



**RT7000**

**HF Transceiver**  
**Technical Manual**

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# Revision History

Date of Revision	Revision Letter	Description of Changes	Pages Affected
2/2004	F	Information regarding updated boards, schematics, part lists including the new Processor board, Ref/Control board and the High Stability option.	All
06/07	G	Removed reference to LCD/Driver boards, added Fast ALC option and updated boards, schematics, part lists.	All
06/09	H	ISDN nomenclature to DHSL. Clarification of COM port use. Additional specifications. IP Interface, 7000ALE-141B, 7000CW1, and RT7000-125W added as options. Updated boards, schematics, part lists.	All
03/10	J	Updated Specifications table to reflect change in duty cycle (PRN 880) and sensitivity. Updated component locations diagrams, schematics and parts lists. Added Daughter board to Front Panel Assembly.  Updated Processor board to 001-01107 assembly.  Updated 7000ALE option to 001-01105 assembly. Added 7000ALE-141B option with Carrier board.  Updated Pre/Post Selector description.	1-5, 1-6  4-23, 4-35, 4-61, 6-59, 6-81, 6-110, 7-16  4-11, 4-125 to 4-128  4-129 to 4-182  6-3 to 6-46  6-147 to 6-51, 7-30 to 7-33
08/10	K	Reorganized manual. Updated Maintenance chapter.	All  Ch 20
06/11	L	Updated component location diagrams, schematics and parts lists to the latest revisions.	Chapters 6, 9, 10, 12 and 14

<b>Date of Revision</b>	<b>Revision Letter</b>	<b>Description of Changes</b>	<b>Pages Affected</b>
03/12	M	Updated component location diagrams, schematics and parts lists to the latest revisions.  Removed DT5300C from Figures 2-3 and 2-5.	Chapters 4 to 16, 18, 19  2-10, 2-12
09/14	N	Updated manual format.  Updated the following component location diagrams, schematics and parts lists:  Synthesizer board schematic (994304) and parts list (001-00901). RF Power Amplifier board parts list (004-00311) and PA heatsink assembly parts list (001-00310). 75 MHz IF board component location diagram (738332), schematic (994292), and parts list (001-00710). 5 MHz IF board schematic (994136) and parts list (001-00800). Audio board parts list (001-00600). Processor board parts list (001-01107). Fast ALC option board schematic (994074) and parts list (001-00207). High-Stability Option board parts list (001-01023). 7000ALE Carrier board parts list (001-01302). Voice Enhancement option board parts list (001-10000). 28V DC/DC Converter board parts list (004-28300). 28V RF Power Amplifier board and assembly parts list (004-00310, 004-28260).  Moved Voice Enhancement option to standard board.  Removed references to parallel printer.  Removed references to transcall.  Replaced RF Amplifier assembly parts list (001-00310 with 004-12260).  Added Index	All  6-5, 6-7 8-7, 8-9 9-4, 9-5, 9-7 10-7, 10-9, 10-11 10-13 11-9 13-34 14-3, 14-5, 14-7 14-25, 15-49 18-23 19-9 19-13, 19-15  Ch 18  2-6, 2-9, 4-4, 4-8, 4-10  11-4 8-9 Index-1 to  Index-6



# Warranty

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Technical Support Services  
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# Safety Considerations

This product and manual must be thoroughly understood before attempting installation and operation. To do so without proper knowledge can result in equipment failure and bodily injury.

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**Caution:** Before applying AC power, be sure that the equipment has been properly configured for the available line voltage. Attempted operation at the wrong voltage can result in damage and voids the warranty. See the manuals section on installation. **DO NOT** operate equipment with cover removed.

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## Earth Ground

All Datron products are supplied with a standard, 3-wire, grounded AC plug. **DO NOT** attempt to disable the ground terminal by using 2-wire adapters of any type. Any disconnection of the equipment ground causes a potential shock hazard that could result in personal injury. **DO NOT** operate any equipment until a suitable ground has been established. Consult the manual section on grounding.

## Servicing

Only trained personnel should perform product repair. To avoid electric shock, **DO NOT** open the case unless qualified to do so.

Various measurements and adjustments described in this manual are performed with AC power applied and the protective covers removed. Capacitors (particularly the large power supply electrolytic type) can remain charged for a considerable time after the unit has been shut off. Use particular care when working around them, as a short circuit can release sufficient energy to cause damage to the equipment and possible injury.

To protect against fire hazard, always replace line fuses with ones of the same current rating and type (normal delay, slow blow, etc.). **DO NOT** use higher value replacements in an attempt to prevent fuse failure. If fuses are failing repeatedly this indicates a probable defect in the equipment that needs attention.

Use only genuine Datron factory parts for full performance and safety of this product.



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# Contents

## Chapter 1: Introduction

<b>1.1</b>	<b>The RT7000</b> .....	<b>1-1</b>
<b>1.2</b>	<b>Transceiver Configurations</b> .....	<b>1-1</b>
<b>1.3</b>	<b>Technical Specifications</b> .....	<b>1-2</b>
<b>1.4</b>	<b>Internal Options</b> .....	<b>1-3</b>
<b>1.5</b>	<b>RT7000 Variations</b> .....	<b>1-5</b>
<b>1.6</b>	<b>Input Power Requirements</b> .....	<b>1-6</b>
<b>1.7</b>	<b>Antenna Requirements</b> .....	<b>1-6</b>
<b>1.8</b>	<b>Accessories</b> .....	<b>1-6</b>
<b>1.9</b>	<b>Referenced Manuals</b> .....	<b>1-6</b>

## Chapter 2: Installation

<b>2.1</b>	<b>Unpacking and Inspection</b> .....	<b>2-1</b>
<b>2.2</b>	<b>Pre-installation Check</b> .....	<b>2-1</b>
<b>2.3</b>	<b>Location Considerations</b> .....	<b>2-1</b>
<b>2.4</b>	<b>Front Panel Connections</b> .....	<b>2-2</b>
	Figure 2-1    Front Panel Connections .....	2-2
	Table 2-1    Audio Accessories .....	2-2
	Table 2-2    Front Panel Audio Connector Pin Assignments .....	2-3
<b>2.5</b>	<b>Rear Panel Connections</b> .....	<b>2-3</b>
	Figure 2-2    RT7000 Rear Panel .....	2-4
	Table 2-3    ACCESSORY 1 Pin Assignments .....	2-6
	Table 2-4    ACCESSORY 2 Pin Assignments .....	2-7
	Table 2-5    ACCESSORY 3 Pin Assignments .....	2-8
	Figure 2-3    Power Cabling Accessories .....	2-10
	Figure 2-4    RF Cabling Accessories .....	2-11
	Figure 2-5    Control Cabling Accessories .....	2-12

---

## Chapter 3: Theory of Operation

<b>3.1</b>	<b>Transceiver Boards</b> .....	<b>3-1</b>
<b>3.2</b>	<b>Power Distribution</b> .....	<b>3-1</b>
	Figure 3-1 System Diagram .....	3-2
	Figure 3-2 Power Distribution Diagram .....	3-3
	Table 3-1 Transceiver Power Distribution .....	3-4
	Figure 3-3 Transceiver Frequency Generation .....	3-5
	Figure 3-4 Transceiver Frequency Mixing Schematic .....	3-5
<b>3.3</b>	<b>Frequency Generation</b> .....	<b>3-6</b>
	Table 3-2 LO/BFO Frequency/Modulation Mode .....	3-7
<b>3.4</b>	<b>Receive Signal Flow</b> .....	<b>3-8</b>
	Figure 3-5 Transceiver Receive Path Diagram .....	3-9
<b>3.5</b>	<b>Transmit Signal Flow</b> .....	<b>3-9</b>
<b>3.6</b>	<b>Receive and Transmit Path Subassemblies</b> .....	<b>3-10</b>
	Figure 3-6 Transceiver Transmit Path .....	3-11
<b>3.7</b>	<b>Transceiver Control Path</b> .....	<b>3-11</b>
<b>3.8</b>	<b>Mainframe</b> .....	<b>3-12</b>
	Figure 3-7 Mainframe Wiring Schematic Diagram (994200 Rev. J) .....	3-13
<b>3.9</b>	<b>Motherboard</b> .....	<b>3-15</b>
	Figure 3-8 Motherboard Connector Locations Diagram (738262 Rev. E) .....	3-16

## Chapter 4: Interface/Power Supply Board

<b>4.1</b>	<b>Circuit Description</b> .....	<b>4-1</b>
	Figure 4-1 Power Supply Block Diagram .....	4-3
<b>4.2</b>	<b>Connector Pin Assignments</b> .....	<b>4-3</b>
	Table 4-1 J16 Connector Pin Assignments .....	4-4
	Table 4-2 J17 Connector Pin Assignments .....	4-5
	Table 4-3 J18 Connector Pin Assignments .....	4-6
	Table 4-4 J25 Connector Pin Assignments .....	4-6
	Table 4-5 J29 Connector Pin Assignments .....	4-7
	Table 4-6 Direct Connections to Interface/Power Supply Board .....	4-11
	Table 4-7 RF Power Connections .....	4-11
<b>4.3</b>	<b>Component Locations, Schematic and Parts List</b> .....	<b>4-11</b>
	Figure 4-2 Interface/Power Supply Board Component Locations (738299 Rev. E) .....	4-12
	Figure 4-3 Interface/Power Supply Board Schematic Diagram 1 of 2 (994247 Rev. L) .....	4-13
	Figure 4-4 Interface/Power Supply Board Schematic Diagram 2 of 2 (994247 Rev. L) .....	4-15
	Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB) .....	4-17

---

## Chapter 5: Reference/Control Board

<b>5.1</b>	<b>Circuit Description</b> . . . . .	<b>5-1</b>
	Figure 5-1 Reference/Control Board Block Diagram . . . . .	5-2
<b>5.2</b>	<b>Connector Pin Assignments</b> . . . . .	<b>5-3</b>
	Table 5-1 J3 Connector Pin Assignments . . . . .	5-3
<b>5.3</b>	<b>Component Locations, Schematics and Parts List</b> . . . . .	<b>5-4</b>
	Figure 5-2 Reference/Control Board Component Locations (738341 Rev. B) . . . . .	5-4
	Figure 5-3 Reference/Control Board Schematic Diagram (994487 Rev. B) . . . . .	5-5
	Table 5-2 Reference/Control Board Parts List (001-00206 Rev. H) . . . . .	5-7

## Chapter 6: Synthesizer Board

<b>6.1</b>	<b>Circuit Description</b> . . . . .	<b>6-1</b>
	Figure 6-1 Synthesizer Board Block Diagram . . . . .	6-2
<b>6.2</b>	<b>Connector Pin Assignments</b> . . . . .	<b>6-3</b>
	Table 6-1 J4 Connector Pin Assignments . . . . .	6-3
<b>6.3</b>	<b>Component Locations, Schematic and Parts List</b> . . . . .	<b>6-3</b>
	Figure 6-2 Synthesizer Board Component Locations (738351 Rev. H) . . . . .	6-4
	Figure 6-3 Synthesizer Board Schematic Diagram (994304 Rev. G) . . . . .	6-5
	Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE) . . . . .	6-7

## Chapter 7: RF Filter Board

<b>7.1</b>	<b>Circuit Description</b> . . . . .	<b>7-1</b>
	Figure 7-1 RF Filter Board Block Diagram . . . . .	7-2
<b>7.2</b>	<b>Connector Pin Assignments</b> . . . . .	<b>7-3</b>
	Table 7-1 J22 Connector Pin Assignments . . . . .	7-3
<b>7.3</b>	<b>Component Locations, Schematic and Parts List</b> . . . . .	<b>7-3</b>
	Figure 7-2 RF Filter Board Component Locations (738228 Rev. L) . . . . .	7-4
	Figure 7-3 RF Filter Board Schematic Diagram (994139 Rev. R) . . . . .	7-5
	Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB) . . . . .	7-7

## Chapter 8: RF Power Amplifier Board

<b>8.1</b>	<b>Circuit Description</b> . . . . .	<b>8-1</b>
	Figure 8-1 RF Power Amplifier Board Block Diagram . . . . .	8-2
<b>8.2</b>	<b>Component Locations, Schematic and Parts List</b> . . . . .	<b>8-3</b>
	Figure 8-2 RF Power Amplifier Board Component Locations (738587 Rev. A) . . . . .	8-4
	Figure 8-3 RF Power Amplifier Board Schematic Diagram (994182 Rev. G) . . . . .	8-5
	Table 8-1 RF Power Amplifier Board Parts List (004-00311 Rev. G) . . . . .	8-7
	Table 8-2 PA Heatsink Assembly Parts List (001-00300 Rev. N) . . . . .	8-9
	Table 8-3 RF Power Amplifier Assembly (004-12260 Rev. V) . . . . .	8-9

---

## Chapter 9: 75 MHz IF Board

<b>9.1</b>	<b>Circuit Description</b> .....	<b>9-1</b>
<b>9.2</b>	<b>Connector Pin Assignments</b> .....	<b>9-2</b>
	Table 9-1 J6 Connector Pin Assignments .....	9-2
	Figure 9-1 75 MHz IF Block Diagram .....	9-3
<b>9.3</b>	<b>Component Locations, Schematic and Parts List</b> .....	<b>9-3</b>
	Figure 9-2 75 MHz IF Board Component Locations (738332 Rev. J) .....	9-4
	Figure 9-3 75 MHz IF Board Schematic Diagram (994292 Rev. N) .....	9-5
	Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF) .....	9-7

## Chapter 10: 5 MHz IF Board

<b>10.1</b>	<b>Circuit Description</b> .....	<b>10-1</b>
	Figure 10-1 5 MHz IF Board Block Diagram .....	10-3
<b>10.2</b>	<b>Connector Pin Assignments</b> .....	<b>10-4</b>
	Table 10-1 J5 Connector Pin Assignments .....	10-4
<b>10.3</b>	<b>Component Locations, Schematic and Parts List</b> .....	<b>10-5</b>
	Figure 10-2 5 MHz IF Board Component Locations (738208 Rev. K) .....	10-6
	Figure 10-3 5 MHz IF Board Schematic Diagram 1 of 3 (994136 Rev. P) .....	10-7
	Figure 10-4 5 MHz IF Board Schematic Diagram 2 of 3 (994136 Rev. P) .....	10-9
	Figure 10-5 5 MHz IF Board Schematic Diagram 3 of 3 (994136 Rev. P) .....	10-11
	Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM) .....	10-13

## Chapter 11: Audio Board

<b>11.1</b>	<b>Circuit Description</b> .....	<b>11-1</b>
	Figure 11-1 Audio Board Block Diagram .....	11-2
<b>11.2</b>	<b>Connector Pin Assignments</b> .....	<b>11-3</b>
	Table 11-1 J7 Connector Pin Assignments .....	11-3
	Table 11-2 J8 Connector Pin Assignments .....	11-3
<b>11.3</b>	<b>Component Locations, Schematic and Parts List</b> .....	<b>11-5</b>
	Figure 11-2 Audio Board Component Locations (738211 Rev. G) .....	11-6
	Figure 11-3 Audio Board Schematic Diagram (994157 Rev. I) .....	11-7
	Table 11-3 Audio Board Parts List (001-00600 Rev. AA) .....	11-9

## Chapter 12: Front Panel Assembly

<b>12.1</b>	<b>Circuit Description</b> .....	<b>12-1</b>
	Figure 12-1 Front Panel Assembly Block Diagram .....	12-3
<b>12.2</b>	<b>Connector Pin Assignments</b> .....	<b>12-4</b>
	Table 12-1 J1 Connector Pin Assignments .....	12-4

Table 12-2	Front Panel Interconnections to Display . . . . .	12-5
Table 12-3	J4 Connector Pin Assignments . . . . .	12-5
Table 12-4	J6 Connector Pin Assignments . . . . .	12-6
Table 12-5	J7 Connector Pin Assignments . . . . .	12-6
Table 12-6	J8 Connector Pin Assignments . . . . .	12-7
Table 12-7	J9, J12 Connector Pin Assignments . . . . .	12-7
<b>12.3</b>	<b>Component Locations, Schematics and Parts List. . . . .</b>	<b>12-7</b>
Figure 12-2	Front Panel Assembly Component Locations (738261 Rev. K). . . . .	12-8
Figure 12-3	Front Panel Assembly Schematic Diagram (994198 Rev. V) . . . . .	12-9
Table 12-8	Front Panel Assembly Parts List (004-01110 Rev. AH). . . . .	12-11
<b>12.4</b>	<b>Keypad and Switch Matrix. . . . .</b>	<b>12-18</b>
Figure 12-4	Front Panel Keypad Switch Matrix (994199 Rev. A) . . . . .	12-18
<b>12.5</b>	<b>Front Panel Assembly Daughter Board . . . . .</b>	<b>12-20</b>
Figure 12-5	Front Panel Daughter Board Component Locations (738055 Rev. A). . . . .	12-20
Table 12-9	Front Panel Daughter Board Parts List (004-01111 Rev. B) . . . . .	12-20
Figure 12-6	Front Panel Daughter Board Schematic Diagram (994100 Rev. A). . . . .	12-21

## Chapter 13: Processor Board

<b>13.1</b>	<b>Circuit Description . . . . .</b>	<b>13-1</b>
Figure 13-1	RX Audio Distribution Block Diagram. . . . .	13-7
Figure 13-2	TX Audio Distribution Block Diagram. . . . .	13-7
Figure 13-3	Main Processor Block Diagram . . . . .	13-8
Table 13-1	SPI Enable Line Descriptions. . . . .	13-9
<b>13.2</b>	<b>Connector Pin Assignments . . . . .</b>	<b>13-9</b>
Table 13-2	J14 Connector Pin Assignments . . . . .	13-9
Table 13-3	J15 Connector Pin Assignments . . . . .	13-12
<b>13.3</b>	<b>Component Locations, Schematics and Parts List. . . . .</b>	<b>13-14</b>
Figure 13-4	Processor Board Component Locations (738018 Rev. B) . . . . .	13-15
Figure 13-5	Processor Board Schematic Diagram 1 of 8 (994088 Rev. E). . . . .	13-17
Figure 13-6	Processor Board Schematic Diagram 2 of 8 (994088 Rev. E). . . . .	13-19
Figure 13-7	Processor Board Schematic Diagram 3 of 8 (994088 Rev. E). . . . .	13-21
Figure 13-8	Processor Board Schematic Diagram 4 of 8 (994088 Rev. E). . . . .	13-23
Figure 13-9	Processor Board Schematic Diagram 5 of 8 (994088 Rev. E). . . . .	13-25
Figure 13-10	Processor Board Schematic Diagram 6 of 8 (994088 Rev. E). . . . .	13-27
Figure 13-11	Processor Board Schematic Diagram 7 of 8 (994088 Rev. E). . . . .	13-29
Figure 13-12	Processor Board Schematic Diagram 8 of 8 (994088 Rev. E). . . . .	13-31
Table 13-4	Processor Board Parts List (001-01107 Rev. K) . . . . .	13-33

---

## Chapter 14: Fast ALC and High Stability Options

<b>14.1</b>	<b>Fast ALC Option (7000FALC)</b> .....	<b>14-1</b>
	Figure 14-1 Fast ALC Option Component Locations (738341 Rev. B) .....	14-2
	Figure 14-2 Fast ALC Option Schematic Diagram 1 of 2 (994074 Rev. C) .....	14-3
	Figure 14-3 Fast ALC Option Schematic Diagram 2 of 2 (994074 Rev. C) .....	14-5
	Table 14-1 Fast ALC Option Parts List (001-00207 Rev. F) .....	14-7
<b>14.2</b>	<b>High-Stability Option (7000HS)</b> .....	<b>14-10</b>
	Figure 14-4 High Stability Option Component Locations (738341 Rev. B) .....	14-12
	Figure 14-5 High Stability Option Schematic Diagram (994487 Rev. B) .....	14-13
	Table 14-2 High Stability Option Parts List (001-01022 Rev. G) .....	14-15
<b>14.3</b>	<b>High Stability Fast ALC Option (7000HS-FALC)</b> .....	<b>14-18</b>
	Figure 14-6 High Stability Fast ALC Option Component Locations (738341 Rev. B) .....	14-20
	Figure 14-7 High Stability Fast ALC Option Schematic Diagram 1 of 2 (994074 Rev. C) .....	14-21
	Figure 14-8 High Stability Fast ALC Option Schematic Diagram 2 of 2 (994074 Rev. C) .....	14-23
	Table 14-3 High Stability Fast ALC Option Parts List (001-01023 Rev. E) .....	14-25

## Chapter 15: ALE Options

<b>15.1</b>	<b>7000ALE</b> .....	<b>15-1</b>
	Figure 15-1 7000ALE Option Block Diagram .....	15-4
	Figure 15-2 7000ALE Option Jumper Placement .....	15-5
	Figure 15-3 7000ALE Option Component Locations (738018 Rev. B) .....	15-7
	Figure 15-4 7000ALE Option Schematic Diagram 1 of 8 (994081 Rev. E) .....	15-9
	Figure 15-5 7000ALE Option Schematic Diagram 2 of 8 (994081 Rev. E) .....	15-11
	Figure 15-6 7000ALE Option Schematic Diagram 3 of 8 (994081 Rev. E) .....	15-13
	Figure 15-7 7000ALE Option Schematic Diagram 4 of 8 (994081 Rev. E) .....	15-15
	Figure 15-8 7000ALE Option Schematic Diagram 5 of 8 (994081 Rev. E) .....	15-17
	Figure 15-9 7000ALE Option Schematic Diagram 6 of 8 (994081 Rev. E) .....	15-19
	Figure 15-10 7000ALE Option Schematic Diagram 7 of 8 (994081 Rev. E) .....	15-21
	Figure 15-11 7000ALE Option Schematic Diagram 8 of 8 (994081 Rev. E) .....	15-23
	Table 15-1 ALE Option Parts List (001-01105 Rev. K) .....	15-25
<b>15.2</b>	<b>7000ALE-141B</b> .....	<b>15-45</b>
	Figure 15-12 ALE Carrier Board Component Locations (738045 Rev. A) .....	15-46
	Figure 15-13 7000ALE-141B Option Carrier Board Schematic Diagram (994089 Rev. A) .....	15-47
	Table 15-2 Carrier Board Parts List (001-01302 Rev. E) .....	15-49

---

## Chapter 16: Remote Control Options

<b>16.1 FSK Remote Control Option (7000RF)</b> .....	<b>16-1</b>
Figure 16-1 FSK Remote Control Jumper Placement .....	16-2
Figure 16-2 FSK Remote Control Component Locations (738232 Rev. D) .....	16-4
Figure 16-3 FSK Remote Control Schematic Diagram (994162 Rev. C) .....	16-5
Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P) .....	16-7
<b>16.2 DHSL Remote Control Option (7000RI)</b> .....	<b>16-14</b>
Figure 16-4 DHSL Remote Control Component Placement .....	16-16
Figure 16-5 DHSL Remote Control Component Locations (738248 Rev. E) ..	16-18
Figure 16-6 DHSL Remote Control Schematic Diagram (994184 Rev. G) ..	16-19
Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N) .....	16-21

## Chapter 17: RF Filter Options

<b>17.1 Narrowband CW Filter Option (7000CW)</b> .....	<b>17-1</b>
Figure 17-1 Narrowband CW Option Component Placement .....	17-2
<b>17.2 Wideband 1 Filter Option (7000WB1)</b> .....	<b>17-2</b>
Figure 17-2 Wideband WB1 Filter Option Component Placement .....	17-3
<b>17.3 Narrow and Wideband Filter Option (7000CW1)</b> .....	<b>17-3</b>
Figure 17-3 Combination Narrow and Wideband CW1 Filter Component Placement .....	17-4

## Chapter 18: Voice Enhancement Board

<b>18.1 Circuit Description</b> .....	<b>18-1</b>
Figure 18-1 Voice Enhancement Board Block Diagram .....	18-2
<b>18.2 Connector Pin Assignments</b> .....	<b>18-2</b>
Table 18-1 J1 Connector Pin Assignments .....	18-2
<b>18.3 Component Locations, Schematics, and Parts List</b> .....	<b>18-3</b>
Figure 18-2 Voice Enhancement Board Component Locations (738574 Rev. B) .....	18-4
Figure 18-3 Voice Enhancement Board Schematic Diagram 1 of 4 (994536 Rev. B) .....	18-5
Figure 18-4 Voice Enhancement Board Schematic Diagram 2 of 4 (994536 Rev. B) .....	18-7
Figure 18-5 Voice Enhancement Board Schematic Diagram 3 of 4 (994536 Rev. B) .....	18-9
Figure 18-6 Voice Enhancement Board Schematic Diagram 4 of 4 (994536 Rev. B) .....	18-11
Table 18-2 Voice Enhancement Board Parts List (001-10000 Rev. G) .....	18-13

---

## Chapter 19: Other Options

<b>19.1 Additional Channels Option (7000ACH)</b> . . . . .	<b>19-2</b>
Figure 19-1 Additional Channel Jumper Placement . . . . .	19-2
<b>19.2 Data Interface Option (7000RS)</b> . . . . .	<b>19-3</b>
Figure 19-2 Data Interface Component and Jumper Placement . . . . .	19-3
<b>19.3 Encryption Option (7000ENCR)</b> . . . . .	<b>19-4</b>
<b>19.4 Noise Blanker Option (7000NB)</b> . . . . .	<b>19-5</b>
Figure 19-3 Noise Blanker Component Locations (738233 Rev. D) . . . . .	19-6
Figure 19-4 Noise Blanker Schematic Diagram (994163 Rev. B) . . . . .	19-7
Table 19-1 Noise Blanker Parts List (001-01202 Rev. H) . . . . .	19-9
<b>19.5 Recorder Option (7000RCDR)</b> . . . . .	<b>19-11</b>
Figure 19-5 Recorder Option Jumper Placement . . . . .	19-11
<b>19.6 N1304A Encoder Option (RT7000AIRSELCALL)</b> . . . . .	<b>19-12</b>

## Chapter 20: Alternate Configurations

<b>20.1 Computer Control Version (RT7000C)</b> . . . . .	<b>20-1</b>
<b>20.2 28V Version (RT7000-28)</b> . . . . .	<b>20-1</b>
Figure 20-1 28V Mainframe Wiring Schematic Diagram (994234 Rev. L) . . . . .	20-3
<b>20.3 DC/DC Converter</b> . . . . .	<b>20-5</b>
Figure 20-2 DC-DC Converter Component Locations (738283 Rev. A) . . . . .	20-6
Figure 20-3 DC-DC Converter Schematic Diagram (994226 Rev. A) . . . . .	20-7
Table 20-1 DC-DC Converter Parts List (004-28300 Rev. G) . . . . .	20-9
<b>20.4 28V RF Amplifier Assembly</b> . . . . .	<b>20-9</b>
Figure 20-4 RF Power Amplifier Board Component Locations (738254 Rev. E) . . . . .	20-10
Figure 20-5 28V RF Amplifier Board Schematic Diagram (994235 Rev. J) . . . . .	20-11
Table 20-2 28V RF Amplifier Board Parts List (004-00310 Rev. V) . . . . .	20-13
Table 20-3 28V RF Amplifier Assembly Parts List (004-28260 Rev. T) . . . . .	20-15
<b>20.5 28V RF Filter Board</b> . . . . .	<b>20-15</b>
Figure 20-6 28V RF Filter Board Component Locations (738228 Rev. L) . . . . .	20-16
Figure 20-7 28V RF Filter Board Schematic Diagram (994532 Rev. C) . . . . .	20-17
Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F) . . . . .	20-19
<b>20.6 Extended Front Panel Control (RT7000E)</b> . . . . .	<b>20-24</b>
Figure 20-8 RT7000E Connector Transition Component Locations (738281 Rev. H) . . . . .	20-26
Figure 20-9 RT7000E Extended Control Interface Schematic Diagram (994225 Rev. G) . . . . .	20-27
Table 20-5 RT7000E Extended Control Interface Board Parts List (003-01003 Rev. L) . . . . .	20-29

---

<b>20.7 Pre/Post Selector (RT7000PP)</b> .....	<b>20-30</b>
Figure 20-10 RT7000PP Internal Wiring Diagram .....	20-31
Figure 20-11 RT7000PP Cabling Connections .....	20-32
<b>20.8 FSK Remote Control (RT7000RF)</b> .....	<b>20-33</b>
<b>20.9 DHSL Remote Control (RT7000RI)</b> .....	<b>20-33</b>
<b>20.10 Receiver Only (RT7000RX)</b> .....	<b>20-33</b>
<b>20.11 Transmitter Only (RT7000TX)</b> .....	<b>20-33</b>

## Chapter 21: Maintenance

<b>21.1 Subassembly Breakdown</b> .....	<b>21-1</b>
<b>21.2 Internal Layout</b> .....	<b>21-1</b>
<b>21.3 Board Access</b> .....	<b>21-2</b>
Figure 21-1 Board Locations .....	21-5
Figure 21-2 Final Assembly .....	21-6
Figure 21-3 Front Panel Assembly .....	21-7
Figure 21-4 Rear Panel Assembly .....	21-9
Table 21-1 Subassemblies .....	21-9
<b>21.4 Test Equipment</b> .....	<b>21-11</b>
<b>21.5 Basic Performance Test</b> .....	<b>21-12</b>
<b>21.6 Detailed Performance Test</b> .....	<b>21-12</b>
Table 21-2 Detailed Performance Test Parameters .....	21-13
<b>21.7 Subassembly Troubleshooting</b> .....	<b>21-14</b>
Table 21-3 BITE Line Descriptions .....	21-15
<b>21.8 Main Processor Troubleshooting</b> .....	<b>21-19</b>
Table 21-4 Processor Board LED Indications .....	21-19
Table 21-5 Troubleshooting the Processor Board .....	21-20
<b>21.9 Alignment Procedures</b> .....	<b>21-24</b>
<b>21.10 Jumper Settings</b> .....	<b>21-25</b>
Table 21-6 RT7000 Option Enable Assignments .....	21-25
Figure 21-5 RT7000 Jumpers and Adjustments Locations .....	21-26
<b>21.11 Board Functional Tests</b> .....	<b>21-28</b>

## Index





## Chapter 1: Introduction

### 1.1 The RT7000

The RT7000 is an advanced HF transceiver providing a complete range of both voice and data operations over the entire high frequency (1.6 to 30 MHz) spectrum. The RT7000 includes multiple microprocessors, a direct digital synthesis (DDS) PLL as well as a variety of built-in options such as automatic link establishment (ALE), high-speed data transmission and encryption.

The RT7000 is part of the 7000-series family of radios and accessories that includes power supplies, automatic antenna tuners, RF power amplifiers and audio equipment. The RT7000 can be integrated into system configurations to fit a wide range of communication requirements.



### 1.2 Transceiver Configurations

The RT7000 is adaptable as a fixed station or in a rack mount installation using the Datron rack mount kit. It can also be operated remotely using a number of remote and extended control configurations. The front panel of a standard RT7000 can be easily removed for remote control up to 50 feet from the radio.

Full function, modem-based remote control heads using either FSK or DHSL signaling protocols are also available for long distance, 2-wire remote operation.

## 1.3 Technical Specifications

**Note:** Specifications are subject to change without notice or obligation.

Characteristic	Specification
<b>General</b>	
Frequency range	1.6 to 30 MHz (TX); 100 Hz to 30 MHz (RX); 10 Hz channel spacing
Memory channels	256 standard, 1000 optional
Scanning (ALE option)	Multiple scan groups, operator selectable scan rates
Channel programming	From front panel or remotely using a computer or dedicated remote control console
Frequency stability	0.5 ppm
Modes	USB, LSB, CW, AME; simplex or half-duplex
Input power	11 to 15.5 Vdc
Input power protection	Reverse polarity, transient and under/over voltage
Antenna port	50 ohms, type N connector
Antennas	50 ohms or automatic antenna tuner (AT7000B, RAT1000C) for narrowband antennas
Interface	Control: two RS-232 COM ports; COM1 only configurable as EIA RS-422/423/485 with 7000RS option Audio: 600 ohms, balanced and isolated
<b>Transmitter</b>	
RF power output	125W PEP, 100W average; programmable - three levels
Duty cycle	Continuous service, all modes
Harmonics	-60 dB (2 to 30 MHz) nominally
<b>Receiver</b>	
Sensitivity	-113 dBm at 10 dB SINAD
Attenuator	+20 dB, operator switchable
Audio	5W into 4 ohms; 0 dBm into 600 ohms

Characteristic	Specification
<b>Mechanical</b>	
Size (H x W x D)	3.5 in. x 13 in. x 17 in. (8.9 cm x 33 cm x 43 cm)
Weight	21 lbs (9.5 kg)
<b>Environmental</b>	
Cooling	On-demand fan (internal)
Temperature	-30°C to +60°C, operating
Shock, Vibration	Per MIL-STD-810

## 1.4 Internal Options

The following internal options are available in the RT7000. Chapters 15 to 19 provide descriptions of these options.

**7000ACH** Additional channels. Increases operational channel capacity to 1000 (refer to “Additional Channels Option (7000ACH)” on page 19-2).

**7000ALE** FED-STD-1045 compatible automatic link establishment system. Provides complete 1045 capability, including link quality analysis, auto-linking, sounding, and orderwire message transmission and reception. Implemented on assembly board 001-01105 (refer to “7000ALE” on page 15-1).

### 7000ALE-141B

MIL-STD-188-141B (Appendix A) automatic link establishment system. Provides 141B compatibility including link quality analysis, auto-linking, sounding, and orderwire messaging. 7000ALE-141B provides superior link establishment performance for networks with heavy traffic and noisier environments. Implemented on assembly board 001-01302 (refer to “7000ALE-141B” on page 15-45).

**7000CW** Narrowband filter with 500 Hz bandwidth for CW operation (refer to “Narrowband CW Filter Option (7000CW)” on page 17-1).

**7000CW1** Combination of 500 Hz narrowband filter for CW operation and 300 to 3300 Hz wideband filter with tailored group delay characteristics for data operation. Implemented on assembly board 001-00800 (MA) (refer to “Narrow and Wideband Filter Option (7000CW1)” on page 17-3).

- 7000ENCR High-level voice encryptor uses enhanced domain transform (EDT) ciphering techniques providing long-term security (refer to “Encryption Option (7000ENCR)” on page 19-4).
- 7000FALC Fast ALC loop for use with linear amplifiers like the RT1000D that use peak detection ALC (refer to “Fast ALC Option (7000FALC)” on page 14-1).
- 7000HS High-stability reference oscillator allows 0.1 parts per million frequency stability (refer to “High-Stability Option (7000HS)” on page 14-10).
- 7000HS-FALC High Stability reference oscillator and fast ALC loop operation (refer to “High Stability Fast ALC Option (7000HS-FALC)” on page 14-18).
- 7000NB Impulse-type noise blanker used in high-noise environments (refer to “Noise Blanker Option (7000NB)” on page 19-5).
- 7000RCDR Combines receive and transmit audio and routes them to the rear panel **ACCESSORY 2** connector (refer to “Recorder Option (7000RCDR)” on page 19-11).
- 7000RF Internal modem allows remote control from the RT7201F FSK controller. Implemented on assembly board 001-01402 (refer to “FSK Remote Control Option (7000RF)” on page 16-1).
- 7000RI Internal modem allows remote control from the RT7201I DHSL controller. Implemented on assembly board 001-01403 (refer to “DHSL Remote Control Option (7000RI)” on page 16-14).
- 7000RS Modem interface board configures the COM1 serial port for RS-422, RS-423 or RS-485 to provide data protocol for external control of the radio through a computer. This is in addition to the standard RS-232 interface (refer to “Data Interface Option (7000RS)” on page 19-3).
- 7000VEM DSP-based voice enhancement provides superior voice recognition and signal-quality improvement in noisy environments (refer to “N1304A Encoder Option (RT7000AIRSELCALL)” on page 19-12).

**Note:** The 7000VEM option is now a standard feature for new radios, however, it is still available as an option for older radios. It is implemented on assembly board 001-10000.

7000WB1 Wideband data filter providing 300 to 3300 Hz with tailored group delay characteristics for data operation (refer to “Wideband 1 Filter Option (7000WB1)” on page 17-2).

#### RT7000AIRSELCALL

Operating with N-1304B (or equivalent) SELCALL devices and Datron power amplifiers, it adds a secondary control line to the radio and allows use of the ICAO-mandated ground-to-air SELCALL 3-tone system (refer to “N1304A Encoder Option (RT7000AIRSELCALL)” on page 19-12).

## 1.5 RT7000 Variations

This manual provides basic descriptions of variations of the RT7000. Options described here may not be available on your transceiver. For more information about these variations, contact Datron World Communications, Inc. Chapter 20 provides descriptions for these variations.

RT7000C Designed for computer control. A blank front panel replaces the standard front panel (refer to “Computer Control Version (RT7000C)” on page 20-1).

RT7000E Designed for extended control use. A line driver panel replaces the standard front panel. It is used with the RT7201E control head for remote operation up to 50 ft. (15m) (refer to “Extended Front Panel Control (RT7000E)” on page 20-24).

RT7000PP Allows the addition of the RT5830 Pre/Postselector for co-sited operation (refer to “Pre/Post Selector (RT7000PP)” on page 20-30).

**Note:** The RT7000 is not field upgradeable to a RT7000PP.

RT7000RF Designed for long distance remote-only use beyond 2 km. A blank front panel replaces the standard front panel. An internal modem card (7000RF) is installed. For full function FSK remote control, use with the RT7201F Remote Control Head (refer to “FSK Remote Control (RT7000RF)” on page 20-33).

RT7000RI Designed for remote-only use up to 2 km. The standard front panel is replaced with a blank front panel. An internal modem card (7000RI) is installed. For full function, real time, DHSL remote control, use with the RT7201I Remote Control Head (refer to “DHSL Remote Control (RT7000RI)” on page 20-33).

RT7000RX Receiver only. It includes the full receiver functions of the RT7000, excluding transmit features (refer to “Receiver Only (RT7000RX)” on page 20-33).

RT7000TX Transmitter only. It includes the full transmitter functions of the RT7000, excluding receiver features (refer to “Transmitter Only (RT7000TX)” on page 20-33).

## 1.6 Input Power Requirements

The RT7000 is powered from a nominal +12 Vdc. Good performance is achieved when the input voltage is between the range of 11V and 15.5V.

## 1.7 Antenna Requirements

The RT7000 has an RF output impedance of 50 ohms and is used with either broadband or narrowband antennas, in conjunction with an automatic antenna tuner.

## 1.8 Accessories

The RT7000 interfaces with a variety of accessory equipment to produce systems that meets the most complex communication requirements. For more information on accessories, refer to “Accessory Connectors” on page 2-5.

## 1.9 Referenced Manuals

- RT7000-MS Operator Manual
- 7000ALE-MSOP Radio Control Program Operator Manual
- 7000ENCR-MSOP 7000-Series Encryption Operator Manual
- RT7201I-MS DHSL Remote Control Head Technical Manual
- RT7201F-MS FSK Remote Control Head Technical Manual



## Chapter 2: Installation

### 2.1 Unpacking and Inspection

When unpacking the RT7000, carefully remove the equipment from its container and inspect it for any possible damage. If anything is damaged, notify Datron.

Check the equipment against the packing list. Save the original container and packing materials for storage or reshipping purposes.

### 2.2 Pre-installation Check

The RT7000 is completely aligned and tested prior to shipment. However, to insure proper functioning prior to installation, perform an operations check. For more information, refer to “Basic Performance Test” on page 21-12.

### 2.3 Location Considerations

The RT7000 can be successfully installed in various locations and operated remotely using a remote head or extended control. Information in this chapter pertains to the main body of the RT7000, whether it is controlled locally or from a remote site.

#### 2.3.1 Temperature Considerations

The RT7000 should be installed in an environment where the temperature is within the specified range ( $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ), and there is adequate ventilation around the rear of the RT7000 to allow for air flow. The RT7000 uses an on-demand fan for cooling the internal heat sink during periods of prolonged transmit operation. The intake and exhaust vents for this fan are located on the rear panel. Make sure there is sufficient space during installation for the cooling air to circulate properly.

To prevent unwanted noise, locate the RT7000 as far away as possible from electrostatic and magnetic field-generating equipment.

When attaching external cables to the RT7000, allow for sufficient slack in the cables. This prevents damage from sharp bends and ensures easy disconnection.

### 2.3.2 Fixed Station Applications

Unless otherwise specified when ordered, the RT7000 is shipped ready for operation in a fixed station desktop configuration. It can also be mounting in a rack using the appropriate rack kit. The rack mount kit is ordered separately.

### 2.3.3 Vehicular or Marine Applications

For vehicle or shipboard applications, Datron offers rack, mobile and shock mount kits suitable for most installations.

## 2.4 Front Panel Connections

The RT7000 front panel hosts two 6-pin audio connectors. These two connectors are wired in parallel and are compatible with various audio accessories.



**Figure 2-1 Front Panel Connections**

The input impedance for each connector is 150 ohms (nominal). The RT7000 supports most dynamic, ceramic or magnetic headphones. Table 2-1 below lists the compatible low-level audio accessories.

**Table 2-1 Audio Accessories**

Part Number	Description
MRR	Heavy-duty hand microphone
MHS	U.S. MIL-STYLE H-189/U handset
KYR	Morse key
HPR	Headphones

**Table 2-1 Audio Accessories (continued)**

Part Number	Description
H3M	Headphones with boom microphone
H-250/U	Non-repairable version of MHS

All Datron audio accessories have the correct mating connector. Datron offers mating adapters for other low-level audio accessories. Table 2-2 below provides pin assignments for the audio connectors.

**Table 2-2 Front Panel Audio Connector Pin Assignments**

Pin	Signal	Description
A	GND	Ground
B	RX	Receive audio (unmuted)
C	PTT	Push-to-talk
D	TX	Transmit audio
E	CW	CW key line (morse code)
F	12V	+12 Vdc

## 2.5 Rear Panel Connections

The RT7000 rear panel is attached to the side panels by four hex head bolts. The heatsink which dominates the rear panel maintains the operating temperature within specifications eliminating the need for an internal cooling fan. The rear panel hosts the following connectors:

- DC input connector
- Remote control connector
- Accessory connector 1, 2 and 3
- Antenna
- Fan power

Optional cooling fans can be mounted to the heatsink.

