



**Rockwell  
International**

**instructions**

# RF Translator (637-1767-( ))

Collins Telecommunications Products Division

523-0767959-102211

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RF Translator  
(637-1767-( ))

## 1. DESCRIPTION

RF Translator 637-1767-( ), shown in figure 1, is a module enclosed in an rf secure compartment (metal box construction). The rf translator module contains a metal box subassembly with internal shielding between various circuit elements and three 2-layer planar cards. It uses a 56-pin edge-on connector (2 layers, 28 pins each) and four subminiature rf connectors for external connections.

The rf translator module consists of two mixers, a receive overload, and rf filter circuits.

The rf translator configuration differences are as follows:

- 637-1767-001, FL14 109.350 00 MHz filter,  $\pm 7.50$  kHz at 3-dB points (narrowband filter).
- 637-1767-002, FL14 109.350 00 MHz filter,  $\pm 6.10$  kHz at 0.5-dB points (broadband filter).

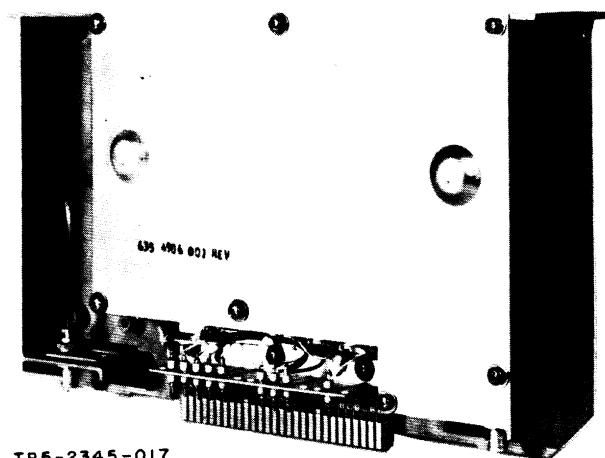
## 2. PRINCIPLES OF OPERATION

### 2.1 General (Refer to figure 2.)

The rf translator converts the 100-kHz (0.100-MHz) to 30.0-MHz receive rf input to a 9.45-MHz receive if frequency.

### 2.2 Receive Function (Refer to figure 2.)

When a receive signal is supplied to the rf translator, it is overload checked and supplied through K1 to the associated bandpass filter. If an overload exists, Q1 causes K1 to deenergize, and the receive rf is loaded through R4 and supplied as receive rf through K1 to the associated bandpass filter.



