overhaul manual

Collins 618T-( )
Airborne SSB Transceivers

This manual includes coverage of the following equipment:

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Collins Air Transport Division
Avionics and Missiles Group
Rockwell International
Cedar Rapids, Iowa 52406

Printed in the United States of America

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We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

Send your comments to: Publications Department
Rockwell Collins
Cedar Rapids, Iowa 52406

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CAUTION

The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have complete and up-to-date publications by referring to the applicable Publications and Service Bulletin Indexes.

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List of Effective Pages
Page 1
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23-10-0

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List of Effective Pages
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Oct 1/78
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This page replaces List of Effective Temporary Revision Pages dated Nov 1/75.

23-10-0

List of Effective Temporary Revision Pages
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<td>To improve discriminator output of power amplifier</td>
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<td>A: Installation of improved high-voltage connectors</td>
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<td>B: Installation of guide plate and indexing pin to ensure installation of unit to shockmount having correct power source.</td>
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<td>B: Improvement in dropout action of sidetone relay K3</td>
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<td>C: Addition of 115-volt, 490-cycle safety interlock</td>
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<td>D: Improvement in microphone audio switching</td>
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<td>To minimize possibility of vfo locking on wrong frequency</td>
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<td>Substitution of variable frequency oscillator 70K-5 for variable frequency oscillator 70K-3</td>
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<td>Enable gain of AM/audio modules with MCN above 2649 and 3058 to be more easily adjusted</td>
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<td>Increase power dissipation rating of resistor R3 in power amplifier</td>
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<td>Countertact effects of variations in semiconductor characteristic in keyer circuit operation</td>
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<td>Provide transient protection for relays K2 and K6 and allow relays from different vendors to be used in K7 position</td>
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<td>Add filter to 18-volt dc input line</td>
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<td>Improve reliability and performance of pa module</td>
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<td>Improved transmit gain control circuit</td>
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<td>Increase power dissipation rating of resistor R3 in power amplifier</td>
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<td>Increase SELCAL gain and improve isolation between SELCAL and audio input circuits</td>
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<td>Counteract effects of variations in semiconductor characteristics on keyer circuit operation</td>
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<td>Provide transient protection for relays K2 and K5 and allow relays from different vendors to be used in K7 position</td>
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<td>Add filter to 18-volt dc input line</td>
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<td>703</td>
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<td>4. Unit Performance Checks and Adjustments</td>
<td>707</td>
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<td>A. Use of Test Procedures</td>
<td>707</td>
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<td>B. Test Equipment Required</td>
<td>707</td>
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<tr>
<td>C. Power Requirements</td>
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<td>D. Unit Performance Test</td>
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<td>5. Module Checks and Adjustments</td>
<td>724</td>
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<tr>
<td>A. Use of Test Procedures</td>
<td>724</td>
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<tr>
<td>B. Test Equipment Required</td>
<td>724</td>
</tr>
<tr>
<td>C. Power Requirements</td>
<td>724</td>
</tr>
<tr>
<td>D. Module Checks and Adjustments</td>
<td>725</td>
</tr>
</tbody>
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FOREWORD

This manual has been prepared in accordance with Air Transport Association Specification No. 100 for Manufacturer's Technical Data. If used as intended, this manual will facilitate the effective, continued operation of the 618T-1/1B/2/2B/3/3B/4/4B/5/5B/6/6B Airborne SSB Transceivers.

This manual contains all information required for shop testing, repair, and mechanical overhaul. It contains complete performance tests and functional (simple go/no-go) checks that may be used to determine whether the equipment needs repair.

To facilitate discussion, the term 618T-( ) will be understood to refer to all versions of the transceiver. The last digit or the last two digits will be used only when referring to a specific version; for example, 618T-3 or 618T-2B.

An alphanumeric prefix is assigned to components for ease of location. For example, A4A5R66 indicates that resistor R66 is located in module A4 on circuit board A5. Components without a prefix are located on the 618T-( ) chassis or front panel.

The following is a list of related publications.

<table>
<thead>
<tr>
<th>PUBLICATION</th>
<th>COLLINS PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B Airborne SSB Transceivers Maintenance Manual (with installation data)</td>
<td>520-5970004</td>
</tr>
<tr>
<td>618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B Airborne SSB Transceivers Illustrated Parts Catalog</td>
<td>520-5970005</td>
</tr>
<tr>
<td>HF Interconnecting Wiring Diagrams Manual</td>
<td>523-0758695</td>
</tr>
<tr>
<td>714E-1/2( )/3( ) Radio Set Control Overhaul Manual</td>
<td>523-0759328</td>
</tr>
<tr>
<td>714E-6( ) Radio Set Control Overhaul Manual</td>
<td>523-0759869</td>
</tr>
<tr>
<td>678P-1/2 Radio Set Test Harness</td>
<td>523-0758156</td>
</tr>
<tr>
<td>678Y-1/3 Maintenance Kit</td>
<td>523-0757128</td>
</tr>
<tr>
<td>678Z-1 Function Test Set</td>
<td>523-0757125</td>
</tr>
<tr>
<td>390J-2 Shockmount, Unit Instructions</td>
<td>523-0756546</td>
</tr>
</tbody>
</table>
618T-1/2/3 Airborne SSB Transceivers

618T-1B/2B/3B Airborne SSB Transceivers

618T-( ) Airborne SSB Transceiver

Figure 1
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618T-( ) Airborne SSB Transceiver - Description and Operation

1. GENERAL.

This manual contains information for disassembly, cleaning, inspection, repair, assembly, alignment, testing, adjustment, and troubleshooting of the 618T-( ) Airborne SSB Transceiver (refer to figure 1).

All procedures in this manual are to be performed in a maintenance shop with the proper test equipment.

Figure 2 is a list of equipment covered in this manual.

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>COLLINS PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>618T-1</td>
<td>Airborne SSB transceiver</td>
<td>522-1230-000</td>
</tr>
<tr>
<td>618T-1</td>
<td>Airborne SSB transceiver with squelch capability</td>
<td>522-1230-021</td>
</tr>
<tr>
<td>618T-1</td>
<td>Airborne SSB transceiver with narrow-band selectivity</td>
<td>522-1230-022 (See note 1.)</td>
</tr>
<tr>
<td>618T-1</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-1230-023 (See note 1.)</td>
</tr>
<tr>
<td>618T-1B</td>
<td>Airborne SSB transceiver with squelch</td>
<td>522-4828-001</td>
</tr>
<tr>
<td>618T-1B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-4828-002 (See note 1.)</td>
</tr>
<tr>
<td>618T-2</td>
<td>Airborne SSB transceiver</td>
<td>522-1501-000</td>
</tr>
<tr>
<td>618T-2</td>
<td>Airborne SSB transceiver with squelch capability</td>
<td>522-1501-041</td>
</tr>
<tr>
<td>618T-2</td>
<td>Airborne SSB transceiver with narrow-band selectivity</td>
<td>522-1501-043 (See note 1.)</td>
</tr>
<tr>
<td>618T-2</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-1501-044 (See note 1.)</td>
</tr>
<tr>
<td>618T-2B</td>
<td>Airborne SSB transceiver with squelch</td>
<td>522-4829-001</td>
</tr>
<tr>
<td>618T-2B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-4829-002 (See note 1.)</td>
</tr>
<tr>
<td>618T-3</td>
<td>Airborne SSB transceiver</td>
<td>522-1660-000</td>
</tr>
<tr>
<td>618T-3</td>
<td>Airborne SSB transceiver with squelch capability</td>
<td>522-1660-031</td>
</tr>
<tr>
<td>618T-3</td>
<td>Airborne SSB transceiver with narrow-band selectivity</td>
<td>522-1660-033 (See note 1.)</td>
</tr>
<tr>
<td>618T-3</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-1660-034 (See note 1.)</td>
</tr>
<tr>
<td>EQUIPMENT</td>
<td>DESCRIPTION</td>
<td>COLLINS PART NUMBER</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>618T-3B</td>
<td>Airborne SSB transceiver with squelch</td>
<td>522-4830-001</td>
</tr>
<tr>
<td>618T-3B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>522-4830-002</td>
</tr>
<tr>
<td>618T-4</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2586-002</td>
</tr>
<tr>
<td>618T-4</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2586-001</td>
</tr>
<tr>
<td>618T-4B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2587-001</td>
</tr>
<tr>
<td>618T-5</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2588-002</td>
</tr>
<tr>
<td>618T-5</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2588-001</td>
</tr>
<tr>
<td>618T-5B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2590-002</td>
</tr>
<tr>
<td>618T-6</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2590-001</td>
</tr>
<tr>
<td>618T-6B</td>
<td>Airborne SSB transceiver with narrow-band selectivity and squelch</td>
<td>622-2591-001</td>
</tr>
<tr>
<td>516H-1</td>
<td>Power supply</td>
<td>622-1204-000</td>
</tr>
</tbody>
</table>

**NOTE 1:** Narrow-band transceivers have been given different type and part numbers in order to more easily identify them from their wide-band equivalents. Consequently, the following nomenclature changes have been made.

### NOMENCLATURE CHANGE

<table>
<thead>
<tr>
<th>OLD NOMENCLATURE</th>
<th>TO</th>
<th>NEW NOMENCLATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>618T-1</td>
<td></td>
<td>618T-4</td>
</tr>
<tr>
<td>618T-1</td>
<td></td>
<td>618T-4</td>
</tr>
<tr>
<td>618T-1B</td>
<td></td>
<td>618T-4B</td>
</tr>
<tr>
<td>618T-2</td>
<td></td>
<td>618T-5</td>
</tr>
<tr>
<td>618T-2</td>
<td></td>
<td>618T-5</td>
</tr>
<tr>
<td>618T-2B</td>
<td></td>
<td>618T-5B</td>
</tr>
<tr>
<td>618T-3</td>
<td></td>
<td>618T-6</td>
</tr>
<tr>
<td>618T-3</td>
<td></td>
<td>618T-6</td>
</tr>
<tr>
<td>618T-3B</td>
<td></td>
<td>618T-6B</td>
</tr>
</tbody>
</table>

Equipment Covered
Figure 2 (Sheet 2)
NOTE 2: The following service bulletin changes have also been incorporated:

618T-1; service bulletins are now applicable to all 618T-1 and 618T-4 units.

618T-1B; service bulletins are now applicable to all 618T-1B and 618T-4B units.

618T-2; service bulletins are now applicable to all 618T-2 and 618T-5 units.

618T-2B; service bulletins are now applicable to all 618T-2B and 618T-5B units.

618T-3; service bulletins are now applicable to all 618T-3 and 618T-6 units.

618T-3B; service bulletins are now applicable to all 618T-3B and 618T-6B units.

NOTE 3: Since the information covering the new type numbers is already available in this manual under the old nomenclature, the new nomenclature will not be incorporated. Refer to this table for cross-reference between old and new nomenclature.

Equipment Covered
Figure 2 (Sheet 3)
2. PURPOSE OF EQUIPMENT.

The 618T-( ) Airborne SSB Transceiver is used for voice, CW, or data communications in the high-frequency band. The 618T-1/2/3 operates from 2,000 through 29,999 MHz in 1-kHz increments. The 618T-1B/2B/3B operates from 2,0000 through 29,9999 MHz in 0.1-kHz increments.

Figure 3 is a list of associated equipment. Refer to the applicable manual for detailed information about the equipment listed in figure 3.

<table>
<thead>
<tr>
<th>MODEL NO</th>
<th>COLLINS PART NO.</th>
<th>DESCRIPTION</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>714E-1</td>
<td>522-1261-000</td>
<td>Radio set control</td>
<td>Provides remote control of 618T-1, 618T-2, and 618T-3.</td>
</tr>
<tr>
<td>714E-2</td>
<td>522-2213-XXX</td>
<td>Radio set control</td>
<td>Provides remote control of 618T-1B, 618T-2B, and 618T-3B.</td>
</tr>
<tr>
<td>714E-2A</td>
<td>522-2292-XXX</td>
<td>Radio set control</td>
<td>Provides remote control of 618T-1B, 618T-2B, and 618T-3B.</td>
</tr>
<tr>
<td>714E-2B</td>
<td>787-6377-XXX</td>
<td>Radio set control</td>
<td>Provides remote control of 618T-1B, 618T-2B, and 618T-3B.</td>
</tr>
<tr>
<td>714E-3</td>
<td>522-2457-XXX</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-3B</td>
<td>522-3803-XXX</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-3D</td>
<td>787-1029-XXX</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-3F</td>
<td>787-6378-XXX</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-3G</td>
<td>787-6557-001</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-6</td>
<td>522-4466-001</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-6A</td>
<td>772-5271-001</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-6A</td>
<td>772-5272-001</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>714E-6A</td>
<td>772-1225-001</td>
<td>Shockmount</td>
<td>Provides shock isolation mounting between 618T-( ) and aircraft.</td>
</tr>
<tr>
<td>390J-1</td>
<td>522-1653-000</td>
<td>Power supply (618T-1/1B only)</td>
<td>Provides dc and ac power for 618T-1/1B.</td>
</tr>
<tr>
<td>390J-2</td>
<td>522-3353-005/015</td>
<td>Power supply (618T-1/1B only)</td>
<td>Provides dc and ac power for 618T-1/1B.</td>
</tr>
<tr>
<td>516H-1</td>
<td>522-1204-00</td>
<td>Power supply (618T-1/1B only)</td>
<td>Provides dc and ac power for 618T-1/1B.</td>
</tr>
<tr>
<td>180L-2</td>
<td>506-1199-004</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180L-3</td>
<td>522-0092-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180L-3A</td>
<td>522-0293-004</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>AT-101</td>
<td>522-1375-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>AT-101A</td>
<td>522-3323-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>AT-102</td>
<td>522-1376-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>AT-102A</td>
<td>522-3324-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>AT-107</td>
<td>787-6370-001</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180R-6</td>
<td>522-0998-005</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180R-7</td>
<td>522-1416-005</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180R-8</td>
<td>522-1422-004</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>180R-12</td>
<td>522-3159-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>490S-1</td>
<td>732-6143-001</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>490T-1</td>
<td>522-3443-000</td>
<td>Antenna coupler system</td>
<td>Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.</td>
</tr>
<tr>
<td>EQUIPMENT</td>
<td>COLLINS PART NO.</td>
<td>DESCRIPTION</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>490T-1A</td>
<td>522-3444-001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>490T-2</td>
<td>522-3445-000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>490R-1</td>
<td>522-3897-000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>490R-2</td>
<td>522 1096-001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>490R-3</td>
<td>522-3535-000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>490R-4</td>
<td>522-4787-001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>437R-1</td>
<td>522-3635-00</td>
<td>Helical monopole loading coil</td>
<td>Tunable loading coil used in long-wire antenna installations where length of antenna is restricted by vehicle size.</td>
</tr>
</tbody>
</table>

Associated Equipment (Sheet 2 of 2)  
Figure 3

3. EQUIPMENT SPECIFICATIONS.

Figure 4 lists the equipment specifications for the 618T-( ) Airborne SSB Transceiver.

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design specifications</td>
<td></td>
</tr>
<tr>
<td>ARINC characteristic</td>
<td>ARINC Document No. 533, Airborne HF SSB/AM System.</td>
</tr>
<tr>
<td></td>
<td>ARINC Document No. 404, Air Transport Equipment Cases and Racking.</td>
</tr>
<tr>
<td>TSO</td>
<td>FAA TSO C-31b and C-32b.</td>
</tr>
<tr>
<td>Physical specifications</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>10-1/8 in. wide, 7-5/8 in. high, and 22-3/16 in. long.</td>
</tr>
<tr>
<td>Weight</td>
<td>50 lb (nominal).</td>
</tr>
</tbody>
</table>

Equipment Specifications (Sheet 1 of 4)  
Figure 4
<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental specifications</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>-40 to +55 °C (-40 to +131 °F) continuous.</td>
</tr>
<tr>
<td></td>
<td>+55 to +70 °C (+131 to +158 °F) 30 minutes.</td>
</tr>
<tr>
<td></td>
<td>-65 °C (-85 °F) storage.</td>
</tr>
<tr>
<td>Humidity</td>
<td>Up to 95% relative humidity at +50 °C (+122 °F) for 48 hours.</td>
</tr>
<tr>
<td>Altitude</td>
<td>Pressure equivalent of 30,000 ft with externally supplied cooling air.</td>
</tr>
<tr>
<td>Shock</td>
<td>With isolators</td>
</tr>
<tr>
<td></td>
<td>12 impact shocks, 15 g, 11 ms minimum.</td>
</tr>
<tr>
<td></td>
<td>4 impact shocks, 30 g, 11 ms minimum.</td>
</tr>
<tr>
<td></td>
<td>Without isolators</td>
</tr>
<tr>
<td></td>
<td>18 impact shocks, 6 g, 10 ms minimum.</td>
</tr>
<tr>
<td>Electrical specifications</td>
<td></td>
</tr>
<tr>
<td>Power requirements</td>
<td>618T-1/1B with 516H-1 Power Supply</td>
</tr>
<tr>
<td></td>
<td>22.5 to 30.25 vdc, approximately 1150 w.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> Approximately 1030 w are consumed by the 516H-1 Power Supply.</td>
</tr>
<tr>
<td></td>
<td>103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 165 w.</td>
</tr>
<tr>
<td>618T-2/2B</td>
<td>103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 160 w.</td>
</tr>
<tr>
<td></td>
<td>103.5 to 126.5 vac (line to neutral), 380 to 420 Hz, 3-phase, approximately 1000 w.</td>
</tr>
<tr>
<td></td>
<td>22.5 to 30.25 vdc, approximately 120 w.</td>
</tr>
<tr>
<td>618T-3/3B</td>
<td>103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 100 w.</td>
</tr>
<tr>
<td></td>
<td>22.5 to 30.25 vdc, approximately 1150 w.</td>
</tr>
<tr>
<td>CHARACTERISTIC</td>
<td>SPECIFICATION</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Frequency range                             | 618T-1/2/3  
2.000 to 29,999 MHz in 1.0-kHz increments.  
618T-1B/2B/3B  
2.0000 to 29,9999 MHz in 0.1-kHz increments. |
| Frequency channels                          | 618T-1/2/3  
28,000.  
618T-1B/2B/3B  
280,000. |
| Frequency stability                         | 0.8 ppm.                                                                     |
| Channel change time                         | 8 s average (independent of external antenna tuner).                         |
| Warmup time                                 | 15 minutes                                                                    |
| Types of emission                           | 3A3H: compatible am (that is, usb with the carrier inserted).  
3A3J: ssb (that is, am with the carrier suppressed (usb or lsb)).  
Cw: 1-kHz tone in usb.                        |
| Transmit characteristics                    |                                                                              |
| Rf power output                             | Ssb: 400-W pep +2, -1 dB.  
Am: 125-W carrier ±1 dB.  
Cw: 125-W locked key ±1 dB. |
| Rf output impedance                         | 51.5 ohms.                                                                   |
| Audio input impedance                       | 80 ohms unbalanced, 600 ohms balanced.                                       |
| Audio-frequency response                    | 5-dB peak-to-valley ratio from 300 to 3000 Hz.  
5-dB peak-to-valley ratio from 300 to 2500 Hz. |
| (618T-( ) without narrow-band selectivity)  |                                                                              |
| Audio-frequency response                    |                                                                              |
| (618T-( ) with narrow-band selectivity)     |                                                                              |
| Distortion                                  | SSB: third-order distortion products down at least 30 dB  
AM: less than 10% at 80% modulation with 1000 Hz and 1000 µV at the antenna. |
<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive characteristics</td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>SSB: 1 μV for 10-dB spur ratio.</td>
</tr>
<tr>
<td></td>
<td>AM: 3 μV modulated 30% at 1000 Hz for a 6-dB</td>
</tr>
<tr>
<td></td>
<td>spur ratio.</td>
</tr>
<tr>
<td>Selectivity (618T- ( ) without narrow-band</td>
<td>SSB: 300 to 3000 Hz, not more than 5-dB variation.</td>
</tr>
<tr>
<td>selectivity)</td>
<td>6.0 kHz, 60 dB down.</td>
</tr>
<tr>
<td></td>
<td>AM: 6.0 kHz, not more than 5-dB variation.</td>
</tr>
<tr>
<td></td>
<td>14.0 kHz, not less than 60 dB down.</td>
</tr>
<tr>
<td>Selectivity (618T- ( ) with narrow-band</td>
<td>SSB: 2.2 kHz, 6 dB down.</td>
</tr>
<tr>
<td>selectivity)</td>
<td>4.0 kHz, 60 dB down.</td>
</tr>
<tr>
<td></td>
<td>AM: 6.0 kHz, not more than 5-dB variation.</td>
</tr>
<tr>
<td></td>
<td>14.0 kHz, not less than 60 dB down.</td>
</tr>
<tr>
<td>Age characteristics</td>
<td>Maximum variation of audio output is 6 dB for</td>
</tr>
<tr>
<td></td>
<td>input signals from 10 to 100,000 μV. No overload</td>
</tr>
<tr>
<td></td>
<td>below 1-V signal input.</td>
</tr>
<tr>
<td>If rejection</td>
<td>80 dB minimum.</td>
</tr>
<tr>
<td>Audio output power</td>
<td>300 mW into 300-ohm load with 1000-μV input</td>
</tr>
<tr>
<td>Audio distortion</td>
<td>modulated 30% at 1000 Hz.</td>
</tr>
<tr>
<td></td>
<td>Less than 10% with 1000-μV input modulated 80%</td>
</tr>
<tr>
<td></td>
<td>at 1000 Hz.</td>
</tr>
<tr>
<td>Audio-frequency response (618T- ( ) without</td>
<td>5-dB peak-to-valley ratio from 300 to 3000 Hz.</td>
</tr>
<tr>
<td>narrow-band selectivity)</td>
<td></td>
</tr>
<tr>
<td>Audio-frequency response (618T- ( ) with narrow-</td>
<td>6-dB peak-to-valley ratio from 300 to 2500 Hz.</td>
</tr>
<tr>
<td>band selectivity).</td>
<td></td>
</tr>
<tr>
<td>Selective calling (SELCAL) output level</td>
<td>Not less than 0.1 V into 500-kΩ resistive load</td>
</tr>
<tr>
<td>Image and spurious frequency response</td>
<td>with 5-μV input modulated 30% at 1000 Hz.</td>
</tr>
<tr>
<td></td>
<td>60 dB minimum below desired frequency relative to</td>
</tr>
<tr>
<td></td>
<td>5-μV input.</td>
</tr>
</tbody>
</table>

Equipment Specifications (Sheet 4 of 4)
Figure 4

4. EQUIPMENT DESCRIPTION.

A. Mechanical Description.

The 618T- ( ) Airborne SSB Transceiver, housed in a standard 1-ATR case, is 10-1/8 inches wide, 7-5/8 inches high, and 22-3/16 inches long and weighs 50 pounds (nominal). A PHONE jack, MIC jack, meter, meter selector switch, and SQUELCH IN-OUT switch are located on the front panel of the 618T- ( ). Three meter selector
switch positions check internal power supply voltages of the 618T-( ). The fourth switch position monitors the power amplifier plate current, and the fifth position, CAL TONE (618T-1/2/3 only), compares the operating frequency of the 618T-( ) with WWV. A 400-Hz blower provides forced air cooling, and all antenna connections are located on the front panel of the 618T-( ). The SQUELCH IN-OUT switch allows the selection of squelch or no squelch modes of reception. All electrical connections are made at a 60-pin connector located at the rear of the unit. A separate grounding pin is located beside the 60-pin connector.

The 618T-( ) features modular construction. Figure 5 lists the module complement for the specific versions of the 618T-( ). Each module is equipped with locating pins to prevent improper location of the module and permit proper alignment of the connectors before engagement. There are no mechanical linkages between any modules in the 618T-( ). Maintenance of the 618T-( ) is simplified by the modular construction, and color-coded test points on the modules permit troubleshooting without removing the modules from the chassis. Transistors, widely used in the 618T-( ), increase reliability and reduce weight and power consumption.

<table>
<thead>
<tr>
<th>MODULE</th>
<th>FUNCTION</th>
<th>COLLINS PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Frequency divider (618T-1/2/3 only)</td>
<td>546-2142-005</td>
</tr>
<tr>
<td>A2</td>
<td>Rf oscillator</td>
<td>544-9286-005 (early model)</td>
</tr>
<tr>
<td></td>
<td>Rf oscillator including squelch circuits</td>
<td>528-0251-005 (late model)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>528-0690-001 (early model)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>528-0690-002 (late model)</td>
</tr>
<tr>
<td>A3</td>
<td>If translator (618T-( ) without narrow-band selectivity)</td>
<td>544-9286-000</td>
</tr>
<tr>
<td></td>
<td>If translator (618T-( ) with narrow-band selectivity)</td>
<td>528-0720-001</td>
</tr>
<tr>
<td>A4</td>
<td>kHz-frequency stabilizer (618T-1/2/3 only)</td>
<td>544-9288-005 (early model)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>528-0112-005 (late model)</td>
</tr>
<tr>
<td>A5</td>
<td>Low-voltage power supply</td>
<td>544-9292-00</td>
</tr>
<tr>
<td>A6</td>
<td>Electronic control amplifier</td>
<td>544-9290-005</td>
</tr>
<tr>
<td>A7</td>
<td>3-phase high-voltage power supply (618T-2/2B only)</td>
<td>544-9291-00 (early model, MCN 7,999 and below)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>544-9291-00 (late model, MCN 18,000 and above)</td>
</tr>
</tbody>
</table>

618T-( ) Module Complement (Sheet 1 of 3)

Figure 5
<table>
<thead>
<tr>
<th>MODULE</th>
<th>FUNCTION</th>
<th>COLLINS PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A8</td>
<td>27.5-Vdc high-voltage power supply (618T-3/3E only)</td>
<td>545-4971-000 (early model, MCN 4249 and below) 546-6053-000 (late model)</td>
</tr>
<tr>
<td>A9</td>
<td>AM/audio amplifier</td>
<td>544-9287-000 (early model) 546-6053-000 (late model)</td>
</tr>
<tr>
<td>A10</td>
<td>MHZ-frequency stabilizer</td>
<td>544-9239-005 (early model) 528-0329-005 (late model)</td>
</tr>
<tr>
<td>A11</td>
<td>Power amplifier</td>
<td>544-9283-000</td>
</tr>
<tr>
<td>A12</td>
<td>Rf translator (618T-1/2/3 only)</td>
<td>544-9284-00 (early model) 528-0113-000 (late model) 528-0682-001</td>
</tr>
<tr>
<td></td>
<td>(618T-1/2/3 only)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(618T-1B/2B/3B only)</td>
<td></td>
</tr>
<tr>
<td>A12A1</td>
<td>Autopositioner-submodule (618T-1/2/3 only)</td>
<td>546-5873-017 528-0683-001</td>
</tr>
<tr>
<td></td>
<td>(618T-1B/2B/3B only)</td>
<td></td>
</tr>
<tr>
<td>A12A2</td>
<td>Variable-frequency oscillator (vfo) submodule (618T-1/2/3 only)</td>
<td>522-1380-003 (70K-3) 522-2424-004 (70K-5) 522-3552-000 (70K-9)</td>
</tr>
<tr>
<td>A13</td>
<td>Single-phase high-voltage power supply (618T-1/1B only)</td>
<td>545-5858-000</td>
</tr>
<tr>
<td>MODULE</td>
<td>FUNCTION</td>
<td>COLLINS PART NUMBER</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>---------------------</td>
</tr>
<tr>
<td>A15</td>
<td>Frequency divider-stabilizer (618T-1B/2B/3B only)</td>
<td>528-0671-001</td>
</tr>
<tr>
<td>A16</td>
<td>Control data converter (618T-1B/2B/3B only)</td>
<td>528-0641-001</td>
</tr>
<tr>
<td></td>
<td>Chassis (618T-1/2/3 only)</td>
<td>544-9293-000</td>
</tr>
<tr>
<td></td>
<td>Chassis with squelch capability (618T-1/2/3 only)</td>
<td>544-9293-000 (MCN 2, 332 and above)</td>
</tr>
<tr>
<td></td>
<td>Chassis (618T-1B/2B/3B only)</td>
<td>757-8930-001</td>
</tr>
</tbody>
</table>

618T-( ) Module Complement (Sheet 3 of 3)  
Figure 5

B. Electrical Description.

The 618T-( ) Airborne SSB Transceiver is remotely controlled completely by the 714E-( ) Radio Set Control. For the 618T-1/2/3, any one of 28,000 communication channels, spaced 1 kHz apart in the 2.000- through 29,999-MHz range, can be directly selected at the 714E-1/2( )/3( ) Radio Set Control. For the 618T-1B/2B/3B, any one of 280,000 communication channels, spaced 0.1 kHz apart in the 2,0000- through 29,9999-MHz range, can be directly selected at the 714E-6( ) Radio Set Control. The function selector control on the 714E-( ) selects the desired mode of operation: usb, lsb, am, cw, or data.

NOTE: All of the previously mentioned operational modes are not available on some versions of the 714E-( ) Radio Set Control. Refer to the 714E-1/2( )/3( ) Radio Set Control Overhaul Manual, Collins part number 523-0759328 or to the 714E-6( ) Radio Set Control Overhaul Manual, Collins part number 523-0759269, for a listing of the functional modes of operation available on various versions of the 714E-( ).

An rf sensitivity control on the 714E-( ) controls the rf sensitivity of the 618T-( ) in all operational modes except data, in which case the rf sensitivity is set within the 618T-( ) for maximum receive sensitivity.

In 618T-( ) installations where the squelch function is used, the rf sensitivity control on the 714E-( ) is used as a squelch control that adjusts the squelch circuit within the 518T-( ) to the desired operating level.

The operating frequency of the 618T-( ) is crystal controlled and stabilized to within 0.8 part per million. The 618T-( ) is capable of 400 watts pep output in sideband operations and 125 watts carrier in am, cw, or data operations. Transmit output impedance is 52 ohms unbalanced.
The tuned circuits and output circuit of the 618T-( ) are tuned automatically by an Autopositioner and a servo motor. The receiver portion of the 618T-( ) is muted during tuning. The average tuning time of the 618T-( ), independent of an external antenna tuner, is 8 seconds.

C. Controls and Indicator.

The controls and indicator located on the 618T-( ) front panel are shown in figure 6. Figure 7 lists all controls and indicator and describes the functions of each.

D. Model Differences.

There are nine models of the 618T-( ). The following paragraphs describe differences between the nine models.

1. 618T-1 Airborne SSB Transceiver, Collins part number 522-1230-00, 522-1230-021, 522-1230-022*, or 522-1230-023*.

The 618T-1 retrofits most 618S-( ) installations with no changes necessary in the aircraft wiring. The 516H-1 Power Supply required is mountable in the 416W-1 Power Supply shockmount. The primary power required for the 618T-1 is listed in figure 4. The 618T-1 (Collins part number 522-1230-00) does not have audio squelch capability. The 618T-1 (Collins part number 522-1230-021) has audio squelch capability. The 618T-1 (Collins part number 522-1230-022) has narrow-band selectivity. The 618T-1 (Collins part number 522-1230-023) has narrow-band selectivity and audio squelch capability.

2. 618T-1B Airborne SSB Transceiver, Collins part number 522-4828-001 or 522-4828-002*.

The 618T-1B retrofits most 618S-( ) installations with the addition of four control wires from the 618T-1B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-1B are identical to those of the 618T-1. The 618T-1B (Collins part number 522-4828-001) has audio squelch capability. The 618T-1B (Collins part number 522-4828-002*) has audio squelch and narrow-band selectivity capability.

3. 618T-2 Airborne SSB Transceiver, Collins part number 522-1501-00, 522-1501-041, 522-1501-043*, or 522-1501-044*.

Primary power requirements for the 618T-2 are listed in figure 4. The 618T-2 (Collins part number 522-1501-00) does not have audio squelch capability. The 618T-2 (Collins part number 522-1501-041) has audio squelch capability. The 618T-2 (Collins part number 522-1501-043*) has narrow-band selectivity. The 618T-2 (Collins part number 522-1501-044*) has audio squelch and narrow-band selectivity.

*The above part numbers are obsolete and are replaced with type numbers 618T-4/4B/5/5B/6/6B. Refer to figure 2 for cross-reference of old part numbers to new part numbers.
(4) 618T-2B Airborne SSB Transceiver, Collins part number 522-4829-001 or 522-4829-002*.

The 618T-2B retrofits 618T-2 installations with the addition of four control wires from the 618T-2B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-2B are identical to those of the 618T-2. The 618T-2B (Collins part number 522-4829-001) has audio squelch capability. The 618T-2B (Collins part number 522-4829-002*) has audio squelch and narrow-band selectivity.

(5) 618T-3 Airborne SSB Transceiver, Collins part number 522-1660-00, 522-1660-031, 522-1660-033*, or 522-1660-034*.

Primary power requirements for the 618T-3 are listed in figure 4. The 618T-3 may also retrofit some 618S-( ) installations. Retrofit installation data is contained in the 618T-( ) Maintenance Manual, Collins part number 520-520-0004. The 618T-3 (Collins part number 522-1660-00) does not have audio squelch capability. The 618T-3 (Collins part number 522-1660-031) has audio squelch capability. The 618T-3 (Collins part number 522-1660-033*) has narrow-band selectivity. The 618T-3 (Collins part number 522-1660-034*) has audio squelch and narrow-band selectivity.

(6) 618T-3B Airborne SSB Transceiver, Collins part number 522-4830-001 and 522-4830-002*.

The 618T-3B retrofits 618T-3 installations with the addition of four control wires from the 618T-3B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-3B are identical to those of the 618T-3. The 618T-3B (Collins part number 522-4830-001) has audio squelch capability. The 618T-3B (Collins part number 522-4830-002) has audio squelch and narrow-band selectivity.
Typical Control and Indicator Locations
Figure 6
CONTROL/INDICATOR | FUNCTION
-----------------|-------------------------------------------------------------
Meter switch (S1) | Places meter M1 in correct circuit to indicate condition of internal power supplies (1500V, 130V, and 28V positions) or power amplifier plate current (PA MA position).
ANT JUMPER switch (S2) (chassis with MCN 3025 and above) | Places antenna transfer relay K5 in circuit (when set to IN) for 618T-( ) that uses common antenna for both transmit and receive modes. S2 is located in 618T-( ) relay compartment.
Squelch enable switch (S3) | Activates audio squelch circuitry within the 618T-( ).
Meter (M1) | Indicates the conditions of internal power supplies or power amplifier plate current.

Control and Indicator Functions
Figure 7

5. THEORY OF OPERATION.

A. General.

The 618T-( ) Airborne SSB Transceiver provides USB, LSB, AM, CW, and data modes of operation. The 618T-1/2/3 provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 1-kHz increments. The 618T-1B/2B/3B provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 0.1-kHz increments. The following is the functional theory of operation of the 618T-( ). Refer to figures 17 and 18. Figure 17 is a functional block diagram of the 618T-1/2/3; figure 18 is a functional block diagram of the
618T-1B/2B/3B. Where specific differences between versions of the 618T-( ) exist, references to the applicable block diagram will be made. Transmit signal paths and functions common to both transmit and receive are shown in solid lines. Receive only functions are shown in dashed lines. Modules are defined by dashed lines. Begin with the transmit function at the left of the applicable illustration.


(1) Transmit Mode.

The AM/audio amplifier, A9, provides three stages of amplification in the transmit mode. For voice, the unbalanced input (80 ohms) is amplified by audio amplifiers A9Q1 and A9Q2. An additional audio amplifier, A9Q8, is provided for 600-ohm balanced inputs and for CW. The CW is produced by amplifying the 1-kHz tone from keyers A1Q12 and A1Q13 of frequency divider A1 in the 618T-1/2/3 (see figure 17). In the 618T-1B/2B/3B, the 1-kHz tone is generated by A16Q8 and A16Q10 of control data converter A16. Variable level adjustments are provided in amplifier stages A9Q8 and A9Q1 to equalize voice and CW at the output of amplifier A9Q2.

Amplifier A9Q2 provides an output to the headset for sidetone monitoring. This sidetone output is also variable at the 618T-( ) front panel so that receive and sidetone signals can be approximately equal. The transmit signal path continues from audio amplifier A9Q2 to a balanced modulator in if translator A3. There the audio is combined with a 500-kHz carrier from rf oscillator A2. Details of the balanced modulator are shown in figure 21.

The balanced modulator produces intelligence as sidebands of the 500-kHz carrier and then suppresses the carrier. The double sideband signal appears at the output of the balanced modulator and is amplified by ALC (automatic load control) amplifier A3Q1. The 1-kHz signal for CW is adjusted to a fixed value and does not vary in amplitude. The voice signal may overdrive power amplifier A11 if the operator speaks too loudly or during voice peaks. Feedback from the grid circuit of the power amplifier A11 is generated if the driving signal causes power amplifier grid current to flow. The feedback voltage, in turn, reduces the gain of audio amplifier A3Q1. In this manner, drive to power amplifier A11 is held at optimum value near grid current threshold. Details of the audio circuits are shown in figure 18.

The transmit signal continues from audio amplifier A3Q1 through if. amplifier A3Q2 and is then fed to one of two mechanical filters FL1 or FL2. Either FL1 or FL2 is selected by the mode selector switch (in USB or LSB position) on the radio set control. Only one sideband is needed since both contain identical intelligence. The bandpass of FL1 and FL2 is 3 kHz (nominal). Beyond the selected filter, the signal is a suppressed carrier containing one set of sidebands that represent the voice modulation.

Since the suppression of the carrier prevents a conventional AM receiver from detecting the SSB signal, the carrier must be reinserted for compatibility with conventional AM receivers. This happens when the function selector switch on the radio set control is switched to the AM position. In the AM mode of operation, the USB filter is also selected. Note that the transmit signal from the mechanical
filter goes directly to if amplifier A3Q4, bypassing if amplifier A3Q3 (and A3Q7 for if translator module Collins part number 528-0720-001). If amplifier A3Q4 is controlled by tgc/adc (transmit gain control/automatic drive control) amplifier A3Q6, a dc amplifier that operates to reduce the gain of if amplifier A3Q4.

In all modes except SSB, the tgc circuit maintains the rf carrier level constant within 1 db to compensate for varying rf gain over the operating range of the 618T-( ). The tgc does not function in the SSB mode since there is no carrier for tgc reference. The feedback voltage applied to tgc/adc amplifier A3Q6 is a rectified sample of the carrier obtained from a linear demodulator and is proportional to the average instantaneous peak carrier amplitude. Refer to figure 16 for additional circuit details.

The adc circuit provides override or additional control of if amplifier A3Q4 during the tuning cycle or if a 618T-( ) malfunction occurs resulting in excessive rf plate voltage or plate current swing. The feedback voltages applied to the adc and tgc circuits combine so that linear operation is maintained for power amplifier A11 during changes in rf gain and rf drive. The transmit signal, after amplification by if amplifier A3Q4, is applied to TX/RX switch CR6 and then to rf translator A12.

The transmit signal from the if translator is combined in if mixer A12V1 with the output of vfo A12A2 in the 618T-1/2/3 and with the output of frequency divider-stabilizer A15 in the 618T-1B/2B/3B. For any of the operating frequencies, the output of If mixer A12V1 will be 3,000 to 2,001 MHz in the 618T-1/2/3 and 3,0000 to 2,0001 MHz in the 618T-1B/2B/3B. This range is tuned by the variable if filter. The transmit signal gets from the variable if filter to one of two paths. If the operating frequency is below 7 MHz, the transmit signal is mixed in transmit 17.5-MHz mixer A12V2 and applied to the 14.5/15.5-MHz bandpass filter. If the operating frequency is above 7 MHz, the transmit signal goes from the variable if filter directly to hf transmit mixer A12V3, bypassing the 17.5-MHz mixer. The output of 17.5-MHz mixer A12V2 is the difference output between transmit signal and 17.5-MHz oscillator A12V10. The output of the 14.5/15.5-MHz bandpass filter is applied to the hf transmit mixer A12V3. The output of this mixer is the difference signal from 2 through 29 MHz. The hf oscillator, A12V11, operates below the transmit signal from 2 through 6 MHz and above the transmit signal from 7 through 29 MHz. The hf oscillator also doubles frequencies to provide heterodyning for operating frequencies 14 through 29 MHz. Figure 26 lists all hf oscillator A12V11 frequencies. The output of hf transmit mixer A12V3 is the transmit signal at the operating frequency. Transmit mixers A12V1, A12V2, and A12V3 provide linear amplification and are balanced mixers; that is, the oscillator signal for each mixer is simultaneously applied to one triode element for mixing and to the other element 180 degrees out of phase for cancellation (balancing out) of the oscillator output in the signal path. Extra circuits are provided in hf transmit mixer A12V3 to provide cancellation through a nulling adjustment. The balanced mixers help reduce spurious signals that can distort the signal within the 618T-( ) and/or radiate interference at unwanted frequencies. After the hf mixing, the transmit signal is amplified by linear voltage amplifiers in two stages; rf amplifier A12V4 and A12V5 and driver amplifier A12V6 and A12V7.
The driver stages provide sufficient rf voltage to drive power amplifier A11. Other than the alc, tgc, and adc circuits previously discussed, an additional feedback circuit for rf is also applied from power amplifier A11 plate circuit to drivers A12V6 and A12V7. This feedback provides power amplifier and driver neutralization.

The power amplifier develops approximately 125 watts carrier power in the AM mode and 400 watts pep. in SSB mode. The output of power amplifier A11 is coupled to an antenna coupler so that a variety of antennas may be driven with minimum vswr.

The power amplifier consists of two parallel connected tetrodes driving a pi network that combines the functions of tank circuit loading of the tubes and impedance matching to low-impedance unbalanced transmission lines.

Coarse tuning and antenna loading are performed by a motor that is actuated through band switching in rf translator A12. Fine tuning to resonance requires that the 618T-(-) be keyed after frequency selection. Since a carrier must be present, internal switching selects the AM mode for this operation. Resonance is achieved by discriminating between the rf input and output phase and applying the detected difference as an error voltage to a servo motor. The servo motor drives a roller coil to tune the tank circuit.

Electronic control amplifier A6 inverts the error signal (a dc voltage) to 400 Hz and amplifies it sufficiently to drive the servo motor.

Grid current flow is detected in this module and fed back as controlling bias voltage to the alc amplifier in the if. translator to control transmit if. gain. A sample of rf voltage is taken from the plate circuit, rectified, and applied as negative dc voltage to the tgc/adc amplifier in if. translator A3 for additional if. gain control.

(2) Receive Mode.

In the receive mode (the signal path traced from the top, right section of block diagrams, figures 17 and 18), the signal is coupled from the antenna directly to rf amplifiers A12V4 and A12V5. Conversion of the received signal in rf translator A12 in the receive mode is similar to that in the transmit mode except that separate unbalanced mixer circuit stages are used. The signal level is adjusted manually by varying the rf sensitivity control on the radio set control that controls the cathode bias of rf amplifiers A12V4 and A12V5 and thereby varies the signal-to-noise ratio. The rf sensitivity control is not an audio level control.

The received signal continues through rf translator A12 to receive if mixer A12V8. The output of if mixer A12V8 is applied directly to if. amplifier A3Q2 in if. translator A3 and to if. amplifier A9Q3 in AM/audio amplifier A9. This allows detection of receive signals in both SSB and AM modes regardless of the position of the function selector control on the radio set control.

Using the data or SELCAL (selective calling) output, AM reception is available with the function selector control in any position. Assume that the received
signal is AM. The signal is amplified by if amplifier A9Q3 and passed through 6-kHz mechanical filter A9FL1 whose selectivity allows both sidebands to pass. The signal from the mechanical filter is amplified by A9Q4, A9Q5, and A9Q6, detected by AECR4, then provided with two alternate paths. For data and SELCAL, the detected signal passes through audio amplifier A9Q9. For other modes, the signal is applied to audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

Now assume that the received signal is ssb. The output of if mixer A12V8 is amplified by if amplifier A3Q2 and then passed through mechanical filter A3FL1 or A3FL2, as selected at the radio set control. The signal from the mechanical filter is amplified by if amplifiers A3Q7 (for if translator module Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. Note that tgc/agc amplifier A3Q6 is used and biased for maximum gain operation of if amplifier A3Q4 in the receive mode. Also TX/RX switch CR6 is reverse biased to prevent entry of receive signals into rf translator A12. From if amplifier A3Q5, the signal goes to the product detector, where it is combined with a 500-kHz carrier from rf oscillator A2. The output of the product detector, the detected audio, is applied through audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

A number of agc feedback loops are used in the 618T-. The ssb agc is developed from the audio signal. Agc is first applied to rf amplifiers A12V4 and A12V5. Two sources, other than manual rf sensitivity, combine to control this stage. A very strong signal causes the agc circuit in the plate circuit of receive if mixer A12V8 to reduce the gain of both the if mixer and the rf amplifier. A normal signal level is controlled by agc from detector A9CR2 and A9CR7 in AM/audio amplifier A9. The agc voltage is proportional to the rms audio output voltage from A9Q2.

(5) Frequency Selection and Translation, 618T-1/2/3.

Refer to the 618T-1/2/3 block diagram, figure 17, and to figure 19, a block diagram of the 618T-1/2/3 frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1/2/3 to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits are formed by the four frequency selector controls on the radio set control.

The 100-, 100-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of translator A12. These motors, A12A1B1 controlled by the 1-kHz frequency select control and A12A1D2 controlled by the 10– and 100-kHz frequency selector controls, mechanically coarse tune variable-frequency oscillator (vfo) A12A2. Autopositioner A12A1 also tunes the 2- to 3-MHz variable if, stage and fine tunes rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and rf driver turret switches A12S2 and A12S3.

The 1-MHz frequency select on the radio set control operates band motor A12B1 that mechanically fine tunes hf oscillator A12V11, rf amplifier turret switches A12S3, A12S7, A12S5, and A12S4, and rf driver turret switches A12S2 and A12S3. It operates PA BAND switch A12S12 and also controls switching of 17.5-MHz oscillator A12V10 on operating frequencies below 7 MHz.
As an example, an operating frequency of 2,520 MHz has been selected at the radio set control (figure 19). Operation for the receive mode is the same except for the selection of fine tuning of roller coil servo motor A12B2 and the antenna coupler in the receive mode. Fine tuning of these two stages is obtained by keying the transceiver.

The 500-kHz if. is produced in AM/audio amplifier A9 and if. translator A3 upon application of an audio signal at the microphone. This 500-kHz if. is applied to if. mixer A12V1, where it is mixed with the vfo A12A2 output. The injection frequency from vfo A12A2 varies between 3.5 and 2.5 MHz in 1-kHz steps as the operating frequency selected at the remote control unit varies from X.000 to X.999 MHz. The vfo frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from 3.500 MHz (upper vfo limit).

Example:  
2,520-MHz operating frequency  
3,500-MHz vfo upper limit  
-0.520 MHz  
2.980 MHz = vfo frequency

The if. mixer A12V1 output is tuned to the mixed difference frequency, which is a variable if. in the range of 3 to 2 MHz. The exact variable if. is found by subtracting the 500-kHz if. input from the vfo injection frequency. For this example, the resultant is 2.480 MHz.

From the variable if. circuits, the signal is fed to 17.5-MHz mixer A12V2. The 17.5-MHz mixer, A12V2, raises the 3- to 2-MHz if. to a 14.5- to 15.5-MHz signal due to the possibility of harmonic distortion entering the transmitter bandpass at operating frequencies between 2 and 7 MHz. The 17.5-MHz mixer, A12V2, is fed by 17.5-MHz oscillator A12V10. The resultant frequency, after mixing occurs, is 14.5 to 15.5 MHz, found by subtracting the variable if. from the 17.5-MHz injection frequency.

The 15.020-MHz signal, the 17.5-MHz mixer A12V2 output, is filtered by a 14.5- to 15.5-MHz bandpass filter and fed to hf mixer A12V3. The hf mixer combines the 14.5- to 15.5-MHz signal with an injection frequency from hf oscillator A12V11. Figure 26 lists the hf oscillator A12V11 frequencies mechanically set up by band motor A12B1 for all settings of the 1-MHz frequency selector control on the radio set control. The hf mixer A12V3 output, the difference between the hf oscillator A12V11 injection frequency and the variable if. or 17.5-MHz mixer A12V2 output, is now the desired operating frequency originally selected at the radio set control.

The hf mixer A12V3 output is fed to rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and to rf driver turret switches A12S2 and A12S3. Here the final output is fine tuned and mechanically controlled by band motor A12B1, dc motor A12A1B2, and dc motor A12A1B1. The signal is then fed to power amplifier A11 output tank switch A11S2.
The 8-position output tank switch, A11S2, is mechanically coarse tuned by the motor A11B1. From the output tank, the signal is fed to power amplifier roller coil A11I4 and then to the antenna coupler and antenna.

Power amplifier roller coil A11I4 and the antenna coupler must receive rf produced by keying the transceiver before fine tuning of these two elements is possible. The rf actuates roller coil servo motor A11B2 that mechanically tunes power amplifier roller coil A11I4.

(4) Frequency Selection and Translation, 618T-1B/2B/3B.

Refer to 618T-1B/2B/3B block diagram, figure 18, and to figure 20, a block diagram of 618T-1B/2B/3B frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1B/2B/3B to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits are formed by the five frequency selector controls on the radio set control.

The 100-, 10-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of rf translator A12. These motors, A12A1B1 controlled by the 1-kHz selector control and A12A1B2 controlled by the 100- and 10-kHz selector controls, operate inverted binary coded decimal (BCD) switches A12A1S2, A12A1S4, and A12A1S6 that transform the 100-, 10-, and 1-kHz reentry code frequency control information, from the radio set control, to inverted BCD frequency control information that is fed directly to frequency divider-stabilizer A15. The 0.1-kHz reentry code frequency control information from the radio set control is converted to inverted BCD frequency control information by control data converter A16 and fed directly to frequency divider-stabilizer A15. A 1-kHz oscillator, A16Q9 and A16Q10, in control data converter A16 provides a 1-kHz tone during transceiver tuning and CW transmission.

Frequency divider-stabilizer A15 contains the circuits necessary to supply variable injection frequency from 2.5001 to 3.5000 MHz in 100-kHz increments to if mixer stage A12V1 in rf translator A12. Eight circuits comprise the basic portion of frequency divider-stabilizer A15 (see figure 42 or 838).

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's) A15A7Q2 and A15A7Q4. One oscillator has a frequency range from 2.5001 to 3.000 MHz, and the other has a range from 3.0001 to 3.5000 MHz. Transistor switches, operated by 100-kHz frequency control information from Autopositioner A12A2, turn on the proper oscillator depending on the frequency selected. The output frequency of vco A15A7 is controlled by a dc output voltage from phase/frequency discriminator A15A5 applied across variable capacitors in the vco circuitry. The output of vco A15A7 is fed to isolation amplifier A15A8 before being applied to if mixer A12V1. Isolation amplifier A15A8 provides a constant output impedance for vco A15A7. An additional output from isolation amplifier A15A8 is applied directly to variable frequency divider circuitry A15A1, A15A2, A15A3, and A15A4. The variable frequency divider circuitry divides the output frequency of isolation amplifier A15A8 25,001 to 35,000 times depending upon the frequency control information from the radio set control. When vco A15A7 is operating on the proper frequency, the output of the
variable frequency divider circuit will always be 100 Hz. The output of variable frequency divider A15A1, A15A2, A15A3, and A15A4 is applied directly to phase/frequency discriminator A15A5. A second input to phase/frequency discriminator A15A5 is from reference divider A15A6. The input to reference divider A15A6 is a 100-kHz reference signal from rf oscillator A2. Reference divider A15A6, a 1000-to-1 frequency divider, provides a continuous output of 100 Hz, a reference used for comparison with the output of the variable frequency circuitry, that is as accurate as the reference signal.

When vco A15A7 is operating on the proper frequency, the dc output voltage from phase/frequency discriminator A15A5 will remain constant because the outputs from the variable frequency divider circuits and the reference divider will both be 100 Hz. A change in frequency control information from the radio set control causes the output of the variable divider circuits to vary from 100 Hz. The output voltage from the phase/frequency discriminator will change, causing the effective capacitance of the voltage variable capacitors to change. This will cause the vco to sweep across its entire frequency range until a frequency is reached where the output of the variable frequency divider circuit is again 100 Hz. At this point, the phase/frequency discriminator is able to lock the output frequency of vco A15A7. When vco A15A7 is phase locked, its output frequency is as accurate as the 100-kHz reference signal from rf oscillator A2.

The output frequency is applied to if mixer A12V1 in rf translator A12, where it is mixed with the 500-kHz if, from AM/audio amplifier A9 and if, translator A3. From this point on, the frequency translation process of the 618T-1B/2B/3B is identical to the 618T-1/2/3 explained previously. The vco operating frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from the upper output frequency limit of the vco, 3.500 MHz.

Example: 2.5200-MHz operating frequency

\[
\begin{align*}
3,5000-MHz & \text{vco upper limit} \\
-0.5200 \text{ MHz} & \\
2.9800 \text{MHz} & \text{vco operating frequency}
\end{align*}
\]

(5) Frequency Stabilizing Circuits, 618T-1/2/3.

Four 618T-1/2/3 Airborne SSB Transceiver modules stabilize the frequencies of the three injection oscillators in rf translator A12. These modules phase lock the frequencies of the oscillators with frequencies derived from a reference oscillator. The 500-kHz if, injection frequency is also derived from this reference oscillator. Therefore, each of the 28,000 possible 618T 1/2/3 rf operating frequencies is as stable as the crystal-controlled reference frequency in rf oscillator A2.

Refer to figure 8. The MHz-frequency stabilizer, A10, stabilizes the 17.5-MHz and if injection oscillators in rf translator A12. The kHz-frequency stabilizer, A4, stabilizes variable frequency-oscillator A12A2 in rf translator A12.
618T-1/2/3 Frequency Stabilizing Circuits, Block Diagram
Figure 8

Radio-frequency oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are references in the frequency stabilizing process. The 500-kHz output is also used in a separate output for IF injection.

Frequency divider A1 converts the 100-kHz output of rf oscillator A2 to two different outputs that are used as references in kHz-frequency stabilizer A4.

In general, the frequency stabilizing circuits operate as follows. Samples of the injection oscillator signals are fed to the frequency stabilizing modules. A reference frequency derived from the crystal reference oscillator is also fed to these modules. The signal and reference frequencies are compared by discriminators in the modules, and dc error voltages proportional to the phase difference between the signal and reference frequencies are fed back to the oscillators. These dc error voltages are applied to voltage-variable capacitors in the tuned circuits of the oscillators to tune them so that they will be phase locked to the reference frequencies.

The voltage-variable capacitors used in the oscillator tuned circuits are semiconductor devices with a capacitance that varies as the dc voltage across them varies. The relationship between capacitance and dc tuning voltage for a typical voltage-variable capacitor is shown in figure 9. To obtain a linear relationship between capacitance and voltage, a dc bias voltage is applied to the device, and the voltage across it is varied by only a small amount.
(6) Frequency Stabilizing Circuits, 618T-1B/2B/3B.

Two 618T-1B/2B/3B Airborne SSB Transceiver modules stabilize the two injection oscillators in rf translator A12. MHz-frequency stabilizer A10 stabilizes the 17.5-MHz and hf oscillators in rf translator A12.

Refer to figure 10. Rf oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are used as references in the frequency stabilizing processes. The 500-kHz output is also used in a separate output for if injection.

Frequency divider-stabilizer module A15, as previously explained, is stabilized by the comparison of the operating frequency of vco A15A7 with the 100-kHz reference frequency from rf oscillator A2. The comparison and stabilizing functions are performed by phase/frequency discriminator A15A5.

The frequency stabilization process of the 17.5-MHz and hf oscillators is identical to that of the 618T-1/2/3.

(7) Squelch Circuits.

The audio squelch circuit is physically located in a new model rf oscillator module, Collins part number 528-0690-001/528-0690-002, that is directly interchangeable with existing rf oscillator modules. The audio squelch level is adjusted at the radio set control. New versions of the radio set control, the 714E-3D used...
with the 618T-1/2/3, and the 714E-6A used with the 618T-1B/2B/3B contain a squelch level control (SQL) in place of the existing rf sensitivity control (RF SENS).

The squelch amplifier and control circuit is comprised of two frequency-sensitive active filters, two peak detector stages, a comparator, and a holding circuit. The holding circuit serves to drive the audio squelch relay. The squelch amplifier and control circuit receives audio input signals from AM/audio amplifier A9. The squelch circuit filters and converts the input signal to dc voltages. These voltages are compared by the comparator that has a bias determined by the squelch level control on the 714E-( ) Radio Set Control. After comparison, the squelch circuit energizes the holding circuit and the squelch relay. If sufficient and desirable audio is present, the squelch relay connects the audio signal to the balanced output line of AM/audio amplifier A9. If noise predominates, the squelch relay disconnects the balanced output line and inserts a 300-ohm load across the output of AM/audio amplifier A9. When the squelch level control is turned to the extreme clockwise position, the comparator is biased on and, in turn, energizes the holding circuit and squelch relay.

(8) Selective Calling (SECAL).

A selective calling system, used in conjunction with the 618T-( ) Airborne SSB Transceiver, allows the ground radio operator to call a single aircraft of a group of aircraft, thus relieving aircraft personnel in flight of having to constantly monitor the ground station radio frequency.

The Collins selective calling system consists of the 456C-1 Airborne Selective Calling Unit, the 288A-1 Tone Generator, the 614J-1 Remote Control Panel, the 614K-1 Remote Control Console, and the 278H-1 Preset Remote Control Panel.
The 456C-1 Airborne Selective Calling Unit is the airborne portion of the system. The 288A-1 and one or more of the control units make up the ground station system.

The ground operator selects a code of four audio frequency tones at one of the control units. The operator then presses an activate switch that causes the 288A-1 Tone Generator to produce the four selected tones to the transmitter in the proper time sequence and time duration. The 456C-1 Airborne Selective Calling Unit is connected to the audio output line of the 618T-( ) Airborne SSB Transceiver. When the proper tones are received in the proper sequence, the 456C-1 actuates a visual or aural signal, alerting flight personnel. Switches on the front panel of the 456C-1 allow flight personnel to change the calling codes without removing the unit from the aircraft.

(9) Power Distribution Circuits, 618T-( ).

Refer to figure 11. The power distribution circuits are activated when the function selector switch on the radio set control is moved from OFF. In the 618T-1/2/3, a 400-Hz interlock relay, K9, is energized only when both ac and dc input power to the 618T-( ) is present. A delay relay, K10, disables the frequency stabilizer circuits during operating frequency changes. Operating frequency changes appear as drift to the frequency stabilizer circuits, and therefore the stabilizer circuits must be disabled to prevent an attempted phase lock on an erroneous spectrum point. Resistor R22 and capacitor C13, in transistor stage Q1, delay the energizing of relay K10 for approximately 1/2 second after 130 volts dc has been applied to delay interlock relay K8. This time delay circuit prevents the frequency stabilizer circuits from phase locking on an erroneous spectrum point. In the 618T-1B/2B/3B, only the MHz-frequency stabilizing circuits are affected by the time delay circuits as explained above. The time delay is unnecessary for the phase-locking action of frequency divider-stabilizer A15.

(10) Keying Circuits.

Refer to figure 12, a simplified schematic diagram of the keying circuits. The major keying function is the transfer of circuits from receive mode to transmit mode. When the 618T-( ) is keyed, the following action occurs:

AM/audio amplifier A9 is switched to a speech amplifier function.
Two receive stages are bypassed in if translator A3.
The receive mixers in rf translator A12 are switched out.
The transmit mixers in rf translator A12 are switched in.
The antenna transfer relay operates, and the rf driver is coupled to the rf amplifier.
Voltage is applied to the plates and screens of the power amplifier tubes.
The 500-kHz carrier is removed from the product detector and applied to the balanced modulator for sideband generation.

The first function when the 618T-( ) is keyed after a frequency change is fine tuning of the power amplifier output circuit and antenna coupler. Keying provides rf to the antenna coupler, and a 1-kHz tone in the headset indicates the tune power cycle. The antenna coupler locks the key line so that it remains closed.
until the power amplifier roller coil has tuned for 180 degrees difference between grid and plate circuit and the antenna coupler has tuned for minimum vswr (1.3:1). During tuning, the output circuit is in series with a resistor to help stabilize transmitter load. The position of the function selector switch on the radio set control is not important during this tuning function since the AM mode is selected internally to provide the necessary carrier for phase and vswr differentiation for tuning. After power amplifier A11 and the antenna coupler are tuned, the key line opens, and the mode of operation is again under the control of the function selector switch.

If the CW mode is used, a 1-kHz tone from frequency divider A1 in the 618T-1/2/3 and control data converter A16 in the 618T-1B/2B/3B is processed for the proper keying waveform by components on CW TR delay relay A9K2. Recycle relay K4 is a part of keying function so that a transmission cannot be made during a change of frequency. In voice modes, keying is accomplished by depressing the push-to-talk switch on the microphone. Protective circuits include overload relays A7K3 or A8K2, depending upon the power supply being used, and the step-start relay in the high-voltage power supply that switches current-limiting resistors in each leg of the incoming ac line to prevent surges before tube warmup. If a frequency change should be made while keying, the key line is interrupted, recycle takes place, and after the frequency change is completed, the key line closes again. Then, rf (tune power) is applied with the key locked while the power amplifier A11 roller coil and antenna coupler retune to the new frequency. The key then opens again, and a transmission may be made. Tune power function is automatic only when an antenna coupler is available to lock the keying circuits. When the receiver-transmitter is operated separately, the key must be held down manually until power amplifier A11 tunes.

(11) Recycle Circuits.

(a) 618T-1/2/3.

Refer to figure 13. A change of frequency is called recycle. When any of the frequency selector switches on the radio set control is moved, recycle relay K4 is energized. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna coupler, and disable the frequency stabilizing signals. Recycle relay K4 opens when the servo motors stop, but there is some residual motion in the mechanical linkage. The frequency stabilizing circuits are restored when recycle relay K4 opens. To prevent these circuits from attempting to phase lock vfo A12A2 during this interval, the +18 volts to 1kHz-frequency stabilizer A4 discriminator circuits is delayed for approximately 1/2 second. The delay circuit, contained on terminal board TB2, consists of transistor stage Q1.

(b) 618T-1B/2B/3B.

Refer to figure 13. When any of the frequency selector switches on the radio set control are moved, relay K4 is energized, and the 618T-1B/2B/3B is recycled. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna coupler, and disable the MHz-frequency
Keying Circuits, Simplified Schematic Diagram

Figure 12

stabilizing circuits. When the servo motors stop, recycle relay K4 opens and restores the MHz-frequency stabilizing circuits. The kHz-frequency stabilizing circuits are unaffected by the actions of recycle relay K4. These circuits receive frequency control information directly from the radio set control and therefore begin to stabilize on the new frequency immediately.

(12) Audio and Sidetone Circuits.

Figure 14 is a simplified schematic diagram of the audio and sidetone circuits. The sidetone is taken from audio amplifier stage A9Q2 to provide monitoring of the transmission. The sidetone passes from A9Q2, through keying relay K3 in the sidetone level adjust network, and through sidetone relay K6 to the headact. A combination of two voltages is necessary to energize sidetone relay K6. One voltage, derived from the rf output of power amplifier A11, is rectified by CR1 and CR2, filtered by C12, and applied to sidetone relay K6. The second voltage, from the high-voltage power supply, is proportional to power amplifier plate current. For sidetone relay K6 to energize, both sufficient plate current and plate voltage swing must be present in power amplifier A11. Capacitor C5, across the coil of sidetone relay K6, keeps the coil energized in the sideband transmit mode when the output voltage varies with speech.
Recycle Circuits, Simplified Schematic Diagram

Figure 13
Audio and Sidetone Circuits, Simplified Schematic Diagram

Figure 14

(13) ALC Circuits.

Figure 15 is a simplified schematic diagram of the alc circuits. Automatic load control functions when the power amplifier is driven into grid current. The duration of voice peaks and their period of recurrence, as well as average voice volume, differs between operators. These differences affect the amount of drive to the power amplifier grid and must be compensated for since the grid circuit must be driven at the threshold of grid current to derive maximum linear output. The alc circuits control the drive to the power amplifier by monitoring power amplifier grid voltage. Voice peaks that drive the power amplifier grids into grid current (class AB2) increase the voltage drop across resistor A11R1 in the grid bias circuit. Resistor A11R1 is common to the grid circuit of the power amplifier and the source-gate circuit of ALC amplifier A3Q1 in the if translator. The voltage drop across A11R1 increases with grid current flow and reduces the current in A3Q1. With the gain of A3Q1 lowered, drive to the power amplifier is decreased. The time constant of the circuit permits a slow decay for the feedback voltage required because of the intervals between voice peaks. Audio gain adjustment is made in the speech amplifiers (AM/audio amplifier module).
(14) TGC Circuits.

Transmitter gain control regulates carrier level in the AM mode to compensate for variations in gain throughout the 618T-( ) frequency range. (Refer to figure 16.) Transmitter gain control is a feedback voltage derived by sampling and rectifying the carrier voltage in a linear demodulator. This circuit is in the antenna relay compartment. A 10-to-1 voltage divider (C25 and C26) provides approximately 8 volts of rf to diode CR7 that rectifies and produces negative feedback voltage. Diode CR7, resistor R30, and capacitor C27 form the linear demodulator. The tgc feedback voltage obtained is proportional to average instantaneous peak carrier amplitude and is independent of frequency or modulation index. The tgc does not control the SSB level, but does maintain carrier level within the limits of 70 to 90 volts rms over the 618T-( ) frequency range.

C. Detailed Theory of Operation.

(1) AM/Audio Amplifier A9. (Refer to figure 822.)

The AM/audio amplifier, A9, amplifies voice, CW, or DATA signals in the transmit mode. Inputs are provided for mike or key and for balanced interphone.
NOTE:
UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS.

TGC and ADC Circuits, Simplified Schematic Diagram
Figure 16
618T-1/2/3 Frequency Selection and Translation, Block Diagram

Figure 19
618T-1B/2B/3B Frequency Selection and Translation, Block Diagram

Figure 20
lines. A 1-kHz tone is fed to this module for CW keying and as an antenna coupler tuning indicator. The 500-kHz if. signal from the rf translator module is also received by AM/audio amplifier A9 in the receive mode. DATA and SELCAL signals are amplified in three audio stages of amplification, while voice (microphone) signals are amplified in two audio stages. The amplified audio output is available for headphones, interphone lines, and for developing age for SSB received signals.

(a) Transmit.

When the CW key is depressed, CW TR delay relay A9K2 switches the receiver-transmitter from receive to transmit.

When the CW key is depressed or during the tone cycle of an antenna tuner or antenna coupler, CW keying relay A9K1 connects the 1-kHz tone to the input of audio amplifier A9Q8. In AM/audio amplifier A9 modules MCN 40000 and above (CPN 546-7267-004), the 1-kHz tone is filtered by A9U1 before being applied to audio amplifier A9Q8. Capacitors A9C47 and A8C49 hold relay A9K2 closed for approximately 550 milliseconds after the key is released.

Besides the tone input, two af inputs are provided. One input is single ended and applied through A9R6 to the base circuit of audio amplifier A9Q1. The second af input is a 600-ohm balanced input for other modulating sources, such as interphone or data. This second input is applied through A9R5 to the base of audio amplifier A9Q8.

Audio amplifiers A9Q8, A9Q1, and A9Q2 form the speech amplifier for transmit. The output of A9Q2 in transmit is single ended and coupled from the collector of A9Q2, through resistor A9R49, to the balanced modulator in if. translator A3.

(b) Receive.

In the receive mode, the three stages used for speech amplification become the output audio amplifier. Detected AM audio from diode A9CR4 is applied to the base of transistor A9Q8 through resistor A9R2 and capacitor A9C1 after selection by AM/SSB relay A3K3 in if. translator A3. Detected SSB audio is routed in the same manner from the product detector in if. translator A3.

The 500-kHz if. signal from the If mixer in rf translator A12 is amplified in stages A9Q3 through A9Q6. Bandwidth is restricted to 6 kH by mechanical filter F1 in the output circuit of if. amplifier A9Q3.

