PRO-2020

PLL SYNTHESIZED
VHF/UHF AM/FM RECEIVER

Catalog Number: 20-112

Manual provided by G.E. Taylor, scanned by L.P. Glaister VE7IT
GENERAL OPERATION OUTLINE

Turn Power SW ON
Automatically set to SCAN mode and start scanning when the SQ is on.

Press MANUAL.
When MANUAL is pressed again the channel advances.
To select channel 1 thru 20, enter number (via key board) and press MANUAL.

Press PROGRAM to set to program mode.

Program the desired frequency in each channel as follows:

Key-in the desired frequency with numeral keys.

Press ENT to memorize the frequency.
If wrong frequency (out of band) is entered, display shows 0 0 0 0 0.
Press CLEAR to clear.

Press PROGRAM.
Advances to next channel, key-in the frequency and press ENT; repeat to memorize desired frequencies, one by one.

Press LIMIT and key-in lower frequency with numeral keys.

Press ENT.

Press LIMIT and key-in upper frequency.

Press ENT.

Press ▲ to search from lower frequency. Press ▼ to search from upper frequency.
Squelch must be on.

Press PRIORITY; if SQUELCH is ON, starts priority function.
If SQUELCH is OFF, set to the priority channel.

Press PRIORITY to clear priority.
DISASSEMBLY DIAGRAM

Step 1: Remove two bracket screws (A) and the bracket (B).

Step 2: Remove four screws (C) two from each side of the Cabinet.

Step 3: Remove two screws (D) from back of cabinet.

Step 4: Open the cabinet. Use care not to damage leads of speaker installed on the cabinet.
ALIGNMENT AND TEST POINT POSITIONS

[Diagram showing alignment points]

ALIGNMENT PREPARATION

Test equipment required
1. Oscilloscope (0 ~ 500 kHz, 0 ~ 50 MHz)
2. AC VTVM
3. DC VTVM
4. Frequency Counter (60 MHz)
5. 8 ohm dummy load
6. Slow Sweep Generator with variable marker (10.7 MHz)
7. VHF Sweep Generator with variable marker (30 ~ 50 MHz, *68 ~ 88 MHz, 108 ~ 174 MHz)
8. UHF Sweep Generator with variable marker (410 ~ 512 MHz)
9. FM Signal Generator (30 ~ 50 MHz, *68 ~ 88 MHz, 138 ~ 174 MHz, 410 ~ 512 MHz)
10. AM Signal Generator (108 ~ 136 MHz)

NOTE 1: Use non-metallic tuning tools.
The test equipment and Receiver should be warmed up at least 10 minutes before proceeding with alignment.
Input signal from the Generator should be kept as low as possible and still obtain usable output.

NOTE 2: A 9-volt battery is required to hold the memory when AC is disconnected. Always be sure the unit is loaded with a fresh 9-volt battery or the pre-programmed channels will be lost (and will have to be re-programmed).

NOTE 3: For servicing VHF Mid band of European/Australian models, see Appendix on pages 41 and 42.
REFERENCE FREQUENCY OSC ALIGNMENT

Step 1: Connect Frequency Counter to TP1 and ground. Connect the ground first to prevent IC-8 latch-up.
Step 2: Adjust TC-1 so that the frequency is 6.40000 MHz ±10 Hz.

NOTE 1: If 6.4 MHz fails to oscillate, it may be due to IC-8 latch-up.
Unplug the power connector momentarily to turn power supply completely off.

IF SECTION ALIGNMENT

Step 1: Connect instruments as shown below.

Step 2: Adjust T105 so that the frequency is 6.40000 MHz ±10 Hz.

NOTE: If 6.4 MHz fails to oscillate, it may be due to IC-8 latch-up.
Unplug the power connector momentarily to turn power supply completely off.

VCO ALIGNMENT

VHF LO BAND
Step 1: Connect a DC VTVM to TP104 and ground.
Step 2: Program CH1, 2 and 3 as follows:
CH1 (30 MHz), CH2 (40 MHz), CH3 (50 MHz).
Step 3: Select Channel 3 (50 MHz) and adjust TC-101 for 9.0V on the DC VTVM.
Step 4: Select Channel 1 (30 MHz) and adjust T103 for 1.0V on the DC VTVM.
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should show as below.