## 2.5.1

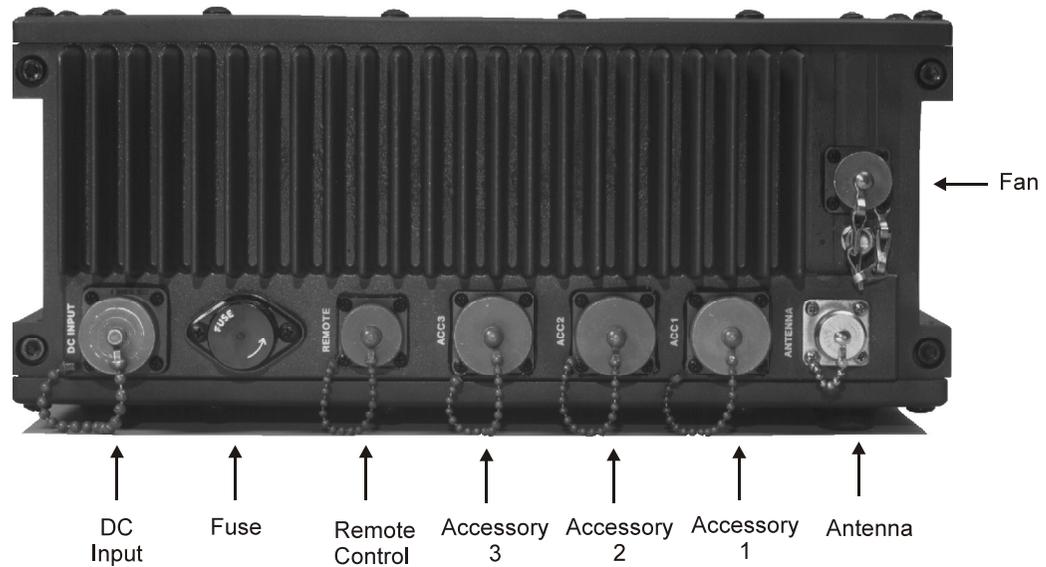


Figure 2-2 RT7000 Rear Panel

## 2.5.2 Power to the RT7000

Input power for the RT7000-12 is nominally 13.8 Vdc with a maximum current requirement of 25A. The recommended operational voltage range is 11 to 15.5 Vdc. The RT7000-28 requires +28 Vdc at a maximum of 15A (operation range of 22 to 30 Vdc). The DC input connector is a 2-pin, 30A circular receptacle with a square flange. The included DC power cable (C991556) is unterminated to provide connection to a variety of DC power sources. The pin assignments for the DC input power connector are as follows:

Pin	Signal	Description
A	+V	12 Vdc return (ground)
B	GND	12 Vdc supply

The DC power connection between the RT7000 and its power source should be as short as possible. If a Datron power cable is not available, use a 14 AWG cable for runs up to 3 feet, a 12 AWG cable for runs to 9 feet, or a 10 AWG cable for longer runs.

Datron offers two DC power supplies recommended for use with the RT7000 when a +12 Vdc primary power source is not available.

**UPF7000A-12:** A continuous duty (FSK) 12 Vdc power supply designed to power the RT7000-12. It accepts inputs from 85 to 240 VAC, 47/63Hz with automatic voltage selection. The UPF7000A-12 features a rugged waterproof chassis. This power supply requires the C991511 cable to connect to the RT7000.

**UPF7000A-28:** A continuous duty (FSK) 28 Vdc power supply designed to power the RT7000-28. It accepts inputs from 85 to 240 VAC, 47/63Hz with automatic voltage selection. The UPF7000A-28 features a rugged waterproof chassis. This power supply requires the C991511 cable to connect to the RT7000.

The waterproof fuse holder (346877) on the rear panel contains either a 25A(12V), 3-AG or a 15A (28V), 3-AG fuse.

### 2.5.3 Antenna Connector

The RT7000 is designed to transmit into a 50 ohm RF impedance. The output RF antenna connector is a type N connector. Broadband antennas and dipoles can be connected directly to this output, while high-power amplifiers and antenna tuners use specially-designed Datron cables. For specific connections, refer to Figure 2-4 on page 2-11.

### 2.5.4 External Fan Connector

The power connector for the optional external fan (RT7000FAN-1) has the following pin assignments:

Pin	Signal	Description
A	12V	+12V (from <b>ACCESSORY 1</b> pin B)
B	GND	Ground

### 2.5.5 Accessory Connectors

A variety of external accessories are available from Datron for use with the RT7000. For some of these accessories and their control cabling, refer to Figure 2-5 on page 2-12. For more information on any individual accessory, refer to the specific manual for that piece of equipment.

The RT7000 provides three rear panel 26-pin MIL-C accessory connectors for attaching various peripheral equipment. If an installation includes accessories that share one or more of the **ACCESSORY** connectors, an external accessory combiner box (RT7000IOX) can be attached to any of these connectors. For the location of these connectors, refer to Figure 2-2 on page 2-4.

**Table 2-3 ACCESSORY 1 Pin Assignments**

<b>Pin</b>	<b>Signal</b>	<b>Description</b>
A	GND	Ground
B	EXTCWKEY	External CW key
C	COM1RXD	COM1 receive data
D	STROBE	Not used
E	COM1CTS	COM1 clear-to-send (handshake)
F	D0	Not used
G	COM1TXD	COM1 transmit data
H	D1	Not used
J	COM1RTS	COM1 ready-to-send (handshake)
K	D2	Not used
L	D3	Not used
M	D4	Not used
N	D5	Not used
P	D6	Not used
R	AUXPTT	Auxiliary PTT
S	BUSY	Not used
T	DI/O SEL	Not used
U	ACK	Not used
V	SEL	Not used
W	D7	Not used
X	BALTXA1	Transmit balanced audio 1
Y	BALTXA2	Transmit balanced audio 2
Z	BALRXA1	Receive balanced audio 1
a	BALRXA2	Receive balanced audio 2
b	12V ACC	+12V supply for accessories
c	12V ACC	+12V supply for accessories

**Table 2-4 ACCESSORY 2 Pin Assignments**

<b>Pin</b>	<b>Signal</b>	<b>Description</b>
A	GND	Ground
B	GND	Ground
C	COM2TXD	COM2 transmit data
D	COM2RXD	COM2 receive data
E	/RETX	Retransmit
F	TC/SCALM	Not used
G	ASTROBE	ATU strobe (antenna tuner)
H	ACLOCK	ATU clock (antenna tuner)
J	ATUKEY	ATU key (antenna tuner)
K	ADATA	ATU data (antenna tuner)
L	ATUINIT	ATU initialize (antenna tuner)
M	ACHKTUNE	ATU check tune (antenna tuner)
N	PWRON	Power enable from front panel switch
P	EXTCWKEY	External CW key input
R	AUXPTT	Auxiliary PTT
S	SQA	Squelched audio output
T	EXTSPKR	External speaker output audio
U	GND	Ground
V	12VACC	+12 Vdc for accessory
W	28VOUT	+28 Vdc output
X	BALTXA3	Transmit balanced audio 3
Y	BALTXA4	Transmit balanced audio 4
Z	BALRXA3	Receive balanced audio 3
a	BALRXA4	Receive balanced audio 4
b	12V ACC	+12V supply for accessories
c	12V ACC	+12V supply for accessories

**Table 2-5 ACCESSORY 3 Pin Assignments**

<b>Pin</b>	<b>Signal</b>	<b>Description</b>
A	GND	Ground
B	GND	Ground
C	EXTCLK	External clock
D	AMPALC	ALC (external amp)
E	AMPPTT\	PTT line (external amp)
F	FILTG\	External amp (spare)
G	ATURX	ATU receive data (antenna tuner)
H	EXTRXD	External SPI receive data
J	EXTEN1	External SPI enable 1
K	EXTTXD	External SPI transmit data
L	EXTIN1	External BITE
M	ATUTX	ATU transmit data (antenna tuner)
N	FLTG	External amp (low-pass filter G select line)
P	EXTEN2	External SPI enable 2
R	FLTE	External amp (low-pass filter E select line)
S	FLTF	External amp (low-pass filter F select line)
T	FLTC	External amp (low-pass filter C select line)
U	FLTD	External amp (low-pass filter D select line)
V	FLTA	External amp (low-pass filter A select line)
W	FLTB	External amp (low-pass filter B select line)
X	GND	Ground
Y	NC	No connection
Z	5V	+5V accessory supply voltage
a	5V	+5V accessory supply voltage
b	12V ACC	+12V accessory supply voltage
c	12V ACC	+12V accessory supply voltage

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External Encryption	The RT7000 provides for an optional embedded encryption board (7000ENCR). External encryption can also be implemented through either <b>ACCESSORY 1</b> or <b>ACCESSORY 2</b> using balanced audio pins (BALTX3/4 and BALRX3/4) (refer to Table 2-3 on page 2-6 or Table 2-4 on page 2-7).
EIA Data Interface Standards	<p>The RT7000 interfaces with a variety of data communications equipment (DCE) or data terminal equipment (DTE) using EIA standards RS-232, RS-422, RS-423 or RS-485. <b>ACCESSORY 1</b> is configured to provide the standard I/O port (COM1) for these interfaces. The RS-232 standard is default; RS-422/423/485 are optional (refer to Table 2-3 on page 2-6).</p> <p><b>Note:</b> It is necessary to order the 7000RS option and to specify the required protocol so the Processor board is configured for the appropriate protocol. If the 7000RS option is installed, the COM1TXD and COM2RXD becomes a 2-wire bidirectional RS-422/423/485 interface.</p> <p>A 3-wire RS-232 (COM2) interface is also available on <b>ACCESSORY 2</b>.</p>
Automatic Antenna Tuners	The RT7000 interfaces with the complete line of Datron automatic antenna tuners, including the AT/RAT7000B and RAT1000C. The AT7000B and RAT7000B use <b>ACCESSORY 3</b> ATU pins (refer to Table 2-5 on page 2-8); the RAT1000C uses <b>ACCESSORY 2</b> ATU pins (refer to Table 2-4 on page 2-7).
Data Terminal Interface	The RT7000 interfaces with its own line of data terminals or to other external units through the COM1 and COM2 serial interface ports and the balanced audio (BALRX and BALTX) lines on <b>ACCESSORY 1</b> (refer to Table 2-3 on page 2-6).
External Speaker	An external speaker can be attached to the RT7000 on the EXTSPKR line (pin 22) of <b>ACCESSORY 2</b> (refer to Table 2-4 on page 2-7).
External High-Power RF Amplifiers	The RT7000 interfaces with all existing Datron's RF power amplifiers such as the RA500D (500W) and RA1000D (1000W) RF amplifiers using <b>ACCESSORY 3</b> pins 1 to 12 (refer to Table 2-5 on page 2-8).

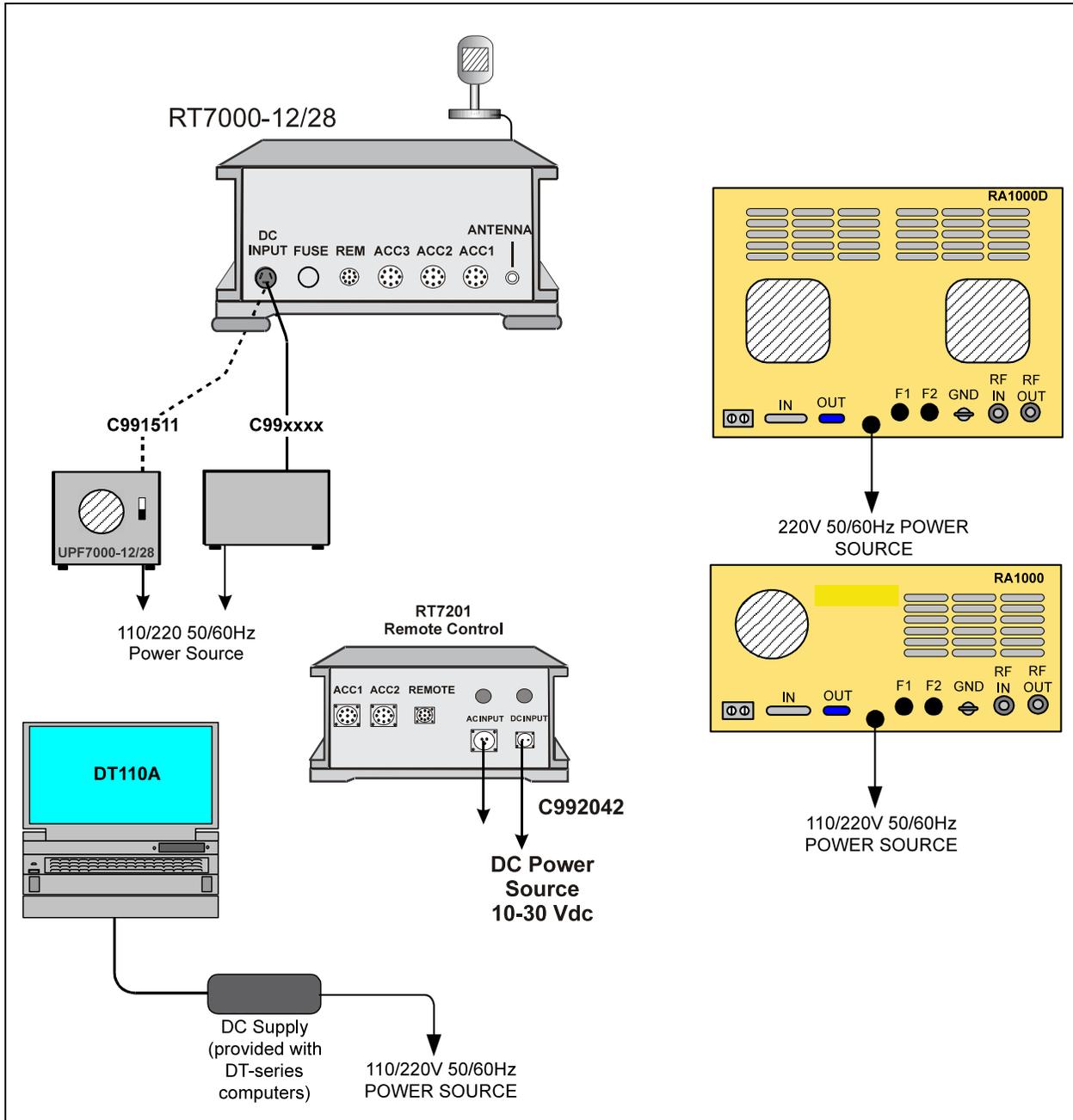


Figure 2-3 Power Cabling Accessories

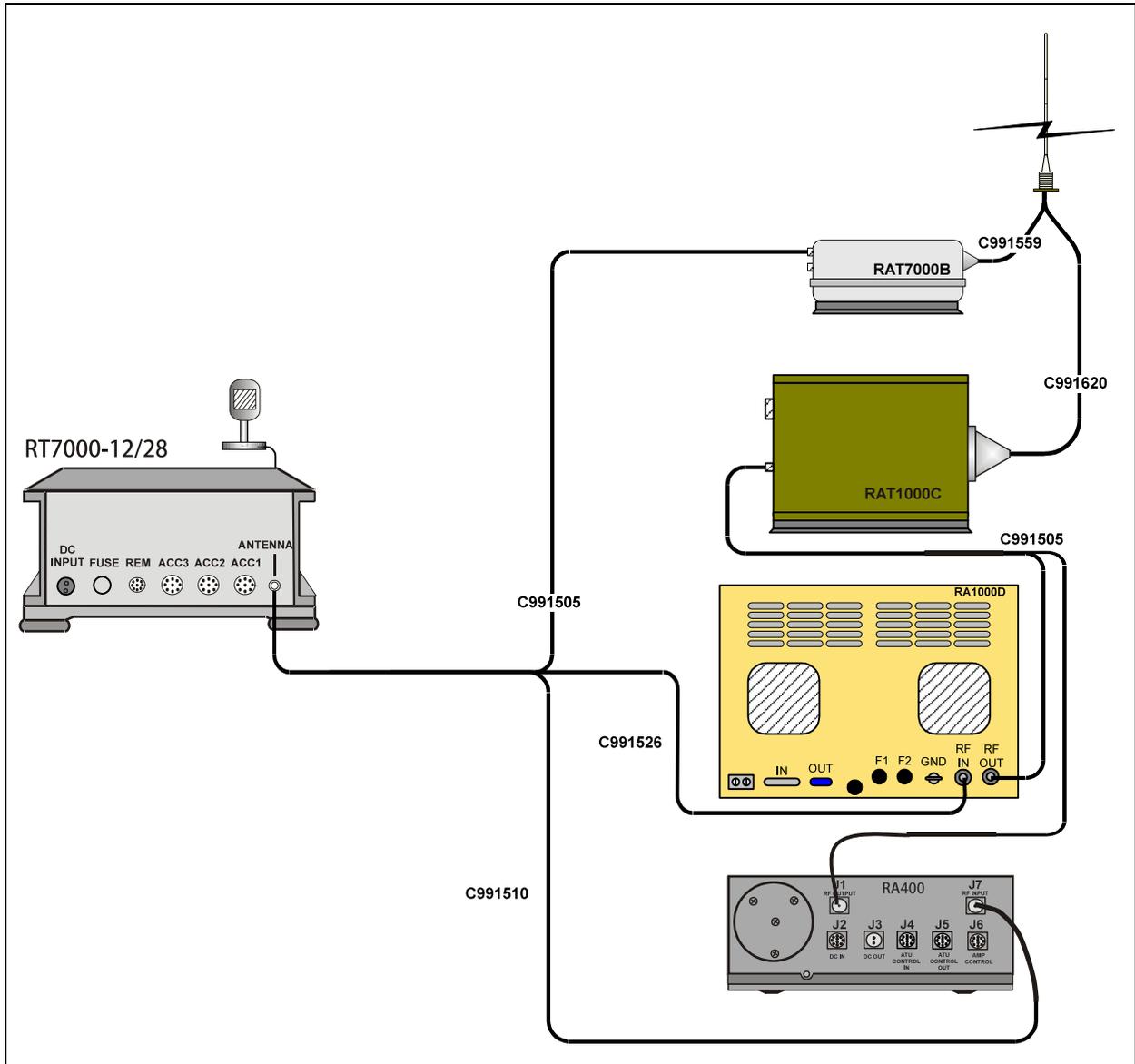


Figure 2-4 RF Cabling Accessories

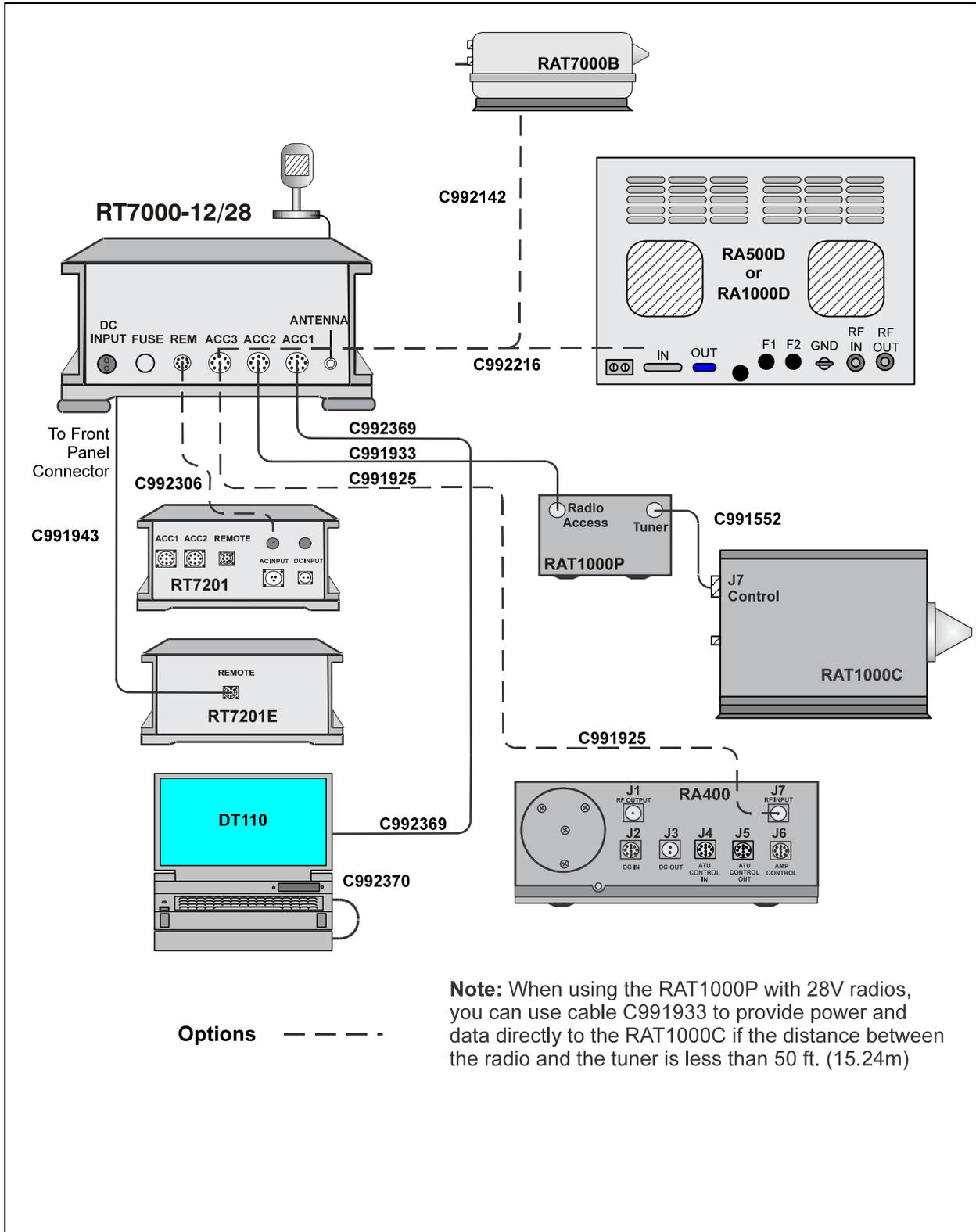


Figure 2-5 Control Cabling Accessories

## 2.5.6 Remote Control

The RT7000 can be controlled remotely using an extended front panel or a remote control head.

### Extended Front Panel Control

The RT7000 front panel can be removed from the chassis and replaced with a line driver panel (RT7000E) to control it remotely. This special version of the radio can control operations from distances up to 50 feet.

### FSK and DHSL Remote Control

The RT7000 can be controlled remotely from longer distances using either the RT7201F or RT7201I remote control heads. Both control heads require that modem interface boards (7000RF or 7000RI) be installed inside the RT7000. The RT7201F uses FSK and is for long-range remote requirements, while the RT7201I uses DHSL and is for real-time control up to 2 km.

These modem-based remote control units connect to the RT7000 through the DB 9-pin **REMOTE** connector on the rear panel.

Pin	Signal	RT7201F	RT7201I
1	GND	x	x
2	+12V UNREG	x	x
3	+12V ACC		
4	Spare (REMSP)		
5	DHSL1		x
6	DHSL2		x
7	REMRXA	x	
8	REMTXA	x	
9	PWRON\	x	x

For a complete description of these pins, refer to the RT7201F FSK Remote Control Head (RT7201F-MS) technical manual or the RT7201I DHSL Remote Control Head (RT7201I-MS) technical manual.





## Chapter 3: Theory of Operation

This chapter describes the overall operation of the RT7000 including power distribution, frequency generation, receive and transmit paths and control signals.

### 3.1 Transceiver Boards

The RT7000 (12V version) can accommodate a total of eighteen boards either standard or option boards. Many of these are plug-in boards that can be removed and serviced easily. Figure 21-1 on page 21-5 provides the location of these boards.

Most of the wiring between individual assemblies in the RT7000 is implemented through the Motherboard, eliminating wiring harnesses. Other connections between the circuit boards, front and rear panel controls, and connectors, are made using a combination of coaxial cable and ribbon cable assemblies. For more information on these boards, refer to Figure 3-1 on page 3-2.

### 3.2 Power Distribution

The RT7000 receives its source power through the rear panel **DC INPUT** connector. This power is routed to the Interface/Power Supply board through connector J26. The PWRON line from the front panel **POWER** switch (J21-7) activates a relay on the Interface/Power Supply board, turning the RT7000 on and allowing the distribution of power to the other subassemblies. Figure 4-1 on page 4-3 shows the power distribution in the RT7000.

Voltages derived from the +12 Vdc source power input include the following:

Voltage	Description
+12V PA +28V PA	Unregulated, unswitched, raw input power to the RF Power Amplifier board
+12V UNREG	Unregulated, switched input power to the front panel assembly and the remote control devices via the rear panel <b>REMOTE</b> connector

Voltage	Description
+12V ACC	Regulated, switched, filtered +12 Vdc provides power to all of the rear panel connectors
+12V FAN	Unregulated, switched, filtered +12 Vdc supply drives the heatsink fan
+12V	Regulated, switched, filtered +12 Vdc supply provides power to all internal subassemblies in the RT7000 except the front panel
+5V	Regulated, switched, filtered +5 Vdc supply for the Processor board, <b>ACCESSORY3</b> connector, and the ALE option slot

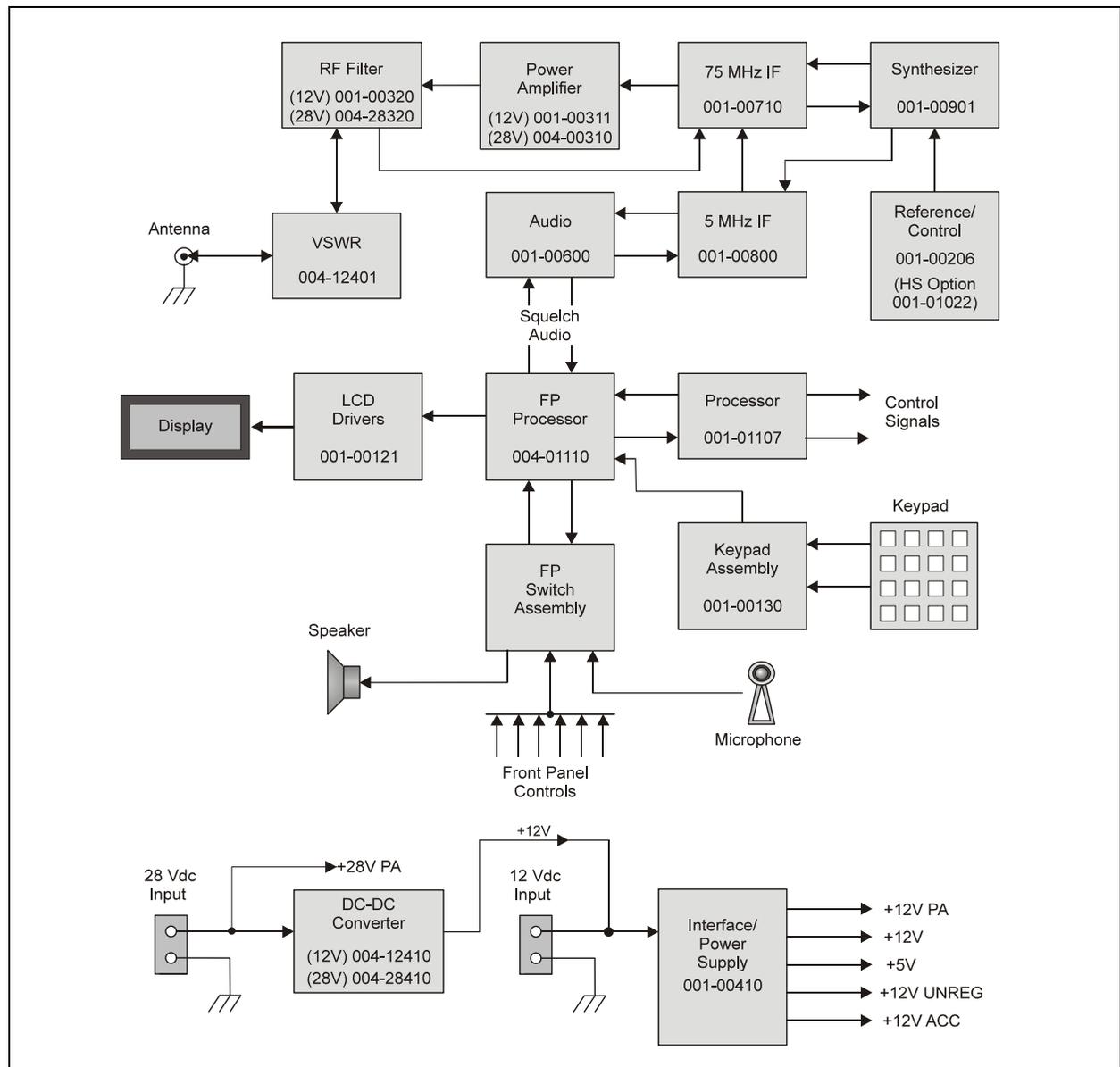


Figure 3-1 System Diagram

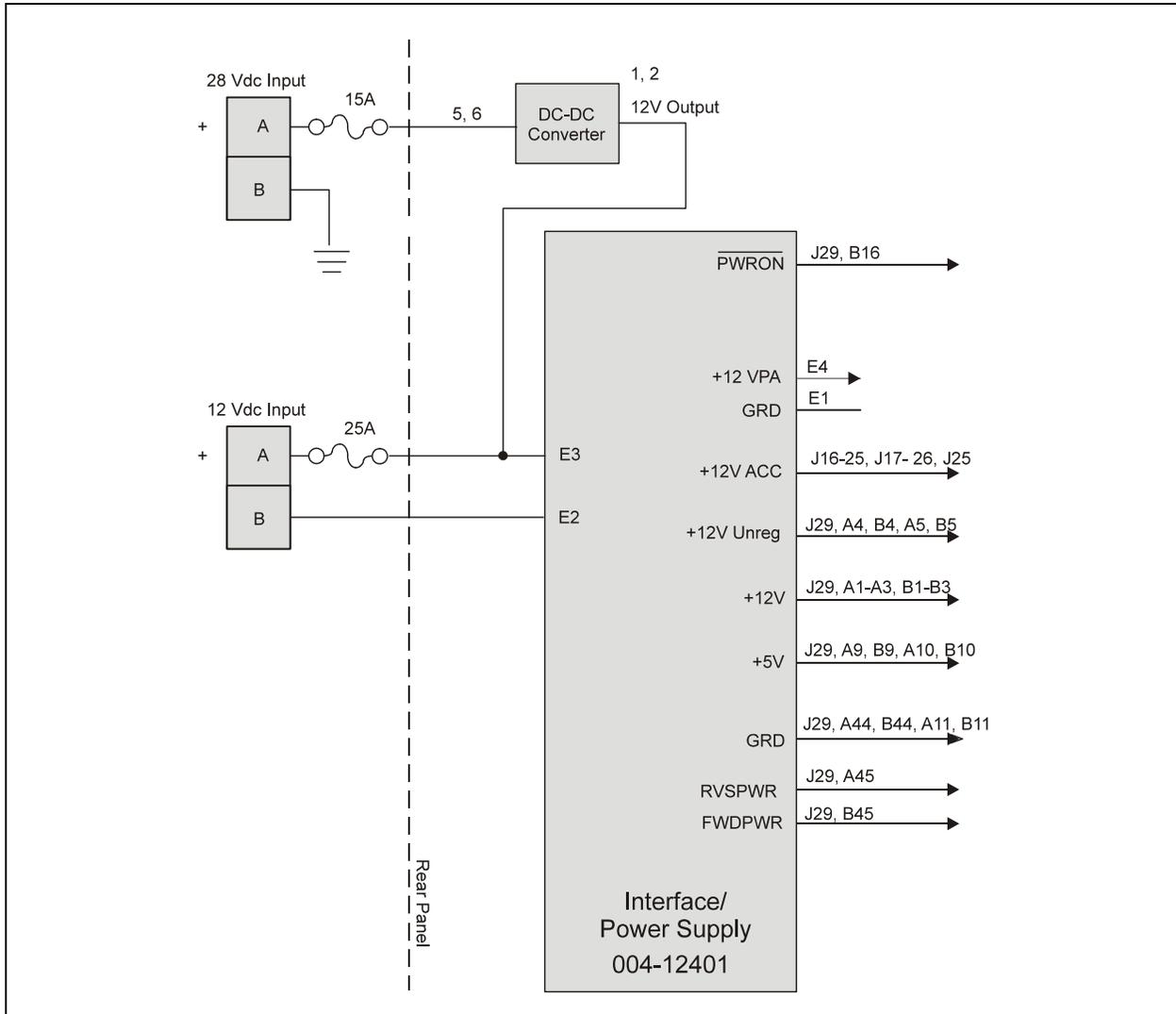


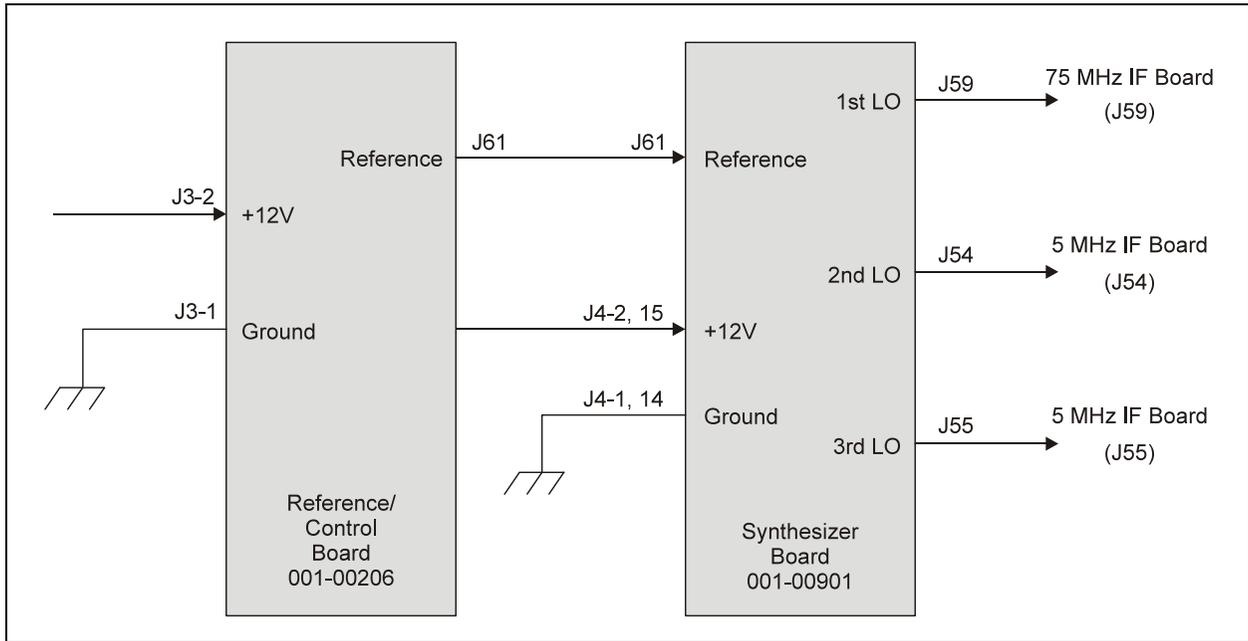
Figure 3-2 Power Distribution Diagram

**Table 3-1 Transceiver Power Distribution**

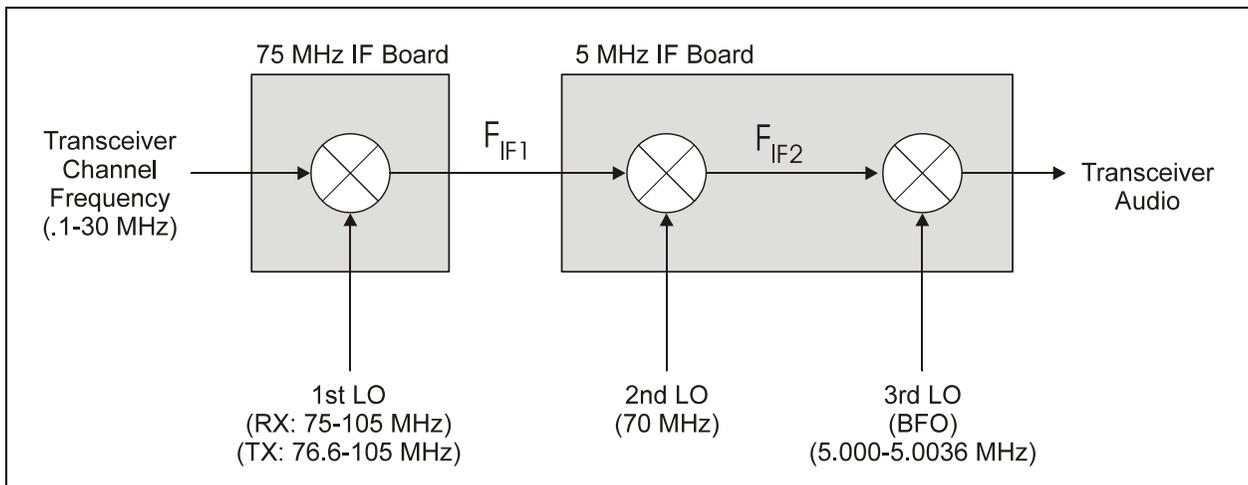
<b>Voltage</b>	<b>Distribution</b>	<b>Connector</b>
+12V PA	RF Power Amplifier board	
+12V ACC	Rear panel assembly	
+28V	ACCESSORY 2	Pin W
	REMOTE	
	ACCESSORY 1	Pin b, c
	ACCESSORY 2	Pins c
	ACCESSORY 3	Pins b, c
+12V UNREG	Front panel assembly	J1-3, 4, J33
	Rear panel assembly	
	REMOTE	Pin J
+12V	Processor board	J14-A31, B31; J15-A31, B31
	Reference/control board	J3-2
	RF Filter board	J22-3, 4
+12V	Processor board	J14-A31, B31; J15-A31, B31
	Reference/Control board	J3-2
	RF Filter board	J22-3, 4
	Synthesizer board	J4-2, 15
	75 MHz IF board	J6-2, 15
	5 MHz IF board	J5-2, 15
	Audio board	J7-2, 15
	ECU/RCU board	J11-2, 15
	ALE option slot	J13-2, 15
	Option slot 1	J9-2, 15
	Option slot 2	J10-2, 15
	Noise Blanker/FM board	J2-2, 15
+5V	Rear panel assembly	
	ACCESSORY 3	Pin Z, a
	Processor board	J15-A28, B28
	ALE option slot	J13-6, 18

**Table 3-1 Transceiver Power Distribution**

Voltage	Distribution	Connector
PWRON	Front panel assembly	J1-26
	Rear panel assembly	
	REMOTE	Pin D
	ACCESSORY 2	Pin N



**Figure 3-3 Transceiver Frequency Generation**



**Figure 3-4 Transceiver Frequency Mixing Schematic**

### 3.3 Frequency Generation

Figure 3-4 on page 3-5 shows the boards used in frequency generation. All frequencies are tied to the reference oscillator on the Reference/Control board that generates a reference frequency of 16.777216 MHz, and outputs it to the Synthesizer board through an internal coaxial cable (J61 on both boards). The DDS on the Synthesizer board compares the reference frequency input with a feedback frequency from the VCO and generates three local oscillator (LO) output frequencies as follows:

Frequency	Value	Level
First LO	75.1 to 105 MHz (10 Hz steps)	0 dBm $\pm$ 2 dB (50 ohm)
Second LO	$\approx$ 70 MHz	0 dBm $\pm$ 2 dB (50 ohm)
Third LO	5.000 MHz (LSB, voice) 5.003 MHz (USB, voice) 5.0036 MHz (USB, data)	0 dBm $\pm$ 2 dB (50 ohm)

These LO frequencies result in intermediate frequencies (IF) of 75 MHz and 5 MHz. The beat frequency oscillator (BFO) uses different values depending on the modulation mode selected, allowing the RT7000 to use only one sideband filter instead of the usual two (USB and LSB). This allows the RT7000 to use both USB and LSB as standard modulation modes. The third value of BFO (5.0036 MHz) is for USB operation when the optional wideband data filter is installed. The first LO is offset by 3 kHz in USB mode with the standard voice-grade filter, and by 3.6 kHz in USB mode with the optional data-grade filter. Table 3-2 on page 3-7 provides an example:

**Table 3-2 LO/BFO Frequency/Modulation Mode**

<b>Channel frequency = 1.6 MHz, USB, voice, 1 kHz modulation</b>	
First LO	= 75 MHz + channel frequency + 3 kHz
	= 75 MHz + 1.6 MHz + 3 kHz
	= 76.603 MHz
First IF	= First LO - input frequency
	= 76.603 MHz - (1.6 MHz + 1 kHz)
	= 75.002 MHz
Second IF	= First IF - second LO
	= 75.002 MHz - 70 MHz
	= 5.002 MHz
Output Audio	= BFO - second IF
	= 5.003 MHz - 5.002 MHz
	= 1 kHz
<b>Channel frequency = 1.6 MHz, LSB, voice, 1 kHz modulation</b>	
First LO	= 75 MHz + channel frequency
	= 76.6 MHz
First IF	= 76.6 MHz - (1.6 MHz - 1 kHz)
	= 75.001 MHz
Second IF	= 75.001 MHz - 70 MHz
	= 5.001 MHz
Output Audio	= BFO - second IF
	= 5.000 MHz - 5.001 MHz
	= -1 kHz
<b>Channel frequency = 1.6 MHz, USB, data, 1 kHz modulation</b>	
First LO	= 76.6036 MHz
First IF	= 75.0026 MHz
Second IF	= 5.0026 MHz
<b>Channel frequency = 1.6 MHz, USB, data, 1 kHz modulation</b>	
Output Audio	= BFO - second IF
	= 5.0036 - 5.0026
	= 1 kHz

## 3.4 Receive Signal Flow

The RT7000 receives the receive signal (channel frequency) through the 50 ohm antenna connector J50 on the rear panel, then passes the signal through the VSWR board (E4). The receive signal is applied to the RF Filter board at J50. In the RF Filter board, the signal is filtered before going to the 75 MHz IF board at J52. Figure 3-5 on page 3-9 provides a block diagram of the receive path in the RT7000.

The 75 MHz IF board mixes the channel frequency with the first LO to form the first IF at 75 MHz. It then filters and amplifies the signal before sending it to the 5 MHz IF board through J53. The 5 MHz IF board mixes the receive signal with the fixed 70 MHz second LO to produce the second IF at 5 MHz. It also filters and amplifies the receive signal then mixes it with the third LO (BFO) to remove the carrier frequency, leaving just the baseband audio.

The demodulated audio (DEMODA) exits the 5 MHz IF at J5 pin 21 and is applied to the Audio board at J8 pin 21. The Audio board processes the audio, passes it through the squelch gate, then sends it out as unbalanced squelched audio through J8 pin 7 (SQA) to drive the front panel speaker (J1 pin 30). It can also be routed to an external speaker through **ACCESSORY 2** pin T. The Audio board provides four channels of balanced squelched audio to the rear panel accessory connectors: two to **ACCESSORY 1** and two channels to **ACCESSORY 2** connector (pins Z and a).