The AM if. signal, after amplification, is detected by diode A9CR4 and applied to the audio amplifier and a separate stage for SELCAL. This audio amplifier stage (A9Q9) permits interception of AM signals regardless of the position of the mode switch on the radio set control.

(2) IF. Translator A3. (Refer to figure 813.)

The if. translator, A3, functions both in transmit and receive modes. In the transmit mode, it produces a 500-kHz SSB or AM signal. In the receive SSB mode, it provides if. amplification and product detection.
(a) Transmit.

In the transmit mode, if translator A3 translates audio into an ssb or am signal at 500 kHz. The amplified audio from am/audio amplifier A9 is translated in the balanced modulator to the 500-kHz reference, producing a double sideband signal with a suppressed carrier. The signal is then amplified by alc amplifier A3Q1, whose output level varies according to its bias. Details of alc amplifier A3Q1 are contained in chassis circuit theory. After additional amplification by if amplifier A3Q2, sideband select relay A3K2 routes the signal through mechanical filter A3FL1 or A3FL2, depending upon the position of the function selector switch (usb or lsb) on the radio set control. When if translator (Collins part number 528-0720-001) is used, A3K3 switches the output of mechanical filter A3FL1 or A3FL2. If the function selector switch is in the am position, the usb mode is selected and the 500-kHz carrier is reinserted with the signal at the filter output. Amplifier A3Q7 is an FET transistor that provides a high impedance for the output of mechanical filters A3FL1 and A3FL2 (used on if translator, Collins part number 528-0720-001 only). Relay A3K5 routes the signal around if amplifier A3Q3 since this stage is used only in the receive mode. Additional amplification is provided by if amplifier A3Q4, and its output is the if translated signal to be converted to operating frequency in rf translator A12. Diode A3CR6 prevents the passage of unwanted spurious signals produced by receive and transmit mixers in rf translator A12.

The balanced modulator (A3CR8 through A3CR11) is a diode chopper that reverses polarity of the applied audio at a 500-kHz rate. Figure 21 is a simplified diagram of the balanced modulator. The 500-kHz carrier voltage is nearly 10 times larger than the audio voltage so the audio voltage peaks do not switch the diodes. The switching action of the diodes causes 500-kHz current in the primary windings of transformer A3T1 to reverse direction. By utilizing matched diodes and by adjustment of A3R9 and A3C9, the current flow during both positive and negative half-cycles is nearly equal. Therefore, the current flow in A3T1 is effectively canceled and the 500-kHz carrier is suppressed.

(b) Receive.

In the receive mode, if translator A3 converts the signal from if mixer A12V8 of rf translator A12 to audio at the product detector in either lsb or usb mode. The signal is amplified by if amplifier A3Q2, the sideband selected as in the transmit mode, and further amplified by A3Q7 (used on if translator Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. The output is combined in the product detector with the 500-kHz carrier. The output of the product detector is proportional to the 500-kHz carrier and the ssb signal. The detected audio is routed to am/audio amplifier A9 by ssb/am relay A3K3 that is deenergized in usb to lsb mode.

Several selected components are used in if translator A3. At the output of the mechanical filters, resistor A3R5 is selected for the proper signal level, and resistor A3R45 is selected to equalize lsb and usb gain within ±2 dB. The input level to if amplifier A3Q2 is adjusted by selection of A3R2.
Balanced Modulator, Simplified Schematic Diagram
Figure 21

(3) RF Translator A12, 618T-1/2/3. (Refer to figure 830.)

The prime function of rf translator A12, Collins part number 528-0113-00, is to translate the 500-kHz input to the 29,000 operating frequencies of the 618T-1/2/3 in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2,000 to 6,999 MHz. (Refer to figure 22.)

Although conversion methods differ in the two tuning ranges, the first conversion, from transmit if mixer A12V1 to the variable if, output, is identical throughout the 2,000- to 29,999-MHz range. For convenience, the range from 2,000 to 6,999 MHz will be called the low band, and the range from 7,000 to 29,995 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set
control shown in figure 22 is 3.451 MHz. To calculate the variable frequency oscillator (vfo) A12A2 operating frequency, subtract the last three digits of the operating frequency of the radio set control from 3.500 MHz, the upper frequency limit of the vfo.

Example: 3.451-MHz operating frequency

3.500-MHz vfo upper limit
-0.451 MHz

3.049-MHz vfo operating frequency (injection frequency)

In the transmit mode, the injection frequency, 3.049 MHz, is combined in transmit if mixer A12V1 with the 500-kHz input from if. translator A3. The difference frequency, 2.549 MHz, is tuned by the variable if, that is mechanically connected to the Autopositioner linkage. The MHz digit enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.549-MHz variable if signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 14.951 MHz, is passed through the 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VFO Frequency.
   3.500 MHz minus last three digits of operating frequency.

2. Variable IF.
   3.000 MHz minus last three digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.
   14.500 MHz plus last three digits of operating frequency.

A third conversion stage converts the 14.951-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 14.951-MHz signal with the output of hf oscillator A12V11 to obtain the operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the output frequency of hf oscillator A12V11 is between 12.5 and 8.5 MHz, while the operating frequency is between 2 through 6.999 MHz. The example, 3 MHz, requires an hf oscillator output of 11.500 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and the rf driver stages, while the Autopositioner uses a mechanical gear train to fine tune the rf amplifier and rf driver stages.
618T-1/2/3 Frequency Translation 2 to 6,999 MHz, Block Diagram

Figure 22

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(b) **Frequency Translation, 6.999 to 29.999 MHz.** (Refer to figure 23.)

The operating frequency of the radio set control, shown in figure 23, is 9.451 MHz. The last three digits of the operating frequency, .451 MHz, are the same as those used in the 2- through 6.999-MHz explanation, since, for all operating frequencies from 2 through 29.999 MHz, the vfo and variable if. frequencies are determined by the last three digits of the operating frequency only.

Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.549-MHz signal from If mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this mixer is not used for operating frequencies above 6.999 MHz.

The variable if. signal, 2.549 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.451 MHz (12.000 MHz minus 2.549 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

**RF translation in the receive mode is substantially the reverse of that of the transmit mode.** The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit If mixer A12V1 is replaced by receive If mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of If, translator A3 and AM/audio amplifier A9.

(c) **Autopositioner A12A1 Mechanism, 618T-1/2/3 Only (Collins Part Number 546-6873-005).**

The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation. For kHz increments of tuning, the Autopositioner contains two motors that drive a single shaft coupled to the vfo shaft. Another mechanical output from the Autopositioner tunes the variable if. and fine tunes the rf amplifier and rf driver through a train of gears as explained in the preceding sections covering frequency translation. The basic elements of the Autopositioner system are shown in figure 24. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

A typical cycle of operation of the Autopositioner is as follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When
the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the Autopositioner shaft, the rotor of the seeking switches, and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened, and the pawl is dropped into a stop-wheel notch to halt shaft rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop-wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of the radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. When the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its shaft (and connected tuning elements) to the proper position to restore the symmetry of the control system. It is a reentrant control system providing a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

The reentrant system is comparable to a single-pole, double-throw switch scheme shown in figure 25. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens, and the motor stops. The total number of combinations of switch positions in such a system is \(2^n - 1\), where \(n\) is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 832 is a schematic diagram of the Autopositioner submodule. There are three seeking switches in the Autopositioner: the 100-, 10-, and 1-kHz seeking switches corresponding to the last three digits of operating frequency selected on the radio set control. For the selected vfo frequency to be set up, all three seeking switches must be satisfied. Since each of the three switches has 10 positions, there are 100 or 1000 possible switch combinations or shaft positions. Since the 1000 possible combinations occur within a 1-MHz range, the 618T-1/2/3 tunes in 1-kHz increments.

The 100-kHz seeking switch is geared to the output shaft by an intermittent movement so that it is advanced one position for each revolution (100 kHz) of the Autopositioner output shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the output shaft. The stop wheel has 10 notches,
61ST-1/2/3 Frequency Translation 1 to 29.999 MHz, Block Diagram 
Figure 23
making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire output shaft assembly through the action of a cam. The cam turns the output shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.
618T-1/2/3 Remote Frequency Control, Simplified Schematic Diagram

Figure 25

(d) Balanced Mixer Theory.

Refer to figure 830. The rejection of unwanted mixer products produced by frequency translation in rf translator A12 includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.
Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C128 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In transmit, a key-line ground is applied through A12P9-16 to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit hf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +27.5-volt dc line at A12P9-17 and thus biased off).

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the agc voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +27.5-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier.
grid tank. Components of the 2- to 29.990-MHz tuned circuit are selected by 28-position band switches A12S4, A12S4, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contacts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver If mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

**Variable Frequency Oscillator A12A2.**

Variable frequency oscillator A12A2 is a submodule of rf translator A12. Refer to the schematic diagram in figure 833. The vfo is variable-reactance tuned by inductor A12A2L2. The inductor is mechanically driven by Auto-positioner A12A1 and changes the vfo 100 kHz for every revolution of the Autopositioner shaft. Ten turns of the Autopositioner shaft cover the 1-MHz range of the vfo minus 1 kHz (3.500 to 2.501 MHz). Variable inductor A12A2L1 is manually tuned to set the upper frequency limit when making tracking adjustments. Mechanical tracking adjustments are performed by adjustment of the shaft coupling between the vfo and the Autopositioner. Capacitors A12A2C12, A12A2C9, and voltage variable capacitor A12A2VC1 are in parallel with inductor A12A2L1 and A12A2L2 to form the major portion of the tuned circuit. A12A2VC1 is back biased by a +10.000-volt calibrated reference, and the application of dc voltage to its anode terminal varies its capacity and thus, the vfo A12A2 output frequency.
The voltage applied to A12A2VC1 anode is the error voltage produced by kHz-frequency stabilizer A4 to provide phase locking of vfo A12A2 to the 3-MHz reference crystal oscillator. If the vfo output frequency is too high, a positive error voltage is applied that decreases the back bias and causes A12A2VC1 capacitance to increase, in turn lowering vfo A12A2 output frequency.

Negative error voltage is applied when vfo A12A2 output frequency is too low. Refer to kHz-frequency stabilizer A4 detailed theory for the detailed theory of this process.

The output of transistor A12A2Q1 is coupled through capacitor A12A2C3 to the base of buffer amplifier A12A2Q2. The output of buffer amplifier A12A2Q2 is coupled through capacitor A12A2C10 to the base of buffer amplifier A12A2Q3. The output of buffer amplifier A12A2Q3 drives isolation amplifier A12A2Q4 and is also coupled to transformer A12A2T1. The output of transformer A12A2T1 provides the rf sample voltage for kHz-frequency stabilizer A4. The output of amplifier A12A2Q4 is the oscillator injection output coupled to the if mixer through transformer A12A2T2. Inductor A12A2Z1 is a 500-kHz trap that isolates the 500-kHz carrier from the oscillator.

To prevent signals from rf translator A12 from entering vfo A12A2 and providing false error signals to kHz-frequency stabilizer A4, vfo A12A2 contains an isolation bridge adjusted by A12A2R15. When the bridge is balanced, signals from rf translator A12 develop opposite and equal voltages across A12A2R14 and A12A2R15 and no output is produced. The unilateral network of capacitor A12A2C18 and resistor A12A2R19 provide isolation as well as positive feedback to increase the gain of the isolation output stage. The 70K3, 70K5, and 70K9 vfo's are basically similar. The 70K9 differs principally in the use of oven temperature control for crystal stability.

(ii) 17.5-MHz Oscillator A12V10.

Refer to figure 830. The 17.5-MHz oscillator, A12V10, is also fine tuned by a voltage-variable capacitor. Capacitor A12C276 responds in the same manner as the one used in vfo A12A2. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to the MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(iii) HF Oscillator A12V11.

Refer to figure 830. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator
remains in operation for all 23 frequencies that are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

RF Translator A12, 618T-1B/2B/3B. (Refer to figure 828.)

The prime function of rf translator A12 (Collins part number 528-0682-001) is translation of the 500-kHz input to the 280,000 operating frequencies of the 618T-1B/2B/3B Airborne SSB Transceiver in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2.0000 to 6.9999 MHz. (Refer to figure 27.)

Although conversion methods differ in the two tuning ranges, the first conversion from transmit if mixer A12V1 to the variable if. output is identical throughout the 2.0000- to 29.9999-MHz range. For convenience, the range from 2.0000 to 6.9999 MHz will be called the low band, and the range from 7.0000 to 29.9999 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set control shown in figure 27 is 3.7434 MHz. To calculate the voltage-controlled oscillator (vco) A15A7 operating frequency, subtract the last four digits of the operating frequency (from the radio set control) from 3.5000 MHz, the upper frequency limit of the vco.

Example: 3.7434-MHz operating frequency

\[
\begin{align*}
3.5000\text{-MHz vfo upper limit} \\
-0.7434 \text{ MHz} \\
2.7566\text{-MHz vco operating frequency (injection frequency)}
\end{align*}
\]

In the transmit mode, the injection frequency, 2.7566 MHz, is combined with the 500-kHz input from if. translator A3 in transmit if mixer A12V1. The difference frequency, 2.2566 MHz, is tuned by the variable if. that is mechanically connected to the Autopositioner mechanical linkage. The MHz digit 2 enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.2566-MHz variable if. signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 15.2434 MHz, is passed through 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VCO Frequency.

3.5000 MHz minus last four digits of operating frequency.
<table>
<thead>
<tr>
<th>OPERATING FREQUENCY (MHz)</th>
<th>HF OSCILLATOR FREQUENCY (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>*12.500</td>
</tr>
<tr>
<td>3-4</td>
<td>*11.500</td>
</tr>
<tr>
<td>4-5</td>
<td>*10.500</td>
</tr>
<tr>
<td>5-6</td>
<td>*9.500</td>
</tr>
<tr>
<td>6-7</td>
<td>*8.500</td>
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<td>10.000</td>
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<td>11.000</td>
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<td>**8.500</td>
</tr>
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</tr>
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<td>16-17</td>
<td>**9.500</td>
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<td>**10.000</td>
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<td>**10.500</td>
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<td>19-20</td>
<td>**11.000</td>
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<tr>
<td>20-21</td>
<td>**11.500</td>
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<td>21-22</td>
<td>**12.000</td>
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<td>**12.500</td>
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<td>**13.000</td>
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<td>**14.500</td>
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<td>**15.000</td>
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<td>28-29</td>
<td>**15.500</td>
</tr>
<tr>
<td>29-30</td>
<td>**16.000</td>
</tr>
</tbody>
</table>

*Hf oscillator frequencies that are mixed with the 14.5- to 15.5-MHz output from the 17.5-MHz mixer.

**Hf oscillator frequencies that are doubled before injection into the hf mixer.
2. Variable IF.

3.0000 MHz minus last four digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.

14.5000 MHz plus last four digits of operating frequency.

A third stage converts the 15.2434-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 15.2434-MHz signal with the output of hf oscillator A12V11 to attain the desired operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the frequency of the hf oscillator is from 12.5000 to 8.5000 MHz, while the operating frequency is from 2.0000 to 6.9999 MHz. The example MHz digit 3 requires an hf oscillator output of 11.5000 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and rf driver stages, while the Autopositioner fine tunes the rf amplifier and rf driver stages through a mechanical gear train.

(b) Frequency Translation, 7.0000 to 29.9999 MHz. (Refer to figure 28.)

The operating frequency of the radio set control, shown in figure 28, is 9.7434 MHz. The last four digits of the operating frequency, 7434 MHz, are the same as those used in the 2- through 6.9999-MHz explanation, since, for all operating frequencies from 2 through 29.9999 MHz, the vco and variable if. frequencies are determined by the last four digits of the operating frequency only.

Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.2566-MHz signal from if mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this stage is not used for operating frequencies above 6.9999 MHz. The variable if. signal, 2.2566 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.7434 MHz (12.0000 to 2.2566 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

Radio-frequency translation in the receive mode is substantially the reverse of that of the transmit mode. The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit if mixer A12V1 is replaced by receive if mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of if. translator A3 and AM/audio amplifier A9.
618T-1B/2B/3B Frequency Translation 2 to 6.9999 MHz, Block Diagram
Figure 27
618T-1B/2B/3B Frequency Translation 7 to 29,999 MHz, Block Diagram

Figure 28
Autopositioner A12A1 Mechanism (Collins Part Number 528-0683-001).

Refer to figure 829. The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation.

For kHz increments of tuning, the Autopositioner contains two motors that mechanically position switches for converting binary coded decimal (BCD) frequency control information from the radio set control to inverted BCD frequency control information used in frequency divider-stabilizer A15 for vco output frequency control. Another mechanical output from the Autopositioner, a gear train, tunes the variable if, and fine tunes the rf amplifier and rf driver stages (explained in the sections covering frequency translation). The basic elements of the Autopositioner system are shown in figure 29. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

A typical operational cycle of the Autopositioner follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the rotors of the seeking switches and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened and the pawl is dropped into a stop-wheel notch to halt rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. Whenever the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its elements to the proper position to restore the symmetry of the control system. It provides a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

The system is comparable to a single-pole, double-throw switch scheme shown in figure 30. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the
618T-1B/2B/3B Autopositioner System, Basic Elements
Figure 29

relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens and the motor stops. The total number of combinations of switch positions in such a system is \(2^n-1\), where \(n\) is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 829 is a schematic diagram of Autopositioner A12A1. There are three seeking switches and associated inverted BCD switches in Autopositioner A12A1: 100-, 10-, and 1-kHz switches. The 0.1-kHz inverted BCD frequency control information is not a function of Autopositioner A12A1. For the selected vco frequency to be set up, all 3 switches must be satisfied. Since all 3 switches have 10 positions each, there are \(10^3\) or 1000 possible combinations. Since the 1000 possible combinations occur within a 1-MHz
range, the Autopositioner tunes the 618T-1B/2B/3B in 1-kHz increments. The 0.1-kHz tuning process theory will be explained in the control data converter A18 and frequency divider-stabilizer A16 sections.

The 100-kHz seeking switch is geared so that it is advanced one position for each revolution (100 kHz) of the Autopositioner shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the shaft. The stop wheel has 10 notches, making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor A12B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire shaft assembly through the action of a cam. The cam turns the shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.
(d) Balanced Mixer Theory.

Refer to figure 828. The rejection of unwanted mixer products, produced by frequency translation in rf translator A12, includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.

(e) Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C123 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

(f) Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In
transmit, a key-line ground is applied through of A12P9-16, to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit hf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +28-volt dc line at A12P9-17 and thus biased off.)

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the age voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +28-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier grid tank. Components of the 20- to 29.999-MHz tuned circuit are selected by the 28-position band switches A12S4, A12S5, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contacts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver hf mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and the turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking
switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

(g) 17.5-MHz Oscillator A12V10.

Refer to figure 828. The 17.5-MHz oscillator, A12V10, is fine tuned by voltage variable capacitor A12C276. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(h) HF Oscillator A12V11.

Refer to figure 828. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator remains in operation for all 28 frequencies which are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

(5) Power Amplifier A11, 618T-( ). (Refer to figure 826.)

(a) General.

Power amplifier A11 amplifies the low-level rf output of rf translator A12. The power output is 400 watts pep, nominal in the SSB mode and 125 watts with carrier reinserted (amplitude-modulated equivalent). In the voice mode, voice peaks that cause grid current flow develop a control voltage for an automatic load control circuit that reduces drive. The plate circuit is under the control of transmit gain control (tgc) circuits and automatic drive control (adc) circuits.

(b) Power Amplifier Supply Voltages.

Static plate current has a marked effect on the linearity of power amplifier A11. Provision is made to monitor the static plate current balance of the individual power amplifier tubes with switches A11S4 and A11S5. Depressing these switches, with no drive applied to the grid circuit, permits separate checking of plate current for each tube. Drive to the power amplifier may be disconnected by removing the 500-kHz jumper cable between J5 and J6 on the right-hand side of the front cover.
The filaments operate on ac 
ac dc voltage depending
upon the high-voltage power
supply used. Grid bias
(which is not metered) is
obtained by rectifying and
filtering 115 volts, 400 Hz.
Adjustment of bias is
made by varying A11R3
for a setting of 300 ma on
the front panel meter
(100-ma static plate cur-
tent for each power
amplifier tube and 100-ma
plate current for driver
tubes and bleeder resis-
tor totaling 300 ma). Ad-
justment is made of
transmit gain control
tgc) to provide the rated
rf voltage output. Filter
A11F1 is a low-pass
LC circuit required to
prevent the passage of
rf energy into the power
supply. Capacitor
A11C1 couples rf
energy back to rf
translator A12 for
feedback neutralization.

(c) Band Switching and
Loading.

The rf voltage at operat-
ing frequency is applied
to power amplifier A11
from rf translator A12.
Power amplifier tubes
A11V1 and A11V2 are connected in parallel. The plate load is a pi network
that steps up the 50-ohm antenna impedance to match the 1000-ohm plate
circuit of A11V1 and A11V2 (refer to the simplified schematic diagram of
the output network in figure 31 and to the schematic diagram in figure 326
for power amplifier A11). The pi network for the plate load consists of
variable inductor (or roller coil) A11L4 and various shunt capacitors. The
shunt capacitors are selected by servo motor A11B1 driving wafer switches
A11S1, A11S2, and A11S3. Wafer switch A11S1 is a seeking switch that
derives the band information from wafer switch A12S12 in rf translator A12.
The band information divides the twenty-eight 1-MHz increments into eight
ranges of coarse tuning for power amplifier A11. Figure 31, a simplified
schematic diagram of the pi network, lists the tuning range for each of the
eight bands.

NOTE:
BROKEN ARROW INDICATES THAT VALUE IS VARIED IN 8 STEPS.

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The coarse tuning for the eight bands occurs during recycle. Band-switch motor A12B1 in rf translator A12 positions band switch A12S12 according to the operating frequency selected. Band switch A12S12, in turn, provides band information to seeking switch A11S1 in power amplifier A11 and activates motor A11B1.

(d) Servo Tuning.

After changing frequency, variable inductor A11L4 requires retuning. On some of the eight bands, the variable inductor is combined in series with other inductors as shown in figure 31. On the other bands the variable inductor is connected in series parallel.

Inductor A11L8 (see figure 826) is a compensating inductor that is tapped so that the parallel combination of A11L8 and C (out) approaches resonance at the high end of the band being used. The high impedance of this parallel resonant circuit holds the output impedance, and therefore, the amplifier plate load nearly constant over the entire tuning range of the band in use. The 52-ohm output of power amplifier A11 is generally coupled to an antenna tuner or antenna coupler. A signal from the antenna coupler during the tuning cycle energizes relay A11K3 and connects 25 ohms of resistance in series with the 52-ohm output to prevent the antenna coupler from attempting to tune prematurely.

(e) Phase Discriminator.

A servo loop tunes the power amplifier plate circuit to resonance. The phase discriminator that provides the error signal is shown in the power amplifier A11 schematic diagram. The signal at the power amplifier grids is coupled to the phase discriminator through parasitic suppressor A11E3. This is the reference signal. The error signal is picked off the pi network circuit by transformer A11T1 and applied to diodes A11CR2A and A11CR2B with equal potential but opposite polarity. Rectification of the error signal by these diodes causes unilateral current flow in resistors A11R12 and A11R13, and the resultant voltage drops across these resistors are opposite in polarity, causing cancellation and zero output voltage. If the rf voltage in the power amplifier plate circuit is not 180 degrees out of phase with grid voltage, the grid voltage reference will reinforce the current flow in either diode circuit A11CR2A or A11CR2B, depending upon the direction of phase error. The net difference in voltage drops between A11R12 and A11R13 is the error voltage. The polarity of the error voltage is determined by the direction of the phase error.

Refer to figure 817, a schematic diagram of electronic control amplifier A6. The 400-Hz chopper (A6G1) receives the error voltage from the power amplifier module and inverts it into a 400-Hz error signal. The error signal is then amplified in A6Q1 through A6Q4, phase inverted by A6Q5, and applied to push-pull amplifier A6Q6 and A6Q7. The push-pull amplifier output provides sufficient 400-Hz power to drive servo motor A11B2 in the power amplifier module. The solenoid of chopper A6G1 is supplied by the same 115-volt, 400-Hz phase leg as the reference winding of servo motor A11B2. This establishes phase relationship with the polarity of the signal voltage.
from the electronic control amplifier module. Therefore, servo motor A12B2 will run in the direction determined by the polarity of the error voltage and tune roller coil A11L4. Continuous sampling of the phase angle tuning of the roller coil provides feedback to reduce the error voltage to zero when the plate circuit is tuned to resonance.

(6) RF Oscillator A2, 618T-( ) (Collins Part Number 528-0251-005).

Refer to figure 811. A 3-MHz signal is generated by temperature-compensated crystal oscillator subassembly A2A1. The 3-MHz signal is applied to locked oscillator divider A2Q4. This locked oscillator divides the 3-MHz frequency by 6 to produce a 500-kHz output. This 500-kHz output is applied to amplifier A2Q5 and emitter-follower amplifier A2Q7. The output of amplifier A2Q5 is fed to the MHz-frequency stabilizer module and to amplifier A2Q6. The output of A2Q6 is fed to the if. translator module. Emitter-follower A2Q7 isolates locked oscillator A2Q8 from preceding circuit stages. The 500-kHz signal from A2Q7 is applied to locked oscillator divider A2Q8. This locked oscillator divides the 500-kHz signal by 5 to produce a 100-kHz output. This output is amplified by 100-kHz amplifier stage A2Q9 and fed to the frequency divider module.

The 3-MHz crystal oscillator in this module is the basis of the entire 618T-( ) frequency scheme. Therefore, it is very important that the oscillator frequency be kept as constant as possible. In the earlier version of rf oscillator module A2 (figure 812), the crystal is enclosed in a temperature-regulating oven that maintains the crystal temperature at 80 ±0.2 °C. The oven control circuit consists of a temperature-sensitive bridge and an audio amplifier composed of Q12 through Q15.

The bridge is composed of four resistance windings. The resistance values of two of the windings, made of a copper-nickel alloy, do not vary with temperature. These windings are on opposite legs of the bridge. The resistance values of the other two windings, which are made of pure copper, vary with temperature, the resistances being greater at a higher temperature. The resistances of the two temperature-variable windings are chosen so that, when the temperature of the oven is at the preset value, the values of all four winding resistances are equal and the bridge output is zero.

A new version of rf oscillator A2, Collins part number 528-0690-001 (figure 810), includes a squelch amplifier and control circuit. The oscillator portion of the module functions identically to rf oscillator A2, Collins part number 528-0251-005, explained above. The theory of operation of the squelch amplifier and control circuit is explained in paragraph 5.C.(15) of this manual.

(7) Frequency Divider A1, 618T-1/2/3. (Refer to figure 809.)

(a) General.

The spectrums used in the frequency stabilization circuits in the 618T-1/2/3 are a series of discrete frequencies, or spectrum points, spaced at equal intervals over a frequency range. These spectrums are produced by creating pulses of a certain frequency. A pulse with a repetition rate of exactly 1 kHz, for example, is composed of a series of sine waves of various
frequencies. A 1-kHz pulse contains many sine-wave frequencies spaced exactly 1 kHz from the other at 2 kHz, 3 kHz, 4 kHz, etc. The amplitude of these 1-kHz spectrum points decreases as the frequencies get further from the fundamental 1 kHz.

Each spectrum point frequency has precisely the same frequency stability and phase relations as the fundamental 1-kHz frequency. Therefore, spectrum points may be used as injection frequencies or reference frequencies in stabilization circuits if they are generated by pulses that are derived from the crystal oscillator in rf oscillator module A2.

As stated previously, the amplitude of the 1-kHz spectrum point frequencies decreases as the frequencies progress away from the fundamental 1 kHz. In some instances, it is desirable to use spectrum points so far from the fundamental frequency that their amplitude is too small to be useful. If, for example, the 1-kHz spectrum points around 550 kHz are needed, it is possible to increase their amplitude in the following manner.

The fundamental 1-kHz pulse is used to synchronize a monostable multivibrator at 1 kHz. The multivibrator output is a 1-kHz rectangular pulse. This pulse keys a free-running oscillator on and off at a 1-kHz rate. The keyed oscillator is tuned to the frequency about which the spectrum points are to be used, in this case 550 kHz.

It is not necessary for the free-running frequency of the keyed oscillator to be exactly 550 kHz for a spectrum point to be at 550 kHz. The free-running oscillator frequency does not appear in the spectrum. It merely determines the frequency about which the amplitude of the spectrum frequencies will be greatest. In the example, if the keyed oscillator were tuned to 550.2 kHz and keyed by an exact 1-kHz pulse, the spectrum output would be a series of frequencies, one at exactly 550 kHz and others extending on each side of 550 kHz at exact 1-kHz intervals. The amplitudes of the spectrum points decrease as they progress further from 550 kHz.

It is important to remember that each spectrum point frequency is as stable and exact as the original 1-kHz keying frequency and that the free-running frequency of the keyed oscillator only determines the frequency around which the amplitude of the spectrum point is greatest, so it does not have to be exact.

(b) Details.

The frequency divider module transforms a 100-kHz sine-wave input from rf oscillator module A2 to a 10-kHz pulse and a 1-kHz spectrum, centered at 550 kHz, that are used for frequency stabilization in kHz-frequency stabilizer module A4.

Refer to figures 32 and 33. The 100-kHz input from the rf oscillator module is fed through emitter-follower amplifier A1Q1 to locked oscillator A1Q2. This locked oscillator divides the 100-kHz signal by 2 to produce a 50-kHz output. The 50-kHz output is fed through emitter-follower amplifier A1Q3 to locked oscillator A1Q4. Locked oscillator A1Q4 divides the 50-kHz output
by 5 to produce a 10-kHz output. The 10-kHz signal is differentiated by A1C10 and A1R14 to produce a 10-kHz pulse. This pulse is inverted by A1Q8 and triggers blocking oscillator A1Q6. The 10-kHz pulse output of blocking oscillator A1Q6 is coupled through transformer A1T1 to connector A1P1.

The 1-kHz spectrum is produced as follows. Part of the 10-kHz output of locked oscillator A1Q4 is fed through isolation amplifier A1Q7 to locked oscillator A1Q8. Locked oscillator A1Q8 divides the 10-kHz output by 2 to produce a 5-kHz output. The 5-kHz signal switches transistor A1Q9 to produce a positive square wave at the output of A1Q9. Refer to figure 809. When A1Q9 is switched on, A1C22, A1C45, and A1C23 are charged through A1R28. When A1Q9 is switched off, A1C22 and A1C45 discharge through diodes A1CR3 and A1R27. The charge on A1C45 is trapped by diode A1CR4. Thus, each square-wave pulse charges A1C23 to a higher voltage. The value of the A1C22 and A1C45 parallel combination determines the amount of voltage added to A1C23 during each cycle. A1C23 is connected to the input of unijunction transistor A1Q10.

A unijunction transistor is a single-junction semiconductor device whose input is shorted to ground when it exceeds a certain value. When the transistor input voltage across A1C23 becomes high enough, A1C23 is discharged through A1Q10, causing a positive pulse to appear at the output of A1Q10. The value of A1C45 is selected so that every fifth cycle the voltage across C23 is sufficient to cause A1Q10 to conduct. Therefore, the 5-kHz square-wave input to A1Q10 produces a 1-kHz pulse output that is amplified by A1Q11 and used to trigger a monostable multivibrator composed of A1Q12 and A1Q13. The multivibrator output triggers keyed oscillator A1Q14 on and off at a 1-kHz rate. The free-running frequency of keyed oscillator A1Q14 is 550 kHz. Therefore, the output of A1Q14 is a 1-kHz spectrum centered around 550 kHz. A series tuned circuit, A1L8 and C33, produces the spectrum
pulse. The 10-kHz pulse and 1-kHz spectrum outputs of the frequency divider module are fed to kHz-frequency stabilizer A4.

(8) kHz-Frequency Stabilizer A4, 618T-1/2/3. (Refer to figure 814.)

(a) General.

The kHz-frequency stabilizer, A4, stabilizes the frequency of the vfo sub-module in rf translator A12. Figure 814 is a schematic diagram of kHz-frequency stabilizer A4.

Refer to figures 34 and 37. The vfo frequency is phase locked in 1-kHz steps with the crystal-generated reference frequency from oscillator module A2 by the action of the kHz stabilizer. A voltage-variable capacitor in the tuned circuit of the vfo tunes the vfo according to a dc tuning voltage from the kHz-frequency stabilizer. The tuning voltage for the voltage-variable capacitor is a combination of an adjustable bias voltage from a bias supply and frequency/phase-sensitive control voltages from frequency and phase discriminators. The frequency discriminator initially tunes the vfo within capture range of the phase discriminator.

The inputs to the phase discriminator are two 250-kHz signals. One is the vfo frequency that has been heterodyned to 250 kHz. The other is the rf oscillator crystal frequency that has been heterodyned to 250 kHz. The phase discriminator output is a dc error signal proportional to the phase difference between the 250-kHz signals. This error signal shifts the vfo frequency, by tuning the voltage-variable capacitors in the vfo, until the two signals are phase locked. By phase locking the vfo to the rf oscillator, the vfo frequency is as accurate as that of the rf oscillator reference frequency.

(b) Frequency Discriminator.

The vfo output, which varies from 3500 to 2501 kHz in 1000 1-kHz steps, is amplified by A4Q1 and mixed in A4Q2 with a spectrum of frequencies, spaced 10 kHz apart, which are centered 350 kHz higher in frequency than the vfo. As the vfo is tuned from 3500 to 2501 kHz, the center of the 10-kHz spectrum moves from 4050 to 3050 kHz. This 10-kHz spectrum is derived from the 10-kHz pulse from frequency divider module. The 10-kHz pulse synchronizes a monostable multivibrator, A4Q9 and A4Q10, which in turn triggers keyed oscillator A4Q11 to produce the spectrum. The free-running frequency of this keyed oscillator determines the frequency about which the 10-kHz spectrum points are located and is tuned to stay 550 kHz higher than the vfo. The keyed oscillator is tuned by a dc voltage applied to a voltage-variable capacitor, A4C52. The tuning voltage comes from a precision resistive divider located in Autopositioner A12A1.

The output of mixer A4Q2, the difference between the vfo frequency and the 10-kHz spectrum frequencies, contains frequencies spaced 10 kHz apart and centered at 550 kHz. The exact frequencies present depend on the vfo frequency being fed to mixer A4Q2. This series of frequencies is fed to a second mixer, A4Q3, where it is mixed with a signal from a free-running digit oscillator, A4Q12. The digit oscillator output is a single frequency that
50-kHz locked oscillator, TP1, 10 us/cm, 1.5 v peak to peak

20:1 Lissajous figure, TP3

CAL TONE output, TP6 (module extender) 500 us/cm, 1.25 v peak to peak across 5.6K (Remove AM/audio amplifier module for this check.)

2:1 Lissajous figure, TP1

10-kHz pulse output, J1, 50 us/cm, 6 v peak into 50-ohm load

1-kHz keyer, J3, 200 us/cm, -11 v peak

10-kHz locked oscillator, TP2, 50 us/cm, 2.3 v peak to peak

10-kHz pulse output, J1, 1 us/cm

1-kHz keyer, J3, expanded

10:1 Lissajous figure, TP2

Unijunction divider, TP4, 200 us/cm

1-kHz spectrum, TP5, 500 us/cm, 7 v peak to peak

5-kHz locked oscillator, TP3, 100 us/cm, 4.3 v peak to peak

Unijunction divider, TP4, 5th step and firing point, firing point voltage 6.65 v

1-kHz spectrum, TP5, expanded

618T-1/2/3 Frequency Divider A1, Waveforms
Figure 33

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61ST-1/2/3 kHz-Frequency Stabilizer A4, Block Diagram

Figure 34

is varied by the 1-kHz frequency selector switch on the radio set control. The digit oscillator is tuned by a voltage-variable capacitor, A4C66, to ten 1-kHz frequencies from 296 to 305 kHz. The tuning voltage for the digit oscillator is derived from another precision resistive divider in Auto-positioner A12A1. The free-running digit oscillator frequency is mixed in A4Q3 with the series of frequencies spaced 10 kHz apart and centered around 55C kHz. The output of A4Q3 is a series of frequencies spaced 10 kHz apart, centered around 250 kHz. One of these frequencies is 250 kHz plus or minus the vfo frequency error and the digit oscillator frequency error. The output of mixer A4Q3 is passed through mechanical filter FL1, which has a bandwidth of 10 kHz centered at 250 kHz. The mixer output frequency near 25C kHz is passed, but all the other frequencies are filtered out, for the nearest frequencies are 10 kHz away and will not pass through the filter whose bandwidth extends 5 kHz on either side of 250 kHz. The signal if frequency (250 kHz plus or minus the vfo and digit oscillator errors) is then amplified by if amplifiers A4Q5 through A4Q8 and fed to the frequency discriminator.

kHz-frequency stabilizer A4 is part of a feedback loop between the vfo output and a tuning-voltage input to a voltage variable capacitor in the vfo tune circuit. The module continually compares the vfo output frequency with a reference frequency and sends a dc tuning voltage to the vfo until it is phase locked with the reference. If the vfo drifts out of phase lock with the
reference, kHz-frequency stabilizer A4 senses this change and provides a dc error voltage to keep the vfo phase locked with the reference at all times.

The free-running frequency of vfo A12A2, after tracking adjustments, will vary approximately ±2 kHz. Phase lock of the vfo reduces this error considerably. For example, at a vfo frequency of 3.500 MHz, the allowable error is only 2.8 Hz, the same 0.8-part-per-million accuracy of the 3-MHz crystal oscillator. This difference is too great to be controlled by one discriminator. The frequency discriminator can capture the vfo with a 2-kHz error but it becomes insensitive to frequency error at a fraction of 1 kHz, usually ±200 Hz. The phase discriminator retains its sensitivity down to the region of ±3 Hz, but its capture range is too narrow to initially change the vfo error. Therefore both discriminators are needed. The output circuits of the frequency and phase discriminators work simultaneously and are series connected to provide the dc error voltage.

Initially, assume that the vfo is to be captured by the frequency discriminator because the vfo frequency error is too great to be captured by the phase discriminator. Capture of vfo frequency by the frequency discriminator is accomplished by mixing the vfo frequency with a 10-kHz reference spectrum to obtain an if signal that is amplified and applied to the frequency discriminator. It produces a dc error voltage that is applied to a voltage-variable capacitor in the vfo and the frequency is corrected within the capability of the frequency discriminator. Final vfo frequency correction is made by mixing the partially corrected vfo frequency with a 1-kHz reference spectrum. This yields a reference if. The reference if, is amplified and compared with the signal if in the phase discriminator. The phase discriminator produces a dc error voltage that overrides the output of the frequency discriminator, applies it to the same voltage-variable capacitor, and phase locks the vfo. Note that the phase discriminator does not compare the reference if, with the frequency discriminator dc output voltage but with the same signal if, applied to the frequency discriminator. Note also that both the frequency and phase discriminators correct the vfo frequency once the vfo is within the capture range of the discriminators.

During normal 618T-1/2/3 operation, the phase discriminator usually retains control of the vfo, and the frequency discriminator does not sense an error. The frequency discriminator can be expected to function when the 618T-1/2/3 is first turned on and when a frequency change is made.

(c) Frequency Translation, 618T-1/2/3.

The frequency translation processes that convert the vfo and reference frequencies to 250 kHz will now be explained in detail for a typical 618T-1/2/3 operating frequency. The principles of operation are exactly the same for each of the other 999 possible vfo frequencies.

Refer to figure 36. Assume that the 618T-1/2/3 operating frequency is X.245 MHz on any of the 28 bands. The vfo frequency will then be 3.500 MHz -0.244 MHz or 3.257 MHz (3257 kHz). Also assume, in this example, that the vfo is phase locked with the reference. The vfo frequency, therefore, will be exactly 3257 kHz.
The vfo output is fed to the first signal mixer in the kHz-frequency stabilizer. The injection to this mixer is a series of 10-kHz harmonics around a frequency that is approximately 550 kHz higher than the vfo frequency. In the example, these 10-kHz harmonics have the greatest amplitude around the 3810-kHz harmonic. This 10-kHz spectrum is produced by a keyed oscillator in the kHz-frequency stabilizer module that operates in the same manner as the keyed oscillator in the frequency divider module. The reference pulse for this 10-kHz keyed oscillator is the 10-kHz pulse output of the frequency divider module. Thus, each frequency in this 10-kHz spectrum is as stable as the 10-kHz reference pulse. The oscillator free-running frequency is tuned by a tuning voltage tapped from a precision resistive voltage divider in the Autopositioner to keep the harmonic of greatest amplitude approximately 550 kHz higher than the vfo frequency.

The first signal mixer output is another 10-kHz spectrum that is the difference between injection spectrum and the vfo input. This spectrum will be centered at approximately 550 kHz. The exact spectrum frequencies depend on the vfo frequency. In the example, this spectrum is centered around 553 kHz. This first signal mixer output is fed to the input of a second signal mixer. The injection frequency for this mixer is the output of a digit oscillator.

The digit oscillator is a free-running oscillator in the kHz-frequency stabilizer module. It is tuned by a voltage-variable capacitor whose tuning voltage is tapped from a precision resistive voltage divider in the Autopositioner. The digit oscillator output frequency depends on the 1-kHz digit in the 618T-1/2/3 operating frequency and varies in 1-kHz steps from 296 kHz when the operating frequency is X.XX6 MHz to 305 kHz when the operating frequency is X.XX5 MHz. Figure 35 lists the digit oscillator frequency for each operating frequency digit. Figure 36 contains an example operating frequency.

In the example, the operating frequency is X.243 MHz, and the digit oscillator frequency will correspond to the X.XX3-MHz setting or 303 kHz. Because the digit oscillator is a completely free-running oscillator, its output frequency will depart somewhat from exactly 303 kHz. This error has been designated in the example as e.

The second signal mixer output is tuned to the mixer difference frequency output. When the digit oscillator is mixed with the 10-kHz spectrum, the output will be another 10-kHz spectrum centered at approximately 250 kHz. One of the mixer products will vary from 250 kHz only by the digit oscillator frequency error introduced in the mixing process. This mixer product is filtered from the spectrum by a mechanical filter whose bandwidth is 4 kHz on either side of 250 kHz. This 250-kHz frequency is the input signal to the frequency and phase discriminators. The 250-kHz reference frequency is derived in a manner similar to the 250-kHz signal previously described.

The 1-kHz reference spectrum from 546 to 555 kHz, and output of the frequency divider module, is mixed with the digit oscillator output in the reference mixer. The mixer difference frequency output will contain (in addition to the other mixer products) a product that is the difference between
<table>
<thead>
<tr>
<th>618T-1/2/3 OPERATING FREQUENCY (MHz)</th>
<th>DIGIT OSCILLATOR FREQUENCY (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X.XX6</td>
<td>296</td>
</tr>
<tr>
<td>X.XX7</td>
<td>297</td>
</tr>
<tr>
<td>X.XX8</td>
<td>298</td>
</tr>
<tr>
<td>X.XX9</td>
<td>299</td>
</tr>
<tr>
<td>X.XX0</td>
<td>300</td>
</tr>
<tr>
<td>X.XX1</td>
<td>301</td>
</tr>
<tr>
<td>X.XX2</td>
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<tr>
<td>X.XX3</td>
<td>303</td>
</tr>
<tr>
<td>X.XX4</td>
<td>304</td>
</tr>
<tr>
<td>X.XX5</td>
<td>305</td>
</tr>
</tbody>
</table>

618T-1/2/3 Digit Oscillator Frequency for Each Operating Frequency Digit  
Figure 35

the 553-kHz reference spectrum component and the 303-kHz digit oscillator output. This 250-kHz reference mixer output will, like the 250-kHz signal from the second signal mixer, vary from exactly 250 kHz by the frequency error of the digit oscillator introduced in the reference mixer. The mixer products in the output of the reference mixer will be spaced 1 kHz apart. The 250-kHz spectrum component is filtered out by a crystal filter whose bandpass extends 5 kHz on either side of 250 kHz. This 250-kHz frequency is the reference input to the phase discriminator.

For the reference if, to function properly, digit oscillator frequency error e is held within ±150 Hz. If the error exceeds ±200 Hz, the 1-kHz reference spectrum component near 250 kHz (at the output of the reference mixer) will not fall within the bandpass of the crystal filter in the reference channel. If this happens, the 250-kHz reference if. will not be applied to the reference if. amplifiers and therefore not to the phase discriminator.

The digit oscillator frequency must be accurate. Therefore, the voltage that tunes the voltage-variable capacitor in the oscillator tuned circuit must be stable. This dc tuning voltage comes from a bridge circuit shown in figure 38. Part of this circuit is in the kHz-frequency stabilizer module, part in the chassis, and part in the Autopositioner submodule located in the rf
618T-1/2/3 kHz-Frequency Stabilizer A4, Frequency Translation Process
Figure 36

translator module. The bridge output is kept constant by the action of three series breakdown diodes CR6, CR7, and CR8. A 40-ohm resistor, R58, in the bridge arm opposite the diodes, nearly equals the resistance of the diodes in the breakdown condition. Because of the ratio of resistances between the upper and lower arms of the bridge, voltage changes at the bridge input are nearly eliminated at the bridge output.

The precision resistive voltage divider in the Autopositioner that provides the tuning voltage for the digit oscillator is connected across the bridge output. The digit oscillator frequency may be adjusted by varying R58, which is in series with the divider.

The VFO bias voltage and 10-kHz keyed oscillator tuning voltage are also taken from precision voltage dividers that are connected across the breakdown diode circuit of the bridge. Currents in both of these dividers may be varied to produce the proper tuning voltage for the voltage-variable capacitors.

The 250-kHz signal is applied to a frequency discriminator that is tuned to 250 kHz. The frequency discriminator dc output voltage is applied in series with the phase discriminator dc output to the voltage-variable capacitor in
the vfo tuned circuit. The frequency discriminator output shifts the vfo frequency to within the phase discriminator capture range.

The phase discriminator compares the two 250-kHz if. signals and produces a dc output voltage proportional to the phase difference between the two. The effect of digit oscillator frequency error is canceled in the phase discriminator, for the error appears in both discriminator inputs.

The phase discriminator dc output is not necessarily zero, for the two inputs may not be exactly in phase even though they are phase locked. The discriminator output, however, will remain constant as long as there is no relative phase drift between the 250-kHz signal and reference frequencies.

If the vfo frequency tends to drift with respect to the reference, the phase discriminator dc output voltage will change. This in turn will retune the vfo to decrease the phase drift to zero.

The vfo input to the kHz-frequency stabilizer module and the vfo dc tuning voltage from the stabilizer are carried on the same line. The vfo rf voltage is added to the dc tuning voltage so that there are both useful ac and dc components in the line. The two components are separated at the end of the line.

(9) MHz-Frequency Stabilizer A10, 618T-( ). (Refer to figure 824.)

The MHz-frequency stabilizer, A10, phase locks 17.5-MHz oscillator A12V10 and hf oscillator A12V11 with a 500-kHz spectrum. Both oscillators are contained in rf translator A12. The 17.5-MHz oscillator, A12V10, has one operating frequency, and hf oscillator A12V11 operates on 16 frequencies. Both 17.5-MHz oscillator A12V10 and hf oscillator A12V11 operate on frequencies that are harmonics of 500 kHz. A 500-kHz reference from rf oscillator A2 is used by MHz-frequency stabilizer A10 to generate 500-kHz harmonics comprising a spectrum. The spectrum is combined in separate mixer/amplifiers for each oscillator, and the output is rectified and provides an error signal for oscillator control through the use of a voltage-variable capacitor.

Refer to the block diagram, figure 39, and to the schematic diagram, figure 824. The MHz-frequency stabilizer is part of a feedback loop between the oscillator output and the dc tuning voltage input to a voltage-variable capacitor in the oscillator. The mixer/amplifier subassembly is identical for each oscillator. Subassembly A10A1 controls 17.5-MHz oscillator A12V10, and subassembly A10A2 controls hf oscillator A12V11. The 16 frequencies of hf oscillator A12V11 are fundamental frequencies. There are 28 output frequencies in hf oscillator A12V11 plate circuit, but 12 of these are obtained by doubling the fundamental frequency.

The following discussion describes the phase lock of 17.5-MHz oscillator A12V10. The theory applies as well to each of the 16 fundamental frequencies of hf oscillator A12V11.

The oscillator control voltages appear at connectors A10P1A1 and A10P1A2. The sample rf frequency and the dc error voltage to correct it are diplexed and
618T-1/2/3 kHz-Frequency Stabilizer A4, Waveforms

Figure 37
618T-1/2/3 Voltage Stabilizing Bridge Circuit, Simplified Schematic Diagram
Figure 38
crosscoupled. That is, the rf sample from 17.5-MHz oscillator A12V10 and the dc error voltage used to correct hf oscillator A12V11 both appear at A10P1A1. Similarly, the rf sample from hf oscillator A12V11 and the dc error voltage to correct 17.5-MHz oscillator A12V11 both appear at A10P1A2.

From connector A10P1A1, the rf sample from 17.5-MHz oscillator A12V11 is amplified by rf amplifiers A10A1Q1 and A10A1Q2 and mixed with the 500-kHz spectrum in mixer A10A1Q3. The spectrum is a series of differentiated pulses containing reference frequencies equally spaced at 500-kHz intervals from 500 kHz to approximately 25 MHz. Each 500-kHz spectrum point is a harmonic of the reference pulse from rf oscillator A2 and therefore is as stable as the crystal fundamental.

MHz-Frequency Stabilizer A10, Block Diagram
Figure 39
If the connection to connector A10P1A1 is interrupted, the sample rf signal from 17.5-MHz oscillator A12V10 is interrupted, and the remaining input to A10A1 amplifier/mixer is the differentiated 500-kHz reference pulse from the spectrum generator. The reference pulse injection to mixer A10A1Q3 is adjusted with A10R5 on the spectrum generator. Resistors A10A1R10 and A10A1R11, together with thermistor A10A1RT1, form a voltage divider that also influences the amplitude of the injection voltage. Thermistor A10A1RT1 holds amplitude variations relatively constant over a wide temperature range.

The spectrum is applied to the base of mixer A10A13 and, due to the nonlinear characteristics of the mixer, the spectrum points mix. Since each spectrum point is separated by 500 kHz, a 1-MHz component is obtained by the mixing of every other spectrum point. In the range of the 17.5-MHz amplifier, these components appear at 16.5 MHz, 17.5 MHz, 18 MHz, 17 MHz, etc.

This 1-MHz component is applied to amplifier A10A1Q4, which is tuned to 1 MHz; it filters out the undesired spectrum products. The desired 1-MHz component is detected by A10A1CR2 and filtered by the 1-MHz stop filter made up of A10L15 and A10C11. Spectrum amplitude adjustment A10R5 is set so that the detected voltage from the spectrum alone is +6.5 volts. This dc voltage is the bias voltage for the 17.5-MHz oscillator A12V10 voltage-variable capacitor.

With the connection completed to connector A10P1A1, the sample rf signal from 17.5-MHz oscillator A12V10 is amplified in rf isolation amplifiers A10A1Q1 and A1CA1Q2 and then mixed in A10A1Q3 with the spectrum reference.

Two frequencies that are not identical differ in phase relationship. This difference may be used to produce an error voltage. Presume that only a 1-Hz error exists in 17.5-MHz oscillator A12V10 frequency. If this error is in the direction of the upper spectrum point (18.5 MHz), the difference frequency is 999,999 Hz. The difference frequency between the oscillator and the lower spectrum point at 16.5 MHz is 1,000,001 Hz.

Both of the previously mentioned mixer products represent oscillator frequency error, and they drift, phase relative, to the third mixer output, of which the 1-MHz component is the reference. Refer to the diagram of mixer output phasors in figure 40. This figure is a phasor representation of the three 1-MHz mixer output products. The 1-MHz reference is represented by a vertical phasor that is rotating counterclockwise at a 1-MHz rate. The two signal phasors that represent the sum and the difference between the reference and the 1-Hz errors are shown approximately 90 degrees out of phase with the reference. This is an instantaneous phase relationship to the reference and varies constantly since there is no phase lock. Because the two signal phasors are the sum and difference of one reference, they always lead and lag the reference by equal angles.

If the 17.5-MHz oscillator is phase locked with reference, the three phasors are all rotating at exactly the same rate. The sum of the three 1-MHz components will be a single 1-MHz frequency represented by a vertical phasor. (The three phasors rotate at a 1-MHz rate but are stationary relative to one another.)
Phasor Diagrams
Figure 40
The vertical plot of tuning voltage in the figure represents the magnitude of the output voltage from A10A1CR2. Only under the condition that all three 1-MHz signals are at the same phase will the maximum voltage be developed. However, the condition of phase lock does not represent zero phase difference between phasors. Phase lock will occur at some angle less than 90 degrees, at which time the signal phasors will not change phase relationship with the reference. Exact in-phase relationship will periodically occur when there is no phase lock, however. Since both signal phasors are drifting relative to reference, the voltage they develop will drift accordingly. This varying voltage alternately adds to and subtracts from the reference that is represented by the +6.5-volt bias. The result is that the detector output at A10A1CR2 will change from near-0 volt when the signal phasors are in opposite phase with the reference to approximately +13 volts when the signal phasors swing in phase with the reference. The time required for this voltage change to occur depends upon the frequency error. With the 1-Hz error, the time for 1/2 cycle (0 volt to peak) will be 500 milliseconds.

Because this 0- to 13-volt output is applied to the voltage sensitive capacitor in the 17.5-MHz oscillator, the frequency of the oscillator will swing through its entire correction range in 500 milliseconds. With only a 1-Hz error to correct, the first slight change in voltage will correct it. When the error is reduced to 0.1 Hz, the rate of output voltage change slows to 5 seconds for 0 volt to peak. When the error is reduced to 0.01 Hz, the rate of change is 50 seconds. Ultimately, the exact frequency is reached and the drift rate is zero. At this point there is phase lock and the output voltage is zero.

When the 618T-( ) is turned on, it is possible that the signal phasors will be at the wrong point in the drift cycle. Assume that +7.5 volts is the correct locking voltage, but the oscillator begins operating and produces phasors that are rotating in the direction of in-phase condition with the reference and already producing an 8-volt dc output. The voltage is on the increase and tunes the oscillator even higher in frequency. In turn, a larger error is created. Since the larger the error the more rapid the drift rate, the increasing output voltage accelerates to maximum almost instantly.

When an approximate 12-volt dc output is reached, the oscillator is at the high end of its correction range. At this point, 17.5-MHz recycle stage A10A3 operates, and unijunction transistor A10Q3 fires. This occurs due to discharge of capacitor A10C5, which was initially charged by the rising output voltage. When the unijunction transistor fires, A10C5 discharges to ground, and the output voltage is reduced to zero. The oscillator is then tuned to the opposite (low) end of the correction range. Capacitor A10C5 begins to charge again as the oscillator is tuned toward phase lock by the output voltage. As previously explained, the rate of change slows until it becomes zero at the correct frequency and the oscillator is phase locked to the reference.

(10) Control Data Converter A16, 618T-1B/2B/3B. (Refer to figure 848.)

Control data converter A16 converts 0.1-kHz reentry code frequency control data from the radio set control to inverted binary coded decimal (BCD) frequency control data. The inverted BCD data controls the 0.1-kHz frequency circuitry in divider-stabilizer A15 in both transmit and receive modes of operation. A 1-kHz oscillator in control data converter A16 provides a 1-kHz tone for transceiver tuning and CW transmission.
Figure 848 is a schematic diagram of control data converter A16. Refer to figure 41, a functional logic diagram of control data converter A16. The use of the reentry code frequency control system provides a selection of any one of ten 0.1-kHz frequency selections (0 through 9) on four control wire inputs to control data converter A16 from the radio set control. The frequency control information presented to control data converter A16 is a combination of grounded and open-to-ground circuits. The output of control data converter A16, fed directly to frequency divider-stabilizer A15, is a combination of 0 volt dc (logic 0) and positive voltage to ground (logic 1).

The following discussion describes the actions of control data converter A16 for one frequency setting on the radio set control. The principles apply, however, to the other nine settings.

When the 0.1-kHz frequency selector switch on the radio set control is set to 2, control data converter connector A16P1-2 and A16P1-4 are grounded while A16P1-3 and A16P1-5 are open to ground. The ground at A16P1-2 applies logic 0 to the input of inverter A16Q5 and to one input of AND gates A16CR9 and A16CR10, A16CR18 and A16CR19, and A16CR26 and A16CR27. The open at A16P1-3 applies logic 1 to the input of inverter A16Q6 and to one input of AND gates A16CR9 and A16CR10 and A16CR22, A16CR23, and A16CR24. AND gate A16CR9 and A16CR10 with inputs of logic 0 and logic 1 has an output of logic 0 that is applied directly to the input of inverter A16Q1. Inverter A16Q1 inverts the logic 0 input to a logic 1 output and applies it directly to output A16P1-23.

The ground at A16P1-4 applies logic 0 to the input of inverter A16Q7 and to one input of AND gates A16CR20 and A16CR21 and A16CR26 and A16CR27. The open circuit at A16P1-5 applies logic 1 to the input of inverter A16Q8.

Inverter A16Q5, with a logic 0 input, applies a logic 1 output to one input of AND gate A16CR22, A16CR23, and A16CR24. Inverter A16Q6, with a logic 1 input, applies a logic 0 output to one input of AND gates A16CR14 and A16CR15 and A16CR32 and A16CR33. Inverter A16Q7, with a logic 0 input, applies a logic 1 output to one input of AND gates A16CR14 and A16CR15, A16CR16 and A16CR17, and A16CR22, A16CR23, and A16CR24. Inverter A16Q8, with a logic 1 input, applies a logic 0 output to AND gates A16CR16 and A16CR17 and A16CR32 and A16CR33. AND gate A16CR32 and A16CR33, with logic 0 inputs, applies a logic 0 output to one input of AND gates A16CR18 and A16CR19 and A16CR20 and A16CR21 and to the input of AND gate A16CR25.

AND gate A16CR14 and A16CR15, with a logic 0 and a logic 1 input, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR16 and A16CR17, with logic 1 and logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR18 and A16CR19, with logic 0 inputs, applies a logic 0 output to one input of AND gate A16CR11, A16CR12, and A16CR13. AND gate A16CR22, A16CR23, and A16CR24, with logic 1 inputs, applies a logic 1 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR20 and A16CR21, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR25, with a logic 0 input, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37. AND gate A16CR26 and A16CR27, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37.
618T-1B/2B/3B Control Data Converter A16, Functional Logic Diagram

Figure 41

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OR gate A16CR11, A16CR12, and A16CR13, with three logic 0 inputs, applies a logic 0 output to inverter A16Q2 that inverts it to produce a logic 1 output at A16P1-22. OR gate A16CR34 and A16CR35, with a logic 1 and a logic 0 input, applies a logic 1 output to inverter A16Q3 that inverts it to produce a logic 0 output at A16P1-21. OR gate A16CR36 and A16CR37, with logic 0 at both inputs, applies a logic 0 output to inverter A16Q4 that inverts it to produce a logic 1 output at A16P1-20.

(11) Frequency Divider-Stabilizer A15.

Frequency divider-stabilizer A15 supplies and stabilizes a variable frequency from 2.5001 MHz to 3.5000 MHz in 100-Hz steps to the IF mixer in rf translator A12.

Figures 838 through 847 are schematic diagrams of the individual circuit boards in frequency divider-stabilizer A15. Refer to figure 42, a block diagram of frequency divider-stabilizer A15.

The 2.5001- to 3,5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's). One oscillator has a frequency range from 2,5001 to 3,0000 MHz. The other oscillator has a frequency range from 3,000 to 3.5000 MHz. Transistor switches are operated by information supplied through the 100-kHz radio set control lines that turn on the proper oscillator, depending upon the frequency selected. The oscillator output frequency is controlled by a dc voltage input from phase/frequency discriminator circuit board A15A5 that is applied across voltage-variable capacitors in the oscillator circuit. As the voltage applied across the voltage-variable capacitors increases, the capacitance decreases; thus increasing the oscillator frequency. Also, as the voltage applied across the voltage-variable capacitors decreases, the oscillator frequency decreases.

The output of the oscillator is fed into an isolation amplifier before being applied to the IF frequency mixer. The output of the vco must work into a constant impedance source supplied by the isolation amplifier. The output impedance of the isolation amplifier may vary a considerable amount, but the input impedance will remain constant. Two outputs are obtained from the isolation amplifier: one output is connected to the IF mixer stage of rf translator A2, while the other output is connected directly to the variable frequency divider circuit.

The variable frequency divider circuit is capable of dividing the output frequency of the vco 25,001 to 35,000 times, depending upon the frequency control information supplied by the radio set control. The variable frequency divider circuit, consisting of three divide-by-10 circuit boards (A15A1, A15A2, and A15A3) and one divide-by-26-to-35 circuit board (A15A4), is actually a counting circuit. With no frequency control information applied to the frequency control lines, each of the divide-by-10 circuit boards counts 10 input pulses prior to producing 1 output pulse. The three divide-by-10 circuits are connected in series and, therefore, 1000 input pulses are required at the input to divide-by-10 circuit board A15A1 to produce 1 output pulse from divide-by-10 circuit board A15A3. Divide-by-26-to-35 circuit board A15A4 requires 35 input pulses to produce 1 output pulse. Divide-by-26-to-35 circuit board A15A4 is connected in series with the output of the three divide-by-10 circuit boards and, therefore, 35,000 input pulses
are required at the input of divide-by-10 circuit board A15A1 for 1 pulse output from divide-by-26-to-35 circuit board A15A4. The output of the divide-by-26-to-35 circuit board, when the vco is locked on frequency, is 100 pulses per second. Therefore, an input of 3,500,000 pulses per second is required at the input of divide-by-10 circuit board A15A1 for an output of 100 pulses per second from divide-by-26-to-35 circuit board A15A4.

The frequency control information supplied to the variable frequency divider circuit boards control lines by the radio set control tells each divider circuit board how many pulses not to count. Since the variable divider circuitry normally counts 35,000 pulses with no frequency information on the control lines, it will count 35,000 pulses minus the number of pulses defined by the information appearing on the control lines.

An example of the frequency division process follows. Assume that the radio set control is set to a frequency of XX,7434 MHz (743,400 Hz), that the vco output frequency is 3.5000 MHz (3,500,000 Hz), and that the variable divider circuit is dividing the vco output by 35,000 to attain the required output of 100 pulses per second (pps). The frequency control information will appear on the variable divider circuit control lines as a 7 on divide-by-26-to-35 circuit board A15A4, a 4 on divide-by-10 circuit board A15A3, a 3 on divide-by-10 circuit board A15A2, and a 4 on divide-by-10 circuit board A15A1. The action of telling a divider circuit how many pulses not to count is accomplished by an addition process. The vco output frequency is now 2,7566 MHz (3,5000 MHz minus the radio set control setting of XX,7434 MHz). Divide-by-10 circuit board A15A1 is told not to count 4 pulses and is told so at a repetition rate of 100 times per second or, in effect, 400 pulses have been added to the input frequency, 2,756,600 pulses per second (pps), from the isolation amplifier. The combined frequency is now 2,757,000 pps, and after being divided by 10 by circuit board A15A1, becomes 275,700 pps that is fed directly to divide-by-10 circuit board A15A2. Divide-by-10 circuit board A15A2 is told not to count 300 pps. When 300 pps is added to the input frequency to circuit board A15A2 (275,700 pps), the result is 276,000 pps and after division by 10 becomes 27,600 pps and is fed directly to divide-by-10 circuit board A15A3. Divide-by-10 circuit board A15A3 is told not to count 400 pps. When 400 pps is added to the input frequency of circuit board A15A3 (27,600 pps), the result is 28,000 pps and after division by 10 becomes 2,800 pps and is fed directly to divide-by-26-to-35 circuit board A15A4. Divide-by-26-to-35 circuit board A15A4 is told not to count 700 pps. When 700 pps is added to the input frequency of circuit board A15A4 (2,800 pps), the result is 3,500 pps and after division by 35 becomes 100 pps and is fed directly to the phase/frequency discriminator circuit board A15A5. When the vco is locked on the proper frequency, the output of the variable frequency divider circuitry is 100 pps.

The reference frequency divider, divide-by-1000 circuit board A15A6, produces a 1 output pulse from 1000 input pulses. The input signal to circuit board A15A6 is a 100-kHz signal obtained from rf oscillator A2. The output of reference frequency divider circuit board A15A6 is 100 pps with an accuracy equal to the frequency standard. The 100-pps output is compared with the output of the variable frequency divider circuit. When the vco is locked on frequency, the outputs of both the reference frequency divider and the variable frequency divider circuits
618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram

Figure 42

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are 100 pps and, therefore, the output frequency of the vco is as accurate as the frequency standard. The output of reference frequency divider circuit board A15A6 is fed directly to phase/frequency discriminator circuit board A15A5.

Phase/frequency discriminator circuit board A15A5 constantly compares the two input signals from the variable frequency divider circuit and the reference divider circuit. If the two input signals differ only slightly in frequency, the phase discriminator sends a dc voltage to the voltage-variable capacitors in the vco that changes the output frequency of the vco until the output frequency of the variable frequency divider circuit is 100 pps and is frequency locked to the 100-pps reference signal.

If the difference in frequency between the reference signal and the variable frequency divider output signal becomes so great that the phase discriminator cannot bring them to a frequency lock, the discriminator sends a narrow pulse to the voltage-variable capacitors in the vco. The narrow pulse drives the frequency of the vco to either limit of its frequency range with the polarity of the pulse determining to which limit of the frequency range the vco is driven. After the vco reaches one limit of its frequency range, it sweeps across its entire frequency range until the phase discriminator is able to bring the output of the variable frequency divider circuit into frequency lock with the reference signal. For example, assume that the vco output frequency is 3,500 MHz and that the variable frequency divider circuit is dividing by 35,000. The output of the variable divider circuit is 100 pps and is phased locked with the 100-pps output of the reference divider circuit. Now assume that the frequency control information changes and tells the variable divider circuitry to divide by 25,001. Momentarily, the output frequency of the vco will remain at 3,500 MHz, but the output of the variable divider circuitry will be 140 pps (3,500 MHz divided by 25,001). The frequency discriminator circuit sends a narrow negative pulse to the voltage-variable capacitors in the vco, causing the vco to sweep toward the lower limit of its frequency range (2,5001 MHz). As the vco output frequency reaches 2,5001 MHz, the output of the variable frequency divider circuitry will be 100 pps and will allow the phase discriminator to lock the output frequency of the vco at 2,5001 MHz. The output of phase/frequency discriminator circuit board is fed directly to low-pass filter A15FL1.

Low-pass filter A15FL1 extracts the average dc voltage from the input voltage supplied by phase/frequency discriminator circuit board A15A5. This dc voltage is fed through the lead-lag (compensation) network to the voltage-variable capacitors in the vco.

The lead-lag (compensation) network performs two functions. It compensates for any phase shift at lower frequencies caused by filter A15FL1 and acts as an attenuator at lower frequencies to prevent undesired oscillations. The output of lead-lag network is fed directly to the voltage-variable capacitors in the vco.

(12) Low-Voltage Power Supply A5.

(a) General.

Low-voltage power supply A5 includes a rectifier-filter power supply circuit that produces +130 volts dc from the 115-volt, 400-Hz line input and ac.
+18-volt dc divider power supply that provides the highly regulated voltage required for stable transistor operation in the 618T-( ). Low-voltage power supply A5 also contains a transient blanker circuit that protects transistors in the 618T-( ) from transient line voltage surges. A schematic diagram of low-voltage power supply A5 is shown in figure 816.

(b) Transient Blanker Circuit.