30 MHz Voltage at TP104 1.0V
40 MHz Voltage at TP104 3.4 ± 0.3V
50 MHz Voltage at TP104 9.0V

VHF HI BAND AND AIRCRAFT
Step 1: Connect a DC VTVM to TP104 and ground.
Step 2: Program CH1, 2, 3, 4, 5 and 6 as follows.
CH1 (108 MHz), CH2 (120 MHz), CH3 (136 MHz), CH4 (138 MHz), CH5 (160 MHz), CH6 (174 MHz).
Step 3: Select Channel 6 (174 MHz) and adjust TC102 for 8.0V on the DC VTVM.
Step 4: Select Channel 1 (108 MHz) and adjust L107 for 1.0V on the DC VTVM.
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should show as below.

108 MHz Voltage at TP104 1.0V
120 MHz Voltage at TP104 2.1 ± 0.3V
136 MHz Voltage at TP104 3.6 ± 0.3V
138 MHz Voltage at TP104 1.8 ± 0.3V
160 MHz Voltage at TP104 3.9 ± 0.3V
174 MHz Voltage at TP104 8.0V
UHF BAND
Step 1: Connect a DC VTVM to TP-104 and ground.
Step 2: Program CH1, 2 and 3 as follows:
   - Ch1 (410 MHz), CH2 (430 MHz), CH3 (512 MHz).
Step 3: Select Channel 3 (512 MHz) and adjust TC-106 for 9.0V on the DC VTVM.
Step 4: Select Channel 1 (410 MHz) and adjust L111 for 1.0V on the DC VTVM.
Step 5: Repeat steps 3 and 4 until no improvement is observed. The DC VTVM should show as below.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Voltage at TP-104</th>
</tr>
</thead>
<tbody>
<tr>
<td>410 MHz</td>
<td>1.0V</td>
</tr>
<tr>
<td>430 MHz</td>
<td>1.8 ± 0.3V</td>
</tr>
<tr>
<td>512 MHz</td>
<td>9.0V</td>
</tr>
</tbody>
</table>

RF AMP ALIGNMENT

VHF LO BAND
Step 1: Connect instruments as shown below.

ANT. JACK
UNIT UNDER TEST
SWEEP GENERATOR 30 MHz ~ 50 MHz

TP-101
SCOPE

Step 2: Program 30 MHz (CH1), 40 MHz (CH2) and 50 MHz (CH3).
Step 3: Select Channel 2 (40 MHz) and adjust T101 and T102 for maximum RF waveform.
Step 4: Check Channels 1 ~ 3 for the maximum RF waveform. A slight deviation (as shown below) is acceptable.

VHF HI AND AIRCRAFT
Step 1: Connect instruments as shown below.

ANT. JACK
UNIT UNDER TEST
SWEEP GENERATOR 108 MHz ~ 174 MHz

TP-102
SCOPE
Step 2: Program 108 MHz (CH1), 120 MHz (CH2), 136 MHz (CH3), 138 MHz (CH4), 160 MHz (CH5) and 174 MHz (CH6).

Step 3: Select Channel 1 (108 MHz) and adjust L104 and L106 for maximum RF waveform.

Step 4: Select Channel 5 (160 MHz) and adjust L103 and L105 for maximum RF waveform.

Step 5: Repeat steps 3 and 4 to obtain the maximum RF waveform for each channel.

Step 6: Check Channels 1 ~ 6 for the maximum RF waveform at each frequency marker. A slight deviation (as shown below) is acceptable.

UHF BAND

Step 1: Connect instruments as shown below.

Step 2: Program 410 MHz (CH1), 430 MHz (CH2) and 512 MHz (CH3).

Step 3: Select Channel 2 (430 MHz) and adjust TC-103, TC-104, and TC-105 for maximum RF waveform.

Step 4: Select Channel 3 (512 MHz) and adjust TC-107 for maximum RF waveform.

