input Circuits' provides details of the filtering arrangements for the tuned ranges.

CHAPTER 4

DETAILED TECHNICAL DESCRIPTION

ANTENNA INPUT CIRCUITS (Figs. 3, 4 and 5)

1. The input impedance at the antenna input J2601 is 75 ohms nominal under all operating conditions. Signals are fed via a 500 mA fuse to a five position attenuator which provides up to 40 dB of attenuation.

2. The 1 MHz low-pass filter is permanently in circuit. A 500 kHz low-pass filter is included in the r.f. range switch positions except 'wb 980' and the tuned range position '300-980 kHz'.

3. The r.f. range switch selects either of two wide-band input conditions 'wb 980' or 'wb 500' or any of the five double tuned filters.

4. The double tuned filters consist of the paired transformers T2801 to T2810; their associated trimmer cpacitors C2801 to C2805; the common variable capacitors C2601A, C2601B, and fixed capacitor C2602.

5. A sixth tuned range is provided to cover 300-500 kHz with the 500 kHz low-pass filter in series with the 300-980 kHz tuned filters. The filters are tuned over an approximate 3 : 1 frequency range by the Tuning control on the front panel (C2601).

6. In the wide-band input positions an auto-transformer (Fig. 7) steps up the antenna impedance to the base of Q1 (Fig. 6). This keeps the system gain and noise figure essentially constant in both wide-band and tuned modes. (See Fig. 4 for switching details).

7. A spark gap (E2601) is included for protection against short duration, high voltage transients.

For alignment procedures see Chapter 5.

R. F. AMPLIFIER (Fig. 6)

8. The selected input spectrum is capacitance coupled via C2-C3 to the base of r.f. amplifier Q1. Diode CR1 protects Q1 against overload. A.G.C. and/or manual gain control is effected by means of Q2 which acts as a variable emitter impedance that changes with the circuit d.c. conditions.

9. D.C. conditions corresponding to maximum gain are set by potentiometer R3 with -4V applied to the a.g.c. line. Under these conditions Q2 has a low collector impedance and little degeneration occurs in the emitter of Q1.

10. The action of the a.g.c. circuit is to cause the a.g.c. voltage to move toward zero, thereby increasing the collector impedance of Q2 and decreasing the gain of Q1. The control characteristic is made more linear by the clamp circuit consisting of R7, R8, CR2, and Zener diode VR1.

11. The output circuit of the r.f. stage is a 1 MHz low-pass filter consisting of coil assemblies A1, A2, and capacitors C4, C8, and C9. This filter couples the amplified signal spectrum to the balanced mixer, and also discriminates against 3 MHz heterodyne signal leakage back into the r.f. stage and antenna circuits.

BALANCED MIXER (Fig. 6)

12. Q3 and Q4 are connected as a balanced mixer so that the 3 MHz heterodyne signal and the input signal spectrum tend to cancel in the output circuit.

13. Balance adjustment is provided by potentiometer R12.

14. The input spectrum is applied to Q3 base via C10, C11 in parallel, and also to Q4 emitter via C13, C14 in parallel. The 3 MHz heterodyne signal is applied to Q4 base via C35, C36, and to Q3 emitter via C15, C16, at a suitable mixing level.

15. The required output spectrum in the range 2.997 MHz to 2.02 MHz is selected by the 2-3 MHz band-pass filter consisting of coils A3-A6, and is then fed to the following output amplifier.

OUTPUT AMPLIFIER (Fig. 7)

16. R3, C21, and the 3 MHz crystal Y1 constitute a notch filter with maximum attenuation at the series resonant frequency of Y1 and C21. By adjusting C21 the resonant frequency is set to 3 MHz to trap the heterodyne signal.

17. The first 3 MHz trap circuit is followed by buffer Q5 and amplifier Q6 which is RC coupled to a second notch filter Y2, R31, and C27.

18. Emitter follower Q7 provides a low impedance drive to the input of the associated receiver.

HARMONIC GENERATOR AND 3 MHz AMPLIFIER (Fig. 6)

19. The 1 MHz output supplied by the associated receiver is fed via transformer L1 to the harmonic generator stage Q8. The collector voltage of Q8 is limited by voltage divider R38 and R39. The Q8 collector load consists of a 3 MHz tuned circuit A7 with a capacitance tap at terminal 6 to provide a low impedance drive to amplifier Q9.

20. The gain of Q9 can be varied by potentiometer R42 to provide the correct drive level to the balanced mixer via the double tuned 3 MHz transformer A8, and A9. The secondary of A9 is tapped to provide a low impedance output, and the large coupling capacitors C35, and C36 are used to preserve the symmetry of the balanced mixer.

POWER SUPPLY

21. The -16V d.c. power supply for the RA. 337 is provided by the associated receiver. The switching in the receiver is so arranged that when the MHz control is set to '00' the receiver front end is muted, and a -16V d.c. supply is switched to a terminal on the receiver's rear panel.

CHAPTER 5

ALIGNMENT

INTRODUCTION

1. The procedures in this section provide data which is typical of a correctly functioning unit. They include individual circuit tests in addition to overall gain tests.

2. The procedures should be carried out independently of the associated receiver, or until any fault in the RA. 337 has been definitely isolated from the receiver.

3. The power supply, a. g. c. potential, and 1 MHz supply can be derived from the receiver in lieu of other sources.

EQUIPMENT REQUIRED

4. (1) Signal Generator : 3 kHz to 30 MHz. 75 ohms impedance.
(2) Electronic Voltmeter : 3 MHz. 0-100 mV.
(3) Oscilloscope.
(4) 1μF Capacitor.

R. F. ATTENUATOR

5. (a) Connect the signal generator to the antenna input.

(b) Connect the voltmeter to terminal E2701 on the low-pass filter board.

(c) Set the 'r. f. att. ' switch to 'min', and the 'r. f. range kHz' switch to 'wb 500'.