Refer to figure 43. Sudden changes in load on the primary power circuits often cause large transient peaks on the 27.5-volt dc line feeding the 618T-( ). Low-voltage power supply A5 contains a transient blanker circuit that protects transistors during transients by dropping the 27.5 volts dc to zero for the duration of the transient. A threshold of 32 volts dc is chosen as the maximum. If this voltage is exceeded, the transient blanker circuit operates. Refer to figure 44. When the voltage is below 32 volts, A5Q2 is forward biased and current flows through A5R1, A5R10, emitter to base of A5Q2, A5CR4, and resistors A5R2 through A5R6. Transistor A5Q2 becomes saturated, thereby making the collector voltage nearly equal to emitter voltage. The resistors form a voltage-dividing network, and there is a 1-volt drop across A5R1, A5R10, and emitter to collector of A5Q2. The output

![Transient Blanker Waveforms](image)
voltage is then 26.5 volts dc. If the input voltage exceeds 32 volts dc, diode A5CRI breaks down and A5Q1 becomes forward biased. Current flow from emitter to base of A5Q1 is shunted to ground through A5CRI and A5Q1, saturates A5Q1, and cuts off A5Q2 by removing its forward bias. At this point there is no output from A5Q2 collector. Cutoff remains until the voltage again drops below 32 volts dc. Then, A5CRI ceases conduction, and normal bias is restored at A5Q2.

(c) Voltage Regulator Circuit

Refer to the +18-volt dc regulator in the center portion of the schematic diagram (figure 816). The +18-volt dc voltage regulator consists of two dc amplifiers A5Q3 and A5Q4 and a series regulator A5Q5. The dc amplifiers regulate the control voltage to the series regulator. Amplifier A5Q4 is controlled by a seasing voltage developed by a voltage-divider circuit and a zener diode controlled circuit both of which are connected to the output. The zener diode A5CRI2 provides a reference voltage 9.3 volts below the output voltage that is applied to the emitter of A5Q4. A variation in the output is sensed directly at the emitter of A5Q4. The voltage divider consists of A5R14, A5R15, A5R16, A5RT1, and A5R17. A5R15 is set to develop +18 volts at the output. Approximately one-half of the variation in the output will be sensed by the base of A5Q4. Because of the difference of the variation of the output sensed by the emitter and base of A5Q4, an increase in the output decreases the current through A5Q4 and a decrease in the output increases the current through A5Q4. When A5Q4 decreases conduction, it decreases the current through A5Q3 and, in turn, decreases the current through A5Q5, reducing the output voltage. A decrease in the output voltage will have the opposite reaction. If the output is shorted, the base-emitter junction of A5Q4 will not be supplied enough voltage to provide base current and A5Q4 will turn off. This shuts off A5Q3 and A5Q5 and prevents A5Q6 from burning out if the 18-Vdc output is shorted to ground. Thermistor A5RT1 compensates for the change in amplification due to temperature variation.

(d) +130-Volt DC Supply.

Refer to figure 816. The third portion of low-voltage power supply A5 contains the +130-volt dc supply. The circuit is a conventional half-wave rectifier followed by a pi network filter and A5R11 bleeder resistor. A5R8 is a protective (fusible) resistor for diode A4CR3.


(a) 516H-1 Power Supply.

The 516H-1 Power Supply is an external power supply that is used, in conjunction with a single-phase high-voltage power supply module, to provide operating voltages for the 618T-1/1B Airborne SSB Transceiver. The 516H-1 mounts directly in the shockmount tray used by the power supply for the 618S and is used primarily in 618S retrofit installations. Figure 649 is a schematic diagram of the 516H-1 Power Supply.
The 516H-1 is completely transistorized and uses a saturable-core oscillator to convert 27.5 volts dc to 1500 Hz ac. The saturable-core oscillators, Q1 and Q2, used in the inverter circuit, are fast-acting switches whose switching action depends on the saturation of the core of transformer T1 in the oscillator circuit. When the oscillator is first energized, unbalance in the two halves of the oscillator circuit causes saturation current to flow in one transistor and the other transistor to be cut off. This current increases until the core of transformer T1 becomes saturated. When this occurs, voltage is no longer induced in the windings of T1 and the saturation current is cut off. When the magnetic field in the transformer windings starts to collapse, voltages are induced in the windings that cause the transistor that was previously cut off to be saturated and vice versa. This action produces a square-wave output at the transformer output. This square wave switches transistors Q3 through Q8, in a push-pull power circuit, to provide a 400-volt, 1500-Hz square-wave output from the power supply. The output of the 516H-1 Power Supply is fed to the single-phase high-voltage power supply module.

(b) Single-Phase High-Voltage Power Supply A13.

Refer to figure 837. The single-phase high-voltage power supply module contained in the 618T-( ) case steps up the 400-volt, 1500-Hz input to 1500 volts and rectifies it to provide the 1500-volt dc plate voltage for the power amplifier. This module also supplies the control voltage, vacuum-tube filament voltage, and a 200-volt dc plate voltage for tubes in the rf translator module. Early models also provide 400 volts for power amplifier screen voltage. In later models of the 618T-( ), however, this screen voltage is derived from the 1500-volt plate voltage input to the power amplifier module. The single-phase high-voltage power supply module also contains an overload relay that is automatically reset when the key-line ground is removed.

(14) 3-Phase High-Voltage Power Supply A7 (618T-2/2B).

Refer to figures 818 and 819. The 3-phase high-voltage power supply, A7, is a single unit that plugs into the 618T-2 chassis and derives its operating voltage from a 115-volt (line-to-neutral), 400-Hz, 3-phase primary power source. This module is used only in 618T-2/2B Airborne SSB Transceiver.

The time delay plate contactor relay, K1, is energized 30 seconds after the 618T-2/2B is turned on at the radio set control. When time delay relay K7 in the chassis circuit (see figure 807) is energized, A7R1, A7R2, and A7R3 are in series with the primary winding of A7T1, limiting the initial current transient. After the transient, step-start relay A7K2 is energized by the closing of relay contacts A7K1-3 and A7K1-4, and relay A7K2 bypasses resistors A7R1, A7R2, and A7R3, permitting full input voltage to be applied to A7T1 (MCN 17,999 and below). For modules with MCN 18,000 and above (figure 818), step-start relay A7K1 has been eliminated and capacitors A7C27, A7C28, and A7C29, in parallel with the primary winding of A7T1, provide initial current transient protection.

The two A7T1 secondaries supply diode rectifier banks connected in series to provide 1500- and 400-volt dc input to the power amplifier module. Bleeder resistors A7R11, A7R14, and A7R15 provide a 260-volt dc output for the rf translator module.

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Transformer A7T2 supplies filament voltage for vacuum tubes in the 618T-2/2B. Overload relay A7K3 contains one winding (1 and 2) in series with the ground return of the rectifier to monitor total current. Approximately 750 to 800 mA will energize A7K3, opening contacts 6 and 7 and disrupting operation. Contacts 5 and 7 close and latch the relay with 27.5 volts dc through winding 3 and 4.

A7R5 through A7R8 form a bleeder that is tapped at A7R7 and A7R8 to provide the 618T-2/2B front panel meter with a voltage sample of monitoring +1500 volts dc. The AM tge terminal (A7P1-15) is the current control voltage for the tgc/adc amplifier in the IF translator module. The control voltage that is dropped across A7R13, A7R4, and the overload coil of A7K3 by the flow of current is negative, and, therefore, varies proportionately with current consumption. If plate current in the power amplifier module is excessive, the negative voltage reduces the gain of the IF amplifier that results in reduced drive to the power amplifier module. Refer to figure 16 for further study of this circuit. The AM tge voltage is also the source for plate current metering (PA MA) at the 618T-2/2B front panel meter.

Filter A7FL1 is a low-pass filter used to prevent rf from entering the module on the high-voltage load. Diodes across relays suppress transients during switching.

(15) 27.5-Volt DC High-Voltage Power Supply A8 (618T-3/3B).

27.5-volt dc high-voltage power supply A8 is a single unit that plugs into the 618T-3/3B. It performs the same operations as the 516H-1 Power Supply and single-phase high-voltage power supply module in combination. The schematic diagram is shown in figure 820. The 27.5-volt input power is applied to switching transistors for transformation to high voltage. The module also supplies 27.5-volt dc power for application to the low-voltage power supply module and to the vacuum tubes for heater voltage.

When the radio set control function selector switch is moved from the OFF position, a ground is completed at A8P1-13. This supplies a ground for relay A8K1 through contacts 6 and 7 of overload relay A8K2 and diode A8CR26. Chassis relay K7 delays relay A8K1 for 30 seconds. When relay A8K7 contacts close, 27.5 volts dc is applied to relay A8K1 through A8P1-18. Diode A8CR32 across relay A8K1 solenoid suppresses rf transients.

With relay A8K1 energized, delay relay A8K3 is energized by 27.5 volts dc through contacts 3 and 4 of A8K1. Relay A8K3 has the same ground return as A8K1. Relay A8K3 contacts 3 and 8 and latch relay A8K1 contacts 4 and 7 provide continuity for 27.5 volts dc at A8P1-32 to energize the saturable core oscillator A8Q1 and A8Q2. Transistors A8Q1 and A8Q2 are fast-acting switches. The switch action depends upon the saturation of transformer A8T2. When the oscillator is first energized, unbalance causes one transistor to conduct to saturation and the other to cut off. After the first half-cycle, when the magnetic field surrounding A8T2 windings begins to collapse, the saturated transistor is cut off and the other transistor becomes saturated. This action produces a square-wave output at the A8T2 secondary.
The rectifier consists of the push-pull power circuit A8Q9–Q11 and A8Q12–Q14, transformer A8T1, and bridge rectifiers A8CR18 and A8CR21 for low voltage and A8CR6 and A8CR17 for high voltage. The output of A8Q9 and A8Q12 is 400 volts ac at approximately 1500 Hz that is stepped up to 1500 volts across A8T1 secondary taps 4 and 5. The 400- and 1500-volt bridge rectifiers are series connected, and ground is returned through the series combination of A8R21 and A8R17 and the relay A8K2 overload winding. A current of 750 to 800 ma will energize the winding and break contacts 7 and 6 of relay A8K2, thus disrupting input to the rectifier.

Terminal A8P1–15 returns a small negative voltage for metering of plate current at the front panel. Voltage drop is read across A8K2 coil and A8R17 and A8R21 in series. This same negative voltage overrides carrier tgc and reduces drive to the power amplifier module if plate current swing is excessive. Refer to figure 16 for further study of the tgc circuit.

Terminal A8P1–35 returns one-fourth of the voltage (bled by resistors A8R13 through A8R16) to the 618T–3/3B for metering of high voltage (+1500 volts) at the front panel.

Resistors A8R18, A8R22, and A8R23 are the low-voltage bleeders with a tap at the junction of A8R18 and A8R22 to supply +260 volts to the rf translator module.

Filter A8F11 is in series with the high-voltage output to prevent rf energy from entering the power supply. Coil A8L1 at terminal A8P1–32 serves the same purpose.

Diodes are used for dc voltage blocking transient suppression, rf interference suppression, and, in the oscillator circuit, zener diode A8CR24 is used for stabilization of transistors A8Q1 and A8Q2.

(16) Squelch Amplifier and Control Circuit (618T–( )).

The squelch amplifier and control circuit, physically located in rf oscillator module A2, Collins part number 528-0690-001 (figure 810), and Collins part number 528-0690-002 (figure 810A) receives input audio signals from AM/audio amplifier module A9. The squelch circuit converts the input signal to a dc voltage and compares it with a threshold level provided by a squelch level control on the radio set control. After comparison, the squelch circuitry commands the squelch relay to connect the audio signal to the balanced output line, if sufficient and desirable audio is present, or to disconnect the balanced output line and insert a 330–ohm load across the AM/audio amplifier module output if noise predominates.

(a) Squelch Amplifier and Control Circuits in RF Oscillator; Collins Part Number: 528-0690-001. (Refer to figure 810.)

The squelch amplifier circuit consists of amplifier, summation, and comparison stages. The comparison stage also drives the squelch relay.

The amplifier stages are in two parallel frequency-sensitive channels. The high frequency includes a resonant circuit peaked at approximately 2.5 kHz.
while the low-frequency channel includes a resonant circuit peaked at approximately 600 Hz. The output from each channel is fed through a buffer stage, diode detectors, and into a summation circuit.

The summation circuit provides the algebraic sum of the outputs of the two frequency-sensitive channels to a dc amplifier that provides the input to the comparison circuit.

The comparison circuit determines whether the desired audio level exceeds the threshold level set by the squelch level control on the radio set control. If the level is exceeded, a signal is capacitor coupled to the gate of an scr. The scr is triggered and energizes the squelch relay that connects the audio output signal from AM/audio amplifier A9 directly to the balanced audio output lines. If the audio level does not exceed the threshold level, the squelch relay is deenergized and connects a 300-ohm load directly across the audio lines of AM/audio amplifier A9. During transmit operation, the squelch circuit is disabled to permit passage of the sidetone for monitoring.

The capacitor coupling to the scr gate provides a form of syllabic detector. If the signal from the summing amplifier to the coupling capacitor does not switch at a rate slow enough for the coupling capacitor to discharge between pulses, the scr will not be triggered on, and the squelch relay will be deenergized. When the scr is turned off, C18 charges and holds Q9 on for 1 to 5 seconds. This prevents relay chatter that could be caused by the syllabic rate signals supplied to the coupling capacitor.

When the squelch level on the radio set control is turned to the extreme clockwise position, the squelch override dc amplifiers override the squelch amplifier and control circuit and connects the audio signal directly to the headset.

(b) Squelch Amplifier and Control Circuits in RF Oscillator, Collins Part Number 528-0690-002. (Refer to figure 810A.)

The amplifier consists of a low-pass filter, high-pass filter, isolation amplifiers, comparator, override switch, and a relay driver with holding capability.

The high-pass filter (audio above approximately 1.2 kHz) and the low-pass filter (audio below approximately 1.2 kHz) convert the input signal to a dc voltage. The dc output of the filters is coupled through isolation stages (Q4 and Q7) to a comparator. When the frequency of the input signal to the filters is below approximately 1.2 kHz (audio), the input to the positive terminal (noninverting input) will be larger than the input to the negative terminal (inverting input) of the comparator and its output will go positive. The positive voltage turns on Q8 which turns on Q9 and energizes relay K1. With K1 energized, the audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the audio signal is lost momentarily, the 10-μF capacitor on the base of Q8 holds
Q8 on for a period of 1 to 5 seconds. When the input signal to the filters is above approximately 1.2 kHz (noise), the comparator output is zero. Switch Q8 and Q9 are turned off and relay K1 is deenergized. The input from AM/audio amplifier A9 is dropped across the 330-ohm resistor.

The override switch has a preset dc level on the noninverting input. The dc level on the inverting input is determined by the setting of the RF SENS/SQL control on the 714E- ( ) Radio Set Control. When the squelch override condition is desired, the 714E-( ) RF SENS/SQL control is adjusted so the inverting input to the override switch is at a lower dc level than at the noninverting input. The output of the override switch goes positive, turns on Q8 which turns on Q9 and energizes K1. The audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the RF SENS/SOL control is left in the override position, K1 remains energized regardless of the frequency input to the squelch circuits.
618T-( ) Airborne SSB Transceiver - Disassembly

1. GENERAL.

The disassembly procedures for the 618T-( ) Airborne SSB Transceiver contained in this section should be followed when it is necessary to remove a part in order to repair or replace it. The 618T-( ) should not be disassembled completely as a routine part of the overhaul procedure.

2. GENERAL TECHNIQUES AND PRECAUTIONS IN DISASSEMBLY OF THE 618T-( ) AIRBORNE SSB TRANSCEIVER.

Standard electrical disassembly techniques apply to the 618T-( ) Airborne SSB Transceiver. However, special attention should be given to the following techniques:

A. Removal of Electrical Wiring.

Tag or otherwise identify all disconnected electrical wiring. Note color coding, placement of wires, and method of insulation (if any) before unsoldering or removing.

B. Removal of Transistors and Diodes.

When removing transistors or diodes, use long-nosed pliers to grasp the lead to which heat is applied between the solder joint and the component. This will bleed off some of the heat that conducts into the component from the soldering iron.

C. Removal of Printed Circuit Boards.

Printed circuit boards may be removed from the module chassis by removing the screws which fasten the boards to the spacers on the module chassis. Be careful, when removing circuit boards, not to damage any connecting wiring or components that are mounted on the board. Refer to the repair section for information regarding removal of components from printed circuit boards.

3. SPECIFIC DISASSEMBLY TECHNIQUES.

A. Removal of Side Covers, Front Panel Cover, and Front Panel.

(1) Modules may be exposed by removing the two side covers on the 618T-( ). To do this, loosen four screws, two on each side, at rear of transceiver. Side covers then may be lifted off.

(2) The front panel cover may be removed by turning the two Dzus fasteners on the cover and pulling cover forward. This will expose the blower filter, sidetone level adjusting screw, audio level adjusting screw, and S3 (on units with squelch capability).

(3) To expose the components on the rear of the front panel and in the relay compartment on the front of the chassis, remove four screws at the four corners...
of the front panel. The front panel may then be moved to expose the components, but will remain attached to the main chassis by a wiring cable.

B. Removal of Module Covers and Modules.

1. Most module covers may be removed by pulling the attached handles. Module covers equipped with handles are not equipped with screws. The rf translator A12 cover is a press fit and may be removed by pulling upward with fingers inserted in the cover holes. The power amplifier module cover is attached with screws, but the cover screw holes are slotted so that the screws need only be loosened. High-voltage rectifier module covers are also attached with screws.

2. Remove modules from the chassis by loosening the reddened captive hold-down screws at the corners of the module and pulling straight out.

CAUTION: DO NOT TWIST OR PRY ON MODULE TO DISENGAGE MATING CONNECTORS OR CONNECTORS MAY BE DAMAGED.

C. Removal of VFO and Autopositioner from RF Translator A12.

1. With rf translator A12 in the chassis and power applied to the 618T-( ), position the vfo and Autopositioner to 500 kHz by setting the frequency indicator on the 714E-( ) to X.500 MHz. Turn power off.

2. Remove rf translator A12 from the 618T-( ) chassis.

3. Remove the top and bottom covers from rf translator A12.

4. Refer to figure 101. Remove four screws (1) fastening the vfo to the Autopositioner.

5. Remove four screws (2) fastening the vfo brackets to the rf translator chassis and backplate.

6. Loosen two screws (3) holding the back brackets on the vfo. Rotate the brackets approximately 90 degrees in order to get room to move the vfo.

7. Loosen two setscrews (4) retaining the coupler to the vfo shaft.

8. Refer to figure 104. Loosen two screws (14) holding the cable guide plate (15). Remove the cable guide plate. Note placement of cables.

9. Refer to figure 101. Remove four tubes (5) adjacent to the vfo and Autopositioner.

10. To remove the vfo, tag and unsolder the vfo leads (6) from connectors P6 and P9-31 and the other internal connections in the module. Note placement of these leads on the rf translator chassis. The vfo may then be lifted from rf translator A12.

NOTE: Variable frequency oscillator 70K-9 has four leads; vfo 70K-5, three leads; and vfo 70K-3, two leads. Consult the appropriate schematic.
On rf translator A12 (Collins part number 528-0113-013), a filter circuit for the vfo was incorporated at approximately MCN 1100. The filter circuit consists of A12L41, A12L122, A12L131, and A12L261. In rf translator modules containing this circuit, the white sleeved vfo coaxial lead is connected to terminal E85 instead of J5. See figure 105.

(11) Refer to figure 102. Remove 3/8-inch flatted shaft (7), directly above 25-pin connector (8), by loosening clamp (9) on the gear that drives the shaft. Pull the shaft out through the gear.

(12) Remove 2 screws (10) holding the 25-pin connector to the bottom of the rf translator chassis.

(13) Refer to figure 103. Using a sharp pencil, make a mark on a tooth of gear G8. Make a corresponding mark on the rf translator chassis.

(14) Remove idler gear G9.

(15) Remove four screws (11) holding the Autopositioner to the gearplate.

(16) Carefully maneuver the Autopositioner to free it from the mounting plate. Remove the Autopositioner by slowly lifting it from the rf translator chassis. Be careful not to damage the 28-position switch wafer when pulling 25-pin connector (8) up through the chassis (figure 102).

D. Disassembly of VFO A12A2 (618T-1/2/3 Only).

The vfo is a potted assembly and cannot be disassembled in the field. Attempting to disassemble or adjust the vfo will result in misalignment and loss of accuracy. If the source of trouble is the vfo, it should be returned to the factory and replaced with a new unit.

E. Replacement of 7CK-5 VFO With 70K-9 VFO (618T-1/2/3 Only).

70K-9 vfo, Collins part number 522-3552-019, contains all parts required to perform this procedure. Holders of 70K-9 vfo need order replacement kit, Collins part number 757-1376-001, only. Replacing the 70K-5 vfo with the 70K-9 vfo requires removing the 70K-5 vfo and Autopositioner, changing the flexible coupling on the Autopositioner shaft, installing a new 70K-9 vfo, and reinstalling the Autopositioner. The vfo, rf translator slug rack, and 28-position switches must then be aligned. Installation of the 70K-9 vfo will not significantly change the weight of the 618T-( ).

(1) Perform step 3.C (removal of vfo and Autopositioner from rf translator A12).

(2) Refer to figure 106. Position shaft midway between end stops on the 70K-9 vfo to be installed.

CAUTION: DO NOT LOOSEN SETSCREW SECURING THE COUPLING DEVICE ON THE 70K-9 VFO SHAFT. THIS COUPLING IS PART OF THE 70K-9 VFO MECHANICAL END STOP MECHANISM AND HAS BEEN PRESET AT THE FACTORY.
RF Translator A12, Bottom View
Figure 102

RF Translator A12, Gearplate
Figure 103
RF Translator With Autopositioner Removed, Top View
Figure 104
RF Translator, Low-Frequency Mixer Compartment, Bottom View
Figure 105
(3) Place the 70K-9 vfo in position in rf translator A12, taking care to position the coaxial cable under the vfo as noted in step 3.C.(10). Secure the vfo temporarily in place by fastening one of the rear brackets to the rear plate.

(4) Refer to figure 104. The coaxial cable (17) and shielded-twisted-pair cable (18) from the vfo should be routed adjacent to the slug rack. The cable guide plate (15) removed in step 3.C.(8) should be mounted in place, as shown, using two screws (14).

(5) Refer to figure 102. Remove two screws (10) holding P9 to chassis.


(7) Route shielded-twisted-pair cable (18) from the vfo as shown in figure 104. Install grounding lug (Collins part number 304-0898-000) under mounting screw securing tube socket XV2. Solder cable shield and white wire to the grounding lug. Solder red wire to the terminal of feedthrough capacitor C151 as shown.

**NOTE:** Keep the cable routed close to the rf translator chassis so that the cable does not interfere with the Autopositioner, which will be installed above part of this cable.

(8) Route the green and white sleeved vfo coaxial leads through the holes in the rf translator chassis, using the same lead placement noted when removing the vfo
leads in step 3.C.(10). Remove the outer insulation from these coaxial leads at
the point where the leads pass through the chassis. Solder the grounded bus
wires to the shields in the same manner in which the vfo leads were grounded.
Solder the green sleeved coded coaxial to P6 and the white sleeved coded coaxial
to J5. (Refer to step 3.C.(10).)

(9) Replace the coaxial connector mounting plate assembly and secure it with three
screws (16, figure 102).

(10) Remove the screw installed in step 3.E.(3) to temporarily hold the vfo in place.
Loosen the vfo rear bracket screw and rotate the bracket approximately 180
degrees from the normal position to provide more room for installing the
Autopositioner.

(11) Refer to figure 101. Slip the front vfo mounting bracket into position. Do not
install any mounting screws.

(12) Remove the flexible coupling from the Autopositioner shaft. Replace it with the
new flexible coupling (Collins part number 549-7715-002) that mates with the
70K-9 vfo coupling. Insert, but do not tighten the setscrews (Collins part
number 328-0048-000) on the Autopositioner coupling.

NOTE: The new Autopositioner flexible coupling (Collins part number
549-7715-002) is considerably thicker than the Autopositioner
flexible coupling (Collins part number 546-5825-002) that was
used with the 70K-5 vfo.

(13) Perform step 4.E of the Assembly section (replacement of Autopositioner and
vfo in rf translator A12).


(1) Removal of the Reversing Switch.

(a) Refer to figure 107. Rotate gear (9) or (5) by hand to position control cam
(34) for minimum tension on spring (139).

CAUTION: ALWAYS TURN THE GEARS SO THAT THE CAM ROTATES IN
COUNTERCLOCKWISE DIRECTION AS VIEWED FROM THE
GEARPLATE SIDE.

(b) Remove spring (139) by unhooking bar (140). Do not stretch the spring
excessively while removing it.

(c) Remove cable clamp bracket (27) by removing screw (28).

(d) Remove cable clamp (66) by removing screw (67) and lockwasher (68).
Lay the cable back so that reversing switch (64) is accessible.

(e) Remove two screws (65) holding the switch to mounting plate (134). Remove
the reversing switch from the bracket.
(f) Tag and unsolder the six wires connected to the switch. Reversing switch terminal identification is given in figure 108(A). The switch may now be removed.

(2) Removal of 1-kHz Switches. (Refer to figure 107.)

(a) Rotate gear (9) or (5) by hand to position control cam (34) for minimum tension on spring (139).

(b) Remove spring (139) by unhooking from bar (140). Loosen screw (14) of gear clamp (13), and remove spur gear (15).

(c) Disengage vfo shaft coupling (60) from shaft (119) by loosening two set-screws (58).

(d) Remove two cable clamps (157) by removing two screws (158).

(e) Remove relay (150) from bearing plate (165) by removing two nuts (151) and two lockwashers (152).

(f) Remove dc motor (153) and motor mount (154) from the bearing plate by removing two screws (155) and two lockwashers (156).

(g) Loosen bearing plate (165) by removing four screws (142). Lift the plate straight up to clear shaft (119) and camshaft (36).

(h) Remove 1-kHz rotary switch sections (37/52, 53/56) from bearing plate by removing two screws (38). Be careful not to lose any of the small ceramic spacers (41) and fiber washers (39).

(i) Tag any leads before unsoldering from switch terminals. Refer to figure 109(B).

(3) Removal of 10-kHz and 100-kHz Switches. (Refer to figure 107.)

(a) Perform steps (a) through (g) of paragraph 3.F.(2).

(b) Rotate gear (9) or (5) by hand to position control cam (34) so that screw (19) holding resistor (18) to front plate (30) is accessible.

(c) Remove screw (19) holding resistor (18) to front plate. Note placement of the resistor leads. Do not lose the washers at the ends of this resistor.

(d) Remove cable clamp (25) by removing screw (26).

(e) Remove spur gear (15) by loosening setscrew (14) in gear clamp (13) and pulling straight off.

(f) Pull output shaft (114) out of the hole in the front plate. Be careful not to lose the shim washers (if any) between the output shaft and the front plate. The switch assembly is now free of the Autopositioner chassis.

(g) Remove cable clamp (66) by removing screw (67) and lockwasher (68).

(h) Remove reversing switch (64) by removing two screws (65).

(i) Tag and unsolder the six wires connected to solenoid (124) and relay (150). Selenoid relay terminal identification is given in figure 108(B).
(j) Remove two screws (78) and four washers (79) holding switch wafers (77/81, 83, 84/93, 94) to bracket (134). Switch wafers may now be removed. Tag any leads before unsoldering from switch terminals. Refer to figure 109(A).

(4) Solenoid Clutch Disassembly.
(Refer to figure 107.)

(a) Perform steps (a) through (f) of paragraph 3.F.(3).

(b) Bend down tabs on washer (108) under nut (107). Remove nut (107), washer (108), and spring washer (109).

(c) Remove clutch disc (110) and clutch gear (111).

CAUTION: DO NOT TOUCH THE CLUTCH SURFACES WITH FINGERS. KEEP SURFACES FREE OF DUST, DIRT, AND LUBRICANTS OF ANY KIND.

(5) Removal of Solenoid. (Refer to figure 107.)

(a) Perform steps (a) through (j) of paragraph 3.F.(3) and steps (b) and (c) of paragraph 3.F.(4).

NOTE: Disassembly of the following spring pin connection is not recommended. Assembly of wheel (112) and shaft (119) cannot be accomplished without alignment fixture since each wheel (112) is unique. The notched wheel (112) is first aligned, then shaft (119) is drilled for spring pin (113). Replacement must be made at subassembly level (CPN 546-6849-004).

(b) Remove spring pin (113) through hub of wheel (112) and shaft (119) with a punch. Slide hub and attached notched wheel (112) off shaft.

Autopositioner A12A1, Alignment
Figure 108

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Autopositioner A12A1, Switch Identification
Figure 109

(c) Remove armature (117) from solenoid (124) by removing two screws (118).
Be careful not to lose small fiber actuator (126) that separates armature (117) from the solenoid relay contacts.
Screws (118) are color coded for mounting the armature only.

(d) Remove retaining ring (120) from shaft (119).
(e) Unsolder the insulated jumper wire from terminal 2 of the solenoid. See figure 108(B).

(f) Remove solenoid (124) from mounting plate (134) by removing two screws (125) and mounting post (123).

G. Removal of Turrets from RF Translator A12. (Refer to figure 101.)

1. With rf translator A12 in the chassis and power applied to the 618T-( ), position turrets to the 2-MHz position by setting frequency indicator on the 714E-( ) to 2,000 MHz. Allow to tune and turn off power to 618T-( ).

2. Remove rf translator A12 from 618T-( ) chassis.

3. Remove the top and bottom covers from rf translator A12.

4. Remove the turret cover by removing 14 screws on cover.

5. Remove two phenolic aligning posts (13) by removing the two screws on rear of module. Slide the rods out through the gearplate.

NOTE: Late versions of rf translator A12 contain a notation on the gearplate concerning turret setscrews. The setscrews must be loosened before performing step 6. If this notation is found, use a no. 2 Bristol wrench and loosen the setscrews that hold turrets A12S1, A12S3, A12S4, and A12S7. The module bottom cover illustrates the location of these turrets. Access to the setscrews is through the hole adjacent to the color-coded dot on each turret.

6. Remove the turret shaft by loosening the clamp on the gear that drives the shaft. Pull the shaft out through the gear.

7. Remove the turrets at the bottom of rf translator A12 by pushing them from the top of the module.
Use care to avoid catching spring contacts, extending from the turret faces, in the shaft holes.

H. Disassembly of Power Amplifier Module A11. (Refer to figure 110.)

1. Remove nine screws (S) from gearplate.

2. Remove the top cover plate from the module by loosening 17 screws, sliding it toward the gearplate, and lifting it off.

3. Remove the square plate on the end of the module opposite the gearplate by removing the eight screws.

4. Remove the two nylon screws and washers holding the roller coil assembly to bracket at end of roller coil nearest tubes. Push the screen bypass capacitor out of the way to get at these screws.

5. Remove the one screw and washer holding the end of the large silver-plated coil to the bracket on the roller coil assembly.

6. Loosen the one screw holding the lower strap on the roller coil assembly.

7. Disconnect resistors A11R42 and A11R43.

8. Pull the gearplate out from the chassis. Be careful to pull straight out because the band-switch shaft comes out with the gearplate. The gearplate will remain connected to the module chassis by the wiring cable.

   **CAUTION:** SHORT PLATE STRAPS TO CHASSIS WITH A SCREWDRIVER WITH AN INSULATED HANDLE BEFORE REMOVING TUBES.

9. To remove the power amplifier tubes, remove the tube cover plate from the end of the module opposite the gearplate by removing six screws. Loosen the straps around the tube. Remove the tubes with the tube pullers supplied in the 678Y-1 Maintenance Kit chimneys.

I. Removal of Crystal from RF Oscillator A2 (Early Model). (Refer to figure 111.)

1. Remove rf oscillator A2 from the 618T-( ) chassis.

2. Remove the dust cover from the module.

3. Remove the triangular-shaped cover plate from the top of the module by removing four screws.

4. Remove the two holddown screws on the foam-insulated end of the module.

5. Remove the foam plug from the top of the module. Pull the wire cable so that it is outside the insulation.

6. Tilt the insulating foam so that the bottom of the foam is exposed.
Oven and Crystal Oscillator Assembly, RF Oscillator A2 (Early Model)
Figure 111

(7) Remove the foam plug from the bottom of the module. Pull the wire cable so that it is outside the foam.

(8) With a finger, push the oven and crystal oscillator assembly up through the foam. Do not use a tool to push the oven out of the foam or the oven may be damaged.

(9) Remove two screws (1) from circuit board (2) to loosen oven assembly (3).

(10) Remove two screws (4) from opposite sides of the oven.

(11) Hold the circuit board in one hand, and remove the oven to expose crystal (5).

(12) Remove all grease (6) from around the crystal. Wipe all grease from the crystal. Do not get grease on the circuit board.

(13) Unsolder green crystal lead (7) from the circuit board.

(14) Unsolder blue crystal lead (8) from C1 (9). The crystal may now be removed.

J. Removal of Crystal from RF Oscillator A2 (Late Model).

(1) Remove rf oscillator A2 from the 618T-( ) chassis.

(2) Remove the dust cover from the module.
(3) Remove the large foam protective plug from the module.

(4) Tag and unsolder the three leads at the reference oscillator board.

(5) Remove the reference oscillator board from the foam protection plug. The reference oscillator board contains the crystal.
618T-( ) Airborne SSB Transceiver – Cleaning

1. GENERAL.

This section presents instructions for cleaning parts and disassembled subassemblies of the 618T-( ) Airborne SSB Transceiver.

Instructions are arranged to facilitate reference by paragraph to the procedure for cleaning. All parts requiring particular methods of cleaning are considered separately, and parts similar enough to permit identical cleaning procedures are grouped.

2. CLEANING MATERIALS.

The use of the word "solvent" in the following procedures means Turcosol or Stoddard solvent. The cleaning materials referred to are listed in figure 201.

In this section, "air jet" refers to a hand-operated air nozzle supplied with clean, dry, compressed air at a maximum of 28 psig.

**WARNING:** USE CLEANING SOLVENT UNDER A VENTILATED HOOD. AVOID BREATHING SOLVENT VAPOR AND FUMES. WEAR A SUITABLE MASK WHEN NECESSARY. AVOID CONTINUOUS CONTACT WITH SOLVENT. USE GOGGLES, GLOVES, AND APRON TO PREVENT IRRITATION FROM PROLONGED CONTACT. CHANGE CLOTHING UPON WHICH SOLENTS HAVE BEEN SPILLED. OBSERVE ALL FIRE PRECAUTIONS FOR FLAMMABLE MATERIALS. USE THESE MATERIALS IN A HOOD PROVIDED WITH EXPLOSION-PROOF ELECTRICAL EQUIPMENT AND AN EXHAUST FAN WITH SPARKPROOF BLADES. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.

**WARNING:** WEAR GOGGLES WHEN USING AN AIR JET TO BLOW DUST AND DIRT FROM EQUIPMENT. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>RECOMMENDED TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvent</td>
<td>Turcosol or Stoddard solvent</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td></td>
</tr>
<tr>
<td>Chamois skin</td>
<td></td>
</tr>
<tr>
<td>Cloth, lintless cotton</td>
<td></td>
</tr>
<tr>
<td>Detergent, powder</td>
<td></td>
</tr>
<tr>
<td>Paper, lens tissue</td>
<td></td>
</tr>
<tr>
<td>Paper, fine grade tissue</td>
<td></td>
</tr>
<tr>
<td>Cleaning agent</td>
<td>Miller-Stephenson #MS-230 Contact RB-NU</td>
</tr>
</tbody>
</table>
3. PROCEDURES.

A. Bearings, Sealed and Porous Bronze.

NOTE: Refer to figures 23, 24, 34, and 43 of the 618T-( ) illustrated parts catalog (Collins part number 520-5970005).

Normally, sealed bearings require no cleaning or lubrication, since they are lubricated by the manufacturer for lifetime operation. It is recommended that these bearings be replaced if faulty; however, under certain circumstances, lubrication may be necessary. If lubrication is necessary, bearings must be thoroughly cleaned as follows:

(1) Sealed Ball Bearings.

(a) Sealed ball bearings must be cleaned in a suitable bearing-cleaning machine, such as a spray cleaner or an ultrasonic installation. Follow the manufacturer's instructions for proper use of these machines.

(b) If bearings are not to be lubricated, protect bearings from dust and moisture before inspection.

CAUTION: PERMANENT DAMAGE MAY RESULT FROM FORCIBLY SPINNING A BEARING BEFORE IT IS THOROUGHLY CLEAN. BEARINGS MUST NOT BE HANDLED WITH BARE HANDS DURING AND AFTER CLEANING AND PRESERVATION. OPERATORS MUST WEAR RUBBER GLOVES OR FINGERSTALLS TO AVOID CONTAMINATING BEARINGS WITH FINGERPRINTS. KEEP HANDLING TO A MINIMUM.

(2) Porous Bronze Bearings.

Lubrication of porous bronze bearings is not recommended. Wipe dust from items that contain porous bronze bearings with a clean, dry, lintless cloth. Protect the bearings from dust and moisture pending inspection.

B. Blower Filter.

The blower filter should be cleaned regularly. Always clean the filter before the air outlet side becomes dirty.

(1) Slowly immerse the filter, dirty side up, in cool water that contains a mild detergent. This will float out dirt and lint. A slight up-and-down motion will remove any remaining particles. If it is impossible to immerse filter, pass a fine spray of water through it in the direction opposite that of the air flow.

(2) Shake the filter to remove excess water. Allow the filter to dry.

(3) Before replacing the filter, lightly coat all filter surfaces with Air-Maze Filterkote "M" Water Soluble Oil, Collins part number 005-0609-00.
C. Cables, Covered.

(1) Clean outer surfaces of flexible Vinylite conduit by wiping dirt from surfaces with a lintless cloth moistened with solvent.

(2) Wipe dry with a clean, dry, lintless cloth.

(3) Treat all connector terminals as directed in paragraph F. Wipe lug terminals clean with a lintless cloth moistened with solvent, and dry with a clean, dry, lintless cloth.

D. Castings.

Castings should be cleaned as follows:

(1) Remove most of the surface grease with rags.

(2) Blow dust from surfaces, holes, and recesses using an air jet.

(3) Immerse casting in bath of solvent, and scrub until clean, working over all surfaces and into all holes and recesses with a suitable nonmetallic brush. Flat, woodbacked brushes with soft fiber bristles are recommended for surfaces; round brushes, like those used for washing bottles and test tubes, are recommended for holes and recesses.

(4) Raise casting from bath, and permit solvent to drain into bath.

(5) Immerse in rinsing bath of cleaning solvent, rinse, and raise from bath. Position casting to drain dry so solvent is not trapped in holes or recesses. When practical positioning will not permit complete draining, use air jet to blow out any trapped solvent.

(6) When thoroughly dry, touch up any minor damage to finish. Extensive damage to finish may require complete refinishing.

(7) Protect the casting from dust and moisture pending inspection.

E. Chassis, Wired.

The following cleaning procedures should be used for chassis containing terminal boards, resistor and capacitor assemblies, rf coils, switches, tube sockets, inductors, transformers, and other wired parts.

(1) Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with an air jet.

CAUTION: AVOID AIR-BLASTING SMALL COILS, LEADS, AND OTHER DELICATE PARTS BY HOLDING THE AIR JET NOZZLE TOO CLOSE. USE CAUTION IN USE OF BRUSHES ON DELICATE PARTS.
NOTE: When necessary to disturb the dress of wiring and cables, dressing should be noted and wiring and cables restored to dress after cleaning is completed.

(2) Clean jacks as instructed in paragraph J.
(3) Clean sockets as instructed in paragraph O.
(4) With minimum disturbance of wiring, clean connectors as prescribed in paragraph I.
(5) Clean wafer switches as directed in paragraph P.
(6) Clean ceramic or plastic insulators by method given in paragraph I.
(7) Finish cleaning chassis by wiping down all finished surfaces with a lintless cloth moistened with solvent.
(8) Dry and polish these surfaces, using a clean, dry, lintless cloth.
(9) Protect chassis from dust, moisture, and damage before inspection.

F. Connectors.
(1) Wipe dust and dirt from bodies, shells, and cable clamps using a lintless cloth moistened with solvent. Wipe dry with a clean, dry, lintless cloth.
(2) Remove dust from inserts using a small soft-bristled brush and an air jet.
(3) Wash dirt and any traces of lubricant from inserts, insulation, and contacts using a solvent applied sparingly with a small camel-hair brush.

CAUTION: DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT COVERING ANY WIRES OR CABLES CONNECTED TO CONTACT TERMINALS OF THE INSERT.
(4) Dry insert with the air jet.

G. Covers and Shields.

Clean all unfinished, finished, and partly finished sheet metal covers, such as dust covers, inspection covers, chassis covers, and housings, according to applicable steps of procedures used for cleaning castings. Refer to paragraph D.

H. Gears, Metal and Fiber.

If gear trains are disassembled for replacement of defective gears, the gears should be cleaned according to the following procedures:

(1) Metal gears should be cleaned according to applicable steps of paragraph K.
(2) Composition or plasticized gears and nylon friction clutches should be cleaned according to procedures given in steps (3) and (4).

(3) Remove all surface dust and dirt by using a soft-bristled brush in conjunction with an air jet.

(4) Using a clean, lintless cloth lightly moistened with solvent, clean composition gears by wiping them clean.

**CAUTION:** SOLVENT SHOULD NOT BE USED TO CLEAN GEARs COMPOSEd OF OR CONTAINING NYLON. CLEAN THESE GEARs USING A WASHING BATH OF 2 OUNCES OF DETERGENT POWDER TO A GALLON OF WATER AND USING SUITABLE BRUSHES TO REMOVE SURFACE DIRT OR FOREIGN MATTER. GEARs COMPOSED OF EPOXY AND SUPPORTING BASE MATERIAL ARE SUSCEPTIBLE TO SOFTENING IF SOLVENT IS APPLIED FOR TOO LONG OR IF TOO MUCH SOLVENT IS USED. USE CARE IN CLEANING THESE GEARs WITH SOLVENT, AND DRY WITH A CLEAN, LINTLESS CLOTH.

I. Insulators, Ceramic or Plastic.

Clean all ceramic insulators and plastic standoff insulators as follows:

(1) Wipe clean with a clean, lintless cloth lightly moistened with solvent.

(2) Wipe dry, and polish using a dry, clean, lintless cloth.

J. Jacks.

(1) Remove dust from exteriors with a camel-hair brush and an air jet.

(2) Blow dust from interior of female contact with the air jet.

K. Machined Metal Parts.

Detached shafts, keys, pins, collars, worms, springs, and similar machined parts should be cleaned in a suitable cleaning machine, if available; otherwise, proceed as follows:

(1) Use procedures listed in steps (1) through (5) of paragraph D and steps (2) and (3) of this paragraph.

**CAUTION:** TO PREVENT CORROSION, AVOID TOUCHING ANY MACHINED OR FINISHED SURFACES WITH BARE HANDS AFTER CLEANING.

(2) Dry in a dust-free, dry area or suitable enclosure. Radiant heat used in a ventilated enclosure is recommended for drying, particularly if humidity is high.

(3) When dry, immediately apply a light coat of MIL-L-7870 lubricating oil to any bare steel surfaces.
L. Mechanical Metal Parts.

The detached miscellaneous mechanical metal parts include ventilating grilles, mounting plates, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware. These should be cleaned in a suitable cleaning machine or according to applicable steps of procedures for castings. Refer to paragraph D.

M. Molded Plastic Parts.

Plastic parts include insulating members, terminal boards, mounting blocks, etc. These should be cleaned in the following manner:

1. Using an air jet, blow loose dust and dirt from surfaces, holes, and crevices.
2. Wipe clean using a lintless cloth moistened with solvent.
3. Dry and polish with a clean, dry, lintless cloth.

N. Relay Contacts.

**CAUTION:** DO NOT USE BURNISHING TOOL ON RELAY CONTACTS EXCEPT AS DETAILED IN THE REPAIR SECTION. BURNISHING OF GOLD-FLASHED RELAY CONTACTS IS NOT RECOMMENDED BECAUSE REMOVAL OF SURFACE FINISH MAY DEGRADE PERFORMANCE WITH LOW-LEVEL SIGNALS.

1. Remove loose foreign materials from relay contacts with an air jet. If possible, operate relay armature manually while using air jet.

2. Spray contacts with Miller-Stephenson MS-230 Contact RE-NU or equivalent cleaning agent. Use force of spray to loosen heavy buildup on contacts.

3. If necessary to remove any remaining residue, hold the contacts closed by manually operating relay armature and pass small strips of clean white paper back and forth between each pair of contacts.

O. Sockets.

Bakelite sockets are cleaned as follows:

1. Remove any resin adhering to silver-plated contacts using a hardwood stick with a wedge point.

**CAUTION:** DO NOT USE METAL TOOLS TO REMOVE FOREIGN MATTER FROM THESE CONTACTS, AS DAMAGE TO THE CONTACT PLATING INVITES CORROSION, WHICH MAY END ULTIMATELY IN FAILURE OF THE EQUIPMENT. EXISTING CORROSION CONTACTS SHOULD NOT BE DISTURBED. CORROSION INDICATES DAMAGE TO PLATING AND NECESSITY FOR REPLACEMENT OF SOCKET.
(2) Wash contacts with solvent applied lightly with a small, soft-bristled brush.

(3) Using a lintless cloth moistened with solvent, remove any foreign matter adhering to body of socket or wafer.

(4) Repeat alcohol wash and dry with an air jet.

P. Switches, Wafer.

Clean switches of the phenolic wafer type as follows:

(1) Remove all dust with an air jet, turning switch rotor back and forth several times while blowing.

(2) Wash all contacts and insulation with solvent lightly applied with a small, camel-hair brush.

(3) Dry with air jet; then repeat wash using clean solvent while turning switch rotor.

Q. Turret Assembly Contacts.

Clean turret assembly contacts as follows:

CAUTION: TO PREVENT CORROSION, AVOID TOUCHING CONTACTS WITH BARE HANDS AFTER CLEANING.

(1) Remove all dust with an air jet.

(2) Wash all contacts with alcohol, lightly applied with a small camel-hair brush.

(3) Dry with an air jet.

(4) Repeat alcohol wash and dry with an air jet.
618T-( ) Airborne SSB Transceiver - Inspection/Check

1. GENERAL.

This section presents instructions necessary to verify by inspection, the condition of disassembled and cleaned assemblies of the 618T-( ). Inspection will reveal defects that result from wear, damage, deterioration, or other causes. Detailed inspection procedures are arranged alphabetically. Wear tolerances are listed in the fits and clearances section of this manual where applicable. Refer to the repair section of this manual for replacement of defective parts.

2. PROCEDURES.

A. Bearings.

(1) Bearings, Porous Bronze.

Inspect bearings for pitted, scarred, or scuffed load-bearing surfaces. Inspect for burns, corrosion, and any abnormal conditions occurring on load-bearing surfaces.

(2) Bearings, Ball.

The following inspection procedure applies to ball bearings of the shielded type. After the bearing has been cleaned, it is inspected to determine whether it is serviceable, and the bearing is cleaned again. After final cleaning, lubricate for installation. Inspect bearings as outlined below:

CAUTION: ALL INSPECTION REQUIRES THE UTMOST CLEANLINESS. OPERATORS HANDLING BEARINGS MUST WEAR RUBBER GLOVES OR FINGERSTILLS TO PREVENT CORROSION FROM FINGERPRINTS.

(a) Check for blue or purple discoloration (from overheating) of any part of bearing.

(b) Check for tarnished outer surfaces (indicated by a light discoloration of highly finished surfaces).

(c) Check for rust.

(d) Check for pitted, scarred, scuffed, or balled surfaces of bearings, balls, and races.

(e) Check for flat bearing balls, broken ball separators, flaking or spalling of load-carrying surfaces, and all other abnormal conditions.

In addition to the above inspection, check for undersized od (outside diameter) caused by creepage of outer race in its housing. This applies to all ball bearings with races that do not separate when the bearing is removed from companion
parts. Also, check with a plug gauge for oversize or defective bore caused by the inner race having turned on its shaft and for excessive radial play. Use a suitable radial gauge equipped with a dial indicator calibrated in ten-thousandths of an inch when checking radial play of each bearing. A noise inspection of this type of bearing can be made by mechanical rotation. If motor driven, the bearing should be lubricated lightly with recommended lubricant (see lubricant chart, figure 501), and rotated at 500 to 1000 r/min. A dental lathe can be used to drive the inner race while the outer race is held in gloved fingers. A used but serviceable bearing will develop a certain amount of noise. A light, uniform noise is to be expected, but loud noise, nonuniform noises such as clicks or buzzes, and vibration originating in the bearing indicate that it is unfit for service. If manually rotated, the bearing must be clean and dry (unlubricated), and the outer race should be spun with the gloved finger while the bearing is held by a bearing holder inserted in its bore. Hold the bearing in several positions while making the check, and listen for any vibration or intermittent resistance.

B. Capacitors.

Inspect capacitors for defects listed in figure 301.

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>METAL TYPE</th>
<th>MOLDED TYPE</th>
<th>CERAMIC TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage of electrolyte (at case seams or around terminal insulation)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracked, broken, or charred terminal insulation</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case damage (dents or holes)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case damage (cracks or breakage)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Loose, broken, or corroded terminal studs, lugs, or leads</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Loose, broken, or poorly soldered connections</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Fixed-Capacitor Inspection
Figure 301

C. Chassis.

Inspect chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, or damaged handles. Inspect for corrosion and damage to finish that requires work in finishing department.
D. Connectors.

Inspect connector bodies for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, broken, or corroded terminal connections.

E. Covers and Shields.

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Inspect for damaged fastener devices, corrosion, and damage to finish that requires work in finishing department.

F. Gaskets and Seals.

Inspect gaskets and seals for deformation and for damage such as tears, creases, rough surfaces, and imbedded foreign matter.

G. Gears, Metal and Fiber.

Inspect gears for broken, chipped, or badly worn teeth. Inspect gear bodies for cracks and deformation. Inspect surfaces for corrosion or other abnormal conditions.

H. Insulators, Ceramic or Plastic.

Inspect ceramic or plastic insulators for evidence of damage, such as broken or chipped edges, burned areas, or foreign material.

I. Jacks.

Inspect jacks for corrosion, rust, loose or broken parts, cracked insulation, bad contacts, and other irregularities.

J. Machined Metal Parts.

Inspect for physical damage to surfaces, corners, and edges. Inspect closely all machined surfaces, holes, bores, counterbores, slots, grooves, shoulder, flanges, teeth, tapped holes, and all threaded members, both male and female, for damage of any sort, including roughness of surface, corrosion, or foreign matter. Inspect plated or finished areas for damage requiring replating or refinishing beyond touch-up repair.

K. Mechanical Metal Parts.

Inspect unmachined mechanical metal parts, including mounting plates, chassis, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware, for damage or deformation. Inspect for corrosion and any damage that would require replating or refinishing beyond practical touchup.
L. Molded Plastic Parts.

Inspect plastic parts, such as terminal boards, mounting blocks, and insulating members, for signs of corrosion, cracked or charred insulation, and loose or missing mounting hardware. Inspect for other abnormal indications that might be a source of later breakdown.

M. Laminated Circuit Boards.

Inspect laminated circuit boards for loose, broken, corroded, or poorly soldered terminal connections. Inspect laminated circuits for any evidence of damage, such as burned, broken, cracked, or corroded plating. Inspect for loose mounting of laminated circuit boards.

N. RF Coils.

Inspect rf coils for broken leads and loose, poorly soldered, or broken terminal connections. Inspect for crushed, scratched, cut, bruised or charred windings; corrosion on windings, leads, terminals, and connections; and for damage to forms.

O. Receptacles.

Inspect receptacles for cracked, broken, or charred insulation. Inspect for damage to all other parts, loose or bent contacts, damage to contact plating, corrosion, and other abnormal conditions.

P. Relays.

Inspect relay contacts for burned or pitted areas, welds, misalignment, and improper separation. Check contact support members for deformation causing contact misalignment or improper contact operation. With the finger, test movable contacts for sluggish action or sticking at any point of travel in either direction. Check for damage to armature. Inspect for foreign matter between end of pole piece and armature. Inspect for loose coil, corrosion, loose leads or terminals, and for cuts and damage to coil. Inspect for loose, broken, brittle, or charred insulation on coil or leads between contact support members and between terminals on relay. Inspect for bent, loose, or broken terminals. Inspect relay mounting and mechanical parts for looseness and physical damage or corrosion.

Q. Resistors.

Inspect fixed composition resistors for cracked, broken, blistered, or charred bodies and loose, broken, poorly soldered, or corroded terminal connections.

Inspect fixed wire-wound resistors for signs of heating; cracked, broken, or charred insulation; loose, poorly soldered, broken, or corroded terminal connections; and loose mounting.

R. Semiconductors.

Inspect diodes, silicon-controlled rectifiers, and transistors for cracked, broken blistered, or charred bodies. Inspect for loose, broken, poorly soldered, or corroded terminal connections.
S. Sockets.

Inspect sockets for loose, broken, or missing socket-mounting rings. Inspect for cracked, broken, or charred insulation. Inspect for broken, corroded, or deformed contacts and loose, poorly soldered, broken, or corroded connections.

T. Switch Wafers, Rotary.

Inspect switch wafers for bent, weak, broken, or deformed contacts. Inspect for corrosion, damage to contact plating, and cracked or broken contact insulation. Check to see that movable contacts are free to turn properly, without binding, throughout entire travel. Inspect parts mounted on switch wafers for damage.

U. Soldered Terminal Connections.

Inspect soldered terminal connections for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond, using the point of a tool. Examine for excess of solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductor, or other parts. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also, look for insulation that is stripped back too far from joint or badly frayed at joint. Inspect for corrosion (verdigris) on copper conductor at the joint.

V. Transformers and Reactors.

Inspect transformers and reactors for signs of excessive heating, damage to case, cracked or broken ceramic insulators, and other irregularities. Inspect for corroded, poorly soldered, or loose terminals and loose, broken, or missing mounting hardware.

W. Wiring.

Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for damage and charring. Inspect wires for breakage and for improper dress in relation to adjacent wiring and chassis.
Subject: Repair

Add the following caution to the General paragraph.

CAUTION: ANY MODIFICATION OF PARTS MANUFACTURED FROM BERYLLIUM OXIDE WHICH GENERATES BeO DUST MUST BE CAREFULLY CONTROLLED TO PREVENT INHALATION. RESPIRATORY EXPOSURE CAN RESULT IN UNFAVORABLE RESPIRATORY CONDITIONS. ORDINARY HANDLING AND ASSEMBLY OF PARTS MAY BE CONDUCTED WITHOUT CONCERN WHERE NO BeO DUST IS PRESENT.

The following assemblies include the indicated components made with beryllium oxide:

<table>
<thead>
<tr>
<th>ASSEMBLY</th>
<th>COMPONENT AND CPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A11 PA, 544-9283-000</td>
<td>1A11V1, V2 PA Tubes; 256-0169-010</td>
</tr>
</tbody>
</table>
618T-( ) Airborne SSB Transceiver - Repair

1. GENERAL.

This section presents instructions for the replacement or repair of damaged or defective components of the 618T-( ). Faulty parts usually are detected through procedures in the inspection/check or testing section of this manual. If a new part is to be installed, it should first be inspected and tested.

Most of the repair or replacement instructions apply to disassembled equipment. Refer to the disassembly section for proper instructions.

2. PROCEDURES.

A. Bearings.

Shielded bearings will rarely need lubrication. If defective, replace with another bearing, new or known to be good.

Porous bearings never need lubrication. If defective or dry, replace with a new bearing.

B. Capacitors.

If defective or suspected of causing difficulties, capacitors should be replaced. Clean all connections thoroughly, and apply new solder.

C. Connectors.

Straighten bent pins and damaged shell areas. Replace bad connections, broken wires, or wires with split insulation. If connector insert is broken, replace connector.

D. Covers and Shields.

Replace damaged screws, straighten any dents or warped sections, and retouch scratched or worn painted surfaces.

E. Frame.

Straighten misshapen areas. Remove all corrosion with a suitable cleaner. Retouch silk screening and refinish where needed.

F. Gears, Metal and Fiber.

Metal or fiber gears should be replaced if found defective in inspection or testing. Instructions are given in the assembly and disassembly sections of this manual.
G. Integrated Circuits (Flatpacks). (Refer to figure 401.)

(1) Remove defective flatpack.

(a) Before removing the flatpack, note the position of the printed dot in the corner of the flatpack relative to positioning of the flatpack on the circuit board.

(b) If the flatpack and board have been coated with epoxy, perform the following procedure; if not, proceed to step (c).

CAUTION: APPLY ONLY AS MUCH HEAT AS NECESSARY TO LOOSEN THE EPOXY. ALSO, SCRAPE FROM CIRCUITRY TO THE BOARD; CIRCUITRY CAN BE ACCIDENTALLY LIFTED FROM THE BOARD IF TOO MUCH HEAT IS APPLIED OR IF THE SCRAPER CATCHES ITS EDGE. DON'T RUSH. THIS IS A VERY DELICATE OPERATION.

1. Touch the tip of a small soldering iron between each lead of the flatpack.

   NOTE: This step is sometimes necessary before the individual leads can be grasped with a tweezers.

2. Soak a piece of shielding braid in 1544 rosin. Lay the braid over the leads on one side of the flatpack, and apply heat with the soldering iron.

   NOTE: This step both loosens the epoxy coating and removes some of the solder from the connections.

3. Use tweezers to grasp each lead, one at a time, adjacent to the planar board. Heat each lead and lift it just far enough to break the connection to its pad. Repeat until all of the leads are unsoldered. Clean the tweezers periodically by dipping in cleaning solvent.

4. If the flatpack is still attached, carefully lift it, and sever the attaching epoxy coating with a hot soldering iron.

5. Carefully remove the remaining epoxy from the connection pads. Remove the larger pieces by first heating them slightly with the iron, and then, while they are still hot, scraping them away using a bakelite probe or a knife with a curved blade.

(e) If the flatpack is not coated with epoxy, either perform steps (b)2 and (b)3 above, or proceed as follows:

1. Mount the flatpack removal tool in an arbor press so that the two prongs of the spring are facing you.

2. Thread the defective flatpack onto the spring so that the prongs pass under all the leads of the flatpack.
3. Apply just enough pressure so that all the connections make contact with the heating unit. As soon as the solder melts, remove the flatpack by gently releasing pressure and pulling away.

**CAUTION:** APPLY ONLY NECESSARY PRESSURE TO MAKE GOOD THERMAL CONTACT. TOO MUCH PRESSURE MAY DAMAGE THE BOARD.

(d) Soak a piece of shielding braid in 1544 rosin (figure 401). Lay the braid over the connecting pads, and heat with a soldering iron until the excess solder is drawn into the braid.

**CAUTION:** DO NOT APPLY MORE HEAT THAN NECESSARY.

(e) Clean the connecting pads with a small brush dipped in cleaning solvent (figure 401).

(f) Retin the connecting pads lightly. Use enough solder to form a crescent-shaped bulge but not enough to form a U-shaped bulge (about 1/32 inch of 0.020-inch diameter solder).

(2) Prepare the new flatpack as follows:

(a) The bottom of the flatpack should be spaced away from the circuit board slightly. The manufacturer cements a small plastic pedestal to the side of the flatpack that faces the circuit board, using Armstrong A12 adhesive. If replacement pedestals are not available, insert a toothpick under the flatpack while soldering the leads of the flatpack, and then remove the toothpick.

(b) Provide strain relief in the leads by bending them downward and outward as follows:

1. Use long-nosed pliers to grasp all leads on one side of the flatpack about 1/16 inch away from the body of the flatpack. Simultaneously bend all leads down at about a 65-degree angle.

2. Grasp the bent leads with the long nose at a point about 1/16 inch from the first bend (step 1), and simultaneously bend all leads on this side back 65 degrees so that the end portions of the leads are slightly below and parallel to the bottom of the flatpack.

3. Repeat steps 1 and 2 on the leads extending from the other side of the flatpack.

(c) Temporarily lay the flatpack in position on the circuit board. Mark and cut the flatpack leads so that they extend to the ends of, but not beyond, their circuit pads.

(d) If necessary, use tweezers to bend leads so they lay directly over their circuit pads.

(e) Pre-tin the flatpack leads.
1. Dip the leads into 1544 rosin (figure 401) to a depth up to the first (lower) bend in the leads.

2. Either dip the leads of the flatpack into a solder pot to a depth up to the lower bend, or tin the leads with a soldering iron (figure 401).

   NOTE: Solder is permitted on the ascending portion of the lead, but not on the portion of the lead that extends straight out from the flatpack.

   CAUTION: DO NOT ALLOW SOLDER NEARER THAN 1/16 INCH TO THE FLATPACK. THIS MIGHT CAUSE HEAT DAMAGE TO THE FLATPACK AND ALSO SERIOUSLY DEGRADE THE STRAIN RELIEF FEATURE OF THE DOUBLE BEND.

3) Replace flatpack.

   (a) Use a pipe cleaner to apply 1544 rosin to the connection pads on the circuit board.

   (b) Refer to step (1)(a); position the dot near one corner of the replacement flatpack in the same position relative to the circuit board as the original flatpack.

   NOTE: If original positioning of the flatpack was not recorded, observe whether one of the corner circuit pads on the board is longer than the other pads. If so, use tweezers to position the flatpack to the circuit board so that the lead nearest the dot on the flatpack lays over the longer circuit pad.

   A photo or figure in the illustrated parts list section of this manual may show proper positioning of the replacement flatpack.

   If an identical unit is available, the proper position can be ascertained by noting the positioning in the identical unit.

   (c) While holding the flatpack in position, tack-solder the two corner leads on one side of the flatpack.

   (d) Rotate the board 180 degrees, and tack-solder the other two corner leads.

   (e) Use a tweezers to grasp each lead near the board. Apply just enough pressure so that the lead lays directly over its connecting pad and so that the entire lower part of the lead contacts the pad. Heat lead with iron until solder from the pad flows up around the edges of the lead and remove the soldering iron. Continue to hold the lead until the solder solidifies. Repeat until all the leads are soldered. Periodically clean tweezers by dipping in a cleaning solvent.

   CAUTION: DO NOT APPLY MORE HEAT THAN NECESSARY.
NOTE: The surface of the special soldering tip listed in figure 401 is small enough (0.015-inch maximum width) to touch only one lead at a time. If two adjacent pads are accidentally bridged with solder, the solder can be removed by quickly stroking it with the iron in a direction parallel to the pads.

If not enough pressure is applied, usually only the tip of the lead will contact the circuit pad, and if too much pressure is applied, usually only the first bend of the lead will contact the pad.

(f) Use a small brush and cleaning solvent to remove any remaining 1544 rosin from connecting pads.

CAUTION: CLEANING SOLVENT WILL REMOVE PRINTED IDENTIFICATION FROM COMPONENTS. ALSO, CLEANING SOLVENT WILL DISSOLVE THE SMALL PEDESTAL OF THE FLATPACK. AFTER CLEANING IMMEDIATELY BLOW AREA DRY.

(g) If the flatpack had been coated with epoxy, replace the coating as follows:

1. Obtain a 1-ounce bottle of Dennis 1169A liquid and a 2-ounce bottle of Dennis 1169B liquid (Collins part number 821-0166-00). Mix these two liquids together by pouring the contents of the small bottle into the larger bottle. Replace the lid and mix by shaking. Small amounts of coating material may be used by measuring equal portions of 1169A and 1169B into a paper cup. Use a separate measuring spoon for each item. Mix thoroughly with a stirring stick.

2. Use an expendable brush to coat the replaced flatpack and surrounding area from which the original coating was removed.

3. Allow to dry overnight, or place assembly in an oven and bake 1 hour at 60 °C.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>MANUFACTURER AND TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illuminated magnifying glass</td>
<td>Various, 3-10X magnification.</td>
<td>Magnify working area to make repair.</td>
</tr>
<tr>
<td>20-watt soldering iron</td>
<td>Hexacon Model 25S or equivalent.</td>
<td>Remove/replace flatpacks.</td>
</tr>
<tr>
<td>Special soldering iron tip</td>
<td>Fabricate per figure 1004.</td>
<td>Remove/replace flatpacks.</td>
</tr>
<tr>
<td>Flatpack removal tool</td>
<td>Fabricate per figure 1005.</td>
<td>Remove flatpacks.</td>
</tr>
</tbody>
</table>

Repair Tools and Supplies (Sheet 1 of 3)
Figure 401

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<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>MANUFACTURER AND TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tweezers, metal</td>
<td>Claus No. 231, Fremont, Ohio, or equivalent. Maximum jaw width is 0.030 inch.</td>
<td>Maneuver flatpack leads and provide heat sink.</td>
</tr>
<tr>
<td>Solder, 0.020-inch diameter, 60/40</td>
<td>Cen-Tri-Coro energized rosin core per QQ-S-51d.</td>
<td>Bond components to circuit board.</td>
</tr>
<tr>
<td>or</td>
<td>Kester 44 Sn 63 0.015 solder or equivalent</td>
<td></td>
</tr>
<tr>
<td>Solder, 0.015-inch diameter, 63137</td>
<td>Kester 1544.</td>
<td>Facilitate soldering to circuit boards.</td>
</tr>
<tr>
<td>rosin core 1544 rosin</td>
<td>CAUTION: REPLACE WITH FRESH ROSIN IF PARTIALLY CRYSTALLIZED.</td>
<td></td>
</tr>
<tr>
<td>Pipe cleaners</td>
<td>Various.</td>
<td>Apply and remove rosin flux.</td>
</tr>
<tr>
<td>Cleaning solvent</td>
<td>Trichloroethylene or equivalent.</td>
<td>Remove excess rosin flux.</td>
</tr>
<tr>
<td>Lintless tissue</td>
<td>Kimberly-Clark Corporation, Kimwipes or equivalent.</td>
<td>Remove excess rosin flux.</td>
</tr>
<tr>
<td>Shielding braid</td>
<td>Various; fine mesh of silver-plated braid works best.</td>
<td>Remove old solder from connecting pads on circuit board.</td>
</tr>
<tr>
<td>#26 stranded wire</td>
<td>Various; silver-plated wire works best.</td>
<td>Remove old solder from holes in circuit board.</td>
</tr>
<tr>
<td>Small brush</td>
<td>Various, but should have fairly stiff bristles.</td>
<td>Remove excess rosin flux and general cleaning.</td>
</tr>
<tr>
<td>Post coating</td>
<td>Dennis 1169, Collins part number 821-0166-00.</td>
<td>Replacement of epoxy coating on coated boards after repair.</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>MANUFACTURER AND TYPE</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Small expendable brushes</td>
<td>Various.</td>
<td>Same as above.</td>
</tr>
<tr>
<td>60 ±5 °C oven</td>
<td>Various.</td>
<td>Heat-cure of epoxy coating on coated boards after repair (optional).</td>
</tr>
<tr>
<td>Bakelite probe</td>
<td>6-inch length of bakelite rod with 1/8-inch diameter. Sharpen to point on one end, and grind to screwdriver shape on the other end.</td>
<td>Aid for removing epoxy coating from circuit board.</td>
</tr>
<tr>
<td>Knife with curved blade</td>
<td>Various, such as X-acto handle with #22 curved blade of X-acto Company, 48-41 Van Dam Street, Long Island, New York 11101, or a small pen knife.</td>
<td>Aid for removing epoxy coating from circuit board.</td>
</tr>
<tr>
<td>Toenail cutters or side cutters</td>
<td>Various. The toenail cutters is preferred because there is less danger of forming a burr on the lead with it. (Refer to caution following step G.(1)(b).)</td>
<td>Remove defective components from circuit board.</td>
</tr>
</tbody>
</table>

Repair Tools and Supplies (Sheet 3 of 3)
Figure 401

H. Relays.

CAUTION: DO NOT BURNISH RELAY CONTACTS EXCEPT THOSE THAT ARE LISTED BELOW. RELAY CONTACT PERFORMANCE IN LOW SIGNAL LEVEL CIRCUITS MAY BE DEGRADED IF CONTACTS ARE BURNISHED.

If inspector reveals extensive pitting or burning of relay contacts and relay appears to be defective or is in danger of becoming defective, replace relay. Make sketch of wire connections to simplify rewiring. Burnishing of relay contacts with a burnishing tool is recommended only for the following relays:

Main chassis: Relay KL (Collins part number 972-1544-000)
618T-1 high-voltage power supply module: all relays
618T-2 high-voltage power supply module: all relays
618T-3 high-voltage power supply module: all open frame relays

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I. Resistors.
Replace defective resistors with components known to be good, and carefully resolder bad connections.