Step 5: Check Channels 1 ~ 3 for the maximum RF waveform at each frequency marker. A slight deviation (as shown below) is acceptable.
OVERALL ALIGNMENT AND SENSITIVITY MEASUREMENT

Step 1: Connect Signal Generator (SSG) to ANTenna jack and AC VTVM to EXT. SPKR Jack.
Step 2: Turn SQUELCH fully counterclockwise. Set for reception of the channels noted in the following chart.
Set the SSG to the center of each band.

<table>
<thead>
<tr>
<th>CH</th>
<th>BAND</th>
<th>FREQ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VHF LO (MID)</td>
<td>40 MHz (78 MHz)</td>
</tr>
<tr>
<td>2</td>
<td>VHF HI</td>
<td>160 MHz</td>
</tr>
<tr>
<td>3</td>
<td>UHF</td>
<td>512 MHz</td>
</tr>
<tr>
<td>4</td>
<td>AIRCRAFT</td>
<td>120 MHz</td>
</tr>
</tbody>
</table>

Step 3: Set the Signal Generator frequency to 512 MHz (channel 3). Readjust TC-107 for maximum sensitivity.
Step 4: Set the Signal Generator frequency to 120 MHz (channel 4). Adjust T104, T106 and T107 for maximum sensitivity.
Step 5: For each frequency/channel, set Signal Generator to each frequency (FM: 3 kHz deviation, AM: 60% modulation). Set VOLUME control for 0 dB (0.775 V) reading on the VTVM.
Step 6: Turn off the modulation and measure the (S + N)/N ratio.

ZEROMATIC FUNCTION AND HOW TO CHECK IT

* Zeromatic functions when OUTPUT 1 is in “H” level.

<table>
<thead>
<tr>
<th>e₁</th>
<th>0 &lt; e₁ &lt; e₃</th>
<th>e₃ &lt; e₁ &lt; e₂</th>
<th>e₂ &lt; e₁ &lt; Vcc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT 1 (Pin No. 2)</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>OUTPUT 1 (Pin No. 4)</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

To adjust e₁ voltage, receive signal in Manual mode, and set T105 to get half supply voltage (IC101, 4 pin). It is convenient to use the National Weather Service Signal for the adjustment.
In the event Zeromatic does not function right, refer to “REFERENCE FREQUENCY OSC ALIGNMENT” and check 6.4 MHz, and adjust T105 again.

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- 12 -
RESET TIMING (IC-1)

Pin No  5V
42  0V
    5V
31  0V

NOTE:
Pin 31 of IC-1 is the RESET terminal which functions at L level. It reverts to H level 2ms after Pin 42 VDD.

Figure 1

CPU CLOCK OSCILLATION WAVEFORM (IC-1)

Pin No  4V
27  0V

NOTE:
This is the basic waveform of CPU (IC-1). Ceramic Resonator (X-2) generates 400 kHz for about 2.5μs.

Figure 2

IC-3 INPUT/OUTPUT WAVEFORM

Pin No  5V
1  0V
    5V
5  0V

NOTE:
Waveform at Pin No. 5 is CPU (IC-1) interrupt signal. Must have above waveform or the CPU program malfunctions.

Figure 3
IC-4 INPUT/OUTPUT TIME CHART (150 MHz displayed, in Program Mode)

Pin No

1  5V  0V
3  5V  0V
INPUT 4  5V  0V
5  5V  0V
6  5V  0V
15 -26V
14  5V  0V
-26V
13  5V  0V
-26V
12  5V  0V
-26V
OUTPUT 11  5V  0V
-26V
10  5V  0V
-26V
9  5V  0V
-26V

0.12 ms  0.3 ms  1.3 ms  2.4 ms
IC-6 INPUT/OUTPUT TIME CHART (150 MHz displayed, in Program Mode)

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Input/Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>13</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>12</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>11</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>14</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>2</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>15</td>
<td>5V</td>
</tr>
<tr>
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<td>0V</td>
</tr>
<tr>
<td>1</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>6</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>7</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>4</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>9</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>5</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
</tbody>
</table>

- 2.6 ms  1.3 ms
- 11.7 ms
 PLL CLOCK AND DATA INPUT WAVEFORMS (IC-8)

*Measured during SCAN: 150 MHz displayed on CH1, CH2 ~ 20 are locked out.