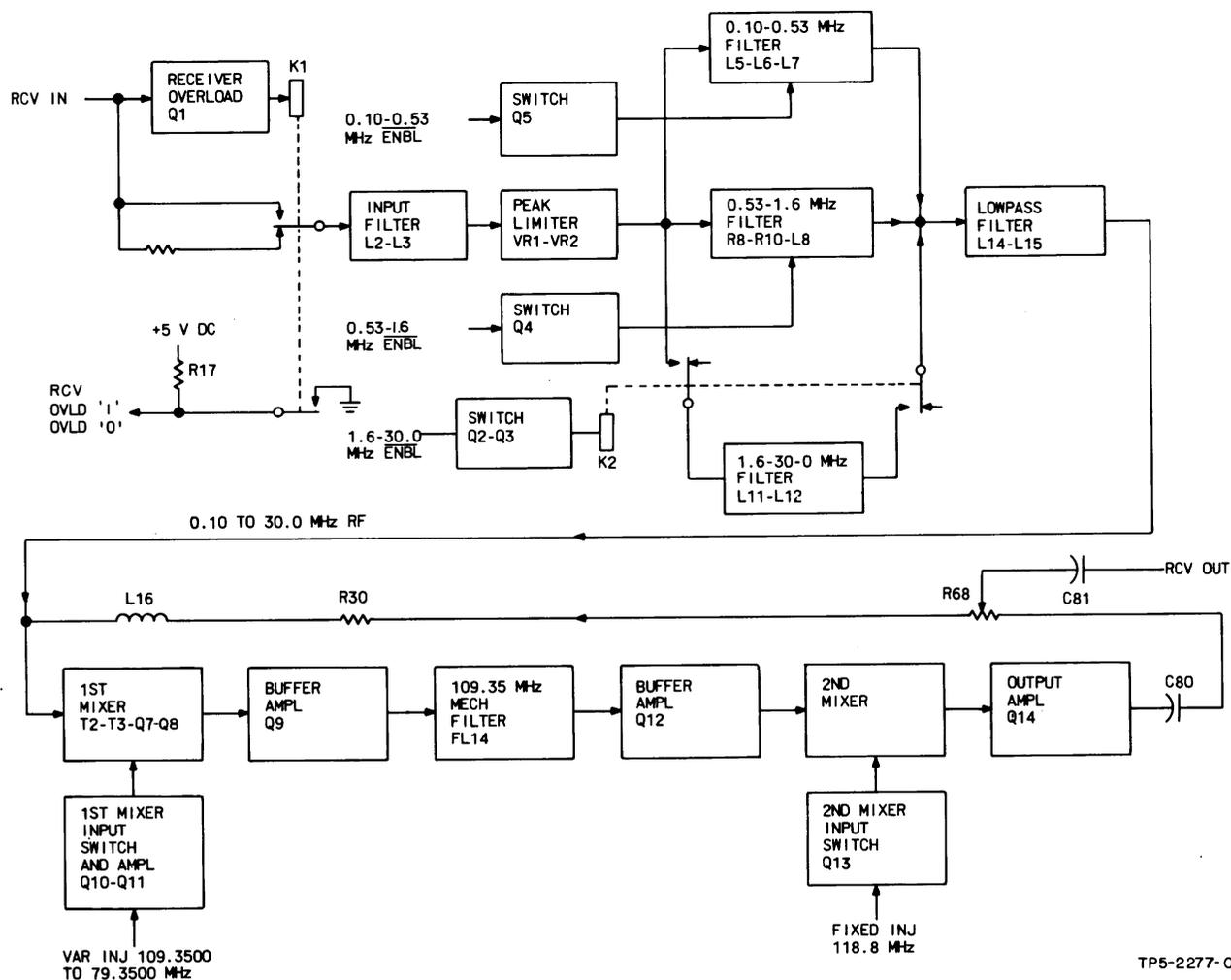
TP5-2345-017

RF Translator  
Figure 1

The bandpass filter is selected by the receiver frequency control. Enable signals from the receiver frequency control enable filter L5-L7 for 100- to 530-kHz (0.10- to 0.53-MHz) operation; enable filter R8-R10-L8 for 530-kHz to 1.6-MHz (0.53- to 1.6-MHz) operation; and energize K2 to enable filter L11-L12 for 1.6- to 30.0-MHz operation.

The signal from K1 is supplied through the selected bandpass filter and through low-pass filter L14-L15 to the grounded gate balanced FET first mixer circuit T1-T2, Q7-Q8.

In the first mixer the 100-kHz to 30.0-MHz signal is mixed with a 109.3500- to 79.3500-MHz variable injection signal to provide a 109.35-MHz if signal. This signal is supplied through source follower FET buffer amplifier Q9, mechanical filter FL14, and a second source follower FET buffer amplifier Q12 to the second mixer circuit.



Functional Block Diagram  
Figure 2

In the second mixer the 109.35-MHz if signal is mixed with a 118.8-MHz fixed injection signal to provide a 9.45-MHz receive if output signal. The receive if output signal is supplied through output amplifier Q14, receive output switch CR24-CR25, and output control R68, to the rf translator receive if output.

### 2.3 RF Mixer SRA-1 (Refer to figure 3.)

The SRA-1 is a broadband ring modulator mixer device used in 50-ohm rf/lf applications.

## 3. TESTING/TROUBLESHOOTING PROCEDURES

### 3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the rf translator module are

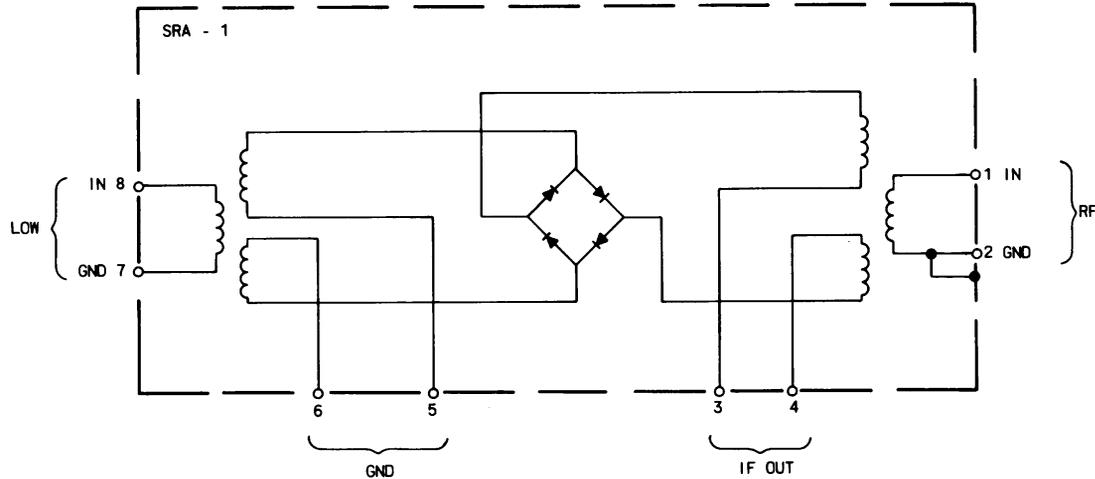
listed in the maintenance section of this instruction book.

### 3.2 Testing

The test procedures in table 1 check total performance of the rf translator module. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

**Note**

In emergencies, RF Translator 637-1767-001 can be replaced by RF Translator 635-4903-001. In this type of repair, use the test procedures given in table 1 to test RF Translator 635-4903-001.



**CHARACTERISTICS**

PEAK INPUT POWER: 50 mW MAX.  
 PEAK CURRENT, ANY PORT: 40 mA MAX.  
 FREQUENCY RANGE (MHz):  
 LOW - 0.5 TO 500  
 RF - 0.5 TO 500  
 IF - DC TO 500  
 CONVERSION LOSS: 6.5 dB TYPICAL,  
 8.5 dB MAX. (SIGNAL AT IF PORT,  
 OUTPUT AT RF PORT)  
 TEST CURRENT WHEN CHECKING  
 CONTINUITY MUST NOT EXCEED 20 mA.

ISOLATION (dB):  
 LOW BAND EDGE;  
 LOW TO RF - 35 dB MIN.  
 LOW TO IF - 30 dB MIN.  
 MID-RANGE;  
 LOW TO RF - 30 dB MIN.  
 LOW TO IF - 25 dB MIN.  
 UPPER BAND EDGE;  
 LOW TO RF - 25 dB MIN.  
 LOW TO IF - 20 dB MIN.