(d) Determine that an input signal of 500 kHz at 60 mV e. m. f. produces 30 mV at E2701.

(e) Switch the 'r. f. att. ' step by step to maximum and check that each step produces a 10 dB drop in level at E2701. (At each step, increase the input level by 10 dB to maintain the output at E2701 at 30 mV).

(f) Return the 'r. f. att. ' switch to 'min', and the signal generator output to 60 mV e. m. f.

LOW-PASS FILTERS : 500 kHz and 1 MHz

6. (a) Connect the signal generator to the antenna input socket (60 mV e. m. f.).

(b) Set R3 (Fig. 6) and the 'r. f. att. ' switch to minimum.

(c) Connect the voltmeter to terminal E2703.

(d) Set the 'r. f. range' to 'wb 980'.

(e) Vary the signal generator frequency from 3 kHz to 1 MHz while peaking coils L2705 to L2708 (on the 1 MHz board) to obtain not more than 6 dB peak to trough ripple across the pass band.

(f) Set the 'r. f. range' to 'wb 500' and peak coils L2701 to L2704 on the 500 kHz board to obtain not more than 3 dB peak to trough ripple across the pass band 3 kHz to 500 kHz.

(g) Connect the voltmeter to E2501.

(h) Set the 'r. f. range' switch to 'wb 980'.

(i) Set the signal generator to 980 kHz and determine that 60 mV e. m. f. input produces approximately 60 mV on the voltmeter.

(j) Set the signal generator to 3 kHz and 60 mV e. m. f. ; the voltmeter should read at least 20 mV (still connected to E2501).

(k) Set the 'r. f. range' to 'wb 500'.

(l) Set the signal generator to 500 kHz when a 60 mV e. m. f. input should produce 60 mV on the voltmeter.

TUNED FILTER CIRCUITS

7. 3 kHz to 10 kHz

(a) Set the 'r. f. range' switch to 3-10 kHz.

(b) Connect the signal generator to the antenna input socket and set to 3 kHz (30 mV e. m. f.).

(c) Connect the voltmeter to E2501.

(d) Adjust the 'tuning' control for maximum reading on the voltmeter.

(e) Loosen the dial set screw and, without moving the tuned position of capacitor C2601, set the dial to 3 kHz and tighten the set screw.

(f) Set the signal generator to 10 kHz and tune the RA. 337 to 10 kHz. Adjust C2801 for maximum reading on the voltmeter. Determine that 60 mV e. m. f. input produces approximately 60 mV output.

8. 10 kHz to 30 kHz

(a) See para. 7 (3 kHz to 10 kHz) for dial calibration procedure of the 'tuning' control.

(b) Set the signal generator to 10 kHz (60 mV e. m. f.).

(c) Set the 'r. f. range' switch to 10 - 30 kHz.

(d) Tune the RA. 337 to 10 kHz.

(e) Adjust transformers T2803 and T2804 for maximum reading on the voltmeter connected to E2501 terminal.

(f) Tune the signal generator and the RA. 337 to 30 kHz.

(g) Adjust C2802 for maximum reading on the voltmeter.

(h) Determine that 60 mV e. m. f. input produces 60 mV output.

OTHER RANGES

9. For the ranges shown below repeat the procedure detailed above for 10 - 30 kHz.

R. F. Range kHz	Transformers	Capacitor
30 - 100	T2805, T2806	C2803
100 - 300	T2807, T2808	C2804
300 - 980	T2809, T2810	C2805

10. The 300 - 500 kHz range is aligned when adjusting the 300 - 980 kHz range.

L.F. CONVERTER

2500 Series

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
Resistors		Ohms		watts	
R1	Fixed Composition	5.1k	5	1/4	RC07GF512J
R2	Fixed Composition	470	5	1/4	RC07GF471J
R3	Potentiometer	1k	30	1/2	Beckman 62P-R1K
R4	Fixed Composition	220	5	1/4	RC07GF221J
R5	Fixed Composition	680	5	1/4	RC07GF681J
R6	Fixed Composition	27	5	1/4	RC07GF270J
R7	Fixed Composition	1.8k	5	1/4	RC07GF182J
R8	Fixed Composition	220	5	1/4	RC07GF221J
R9	Fixed Composition	2.7k	5	1/4	RC07GF272J
R10	Fixed Composition	15k	5	1/4	RC07GF153J
R11	Fixed Composition	4.7k	5	1/4	RC07GF472J
R12	Potentiometer	10k	5	1/2	Beckman 62P-R10K
R13	Fixed Composition	120	5	1/4	RC07GF121J
R14	Fixed Composition	1k	5	1/4	RC07GF102J
R15	Fixed Composition	120	5	1/4	RC07GF121J
R16	Fixed Composition	15k	5	1/4	RC07GF153J
R17	Fixed Composition	4.7k	5	1/4	RC07GF472J
R18	Fixed Composition	6.8k	5	1/4	RC07GF652J
R19	Fixed Composition	10	5	1/4	RC07GF100J
R20	Fixed Composition	3.9k	5	1/4	RC07GF392J
R21	Fixed Composition	1k	5	1/4	RC07GF102J
R22	Fixed Composition	4.7k	5	1/4	RC07GF472J
R23	Fixed Composition	10k	5	1/4	RC07GF103J
R24	Fixed Composition	220	5	1/4	RC07GF221J
R25	Fixed Composition	220	5	1/4	RC07GF221J
R26	Fixed Composition	10k	5	1/4	RC07GF103J
R27	Fixed Composition	15k	5	1/4	RC07GF153J
R28	Fixed Composition	3.9k	5	1/4	RC07GF392J
R29	Fixed Composition	820	5	1/4	RC07GF821J
R30	Fixed Composition	1k	5	1/4	RC07GF102J
R31	Fixed Composition	3.9k	5	1/4	RC07GF392J
R32	Fixed Composition	4.7k	5	1/4	RC07GF472J
R33	Fixed Composition	10k	5	1/4	RC07GF103J
R34	Fixed Composition	220	5	1/4	RC07GF221J
R35	Not Used				