The front panel **SQUELCH** switch controls the syllabic squelch circuit on the Processor board. The 5 MHz IF board generates the receiver's automatic gain control (AGC) and sets the threshold.

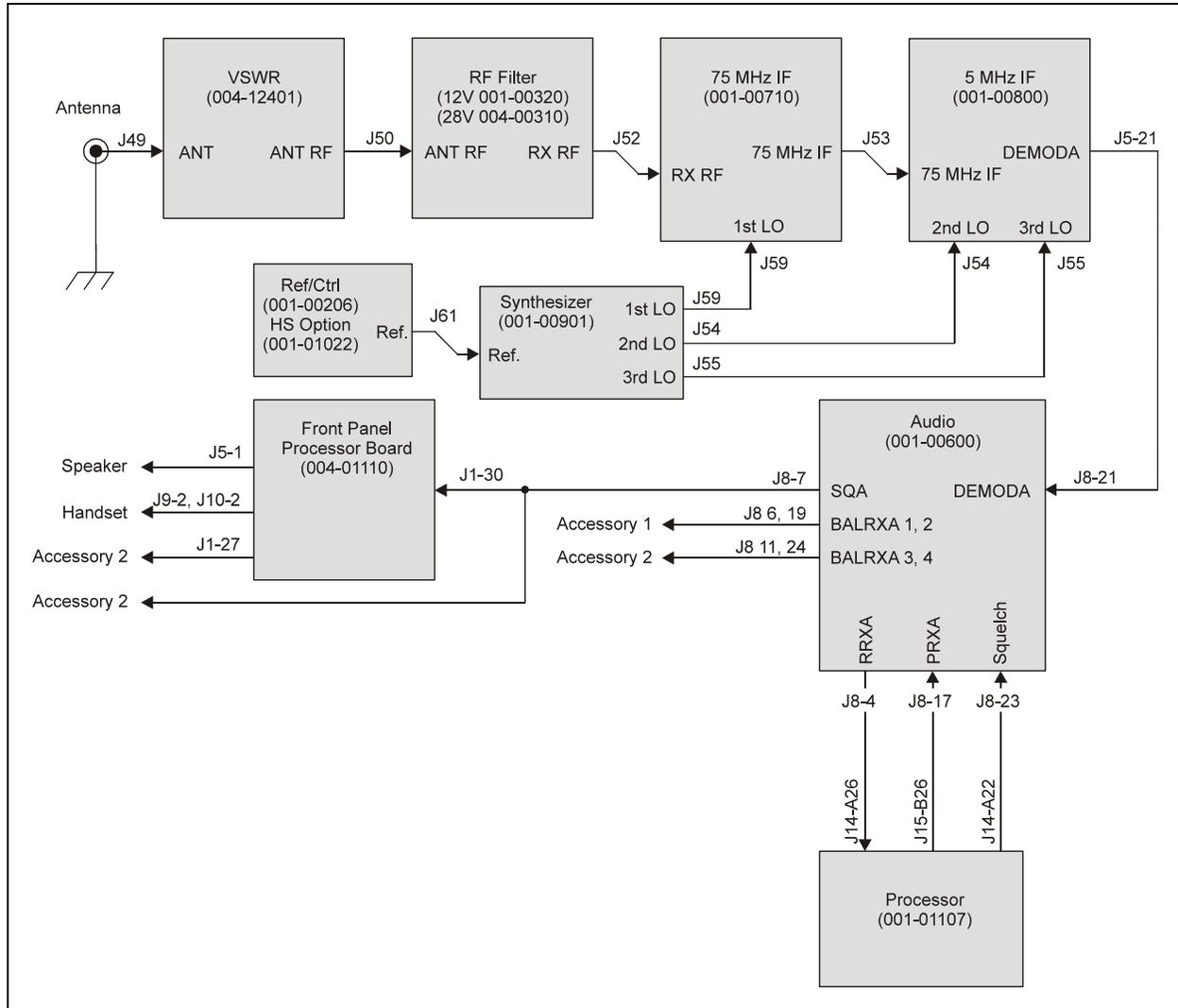


Figure 3-5 Transceiver Receive Path Diagram

### 3.5 Transmit Signal Flow

Figure 3-6 on page 3-11 provides a diagram of the transceiver transmit path. Primary unbalanced audio originates at microphones or headsets connected to either of the front panel audio connectors at J1 pin 25 and is applied to the Audio board at J8 pin 20. Balanced 600 ohm audio is received from either **ACCESSORY 1** or **ACCESSORY 2** (pins X, Y), and enters the Audio board at J8 pins 5 and 18. The Audio board modulates the audio signal (MODA) and sends it to the 5 MHz IF board where it is mixed with the third LO (BFO) to form the IF at 5 MHz. The modulated audio is filtered and amplified, then mixed with the second LO to form the IF at 75 MHz before being routed to the 75 MHz IF board. On the 75 MHz IF board, the transmit signal is amplified and filtered, then mixed with the first LO to form the low-level transmit channel frequency RF. It is amplified again in the TX exciter circuitry before being sent to the RF Power Amplifier board.

In the RF Power Amplifier, the transmit signal is amplified to its final output power level and routed to the RF Filter board. The RF Filter board provides the necessary harmonic filtering before the signal reaches the antenna port. Just prior to this, the signal passes through the VSWR circuit where it is sampled by a forward and reflected power detector. These RF samples are fed back to the Reference/Control board where they are processed to make up the transmitter automatic level control (ALC) circuit and VSWR measurement. The raw ALC voltage is sent back to the 75 MHz IF board where it controls the gain of the low-level exciter amplifier.

## **3.6 Receive and Transmit Path Subassemblies**

The receive/transmit path includes the following standard subassemblies:

- VSWR circuit
- RF Filter board
- RF Power Amplifier board
- 75 MHz IF board
- 5 MHz IF board
- Audio board
- Processor board

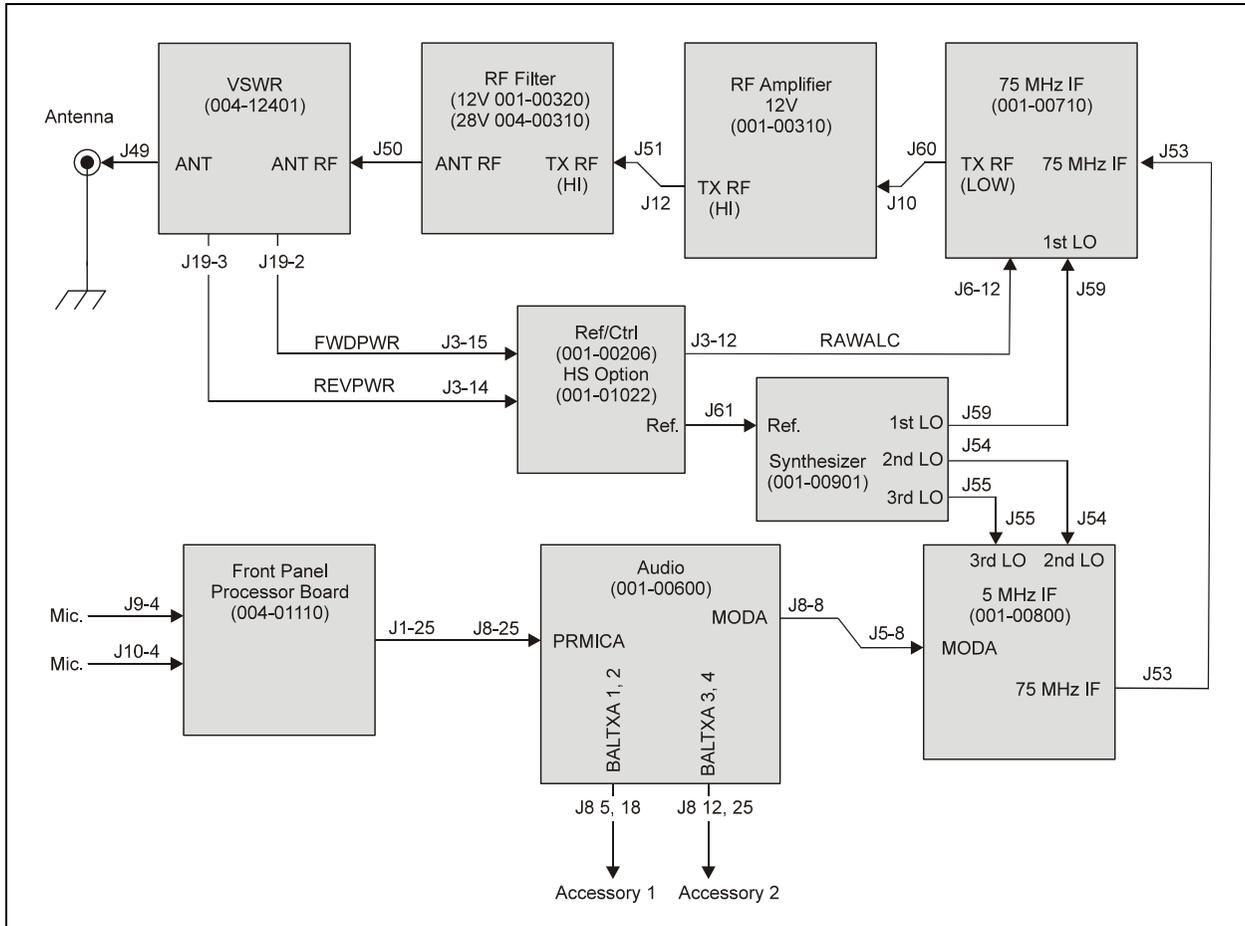


Figure 3-6 Transceiver Transmit Path

### 3.7 Transceiver Control Path

The RT7000 is controlled by two microprocessors: the main controller on the Processor board, and a secondary controller in the Front Panel Processor board. The secondary controller processes all of the commands from control devices on the front panel such as clarifier, volume, switches, and keys on the keypad. It relays them to the main processor to initiate the appropriate action in the radio. The main processor controls all radio operations and processes any commands received from the rear panel accessory connectors. For more information regarding the main processor, refer to “Chapter 14: Processor Board.”

## 3.8 Mainframe

Figure 3-7 on page 3-13 provides a mainframe schematic that shows all of the wiring between the front panel, rear panel, and Motherboard. This schematic traces signals between assemblies. Most signal lines have arrows that show the direction of the signal flow.



## 3.9 Motherboard

The Motherboard is the backbone of the RT7000. It provides connectivity between the various boards; all the other circuit boards plug into the Motherboard as shown in Figure 3-8 on page 3-16. It has no active or passive components.

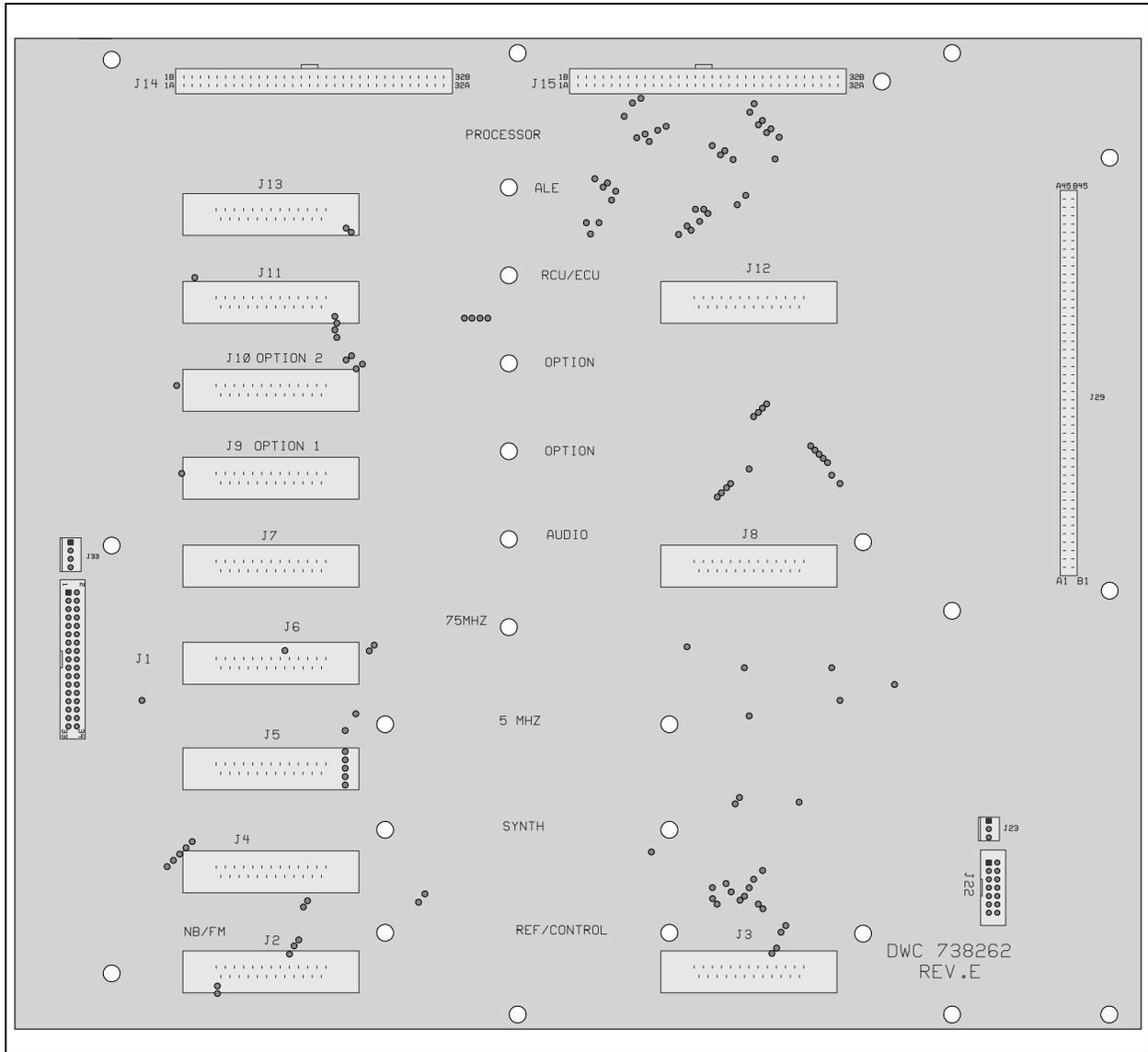


Figure 3-8 Motherboard Connector Locations Diagram (738262 Rev. E)



## Chapter 4: Interface/Power Supply Board

### 4.1 Circuit Description

The Interface/Power Supply board consists of the power supply and a heatsink. The board is mounted to the heatsink and together they are mounted on the vertical chassis bracket located directly behind the main heatsink, facing the inside of the rear panel. The Interface/Power Supply board is connected to the rear panel through the DC power cable which plugs into the 3-pin J26 connector.

#### 4.1.1 Power Distribution

The Interface/Power Supply board includes three voltage regulators that provide the following supply voltages:

- +12V PA (+12 Vdc unswitched, unregulated)
- +12V UNREG (+12 Vdc switched, unregulated)
- +12V (+12 Vdc switched, regulated)
- +12V ACC (+12 Vdc switched, regulated)
- +5V (+5 Vdc switched, regulated)

#### 4.1.2 Harmonic Filter Band Switching

Decoder and line driver U1 converts the serial harmonic filter band-switching data from the Processor board into parallel data used for pass band filter selection on optional external amplifiers such as the RA500D and RA1000D. This information goes through J25 directly to **ACCESSORY 3** on the rear panel along with serial data signals from the Processor board for the RAT7000B antenna tuner.

#### 4.1.3 Accessory Interface

The Interface/Power Supply board functions as a distribution platform for signals routed from the Processor board to the various rear panel accessory connectors to support external audio, amplifiers, antenna tuners and remote

control units. Signals are routed from the Motherboard through J29 to **ACCESSORY 1** through J16, **ACCESSORY 2** through J17, **ACCESSORY 3** through J25 and the **REMOTE** through J18.

### 4.1.4 Voltage Protection

The Interface/Power Supply board also includes circuitry that protects against reverse polarity (diode D1), and over-voltage and under-voltage events (voltage monitor U3).

### 4.1.5 VSWR Circuit

The Interface/Power Supply board provides VSWR detection circuitry that samples forward and reverse power from the RF output power line (J50 to J49). The forward (FWDPWR) and reverse (RVSPWR) power samples are routed to the Reference/Control module to control the ALC circuitry (refer to “Automatic Level Control” on page 5-1).

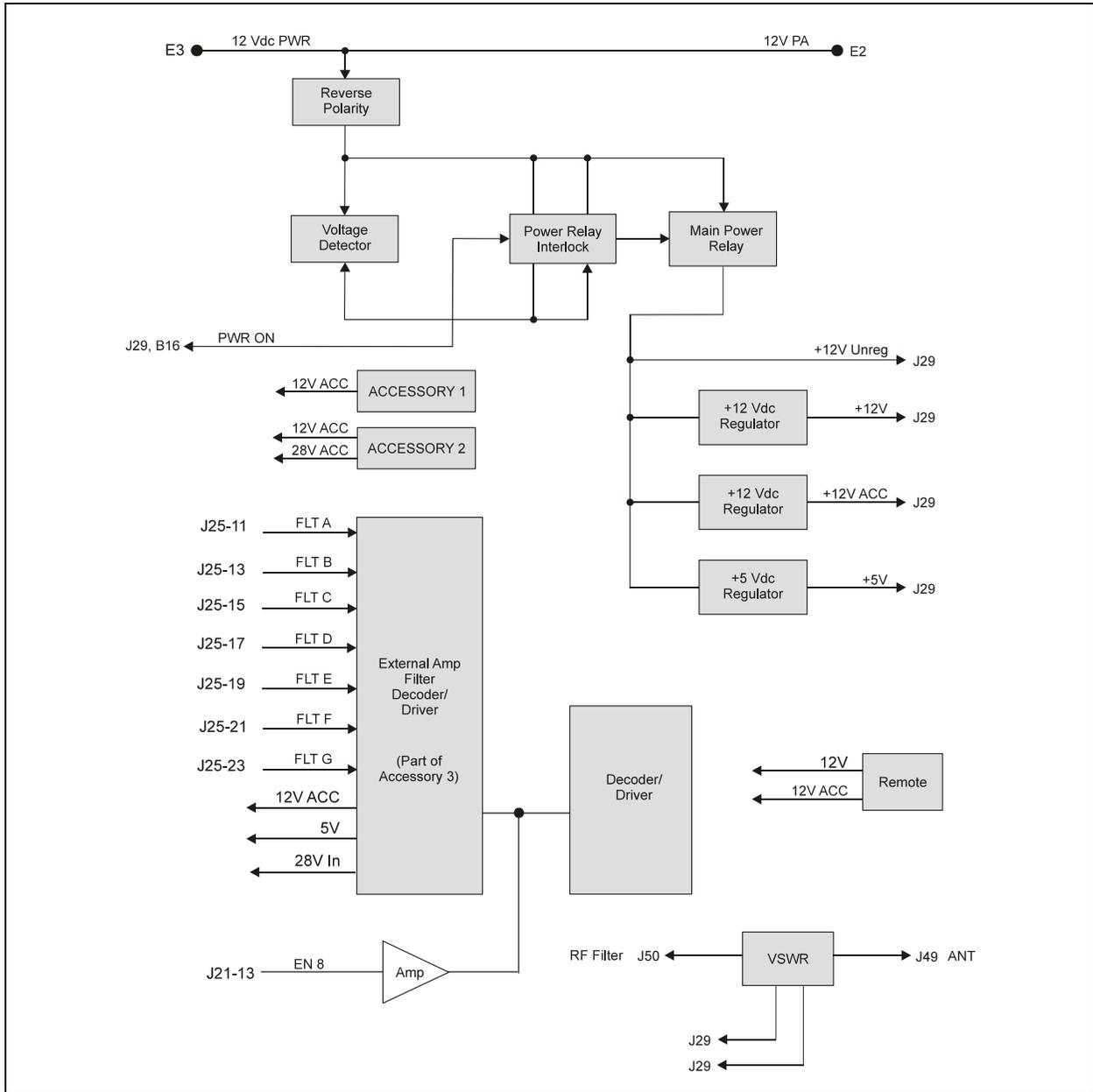


Figure 4-1 Power Supply Block Diagram

## 4.2 Connector Pin Assignments

The following tables provide the connections between the Interface/Power Supply board and the rest of the RT7000.

### 4.2.1 J16 Connector

J16 connects to the rear panel **ACCESSORY 1** connector.

**Table 4-1 J16 Connector Pin Assignments**

Pins	Signal	Description
1	GND	Ground
2	EXTCWKEY	External CW key
3	COM1RXD	COM1 receive data
4	STROBE	Not used
5	COM1CTS	COM1 clear-to-send (handshake)
6	DATA0	Not used
7	COM1TXD	COM1 transmit data
8	DATA1	Not used
9	COM1RTS	COM1 request-to-send (handshake)
10	DATA2	Not used
11	DATA3	Not used
12	DATA4	Not used
13	DATA5	Not used
14	DATA6	Not used
15	AUXPTT\	Auxiliary PTT
16	BUSY	Not used
17	DI/OSEL	Not used
18	ACK	Not used
19	SELECT	Not used
20	DATA7	Not used
21	BALTXA1	Transmit balanced audio 1
22	BALTXA2	Transmit balanced audio 2
23	BALRXA1	Receive balanced audio 1
24	BALRXA2	Receive balanced audio 2
25	+12VACC	+12V supply for accessories
26	+12VACC	+12V supply for accessories

## 4.2.2 J17 Connector

J17 connects to the rear panel **ACCESSORY 2** connector.

**Table 4-2 J17 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	COM2TXD	COM2 transmit data
4	COM2RXD	COM2 receive data
5	RETX\	Retransmit enable
6	TC/SCALM	Not used
7	ASTROBE	ATU strobe (antenna tuner)
8	ACLOCK	ATU clock (antenna tuner)
9	ATUKEY\	ATU key (antenna tuner)
10	ADATA	ATU data (antenna tuner)
11	ATUINIT	ATU initialize (antenna tuner)
12	ACHKTUNE	ATU check tune (antenna tuner)
13	PWRON\	Power enable from front panel switch
14	EXTCWKEY	External CW key input
15	AUXPTT	Auxiliary PTT
16	SQA	Squelched audio output
17	EXTSPKR	External speaker output audio
18	GND	Ground
19	+12VACC	+12 Vdc for accessory
20	TUNER 28V	+28 Vdc output
21	BALTXA3	Balanced transmit audio 3
22	TALTXA4	Balanced transmit audio 4
23	BALRXA3	Balanced receive audio 3
24	BALRXA4	Balanced receive audio 4
25	+12VACC	+12V supply for accessories
26	+12VACC	+12V supply for accessories

### 4.2.3 J18 Connector

J18 connects to the rear panel **REMOTE** connector.

**Table 4-3 J18 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	REMTXA	Remote transmit audio
4	PWRON\	Power on signal from front panel switch
5	REMSP	Not used
6	REMRXA	Remote receive audio
7	DHSL1	Remote DHSL line 1
8	DHSL2	Remote DHSL line 2
9	+12V UNREG	Unregulated +12 Vdc supply voltage
10	+12VACC	Regulated +12 Vdc supply voltage

### 4.2.4 J25 Connector

J25 connects with the rear panel **ACCESSORY 3** connector. The **ACCESSORY 3** connects to either an external amplifier (RA500D or RA1000D) or an automatic antenna tuner (RAT7000B).

**Table 4-4 J25 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	EXTCLK	External clock
4	AMPALC	ALC (external amp)
5	AMPPTT\	PTT line (external amp)
6	FILTG\	External amp (spare)
7	ATURX	ATU receive data (antenna tuner)
8	EXTRXD	External SPI receive data
9	EXTEN1	External SPI enable 1
10	EXTTXD	External SPI transmit data
11	EXTIN1	External BITE
12	ATUTX	ATU transmit data (antenna tuner)
13	FLTG	External amp (low-pass filter G select line)

**Table 4-4 J25 Connector Pin Assignments**

Pin	Signal	Description
14	EXTEN2	External SPI enable 2
15	FLTE	External amp (low-pass band filter E select line)
16	FLTF	External amp (low-pass band filter F select line)
17	FLTC	External amp (low-pass band filter C select line)
18	FLTD	External amp (low-pass band filter D select line)
19	FLTA	External amp (low-pass band filter A select line)
20	FLTB	External amp (low-pass band filter B select line)
21	GND	Ground
22	NC	No connection
23	+5V	+5V accessory supply voltage
24	+5V	+5V accessory supply voltage
25	+12VACC	+12V accessory supply voltage
26	+12VACC	+12V accessory supply voltage

**Note:** The connection between the J25 and **ACCESSORY 3** connectors is not pin for pin.

#### 4.2.5 J29 Connector

J29 connects to the Motherboard to route all accessory and remote control signals to the rear panel connectors as well as distributing supply voltages to the other boards.

**Table 4-5 J29 Connector Pin Assignments**

Pins	Signal	Description
A1	+12V	Regulated +12 Vdc supply voltage
A2	+12V	Regulated +12 Vdc supply voltage
A3	+12V	Regulated +12 Vdc supply voltage
A4	+12V UNREG	Unregulated +12 Vdc supply voltage
A5	+12V UNREG	Unregulated +12 Vdc supply voltage
A6	BALRXA3	Balanced receive audio 3

**Table 4-5 J29 Connector Pin Assignments (continued)**

<b>Pins</b>	<b>Signal</b>	<b>Description</b>
A7	BALXA3	Balanced transmit audio 3
A8	NC	No connection
A9	+5V	Regulated +5 Vdc supply voltage
A10	+5V	Regulated +5 Vdc supply voltage
A11	GND	Ground
A12	NC	No connection
A13	NC	No connection
A14	GND	Ground
A15	EXTSPKR	External speaker output audio
A16	SQA	Remote receive audio
A17	SER IN	Serial data in (harmonic filter selection data)
A18	SPICLK	SPI bus clock
A19	BALRXA1	Balanced receive audio 1
A20	BALXA1	Balanced transmit audio 1
A21	DHSL1	Remote DHSL line 1
A22	DHSL2	Remote DHSL line 2
A23	REMRXA	Remote receive audio
A24	EXTEN2	External SPI enable 2
A25	ATUTX	ATU transmit data (antenna tuner)
A26	EXTTXD	External SPI transmit data
A27	EXTRXD	External SPI receive data
A28	FLTG\	External amp (spare)
A29	EXTCWKEY	External CW key input
A30	ATUINIT	ATU initialize (antenna tuner)
A31	ATUKEY	ATU key (antenna tuner)
A32	ASTROBE	ATU strobe (antenna tuner)
A33	RETX\	Retransmit enable
A34	COM2TXD	COM2 transmit data
A35	SELECT	Not used
A36	DI/OSEL	Not used
A37	AUXPTT\	Auxiliary PTT
A38	DATA5	Not used

Table 4-5 J29 Connector Pin Assignments (continued)

Pins	Signal	Description
A39	DATA3	Not used
A40	COM1RTS	COM1 request-to-send (handshake)
A41	COM1TXD	COM1 transmit data
A42	COM1CTS	COM1 clear-to-send (handshake)
A43	COM1RXD	COM1 receive data
A44	GND	Ground
A45	RVSPWR	Reverse power sample to Ref/Ctrl board
B-Pins	Signal	Description
B1	+12V	Regulated +12 Vdc supply voltage
B2	+12V	Regulated +12 Vdc supply voltage
B3	+12V	Regulated +12 Vdc supply voltage
B4	+12V UNREG	Unregulated +12 Vdc supply voltage
B5	+12V UNREG	Unregulated +12 Vdc supply voltage
B6	BALRXA4	Balanced receive audio 4
B7	BALTXA4	Balanced transmit audio 4
B8	NC	No connection
B9	+5V	Regulated +5 Vdc supply voltage
B10	+5V	Regulated +5 Vdc supply voltage
B11	GND	Ground
B12	NC	No connection
B13	NC	No connection
B14	GND	Ground
B15	NC	No connection
B16	PWRON\	Power enable from front panel switch
B17	SPIRXD	SPI receive data
B18	SPITXD	SPI transmit data
B19	AMPALC	ALC (external RF power amplifier)
B20	BALRXA2	Balanced receive audio 2
B21	BALTXA2	Balanced transmit audio 2
B22	REMSP	Not used
B23	REMTXA	Remote transmit audio
B24	EXTIN1	External BITE

**Table 4-5 J29 Connector Pin Assignments (continued)**

<b>Pins</b>	<b>Signal</b>	<b>Description</b>
B25	EXTEN1	External SPI enable 1
B26	ATURX	ATU receive data (antenna tuner)
B27	AMPPTT\	PTT line (external amp)
B28	EXTCLK	External clock
B29	ENB	Enable strobe for serial data decoder (harmonic filter selection)
B30	ACHKTUNE	ATU check tune (antenna tuner)
B31	ADATA	ATU data (antenna tuner)
B32	ACLOCK	ATU clock (antenna tuner)
B33	TC/SCALM	Not used
B34	COM2RXD	COM2 receive data
B35	DATA7	Not used
B36	ACK	Not used
B37	BUSY	Not used
B38	DATA6	Not used
B39	DATA3	Not used
B40	DATA2	Not used
B41	DATA1	Not used
B42	DATA0	Not used
B43	STROBE	Not used
B44	GND	Ground
B45	FWDPWR	Forward power sample to Ref/Ctrl board

### 4.2.6 Direct Connections

The Interface/Power Supply board includes the following direct hardware connections.

**Table 4-6 Direct Connections to Interface/Power Supply Board**

Conn.	Signal	Description
E1	GND	Ground.
E2	GND	Ground.
E3	12V OUT	Unregulated and unswitched +12 Vdc output supply voltage to Power Amplifier board.
E4	+12V IN	+12 Vdc input supply voltage from DC power source.
E5	+12V OUT	Unregulated and unswitched +12 Vdc supply voltage to radio.

### 4.2.7 RF Connections

The Interface/Power Supply board includes two RF power connections for the VSWR circuitry.

**Table 4-7 RF Power Connections**

Conn.	Signal	Description
J49	ANT	RF output power to rear panel antenna connector.
J50	RF IN/OUT	RF input from the RF Filter board.

## 4.3 Component Locations, Schematic and Parts List

This section includes the components location diagram, schematic and parts list for the Interface/Power Supply board.

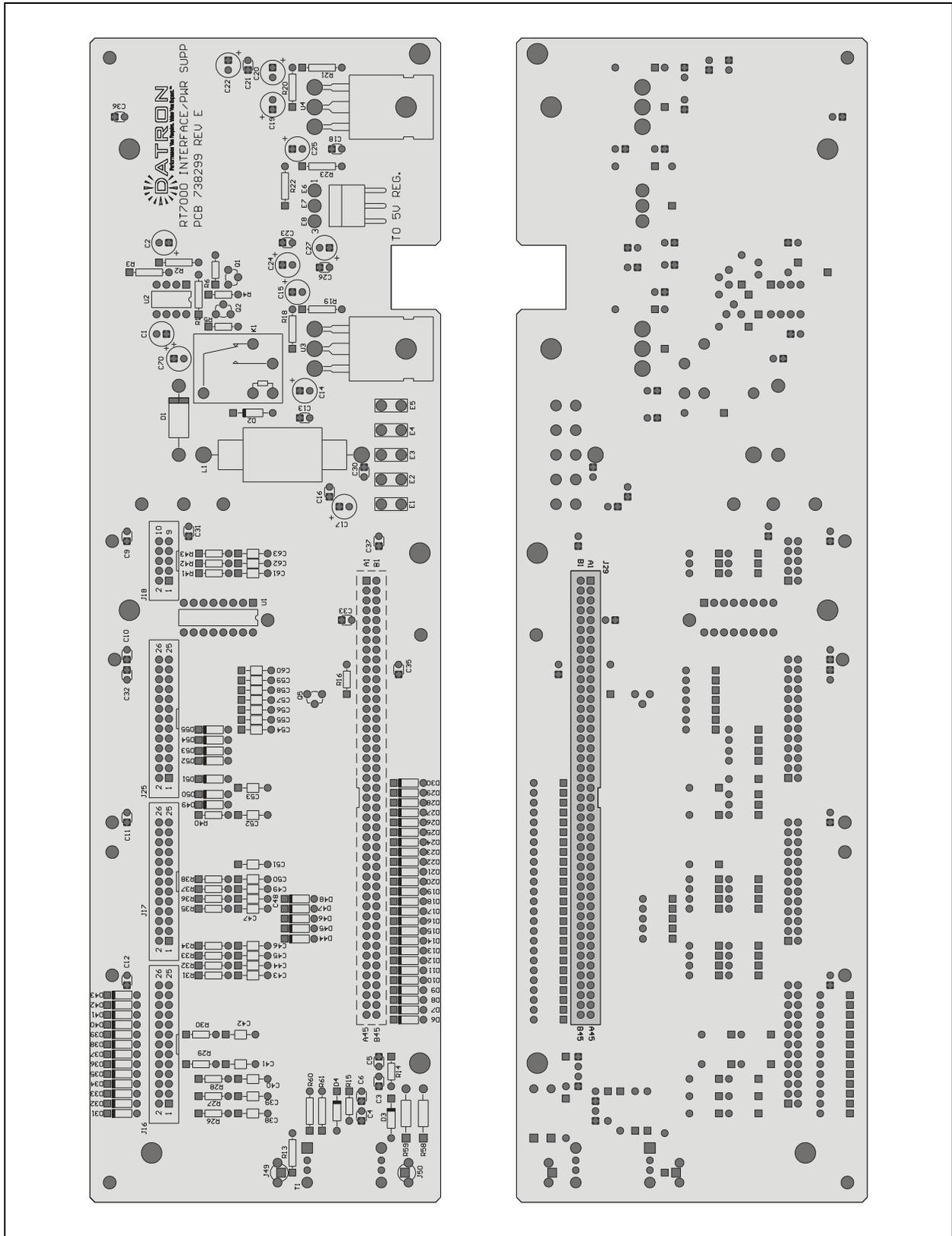


Figure 4-2 Interface/Power Supply Board Component Locations (738299 Rev. E)

D	7000-225	D3 D4 WERE 2800
E	RT7000-051	DEL R FROM A15 LINE
F	RT7000-052	REMOVE -9V CKT
G	RT7000-056	CH C1 C2 TO 47
H	05-0457	C3-C6 WAS .01
J	06-0234	C17 C22 C27 WAS 10
K	07-0417	C24 WAS 47UF
L	10-0426	UPDATED SCHEMATIC TO ALTIUM

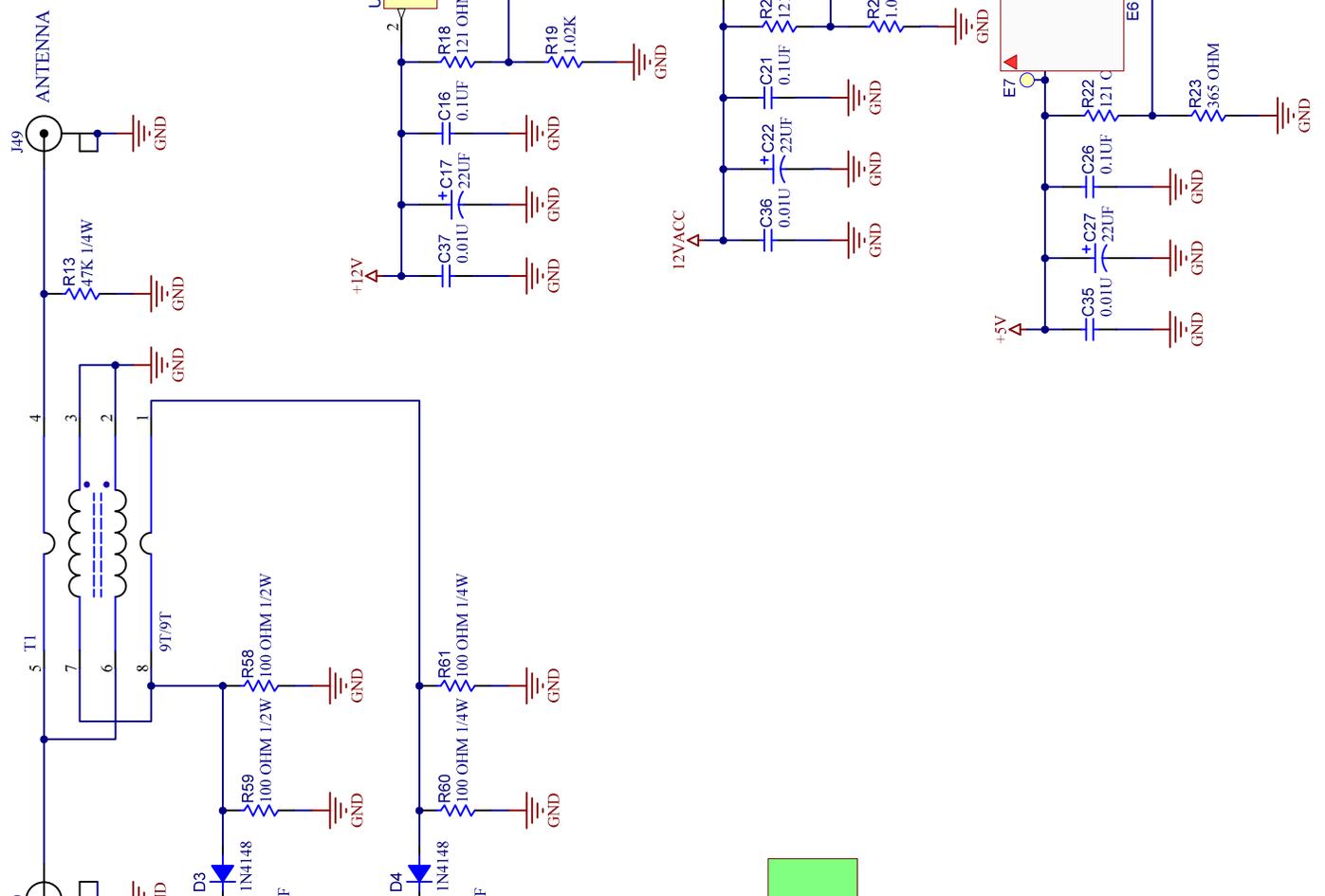




Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)

Designator	Part Number	Description
C1	234470	"CAP, 47UF AL 35V 20% 6.3X11X2.5"
C10	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C11	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C12	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C13	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C14	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C15	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C16	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C17	241226	"CAP,T,22UF,25V,20%,RA,.1SP"
C18	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C19	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C2	234470	"CAP, 47UF AL 35V 20% 6.3X11X2.5"
C20	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C21	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C22	241226	"CAP,T,22UF,25V,20%,RA,.1SP"
C23	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C24	230101	"CAP, 100UF AL 20% 25V 6X11"
C25	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C26	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C27	241226	"CAP,T,22UF,25V,20%,RA,.1SP"
C3	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C30	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C31	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C32	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C33	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C35	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C36	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C37	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C38	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C39	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C4	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"

**Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)**

Designator	Part Number	Description
C40	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C41	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C42	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C43	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C44	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C45	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C46	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C47	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C48	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C49	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C5	DNP	"NULL PART, VACANT PCB LOCATION"
C50	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C51	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C52	DNP	"NULL PART, VACANT PCB LOCATION"
C53	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C54	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C55	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C56	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C57	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C58	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C59	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C6	DNP	"NULL PART, VACANT PCB LOCATION"
C60	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C61	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C62	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C63	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C70	232100	"CAP, 10UF AL 35V 20% 6.3X7X2.5"
C9	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
D1	320420	"DIODE, 1N5822 SCHKY 3A DO-201AD"
D10	320002	"DIODE, 1N4148/1N4150 DO-35"
D11	320002	"DIODE, 1N4148/1N4150 DO-35"
D12	320002	"DIODE, 1N4148/1N4150 DO-35"

Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)

Designator	Part Number	Description
D13	320002	"DIODE, 1N4148/1N4150 DO-35"
D14	320002	"DIODE, 1N4148/1N4150 DO-35"
D15	320002	"DIODE, 1N4148/1N4150 DO-35"
D16	320002	"DIODE, 1N4148/1N4150 DO-35"
D17	320002	"DIODE, 1N4148/1N4150 DO-35"
D18	320002	"DIODE, 1N4148/1N4150 DO-35"
D19	320002	"DIODE, 1N4148/1N4150 DO-35"
D2	320102	"DIODE, 1N4001 1A 50V DO-41"
D20	320002	"DIODE, 1N4148/1N4150 DO-35"
D21	320002	"DIODE, 1N4148/1N4150 DO-35"
D22	320002	"DIODE, 1N4148/1N4150 DO-35"
D23	320002	"DIODE, 1N4148/1N4150 DO-35"
D24	320002	"DIODE, 1N4148/1N4150 DO-35"
D25	320002	"DIODE, 1N4148/1N4150 DO-35"
D26	320002	"DIODE, 1N4148/1N4150 DO-35"
D27	320002	"DIODE, 1N4148/1N4150 DO-35"
D28	320002	"DIODE, 1N4148/1N4150 DO-35"
D29	320002	"DIODE, 1N4148/1N4150 DO-35"
D3	320002	"DIODE, 1N4148/1N4150 DO-35"
D30	320002	"DIODE, 1N4148/1N4150 DO-35"
D31	320002	"DIODE, 1N4148/1N4150 DO-35"
D32	320002	"DIODE, 1N4148/1N4150 DO-35"
D33	320002	"DIODE, 1N4148/1N4150 DO-35"
D34	320002	"DIODE, 1N4148/1N4150 DO-35"
D35	320002	"DIODE, 1N4148/1N4150 DO-35"
D36	320002	"DIODE, 1N4148/1N4150 DO-35"
D37	320002	"DIODE, 1N4148/1N4150 DO-35"
D38	320002	"DIODE, 1N4148/1N4150 DO-35"
D39	320002	"DIODE, 1N4148/1N4150 DO-35"
D4	320002	"DIODE, 1N4148/1N4150 DO-35"
D40	320002	"DIODE, 1N4148/1N4150 DO-35"
D41	320002	"DIODE, 1N4148/1N4150 DO-35"

**Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)**

Designator	Part Number	Description
D42	320002	"DIODE, 1N4148/1N4150 DO-35"
D43	320002	"DIODE, 1N4148/1N4150 DO-35"
D44	320002	"DIODE, 1N4148/1N4150 DO-35"
D45	320002	"DIODE, 1N4148/1N4150 DO-35"
D46	320002	"DIODE, 1N4148/1N4150 DO-35"
D47	320002	"DIODE, 1N4148/1N4150 DO-35"
D48	320002	"DIODE, 1N4148/1N4150 DO-35"
D49	320002	"DIODE, 1N4148/1N4150 DO-35"
D50	320002	"DIODE, 1N4148/1N4150 DO-35"
D51	320002	"DIODE, 1N4148/1N4150 DO-35"
D52	320002	"DIODE, 1N4148/1N4150 DO-35"
D53	320002	"DIODE, 1N4148/1N4150 DO-35"
D54	320002	"DIODE, 1N4148/1N4150 DO-35"
D55	320002	"DIODE, 1N4148/1N4150 DO-35"
D6	320002	"DIODE, 1N4148/1N4150 DO-35"
D7	320002	"DIODE, 1N4148/1N4150 DO-35"
D8	320002	"DIODE, 1N4148/1N4150 DO-35"
D9	320002	"DIODE, 1N4148/1N4150 DO-35"
E1	860047	"CONN, TAB 1/4" FLAG QUICK DISCONNECT PCB"
E2	860047	"CONN, TAB 1/4" FLAG QUICK DISCONNECT PCB"
E3	860047	"CONN, TAB 1/4" FLAG QUICK DISCONNECT PCB"
E4	860047	"CONN, TAB 1/4" FLAG QUICK DISCONNECT PCB"
E5	860047	"CONN, TAB 1/4" FLAG QUICK DISCONNECT PCB"
E6	610177	"HEADER,MLX,3PIN,.156,RT ANG,"
E7	610177	"HEADER,MLX,3PIN,.156,RT ANG,"
E8	610177	"HEADER,MLX,3PIN,.156,RT ANG,"
J16	614021	"HEADER, 2X13 MLX 0.1 VERT"
J17	614021	"HEADER, 2X13 MLX 0.1 VERT"
J18	613054	"HEADER, 2X5 MXL 0.1 SRT"
J25	614021	"HEADER, 2X13 MLX 0.1 VERT"
J29	620046	SOCKET 90 PIN DUAL ROW
J49	614025	"CONN,RF PIN FEMALE JACK VERT"

Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)

Designator	Part Number	Description
J50	614025	"CONN,RF PIN FEMALE JACK VERT"
K1	540079	"RELAY,SPDT 12VDC 10 AMP"
L1	430048	"CHOKE,68UH HEAVY DUTY HASH"
Q1	310052	"XSTR, PN2907A PNP TO92"
Q2	310057	"XISTOR,NPN,PN2222A,TO92"
Q5	310138	"XISTOR,N-CHANNEL MOSFET,VN2222L,TO92"
R1	1118701	"RES, 18.7K, 1/8W, 1%"
R13	124473	"RES,47K 1/4W 5% CARBON FILM"
R14	113102	"RES, 1K OHM 1/8W CF 5%"
R15	113102	"RES, 1K OHM 1/8W CF 5%"
R16	113103	"RES, 10K OHM 1/8W CF 5%"
R18	1111210	"RES,121 1/8W 1% METAL FILM"
R19	1111021	"RES, 1.02K OHM 1/8W 1% MF"
R2	1111471	"RES, 1.47K, 1/8W, 1%, MF"
R20	1111210	"RES,121 1/8W 1% METAL FILM"
R21	1111021	"RES, 1.02K OHM 1/8W 1% MF"
R22	1111210	"RES,121 1/8W 1% METAL FILM"
R23	1113650	"RES,365 OHM 1/8W 1% MF AXIAL"
R26	113101	"RES,100 OHM 1/8W CF 5%"
R27	113101	"RES,100 OHM 1/8W CF 5%"
R28	113101	"RES,100 OHM 1/8W CF 5%"
R29	113101	"RES,100 OHM 1/8W CF 5%"
R3	1111651	"RES, 1.65K, 1/8W, 1%, MF"
R30	113101	"RES,100 OHM 1/8W CF 5%"
R31	113101	"RES,100 OHM 1/8W CF 5%"
R32	113101	"RES,100 OHM 1/8W CF 5%"
R33	113101	"RES,100 OHM 1/8W CF 5%"
R34	113101	"RES,100 OHM 1/8W CF 5%"
R35	113101	"RES,100 OHM 1/8W CF 5%"
R36	113101	"RES,100 OHM 1/8W CF 5%"
R37	113101	"RES,100 OHM 1/8W CF 5%"
R38	113101	"RES,100 OHM 1/8W CF 5%"

**Table 4-8 Interface/Power Supply Parts List (004-12401 Rev. AB)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R4	113103	"RES, 10K OHM 1/8W CF 5%"
R40	113101	"RES,100 OHM 1/8W CF 5%"
R41	113101	"RES,100 OHM 1/8W CF 5%"
R42	113101	"RES,100 OHM 1/8W CF 5%"
R43	113101	"RES,100 OHM 1/8W CF 5%"
R5	113103	"RES, 10K OHM 1/8W CF 5%"
R58	134101	"RES,100 OHM 1/2W 5% FILM"
R59	134101	"RES,100 OHM 1/2W 5% FILM"
R6	113102	"RES, 1K OHM 1/8W CF 5%"
R60	124101	"RES,100 OHM 1/4W 5% CF"
R61	124101	"RES,100 OHM 1/4W 5% CF"
T1	459316	"XFMR ASSY, 9T/9T#30 1-490061"
U1	330384	"IC,5821 8-BIT SER DRIVER DIP16"
U2	330398	"IC, MC33161P VOLT MONITOR DIP-8"
U3	330393	"IC,LT1084CP ADJ VREG 5A TO-3P"
U4	330393	"IC,LT1084CP ADJ VREG 5A TO-3P"
XU3	812421	SCREW PAN PHIL 4-40X7/16 SS
XU3	821403	"NUT, 1/4 HEX 4-40 SS"
XU3	831401	WASHER SPLIT LOCK #4 SS
XU4	831401	WASHER SPLIT LOCK #4 SS
XU4	821403	"NUT, 1/4 HEX 4-40 SS"
XU4	812421	SCREW PAN PHIL 4-40X7/16 SS



## Chapter 5: Reference/Control Board

### 5.1 Circuit Description

The Reference/Control board plugs into the Motherboard at J3. It is located on the right side of the chassis, second slot from the front. The Reference/Control board includes the following circuitry:

- 16.777216 MHz reference oscillator
- ALC processing circuitry
- RF power level setting potentiometers
- Serial to parallel decoders for harmonic filter band-switching circuits on the RF Filter board.