TP5-2278-013

*RF Mixer SRA-1  
 Figure 3*

*Table 1. RF Translator, Testing and Troubleshooting Procedures.*

| TEST     | PROCEDURE   | NORMAL INDICATION   | IF INDICATION IS ABNORMAL      |
|----------|---|---|--------------------------------|
| 1. Setup | a. Remove top cover of unit containing the rf translator that is to be tested.<br>b. Remove rf translator. Install rf translator on extender and place it in the unit.<br>c. Set unit LINE SELECTOR switch to 115 V.<br>d. Connect unit to 115-V ac power source and set power on.<br>e. Measure dc voltages between the following pins and ground (P1-1, 28, 29, 56):<br><br>P1-25<br>P1-53<br>P1-23<br>P1-51<br>P1-27<br>P1-6 | } +24.0 ±1.0 V dc<br>} +15.0 ±1.0 V dc<br>+5.0 ±0.2 V dc<br>-15.0 ±1.0 V dc | Check associated power supply. |

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

| TEST                                  | PROCEDURE   | NORMAL INDICATION   | IF INDICATION IS ABNORMAL  |
|---------------------------------------|---|---|--|
| <p>2. Receiver SSB sensitivity</p>    | <p>a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to USB.</p> <p>b. Connect an rf signal generator to J1 (RW ANT jack on rear panel).</p> <p>c. Connect an audio vtm to A6TP2 (SSB audio).</p> <p>d. Set the rf signal generator to 250.0 kHz and receiver front panel frequency controls to 249.0 kHz.</p> <p>e. Set the rf signal generator level at 0.00 <math>\mu</math>V.</p> <p>f. Note noise level on audio vtm.</p> <p>g. Adjust rf signal generator level to 0.30 <math>\mu</math>V and note signal level on audio vtm.</p> <p>h. Repeat steps e, f, and g with rf signal generator at each of the following frequencies:<br/>(receiver front panel frequency controls set 1000 Hz below each frequency given).</p> <p>500 kHz</p> <p>1.0 MHz</p> <p>1.6 MHz</p> <p>5.0 MHz</p> <p>10.0 MHz</p> <p>15.0 MHz</p> <p>20.0 MHz</p> <p>25.0 MHz</p> <p>30.0 MHz</p> | <p>Reference</p> <p>NLT 2 dB above reference</p> <p><b>Note</b></p> <p>Signal strength of step g varies with frequency.</p> <p>NLT 3 dB above reference</p> <p>NLT 3 dB above reference</p> <p>NLT 10.5 dB above reference</p> | <p>Check M1, Q14, Q12, FL14, Q9, Q8, Q7, Q5, and associated circuits.</p> <p>Same as step g.</p> <p>Check Q4 and associated circuits. Check Q2, Q3, K2, and associated circuits.</p> <p>Same as 1.6 MHz.</p> |
| <p>3. Receiver gain</p> <p>(Cont)</p> | <p>a. Connect an rf signal generator to J1 (RCV ANT jack on rear panel).</p> <p>b. Connect an rf vtm (with 50-<math>\Omega</math> load) to J3.</p> <p>c. Set the rf signal generator and receiver front panel frequency controls to 1.600 MHz.</p> <p>d. Set the rf signal generator level at -30 dB mW.</p>  |   |  |









## 4. ALIGNMENT/ADJUSTMENT

### 4.1 Receiver Alignment (Adjustment of T3, L24, L26, and L29)

- Connect an rf signal generator through a 6-dB load to J1 (RCV ANT jack on rear panel).
- Connect an rf vtvm (with 50- $\Omega$  load) to J3.
- Set input to J1 at 15.0000 MHz and -30 dB mW.
- Set front panel controls for 15 000.0 kHz.
- Set R68 (receive gain) at full counterclockwise position.
- Adjust T3, L24, L26, and L29 for maximum output, as indicated by vf vtvm.
- Perform step f a minimum of three times.

### 4.2 Mixer Balance (Adjustment of R31)

- Use a dvm with a 10- $\mu$ H choke in series with a test probe to measure voltage readings at T2-2 and T2-5 to ground.
- Adjust R31 for equal dc voltage reading at T2-2 and T2-5 to ground.

### 4.3 Injection Level Adjustment (Adjustment of T4)

- Connect an rf vtvm (set to 10-V scale) between T2-1 and ground.
- Vary input frequency from 2.0 to 29.9 MHz, and note that voltage varies between 3.0 and 7.0 V rms and that the higher voltage readings occur between 27 and 29.9 MHz.
- If voltage exceeds the limits of step b or is higher at other than 27 to 29.9 MHz, adjust slug of T4 to achieve the desired levels.

### 4.4 Translator Gain Adjustment (Adjustment of R68, T1, and T2)

- Set the rf signal generator for 15.000 00 MHz at -30 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Connect an rf vtvm (with 50- $\Omega$  load) to J3.
- Adjust R68 for -10-dB mW reading on the rf vtvm.
- Set the rf signal generator for 29.9000 MHz at -30 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Using a pointed plastic tool, carefully adjust the leads and windings of T1 and T2 for maximum reading on the rf vtvm.

**Note**

The objective is to make the output at 29.900 00 MHz as large as possible with an output difference between 29.900 00 and 15.000 00 MHz of not more than 1.0 dB.

- Repeat steps c, d, and e until no improvement is possible.

### 4.5 Final Noise Balance (Adjustment of R31)

- Set the front panel frequency controls for 15 000.00 kHz and disconnect the rf signal generator.
- Connect an audio voltmeter to the channel A if SSB audio output. Reference the background noise level on the audio voltmeter.
- Adjust R31 (20-turn potentiometer) for a minimum noise level. Make this adjustment very slowly to assure a true minimum.

### 4.6 T1 and T2 Position Fixing

**Note**

If T1 and T2 require position fixing, it is recommended that the rf translator be returned to the factory. If field repair of T1 and T2 is desired, the following procedures may be used. Do not make these adjustments unless repair has been made to the T1 and/or T2 area of the rf translator.

- Set the rf signal generator for 29.900 00 MHz at -24 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Connect an rf vtvm (with 50- $\Omega$  load) to J3. Reference the rf vtvm reading.
- Using a pipe cleaner, carefully apply a very thin coat of Q-Max to the windings of T1 and T2 and the support rods that hold T1 and T2 in position.
- After Q-Max is applied, it may be necessary to slightly readjust wires for maximum output. Refer to paragraph 4.4.