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
		Ohms		watts	
R36	Fixed Composition	3.3k	5	1/4	RC07GF332J
R37	Fixed Composition	1.8k	5	1/4	RC07GF182J
R38	Fixed Composition	4.7k	5	1/4	RC07GF472J
R39	Fixed Composition	150	5	1/4	RC07GF151J
R40	Fixed Composition	3.9k	5	1/4	RC07GF392J
R41	Fixed Composition	15k	5	1/4	RC07GF153J
R42	Potentiometer	100	30	1/2	Beckman 62P-R100
R43	Fixed Composition	1.5k	5	1/4	RC07GF152J
R44	Fixed Composition	100	5	1/4	RC07GF101J
R45	Fixed Composition	10	5	1/4	RC07GF100J
R46	Fixed Composition	1k	5	1/4	RC07GF102J
Capacitors					
		µF		volts	
C1	Electrolytic	5	+100-20	25	Sprague TE-1202
C2	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C3	Electrolytic	5	+100-20	25	Sprague TE-1202
C4	Fixed Mica	1500pF	5	500	CM06F152JN3
C5	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C6	Electrolytic	5	+100-20	25	Sprague TE-1202
C7	Electrolytic	5	+100-20	25	Sprague TE-1202
C8	Fixed Mica	1800pF	5	500	CM06F182JN3
C9	Fixed Mica	1200pF	5	500	CM06F122JN3
C10	Electrolytic	5	+100-20	25	Sprague TE-1202
C11	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C12	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C13	Electrolytic	5	+100-20	25	Sprague TE-1202
C14	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C15	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C16	Electrolytic	5	+100-20	25	Sprague TE-1202
C17	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C18	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C19	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C20	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C21	Variable	7-35pF (Temp coef N-1500)			RCI 28021
C22	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C23	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C24	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C25	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7

L.F. CONVERTER - 2500 Series contd

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
		µF		volts	
C26	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C27	Variable	7-35 pf	(Temp coef N-1500)		RCI 28021
C28	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C29	Not Used				
C30	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C31	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C32	Fixed Mica	5000pf	5	500	CM07F502JN3
C33	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C34	Ceramic, Disc	.047	20	25	Sprague Monolythic 3C15
C35	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C36	Electrolytic	5	+100-20	25	Sprague TE-1202
C37	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C38	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
C39	Ceramic, Disc	.1	20	25	Sprague Monolythic 5C7
Inductors					
A1	Coil Assembly				RCI D-02253
A2	Coil Assembly				RCI D-02254
A3	Coil Assembly				RCI D-02255
A4	Coil Assembly				RCI D-02256
A5	Coil Assembly				RCI D-02257
A6	Coil Assembly				RCI D-02258
A7	Coil Assembly				RCI D-02259
A8	Coil Assembly				RCI D-02260
A9	Coil Assembly				RCI D-02261
L2501	Coil Assembly, Wide Band Transformer				RCI D-02262
Transformer					
T2501	RF Wide Band Transformer				RCI D-02252
Diodes					
VR2501	Zener 1N702				RCI 33503
CR1	Germanium 1N281				RCI 35508
CR2	Germanium 1N281				RCI 35508
Transistors					
Q1	TI-363				RCI 30004
Q2	2N2996				RCI 30252
Q3	TI-363				RCI 30004
Q4	TI-363				RCI 30004
Q5	2N3323				RCI 30251

L.F. CONVERTER - 2500 Series contd

Cct. Ref.	Description	Value	%	Rat.	Mfr. Part No.
Q6	2N3283				RCI 30500
Q7	2N3323				RCI 30251
Q8	2N3323				RCI 30251
Q9	2N3323				RCI 30251
Crystals					
Y1	2.9997 mc				Perrott Eng. Labs. CR69/U
Y2	2.9997 mc				Perrott Eng. Labs. CR69/U

R.F. ATTENUATOR AND TUNED FILTERS

2600 Series

Resistors		Ohms		watts	
R2601	Composition	15	5	1/4	RC07GF
R2602	Composition	56	5	1/4	RC07GF
R2603	Composition	56	5	1/4	RC07GF
R2604	Composition	47	5	1/4	RC07GF
R2605	Composition	33	5	1/4	RC07GF
R2606	Composition	33	5	1/4	RC07GF
R2607	Composition	56	5	1/4	RC07GF
R2608	Composition	56	5	1/4	RC07GF
R2609	Composition	15	5	1/4	RC07GF
Capacitors				volts	
C2601A&B	Variable; 2 Section, Ganged				RCI C-02122
C2602	Silver/Mica	7pf	5	500	CM05070JN3
Miscellaneous					
E2601	Lightning Arrester				Siemens B1-A230
S2601(A&B)	5 position, 2 wafer, modified Switch Assembly	(RF Attenuator)			RCI A-02841 (40 dB)
Connectors (Rear Panel)					
J2601	Coaxial, BNC, UG-1094/U, Male				Transradio BN12/5
J2602	Coaxial, UG-1094/U, Male	"			Transradio BN12/5
J2603	Coaxial, UG-1094/U, Male	"			Transradio BN12/5
TB2601	Terminal Block				Cinch 351-28-03-001

R.F. ATTENUATOR AND TUNED FILTERS

2800 Series

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
Capacitors					
C2801	Variable	4.5-20(Temp. Coef. N-750)7S			Triko RCI 28020
C2802	Variable	4.5-20(Temp. Coef. N-750)7S			Triko RCI 28020
C2803	Variable	4.5-20(Temp. Coef. N-750)7S			Triko RCI 28020
C2804	Variable	7-35 (Temp. Coef. N-1500)7S			Triko RCI 28021
C2805	Variable	4.5-20(Temp. Coef. N-750)7S			Triko RCI 28020
C2806	Mica	12	10	500	CM05C120JN3
C2807	Ceramic, Disc	.047	20	25	Sprague 3C15
C2808	Ceramic, Disc	.047	20	25	Sprague 3C15