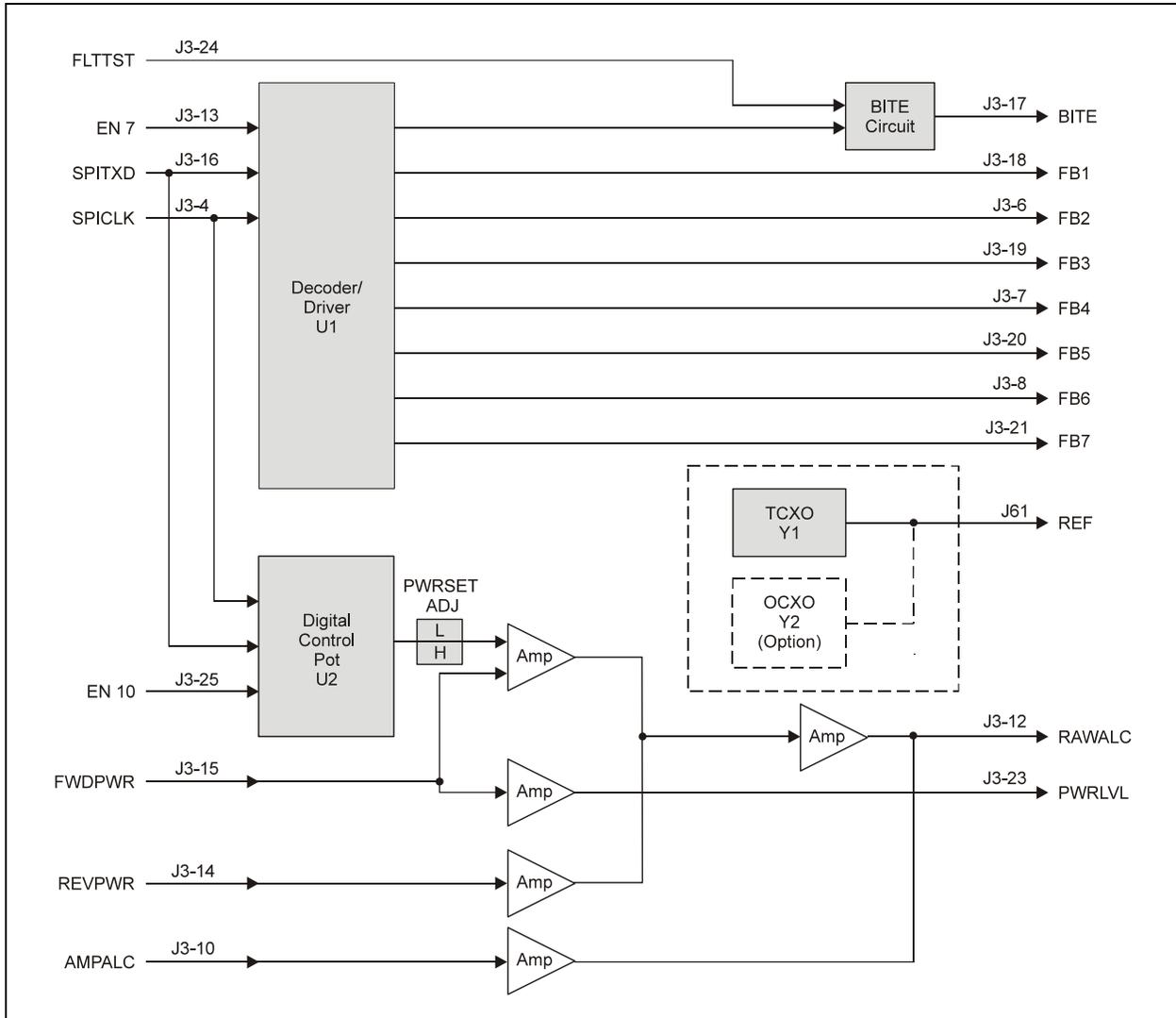
#### 5.1.1 Reference Oscillator

The Reference/Control board includes the 16.777216 MHz oscillator Y1 that provides the reference frequency to the Synthesizer board through coaxial connector J61.

#### 5.1.2 Automatic Level Control

The ALC processing circuitry receives the forward (FWD PWR) and reverse (RVSPWR) power signals from the power level detectors on the Interface/Power Supply board. The power level detector only detect power levels on the transmitted power. The ALC circuitry uses digital potentiometer U2 controlled through serial data from the Processor board to adjust the bias to forward power amplifier U3C. The forward power amplifier bias can also be manually adjusted by R22 which controls the low RF power setting; R1 controls the high RF power setting. The ALC circuit combines the forward and reverse power signals, then amplifies the output ALC signal (RAWALC) to the ALC circuitry on the 75 MHz IF board.

The Reference/Control board also includes decoder chip U1 that converts serial data from the Processor board to parallel data that selects the filter band on the RF Filter board. The decoder controls the filter selection process by energizing and de-energizing relays on the RF Filter board that insert or remove specific filter circuits according to the serial data based on the selected channel frequency.



**Figure 5-1 Reference/Control Board Block Diagram**

### 5.1.3 High Stability Option

The Reference/Control board may include an optional high stability oscillator. If the high stability option is installed, the board is given a new part number.

## 5.2 Connector Pin Assignments

Table 5-1 provides the connections between the Reference/Control board and the rest of the radio.

**Table 5-1 J3 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	12V	+12 Vdc supply
3	NC	No connection
4	SPICLK	Clock
5	PTT\	PTT (active low)
6	FB2	Filter band 2 control line
7	FB4	Filter band 4 control line
8	FB6	Filter band 6 control line
9	TRSW\	T/R relay control line (active low)
10	AMPALC	Input from external amplifier ALC
11	No connection	No connection
12	RAWALC	Transceiver ALC line
13	EN7	External amplifier filter band decoder enable line
14	RVSPWR	Reflected power indicator
15	FWDPWR	Forward power indicator
16	SPITXD	Serial TX data line
17	BITE\	BITE line (active low)
18	FB1	Filter band 1 control line
19	FB3	Filter band 3 control line
20	FB5	Filter band 5 control line
21	FB7	Filter band 7 control line
22	NC	No connection
23	PWRLVL	RF power level status line
24	FLTTST	RF Filter board status line
25	EN10	RF power level control enable

### 5.3 Component Locations, Schematics and Parts List

This section provides a component locations diagram, schematic and parts list for the Synthesizer board.

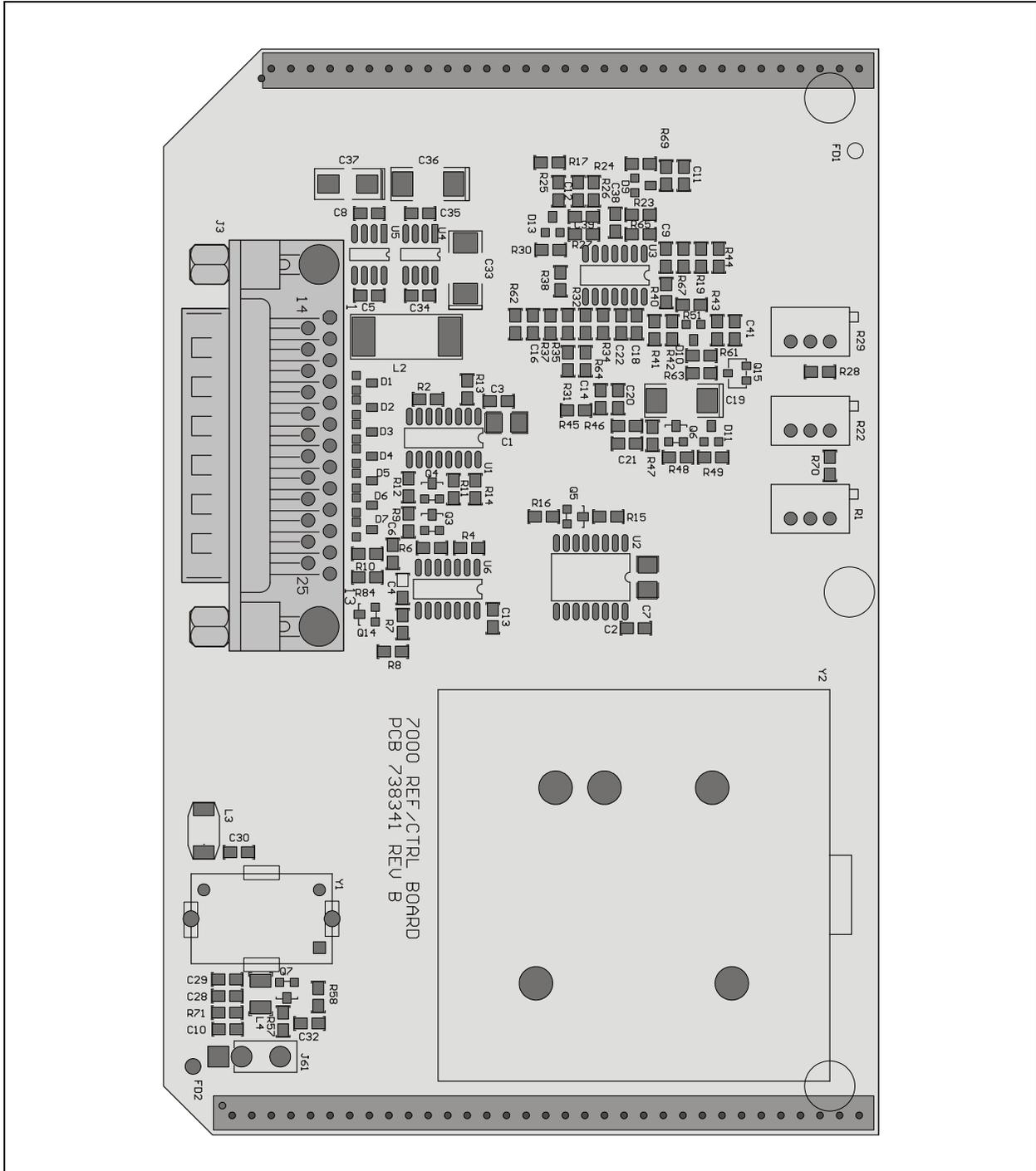
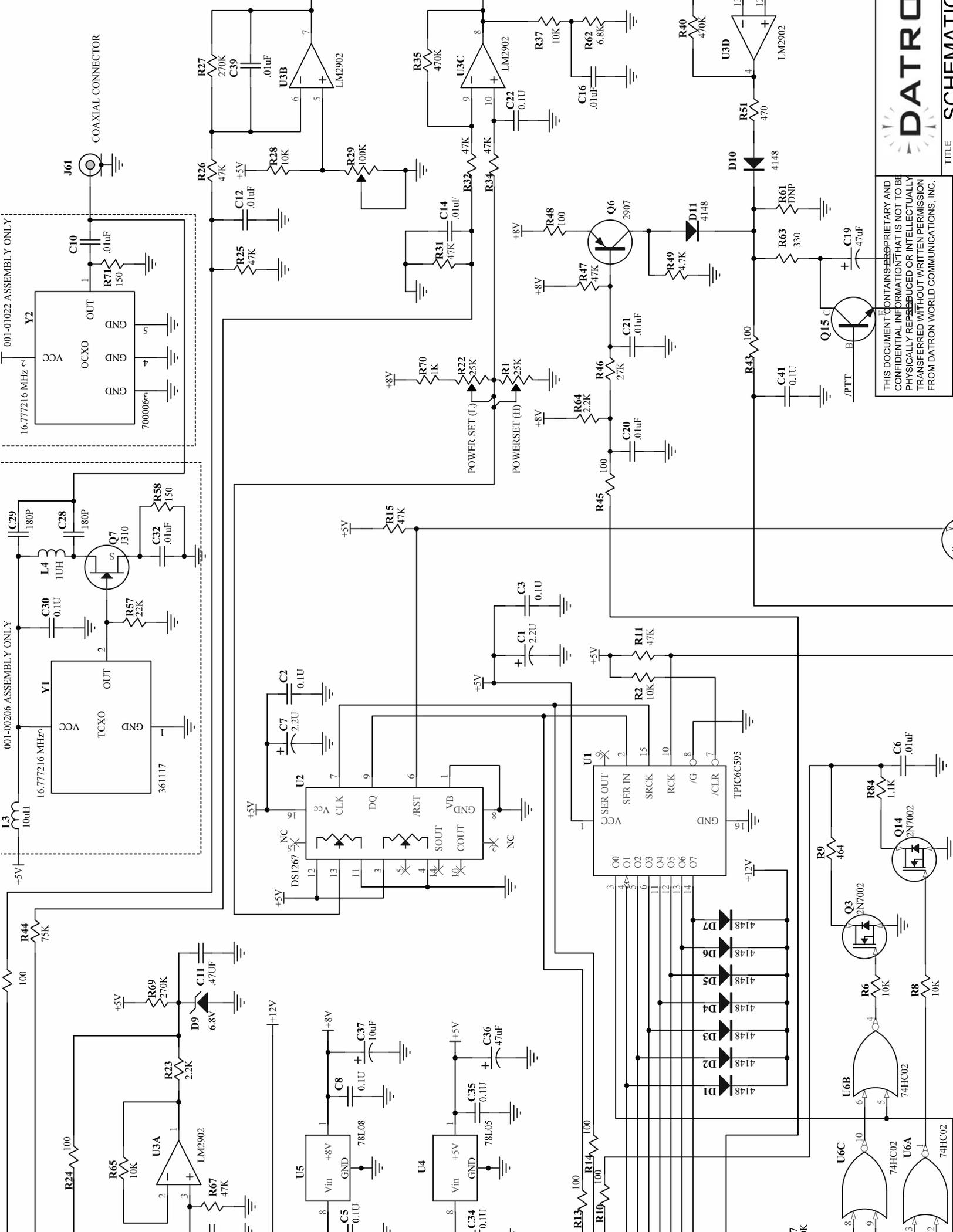


Figure 5-2 Reference/Control Board Component Locations (738341 Rev. B)



001-01022 ASSEMBLY ONLY

001-00206 ASSEMBLY ONLY

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Table 5-2 Reference/Control Board Parts List (001-00206 Rev. H)

Designator	Part Number	Description
C1	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C10	DNP	"NULL PART, VACANT PCB LOCATION"
C11	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C12	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C14	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C16	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C19	022476000	"CAP, 47UF TA 20V 20% 7343"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C21	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C22	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	021181000	CAP 180PF NPO 100V 5% 0805
C29	021181000	CAP 180PF NPO 100V 5% 0805
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C32	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C33	022476000	"CAP, 47UF TA 20V 20% 7343"
C34	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	022476000	"CAP, 47UF TA 20V 20% 7343"
C37	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C38	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C39	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C4	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C41	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C7	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 5-2 Reference/Control Board Parts List (001-00206 Rev. H)**

Designator	Part Number	Description
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D11	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D9	037703002	"DIODE,ZENER,6.8V,350MW,SOT-23"
J3	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J61	614024	"CONN,RF PIN FEMALE JACK #45"
L2	041103002	"IND, 10UH FR 15% IHSM-4825"
L3	041103003	"IND,SM,10uH,.7A,DTI608C-103"
L4	041102000	"INDUCTOR,CHIP,1UH,SMT,1210,10%"
Q14	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q15	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q7	032001	"JFET-N,J310, RF AMP, SOT-23"
R1	170335	"RES, 25K TRIM SIDE ADJ"
R10	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R11	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R12	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R13	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R14	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R15	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R16	013101000	"RES,100 OHM 1/8W 5% TK 0805"

**Table 5-2 Reference/Control Board Parts List (001-00206 Rev. H)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R17	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R19	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R2	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R22	170335	"RES, 25K TRIM SIDE ADJ"
R23	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R24	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R25	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R26	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R27	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R28	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R29	170334	"RES,100K TRIM SIDE ADJ"
R30	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R31	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R32	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R34	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	"RES, 12K OHM 1/8W 5% TK 0805"
R42	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R43	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R44	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R45	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R46	013273000	"RES,27K OHM 1/8W 5% TK 0805"
R47	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R48	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R49	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R51	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R57	013223000	"RES, 22K OHM 1/8W 5% TK 0805"
R58	013151000	"RES,150 OHM 1/8W 5% TK 0805"

**Table 5-2 Reference/Control Board Parts List (001-00206 Rev. H)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R6	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R61	DNP	"NULL PART, VACANT PCB LOCATION"
R62	013682000	"RES, 6.8K OHM 1/8W 5% TK 0805"
R63	013331000	"RES,330 OHM 1/8W 5% TK 0805"
R64	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R65	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R67	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R69	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R7	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R70	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R71	DNP	"NULL PART, VACANT PCB LOCATION"
R8	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R84	013110100	"RES, 1.1K OHM 1/8W 1% TK 0805"
R9	013464000	"RES, 464 OHM 1/8W 1% TK 0805"
U1	033087	"IC, TPIC6C595 8-B S/REG SO-16"
U2	033305003	"IC,DS1267S 10KX2 DIG POT SOW16"
U3	033304000	"IC, LM2902D QUAD-OP AMP SO-14"
U4	033003	"IC,VREG 78L05 5V 5% SOIC-8"
U5	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U6	033081	"IC, 74HC02 QUAD 2-I NOR SO-14"
Y1	361117	"TCXO 16.777216MHz, 0.5PPM"



## Chapter 6: Synthesizer Board

### 6.1 Circuit Description

The Synthesizer board is located in the second card slot from the right and plugs into the motherboard at J4. It takes the reference frequency (16.777216 MHz) from the Reference/Control board and generates three local oscillator (LO) frequencies using a process known as direct digital synthesis (DDS) as part of a standard phase locked loop (PLL) circuit.

The DDS consists of 24-bit numerically controlled oscillator (NCO) U7 and digital-to-analog converter (DAC) U8 that generates a frequency derived from the 16.7 MHz reference frequency and the selected channel frequency data from the Processor board.

Mixer and oscillator U2 mixes the DDS frequency with the 70 MHz second LO to generate an output frequency of 5.95 to 7.00 MHz. This frequency is filtered by a series of LC networks, then mixed with the first LO at MX1. The resulting frequency is fed back to the first local oscillator PLL to generate the first LO at 75 to 105 MHz incremented in 10 Hz steps.

The second LO is the fixed 70 MHz output of the voltage controlled oscillator. The 5 MHz third LO is generated by PLL U1, tied to the reference frequency and programmed to one of three outputs, depending on the setting of the mode switch.

Data for all of the synthesizers on the board are input in serial format, with all data clocked as required to update frequency selection, then latched into the particular synthesizer device by the appropriate enable line.

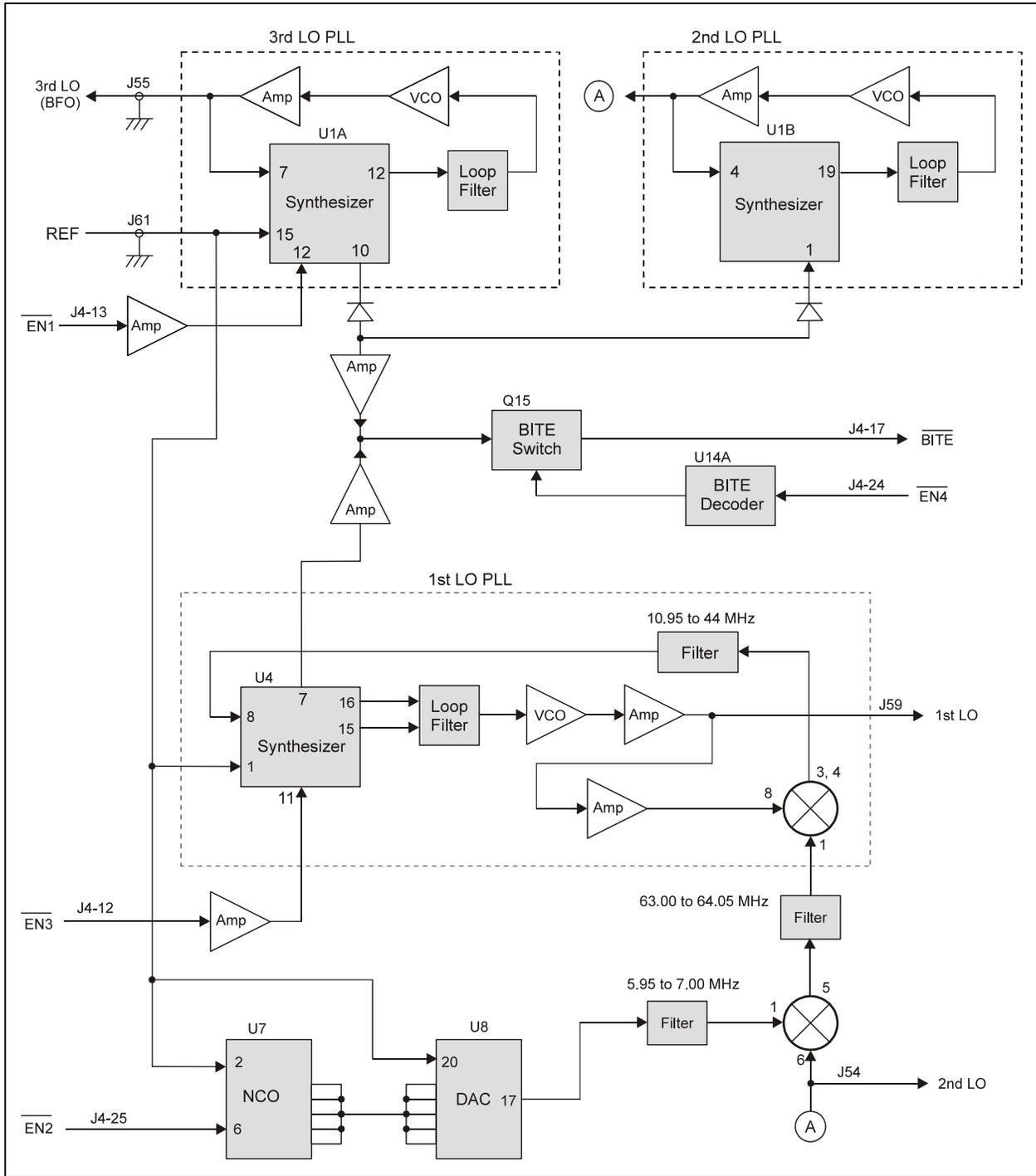


Figure 6-1 Synthesizer Board Block Diagram

## 6.2 Connector Pin Assignments

Table 6-1 provides the connections between the Synthesizer board and the rest of the radio.

J4 is a 25-pin connector that plugs into the Motherboard.

**Note:** The pins not listed have no connection on the Synthesizer board.

**Table 6-1 J4 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	12V	+12V supply
3	SPIRXD	Receive serial data line
4	SPICLK	Clock line
11	EN5	Not used
12	EN3	First LO synthesizer enable
13	EN1	Third LO synthesizer enable
14	GND	Ground
15	+12V input	+12V
16	SPITXD	Transmit serial data line
17	BITE	BITE signal to processor
24	EN4	BITE enable
25	EN2	DDS enable

## 6.3 Component Locations, Schematic and Parts List

This section provides a component locations diagram, schematic and parts list for the Synthesizer board.

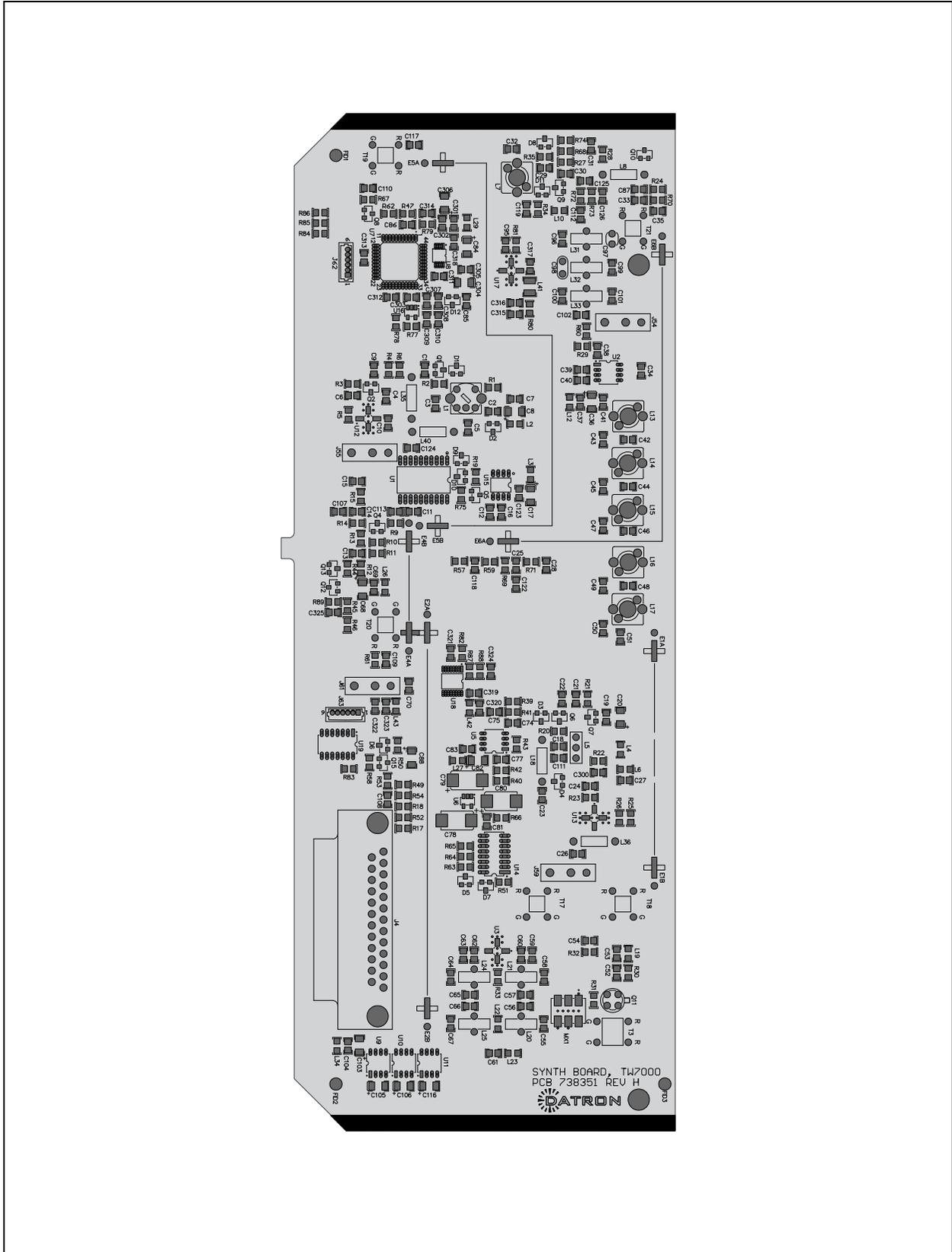
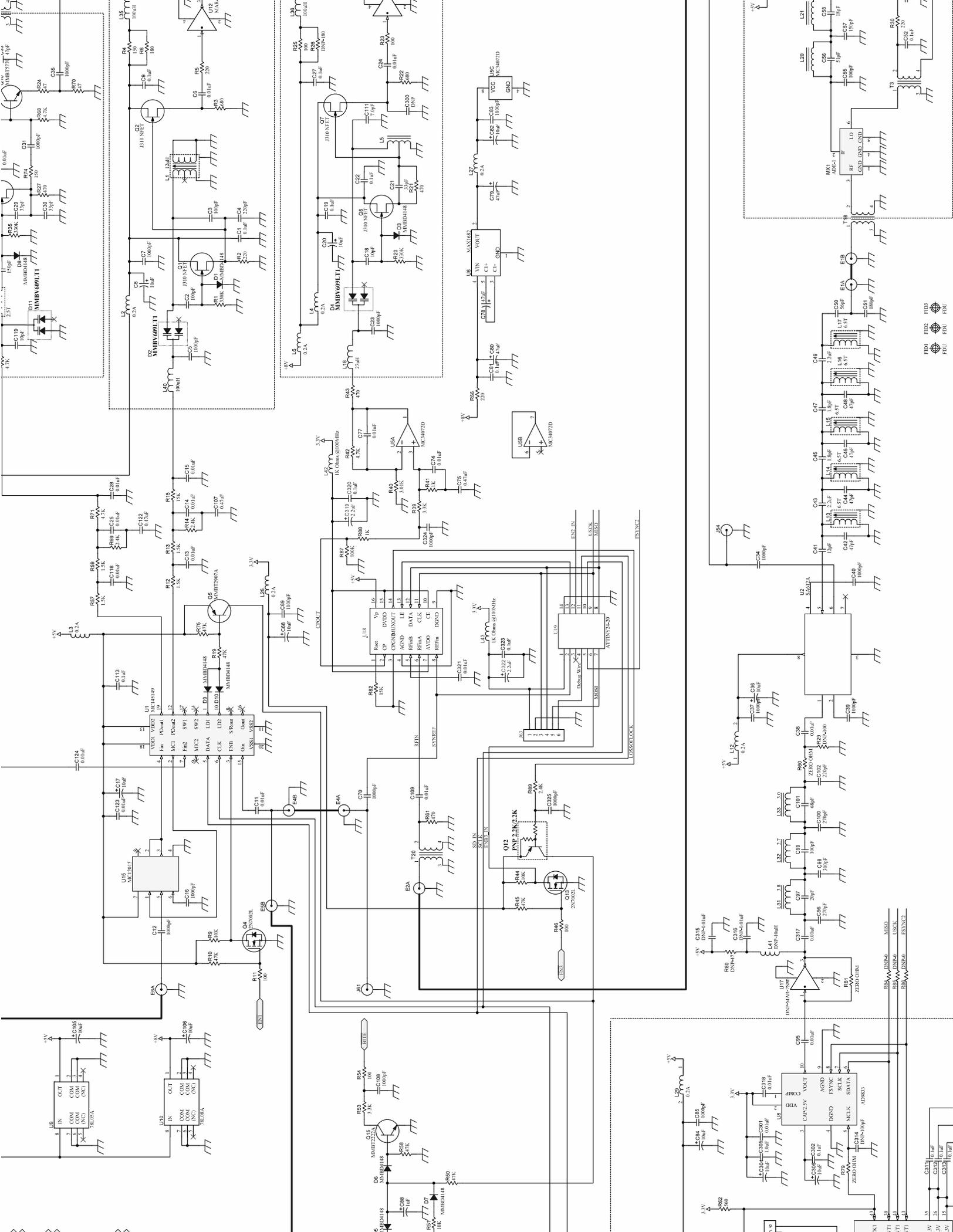


Figure 6-2 Synthesizer Board Component Locations (738351 Rev. H)



**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C10	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C100	021271000	"CAP, 270PF NP0 100V 5% 0805"
C101	021680000	"CAP, 68PF NP0 100V 5% 0805"
C102	021221000	"CAP, 220PF NP0 100V 5% 0805"
C103	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C104	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C105	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C106	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C107	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C108	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C109	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C110	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C111	021709000	"CAP, 7.0PF NP0 50V 0.50PF 0805"
C112	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C113	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C116	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C117	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C118	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C119	021100000	"CAP, 10PF, NP0, 100V, 5%, 0805"
C12	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C122	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C123	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C124	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C125	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C126	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C13	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C14	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C15	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C16	021102002	"CAP, 1000PF X7R 50V 10% 0805"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C17	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C18	021100000	"CAP, 10PF, NP0, 100V, 5%, 0805"
C19	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C2	021101000	"CAP, 100PF NP0 100V 5% 0805"
C20	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C21	021330001	"CAP, 33PF NP0 200V 2% 0805"
C22	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C23	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C24	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C25	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C26	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C27	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C29	021330001	"CAP, 33PF NP0 200V 2% 0805"
C3	021101000	"CAP, 100PF NP0 100V 5% 0805"
C30	021330001	"CAP, 33PF NP0 200V 2% 0805"
C300	DNP	"NULL PART, VACANT PCB LOCATION"
C301	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C302	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C303	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C304	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C305	021105006	"CAP,1.0UF 10V X7R 10% 0805"
C306	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C307	021105006	"CAP,1.0UF 10V X7R 10% 0805"
C308	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C309	021105006	"CAP,1.0UF 10V X7R 10% 0805"
C31	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C310	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C311	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C312	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C313	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C314	DNP	"NULL PART, VACANT PCB LOCATION"

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)

Designator	Part Number	Description
C315	DNP	"NULL PART, VACANT PCB LOCATION"
C316	DNP	"NULL PART, VACANT PCB LOCATION"
C317	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C318	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C319	022225004	"CAP, 2.2UF TA 10V 20% 0805"
C32	021151000	"CAP, 150PF NP0 100V 5% 0805"
C320	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C321	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C322	022225004	"CAP, 2.2UF TA 10V 20% 0805"
C323	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C324	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C325	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C33	021470000	"CAP, 47PF NP0 100V 5% 0805"
C34	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C35	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C36	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C37	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C38	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C39	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C4	021221000	"CAP, 220PF NP0 100V 5% 0805"
C40	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C41	021120000	"CAP, 12PF NP0 100V 5% 0805"
C42	021470000	"CAP, 47PF NP0 100V 5% 0805"
C43	021229000	"CAP, 2.2PF NP0 100V 0.25PF 0805"
C44	021470000	"CAP, 47PF NP0 100V 5% 0805"
C45	021189000	"CAP,SM,CER,1.8pf,+/-0.25pf,0805"
C46	021470000	"CAP, 47PF NP0 100V 5% 0805"
C47	021189000	"CAP,SM,CER,1.8pf,+/-0.25pf,0805"
C48	021470000	"CAP, 47PF NP0 100V 5% 0805"
C49	021229000	"CAP, 2.2PF NP0 100V 0.25PF 0805"
C5	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C50	021560000	"CAP, 56PF NP0 100V 5% 0805"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C51	021181000	CAP 180PF NP0 100V 5% 0805
C52	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C53	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C54	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C55	021101000	"CAP, 100PF NP0 100V 5% 0805"
C56	021510009	"CAP, 51PF NP0 100V 5% 0805"
C57	021151000	"CAP, 150PF NP0 100V 5% 0805"
C58	021180000	"CAP, 18PF NP0 100V 5% 0805"
C59	021121000	CAP 120PF NP0 100V 5% 0805
C6	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C60	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C61	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C62	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C63	021101000	"CAP, 100PF NP0 100V 5% 0805"
C64	021510009	"CAP, 51PF NP0 100V 5% 0805"
C65	021151000	"CAP, 150PF NP0 100V 5% 0805"
C66	021180000	"CAP, 18PF NP0 100V 5% 0805"
C67	021121000	CAP 120PF NP0 100V 5% 0805
C68	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C69	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C7	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C70	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C74	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C75	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C77	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C78	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C79	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C8	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C80	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C81	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C82	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C83	021102002	"CAP, 1000PF X7R 50V 10% 0805"

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)

Designator	Part Number	Description
C84	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C85	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C86	021105006	"CAP,1.0UF 10V X7R 10% 0805"
C87	021470000	"CAP, 47PF NP0 100V 5% 0805"
C88	022105002	"CAP, 1UF TA 35V 10% 3216"
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C95	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C96	021271000	"CAP, 270PF NP0 100V 5% 0805"
C97	210200	"CAP,20 PF DISC NP0"
C98	221301	"CAP, 300PF MICA 50V 5% DM5"
C99	021101000	"CAP, 100PF NP0 100V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D11	037704017	"DIODE,MMBV609LT1 DUAL V-CAP SOT-23"
D12	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037704017	"DIODE,MMBV609LT1 DUAL V-CAP SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037704017	"DIODE,MMBV609LT1 DUAL V-CAP SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D8	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D9	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
E1	769330-1	"SEMI-RIGID CA,SYNTH,E1,TW7000"
E2	769330-2	"SEMI-RIGID CA,SYNTH,E2,TW7000"
E4	769330-4	"SEMI-RIGID CA,SYNTH,E4,TW7000"
E5	769330-3	"SEMI-RIGID CA,SYNTH,E5,TW7000"
E6	769330-5	"SEMI-RIGID CA,SYNTH,E5,TW7000"
J4	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J54	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J55	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J59	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
J61	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J62	080004001	"CONN,1.25MM,HEADER,6PIN"
J63	080004001	"CONN,1.25MM,HEADER,6PIN"
L1	490146	"INDUCTOR,12 UH VARIABLE"
L10	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L12	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L13	490114	"IND, VAR 0.18-0.29UH BLUE 7MM"
L14	490114	"IND, VAR 0.18-0.29UH BLUE 7MM"
L15	490114	"IND, VAR 0.18-0.29UH BLUE 7MM"
L16	490114	"IND, VAR 0.18-0.29UH BLUE 7MM"
L17	490114	"IND, VAR 0.18-0.29UH BLUE 7MM"
L18	430013	"IND, 27UH, FE, 135MA, 10%, IM-2"
L19	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L2	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L20	459260	"IND ASSY,8T#24 MAG 1-490032"
L21	459261	"IND ASSY,9T#24 MAG 1-490032"
L22	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L23	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L24	459260	"IND ASSY,8T#24 MAG 1-490032"
L25	459261	"IND ASSY,9T#24 MAG 1-490032"
L26	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L27	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L29	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L3	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L31	459232	IND ASSY 21T #26MAG 1-490060
L32	459230	IND ASSY 17T#26 MAG 1-490060
L33	459231	IND ASSY 18T#26 MAG 1-490060
L34	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L35	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L36	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L4	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L40	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)