Pin No

<table>
<thead>
<tr>
<th>CLOCK 21</th>
<th>5V</th>
<th>0V</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>5V</td>
<td>0V</td>
</tr>
<tr>
<td>18</td>
<td>5V</td>
<td>0V</td>
</tr>
</tbody>
</table>

Data

<table>
<thead>
<tr>
<th>DATA 17</th>
<th>5V</th>
<th>0V</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>5V</td>
<td>0V</td>
</tr>
</tbody>
</table>

0.13 ms

0.65 ms

320 ms

0.1 ms
MEMORY CHECK

POWER ON

Apply 150 MHz to CH1

Unplug AC/DC cords

Does Pin No. 22 of IC-2 show 2 ~ 5 Volts?

NO

YES

Plug in AC/DC cords

Is 150 MHz displayed on CH1?

NO

YES

Memory circuitry is OK

Is a pulse existing at Pin No. 1, 2, 3, and 4 of IC-1?

NO

YES

Defective IC-2 and/or associated circuitry

Defective CPU (IC-1) and/or IC-2

Defective D126 ~ 129 or battery

Apply 150 MHz to CH1

Is 150 MHz reception OK?

NO

YES

Defective IC-8

Press ENT KEY sequentially

Is a pulse existing at each Pin No. 9, 11, 13, 15, 19 and 20 of IC-2?

NO

YES

Defective CPU (IC-1), IC-9 and/or associated circuitry

150 MHz enters CH1 ~ 5 but is locked out in other CH

Press SCAN to turn SQ on
**RECEPTION CHECK**

**Table-1**

<table>
<thead>
<tr>
<th>IC-10 Pin No.</th>
<th>11</th>
<th>8</th>
<th>3</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ. BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOW or MID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>AIRCRAFT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HIGH</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>UHF</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTE:**

- 1 ± 7.6V
- 0 ± 6V

---

**Does power on properly?**

- **NO**
  - **YES**
  - **DO**
  - **NO**
  - **YES**
  - **DO**
  - **NO**
  - **YES**
  - **DO**
  - **NO**
  - **YES**
  - **END**