Switch (Front Panel)

S2801 (A, B, C, D, E, &F) 8 position, 6 wafer (RF Range kHz) RCI C-02097

Transformers

T2801	RCI D-02181
T2802	RCI D-02182
T2803	RCI D-02183
T2804	RCI D-02184
T2805	RCI D-02185
T2806	RCI D-02186
T2807	RCI D-02187
T2808	RCI D-02188
T2809	RCI D-02189
T2810	RCI D-02190

Fuse

F2801	Pigtail, 500 mA, 125V	Littlefuse 279.500

Choke

L2801	680 µH, ±5%	Miller 9220-20

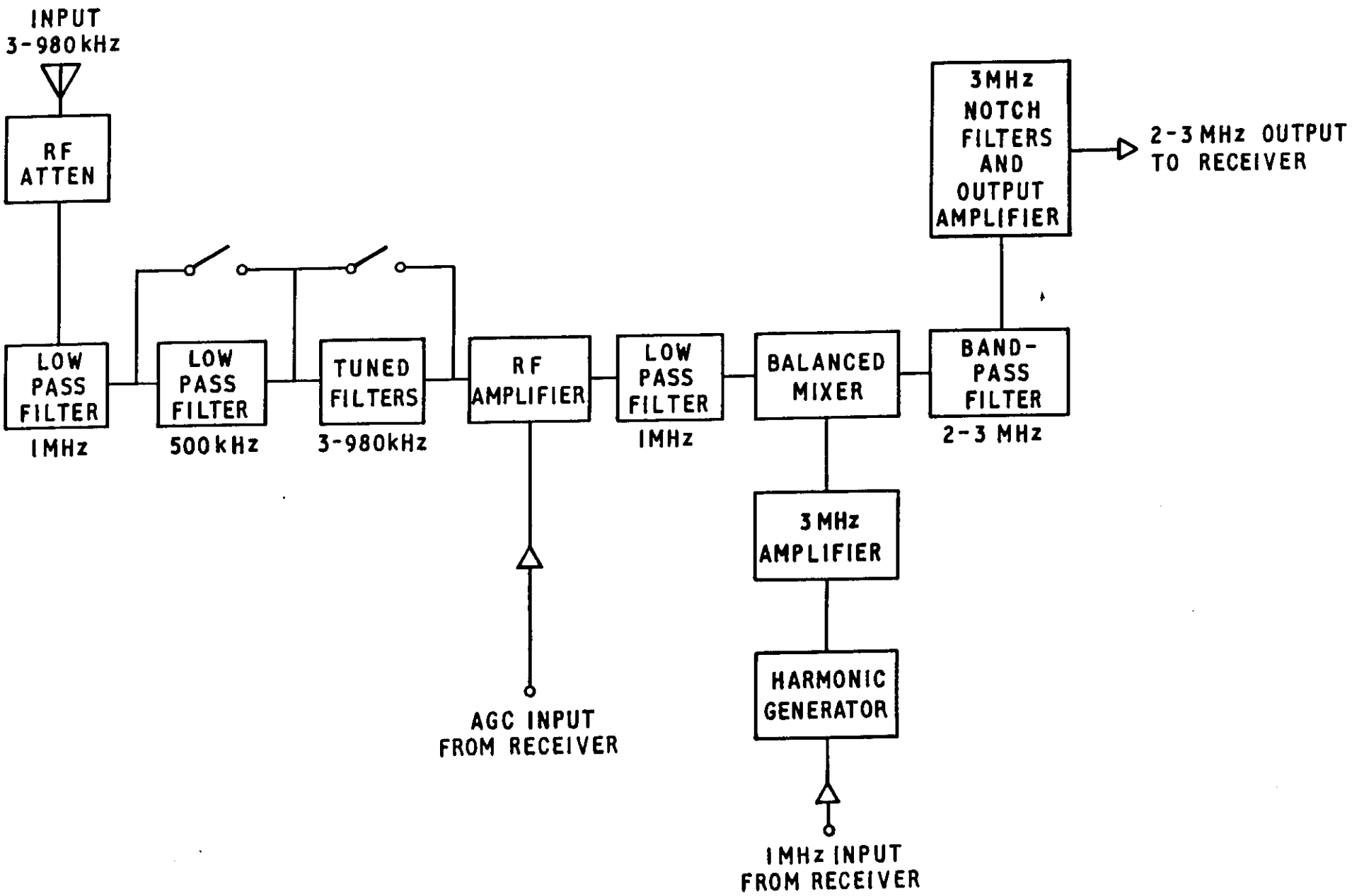
L.P. FILTERS

2700 Series

Capacitors		pf		volts	
C2701	Mica	5000	5	500	CM07F502JN3
C2702	Mica	910	5	500	CM06F911JN3
C2703	Mica	6200	5	500	CM07F622JN3
C2704	Mica	5600	5	500	CM07F562JN3
C2705	Mica	3600	5	500	CM07F362JN3

L.P. FILTERS - 2700 Series contd

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
C2706	Mica	9100	5	500	CM07F912JN3
C2707	Mica	4300	5	500	CM06F432JN3
C2708	Mica	3300	5	500	CM06F332JN3
C2709	Mica	910	5	500	CM06F911JN3
C2710	Mica	2400	5	500	CM06F242JN3
C2711	Mica	680	5	500	CM06F681JN3
C2712	Mica	2700	5	500	CM06F272JN3
C2713	Mica	4700	5	500	CM06F472JN3
C2714	Mica	1300	5	500	CM06F132JN3
C2715	Mica	7500	5	500	CM07F752JN3
C2716	Mica	1800	5	500	CM07F182JN3
C2717	Mica	2700	5	500	CM06F272JN3
C2718	Mica	1300	5	500	CM06F132JN3
Inductors		µH			
L2701	Filter Coil Assembly	27			Nytronics Wee VL-27
L2702	Filter Coil Assembly	15			Nytronics Wee VL-15
L2703	Filter Coil Assembly	10			Nytronics Wee VL-10
L2704	Filter Coil Assembly	18			Nytronics Wee VL-18
L2705	Filter Coil Assembly	12			Nytronics Wee VL-12
L2706	Filter Coil Assembly	4.7			Nytronics Wee VL-4.7
L2707	Filter Coil Assembly	3.3			Nytronics Wee VL-3.3
L2708	Filter Coil Assembly	6.8			Nytronics Wee VL-6.8