Designator	Part Number	Description
L41	DNP	"NULL PART, VACANT PCB LOCATION"
L42	045162000	"IND, BEAD 1K OHM 0.5A 0805"
L43	045162000	"IND, BEAD 1K OHM 0.5A 0805"
L5	459259	"IND,7T-TAP-4T#30 MAG 1-490068"
L6	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L7	490109	COIL 12.5T (MD) SQ LG PI CORE
L8	430047	"INDUCTOR,0.22 UH MOLDED"
MX1	066000001	"MIXER,SM,0.5 TO 500MHZ, ADE-1"
Q1	032001	"JFET-N,J310, RF AMP, SOT-23"
Q10	031100032	"XSTR, MMBT5770 NPN RF SOT-23"
Q11	310165	"XSTR, BFY90 NPN RF TO-72"
Q12	031105004	"XSTR, PNP 2.2K/2.2K 50V SC-59"
Q13	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q15	032004	"XSTR,MMBT2222A NPN SOT23"
Q2	032001	"JFET-N,J310, RF AMP, SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q6	032001	"JFET-N,J310, RF AMP, SOT-23"
Q7	032001	"JFET-N,J310, RF AMP, SOT-23"
Q8	031100032	"XSTR, MMBT5770 NPN RF SOT-23"
Q9	032001	"JFET-N,J310, RF AMP, SOT-23"
R1	013334000	RES SM CF 330K 0.1W 5% 0805
R10	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R11	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R12	013150100	"RES, 1.5K OHM 1/8W 1% TK 0805"
R13	013150100	"RES, 1.5K OHM 1/8W 1% TK 0805"
R14	013242000	"RES,2.4K OHM 1/8W 5% TK 0805"
R15	013150200	"RES, 15K OHM 1/8W 1% TK 0805"
R17	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R18	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R19	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R2	013221000	"RES, 220 OHM, 1/8W, 5%, TK, 0805"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R20	013334000	RES SM CF 330K 0.1W 5% 0805
R21	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R22	013681000	"RES,680 OHM 1/8W 5% TK 0805"
R23	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R24	013470000	"RES, 47 OHM 1/8W 5% TK 0805"
R25	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R26	DNP	"NULL PART, VACANT PCB LOCATION"
R27	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R28	013223000	"RES, 22K OHM 1/8W 5% TK 0805"
R29	DNP	"NULL PART, VACANT PCB LOCATION"
R3	013681000	"RES,680 OHM 1/8W 5% TK 0805"
R30	013221000	"RES, 220 OHM, 1/8W, 5%, TK, 0805"
R31	013122000	"RES,1.2K OHM 1/8W 5% TK 0805"
R32	013561000	"RES,560 OHM 1/8W 5% TK 0805"
R33	013750900	"RES, 75 OHM 1/8W 1% TK 0805"
R34	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R35	013334000	RES SM CF 330K 0.1W 5% 0805
R39	013332000	"RES,3.3K OHM 1/8W 5% TK 0805"
R4	013151000	"RES,150 OHM 1/8W 5% TK 0805"
R40	013301100	"RES, 3.01K OHM 1/8W 1% TK 0805"
R41	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R42	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R43	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R44	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R45	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R46	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R47	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R49	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R5	013221000	"RES, 220 OHM, 1/8W, 5%, TK, 0805"
R50	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R51	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R52	013101002	"RES, 100 OHM 1/8W 1% TK 0805"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R53	013332000	"RES,3.3K OHM 1/8W 5% TK 0805"
R54	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R57	013150100	"RES, 1.5K OHM 1/8W 1% TK 0805"
R58	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R59	013150100	"RES, 1.5K OHM 1/8W 1% TK 0805"
R6	013180001	"RES, 180 OHM 1/8W 1% TK 0805"
R60	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R61	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R62	013561000	"RES,560 OHM 1/8W 5% TK 0805"
R63	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R64	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R65	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R66	013221000	"RES, 220 OHM, 1/8W, 5%, TK, 0805"
R67	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R68	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R69	013242000	"RES,2.4K OHM 1/8W 5% TK 0805"
R70	013470000	"RES, 47 OHM 1/8W 5% TK 0805"
R71	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R72	013220000	"RES,22 OHM 1/8W 1% TK 0805"
R73	013100000	"RES,10 OHM 1/8W 5% TK 0805"
R74	013151000	"RES,150 OHM 1/8W 5% TK 0805"
R75	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R77	013174300	"RES, 174K OHM 1/8W 1% TK 0805"
R78	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R79	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R80	DNP	"NULL PART, VACANT PCB LOCATION"
R81	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R82	013150200	"RES, 15K OHM 1/8W 1% TK 0805"
R83	DNP	"NULL PART, VACANT PCB LOCATION"
R84	DNP	"NULL PART, VACANT PCB LOCATION"
R85	DNP	"NULL PART, VACANT PCB LOCATION"
R86	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R87	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R88	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R89	013242000	"RES,2.4K OHM 1/8W 5% TK 0805"
R9	013103000	"RES,10K OHM 1/8W 5% TK 0805"
T17	459258	"XFMR,1T-2T#30 MAG 1-490352"
T18	459237	XFMR 2T-2T#32 MAG 1-490352
T19	459265	"XFMR,2T2T 32 AWG MAG 1-490351"
T20	459238	XFMR 2T-8T #32 MAG 2-490201
T21	459237	XFMR 2T-2T#32 MAG 1-490352
T3	459239	XFMR 5T-2T#30 MAG 1-491301
U1	033304017	"IC, MC145149 DUAL PLL SYN SOIC-20"
U10	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U11	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U12	380013	"IC, MAR-2SM RF AMP 2GHZ MICRO-X"
U13	380013	"IC, MAR-2SM RF AMP 2GHZ MICRO-X"
U14	033007	"IC,74HC595 8-BIT SIPO SOIC-16"
U15	033304018	"IC,PRE, 2MOD, MC12015, SO-8"
U16	034400011	"IC, LT1761, LDO VREG, 0.1A, ADJ, SOT23-5"
U17	DNP	"NULL PART, VACANT PCB LOCATION"
U18	033303117	"IC,ADF4002 PLL SYN TSSOP-16"
U19	033301133	"IC, ATTINY24-20 RISC UCNTRL SOIC14"
U2	033308011	"IC, SA612A DBL BAL MIXER/OSC SOIC-8"
U3	033306043	"IC, MAR-6SM+ RF AMP SMT"
U5	033304019	"IC, MC33072D DUAL OP-AMP SO-8"
U6	033309019	"IC, MAX1682 SMPS V-DBLR SOT23-5"
U7	033301027	"IC, XC9572XL CPLD 7.5NS 3.3V VQFP-44"
U8	033303098	"IC, AD9833 10-BIT DDS MSOP10"
U9	033003	"IC,VREG 78L05 5V 5% SOIC-8"
XL13	490067	INDUCTOR CAN
XL14	490067	INDUCTOR CAN
XL15	490067	INDUCTOR CAN
XL16	490067	INDUCTOR CAN

**Table 6-2 Synthesizer Board Parts List (001-00901 Rev. AE)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
XL17	490067	INDUCTOR CAN
XL7	490067	INDUCTOR CAN





## Chapter 7: RF Filter Board

### 7.1 Circuit Description

The RF Filter board is mounted on the heat sink assembly and connects to the VSWR circuit (J50), the RF Power Amplifier board (J51), and the 75 MHz IF board (J52) through coaxial cables. It receives filter select signals from the Reference/Control board through connector J22. The RF Filter board includes the seven harmonic filters, the receive/transmit relay, and the receive overload protection circuit. Figure 7-1 on page 7-2 provides a block diagram of the RF Filter board.

#### 7.1.1 Harmonic Filter Bands

The RF Filter board filters the transmit and receive RF signal for harmonic and spurious tones over the 1.6 to 30 MHz operating frequency range. The RF Filter board divides the frequency range into the following seven frequency bands:

Band	Frequency Range
FB 1	1.6 MHz to 2.74 MHz
FB 2	2.75 MHz to 3.99 MHz
FB 3	4.0 MHz to 6.24 MHz
FB 4	6.25 MHz to 8.99 MHz
FB 5	9.0 MHz to 13.49 MHz
FB 6	13.5 MHz to 20.99 MHz
FB 7	21.0 MHz to 30 MHz (0 MHz to 1.6 MHz)

Decoder U1 on the Reference/Control board selects the filter band (FB) based on the selected channel frequency information received as serial data from the Processor board. The FB signals from the Reference/Control board energize relays on the RF Filter board to insert the appropriate filter in the RF transmit or receive path.

### 7.1.2 T/R Relay

The transmit/receive switch (T/RSW) signal (active low) from the Reference/Control board (which is actually the PTT signal from the Processor board) energizes the transmit/receive relay K15 by turning on Q1 that connects the relay to ground. This connects the filter circuit with the transmit connector J52.

### 7.1.3 Receive Overload Switch

The receive relay K16 is energized by the receive signal when transmit relay K15 is de-energized. The receive line to K16 includes op amp U1A that functions as part of an overload protection circuit. This circuit protects downstream circuitry (75 MHz IF board) against excessively strong receive signals.

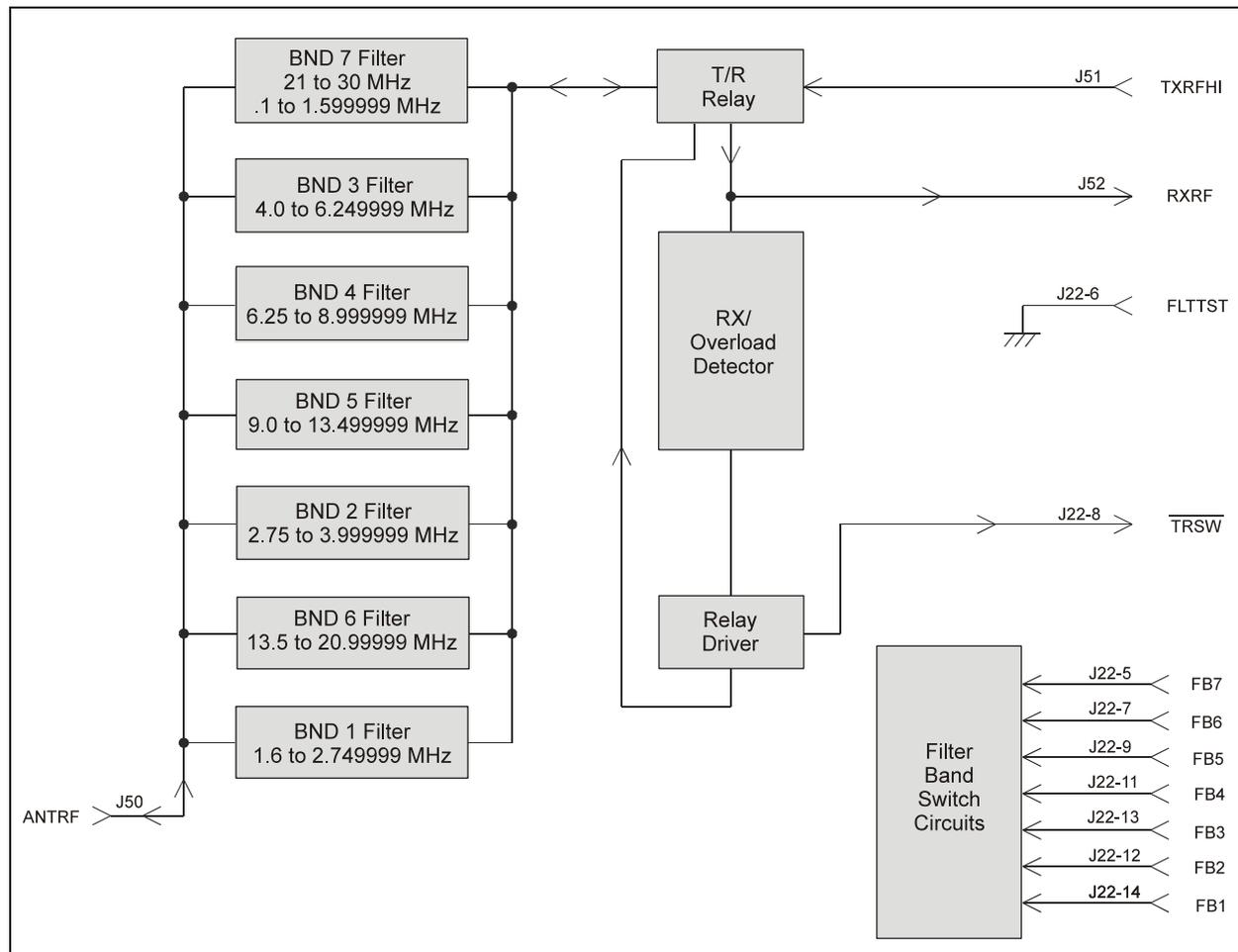


Figure 7-1 RF Filter Board Block Diagram

## 7.2 Connector Pin Assignments

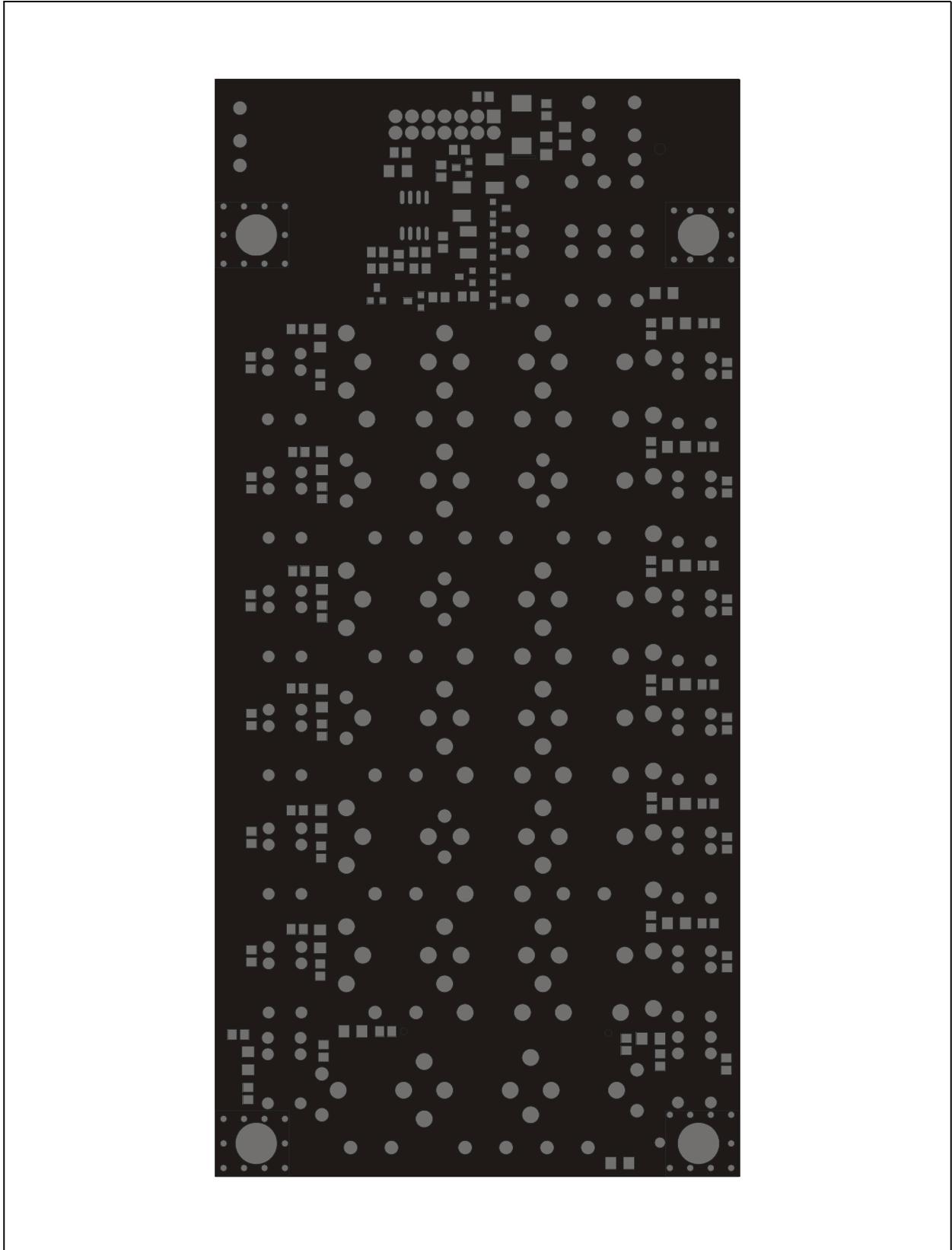
J22 connects to the Reference/Control board (J3) through the Motherboard.

**Table 7-1 J22 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	+12V	+12 Vdc supply
4	+12V	+12 Vdc supply
5	FB7	Filter band 7 select line
6	FLTTST	RF filter BITE line
7	FB3	Filter band 3 select line
9	FB4	Filter band 4 select line
10	TRSW	T/R relay control line
11	FB5	Filter band 5 select line
12	FB6	Filter band 6 select line
13	FB2	Filter band 2 select line
14	FB1	Filter band 1 select line

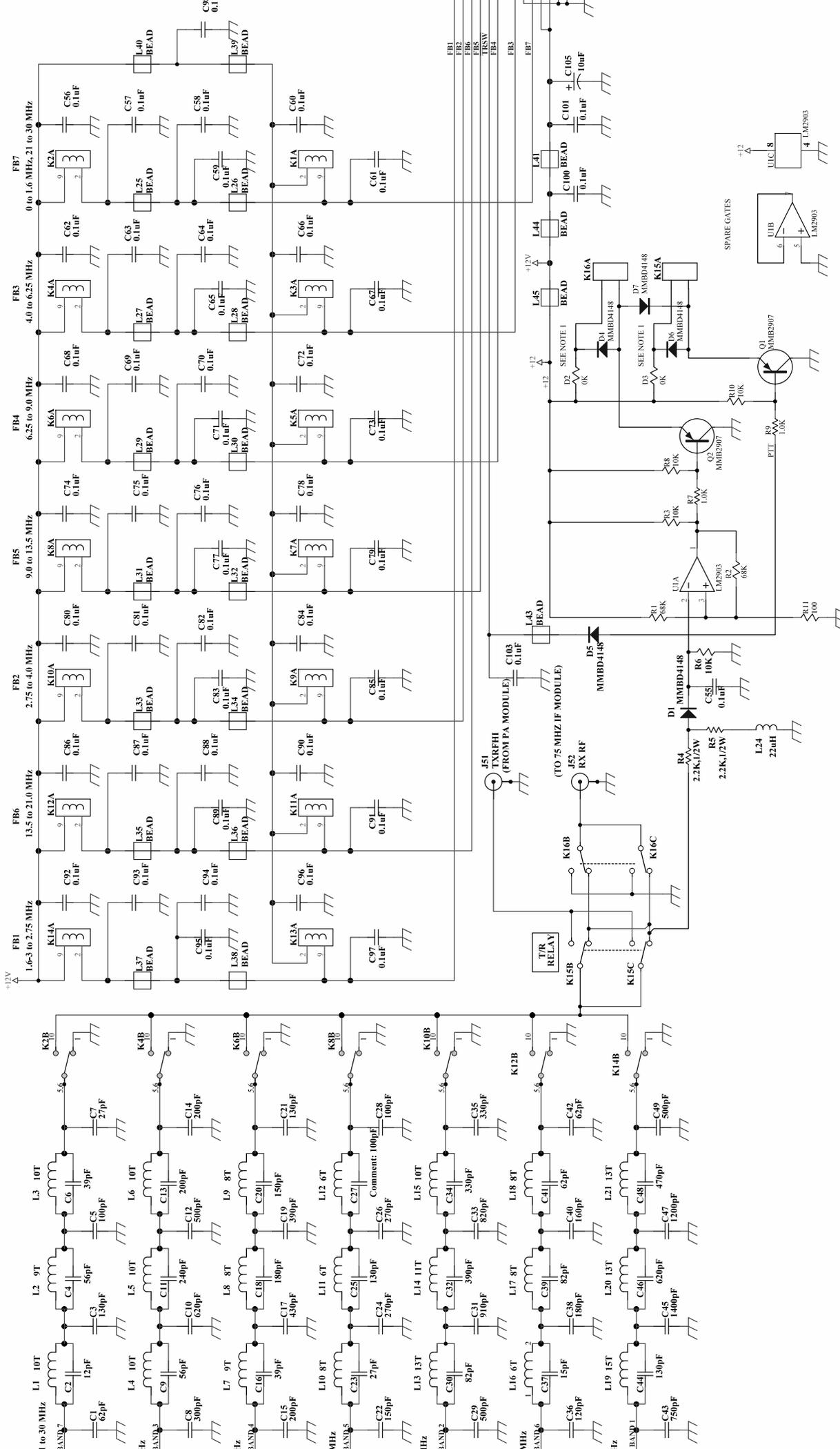
## 7.3 Component Locations, Schematic and Parts List

This section includes the component locations diagram, schematic and parts list for the RF Filter board.



**Figure 7-2 RF Filter Board Component Locations (738228 Rev. L)**

G	TW7000-259	CHG K16 CKT
H	7000-263	SEE ECN
J	TW7000-302	REDRAWN IN PROTECT
K	ECO 01-0611	C-49 WAS 500pF
L	ECO 01-0679	C-49 WAS 100pF
M	ECO 02-0039	L18 WAS 7T
N	05-0061	SEE ECO
P	07-4039	
R	08-0296	D2,D3 WAS MMBD4148
		K13 WAS 1.6-3



ED WITH A ZERO OHM RESISTOR.

Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)

Designator	Part Number	Description
C1	220620	"CAP, 62PF MICA 500V 5% DM15"
C10	224621	"CAP, 620PF MICA 500V 5% DM19"
C100	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C101	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C103	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C105	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C11	224241	"CAP, 240PF MICA 500V 5% DM19"
C12	224501	"CAP, 500PF MICA 500V 5% DM19"
C13	224201	"CAP, 200PF MICA 500V 5% DM19"
C14	224201	"CAP, 200PF MICA 500V 5% DM19"
C15	224201	"CAP, 200PF MICA 500V 5% DM19"
C16	220390	"CAP, 39PF MICA 500V 5% DM15"
C17	220431	"CAP, 430PF MICA 500V 5% DM15"
C18	224181	"CAP, 180PF MICA 500V 5% DM19"
C19	224391	"CAP, 390PF MICA 500V 5% DM19"
C2	220120	"CAP, 12PF MICA 500V 5% DM15"
C20	220151	"CAP, 150PF MICA 500V 5% DM15"
C21	224131	"CAP, 130PF MICA 500V 5% DM19"
C22	220151	"CAP, 150PF MICA 500V 5% DM15"
C23	220270	"CAP, 27PF MICA 500V 5% DM15"
C24	224301	"CAP, 300PF MICA 500V 5% DM19"
C25	224131	"CAP, 130PF MICA 500V 5% DM19"
C26	224271	"CAP, 270PF MICA 500V 5% DM19"
C27	220101	"CAP, 100PF MICA 500V 5% DM15"
C28	220101	"CAP, 100PF MICA 500V 5% DM15"
C29	224501	"CAP, 500PF MICA 500V 5% DM19"
C3	224131	"CAP, 130PF MICA 500V 5% DM19"
C30	220820	"CAP, 82PF MICA 500V 5% DM15"
C31	220911	"CAP, 910PF MICA 100V 5% DM15"
C32	224391	"CAP, 390PF MICA 500V 5% DM19"
C33	224821	"CAP, 820PF MICA 500V 5% DM19"

Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)

Designator	Part Number	Description
C34	224331	"CAP, 330PF MICA 500V 5% DM19"
C35	224331	"CAP, 330PF MICA 500V 5% DM19"
C36	220121	"CAP, 120PF MICA 500V 5% DM15"
C37	220150	"CAP, 15PF MICA 500V 5% DM15"
C38	224181	"CAP,180PF MICA 500V 5% DM19"
C39	220820	"CAP, 82PF MICA 500V 5% DM15"
C4	220560	"CAP, 56PF MICA 500V 5% DM15"
C40	220161	"CAP, 160PF MICA 500V 5% DM15"
C41	220620	"CAP, 62PF MICA 500V 5% DM15"
C42	220620	"CAP, 62PF MICA 500V 5% DM15"
C43	224751	"CAP, 750PF MICA 500V 5% DM19"
C44	224131	"CAP, 130PF MICA 500V 5% DM19"
C45	224142	"CAP, 1400PF MICA 500V 5% DM19"
C46	224621	"CAP, 620PF MICA 500V 5% DM19"
C47	224122	"CAP, 1200PF MICA 500V 5% DM19"
C48	224471	"CAP, 470PF MICA 500V 5% DM19"
C49	224501	"CAP, 500PF MICA 500V 5% DM19"
C5	220101	"CAP, 100PF MICA 500V 5% DM15"
C55	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C56	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C57	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C58	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C59	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	220390	"CAP, 39PF MICA 500V 5% DM15"
C60	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C61	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C62	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C63	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C64	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C65	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C66	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C67	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)

Designator	Part Number	Description
C68	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C69	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C7	220270	"CAP, 27PF MICA 500V 5% DM15"
C70	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C71	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C72	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C73	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C74	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C75	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C76	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C77	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C78	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C79	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C8	224301	"CAP, 300PF MICA 500V 5% DM19"
C80	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C81	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C82	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C83	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C84	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C85	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C86	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C87	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C88	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C89	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	220560	"CAP, 56PF MICA 500V 5% DM15"
C90	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C91	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C92	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C93	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C94	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C95	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C96	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C97	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C98	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	013000000	"RES, ZERO OHM 2A TK 0805"
D3	013000000	"RES, ZERO OHM 2A TK 0805"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
J22	620017	"HEADER, 2X7 MLX 0.1"
J50	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J51	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J52	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
K1	540077	"RELAY, SPDT 12V 1A PCB"
K10	540077	"RELAY, SPDT 12V 1A PCB"
K11	540077	"RELAY, SPDT 12V 1A PCB"
K12	540077	"RELAY, SPDT 12V 1A PCB"
K13	540077	"RELAY, SPDT 12V 1A PCB"
K14	540077	"RELAY, SPDT 12V 1A PCB"
K15	540080	"RELAY,DPDT 2 AMP SEALED"
K16	540080	"RELAY,DPDT 2 AMP SEALED"
K2	540077	"RELAY, SPDT 12V 1A PCB"
K3	540077	"RELAY, SPDT 12V 1A PCB"
K4	540077	"RELAY, SPDT 12V 1A PCB"
K5	540077	"RELAY, SPDT 12V 1A PCB"
K6	540077	"RELAY, SPDT 12V 1A PCB"
K7	540077	"RELAY, SPDT 12V 1A PCB"
K8	540077	"RELAY, SPDT 12V 1A PCB"
K9	540077	"RELAY, SPDT 12V 1A PCB"
L1	459325	"IND ASSY,10T,#20,1-490006"
L10	451122	"IND ASSY,8T#20 1-490008"
L11	459424	"IND ASSY,6T#20 1-490008 COMPRS"

Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)

Designator	Part Number	Description
L12	459424	"IND ASSY,6T#20 1-490008 COMPRS"
L13	459119	"IND ASSY, 13T#22 1-490009"
L14	459103	"IND ASSY,11T#22,AWG,1-490009"
L15	459174	"IND ASSY,10T#22 AWG 1-490009"
L16	459131	"IND ASSY, 6T#20 AWG 1-490008"
L17	451127	"IND ASSY, 8T#20 1-490010"
L18	459425	"IND ASSY,8T#20 1-490010 COMPRS"
L19	451115	"IND ASSY,15T#22 1-490009"
L2	459326	"IND ASSY,9T,#20,2-490104"
L20	459119	"IND ASSY, 13T#22 1-490009"
L21	459119	"IND ASSY, 13T#22 1-490009"
L24	041223000	IND SM 22UH 1210 10%
L25	045000001	"BEAD, FERRITE Z=120 1206"
L26	045000001	"BEAD, FERRITE Z=120 1206"
L27	045000001	"BEAD, FERRITE Z=120 1206"
L28	045000001	"BEAD, FERRITE Z=120 1206"
L29	045000001	"BEAD, FERRITE Z=120 1206"
L3	459325	"IND ASSY,10T,#20,1-490006"
L30	045000001	"BEAD, FERRITE Z=120 1206"
L31	045000001	"BEAD, FERRITE Z=120 1206"
L32	045000001	"BEAD, FERRITE Z=120 1206"
L33	045000001	"BEAD, FERRITE Z=120 1206"
L34	045000001	"BEAD, FERRITE Z=120 1206"
L35	045000001	"BEAD, FERRITE Z=120 1206"
L36	045000001	"BEAD, FERRITE Z=120 1206"
L37	045000001	"BEAD, FERRITE Z=120 1206"
L38	045000001	"BEAD, FERRITE Z=120 1206"
L39	045000001	"BEAD, FERRITE Z=120 1206"
L4	459134	"IND ASSY, 10T#22 AWG 1-490008"
L40	045000001	"BEAD, FERRITE Z=120 1206"
L41	045000001	"BEAD, FERRITE Z=120 1206"
L43	045000001	"BEAD, FERRITE Z=120 1206"

**Table 7-2 RF Filter Board Parts List (001-00320 Rev. AB)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
L44	045000001	"BEAD, FERRITE Z=120 1206"
L45	045000001	"BEAD, FERRITE Z=120 1206"
L5	459134	"IND ASSY, 10T#22 AWG 1-490008"
L6	459134	"IND ASSY, 10T#22 AWG 1-490008"
L7	459120	"IND ASSY,9T#22 1-490008"
L8	459105	"IND ASSY, 8T#22 AWG 1-490008"
L9	459105	"IND ASSY, 8T#22 AWG 1-490008"
Q1	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q2	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
R1	013683000	"RES,SM,CF,68K 0.1W 5% 0805"
R10	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R11	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R2	013683000	"RES,SM,CF,68K 0.1W 5% 0805"
R3	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R4	019222002	"RES, 2.2K 1/2W 5% TK 2010"
R5	019222002	"RES, 2.2K 1/2W 5% TK 2010"
R6	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R7	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R8	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R9	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
U1	033304061	"IC,SM,LIN,COMPAR,DUAL,LM2903MX"



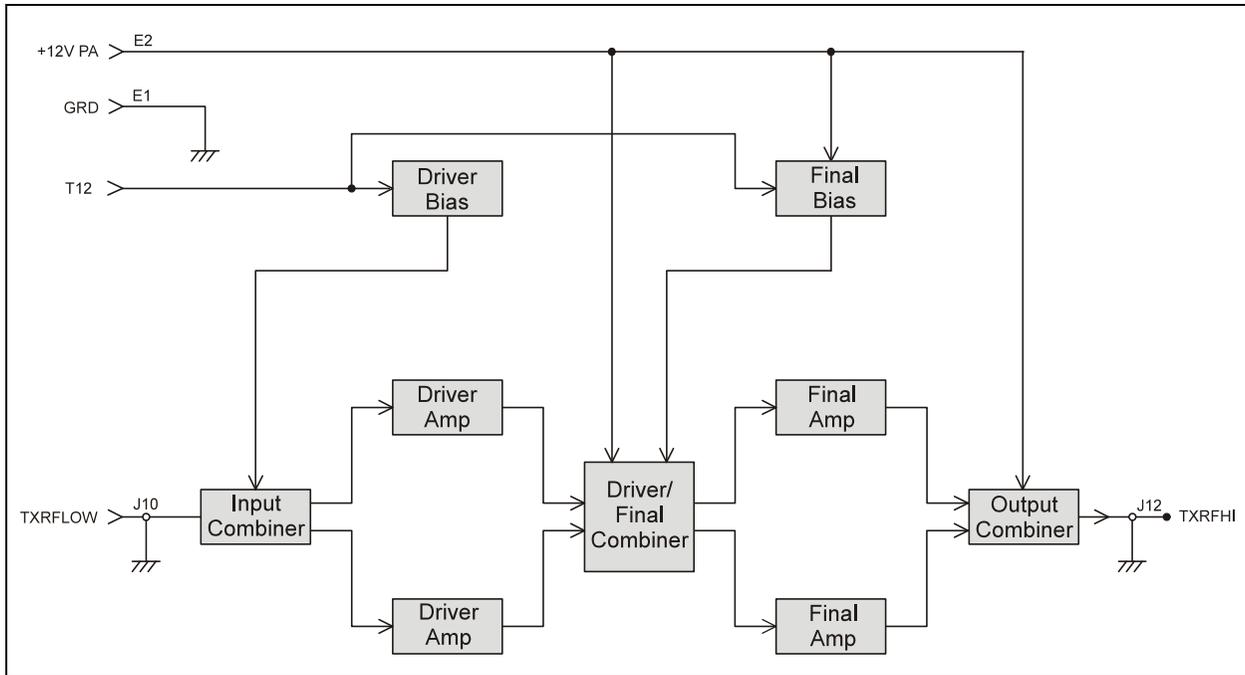
## Chapter 8: RF Power Amplifier Board

### 8.1 Circuit Description

The RF Power Amplifier board is a two-stage broadband 1.6 to 30 MHz power amplifier capable of putting out 150W of RF power. It is located on the heat sink assembly and is driven by the exciter circuitry on the 75 MHz IF board through coaxial connector J10 (TXRFLOW). The high power output is applied to the RF Filter board through connector J12 (TXRFHI). Power (12 Vdc) for the board comes directly from primary DC input power source, unregulated, unswitched, through a pendant cable terminated in connector J24 (refer to Figure 8-1 below).

### 8.1.1 RF Amplifiers

The RF Power Amplifier board contains class-AB driver amplifiers and class-AB final amplifiers that operate in a push-pull mode. Special broadband transformers are used in the combiner circuits shown in Figure 8-1. Each stage has its own separate bias network, turned on by the T12 line (+12 Vdc only in transmit mode) from the 75 MHz IF board.



**Figure 8-1 RF Power Amplifier Board Block Diagram**

### 8.1.2 RF Amplifier Thermal Control

The RT7000 is cooled by an external heatsink on the rear panel designed to maintain temperature on the RF Power Amplifier assembly within operational specifications. Additionally, a thermal sensor mounted on the RF Amplifier assembly sends a signal (TSENSE) to the Processor board through J23 when the RF Amplifier assembly exceeds a predetermined level. In response to high temperature, the processor sends a signal on the serial data line that reduces the RF power output until the RF Power Amplifier assembly returns to operational specifications.

## **8.2 Component Locations, Schematic and Parts List**

This section includes a component locations diagram, schematic and parts list for the RF Power Amplifier board.

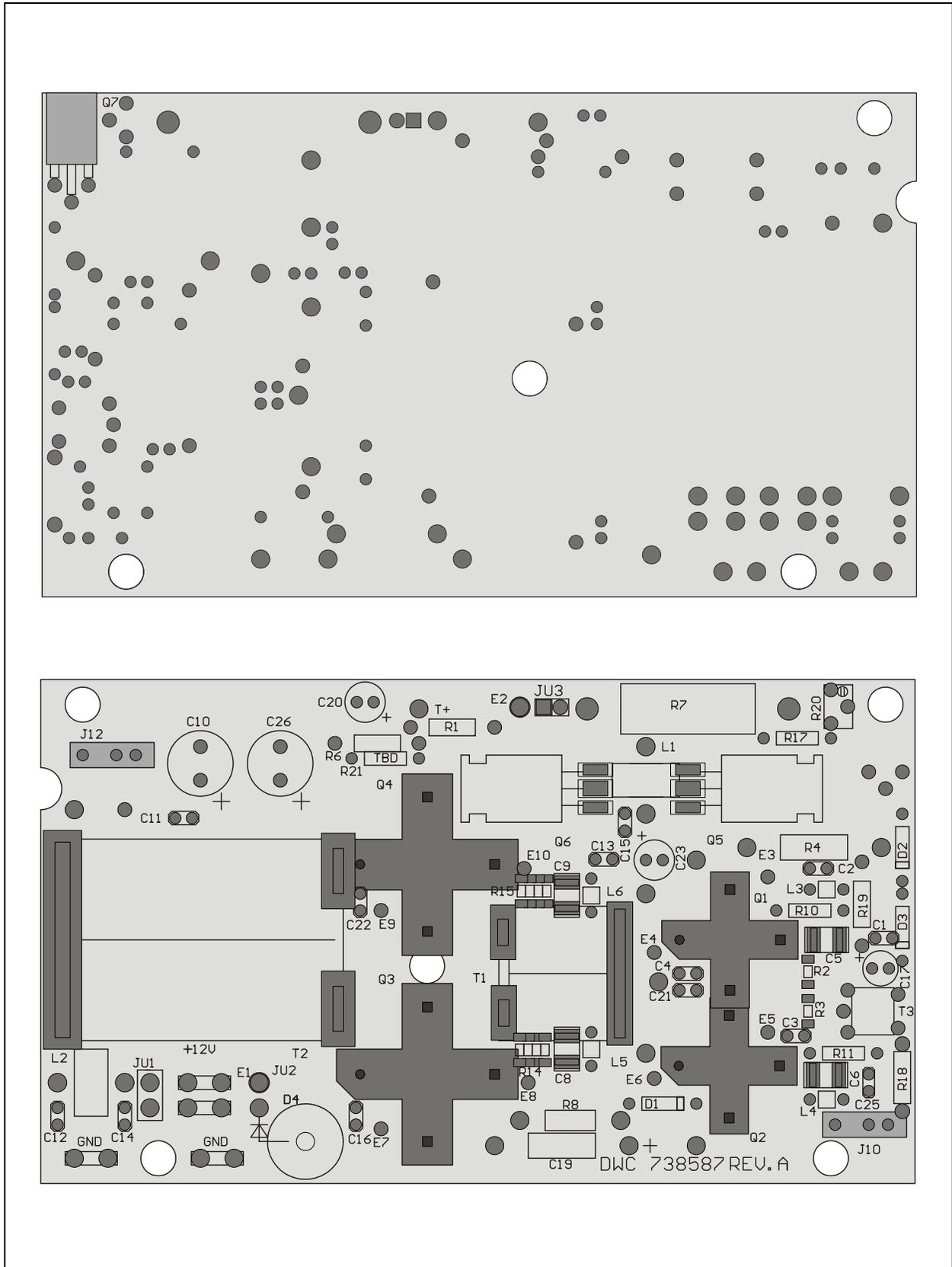
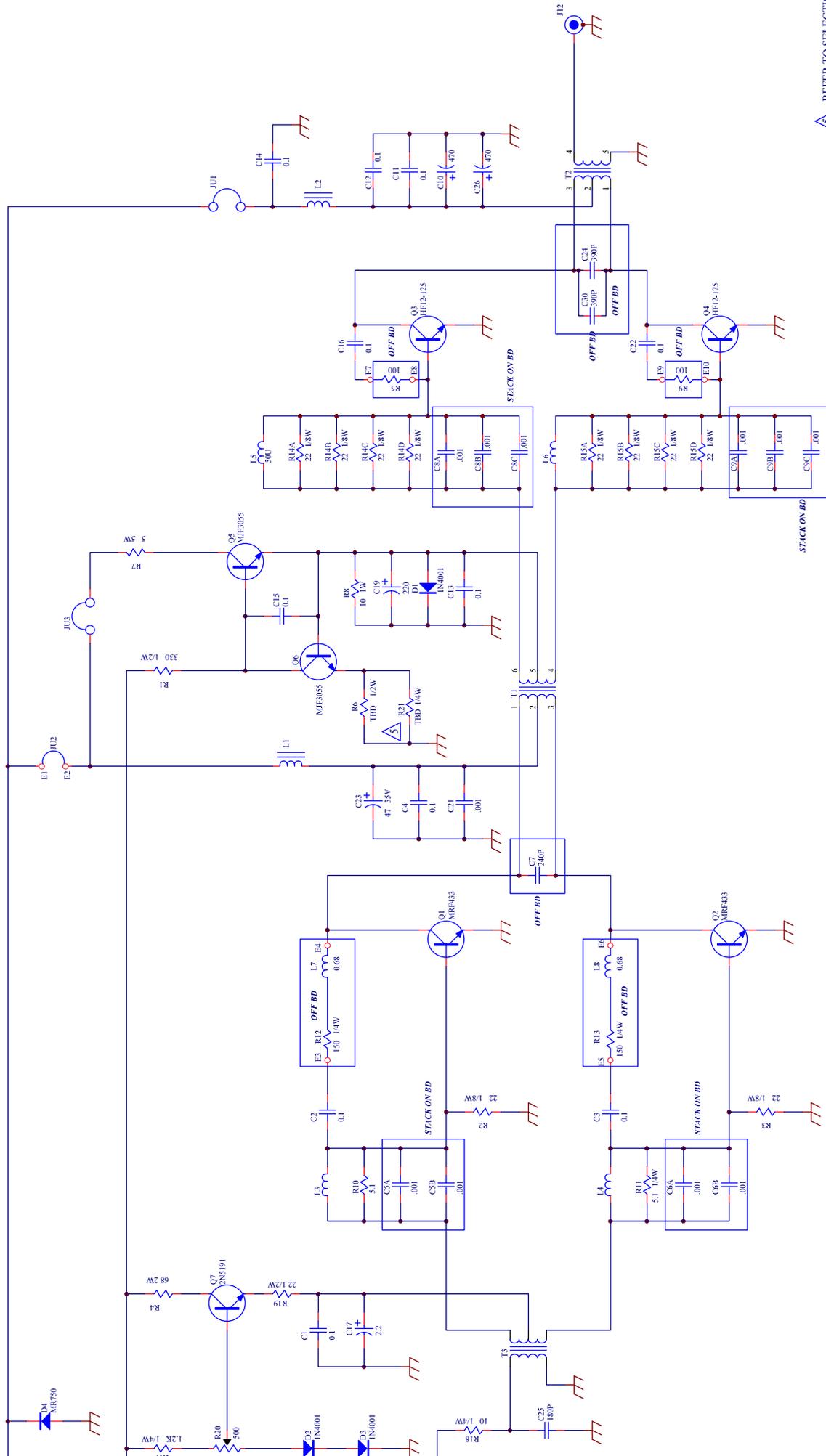


Figure 8-2 RF Power Amplifier Board Component Locations (738587 Rev. A)



REFER TO SELECTION PROCEDURE IN TECHNICAL MANUAL.  
 4 INDUCTANCE IS IN MICROHEN  
 3 DIODES ARE 1N4148  
 2 CAPACITANCE IS IN MICROFAR  
 1 RESISTANCE IS IN OHMS

NOTES: UNLESS OTHERWISE SPECIFIED

**Table 8-1 RF Power Amplifier Board Parts List (004-00311 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C10	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C11	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C12	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C13	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C14	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C15	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C16	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C17	231020	"CAP, 2.2UF AL 50V 20% 2MM LS"
C19	230201	"CAP, 220UF AL 16V 20% AX 8X16"
C2	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C20	231500	"CAP, 47UF AL 16V 20% 5X11X0.1"
C21	210102	"CAP, .001UF Y5P 50V 20% 0.1LS"
C22	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C23	234470	"CAP, 47UF, AL, 35V, 20%, 6.3X11X2.5"
C25	221301	"CAP, 300PF MICA 50V 5% DM5"
C26	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C27	221620	"CAP, 62PF MICA 300V 5% DM5"
C3	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C4	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C5A	216102-1	"CAP,1000PF 10% CHIP CER"
C5B	216102-1	"CAP,1000PF 10% CHIP CER"
C6A	216102-1	"CAP,1000PF 10% CHIP CER"
C6B	216102-1	"CAP,1000PF 10% CHIP CER"
C7	224221	"CAP, 220PF MICA 500V 5% DM19"
C8A	216102-1	"CAP,1000PF 10% CHIP CER"
C8B	216102-1	"CAP,1000PF 10% CHIP CER"
C8C	216102-1	"CAP,1000PF 10% CHIP CER"
C9A	216102-1	"CAP,1000PF 10% CHIP CER"
C9B	216102-1	"CAP,1000PF 10% CHIP CER"
C9C	216102-1	"CAP,1000PF 10% CHIP CER"

**Table 8-1 RF Power Amplifier Board Parts List (004-00311 Rev. G)**

Designator	Part Number	Description
D1	320102	"DIODE, 1N4001 1A 50V DO-41"
D2	320102	"DIODE, 1N4001 1A 50V DO-41"
D3	320102	"DIODE, 1N4001 1A 50V DO-41"
D4	320421	"DIODE, MR750 6A 50V AXIAL"
J10	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J12	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
L1	459113	"IND ASSY,3T,#18,1-490302"
L2	459113	"IND ASSY,3T,#18,1-490302"
L3	459114	"IND ASSY,6T#30GA RED 1-490201"
L4	459114	"IND ASSY,6T#30GA RED 1-490201"
L5	459114	"IND ASSY,6T#30GA RED 1-490201"
L6	459114	"IND ASSY,6T#30GA RED 1-490201"
Q7	310055	"XSTR,2N5191 NPN 4A 60V TO225"
R1	134331	"RES,330 OHM 1/2W 5% CF"
R10	124050	"RES,5.1 OHM 1/4W 5% CF"
R11	124050	"RES,5.1 OHM 1/4W 5% CF"
R14A	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14B	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14C	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14D	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15A	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15B	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15C	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15D	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R17	124XXX	"RESISTOR 1/4W, TBD"
R18	113101	"RES,100 OHM 1/8W CF 5%"
R2	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R3	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R4	154680	"RES, 68 OHM MOX 2W 5%"
R6	144XXX	"RES,TBD,OHMS 1W 5%"
R7	161050	"RES, 5 OHM 5W 5% WW SQR CERMET"
R8	144100	"RES,10 OHM 1W 5% CF"

**Table 8-1 RF Power Amplifier Board Parts List (004-00311 Rev. G)**

Designator	Part Number	Description
T1	459211	"XFMR,1T1T #20AWG 6-490302"
T2	459212	"XFMR ASSY,4T#20 AWG 4-490502"
T3	451136-1	"XFMR ASSY,4T2T#32 GA 1-490303"

**Table 8-2 PA Heatsink Assembly Parts List (001-00300 Rev. N)**

Designator	Part Number	Description
J10	001-00014	"CABLE ASSY,TW7000 COAX 27"
J50	001-00011	"CABLE ASSY,TW7000 COAX 9"
J51	001-00011	"CABLE ASSY,TW7000 COAX 9"

**Table 8-3 RF Power Amplifier Assembly (004-12260 Rev. V)**

Designator	Part Number	Description
L7	430005	"IND, 0.68UH AIR 15% 1.3A AX"
L8	430005	"IND, 0.68UH AIR 15% 1.3A AX"
Q1	310140	"XISTOR,RF,NPN,12.5V"
Q2	310140	"XISTOR,RF,NPN,12.5V"
Q3	310015	"XSTR,NPN HF12-125,GRADED"
Q4	310015	"XSTR,NPN HF12-125,GRADED"
Q5	310133	"XSTR, MJF3055 NPN TO-220 INS"
Q6	310133	"XSTR, MJF3055 NPN TO-220 INS"
Q7	310055	"XSTR,2N5191 NPN 4A 60V TO225"
R12	124151	"RES,150 OHM 1/4W 5% CF"
R13	124151	"RES,150 OHM 1/4W 5% CF"
R5	154101	"RES,100 OHM 2W 5% MOX STD"
R9	154101	"RES,100 OHM 2W 5% MOX STD"





## Chapter 9: 75 MHz IF Board

### 9.1 Circuit Description

The 75 MHz IF board plugs into the motherboard at J6 and is located in the fourth card slot from the right side of the radio. It is used in both the transmit and receive paths.