J. Semiconductors.
Use long-nosed pliers as a heat sink while applying heat to a lead of a semiconductor.

K. Soldered Terminal Connections.
Resolder cold-soldered or resin joints. Remove all traces of corrosion.

L. Switches.
Switches are usually replaced and seldom repaired. Wafers in wafer-type switches may be replaced separately and so may defective pins in the crimped-pin type of connector. Leads should be properly identified to simplify rewiring.

M. Transformers and Reactors.
Replace or resolder as required.

N. Variable Resistors.
Add a drop or two of contact cleaner (carbon tetrachloride) to windings of a resistor with rough operation. Clean corroded terminals. Replace resistor if shaft is loose in case.

O. Wiring.
Replace damaged wiring with wire of the same size and color code. Ensure that no bare wires are touching chassis, other bare wires, or metal cases of other parts.

If a wire is to be removed from a terminal or component, it should be marked with an indication tag to prevent incorrect connections.

NOTE: When necessary to disturb the dress of the wires, carefully ensure that the original wire dress is maintained when replacing wires.
618T-( ) Airborne SSB Transceiver - Assembly

1. GENERAL.

This section presents assembly instructions and mechanical alignment procedures for the 618T-( ) Airborne SSB Transceiver. The order of assembly starts with the individual components and proceeds to the completed equipment. Fits, clearances, tolerances, and torques are contained in this section. The required lubrication and sealing procedures are also listed in this section.

2. PRECAUTIONS AND GENERAL TECHNIQUES.

Before soldering any part, refer to the notes of color coding, placement of leads, and wire insulation made during disassembly.

CAUTION: WHEN REPLACING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEADS TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

3. LUBRICATION DATA.

Figure 501 lists all items that can be lubricated and specifies the type of lubricant to be used. The lubricants listed for each item in figure 501 must be used; substitutions are not recommended.

A. Contamination and Compatibility.

The following is an example of problems that may be encountered when using lubricants that are not compatible.

Major contamination problems that arise between Versilube and conventional lubricants or hydraulic fluids are a result of some additives used in these fluids (oxidation inhibitors, corrosion inhibitors, etc.). Many of these additives are not soluble in Versilube and will precipitate as gummy or crystalline sludges when the fluids are mixed. When inadequate cleaning procedures lead to this type of contamination, high torques, sticking mechanisms, lubrication failure, and ultimate failure of the equipment can result.

CAUTION: THE IMPORTANCE OF MAINTAINING THE CORRECT LUBRICANT CANNOT BE OVEREMPHASIZED. SINCE FAILURE CAN RESULT FROM IMPROPER USE OF LUBRICANTS, IT IS IMPERATIVE THAT THE CORRECT LUBRICANTS BE USED IN THE RIGHT PLACE AND IN THE RIGHT AMOUNT.

B. Bearings.

It is recommended that porous bronze bearings be replaced if faulty or dry.

CAUTION: DO NOT LUBRICATE ANY BEARING. IF A PRESS-FIT BRONZE BEARING IS REMOVED, IT MUST BE REPLACED WITH A NEW BEARING.

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<table>
<thead>
<tr>
<th>NAME</th>
<th>SUPPLIER</th>
<th>COLLINS PART NUMBER</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL-G-3278</td>
<td>Standard Oil Company of New Jersey</td>
<td>005-0423-00</td>
<td>Protective coating and lubricant for gear teeth and switch detents.</td>
</tr>
<tr>
<td>Beacon 325</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIL-L-7870</td>
<td>Panaf Manufacturing Company, Milwaukee, Wisconsin</td>
<td>005-0116-00</td>
<td>Protective coating and lubricant for gear teeth and switch detents.</td>
</tr>
<tr>
<td>Filterkote &quot;M&quot;</td>
<td>Air-Maze Corporation Cleveland, Ohio</td>
<td>005-0609-00</td>
<td>Water soluble oil for use on air filters that must be cleaned in water.</td>
</tr>
<tr>
<td>MIL-I-8660</td>
<td>Dow Corning Corporation, Midland, Michigan</td>
<td>005-0201-00</td>
<td>Insulating and sealing.</td>
</tr>
<tr>
<td>Blue Glyptal</td>
<td>General Electric Company, Waterbury, New York</td>
<td>005-0133-00</td>
<td>Secure hardware where other locking means are not provided.</td>
</tr>
<tr>
<td>Lubricant</td>
<td>The lubricant is composed of 37-1/2 parts butyl alcohol (by weight); 37-1/2 parts xylene (by weight); 25 parts grease per Mil-G-23327, Aero-Shell 7, Collins part number 005-0810-00, (by weight).</td>
<td>005-1796-010</td>
<td>Lubrication of printed circuit contact ring surface on sides of turret switch compartments.</td>
</tr>
</tbody>
</table>

Lubricants and Sealants
Figure 501

4. DETAILED ASSEMBLY PROCEDURES.

A. Replacement of Crystal in RF Oscillator A2 (Early Model). (Refer to figure 111.)

1. Position crystal (5) as shown.

2. Solder blue crystal lead (8) to A2C1 (9). Make connection quickly to avoid overheating the crystal.

3. Solder green crystal lead (7) to circuit board (2). Make connection quickly to avoid overheating the crystal.

4. Repack grease (6), Collins part number 005-0201-00, around the base of the crystal.

5. Place oven (3) over the crystal and A2C1.

6. Replace two screws (4) on opposite sides of the oven.
Subject: Assembly of Power Amplifier All

Insert the following note in paragraph B. before step (1).

NOTE: If gear assembly (item 34-7D in illustrated parts catalog) has been disassembled, reassemble as follows. Assemble 100-tooth spur gear (34-8), 44-tooth spur gear (34-9), spring tension washer (34-9B), retaining ring (34-9D) and retaining ring (34-7E). Torque to slip clutch (between gears 34-8 and 34-9) shall be 5 to 10 inch-ounces while slipping. Use (2) flat washers (34-9A) and/or (2) washers (34-9C) to adjust for proper torque. Take precautions to keep clutch surfaces free of lubricants.
(7) Replace two screws (1) that fasten the oven to the circuit board.

(8) Replace the oven and the crystal oscillator assembly in foam.

(9) Replace the wires extending from bottom of foam, and replace the foam plug at bottom.

(10) Replace the wires extending from the top of the foam, and replace foam plug at top.

(11) Replace the foam in the module chassis.

(12) Replace the two holddown screws.

(13) Replace the cover plate.

(14) Replace the dust cover.

(15) Replace the module in the 618T-( ) chassis.

B. Assembly of Power Amplifier A11. (Refer to figure 110.)

(1) Replace the gearplate by sliding the hand-switch shaft through the switch. Be sure that the lower strap is inserted under the securing screw washers when the gearplate is pushed into place. Resolder resistors A11R42 and A11R43 before the gearplate is completely seated.

**NOTE:** If the shaft is not chamfered on end, chamfer slightly before replacing.

(2) Replace nine screws (S) on the gearplate.

(3) Tighten the screw securing the lower strap to the roller coil assembly.

(4) Replace the screw and washer holding the large silver-plated coil to the roller coil assembly. Use the hole nearest the gearplate.

(5) Replace the two nylon screws and washers holding the roller coil assembly to the bracket near the tubes. Damage will result if the screws are secured too tightly.

**CAUTION:** BEND THE SCREEN BYPASS CAPACITOR DOWN TO COVER THE SCREWS JUST REPLACED. IF THE CAPACITOR IS NOT POSITIONED CORRECTLY, THE PLATE STRAP WILL ARC TO THE CAPACITOR.

(6) Replace the square plate on the rear of the module using eight screws.

(7) Replace the top cover plate by laying it in position, pushing it toward the rear of the module, and tightening 17 screws.

C. Replacement of Turrets in RF Translator A12. (Refer to figure 101.)

**NOTE:** Apply a thin film of lubricant (figure 501) to the contact ring surface of printed circuit on sides of turret switch compartments. Refer to figure 501A for contact positioning dimensions.
NOTE:
DIMENSIONS ARE FOR REFERENCE ONLY.
Subject: Contact Positioning Diagram, Figure 501A.
Correct gauge dimensions and detail AA.

Interchangeability check:
With turret located on simulated shaft and
With turret setscrew tightened, contacts
Next to reference hole (S, solidus guaging) must
Align with centerline within limits.

Note:
Dimensions are for reference only.
(1) Insert the turrets from the bottom of the module so that all color-coded dots on
the turrets are in a line at the top of the module.

NOTE: Each turret is marked with two color-code dots: one white and one a
standard color-code color. The white dot is always nearest the gear-
plate. Turrets are color coded so that turret S1 is nearest the gear-
plate. Therefore, color-code dots should be (from the gearplate):
white, brown, white, red, white, orange, etc. When inserting the tur-
ret, orient it so that the spring contacts which project from the faces
of the turret will not fall into the shaft holes when the turret is being
positioned.

(2) When all seven turrets are in place, replace the turret shaft through the gear
that turns the shaft. Before tightening the shaft clamp, refer to paragraph 6.B
in this section for the turret alignment procedure.

(3) Replace two aligning rods (13) by inserting through the gearplate. Secure the
rods with two screws through the rear plate. Refer to note in paragraph
3.G.(5) of disassembly section concerning rf translator modules with turret
setscrews.

D. Assembly of Autopositioner A12A1. (Refer to figure 107.)

(1) Replacement of Solenoid.

(a) Replace solenoid (124) on mounting plate (134) using two screws (123) and
post (123). Be sure that the post holding the reversing switch level is in
the correct hole. Align solenoid (124) so that its shaft hole is lined up with
shaft hole in mounting plate (134) before tightening screws.

(b) Solder the insulated jumper from solenoid relay terminal 6 to solenoid
terminal 2. See figure 108(B).

(c) Replace retaining ring (120) on shaft (119).

(d) Replace armature (117) in solenoid (124) using two screws (118).

NOTE: Be sure these two screws (118) are the same as those removed
during disassembly. If screws are lost, they must be replaced
with screws having the same color code.

(e) Replace notched wheel (112) on shaft (119). Replace spring pin (113)
through the hole in the notched wheel and shaft.

NOTE: Assembly of wheel (112) and shaft (119) cannot be accomplished
without alignment fixture since each wheel (112) is unique. The
notched wheel (112) is first aligned, then shaft (119) is drilled for
spring pin (113). Replacement must be made at subassembly
level (CPN 546-6849-004).
(f) Replace small fiber actuator (126) between armature (117) and the solenoid relay contacts. See figure 108(B) for proper placement of the actuator.

(g) Perform steps (a) through (c) of paragraph 4.D.(2).

(2) Solenoid Clutch Assembly. (Refer to figure 107.)

(a) Replace spur gear (111) and clutch disc (110).

**CAUTION:** DO NOT LUBRICATE OR CLEAN CLUTCH SURFACES ON 110, 111, OR 112. WIPE WITH DRY, CLEAN, LINTLESS CLOTH. DO NOT TOUCH CLUTCH SURFACES WITH FINGERS.
(b) Replace spring washer (109) with concave side against disc (110). Replace washer (108) and nut (107).

(c) Tighten nut (107) until 30 or 40 in.-oz of torque is needed to slip spur gear (111). This torque can be measured with a Waters Torque Watch, Model 651C3, or equivalent. Attach the torque watch to the end of shaft (119). Hold gear (111) stationary and rotate the watch. Adjust nut (107) until the proper torque is indicated on the watch. Bend two tabs on washer (108) against flats on nut (107) when the clutch is torqued properly.

(d) Perform steps (a) through (j) of paragraph 4.D.(4).

(3) Replacement of Switch Wafers.

Because of problems encountered in replacing individual resistors on the switch wafers, the entire switch wafer assembly, which includes resistors on the wafer, should be replaced if one or more of the resistors is defective. Collins part numbers for all switch wafer assemblies are given in figure 502. Refer to figure 109 for identification of these wafers and connecting wiring between wafers.

<table>
<thead>
<tr>
<th>SWITCH WAFER</th>
<th>COLLINS PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>269-2190-00</td>
</tr>
<tr>
<td>S2</td>
<td>269-2190-00</td>
</tr>
<tr>
<td>S3</td>
<td>546-6865-003</td>
</tr>
<tr>
<td>S4</td>
<td>546-6862-002</td>
</tr>
<tr>
<td>S5</td>
<td>546-6861-002</td>
</tr>
<tr>
<td>Sf</td>
<td>546-6860-002</td>
</tr>
</tbody>
</table>

(4) Replacement of 10- and 100-kHz Switches. (Refer to figure 107.)

(a) Position the switch wafers on shaft (116) so that they are oriented as shown in figure 108(D).

(b) Resolder any cable leads that were unsoldered during disassembly. Use figure 109(A) as a guide when replacing wires that connect the switch wafers.

(c) Replace all metal spacers (82, 95) between the switch wafers. Fasten the wafers together and to mounting plate (134) with two screws (78) and washers (79).

(d) Place the six solenoid leads that were unsoldered earlier through the hole in the mounting plate (134). Resolder these six wires to solenoid (124) and solenoid switch block (133). See figure 108(B). Retie these wires.

(e) Replace reversing switch (64) using two screws (65). Be sure the switch leaf is in the slot in reversing switch panel (101).

(f) Replace cable clamp (66) using screw (67) and washer (68).
(g) Place the switch assembly in Autopositioner chassis. Be sure to place all the shim washers (if any) that were removed earlier over the shaft before inserting the shaft through the gearplate. Be sure spur gear (111) meshes with gear (159).

(h) Replace cable clamp (25) using screw (26).

(i) Replace resistor (18) on front plate (30) using screw (19) and washers (20, 21, 22). Position the resistor terminals so that they are parallel to the long sides of the front plate.

(j) Perform steps (a) through (j) of paragraph 4.D.(5).

(5) Replacement of 1-kHz Switches. (Refer to figure 107.)

(a) Resolder any cable wires or wires connecting wafer (37/52, 53/56) that were removed during disassembly. Use figure 109(B) as a guide.

(b) Replace all ceramic spacers (41) and fiber washers (39) between the switch wafer. Fasten the wafer together and fasten them to the bearing plate (165) with two screws (38).

(c) Rotate gear (9 or 5) by hand to position control cam (34) for minimum tension on spring (139).

(d) Place bearing plate (165) in position at the ends of the mounting posts (141). When sliding camshaft (36) through 1-kHz switch sections, be sure both sections are aligned as shown in figure 108(C). Tighten the bearing plate using four screws (142).

(e) Replace dc motor (153) and motor mount (154) on the bearing plate using two screws (155) and two washers (156).

(f) Replace relay (150) on the bearing plate using two nuts (151) and two lock-washers (152).

(g) Replace two cable clamps (157) using two screws (158).

(h) Replace vfo shaft coupling (59) on shaft (119) by tightening two setscrews (58).

(i) Replace output shaft spur gear (15) using set screw (14) in gear clamp (13). Be sure this gear has maximum face width engagement with gear (11).

(j) Replace spring (139) by hooking onto bar (140).

(k) Refer to paragraph 6.A. for Autopositioner testing procedure before replacing A12A1 in the rf translator A12 chassis.

(6) Replacement of Reversing Switch. (Refer to figure 107.)

(a) Resolder the six wires connected to switch (64). Refer to figure 108(A).
NOTE: Be sure switch leads are positioned so that there is clearance for the switch assembly to rotate.

(b) Replace the switch in bracket (134). The brass-plate side should be against the bracket. Be sure the switch leaf is in the slot in reversing switch lever (101).

NOTE: On some units, a spring clip is mounted with a finger between the reversing switch and the bracket.

(c) Replace two screws (65) through the switch. When the spring clip is used, tighten clamp (9) so that the switch leaf is the same distance from the center of the hole in the bracket in both positions.

(d) Replace cable clamp (66) using screw (67) and washer (68).

(e) Replace cable clamp bracket (27) using screw (28).

(f) Replace spring (138) by hooking bar (139) in slots on mounting posts (140). Hook the free end of the spring in place first.

NOTE: Check again to see that the switch leads are positioned so that there is clearance for the switch assembly to rotate.

E. Replacement of Autopositioner and VFO in RF Translator A12. (Refer to figures 101, 102, and 163.)

NOTE: Be sure that the Autopositioner is positioned to 500 kHz before installing it in the rf translator module.

(1) Carefully maneuver the Autopositioner into place under the gearplate. Place 25-pin connector (8) through the 28-position switch to its position at the bottom of the module. Be careful not to damage the switch wafers when placing the connector through the switch.

(2) Replace four screws (11) holding the Autopositioner to the gearplate. Leave the screws one-half of a turn loose.

(3) Position the two slug racks (12) at equal height above the chassis.

CAUTION: MAKE CERTAIN THAT THE TWO SLUG RACKS ARE EQUAL IN HEIGHT ABOVE THE CHASSIS. THE SLUG RACK HAS NO STOPS. THEREFORE, IF THE RACKS ARE NOT POSITIONED CORRECTLY AT 500 kHz, THE AUTOPositionER COULD RUN BACK BEYOND ITS DESIGN RANGE, STRETCHING AND RUINING THE TAPE.

With the slug racks in this position, position the clamp on the slug rack so that it is facing the top of the module.

(4) Align the mark on gear G8 (made in step 3.C. (13) of the Disassembly section) with the mark on the rf translator chassis. Replace idler gear (G9).
(5) Position the Autopositioner in the oversize mounting holes to remove as much backlash as possible in the idler gear drive. Tighten four Autopositioner mounting screws (11).

(6) Fasten 25-pin connector (8) to the bottom of the rf translator chassis with two screws (10).

(7) Replace 3/8-inch flatted shaft (7) above the 25-pin connector by placing it through the gear that turns the shaft.

(8) Tighten clamp (9) that holds the shaft.

(9) Position the vfo shaft midway between the end stops by positioning the stop mechanism as shown in figure 106.

(10) Place the vfo in position under the Autopositioner. Run the vfo leads (6) through the holes in the rf translator chassis, and solder the leads to connectors P6 and P9-31 and internal connections in the module.

(11) Replace four screws (1) fastening the vfo to the Autopositioner.

(12) Replace four tubes (5) adjacent to the vfo and the Autopositioner.

(13) Rotate rear brackets (3) on the vfo so that they can be fastened to the rear plate.

(14) Replace four screws (2) fastening the vfo brackets to the rear plate and the rf translator chassis.

(15) Tighten the setscrews in the coupler on the Autopositioner output shaft. Refer to figure 730 for slug rack alignment and for vfo alignment. Refer to figure 101 for coupler adjustment.

F. Replacement of Modules and Module Covers. (Refer to figure 504.)

(1) Replace the modules on the chassis by carefully engaging the aligning pins and connectors on the bottom of the module and tightening the redheaded captive holddown screws.

CAUTION: BE CERTAIN THAT ALL CONNECTORS ARE SEATED PROPERLY BEFORE TIGHTENING THE HOLDDOWN SCREWS. CONNECTORS MAY BE DAMAGED IF CONNECTORS ARE NOT MATED PROPERLY. BE CERTAIN THAT GASKETS ON J25, J26, AND J29 ARE IN PLACE BEFORE THE MODULES ARE FASTENED ON THE CHASSIS.

(2) Replace the module covers by placing them over the modules and pushing them toward the chassis. The covers are held in place without screws.

G. Replacement of Front Panel, Front Panel Cover, and Side Covers of 618T-( ).

NOTE: Be sure that ANT JUMPER switch S2 is in the proper position before replacing the 618T-( ) front panel. Refer to the silk screening on the antenna transfer relay compartment cover for positions of S2 (figure 503). If the
618T-( ) Airborne SSB Transceiver, Front Panel (Rear View) and Relay Compartment

Figure 503

same antenna is used for both transmit and receive, set S2 to IN (chassis with MCN 3025 and above). For chassis with MCN 3024 and below, connect a jumper wire between K5-5 and K5-8. If separate antennas are used for transmit and receive, set S2 to OUT (chassis with MCN 3025 and above) or omit jumper wire between K5-5 and K5-8 on units with MCN 3024 or below.

(1) Replace the front panel by tightening the four screws located at each corner of the panel.

(2) Replace the front panel cover by placing the cover over the front panel and turning two Dzus fasteners on the cover.

(3) Replace the side covers by placing the covers in the slots at the front of the chassis and tightening the four screws at the rear of the chassis.

5. VISUAL CHECKS.

After replacing all the modules in the chassis, check that each module is secure and seated properly. Inspect each module for loose parts, broken wires and hardware, and loose plugs and connectors.

NOTE: Check cable wires from A12P9 and A12A1P1 for contact with moving parts of band-switch shaft. If contact is made, use sufficient lacing cord to locate wires so they do not touch band-switch shaft.
618T-( ) Airborne SSB Transceiver, Left and Right Side Views (Modules Removed)
Figure 504
6. ALIGNMENT AND ADJUSTMENT PROCEDURES.

A. Autopositioner A12A1 Alignment and Check.

The following procedure is to be performed with Autopositioner A12A1 fastened to the rf translator module extender that is supplied with the 678Y-( ) Maintenance Kit. Use the special attachment in this kit to fasten the Autopositioner to the extender. Set the 714E-( ) mode selector switch to OFF.

1. Check to see that the actuating leaf of the reversing switch is visible in both operating positions through the hole in the switch mounting bracket.

2. Refer to figure 108(b). Check that the gap between contacts 3 and 4 on solenoid relay (with pawl in notch) is at least 0.015 inch.

3. Check that contacts 3 and 4 on the solenoid relay are closed when the pawl engages the notched wheel by at least 0.005 inch.

4. Check that the gap between contacts 5 and 6 on the solenoid relay (with back of pawl against solenoid housing) is at least 0.015 inch.

5. Rotate the 1-kHz cam by hand until the hole in the cam is adjacent to the cam follower. Set frequency to XX.000 MHz, any megahertz band. Momentarily switch the mode selector on the 714E-( ) to USB, then back to OFF. While doing this, observe the direction of rotation of the camshaft from the gearplate side. When viewed from this side, the shaft must rotate counterclockwise.

**CAUTION:** CAM WILL BE DAMAGED IF IT ROTATES CLOCKWISE.

6. Push the actuating leaf of the reversing switch toward the cam. Momentarily switch the 714E-( ) mode selector to USB, then back to OFF. Clutch gear should rotate clockwise as viewed from the gearplate side. With the leaf in the opposite position, the clutch gear rotation should be in the opposite direction. If directions of rotation are improper, rewire the reversing switch as shown in figure 108(A).

7. Attach the calibrated disc and pointer supplied in the 678Y-( ) Maintenance Kit to the Autopositioner output shaft. Check that the disc rotates one position for each 1-kHz change in frequency, 10 positions for each 10-kHz change, and one revolution for each 100-kHz change.

B. RF Translator A12 Turret and Switch Alignment. (Refer to figure 505.)

1. With the 714E-( ) positioned to 2.000 MHz, adjust the turret drive shaft so that the 2-MHz turret contacts (identified by color coding) are centered on the fixed contacts. Tighten the clamp screw.

**NOTE:** Refer to the note following paragraph 3.G.(5) of the disassembly procedures concerning the turret setscrews.

2. Adjust the band-switch shaft until the clip is positioned as shown in figure 505. Tighten the clamp screw.
(3) Recycle the Autopositioner to 2.000 MHz, and recheck the turret contacts and band-switch clip positions. Readjust them if necessary.

(4) Early models of rf translator A12 have a 28-position switch in place of the turrets. To align this switch, remove the module covers, place the rf translator module on the module extender supplied with the 678Y-( ) Maintenance Kit, and apply power to the 618T-( ). Set the 714E-( ) to 22,000 MHz. View the band switch from the bottom of the module. (The switch will be on the right side when viewed from the bottom of the module.) Inspect the 5th switch wafer from the gearplate. The tooth on the rotor should be in the center of the 22-MHz clip, which is the 8th clip clockwise from the left-hand mounting hole on the switch wafer. This clip can be identified by the fact that the wiring to the first seven clips goes to the left, and the wiring to the 8th to 14th clip goes to the right side as viewed from the bottom of the module. If the tooth on the rotor is not centered in the clip, loosen the clamp on the gear mounted on the switch shaft, and rotate the shaft until the rotor tooth is centered in the switch clip. Reposition rf translator to 22,000 MHz, and again check to see that the rotor tooth is centered in the 22-MHz clip position. Repeat this procedure if necessary.
Subject: ALIGNMENT AND ADJUSTMENT PROCEDURES
RF Translator A12 Turret and Switch Alignment
(Refer to figure 505).

Add step 6.B.(5) as follows.

(5) Turret switch contact pressure should be checked when gold plated finger contact is replaced. Bend gold finger contact (with turret removed) to obtain 6 to 13 oz contact pressure with the turret installed.
618T-( ) Airborne SSB Transceiver - Fits and Clearances

The fits and clearances for the 618T-( ) Airborne SSB Transceiver can be found in the assembly section of this manual.
618T-( ) Airborne SSB Transceiver - Testing

1. GENERAL.

This testing section is divided into three main divisions. These divisions, and a brief description of what each division contains, are listed below.

A. Operational Check.

The operational check is a functional, go/no-go check to be performed under normal operating conditions. Test equipment required to perform this test is listed in paragraph 3. If this check shows that the 618T-( ) is not operating properly, perform the unit performance checks and adjustments.

B. Unit Performance Checks and Adjustments.

The unit performance checks are detailed black-box checks performed at a test bench equipped with regular and special test equipment for the 618T-( ). These checks indicate whether or not the 618T-( ) meets the performance standards of the equipment specifications. If this check indicates that the 618T-( ) is not operating properly, refer to the module checks and adjustments to isolate trouble within the unit to a particular module or group of modules.

C. Module Checks and Adjustments.

The module checks and adjustments are detailed procedures for checking and adjusting each of the individual 618T-( ) modules. The adjustments in these procedures are not affected by module replacement. These checks will isolate the trouble within a module to a particular stage or group of stages.

2. TEST EQUIPMENT AND POWER REQUIREMENTS.

A. Test Equipment Required.

The test equipment required to perform the checks and adjustments in this section is listed in figure 1001.

B. Transistor Test Equipment.

Transistor damage from test equipment usually results when an incorrect value of voltage is applied to the transistor elements. Observe the following precautions regarding test equipment when testing transistor circuits.

(1) Observe polarity when using external power supplies. A diode, connected in series with the supply, will prevent reverse current flow.

(2) Do not cause transients by rapid power switching of external supply. Do not use external supply not equipped with transient protection.

(3) Make the ground connection first.
(4) Do not troubleshoot transistor circuits by bridging capacitors and resistors while power is applied. Do not use capacitor testers for capacitors in circuit unless the capacitor tester applied voltage is known to be safely below rated component voltages.

(5) Be certain external power supply has adequate regulation at the current values drawn by the transistor circuits.

(6) Use at least 20,000-ohm-per-volt meters or vacuum-tube voltmeters for making all measurements.

(7) Use test prods that are clean and sharp. It is good practice to cover all of the exposed prod, except about 1/8 inch on the end, with plastic tape or some other insulating material.

(8) Before using an ohmmeter to make transistor resistance measurements, check the ohmmeter on all scales by placing an external, low-resistance milliammeter in series with the ohmmeter leads. If the ohmmeter draws more than one milliampere on any range, do not use this range on circuits containing small transistors.

(9) When using an ohmmeter to make transistor resistance measurements, remember that these components are polarity conscious; therefore, be sure that the correct polarity is applied to the circuit by the ohmmeter.

C. Power Requirements.

Power requirements for the 618T-( ) are as follows:

(1) 618T-1/1B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 165 watts.
23.5 to 30.25 volts dc at 1150 watts.

(2) 618T-2/2B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 160 watts.
103.5 to 126.5 volts ac, 3-phase, 380 to 420 Hz (with Y-connected, line-to-grounded neutral) at 1000 watts.
23.5 to 30.25 volts dc at 120 watts.

(3) 618T-3/3E:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 100 watts.
23.5 to 30.25 volts dc at 1150 watts.
3. **OPERATIONAL CHECK.**

**NOTE:** If any of the following checks indicate that the 618T-( ) is not operating properly, perform the 618T-( ) unit performance check and adjustments.

A. **Test Procedures.**

   The test procedures are presented in tabular form. Figure 701 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

   **CAUTION:** DO NOT OPERATE THE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.

B. **Test Equipment.**

   A 714E-( ) Radio Set Control, an Electro-Voice 250 Carbon Microphone, and high-impedance headphones are required to perform the operational check.

C. **Equipment Setup.**

   Connect the 618T-( ) in its normal operating installation to perform the operational check procedure. Ensure that the 618T-( ) is grounded properly.
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. RECEIVER CHECKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Power Supply Checks</td>
<td>Set 714E-( ) mode selector switch to AM.</td>
<td>618T-( ) blower should operate.</td>
<td>CAUTION: IF BLOWER DOES NOT OPERATE, IMMEDIATELY SET 714E-( ) MODE SELECTOR SWITCH TO OFF.</td>
</tr>
<tr>
<td></td>
<td>With 618T-( ) unkeyed, set front panel meter switch to 28V, then to 130V.</td>
<td>618T-( ) front panel meter should indicate in red area at both settings.</td>
<td></td>
</tr>
<tr>
<td>B. Frequency Check</td>
<td>Set 618T-( ) operating frequency to an operating frequency of WWV.</td>
<td></td>
<td>WWV transmits on 2,500, 5,000, 10,000, 15,000, 20,000, and 25,000 MHz.</td>
</tr>
<tr>
<td>Using WWV Voice Transmission</td>
<td>Adjust 714E-( ) RF SENS/SQL control to a comfortable listening level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At a time when WWV is making a voice transmission, switch the 714E-( ) between USB and LSB.</td>
<td>Voice quality should be equally good in both USB and LSB.</td>
<td></td>
</tr>
<tr>
<td>C. (Deleted)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Squelch Check</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(If applicable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Squelch Adjustment</td>
<td>Set 714E-( ) to AM, USB, or LSB and to a frequency that is clear of transmission.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set squelch (SQL) control on 714E-( ) fully clockwise.</td>
<td>Squelch should be overridden, and background noise should be heard.</td>
<td>Do not turn the SQL control further counterclockwise than necessary to block the carrier noise, or blocking of low-level audio signals may result.</td>
</tr>
<tr>
<td></td>
<td>Using either speaker or headphones, adjust (SQL) control on 714E-( ) counterclockwise until carrier noise ceases.</td>
<td>Background noise should not be heard.</td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>(2) Listening Check</td>
<td>Set 714E-( ) to am, usb, or lsb to a frequency on which various transmissions can be received.</td>
<td>Audio output should be obtained in speaker or headphones during voice transmissions. One to five seconds after voice transmissions cease, squelch should operate and remove audio output and background noise.</td>
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</tr>
<tr>
<td>2. TRANSMITTER CHECKS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Power Supply Checks</td>
<td>Set 618T-( ) operating frequency to one on which transmissions may be made.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed.</td>
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<tr>
<td></td>
<td>Key 618T-( ).</td>
<td>CAUTION: 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY IMMEDIATELY.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set front panel meter switch, in turn, to 1500V, 130V, and 25V.</td>
<td>Front panel meter should indicate in red area in each position.</td>
<td></td>
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<tr>
<td></td>
<td>Unkey 618T-( ).</td>
<td></td>
<td></td>
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<tr>
<td>B. Power Amplifier Plate Current Check</td>
<td>Set 618T-( ) front panel meter switch to PA MA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disconnect coaxial jumper from 500KC STD connector on right front of 618T-( ).</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Key 618T-( ).</td>
<td>618T-( ) front panel meter should indicate 280 to 300 ma.</td>
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</tr>
<tr>
<td></td>
<td>Unkey 618T-( ).</td>
<td>Panel meter scale is read X100 with meter switch to PA MA position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reconnect coaxial jumper to 500KC STD connector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>CHECKS</td>
<td>PROCEDURE</td>
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<tr>
<td>C. Transmission Checks</td>
<td>Make test transmissions in USB, LSB, and AM modes.</td>
<td>If possible, establish 2-way communications with another station.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES**
- Side tone should be present in all modes and be of good quality.
- Front panel meter should indicate approximately 500 ma on voice peaks.
- Obtain signal quality reports from other station, and note quality of received signal.

**RESULTS**
- Unplug 618T(-) and set 714E(-) to OFF.
4. **UNIT PERFORMANCE CHECKS AND ADJUSTMENTS.**

**A. Use of Test Procedures.**

The test procedures are presented in tabular form. Figure 704 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

**B. Test Equipment Required.**

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

**C. Power Requirements.**

Power requirements for the 618T-( ) are listed in paragraphs 2.C.(1), 2.C.(2), and 2.C.(3) in this section.

**D. Unit Performance Test.**

(1) **Test Setup.**

(a) Remove side dust covers from the 618T-( ), and ensure that all modules and holddown screws are secure.

(b) Place the 618T-( ) on mounting tray supplied in the 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set the 678P-( ) Test Harness controls as follows:

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY INTLK</td>
<td>BY PASS</td>
</tr>
<tr>
<td>AC</td>
<td>OFF</td>
</tr>
<tr>
<td>DC POWER</td>
<td>OFF</td>
</tr>
<tr>
<td>300 Ω AUDIO LOAD</td>
<td>IN</td>
</tr>
<tr>
<td>CW KEY</td>
<td>Center (off) position</td>
</tr>
<tr>
<td>KEY</td>
<td>Center (off) position</td>
</tr>
<tr>
<td>WATTS</td>
<td>FORWARD, 200</td>
</tr>
</tbody>
</table>

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding unit under test (618-1/1B, -2/2B, or -3/3B). Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).

(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 678P-( ), 714E-1, 714E-2/3, 714E-6 selector switch to the applicable position.

NOTE: If testing a 618T-1B/2B/3B, set the 0.1 kHz digit on the 714E-( ) to 0.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

(k) Perform test procedures as outlined in figure 704. Tests must be performed in the order given.

CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.
61ET-( ) Test Setup Diagram Using a 678P-( ) Test Harness
Figure 702

NOTES:

1. SET 678P-( ) CONTROLS AS FOLLOWS:
   KEY INTLK ——— BY PASS
   678T-2/2, OFF, 678T-3/3B ——— AS REQUIRED (SET TO OFF FOR 678T-1/18)
   POWER ——— FORWARD, 200
   300Ω AUDIO LOAD ——— IN
   7/4E-1/7/4E-2/3/7/4E-8 ——— AS REQUIRED

2. SET "ANT JUMPER" TOGGLE SWITCH IN 678T-( ) RELAY COMPARTMENT TO "OUT!"
Bench Test Setup
Figure 703
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PRELIMINARY CHECKS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Power Supply and Power Amplifier Plate Current Check</td>
<td>Set 714E-( ) mode selector switch to AM. With 618T-( ) unkeyed, set front panel meter switch to 28V and 130V. Set 618T-( ) front panel meter switch to PA MA, and disconnect coaxial jumper from 500KC STD connector on front panel of 618T-( ). <strong>NOTE:</strong> 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ). Use a nonmetallic tool, and depress switch A1154 in power amplifier A11. Key 618T-( ). Note meter reading, and unkey 618T-( ) before releasing A1154. Repeat for A1155 instead of A1154. Reconnect 500KC STD jumper. Set 618T-( ) front panel meter switch to 1500V, and key 618T-( ). Unkey 618T-( ).</td>
<td>618T-( ) blower should operate. <strong>CAUTION:</strong> IF BLOWER DOES NOT OPERATE IMMEDIATELY, SET 714E-( ) TO OFF. 618T-( ) front panel meter should indicate in red area of scale for both settings. 618T-( ) front panel meter should indicate 280 to 300 ma. <strong>CAUTION:</strong> 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY 618T-( ) IMMEDIATELY. 618T-( ) front panel meter should indicate 80 to 120 ma less than previous step. Same as for A1154. 618T-( ) panel meter should indicate in red area of scale.</td>
<td>If indication is abnormal, replace tubes with matched pair, and recheck.</td>
</tr>
<tr>
<td>B. +18-Volt Check</td>
<td>(1) Preferred Method Connect Fluke 801 VTVM across A5J3 and ground in low-voltage power supply A5.</td>
<td>Vtvm should indicate +17.82 to +18.18 volts dc.</td>
<td>Adjust A5R15 to provide required results</td>
</tr>
</tbody>
</table>
### Test/Step

<table>
<thead>
<tr>
<th>Notes</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>pageTitle</td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>E.</strong> YFO Capture (6187-1/2,3 (6187-1/2,3 only))</td>
<td>Connect 6782-1 U2-FREQ DIV jack to 714G-1. Connect 6782-1 GRND jack to 6187-1.</td>
</tr>
<tr>
<td>Set 714E-1 to 2.999 MHz.</td>
<td>Connect frequency counter, through 6787-1, probe no. 1, to 7125.</td>
</tr>
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</tbody>
</table>

**NOTE:** If kHz-frequency stabilizer A4 is Collins part number 258-01-4, then 6782-1 U2-CAPTURE RANGE SELECTOR switch should be in 70K-4 CAPTURE RANGE SELECTOR position. If position is also correct for 6782-1 U2-CAPTURE RANGE SELECTOR switch, then the frequency counter should indicate as follows for each setting:

- **2.5000 MHz** to 2.50002 MHz
- 2.6100 MHz to 2.610004 MHz
- 2.7200 MHz to 2.720002 MHz
- 2.8300 MHz to 2.830002 MHz
- 2.9400 MHz to 2.940002 MHz
- 3.0500 MHz to 3.050002 MHz
- 3.1600 MHz to 3.160002 MHz
- 3.2700 MHz to 3.270002 MHz
- 3.3800 MHz to 3.380002 MHz
- 3.4900 MHz to 3.490002 MHz
- 3.6000 MHz to 3.600002 MHz
- 3.7100 MHz to 3.710002 MHz
- 3.8200 MHz to 3.820002 MHz
- 3.9300 MHz to 3.930002 MHz
- 4.0400 MHz to 4.040002 MHz
- 4.1500 MHz to 4.150002 MHz
- 4.2600 MHz to 4.260002 MHz
- 4.3700 MHz to 4.370002 MHz
- 4.4800 MHz to 4.480002 MHz
- 4.5900 MHz to 4.590002 MHz

- **2.5000 MHz** to 2.50002 MHz
- 2.6100 MHz to 2.610004 MHz
- 2.7200 MHz to 2.720002 MHz
- 2.8300 MHz to 2.830002 MHz
- 2.9400 MHz to 2.940002 MHz
- 3.0500 MHz to 3.050002 MHz
- 3.1600 MHz to 3.160002 MHz
- 3.2700 MHz to 3.270002 MHz
- 3.3800 MHz to 3.380002 MHz
- 3.4900 MHz to 3.490002 MHz
- 3.6000 MHz to 3.600002 MHz
- 3.7100 MHz to 3.710002 MHz
- 3.8200 MHz to 3.820002 MHz
- 3.9300 MHz to 3.930002 MHz
- 4.0400 MHz to 4.040002 MHz
- 4.1500 MHz to 4.150002 MHz
- 4.2600 MHz to 4.260002 MHz
- 4.3700 MHz to 4.370002 MHz
- 4.4800 MHz to 4.480002 MHz
- 4.5900 MHz to 4.590002 MHz

**NOTE:** If kHz-frequency stabilizer A4 is Collins part number 258-01-4, then 6782-1 U2-CAPTURE RANGE SELECTOR switch should be in 70K-4 CAPTURE RANGE SELECTOR position. If position is also correct for 6782-1 U2-CAPTURE RANGE SELECTOR switch, then the frequency counter should indicate as follows for each setting:

- **2.5000 MHz** to 2.50002 MHz
- 2.6100 MHz to 2.610004 MHz
- 2.7200 MHz to 2.720002 MHz
- 2.8300 MHz to 2.830002 MHz
- 2.9400 MHz to 2.940002 MHz
- 3.0500 MHz to 3.050002 MHz
- 3.1600 MHz to 3.160002 MHz
- 3.2700 MHz to 3.270002 MHz
- 3.3800 MHz to 3.380002 MHz
- 3.4900 MHz to 3.490002 MHz
- 3.6000 MHz to 3.600002 MHz
- 3.7100 MHz to 3.710002 MHz
- 3.8200 MHz to 3.820002 MHz
- 3.9300 MHz to 3.930002 MHz
- 4.0400 MHz to 4.040002 MHz
- 4.1500 MHz to 4.150002 MHz
- 4.2600 MHz to 4.260002 MHz
- 4.3700 MHz to 4.370002 MHz
- 4.4800 MHz to 4.480002 MHz
- 4.5900 MHz to 4.590002 MHz

- **2.5000 MHz** to 2.50002 MHz
- 2.6100 MHz to 2.610004 MHz
- 2.7200 MHz to 2.720002 MHz
- 2.8300 MHz to 2.830002 MHz
- 2.9400 MHz to 2.940002 MHz
- 3.0500 MHz to 3.050002 MHz
- 3.1600 MHz to 3.160002 MHz
- 3.2700 MHz to 3.270002 MHz
- 3.3800 MHz to 3.380002 MHz
- 3.4900 MHz to 3.490002 MHz
- 3.6000 MHz to 3.600002 MHz
- 3.7100 MHz to 3.710002 MHz
- 3.8200 MHz to 3.820002 MHz
- 3.9300 MHz to 3.930002 MHz
- 4.0400 MHz to 4.040002 MHz
- 4.1500 MHz to 4.150002 MHz
- 4.2600 MHz to 4.260002 MHz
- 4.3700 MHz to 4.370002 MHz
- 4.4800 MHz to 4.480002 MHz
- 4.5900 MHz to 4.590002 MHz
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. (Cont)</td>
<td><strong>PROCEDURE</strong>&lt;br&gt;stabilizer A4 is Collins part number 544-9258-005, connect 6782-1J1-1 KC STAB jack to A411, and place 6782-1 CAPTURE RANGE switch in 70K-3 CAPTURE RANGE position. Ground A1248 to 618T-1(-) chassis. Adjust R3 on 678Z-1 for a frequency indication of 3.5 and 4.0 kHz higher than reference. Without changing setting of 678Z-1 R3, ground A1248. Adjust R3 on 678Z-1 for a frequency indication of 3.5 and 4.0 kHz lower than reference. Without changing setting of 678Z-1 R3, ground A1248. Same as above. Without changing setting of 678Z-1 R3, ground A1248.<strong>&lt;br&gt;<strong>F. Digit Oscillator Check (618T-1/2/3 only)</strong>&lt;br&gt;Connect frequency counter to the digit oscillator output (A475 in kHz-frequency stabilizer A4) through probe no. 1 of the 678Y-(-) Maintenance Kit. Set 714E(-) to each of the following frequencies, and observe the count. (1) 295.850 to 296.150 MHz</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-8

This TEMPORARY REVISION replaces TEMPORARY REVISION NO 23-10-0-7

Insert facing page 714A, 23-10-0

Subject: Unit Performance Test Procedures

Replace test step 2. (RECEIVER TESTS) procedure column with the following:

<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. RECEIVER TESTS</td>
<td>During all receiver tests, the HP 506A Signal Generator is connected through a 6-dB attenuator (Measurements Corp. 80-ZH3) to 618T-( ). Remove 618T-( ) front dust cover. Set SIDETONE control R9 and AUDIO control R10 fully clockwise. Set 618T-( ) squelch enable switch S3 to SQL OUT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td>NOTES</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>F. (Cont)</td>
<td>(2) 2.000 MHz</td>
<td>(2) 290.850 to 300.150 kHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) 2.065 MHz</td>
<td>(3) 304.850 to 305.150 kHz</td>
<td></td>
</tr>
<tr>
<td>2. RECEIVER TESTS</td>
<td>During all receiver tests, the HP 606A Signal Generator is connected through a 6-dB attenuator (Measurements Corp. 80-2H3) to 618T- ( ) connector J3 (AUX RCVR ANT.). Remove 618T- ( ) front dust cover. Set SIDETONE control R9 and AUDIO control R10 fully clockwise. Set 618T- ( ) squelch enable switch S3 to SQL OUT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. AM Gain and Sensitivity</td>
<td>Set the 714E-( ) frequency selector to 2.100 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise. Connect Ballantine 310A VTVM to the 676P-( ) HEADSET jack. Set the signal generator for 3-uv output at 2.100 MHz, modulated 30% at 1000 Hz. Remove the modulation. Repeat for each MHz band from 2.100 through 22.100 and 29.900 MHz. At each setting, remove modulation, and observe change in vtvm indication. Change signal generator output level from 3 uv to 5 uv with 714E-( ) and signal generator at 2.100 MHz. Repeat for all frequencies listed above. Change signal generator output level from 5 uv to 50 uv with the 714E-( ) and the signal generator set to 23.900 MHz. Change signal generator output from 50 to 1000 uv.</td>
<td>Note the vtvm indication in db (reference). Vtvm indication should drop NLT 6 db from reference. Same as above for each band. Record results of this test for future use.</td>
<td>Vtvm should indicate not less than 3.9 v (50 mw into 300-ohm load). Same as above for each band. Vtvm should indicate not less than 7.75 v (200 mw into 300-ohm load). Vtvm indicates not less than 9.5 v (300 mw into 300-ohm load).</td>
</tr>
</tbody>
</table>
### TEST/STEP

<table>
<thead>
<tr>
<th>2. SSE Gain and Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.</td>
</tr>
</tbody>
</table>

#### PROCEDURE

Set 714E-( ) to 2.100 MHz, USB.

- Adjust signal generator frequency slightly for maximum reading on ac vtm.
- Remove input signal by tuning signal generator 10 kHz off frequency.
- Readjust signal generator to frequency which produces maximum vtm indication.

Vtm should indicate not less than a 10-db. drop in signal.
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. (Cont)</td>
<td>Adjust signal generator output level for 3 uv with no modulation.</td>
<td>Vtvm indicates not less than 3.9 v (50 mw into a 300-ohm load).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set 714E-( ) mode selector switch to LSB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjust signal generator output level for 1 uv with no modulation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjust signal generator frequency for maximum reading on the ac vtvm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remove input signal by tuning signal generator 10 kHz off frequency.</td>
<td>Vtvm should indicate not less than 10-db drop in signal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Readjust signal generator to frequency which produces maximum vtvm indication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjust signal generator output level for 3 uv with no modulation.</td>
<td>Vtvm indicates not less than 3.9 v (50 mw into 300-ohm load).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeat step B at 8.400 and 29.900 MHz.</td>
<td>Same as above.</td>
<td></td>
</tr>
<tr>
<td>C. AGC Characteristics</td>
<td>Set 714E-( ) to 7.300 MHz, AM.</td>
<td>Record vtvm indication for reference.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set signal generator to 7.300 MHz modulated 30% at 1000 Hz at an output level of 10 uv.</td>
<td>Vtvm should indicate not more than a 6-db increase over reference.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase signal generator output to 100,000 uv.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set 714E-( ) to 7.300 MHz, USB.</td>
<td>Record vtvm indication for reference.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set signal generator to 7.300 MHz unmodulated at a level of 10 uv.</td>
<td>Vtvm should indicate not more than 6-db increase over reference.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjust frequency of signal generator for maximum indication on vtvm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase signal generator output level to 100,000 uv.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Vom HP-410B VTVM Rf dummy load</td>
<td>WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 3-PHASE HIGH-VOLTAGE POWER SUPPLY A7. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A7 REMOVED. Remove A7 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A7 to perform this step. Replace dust cover on A7 and replace A7 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12 from 618T-( ) chassis. Connect A12 through module extender to 618T-( ) chassis. Remove dust cover from A12. Unless otherwise specified, the steps are performed with the 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.</td>
</tr>
<tr>
<td>2</td>
<td>1500-v check</td>
<td>Set 618T-( ) front panel meter selector switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).</td>
<td>Front panel meter should indicate in red area.</td>
</tr>
<tr>
<td>Step</td>
<td>Description</td>
<td></td>
<td></td>
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<tr>
<td>------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DISCONNECT ALL TEST EQUIPMENT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TURN POWER OFF.</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>NOTE: THERE ARE NO INDICATIONS TO DEPEND ON.</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>VERIFY 240 V 50/60 VAC.</td>
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</tr>
<tr>
<td>5</td>
<td>CONNECT HP-7105 VTM TO A25.</td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>VERIFY 384 V DC.</td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>VERIFY 480 V DC.</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>VERIFY 480 V DC.</td>
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</tbody>
</table>

**Remedy**

- Replace all G15 in 61ST-().
- Replace all G15 in 61ST-()
- Remove module exterior.
- Remove G15 from module.
- Disconnect all test equipment.
- Turn power off.

**Test Procedure**

- Connect HP-7105 VTVM to A25.
- Verify 240 V 50/60 VAC.
- Verify 384 V DC.
- Verify 480 V DC.
- Verify 480 V DC.

**Test Equipment**

- HP-7105 VTVM.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness, 678T-( ) Maintenance Kit, 714E-( ) Radio Set Control, HP-410B VOM, VOM, RF dummy load</td>
<td>WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 27.5-VDC HIGH-VOLTAGE POWER SUPPLY A8. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A8 REMOVED. Remove 27.5-vdc high-voltage power supply A8 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A8 to perform this step. Replace dust cover on A8 and replace A8 in 618T-( ) chassis. Remove rf translator A12 from 618T-( ) chassis. Connect rf translator A12 through module extender to 618T-( ) chassis. Remove dust cover from A12. Connect 618T-( ), 678P-( ), and RF dummy load as shown in figure 702. Unless otherwise specified all steps are performed with 714E-( ) in AM, no signal in, and 618T-( ) unkeyed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1500-v check</td>
<td>Set 618T-( ) front panel meter selector switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).</td>
<td>Front panel meter should indicate in red area.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
</tr>
<tr>
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<tr>
<td>3</td>
<td>260-v check</td>
<td>Connect HP-410B VTVM dc probe to TP19 on A12 module extender. Key 618T-( )&lt;br&gt;Note HP-410B indication. &lt;br&gt;<strong>NOTE:</strong> There are no adjustments in A8. If preceding checks indicate module output is abnormal, turn power off, remove A8 from 618T-( ) chassis, and use a voltmeter to check for faulty diodes, transformer winding continuity, and proper relay operation. If +1500-v output is normal but +260-v output is abnormal, check bleeder resistors A8R22 and A8R23. Refer to applicable module schematic diagram.&lt;br&gt;Figure 820 applies to modules with MCN 4250 or above. Figure 821 applies to modules with MCN 4249 or below.</td>
<td>+234 to +286 v.</td>
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<tr>
<td>4</td>
<td>Disconnect</td>
<td>Turn power off. Disconnect all test equipment. Remove A12 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A12. Replace A12 in 618T-( ) chassis.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Signal generator -dB attenuator Audio oscillator Rf dummy load Distortion analyzer</td>
<td>This test procedure applies to both early and late models of AM/audio amplifier A9. Refer to figure 723 for location of all test points on A9. Remove AM/audio amplifier A9 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A9 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect AM/audio amplifier A9 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM, no signal in, and 618T-( ) unkeyed.</td>
<td>Not more than +6 Vdc.</td>
<td>A9Q7 and associated circuit.</td>
<td>Check A9Q7 and associated circuit.</td>
</tr>
<tr>
<td>2</td>
<td>If, age voltage check</td>
<td>Connect HP-410B VTVM dc probe to A9J1. Check voltage at A9J1. Disconnect HP-410B.</td>
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<tr>
<td>3</td>
<td>Audio amplifier gain adjustment</td>
<td>Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack. Connect audio oscillator to 678Z-1 NO. 1 AUDIO IN. Connect 678Z-1 AUDIO OUT to 678P-( ) MIKE input.</td>
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<td>STEP</td>
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Module Checks and Adjustments,
AM/Audio Amplifier A9
Figure 722 (Sheet 2)

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<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
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<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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<td></td>
<td></td>
<td></td>
<td>Set audio oscillator output to 1 kHz, 0.78 vrms (as indicated on vtm).</td>
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<td></td>
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<td></td>
<td>Connect Ballantine 310A VTM to A9J4.</td>
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<td></td>
<td>Check voltage at A9J4.</td>
<td>5.7 vrms for units with MCN 3508 or above.</td>
<td>A9R5 incorrectly adjusted.</td>
<td>Adjust A9R5.</td>
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<td></td>
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<td></td>
<td>8.7 vrms for units with MCN between 2650 and 3508.</td>
<td>A9R5 incorrectly adjusted.</td>
<td>Adjust A9R5.</td>
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<tr>
<td></td>
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<td>12.0 vrms for units with MCN below 2650.</td>
<td>A9R5 incorrectly adjusted.</td>
<td>Adjust A9R5.</td>
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<td></td>
<td>0.78 vrms with correct voltage at A9J4.</td>
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<td></td>
<td>Check audio oscillator output voltage (as indicated on HP-410B VTM).</td>
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<td></td>
<td>Disconnect HP-410B VTM and audio oscillator.</td>
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<tr>
<td>4</td>
<td>AM receive if. alignment</td>
<td></td>
<td>Connect Ballantine 310A VTM to 678P-( ) HEADSET jack.</td>
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<td></td>
<td>Set 714E-( ) to AM.</td>
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<td></td>
<td>Set 618T-( ) front panel AUDIO control fully clockwise.</td>
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<td></td>
<td>Disconnect coaxial jumper from RCVR IF, IN connector at left front of 618T-( ).</td>
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<td></td>
<td>Connect signal generator, through 6-db attenuator, to RCVR IF, IN jack.</td>
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<td></td>
<td>Set signal generator output to 500 kHz, 30% modulated with 1 kHz.</td>
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<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>4 (Cont)</td>
<td>Adjust signal generator output level for 2 to 3 vrms at 678P-( ) HEADSET jack. Adjust A9C18, A9C19, A9L2, A9L3, A9T2 to peak voltage at 678P-( ) HEADSET jack. Increase signal generator output level to 300 uv. Adjust A9T3 to null voltage at 678P-( ) HEADSET jack. Adjust signal generator output level for 5.0 vrms at 678P-( ) HEADSET jack. Note signal generator output level.</td>
<td>Between 100 and 200 uv. A9R56. NOTE: A9R56 is a selected value of resistance in this circuit.</td>
<td>Replace A9R56 with a resistor selected from complement listed in the 618T-( ) illustrated parts catalog.</td>
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<tr>
<td>5 (Cont)</td>
<td>SELCAL output voltage check Connect signal generator through 6-db attenuator to RCVR IF, IN jack. Connect Ballantine 310A VTVM to TP12 on module extender. Set signal generator to 500 kHz, 500 uv, 30% modulated with 1 kHz.</td>
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<td>STEP</td>
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<tr>
<td>5 (Cont)</td>
<td>6 KHz active filter adjuster (AM/SSB or AM audio amplifier A9 MCN 49000 and above)</td>
<td>Connect distortion analyzer to jack 94 on module A9. Key 61ST-1 in CW mode. Adjust A9R62 for minimum distortion at 1 kHz.</td>
<td>Check A9Q9 and associated circuit (late model). Check A9T4 (early model).</td>
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</tbody>
</table>

**PROBABLE CAUSE OF ABNORMAL RESULT**

A9Q9 and associated circuit (late model).

A9T4 (early model).

**REQUIRED TEST RESULT**

Not less than 0.1 v.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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<tbody>
<tr>
<td>7</td>
<td>Disconnect</td>
<td></td>
<td>Reset 618T-( ) front panel AUDIO control according to unit performance test procedures, step 4.G, figure 704. Turn power off. Disconnect all test equipment. Remove A9 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A9. Replace A9 in 618T-( ) chassis. Reconnect coaxial jumper to RCVR IF, IN jack.</td>
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AM/Audio Amplifier A9, Checks and Adjustments

Figure 723
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<th>TEST EQUIPMENT</th>
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<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness 678Y-( ) Maintenance Kit 714A-( ) Radio Set Control HP-410B VTVM Boonton 91-C RF VTVM Signal generator 6-db attenuator Oscilloscope</td>
<td>The following test procedure applies to MHz-frequency stabilizer A10, Collins part number 528-0029-005 only. Refer to figure 725 for location of all test points on A10 and module extender. Remove MHZ-frequency stabilizer A10 from 618T-( ) chassis and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A10 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect MHz-frequency stabilizer A10 through module extender to 618T-( ) chassis. Unless otherwise specified all steps are performed with 714A-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
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<tr>
<td>2</td>
<td>Transistor supply voltage check</td>
<td>Connect HP-410B VTVM dc probe to A10J2. Check voltage at A10J2.</td>
<td>+15 to +18 V.</td>
<td>Low-voltage power supply A5.</td>
<td>Check low-voltage power supply A5.</td>
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<td>STEP</td>
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<td>3</td>
<td>HF oscillator dc output check</td>
<td>Connect oscilloscope and HP 4060 VTM to A103.</td>
<td>Check voltage at A103.</td>
<td>A1A2Q1 through associated circuits. Oscilloscope may need retuning.</td>
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<tr>
<td>4</td>
<td>17.5-MHz oscillator voltage output check</td>
<td>Connect oscilloscope and HP 4060 VTM to A104.</td>
<td>Check voltage at A104.</td>
<td>A1A1Q1 through associated circuits. Oscilloscope may need retuning.</td>
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<tr>
<td>5</td>
<td>HF oscillator rf input check</td>
<td>Connect Boonton 91-g RF VTM to A105.</td>
<td>Check voltage at A105.</td>
<td>A12V1 and associated circuit.</td>
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<tr>
<td>5</td>
<td>17.5-MHz oscillator rf input check</td>
<td>Connect Boonton 91-g RF VTM to A105.</td>
<td>Check voltage at A105.</td>
<td>A12V1 and associated circuit.</td>
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Module Checks and Adjustments, MHz-Frequency Stabilizer A10.  
Late Model (Sheet 2 of 5)  
Figure 724  
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<table>
<thead>
<tr>
<th>STEP</th>
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<th>TEST EQUIPMENT</th>
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<th>REMEDY</th>
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<tr>
<td>8</td>
<td>Pulse generator output check</td>
<td>Set oscilloscope for 5 v/cm, 0.5 µs/cm.</td>
<td>Connect oscilloscope vertical input to A10A3TP2. Check waveform at A10A3TP2.</td>
<td>20 to 28 v peak to peak.</td>
<td>A10A3Q2 and associated circuit.</td>
<td>Check A10A3Q2 and associated circuit.</td>
</tr>
<tr>
<td>9</td>
<td>Mixer input check (A10A1Q3)</td>
<td>Set oscilloscope for 0.5 v/cm, 0.5 µs/cm.</td>
<td>Connect oscilloscope vertical input to A10A3TP3. Check waveform at A10A3TP3.</td>
<td>1.2 to 2.0 v peak to peak.</td>
<td>A10A3Q2 and associated circuit.</td>
<td>Check A10A3Q2 and associated circuit.</td>
</tr>
<tr>
<td>10</td>
<td>Mixer input check (A10A2Q3)</td>
<td>Set oscilloscope for 0.5 v/cm, 0.5 µs/cm.</td>
<td>Connect oscilloscope vertical input to junction of A10A2R9 and A10A2R10. Check waveform at junction of A10A2R9 and A10A2R10.</td>
<td>1.2 to 2.0 v peak to peak.</td>
<td>A10A2Q3 and associated circuit.</td>
<td>Check A10A2Q3 and associated circuit.</td>
</tr>
<tr>
<td>11</td>
<td>Mixer output/if. amplifier input check</td>
<td>Set oscilloscope for 0.5 v/cm, 0.5 µs/cm.</td>
<td>Connect oscilloscope vertical input to A10A1TP4. Check waveform at A10A1TP4.</td>
<td>0.5 to 0.9 v peak to peak.</td>
<td>A10A1Q3 and associated circuit.</td>
<td>Check A10A1Q3 and associated circuit.</td>
</tr>
<tr>
<td>12</td>
<td>Reference spectrum level adjustment</td>
<td>Disconnect coaxial jumpers at A1 and A2 on module extender. Connect HP-410B VTVM de probe to A10J1.</td>
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<td>STEP</td>
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<td></td>
<td></td>
<td>Connect HP-410B VTVM dc probe to A10J3.</td>
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<td></td>
<td>Check voltage at A10J3.</td>
<td>+6 to +7 v.</td>
<td>A10A3R5 incorrectly adjusted.</td>
<td>Adjust A10A3R5.</td>
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<td>NOTE: If necessary, readjust A10A3R5 and A10A3R6 until the voltage at A10J1 and A10J3 is +6 to +7 v.</td>
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<td>13</td>
<td>Recycle check</td>
<td>The two coaxial jumpers remain disconnected.</td>
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<td></td>
<td>Connect signal generator through 6-db attenuator to module input at A1 on module extender.</td>
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<td></td>
<td>Connect Boonton 91-C RF VTVM to A10J5.</td>
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<td>Set signal generator output level for 80 mv at 17.503 MHz (as indicated on Boonton 91-C).</td>
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<td></td>
<td>Connect oscilloscope vertical input to A10J3.</td>
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<td>Set oscilloscope for 5 v/cm, dc, 5 ms/cm.</td>
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<td>Check waveform at A10J3.</td>
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<td>(Cont)</td>
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<td><img src="image" alt="Waveform Diagram" /></td>
<td>Peak value must be +9 to -12 v. Minimum value must be 0 to +4 v. Period must be 5 to 15 ms.</td>
<td>Check A10A3Q3 and associated circuit.</td>
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<tr>
<td>13 (Cont)</td>
<td></td>
<td>Connect signal generator through 6-db attenuator to module input at A2 on module extender.</td>
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<td>Connect Boonton 91-C RF VTVM to A10J4.</td>
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<td>Tune signal generator output level for 80 mv at 8.093 MHz (as indicated on Boonton 91-C).</td>
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<td></td>
<td>Connect oscilloscope vertical input to A10J1.</td>
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<td></td>
<td>Set oscilloscope for 5 v/cm, dc, 5 ms/cm.</td>
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<td>Check waveform at A10J1.</td>
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<td>![Waveform Image]</td>
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<td></td>
<td></td>
<td>Peak value must be +9 to +12 v. Minimum value must be 0 to +1 v. Period must be 5 to 15 ms.</td>
<td></td>
<td>A10A3Q4 and associated circuit.</td>
<td>Check A10A3Q4 and associated circuit.</td>
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<tr>
<td>14</td>
<td>Disconnect</td>
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<td>Turn power off.</td>
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<td></td>
<td>Disconnect all test equipment.</td>
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<td></td>
<td></td>
<td>Remove A10 from module extender.</td>
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<td></td>
<td>Remove module extender from 615T-( ) chassis.</td>
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<td></td>
<td>Reconnect coaxial jumpers to module extender.</td>
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<td></td>
<td>Replace dust cover on A10.</td>
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<td></td>
<td>Replace A10 in 615T-( ) chassis.</td>
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</table>
Note:
1. Metal cover must be removed from A10A3 to perform tests on circuit board.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td>The following test procedure applies to MHz-frequency stabilizer A10, Collins part number 544-9289-005 only. Refer to figure 727 for location of all test points on A10 and module extender. Remove MHz-frequency stabilizer A10 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A10 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect MHz-frequency stabilizer A10 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
<td>+15 to +18 Vdc.</td>
<td>Low-voltage power supply A5. L7 open or components shorted on +18-Vdc line.</td>
<td>Check low-voltage power supply A5.</td>
</tr>
<tr>
<td>2</td>
<td>Transistor supply voltage check</td>
<td>HP-410B VTVM dc probe to A10J2. Check voltage at A10J2.</td>
<td>+15 to +18 Vdc.</td>
<td>Low-voltage power supply A5.</td>
<td>Check low-voltage power supply A5.</td>
<td></td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>3</td>
<td>Hf oscillator dc tuning voltage output check</td>
<td>Connect oscilloscope and HP 410B VTVM dc probe to A10J1. Check voltage at A10J1.</td>
<td>Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.</td>
<td>A10A1Q1 through A10A1Q4 and associated circuits or hf oscillator may need retuning.</td>
<td>Check A10A1Q1 through A10A1Q4 and associated circuits.</td>
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<tr>
<td>4</td>
<td>17.5-MHz oscillator dc tuning voltage output check</td>
<td>Connect oscilloscope and HP 410B VTVM dc probe to A10J3. Set 7.14E-3 operating frequency to any frequency from 2.000 to 6.999 MHz. Check voltage at A10J3.</td>
<td>Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.</td>
<td>A10A2Q1 through A10A2Q4 and associated circuits or 17.5-MHz oscillator may need retuning.</td>
<td>Check A10A2Q1 through A10A2Q4 and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>17.5-MHz oscillator rf input check</td>
<td>Connect Boonton 91-C RF VTVM to A10J5. Check voltage at A10J5.</td>
<td>100 mv minimum.</td>
<td>A12V12 and associated circuit.</td>
<td>Check A12V12 and associated circuit.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>500-kHz reference input check</td>
<td>Connect Boonton 91-C RF VTVM to A10J6. Check voltage at A10J6.</td>
<td>Approximately 1.0 v.</td>
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<td>STEP</td>
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<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>8</td>
<td>Squaring amplifier output check</td>
<td>Set oscilloscope for 3.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10R4 and A10C7. Check waveform at junction of A10R4 and A10C7.</td>
<td>![Waveform 1]</td>
<td>A10Q1 and associated circuit.</td>
<td>Check A10Q1 and associated circuit.</td>
<td></td>
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<tr>
<td>9</td>
<td>Pulse amplifier input check</td>
<td>Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10C7 and A10R5. Check waveform at junction of A10C7 and A10R5.</td>
<td>![Waveform 2]</td>
<td>A10Q1 and associated circuit.</td>
<td>Check A10Q1 and associated circuit.</td>
<td></td>
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<tr>
<td>10</td>
<td>Spectrum generator input check</td>
<td>Set oscilloscope for 5.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10R5 and A10R7. Check waveform at junction of A10R5 and A10R7.</td>
<td>![Waveform 3]</td>
<td>A10Q2 and associated circuit.</td>
<td>Check A10Q2 and associated circuit.</td>
<td></td>
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<tr>
<td>11</td>
<td>Spectrum generator output check</td>
<td>Set oscilloscope for 5.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10L4 and A10CR1. Check waveform at junction of A10L4 and A10CR1.</td>
<td>![Waveform 4]</td>
<td>A10Q3 and associated circuit.</td>
<td>Check A10Q3 and associated circuit.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mixer input check (A10A1Q3)</td>
<td>Set oscilloscope for 0.5 v/cm, 1.0 us/cm. Connect oscilloscope vertical input to junction of A10A1C3 and A10A1R7.</td>
<td>![Waveform 5]</td>
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<tr>
<td>13</td>
<td>Mixer input check (A10A2Q3)</td>
<td>Set oscilloscope for 0.5 v/cm, 1.0 us/cm. Connect oscilloscope vertical input to junction of A10A2C5 and A10A2C7. Check waveform at junction of A10A2C5 and A10A2C7.</td>
<td>Spectrum pulse generator circuit.</td>
<td>Check spectrum pulse generator circuit.</td>
<td></td>
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<tr>
<td>15</td>
<td>Mixer output/IF amplifier input check (A10A2Q4)</td>
<td>Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10A2C7 and A10A2L2. Check waveform at junction of A10A2C7 and A10A2L2.</td>
<td>See waveform in step 14.</td>
<td>A10A2Q3 and associated circuit.</td>
<td>A10A2Q3 and associated circuit.</td>
<td></td>
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<tr>
<td>Step</td>
<td>Description</td>
<td>Test Procedure</td>
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<tr>
<td>16</td>
<td>Reference spectrum level</td>
<td>Disconnect coaxial jumpers at A1-A2 on module extenders. Connect HP-410B VTMV dc probe at A1021. Check voltage at A1021. NOTE: Adjust A107 if necessary, readjust A107 until the voltage at A1021 is +6.0 to +7.0 V. Connect coaxial jumpers on module extenders, +8.0 to +7.0 V. Connect HP-410B VTMV dc probe to A1023. Set oscilloscope for 5.0 V/cm, 20 ns/div. Connect signal generator output to module input at A1 on module extenders.</td>
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<tr>
<td>17</td>
<td>Recycle check</td>
<td>Adjust A107. Set signal generator output level for 80 mv at 17.500 MHz as indicated on Bonnont-91-C. Connect oscilloscope to A1021. Set oscilloscope for 5.0 V/cm, 20 ns/div.</td>
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<tr>
<td>17</td>
<td>Check waveform at A10J3.</td>
<td></td>
<td>Connect signal generator output, through 6-dB attenuator, to module input at A2 on module extender. Connect Boonton 91-C RF VTVM to A10J4. Set signal generator output level for 80 mv at 8.003 MHz as indicated on Boonton 91-C. Connect oscilloscope vertical input to A10J1. Set oscilloscope for 5.0 v/cm, dc, 2.0 ms/cm. Check waveform at A10J1.</td>
<td>See waveform below. Peak value must be +0.0 to +12.0 v. Minimum value must be 0 to +4.0 v. Period must be 2 to 8 ms.</td>
<td>A10Q4 and associated circuit.</td>
<td>Check A10Q4 and associated circuit.</td>
</tr>
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</table>
MHz-Frequency Stabilizer A10, Early Model, Checks and Adjustments
Figure 727
<table>
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<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
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<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P- ( ) Test Harness 678Y- ( ) Maintenance Kit 678Z-1 Function Test Set 7142- ( ) Radio Set Control HP-410B VTVM Rf dummy load Audio oscillators(two) Ballantine 310A VTVM HP-711A Power Supply Vom</td>
<td>Refer to figure 729 for location of all test points on A11. <strong>WARNING:</strong> VOLTAGES DANGEROUS TO LIFE EXIST IN POWER AMPLIFIER A11. TURN POWER OFF AND SHORT PLATES OF TUBES TO GROUND BEFORE GAINING ACCESS CAUTION: DO NOT OPERATE POWER AMPLIFIER A11 MORE THAN 1 SECOND WITH MODULE COVER REMOVED, DAMAGE TO TUBES WILL RESULT. Remove power amplifier A11 from 618T- ( ) and perform visual inspection as described in inspection/check section. Remove dust cover from A11 to perform this step. Replace A11 in 618T- ( ) chassis. Connect 618T- ( ), 678P- ( ), HP-410B VTVM, and rf dummy load as shown in figure 702. Unless otherwise specified, all steps are performed with 714E- ( ) in AM mode, no signal in, and 618T- ( ) unkeyed.</td>
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<td>STEP</td>
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<tr>
<td>2</td>
<td>Static plate current adjustment</td>
<td></td>
<td>Disconnect coaxial jumper between 500 KC STD and 500 KC REP connectors at right front of 618T-{ }. Set front panel meter switch to PA MA. 618T-{ } requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-{ }. CAUTION: UNKEY IMMEDIATELY IF BLOWER DOES NOT SPEED UP. Read front panel meter on 618T-{ }. Unkey 618T-{ } and reconnect coaxial jumper.</td>
<td>280 to 300 MA (meter is read X100).</td>
<td>A11R2 incorrectly adjusted.</td>
<td>Adjust A11R2 to provide required results.</td>
</tr>
<tr>
<td>3</td>
<td>Tgc adjustment</td>
<td></td>
<td>CAUTION: DO NOT KEY 618T-{ } WITH POWER AMPLIFIER COVER OFF OR WITH LOOSE COVER SCREWS. Connect HP-410B as in figure 702. Set 714E-{ } to AM, 29.900 MHz for 618T-{ } with MCN below 6500, 2.100 MHz for 618T-{ } with MCN 6500 or above. Key 618T-{ }. Check voltage on HP-410B VTVM. Unkey 618T-{ }. Disconnect HP-410B VTVM.</td>
<td>72v for 618T-{ } with MCN below 6500.</td>
<td>TGC ADJ control A11R5 incorrectly adjusted.</td>
<td>Adjust TGC ADJ control A11R5 to provide required results.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
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<tr>
<td>4</td>
<td>Recycle line check</td>
<td>Change frequency so that band-switch motor will run; reset to original frequency.</td>
<td>When band-switch motor is running, 678P-( ) COUPLER RETUNE lamp is on; when band-switch motor is not running, 678P-( ) COUPLER RETUNE lamp is off.</td>
<td>Relay A11K1.</td>
<td>Check relay A11K1.</td>
<td></td>
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<tr>
<td>5</td>
<td>Adc adjustment</td>
<td>Set 714E-( ) to AM, 2,900 MHz.</td>
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<td></td>
<td>Remove plug at upper left of power amplifier module cover.</td>
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<td></td>
<td>Connect HP-410B VTVM dc probe to A11J5.</td>
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<td><strong>CAUTION:</strong> MAKE ADJUSTMENT QUICKLY TO AVOID DAMAGE TO MODULE DUE TO LACK OF COOLING AIR. REPLACE PLUG AS SOON AS ADJUSTMENT IS MADE.</td>
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<td></td>
<td></td>
<td>Key 618T-( ).</td>
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<td>Check voltage at A11J5.</td>
<td></td>
<td>-4.75 vdc.</td>
<td>A11R20 incorrectly adjusted.</td>
<td>Adjust A11R20 to provide required results.</td>
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<td></td>
<td>Unkey 618T-( ).</td>
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<td></td>
<td></td>
<td>Disconnect HP-410B VTVM.</td>
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<td>6</td>
<td>Pep. limiter adjustment (618T-( ), MCN 7389 or below, only)</td>
<td>Connect 678Z-1 J2-IF. TRANS jack to A332.</td>
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<td></td>
<td>Connect 678Z-1 J2-FREQ DIV jack to A1J2.</td>
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<td>REMEDY</td>
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<tr>
<td>Check all and bin circuits.</td>
<td>Bias input not at proper level.</td>
<td>Less than 1.0 Vdc.</td>
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</tbody>
</table>

**TEST PROCEDURE**

*NOTE: B versions of the 618T-1 have no TGG control and GND. A version has a TGG override. Apply +18 Vdc to GND and -28 Vdc to 618Z-1 J2. FREQ DIV jack instead of the above step.*

Connect 618Z-1 GND jack to 618T-1 jack.