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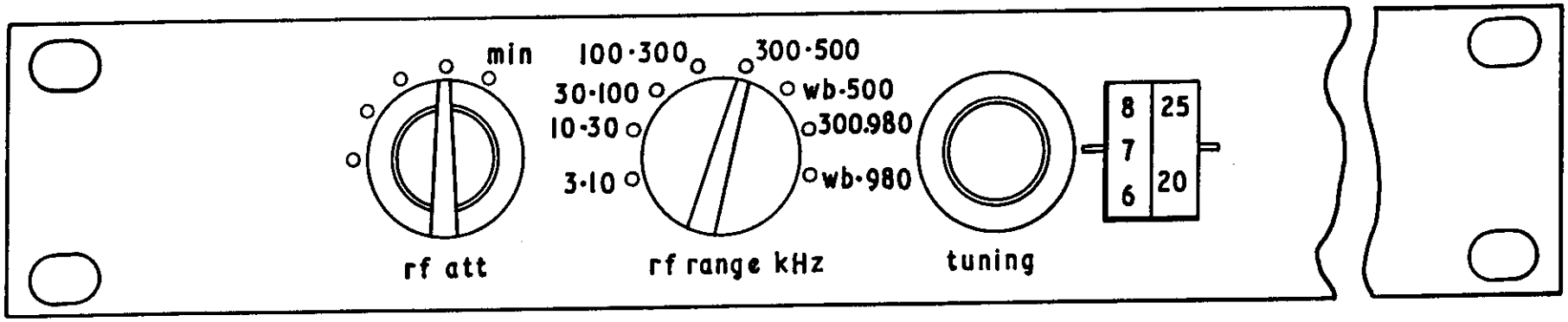
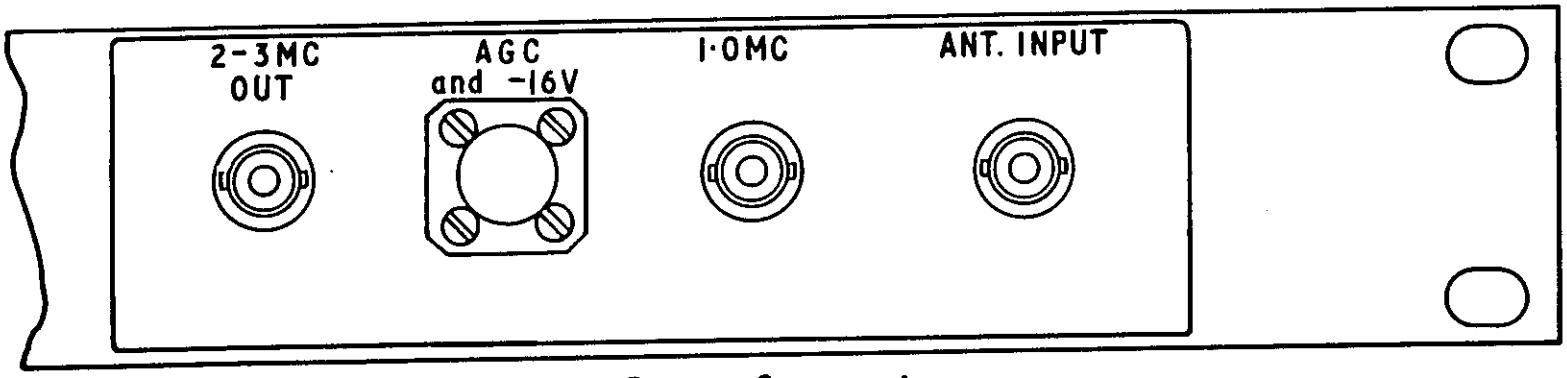
BLOCK DIAGRAM: RA.337