## 5. REPAIR

Repair of the rf translator module is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

## 6. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram, figure 4. The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

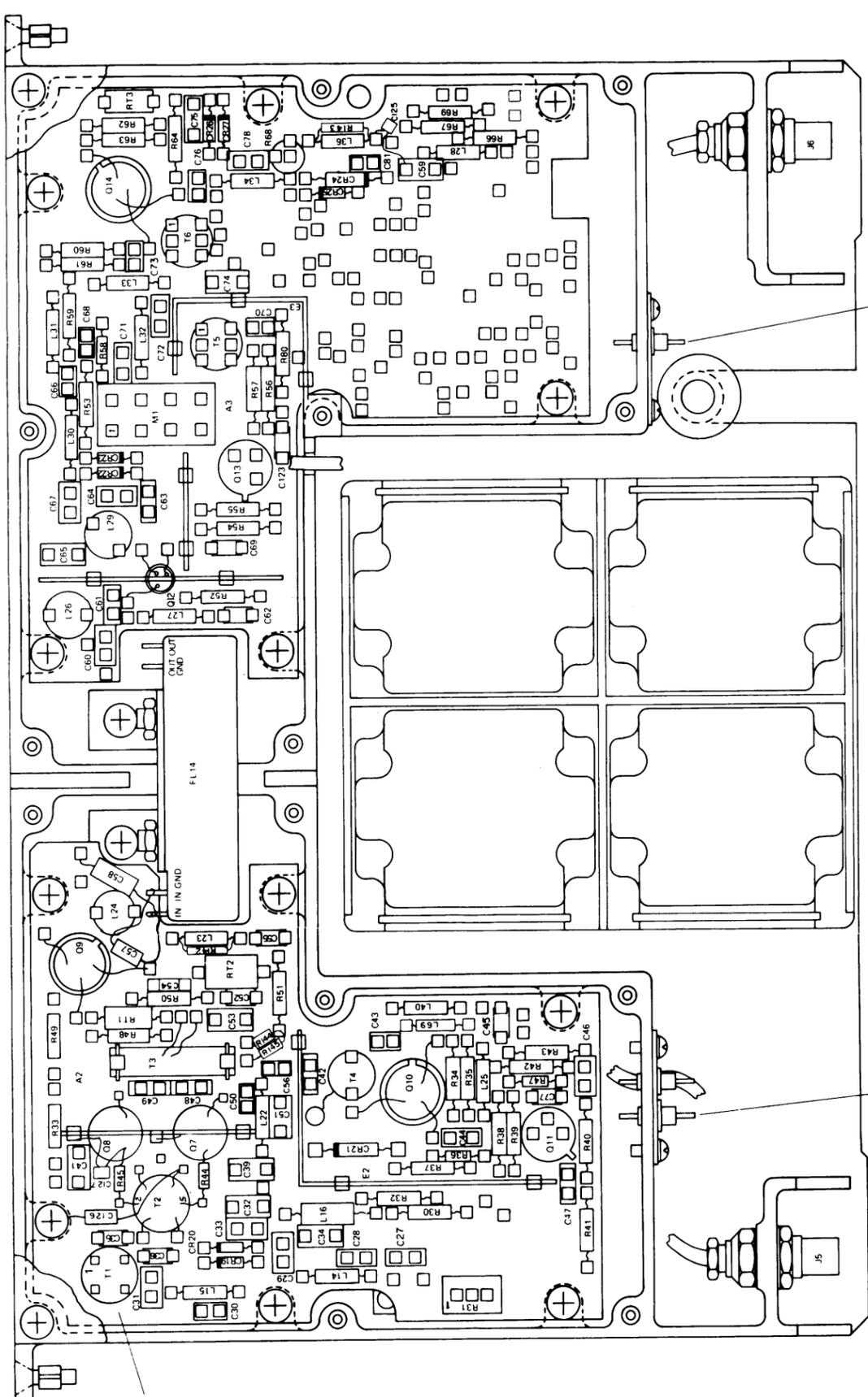
Use the reference designator indicated on schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed

in the EFFECTIVITY column of the modification history.

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

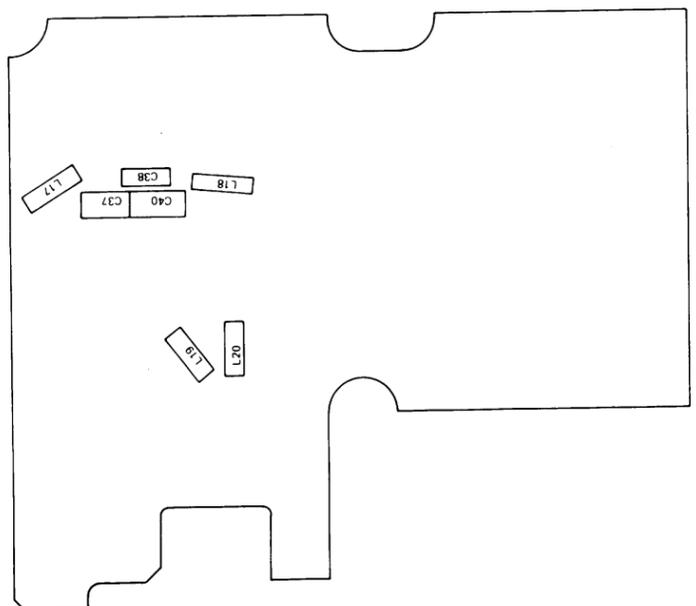
| <u>CIRCUIT CARD/<br/>SUBASSEMBLY</u> | <u>COLLINS<br/>PART<br/>NUMBER</u> | <u>LATEST<br/>EFFECTIVITY</u> |
|--------------------------------------|------------------------------------|-------------------------------|
| Rf translator module                 | 637-1767-001                       | REV P                         |
| Rf translator module                 | 637-1767-002                       | REV P                         |
| Rf filter board A1                   | 635-0780-002                       | REV H                         |
| First mixer board A2                 | 635-0782-002                       | REV L                         |
| Second mixer board A3                | 635-0784-002                       | REV J                         |