Set 618Z-1 FUNCTION SELECTOR switch to TGG OVERRIDE.

Set 618Z-1 to USB, 7.500 MHz.

Connect VOM between A131 (-) and A144 (+). Use key 618T-1. (Cont.)

**TEST EQUIPMENT**

- 618Z-1
- 618T-1
- VOM
- Audio oscillator
- Key 618T-1
- Test point

**DESCRIPTION**

Module Checks and Adjustments,
Power Amplifier A11
Figure 728 (Sheet 4)

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<tr>
<td>6</td>
<td>(Cont)</td>
<td>Connect HP-410B VTVM as shown in figure 702.</td>
<td><strong>CAUTION:</strong> DO NOT KEEP THE 618T-(- ) RF OUTPUT VOLTAGE AT ITS MAXIMUM VALUE ANY LONGER THAN NECESSARY TO NOTE THE MAXIMUM INDICATION. SET THE 678Z-1 TGC &amp; CAPTURE RANGE CONTROL FULLY COUNTERCLOCKWISE AFTER NOTING THIS VOLTAGE. Key 618T-(- ). Turn 678Z-1 TGC &amp; CAPTURE RANGE control clockwise until the dc voltage between A11J1 and A11J4 begins to change. This is grid current threshold. Check rf output voltage on HP-410B VTVM. Disconnect audio oscillators and vvm.</td>
<td>161 v maximum.</td>
<td>A11R38 incorrectly adjusted.</td>
<td>Adjust A11R38 to provide required results.</td>
</tr>
<tr>
<td>STEP</td>
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<tr>
<td>8</td>
<td>Tgc reference voltage check</td>
<td>Connect HP-410B VTVM to A11J2.</td>
<td>Set 714E-( ) to AM.</td>
<td>5 to -7 v.</td>
<td>A11R4, A11R5, and/or A11CR8 (late model only).</td>
<td>Check A11R4, A11R5, and/or A11CR8 (late model only).</td>
</tr>
<tr>
<td></td>
<td>Unkey 618T-( ).</td>
<td></td>
<td>Key 618T-( ).</td>
<td></td>
<td>A11R4, A11R5, and/or A11R25 (early model only).</td>
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<tr>
<td></td>
<td>Unkey 618T-( ).</td>
<td></td>
<td>Key 618T-( ).</td>
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<tr>
<td>10</td>
<td>Bias supply voltage check</td>
<td>Connect vvm between A11J1 (+) and A11J4 (-).</td>
<td>Set 714E-( ) to AM.</td>
<td>Approximately 1.5 vdc less than voltage at A11J1 (see reference in step 7).</td>
<td>Bias circuit.</td>
<td>Check bias circuit.</td>
</tr>
<tr>
<td></td>
<td>Unkey 618T-( ).</td>
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<td>Key 618T-( ).</td>
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<td>STEP</td>
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<tr>
<td>12</td>
<td>Disconnect</td>
<td></td>
<td>Turn power off. Disconnect all test equipment.</td>
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Power Amplifier A11, Checks and Adjustments
Figure 729
<table>
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<th>STEP</th>
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<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td>Refer to figure 731 for location of all test points on A12.</td>
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<tr>
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<td></td>
<td>678Y-( ) Maintenance Kit</td>
<td>Remove rf translator A12 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A12 to perform this step.</td>
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<tr>
<td></td>
<td></td>
<td>678Z-1 Function Test Set</td>
<td>Replace A12 in 618T-( ) chassis.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>*14E-( ) Radio Set Control</td>
<td>Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702.</td>
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<tr>
<td></td>
<td></td>
<td>Signal generator</td>
<td>Remove rf translator A12 top cover plate by pulling cover off with fingers inserted in cover holes.</td>
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<tr>
<td></td>
<td></td>
<td>Booton 91-C RF VTVM</td>
<td>NOTE: When necessary to use module extender, test setup is as follows:</td>
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<tr>
<td></td>
<td></td>
<td>Frequency counter</td>
<td>Connect rf translator A12, through module extender, to 618T-( ) chassis.</td>
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<td></td>
<td></td>
<td>3-db attenuator</td>
<td>Disconnect coaxial jumper at J34 on module extender.</td>
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<td>31S-1 Receiver</td>
<td>Connect signal generator, through 6-db attenuator, to module input at J34 on module extender. Set signal generator to 500 kHz, unmodulated.</td>
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<tr>
<td></td>
<td></td>
<td>Ballantine 310A VTVM</td>
<td>Remove block holding J30 and J31 on module extender. J30 and J31 mate with plugs P2 and P3 on rf translator A12.</td>
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<td>Vom</td>
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<td>HP-711A Power Supply</td>
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<td></td>
<td>Rf dummy load</td>
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<td>STEP</td>
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<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<td>1</td>
<td>(Cont)</td>
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<td>Connect RF TRANSLATOR LOAD, supplied in 678y-( ) Maintenance Kit, to P2 and P3. Make this connection so that blue test point on RF TRANSLATOR LOAD is on the same side as P9. Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Certain low-voltage signals may require a Boonton 91-C RF VTVM. Unless otherwise specified, perform all steps with 714E- ( ) in AM mode at 2.XXX MHz, no signal in, and G1ST-( ) unkeyed.</td>
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<tr>
<td>2</td>
<td>17.5-MHz oscillator output check</td>
<td>Connect Boonton 91-C RF VTVM to A12J1. Check voltage at A12J1. Connect frequency counter to A12J1. Check frequency at A12J1.</td>
<td>0.9 v (min).</td>
<td>17.5-MHz oscillator and associated circuit.</td>
<td>Check 17.5-MHz oscillator and associated circuit.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hf oscillator output check</td>
<td>Connect Boonton 91-C RF VTVM to A12J7. Check voltage at A12J7. Connect frequency counter to A12J7. Check frequency at A12J7.</td>
<td>0.6 v (min). 12.5 MHz ±10 Hz.</td>
<td>Hf oscillator and associated circuit.</td>
<td>Check hf oscillator and associated circuit.</td>
<td></td>
</tr>
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<td>STEP</td>
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<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
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<tr>
<td>4</td>
<td>Vfo/vco output voltage check</td>
<td>Connect Boonton 91-C RF VTVM to A12J5. Check voltage at A12J5.</td>
<td></td>
<td>0.6 V (min)</td>
<td>Insufficient input level to vfo/vco.</td>
<td>Check vfo/vco input level.</td>
</tr>
<tr>
<td>5</td>
<td>Bandpass filter (low-frequency end) check</td>
<td>Connect Boonton 91-C RF VTVM to A12J2. 618T-( ) requires a minimum warm-up period of 15 minutes before unit is keyed. Key 618T-( ). Check voltage at A12J2. Unkey 618T-( ).</td>
<td></td>
<td>50 to 350 mv.</td>
<td>Tubes, supply voltages.</td>
<td>Check tubes and supply voltages.</td>
</tr>
<tr>
<td>7</td>
<td>Driver grid voltage check</td>
<td>Connect, Boonton 91-C RF VTVM to A12J4. Key 618T-( ). Check voltage at A12J4. Unkey 618T-( ).</td>
<td></td>
<td>From 2.0 to 4.5 V.</td>
<td>RF amplifier or coil assembly defective or misaligned.</td>
<td>Check and align rf circuits (step 15).</td>
</tr>
<tr>
<td>8</td>
<td>Recycle line check</td>
<td>Set 714E-( ) to 2.100 MHz, AM. Reset 714E-( ) to 3.100 MHz.</td>
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<td>8</td>
<td>(Cont)</td>
<td></td>
<td>Check 678P-( ) COUPLER RETUNE lamp as 618T-( ) is recycling. Set 714E-( ), in turn, to 2.200, 2.110, and 2.101 MHz checking 678P-( ) COUPLER RETUNE lamp each time 618T-( ) recycles.</td>
<td>678P-( ) COUPLER RETUNE lamp should light as 618T-( ) is recycling. Same as above.</td>
<td>618T, chassis relay K4.</td>
<td>Check A12K3 and chassis relay K4.</td>
</tr>
<tr>
<td>9</td>
<td>Vfo check and alignment (618T-1/2/3)</td>
<td></td>
<td>Connect frequency counter, through 678Y-( ) probe no. 1, to A12J5. Ground A12J5 to 618T-( ) chassis.</td>
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<tr>
<td></td>
<td>A Tracking check</td>
<td></td>
<td>NOTE: There are two CALIBRATION SET UP POINTS (frequency offset) stamped on the vfo case. Enter these points on the graph of figure 732. Connect the two points with a straight line drawn across the graph.</td>
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<td></td>
<td>Set 714E-( ) to 2.999 MHz and record frequency counter indication on graph.</td>
<td>2,501 MHz, + frequency offset, ±600 Hz from line on graph.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Set 714E-( ) to 2.000 MHz and record frequency counter indication on graph.</td>
<td>3,500 MHz, + frequency offset, ±600 Hz from line on graph.</td>
<td></td>
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</tr>
</tbody>
</table>
Subject: Module Checks and Adjustments, RF Translator A12 (Sheet 4 of 34), Figure 730

Add NOTE in TEST PROCEDURE column at the beginning of step 9.

NOTE: Before checking vfo calibration or doing alignment procedure, check KHz - Frequency Stabilizer A4 module checks and adjustments procedure figure 714, particularly steps 1 through 5.
<table>
<thead>
<tr>
<th>STEP</th>
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</thead>
<tbody>
<tr>
<td>9A</td>
<td>Capture range check</td>
<td></td>
<td>Plot the midpoint frequencies of the vfo by setting the 714E-( ) to 2.711, 2.922, 2.333, 2.444, 2.555, 2.666, 2.7777, and 2.888 MHz; record the frequency counter indication at each point. Unground A12J8. Frequency counter remains connected to A12J5. Set 714E-( ) to 2.999 MHz.</td>
<td>±1 kHz from line on graph.</td>
<td>Vfo out of alignment</td>
<td>Perform vfo alignment (step 9.C).</td>
</tr>
<tr>
<td></td>
<td>(Cont)</td>
<td></td>
<td>Connect 678Z-1 J2-FREQ DIV jack to A1J2. Connect 678Z-1 GRND jack to 618T-( ) chassis.</td>
<td>Frequency counter indication should be 2.501 MHz ±0.8 ppm. Record this reading for reference.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** If kHz-frequency stabilizer A4 is Collins part number 528-0112-006, connect 678Z-1 J2-KC STAB jack to A4J3, and place 678Z-1 FUNCTION SELECTOR switch in 70K-5 CAPTURE RANGE position. That position is also correct for vfo 70K-9. If kHz-frequency stabilizer A4 is Collins part number 544-9288-005, connect.
<table>
<thead>
<tr>
<th>STEP</th>
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</thead>
<tbody>
<tr>
<td>9B</td>
<td>(Cont)</td>
<td>678Z-1 J1-KC STAB jack to A4J1, and place 678Z-1 FUNCTION SELECTOR switch in 70K-3 CAPTURE RANGE position. Ground A12J8 to 618T-( ) chassis. Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz higher than reference. Without changing setting of 678Z-1 R3, unground A12J8.</td>
<td>Frequency indication should return to that of reference within 1 second.</td>
<td>Locking circuits in kHz frequency stabilizer A4. Perform applicable step in kHz-frequency stabilizer A4 test procedures (figure 714).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9B</td>
<td>(Cont)</td>
<td>678Z-1 R3, unground A12J8. Ground A12J8. Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz lower than reference. Without changing setting of 678Z-1 R3, unground A12J8. Repeat above procedure with 714E-( ) set to 2.000 MHz. Reference indication should be 3.500 MHz ±0.8 ppm per month (all other steps and indications should be identical). Disconnect 678Z-1.</td>
<td>Same as above.</td>
<td>Same as above.</td>
<td>Same as above.</td>
<td></td>
</tr>
</tbody>
</table>
618T-( ) AIRBORNE SSB TRANSCIEVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-11

Insert facing page 701/36, 23-10-0

Subject: Module Checks and Adjustments, RF Translator A12 (Sheet 6 of 34), Figure 730

Add NOTE in TEST PROCEDURE column after the first paragraph in the column before "Ground A12J8 to 618T-( ) chassis", as follows:

NOTE: KC STAB 544-9288-005 used with 70K-3 only. KC STAB 528-0112-005 used with 70K-5 or 70K-9 only.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
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<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>9 (Cont)</td>
<td>Alignment</td>
<td></td>
<td>If the vfo did not check out as in steps 9.A and 9.B, perform the following steps: Leave frequency counter connected and ground A12J8.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
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<tr>
<td>9C</td>
<td>(Cont)</td>
<td></td>
<td>CAUTION: ON 70K-9 VFO, DO NOT LOOSEN SET-SCREWS ON OLDHAM COUPLER SECURED TO VFO SHAFT. DAMAGE TO VFO MAY RESULT DUE TO LOSS OF END STOP CALIBRATION. Set 714E- ( ) to 2.999 MHz and loosen the screws securing the Oldham coupler to the Auto-positioner shaft. Manually twist the vfo drive shaft to obtain 2.501 MHz + frequency offset, ±200 Hz. Tighten Oldham coupler. Set 714E- ( ) to 2.060 MHz, and remove cap on vfo to expose A12A2L1. Adjust A12A2L1 for 3.500 MHz, +frequency offset, ±200 Hz. NOTE: L1 cap may affect frequency. Replace cap after adjustment and reread frequency. Repeat the above steps until the proper indication is obtained. If unable to obtain proper results, after several tries, send vfo to Collins Radio Co. for repair. Unground A12J8 and disconnect frequency counter.</td>
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<tr>
<td>10</td>
<td>(Cont)</td>
<td>17.5-MHz oscillator phase-locking check and alignment</td>
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Module Checks and Adjustments, RF Translator A12 (Sheet 7 of 34) Page 701/97
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<tr>
<th>STEP</th>
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</thead>
<tbody>
<tr>
<td>10A</td>
<td>17.5-MHz oscillator phase-locking check using S1S-1 Receiver</td>
<td></td>
<td>Couple S1S-1 Receiver to the 17.5-MHz oscillator by placing the receiver antenna wire near oscillator tube A12V10. Set 714E-(-) to any frequency between 2.000 and 6.000 MHz. Tune S1S-1 Receiver to 17.5 MHz. Ground A10J3. Unground A10J3.</td>
<td>Oscillator will unlock and vary slightly from 17.5 MHz. Oscillator should lock to 17.5 MHz.</td>
<td>17.5-MHz oscillator circuit aligned improperly.</td>
<td>Proceed to step 10B.</td>
</tr>
<tr>
<td>10A</td>
<td>17.5-MHz oscillator phase-locking check (alternate) using frequency counter</td>
<td></td>
<td>Connect frequency counter (use no 1 probe) to A12J1. Set 714E-(-) to any frequency between 2.000 and 6.999 MHz. Note frequency counter indication. Ground A10J3. Unground A10J3.</td>
<td>Oscillator will unlock and vary slightly from 17.5 MHz. Oscillator should lock to 17.5 MHz.</td>
<td>17.5-MHz oscillator circuit aligned improperly.</td>
<td>Proceed to step 10B.</td>
</tr>
<tr>
<td>B</td>
<td>17.5-MHz oscillator phase-locking alignment</td>
<td></td>
<td>If indication is normal, proceed to step 11A (alternate). Connect HP 410B VTVM dc probe to A10J3. Adjust A12L90 until the 17.5 MHz oscillator locks at 17.5 MHz and the voltage at A10J3 is +6.3 to +7.3 V.</td>
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<tr>
<td>10B</td>
<td>Connect Bonton 51-C RF VTM to A12J1. Adjust A12T4 to peak voltage at A12J1. Repeat step 10A.</td>
<td>Phase-locking restored.</td>
<td>17.5-MHz oscillator circuit, MHz-frequency stabilizer A10.</td>
<td>Check 17.5-MHz oscillator and MHz-frequency stabilizer A10.</td>
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<tr>
<td>11 A</td>
<td>Hf oscillator phasing-locking check and alignment.</td>
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<tr>
<td></td>
<td>Hf oscillator phase-locking check using 515-1 Receiver</td>
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<td></td>
<td>Couple 51S-1 Receiver to hf oscillator by placing receiver antenna wire near oscillator tube A12V11. Set 714E(-) in turn, to each frequency listed in figure 733. Tune 51S-1 Receiver, in turn, to each of the hf oscillator frequencies corresponding to the 714E(-) frequency. Ground A10J1 momentarily at each frequency.</td>
<td>If oscillator must unlock when A10J1 is grounded; relock to original frequency when A10J1 is ungrounded.</td>
<td>Coils in coil block A12Z5 incorrectly Adjusted.</td>
<td>Continue test.</td>
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<td>STEP</td>
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<tr>
<td>11A</td>
<td>Hf oscillator phase-locking check using frequency counter</td>
<td>Connect frequency counter (use no 1 probe) to A12J7. Set 714E(-), in turn, to each frequency listed in figure 733. Ground A10J1 momentarily at each frequency. If indications are normal, proceed to step 12. <strong>NOTE:</strong> If the preceding checks indicated that the hf oscillator is unlocked on one of the bands, perform the following adjustment. If the hf oscillator is unlocked on all bands, refer to the MHz-frequency stabilizer checks and adjustments. Place rf translator A12 on module extender supplied in 876Y-( ) Maintenance Kit. This procedure can be accomplished with the module mounted in the chassis if the chassis is a late version.</td>
<td>Hf oscillator must unlock when A10J1 is grounded; relock to original frequency when A10J1 is ungrounded.</td>
<td>Coils in coil block A12Z5 incorrectly adjusted.</td>
<td>Continue test.</td>
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| 11B  | (Cont)      | (MCN 21332 and above). Holes have been provided for this purpose. Perform setup procedure detailed, in note, in step 1 of this test procedure. **NOTE:** The following adjustments are made at coil block A1225. Coils in this block may be adjusted through holes in rf translator A12 sideplate opposite gearplate. Refer to silk screening above adjustment holes for number and location of each coil in coil block. Connect HP-410B VTVM dc probe to A10J1. Set 714E-( ) to frequency at which the oscillator is unlocked. Refer to figure 733. Adjust the proper coil in A1225 until the hf oscillator locks at the correct frequency. Continue to adjust the coil until the voltage at A10J1 is +6.3 to +7.3 v. **NOTE:** If on any band, the coil core adjustment range is insufficient to lock the oscillator, set that core flush with the block surface. Adjust the common (C) coil for proper lock. Whenever the core in the common (C) coil is
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<tr>
<td>11B</td>
<td>(Cont)</td>
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<td>repositioned, all individual band coils must be repositioned. When test is completed, remove rf translator A12 from module extender, and install A12 in 618T-( ) chassis. Connect Boonton 91-C RF VTVM to A12J7. Set 714E-( ) to 6.XXX MHz. Adjust bottom core in A12T5 to peak voltage at A12J7. Set 714E-( ) to 14.XXX MHz. Adjust top core in A12T5 to peak voltage at A12J7. Set 714E-( ) to 29.XXX MHz. Adjust A12C187 to peak voltage at A12J7. Repeat above three steps. Repeat step 11A. NOTE: If the preceding adjustments fail to restore hf oscillator phase-locking, refer to MHz-frequency stabilizer A10 checks and adjustments.</td>
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<tr>
<td>12</td>
<td>Receive if. output adjustment (Cont)</td>
<td></td>
<td>Set 714E-( ) frequency selector to 9.990 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise. Set AUDIO control on 618T-( ) front panel fully clockwise.</td>
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| 12 (Cont) | | | Connect HP-410B VTVM ac probe to 678P-( ) HEADSET jack. Connect signal generator, through 6-db attenuator, to AUX KVM AN'T jack at left front of 618T-( ). Set signal generator to 9.990 MHz, 30% modulated with 1 kHz. Adjust signal generator to provide 3 v at 678P-( ) HEADSET jack. Tune signal generator around 9.990 MHz to peak the voltage at 678P-( ) HEADSET jack. Adjust A12T3 to peak voltage at 678P-( ) HEADSET jack. Keep voltage at HEADSET jack below 3.5 vrms while making this adjustment by reducing signal generator output level. 
NOTE: For rf translator A12 MCN 6392 and above, the following adjustment must be performed. Set 714E-( ) to lowest gain band as determined in step 2A of unit performance test procedures, figure 704. Set signal generator to frequency corresponding to that set on 714E-( ) with 3.0-uv output modulated 30% with 1.0 kHz. | | | | |
<table>
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</thead>
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<tr>
<td>12 (Cont)</td>
<td></td>
<td></td>
<td>Adjust A12E78 to provide approximately 3.7 vrms at 6756P-( ) HEADSET jack.</td>
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<tr>
<td>13</td>
<td>Variable/ bandpass if alignment check</td>
<td></td>
<td>Place rf translator A12 on module extender supplied in 6756Y-( ) Maintenance Kit. Perform setup procedure detailed in note in step 1 of this test procedure. Connect HP-410B VTVM ac probe, through test probe no. 2 (supplied in 6756Y-( ) Maintenance Kit), to A12J2. Ground A12J3 to 618T-( ) chassis. CAUTION: DAMAGE TO THE RF PLATE COILS MAY RESULT FROM FAILURE TO GROUND A12J3. Set 714E-( ) to 6.000 MHz. Key 618T-( ). Adjust signal generator to provide 0.5 V at A12J2. Vary 714E-( ) frequency from 6.000 MHz in 100-kHz steps. NOTE: If the maximum-to-minimum voltage at A12J3 is more than 2:1 across the frequency range, complete this test procedure. If the variation is less than 2:1, both the variable and bandpass if circuits are aligned properly.</td>
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<td><strong>PROBABLE CAUSE OF ABNORMAL RESULT</strong></td>
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13. (Cont.)

- **A Variable If. alignment**

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Figure 730
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<tr>
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<tr>
<td>13A</td>
<td>(Cont)</td>
<td></td>
<td>Adjust A12L2, A12L3, A12L4, and A12L130 to peak voltage at A12J2. A12L130 may be adjusted to give two peaks. Adjust for the peak that provides the highest voltage at A12J2.</td>
<td>Variable if. circuits aligned properly.</td>
<td>Variable if. circuits aligned incorrectly.</td>
<td>Continue test procedure.</td>
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<td>NOTE: If rf translator A12 MCN is below 1508, A12C273 replaces A12L130. The adjustment procedure is the same.</td>
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<td>Set 714E-( ) to 8.000 MHz.</td>
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<td></td>
<td>Key 615T-( ).</td>
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<td>Adjust A12C7, A12C10, and A12C13 to peak voltage at A12J2.</td>
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<td>Repeat peaking procedure until no further improvement can be made.</td>
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<td>Set 714E-( ) to OFF.</td>
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<td>Remove 6AH6WA tube, and replace it with the original tube.</td>
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<td>(Cont)</td>
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<td>NOTE: At this point repeat step 13, variable/bandpass if, alignment check.</td>
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<td></td>
<td>Set 714E-( ) to X.500 MHz.</td>
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<td>Check that both slug racks are equal in height above the chassis (within 1/32 inch). If they are not, loosen setscrews in slug rack gear, and position racks properly. Tighten setscrews.</td>
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<tr>
<td>13A</td>
<td>(Cont)</td>
<td></td>
<td>Set 714E-( ) to X.600 MHz; reset to X.500 MHz. Again check to see that slug racks are positioned at the same height. If they are not, re-position them. Set 714E-( ) to X.000 MHz. Turn power off. Remove rf translator A12 from module extender. Remove bottom cover plate from A12. Inspect, from bottom of module, slugs and capacitor driven by slug rack. Measure distance from capacitor bottom to capacitor form bottom. Measure distance from slug bottoms to coil bottoms.</td>
<td>A12C139-1/3 in.</td>
<td>Slugs and/or capacitor adjusted incorrectly.</td>
<td>Adjust slugs and/or capacitor from top of module. Use no. 8 Bristol wrench supplied in 678Y-( ) Maintenance Kit.</td>
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NOTE: If any of the preceding mechanical adjustments are made, repeat peaking procedures performed earlier in this step.

NOTE: In rf translator A12, Collins part number 528-0113-00 (early model), A12L6, A12L37, A12L40, and A12C139 are adjusted as above. Coils A12L59 and A12L41 are adjusted as follows: A12L59=15/32 in. A12L41=1/4 in.
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<tr>
<td>13A (Cont)</td>
<td>Bandpass if. alignment</td>
<td></td>
<td>Replace bottom cover plate on A12. Unground A12J0. Replace rf translator A12 on module extender. <strong>NOTE:</strong> Before performing this step, perform step 13, variable/bandpass if: alignment check, to determine if the following alignment procedure is required. Ground A12J3 to 618T-( ) chassis. Connect HP-410B VTVM ac probe to A12J2. Set 714E-( ) to 6.500 MHz, AM. Key 618T-( ). Adjust signal generator to provide approximately 0.5 vrms at A12J2. Keep voltage at A12J2 constant, by varying signal generator output level, during the following peaking procedure. <strong>CAUTION:</strong> IN THE FOLLOWING STEP, ADJUST THE TWO COILS ONLY. DO NOT ADJUST ANY OTHER COIL IN A12FL1 AT THIS TIME.</td>
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<td>13B</td>
<td>(Cont)</td>
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<td>Adjust A12L123 then A12L128 to peak voltage at A1232. These adjustments are made through holes in module end plate nearest filter A12FL1.</td>
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<td>Bandpass if circuits aligned properly.</td>
<td>Bandpass if circuits aligned incorrectly.</td>
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<td>13C</td>
<td>Internal adjustment of A12FL1</td>
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<td>CAUTION: THE FOLLOWING STEPS ARE NOT A PART OF THE NORMAL ALIGNMENT PROCEDURE. THE COILS IN A12FL1 ARE PREADJUSTED AT THE FACTORY.</td>
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<td>NOTE: The coils in A12FL1 should be adjusted only if it is known that they are out of alignment. For instance, it is possible that one of the coils could be inadvertently adjusted. All coils in A12FL1 would then have to be realigned.</td>
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<td>Replace 17.5-MHz oscillator tube A12V10 with a SAH6WA tube with pin 1 cut off.</td>
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<td>Remove A12V2. Connect A13V2, through 9-pin tube extender supplied in 678Y-( ) Maintenance Kit, to rf translator A12 chassis.</td>
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<td>Connect signal generator, through 6-db attenuator, to pin 2 of A12V2. Set signal generator to 15,000 MHz.</td>
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<tr>
<td>12C</td>
<td>(Cont)</td>
<td>Connect Boonton 91-C RF VTM through tube extender, to pin 1 or 6 of A12V2. Set 714E-(-) to 6,500 MHz, AM. Key 618T-(-). Adjust signal generator output level to provide approximately 0.5 vrms as read on Boonton 91-C RF VTM. <strong>NOTE:</strong> The following adjustments are made through holes in module end plate nearest A12FL1. Refer to silk screening near adjustment holes for location of specific test and adjustment points. Ground test point 1. Adjust A12L123 for a peak indication on Boonton 91-C RF VTM. Unground test point 1. Ground test point 2. Adjust A12L125 for a null indication on Boonton 91-C RF VTM. Unground test point 2. Ground test point 3. Adjust A12L126 for a peak indication on Boonton 91-C RF VTM. Unground test point 3. Ground test point 4.</td>
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<td>13C</td>
<td>(Cont)</td>
<td></td>
<td>Adjust A12L127 for a null indication on Boonton 91-C RF VTVM. Unground test point 4. Adjust A12L128 for a peak indication on Boonton 91-C RF VTVM. Disconnect signal generator from A12V2. Remove tube extender from A12V2 and replace A12V2 in rf translator A12 chassis. Replace original A12V10 in rf translator A12 chassis. NOTE: At this point repeat step 13, variable/bandpass if alignment check.</td>
<td>Bandpass if circuits aligned properly.</td>
<td>Bandpass if circuits aligned incorrectly. A12FL1 defective.</td>
<td>Repeat steps 13B and 13C of this test procedure. Replace A12FL1.</td>
</tr>
</tbody>
</table>

| 14   | Transmit gain check | Connect signal generator, through GENERATOR LOAD (supplied in 678Y-( ) Maintenance Kit), to J34 on module extender. Connect RF TRANSLATOR LOAD, supplied in 678Y-( ) Maintenance Kit, to A12P2 and A12P3 so that the blue test point is connected to A12P2. Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Set signal generator to 500 kHz unmodulated. Set 714E-( ) to AM, 2 MHz. Key 618T-( ). | | | | |

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<td>14</td>
<td>(Cont)</td>
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<td>Adjust signal generator output level for 40 vrms on HP-410B VTVM.</td>
<td>Not more than 4000-uv signal generator output.</td>
<td>CAUTION: DO NOT EXCEED 40 VRMS AT RF TRANSLATOR LOAD BLUE TEST POINT OR DAMAGE TO DRIVER PLATE LOAD MAY RESULT.</td>
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<td>Set signal generator to provide 20 v on HP-410B VTVM.</td>
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<td>Set 714E-( ) to AM, 2.999 MHz.</td>
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<td>Key 61ST-( ).</td>
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<td>Adjust signal generator output level for 40 v on HP-410B VTVM.</td>
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<td>Adjust signal generator output level for 40 v on HP-410B VTVM.</td>
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<td>Repeat above procedure at 1-MHz increments for entire frequency range (2 to 2.999 MHz through 29 to 29.999 MHz).</td>
<td></td>
<td>Repeat above procedure at 1-MHz increments for entire frequency range (2 to 2.999 MHz through 29 to 29.999 MHz).</td>
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<td>Set 714E=( ) to OFF.</td>
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<td>Signal generator output level should be within 12 db of output required for 40 v at 2 MHz.</td>
<td>RF circuits not aligned properly.</td>
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<td>Disconnect signal generator, HP-410B VTVM, GENERATOR LOAD, and RF TRANSLATOR LOAD.</td>
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<td>Signal generator output level required to produce 40 vrms on the HP-410B VTVM should not vary more than 12 db across any one band.</td>
<td>Perform step 15 of this test procedure.</td>
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<td>Reconnect jumper to J34 on module extender.</td>
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<td>Reconnect jumper to J34 on module extender.</td>
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<td>15</td>
<td>Rf circuit alignment using 51S-1 Receiver (refer to step 15A for alternate)</td>
<td></td>
<td>Remove turret cover plate. Set 714E-( ) to 2.XXX MHz, AM. Check turrets (A12S1 through A12S7) from top of module to see that turret contacts in line with color-code dots on turrets are making contact with fixed contacts on module chassis. If they are not, loosen clamp on turret shaft gear, insert screwdriver into slot in end of turret shaft, and rotate turrets counterclockwise until they are aligned properly. Tighten clamp on turret shaft gear. Set 714E-( ) to 3.XXX MHz; reset 714E-( ) to 2.XXX MHz. If turret contacts do not return to proper alignment position, repeat above step. Couple 51S-1 Receiver to rf translator A12 rf output by placing receiver antenna lead wire near driver tubes A12V6 and A12V7. Observe receiver 5-meter peaking indication to determine that rf adjustments in the following steps are being made at proper frequency. Set 714E-( ) to 2.000 MHz, AM. Connect 678Z-1 J2 IF. TRANS jack to test point J2 in IF. translator A3.</td>
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<tr>
<td>15 (Cont)</td>
<td>Connect 678Z-1 J2-FREQ DIV jack to test point J2 in frequency divider A1.</td>
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<td><strong>NOTE</strong>: B versions of the 618T-( ) have no module A1 for tgc override, so apply +13 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 678Z-1 FUNCTION SWITCH to TGC OVERRIDE. Set 678Z-1 TGC &amp; CAPTURE RANGE control R3 fully counterclockwise. Connect RF TRANSLATOR LOAD as in step 14 of this test procedure. Key 618T-( ). Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Slowly adjust TGC &amp; CAPTURE RANGE control to provide approximately 30 v at RF TRANSLATOR LOAD blue test point. <strong>CAUTION</strong>: KEEP VOLTAGE AT RF TRANSLATOR LOAD BLUE TEST POINT BELOW 60 VRMS WHILE MAKING THE FOLLOWING ADJUSTMENTS. Adjust A12L9A, A12L23A, and A12L43A to peak voltage.</td>
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<td>15</td>
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<td>at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 2.999 MHz, AM. Adjust A12L7, A12L88, and A12L42 to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 2.000 MHz, AM. Adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils in turrets to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 29.999 MHz, AM. Adjust A12C27, A12C103 and A12C65 to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 29.000 MHz, AM. Adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils in turrets to peak voltage at RF TRANSLATOR LOAD blue test point. Repeat above steps on 2- and 29-MHz bands, until no further improvement is noted. Replace turret cover plate. Set 714E-( ), in turn, to 3.000 MHz, 4.000 MHz, through 29.000 MHz.</td>
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<td>15</td>
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<td>frequency, adjust the MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils, through holes in turret cover plate, to peak voltage at RF TRANSLATOR LOAD test point. Place A12 in 618T-( ) chassis. Set A12S15 to off (fully counterclockwise). CAUTION: NEVER OPERATE A12S15 WHILE KEYING 618T-( ). Set 714E-( ) in turn, to 2.500 MHz, 4.500 MHz, through 29.500 MHz, and adjust the DRIVER PLATE coil to peak voltage at 618T-( ) rf output. Set A12S15 to on (fully clockwise).</td>
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<tr>
<td>15A</td>
<td>Rf circuit alignment (alternate) using signal generator</td>
<td>Remove turret cover plate. Set 714E-( ) to 2.XXX MHz, mode selector to AM. Check turrets (A12S1 through A12S7) from top of module to see that turret contacts in line with color-coded dots on turrets are making contact with fixed contacts on module chassis. If they are not, loosen clamp on turret shaft gear, insert screwdriver into slot in end of turret shaft, and rotate turrets counterclockwise until they are aligned properly. Tighten clamp on turret shaft gear.</td>
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<td>15A</td>
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<td>Set 714E- ( ) to 2.XXX MHz; reset to 2.XXX MHz. If turret contacts do not return to proper alignment position, repeat above step. Set 714E-( ) to 2.000 MHz. Remove tubes A12V10 and A12V11. Set signal generator to 2.000 MHz, output level to minimum. Using no 2 probe, connect signal generator through 6-dB attenuator to J2. Connect HP 410B vtvm to probe T-connector in rf output line. <strong>CAUTION</strong>: DO NOT EXCEED 70 VOLTS ON HP 410B VTVM DURING FOLLOWING TESTS. Set switch A12SI5 (FEED-BACK) to maximum ccw position. <strong>CAUTION</strong>: NEVER OPERATE SWITCH A12SI5 WHILE 618T-( ) IS KEYED. Key 618T-( ) and adjust signal generator to provide approximately 30 volts as measured on HP 410B VTVM. Adjust A12L9A, A12L23A, and A12L43A to peak voltage on HP 410B. Readjust signal generator to maintain approximately 30 volts on HP 410B.</td>
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<tr>
<td>13A</td>
<td>(Cont)</td>
<td></td>
<td>NOTE: Adjust signal generator to keep output voltage on HP 410B at approximately 30 volts during remainder of this test. With 618T-() keyed, adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils to peak voltage on HP 410B. Unkey 618T-(). Set signal generator and 714E-() to 2.999 MHz. Key 618T-() and adjust A12L7, A12L38, and A12L42 to peak voltage on HP 410B. Unkey 618T-(). Repeat tuning at 2.000 and 2.999 MHz until tracked. Set signal generator and 714E-() to 29.000 MHz. Key 618T-() and adjust MIXER PLATE, RF AMP GRID, RF AMP PLATE, and DRIVER PLATE coils to peak voltage on HP-410B. Unkey 618T-(). Set signal generator and 714E-() to 29.999 MHz. Key 618T-() and adjust A12C27, A12C103, and A12C65 to peak voltage on HP 410B. Unkey 618T-().</td>
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<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>15A (Cont)</td>
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<td>Repeat tuning at 29.000 and 29.999 MHz until tracked. Remove A12 from chassis, replace turret cover, and reinstall A12 in chassis. Set signal generator and 714E-( ), in turn, to 3.000, 4.000, through 29.000 MHz. At each frequency, key and adjust MIXER PLATE, RF AMP PLATE coils to peak voltage on HP 410B. Unkey 618T-( ). Set signal generator and 714E-( ), in turn, to 3.500, 4.500, through 29.500 MHz. At each frequency, key and adjust DRIVER PLATE coil to peak voltage on HP 410B. Unkey 618T-( ). Replace tubes A12V10 and A12V11 in A12 chassis. Set FEEDBACK switch A12S1S to ON position (maximum clockwise stop). Remove signal generator, 0-dB attenuator, and HP 410B VTVM.</td>
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<td>STEP</td>
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<tr>
<td>18</td>
<td>If mixer balance adjustment</td>
<td>Connect oscilloscope to T-connector in RF output line through the 678Y(10) 8-to-30-MHz divider. Set T41E(0) to 29.999 MHz, AM. Key 6187T(1). Adjust A12C25E for minimum observable ripple on the RF envelope displayed on the oscilloscope. Unkey 6187T(1). Replace A12 on the module extender and reconnect all the equipment as instructed in note in step 1.</td>
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<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>17</td>
<td>Neutralization adjustments</td>
<td>NOTE: Neutralization must be performed if either of the rf translator driver tubes, A12V6 and A12V7, have been replaced. Rf circuits must be aligned (see step 10) before making neutralization adjustments. Set 714E-( ) to 29.000 MHz, USB. Remove power. Ground A12F3. Remove small block that holds J30 and J31 on module extender. Connect RF TRANSLATOR LOAD, supplied in 678Y-( ) Maintenance Kit, to A12P2 and A12P3 so that blue test point on load block is on same side as connector A12F3. Connect signal generator, through GENERATOR LOAD (supplied in 678Y-( ) Maintenance Kit), to the coax connector on the RF TRANSLATOR LOAD. Remove turret cover plate. Attach neutralizing detector (supplied in 678Y-( ) Maintenance Kit) across A12L56B in rf amplifier plate compartment by connecting one lead of neutralizing detector to wire loop adjacent to trimmer capacitor A12C103. Connect second lead to bus wire connected to lug mounted on A12C103. Do not connect between grid and ground.</td>
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<td>(Cont)</td>
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Figure 730
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<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
</table>
| 17 (Cont) | Connect vmm to neutralizing detector output jacks, and set vmm to most sensitive current scale. Revers vmm leads if meter does not read upscale.  
Set feedback switch A12S15 to off by rotating switch fully counterclockwise.  
CAUTION: NEVER OPERATE A12S15 WHILE KEYING 618T-( ).  
Set 714E-( ) to USB, and do not key 618T-( ).  
Adjust signal generator for 2.0- to 3.8-v output at 29.000 MHz unmodulated.  
Adjust driver grid coil A12L58B for maximum indication on vmm.  
Adjust driver plate neutralization capacitor A12C128, located below A12C141, for null indication on vmm.  
This completes driver neutralization.  
Set 714E-( ) to OFF.  
Disconnect all test equipment.  
Replace turret cover plate.  
Unground A12J3.  
Remove A12 from module extender.  
Remove module extender from 618T-( ) chassis. | | | | | | |
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<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
</table>
| 17 (Cont) | Replace A12 in 618T-( ) chassis.  
Set 714E-( ) to 29,000 MHz, AM.  
Override 618T-( ) tgc as follows:  
Connect 678Z-1 J2-FREQ DIV jack to J2 on frequency divider A1.  
**NOTE:** B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step.  
Connect 678Z-1 J2-IF, TRANS jack to J2 on if, translator A3.  
Connect 678Z-1 GRND jack to 618T-( ) chassis.  
Set 678Z-1 Function Test  
Set TGC & CAPTURE RANGE control R3 fully counterclockwise.  
**CAUTION:** ALL AUDIO INPUTS MUST BE REMOVED, DO NOT MODULATE. DO NOT EXCEED 125 W AM RF OUTPUT WITH TGC OVERRIDEN. | | | | | | |
<p>|  | (Cont) | | | | | |</p>
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<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION (Cont)</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
</table>
| 17   |                   |                | Connect HP-410B VTVM ac probe to rf output line.  
     | (Cont)            |                | NOTE: S15 must be in counterclockwise position.  
     |                   |                | Key 618T-(- ).  
     |                   |                | Slowly advance 678Z-1 TGC & CAPTURE RANGE control to obtain approximately 50 v rf output.  
     |                   |                | NOTE: Do not exceed 50 v rf output during this procedure by adjusting 678Z-1 TGC & CAPTURE RANGE control.  
     |                   |                | Adjust driver grid coil A12L56B for maximum rf output as indicated on HP-410B VTVM.  
     |                   |                | Adjust A12L74B in driver plate circuit to peak rf output.  
     |                   |                | While keying, alternately adjust A12C141, and rotate large roller coil gear A11G4. Roller coil gear A11G4, accessible between power amplifier A11 gear-plate and 618T-(- ) chassis, may be rotated by hand. A12C141 is adjusted properly when the drop in rf output voltage is approximately symmetrical as the roller coil gear is rotated either side of the tuned position.  
<pre><code> |                   |                | Unkey 618T-(- ).  |
</code></pre>
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 17 (Cont) | This completes power amplifier neutralization. Set feedback switch A12S15 to on by rotating switch fully clockwise. With VGC overridden, provide approximately 50 v rf output as in preceding step. Key 618T-(-). Adjust feedback neutralization as in A12C-27. To do this, alternately adjust A12C-27 and large roller coil gear on power amplifier coil 11. Roller coil gear is accessible between power amplifier and 618T-(-) chassis and can be rotated with one finger. When A12C-27 is adjusted properly, a symmetrical waveform will be observed as roller coil gear is moved either side of tuned position. 

**NOTE:** Because electronic circuits can produce a positive signal for power amplifier 11, it will return the tuned position when the roller coil is released. It is not necessary to displace the position of the roller coil gear a large amount. Key 618T-(-). |
<table>
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<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
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<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
</table>
| 17   | (Cont)      |                | Reset tgc as follows:  
Key 618T(-) at 2.000 MHz.  
Note rf output.  
Repeat in 1-MHz increments for the entire hf band.  
Disconnect 678Z-1 connections from 618T(-).  
Set 714E(-) to frequency that gave lowest rf output.  
Key 618T(-).  
Set A11R5 for 75 v rf output.  
This completes neutralization procedures. | Determine which frequency has lowest rf output. | | |
| 18   | Receive/ transmit gain balance check | Leave rf translator A12 connected to 618T(-) chassis while performing this procedure. Remove rf translator A12 top cover plate.  
Connect 678Z-1 J2-IF, TRANS jack to J2 in if. translator A3.  
Connect 678Z-1 J2-FREQ DIV jack to J2 in frequency divider A1.  
NOTE: B versions of the 618T(-) have no module A1 for tgc override, so apply +18 vdc (using the HF-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step.  
Connect 678Z-1 GRND jack to 618T(-) chassis. | | | |
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<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
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<th>REQUIRED TEST RESULT</th>
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<th>REMEDY</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR control to TGC OVERRIDE.</td>
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<td>18</td>
<td>(Cont)</td>
<td></td>
<td>Set 678Z-1 TGC &amp; CAPTURE RANGE control R3 fully counterclockwise.</td>
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<td></td>
<td>Set 714E-( ) to 29,000 MHz, AM.</td>
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<td></td>
<td></td>
<td></td>
<td>Key 618T-( ).</td>
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<td></td>
<td>Adjust 678Z-1 TGC &amp; CAPTURE RANGE control clockwise until rf output is approximately 30 vrms.</td>
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<td></td>
<td>Adjust RF AMP PLATE coil to peak rf output voltage as read on HP-410B VTVM.</td>
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<td>Unkey 618T-( ).</td>
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<td></td>
<td>Set 714E-( ) RF SENS/SQL control fully clockwise. Set AUDIO control R10 fully clockwise.</td>
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<td></td>
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<td></td>
<td>Connect signal generator, through 6-dB attenuator, to AUX RCVR ANT connector at left front of 618T-( ).</td>
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<td></td>
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<td></td>
<td>Set signal generator output to 29,000 MHz, 30% modulated with 1.0 kHz.</td>
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<td></td>
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<td></td>
<td>Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack.</td>
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<td></td>
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<td></td>
<td>Adjust signal generator output level to provide 3.0 vrms at 678P-( ) HEADSET jack.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>18</td>
<td>(Cont)</td>
<td></td>
<td>Readjust RF AMP PLATE coil to peak voltage at 678P-( ) HEADSET jack. If this adjustment causes the voltage at the 678P-( ) HEADSET jack to exceed 3.3 vrms, replace A12C61 with a value of capacitance that will provide the required results. <strong>NOTE</strong>: A12C61, located in driver compartment, is accessible from bottom of module. A12C61 is a selected value of capacitance. Select value of A12C61 from complement given in 618T-( ) illustrated parts catalog. If A12C61 is replaced, repeat step 17.</td>
<td>0.05 vrms at 678P-( ) HEADSET jack.</td>
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<td></td>
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<td></td>
<td>Set 714E-( ) to 7.300 MHz, AM.</td>
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<td></td>
<td>Set signal generator output to 7.300 MHz, 1000 uv, 30% modulated with 1 kHz.</td>
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<td></td>
<td>Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack.</td>
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<td></td>
<td>Adjust AUDIO level control R10, on 618T-( ) front panel, for 5.5 vrms at 678P-( ) HEADSET jack.</td>
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<td></td>
<td>Set 714E-( ) RF SENS/SQL control fully counterclockwise.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>19</td>
<td>Disconnect</td>
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<td>Turn power off.</td>
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<td>Disconnect all test equipment.</td>
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<td></td>
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<td></td>
<td>Connect coaxial jumper to AUX RCVR ANT. connector at left front of G18 (-).</td>
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RF Translator A12, Checks and Adjustments
Figure 731
<table>
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<tr>
<th>714E-( ) FREQUENCY (MHz)</th>
<th>HF OSCILLATOR FREQUENCY (MHz)</th>
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<td>2.XXX</td>
<td>12.500</td>
<td>Z5-2</td>
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<td>3.XXX</td>
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Coil Block Z5, Adjustments

Figure 733
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<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
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<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td>WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN SINGLE-PHASE HIGH-VOLTAGE POWER SUPPLY A13. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A13 REMOVED.</td>
<td>Replace dust cover on A13, and replace A13 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12, from 618T-( ) chassis. Connect rf translator A12, through module extender, to 618T-( ) chassis. Remove dust cover from A12. Unless otherwise specified, the steps are performed with the 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>2</td>
<td>1500-v check</td>
<td></td>
<td>Set 618T-( ) front panel meter switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before unit is keyed. Key 618T-( ). Unkey 618T-( ).</td>
<td>Front panel meter should indicate in red area.</td>
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<tr>
<td>3</td>
<td>260-v check</td>
<td></td>
<td>Connect HP-410B VTVM dc probe to TP19 on A12 module extender. Key 618T-( ). Note HP-410B indication.</td>
<td>+234 to +286 v.</td>
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</tbody>
</table>

**NOTE:** There are no adjustments in A13. If preceding checks indicate module output is abnormal, turn power off, remove A13 from 618T-( ) chassis, and use a vom to check for faulty diodes, transformer winding continuity, and proper relay operation. If +1500-v output is normal but +260-v output is abnormal, check bleeder resistors A13R11 and A13R12. Refer to schematic diagram.

<p>| 4    | Disconnect  |                | Turn power off. Disconnect all test equipment. Remove A12 from module extender. |        |        |        |</p>
<table>
<thead>
<tr>
<th>REMEDY</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
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<tr>
<th>REQUIRED TEST RESULT</th>
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<thead>
<tr>
<th>TEST PROCEDURE</th>
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<tbody>
<tr>
<td>Remove module extender from 6187(-) chassis. Replace A12 in 6187(-) chassis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST EQUIPMENT</th>
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<tr>
<th>DESCRIPTION</th>
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<tr>
<th>STEP (Cont)</th>
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<td>4</td>
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<td>STEP</td>
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<td>1</td>
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<td>STEP</td>
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</tbody>
</table>

NOTE: Vco A15A7 and isolation amplifier A15A8 are sealed assemblies and cannot be disassembled in the field. The source of isolation leak for the isolation unit should be identified and repaired.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Cont)</td>
<td>5-vdc regulator check</td>
<td></td>
<td>returned to the factory and replaced with a new unit.</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>5-vdc regulator check</td>
<td></td>
<td><strong>CAUTION:</strong> CARE MUST BE EXERCISED WHEN CONNECTING A TEST PROBE TO AN INTEGRATED CIRCUIT (FLATPACK). IF AT ALL POSSIBLE, CONNECT TEST PROBE TO CIRCUIT BOARD ADJACENT TO FLATPACK. USE A SHARP PROBE. FLATPACK MAY BE DAMAGED IF TOO MUCH PRESSURE IS APPLIED OR IF FLATPACK LEADS ARE SHORTED TOGETHER. EPOXY (POSTCOATING) REMOVED DURING TESTING MUST BE REPLACED UPON COMPLETION OF TEST. REFER TO REPAIR SECTION OF THIS MANUAL FOR DETAILED INSTRUCTIONS PERTAINING TO REPLACEMENT OF EPOXY.</td>
<td>From 4.9 to 5.1 Vdc</td>
<td>A15A9, zener diode A15A9CR6</td>
<td>Check A15A9, voltage at zener diode A15A9CR6.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>REMEDY</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REQUIRED TEST RESULT</td>
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</table>

**Test Procedure**

1. See caution in step 4 of this test procedure.
2. Oscilloscope vertical amplifier control remains set at 2 V/cm.
4. Set time base so that 10 pulses are displayed on oscilloscope.
5. Remove oscilloscope vertical input from CLOCK OUT point.
6. Do not change oscilloscope setting.
7. Place oscilloscope vertical input on A15A2 CLOCK OUT point.
8. Do not change oscilloscope setting.
9. Oscilloscope vertical control remains set at 2 V/cm.
10. Place vertical input on A15A2 CLOCK OUT point at A15A2A4-14.
11. Set time base so that 10 pulses are displayed on oscilloscope.

**Test Equipment**

- Divide-by-10 board A15A2 check
- Divide-by-10 board A15A3 check
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Selectivity</td>
<td><strong>Set 714E-( ) to 2.100, AM.</strong>&lt;br&gt;Connect the frequency counter to the signal generator output through a T-connector.&lt;br&gt;Adjust signal generator for 2.100 MHz modulated 30% at 1000 Hz and output level for an ac tvvm indication of 6.0 v.&lt;br&gt;Increase signal generator output 60 db, then tune signal generator above 2.100 MHz until the ac tvvm indication drops back to 6.0 v.&lt;br&gt;Lower the signal generator frequency below 2.100 MHz until the tvvm again indicates 6.0 v.&lt;br&gt;Compute the difference between the two frequencies recorded.&lt;br&gt;&lt;br&gt;<strong>Set 714E-( ) mode selector switch to USB.</strong>&lt;br&gt;Set signal generator to 2.100 MHz unmodulated with an output level of 1 uv.&lt;br&gt;Adjust signal generator frequency for maximum ac tvvm indication.&lt;br&gt;Adjust signal generator output level for an ac tvvm indication of 6.0 v.&lt;br&gt;Increase signal generator output 60 db, and tune signal generator on each side of band pass until the 6-v reference audio output is repeated on each side.&lt;br&gt;Compute difference between measured frequencies.&lt;br&gt;&lt;br&gt;Repeat with 714E-( ) mode selector switch set to LSB.</td>
<td>Note and record the frequency.&lt;br&gt;Note and record the frequency.&lt;br&gt;Difference should be not more than 14 kHz for equipment with and without narrow-band selectivity.</td>
<td></td>
</tr>
<tr>
<td>E. Audio Distortion</td>
<td><strong>Set 714E-( ) to 7.300 MHz, AM.</strong>&lt;br&gt;Set signal generator to 7.300 MHz 80% modulated at 1000 Hz and output level to 1000 uv.&lt;br&gt;Connect distortion analyzer to HEADSET jack on the 679P-( ), and measure the distortion.</td>
<td>Not more than 10%</td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td>NOTES</td>
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</tr>
<tr>
<td><strong>F. Low Channel Operation and Squelch Delay Check for 618T-()</strong>&lt;br&gt;With RF Oscillator Module 528-0639-001</td>
<td>Set 618T-() squelch enable switch S3 to SQL IN.&lt;br&gt;Rotate 714E-() RF SENS/SQL control fully counterclockwise.&lt;br&gt;Set signal generator to 7.300 MHz externally modulated 30% at 600 Hz and an output level of 5 μV.&lt;br&gt;Turn 600-Hz external modulation off for 10 seconds, then turn it back on. Squelch relay is energized for 1 to 5 seconds when modulation is reapplied, then deenergized.</td>
<td>An energized relay is indicated by an audio voltage output at 618T-() receive output. There is no output when squelch relay is deenergized. Therefore, audio is present only for 1 to 5 seconds when modulation is reapplied.</td>
<td></td>
</tr>
<tr>
<td><strong>G. Low Channel Operation and Squelch Delay Check for 618T-()</strong>&lt;br&gt;With RF Oscillator Module 528-0639-002</td>
<td>Set 618T-() squelch enable switch S3 to SQL IN.&lt;br&gt;Rotate 714E-() RF SENS/SQL control fully counterclockwise.&lt;br&gt;Set signal generator to 7.300 MHz externally modulated 30% at 600 Hz and an output level of 5 μV.&lt;br&gt;Turn external modulation off.</td>
<td>Uninterrupted audio output is present. Squelch relay drops out within 1 to 5 seconds. This is indicated by loss of audio output.</td>
<td></td>
</tr>
<tr>
<td><strong>H. High Channel Squelch Check for all 618T-() With Squelch Capability</strong></td>
<td>Set 618T-() squelch enable switch S3 to SQL IN.&lt;br&gt;Rotate 714E-() RF SENS/SQL control fully counterclockwise.&lt;br&gt;Set signal generator to 7.300 MHz externally modulated 30% at 2500 Hz and an output level of 50 μV.&lt;br&gt;Turn modulation off and on and note operation of squelch relay.</td>
<td>Squelch relay does not operate as indicated by no audio output from 618T-().</td>
<td></td>
</tr>
<tr>
<td>NOTES</td>
<td>RESULTS</td>
<td>PROCEDURE</td>
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<td></td>
<td><strong>BEGIN</strong></td>
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<tr>
<td></td>
<td></td>
<td>1. Switch swich S5 to S2.</td>
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<td></td>
<td>2. Switch swich S7 to S1.</td>
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<td>3. Transmitter.</td>
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<td><strong>END</strong></td>
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</tbody>
</table>

**CAUTION:** For all Transmitter Tests, load is connected to GST-7. (*) ANT.

Ensure that BHR 8201 is dummy.

**NOTE:**
- Switching start switch S5 to S2.
- Switching swich S7 to S1.
- Switching swich S1 to S2.

**PROCEDURE:**

1. Switch swich S5 to S2.
2. Switch swich S7 to S1.
3. Transmitter.
Subject: Unit Performance Test Procedures

Add test step 2.1 (Antenna Switch Check) following test step 2.0 I. (Squelch Override Check)

<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
</table>
| 2.1 Antenna Switch Check | Set radio control to 27.1 MHz AM Mode.  
Set generator to 3 μV, 30% modulated at 1 kHz.  
Set ANT JUMPER toggle switch in 618T-( ) relay compartment to IN.  

CAUTION: Transmitter must be disabled for this test to avoid damage to test equipment. Do not key the 618T-( ) during this test.  
Disconnect 678P-( ) coax cable from connector J4 (Main ANT) of 618T-( ).  
Disconnect signal generator from connector J3 (AUX RCVR ANT) of 618T-( ).  
Connect signal generator to connector J4 (Main ANT).  
Disconnect signal generator from J4 (Main ANT) and reconnect it to connector J3 (AUX RCVR ANT).  
Reconnect 678P-( ) coax cable to connector J4 (Main ANT) of 618T-( )  
Set ANT JUMPER toggle switch in 618T-( ) relay compartment to IN. | 1 kHz audio output is present. 1 kHz audio output disappears. |       |

520-5970003-F81113
<table>
<thead>
<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
</table>
| A. AM Power Output and TGC Adjustment | **CAUTION:** DO NOT KEY 618T-() WITH POWER AMPLIFIER COVER OFF OR WITH LOOSE COVER SCREWS. DO NOT OPERATE POWER AMPLIFIER MORE THAN 1 S. DAMAGE TO TUBES WILL RESULT.  
Set 714E-() to 2.100 MHz, AM.  
Connect HP 455A Probe T-Connector between Bird 3201 Dummy Load and 618T-() ANT. jack. Connect HP 410B VTVM to the probe T-connector.  
Key 618T-(), and allow time for it to tune.  
Repeat with the 714E-() frequency selector switches set to each MHz band from 3.100 to 23.1 MHz and at 29.900 MHz.  
Key 618T-() with 714E-() at 2.000 MHz, AM mode.  
Check voltage on HP-410B VTVM.  
Set 714E-(), in turn, to 3.000, 4.000 through 29.000 MHz, AM mode.  
Check voltage on HP-410B VTVM, and determine lowest gain MHz band.  
Set 714E-() to lowest gain MHz band as determined above, AM mode, and key 618T-().  
Set A11R5 for 75 v as indicated on HP-410B VTVM.  
Unkey 618T-(). | Vtvm should indicate 70 to 90 v.  
Same as above. | No audio input. |
| B. Residual Output Voltage | Set 714E-() to 2.100 MHz, USB.  
Key 618T-().  
Record HP-410B indication.  
Repeat with 714E-() mode selector switch set to LSB.  
Unkey 618T-(). | Not more than 25 volts.  
Same as above. | No audio input. |
<table>
<thead>
<tr>
<th>TEST/STEP</th>
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<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Single Sideband Power Output</td>
<td>Set 714E-( ) to 2.100 MHz, USB. Connect microphone into MIC jack J2 on 618T-( ) front panel. Key 618T-( ), and talk into the microphone. Set 714E-( ) frequency selector switches to 29,900 MHz, and repeat.</td>
<td>Vtvm should indicate 126 to 175 V, peak Same as above.</td>
<td></td>
</tr>
<tr>
<td>D. Frequency Accuracy</td>
<td>Connect frequency counter through the proper voltage divider to the SNC T-connector in the r: output line. Set 714E-( ) to 2.100 MHz, AM. (Use 2- to 8-MHz capacitive divider.) Key 618T-( ), and observe counter. Repeat for each MHz band from 3.100 to 28.000 MHz and 29,900 MHz. (Use 2- to 8-MHz capacitive divider to 8 MHz. Use 8- to 30-MHz capacitive divider from 8 through 29.9 MHz.)</td>
<td>Counter should indicate 2.100 MHz Counter indication should be the same as frequency setting on 714E-( ). Voltage dividers are supplied in the 678Y-( ).</td>
<td>Tolerance is ±0.8 part per million. Tolerance is ±0.8 part per million.</td>
</tr>
<tr>
<td>E. Modulation Capability</td>
<td>Connect oscilloscope vertical input to probe T-connector using 11- to 14-pf oscilloscope probe. If oscilloscope probe is not available, use 8- to 30-MHz capacitive divider from the 678Y-( ) Maintenance Kit. Set 714E-( ) to 7.300 MHz, AM. Connect audio oscillator to NO. 1 AUDIO IN jack on 678Z-1 Function Test Set. Connect AUDIO OUT jack on 678Z-1 to MIKE jack on 578P-( ) Test Harness using mike cable from 678Y-( ) Maintenance Kit. Connect Ballantine 310A Vtvm to TEST POINT jack on 678Z-1. Key 618T-( ). Set audio oscillator frequency to 2000 Hz, and adjust output level to minimum.</td>
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(Cont)
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<tr>
<th>TEST/STEP</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>E. (Cont)</td>
<td>Slowly increase output level of audio oscillator until 85% modulation is noted on oscilloscope. Unkey 618T-( ). Disconnect 678Z-1 from 678P-( ).</td>
<td>Vtvm should indicate 0.25 v or less.</td>
<td>An oscilloscope indication of a ratio of maximum peak-to-peak envelope height to minimum peak-to-peak envelope height is 12:1 at 85% modulation.</td>
</tr>
<tr>
<td>F. CW Output</td>
<td>See note. Set 714E-( ) to 2.100 MHZ, CW. Operate CW key on 678P-( ) Test Harness. Repeat with 714E-( ) frequency selector switches set to 8.100 and 29.900 MHz. Rapidly key and unkey 618T-( ).</td>
<td>HP-410B VTVM should indicate 70 to 90 v. Same as above.</td>
<td>If 714E-( ) does not have CW switch position, set mode selector switch to USB. No audio input.</td>
</tr>
<tr>
<td>G. Sidetone Operation</td>
<td>Set the 714E-( ) to 7.300 MHZ, USB. Connect high-impedance headphones into PHONE jack on 618T-( ) front panel and microphone to MIC jack on 618T-( ) front panel. Key 618T-( ) and speak into microphone. Unkey 618T-( ).</td>
<td></td>
<td>Sidetone should be audible in headphones.</td>
</tr>
<tr>
<td>4. SYSTEM INTERFACE CHECKS</td>
<td>The following checks are made from ground to the indicated pin on the 618T-( ) rear connector, P40. If 678P-( ) Test Harness is used, measurements can be made to pins on the unused 618T-( ) connected on the 678P-( ). If the 678P-( ) Test Harness is not used, provision should be made in the bench interconnect system for test points in the wiring to the 618T-( ) rear connector pins listed in the following checks.</td>
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<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
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<tr>
<td>B. 115-Volt 400-Hz Output</td>
<td>Set 714E-( ) to AM, any frequency. Connect HP-410B VTVM ac probe to P40-11 of 618T-( ).</td>
<td>Vtv should indicate 103 to 123 vac.</td>
<td>Same 678P-1 equipment have pilot lamps to indicate presence of chopper power and recycle signal. Where present, simply key transmitter on any AM frequency (with no coupler in mockup and observe lamps. Lighted lamps signify flow of recycle signal and chopper power. Where these pilot lamps are not installed, follow procedures in steps B, C, D, and E.</td>
</tr>
<tr>
<td>C. +27.5-Volt DC Output</td>
<td>Set 714E-( ) to AM, any frequency. Connect HP-410B VTVM dc probe to P40-56 of 618T-( ).</td>
<td>Vtv should indicate +24.5 to +30.5 vdc.</td>
<td></td>
</tr>
<tr>
<td>D. Chopper Enable Output</td>
<td>CAUTION: DO NOT CONNECT AN ANTENNA COUPLER TO THE SYSTEM WHILE PERFORMING THIS CHECK. THE ANTENNA COUPLER MAY INTRODUCE VOLTAGES WHICH WILL DAMAGE THE TEST EQUIPMENT USED FOR OHMmeter MEASUREMENTS. Set 714E-( ) to AM, any frequency. Key 618T-( ). (Cont) Release 618T-( ) key.</td>
<td>Chopper ground lamp on 678P-1 lights. Chopper lamp goes out.</td>
<td>If 678P-1 is not equipped with chopper ground and coupler reset lamps, do the</td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td>NOTES</td>
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<tr>
<td>D. (Cont)</td>
<td>Connect HP 410B VTVM ohms probe to P40-9 and common probe to 618T-() chassis. Key 618T-(). Unkey 618T-().</td>
<td>Vtvm should indicate 5 ohms or less. Vtvm should indicate 1 megohm or greater.</td>
<td>following procedures of step D.</td>
</tr>
<tr>
<td>E. Recycle Line Output</td>
<td>CAUTION: DO NOT CONNECT AN ANTENNA COUPLER TO THE SYSTEM WHILE PERFORMING THIS CHECK. THE ANTENNA COUPLER INTRODUCES VOLTAGES WHICH MAY DAMAGE THE TEST EQUIPMENT USED FOR OHMmeter MEASUREMENTS. Set 714E-() to AM, any frequency. After transceiver tuneup, select another frequency with 714E-() and observe coupler return light. Connect HP 410B VTVM ohms probe to P40-28 of 618T-(). Set frequency selector switches on 714E-() to a different frequency, and observe vtvm while Autopositioner is operating.</td>
<td>Coupler return lamp lights during tune cycle.</td>
<td>If 678P-1 is not equipped with chopper ground and coupler return lamps, do the following procedures of step E.</td>
</tr>
<tr>
<td>F. Tune Power Check</td>
<td>Set 714E-() to USB, any frequency. Connect high-impedance headphones to 618T-() PHONE jack on 618T-() front panel. Connect HP 410B VTVM ac probe to HP 455A Probe T-Connector. Key 618T-(). Unkey 618T-().</td>
<td>Vtvm should indicate 25 V or less.</td>
<td></td>
</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td>NOTES</td>
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<tr>
<td>F. (Cont)</td>
<td>Press the TUNE POWER switch on the 678P-( ) test harness, and key 618T-( ). CAUTION: DO NOT HOLD THE TUNE POWER SWITCH DOWN OVER 15 S WHILE 618T-( ) IS KEYPAD.</td>
<td>Vtvm should indicate 55 v or greater, and an audible tone is heard on the headphones.</td>
<td></td>
</tr>
<tr>
<td>G. Receive Audio Output Adjustment</td>
<td>Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Set 714E-( ) to 7.300 MHz, AM. Set RF SENS/SQL control fully clockwise. Set signal generator output to 7.300 MHz, 1000 uv, 30% modulated with 1 kHz. Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack. Adjust AUDIO control R10 on 618T-( ) front panel for 6.5 v on Ballantine 310A. Set 714E-( ) RF SENS/SQL control fully counterclockwise.</td>
<td>Vtvm indicates 0.05 v or less.</td>
<td></td>
</tr>
<tr>
<td>H. Sidetone Output Level Adjustment</td>
<td>Connect 678Z-1 and audio oscillator as shown in figure 702. Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack. Key 618T-( ). Set audio oscillator to 2 kHz, and set output level for 0.25 vrms as measured at 678Z-1 TEST POINT jack. Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Adjust SIDETONE level control R3, on 618T-( ) front panel, for 5.5 vrms at 678P-( ) HEADSET jack. Unkey 618T-( ).</td>
<td></td>
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</tbody>
</table>
Subject: Unit Performance Test Procedure

Replace test step 4.1 (SELCAL Output Voltage Check) with the following:

<table>
<thead>
<tr>
<th>I. SELCAL Output Voltage Check</th>
<th>PROCEDURE</th>
<th>RESULTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect signal generator thru 6-dB attenuator to auxiliary receiver antenna.</td>
<td>Connect Ballantine 310A vtm across pin 60 (SELCAL out) and pin 18 (chassis ground) of 618T-1 or 618T-2/3 power connector located on horizontal top deck of 678P-( ).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOTE: The 618T-1 and 618T-2/3 connectors are in parallel. When testing the 618T-1, make connections to unused 618T-2/3 connector; when testing 618T-2/3, make connections to unused 618T-1 connector.</td>
<td>Set signal generator to 7.3000 MHz, 50 µV, modulated 30% at 1000 Hz.</td>
<td>Not less than 0.1 volt.</td>
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</tr>
<tr>
<td>TEST/STEP</td>
<td>PROCEDURE</td>
<td>RESULTS</td>
<td>NOTES</td>
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</tr>
</tbody>
</table>
| 1. SELCAL Output Voltage Check | Connect signal generator thru 6-dB attenuator to auxiliary receiver antenna. Connect a 2200-ohm resistor load across pin 60 (SELCAL out) and pin 13 (chassis ground) of 618T-1 or 618T-2/3 connector located on horizontal top deck of 67S-( ).  