#### 9.1.1 Voltage Regulation

The 75 MHz IF board is powered by the +12 Vdc supply from the Interface/Power Supply board which it regulates to receive-only 8 Vdc (R8), transmit-only 8 Vdc (T8) and transmit-only 12 Vdc (T12). T12 provides the bias control line for the RF Power Amplifier board. T8 and R8 power the transmit/receive switches and the onboard circuits that operate in either transmit-only or receive-only mode.

#### 9.1.2 Board Programming

Decoder/driver U7A translates the serial data inputs (SPITXD, SPICLK) from the processor into signals to drive the switch matrix. This switch circuit controls the high pass filter (relay K2), the 20 dB attenuator (relay K1), and the BITE status line.

#### 9.1.3 Receive Mode

The receive RF from the RF Filter board is connected through a coaxial cable to connector J52. From there it is applied to a high-pass filter (HPF) that is automatically switched into the circuit for all channel frequencies above 2 MHz. It is then applied to a 20 dB attenuator controlled by the front panel **RX Attenuator** switch. Frequency mixer HX1 mixes the receive signal with the first LO to form the first IF at 75 MHz. Then it is amplified (U1), filtered (XF3), and amplified again (U2) before going out to the 5 MHz IF board at coaxial connector J53. The AGC voltage for the receiver is applied at J6-18 and controls the gain of the last 75 MHz amplifier.

### 9.1.4 Transmit Mode

The modulated 75 MHz audio signal from the 5 MHz IF board is received at J53 and is applied to transmit amplifier U3. U3 gain is controlled by the raw ALC signal (RAWALC) on J6 pin 12 line. The RAWALC line is the ALC voltage from the Reference/Control board. The ALC voltage is a combination of forward and reflected power samples; when the antenna is a perfect 50 ohm match, there is no reflected voltage, and the ALC allows the radio to output the full rated power. As the reflected power goes up, VSWR increases and the larger value on the RAWALC line causes the output power to decrease proportionally.

From U3, the TX signal is applied to 75 MHz filter XF3 and amplified again at U4 prior to mixing with first LO MX1. The transmit signal is now at the channel frequency and is applied to the transmitter exciter circuit with a two-stage amplifier output. The final RF amplifier stage is a push-pull amplifier with a nominal output of +20 dBm. The output signal is connected via a coaxial cable at J60 (TXRFLOW) to the RF Power Amplifier board.

## 9.2 Connector Pin Assignments

Table 9-1 provides the J6 pin assignments.

**Table 9-1 J6 Connector Pin Assignments**

Pins	Signal	Description
1	GND	Ground
2	+12V	+12 Vdc supply
4	SPICLK	SPI clock from the Processor board
5	PTT	Push-to-talk from the Processor board
6	ALC LVL	ALC output to the Processor board
12	RAW ALC	ALC voltage from the Ref/Control board
13	EN11	Decoder/driver enable from the Processor board
14	GND	Ground
15	+12V	+12 Vdc supply voltage
16	SPITXD	Serial TX data line from the Processor board
17	BITE	BITE status line
19	T12	+12 Vdc (transmit-only) to the Power Amplifier board

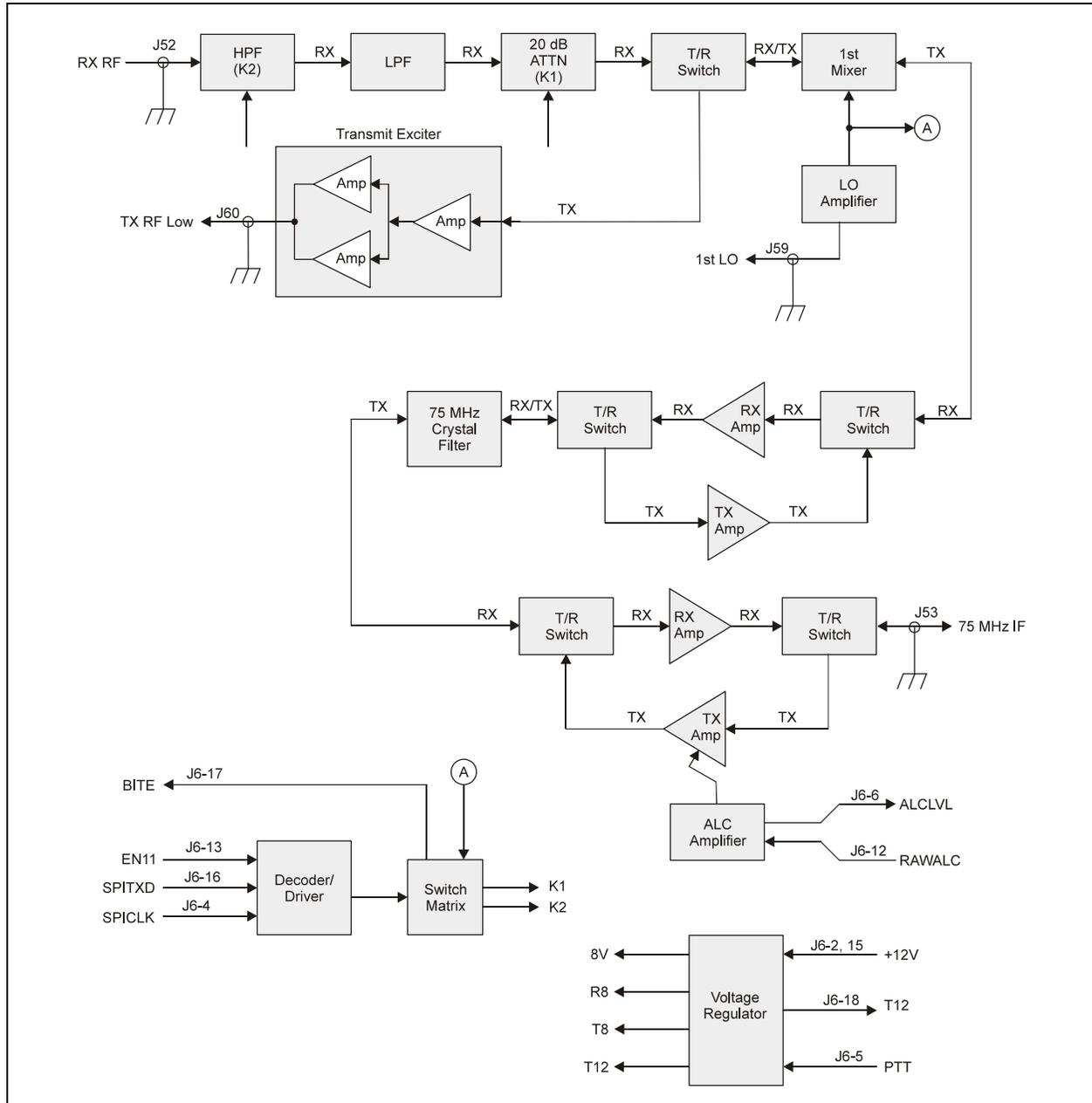


Figure 9-1 75 MHz IF Block Diagram

### 9.3 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the 75 MHz IF board.

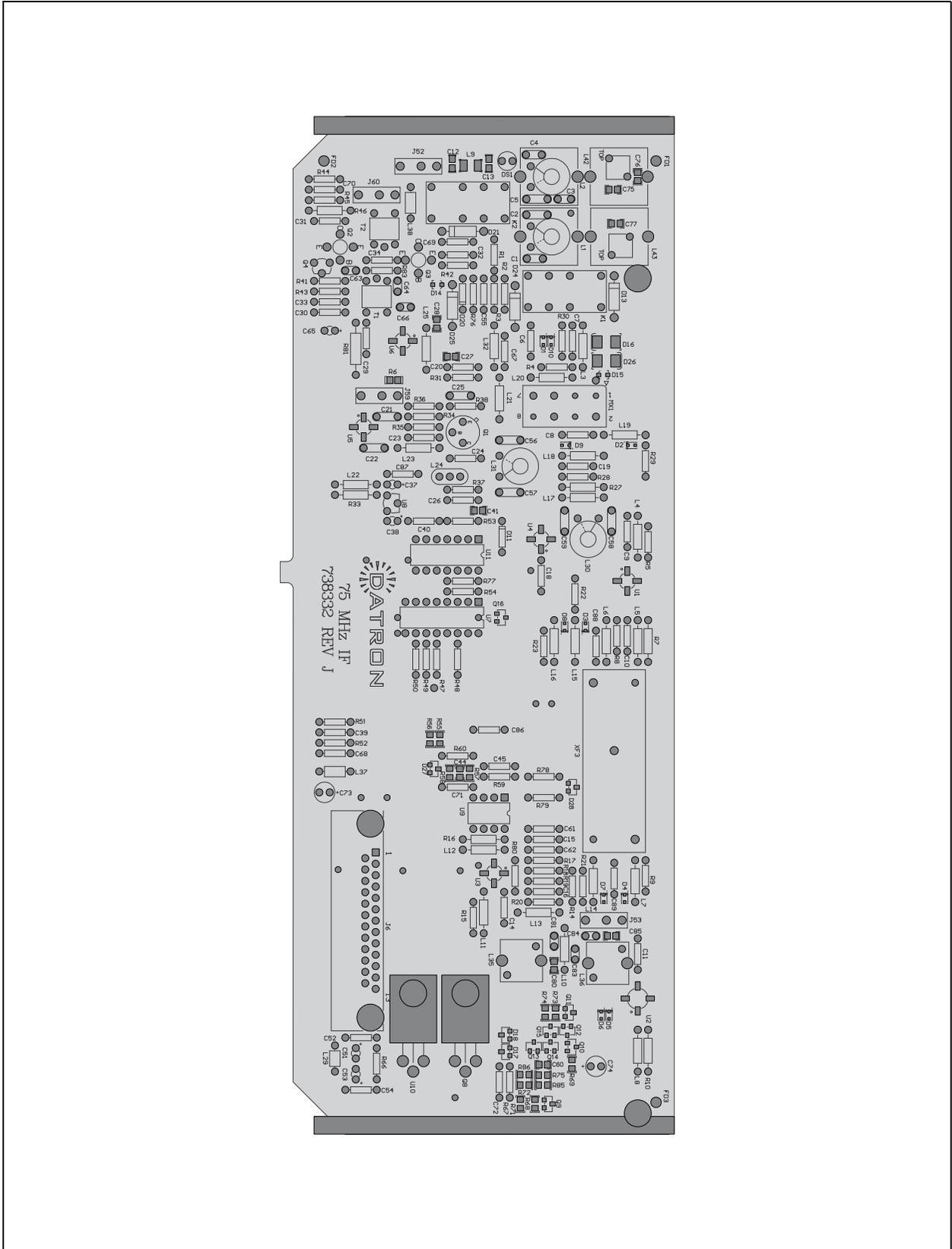


Figure 9-2 75 MHz IF Board Component Locations (738332 Rev. J)

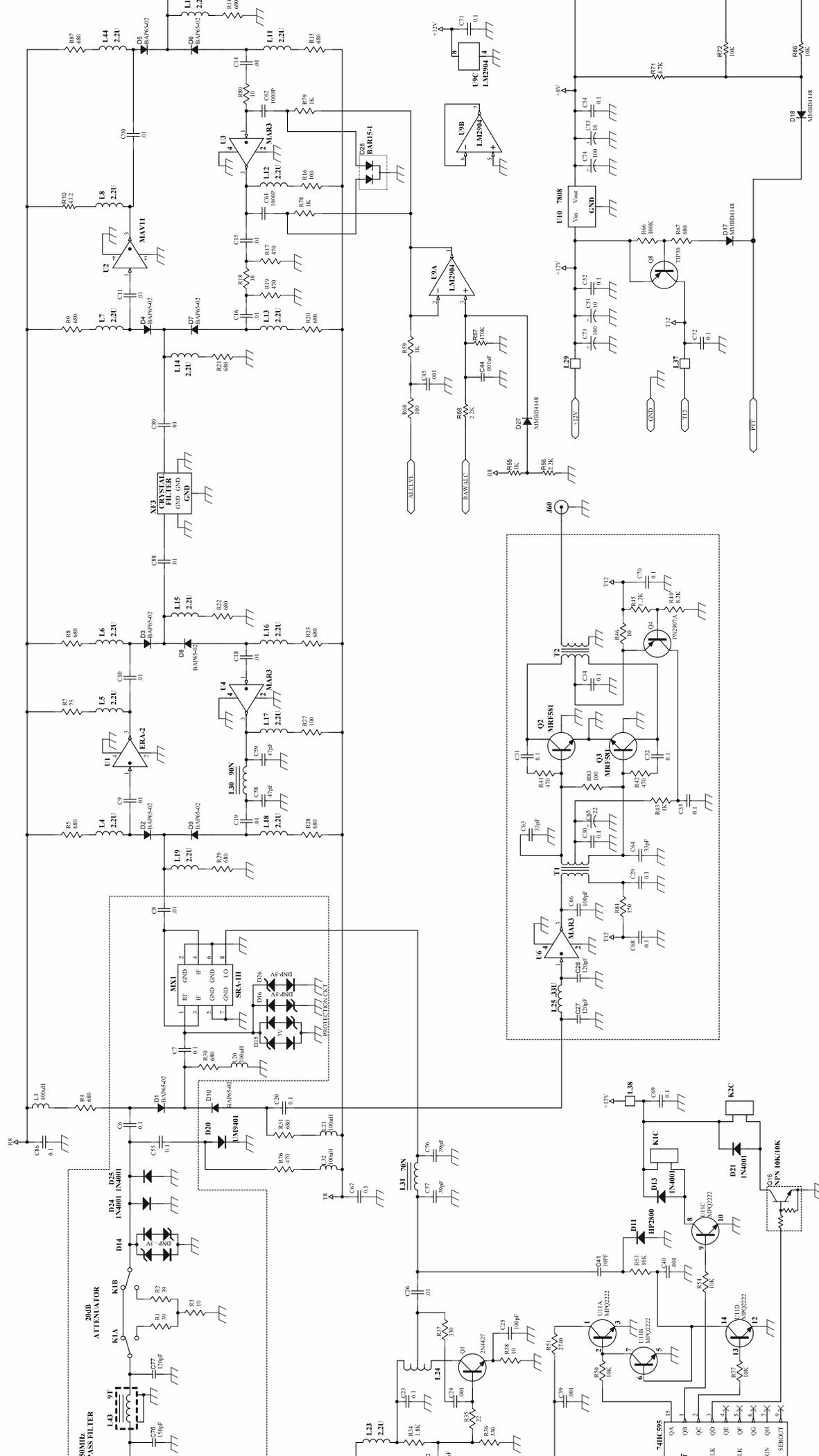


Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)

Designator	Part Number	Description
C1	254152	"CAP,0.0015MF MYLAR"
C10	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C11	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C12	021680001	"CAP, 68PF NP0 100V 2% 0805"
C13	021680001	"CAP, 68PF NP0 100V 2% 0805"
C14	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C15	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C16	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C18	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C19	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C2	254822-1	"CAP,Y,8200PF,50V,5%,RA,.15"
C20	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C21	210101	"CAP,100PF NP0 50V 5% 0.2LS DISK"
C22	210101	"CAP,100PF NP0 50V 5% 0.2LS DISK"
C23	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C24	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C25	210101	"CAP,100PF NP0 50V 5% 0.2LS DISK"
C26	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C27	021121000	CAP 120PF NP0 100V 5% 0805
C28	021121000	CAP 120PF NP0 100V 5% 0805
C29	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C3	254102	"CAP,0.001MF 5% MYLAR"
C30	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C31	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C32	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C33	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C34	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C37	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C38	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C39	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C4	254272	"CAP, 2700PF, POLY, 100V, 10%, 3.5LS"

**Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C40	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C41	021100000	"CAP, 10PF, NP0, 100V, 5%, 0805"
C44	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C45	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C5	254182	"CAP,Y,1800PF,50V,5%,RA,.15"
C51	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C52	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C53	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C54	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C55	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C56	210391	"CAP, 39PF NP0 5% 50V 0.2LS"
C57	210391	"CAP, 39PF NP0 5% 50V 0.2LS"
C58	210470	"CAP,47PF DISK NP0 50V 5% 0.2LS"
C59	210470	"CAP,47PF DISK NP0 50V 5% 0.2LS"
C6	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C60	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C61	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C62	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C63	210330	"CAP,33 PF DISC NP0"
C64	210330	"CAP,33 PF DISC NP0"
C65	241226	"CAP,T,22UF,25V,20%,RA,.1SP"
C66	221101	"CAP, 100PF MICA 300V 5% DM5"
C67	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C68	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C69	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C7	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C70	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C71	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C72	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C73	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C74	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C75	021121000	CAP 120PF NP0 100V 5% 0805

Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)

Designator	Part Number	Description
C76	021151000	"CAP, 150PF NP0 100V 5% 0805"
C77	021121000	CAP 120PF NP0 100V 5% 0805
C8	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C80	021100000	"CAP, 10PF, NP0, 100V, 5%, 0805"
C81	210120	"CAP,12 PF DISC NP0"
C83	210020	"CAP,2PF NP0 50V 0.25P 0.1LS DSK"
C84	210120	"CAP,12 PF DISC NP0"
C85	021100000	"CAP, 10PF, NP0, 100V, 5%, 0805"
C86	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C87	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C88	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C89	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C9	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C90	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
D1	037705010	DIODE PIN 30V 100MA SOD-523
D10	037705010	DIODE PIN 30V 100MA SOD-523
D11	320015	"DIODE, 5082-2800, RF SHTKY, AXIAL"
D13	320102	"DIODE, 1N4001 1A 50V DO-41"
D14	DNP	"NULL PART, VACANT PCB LOCATION"
D15	037700008	"DIODE, GBLC03C, TVS, BI, 3VBRK, SOD323"
D16	DNP	"NULL PART, VACANT PCB LOCATION"
D17	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D18	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037705010	DIODE PIN 30V 100MA SOD-523
D20	320432	"DIODE, UM9401B PIN 5.5W AXIAL "
D21	320102	"DIODE, 1N4001 1A 50V DO-41"
D24	320102	"DIODE, 1N4001 1A 50V DO-41"
D25	320102	"DIODE, 1N4001 1A 50V DO-41"
D26	DNP	"NULL PART, VACANT PCB LOCATION"
D27	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D28	037705019	"DIODE, BAR15-1 DUAL PIN CC SOT23-3"
D3	037705010	DIODE PIN 30V 100MA SOD-523

**Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
D4	037705010	DIODE PIN 30V 100MA SOD-523
D5	037705010	DIODE PIN 30V 100MA SOD-523
D6	037705010	DIODE PIN 30V 100MA SOD-523
D7	037705010	DIODE PIN 30V 100MA SOD-523
D8	037705010	DIODE PIN 30V 100MA SOD-523
D9	037705010	DIODE PIN 30V 100MA SOD-523
DS1	390009	"LAMP, NEON NE-2 STD. 6X18"
J52	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J53	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J59	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J6	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J60	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
K1	540073	"RELAY,2PDT MDX-12-01"
K2	540073	"RELAY,2PDT MDX-12-01"
L1	459228	"IND HORZ,32T AWG32 1-490033"
L10	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L11	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L12	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L13	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L14	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L15	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L16	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L17	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L18	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L19	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L2	459229	"IND HORZ,39T 32AWG 1-490033"
L20	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L21	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L22	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L23	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L24	459227	"IND ASSY,1T/1T 32AWG 1-491301"
L25	430045	"IND,0.33UH 10% AXIAL MOLD TH"

Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)

Designator	Part Number	Description
L29	450132	"IND ASSY,3T#28 MGT 1-490201"
L3	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L30	459243	"IND ASSY,7T#22AWG 1-490032"
L31	459244	"IND ASSY,4T#22AWG 1-490032"
L32	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L35	490144	"IND,VAR 0.22-0.25UH BLUE 10MM"
L36	490144	"IND,VAR 0.22-0.25UH BLUE 10MM"
L37	490204	BEAD FERRITE SHIELD 43 MAT
L38	490204	BEAD FERRITE SHIELD 43 MAT
L4	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L42	490127	COIL 9.5T (MD) SQ
L43	490127	COIL 9.5T (MD) SQ
L44	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L5	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L6	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L7	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L8	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L9	041221000	"IND, 220NH FR 0.45A 20% 1210"
MX1	380021	"MIXER, T17DBM 50KHZ"
Q1	310011	"XSTR, 2N4427 NPN RF TO-39"
Q10	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q11	031102033	"XSTR, PMV65XP MOSFET-P SOT23"
Q12	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q13	031105002	"XSTR, PNP 10K/10K 50V SC-59"
Q14	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q15	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q16	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q2	310130	"XSTR, MRF581A NPN RF SOT-103"
Q3	310130	"XSTR, MRF581A NPN RF SOT-103"
Q4	310052	"XSTR, PN2907A PNP TO92"
Q8	310083	"XSTR, TIP30C PNP 100V TO-220"
Q9	031102033	"XSTR, PMV65XP MOSFET-P SOT23"

**Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R1	113390	"RES,39 OHM 1/8W 5% CARBON FILM"
R10	1124329	"RES, 43.2 OHM, 1/4W, 1%, MF"
R14	113681	"RES,680 OHM 1/8W CF 5%"
R15	113681	"RES,680 OHM 1/8W CF 5%"
R16	124101	"RES,100 OHM 1/4W 5% CF"
R17	113471	"RES,470 OHM 1/8W CF 5%"
R18	113100	"RES,10 OHM 1/8W 5% FILM"
R19	113471	"RES,470 OHM 1/8W CF 5%"
R2	113390	"RES,39 OHM 1/8W 5% CARBON FILM"
R20	113681	"RES,680 OHM 1/8W CF 5%"
R21	113681	"RES,680 OHM 1/8W CF 5%"
R22	113681	"RES,680 OHM 1/8W CF 5%"
R23	113681	"RES,680 OHM 1/8W CF 5%"
R27	124101	"RES,100 OHM 1/4W 5% CF"
R28	113681	"RES,680 OHM 1/8W CF 5%"
R29	113681	"RES,680 OHM 1/8W CF 5%"
R3	113100	"RES,10 OHM 1/8W 5% FILM"
R30	113681	"RES,680 OHM 1/8W CF 5%"
R31	113681	"RES,680 OHM 1/8W CF 5%"
R33	124750	"RES, 75 OHM, 1/4W, 5%, CF"
R34	113182	"RES,1.8K OHM 1/8W 5% CF"
R35	113220	"RES,22 OHM 1/8W 5% CARBON FILM"
R36	113331	"RES,330 OHM 1/8W CF 5%"
R37	113331	"RES,330 OHM 1/8W CF 5%"
R38	113100	"RES,10 OHM 1/8W 5% FILM"
R4	113681	"RES,680 OHM 1/8W CF 5%"
R41	113471	"RES,470 OHM 1/8W CF 5%"
R42	113471	"RES,470 OHM 1/8W CF 5%"
R43	113102	"RES, 1K OHM 1/8W CF 5%"
R44	113822	"RES,8.2K OHM 1/8W CF 5%"
R45	113122	"RES,1.2K OHM 1/8W CF 5%"
R46	124100	"RES, 10 OHM, 1/4W, 5%, CF"

Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)

Designator	Part Number	Description
R47	113101	"RES,100 OHM 1/8W CF 5%"
R48	113101	"RES,100 OHM 1/8W CF 5%"
R49	113101	"RES,100 OHM 1/8W CF 5%"
R5	113681	"RES,680 OHM 1/8W CF 5%"
R50	113103	"RES, 10K OHM 1/8W CF 5%"
R51	1112741	"RES,2740 OHMS 1/8W 1% RN50 MF"
R52	113101	"RES,100 OHM 1/8W CF 5%"
R53	113103	"RES, 10K OHM 1/8W CF 5%"
R54	113103	"RES, 10K OHM 1/8W CF 5%"
R55	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R56	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R57	013474000	RES SM CF 470K 0.1W 5% 0805
R58	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R59	113102	"RES, 1K OHM 1/8W CF 5%"
R6	013510000	"RES,51 OHM 1/8W 5% TK 0805"
R60	113101	"RES,100 OHM 1/8W CF 5%"
R66	113104	"RES,100K OHM 1/8W CF 5%"
R67	113681	"RES,680 OHM 1/8W CF 5%"
R68	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R69	013223000	"RES, 22K OHM 1/8W 5% TK 0805"
R7	124750	"RES, 75 OHM, 1/4W, 5%, CF"
R71	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R72	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R73	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R74	013223000	"RES, 22K OHM 1/8W 5% TK 0805"
R75	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R76	113471	"RES,470 OHM 1/8W CF 5%"
R77	113103	"RES, 10K OHM 1/8W CF 5%"
R78	113102	"RES, 1K OHM 1/8W CF 5%"
R79	113102	"RES, 1K OHM 1/8W CF 5%"
R8	113681	"RES,680 OHM 1/8W CF 5%"
R80	113100	"RES,10 OHM 1/8W 5% FILM"

**Table 9-2 75 MHz IF Board Parts List (001-00710 Rev. AF)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R81	134151	"RES,150 OHM 1/2W 5% CF"
R83	113101	"RES,100 OHM 1/8W CF 5%"
R85	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R86	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R87	113681	"RES,680 OHM 1/8W CF 5%"
R9	113681	"RES,680 OHM 1/8W CF 5%"
T1	459226	"IND ASSY,2T2T/4T#32 1-490303"
T2	459169	"XFMR,3T3T/2T#32 AWG 1-490303"
U1	033306030	"IC, ERA-2SM+ 6 GHZ AMP WW107"
U10	330100	"IC,7808 VREG 8V 1A 4% TO-220"
U11	310101	"XSTR, NPN QUAD MPQ2222A DIP14"
U2	033306031	"IC, MAV-11BSM+ RF AMP SMT"
U3	033306010	"IC,RF AMP,+12dB,+10dBm,MAR3-SM"
U4	033306010	"IC,RF AMP,+12dB,+10dBm,MAR3-SM"
U5	033306029	"IC,SM,MAR-4SM,MONO AMPLIFIER"
U6	033306010	"IC,RF AMP,+12dB,+10dBm,MAR3-SM"
U7	330273	"IC, 74HC595"
U8	330025	"IC, 78L05 VREG 5V 5% TO-92"
U9	330081	"IC, LM2904 OP-AMP DIP-8"
XF3	361111	"XTAL FILTER,75MHZ,4 POLE"



## Chapter 10: 5 MHz IF Board

### 10.1 Circuit Description

The 5 MHz IF board plugs directly into the motherboard in the third card slot from the right side of the radio. It is connected to the Motherboard through the J5 connector and is used in both transmit and receive paths.

The 5 MHz IF board is powered from +12 Vdc and contains voltage regulation and switching circuitry to generate +8 Vdc, +8 Vdc RX only, and +8 Vdc TX only for internal use on the board. The board contains a decoder/driver and switching circuits that process the incoming serial data from the processor, using different enable lines to turn on the appropriate circuits as needed. For example, BITE EN (J5-7) is the BITE enable line that allows the processor to read the status of the BITE line (J5-17). EN1 (J5-13) tells the decoders to latch in the appropriate input data. NBEN (J5-25) is enabled when the Noise Blanker option (7000NB) is installed. It activates relay K3 which routes 5 MHz IF, in receive only, to and from the Noise Blanker option. NB (J5-10) is the status line for the noise blanker.

#### 10.1.1 Receive Mode

The 75 MHz IF signal is received through coaxial connector J53 and is mixed with the 70 MHz second LO at MX1 to form the second IF at 5 MHz. In standard operation, the RX IF signal is then amplified and applied to the crystal filter where the main receiver selectivity is achieved. If the Noise Blanker option is installed, switch K3 is activated and the 5 MHz signal is routed through J56 to the Noise Blanker board before going through the standard receive path. If the Noise Blanker option is present and selected, the signal is processed and returned through J58 where it then goes through the standard IF process.

The standard crystal filter XF1 is a voice-grade 300 to 2700 Hz, 6-pole filter with a 60 dB bandwidth of 5 kHz. Optional Wideband option XF2 (7000WB1) is available with tailored group delay characteristics, a pass band of 300 to 3300 Hz, and a 60 dB bandwidth of 5.6 kHz. Both filters can be installed simultaneously in the RT7000, with filter selection determined by the front panel mode buttons. An optional CW narrowband (7000CW) is also available with a 500 Hz bandwidth center at 1 kHz.

After filtering, the RX signal is again amplified (U8) and heterodyned with the third LO (BFO) at MX2 to produce baseband audio. The audio is then amplified (U17) and applied to the Audio board through J5-21 (DEMOMA). The demodulated audio is also used as input to the AGC circuit. In this circuit, the AGC threshold is set and the AGC output controls the gain of the IF amplifiers.

### 10.1.2 Transmit Mode

The modulated audio (MODA) is received on the 5 MHz IF board at J5-8 and is applied to the third mixer MX2 (which now functions like a balanced modulator) where it is heterodyned with the BFO. It is then amplified and applied to the crystal filter.

After filtering, the TX signal is amplified (U8) and routed to the second mixer (U1) where it is mixed with the fixed 70 MHz LO and sent to the 75 MHz IF board at J53. If the radio is operating in AME or PCS modes, the carrier is injected on the TX signal immediately before the last amplifier stage.

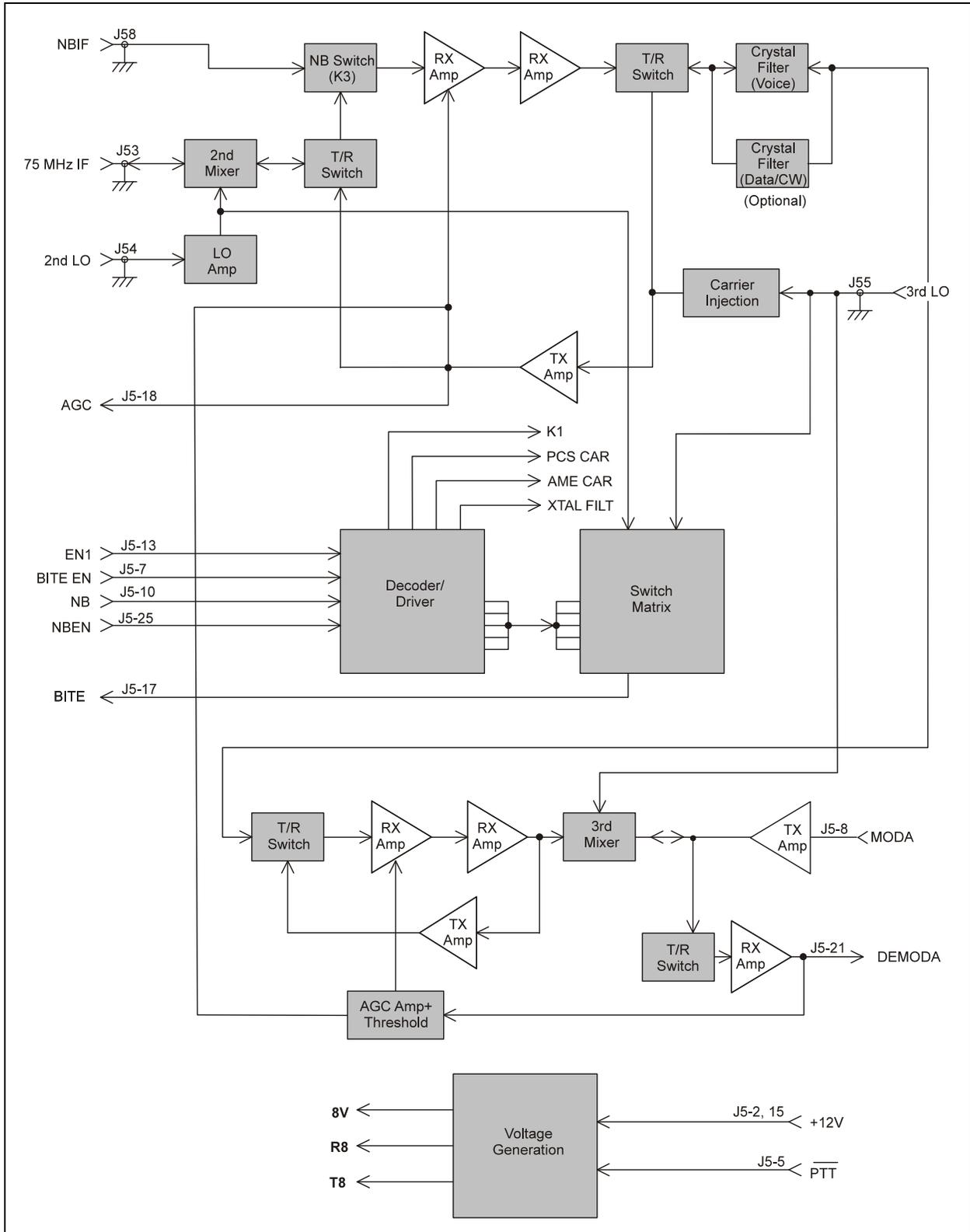


Figure 10-1 5 MHz IF Board Block Diagram

## 10.2 Connector Pin Assignments

For the interconnect lines between the 5 MHz board and the rest of the radio, refer to the table below.

**Table 10-1 J5 Connector Pin Assignments**

Pin	Signal	Description
1, 14	GND	Ground
2, 15	+12V	12 Vdc supply voltage
3	SPIRXD	Serial RX data line
4	SPICLK	SPI serial bus clock
5	PTT	Push-to-talk from the Processor board
6	NC	Not connected
7	BITE ENA	BITE enable input
8	MODA	Modulated audio input
9	NC	Not connected
10	NB/FMTST	Noise blanker status line
13	EN6	Strobe
16	SPITXD	Serial TX data line input
17	BITE	BITE status line output
18	AGC	RX AGC voltage output
19	NC	Not connected
20	NC	Not connected
21	DEMODA	Demodulated audio output
22	NC	Not connected
23	NC	Not connected
24	FM ENA	Not used
25	NB ENA	Enable line to Noise Blanker board

## **10.3 Component Locations, Schematic and Parts List**

This section includes a component location diagram, schematic and parts list for the 5 MHz IF board.