FIG.1



Front Panel



Rear Connectors

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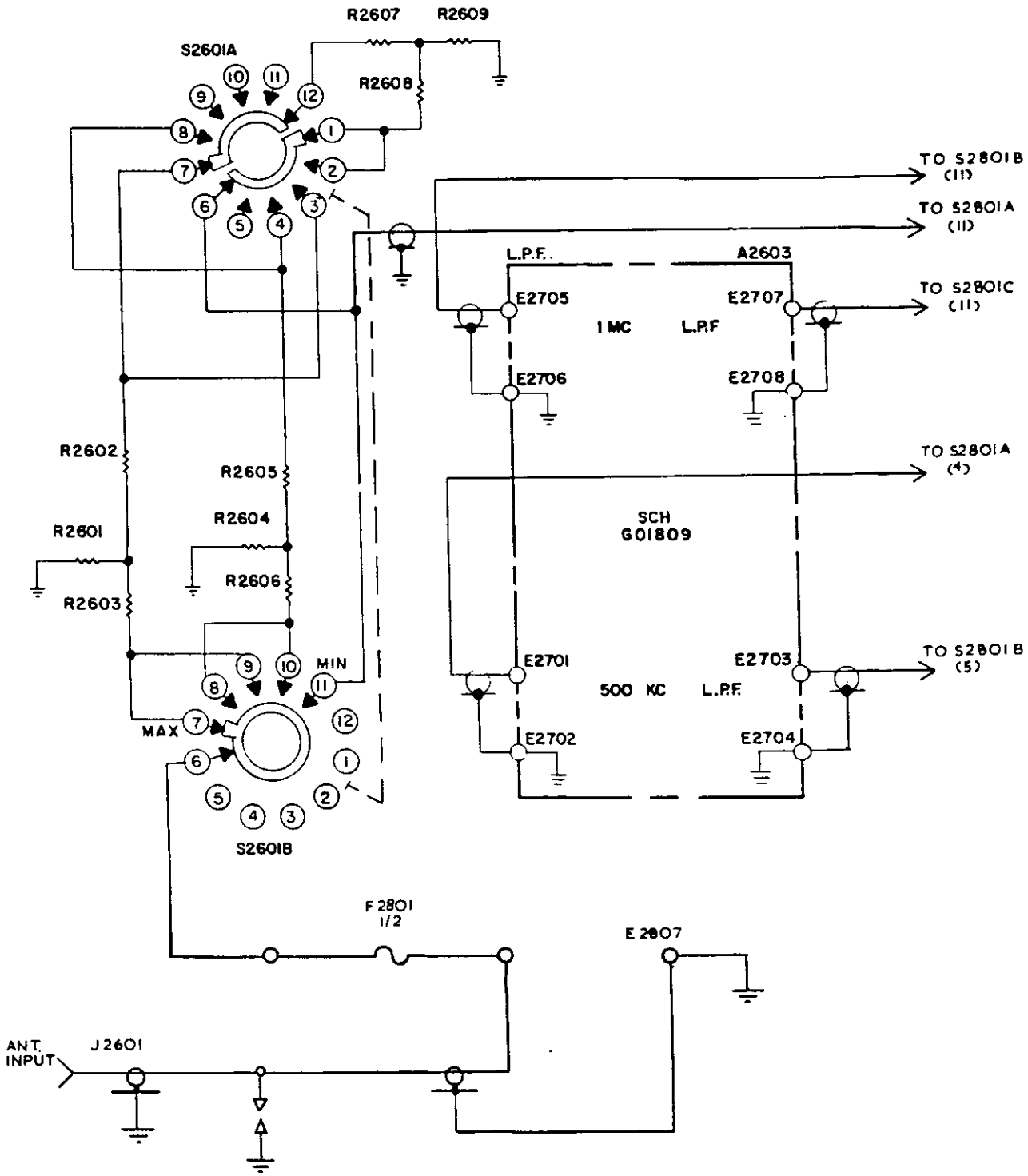
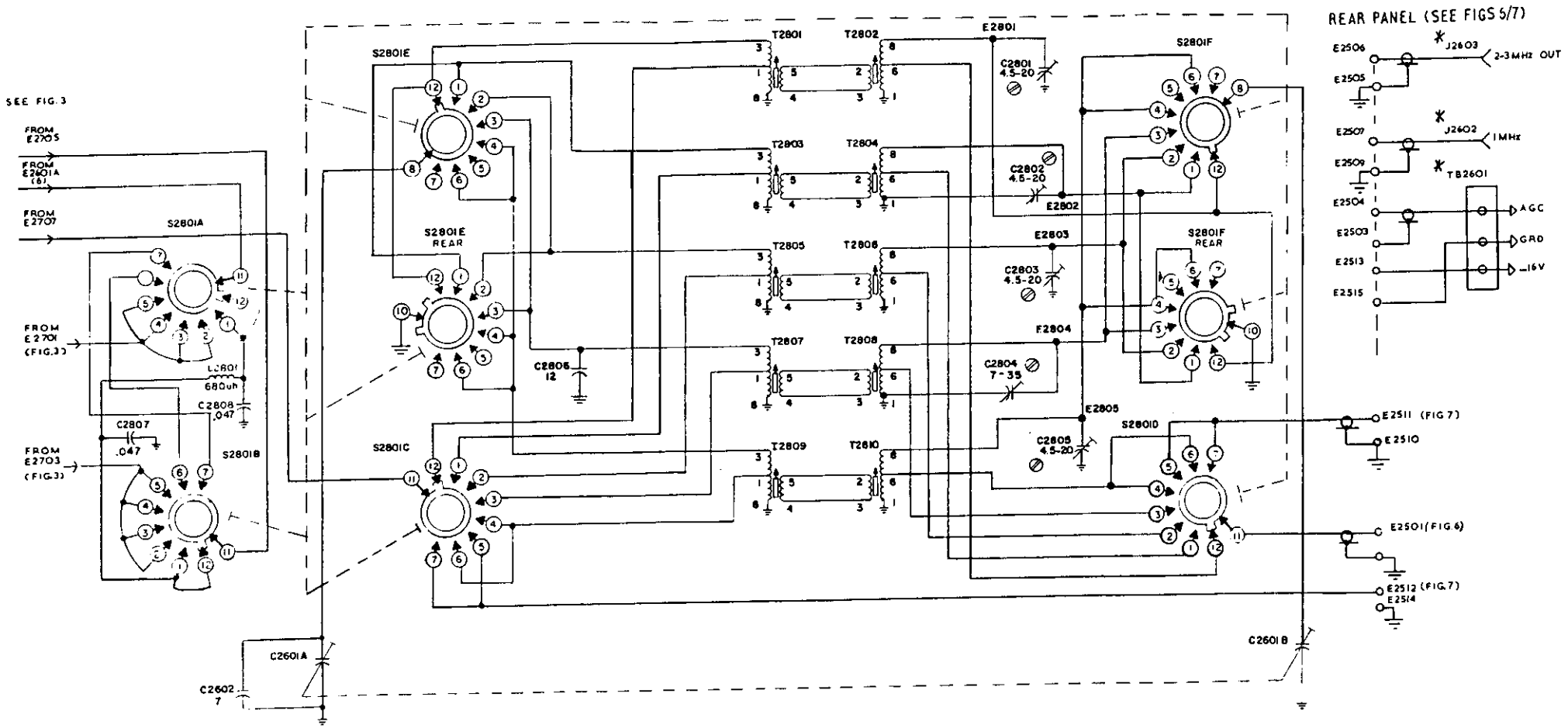
FRONT & REAR PANELS : RA.337

FIG. 2



H293/3 R.F ATTENUATOR & L.P. FILTER RA.337 FIG. 3



NOTES.