**Is Power Supply circuitry OK?**

- **Is DC-DC converter OK?**

**Are IC-1 clock oscillation waveform and reset OK?**

- **Does 6.4 MHz output exist at TP-1?**

**Is input/output waveform of IC-3 OK?**

- **Are IC-4, 5, 6 OK?**

**Are fluorescent indicators OK?**

- **Is IC-1 OK?**

**Is Noise Amp circuitry (consists of IC-101) OK?**

- **Is IF Amp or Noise Amp circuitry (consists of IC-102, 103) OK?**

- **Is SO circuitry (consists of IC-102,103) OK?**

**Is IC-1 OK?**

- Pin 22 stays at L level, and scan sticks at H level

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Manual provided by G.E. Taylor, scanned by L.P. Glaister VE7IT
## TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
</tr>
</thead>
</table>
| 1) Display does not light and no sound when POWER is on.               | 1) Faulty power cord.  
Volume control: MAX.  
Squelch control: counterclockwise (CCW)  
2) Defective power transformer.  
3) Defective power switch.  
4) Defective rectifier D131 or Polarity Protector D130.                |
| 2) Display lights but no sound.                                        | 1) Defective speaker or EXT. SPKR jack.  
Volume control: MAX.  
Squelch control: CCW  
2) Defective audio amplifier IC-105, Q128, 129 and/or associated circuit components.  
3) Defective IF amplifier IC-101 and/or associated circuit components.  
4) Defective functional squelch control and mute switching IC-102, 103 and/or associated circuit components. |
| 3) Sound but display does not light.                                   | 1) Defective DC—DC converter consisting of Q6, 7, 8, D8, 9, 10, 11.  
Volume control: MAX.  
Squelch control: CCW  
2) Defective fluorescent display tube.  
3) Defective DC—DC converter Transformer (T1).  
4) Defective voltage Regulator IC-107.  
5) Defective CPU (IC-1) or associated circuit components.                |
| 4) Does not scan and squelch does not operate.                         | 1) Defective Q119 and/or associated circuit components.  
2) Defective IC-1, D119 and/or associated circuit components.  
3) Defective squelch circuit consisting of IC-102, 103.                  |
| 5) Does not scan but squelch operates.                                 | 1) Faulty connection between Linear and Logic P.C.B.  
2) Defective Keyboard and/or associated circuit components.  
3) Defective IC-1, and/or associated circuit components.                  |
| 6) Displays incorrectly and/or unable to key in correctly.             | 1) Defective Keyboard and/or associated circuit.  
2) Defective CPU (IC-1) and/or associated circuit.  
3) Defective IC-4, 5, 6 and/or associated circuit.                        |
| 7) Displays correctly at the time of programming, but after scanning becomes faulty. | 1) Defective memory IC-2 and/or associated circuit.  
2) Defective IC-3, 9, 10 and/or associated circuit.  
3) Defective IC-1 and/or associated circuit.                              |
| 8) MANUAL scan operates but AUTO scan does not operate.                | 1) All channels are skipped (lockout).  
2) Squelch control is not adjusted right.                                |
| 9) "Zeromatic" does not operate or holds on a drifted frequency at search operation. | 1) Defective Q125, IC-104 in Zeromatic circuit.  
2) Discriminator coil is out of adjustment. TP-105 shall have 1/2 VCC (approx. 3.0V) in normal receiving mode.  
3) Is 6.4 MHz adjusted correctly?                                         |
| 10) All bands do not operate but display OK.                           | 1) Faulty connection between Linear and Logic PCBs.  
2) Defective Q8 ~ 11 in Low-pass filter.  
3) Defective IC-7, 8, 9, 10 and/or associated circuit.  
4) Defective D116, 117 and/or associated circuit.  
5) Defective Q112 and/or associated circuit.                              |
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>11) Low (Mid) band does not operate but Air, Hi, UHF band operate.</td>
<td>1) Defective Low band RF Amp, mixer and/or VCO circuit.</td>
</tr>
<tr>
<td></td>
<td>2) Defective IC-9, 10, Q117 and/or associated circuit.</td>
</tr>
<tr>
<td>12) Aircraft band does not operate but Low, High, UHF operate.</td>
<td>1) Defective D105, 107, Q114, 115 and/or associated circuit.</td>
</tr>
<tr>
<td></td>
<td>2) Defective AM IF Amp including Q120, 121, D120.</td>
</tr>
<tr>
<td>13) Aircraft and High band do not operate but Low, UHF band operate.</td>
<td>1) Defective Q104 ~ 106 in RF Amp mixer and/or in VCO circuit.</td>
</tr>
<tr>
<td></td>
<td>2) Defective Q114 ~ 116 in band switch circuit.</td>
</tr>
<tr>
<td>14) UHF band does not operate but Low Air, High band operate.</td>
<td>1) Defective Q108 ~ 111 in RF Amp mixer and/or VCO circuit.</td>
</tr>
<tr>
<td></td>
<td>2) Defective Q113 in band switch circuit.</td>
</tr>
</tbody>
</table>
IC101 MC3357 or MPS5071

IC-102 TC4016BP or HD14016BP

IC-103 TD62501P
SEMICONDUCTOR LEAD IDENTIFICATION

A) 3SK77 (GR) (BL)
B) 2SC1923(R)(O), 2SC1815(O),(Y)(GR), 2SA495(O), 2SA1015(O),(Y), 2SC2347, 2SC732(BL), 2SC1384(R)
B) or C) 2SC535 (B)
D) 2SC1117
DIODE IDENTIFICATION AND LEAD POLARITY

A) 1S2076A

B) 1N60

C) HZ5C-2, HZ9LC-3, HZ16L-1

D) 1SS81

E) 1SS85

F) 1S1588 (or HV-80)

G) S5277B

H) 1SV89B

I) FC-54
APPENDIX for VHF-MID Band for European/Australian models

VCO ALIGNMENT
Step 1: Connect a DC VTVM to TP-104 and ground
Step 2: Program CH1, 2 and 3 as follows:
   CH1 (68 MHz), CH2 (78 MHz), CH3 (88 MHz)
Step 3: Select channel 3 (88 MHz) and adjust TC-101 for 9.0V on the DC VTVM
Step 4: Select channel 1 (68 MHz) and adjust T103 for 1.0V on the DC VTVM
Step 5: Repeat steps 3 and 4 until no improvement is observed.
The DC VTVM should show as below.
   68 MHz Voltage of TP-104 1.0V
   78 MHz Voltage of TP-104 3.4V ±0.3V
   88 MHz Voltage of TP-104 9.0V