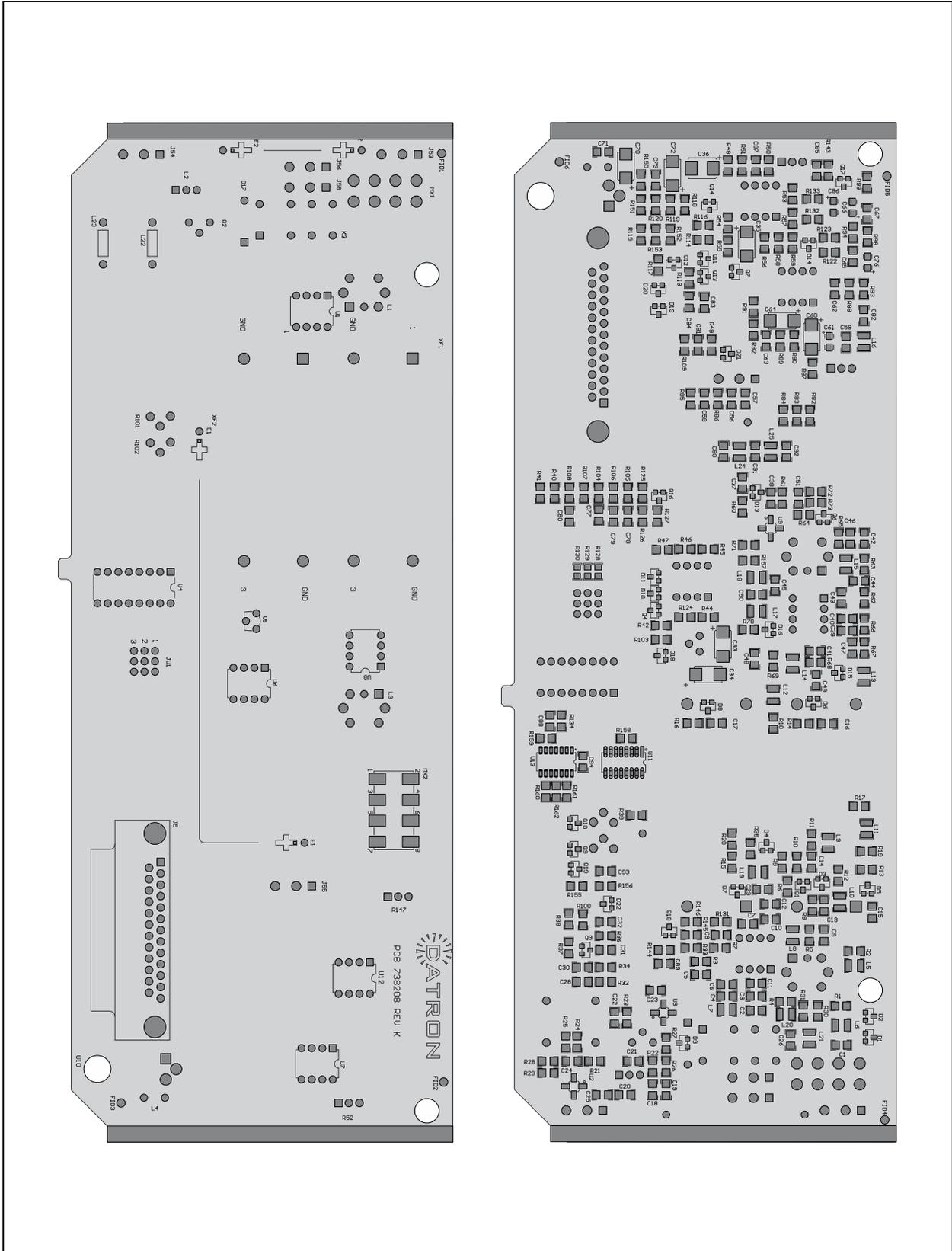
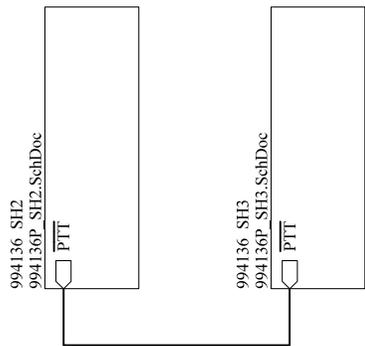


Figure 10-2 5 MHz IF Board Component Locations (738208 Rev. K)



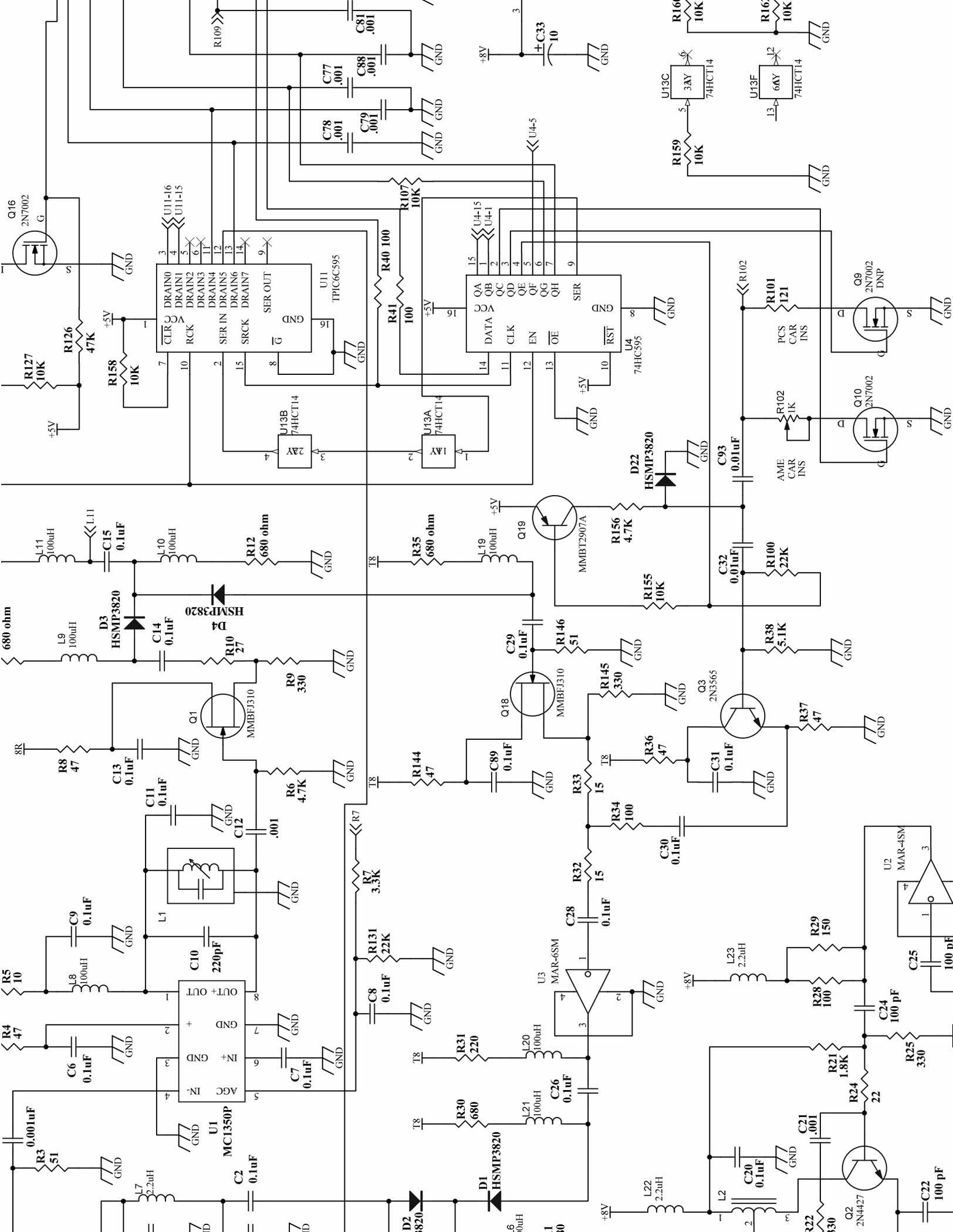
\* Resistor Values for Filter Configuration

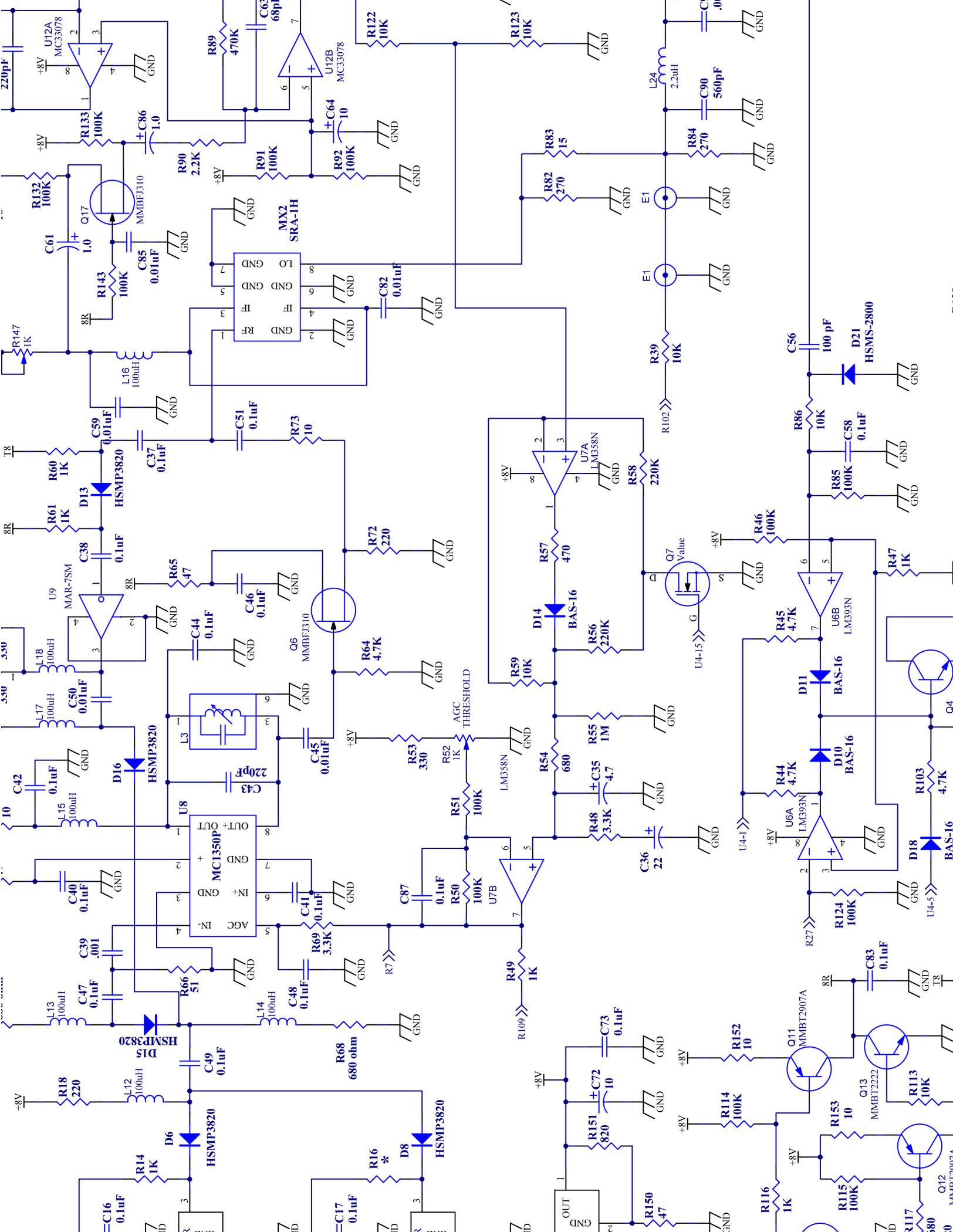
	R128	R129	R130	R15	R16
Standard	1.10K	59K	1.91K	1K	1K
7000CW	1.10K	59K	3.92K	1K	1K
7000WB1	1.10K	59K	1.91K	1K	1K
7000CW1	1.10K	10K	1.91K	100	100

ASSY 001-00800  
PCB 738208

D	VOIDED	J5-13 WAS EN1, REV BITE RE
E	7000-052	U3 WAS MAR-2, R71 WAS A2, R39 WAS 680, R88 WAS 33K.
F	7000-204	DEL FM OPTION ADD TX GAIN
H	VOID	SEE ECN
J	7000-241	SEE ECN
K	99-0069	7000/wb1
L	10-0483	ADD C94 CAP
M	10-0503	R39 WAS 1K - PCS CARRIER A
N	10-0651	ADD C94 U13 R158+R161 CHANGE U11 TO TPIC6C595
P	12-0288	R101 TO 121 OHM

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**Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C10	020221	"CAP, 220PF NP0 50V 10% 1206"
C11	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C12	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C13	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C14	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C15	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C16	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C17	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C18	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C19	020010	"CAP, 1PF, NP0, 50V, 0.25PF, 1206"
C2	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C20	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C21	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C22	020101	"CAP,100PF 100V 5% NP0 1206"
C23	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C24	020101	"CAP,100PF 100V 5% NP0 1206"
C25	020101	"CAP,100PF 100V 5% NP0 1206"
C26	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C28	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C29	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C3	020561	"CAP, 560PF NP0 50V 5% 1206"
C30	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C31	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C32	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C33	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C34	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C35	023047	"CAP, 4.7UF TA 16V 20% 6032"
C36	022226004	"CAP, 22UF TA 16V 10% 6032-28"
C37	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C38	021104	"CAP,.1MF 50V 10% X7R SMT 1206"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
C39	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C4	020561	"CAP, 560PF NP0 50V 5% 1206"
C40	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C41	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C42	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C43	020221	"CAP, 220PF NP0 50V 10% 1206"
C44	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C45	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C46	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C47	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C48	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C49	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C5	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C50	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C51	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C56	020101	"CAP,100PF 100V 5% NP0 1206"
C57	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C58	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C59	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C6	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C60	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C61	022010	"CAP, 1UF TA 16V 10% 1206"
C62	020221	"CAP, 220PF NP0 50V 10% 1206"
C63	020680	"CAP, 68PF, NP0, 50V, 5%, 1206"
C64	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C65	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C66	022010	"CAP, 1UF TA 16V 10% 1206"
C67	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C7	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C70	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C71	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C72	022106001	"CAP,10UF,TA,16V,10%,6032-28"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
C73	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C76	022010	"CAP, 1UF TA 16V 10% 1206"
C77	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C78	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C79	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C8	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C80	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C81	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C82	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C83	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C84	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C85	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C86	022010	"CAP, 1UF TA 16V 10% 1206"
C87	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C88	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C89	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C9	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C90	020561	"CAP, 560PF NP0 50V 5% 1206"
C91	021102	"CAP, 1000PF, X7R, 50V, 10%, 1206"
C92	020561	"CAP, 560PF NP0 50V 5% 1206"
C93	021103	"CAP, 0.01UF, X7R, 50V, 10%, 1206"
C94	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
D1	031005	"DIODE,HSMP-3820 PIN SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D11	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	031005	"DIODE,HSMP-3820 PIN SOT-23"
D14	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D15	031005	"DIODE,HSMP-3820 PIN SOT-23"
D16	031005	"DIODE,HSMP-3820 PIN SOT-23"
D17	320102	"DIODE, 1N4001 1A 50V DO-41"
D18	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D19	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
D2	031005	"DIODE,HSMP-3820 PIN SOT-23"
D20	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D21	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D22	031005	"DIODE,HSMP-3820 PIN SOT-23"
D3	031005	"DIODE,HSMP-3820 PIN SOT-23"
D4	031005	"DIODE,HSMP-3820 PIN SOT-23"
D5	031005	"DIODE,HSMP-3820 PIN SOT-23"
D6	031005	"DIODE,HSMP-3820 PIN SOT-23"
D7	031005	"DIODE,HSMP-3820 PIN SOT-23"
D8	031005	"DIODE,HSMP-3820 PIN SOT-23"
D9	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
E1	769331-1	"SEMI-RIGID CA,5MHZ IF,TW7000"
E2	769331-2	"SEMI-RIGID CA,5MHZ IF,TW7000"
J5	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J53	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J54	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J55	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J56	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J58	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
JU1	614057	"HEADER,9 PIN MALE 3 X 3"
JU1	621105	"MICRO SHUNT, 0.10 IN 1.5A SN"
K3	540073	"RELAY,2PDT MDX-12-01"
L1	420017	INDUCTOR IF 10.7MHZ
L10	045104	"IND,100 UH FR 150MA 10% 1210"
L11	045104	"IND,100 UH FR 150MA 10% 1210"
L12	045104	"IND,100 UH FR 150MA 10% 1210"
L13	045104	"IND,100 UH FR 150MA 10% 1210"
L14	045104	"IND,100 UH FR 150MA 10% 1210"
L15	045104	"IND,100 UH FR 150MA 10% 1210"
L16	045104	"IND,100 UH FR 150MA 10% 1210"
L17	045104	"IND,100 UH FR 150MA 10% 1210"
L18	045104	"IND,100 UH FR 150MA 10% 1210"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
L19	045104	"IND,100 UH FR 150MA 10% 1210"
L2	459242	"XFMR,2T#28 AWG 1-491301"
L20	045104	"IND,100 UH FR 150MA 10% 1210"
L21	045104	"IND,100 UH FR 150MA 10% 1210"
L22	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L23	430031	"IND, 2.2UH, FE, 395MA, 10%, IM-2"
L24	045222	"IND, 2.2UH, FR, 0.32A, 20%, 1210"
L25	045222	"IND, 2.2UH, FR, 0.32A, 20%, 1210"
L3	420017	INDUCTOR IF 10.7MHZ
L4	459032	"IND ASY,3T#30 MAGNET 1-490201"
L5	045104	"IND,100 UH FR 150MA 10% 1210"
L6	045104	"IND,100 UH FR 150MA 10% 1210"
L7	045222	"IND, 2.2UH, FR, 0.32A, 20%, 1210"
L8	045104	"IND,100 UH FR 150MA 10% 1210"
L9	045104	"IND,100 UH FR 150MA 10% 1210"
MX1	380008	"MIXER,SRA-1H +17 DBM"
MX1	843908	"SPACER, PCB FR4, 0.800X.400X.015"
MX2	380007	"MIXER, SCM-1NL 500 MHZ +7DBM"
Q1	032001	"JFET-N,J310, RF AMP, SOT-23"
Q10	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q11	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q12	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q13	032004	"XSTR,MMBT2222A NPN SOT23"
Q14	032004	"XSTR,MMBT2222A NPN SOT23"
Q16	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q17	032001	"JFET-N,J310, RF AMP, SOT-23"
Q18	032001	"JFET-N,J310, RF AMP, SOT-23"
Q19	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q2	310011	"XSTR, 2N4427 NPN RF TO-39"
Q3	032003	"XSTR, MMBTH10LT1 NPN VHF SOT23"
Q4	032004	"XSTR,MMBT2222A NPN SOT23"
Q6	032001	"JFET-N,J310, RF AMP, SOT-23"

**Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
Q7	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q9	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
R1	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R10	013270	"RES,27 OHM 1/8W 5% SMT 1206"
R100	013223	"RES, 22K OHM, 1/4W, 5%, TK, 1206"
R101	1111210	"RES,121 1/8W 1% METAL FILM"
R102	170224	POT 1K 12T 1/4W V-ADJ TH
R103	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R104	013101	"RES,100 OHM 1/4W 5% TK 1206"
R105	013101	"RES,100 OHM 1/4W 5% TK 1206"
R106	013101	"RES,100 OHM 1/4W 5% TK 1206"
R107	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R108	013101	"RES,100 OHM 1/4W 5% TK 1206"
R109	013101	"RES,100 OHM 1/4W 5% TK 1206"
R11	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R113	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R114	013104	"RES,100K OHM 1/4W 5% TK 1206"
R115	013104	"RES,100K OHM 1/4W 5% TK 1206"
R116	013102	"RES,1K OHM 1/4W 5% TK 1206"
R117	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R118	013102	"RES,1K OHM 1/4W 5% TK 1206"
R119	013332	"RES,3,3K 1/8W 5% SMT 1206"
R12	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R120	013332	"RES,3,3K 1/8W 5% SMT 1206"
R122	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R123	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R124	013104	"RES,100K OHM 1/4W 5% TK 1206"
R125	013101	"RES,100 OHM 1/4W 5% TK 1206"
R126	013473	"RES, 47K OHM 1/4W 5% TK 1206"
R127	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R128	013110100	"RES, 1.1K OHM 1/8W 1% TK 0805"
R129	013590200	"RES, 59K OHM 1/8W 1% TK 0805"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
R13	013102	"RES,1K OHM 1/4W 5% TK 1206"
R130	013191100	"RES, 1.91K OHM 1/8W 1% TK 0805"
R131	013223	"RES, 22K OHM, 1/4W, 5%, TK, 1206"
R132	013104	"RES,100K OHM 1/4W 5% TK 1206"
R133	013104	"RES,100K OHM 1/4W 5% TK 1206"
R134	013101	"RES,100 OHM 1/4W 5% TK 1206"
R14	013102	"RES,1K OHM 1/4W 5% TK 1206"
R143	013104	"RES,100K OHM 1/4W 5% TK 1206"
R144	013470	"RES,47 OHM 1/4W 5% TK 1206"
R145	013331	"RES,330 OHM 1/8W 5% SMT 1206"
R146	013510	"RES,51 OHM 1/8W 5% SMT 1206"
R147	170336	"RES, 1K TRIM SIDE ADJ"
R15	013102	"RES,1K OHM 1/4W 5% TK 1206"
R150	013470	"RES,47 OHM 1/4W 5% TK 1206"
R151	013821	"RES,820 OHMS 1/8W 5% SMT 1206"
R152	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R153	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R155	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R156	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R157	013221	"RES,220 OHM 1/4W 5% TK 1206"
R158	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R159	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R16	013102	"RES,1K OHM 1/4W 5% TK 1206"
R160	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R161	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R162	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R17	013221	"RES,220 OHM 1/4W 5% TK 1206"
R18	013221	"RES,220 OHM 1/4W 5% TK 1206"
R19	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R2	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R20	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R21	013182	"RES,1.8K OHM 1/4W 5% TK 1206"

**Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R22	013331	"RES,330 OHM 1/8W 5% SMT 1206"
R23	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R24	013220	"RES,22 OHM 1/8W 5% SMT 1206"
R25	013331	"RES,330 OHM 1/8W 5% SMT 1206"
R26	013471	"RES,470 OHMS 1/8W 5% SMT 1206"
R27	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R28	013101	"RES,100 OHM 1/4W 5% TK 1206"
R29	013151	"RES,150 OHM 1/4W 5% TK 1206"
R3	013510	"RES,51 OHM 1/8W 5% SMT 1206"
R30	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R31	013221	"RES,220 OHM 1/4W 5% TK 1206"
R32	013150	"RES,15 OHM 1/4W 5% TK 1206"
R33	013150	"RES,15 OHM 1/4W 5% TK 1206"
R34	013101	"RES,100 OHM 1/4W 5% TK 1206"
R35	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R36	013470	"RES,47 OHM 1/4W 5% TK 1206"
R37	013470	"RES,47 OHM 1/4W 5% TK 1206"
R38	013512	"RES, 5.1K OHM 1/4W 5% TK 1206"
R39	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R4	013470	"RES,47 OHM 1/4W 5% TK 1206"
R40	013101	"RES,100 OHM 1/4W 5% TK 1206"
R41	013101	"RES,100 OHM 1/4W 5% TK 1206"
R42	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R44	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R45	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R46	013104	"RES,100K OHM 1/4W 5% TK 1206"
R47	013102	"RES,1K OHM 1/4W 5% TK 1206"
R48	013332	"RES,3,3K 1/8W 5% SMT 1206"
R49	013102	"RES,1K OHM 1/4W 5% TK 1206"
R5	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R50	013104	"RES,100K OHM 1/4W 5% TK 1206"
R51	013104	"RES,100K OHM 1/4W 5% TK 1206"

Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)

Designator	Part Number	Description
R52	170336	"RES, 1K TRIM SIDE ADJ"
R53	013331	"RES,330 OHM 1/8W 5% SMT 1206"
R54	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R55	013105	"RES,1M OHM 1/4W 5% TK 1206"
R56	013224	"RES,220K OHM 1/4W 5% TK 1206"
R57	013471	"RES,470 OHMS 1/8W 5% SMT 1206"
R58	013224	"RES,220K OHM 1/4W 5% TK 1206"
R59	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R6	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R60	013102	"RES,1K OHM 1/4W 5% TK 1206"
R61	013102	"RES,1K OHM 1/4W 5% TK 1206"
R62	013470	"RES,47 OHM 1/4W 5% TK 1206"
R63	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R64	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R65	013470	"RES,47 OHM 1/4W 5% TK 1206"
R66	013510	"RES,51 OHM 1/8W 5% SMT 1206"
R67	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R68	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R69	013332	"RES,3,3K 1/8W 5% SMT 1206"
R7	013332	"RES,3,3K 1/8W 5% SMT 1206"
R70	013681	"RES, 680 OHMS 1/4W 5% TK 1206"
R71	013221	"RES,220 OHM 1/4W 5% TK 1206"
R72	013221	"RES,220 OHM 1/4W 5% TK 1206"
R73	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R8	013470	"RES,47 OHM 1/4W 5% TK 1206"
R82	013271	"RES,270 OHM 1/8W 5% SMT 1206"
R83	013150	"RES,15 OHM 1/4W 5% TK 1206"
R84	013271	"RES,270 OHM 1/8W 5% SMT 1206"
R85	013104	"RES,100K OHM 1/4W 5% TK 1206"
R86	013103	"RES, 10K OHM, 1/4W, 5%, TK, 1206"
R87	013151	"RES,150 OHM 1/4W 5% TK 1206"
R88	013223	"RES, 22K OHM, 1/4W, 5%, TK, 1206"

**Table 10-2 5 MHz IF Board Parts List (001-00800 Rev. AM)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R89	013474	"RES,470K 1/8W 5% SMT 1206"
R9	013331	"RES,330 OHM 1/8W 5% SMT 1206"
R90	013222	"RES, 2.2K OHM, 1/4W, 5%, TK, 1206"
R91	013104	"RES,100K OHM 1/4W 5% TK 1206"
R92	013104	"RES,100K OHM 1/4W 5% TK 1206"
R93	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R94	013472	"RES, 4.7K OHM, 1/4W, 5%, TK, 1206"
R98	013101	"RES,100 OHM 1/4W 5% TK 1206"
R99	013101	"RES,100 OHM 1/4W 5% TK 1206"
U1	330009	"IC,LIN,MC1350P,DIP8,IF AMP"
U10	330100	"IC,7808 VREG 8V 1A 4% TO-220"
U11	033087	"IC, TPIC6C595 8-B S/REG SO-16"
U12	330368	"IC, MC33078 DUAL OP-AMP DIP8"
U13	033035	"IC,74HCT14 HEX SCH TRIG SO-14"
U2	033306029	"IC,SM,MAR-4SM,MONO AMPLIFIER"
U3	033306043	"IC, MAR-6SM+ RF AMP SMT"
U4	330273	"IC, 74HC595"
U5	330025	"IC, 78L05 VREG 5V 5% TO-92"
U6	330185	"IC, LM2903 DUAL V-COMPARATOR DIP-8"
U7	330081	"IC, LM2904 OP-AMP DIP-8"
U8	330009	"IC,LIN,MC1350P,DIP8,IF AMP"
U9	380013	"IC, MAR-2SM RF AMP 2GHZ MICRO-X"
XF1	830017	WASHER SEAL
XF1	361088	"CRYSTAL FILTER 5MHZ, STANDARD"



## Chapter 11: Audio Board

### 11.1 Circuit Description

The Audio board is located in the fifth card slot from the right side of the radio. It connects to the Motherboard through connectors J7 and J8, and is used in both receive and transmit paths.

#### 11.1.1 Voltage Regulation

The Audio board operates on a +12 Vdc supply voltage and includes onboard regulators to generate +10 Vdc and +5 Vdc for internal use. Decoder/driver circuits take the serial data control inputs and translate them into binary commands for the TX and RX gates in the board. These gates direct RX and TX audio to the various optional devices installed in the RT7000.

#### 11.1.2 Receive Mode

Demodulated audio from the 5 MHz IF board is applied to the Audio board at (DEMODA) J8 pin 21. It is applied to op amp U8D and passes through the RX CMOS gates. Depending on what options are installed, these gates route the RX audio to the appropriate options or accessory connectors and the commands from the decoder/driver circuits. Primary receiver audio is then applied to op amp U14C, then to the squelch circuit on the Processor board at J8 pin 4 (DSPRRXA).

The squelch circuit on the Processor board samples the audio. If the front panel **SQUELCH** is off, squelch is disabled and squelch gate U13D on the Audio board is always open; if it is on, the squelch gate is controlled by the level and the syllabic nature of the RX audio sampled on the squelch circuit on the Processor board. After processing, squelched audio returns to the Audio board at J8-17 (DSPPRX2). The squelch signal (J8 pin 23) from the processor controls the squelch gate in the Audio board. The squelched audio (SQA) leaves the Audio board at J8 pin 7 and is applied to the internal speaker through the Front Panel Assembly.

Balanced RX audio is sent to accessory 1 at J8 pins 6 and 19. Balanced RX audio is sent to accessory 2 at J8 pins 11 and 24.

### 11.1.3 Transmit Mode

Primary microphone audio (PRIMICA) is received from the front panel at J8 pin 20. Balanced audio from the **ACCESSORY 1** or **ACCESSORY 2** connector is received at J8 pins 5 and 18 and is transformed to unbalanced before being processed like microphone audio. These inputs pass through the TX gating circuits having the same function on the transmit side that the RX gating circuits have on the RX side. The modulated audio output (MODA) is applied to the 5 MHz IF board at J8 pin 8.

The Audio board also includes CW oscillator J16A and B, keyed by the CWKEY line (J8 pin 10). CW tone output is routed through the transmit processing path and goes out as MODA, while a sample of the same tone is connected into the receive path and used for CW sidetone. R99 adjusts the frequency of the CW oscillator.

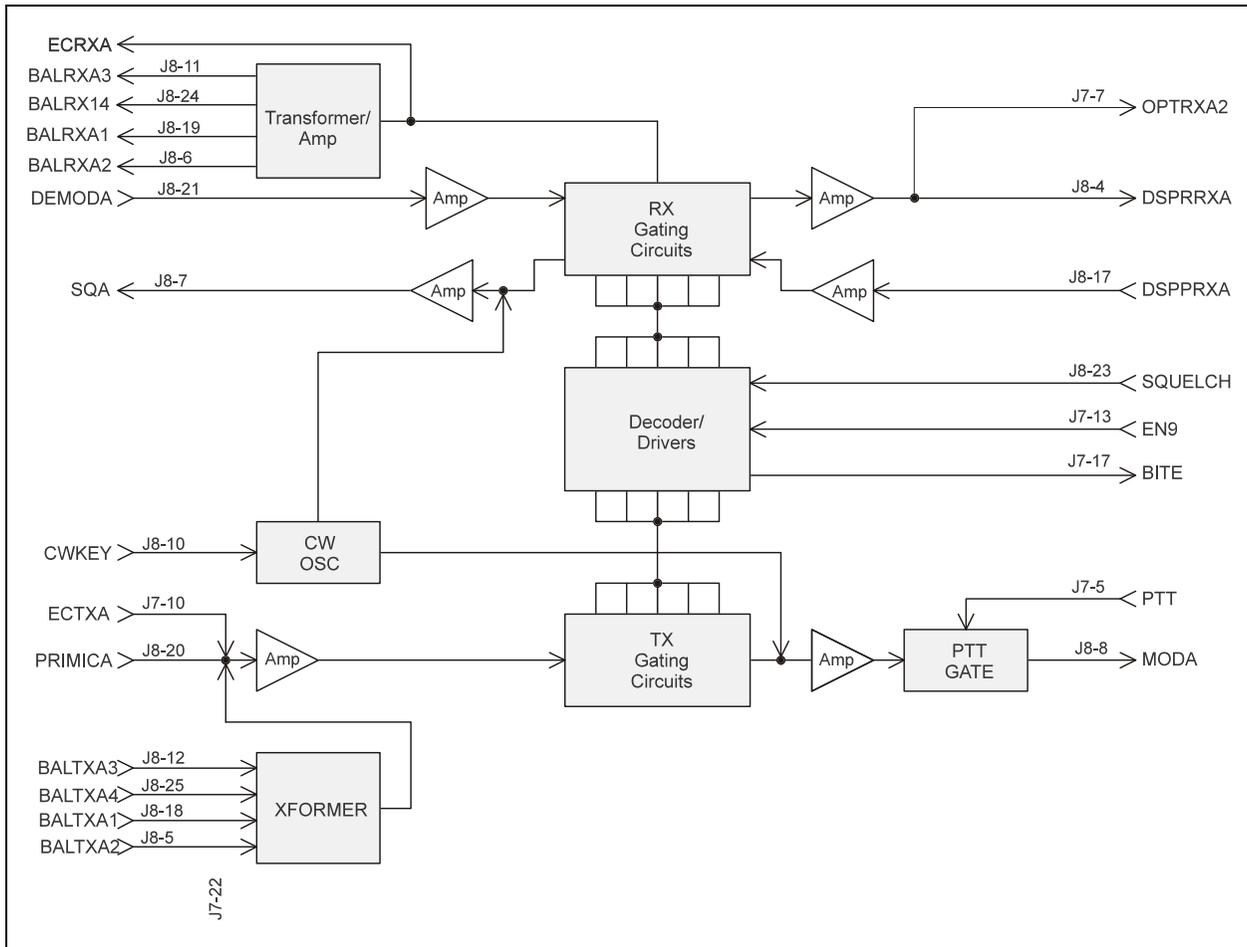


Figure 11-1 Audio Board Block Diagram

## 11.2 Connector Pin Assignments

### 11.2.1 J7 Connector

Table 11-1 provides connections between the Audio board and the rest of the radio.

**Table 11-1 J7 Connector Pin Assignments**

Pin	Signal	Description
1, 14	GND	Ground
2, 15	+12V	+12 Vdc supply voltage
3	SPIRXD	Serial RX data line
4	SPICLK	Clock
5	PTT\	Push-to-talk
6	OPTRXA1	RX audio to option slots
7	OPTRXA2	RX audio to option slots
8	OPTTXA1	TX audio to option slots
9	OPTTXA2	TX audio to option slots
10	ECTXA	TX audio from RCU interface slot
11	ALERXA1	RX audio to ALE option slot
12	ALERXA2	RX audio to ALE option slot
13	EN9	Data enable
16	SPITXD	Serial TX data line
17	BITE\	BITE status line
18	ENCRRXA1	RX audio to encryption slots
19	ENCRRXA2	RX audio to encryption slots
20	ENCRTXA1	TX audio to encryption slots
21	ENCRTXA2	TX audio to encryption slots
22	ECRXA	RX audio to RCU interface slot
23	ALETXA1	TX audio from ALE option slot
24	ALETXA2	TX audio from ALE option slot

### 11.2.2 J8 Connector

J8 connects to the Motherboard.

**Table 11-2 J8 Connector Pin Assignments**

Pin	Signal	Description
1, 14	Ground	
3	DSPRTXA	TX audio out to processor

**Table 11-2 J8 Connector Pin Assignments (Continued)**

<b>Pin</b>	<b>Signal</b>	<b>Description</b>
4	DSPRRXA	RX audio out to processor
5	BALTXA2	Balanced TX audio from <b>ACCESSORY 1</b>
18	BALTXA1	Balanced TX audio from <b>ACCESSORY 1</b>
6	BALRXA2	Balanced RX audio to <b>ACCESSORY 1</b>
19	BALRXA1	Balanced RX audio to <b>ACCESSORY 1</b>
7	SQA	Squelched RX audio output
8	MODA	Modulated TX audio output
9	TCTXAO	Not used
10	CWKEY\	CW key line
11	BALRXA3	Balanced RX audio to <b>ACCESSORY 2</b>
12	BALTXA3	Balanced TX audio from <b>ACCESSORY 2</b>
16	DSPPTXA	TX audio in from processor
17	DSPPRXA	RX audio in from processor
20	PRIMICA	Microphone audio input
21	DEMODA	Demodulated RX audio input
22	TCRXAI	Not used
23	Squelch	Squelch signal from processor
24	BALRXA4	Balanced RX audio to <b>ACCESSORY 2</b>
25	BALTXA4	Balanced TX audio from <b>ACCESSORY 2</b>

## **11.3 Component Locations, Schematic and Parts List**

This section includes a components location diagram, schematic and parts list for the Audio board.

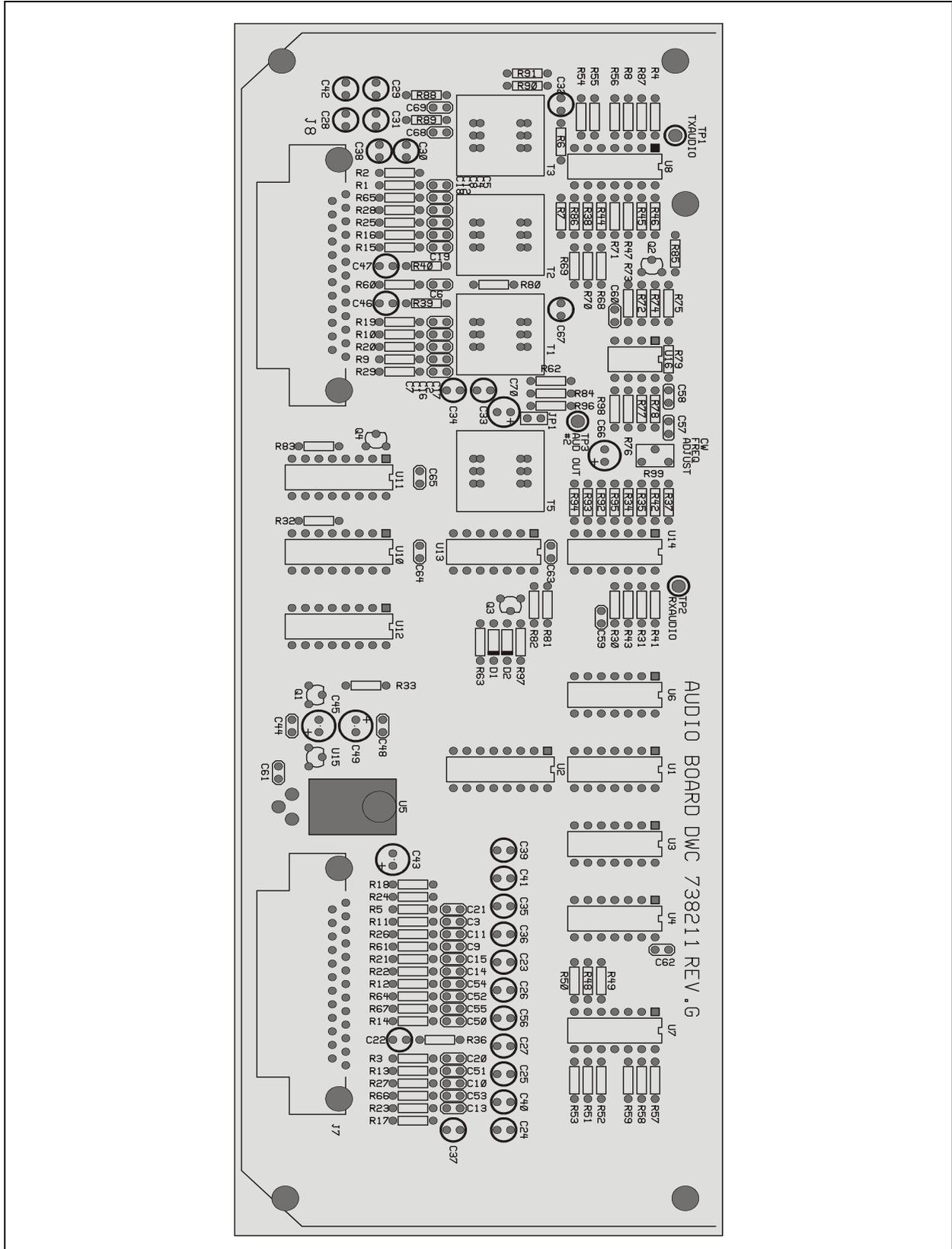
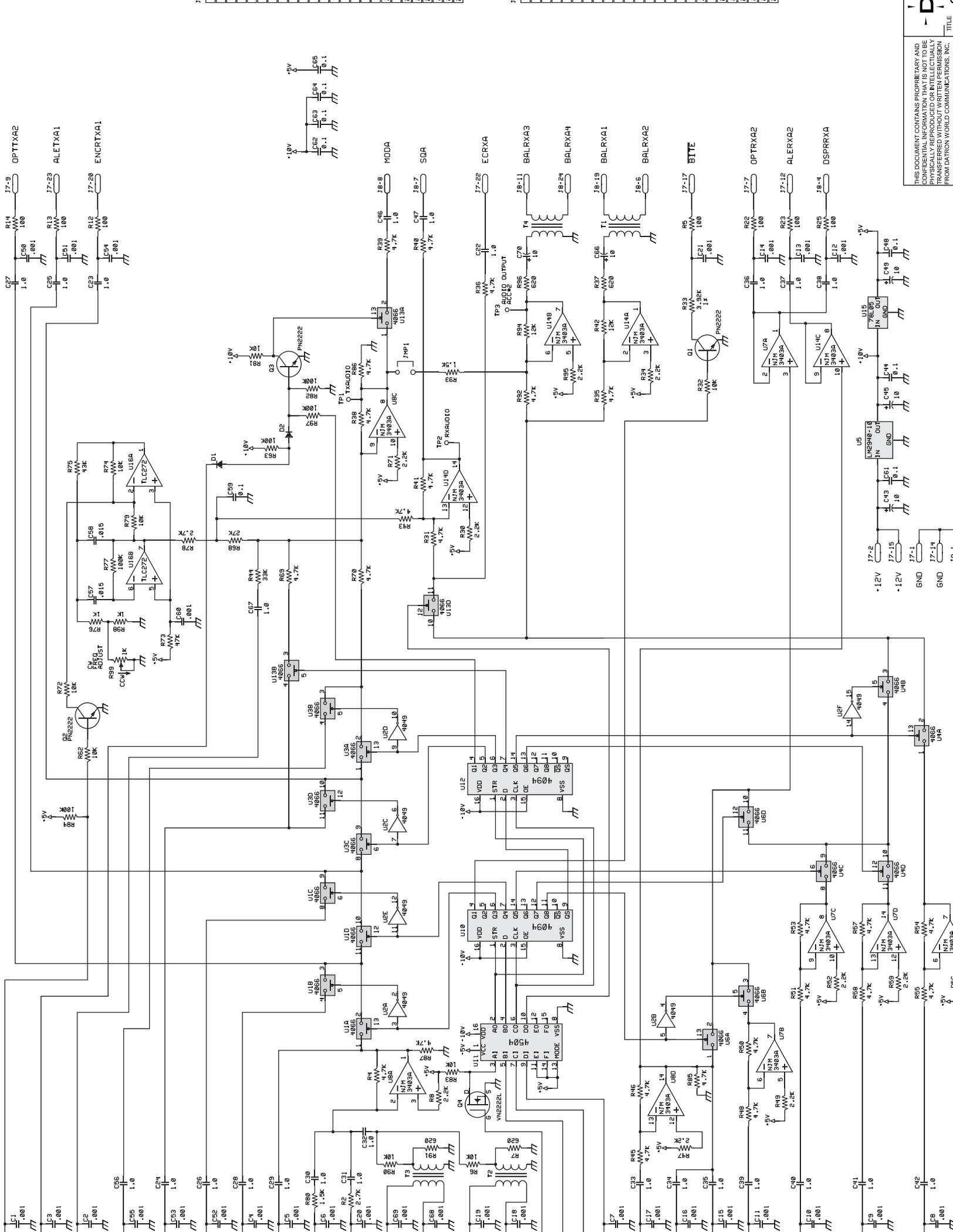


Figure 11-2 Audio Board Component Locations (738211 Rev. G)



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TITLE

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C10	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C11	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C12	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C13	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C14	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C15	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C16	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C17	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C18	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C19	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C2	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C20	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C21	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C22	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C23	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C24	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C25	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C26	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C27	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C28	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C29	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C3	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C30	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C31	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C32	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C33	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C34	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C35	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C36	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C37	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C38	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C39	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C4	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C40	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C41	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C42	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C43	232100	"CAP, 10UF AL 50V 20% 6.3X7X2.5"
C44	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C45	232100	"CAP, 10UF AL 50V 20% 6.3X7X2.5"
C46	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C47	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C48	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C49	232100	"CAP, 10UF AL 50V 20% 6.3X7X2.5"
C5	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C50	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C51	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C52	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C53	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C54	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C55	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C56	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C57	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C58	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C59	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C6	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C60	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C61	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C62	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C63	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C64	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C65	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C66	232100	"CAP, 10UF AL 50V 20% 6.3X7X2.5"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