**NOTE:** The 618T-1 and 618T-2/3 connectors are in parallel. When testing the 618T-1, connect load to unused 618T-2/3 connector; when testing 618T-2/3, connect load to unused 618T-1 connector.  

Connect Ballantine 310A vtvvm across 2200-ohm load.  
Set signal generator to 7.3000 MHz, 50 µV, modulated 30% at 1000 Hz.  
Check voltage at pin 60 of power connector.  
Turn power off.  
Disconnect all test equipment from 618T-( ).  
Reset ANT JUMPER switch S2 to original position: IN, if 618T-( ) is being used with same antenna for transmit and receive; OUT, if separate antennas are being used for transmit and receive.  
Reinstall covers on 618T-( ). | Not less than 0.1 volt |       |
| 5. DISCONNECT                   |                                                                                                                                                                                                          |                               |       |
5. MODULE CHECKS AND ADJUSTMENTS.

A. Use of Test Procedures.

The test procedures are presented in a 7-column, tabular form. Column 1 (STEP) indicates the step number. Column 2 (DESCRIPTION) describes the test to be performed. Column 3 (TEST EQUIPMENT) lists the test equipment needed to perform the test. Test equipment needed to perform entire module test is listed in step 1 initial test requirements, of each module test. Column 4 (TEST PROCEDURE) outlines test procedures to be performed. Column 5 (REQUIRED TEST RESULT) presents the desired results of the test procedure including tolerances required. Column 6 (PROBABLE CAUSE OF ABNORMAL RESULT) lists components and/or circuits that may be causing abnormal results in that particular test. Column 7 (REMEDI) indicates action necessary to correct abnormal results.

When any block under TEST PROCEDURE is blank, the control has been properly set in a previous step and should not be changed.

B. Test Equipment Required.

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

C. Power Requirements.

Power requirements for the 618T- ( ) are listed in paragraph 2.C.(1), 2.C.(2), and 2.C.(3).
D. Module Checks and Adjustments.

(1) Test Setup.

(a) Remove side dust covers from the 618T-( ) , and check all modules and holddown screws for secureness.

(b) Place the 618T-( ) on mounting tray supplied in 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set 678P-( ) Test Harness controls as follows:

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY INTLK</td>
<td>BY PASS</td>
</tr>
<tr>
<td>AC</td>
<td>OFF</td>
</tr>
<tr>
<td>DC POWER</td>
<td>OFF</td>
</tr>
<tr>
<td>300Ω AUDIO LOAD</td>
<td>IN</td>
</tr>
<tr>
<td>CW KEY</td>
<td>Center (off) position</td>
</tr>
<tr>
<td>KEY</td>
<td>Center (off) position</td>
</tr>
<tr>
<td>WATTS</td>
<td>FORWARD, 200</td>
</tr>
</tbody>
</table>

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding to unit under test (618T-1/1B, -2/2B, or -3/3B). Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).


(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 714E-1, 714E-2/3, 714E-6 mode selector switch to the applicable position.
NOTE: If testing a 618T-1B/2B/3B, set the 0.1-kHz digit on the 714E-( ) to zero.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

(2) Module Checks and Adjustments.

Perform test procedures as outlined in figures 706 through 742. When troubleshooting a module, be certain that all other modules and the chassis of the 618T-( ) are normal.

WARNING: 1500 VDC AND 115 VAC 400 Hz ARE PRESENT IN THE 618T-( ). DO NOT REMOVE OR INSERT MODULES WITH POWER APPLIED TO THE 618T-( ).

CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED. FILAMENT VOLTAGE DIVIDER NETWORK WILL BE UNBANCED AND DAMAGE TO OTHER TUBES MAY RESULT.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td>NOTE: This test procedure applies to the 618T-1/2/3 Airborne 68D Transceiver only. Refer to figures 707 and 715 for location of all test points on A1, A4, and module extender. Remove frequency divider A1 and kHz-frequency stabilizer A4 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust covers from A1 and A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect A1 and A4 through module extenders to 618T-( ) chassis. Be sure that coaxial jumpers are connected on A1 module extender. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>3</td>
<td>10-kHz pulse output check</td>
<td></td>
<td>Set oscilloscope for 2 v/cm, dc, 1.0 us/cm.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A1A1J1.</td>
<td></td>
<td>Check 100-kHz output at A2J1,</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Check waveform at A1A1J1.</td>
<td>5 to 7 v peak to peak.</td>
<td>A1A1Q1 through A1A1Q6 and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>associated circuits.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Keyer output check</td>
<td></td>
<td>Set oscilloscope for 5 v/cm, dc, 200 us/cm.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A1A3J3.</td>
<td></td>
<td>Check A1A2Q11, A1A3Q12, A1A3Q13,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check waveform at A1A3J3.</td>
<td>9 to 15 v peak to peak.</td>
<td>and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>50-kHz locked oscillator output</td>
<td></td>
<td>Set oscilloscope for 0.5 v/cm, 10 us/cm.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A1A1TP1.</td>
<td></td>
<td>Check A1A1Q1, A1A1Q2, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check waveform at A1A1TP1.</td>
<td>1.4 to 2.0 v peak to peak.</td>
<td>associated circuits.</td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>6</td>
<td>10-kHz locked oscillator output check</td>
<td>Set oscilloscope for 0.5 v/cm, 50 us/cm. Connect oscilloscope vertical input to A1A1TP2. Check waveform at A1A1TP2.</td>
<td><img src="image" alt="Waveform" /> 1.5 to 2.5 v peak to peak.</td>
<td>A1A1Q3, A1A1Q4, and associated circuits.</td>
<td>Check A1A1Q3, A1A1Q4, and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5-kHz locked oscillator output check</td>
<td>Set oscilloscope for 1.0 v/cm, 100 us/cm. Connect oscilloscope vertical input to A1A1TP3. Check waveform at A1A1TP3.</td>
<td><img src="image" alt="Waveform" /> 2.5 to 4.5 v peak to peak.</td>
<td>A1A1Q7, A1A1Q8, and associated circuits.</td>
<td>Check A1A1Q7, A1A1Q8, and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Keyed oscillator output check</td>
<td>Set oscilloscope for 2 v/cm, 25 us/cm. Connect oscilloscope vertical input to A1A3TP5. Check waveform at A1A3TP5.</td>
<td><img src="image" alt="Waveform" /> 9 to 12 v peak to peak.</td>
<td>A1A3Q14 and associated circuits.</td>
<td>Check A1A3Q14 and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Divider bandwidth check</td>
<td>Disconnect coaxial jumper at A2 on A1 module extender (figure 707). Connect signal generator through 6-db attenuator and BNC T-connector to A2 (upper connector) on A1 module extender.</td>
<td></td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>9 (Cont)</td>
<td></td>
<td>Connect oscilloscope horizontal input to BNC T-connector.</td>
<td></td>
<td>2-to-1 Lissajous pattern.</td>
<td>A1A1L1 incorrectly adjusted.</td>
<td>Adjust A1A1L1 to provide required results.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set signal generator for 100-kHz 0.5-V output.</td>
<td></td>
<td></td>
<td></td>
<td>NOTE: Adjustment of A1A1L1 will center bandwidth.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A1A1TP1.</td>
<td></td>
<td></td>
<td>A1A1Q1, A1A1Q2, and associated circuits.</td>
<td>Check A1A1Q1, A1A1Q2, and associated circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>While varying signal generator above and below 100 kHz, check waveform on oscilloscope.</td>
<td></td>
<td>10-to-1 Lissajous pattern. See note above.</td>
<td>A1A1L2 incorrectly adjusted.</td>
<td>Adjust A1A1L2 to provide required results.</td>
</tr>
<tr>
<td></td>
<td>(Cont)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NOTE: Adjustments of A1A1L2 will center bandwidth.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<td></td>
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<td></td>
<td>While varying signal generator above and below 100 kHz, check waveform on oscilloscope.</td>
<td>20-to-1 Lissajous pattern. See note above.</td>
<td>NOTE: Adjustment of A1A1L4 will center bandwidth.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disconnect oscilloscope, signal generator, and 6-db attenuator.</td>
<td>A1A1L4 incorrectly adjusted.</td>
<td>\</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>Replace coaxial jumper to A2 on module extender.</td>
<td>A1A1Q5 through A1A1Q8 and associated circuits.</td>
<td>Check A1A1Q5 through A1A1Q8 and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Keyed oscillator output adjustment</td>
<td>Connect oscilloscope vertical input to A4J8.</td>
<td>Adjust A1A3L7 and A1A3L8 to peak signal amplitude at A4J8. Adjust for largest of several peaks.</td>
<td></td>
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<tr>
<td></td>
<td>(Cont)</td>
<td></td>
<td>Disconnect oscilloscope.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>10</td>
<td>(Cont)</td>
<td></td>
<td>Turn power off.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Remove kHz-frequency stabilizer A4 from module extender.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Remove A4 module extender from 618T-( ) chassis.</td>
<td></td>
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<td></td>
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<td></td>
<td>Replace dust cover on A4.</td>
<td></td>
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<td></td>
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<td></td>
<td>Replace A4 in 618T-( ) chassis.</td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>CAL TONE output level check</td>
<td></td>
<td>Turn power on.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Set oscilloscope for 0.5 v/cm, 500 us/cm.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to TP6 on A1 module extender.</td>
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<tr>
<td></td>
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<td></td>
<td>Check waveform at TP6 on module extender.</td>
<td></td>
<td>A1A2Q11 and associated circuit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0 to 1.5 v peak to peak.</td>
<td>A1A3R48</td>
<td>Check A1A2Q11 and associated circuit.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>NOTE: A1A3R48 is a selected value of resistance.</td>
<td>Replace A1A3R48 with a resistor selected from complement listed in the 618T-( ) illustrated parts catalog.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>12</td>
<td>Uniunction divider input check</td>
<td>Set oscilloscope for 5 v/cm, 200 μs/cm. Connect oscilloscope vertical input to A1A2TP4. Check waveform at A1A2TP4.</td>
<td>![Waveform Image]</td>
<td>Firing voltage must be 0.6 to 0.7 v above fifth step of pattern.</td>
<td>A1A2Q9 and associated circuit. A1A2C22 and/or A1A2C45. <strong>NOTE:</strong> A1A2C22 and A1A2C45 are selected values of capacitance.</td>
<td>Check A1A2Q9 and associated circuit. Replace A1A2C22 and/or A1A2C45 with a capacitor selected from component list in the 618T-( ) illustrated parts catalog.</td>
</tr>
</tbody>
</table>
Frequency Divider A1, Checks and Adjustments
Figure 707
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness, 678Y-( ) Maintenance Kit, 678Z-1 Function Test Set, 714E-( ) Radio Set Control, Boonton 91-C RF VTVM, HP 410B VTVM, Oscilloscope, Audio oscillator, Frequency counter, Vom, Signal generator, 6-dB attenuator, Ballantine 310A VTVM, Rf dummy load, Headphones</td>
<td>NOTE: This test procedure applies to rf oscillator A2, Collins part numbers 528-0251-005, 528-0530-001, and 528-0530-002. Steps 1 through 7 apply to all Collins part numbers of rf oscillator modules. Steps 8, 9, and 10 include individual squelch checks for rf oscillators 528-0530-001 and 528-0530-002. Refer to figure 708 for location of all test points on A2 and module extender. The rf oscillator module ambient temperature must be between +20 °C (68 °F) and +30 °C (86 °F) while performing this test.</td>
<td>Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A2 to perform this step.</td>
<td>Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702.</td>
<td>Connect rf oscillator A2 through the module extender to 618T-( ) chassis. Rf oscillator A2, Collins part numbers 528-0530-001 and 528-0530-002, must be tested on 618T-( ) chassis with MCN 21332 or above.</td>
</tr>
<tr>
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<td></td>
<td>NOTE: Unless otherwise specified, steps performed with 714P-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>2</td>
<td>Transistor supply voltage check</td>
<td>Connect HP-416B VTVM dc probe to A2J2.</td>
<td>Check voltage at A2J2.</td>
<td>+15 to +17 vdc.</td>
<td>Low-voltage power supply A5.</td>
<td>Check low-voltage power supply A5.</td>
</tr>
<tr>
<td>3</td>
<td>100-kHz reference output check</td>
<td>Connect Boonton 91-C RF VTVM to A2J1.</td>
<td>Check voltage at A2J1.</td>
<td>Not less than 0.4 vrms.</td>
<td>Mixer A2Q9 and associated circuit.</td>
<td>Check mixer A2Q9 and associated circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect frequency counter to A2J1.</td>
<td>Check frequency at A2J1.</td>
<td>100 kHz ±0.1 Hz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>500-kHz reference output to MHz-frequency stabilizer A10 check</td>
<td>Connect Boonton 91-C RF VTVM to A2J3.</td>
<td>Check voltage at A2J3.</td>
<td>0.9 to 1.3 vrms.</td>
<td>A2Q4, A2Q5, and associated circuits.</td>
<td>Check A2Q4, A2Q5, and associated circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect frequency counter to A2J3.</td>
<td>Check frequency at A2J3.</td>
<td>500 kHz ±0.4 Hz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>500-kHz carrier output to balanced modulator check</td>
<td>Connect Boonton 91-C RF VTVM to A2J4.</td>
<td>Check voltage at A2J4.</td>
<td>1.5 to 1.9 vrms.</td>
<td>A2Q4, A2Q5, A2Q6, and associated circuits.</td>
<td>Check A2Q4, A2Q5, A2Q6, and associated circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect frequency counter to A2J4.</td>
<td>Check frequency at A2J4.</td>
<td>500 kHz ±0.4 Hz.</td>
<td></td>
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</tr>
</tbody>
</table>
618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-10

Insert facing page 736, 23-10-0

Subject: Module checks and adjustments, RF Oscillator A2, Late Models, Figure 708

Revise the voltage test results for steps 4 and 5 as follows:

<table>
<thead>
<tr>
<th>STEP</th>
<th>TEST POINT</th>
<th>REQUIRED TEST RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>A2J3</td>
<td>0.6 to 1.3 vrms</td>
</tr>
<tr>
<td>5</td>
<td>A2J4</td>
<td>1.0 to 1.4 vrms</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
</tr>
<tr>
<td>------</td>
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<td>----------------</td>
</tr>
<tr>
<td>6</td>
<td>3-MHz oscillator board test</td>
<td></td>
</tr>
<tr>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>A2 FLI, A2110, or A2C40.</td>
<td>+19-volts output of low-voltage power supply A5.</td>
</tr>
<tr>
<td>REQUIRED TEST RESULT</td>
<td>Approximately 17 Vdc.</td>
<td></td>
</tr>
<tr>
<td>TEST PROCEDURE</td>
<td>Refer to figure 709 for location of 3 MHZ TEST POINT.</td>
<td>Connect frequency counter to 3 MHZ TEST POINT.</td>
</tr>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>6</td>
<td>(Cont)</td>
<td>Un solder coaxial cable at junction of A2Q3 and A2Q4.</td>
</tr>
<tr>
<td>7</td>
<td>Divider bandwidth adjustment</td>
<td>Connect oscilloscope horizontal input to junction of A2R24 and A2Q4.</td>
</tr>
</tbody>
</table>

**TEST PROCEDURE**
- If A17-1 is present, signal amplitude is improper, return oscillator board to Collins Radio Company for repair. Un solder one coaxial cable at bottom of board and two wires from bottom of board.

**REQUIRED TEST RESULT**
- Check A2Q4, A2Q5, and associated circuits.
- A2Q4, A2Q5 are present stable; no phase changes or lissajous pattern.

**PROBABLE CAUSE OF ABNORMAL RESULT**
- Note: Frequency must remain stable; no phase changes or lissajous pattern.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (Cont)</td>
<td>Connect Boonton 91-C RF VTVM to A2J3.</td>
<td>Connect Boonton 91-C RF VTVM to A2J3.</td>
<td>Check voltage at A2J3.</td>
<td>0.9 to 1.3 Vrms.</td>
<td>Incorrect value of A2C14.</td>
<td>Select value of A2C14 that will provide required results. <strong>NOTE</strong>: Select values are listed in the 618T-( ) illustrated parts catalog.</td>
</tr>
<tr>
<td>(Cont)</td>
<td>Connect Boonton 91-C RF VTVM to A2J4.</td>
<td>Connect Boonton 91-C RF VTVM to A2J4.</td>
<td>Check voltage at A2J4.</td>
<td>1.5 to 1.9 Vrms.</td>
<td>Incorrect value of A2C20 and/or A2R44.</td>
<td>Select value of A2C20 that peaks the voltage at A2J3, then select value of A2R44 that provides required results. <strong>NOTE</strong>: Select values are listed in the 618T-( ) illustrated parts catalog.</td>
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<td></td>
<td>A2Q8 and associated circuit.</td>
<td>Check A2Q8 and associated circuit.</td>
</tr>
<tr>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>Incorrect value of A2C235 and/or A2R30.</td>
<td>Select value of A2C235 that peaks at A2J4, then select value of A2R30 that provides results.</td>
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**NOTE:** Select values are listed in the 61ST (-) Illustrated Parts Catalog.

<table>
<thead>
<tr>
<th>TEST PROCEDURE</th>
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<tr>
<td>Connect oscilloscope vertical input to A2J1.</td>
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<th>TEST EQUIPMENT</th>
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<td>7</td>
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Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 6 of 13) Page 740

Figure 708

Dec 1/72
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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<tbody>
<tr>
<td>7 (Cnt)</td>
<td></td>
<td></td>
<td>Set signal generator output to 0.5 Vrms. Vary signal generator frequency from 2.9 to 3.1 MHz as indicated on frequency counter. Check pattern on oscilloscope.</td>
<td>5-to-1 Lissajous pattern.</td>
<td>A2Q7, A2Q8, A2Q9, and associated circuits.</td>
<td>Select value of A2C29 that will provide required results.</td>
</tr>
<tr>
<td>8</td>
<td>Squelch circuit checks and adjustments for RF oscillator A2 (Collins part number 523-0690-001 only)</td>
<td>Comparator circuit static bias check</td>
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<tr>
<td>A</td>
<td>Comparator circuit static bias check</td>
<td></td>
<td>Connect the HP-410B VTVM dc probe to A2A3J8 and note the indication.</td>
<td>+1.9 to +2.1 vdc.</td>
<td>A2A3R32 out of adjustment.</td>
<td>Continue test.</td>
</tr>
<tr>
<td>B</td>
<td>20-volt regulated power supply check</td>
<td></td>
<td>Connect the Fluke 801B VTVM to A2A279 and note the indication.</td>
<td>-19.8 to +20.2 vdc.</td>
<td>A2R9 out of adjustment.</td>
<td>Continue test.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
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<tr>
<td>8C</td>
<td>20-volt regulated power supply adjustment</td>
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<td>Turn power off.</td>
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<td></td>
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<td></td>
<td>Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender.</td>
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<td>Turn power on.</td>
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<td></td>
<td>Set 714E-() RF SENS/SQL control fully clockwise.</td>
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<td></td>
<td>Set SQUELCH ENABLE switch S3 on 618T-( ) front panel to IN.</td>
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<td></td>
<td>Connect 678Z-1 GRND jack to 618T-( ) chassis.</td>
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<td></td>
<td>Connect 678Z-1 J4-XC STAB jack to A2A2J9.</td>
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<td><strong>NOTE:</strong> Ensure 678Z-1 has been calibrated in past 6 months.</td>
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<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR to SET LEVEL.</td>
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<td></td>
<td>Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10.</td>
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<td><strong>CAUTION:</strong> DO NOT OPERATE X10 METER SENSITIVITY SWITCH AT THIS TIME.</td>
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<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR to 10KC CONTROL BIAS (+20V).</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
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<td>SC</td>
<td>(Cont)</td>
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<td><strong>Depress 678Z-1 X10 METER SENSITIVITY switch and note FUNCTION METER indication.</strong></td>
<td>Meter should indicate 0.</td>
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<td></td>
<td>D Comparator circuit static bias and squelch threshold adjustment</td>
<td></td>
<td><strong>Repeat last step several times.</strong></td>
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<td></td>
<td>(Cont)</td>
<td></td>
<td><strong>Connect HP-410B VTVM dc probe to A2A3J8 and adjust A2A3R33.</strong></td>
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<td></td>
<td>D</td>
<td></td>
<td><strong>Set vom to RX10 scale and connect it to TP2 and TP3 on A9 module extender.</strong></td>
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<td><strong>Set AUDIO control R10 on 618T-( ) front panel fully clockwise.</strong></td>
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<td><strong>Set 678P-( ) AUDIO LOAD switch to OUT.</strong></td>
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<td>D</td>
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<td><strong>Set 714E-( ) RF SENS/SQL control fully counterclockwise.</strong></td>
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<td>D</td>
<td></td>
<td><strong>Connect a 330-ohm, 10% resistor from pin 30 of the unused 618T-( ) connector on the 678P-( ) to ground.</strong></td>
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<td><strong>Set A2A3R51 fully clockwise and note that the vom indicates approximately 300 ohms.</strong></td>
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<td>8D</td>
<td>(Cont)</td>
<td></td>
<td>Rotate A2A3R51 slowly counterclockwise until vom indication suddenly increases (indicates that A2A3K1 has operated).</td>
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<td>Disconnect 330-ohm resistor.</td>
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<td></td>
<td>Rotate 714E-( ) RF SENS/SQL control slowly clockwise, and note that shortly before the clockwise stop is reached, the vom indication suddenly increases from approximately 300 ohms (indicates that A2A3K1 has operated).</td>
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<td></td>
<td>Rotate 714E-( ) RF SENS/SQL control slowly counterclockwise, and note that the vom indication drops suddenly to approximately 300 ohms (indicates that A2A3K1 has deenergized).</td>
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<tr>
<td>E</td>
<td>Squeich circuit gain adjustment</td>
<td></td>
<td>Set 714E-( ) RF SENS/SQL control fully counterclockwise.</td>
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<td></td>
<td>Connect audio oscillator to TP2 and TP3 of A9 module extender (TP3 is common).</td>
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<td>Connect HP-410B VTVM ac probe to audio oscillator output.</td>
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<td>Set audio oscillator for 7.0 ±0.5-v output at 1 kHz.</td>
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<td>Record exact output for reference.</td>
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<td>STEP</td>
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<tr>
<td>8E</td>
<td>(Cont)</td>
<td></td>
<td>Connect HP 410B VTVM ac probe to A2A425 and adjust A2A4R55 for voltage indication within 1.0 V of audio voltage level fed into module. Disconnect audio oscillator from TP2 and TP3 of A9 module extender. Remove any antennas connected to the radio. Set the 714E-( ) mode control to USB. Remove A9 module extender from 618T-( ) chassis and install AM/audio amplifier A9. Connect the 410B to 1A2J5 and measure the audio noise level. Connect the 410B to 1A2J7 and adjust 1A2A4R23 for an audio noise level at 1A2J7 of 2 dB greater than that at 1A2J6. Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender. Reconnect audio oscillator to TP2 and TP3 of A9 module extender. Connect the HP 410B VTVM ac probe to audio oscillator output. Set the audio oscillator for 7.0 ±0.5-V output at approximately 600 Hz. Momentarily disconnect the audio oscillator from TP2 of the A9 module extender.</td>
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<tr>
<td></td>
<td>F</td>
<td>Squelch circuit</td>
<td>operation check (low channel)</td>
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<td>STEP</td>
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<tr>
<td>8F</td>
<td>Reconnect the audio oscillator and listen.</td>
<td></td>
<td>Audio should be present in the headphones for about 1 to 5 seconds (indicates relay A2A3K1 is energized), then drop out. No audio should be present (indicates relay A2A3K1 is not energized).</td>
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<tr>
<td>G</td>
<td>Squelch circuit operation check (high channel)</td>
<td></td>
<td>Repeat step 8F except set the audio oscillator to 2500 Hz.</td>
<td>No audio should be present.</td>
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<td>H</td>
<td>Go to step 11.</td>
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<tr>
<td>9</td>
<td>Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-002) below MCN 1234 and without 618T-2/3 Service Bulletin 32 or 618T-2E/3E Service Bulletin No 14</td>
<td></td>
<td>Turn power off. Set 618T-() squelch enable switch S3 under front panel to SQL IN. Disconnect all antenna inputs to 618T-(). Remove AM/audio amplifier A9 from 618T-() chassis and install A9 module extender. Apply power.</td>
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<tr>
<td>A</td>
<td>Squelch delay check</td>
<td></td>
<td>Rotate 71dE-() RF SENS/SQL control to the clockwise stop. Then rotate it quickly to the cow stop and note the time lapse until the voltage at A278 drops to less than 2 Vdc.</td>
<td>1 to 5 seconds.</td>
<td>Failure of delay or relay driver.</td>
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<tr>
<td>TEST</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
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<tr>
<td>9B</td>
<td>Squelch balance check</td>
<td></td>
<td>Plug A9 module into module extender. Check the noise level at A2J6 and then at A2J7 with 714E-( ) RF SENS/SQL control at cw stop.</td>
<td>Noise level at A2J7, 1.5 to 2.5 dB higher than at A2J6.</td>
<td>A2R1 improperly adjusted.</td>
<td>Adjust A2R1 and repeat step 9B.</td>
</tr>
<tr>
<td>C</td>
<td>High channel check</td>
<td></td>
<td>Rotate the 714E-( ) RF SENS/SQL control to the clockwise stop.</td>
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<td>Remove A9 from A9 module extender.</td>
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<td></td>
<td>Connect HP 410B VTVM dc probe to A2J8. Connect an audio oscillator to TP2 and TP3 of A9 module extender.</td>
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<td>Connect HP 410B VTVM ac probe to A2J5. Adjust the audio oscillator for 2.2 kHz with an output of 3 volts measured at A2J5. Note the voltage at A2J8.</td>
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<td></td>
<td>Remove input signal and note the voltage at A2J8.</td>
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<tr>
<td>D</td>
<td>Low channel check</td>
<td></td>
<td>Rotate the 714E-( ) RF SENS/SQL control to the counterclockwise stop. Note the voltage at A2J8.</td>
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<td></td>
<td>Reconnect the audio oscillator to TP2 and TP3 of A9 module extender. Set the audio oscillator frequency to 600 Hz and adjust the output for 3 volts at A2J5.</td>
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<td>Note the voltage at A2J8.</td>
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<td>E</td>
<td>Go to step 11.</td>
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<td>STEP</td>
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<td>10</td>
<td>Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-000-002) above MCN 1284 or below MCN 1284 but including modification per 618T-2/3 Service Bulletin No 32 or 618T-2B/3B Service Bulletin No 14</td>
<td></td>
<td>Turn power off. Set 618T-( ) squelch enable switch S3 under 618T front panel to SQL IN. Disconnect all antenna inputs to the 618T-( ). NOTE: If necessary, position 618T-( ) on its side to gain access to squelch circuits in rf oscillator module.</td>
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<tr>
<td>A</td>
<td>Squelch balance check</td>
<td></td>
<td>Turn power on. Rotate 714E-( ) RF SENS/SQL control to clockwise stop. Check the noise level at A2J6 and then A2J7 using Ballantine 310A.</td>
<td>Noise level at A2J7 should be 1.5 to 2.5 dB higher than at A2J6.</td>
<td>A2R1 improperly adjusted.</td>
<td>Adjust A2R1 and repeat step 10A.</td>
</tr>
<tr>
<td>B</td>
<td>Positive over-ride trip point check</td>
<td></td>
<td>Turn power off. Rotate 714E-( ) RF SENS/SQL control to counterclockwise stop. Remove AM/audio amplifier module A9 and install module extender. Do not plug AM/audio amplifier module into extender. Apply power and set 714E-( ) mode switch to USB. Use HP 410B VTVVM dc probe and measure dc voltage from A2A2U1-6 to ground on modules with service bulletin modification or from A2A2U1A-1 to ground on modules with MCN 1284 and above.</td>
<td>NMT 2.5 volts dc.</td>
<td>A2A3R8 on modules with service bulletin modification or A2A2R41 on modules with MCN 1284 and above misadjusted.</td>
<td>Plug A9 module into module extender. Set 714E-( ) to 7,300 MHz in USB mode. Set RF SENS/SQL control to the counterclockwise stop position.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>10B</td>
<td>(Cont)</td>
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<td></td>
<td>Clip 410-ohm ±10% resistor from TP2 on rf oscillator module extender to ground. Connect a vtmv between A2A3U1-6 or A2A2U1A-1 and ground. Adjust R8 in a counterclockwise direction (R41 in a clockwise direction) until vtmv indicates less than +2.5 Vdc. Adjust R8 in a clockwise direction (R41 in a counterclockwise direction) until vtmv indication increases to a level of between +14 and +18 Vdc. Remove 410-ohm resistor. Remove A9 module from module extender and repeat step 10B.</td>
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</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<td>10B</td>
<td>(Cont)</td>
<td></td>
<td>Connect an 820-ohm ±10% resistor from TP2 on the rf oscillator module extender to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.</td>
<td>NMT 2.5 volts dc.</td>
<td>A2A3R8 or A2A2R41 mis-adjusted.</td>
<td>Refer to previous remedy for adjustment for A2A3R8 or A2A2R41.</td>
</tr>
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<td></td>
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<td></td>
<td>Replace the 820-ohm resistor with a 330-ohm ±10% resistor from TP2 to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.</td>
<td>NLT 14 volts dc.</td>
<td>A2A3R8 or A2A2R41 mis-adjusted.</td>
<td>Refer to previous remedy for adjustment of A2A3R8 or A2A2R41.</td>
</tr>
<tr>
<td>C</td>
<td>Positive over-ride operation and high channel check</td>
<td></td>
<td>Connect an audio oscillator to TP2 and TP3 on AM/audio module extender. Connect Bellantine 310A to A2J5. Adjust audio oscillator to approximately 2.2 kHz at a level providing 5 Vrms at A2J5.</td>
<td>Audio should be present in headphones at 615T-1 channel audio output.</td>
<td>NMT 2.5 volts dc.</td>
<td>-Benz camcorder should be present in headphones.</td>
</tr>
<tr>
<td>D</td>
<td>Squelch delay check</td>
<td></td>
<td>With vtm measure dc voltage at A2J5.</td>
<td>1 to 5 seconds.</td>
<td></td>
<td>Refer to previous remedy for adjustment of A2A3R8 or A2A2R41.</td>
</tr>
<tr>
<td>E</td>
<td>Low channel check</td>
<td></td>
<td>Remove 330-ohm resistor, and note time lapse for audio to be removed from headphones.</td>
<td>With vtm, measure dc voltage at A2J5.</td>
<td>NMT 2.5 volts dc.</td>
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<td></td>
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<td></td>
<td>Change audio oscillator to approximately 500 Hz at a level providing 5 Vrms at A2J5.</td>
<td>Audio should be present in headphones.</td>
<td>NLT 14 volts dc.</td>
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<td></td>
<td></td>
<td></td>
<td>With vtm, measure dc voltage at A2J5.</td>
<td></td>
<td></td>
<td>Refer to previous remedy for adjustment of A2A3R8 or A2A2R41.</td>
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<td>STEP</td>
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<td>11</td>
<td>Disconnect</td>
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**TEST EQUIPMENT**

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<tr>
<th>TEST PROCEDURE</th>
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<tbody>
<tr>
<td>Turn power off.</td>
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<tr>
<td>Disconnect all test equipment.</td>
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<tr>
<td>Remove A2 from module extender.</td>
</tr>
<tr>
<td>Remove module extenders from 618T( ) chassis.</td>
</tr>
<tr>
<td>Replace dust cover on A2.</td>
</tr>
<tr>
<td>Replace A2 and A9 in 618T( ) chassis.</td>
</tr>
</tbody>
</table>

**PROBABLE CAUSE OF ABNORMAL RESULT**

**REMEDY**

<table>
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</thead>
</table>

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*Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 13 of 13)*

Figure 708

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RF Oscillator A2, Late Model, Checks and Adjustments
Figure 769

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23-10-0
Pages 749/750
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Boonton 81-C RF VTVM HP-410B VTVM RF dummy load Oscilloscope Frequency counter Signal generator 6-db attenuator Ballantine 310A VTVM</td>
<td>NOTE: This test procedure applies to the early model rf oscillator A2, Collins part number 544-9235-005 only. Refer to figure 711 for location of all test points on A2 and module extender. Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section. Remove dust cover from A2 to perform this step. The rf oscillator module ambient temperature should be between +20 °C (+68 °F) and +30 °C (+86 °F) while performing this test. Connect 618T-( ), 678P-( ), and dummy load as shown in figure 702. Connect rf oscillator A2 through module extender to 618T-( ) chassis. <strong>NOTE:</strong> Unless otherwise specified, the steps are performed with power on, 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>3</td>
<td>3-MHz reference oscillator check</td>
<td>Connect frequency counter to A2J6. Check frequency at A2J6. Connect Boonton 91-C RF VTM to A2J6. Check voltage at A2J6.</td>
<td>3 MHz ±2 Hz.</td>
<td>3-MHz oscillator frequency incorrectly adjusted.</td>
<td>Adjust A2C1.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>500-kHz reference output to MHz-frequency stabilizer A10 check</td>
<td>Connect Boonton 91-C RF VTM to A2J3. Check voltage at A2J3. Connect frequency counter to A2J3. Check frequency at A2J3.</td>
<td>From 1.0 to 1.2 vrms.</td>
<td>A2Q2 through A2Q5 and associated circuits.</td>
<td>Check A2Q2 through A2Q5 and associated circuits.</td>
<td></td>
</tr>
</tbody>
</table>
Subject: Module checks and adjustments, RF Oscillator A2, Early Model, Figure 710

In step 5, change the voltage test result for A2J4 to read 1.0 to 1.4 vrms.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>500-kHz carrier output to balanced modulator check</td>
<td>Connect Boonton 91-C RF VTVM to A2J4. Check voltage at A2J4. Connect frequency counter to A2J4. Check frequency at A2J4.</td>
<td>1.5 to 1.9 vrms.</td>
<td>A2Q6 and associated circuit.</td>
<td>Check A2Q6 and associated circuit.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>100-kHz reference output check</td>
<td>Connect Boonton 91-C RF VTVM to A2J1. Check voltage at A2J1. Connect frequency counter to A2J1. Check frequency at A2J1.</td>
<td>Not less than 0.4 vrms.</td>
<td>A2Q8 through A2Q11 and associated circuits.</td>
<td>Check A2Q8 through A2Q11 and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Divider bandwidth adjustment</td>
<td>Unsolder coaxial cable at junction of A2C4 and A2C5. Connect signal generator through 6-db attenuator to A2J5 and oscilloscope vertical input. Connect frequency counter to oscilloscope vertical output. Connect oscilloscope horizontal input to A2J4. Set signal generator output to 3 MHz, 50 mv (as indicated by frequency counter).</td>
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<tr>
<td>STEP (Cont)</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>7 (Cont)</td>
<td></td>
<td></td>
<td>Check waveform at A2J4.</td>
<td>6-to-1 Lissajous pattern.</td>
<td>A2C10 and/or A2C14 incorrectly adjusted.</td>
<td>Adjust A2C10 and/or A2C14.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>NOTE:</strong> Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.92 to 3.08 MHz.</td>
<td></td>
<td>NOTE: A2C10 adjusts bandwidth above 3 MHz. A2C14 adjusts bandwidth below 3 MHz.</td>
</tr>
<tr>
<td></td>
<td>Increase signal generator output level to 150 mv.</td>
<td></td>
<td>Check waveform at A2J4.</td>
<td>6-to-1 Lissajous pattern. See note above.</td>
<td>A2C10 and/or A2C14 incorrectly adjusted.</td>
<td>Adjust A2C10 and/or A2C14. See note above.</td>
</tr>
<tr>
<td></td>
<td>Connect oscilloscope horizontal input to A2J4, vertical input to A2J1.</td>
<td></td>
<td>Set signal generator to 3 MHz with 50 mv output.</td>
<td>5-to-1 Lissajous pattern.</td>
<td>A2C29 and/or A2C34 incorrectly adjusted.</td>
<td>Adjust A2C29 and/or A2C34.</td>
</tr>
<tr>
<td></td>
<td>Check waveform at A2J1.</td>
<td></td>
<td></td>
<td><strong>NOTE:</strong> Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.9 to 3.0 MHz.</td>
<td></td>
<td>NOTE: A2C29 adjusts the bandwidth above 3 MHz. A2C34 adjusts the bandwidth below 3 MHz.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>7 (Cont)</td>
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<td></td>
<td>Increase signal generator output level to 150 mv. Check waveform at A2J1.</td>
<td>5-to-1 Lissajous pattern. See note above.</td>
<td>A2C20 and/or A2C34 incorrectly adjusted.</td>
<td>Adjust A2C20 and/or A2C34. See note above.</td>
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<tr>
<td>8</td>
<td>Crystal oven check</td>
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<td></td>
<td>CAUTION: BALLANTINE 310A MUST BE UNGROUNDED FOR THIS STEP. Connect Ballantine 310A VTVM across terminals of A2T3. Check voltage between A2T3 terminal 1 and terminal 3 (this is the output voltage). Connect Ballantine 310A VTVM across A2CR1. Check voltage across A2CR1 (this is the input voltage). Divide output voltage by input voltage.</td>
<td>Several volts (record this voltage). Several hundred microvolts (record this voltage). Quotient should be approximately 6000.</td>
<td>A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.</td>
<td>Check A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.</td>
</tr>
<tr>
<td>9 (Cont)</td>
<td>Disconnect</td>
<td></td>
<td>Turn power off. Disconnect all test equipment. Remove A2 from module extender. Remove module extender from 618T-() chassis.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
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<tr>
<td>9 (Cont)</td>
<td></td>
<td>Replace dust cover on A2.</td>
<td>Replace A2 in 618T-( ) chassis.</td>
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</table>
RF Oscillator A2, Early Model, Checks and Adjustments
Figure 711
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<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-() Test Harness</td>
<td><strong>NOTE:</strong> AM/audio amplifier A9 checks and adjustments must be performed before testing this module.</td>
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<td></td>
<td></td>
<td>678Y-() Maintenance Kit</td>
<td>Refer to figure 713 for location of all test points on A3 and module extender.</td>
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<td>678Z-1 Function Test Set</td>
<td>Remove if. translator A3 from 618T-() and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A3 to perform this step.</td>
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<td>714E-() Radio Set Control</td>
<td>Connect 618T-(), 678P-(), and rf dummy load as shown in figure 702.</td>
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<td>HP-410B VTVM</td>
<td>Connect if. translator A3 through module extender to 618T-() chassis.</td>
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<tr>
<td></td>
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<td>Ballantine 316A VTVM</td>
<td><strong>NOTE:</strong> Unless otherwise specified, all steps are performed with 714E-() in AM mode, no signal in, and 618T-() unkeyed.</td>
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<td>Boonton 91-C RF VTVM</td>
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<td>Frequency counter</td>
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<td>Rf dummy load</td>
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<td>HP-711A Power Supply</td>
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<td>Spectrum analyzer</td>
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<tr>
<td>2</td>
<td>Transistor supply voltage check</td>
<td>Connect HP-410B VTVM dc probe to TP5 on module extender.</td>
<td>Check voltage at TP5 on module extender.</td>
<td>+17.0 to +19.0 Vdc.</td>
<td>Low-voltage power supply A5.</td>
<td>Check low-voltage power supply A5.</td>
</tr>
<tr>
<td>3</td>
<td>Tgc voltage check</td>
<td>Connect HP-410B VTVM dc probe to A3J2, using a coaxial jumper.</td>
<td>Set 714E-( ) to 7.300 MHz.</td>
<td></td>
<td>A3Q6 and associated circuit.</td>
<td>Check A3Q6 and associated circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The 618T-( ) requires a minimum warmup period of 15 minutes.</td>
<td>Key 618T-( ).</td>
<td>+10 to +14 vdc.</td>
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<td>Check voltage at A3J2.</td>
<td>Unkey 618T-( ).</td>
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<tr>
<td>4</td>
<td>500-kHz carrier input to balanced modulator check</td>
<td>Connect HP-410B VTVM ac probe to A3J4.</td>
<td>Key 618T-( ).</td>
<td>1.5 to 1.9 vrms.</td>
<td>A2Q4, A2Q5, A2Q6, and associated circuits.</td>
<td>Check A2Q4, A2Q5, A2Q6, and associated circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check voltage at A3J4.</td>
<td>Unkey 618T-( ).</td>
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<tr>
<td>5</td>
<td>SSB receive if. alignment</td>
<td>Connect coaxial jumper between IF, OUTPUT jack and unmarked coaxial connector on A3 module extender (figure 713).</td>
<td>Set 714E-( ) to USB.</td>
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<tr>
<td>STEP</td>
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<tr>
<td>5</td>
<td>(Cont)</td>
<td></td>
<td>Set 618T-( ) front panel AUDIO control fully clockwise. Disconnect jumper from RCVR IF, IN connector at left front of 618T-( ). Connect HP-410B VTVM ac probe to 678P-( ) HEADSET jack. Connect signal generator through 6-db attenuator to a BNC T-connector. Connect frequency counter to T-connector. Connect remaining portion of T-connector to RCVR IF, IN jack at front of 618T-( ). Set signal generator for 500.3-kHz, CW output. Adjust signal generator output level for 2 to 3 volts at 678P-( ) HEADSET jack. <strong>NOTE:</strong> To prevent overloading, maintain voltage at HEADSET jack below 3.5 v. Do this by reducing signal generator output level as circuit gain is increased. Adjust A3L4, A3L5, and A3T2 to peak voltage at HEADSET jack.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<td>5 (Cont)</td>
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<td></td>
<td>Tune signal generator to 501.0 kfhz.</td>
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<td></td>
<td>Adjust A3C25 and A3C29 to peak voltage at HEADSET jack.</td>
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<td></td>
<td>Set 714E-( ) to LSB.</td>
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<td></td>
<td>Tune signal generator to 499.0 kfhz.</td>
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<td></td>
<td>Adjust A3C27 and A3C32 to peak voltage at HEADSET jack.</td>
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<td></td>
<td>Determine which sideband has lower gain by keeping signal generator output level constant while switching between LSB (with signal generator tuned to 499.0 kfhz) and USB (with signal generator tuned to 501.0 kfhz). Lower gain sideband has lowest voltage at HEADSET jack.</td>
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<td></td>
<td>Set 714E-( ) to the lower gain sideband. Adjust signal generator output level for 5 V at HEADSET jack.</td>
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<td></td>
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<td></td>
<td>Note signal generator output level.</td>
<td>Between 40.0 and 100.0 uv.</td>
<td>Value of A3R5.</td>
<td>Select value of A3R5 that provides required results from complement given in the 618T-( ) illustrated parts catalog.</td>
</tr>
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<td>5 (Cont)</td>
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<td>Disconnect signal generator from RCVR IF, IN connector. Reconnect coaxial jumper to RCVR IF, IN connector. Reset 618T-( ) front panel AUDIO control for 5.5 v at the HEADSET jack by performing step 4.C of figure 704.</td>
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<tr>
<td>6</td>
<td>SSB/AM transmit if. alignment</td>
<td></td>
<td>NOTE: Perform the SSB receive if. alignment procedure, step 5, before performing this procedure. Connect coaxial jumper between RF LOAD and IF OUTPUT coaxial connectors on A3 module extender. Connect Boonton 91-C RF VTVM to RF test point on A3 module extender. Set 714E-( ) to USB. Place short across A3C9 to utilize carrier for alignment. Key 618T-( ). Adjust trimmer on RF LOAD block on A3 module extender for peak indication on Boonton 91-C RF VTVM. Adjust A3T1 and A3L2 for a peak on the Boonton 91-C RF VTVM.</td>
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</table>
Subject: Module checks and adjustments, IF Translator A3, Figure 712.

Replace the portion of test step 6.0 that exists on pages 763 and 764 with sheets 2 and 3 of this temporary revision. Insert sheet 2 facing page 763 and sheet 3 facing page 764.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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<tr>
<td>6</td>
<td>(Cont)</td>
<td></td>
<td>Remove short from A3C9.</td>
<td>0.24 to 0.38 V.</td>
<td>Value of A3R42. Select value of A3R42 that will provide required results from complement given in 618T( ) illustrated parts catalog.</td>
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<td></td>
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<td></td>
<td>Set 714E( ) to AM.</td>
<td>NOTE: Result based on a 1.7 V rms carrier reading at A3J4. See test step 4.</td>
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<td></td>
<td>Check voltage on Boonton 91-C RF VTM.</td>
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<td></td>
<td>Connect 678Z-1 and audio oscillator as shown in figure 702.</td>
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<td></td>
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<td></td>
<td>Key 618T( ) and set audio oscillator output to 1.0 kHz, 0.25 v as measured with Ballantine 310A VTM at 678Z-1 TEST POINT jack.</td>
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<td></td>
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<td>Determine the frequency which results in the lowest gain on USB or LSB in the range of 900 to 2800 Hz (for wideband transceivers 618T-1/1B/2B/3B/3/3B) or 900 to 2300 Hz (for narrowband transceivers 618T-4/4B/5B/6B by keying the 618T( ) and switching between USB and LSB sidebands. The sideband setting which gives the lowest voltage on the Boonton91-C RT VTM at the determined frequency, is the lower gain sideband.</td>
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<td></td>
<td>Set 714E( ) to lower gain sideband and set audio oscillator to the lowest gain frequency.</td>
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<td>STEP</td>
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<tr>
<td>6 (Cont)</td>
<td>Check voltage on the Boonton 91-C RF VTVM.</td>
<td></td>
<td>0.31 TO 0.39 v.</td>
<td>Value of A3R2.</td>
<td>Select value of A3R2 that will provide results from the values given in the 618T (-) illustrated parts catalog.</td>
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<tr>
<td></td>
<td>Set 714E(-) to higher gain sideband.</td>
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<td></td>
<td>While keying the 618T(-), determine the frequency in the 900 to 2800 Hz range (for wideband transceivers 618T-1/1B/2/2B/3/3B) or 900 to 2300 Hz range (for narrowband transceivers 618T-4/4B/5/5B/6/6B) which results in the lowest gain.</td>
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<td></td>
<td>Set audio oscillator to lowest gain frequency.</td>
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<tr>
<td></td>
<td>Check voltage on the Boonton 91-C RF VTVM.</td>
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<td></td>
<td>Disconnect audio oscillator.</td>
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<td>STEP (Cont)</td>
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<td>6</td>
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<td></td>
<td>Remove short from A3C9.</td>
<td>0.24 to 0.38 v.</td>
<td>Value of A3R42.</td>
<td>Select value of A3R42 that will provide required results from complement given in 618T-( ) illustrated parts catalog.</td>
</tr>
<tr>
<td></td>
<td>(Cont)</td>
<td></td>
<td>Set 714E-( ) to AM.</td>
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<td></td>
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<td></td>
<td>Check voltage on Boonton 91-C RF VTVM.</td>
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<td></td>
<td>Connect 678Z-1 and audio oscillator as shown in figure 702.</td>
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<tr>
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<td></td>
<td>Key 618T-( ) and set audio oscillator output to 1.0 kHz, 0.25 v as measured with Ballantine 310A VTVM at 678Z-1 TEST POINT jack.</td>
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<td></td>
<td>Determine lower gain side-band by keying 618T-( ) and switching between USB and LSB. The setting that gives the lower voltage on the Boonton 91-C RF VTVM is the lower gain sideband.</td>
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<td></td>
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<td></td>
<td>Set 714E-( ) to lower gain sideband.</td>
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<tr>
<td>5 (Cont)</td>
<td>Carrier balance adjustment</td>
<td>Check voltage on the Boonton 91-C RF VTVM.</td>
<td>0.31 to 0.39 v.</td>
<td>Value of A3R2.</td>
<td>Select value of A3R2 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.</td>
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<tr>
<td></td>
<td></td>
<td>Set 714E-( ) to higher gain sideband.</td>
<td>Within 2 db of voltage noted in previous step.</td>
<td>Value of A3R45.</td>
<td>Select value of A3R45 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.</td>
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<td></td>
<td>Disconnect audio oscillator.</td>
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<td>7</td>
<td>Carrier balance adjustment</td>
<td>NOTE: Step 7A of this procedure does not produce ideal carrier balance. For best results, proceed to step 7B. Step 7B requires the use of a spectrum analyzer.</td>
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<tr>
<td>A</td>
<td>Carrier balance adjustment</td>
<td>Connect coaxial jumper between RF LOAD and IF, OUTPUT coaxial connectors of A3 module extender.</td>
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<td></td>
<td>Connect Boonton 91-C RF VTVM to RF test point on A3 module extender.</td>
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<td></td>
<td>Set 714E-( ) to USB, 2.100 MHz.</td>
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<td></td>
<td></td>
<td>Key 618T-( ).</td>
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<tr>
<td>7A (Cont)</td>
<td>Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Set 714E-( ) to LSB. Key 618T-( ). Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Repeat above procedure until null voltages are approximately equal. Override tgc using 678Z-1 Function Test Set as follows: Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J2-IF TRANS jack to A3J2. Connect 678Z-1 J2-FREQ DIV jack to A1A2J2. <strong>NOTE:</strong> B versions of the 618T-( ) have no module A1 for TGC override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Set 678Z-1 TGC and CAPTURE RANGE control counterclockwise and FUNCTION SELECTOR to TGC OVERRIDE.</td>
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<td>7B</td>
<td>(Cont)</td>
<td></td>
<td>Connect output of audio oscillator to 678Z-1 NO. 1 AUDIO IN.</td>
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<td>Set output of audio oscillator to 900 Hz.</td>
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<td>Connect output of second audio oscillator to 678Z-1 NO. 2 AUDIO IN.</td>
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<td>Set output of second audio oscillator at 2000 Hz for 618T-1/1B/2B/3B/3B or 2300 Hz for 618T-4/4B/5B/6B.</td>
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<td></td>
<td>Set 714E-( ) to USB, 2.100 MHz.</td>
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<td>Adjust output level of each audio oscillator, while keying 618T-( ), to provide 0.1 volt by alternately monitoring each output with the HP-410B.</td>
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<td>Connect vmm positive probe to A11J1 and common probe to A11J4. Refer to figure 729 for location of these jacks.</td>
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<td>Monitor vmm while keying 618T-( ).</td>
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<td>Slowly adjust 678Z-1 TGC and CAPTURE RANGE control, while keying 618T-( ), to increase drive to power amplifier module. Stop at point that voltage indicated on vmm begins to change. This point is grid current threshold.</td>
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<td>7B</td>
<td>(Cont)</td>
<td>Unkey 618T-()</td>
<td>Connect spectrum analyzer, through 2- to 8-MHz capacitive divider, to 618T-() rf output. Key 618T-(). Monitor rf output voltage with spectrum analyzer, and alternately adjust ASC9 and A3R9 for minimum carrier level. Set 714E-( ) to LSB. Monitor rf output voltage with spectrum analyzer, and alternately adjust ASC9 and A3R9 for minimum carrier level. Alternately adjust ASC9 and A3R9 in USB and LSB until best compromise is reached. Adjust tgc for correct voltage level according to unit performance test procedures, paragraph 3.H, figure 704.</td>
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<td>8</td>
<td>Disconnect</td>
<td>Turn power off. Disconnect all test equipment.</td>
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<td>(Cont)</td>
<td></td>
<td>Remove A3 from module extender.</td>
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<td>Remove module extender from 618T-(-) chassis.</td>
<td>Replace A3 in 618T-(-) chassis.</td>
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<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness, 678Y-( ) Maintenance Kit, 678Z-1 Function Test Set, 714E-( ) Radio Set Control, HP-410B VTVM, Signal generator, 6-db attenuator, Oscilloscope, Frequency counter, Fluke 801B VTVM, Temperature box (range from -50 °C to +80 °C), Rf dummy load</td>
<td>This test procedure applies to both early and late models of kHz-frequency stabilizer A4. Refer to figure 715 for location of all test points on A4. Remove kHz-frequency stabilizer A4 from 618T-( ) and perform visual inspection as described in the inspection/check section of this manual. Remove dust cover from A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect kHz-frequency stabilizer A4 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.</td>
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<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
<td>REQUIRED TEST RESULT</td>
<td>TEST PROCEDURE</td>
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<tr>
<td>Low-voltage power supply A6.</td>
<td>Check supply voltage at A6J3.</td>
<td>17.0 to 19.0 Vdc.</td>
<td>Connect HP-410B VTM dc probe to A4A1J2.</td>
<td>Transistor voltage check.</td>
<td>2</td>
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<tr>
<td>Vfo output at A12J5.</td>
<td></td>
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<td>Check waveform at A4A1J1.</td>
<td>Vfo input check.</td>
<td>3</td>
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<td>Connect oscilloscope vertical input to A4A1J1.</td>
<td>Perform step 26 of this test procedure.</td>
<td>4</td>
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<td>Set oscilloscope for 0.5 V/cm, 20 us/cm for units with 70K-5 20 us/cm for units with 70K-3.</td>
<td>Perform step 27 of this test procedure.</td>
<td>5</td>
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</table>

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 2 of 20)
Figure 714
Dec 1/72

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<table>
<thead>
<tr>
<th>STEP</th>
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<td>8</td>
<td>Signal channel if. input check</td>
<td></td>
<td>Set oscilloscope for 50.0 mv/cm, 2.0 us/cm.</td>
<td>Approximately 50 mV p-p minimum.</td>
<td>A4A1Q3, A4FL1, and associated circuits.</td>
<td>Check A4A1Q3, A4FL1, and associated circuits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A4J7.</td>
<td>Check waveform at A4J7.</td>
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<tr>
<td>9</td>
<td>Reference channel if. input check</td>
<td></td>
<td>Set oscilloscope for 50.0 mv/cm, 2.0 us/cm.</td>
<td></td>
<td>A4A5Q15, A4FL2, and associated circuits.</td>
<td>Check A4A5Q15, A4FL2, and associated circuits.</td>
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<tr>
<td></td>
<td></td>
<td>Connect oscilloscope vertical input to A4J8.</td>
<td>Check waveform at A4J8.</td>
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<tr>
<td>10</td>
<td>First signal mixer input check</td>
<td></td>
<td>Set oscilloscope for 50.0 mv/cm, 100.0 us/cm.</td>
<td></td>
<td>A4A1Q1 and associated circuit.</td>
<td>Check A4A1Q1 and associated circuit.</td>
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<td>Connect oscilloscope vertical input to A4A1TP1.</td>
<td>Check waveform at A4A1TP1.</td>
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<td>11</td>
<td>Second signal mixer input check</td>
<td></td>
<td>Set oscilloscope for 100.0 mv/cm, 100.0 us/cm.</td>
<td></td>
<td>A4A1Q2 and associated circuit.</td>
<td>Check A4A1Q2 and associated circuit.</td>
</tr>
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<td>Connect oscilloscope vertical input to A4A1TP2.</td>
<td>Check waveform at A4A1TP2.</td>
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<td>12</td>
<td>FL1 output/ Q5 input check</td>
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<td>Used for adjustment only.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<td>13</td>
<td>Q6 output/ Q7 input check</td>
<td>Set oscilloscope for 1.0 v/cm, 2.0 us/cm.</td>
<td>Connect oscilloscope vertical input to A4A2TP4. Check waveform at A4A2TP4.</td>
<td><img src="image" alt="Waveform" /></td>
<td>A4A2Q5, A4A2Q6, and associated circuits.</td>
<td>Check A4A2Q5, A4A2Q6, and associated circuits.</td>
</tr>
<tr>
<td>14</td>
<td>Q8 output/ signal input to phase discriminator check</td>
<td>Set oscilloscope for 5.0 v/cm, 2.0 us/cm.</td>
<td>Connect oscilloscope vertical input to A4A2TP8. Check waveform at A4A2TP5.</td>
<td><img src="image" alt="Waveform" /></td>
<td>A4A2Q7, A4A2Q8, and associated circuits.</td>
<td>Check A4A2Q7, A4A2Q8, and associated circuits.</td>
</tr>
<tr>
<td>15</td>
<td>Frequency discriminator dc output check</td>
<td>Ground A4A8TP15. Connect signal generator output through 6-db attenuator to frequency counter and A4J7. Set signal generator for output of 40 mv at 260,000 ±5 Hz. Connect Fluke 801B VTVM between A4A2TP6 and A4A2TP7.</td>
<td>-5 to +5 mvdc.</td>
<td>Frequency discriminator output.</td>
<td>Check frequency discriminator circuit.</td>
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<tr>
<td>Probable Cause of Abnormal Result</td>
<td>Remedy</td>
<td>Required Test Result</td>
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</table>

**Test Procedure**

- Ground A4A67TP12.
- Connect signal generator output through 6-dB attenuator to frequency counter and A4A7.
- Set signal generator for 40-50 kHz output at 250,000 ± Hz.
- Connect Block 30-1 TVM between A4A21P1 and ground.
- Disconnect signal generator and unground A4A67TP15.
- Set oscilloscope for 50.0 mv/cm, 20 μs/cm.
- Check waveform at A4A7TP8.
- Connect oscilloscope vertical input to A4A7TP8.
- Connect HP-410B TVM dc probe to A4A3TP9.
- Check voltage at A4A7TP9.
- Connect signal generator for 2.0 ν/cm, 20.0 μs/cm.
- Set oscilloscope vertical input to A4A7TP10.
- Check waveform at A4A7TP10.

**Test Equipment**

- Spectrum generator output check
- Keyer/keyed oscillator supply voltage check
- Keyed oscillator output check

**Step Description**

- Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 6 of 20)
- Figure 714

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<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
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<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
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<tbody>
<tr>
<td>19</td>
<td>10-kHz pulse input from frequency divider A1 check</td>
<td></td>
<td>Set oscilloscope for 2.0 v/cm, 50.0 us/cm. Connect oscilloscope vertical input to A4A3TP11. Check waveform at A4A3TP11.</td>
<td>A1A1Q1 through A1A1Q6 and associated circuits.</td>
<td>Check A1A1Q1 through A1A1Q6 and associated circuits.</td>
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<tr>
<td>20</td>
<td>Reference mixer input check</td>
<td></td>
<td>Set oscilloscope to 100.0 mv/cm, 1.0 ms/cm. Connect oscilloscope vertical input to A4A5TP12. Check waveform at A4A5TP12.</td>
<td>A1A3Q14 and associated circuit.</td>
<td>Check A1A3Q14 and associated circuit.</td>
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<td>21</td>
<td>Q17 output/ Q18 input check</td>
<td></td>
<td>Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP14. Check waveform at A4A6TP14.</td>
<td>A4A6Q16, A4A6Q17, and associated circuits.</td>
<td>Check A4A6Q16, A4A6Q17, and associated circuits.</td>
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<td>22</td>
<td>Q19 output/ref. input to phase discriminator check</td>
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<td>Set oscilloscope for 10.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP15. Check waveform at A4A6TP15.</td>
<td>A4A6Q18, A4A6Q19, and associated circuits.</td>
<td>Check A4A6Q18, A4A6Q19, and associated circuits.</td>
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<td>TEST PROCEDURE</td>
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<tr>
<td>Set oscilloscope for 5.0 v/cm, 2.0 us/cm.</td>
<td>Check AAA2T1.</td>
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<tr>
<td>Connect oscilloscope vertical input to A4A6TP16.</td>
<td>Check phase discriminator circuit.</td>
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<tr>
<td>Ground AAA2TP6 and A4A6TP15.</td>
<td>Check voltage at A4A6TP17.</td>
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<tr>
<td>Using Fluke 601E, check voltage at A4A6TP17.</td>
<td>-5 to +5 mvdc.</td>
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<tr>
<td>Check voltage at A4A6TP18.</td>
<td>-5 to +5 mvdc.</td>
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<tr>
<td>Set oscilloscope for 5.0 v/cm, 20.0 us/cm.</td>
<td>Check waveform at A4A3TP18.</td>
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<tr>
<td>Connect oscilloscope vertical input to A4A3TP18.</td>
<td>NOTE: Do not perform this step unless it is known that 6737.1 is in accurate calibration.</td>
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<tr>
<td>23 Signal input to phase discriminator check.</td>
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<td>24 Phase discriminator dc output check.</td>
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<tr>
<td>25 Keyor output check.</td>
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<tr>
<td>26 Vf bias adjustment.</td>
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<td>STEP</td>
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<tr>
<td>26A</td>
<td>Late model, Collins part number 528-0112-005 only</td>
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</table>
Subject: Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 10 of 20), Figure 714.