SEE DETAIL A

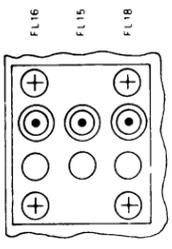
SEE DETAIL C

SEE DETAIL B

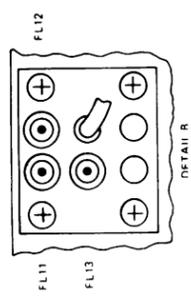


DETAIL A

TP5-1239-039

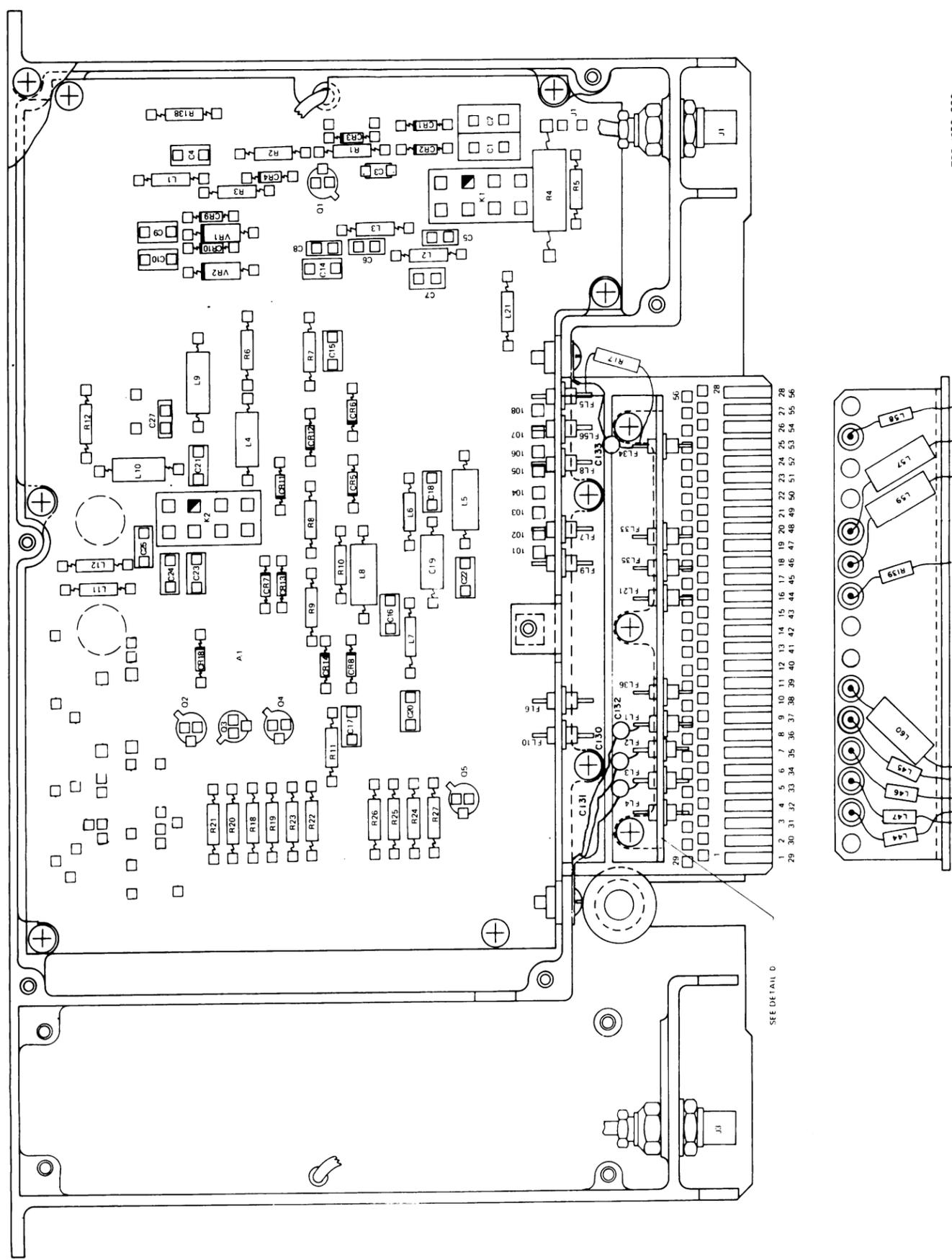


TP5-1239-039



RF Translator, Schematic Diagram  
Figure 5 (Sheet 1 of 6)





TP5-1239-029

DETAIL D

RF Translator, Schematic Diagram  
Figure 5 (Sheet 3)