RF AMP ALIGNMENT
Step 1: Connect instruments as shown below.
Step 2: Program 68 MHz (CH1), 78 MHz (CH2), 88 MHz (CH3).
Step 3: Select Channel 1 (68 MHz) and adjust T101 and T102 for maximum RF waveform.
Step 4: Check the Channels 1 ~ 3 one by one for maximum RF waveform.
Slight deviation as shown below is tolerable.

PARTS LIST REVISION

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Value (µF)</th>
<th>Voltage (V)</th>
<th>Tolerance (%)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>C102</td>
<td>33pF</td>
<td>50</td>
<td>±10</td>
<td>Ceramic</td>
</tr>
<tr>
<td>C109</td>
<td>33pF</td>
<td>50</td>
<td>±10</td>
<td>Ceramic</td>
</tr>
<tr>
<td>C114</td>
<td>47pF</td>
<td>50</td>
<td>±10</td>
<td>Ceramic</td>
</tr>
<tr>
<td>C116</td>
<td>33pF</td>
<td>50</td>
<td>±10</td>
<td>Ceramic</td>
</tr>
<tr>
<td>C117</td>
<td>5pF</td>
<td>50</td>
<td>±0.5pF</td>
<td>Ceramic</td>
</tr>
<tr>
<td>C250</td>
<td>10pF</td>
<td>50</td>
<td>±0.5pF</td>
<td>Ceramic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R271</td>
<td>1.8MΩ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
<th>Substitute Type No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D103</td>
<td>Variable capacitor</td>
<td>not used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Type No.</th>
<th>RS Part No.</th>
<th>Substitute Type No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T101</td>
<td>RF Coil</td>
<td>GR-N653</td>
<td></td>
</tr>
<tr>
<td>T102</td>
<td>RF Coil</td>
<td>GR-N653</td>
<td></td>
</tr>
<tr>
<td>T109</td>
<td>Power Transformer</td>
<td>K6862</td>
<td></td>
</tr>
<tr>
<td>B.T.F.</td>
<td>Trap Filter</td>
<td>20LTR-141</td>
<td></td>
</tr>
<tr>
<td>AC Cord</td>
<td></td>
<td>HAR Class 2</td>
<td></td>
</tr>
</tbody>
</table>
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MID BAND RF SECTION SCHEMATIC DIAGRAM

LOGIC SECTION SCHEMATIC DIAGRAM

In mid band, pin 36 of IC-1 is wired as per dotted line.
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### SPECIFICATIONS