Correct early model Collins part number in DESCRIPTION column of step 26B from 544-2988-005 to 544-9288-005.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBALE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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<tbody>
<tr>
<td>26B</td>
<td>Early model, Collins part number 544-2988-005</td>
<td></td>
<td>Connect 678Z-1 GRND jack to 618T-( ) chassis.</td>
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<td></td>
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<td></td>
<td>Connect 678Z-1 J1-KC STAB jack to A4A1J1.</td>
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<td></td>
<td>Connect 678Z-1 J3-KC STAB jack to A4A4J3.</td>
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<td></td>
<td></td>
<td></td>
<td>Ground A4A2TP5.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.</td>
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<td></td>
<td></td>
<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR switch to 70K-3 VFO BIAS.</td>
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<td></td>
<td>Operate X10 METER SENSITIVITY switch several times.</td>
<td>FUNCTION METER must indicate 0.</td>
<td>A4A4R62 incorrectly adjusted.</td>
<td>Adjust A4A4R62.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unground A4A2TP5.</td>
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<td></td>
<td>Disconnect test leads from A4A1J1, A4A4J3, and chassis.</td>
<td></td>
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<tr>
<td>27</td>
<td>Keyed oscillator adjustment</td>
<td></td>
<td>Connect 678Z-1 J4-KC STAB jack to A4A3J4.</td>
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<td>(Cont)</td>
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<td></td>
<td>Connect 678Z-1 GRND jack to 618T-( ) chassis.</td>
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<td>STEP</td>
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<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<td>27</td>
<td>(Cont)</td>
<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL.</td>
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<td></td>
<td>Set 678Z-1 LEVEL SET control for FUNCTION METER indication of +10.</td>
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<td><strong>CAUTION:</strong> DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.</td>
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<td></td>
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<td></td>
<td>Set 714E-( ) to X.000 MHz.</td>
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<td></td>
<td>Set 678Z-1 FUNCTION SELECTOR switch to 10KC CONTROL BIAS (+20 V).</td>
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<td>Operate X10 METER SENSITIVITY switch several times.</td>
<td>FUNCTION METER should indicate 0.</td>
<td>A4A4R63 incorrectly adjusted.</td>
<td>Adjust A4A4R63.</td>
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<td></td>
<td>Connect HP-410B VTVM dc probe to A4A4J4 and check level.</td>
<td>Check voltage with 714E-( ) set at each frequency listed.</td>
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<td>STEP</td>
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<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<td>27</td>
<td>(Cont)</td>
<td></td>
<td>Connect oscilloscope vertical input to A4J7 (output of A4F1-01)</td>
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<td></td>
<td>Set 714E-( ) to X.000 MHz.</td>
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<td></td>
<td>Adjust A4A3C54 and A4A3C55 to provide peak waveform at A4J7.</td>
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<td></td>
<td>Set 714E-( ) to X.999 MHz.</td>
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<td>Adjust A4A3T2-P and A4A3T2-S to provide peak waveform at A4J7.</td>
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<td>Disconnect oscilloscope from A4J7.</td>
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<tr>
<td>28</td>
<td>Digit oscillator input check</td>
<td></td>
<td>Connect HP-410B VTM do probe to A4A4J6.</td>
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<td>Set 714E-( ) to X.XXXX MHz and check voltage with HP-410B.</td>
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<td>Check voltage with 714E-( ) set at each frequency listed (voltages approximate).</td>
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<td>Connect frequency counter to vertical output of oscilloscope.</td>
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<tr>
<td>Step</td>
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<td>28 (Cont)</td>
<td><strong>Remedy</strong></td>
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<td><strong>Probable Cause of Abnormal Result</strong></td>
<td><strong>Required Test Result</strong></td>
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<tr>
<td>Adjust A44A459 to provide required results.</td>
<td>A44A459 incorrectly adjusted.</td>
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<tr>
<td>Set T1E-( ) to 2.006 MHz.</td>
<td>Counter should indicate 395,850 to 396,150 kHz.</td>
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<tr>
<td>Set T1E-( ) to 2.006 MHz.</td>
<td>Counter should indicate 395,850 to 396,150 kHz.</td>
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<tr>
<td>Connect vertical input of oscilloscope to A44A475 through VREF- test probe no. 1.</td>
<td>Counter should indicate 295,850 to 296,150 kHz.</td>
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<tr>
<td><strong>Test Procedure</strong></td>
<td><strong>Note:</strong> If necessary, readjust A44A459 and A44A14 until proper frequency indications are obtained. Note: 2.006 and 396.000 MHz frequency settings.</td>
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<td>Set T1E-( ) to each of the frequencies listed and note the frequency counter indication.</td>
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<td><strong>Note:</strong> If frequency at each specified setting is not within specified limits, replace A44A459A and A44A14A. A change of +5 kHz will raise the frequency setting about 10 Hz. Leave a minimum capacitance of 0.020 μF.</td>
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<tr>
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<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
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<td>REMEDY</td>
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<tr>
<td>28 (Cont)</td>
<td>Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 14 of 20)</td>
<td></td>
<td>20 pf in the circuit. These capacitors are selected from the complement listed in the 618T-( ) illustrated parts catalog. Connect kHz-frequency stabilizer A4 to 618T-( ) chassis with an 18-inch pendant cable. <strong>NOTE:</strong> The remainder of step 28 is optional. Place A4 in temperature box. Check all frequencies listed in previous steps at temperatures of -55, -5, +5, +50, and +80 °C. Frequency at each digit setting must be within ±200 Hz of frequencies listed in previous step. Remove A4 from temperature box and replace on A4 module extender.</td>
<td>A4A4C64 and A4A4C125.</td>
<td>Replace A4A4C64 and A4A4C125 with capacitors having the same capacitance but with different temperature coefficients.</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Signal channel input adjustment</td>
<td></td>
<td>Connect vertical input of oscilloscope to A4J7. Set 714E-( ) to X.XX0 MHz. Adjust A4A1L2, A4A1L3, A4C18, and A4C19 to peak waveform at A4J7.</td>
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<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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<tr>
<td>29 (Cont)</td>
<td></td>
<td></td>
<td><strong>NOTE:</strong> Check for two tuning points on each capacitor to be sure they are at resonance. Pick the highest point.</td>
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<tr>
<td>30</td>
<td>Module Checks and Adjustments, Mhz-Frequency Stabilizer A4 (Sheet 15 of 20)</td>
<td></td>
<td>Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender. Connect a #22 wire from pin 2 of chassis connector A4J12 to TP2 on module extender. Connect a #22 wire from 618T-( ) chassis to A4 chassis. <strong>NOTE:</strong> Make no other connections between 618T-( ) chassis and module A4 or module extender. Connect oscilloscope vertical input to A4A6TP16. Connect signal generator output through 6-dB attenuator to A4J7 and the frequency counter. Set signal generator output between 249,970 and 250,030 Hz with an output level below that required to saturate if amplifiers (indicated by output at A4A6TP16 dropping sharply or clipping).</td>
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<tr>
<td>TEST EQUIPMENT</td>
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<tr>
<td>STEP DESCRIPTION</td>
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**NOTE:** Some of the following test points and adjustments are located on circuit boards A4A2 and A4A6. Refer to Figure 714 for location of these test points and adjustments on A4A2 and A4A6. To make test connections on A4A2 access the socket via test point 10401070. If necessary, remove A4A6 and the metal divider between A4A6 and A4A2 by removing five screws from A4A6.

Adjust A4A2L8 (0CN through 7250), A4A2C128 (correctly adjusted 0CN through 7250), and A4A42C128. Check voltage at A4A2T97.

0.450 mV.

**NOTE:** The following portion of Step 30 need be performed only if the control box was replaced and if a temperature box is available. If no temperature box is available, return the control to Collins Radio Company for repair.

Module Checks and Adjustments, kHz-Frequency
Stabilizer A4 (Sheet 16 of 20)
Figure 714
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<tr>
<th>STEP</th>
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**Module Checks and Adjustments, kHz-Frequency**

**Stabilizer A4 (Sheet 17 of 20)**

**Figure 714**
<table>
<thead>
<tr>
<th>STEP</th>
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<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
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<tbody>
<tr>
<td>30</td>
<td>Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 18 of 20) (Cont)</td>
<td></td>
<td>Remove A4 from temperature box and replace in 61ST-( ) with A4 module extender. Remove test equipment from A4.</td>
<td>HP-410B indications should be within 3 db of each other.</td>
<td>A4A2C33 and/or A4A2C123.</td>
<td>Same as above.</td>
</tr>
<tr>
<td>31</td>
<td>Reference channel input adjustment</td>
<td></td>
<td>Connect oscilloscope vertical input to A4J8. Set 714E-( ) to X.XX0 MHz. Adjust A4A5L17, A4C55, and A4C66 to peak waveform at A4J8. <strong>NOTE:</strong> Check for two tuning points on each capacitor to be sure they are at resonance. Pick highest point. Set 714E-( ) to X.XX5 MHz. Adjust A1A3L8 in frequency divider A1 to peak waveform at A4J8. Set 714E-( ) to X.XX1 MHz. Adjust A1A3L7 in frequency divider A1 to peak waveform at A4J8.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
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<tr>
<td>32</td>
<td>Reference channel If. adjustment</td>
<td></td>
<td>Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender.</td>
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<td></td>
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<td></td>
<td>Connect a #22 wire from pin 8 of A4J12 to TP8 on module extender.</td>
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<td></td>
<td>Connect a #22 wire from 618T-( ) chassis to chassis of A4.</td>
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<td></td>
<td><strong>NOTE:</strong> Make no other connections between 618T-( ) chassis and A4 or A4 module extender.</td>
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<td></td>
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<td></td>
<td>Connect oscilloscope vertical input to A4A6TP15.</td>
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<td></td>
<td>Connect signal generator output through 6-dB attenuator to A4J8 and frequency counter.</td>
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<td></td>
<td>Set signal generator output between 249,970 and 250,030 Hz. Set signal generator output level just below that required to saturate if. amplifiers (indicated by clipping at A4A6TP15).</td>
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<td></td>
<td>Adjust A4A6L19 and A4A6T3 to provide peak waveform at A4A6TP15. If necessary, reduce signal generator output during peaking procedure to prevent amplifier saturation.</td>
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</tr>
<tr>
<td>Step</td>
<td>Description</td>
<td>Test Equipment</td>
<td>Test Procedure</td>
<td>Remove A4 from module extender.</td>
<td>Replace dust cover on A4 chassis.</td>
<td>Turn power off.</td>
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<tr>
<td>33</td>
<td>Disconnect</td>
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Module Checks and Adjustments, kHz-Frequency
Stabilizer A4 (Sheet 20 of 20)
Figure 714
kHzz-Frequency Stabilizer A4, Checks and Adjustments

Figure 715

NOTES:
1. To test or replace components on circuit board A3, metal cover must be removed.
2. Circuit boards A2 and A4 are located under cover and between circuit boards A1 and A5.
3. Reference designations are abbreviated, prefix the designations with A4.
4. A2LB is incorporated in all modules through MCM 7236.
   A2C128 is incorporated in all modules with MCM 7237 and above.

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<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness  678Y-( ) Maintenance Kit  678Z-1 Function Test Set  714E-( ) Radio Set Control  HP-410B VTVM  HP-711A Power Supply  Variable dc voltage source (+25 to +35 V, 0.40 A)  Rf dummy load</td>
<td>Refer to figure 717 for location of all test points on A5 and module extender. Remove low-voltage power supply A5 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A5 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect low-voltage power supply A5 through module extender to 618T-( ) chassis. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
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<tr>
<td>2</td>
<td>Transient blanker trigger check</td>
<td>Connect Fluke 801B VTVM to A5J3. Check voltage at A5J3. Ground A5J1 to 618T-( ) chassis. Check voltage at A5J3. Unground A5J1.</td>
<td>+17.82 to +18.18 V.</td>
<td>Refer to step 4 of this test procedure.</td>
<td>Refer to step 4 of this test procedure.</td>
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<tr>
<td>STEP</td>
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<td>3</td>
<td>Transient blanker input voltage check</td>
<td>Connect HP 410B VTVM dc probe to A5J2. Check voltage at A5J2.</td>
<td></td>
<td>+27 to +28 Vdc.</td>
<td>Relay K1.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Transient blanker adjustment</td>
<td>Set 714E-() to OFF. Connect A5 to module extender. Connect variable dc voltage source to 618T-() (positive lead to either P40-4 or P40-16 and negative lead to chassis). Set variable dc voltage source to provide ±27.5 V. Connect HP 410B VTVM dc probe to TP5 on module extender. <strong>NOTE:</strong> In the following procedure, the dc voltage must be increased fast enough to prevent Q2 from burning out. Increase dc voltage until voltage at TP5 on module extender drops to not more than 0.1 Vdc. The drop should occur when dc voltage reaches ±31.5 to ±32.5 V. If it does not, set variable dc voltage to ±32 V and adjust ASR5 until voltage at TP5 on module extender drops to not more than 0.1 Vdc.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
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<tr>
<td>4 (Cont)</td>
<td>Repeat this entire test procedure. Disconnect variable dc voltage source and HP-410B VTVM.</td>
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</tbody>
</table>
| 5 | +18-v regulator adjustment | Connect 678Z-1 J2-FREQ DIV jack to J2 in frequency divider A1.  
**NOTE:** B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of performing the above step. +20 Vdc can be used from 1A2J9 or ±16 Vdc from 1A2J2. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 714E-( ) to AM, any frequency. Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust LEVEL SET control until 678Z-1 FUNCTION METER indicates -10. **CAUTION:** DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.  
Set 678Z-1 FUNCTION SELECTOR switch to +18V. |  |  |  |  |  |
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
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<th>REMEDY</th>
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<tr>
<td>5 (Cont)</td>
<td>Operate X10 METER SENSITIVITY switch several times. Disconnect 678Z-1 Function Test Set.</td>
<td>678Z-1 FUNCTION METER must indicate 0 ±1 scale division.</td>
<td>A5R15 incorrectly adjusted.</td>
<td>Adjust A5R15 to provide required indication.</td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>+130-v supply check</td>
<td>Set 618T-( ) front panel meter selector switch to 130V.</td>
<td>Front panel meter must indicate in red area.</td>
<td>Components in +130-v supply circuit in A5.</td>
<td>Check components in +130-v supply circuit in A5.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Disconnect</td>
<td>Turn power off. Remove A5 from module extender. Remove module extender from 618T-( ) chassis. Replace A5 in 618T-( ) chassis.</td>
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Low-Voltage Power Supply A5,
Checks and Adjustments
Figure 717
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<th>TEST EQUIPMENT</th>
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<th>REMEDY</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td>Refer to figure 719 for location of all test points on A6 and module extender.</td>
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<tr>
<td></td>
<td></td>
<td>678Y-( ) Maintenance Kit</td>
<td>Remove A6 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A6 to perform this step.</td>
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<td></td>
<td>714E-( ) Radio Set Control</td>
<td>Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702.</td>
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<tr>
<td></td>
<td></td>
<td>HP-410B VTVM</td>
<td>Connect electronic control amplifier A6, through A6 module extender, to 618T-( ) chassis.</td>
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<tr>
<td></td>
<td></td>
<td>Ballantine 310A VTVM</td>
<td>Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.</td>
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<tr>
<td></td>
<td></td>
<td>Rf dummy load</td>
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<tr>
<td>2</td>
<td>A6Q1 output/ A6Q2 input voltage check</td>
<td>Connect HP-410B VTVM dc probe to A6J1.</td>
<td>Check voltage at A6J1. +5.8 to +7 vdc.</td>
<td>A6Q1, A6Q1, and associated circuits.</td>
<td>Check A6Q1, A6Q1, and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A6Q4 output voltage check</td>
<td>Connect HP-410B VTVM dc probe to A6J2.</td>
<td>Check voltage at A6J2. +5.1 to +6.1 vdc.</td>
<td>A6Q2, A6Q3, A6Q4, and associated circuits.</td>
<td>Check A6Q2, A6Q3, A6Q4, and associated circuits.</td>
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<tr>
<td>5</td>
<td>Amplifier gain check</td>
<td>Set 714E–( ) to AM, X,500 MHz. Connect HP–410B VTVM dc probe to TP9 on module extender. Connect Ballantine 310A VTVM between A6J3 and A6J4. NOTE: Isolate vtvm primary power third wire ground when making balanced output readings. 618T–( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T–( ). Rotate large roller coil gear on top of power amplifier A11 in either direction until amplifier input voltage at TP9 on module extender is 0 ±0.2 V.</td>
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<tr>
<td>5 (Cont)</td>
<td>Check voltage between A6J3 and A6J4.</td>
<td>Between +18 and +30 V.</td>
<td>If voltage is normal, roller coil gear should return to tuned position when released.</td>
<td>A8Q6, A6Q8, A8Q7, and associated circuits.</td>
<td>Check A6Q6, A6Q8, A6Q7, and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Disconnect</td>
<td>Turn power off. Disconnect all test equipment. Remove A6 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A6. Replace A6 in 618T-( ) chassis.</td>
<td></td>
<td>Insufficient torque or mechanical binding of roller coil mechanism.</td>
<td>Check for sufficient torque and mechanical binding of roller coil mechanism.</td>
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Electronic Control Amplifier A6,
Checks and Adjustments
Figure 719
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<tbody>
<tr>
<td>9</td>
<td>Divide-by-26-to-35 board A15A4 check</td>
<td>Set 100-kHz digit control on test fixture to 0. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place oscilloscope vertical input on A15A3 CLOCK OUT at A15A4A5–5. Set time base so that 35 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from A15A3 CLOCK OUT at A15A4A5–5. Do not change setting of oscilloscope. Connect oscilloscope vertical input to A15A4TP1.</td>
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<td>10</td>
<td>Phase/frequency discriminator A15A5 board check</td>
<td>Connect vertical input of oscilloscope to A15A5TP1. Check frequency and voltage at A15A5TP1.</td>
<td>100 pps; 22 v peak-to-peak minimum.</td>
<td></td>
<td>A15A5.</td>
<td>Check A15A5.</td>
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<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
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<td>11</td>
<td>Phase/frequency discriminator A15A5 duty cycle check</td>
<td></td>
<td>The term &quot;duty cycle&quot; as used in this test procedure refers to the ratio of pulse width to total length of the time period. This ratio is multiplied by 100 to express the duty cycle as a percentage. Refer to figure 736 for examples of duty cycle. Figure 736 shows three periods of time, 0.01 second each. The first pulse has a duty cycle of 60%. The period is 0.01 second; pulse width is 0.006 second. Therefore duty cycle = ( \frac{0.006}{0.01} \times 100 = 60% ). The second and third pulses show the minimum (20%) and maximum (80%) duty cycles. Set frequency selector switches on the test fixture, in turn, to 0000, 3000, 5000, and 7000. Oscilloscope vertical input remains connected to A15A5TP1. Check duty cycle at each test fixture frequency setting listed above at A15A5TP1. Set frequency selector switches on test fixture, in turn, to 2999, 4999, 7999, and 9999. Duty cycle must not exceed 80%.</td>
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<td>Continue test.</td>
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<td>STEP</td>
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<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>Phase-frequency discriminator phase-locking time check</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscilloscope vertical input remains connected to A15A6TP1. Check duty cycle at each test point shown above at A15A6TP1. Oscilloscope vertical input remains connected to A15A6TP1. Set duty cycle to 10 V/cm.</td>
</tr>
<tr>
<td>Set frequency selector switches on test fixture to 9000. Set frequency selector switches on test fixture to 9000.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure duty cycle must be 20% or greater. When signal becomes stable, reset 100-kHz switch on test fixture to 0. When signal becomes stable, reset 100-kHz switch on test fixture to 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscilloscope vertical input remains connected to A15A6TP1.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REQUIRED TEST RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscilloscope connected to test fixture to 3.0 s. Not more than 3.0 s.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position 5 to position 4.</td>
</tr>
</tbody>
</table>

Module Checks and Adjustments, Frequency Divider-Stabilizer A15
(Using Test Fixture) (Sheet 8 of 10) Mar 15/71
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Figure 735
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Vco sideband attenuation check</td>
<td></td>
<td>Connect spectrum analyzer to J2-VCO OUT jack on test fixture front panel.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set frequency selector switches on test fixture to 7500.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tune spectrum analyzer to 2.7500 MHz and establish a 0-db reference.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set frequency selector switches on test fixture to 7501.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check signal level on spectrum analyzer.</td>
<td>Not less than 55 db down.</td>
<td>A15FL1.</td>
<td>Check A15FL1.</td>
</tr>
<tr>
<td>(Cont)</td>
<td></td>
<td></td>
<td>Set frequency selector switches on test fixture to 7499.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check signal level on spectrum analyzer.</td>
<td>Not less than 55 db down.</td>
<td>A15FL1.</td>
<td>Check A15FL1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set frequency selector switches on test fixture to 2500.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tune spectrum analyzer to 3.2500 MHz and establish a 0-db reference.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set frequency selector switches on test fixture to 2501.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check signal level on spectrum analyzer.</td>
<td>Not less than 55 db down.</td>
<td>A15FL1.</td>
<td>Check A15FL1.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>13</td>
<td>(Cont)</td>
<td></td>
<td>Set frequency selector switches on test fixture to 2400.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check signal level on spectrum analyzer.</td>
<td>Not less than 55 db down.</td>
<td>A15FL1.</td>
<td>Check A15FL1.</td>
</tr>
<tr>
<td>14</td>
<td>Reset line check</td>
<td></td>
<td>Set frequency selector switches on test fixture to 0000.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connect frequency counter to RESET LINE test point.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Disconnect</td>
<td></td>
<td>Turn power off.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disconnect all test equipment from A15.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace dust cover on A15.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace A15 in 613T-( ) chassis.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Frequency Divider-Stabilizer A15, Duty Cycle Examples
Figure 736
Frequency Divider-Stabilizer A15, Checks and Adjustments

Figure 737
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>HP 410B VTVM Oscilloscope Frequency counter Spectrum analyzer 678Y-1B 678P-1B 714E-6</td>
<td>NOTE: Figure 735 contains module checks and adjustments for frequency divider stabilizer A15 using a test fixture. This test procedure applies only to the 618T-1B/2B/3B Airborne SSB Transceivers. Refer to figure 737 for location of test points on A15. Remove frequency divider-stabilizer A15 from 618T-( ) and perform visual inspection as described in Inspection/Check section of this manual. Remove dust cover from A15 to perform this step. Connect frequency-divider-stabilizer A15 through module extender to 618T-( )B chassis. Connect VCO IN and OUT jacks on module extender with short length of 50-ohm coax jumper cable. Connect 100 KHZ REF IN and OUT jacks on module extender with short length of 50-ohm coax jumper cable.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
</tr>
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<td>------</td>
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</tr>
<tr>
<td>3</td>
<td>Vco frequency check</td>
<td>Set 714E-6 to 7.5555 MHz. Connect frequency counter to VCO OUT jack on front panel of test fixture. Check frequency at VCO OUT jack. <strong>NOTE:</strong> Vco A15A7 and isolation amplifier A15A8 are sealed assemblies and cannot be disassembled in the field. If the source of trouble is the vco or isolation amplifier, the faulty unit should be returned to the factory and replaced with a new unit.</td>
<td>2.9445 MHz ±2.4 Hz.</td>
<td>Divider circuits.</td>
<td>Check divider circuits.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5-Vdc regulator check</td>
<td><strong>CAUTION:</strong> CARE MUST BE EXERCISED WHEN CONNECTING A TEST PROBE TO AN INTEGRATED CIRCUIT (FLATPACK). IF AT ALL POSSIBLE, CONNECT TEST PROBE TO CIRCUIT BOARD ADJACENT TO FLATPACK. USE A SHARP PROBE. FLATPACK MAY BE DAMAGED IF TOO MUCH PRESSURE IS APPLIED OR IF FLATPACK LEADS ARE SHORTED TOGETHER. EPOXY (POSTCOATING) REMOVED DURING TESTING MUST BE REPLACED UPON COMPLETION OF TEST. REFER TO</td>
<td></td>
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</table>

(Cont)
<table>
<thead>
<tr>
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<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>(Cont)</td>
<td></td>
<td>REPAIR SECTION OF THIS MANUAL FOR DETAILED INSTRUCTIONS PERTAINING TO REPLACEMENT OF EPOXY.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connect HP 410B VTVM dc probe to output of A15A9 (5 VDC OUT). (Cathode of A15A9CR6 may be used.)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check voltage at 5 VDC OUT test point.</td>
<td>From 4.9 to 5.1 Vdc.</td>
<td>A15A9, zener diode A15A9CR6.</td>
<td>Check A15A9, voltage at zener diode A15A9CR6.</td>
</tr>
<tr>
<td>5</td>
<td>26-Vdc regulator check</td>
<td></td>
<td>Connect HP 410 VTVM dc probe to output of A15A10 26 VDC OUT. (Emitter of A15A10Q2 located below A15A2 may be used.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Divide-by-10 board A15A1 check</td>
<td></td>
<td>Set 714E-6 to 7.0000 MHz.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set oscilloscope vertical amplifier to 2 V/cm.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Place oscilloscope vertical input on A15A1A1-1.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Set time base so that 10 pulses are displayed on oscilloscope.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remove oscilloscope vertical input from A15A1A1-1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>7</td>
<td>Divide-by-10 board A15A2 check</td>
<td>See caution in step 4 of this test procedure. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place oscilloscope vertical input on CLOCK OUT point at A15A2A1-6. Set time base so that 10 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from CLOCK OUT point. Do not change oscilloscope setting. Place oscilloscope vertical input on A15A2 CLOCK OUT point at A15A2A4-14.</td>
<td></td>
<td>One pulse; 3.2-V peak-to peak minimum.</td>
<td>A15A2.</td>
<td>Check A15A2.</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>REMEDY</td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>Divide-by-10 board A15A6 check</td>
<td>Check A15A3.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>A15A9.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>One pulse; 3.2-V peak-to-peak minimum.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**TEST PROCEDURE**

- See caution in steps 0 of this test procedure.

**TEST EQUIPMENT**

- Oscilloscope vertical amplifier control remains set at 2 V/cm.
- Set time base so that 10 pulses are displayed on oscilloscope.
- Remove oscilloscope vertical input from A15A9 CLOCK OUT at A15A4-14.
- Oscilloscope vertical amplifier input on A15A4 C LOCK OUT.
- Set time base so that 15 pulses are displayed on oscilloscope.
- Remove oscilloscope vertical input from A15A4 C LOCK OUT at A15A4-5.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Phase/frequency discriminator A15A5 board check</td>
<td>Connect vertical input of oscilloscope to A15A5TP1. Check frequency and voltage at A15A5TP1.</td>
<td>100 pp/s; 22-V peak-to-peak minimum.</td>
<td>A15A5.</td>
<td>Check A15A5.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Phase/ frequency discriminator A15A5 duty cycle check</td>
<td>The term &quot;duty cycle&quot; as used in this test procedure refers to the ratio of pulse width to total length of the time period. This ratio is multiplied by 100 to express the duty cycle as a percentage. Refer to figure 738 for examples of duty cycle. Figure 738 shows three periods of time, 0.01 second each. The first pulse has a duty cycle of 60%. The period is 0.01 second; pulse width is 0.006 second. Therefore duty cycle = ( \frac{0.006}{0.01} \times 100 = 60% ). The second and third pulses show the minimum (20%) and maximum (80%) duty cycles. Set frequency selector switches on the test fixture, in turn, to 7.0000, 7.3000, 7.5000, and 7.7000 MHz.</td>
<td></td>
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</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>11 (Cont)</td>
<td>Oscilloscope vertical input remains connected to A15A5TP1.</td>
<td></td>
<td></td>
<td>Duty cycle must not exceed 80%.</td>
<td></td>
<td>Continue test.</td>
</tr>
<tr>
<td></td>
<td>Check duty cycle at each test fixture frequency setting listed above at A15A5TP1.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Set frequency selector switches on test fixture, in turn, to 7.2999, 7.4999, 7.7999, and 7.9999 MHz.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Oscilloscope vertical input remains connected to A15A5TP1.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Check duty cycle at each tester setting listed above at A15A5TP1.</td>
<td></td>
<td></td>
<td>Duty cycle must be 20% or greater.</td>
<td></td>
<td>Continue test.</td>
</tr>
<tr>
<td>12</td>
<td>Phase/frequency discriminator phase-locking time check.</td>
<td>Oscilloscope vertical input remains connected to A15A5TP1.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Set oscilloscope to 10 V/cm, 1 ms/cm.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Set frequency selector switches on test fixture to 7.9000 MHz.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>When signal becomes stable, reset 100-kHz switch on control unit to 0.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>When signal becomes stable, reset 100-kHz switch on control unit to 9.</td>
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<tr>
<td>STEP</td>
<td>REMEDY</td>
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<tr>
<td>12</td>
<td>(Cont)</td>
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</table>

**PROBABLE CAUSE OF ABNORMAL RESULT**

<table>
<thead>
<tr>
<th>TEST PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure the time it takes for the required test result to be obtained from the time the 100-kHz switch is moved to 9.</td>
</tr>
</tbody>
</table>

Perform the above test procedure for the following positions:
- Set 100-kHz switch to position 4.
- From position 9 to position 0. From position 4 to position 5.
- Set 100-kHz switch to position 6 and then to position 5. From position 9 to position 4.

**TEST EQUIPMENT**

Vco sideband attenuation check

**DESCRIPTION**

- Connect spectrum analyzer to VCO OUT jack on module extender.
- Set frequency selector switch(es) on 744-2 to 7,250 MHz and establish a 0-DB reference.
- Tune spectrum analyzer to 2,750 MHz and establish a 0-DB reference.
- Set frequency selector switch(es) on 744-2 to 7,250 MHz.

**REQUIRED TEST RESULT**

- NMT 6 seconds.
- NMT 3 seconds.
- NMT 3 seconds.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Reset line check</td>
<td>Set frequency selector switches on 714E-6 to 7.0000 MHz. Connect frequency counter or oscilloscope vertical input to RESET LINE point.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>REMEDY</th>
<th>Check A15A4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>A15A4.</td>
</tr>
<tr>
<td>REQUIRED TEST RESULT</td>
<td>100 p.p.s.</td>
</tr>
<tr>
<td>TEST PROCEDURE</td>
<td>Check frequency at RESET LINE test point. <strong>NOTE:</strong> Each pulse has less than 1-μs duration. Turn power off. Disconnect all test equipment from A15. Replace dust cover on A15. Replace module extender and replace A15 in 618T-() (Cont.)</td>
</tr>
<tr>
<td>TEST EQUIPMENT</td>
<td>Disconnect</td>
</tr>
<tr>
<td>STEP DESCRIPTION</td>
<td>14  15</td>
</tr>
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</table>

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(Using Module Extender) (Sheet 10 of 10)  
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Figure 737A  
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<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
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<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>Suggested module tester (fabricate as in figure 1103) Frequency counter HP-711A Power Supply Oscilloscope</td>
<td>This test applies only to the 618T-1B/2E/3B Airborne SSB Transceivers. Remove control data converter A16 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A16 to perform this step. Connect control data converter A16 and test equipment as shown in figure 741.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1-kHz oscillator check</td>
<td>Set tester PWR switch to ON. Check frequency on frequency counter connected to J2 on test fixture. Connect oscilloscope vertical input to J2 on test fixture. Check peak-to-peak voltage at J2 on test fixture. Reconnect frequency counter to J2 on test fixture.</td>
<td>950 to 1050 Hz.</td>
<td>A16R21 and/or A16R22 adjusted incorrectly. First adjust A16R22 until frequency is approximately 1000 Hz; then adjust A16R21 until frequency is 950 to 1050 Hz.</td>
<td>A16Q9, A16Q10, and associated circuits. Check A16Q9, A16Q10, and associated circuits.</td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>----------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>3</td>
<td>Converter check</td>
<td>Set FREQUENCY switch on test fixture, in turn, to each frequency listed in figure 739.</td>
<td>Indicator lights on tester must be on or remain off as shown in figure 739.</td>
<td>Refer to REMEDY column.</td>
<td>See figure 740. Set FREQUENCY switch on tester to 0. DS1 through D34 should remain off. If any light or combination of lights is on, check components listed in ACTION column corresponding to light or lights that are on.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Disconnect</td>
<td>Turn power off. Disconnect all test equipment from A16. Replace dust cover on A16. Replace A16 in 618T-{ } chassis.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TESTER FREQUENCY SWITCH POSITION</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X Denotes indicators are lit.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREQUENCY SWITCH ON TESTER IN 0 POSITION</td>
<td>ACTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS2 ON</td>
<td>Check A16Q3, A16CR20 through A16CR24, A16CR34, and A16CR35.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS3 ON</td>
<td>Check A16Q2 and A16CR11 through A16CR19.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS4 ON</td>
<td>Check A16Q1 and A16CR9 through A16CR10.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS1 through DS4 ON</td>
<td>Check switches on tester.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check A16P1 and 618T-( ) chassis jack J15.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Control Data Converter A16, Troubleshooting Chart
Figure 740
Control Data Converter A16,
Test Equipment Setup
Figure 741

NOTES:
1. CONNECT HP-711A POWER SUPPLY TO J4 (+) AND J5 (GROUND) ON TESTER FRONT PANEL.
2. CONNECT HP-5240 FREQUENCY COUNTER TO J2 (1 KHZ OUT) ON TESTER FRONT PANEL. TPQ-7728-012
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>HP 4195A V/T/2M, 6786P-1B, 714E-6, Oscilloscope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set 714E-6 to 7.0000 MHz, A16 mode. Connect control data converter A16 and frequency divider-stabilizer A15 through module extenders to 618T-1B, 2B/3B chassis. Check frequency on frequency counter connected to TP12 on module extender.</td>
</tr>
<tr>
<td>2</td>
<td>1-kHz oscillator check</td>
<td>+0.6 to +1.0 V peak-to-peak voltage. Connect oscilloscope vertical input to J3 TP12 on module extender and check peak-to-peak voltage.</td>
</tr>
</tbody>
</table>

**Probable Cause of Abnormal Result**

- A16R21 and/or A16R22 adjusted incorrectly.
- First adjust A16R21 until frequency is approximately 1000 Hz; then adjust A16R21 until frequency is 950 to 1050 Hz.

**Test Procedure**

- This test applies only to the 618T-1B/2B/3B, A16R21/22.
- Remove control data converter A16 from 618T-1B, as described in inspection section of this manual.
- Remove and rewire A16 from 618T-1B, 2B/3B chassis, to perform this step.

**Required Test Result**

- Set 714E-6 to 7.0000 MHz, A16 mode.
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBAELE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Converter check</td>
<td></td>
<td>Set the 100-Hz frequency switch on the 714E-6, in turn, to each frequency listed in figure 741B. For each setting, measure the dc voltage at the module extender test points listed in figure 741B.</td>
<td>Test point voltages must be as listed in figure 741B.</td>
<td>Refer to REMEDY column.</td>
<td>See figure 741C. Set 100-Hz frequency switch on 714E-6 to 0. ±5 volts should be preset on each test point measured per figure 741B. If not, check components listed in ACTION column, figure 741C, corresponding to voltage or voltages that are wrong.</td>
</tr>
<tr>
<td>4</td>
<td>Disconnect</td>
<td></td>
<td>Turn power off. Disconnect all test equipment from A16. Replace dust cover on A16. Replace A16 in 618T-( ) chassis.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>714E-6 100-Hz FREQUENCY SWITCH POSITION</td>
<td>TP2 (volts)</td>
<td>TP3 (volts)</td>
<td>TP4 (volts)</td>
<td>TP5 (volts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>NMT 0.4</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+5</td>
<td>NMT 0.4</td>
<td>+5</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NMT 0.4</td>
<td>NMT 0.4</td>
<td>+5</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+5</td>
<td>+5</td>
<td>NMT 0.4</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>NMT 0.4</td>
<td>+5</td>
<td></td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>+5</td>
<td>NMT 0.4</td>
<td>NMT 0.4</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>NMT 0.4</td>
<td>NMT 0.4</td>
<td>NMT 0.4</td>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>NMT 0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>NMT 0.4</td>
<td>+5</td>
<td>+5</td>
<td>NMT 0.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NMT means not more than.
Tolerance on +5 volts is ±0.5 volt.

Control Data Converter A16, Test-Point Voltage Chart
Figure 741B
<table>
<thead>
<tr>
<th>Frequency Switch in 0 Position</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP3 is not +5 volts.</td>
<td>Check A16Q3, A16CR20 through A16CR24, A16CR34, and A16CR35.</td>
</tr>
<tr>
<td>TP4 is not +5 volts.</td>
<td>Check A16Q2 and A16CR11 through A16CR19.</td>
</tr>
<tr>
<td>TP5 is not +5 volts.</td>
<td>Check A16Q1 and A16CR9 through A16CR10.</td>
</tr>
<tr>
<td>TP2 through TP5 are not +5 volts.</td>
<td>Check switches on 714E-6.</td>
</tr>
<tr>
<td></td>
<td>Check A16P1 and 618T-( ) chassis jack J15.</td>
</tr>
</tbody>
</table>

Control Data Converter A16, Troubleshooting Chart
Figure 741C
<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>TEST EQUIPMENT</th>
<th>TEST PROCEDURE</th>
<th>REQUIRED TEST RESULT</th>
<th>PROBABLE CAUSE OF ABNORMAL RESULT</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial test requirements</td>
<td>678P-( ) Test Harness</td>
<td><strong>WARNING:</strong> VOLTAGES DANGEROUS TO LIFE EXIST IN 516H-1 POWER SUPPLY. DO NOT APPLY POWER TO 516H-1 POWER SUPPLY WITH DUST COVER REMOVED. Perform visual inspection as described in inspection/check section of this manual. Remove 516H-1 Power Supply dust cover to perform this step. Dust cover may be removed by loosening one Dzus fastener at rear of unit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>678Y-( ) Maintenance Kit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>714E-( ) Radio Set Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rf dummy load</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Continuity check</td>
<td></td>
<td><strong>NOTE:</strong> All continuity checks are performed on P1 of 516H-1 Power Supply.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check continuity from P1-2 to ground.</td>
<td>Continuity.</td>
<td>Connector P1.</td>
<td>Repair or replace P1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check continuity from P1-21 to ground.</td>
<td>Continuity.</td>
<td>Defective terminal connection.</td>
<td>Repair terminal connection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check continuity from P1-6 to P1-8.</td>
<td>Continuity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check continuity from P1-10 to P1-11.</td>
<td>Continuity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check continuity from P1-11 to P1-13.</td>
<td>Continuity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td>TEST EQUIPMENT</td>
<td>TEST PROCEDURE</td>
<td>REQUIRED TEST RESULT</td>
<td>PROBABLE CAUSE OF ABNORMAL RESULT</td>
<td>REMEDY</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>3</td>
<td>1500-V output of single-phase high-voltage power supply A13 check</td>
<td></td>
<td>Connect 618T-(-), 675P-(-), and rf dummy load as shown in figure 702.</td>
<td>618T--( ) front panel meter indicates in red area.</td>
<td>Single-phase high-voltage power supply A13.</td>
<td>Perform module checks and adjustments for single-phase high-voltage power supply A13 as given in figure 794. Check 516H-1 Power Supply. See note in TEST PROCEDURE column of this step.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect 618T-(-), 675P-(-), and rf dummy load as shown in figure 702.</td>
<td>Set 618T--( ) front panel meter switch to 1500V.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set 714E--( ) to AM, any frequency. 618T--( ) requires a minimum warmup period of 15 minutes before unit is keyed. Key 618T--( ).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAUTION: IF 516H-1 BLOWER DOES NOT OPERATE, UNKEY IMMEDIATELY.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: There are no adjustments in 516H-1 Power Supply. If preceding checks indicate module output is abnormal, turn power off, use an ohmmeter to check for faulty transistors and diodes, transformer winding continuity, and proper relay operation in 516H-1 Power Supply.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Disconnect</td>
<td>Disconnect all test equipment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Module Checks and Adjustments
516H-1 Power Supply
Figure 742 (Sheet 2)
618T-( ) Airborne SSB Transceiver - Troubleshooting

1. GENERAL.

Unit troubleshooting data is contained in figures 801 through 805 of this section. Information contained in these figures is to be used, after performing the unit performance test procedures in the testing section of this manual, to isolate the trouble to a particular module or group of modules.

NOTE: Module troubleshooting data is incorporated in the module checks and adjustments section in the testing section of this manual.

After the trouble is located and repaired, the equipment should be completely tested to verify that the repairs have not affected other portions of the circuit.

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>618T-( ) dead.</td>
<td>Check primary power sources (both ac and dc).</td>
</tr>
<tr>
<td></td>
<td>Check circuit breaker and fuses in the 678P-( ) Test Harness.</td>
</tr>
<tr>
<td></td>
<td>Check control unit mode selector switch to see that power-enabling ground is being supplied to pin 59 of 618T-( ) connector P40.</td>
</tr>
<tr>
<td></td>
<td>If all of above checks are positive, check 618T-( ) chassis relays K1 and K9.</td>
</tr>
</tbody>
</table>

General Troubleshooting Data
Figure 801
### Frequency Troubleshooting Chart
**Figure 802**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>618T-( ) rf output frequency abnormal below 7.000 MHz, but normal above 7.000 MHz.</td>
<td>Perform 17.5-MHz oscillator phase-locking check, figure 730.</td>
</tr>
<tr>
<td>618T-( ) rf output frequency abnormal both above and below 7.000 MHz.</td>
<td>For 618T-1/2/3, perform vfo and hf oscillator phase-locking checks, figure 730. For 618T-1B/2B/3B, perform vco frequency check, figure 734.</td>
</tr>
<tr>
<td>618T-( ) rf output frequency varies from the desired frequency by an integral number of kilohertz.</td>
<td>Remove kHz-frequency stabilizer A4 from 618T-( ) chassis. Connect HP-410B VVTM dc probe to pin 2 of chassis connector J12. Voltage at this point should be +18 volts. Rechannel 618T-( ). Voltage at J12-2 should drop to 0 during the time that the 618T-( ) is mechanically tuning. There should be a discernible delay (1/2 to 1 second) between the time that mechanical tuning is complete and +18 volts returns to J12-2. If there is not, check chassis relays K8 and K10 and components on chassis terminal board TB2.</td>
</tr>
</tbody>
</table>

### Receive Troubleshooting Chart
**Figure 803**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain abnormal, but sensitivity normal.</td>
<td>Perform audio amplifier gain adjustment, figure 722.</td>
</tr>
<tr>
<td>Sensitivity abnormal, but gain normal.</td>
<td>Perform receive if. output adjustment, variable/bandpass if. alignment check, and rf circuits alignment, figure 730.</td>
</tr>
<tr>
<td>Gain abnormal in USB and LSB, but normal in AM.</td>
<td>Perform SSB receive if. alignment, figure 712.</td>
</tr>
<tr>
<td>Gain abnormal in AM, but normal in USB and LSB.</td>
<td>Perform AM receive if. alignment, figure 722.</td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>ACTION</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Transmit output power abnormal.</td>
<td>Perform tgc adjustment and rf circuits alignment, figures 704 and 730.</td>
</tr>
<tr>
<td></td>
<td>Perform SSB/AM transmit if. alignment, figure 712.</td>
</tr>
<tr>
<td></td>
<td>Perform rf circuits alignment and variable/bandpass if. alignment check, figure 730.</td>
</tr>
<tr>
<td></td>
<td>Perform neutralization adjustments, figure 730.</td>
</tr>
<tr>
<td>Transmit residual noise abnormal.</td>
<td>Perform carrier balance adjustment, figure 712.</td>
</tr>
<tr>
<td></td>
<td>Perform transmit hf mixer balance adjustment, figure 730. Power source may be noisy.</td>
</tr>
<tr>
<td>Power amplifier static plate current abnormal.</td>
<td>Perform static plate adjustment, figure 750.</td>
</tr>
<tr>
<td>Power amplifier tube balance abnormal.</td>
<td>Perform power amplifier tubes balance check, figure 704.</td>
</tr>
<tr>
<td>CW output abnormal.</td>
<td>Check CW keying circuits in AM/audio amplifier A9.</td>
</tr>
<tr>
<td>AM modulation abnormal.</td>
<td>Perform audio amplifier gain adjustment, figure 722.</td>
</tr>
<tr>
<td>No sidetone.</td>
<td>Check chassis relay K6.</td>
</tr>
</tbody>
</table>

Transmit Troubleshooting Chart
Figure 804

Feb 15/68
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>+260-volt output abnormal.</td>
<td>Check high-voltage power supply module.</td>
</tr>
<tr>
<td>115-volt ac output abnormal.</td>
<td>Check chassis relays K1 and K9.</td>
</tr>
<tr>
<td>Transmitter key interlock abnormal.</td>
<td>Check chassis relay K7.</td>
</tr>
<tr>
<td>Chopper enable abnormal.</td>
<td>Check chassis relay K3.</td>
</tr>
<tr>
<td>Tune power enable.</td>
<td>Check keying and SSB/AM transfer relays.</td>
</tr>
<tr>
<td>Recycle line abnormal.</td>
<td>Check chassis relay K4.</td>
</tr>
<tr>
<td>Key line abnormal.</td>
<td>Check chassis relays K2, K3, and K5.</td>
</tr>
</tbody>
</table>

Antenna Coupler Power/Control Troubleshooting Chart
Figure 805
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>B1</td>
<td>Added C31 and C32.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2</td>
<td>B2</td>
<td>Changed circuit from T1-2 to K3-10 (was to L3-1) and changed circuit from L3-1 to J22-7 (was to T1-2).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 3</td>
<td>B3</td>
<td>Added CR14 between E25 and J9-4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B4</td>
<td>Added FL1 through FL19.</td>
<td>8</td>
<td>27430</td>
</tr>
<tr>
<td>2</td>
<td>B5</td>
<td>Added wire from K9-3 to K9-4 and from K9-8 to K9-7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B6</td>
<td>Renumbered relay contacts for relays K2, K3, and K4, to correct schematic.</td>
<td>618T-1B: 12</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2B/3B: 13</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>C1</td>
<td>Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>C2</td>
<td>Changed L10 from 2 μH to 2 mH, corrected destination at J17-2 to K3-4, and eliminated connection from J24-15 to J21-19 to correct schematic.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet A)

Mar 1/74
### SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>D1</td>
<td>Added wiring: J22-3 to J21-14. K3-1 to J21-25 changed to K3-1 to E46. J17-21 to J21-14 deleted. J28-2 to J21-14 changed to J28-12 to J17-21. J21-25 to K3-1 changed to J21-25 to E45. These changes reduce the noise introduced by the 28-volt power circuit into modules A3 and A9 during transmit.</td>
<td></td>
<td>31045</td>
</tr>
<tr>
<td>1</td>
<td>E1</td>
<td>Added E47, R36 (100 Ω), and CR16 (1N5417) between C5 and E17, relocating one end of C5 from E17 to E47; replaced capacitor C23 with higher voltage rated 10 μF. These changes made to eliminate spike when power is turned on.</td>
<td>618T-1B: 15</td>
<td>MCN 942</td>
</tr>
<tr>
<td>1</td>
<td>E2</td>
<td>Added note 3.</td>
<td>618T-2B/3B: 19</td>
<td></td>
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</table>

618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet B)
618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 306 (Sheet 2)

23-10-0
Pages 809/810
Oct 1/78
# SCHEMATIC CHANGES

<table>
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<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
</table>
| 815/816 817/818 819/820 | A1 | Added switch S3 (SQUELCH IN-OUT).  
Changed circuit from K3-5 to R10A-IN to K3-5 to S3-2.  
Added circuits from:  
J11-2(B9) to B1.  
J11-4(B9) to B29.  
B9 to B29.  
J11-6(B9) to B29.  
J11-8(B9) to B29.  
B9A to B29.  
P40-19 to J11-2.  
R10B-C to J11-4.  
S3-2 to J11-6.  
S3-1 to J11-8. | 618T-1 - 18  
618T-2/3 - 19 | 21332 |
| 815/816 817/818 819/820 | A2 | Deleted circuit from P40-19(B1) to J11-2(B9).  
Changed S3 from toggle- to rotary-type switch.  
Added circuit from J11-2(B9) to B29.  
Added circuit from J32-14(B10) to B29. | | 21332 |

618T-1/2/3 Chassis A, Schematic Diagram (Late Model) (Sheet A)  
Figure 807

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Page 813
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2 (Cont)</td>
<td>Deleted circuit from P40-19 to J11-2.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from P40-30 to J32-14 to P40-30 to S3-9.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from J11 (end-nc) to ground-16 to J11 (end-nc) to ground-17.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from J11-6 to S3-2 to J11-6 to S3-3.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from J32-14 to P40-30 to J32-14 to S3-5.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from J11-6 to S3-2 to J11-6 to S3-3.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from J11-2 to P40-19 to J11-2 to S3-8.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from K3-5 to R10A-IN to K3-5 to S3-2.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed circuit from P40-30 to J32-14 to P40-30 to S3-9.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
<tr>
<td></td>
<td>Changed K7-1 to K7-5.</td>
<td></td>
<td></td>
<td>21332</td>
</tr>
</tbody>
</table>

These changes, A1 and A2, provide audio squelch capability for the 618T-1/2/3 Airborne SSB Transceiver.

| 2, 3 | B1 | Added CR14 between E25 and J9-4. | | |
| 2 | B2 | Added wire from K9-3 to K9-4 and K9-8 to K9-7. | | |
| 2 | B3 | Renumbered relay contacts for relays K2, K3, and K4, to correct schematic. | | |

618T-1/2/3 Chassis A, Schematic Diagram (Late Model) (Sheet B)
Figure 807

23-10-0
Page 814

Mar 15/71
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C1</td>
<td>Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.</td>
<td>618T-1: 29 618T 2/3: 31</td>
<td>30074</td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>C2</td>
<td>Changed value of L10 from 2 µh to 2 mH, corrected destinations at K6-2 and E38; renumbered relay contacts for K2, K3, and K4; and eliminated connection from J24-15 to J21-19 to correct schematic.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2, 3, D1</td>
<td>Added wiring: J22-3 to J21-14. K3-1 to J21-25 changed to K3-1 to E46. J17-21 to J21-14 deleted. J28-12 to J21-14 changed to J28-12 to J17-21. J21-25 to K3-1 changed to J21-25 to E45. Added E45, E46, and CR15 (1N5614). These changes reduce the noise introduced by the 28-volt power circuit into modules A3 and A9 during transmit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>D2</td>
<td>Q1 changed from 2N491 to 2N2647.</td>
<td></td>
<td>31820</td>
</tr>
<tr>
<td>1</td>
<td>E1</td>
<td>Added E47, R36 (100 Ω), and CR16 (1N5417) between C5 and E17, relocating one end of C5 from E17 to E47; replaced capacitor C28 with higher voltage rated 10 µf. These changes made to eliminate spike when power is turned on.</td>
<td>618T-1: 32 618T-2/3: 35</td>
<td>31972</td>
</tr>
<tr>
<td>1</td>
<td>E2</td>
<td>Added note 2.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
618T-1/2/3 Chassis A, Schematic Diagram (Late Model)
Figure 807 (Sheet 2)
Subject: 618T-1/2/3 Chassis A, Schematic Diagram (Late Model), Figure 807 (Sheet 2).

Correct schematic wiring error of relay K4 pins 7 and 13 as follows:
### SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>825/826</td>
<td>A1</td>
<td>Changed circuit from C4 to K4-2.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>827/828</td>
<td></td>
<td>Changed circuit from J24-18 to K3-2 to J24-18 to K2-2.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These changes improve the dropout action of sidetone relay K6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>827/828</td>
<td>A2</td>
<td>Added relay K9, CR4 (1N647), R21 (1800 ohms), and C11 (4 uf).</td>
<td>5</td>
<td>1090</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These changes add a 115-volt, 400-Hz safety interlock circuit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A3</td>
<td>Deleted circuit from K6-1 to terminal E17.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>827/828</td>
<td></td>
<td>Deleted circuit from TB1-2 to K2-13.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>829/830</td>
<td></td>
<td>Changed circuit from K2-12 to J21-3 to K2-12 to terminal E17.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added circuit from K2-13 to K6-1.</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These changes prevent sidetone output prior to operation of 30-second time-delay relay K7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A4</td>
<td>Deleted circuit from P40-54 to J17-4.</td>
<td>5</td>
<td>1500</td>
</tr>
<tr>
<td>827/828</td>
<td></td>
<td>Changed circuit from J17-4 to J2-1 to J17-4 to K2-6.</td>
<td>5</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added circuit from P40-54 to K2-7.</td>
<td>5</td>
<td>1500</td>
</tr>
</tbody>
</table>

618T-1/2/3 Chassis A, Schematic Diagram (Early Model) (Sheet A)
Figure 808

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<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>825/826</td>
<td>A4 (Cont)</td>
<td>Added circuit from K2-7 to J2-1. These changes improve microphone audio switching.</td>
<td>5</td>
<td>1500</td>
</tr>
<tr>
<td>825/826</td>
<td>A5</td>
<td>Changed L4 and L5 from 220 uh to 1500 uh. Deleted L4 and L5.</td>
<td>2475</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A6</td>
<td>Added R26 and R27 in parallel with CR1 and CR2.</td>
<td>3499</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A7</td>
<td>Added C25, C26, C27, and C28. Added R30, R31, R32, and R33. These changes improve the transmit gain control circuit.</td>
<td>4613</td>
<td>6500</td>
</tr>
<tr>
<td>825/826</td>
<td>A8</td>
<td>Added CR7, CR8, and CR9.</td>
<td>5030</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A9</td>
<td>Added L10.</td>
<td>6500</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A10</td>
<td>Added CR10 and R34. Added CR11. These changes provide transient protection for relays K2 and K6.</td>
<td>12</td>
<td>6500</td>
</tr>
<tr>
<td>821/828</td>
<td>A11</td>
<td>Added C29, C30, CR12, and CR13.</td>
<td>8750</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>A12</td>
<td>Changed R33 from 5620 ohms to 3160 ohms.</td>
<td>11766</td>
<td></td>
</tr>
</tbody>
</table>

618T-1/2/3 Chassis A, Schematic Diagram (Early Model) (Sheet B) Figure 808

23-10-0
Page 822
Feb 15/68
<table>
<thead>
<tr>
<th>SHEET</th>
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<th>EFFECTIVITY</th>
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</thead>
<tbody>
<tr>
<td>825/826</td>
<td>A13</td>
<td>Changed R33 from 3160 ohms to 4220 ohms.</td>
<td></td>
<td>13700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added R35.</td>
<td></td>
<td>13700</td>
</tr>
<tr>
<td>827/828</td>
<td>A14</td>
<td>Changed K2, K3, and K4 from open contact-type relay to dust-covered, contact-type relay.</td>
<td>618T-1/2 - 16</td>
<td>18032</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This change is for improved reliability.</td>
<td>618T-3 - 17</td>
<td></td>
</tr>
<tr>
<td>825/826</td>
<td>B1</td>
<td>Reversed pins 1 and 2 at J2 on meter panel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>827/828</td>
<td>B2</td>
<td>Schematic correction.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Changed wire from K2-7 to J2-2 (was to J2-1).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed wire from K4-7 to J2-1 (was to J2-2).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed wire from J17-22 to J2-1 (was to J2-2).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>827/828</td>
<td>C1</td>
<td>Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.</td>
<td>618T-1: 29 618T-2/3: 31</td>
<td>30074</td>
</tr>
<tr>
<td>825/826,</td>
<td>C2</td>
<td>Changed value of L10 from 2 μH to 2 mH and eliminated connection from J24-15 to J21-19 to correct schematic.</td>
<td></td>
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618T-1/2/3 Chassis A, Schematic Diagram (Early Model)
Figure 808 (Sheet C)
<table>
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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>1,2,3</td>
<td>D1</td>
<td>Added wiring: J22-3 to J21-14.</td>
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<td>31045</td>
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<tr>
<td></td>
<td></td>
<td>K3-1 to J21-25 changed to K3-1 to E46.</td>
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<td>31045</td>
</tr>
<tr>
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<td></td>
<td>J17-21 to J21-14 deleted.</td>
<td></td>
<td>31045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J28-12 to J21-14 changed to J28-12 to J17-21.</td>
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<td>31045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J21-25 to K3-1 changed to J21-25 to E45.</td>
<td></td>
<td>31045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added E45, E46, and CR15 (1N5614).</td>
<td></td>
<td>31045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These changes reduce the noise introduced by</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>the 28-volt power circuit into modules A3 and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A9 during transmit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>E1</td>
<td>Added E47, R36 (100 Ω), and CR16 (1N5417)</td>
<td>618T-1: 32</td>
<td>All models</td>
</tr>
<tr>
<td></td>
<td></td>
<td>between C5 and E17, relocating one end of</td>
<td>618T-2, 3:</td>
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<tr>
<td></td>
<td></td>
<td>C5 from E17 to E47; replaced capacitor C28</td>
<td>35</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>with higher voltage rated 10 μf. These changes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>made to eliminate spike when power is turned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>on.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>E2</td>
<td>Added notes 1 and 2.</td>
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618T-1/2/3 Chassis A, Schematic Diagram (Early Model)
Figure 898 (Sheet 2)
618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-5

This TEMPORARY REVISION replaces TEMPORARY REVISION NO 23-10-0-4

Insert facing page 825/826, 23-10-0

Subject: Chassis A, Schematic Diagram

Reverse the polarity of the diode, CR11, which is connected between tie point E42 and terminal 5 of relay K6.
### SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>833/834</td>
<td>A1</td>
<td>Changed CR2 from JAN 1N933M to 1N198.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>833/834</td>
<td>A2</td>
<td>Added R49, and changed R34 from 17,600 ohms to 19,600 ohms.</td>
<td></td>
<td>5000</td>
</tr>
<tr>
<td>833/834</td>
<td>A3</td>
<td>Removed R33 (2200 ohms), and grounded CR5 and L6.</td>
<td>11</td>
<td>5775</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed CR5 from 1N627 to 1N270.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change made to counteract effects that variations in semiconductor characteristics have upon the operation of the keyer circuit (Q12 and Q13).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>833/834</td>
<td>A4</td>
<td>Changed Q1, Q2, Q3, Q5, Q7, Q8, Q9, Q11, and Q14 from 2N1285 to 2N2188 for increased transistor reliability.</td>
<td></td>
<td>5775</td>
</tr>
<tr>
<td>833/834</td>
<td>A5</td>
<td>Changed Q10 from 2N491 to 2N1671B for increased transistor reliability.</td>
<td></td>
<td>9000</td>
</tr>
<tr>
<td>833/834</td>
<td>A6</td>
<td>Changed C7 from 2200 pf to 1800 pf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>833/834</td>
<td>A7</td>
<td>Changed Q5 from 2N2188 to 2N3135.</td>
<td></td>
<td>16750</td>
</tr>
<tr>
<td>833/834</td>
<td>A8</td>
<td>Added C47 and L11, and grounded the shield of P1-A2 and P1-A3.</td>
<td></td>
<td>17900</td>
</tr>
<tr>
<td>833/834</td>
<td>B1</td>
<td>Changed Q1, Q2, Q3, Q7, Q8, Q9, Q11, and Q14 from 2N2188 to 2N3135.</td>
<td>618T-1; 23</td>
<td>30640</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2, 3:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24</td>
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618T-1/2/3 Frequency Divider A1, Schematic Diagram
Figure 809 (Sheet A)
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>B2</td>
<td>Changed R49 from 12 kΩ to 18 kΩ.</td>
<td></td>
<td>31075</td>
</tr>
<tr>
<td>Na</td>
<td>B3</td>
<td>Changed C14 from 5100 pF to 4700 pF.</td>
<td></td>
<td>29366</td>
</tr>
<tr>
<td></td>
<td>B4</td>
<td>Changed C17 from 0.05 μF to 0.022 μF.</td>
<td></td>
<td>31075</td>
</tr>
<tr>
<td>Na</td>
<td>C1</td>
<td>Changed Q12 and Q13 from 2N404 to 2N3251A.</td>
<td></td>
<td>36256</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R35 from 1960 to 3320 ohms. Changed R38 from 6.19 to 10 kilohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>D1</td>
<td>Changed CR1 from 1N270 to 1N4454 to tighten parameter tolerance.</td>
<td></td>
<td>36684</td>
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</table>
618T-1/3/3 Frequency Divider A1, Schematic Diagram
Figure 809
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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>837/838</td>
<td>B1</td>
<td>Changed R25 from 4700 ohms to [1] test select.</td>
<td></td>
<td>460</td>
</tr>
<tr>
<td>837/838</td>
<td>C1</td>
<td>Changed resistor R24 from 4700 to 3900 Ω.</td>
<td></td>
<td>REV R</td>
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RF Oscillator A2 (528-0690-001),
Schematic Diagram
Figure 810 (Sheet 1 of 2)
23-10-0
Pages 837/838
Oct 1/78
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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>840E/840F</td>
<td>A1</td>
<td>Added positive override squelch board A3.</td>
<td>618T-2/3: 32</td>
<td>1284</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2B/3B: 14</td>
<td></td>
</tr>
<tr>
<td>840C/840D</td>
<td>B1</td>
<td>Changed R24 from 4700 to 3900 ohms.</td>
<td></td>
<td>1784</td>
</tr>
</tbody>
</table>
Dec 1/72

RF Oscillator (528-0690-002) Squelch Board (797-3684-001)
With Service Bulletin Incorporation of Positive Override
Squelch, Schematic Diagram (Sheet 2 of 3) 23-10-0
Pages 840E/840F
Figure 810A
NOTE:
UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, DIODES ARE TYPE 1N3064 AND TRANSISTORS ARE TYPE 2N935.
<table>
<thead>
<tr>
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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>A1</td>
<td>Changed C26 from 4700 to 3300 pf.</td>
<td></td>
<td>2775</td>
</tr>
<tr>
<td>Na</td>
<td>A2</td>
<td>Added C34, C41, and R47.</td>
<td></td>
<td>3050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C32 from 0.02 uf to 0.01 uf, C21 from 0.01 uf to 4700 pf, C22 from 0.1 uf to 4700 pf, C18 from 1000 pf to 2200 pf, R25 from 2700 ohms to 4700 ohms, and R40 and R45 to selected values.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A3</td>
<td>Changed C26 connection from ground to junction of C41-R30.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A4</td>
<td>Changed C22 connection from ground to junction of R44-R47.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A5</td>
<td>Added C42 and C43.</td>
<td></td>
<td>6000</td>
</tr>
<tr>
<td>Na</td>
<td>A6</td>
<td>Added C44 between R23 and R26.</td>
<td></td>
<td>6475</td>
</tr>
<tr>
<td>Na</td>
<td>A7</td>
<td>Changed C44 connection from R26 to ground.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A8</td>
<td>Changed R26 from 4700 ohms to 3300 ohms.</td>
<td></td>
<td>16950</td>
</tr>
<tr>
<td>Na</td>
<td>A9</td>
<td>Changed C19 from 1500 pf to 1200 pf.</td>
<td></td>
<td>19250</td>
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<tr>
<td>Na</td>
<td>A10</td>
<td>Changed C16 connection from ground to L6-L3 junction.</td>
<td></td>
<td>19338</td>
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<tr>
<td>Na</td>
<td>A11</td>
<td>Added R48.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A12</td>
<td>Changed R26 from 3300 ohms to 4700 ohms.</td>
<td></td>
<td>22985</td>
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RF Oscillator A2 (528-0251-005), Schematic Diagram
Figure 811 (Sheet A)

Mar 1/74
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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>Na</td>
<td>A13</td>
<td>Changed R40 from selected values to 3900 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>B1</td>
<td>Changed R25 from 4700 ohms to ( 1 ) test select.</td>
<td></td>
<td>27381</td>
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<tr>
<td>Na</td>
<td>C1</td>
<td>Changed R24 from 4700 to 3900 ohms.</td>
<td></td>
<td>32023</td>
</tr>
<tr>
<td>Na</td>
<td>D1</td>
<td>Added capacitor C49 (1 ( \mu )f) and coil L11 (220 ( \mu )H); grounded C16 to improve circuit noise level.</td>
<td></td>
<td>REV BK</td>
</tr>
</tbody>
</table>
## SCHEMATIC CHANGES

<table>
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<th>REVISION IDENTIFICATION</th>
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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>Na</td>
<td></td>
<td>Added C28.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C2 from 62 pf to 91 pf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed Q1 through Q11 from 2N1224 to 2N458.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C4 from 47 uf to 22 uf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C22 from 3900 pf to selected value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C37 from 3000 pf to 3300 pf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C39 and C25 from 0.3 uf to 15 uf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C10 from 5-25 pf to 8-50 pf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed L2 from 2 mh to 1 mh.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R11 from 56K to 33K.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C2 from 91 pf to 100 pf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added R48, C49, C82, and R49.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R41 from 1K to 470 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R39 from 10 kΩ to 12 kΩ.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R15 from 33 kΩ to 18 kΩ.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>B1</td>
<td>Q2 thru Q6 and Q8 thru Q11 changed from 2N1285 to 2N2188.</td>
<td>2684</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>B2</td>
<td>Added R52 (1000 ohms).</td>
<td>2685</td>
<td></td>
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RF Oscillator A2 (544-9285-005), Schematic Diagram
Figure 812 (Sheet A)

23-10-0
Page 845
Nov 1/75
<table>
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<th>SHEET</th>
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<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>NA</td>
<td>C1</td>
<td>Added R51, 68 kΩ, and changed R37 from 4700 to 3300 Ω.</td>
<td></td>
<td>Alt ltr AP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added notes 4 and 5.</td>
<td></td>
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### SCHEMATIC CHANGES

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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>851/852</td>
<td>A1</td>
<td>Deleted C28.</td>
<td></td>
<td>1560</td>
</tr>
<tr>
<td>851/852</td>
<td>A2</td>
<td>Changed value of L6 from 2 mh to 2.2 mh.</td>
<td></td>
<td>5766</td>
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<tr>
<td>851/852</td>
<td>A3</td>
<td>Changed transistors Q2, Q3, Q4, and Q5 from 2N274 to 2N2188.</td>
<td></td>
<td>6250</td>
</tr>
<tr>
<td>851/852</td>
<td>A4</td>
<td>Changed C10, C11, C12, and C15 from 0.05 uf to 0.02 uf.</td>
<td></td>
<td>6499</td>
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<tr>
<td>851/852</td>
<td>A5</td>
<td>Changed R22 from 5600 ohms to 12,000 ohms.</td>
<td></td>
<td>7050</td>
</tr>
<tr>
<td>851/852</td>
<td>A6</td>
<td>Changed C20 from 15 uf to 27 uf. Capacitor C83 (220 uf) was C13 (220 uf).</td>
<td></td>
<td>8835</td>
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<tr>
<td></td>
<td>A7</td>
<td>Resistor R3 from J3 to C6, was from C6 to C1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diode CR4 (1N34AS) was (HD2120).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diode CR3 (1N34AS) was (HD2120).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacitors C42 and C43 reversed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resistors R33 and R34 reversed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relay K5-1 to K2-5; was to P4-14.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R1 from 1000 ohms to 560 ohms.</td>
<td></td>
<td>23591</td>
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IF Translator A3 (544-9286-001), Schematic Diagram (Sheet A)  
Figure 813

April 15/70
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<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>A8</td>
<td>Changed C20 from 27 uf to 15 uf for improved tgc response.</td>
<td>618T-1-19</td>
<td>23501</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2/3-20</td>
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<tr>
<td>Na</td>
<td>B1</td>
<td>Changed Q2, Q3, Q4, and Q5 from 2N2188 to 2N3135.</td>
<td>618T-1: 23</td>
<td>28732</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2: 3:24</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>618T-1B, 2B:3B:4</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>B2</td>
<td>Added R49 (220 ohms).</td>
<td></td>
<td>26240</td>
</tr>
<tr>
<td>Na</td>
<td>B3</td>
<td>Changed CR3 and CR4 from 1N34AS to 1N4454.</td>
<td></td>
<td>28732</td>
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<tr>
<td>Na</td>
<td>C1</td>
<td>Diode quad CR1 replaced by CR8 thru CR11 (1N4454's).</td>
<td></td>
<td>28732</td>
</tr>
<tr>
<td>Na</td>
<td>C2</td>
<td>Changed transistor Q1 from 2N78 to 2N4416. Deleted R17 and C82. Changed R13 from 6.8 to 10 kΩ. Changed R14 from 15 to 470 kΩ. Changed C83 from 220 to 100 μF. Changed C11 and C15 from 0.02 to 0.1 μF. Added CR12 (1N758A).</td>
<td>618T-1:31</td>
<td>33800</td>
</tr>
<tr>
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<td>618T-1B:14</td>
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<td>618T-2/3:34</td>
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<td></td>
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<td>618T-2B/35</td>
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<tr>
<td>Na</td>
<td>C3</td>
<td>Polarity of C83 reversed.</td>
<td></td>
<td>33800</td>
</tr>
<tr>
<td>Na</td>
<td>C4</td>
<td>Added CR13 to prevent transient overcharge of C83 when mode is switched from sideband to AM.</td>
<td></td>
<td>33163</td>
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<tr>
<td>Na</td>
<td>C5</td>
<td>Deleted CR12. Added R16, 3.9 kΩ (diode caused excessive carrier leakage).</td>
<td></td>
<td>33894</td>
</tr>
<tr>
<td>Na</td>
<td>C6</td>
<td>Changed C84 and C26 from 31 to 75 pf to center adjustment of C25 and C27.</td>
<td></td>
<td>33977</td>
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<tr>
<td>Na</td>
<td>C7</td>
<td>Changed C38 from 0.05 to 0.1 μF (reduces transmit noise level).</td>
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<td>DESCRIPTION OF REVISION AND REASON FOR CHANGE</td>
<td>SERVICE BULLETIN</td>
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<td>-------------</td>
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<tr>
<td>NA</td>
<td>D1</td>
<td>Replaced CR6 diode (HD2160) with new diode (1N279) due to availability.</td>
<td></td>
<td>REV BY</td>
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<tr>
<td>NA</td>
<td>D2</td>
<td>Changed transistors Q2, Q3, Q4, and Q5 from 2N3135 to 2N2907A.</td>
<td>CPN 549-0279-005, REV AJ</td>
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<tr>
<td>NA</td>
<td>D3</td>
<td>Added C85 (0.1 µF) to reduce residual noise in AM XMT mode.</td>
<td>CPN 549-0279-005, REV AK</td>
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<tr>
<td>NA</td>
<td>D4</td>
<td>Deleted C85 to improve attack time of AGC.</td>
<td>CPN 549-0279-005, REV AL</td>
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## SCHEMATIC CHANGES