PARTS LIST (Cont)

| REF DES    | DESCRIPTION                                | COLLINS PART NO | USABLE ON CODE |
|------------|--|-----------------|----------------|
| R37        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0728-000    |                |
| R38        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0892-000    |                |
| R39        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0728-000    |                |
| R40        | RESISTOR, FXD, CMPNS, 180Ω, 10%, 1/4W      | 745-0898-000    |                |
| R41        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0728-000    |                |
| R42        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0764-000    |                |
| R43        | RESISTOR, FXD, CMPNS, 2.7kΩ, 10%, 1/4W     | 745-0755-000    |                |
| R44, R45   | RESISTOR, FXD, CMPNS, 180Ω, 10%, 1/8W (A7) | 745-2277-000    |                |
| R46        | RESISTOR, FXD, CMPNS, 220Ω, 5%, 1/8W       | 745-1863-090    |                |
| R47        | NOT USED                                   |                 |                |
| R47        | RESISTOR, FXD, CMPNS, 820Ω, 10%, 1/8W (A5) | 745-2301-000    |                |
| R47        | RESISTOR, FXD, CMPNS, 880Ω, 10%, 1/8W      | 745-2298-000    |                |
| R47        | RESISTOR, FXD, CMPNS, 880Ω, 10%, 1/4W      | 745-0707-000    |                |
| R48        | RESISTOR, FXD, CMPNS, 900Ω, 10%, 1/4W      | 745-0734-000    |                |
| R49        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0892-000    |                |
| R50        | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0701-000    |                |
| R51        | RESISTOR, FXD, CMPNS, 470Ω, 10%, 1/4W (A5) | 745-0713-000    |                |
| R51        | RESISTOR, FXD, CMPNS, 1000Ω, 10%, 1/4W     | 745-0713-000    |                |
| R52, R141  | NOT USED                                   |                 |                |
| R142       | RESISTOR, FXD, CMPNS, 2.2kΩ, 5%, 1/8W (A1) | 745-1863-570    |                |
| R143       | NOT USED                                   |                 |                |
| R144, R145 | RESISTOR, FXD, CMPNS, 1100Ω, 5%, 1/8W (A5) | 745-1863-280    |                |
| T1         | TRANSFORMER, RF                            | 278-0430-180    |                |
| T2         | TRANSFORMER, RF                            | 278-0430-180    |                |
| T3         | TRANSFORMER, RF                            | 278-0431-020    |                |
| T4         | TRANSFORMER, RF                            | 278-0431-010    |                |
|            | SECOND MIXER BOARD A3635-0784-002          |                 |                |

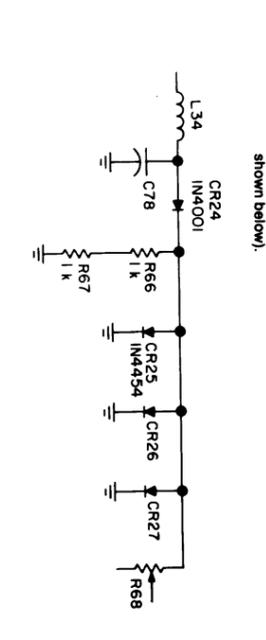
PARTS LIST (Cont)

| REF DES  | DESCRIPTION                                | COLLINS PART NO | USABLE ON CODE |
|----------|--|-----------------|----------------|
| L29      | COIL, RF, VAR                              | 242-0439-020    |                |
| L30      | COIL, RF, 2.70μH                           | 240-2028-000    |                |
| L31      | COIL, RF, 27μH                             | 240-2040-000    |                |
| L32, L33 | COIL, RF, 0.15μH                           | 240-2013-000    |                |
| L34      | COIL, RF, 0.39μH (A4)                      | 240-2017-000    |                |
| L34      | COIL, RF, 0.33μH (A9)                      | 240-2017-000    |                |
| L34      | COIL, RF, 0.27μH                           | 240-2016-000    |                |
| L35      | NOT USED                                   |                 |                |
| L36      | COIL, RF, 220μH (A4)                       | 240-2723-080    |                |
| M1       | MIXER, RF                                  | 277-0405-010    |                |
| Q1-Q11   | NOT USED                                   |                 |                |
| Q12      | TRANSISTOR, FET, U310                      | 352-1042-010    |                |
| Q13      | TRANSISTOR, 2N5109                         | 352-0766-010    |                |
| Q14      | (SEE 637-1767-001)                         |                 |                |
| RT1, RT2 | NOT USED                                   |                 |                |
| RT3      | RESISTOR, THRM, 400Ω, 10%, 0.5W            | 714-1725-000    |                |
| R1-R51   | NOT USED                                   |                 |                |
| R52      | RESISTOR, FXD, CMPNS, 470Ω, 10%, 1/4W      | 745-0701-000    |                |
| R53      | RESISTOR, FXD, CMPNS, 680Ω, 10%, 1/4W      | 745-0707-000    |                |
| R54      | RESISTOR, FXD, CMPNS, 470Ω, 10%, 1/4W      | 745-0737-000    |                |
| R55      | RESISTOR, FXD, CMPNS, 270Ω, 10%, 1/4W      | 745-0892-000    |                |
| R56, R57 | RESISTOR, FXD, CMPNS, 2.7kΩ, 10%, 1/4W     | 745-0764-000    |                |
| R58      | RESISTOR, FXD, CMPNS, 560Ω, 10%, 1/8W      | 745-2295-000    |                |
| R59      | RESISTOR, FXD, CMPNS, 560Ω, 10%, 1/4W      | 745-0704-000    |                |
| R60, R61 | RESISTOR, FXD, CMPNS, 2.7kΩ, 10%, 1/4W     | 745-0892-000    |                |
| R62      | RESISTOR, FXD, CMPNS, 470Ω, 5%, 1/4W       | 745-0482-000    |                |
| R63      | RESISTOR, FXD, CMPNS, 150Ω, 10%, 1/4W      | 745-0893-000    |                |
| R64      | RESISTOR, FXD, CMPNS, 150Ω, 10%, 1/4W      | 745-0719-000    |                |
| R65      | NOT USED                                   |                 |                |
| R66, R67 | RESISTOR, FXD, CMPNS, 1kΩ, 10%, 1/4W (A3)  | 745-0749-000    |                |
| R68      | RESISTOR, VAR, 1000Ω, 30%, 1/2W            | 382-0008-040    |                |
| R69      | RESISTOR, VAR, 1000Ω, 30%, 1/2W            | 745-0728-000    |                |
| R70-R79  | NOT USED                                   |                 |                |
| R80      | RESISTOR, FXD, CMPNS, 820Ω, 10%, 1/4W (A4) | 745-0710-000    |                |
| R81-R142 | NOT USED                                   |                 |                |
| R143     | RESISTOR, FXD, CMPNS, 680Ω, 10%, 1/4W      | 745-0707-000    |                |
| T1-T4    | NOT USED                                   |                 |                |
| T5       | TRANSFORMER, RF                            | 278-0430-170    |                |
| T6       | TRANSFORMER, RF                            | 278-0430-150    |                |