1. UNLESS OTHERWISE STATED:
   RESISTOR VALUES ARE IN OHMS 1/4 WATT
   K = 1000 M = 1000,000
2. * INDICATES LOCATED ON REAR PANEL

RANGE SWITCH AND TUNED FILTERS RA. 337

FIG. 4

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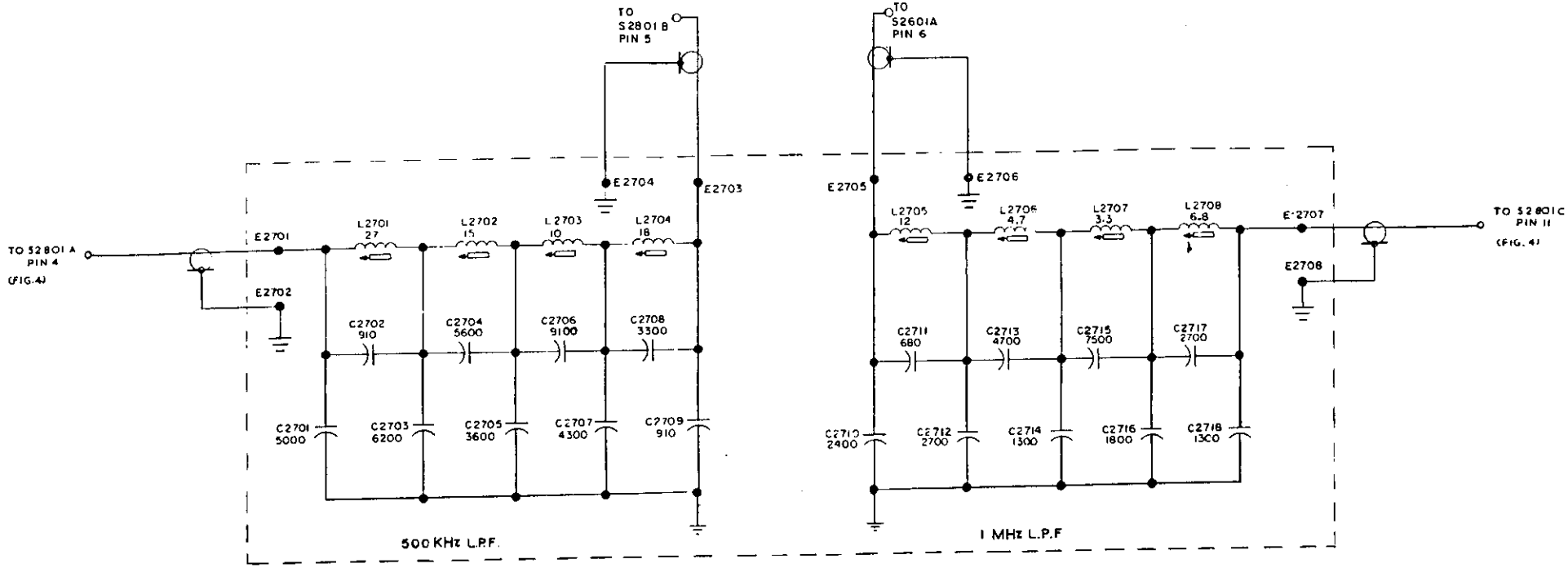

NOTES:
1. UNLESS OTHERWISE NOTED CAPACITOR VALUES GREATER THAN ONE ARE IN PICO FARADS, LESS THAN ONE ARE IN MICROFARADS.
2. INDUCTANCE VALUES GREATER THAN ONE ARE IN MICROHENRIES, LESS THAN ONE ARE IN MILLIHENRIES.