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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>Na</td>
<td>A1</td>
<td>Diode quad CR1 replaced by CR8 thru CR11 (1N4454's).</td>
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<td>174</td>
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<tr>
<td>Na</td>
<td>A2</td>
<td>Changed transistor Q1 from 2N78 to 2N4416. Deleted C82 and R17. Changed R13 from 6800 to 10,000 ohms. Changed R14 from 15 to 470 ohms. Changed C11 and C15 from 0.02 to 0.1 μF. Changed C83 from 220 to 100 μF. Added CR12 (1N758).</td>
<td>618T-1: 31 618T-1B: 14 618T-2/3: 34 618T-2B/3B: 18</td>
<td>290</td>
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<tr>
<td>Na</td>
<td>A3</td>
<td>Polarity of C83 reversed.</td>
<td></td>
<td>277</td>
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<tr>
<td>Na</td>
<td>A4</td>
<td>Added CR13 to prevent transient overcharge of C83 when mode is switched from sideband to AM.</td>
<td></td>
<td>282</td>
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<tr>
<td>Na</td>
<td>A5</td>
<td>Deleted CR12, Added R16, 3.9 kilohms (diode caused excessive carrier leakage).</td>
<td></td>
<td>302</td>
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<tr>
<td>NA</td>
<td>B1</td>
<td>Change value of C6 from 24 to 39 pF to permit better balance of the modulator.</td>
<td></td>
<td>34982</td>
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<tr>
<td>NA</td>
<td>C1</td>
<td>Replaced CR6 diode (Hit2160) with new diode (1N270) due to availability.</td>
<td></td>
<td>REV L</td>
</tr>
<tr>
<td>NA</td>
<td>C2</td>
<td>Added C84 (220 pF) to improve circuit stability.</td>
<td>CPN 790-1916-001, REV F</td>
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<tr>
<td>NA</td>
<td>C3</td>
<td>Changed transistors Q2, Q3, Q4, and Q5 from 2N3135 to 2N2907A.</td>
<td>CPN 790-1916-001, REV H</td>
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<td>SHEET</td>
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<td>DESCRIPTION OF REVISION AND REASON FOR CHANGE</td>
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<td>-----------------------------------------------</td>
<td>-----------------</td>
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</tr>
<tr>
<td>NA</td>
<td>C4</td>
<td>Added C85 (0.1 μF) to reduce residual noise in AM XMT mode.</td>
<td>CPN 790-1916-001, REV J</td>
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<tr>
<td>NA</td>
<td>C5</td>
<td>Deleted C85 to improve attack time of AGC.</td>
<td>CPN 790-1916-001, REV K</td>
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### Schematic Changes

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<th>Service Bulletin</th>
<th>Effectivity</th>
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<tbody>
<tr>
<td>857/858</td>
<td>A1</td>
<td>Changed Q12 from 2N1285 to 2N1132.</td>
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<td>3650</td>
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<tr>
<td>857/858</td>
<td>A2</td>
<td>Changed Q9 from 2N332 to 2N706.</td>
<td></td>
<td>4000</td>
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<tr>
<td></td>
<td></td>
<td>Changed Q11 from 2N128 to 2N706.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Changed R44 from 1500 ohms to 2700 ohms.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Added C124 (5N1800) and C125 (10 pf).</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Changed C43 from 270 pf to 56 pf.</td>
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<td></td>
<td></td>
<td>Deleted CR16, RT1, and R50.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Changed R45 from 3900 ohms to 2700 ohms.</td>
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<tr>
<td></td>
<td></td>
<td>Changed R42 from 2700 ohms to 10,000 ohms.</td>
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<td></td>
<td></td>
<td>Changed R41 from 47,000 to 56,000 ohms.</td>
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<td>Changed C45 from selected value to 5N1800.</td>
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<td></td>
<td></td>
<td>Changed C53 from 1200 pf to 470 pf.</td>
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<tr>
<td>857/858</td>
<td>A3</td>
<td>Changed C36 from 680 pf to 220 pf.</td>
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<td>5349</td>
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<tr>
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<td></td>
<td>Included value for factory selected C37.</td>
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618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model) (Sheet A)
Figure 814

Feb 15/68
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<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>857/858</td>
<td>A4</td>
<td>Changed Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q14, Q15, Q16, Q17, Q18, and Q19 from 2N1285 to 2N2188.</td>
<td></td>
<td>6000</td>
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<tr>
<td></td>
<td></td>
<td>Changed C17 from 270 pf to 150 pf.</td>
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<tr>
<td></td>
<td></td>
<td>Changed R7 from 150,000 ohms to 180,000 ohms.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Changed R10 from 150,000 ohms to 180,000 ohms.</td>
<td></td>
<td>6000</td>
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<tr>
<td></td>
<td></td>
<td>Changed R21 from 240 ohms to 2200 ohms.</td>
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<tr>
<td></td>
<td></td>
<td>Changed R22 from 4700 ohms to 2700 ohms.</td>
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<td>6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R72 from 150,000 ohms to 120,000 ohms.</td>
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<td>6000</td>
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<td></td>
<td></td>
<td>Added CR17 (1N645).</td>
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<td>6000</td>
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<tr>
<td></td>
<td></td>
<td>Changed C43 from 56 pf to 82 pf.</td>
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<tr>
<td></td>
<td></td>
<td>Changed R44 from 390 ohms to 560 ohms.</td>
<td></td>
<td>6000</td>
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<tr>
<td></td>
<td></td>
<td>Changed C124 to C126 and C125 to C127.</td>
<td></td>
<td>6000</td>
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<tr>
<td>857/858</td>
<td>A5</td>
<td>Added C128.</td>
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<td>7237</td>
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<td>857/858</td>
<td>A6</td>
<td>Changed Q12 from 2N2188 to 2N1132.</td>
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<tr>
<td>857/858</td>
<td>A7 (Cont)</td>
<td>Changed C27 from 510 pf to 1000 pf.</td>
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<td>9800</td>
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618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model) (Sheet B)
Figure 814
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<th>EFFECTIVITY</th>
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<tr>
<td>857/858</td>
<td>A7</td>
<td>Changed C29 from 0.05 µF to 0.47 µF.</td>
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<td>9800</td>
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<tr>
<td>857/858</td>
<td>A8</td>
<td>Changed C27 from 1000 pF to 510 pF.</td>
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<tr>
<td>857/858</td>
<td>A9</td>
<td>Changed R61 from 12,000 ohms to 3900 ohms.</td>
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<tr>
<td>857/858</td>
<td>A10</td>
<td>Changed Q7 from 2N2188 to 2N3135.</td>
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<tr>
<td>857/858</td>
<td>A11</td>
<td>Changed R45 from 2700 ohms to 3300 ohms.</td>
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<td>16815</td>
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<tr>
<td>857/858</td>
<td>A12</td>
<td>Changed C20 from 56 pF to 75 pF.</td>
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<tr>
<td>857/858</td>
<td>A13</td>
<td>Changed R13 from 39 kΩ to 27 kΩ.</td>
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<td></td>
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<td>Changed C15 from 200 pF to 180 pF.</td>
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<td></td>
<td>Changed R7 from 180 kΩ to 150 kΩ.</td>
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<td>26599</td>
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<tr>
<td></td>
<td></td>
<td>Changed Q1 thru Q6, Q8, Q12; Q14 thru Q19 from 2N2188 to 2N3135.</td>
<td>618T-1; SB 23</td>
<td>32200</td>
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<tr>
<td>857/858</td>
<td>B1</td>
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<tr>
<td></td>
<td></td>
<td>Changed R7 from 150 kΩ to 82 kΩ.</td>
<td>618T-2, 3: SB 24</td>
<td>32200</td>
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<td>857/858</td>
<td>B2</td>
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</tr>
<tr>
<td>857/858</td>
<td>B3</td>
<td>Changed R10 from 180 kΩ to 82 kΩ.</td>
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<td>32200</td>
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<tr>
<td>857/858</td>
<td>B4</td>
<td>Changed R21 from 2200 ohms to 1200 ohms.</td>
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<tr>
<td>857/858</td>
<td>B5</td>
<td>Changed R23 from 4700 ohms to 1 kΩ.</td>
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<td>32200</td>
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<tr>
<td>857/858</td>
<td>B6</td>
<td>Changed R72 from 120 kΩ to 82 kΩ.</td>
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<td>32200</td>
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<tr>
<td>857/858</td>
<td>B7</td>
<td>Changed R84 from 1800 ohms to 1 kΩ and R82 from 4700 ohms to 1 kΩ.</td>
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<td>32200</td>
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## SCHEMATIC CHANGES

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<th>EFFECTIVITY</th>
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<tr>
<td>NA</td>
<td>C1</td>
<td>Note added to C65 to indicate test select value.</td>
<td></td>
<td>16650</td>
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<tr>
<td>NA</td>
<td>C2</td>
<td>Added R100 (5-megohm thermistor) and R101 (220 kΩ). Added note 5.</td>
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<td>37925</td>
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<tr>
<td></td>
<td></td>
<td>Added R102 (100-kΩ thermistor) and C200 (39 pF). Added note 6.</td>
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<td>37925</td>
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<tr>
<td>NA</td>
<td>D1</td>
<td>Changed value of C1 from 18 to 27 pF to improve 1 kHz spurious.</td>
<td>Alt ltr AC and above</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>D2</td>
<td>Changed zener diodes CR6, CR7, and CR8 from type 1N2167A to 1N036B. Interchangeable parts if 1N2167A zener diodes are not available.</td>
<td>Alt ltr AT and above</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>E1</td>
<td>Changed transistor Q10 from 2N706 to 2N2222A, to improve pulse output of Q10.</td>
<td>CPN 546-6748-004, REV AK</td>
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</tr>
<tr>
<td>NA</td>
<td>E2</td>
<td>Changed C49 (1000 pF) to 1200 pF; Changed R39 (15 kΩ) to 10 kΩ. Deleted diode CR4. Added resistor R104 (1 kΩ). These changes were made to improve 10 kHz keyer operation.</td>
<td>CPN 546-6748-004, REV AL</td>
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</tr>
<tr>
<td>NA</td>
<td>E3</td>
<td>Added note 7.</td>
<td>CPN 546-6748-004, REV AM</td>
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<tr>
<td>NA</td>
<td>E4</td>
<td>Added RT3 (10 kΩ) as determined by temperature tests.</td>
<td>CPN 546-4138-004, REV AW</td>
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<tr>
<td>NA</td>
<td>E5</td>
<td>Changed transistors Q1 thru Q8 from type 2N3135 to 2N2907A.</td>
<td>CPN 546-6754-004 REV AD</td>
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<td>CPN 548-4135-004, REV BB</td>
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618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model) Figure 814 (Sheet D)  

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Oct 1/78
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<tr>
<td>NA</td>
<td>E6</td>
<td>Added capacitor C150 (220 pF) in Q7 and Q8 stages to improve circuit stability.</td>
<td>CPN 548-4135-004, REV BC</td>
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<tr>
<td>NA</td>
<td>E7</td>
<td>Added C129 (220 pF) to improve circuit stability.</td>
<td>CPN 546-6754-004, REV AE</td>
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<tbody>
<tr>
<td>NA</td>
<td>A1</td>
<td>Diodes CR6, CR7, and CR8 changed from 1N2167A to 1N939B. Interchangeable parts if 1N2167A zener diodes are not available.</td>
<td></td>
<td>All models</td>
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618T-1/2/3 kHz–Frequency Stabilizer A4, Schematic Diagram (Early Model) Figure 815 (Sheet A)

23-10-0
Pages 859/860 Nov 1/75
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<tr>
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<tr>
<td>865/866</td>
<td>A1</td>
<td>Changed Q5 from 2N550 to ST4265.</td>
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<tr>
<td>865/866</td>
<td>A2</td>
<td>Changed Q4 from 2N332 to 2N697.</td>
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<tr>
<td>865/866</td>
<td>A3</td>
<td>Changed Q1 from 2N670 to 2N651.</td>
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<td>865/866</td>
<td>A4</td>
<td>Changed Q3 from 2N3053 to 2N1131.</td>
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<td>865/866</td>
<td>A5</td>
<td>Changed Q5 from ST4265 to 2N3053.</td>
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<tr>
<td>865/866</td>
<td>A6</td>
<td>Changed R3 from 27 ohms to 47 ohms.</td>
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<td>865/866</td>
<td>A7</td>
<td>Changed R8 from 40 ohms to 31 ohms.</td>
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<td>23750</td>
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<tr>
<td>865/866</td>
<td>B1</td>
<td>Changed Q5 from 2N3053 to 2N3054.</td>
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<tr>
<td>865/866</td>
<td>B2</td>
<td>Added R22, 33 ohms.</td>
<td>618T-1: 28</td>
<td>29325</td>
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<td>618T-1B: 11</td>
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<td>618T-2: 30</td>
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<td>618T-2B: 12</td>
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<td>618T-3: 29</td>
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<tr>
<td>865/866</td>
<td>B3</td>
<td>Added CR4, 1N645.</td>
<td>618T-1: 28</td>
<td>29325</td>
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<td>618T-2: 30</td>
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<td>618T-2B: 12</td>
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<tr>
<td>NA</td>
<td>C1</td>
<td>CR2 changed from 1N2621A to 1N939B due to part availability.</td>
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<tr>
<td>NA</td>
<td>C2</td>
<td>CR1 changed from 1N3018A to 1N3018B due to part availability.</td>
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Low-Voltage Power Supply A5, Schematic Diagram
Figure 816
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<th>EFFECTIVITY</th>
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<tr>
<td>869/870</td>
<td>A1</td>
<td>Changed R6 from 100 ohms to 120 ohms.</td>
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<tr>
<td>869/870</td>
<td>A2</td>
<td>Added R27.</td>
<td></td>
<td>7000</td>
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<tr>
<td></td>
<td></td>
<td>Changed R6 from 120 ohms to 56 ohms.</td>
<td></td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R14 from 220 ohms to 100 ohms.</td>
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<td>7000</td>
</tr>
<tr>
<td>869/870</td>
<td>A3</td>
<td>Changed Q6 and Q7 from 2N457A to 2N1363 for improved reliability during extreme high-temperature operations.</td>
<td></td>
<td>24,000</td>
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Electronic Control Amplifier A6, Schematic Diagram (Sheet A)  
Figure 817
# SCHEMATIC CHANGES

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<tr>
<td>Na</td>
<td>B1</td>
<td>Added type number 1N4005 to note 1.</td>
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<tr>
<td>Na</td>
<td>B2</td>
<td>Added CR38 for transient suppression</td>
<td>22 for the</td>
<td>22209</td>
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<td>618T-2;</td>
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<td>3 for the</td>
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<td></td>
<td>618T-2B</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>C1</td>
<td>Changed P2-19 and P2-36 V dc out from 250 to 260 V dc to correct schematic error.</td>
<td></td>
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3-Phase High-Voltage Power Supply A7, Schematic Diagram (Late Model)  
Figure 818 (Sheet A)
NOTES:
1. CRI thru CR36 ARE TYPE IN492 OR IN4005.
2. C7 THRU C34 ARE 1000 UF.
3. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS
   AND ALL CAPACITANCE VALUES ARE IN PICOFARADS.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A7.
### SCHEMATIC CHANGES

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<th>PAGE</th>
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<th>EFFECTIVITY</th>
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<tr>
<td>877/878</td>
<td>A1</td>
<td>Deleted CR37, CR38, R12, C25, and C26.</td>
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<tr>
<td>877/878</td>
<td>A2</td>
<td>Added CR37 and CR38.</td>
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<td>3788</td>
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<tr>
<td>877/878</td>
<td>A3</td>
<td>Deleted K1, R1, R2, R3, and CR38. Added C27, C28, C29, C30, C31, R16, and R17. See schematic diagram of late model 3-phase high-voltage power supply (MCN 18000 and up).</td>
<td>618T-2 18</td>
<td>18000</td>
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3-Phase High-Voltage Power Supply A7, Schematic Diagram (Early Model) (Sheet A) Figure 819

Dec 1/72

23-10-0

Pages 875/876
3-Phase High-Voltage Power Supply A7, Schematic Diagram (Early Model)
Figure 819
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Added CR28 and CR29.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circuit from T2-9 to T2-8 was to Q6.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circuit from T2-8 to ground was to Q5.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CR4 from CR5 to CR29 was to T2-8.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CR3 from CR26 to C1 was to T2-9.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circuit from K1-3 to P1-26 was to P1-27.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added circuit from P1-26 to P1-27.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R10 from Q8 to Q9.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R5 from R6 to Q3.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted Q3 from R5 to Q4.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R25 (0.56) from Q9 to R26; was R9 (1) from Q7 to R8.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R26 (0.56 from Q10 to T2-10; was R8 (1) from Q6.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R27 (0.56) from Q11 to T2-7; was R7 (1) from Q5.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R28 (0.56 from Q12 to R27; was R6 (1) from Q4 to R7.</td>
<td>16</td>
<td>4250</td>
</tr>
</tbody>
</table>

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Late Model) (Sheet A)
Figure 820

Feb 15/68
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>A1 (Cont)</td>
<td>Deleted circuit from Q8 to ground.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted circuit from Q3 to ground.</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q9 (164-16) was Q7 (2N1100).</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q10 (164-16) was Q6 (2N1100).</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q11 (164-16) was Q5 (2N1100).</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q12 (164-16) was Q4 (2N1100).</td>
<td>16</td>
<td>4250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These changes converted the early model A8 to the late model A8. These changes are not indicated on either schematic diagram.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A2</td>
<td>Deleted circuit from CR30 (1N645) K3-7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A3</td>
<td>Changed R12 from 160 ohms to 82 ohms.</td>
<td></td>
<td>7300</td>
</tr>
<tr>
<td>Na</td>
<td>B1</td>
<td>Changed R1 from 2200 ohms to 1800 ohms.</td>
<td></td>
<td>11198</td>
</tr>
<tr>
<td>Na</td>
<td>B2</td>
<td>Added (+) positive polarity symbol to C25 (schematic error).</td>
<td>23 for the 618T-3; 3 for 618T-3B</td>
<td>12095</td>
</tr>
<tr>
<td>Na</td>
<td>B3</td>
<td>Added CR33 for transient suppression.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Late Model) (Sheet B) Figure 820

23-10-0 Page 880 Mar 15/71
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>C1</td>
<td>Added Q13 and Q14 (2N3773). Added R29, R30 (0.82 ohm). Changed Q9 thru Q12 from 2N1100 to 2N3773. Changed R25 thru R28 from 0.56 to 0.82 ohm.</td>
<td></td>
<td>13970</td>
</tr>
<tr>
<td>Na</td>
<td>C2</td>
<td>Changed Q9 thru Q14 from 2N3773 to 2N6259.</td>
<td></td>
<td>13975</td>
</tr>
<tr>
<td></td>
<td>D1</td>
<td>Changed voltage between P1-19 and P1-36 from 250 to 260 V dc to correct schematic error.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>Added capacitor C30 (6.8 μF) parallel to C4 to improve circuit stability.</td>
<td>CPN 545-4571-000, REV U</td>
<td></td>
</tr>
</tbody>
</table>
618T-() AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-5

This TEMPORARY REVISION replaces TEMPORARY REVISION NO 23-10-0-4

Insert facing page 881/882, 23-10-0

Subject: 27.5-V dc High-Voltage Power Supply A9, Schematic Diagram

Reverse the polarity of the diode, CR33, which is connected between ground and terminal 2 of relay K2.
<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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</thead>
</table>

This page will contain schematic revision information.

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Early Model) (Sheet A)  
Figure 821

Feb 15/68

23-10-0
Pages 883/884
27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Early Model)
Figure 821
<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>889/890</td>
<td>A1</td>
<td>Changed C47 and C49 from 15 uf to 47 uf to improve operation in CW function.</td>
<td>2</td>
<td>1500</td>
</tr>
<tr>
<td>889/890</td>
<td>A2</td>
<td>Changed R49 from 47,000 ohms to 33,000 ohms to simplify audio gain adjustment.</td>
<td>8</td>
<td>3508</td>
</tr>
<tr>
<td>889/890</td>
<td>A3</td>
<td>Changed Q3, Q4, Q5, Q6, and Q7 from 27274 to 2N2188 for increased transistor reliability.</td>
<td></td>
<td>6486</td>
</tr>
<tr>
<td>889/890</td>
<td>A4</td>
<td>Changed R26 from 2200 ohms to 3900 ohms and C6 from 0.68 uf to 0.33 uf.</td>
<td></td>
<td>7400</td>
</tr>
<tr>
<td>889/890</td>
<td>A5</td>
<td>Added L9 and C53 to reduce transmit noise on the 18-vdc line.</td>
<td>13</td>
<td>7600</td>
</tr>
<tr>
<td>889/890</td>
<td>A6</td>
<td>Changed CR13 from SZ885 to 1N4122.</td>
<td></td>
<td>9255</td>
</tr>
<tr>
<td>889/890</td>
<td>A7</td>
<td>Changed CR2, CR4, CR7, and CR11 from HD2120 to 1N34AS and R12 from 1500 ohms to 1000 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>889/890</td>
<td>A8</td>
<td>Changed C22 from 15 uf to 45 uf to improve TR transfer characteristics.</td>
<td></td>
<td>17300</td>
</tr>
<tr>
<td>889/890</td>
<td>A9</td>
<td>Changed CR5 and CR6 from HD2120 to 1N34AS and R41 from 22,000 ohms to 33,000 ohms.</td>
<td></td>
<td>20000</td>
</tr>
<tr>
<td>889/890</td>
<td>A10</td>
<td>Changed R26 from 3900 ohms to 2200 ohms to increase if. amplifier gain.</td>
<td></td>
<td>21500</td>
</tr>
</tbody>
</table>

AM/ Audio Amplifier A9, Schematic Diagram (Late Model) (Sheet A)
Figure 822

Feb 15/68
<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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</thead>
<tbody>
<tr>
<td>NA</td>
<td>A11</td>
<td>Added CR15 to improve relay arc suppression.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>B1</td>
<td>Reversed polarity of CR15 (schematic error).</td>
<td>618T-1: SB 23</td>
<td>29427</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2, 3; SB 24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-1B, 2B, 3B: SB 4</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>B2</td>
<td>Changed Q3, Q4, Q5, Q6 and Q7 from 2N2188 to 2N3135.</td>
<td>618T-1: 30</td>
<td>32814</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2/3: 33</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2B/3B: 16</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>B3</td>
<td>Replaced RT1 with CR16.</td>
<td></td>
<td>29427</td>
</tr>
<tr>
<td>NA</td>
<td>C1</td>
<td>Replaced L9 (1 mH) with R59 to reduce surge current through chassis relay K4.</td>
<td>618T-1/4: 36, 37</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-1B/4B: 19, 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2/5: 39, 40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-2B/5B: 23, 24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-3/6: 40, 41</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-3B/6B: 24, 25</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>C2</td>
<td>Changed R10 from 5.6 ohms to 4.7 ohms, R14 from 1200 ohms to 1000 and R48 from 2200 ohms to 1800 ohms. Changes to decrease distortion and improve AGC characteristics.</td>
<td></td>
<td>30360</td>
</tr>
<tr>
<td>NA</td>
<td>D1</td>
<td>CR16 removed.</td>
<td></td>
<td>33567</td>
</tr>
<tr>
<td>NA</td>
<td>E1</td>
<td>Active filter consisting of U1, R60, R61, R62, R63, R64, R65, R66, C54, C55, C56, C57, C58, and C59 added between P2-25 and K1-7 to decrease CW emission bandwidth.</td>
<td>618T-1/4: A9 MCN 40000 and above</td>
<td></td>
</tr>
</tbody>
</table>

AM/Audio Amplifier A9, Schematic Diagram (Late Model)
Figure 822 (Sheet B)
Subject: AM/Audio Amplifier A9, Schematic Diagram (Late Model) Figure 822

Insert sheet 5 of this Temporary Revision after page 889/890.

Change the Description of Revision and Reason for Change column for Rev Ident E1 to read as follows:

<table>
<thead>
<tr>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
</tr>
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<tbody>
<tr>
<td>E1</td>
<td>Active filter consisting of U1, R60, R61, R62, R63, R64, R65, R66, C54, C55, C56, C57, C58, and C59 added between P2-25 and K1-7 to decrease CW emission bandwidth. See figure 822, sheet 2 for configuration before modification.</td>
</tr>
</tbody>
</table>
### SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>F1</td>
<td>Changed relay K1 contacts 7 and 4 from previous connection between C57 and C58 to reduce sideband residual output at cold temperature.</td>
<td>CPN 601-3997-001, REV C</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F2</td>
<td>Changed R11 from 82 to 56 Ω, C53 from 0.022 to 0.047 pF, and C50 from 0.33 to 0.27 pF. Added resistor R67 (15 kΩ) and capacitor C60 (0.1 pF). Added CR16 (1N645).</td>
<td>CPN 546-6053-000, REV 3D</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F3</td>
<td>Changed C6 from 0.33 to 0.68 µF to improve audio frequency response.</td>
<td>CPN 601-3997-001, REV E</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F4</td>
<td>Changed resistor R48 from 1800 to 2700 to improve AM mode RCR AGC characteristics.</td>
<td>CPN 546-7273-004, REV AW</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F5</td>
<td>Changed CR2, CR7, and CR11 from 1N34AS to 1N645. Changed CR4 from 1N34AS to 1N270. Changed CR5 and CR6 from 1N34AS to 1N4454A.</td>
<td>CPN 546-7273-004, REV AY</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F6</td>
<td>Changed transistors Q3, Q4, Q5, Q6, and Q7 from 2N2135 to 2N2907A.</td>
<td>CPN 546-7273-004, REV BA</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>F7</td>
<td>Changed capacitor C56 from 1.0 to 0.56 µF.</td>
<td>CPN 601-3997-001, REV G</td>
<td></td>
</tr>
</tbody>
</table>

AM/Audio Amplifier A9, Schematic Diagram (Late Model)
Figure 822 (Sheet C)

23-10-0
Pages 888A/888B
Oct 1/78
Configuration of AM/Audio Amplifier without the following service bulletins: 618T-1/4, 36, 37; 618T-1B/4B, 19, 20; 618T-2/5, 39, 40; 618T-2B/5B, 23, 24; 618T-3/6, 40, 41; 618T-3B/6B, 24, 25.

AM/Audio Amplifier A9, Schematic Diagram

(Late Model) Sheet 2

Figure 822

520-5970003-F91113

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<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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This page will contain schematic revision information.

AM/Audio Amplifier A9, Schematic Diagram (Early Model) (Sheet A)
Figure 823

Feb 15/68
AM/Audio Amplifier A9, Schematic Diagram (Early Model)

Figure 823

Feb 15/68

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Pages 853/894
### SCHEMATIC CHANGES

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<th>PAGE</th>
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<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>897/898</td>
<td>A1</td>
<td>Changed A1Q1, A1Q4, A2Q1, and A2Q4 from 2N1285 to 2N2188.</td>
<td></td>
<td>2835</td>
</tr>
<tr>
<td>897/898</td>
<td>A2</td>
<td>Deleted C12.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interchanged C6 and C9.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R18 to 1000 ohms.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C8 to 1000 pf.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed L3 to 2.2 mh.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C7 to 360 pf.</td>
<td></td>
<td>4200</td>
</tr>
<tr>
<td>897/898</td>
<td>A3</td>
<td>Changed A1C9 and A2C9 to 1 uf.</td>
<td></td>
<td>6350</td>
</tr>
<tr>
<td>897/898</td>
<td>A4</td>
<td>Changed A1Q4 and A2Q4 from 2N2188 to 2N3135.</td>
<td></td>
<td>6580</td>
</tr>
<tr>
<td>897/898</td>
<td>A5</td>
<td>Changed A1Q3 and A2Q3 from 2N706 to 2N916.</td>
<td></td>
<td>17000</td>
</tr>
<tr>
<td>897/898</td>
<td>A6</td>
<td>L2 connected to P1-1 was to junction of L1 and C2. Wiring change to increase voltage on unijunctions Q3 and Q4.</td>
<td></td>
<td>21500</td>
</tr>
<tr>
<td>897/898</td>
<td>B1</td>
<td>Changed A10Q3 and A10Q4 from 2N489 to 2N489A. Change to reduce minimum voltage below 4 V.</td>
<td></td>
<td>30300</td>
</tr>
<tr>
<td>897/898</td>
<td>B2</td>
<td>Replaced L2 with R10 (150 ohms).</td>
<td></td>
<td></td>
</tr>
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</table>
## SCHEMATIC CHANGES

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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>B3</td>
<td>Changed A10A1Q1 and A10A2Q1 from 2N2188 to 2N3135.</td>
<td>618T-1: SB 23 &lt;br&gt; 618T-2, 3: SB 24 &lt;br&gt; 618T-1B, 2B, 3B: SB 4</td>
<td>29500</td>
</tr>
<tr>
<td>NA</td>
<td>C1</td>
<td>Added R7 from base of A10A3Q1 to ground.</td>
<td></td>
<td>36938</td>
</tr>
<tr>
<td>NA</td>
<td>D1</td>
<td>Changed transistors A1Q1, A1Q4, A2Q1, and A2Q4 from 2N2188 to 2N2907A.</td>
<td>CPN 548-5989-005, REV AE</td>
<td></td>
</tr>
</tbody>
</table>

MHz-Frequency Stabilizer A10, Schematic Diagram (Late Model) Figure 824 (Sheet B)
### SCHEMATIC CHANGES

<table>
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<th>REVISION IDENTIFICATION</th>
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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>A1</td>
<td>A1Q1, A1Q4 changed from 2N1285 to 2N2188.</td>
<td></td>
<td>2634</td>
</tr>
<tr>
<td>NA</td>
<td>B1</td>
<td>Changed transistors A1Q1, A1Q4, A2Q1, and A2Q4 from 2N1285 to 2N2907A.</td>
<td>CPN 546-7222-003, REV N</td>
<td></td>
</tr>
</tbody>
</table>
B1K Tip level
Red'w
## SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
</tr>
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<tbody>
<tr>
<td>801/7, 801/8</td>
<td>A1</td>
<td>Replaced plain wire from C40 to junction of C35 and R14 with RG-196J coaxial cable to eliminate jitter from discriminator output.</td>
<td>3</td>
<td>1501</td>
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<tr>
<td>801/7, 801/8</td>
<td>A2</td>
<td>Changed V1 and V2 from 7204 to 7204G.</td>
<td></td>
<td>2250</td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A3</td>
<td>Changed R3 from 680 ohms, 0.5 watt to 180 ohms, 3 watts for improved reliability.</td>
<td>9</td>
<td>5000</td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A4</td>
<td>Placed R23 and R22 in parallel and removed from ground.</td>
<td></td>
<td>6261</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added L12 in series from R22 and R23 to ground.</td>
<td></td>
<td>6261</td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A5</td>
<td>Changed C20 and C58 from 1700 pf to 1800 pf.</td>
<td></td>
<td>6414</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed C38 and C52 from 0.02 uf to 0.022 uf.</td>
<td></td>
<td>6414</td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A6</td>
<td>Added R44.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed R4 from 8200 ohms to 7500 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A7</td>
<td>Changed R16 from 1000 ohms to 1800 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A8</td>
<td>Added R43.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A9</td>
<td>Changed CR2A and CR2B from 1N198 to MP3040.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801/7, 801/8</td>
<td>A10</td>
<td>Added rf ground to discriminator subassembly.</td>
<td>14</td>
<td>6333</td>
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</table>

Power Amplifier A11, Schematic Diagram (Late Model) (Sheet A)
Figure 826

Feb 15/68
<table>
<thead>
<tr>
<th>PAGE</th>
<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>801/7, 801/8</td>
<td>A11</td>
<td>Changed C45 and C46 from 1.2 uf to 0.8 uf.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R41.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R39.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R40.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted CR8A.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted CR8B.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted C62.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted C61.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deleted R38.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added R45.</td>
<td>14</td>
<td>7390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed CR7A and CR7B (10M200Z2) to CR10A and CR10B (50M195ZB2).</td>
<td>14</td>
<td>7390</td>
</tr>
</tbody>
</table>

The above changes (A11) were incorporated to improve the reliability and performance of the power amplifier module.

| 801/7, 801/8 | A12                     | Changed R4 and R44 from 7500 ohms to 15,000 ohms. |               |             |
| 801/7, 801/8 | A13                     | Changed R45 from 470 ohms to 100 ohms.            |               |             |
| 801/7, 801/8 | A14                     | Changed V1 and V2 from 7204G to 8621.             |               |             |
| 801/7, 801/8 | A15                     | Changed C7 from 120 pf to 140 pf.                 |               | 17875       |

Power Amplifier A11, Schematic Diagram (Late Model) (Sheet B)
Figure 826

23-10-0
Page 801/4

Feb 15/68
### SCHEMATIC CHANGES

<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV IDENT</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>NA</td>
<td>A16</td>
<td>Changed shunt strap on transformer T1.</td>
<td></td>
<td>22400</td>
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<tr>
<td>801/7, 801/8</td>
<td>B1</td>
<td>Changed CR1 from 1N1491 to 1N5061.</td>
<td>CPN 549-4304-004, REV G</td>
<td></td>
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</table>

Power Amplifier A11, Schematic Diagram
(Late Model)
Figure 826 (Sheet C)

23-10-0
Pages 801/5, 801/6
Oct 1/78
Power Amplifier A11, Schematic
Diagram (Late Model)
Figure 826

23-10-0
Pages 801/7, 801/8
Oct 1/78
### Schematic Changes

<table>
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<tr>
<th>PAGE</th>
<th>Revision Identification</th>
<th>Description of Revision and Reason for Change</th>
<th>Service Bulletin</th>
<th>Effectivity</th>
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</table>

This page will contain schematic revision information.

---

Power Amplifier A11, Schematic Diagram (Early Model) (Sheet A)

Figure 827

Feb 15/68
Power Amplifier A11, Schematic Diagram (Early Model)
Figure 827

Feb 15/68
Pages 801/11, 801/12
<table>
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<tr>
<th>SHEET</th>
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<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
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<tbody>
<tr>
<td>3</td>
<td>B1</td>
<td>Added R97.</td>
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<tr>
<td>3</td>
<td>B2</td>
<td>Added R96.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B3</td>
<td>Replaced C234 with circuit from P9-15 to R55 and relocated C234.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B4</td>
<td>Changed value of R95 from 50 ohms to 220 ohms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B5</td>
<td>Changed circuit from R93 to P6, and added C288, C289, L132, and L133.</td>
<td>157</td>
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</tr>
<tr>
<td>3</td>
<td>B6</td>
<td>Added L134 from C144 to V8-3 and L135 from C145 to V2-4.</td>
<td>5</td>
<td>MCN 620</td>
</tr>
<tr>
<td>3</td>
<td>C1</td>
<td>Added L136 from C237 to V12-5, L137 from C155 to V5-4, L138 from C287 to C240, and L139 from R71 to C238 to reduce internal signals that are coupled through filament circuits.</td>
<td>618T-1B: 13</td>
<td>MCN 731</td>
</tr>
<tr>
<td>2</td>
<td>C2</td>
<td>Changed value of R30 from 5600 ohms to 8200 ohms to compensate for tube variations and improve rf gain control with high-level rf input signals in receive mode.</td>
<td></td>
<td>MCN 741</td>
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<tr>
<td>3</td>
<td>D1</td>
<td>Added C301 to XV8 to eliminate AM heterodyne at 2.1 MHz. Repositioned L139.</td>
<td></td>
<td>842</td>
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## SCHEMATIC CHANGES

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<tr>
<td>2</td>
<td>E1</td>
<td>Changed L85 from 0.33 to 0.47 µH and L86 from 0.15 to 0.22 µH to improve gain on 3- to 7-MHz bands.</td>
<td></td>
<td>34007</td>
</tr>
<tr>
<td>3</td>
<td>E2</td>
<td>Changed C141 from 1.5 - 10.5 pF to 3.0 - 18.0 pF to extend adjustment for PA neutralization.</td>
<td></td>
<td>34106</td>
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<tr>
<td>1</td>
<td>F1</td>
<td>Changed V11 from 6AH6WA to JAN6AH6WA.</td>
<td></td>
<td>REV AG</td>
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<tr>
<td>1</td>
<td>F2</td>
<td>Changed V10 from 6AH6WA to JAN6AH6WA.</td>
<td></td>
<td>REV AH</td>
</tr>
<tr>
<td>3</td>
<td>F3</td>
<td>Changed direct ground connections of S12 wiper arm to relay connection of K3 motor relay pin 8 to cause rf translation to complete band switching before PA band switches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>F4</td>
<td>Added note 7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>F5</td>
<td>Changed R46 from 2200 to 1800 Ω.</td>
<td></td>
<td>REV AP</td>
</tr>
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<td>SHEET</td>
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<td>EFFECTIVITY</td>
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<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>NA</td>
<td>A1</td>
<td>Renumbered switch 87 contacts per the replaced switch.</td>
<td>618T-1/4: 34 618T-1B/4B: 17 618T-2/5: 37 618T-2B/5B: 21 618T-3/6: 38 618T-3B/6B: 22</td>
<td>All models</td>
</tr>
</tbody>
</table>

618T-1B/2B/3B Autopositioner A12A1, Schematic Diagram Figure 829 (Sheet A)

23-10-0
Pages 801/21, 801/22
Nov 1/75
NOTES
1. UNLESS OTHERWISE INDICATED RESISTANCE VALUES ARE IN OHMS.
2. REFERENCE DESIGNATIONS ARE AbbREVIATED. PREFIX THE DESIGNATIONS
   WITH THE ASSEMBLY DESIGNATION, A/J:
3. T1, T2, T3 AND T4 ARE SHOWN IN THE "OFF" POSITION OR ROTATION
   INCREASES FREQUENCY.
4. T5 AND T6 ARE SHOWN IN THE "6" KHZ POSITION OR ROTATION DECREASES
   FREQUENCY.
5. ALL SWITCHES VIEWED FROM DRIVER END.
   O DRIVER END
   • OPPOSITE DRIVER END
   • BOTH OPPOSITE AND DRIVER END.

618T-1B/2B/3B Autopositioner A12A1, Schematic Diagram
Figure 829

23-10-0
Pages 801/23, 801/24
Nov 1/75
### SCHEMATIC CHANGES

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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>801/27, 801/28</td>
<td>A1</td>
<td>Changed C166 from 4 uf to 1.5 uf.</td>
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<td>4098</td>
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<tr>
<td>801/27, 801/28</td>
<td>A2</td>
<td>Changed R92 from 10,000 ohms to 2200 ohms.</td>
<td></td>
<td>5100</td>
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<tr>
<td></td>
<td></td>
<td>Changed CR6 from 1N67A to 1N645.</td>
<td></td>
<td>5588</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed CR6 from 1N645 to 1N3064.</td>
<td></td>
<td>19350</td>
</tr>
<tr>
<td>801/31, 801/32</td>
<td>A3</td>
<td>Changed C141 from 5-25 pf to 1.5-7.0 pf.</td>
<td></td>
<td>6342</td>
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<tr>
<td></td>
<td></td>
<td>Changed C126 from 91 pf to 68 pf.</td>
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<td>6342</td>
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<tr>
<td>801/27, 801/28</td>
<td>A4</td>
<td>Changed R78 from 47 ohms to 500 ohms.</td>
<td></td>
<td>6292</td>
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<tr>
<td>801/27, 801/28</td>
<td>A5</td>
<td>Added R94 (68) from T1 to ground.</td>
<td></td>
<td>6853</td>
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<tr>
<td>801/27, 801/28</td>
<td>A6</td>
<td>Changed C276 and C277 from HC7005 to 1N953.</td>
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<tr>
<td>801/29, 801/30</td>
<td>A7</td>
<td>Changed R61 from 3300 ohms to 2200 ohms.</td>
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<td>20373</td>
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<tr>
<td>801/27, 801/28</td>
<td>A8</td>
<td>Changed R94 from 68 ohms to 120 ohms.</td>
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<td>20373</td>
</tr>
<tr>
<td>801/29, 801/30, 801/31, 801/32</td>
<td>A9</td>
<td>Deleted C45, C47, C51, C53, C83, C85, C89, C91, C117, and C120.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added circuits S3-11 to S3-12, S3-14 to S3-15, S4-15 to S4-16, S4-17 to S4-18, S4-21 to S4-22, S4-22 to S4-23, S7-15 to S7-16, S7-17 to S7-18, S7-21 to S7-22, and S7-22 to S7-23.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model) (Sheet A)  
Figure 830

Dec 1/72

23-10-0
Page 801/25
<table>
<thead>
<tr>
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<th>REVISION IDENTIFICATION</th>
<th>DESCRIPTION OF REVISION AND REASON FOR CHANGE</th>
<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>2, 3</td>
<td>A9 (Cont)</td>
<td>These changes (A9) improve reliability by removing redundant components.</td>
<td></td>
<td>20193</td>
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<tr>
<td>3</td>
<td>A10</td>
<td>Changed R82 from 6800 ohms to 5600 ohms.</td>
<td></td>
<td>23750</td>
</tr>
<tr>
<td>2</td>
<td>A11</td>
<td>Changed vfo from 70K-5 to 70K-9 (618T-1/2 only). This change improves transceiver operation under extreme environmental conditions.</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A12</td>
<td>Changed vfo from 70K-5 to 70K-9 (618T-3 only). This change improves transceiver operation under extreme environmental conditions.</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B1</td>
<td>Added R96.</td>
<td></td>
<td>25850</td>
</tr>
<tr>
<td>3</td>
<td>B2</td>
<td>Added R95.</td>
<td></td>
<td>25850</td>
</tr>
<tr>
<td>2</td>
<td>B3</td>
<td>Replaced C234, C247, C251, and R80 with circuit from P9-15 to R55.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B4</td>
<td>Replaced circuit from P9-15 to K4-7 with C234, C247, C251, and R80.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B5</td>
<td>Added L132 and L133.</td>
<td></td>
<td>27944</td>
</tr>
<tr>
<td>3</td>
<td>B6</td>
<td>Added L134 from C144 to V8-3, and L135 from C145 to V2-4.</td>
<td>618T-1: 21, 618T-2: 23, 618T-3: 22</td>
<td>28922</td>
</tr>
<tr>
<td>3</td>
<td>B7</td>
<td>Added L136 and L137.</td>
<td></td>
<td>28922</td>
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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>2</td>
<td>C1</td>
<td>Changed value of R30 from 5600 ohms to 8200 ohms to compensate for tube variations and improve rf gain control with high-level rf input signals in receive mode.</td>
<td></td>
<td>31700</td>
</tr>
<tr>
<td>3</td>
<td>D1</td>
<td>C301, 0.05 μF, added to bypass XV8. Eliminates AM heterodyne at 2.1 MHz.</td>
<td></td>
<td>32547</td>
</tr>
<tr>
<td>2</td>
<td>E1</td>
<td>Changed L85 from 0.33 to 0.47 and L86 from 0.15 to 0.22 to improve gain on 3- to 7-MHz bands.</td>
<td></td>
<td>34007</td>
</tr>
<tr>
<td>3</td>
<td>E2</td>
<td>Changed C41 from 1.5 - 7 pF to 3 - 18 pF to extend adjustment for pa neutralization.</td>
<td></td>
<td>34106</td>
</tr>
<tr>
<td>1</td>
<td>F1</td>
<td>Changed V11 from 6AH6WA to JAN6AH6WA.</td>
<td></td>
<td>REV DG</td>
</tr>
<tr>
<td>1</td>
<td>F2</td>
<td>Changed V10 from 6AH6WA to JAN6AH6WA.</td>
<td></td>
<td>REV DJ</td>
</tr>
<tr>
<td>3</td>
<td>F3</td>
<td>Changed direct ground connection of S12 wiper arm to relay connection of K3 motor relay pin 8 to cause rf translator to complete band switching before PA band switches.</td>
<td></td>
<td>REV DP</td>
</tr>
<tr>
<td>1, 3</td>
<td>F4</td>
<td>Added note 9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>F5</td>
<td>Changed resistor R46 from 2200 to 1800 Ω.</td>
<td></td>
<td>REV DV</td>
</tr>
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<td>-------------</td>
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<tr>
<td>801/37, 801/38</td>
<td>A1</td>
<td>Changed L10A from 8.5 uh to 4.4 uh.</td>
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<td>224</td>
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<tr>
<td>801/37, 801/38</td>
<td>A2</td>
<td>Changed L12A and L12B from 2.3 uh to 1.7 uh.</td>
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<td>224</td>
</tr>
<tr>
<td>801/35, 801/36; 801/39, 801/40</td>
<td>B1</td>
<td>Added note 3, making C6 a test select value.</td>
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### SCHEMATIC CHANGES

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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>801/43, 801/44</td>
<td>A1</td>
<td>Added CR3 and CR4 to improve relay arc suppression.</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>801/43, 801/44</td>
<td>A2</td>
<td>Changed R33 from 16 ohms to 14 ohms.</td>
<td>618T-1/4: 34</td>
<td>21152</td>
</tr>
<tr>
<td>NA</td>
<td>B1</td>
<td>Remumbered switch S7 contacts for switch replacement.</td>
<td>618T-1B/4B: 17</td>
<td>All models</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>618T-2/5: 37</td>
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</tr>
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<td></td>
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<td></td>
<td>618T-2B/5B: 21</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>618T-3/6: 38</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>618T-3B/6B: 22</td>
<td></td>
</tr>
</tbody>
</table>
618T-1/2/3 Autopositioner A12A1, Schematic Diagram
Figure 825

23-10-0
Page 801/43, 801/44
Nov 1/75
# SCHEMATIC CHANGES

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<th>SERVICE BULLETIN</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>Na</td>
<td>A1</td>
<td>Change Q4 from 2N2189 to 2N2861.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A2</td>
<td>Changed R23 from 1000 ohms (variable) to factory-selected value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A3</td>
<td>Changed C9 from 620 pf to 1000 pF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A4</td>
<td>Added C31.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>A5</td>
<td>Changed Q1 through Q4 from 2N2861 to 2N3250.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>B1</td>
<td>Changed R23 from 1000 to 56 ohms.</td>
<td>33225</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>C1</td>
<td>Changed R3 from 15 to 14.7 kΩ. Changed C9 from 1000 to test select. Changed C17 from 22 to 47 pF. Changed R15 from 5 to 2 kΩ. Changed R4 from 4020 to 4220. Moved variable capacitor C24 from junction of L7 and L2 to ground to junction of C4 and C5 to ground. Changed C10 from 15 to 18 pF.</td>
<td>Alt Itr BJ</td>
<td></td>
</tr>
</tbody>
</table>

618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Late Model) Figure 833 (Sheet A)
618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Late Model)
Figure 833

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Pages 801/47, 801/48
Nov 1/75
### SCHEMATIC CHANGES

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618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Early Model) (Sheet A)
Figure 834

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Pages 801/49, 801/50
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618T-1/2/3 VFO A12A2 (Model 70K-5), Schematic Diagram (Sheet A)
Figure 835

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Pages 801/53, 801/54
61FT-1/2/3 VFO A12A2 (Model 70K-5), Schematic Diagram

Figure 835
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This page will contain schematic revision information.

618T-1/2/3 VFO A12A2 (Model 70K-3), Schematic Diagram (Sheet A)
Figure 836

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Pages 801/57, 801/58
618T-1/2/3 VFO A12A2 (Model 70K-3), Schematic Diagram

Figure 836
### Schematic Changes

<table>
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<th>EFFECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>A1</td>
<td>Added CR22 for transient suppression.</td>
<td>22 for the 618T-1; 2 for the 618T-1B</td>
<td>2266</td>
</tr>
<tr>
<td>Na</td>
<td>B1</td>
<td>Changed voltage at P1-19 and P1-36 from +250 to +260 V dc to correct schematic error.</td>
<td></td>
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### SCHEMATIC CHANGES

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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram (Sheet A)
Figure 838

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Pages 801/65, 801/66
### SCHEMATIC CHANGES

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<tr>
<td>801/71, 801/72</td>
<td>A1</td>
<td>Changed A5 from SF51 to SF50 for greater fanout capability.</td>
<td></td>
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</tr>
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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 and Squaring Amplifier Assembly A15A1, Schematic Diagram (Sheet A) Figure 839

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Pages 801/69, 801/70
615T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 and Squaring
Amplifier Assembly A15A1, Schematic Diagram
Figure 839

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Pages 801/71, 801/72
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<tbody>
<tr>
<td>801/75,</td>
<td>A1</td>
<td>Changed A5 from SF51 to SF50 for greater fanout capability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801/76</td>
<td></td>
<td></td>
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618T-1B/2B/3B Frequency Divider–Stabilizer A15, Divide by 10. Assemblies A15A2 and A15A3, Schematic Diagram (Sheet A)  
Figure 840

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23-10-0

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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 26-35 Assembly A15A4,
Schematic Diagram (Sheet A)
Figure 841

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Pages 801/77, 801/78
618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 26-35 Assembly A15A4,
Schematic Diagram
Figure 841

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Pages 801/79, 801/80
### SCHEMATIC CHANGES

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<tbody>
<tr>
<td>801/83, 801/84</td>
<td>A1</td>
<td>Added CR2 (1N645). Changed A5 from SG191 to SG190.</td>
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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Phase/Frequency Discriminator A15A5, Schematic Diagram (Sheet A)

Figure 842

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Pages 801/81, 801/82
61FT-1B/2B/3B Frequency Divider-Stabilizer A15, Phase/Frequency Discriminator A15A5, Schematic Diagram

Figure 842

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<th>EFFECTIVITY</th>
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<tbody>
<tr>
<td>801/87, 801/88</td>
<td>A1</td>
<td>Added C15 (0.0 μF) from C1 to ground.</td>
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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Reference Frequency Divider Assembly A15A6, Schematic Diagram (Sheet A)
Figure 843

Dec 1/72

Pages 801/85, 801/86
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<tr>
<td>NA</td>
<td>A1</td>
<td>Corrected C17 from 22 MF to 22 µF. Changed R9 from 215 ohms to test select. Added note 4.</td>
<td></td>
<td>All models</td>
</tr>
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</table>

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Voltage Controlled Oscillator and Isolation Amplifier A15A7/A15A8, Schematic Diagram Figure 844 (Sheet A)
618T-1B/2R/3B Frequency Dividers-Stabilizers A15, Voltage Controlled Oscillators and Isolation Amplifiers A15A7/A16A8, Schematic Diagram

Figure 844

23-10-0
Pages 901/91, 901/92
Nov 1/75
## SCHEMATIC CHANGES

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<tr>
<td>801/95, 801/96</td>
<td>B1</td>
<td>Changed R14 from 2700 ohms to 3900 ohms.</td>
<td></td>
<td>325</td>
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<tr>
<td></td>
<td>B2</td>
<td>Changed C3 from 8µF to 220 µF.</td>
<td></td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>B3</td>
<td>Changed C4 from 0.01 µF to 0.02 µF.</td>
<td></td>
<td>378</td>
</tr>
<tr>
<td></td>
<td>B4</td>
<td>Changed C5 from 220 µF to 33 µF.</td>
<td></td>
<td>265</td>
</tr>
<tr>
<td></td>
<td>B5</td>
<td>Deleted CR6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B6</td>
<td>Added R18, 5600 ohms.</td>
<td></td>
<td>378</td>
</tr>
<tr>
<td>801/95, 801/96</td>
<td>C1</td>
<td>Changed resistor R18 from 5000 to 5.6 Ω to correct schematic error.</td>
<td></td>
<td></td>
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618T-1B/2B/3B Frequency Divider-Stabilizer
A15, 5-Volt DC Regulator Assembly
A15A9, Schematic Diagram
Figure 845 (Sheet A)

23-10-0
Pages 801/93, 801/94
Oct 1/78
618T-1B/2B/3B Frequency Divider-Stabilizer A15, 5-Volt DC Regulator
Assembly A15A9, Schematic Diagram
Figure 845

23-10-0
Pages 801/95, 801/96
Oct 1/78
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618T-1B/2B/3B Frequency Divider-Stabilizer A15, 26-Volt DC Regulator
Assembly A15A10, Schematic Diagram (Sheet A)
Figure 846

Feb 15/68

Pages 801/97, 801/98
618T-1B/23/3B Frequency Divider-Stabilizer A15, 26-Volt DC Regulator
Assembly A15A10, Schematic Diagram
Figure 846
### SCHEMATIC CHANGES

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618T-1B/2B/3B Frequency Divider–Stabilizer A15, Filter FL1 and Lead-Lag Network, Simplified Schematic Diagram (Sheet A)  
Figure 847

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618T-1B/2B/3B Frequency Divider-Stabilizer A15, Filter FL1 and Lead-Lag Network, Simplified Schematic Diagram
Figure 847
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618T-1B/2B/3B Control Data Converter A16, Schematic Diagram (Sheet A)
Figure 848

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Pages 801/105, 801/106
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516H-1 Power Supply, Schematic Diagram (Late Model) (Sheet A)
Figure 849
Feb 15/68
516H-1 Power Supply, Schematic Diagram (Late Model)
Figure 849

Feb 15/68
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This page will contain schematic revision information.

516H-1 Power Supply, Schematic Diagram (Early Model) (Sheet A)  
Figure 850

Feb 15/68  
Pages 801/113, 801/114
516H-1 Power Supply, Schematic Diagram (Early Model)
Figure 850

Feb 15/68
23-10-0
Pages 801/115, 801/116
618T-( ) Airborne SSB Transceiver - Storage Instructions

1. GENERAL.

This section presents storage instructions for the 618T-( ). Make certain that all modules are secured to the chassis and that the unit is installed in the dust cover. If the 618T-( ) must be stored in a hot, humid environment, perform the procedures in the inspection/check section before returning the unit to service. This inspection must be performed before returning the unit to service if the storage period is three months or longer in any environment.
Subject: 618T-( ) Airborne SSB Transceiver-Special Tools, Fixtures, and Test Equipment

Delete Spectrum analyzer, model number 2836, manufactured by Polarad from test equipment required, step 2.
618T-( ) Airborne SSB Transceiver - Special Tools, Fixtures, and Test Equipment

1. GENERAL.

This section presents a list of special tools, fixtures, and test equipment required for the test or overhaul of the 618T-( ) Airborne SSB Transceiver.

2. TEST EQUIPMENT REQUIRED.

Figure 1001 lists all the equipment required to test, troubleshoot, and overhaul the unit. Any substituted test equipment must be equivalent to that listed.

A test fixture for frequency divider-stabilizer A15 is shown in figure 1002 and a test fixture for control data converter A16 is shown in figure 1003. 678Y-1B includes module extenders for data converter and divider stabilizer modules.

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>TYPE OR MODEL NO.</th>
<th>COLLINS PART NUMBER</th>
<th>MANUFACTURER</th>
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<tbody>
<tr>
<td>Rf dummy load</td>
<td>8201</td>
<td></td>
<td>Bird</td>
</tr>
<tr>
<td>Signal generator</td>
<td>606A</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>*Power supply</td>
<td>711A</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>*Power supply</td>
<td>723A</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>6-db attenuator</td>
<td>80-ZH3</td>
<td></td>
<td>Measurements Corp.</td>
</tr>
<tr>
<td>Vtvm</td>
<td>410B</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>Rf vtvm</td>
<td>91-C</td>
<td></td>
<td>Boonton</td>
</tr>
<tr>
<td>Probe T-connector</td>
<td>455A or 11042A</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>Harmonic distortion analyzer</td>
<td>330D</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>Spectrum analyzer</td>
<td>2836</td>
<td></td>
<td>Polarad</td>
</tr>
<tr>
<td>Oscilloscope</td>
<td>545B</td>
<td></td>
<td>Tektronix</td>
</tr>
<tr>
<td>Oscilloscope calibrated amplifier</td>
<td>1A2</td>
<td></td>
<td>Tektronix</td>
</tr>
<tr>
<td>Hf receiver</td>
<td>51S-1</td>
<td>522-2245-000</td>
<td>Collins Radio Co.</td>
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<tr>
<td>Frequency counter</td>
<td>524D</td>
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<td>Hewlett-Packard</td>
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Dec 1/72 Test Equipment Required (Sheet 1 of 2) Figure 1001
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<td>Frequency converter</td>
<td>525A</td>
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<td>Hewlett-Packard</td>
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<td>Audio oscillators (2)</td>
<td>200AB</td>
<td></td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>Test harness</td>
<td>678P-1 or 678P-1B</td>
<td>547-3914-00</td>
<td>Collins Radio Co.</td>
</tr>
<tr>
<td></td>
<td>678P-2 or 678P-2A</td>
<td>777-1861-001</td>
<td></td>
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<tr>
<td>Maintenance kit</td>
<td>678Y-1, 678Y-1B</td>
<td>547-3915-000</td>
<td>Collins Radio Co.</td>
</tr>
<tr>
<td></td>
<td>or 678Y-3</td>
<td>777-1862-001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>801B</td>
<td>522-3401-006</td>
<td></td>
</tr>
<tr>
<td>Function test set</td>
<td>678Z-1 (part of</td>
<td>548-8001-005</td>
<td>Collins Radio Co.</td>
</tr>
<tr>
<td></td>
<td>678Y-3)</td>
<td></td>
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</tr>
<tr>
<td>Differential vtvm</td>
<td>801B</td>
<td></td>
<td>Fluke</td>
</tr>
<tr>
<td>Radio set control</td>
<td>714E-2( ) or 714E-3( )</td>
<td>522-2213-00</td>
<td>Collins Radio Co.</td>
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<td></td>
<td>714E-6( )</td>
<td>522-2457-00</td>
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<td>Ac vtvm</td>
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<td>Ballantine</td>
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<td>Vom</td>
<td>630-NA</td>
<td></td>
<td>Tripplett</td>
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<td>High-impedance headphones</td>
<td></td>
<td></td>
<td>Commercial</td>
</tr>
<tr>
<td>Carbon microphone</td>
<td>205</td>
<td></td>
<td>Electro-Voice</td>
</tr>
<tr>
<td>Temperature box, range</td>
<td></td>
<td></td>
<td>Commercial</td>
</tr>
<tr>
<td>from -50 to +80 ° C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water's torque watch</td>
<td>651C3</td>
<td></td>
<td>Water Mfg. Inc.</td>
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<tr>
<td></td>
<td></td>
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<td>Wayland, Mass.</td>
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* Required if special testers are used.

Test Equipment Required
Figure 1001 (Sheet 2)
Frequency Divider-Stabilizer A15, Test Fixture (Sheet 1 of 4)
Figure 1002
NOTE:

CONNECTOR PL, CANNON DB-25Mắp (COLLINS PART NUMBER 371-0550-000) MATES WITH TEST FIXTURE CONNECTOR PL, CANNON DB-25W (COLLINS PART NUMBER 371-0560-000).

Feb 15/68 Frequency Divider-Stabilizer A15, Test Fixture (Sheet 2 of 4) 23-16-0
Figure 1002 Pages 1006/1006
Frequency Divider-Stabilizer A15, Test Fixture (Sheet 3 of 4)

Figure 1002

Feb 15/68

23-10-0
Page 1007
<table>
<thead>
<tr>
<th>QTY</th>
<th>ITEM</th>
<th>COLLINS PART NO.</th>
<th>MANUFACTURER AND PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>S1 through S4</td>
<td>259-2843-010</td>
<td>Oak Mfg. 255921-BK</td>
<td>Wafer switch, rotary</td>
</tr>
<tr>
<td>4</td>
<td>Knobs</td>
<td>757-0228-001</td>
<td>None required for commercial switch</td>
<td>Knob for rotary wafer switch</td>
</tr>
<tr>
<td>2</td>
<td>S5, S6</td>
<td></td>
<td>Cutler-Hammer 8381K21D</td>
<td>Switch, power on-off</td>
</tr>
<tr>
<td>2</td>
<td>F1, F2</td>
<td>264-4050-000</td>
<td>Buss, 57D3426</td>
<td>Fuse, 1 A</td>
</tr>
<tr>
<td>2</td>
<td>XF1, XF2</td>
<td>265-1248-000</td>
<td>Buss, HKP</td>
<td>Fuseholder</td>
</tr>
<tr>
<td>1</td>
<td>DS17</td>
<td>262-0692-000</td>
<td></td>
<td>130 vdc lamp, power indicator</td>
</tr>
<tr>
<td>1</td>
<td>Mounting bracket and lens</td>
<td>262-1944-000</td>
<td></td>
<td>Mounting bracket and lens for DS17</td>
</tr>
<tr>
<td>1</td>
<td>DS18</td>
<td>262-2828-030</td>
<td>Dialco, 81-0410-011-201</td>
<td>Lamp/socket assembly, red, power indicator</td>
</tr>
<tr>
<td>1</td>
<td>J2</td>
<td>357-9047-000</td>
<td>Cannon, DIC-875</td>
<td>Coaxial connector, test fixture VCO OUT</td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>357-9047-000</td>
<td>Cannon, DIC-875</td>
<td>Mating connector for W2P2</td>
</tr>
<tr>
<td>2</td>
<td>J4, J6</td>
<td>372-1062-000</td>
<td>H. H. Smith, DF30RC</td>
<td>Connector, power in, red</td>
</tr>
<tr>
<td>2</td>
<td>J5, J7</td>
<td>372-1061-000</td>
<td>H. H. Smith, DF30BC</td>
<td>Connector, power in, black</td>
</tr>
<tr>
<td>2</td>
<td>130 V. TP, 26 V. TP</td>
<td>360-0062-00</td>
<td>E. F. Johnson, 105-602</td>
<td>Test jack, red</td>
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<tr>
<td>1</td>
<td>GRND TP</td>
<td>360-0063-00</td>
<td>E. F. Johnson, 105-603</td>
<td>Test jack, black</td>
</tr>
<tr>
<td>2</td>
<td>W1P1, W2P1</td>
<td>371-0915-000</td>
<td>Cannon, DBM-21W1P</td>
<td>Mating connector for test fixture connector J1 and 618T-1B/2B/3B connector J12</td>
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<tr>
<td>2</td>
<td>Test fixture J1, W1J1</td>
<td>371-0920-000</td>
<td>Cannon, DBMF-21W1S</td>
<td>Mating connector for W1P1 and W2P1</td>
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<tr>
<td>1</td>
<td>R1</td>
<td></td>
<td>RC07GF333K</td>
<td>Resistor, 33K, 1/4 w</td>
</tr>
</tbody>
</table>

Frequency Divider-Stabilizer A15, Test Fixture (Sheet 4 of 4)  
Figure 1002
Control Data Converter A16, Test Fixture (Sheet 2 of 3)
Figure 1003

NOTES:
1. CONNECTOR P1, CANNON 08M-F5P (COLLINS PART NUMBER 371-0962-00)
   HATES WITH CANNON 08MF-255 (COLLINS PART NUMBER 371-0965-00).
2. CONNECTOR J1, CANNON 08MF-J55 (COLLINS PART NUMBER 371-0969-00)
   HATES WITH CANNON 08M-25P (COLLINS PART NUMBER 371-0968-00).
<table>
<thead>
<tr>
<th>QTY</th>
<th>ITEM</th>
<th>COLLINS PART NO.</th>
<th>MANUFACTURER AND PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>R1 through R4</td>
<td>745-0773-000</td>
<td>RC07GF472K</td>
<td>Resistor, 4700 ohms 1/4 w</td>
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<tr>
<td>4</td>
<td>R5 through R8</td>
<td>745-2368-000</td>
<td>RC05GF562K</td>
<td>Resistor, 5600 ohms, 1/8 w</td>
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<tr>
<td>1</td>
<td>R9</td>
<td>745-3331-000</td>
<td>RC32GF331K</td>
<td>Resistor, 330 ohms, 1 w</td>
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<tr>
<td>1</td>
<td>C1</td>
<td>913-3680-000</td>
<td>Erie Tech, Prod., 80-5014 X5V0 1037</td>
<td>Capacitor, 0.01 uf</td>
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<tr>
<td>2</td>
<td>A1</td>
<td>351-7134-010</td>
<td>Sylvania, SF162-02</td>
<td>Flatpack, SG 162</td>
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<tr>
<td>2</td>
<td>A2</td>
<td>351-7134-010</td>
<td>Sylvania, SF162-02</td>
<td>Flatpack, SG 162</td>
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<tr>
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<td>Q1 through Q4</td>
<td>357-0197-000</td>
<td>2N697</td>
<td>Transistor, 2N697</td>
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<tr>
<td>1</td>
<td>VR1</td>
<td>353-2710-000</td>
<td>1N751A</td>
<td>Zener diode, 1N751A</td>
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<tr>
<td>2</td>
<td>J1</td>
<td>371-0959-000</td>
<td>Cannon, DBMF-25S</td>
<td>Connector, receptacle</td>
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<tr>
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<td>371-0969-000</td>
<td>Cannon, DBM-25P</td>
<td>Connector, plug</td>
</tr>
<tr>
<td>1</td>
<td>J2</td>
<td>357-9047-000</td>
<td>Cannon, DIC-785</td>
<td>Coaxial connector, 1 KHZ OUT</td>
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<tr>
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<td>J3</td>
<td>360-0062-00</td>
<td>E. F. Johnson, 105-602</td>
<td>Test jack, red</td>
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<tr>
<td>1</td>
<td>J4</td>
<td>372-1062-000</td>
<td>H. H. Smith, DF30RC</td>
<td>Connector, power in, red</td>
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<tr>
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<td>J5</td>
<td>372-1061-000</td>
<td>H. H. Smith, DF30BC</td>
<td>Connector, power in, black</td>
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<tr>
<td>1</td>
<td>P1</td>
<td>264-4050-000</td>
<td>Buss, 57D3426</td>
<td>Fuse, 1 A</td>
</tr>
<tr>
<td>1</td>
<td>XF1</td>
<td>265-1248-000</td>
<td>Buss, HKP</td>
<td>Fuseholder</td>
</tr>
<tr>
<td>1</td>
<td>S2</td>
<td>259-1272-010</td>
<td>Oak, 255987-RK3E</td>
<td>Rotary wafer switch, FREQUENCY SELECTOR</td>
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<tr>
<td>1</td>
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<td>Cutler-Hammer, 381K21D</td>
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<td>262-0179-000</td>
<td>MS25237-327</td>
<td>Indicator lamp</td>
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<td>252-2828-010</td>
<td>MS255256</td>
<td>Lampholder</td>
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<tr>
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<td>MS25237-327</td>
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<td>XDS5</td>
<td>262-2828-030</td>
<td>MS25256-6</td>
<td>Lampholder</td>
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</tbody>
</table>

Control Data Converter A16, Test Fixture (Sheet 3 of 3)  
Figure 1003  
April 15/70
Special Soldering Iron Tip
Figure 1004

NOTES:

1. MATERIAL: SOLID COPPER ROUNDSTOCK, 1" IN. DIA., END TURNED DOWN TO 1/16 IN. DIA.

2. SMALL FLAT SURFACES SHOULD MAKE ABOUT 120° ANGLE WITH BOTTOM SURFACE. THE SMALL, FLAT SURFACE SHOULD MEASURE ABOUT 0.015 IN. ACROSS. USE A SMALL FLAT FILE TO SHAPE SURFACES.

3. ANY TIP WITH A SURFACE WORKING WIDTH OF ABOUT 0.015 IN. WOULD BE SATISFACTORY. THE DESIGN ABOVE FEATURES MECHANICAL STRENGTH AND CAN BE RENEWED MANY TIMES.

Flatpack Removal Tool
Figure 1005

NOTES:

1. HEATING UNIT OF TOOL IS MADE FROM 5/6 INCH COPPER ROUNDSTOCK, 3 3/4 INCHES LONG

2. TURN DOWN ABOUT 2 1/2 INCHES OF SHAFT TO FIT 150-200 WATT SOLDERING IRON

3. MODIFY HANDLE OF SOLDERING IRON AS NECESSARY TO PERMIT MOUNTING IRON ON ANGLED PRESS

4. SPRING PART OF TOOL IS MADE FROM NO. 18 (0.04 INCH DIAMETER) STEEL WIRE, ABOUT 5 INCHES LONG
   - (A) BEND WIRE AROUND NARROW PART OF HEATING UNIT INTO U-SHAPE
   - (B) BEND BOTH SIDES OF WIRE AS SHOWN IN DETAIL A
   - (C) SLIP SPRING AROUND SHANK OF HEATING ELEMENT AND POSITION AS SHOWN
   - (D) TO SECURE SPRING IN POSITION MOUNT HEATING UNIT IN 150-200 WATT SOLDERING IRON AND PUNCH SPRING BETWEEN HEATING UNIT AND BODY OF IRON