<table>
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<tr>
<th>Description</th>
<th>Nominal spec.</th>
<th>Limit spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency Coverage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VHF LOW (* or MID)</td>
<td>30 ~ 50 MHz</td>
<td>* or 68 ~ 88 MHz</td>
</tr>
<tr>
<td>AIRCRAFT</td>
<td>108 ~ 136 MHz</td>
<td>25 kHz steps</td>
</tr>
<tr>
<td>VHF HIGH</td>
<td>138 ~ 174 MHz</td>
<td>5 kHz steps</td>
</tr>
<tr>
<td>UHF</td>
<td>410 ~ 512 MHz</td>
<td>12.5 kHz steps</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VHF LOW (* or MID) FM</td>
<td>0.5 μV</td>
<td>2 μV</td>
</tr>
<tr>
<td>AIRCRAFT FM</td>
<td>1 μV</td>
<td>3 μV</td>
</tr>
<tr>
<td>VHF HIGH FM</td>
<td>0.5 μV</td>
<td>2 μV</td>
</tr>
<tr>
<td>UHF FM</td>
<td>1 μV</td>
<td>4 μV</td>
</tr>
<tr>
<td>MOD.: 60% at 1 kHz (S+N)/N = 20 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selectivity</td>
<td>±9 kHz</td>
<td>±12 kHz</td>
</tr>
<tr>
<td>Spurious Rejection</td>
<td>±15 kHz</td>
<td>±18 kHz</td>
</tr>
<tr>
<td>40 MHz (* or 78 MHz)</td>
<td>50 dB</td>
<td>40 dB</td>
</tr>
<tr>
<td>120 MHz</td>
<td>50 dB</td>
<td>40 dB</td>
</tr>
<tr>
<td>150 MHz</td>
<td>50 dB</td>
<td>40 dB</td>
</tr>
<tr>
<td>UHF (except primary image)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF Rejection</td>
<td>80 dB</td>
<td>40 dB</td>
</tr>
<tr>
<td>Modulation Acceptance</td>
<td>±7 kHz</td>
<td>±5 kHz</td>
</tr>
<tr>
<td>(EIA RS-204-A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal to Noise Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(AM: MOD. 60% at 1 kHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(FM: DEV. 3 kHz at 1 kHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VHF LOW (* or MID)</td>
<td>45 dB</td>
<td>30 dB</td>
</tr>
<tr>
<td>AIRCRAFT</td>
<td>40 dB</td>
<td>25 dB</td>
</tr>
<tr>
<td>VHF HIGH</td>
<td>40 dB</td>
<td>25 dB</td>
</tr>
<tr>
<td>UHF</td>
<td>35 dB</td>
<td>25 dB</td>
</tr>
<tr>
<td>Residual Noise (Vol. Min.)</td>
<td>3 mV</td>
<td>5 mV</td>
</tr>
<tr>
<td>Scanning Speed Fast</td>
<td>9 channels/sec.</td>
<td>6 ~ 12 channels/sec.</td>
</tr>
<tr>
<td>Slow</td>
<td>4 channels/sec.</td>
<td>3 ~ 7 channels/sec.</td>
</tr>
<tr>
<td>Search Rate Fast</td>
<td>9 steps/sec.</td>
<td>6 ~ 12 steps/sec.</td>
</tr>
<tr>
<td>Slow</td>
<td>4 steps/sec.</td>
<td>3 ~ 7 steps/sec.</td>
</tr>
<tr>
<td>Priority Sampling</td>
<td>2 sec.</td>
<td>1.5 ~ 2.5 sec.</td>
</tr>
<tr>
<td>Scan Delay Time</td>
<td>2 sec.</td>
<td>1 ~ 3 sec.</td>
</tr>
<tr>
<td>Audio Output Power</td>
<td>1.5 W</td>
<td>1 W</td>
</tr>
</tbody>
</table>

| Channels of Operation        | Any 20 channels in any band combination |
| Channel, Frequency and Mode Display | Fluorescent multi display 9 letters |
| Receiving System             | Direct Key entry Digital-Controlled Synthesizer, Superheterodyne |
| Power Requirements           | 1st IF: 10.7 MHz 2nd IF: 455 kHz |
| Accessory                    | AC-120 V 60 Hz 19 W (220 ~ 240 V, 50 Hz for European/Australian) |
|                             | DC-13.8 V 10 W |

**NOTE:** Nominal Specs represent the design specs: all units should be able to approximate these – some will exceed and some may drop slightly below these specs. Limit Specs represent the absolute worst condition which still might be considered acceptable: in no case should a unit perform to less than within any Limit Spec.

* VHF MID (68 ~ 88 MHz) range is for European and Australian Models only.
SCHEMATIC DIAGRAM (LOGIC SECTION)

NOTE:
1. RESISTANCE VALUES IN OHMS (±100, M±100000)
2. CAPACITANCE VALUES IN µF (±1µF)
3. (T): TANTALUM CAPACITOR
4. (M): MYLAR CAPACITOR
5. NO SUPX: CERAMIC CAPACITOR
6. • DENOTES DC VOLTAGE MEASURED WITH DC VOMETER (0-00V) UNDER FOLLOWING CONDITIONS:
   • HIGH BAND: 1300 kHz, MANUAL, LIMIT MODE, FINE ADJUST 800 µA
   • LOW BAND: 455 kHz, SEQUENTIAL, FINE ADJUST 1 MHz

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