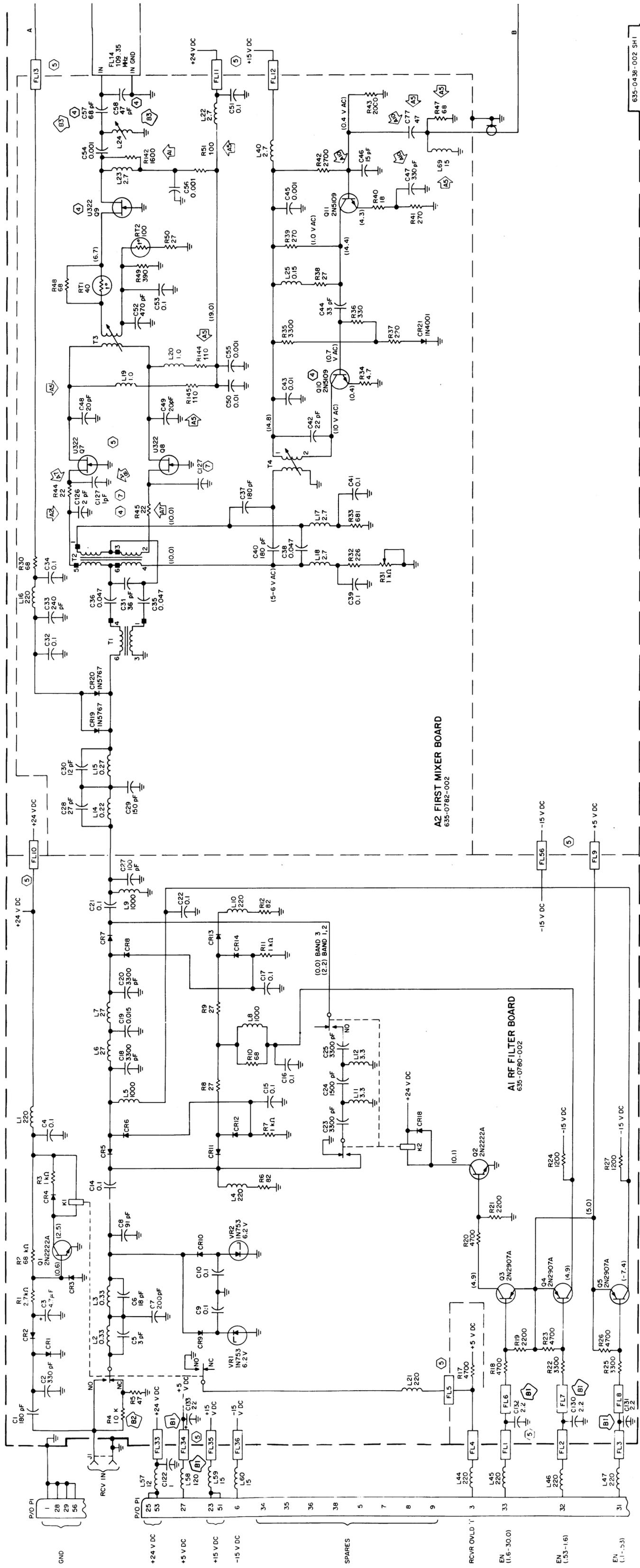
MODIFICATION HISTORY (Cont)

| REVISION IDENT | DESCRIPTION OF REVISION AND REASON FOR CHANGE   | EFFECTIVITY                   |
|----------------|---|-------------------------------|
| A4             | Deleted A3L36, 220μH (replaced with A3R143).<br>Added A3C125, 4700pF.<br>Added A3R143, 220Ω.<br>Changed:<br>A3C61 from 33pF to 27pF.<br>A3C73 from 0.01μF to 0.1μF.<br>A3L34 from 0.39μH to 0.33μH.<br>A3R80 from 47Ω to 68Ω.   | 635-0784-002, REV C and above |
| A5             | Added A2L69, 15μH.<br>Added A2R144, 110Ω.<br>Added A2R145, 110Ω.<br>Changed:<br>A2C48 from 18pF to 20pF.<br>A2C49 from 18pF to 20pF.<br>A2C77 from 1000pF to 36pF.<br>A2L19 from 2.7μH to 1.0μH.<br>A2L20 from 2.7μH to 1.0μH.<br>A2R47 from 820 to 680.<br>A2R51 from 47Ω to 100Ω. | 635-0782-002, REV F and above |
| A6             | Changed A3C65 from 1000pF to 220pF.   | 635-0784-002, REV D and above |
| A8             | Added C127, test select of 1pF or 2pF.  | 637-1767-001, REV H and above |
| A9             | Changed A3L34 from 0.33μH to 0.27μH.  | 635-0784-002, REV G and above |
| A10            | Changed:<br>A2C46 from 5pF to 15pF.<br>A2C47 from 51pF to 33pF.<br>A2C77 from 36pF to 47pF.   | 635-0782-002, REV K and above |
| B1             | Added C130, 2.2μF, electrolytic.<br>Added C131, 2.2μF electrolytic.<br>Added C132, 2.2μF electrolytic.<br>Added C133, 22μF electrolytic.<br>Changed L58 from 4.7μH to 120μH.  | 637-1767-001 REV K and above  |
| B2             | Changed A1R4 from 2200Ω to 15kΩ.  | 635-0780-002 REV H and above  |
| B3             | Changed:<br>C57 from 56pF to 88pF.<br>C58 from 56pF to 47pF.  | 637-1767-001 REV P and above  |
| A3             | Deleted A3CR24, 1N4001; A3CR25, 1N4454; A3R66, 1kΩ; and A3R67, 1kΩ (circuit was as shown below).  | 635-0784-002, REV C and above |
| A2             | Added C126, test select of 2pF to 6pF.  | 637-1767-001, REV C and above |
| A1             | Added A2R142, 2200Ω.  | 635-0782-002, REV E and above |