CIRCUIT: LOW PASS FILTERS RA.337

FIG. 5

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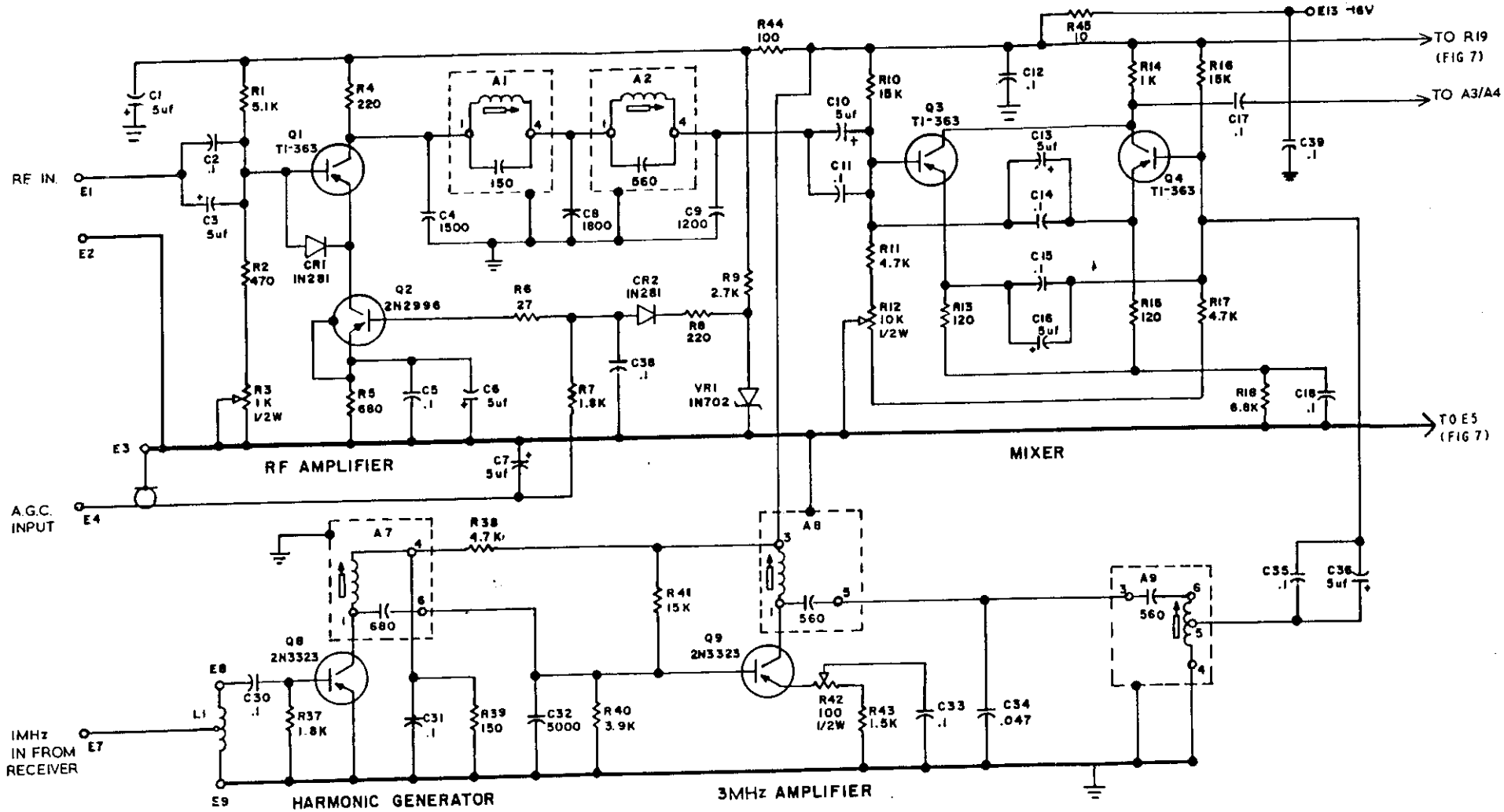

COMPONENT SERIES 2500
SEE NOTES IN FIG. 7

CIRCUIT: L.F CONVERTER RA.337 (SHEET 1)

FIG. 6

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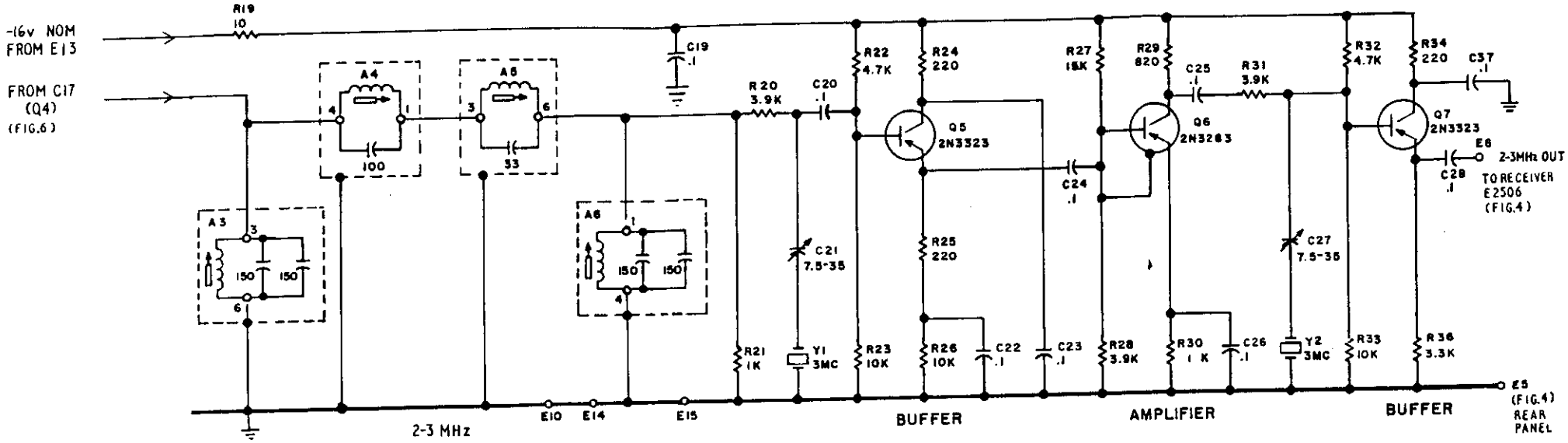

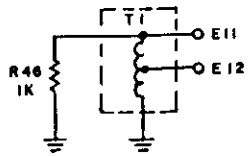

R F WIDEBAND TRANSFORMER

UNLESS OTHERWISE NOTED:

1. RESISTOR VALUES ARE IN OHMS $\frac{1}{4}$ WATT
   K= 1,000 M= 1,000,000
2. CAPACITOR VALUES GREATER THAN ONE ARE IN PICO FARADS, LESS THAN ONE ARE IN MICROFARADS.
3. INDUCTANCE VALUES GREATER THAN ONE ARE IN MICROHENRIES, LESS THAN ONE ARE IN MILLIHENRIES.
4. PRESENCE OF ARROW INDICATES CLOCKWISE ROTATION

COMPONENT
SERIES 2500

CIRCUIT L.F. CONVERTER RA.337 (SHEET 2)

FIG. 7

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CHAPTER 6

LIST OF COMPONENTS

ORDERS FOR SPARE PARTS

In order to expedite handling of spare part orders, please quote:-

(1) Type and serial number of equipment.

(2) Circuit reference, description, manufacturer of part required and part number.

(3) Quantity required.

NOTE: If the equipment is designed on a modular basis, please include the type and description of the module for which the replacement part is required.

K4XL's  BAMA

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