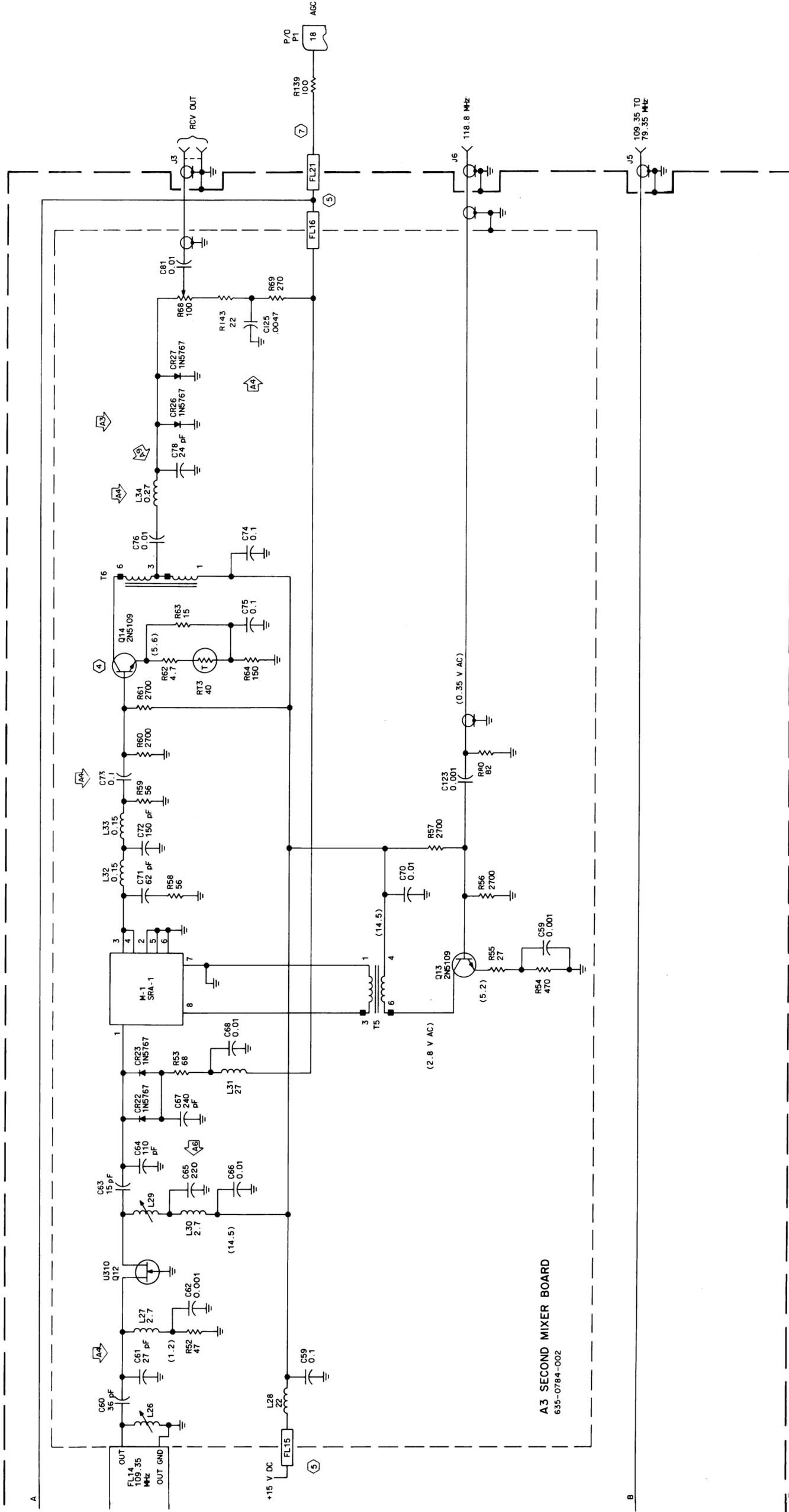
MODIFICATION HISTORY



RF Translator, Schematic Diagram  
Figure 5 (Sheet 4)



RF Translator, Schematic Diagram  
Figure 5 (Sheet 5)



- NOTES:
- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
  - ② UNLESS OTHERWISE SPECIFIED, DIODES ARE TYPE 1N434A.
  - ③ PARTIAL REFERENCE DESIGNATIONS ARE SHOWN FOR COMPLETE DESIGNATION PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
  - ④ INSTALLED ON NEXT HIGHER ASSEMBLY (637-1767-001).
  - ⑤ ALL FILTERS ARE 1750 PF, EXCEPT BANDPASS FILTER FL14.
  - ⑥ U322, A207 AND A208, MATCHED SET.
  - ⑦ TEST SELECT: R139 FROM 82Ω TO 270Ω, C126 FROM 2PF TO 6PF OR REMOVED (A2) C127 FROM 1PF OR 2PF OR REMOVED (A2)

RF Translator, Schematic Diagram  
Figure 5 (Sheet 6)