Designator	Part Number	Description
C67	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C68	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C69	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C7	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C70	232100	"CAP, 10UF AL 50V 20% 6.3X7X2.5"
C8	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C9	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
D1	320002	"DIODE, 1N4148/1N4150 DO-35"
D2	320002	"DIODE, 1N4148/1N4150 DO-35"
J7	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J8	613163	"CONN,DB-25 RT ANGLE PC PLUG"
JP1	650048	"HEADER, PIN 1X2 MLX 0.1 TH"
Q1	310057	"XISTOR,NPN,PN2222A,TO92"
Q2	310057	"XISTOR,NPN,PN2222A,TO92"
Q3	310057	"XISTOR,NPN,PN2222A,TO92"
Q4	310138	"N-MOSFET, VN2222LL, 150MA, 60V, TO92"
R1	113101	"RES,100 OHM 1/8W CF 5%"
R10	113101	"RES,100 OHM 1/8W CF 5%"
R11	113101	"RES,100 OHM 1/8W CF 5%"
R12	113101	"RES,100 OHM 1/8W CF 5%"
R13	113101	"RES,100 OHM 1/8W CF 5%"
R14	113101	"RES,100 OHM 1/8W CF 5%"
R15	113101	"RES,100 OHM 1/8W CF 5%"
R16	113101	"RES,100 OHM 1/8W CF 5%"
R17	113101	"RES,100 OHM 1/8W CF 5%"
R18	113101	"RES,100 OHM 1/8W CF 5%"
R19	113101	"RES,100 OHM 1/8W CF 5%"
R2	113272	"RES,2.7K OHM 1/8W CF 5%"
R20	113101	"RES,100 OHM 1/8W CF 5%"
R21	113101	"RES,100 OHM 1/8W CF 5%"
R22	113101	"RES,100 OHM 1/8W CF 5%"
R23	113101	"RES,100 OHM 1/8W CF 5%"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R24	113101	"RES,100 OHM 1/8W CF 5%"
R25	113101	"RES,100 OHM 1/8W CF 5%"
R26	113101	"RES,100 OHM 1/8W CF 5%"
R27	113101	"RES,100 OHM 1/8W CF 5%"
R28	113101	"RES,100 OHM 1/8W CF 5%"
R29	113101	"RES,100 OHM 1/8W CF 5%"
R3	113101	"RES,100 OHM 1/8W CF 5%"
R30	113222	"RES,2.2K OHM 1/8W CF 5%"
R31	113472	"RES, 4.7K OHM 1/8W CF 5%"
R32	113103	"RES, 10K OHM 1/8W CF 5%"
R33	1113921	"RES, 3.92K OHMS 1/8W 1% MF"
R34	113222	"RES,2.2K OHM 1/8W CF 5%"
R35	113472	"RES, 4.7K OHM 1/8W CF 5%"
R36	113472	"RES, 4.7K OHM 1/8W CF 5%"
R37	113621	"RES,620 OHM 1/8W CF 5%"
R38	113472	"RES, 4.7K OHM 1/8W CF 5%"
R39	113472	"RES, 4.7K OHM 1/8W CF 5%"
R4	113472	"RES, 4.7K OHM 1/8W CF 5%"
R40	113472	"RES, 4.7K OHM 1/8W CF 5%"
R41	113472	"RES, 4.7K OHM 1/8W CF 5%"
R42	113123	"RES,12K OHM 1/8W CF 5%"
R43	113472	"RES, 4.7K OHM 1/8W CF 5%"
R44	113333	"RES,33K OHM 1/8W CF 5%"
R45	113472	"RES, 4.7K OHM 1/8W CF 5%"
R46	113472	"RES, 4.7K OHM 1/8W CF 5%"
R47	113222	"RES,2.2K OHM 1/8W CF 5%"
R48	113472	"RES, 4.7K OHM 1/8W CF 5%"
R49	113222	"RES,2.2K OHM 1/8W CF 5%"
R5	113101	"RES,100 OHM 1/8W CF 5%"
R50	113472	"RES, 4.7K OHM 1/8W CF 5%"
R51	113472	"RES, 4.7K OHM 1/8W CF 5%"
R52	113222	"RES,2.2K OHM 1/8W CF 5%"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R53	113472	"RES, 4.7K OHM 1/8W CF 5%"
R54	113472	"RES, 4.7K OHM 1/8W CF 5%"
R55	113472	"RES, 4.7K OHM 1/8W CF 5%"
R56	113222	"RES,2.2K OHM 1/8W CF 5%"
R57	113472	"RES, 4.7K OHM 1/8W CF 5%"
R58	113472	"RES, 4.7K OHM 1/8W CF 5%"
R59	113222	"RES,2.2K OHM 1/8W CF 5%"
R6	113103	"RES, 10K OHM 1/8W CF 5%"
R60	113101	"RES,100 OHM 1/8W CF 5%"
R61	113101	"RES,100 OHM 1/8W CF 5%"
R62	113103	"RES, 10K OHM 1/8W CF 5%"
R63	113104	"RES,100K OHM 1/8W CF 5%"
R64	113101	"RES,100 OHM 1/8W CF 5%"
R65	113101	"RES,100 OHM 1/8W CF 5%"
R66	113101	"RES,100 OHM 1/8W CF 5%"
R67	113101	"RES,100 OHM 1/8W CF 5%"
R68	113273	"RES,27K OHM 1/8W CF 5%"
R69	113472	"RES, 4.7K OHM 1/8W CF 5%"
R7	113621	"RES,620 OHM 1/8W CF 5%"
R70	113472	"RES, 4.7K OHM 1/8W CF 5%"
R71	113222	"RES,2.2K OHM 1/8W CF 5%"
R72	113103	"RES, 10K OHM 1/8W CF 5%"
R73	113473	"RES, 47K OHM 1/8W CF 5%"
R74	113103	"RES, 10K OHM 1/8W CF 5%"
R75	113433	"RES,43K 1/8W 5% CARBON FILM"
R76	113102	"RES, 1K OHM 1/8W CF 5%"
R77	113104	"RES,100K OHM 1/8W CF 5%"
R78	113272	"RES,2.7K OHM 1/8W CF 5%"
R79	113103	"RES, 10K OHM 1/8W CF 5%"
R8	113222	"RES,2.2K OHM 1/8W CF 5%"
R80	113152	"RES,1.5K OHM 1/8W CF 5%"
R81	113103	"RES, 10K OHM 1/8W CF 5%"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R82	113104	"RES,100K OHM 1/8W CF 5%"
R83	113103	"RES, 10K OHM 1/8W CF 5%"
R84	113104	"RES,100K OHM 1/8W CF 5%"
R85	113472	"RES, 4.7K OHM 1/8W CF 5%"
R86	113472	"RES, 4.7K OHM 1/8W CF 5%"
R87	113472	"RES, 4.7K OHM 1/8W CF 5%"
R88	113101	"RES,100 OHM 1/8W CF 5%"
R89	113101	"RES,100 OHM 1/8W CF 5%"
R9	113101	"RES,100 OHM 1/8W CF 5%"
R90	113103	"RES, 10K OHM 1/8W CF 5%"
R91	113621	"RES,620 OHM 1/8W CF 5%"
R92	113472	"RES, 4.7K OHM 1/8W CF 5%"
R93	113152	"RES,1.5K OHM 1/8W CF 5%"
R94	113123	"RES,12K OHM 1/8W CF 5%"
R95	113222	"RES,2.2K OHM 1/8W CF 5%"
R96	113621	"RES,620 OHM 1/8W CF 5%"
R97	113104	"RES,100K OHM 1/8W CF 5%"
R98	113102	"RES, 1K OHM 1/8W CF 5%"
R99	170345	"RES,1K TRIM SIDE ADJ"
T1	410019	"XFMR, AUDIO MINI 600CT - 600CT"
T2	410019	"XFMR, AUDIO MINI 600CT - 600CT"
T3	410019	"XFMR, AUDIO MINI 600CT - 600CT"
T5	410019	"XFMR, AUDIO MINI 600CT - 600CT"
TP1	860083	TERMINAL TURRET
TP2	860083	TERMINAL TURRET
TP3	860083	TERMINAL TURRET
U1	330074	"IC,DIG,CD4066BE,DIP14,ANALOGSW"
U10	330126	"IC,4094B 8-STG SHIFT REG DIP16"
U11	330395	"IC, MC14504B HEX LEVEL SHIFTER DIP16"
U12	330126	"IC,4094B 8-STG SHIFT REG DIP16"
U13	330074	"IC,DIG,CD4066BE,DIP14,ANALOGSW"
U14	330515	"IC, MC3307 QUAD OP AMP DIP14"

**Table 11-3 Audio Board Parts List (001-00600 Rev. AA)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
U15	330025	"IC, 78L05 VREG 5V 5% TO-92"
U16	330163	"IC, TLC272IP DUAL OP-AMP DIP8"
U2	330080	"IC, 4049B HEX INV BUFFER DIP16"
U3	330074	"IC, DIG, CD4066BE, DIP14, ANALOGSW"
U4	330074	"IC, DIG, CD4066BE, DIP14, ANALOGSW"
U5	330396	"IC, LM2940-10 VREG 10V 1A TO220"
U6	330074	"IC, DIG, CD4066BE, DIP14, ANALOGSW"
U7	330515	"IC, MC3307 QUAD OP AMP DIP14"
U8	330515	"IC, MC3307 QUAD OP AMP DIP14"





## Chapter 12: Front Panel Assembly

### 12.1 Circuit Description

The Front Panel Assembly consists of the front panel and four boards: Front Panel Processor, Keypad, LCD/Driver, and Switch. It connects to the main body of the radio by a single ribbon cable attached to connector J1.

Figure 12-1 on page 12-3 provides a block diagram of the interconnections between the Front Panel Processor board and the Motherboard.

#### 12.1.1 Front Panel Processor Board

The Front Panel Processor board provides direct electrical connections to the speaker (J5), microphone connectors (J9, J10), mode (J19), status (J14), function (J15), clarifier (J8), volume control (J7), lite (J16), source power (J12), and the Motherboard (J1). The board's main function is to process front panel commands, and interact with the processor on the Processor board. It also provides the TX and RX paths for the front panel audio. Transmit audio is received on pin 4 of either of the two microphone connectors and is applied to voice operated gain adjusting device (VOGAD) U17 (includes speech compression), then output to the Audio board as PRIMICA (J1 pin 25). The RX audio is received on the Front Panel Processor board on J pin 30 as SQA and is routed to the top of the volume control (J7 pin 3). It is then attenuated using the front panel **VOL** control knob and output on the wiper of the control (J7 pin 4) to audio amplifier U14 before going to front panel audio connectors J9 and J10, pin 2 (handset audio). It also is routed to the speaker disable circuit before going to both the speaker (J5 pin 2) and to the motherboard connector (J1 pin 27).

Parity tree U5 monitors the PTT, CW, clarifier, and keypad. Any change of status in one of these inputs causes the output at pin 9 to change its state. Monostable vibrator U4 is configured as a one shot; it outputs a 20 ms pulse when there is an input change. The output goes to Q1 that is connected to the interrupt line (IRQ) (pin-2) of processor U13. U16 provides power on/off conditioning for the processor. Y1 (2.3576 MHz) is the crystal for the internal clock of the processor (OSC1 and OSC2). PD0 through PD7 are SPI serial data ports. The processor updates the LCD and sends commands to the radio as required.

When a key on the front panel keypad is pressed, a row column gets crossed and a connection is made. This causes a pulse to come out of U12 pin 3. The pulse then stops the keypad scanning oscillator U19C. The oscillator drives counter U9 which is scanning the rows and columns. When keypad scanning stops, U10 records the count which corresponds to a unique key. After reading the key, the processor restarts the scanning loop by toggling U3 pin 7. U2 is a parallel to serial chip, and jumpers J11 configure the front panel. This configuration is read by the processor on power up. The function of J11 jumpers are as follows:

<b>Jumper</b>	<b>Functions</b>	<b>Default Position</b>
1.	All function lockout	Off
2.	Frequency change lockout	Off
3.	Frequency display lockout	Off
4.	Mode change lockout	Off
5.	Power change lockout	Off
6.	PTT lockout	Off
7.	CW lockout	Off
8.	RT7000 lockout	On
9.	No function assigned	N/A
10.	No function assigned	N/A



## 12.2 Connector Pin Assignments

### 12.2.1 J1 Connector

J1 connects to the Motherboard.

**Table 12-1 J1 Connector Pin Assignments**

Pin	Signal	Description
1, 2	GND	Ground
3, 4	+12V UNREG	+12 Vdc unregulated supply voltage
5	PB7	Data bus line for display drivers
6	PB6	Data bus line for display drivers
7	PB5	Data bus line for display drivers
8	PB4	Data bus line for display drivers
9	PB3	Data bus line for display drivers
10	PB2	Data bus line for display drivers
11	PB1	Data bus line for display drivers
12	PB0	Data bus line for display drivers
13	FPCWKEY	Front panel CW key line
14	FPCWA	Front panel CW audio
15	FPWSP1	Front panel spare
16	FPPTT	Front panel PTT
17	FPSPITXD	Front panel serial TX data
18	FPSPIRXD	Front panel serial RX data
19	FPSPICKL	Front panel serial clock
20	FPBITE	Front panel BITE
21	ENA	Enable
22	FPWSP2	Front panel spare
23	DHSLMSEL	DHSL
24	FPTCALM	Not used
25	PRIMICA	Microphone audio output
26	PWRON	Power on/off switch status
27	EXTSPKR	Speaker RX audio
28	CWKEY	CW key line
29	MODEM EN	Modem enable
30	SQA	Squelched RX audio output

**Table 12-1 J1 Connector Pin Assignments (Continued)**

Pin	Signal	Description
31	FPRXD	Front panel RX data
32	FPTXD	Front panel TX data
33	FPSP1	Front panel spare
34	EXAUDPTT	External audio PTT

**12.2.2 J3 Connector**

J3 connects to the Display board.

**Table 12-2 Front Panel Interconnections to Display**

Pin	Signal	Description
1	PB0	Display driver data bus
2	PB1	Display driver data bus
3	PB2	Display driver data bus
4	PB3	Display driver data bus
5	PB4	Display driver data bus
6	PB5	Display driver data bus
7	PB6	Display driver data bus
8	PB7	Display driver data bus
9	5V	+5 Vdc supply voltage
10	GND	Ground
11	BKLT1	Backlight 1 signal
12	BKLT2	Backlight 2 signal

**12.2.3 J4 Connector**

J4 connects to the Display board.

**Table 12-3 J4 Connector Pin Assignments**

Pin	Signal	Description
1	SYNC	Not used
2	WE	Write enable
3	RE	Read enable
4	READY	Not used
5	+12V	Heater
6	CS2	Chip select 2

**Table 12-3 J4 Connector Pin Assignments (Continued)**

Pin	Signal	Description
7	CS1	Chip select 1
8	SPITXD	Serial peripheral interface
9	CLKDIS	Not used
10	HEATER SW	Not used
11	SENSE 1	Not used
12	CONTRAST	Not used

**12.2.4 J6 Connector**

J6 connects to the front panel keypad.

**Table 12-4 J6 Connector Pin Assignments**

Pin	Signal	Description
1	C0	Column 0 switch matrix data
2	C1	Column 1 switch matrix data
3	C2	Column 2 switch matrix data
4	C3	Column 3 switch matrix data
5	C4	Column 4 switch matrix data
6	C5	Column 5 switch matrix data
7	C6	Column 6 switch matrix data
8	C7	Column 7 switch matrix data
9	R0	Row 0 switch matrix data
10	R1	Row 1 switch matrix data
11	R2	Row 2 switch matrix data
12	R3	Row 3 switch matrix data
13	R4	Row 4 switch matrix data
14	R5	Row 5 switch matrix data
15	R6	Row 6 switch matrix data

**12.2.5 J7 Connector**

J7 connects to the front panel

**Table 12-5 J7 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground

**Table 12-5 J7 Connector Pin Assignments (Continued)**

Pin	Signal	Description
2	PWRON	Power switch status (ground when on)
3	SQA	Squelched RX audio, top of volume pot
4	VOL CTRL	Volume-controlled RX audio (wiper of volume pot)
5	GND	Ground

**12.2.6 J8 Connector**

J8 connects to the front panel **CLARIFIER** switch.

**Table 12-6 J8 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	CLAR CTRL A	Clarifier control A
3	CLAR CTRL B	Clarifier control B
4	CLAR SW A	Clarifier switch A
5	CLAR SW B	Clarifier switch B

**12.2.7 J9, J12 Connectors**

J9 and J12 connect to the front panel audio connectors.

**Table 12-7 J9, J12 Connector Pin Assignments**

Pin	Signal	Description
1	GND	Ground
2	HNDST AUDIO	Handset audio
3	PTT	PTT
4	MIC AUDIO	Microphone audio
5	CW	CW key
6	12V	+12V

**12.3 Component Locations, Schematics and Parts List**

This section includes a component locations diagram, schematic and parts list for the Front Panel Assembly.

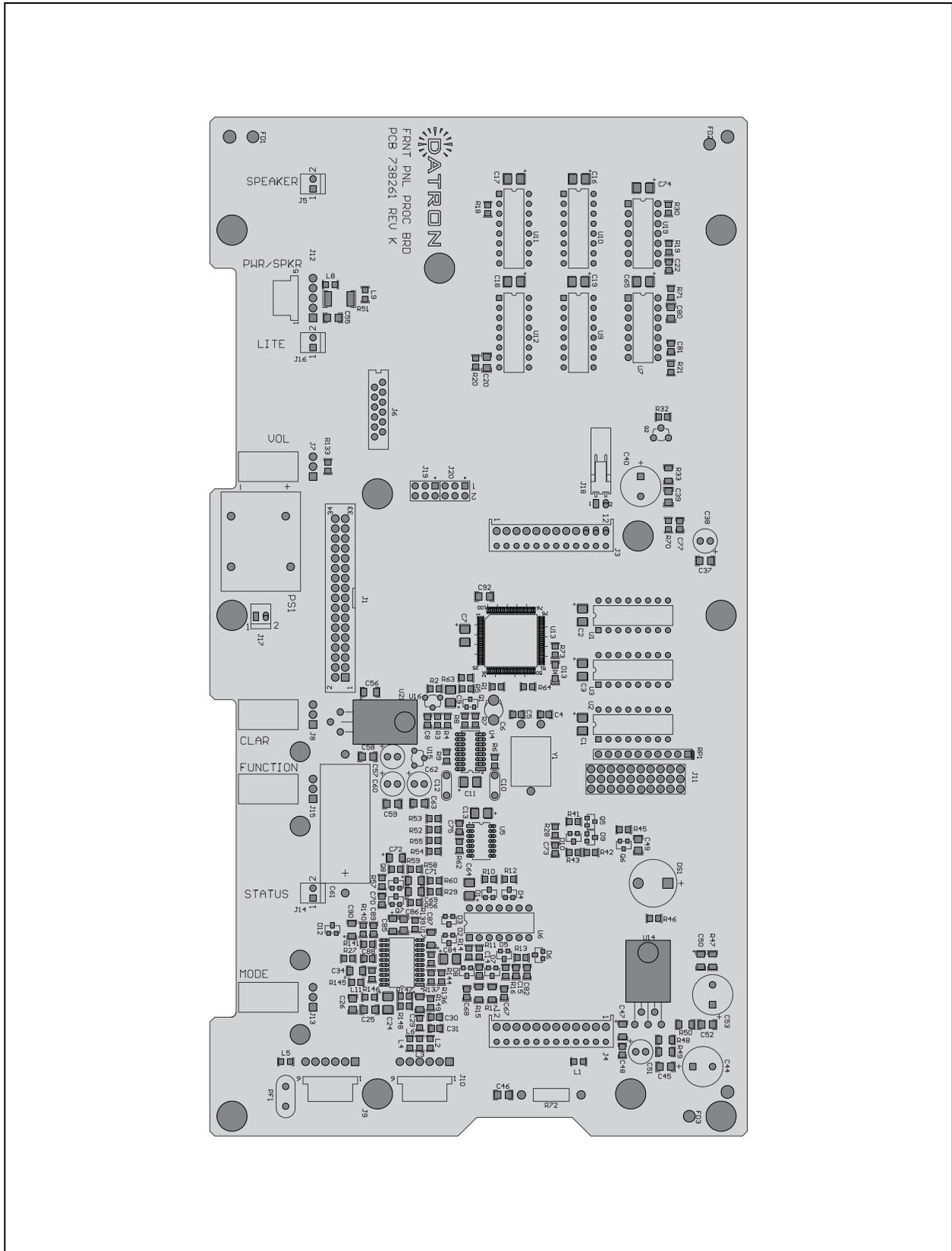


Figure 12-2 Front Panel Assembly Component Locations (738261 Rev. K)



Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)

Designator	Part Number	Description
C1	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C10	254223	"CAP, 0.022UF POLY 100V 5% 5LS"
C11	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C12	254223	"CAP, 0.022UF POLY 100V 5% 5LS"
C13	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C14	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C15	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C16	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C17	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C18	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C19	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C2	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C20	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C22	021121000	CAP 120PF NPO 100V 5% 0805
C24	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C25	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C26	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C29	022106003	"CAP, TA 10UF 16V 20% 3216"
C3	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C30	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C31	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C34	022106003	"CAP, TA 10UF 16V 20% 3216"
C37	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C38	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C39	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C4	021270000	"CAP, 27PF NPO 100V 5% 0805"
C40	231471	"CAP, 470UF AL 16V 20% 10X12.5X5"
C44	231471	"CAP, 470UF AL 16V 20% 10X12.5X5"
C45	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C46	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C47	022106003	"CAP, TA 10UF 16V 20% 3216"

**Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C48	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C49	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C5	021270000	"CAP, 27PF NPO 100V 5% 0805"
C50	022105002	"CAP, 1UF TA 35V 10% 3216"
C51	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C52	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C53	231471	"CAP, 470UF AL 16V 20% 10X12.5X5"
C55	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C56	022475001	"CAP, 4.7UF TA 25V 10% 3216"
C57	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C58	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C59	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C6	DNP	"NULL PART, VACANT PCB LOCATION"
C60	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C61	230202	"CAP, 2200UF AL 16V 20% AX 13X26"
C62	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C63	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
C64	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C65	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C67	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C68	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C69	022106003	"CAP, TA 10UF 16V 20% 3216"
C7	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C70	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C71	022106003	"CAP, TA 10UF 16V 20% 3216"
C72	022106003	"CAP, TA 10UF 16V 20% 3216"
C73	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C74	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C75	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C77	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C8	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C80	021104	"CAP,.1MF 50V 10% X7R SMT 1206"

Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)

Designator	Part Number	Description
C81	021102002	"CAP, 1000PF X7R 50V 10% 0805"
C82	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C84	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C85	022106003	"CAP, TA 10UF 16V 20% 3216"
C86	021475002	"CAP, 4.7UF X5R 25V 10% 1206"
C87	022106003	"CAP, TA 10UF 16V 20% 3216"
C88	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C89	021270000	"CAP, 27PF NPO 100V 5% 0805"
C9	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C90	022106003	"CAP, TA 10UF 16V 20% 3216"
C92	021104	"CAP,.1MF 50V 10% X7R SMT 1206"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D12	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	035500002	"LED, GREEN TOP-V 1206"
D2	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D8	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D9	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
DS1	710104	"BUZZER,MICRO"
J1	004-00141	"CA ASSY, RT7000 RIBBON CABLE"
J10	610245	"HEADER,MLX,6PIN,.100,RTANG,W/L"
J11	614017	"HEADER,30 PIN MALE 3 X 10"
J12	610218	"HEADER,MLX,5PIN,.100,RT ANG"
J13	610163	"HEADER,MLX,3PIN,.100,RT ANG"
J14	610105	"HEADER, 1X2 W/LB-LOCK 0.1 TH"
J15	610163	"HEADER,MLX,3PIN,.100,RT ANG"
J16	610105	"HEADER, 1X2 W/LB-LOCK 0.1 TH"

**Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)**

Designator	Part Number	Description
J17	DNP	"NULL PART, VACANT PCB LOCATION"
J18	DNP	"NULL PART, VACANT PCB LOCATION"
J19	620073	"HEADER, 2X3 MLX 0.1 STR"
J20	DNP	"NULL PART, VACANT PCB LOCATION"
J3	613155	"CONN,BOTTOM ENTRY,12 PIN,GOLD"
J4	613155	"CONN,BOTTOM ENTRY,12 PIN,GOLD"
J5	610105	"HEADER, 1X2 W/LB-LOCK 0.1 TH"
J6	610623	CONN 21FF-FFC 12 CONTACT ST
J7	610163	"HEADER,MLX,3PIN,.100,RT ANG"
J8	610163	"HEADER,MLX,3PIN,.100,RT ANG"
J9	610245	"HEADER,MLX,6PIN,.100,RTANG,W/L"
L1	045000000	BEAD FERRITE Z=600 0.2A 0805
L11	045000000	BEAD FERRITE Z=600 0.2A 0805
L2	045000000	BEAD FERRITE Z=600 0.2A 0805
L3	045000000	BEAD FERRITE Z=600 0.2A 0805
L4	045000000	BEAD FERRITE Z=600 0.2A 0805
L5	045000000	BEAD FERRITE Z=600 0.2A 0805
L6	045000000	BEAD FERRITE Z=600 0.2A 0805
L8	045000000	BEAD FERRITE Z=600 0.2A 0805
L9	045000000	BEAD FERRITE Z=600 0.2A 0805
PF1	550042	"FUSE,POLY RESISTOR 1.4 AMPS"
PS1	702118	"EL DRIVER,12V IN,100VRMS OUT"
Q1	032004	"XSTR,MMBT2222A NPN SOT23"
Q2	310138	"XISTOR,N-CHANNEL MOSFET,VN2222L,TO92"
Q5	032004	"XSTR,MMBT2222A NPN SOT23"
Q6	032004	"XSTR,MMBT2222A NPN SOT23"
Q7	032001	"JFET-N,J310, RF AMP, SOT-23"
Q8	032001	"JFET-N,J310, RF AMP, SOT-23"
R1	013105000	"RES,1M OHM 1/8W 5% TK 0805"
R10	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R11	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R12	013473000	"RES,47K OHM 1/8W 5% TK 0805"

Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)

Designator	Part Number	Description
R13	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R133	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R136	013680100	"RES, 6.8K OHM 1/8W 1% TK 0805"
R137	013203001	"RES, 20K OHM 1/8W 1% TK 0805"
R139	013105000	"RES,1M OHM 1/8W 5% TK 0805"
R14	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R140	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R141	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R144	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R145	013110200	"RES, 11K OHM 1/8W 1% TK 0805"
R146	013768100	"RES, 7.68K OHM 1/8W 1% TK 0805"
R147	013768100	"RES, 7.68K OHM 1/8W 1% TK 0805"
R148	013110200	"RES, 11K OHM 1/8W 1% TK 0805"
R149	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R15	013471	"RES,470 OHMS 1/8W 5% SMT 1206"
R16	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R17	013471	"RES,470 OHMS 1/8W 5% SMT 1206"
R18	013221000	"RES,220 OHM 1/8W 1% TK 0805"
R19	013154000	"RES,150K OHM 1/8W 5% TK 0805"
R2	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R20	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R21	013474000	RES SM CF 470K 0.1W 5% 0805
R27	013474000	RES SM CF 470K 0.1W 5% 0805
R28	013474000	RES SM CF 470K 0.1W 5% 0805
R29	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R3	013203500	"RES,20K OHM 1/8W 5% TK 0805"
R30	013474000	RES SM CF 470K 0.1W 5% 0805
R32	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R33	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R4	013182200	"RES, 18.2K OHM 1/8W 1% TK 0805"
R41	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R42	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"

**Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R43	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R45	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R46	013221000	"RES,220 OHM 1/8W 1% TK 0805"
R47	014022000	"RES,SM,TK,2.2,1/4W,5%,1206"
R48	013221	"RES,220 OHM 1/4W 5% TK 1206"
R49	013100	"RES, 10 OHM 1/4W 5% TK 1206"
R5	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R50	013101	"RES,100 OHM 1/4W 5% TK 1206"
R51	018470000	"RES,47 OHM 1W 5% TK 2512"
R52	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R53	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R54	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R55	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R56	013474000	RES SM CF 470K 0.1W 5% 0805
R57	013474000	RES SM CF 470K 0.1W 5% 0805
R58	013474000	RES SM CF 470K 0.1W 5% 0805
R59	013474000	RES SM CF 470K 0.1W 5% 0805
R6	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R60	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R62	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R63	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R64	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R7	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R70	013474000	RES SM CF 470K 0.1W 5% 0805
R71	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R72	134015	"RES,1.5 OHM 1/2W 5% CF"
R73	013301100	"RES, 3.01K OHM 1/8W 1% TK 0805"
R8	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R9	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
RP1	182002	"R-NET, 100K X 9 BUSS 2% TK SIP10"
U1	330348	"IC, 74HC259N 8-BIT LATCH DIP16"
U10	330381	"IC, 74HC589 8-BIT SIPO 3-S DIP16"

**Table 12-8 Front Panel Assembly Parts List (004-01110 Rev. AH)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
U11	330194	IC CD4051BE
U12	330194	IC CD4051BE
U13	033301015	"IC,MCU AVR 64K FLASH 100-TQFP"
U14	330043	"IC, TDA2003AH 10W AUDIO AMP TO220"
U15	330025	"IC, 78L05 VREG 5V 5% TO-92"
U16	330341	"IC,RE5LV21 V-DET 2.1V 3% TO92"
U17	033304160	"IC, SA575 COMPANDOR SO20"
U19	330342	"IC,4093B,QD 2-I SCH-NAND,DIP14"
U2	330349	"IC, 74HC251N 1-8 MUX 3-S DIP16"
U21	330002	"IC, LM2940-12 VREG 12V 1A TO220"
U3	330380	"IC,74HC137"
U4	033013	"IC, MC14528BD DUAL M-VIB S016"
U5	033303197	"IC, 74HC280 9-B PARITY SO14"
U6	330342	"IC,4093B,QD 2-I SCH-NAND,DIP14"
U7	330040	"IC, CD4013 DUAL-D F-F DIP14"
U9	330057	"IC, CD4520BE DUAL BIN CNTR DIP16"
Y1	361085	"XTAL, 2.4576 MHZ XT HC-49/U"

## 12.4 Keypad and Switch Matrix

The front panel keypad and switch matrix (one assembly) mount directly onto the front panel. The ribbon cable plugs into J6 on the Front Panel Processor board.

Figure 12-4 below shows the connections from any key on the keypad to J6. For example the **TUNE** key connects to row R5 and column C1, pins 2 and 14 on J6 (refer to Table 12-4 on page 12-6).

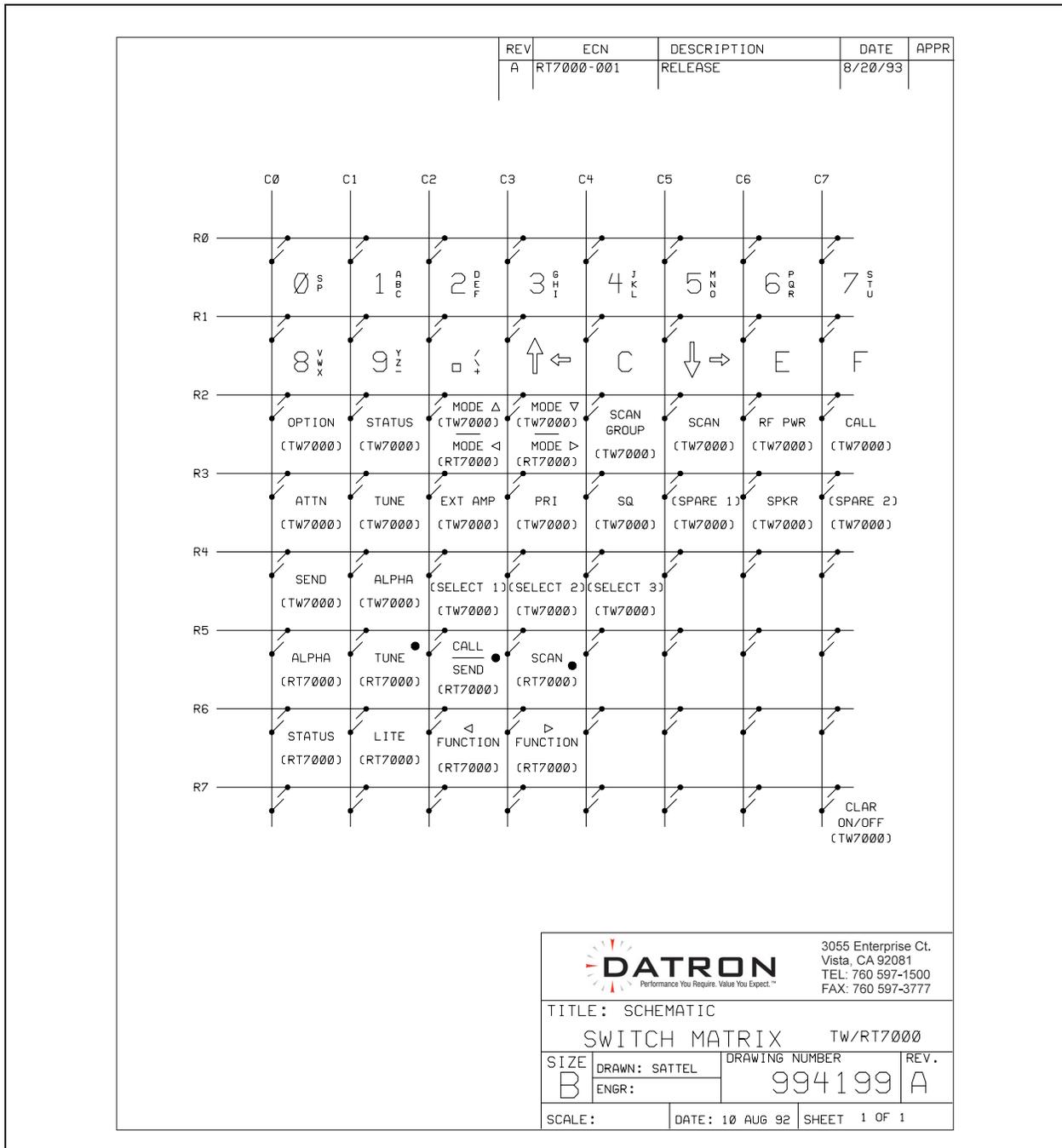
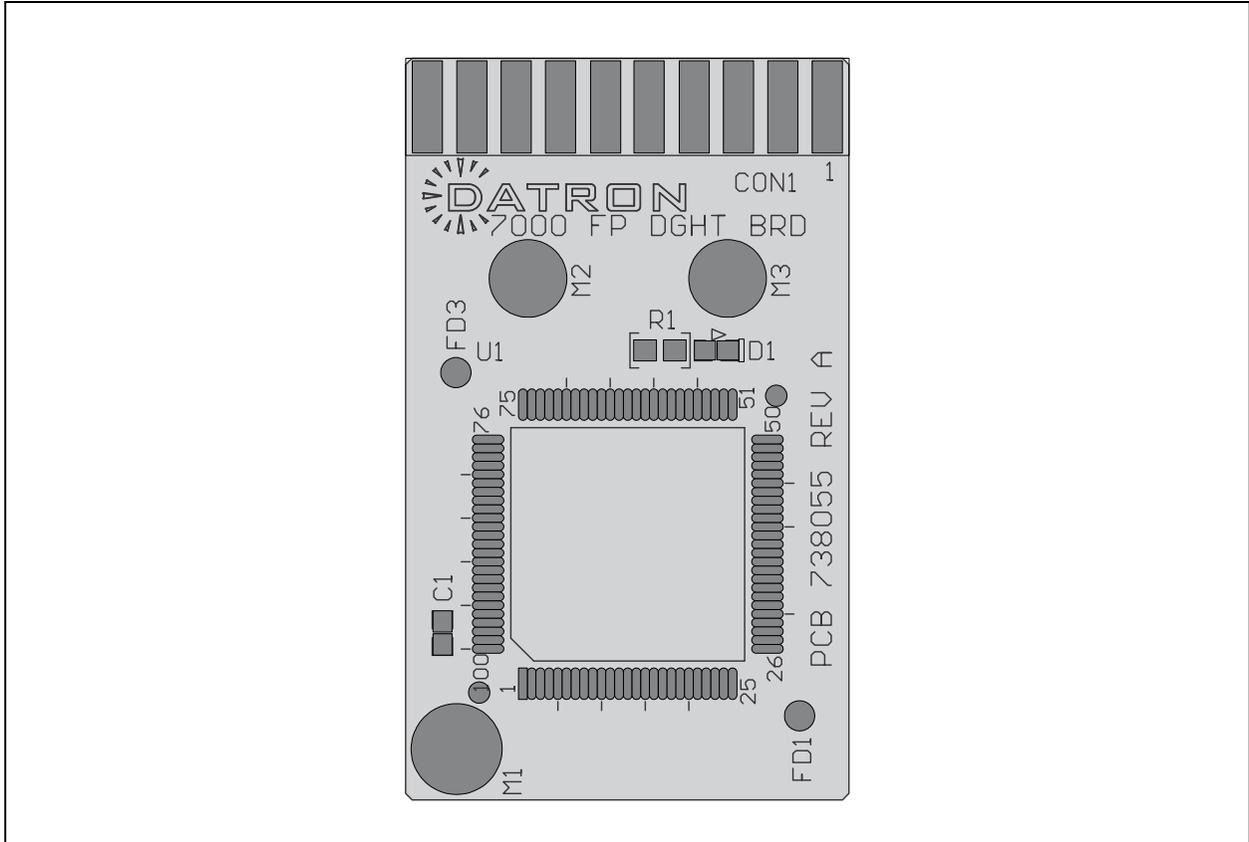


Figure 12-4 Front Panel Keypad Switch Matrix (994199 Rev. A)

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## 12.5 Front Panel Assembly Daughter Board

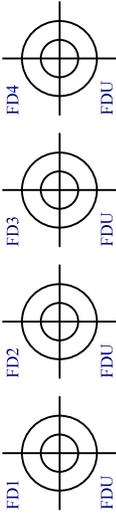
The Front Panel Processor board includes a small daughter board that includes programmable display processor U1. The display processor resides on a plug-in daughter board installed during production. The daughter board plugs into the existing PLCC32 socket.



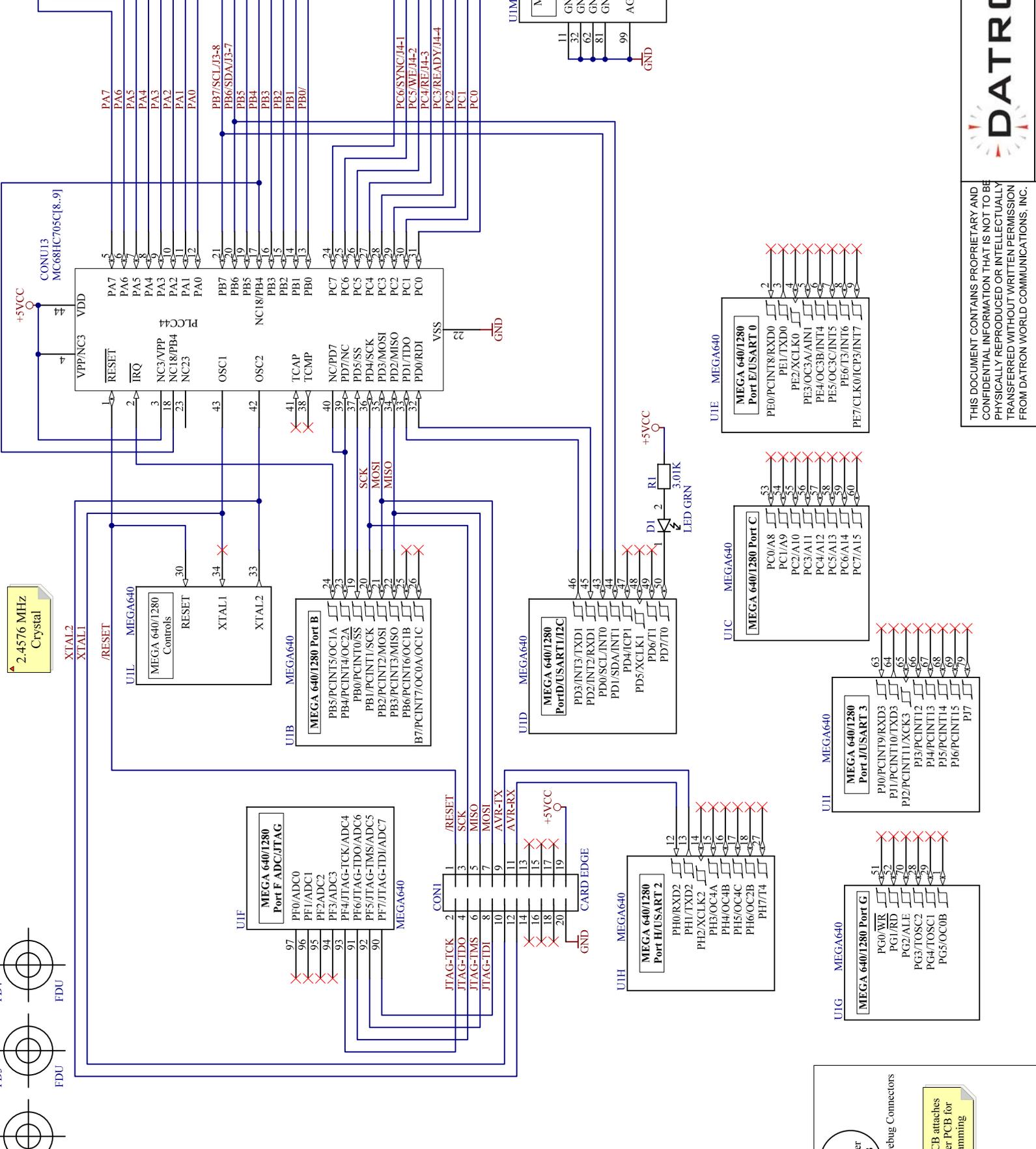
**Figure 12-5 Front Panel Daughter Board Component Locations (738055 Rev. A)**

**Table 12-9 Front Panel Daughter Board Parts List (004-01111 Rev. B)**

Designator	Part Number	Description
C1	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
CONU13	089044001	"CON,ADAPTER,PLCA44"
D1	035500006	"LED,SMT 0603,GREEN,HIGH EFF"
M2	815202	SCREW FILST PHIL 2-56X5/16 SS
M3	815202	SCREW FILST PHIL 2-56X5/16 SS
R1	012301101	"RES,3.01K OHM 1/10W 1% TK 0603"
U1	033301015	"IC,MCU AVR 64K FLASH 100-TQFP"



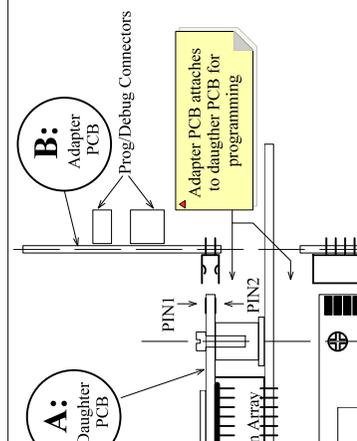
Ports To	ATMEGA640 (New)
	Bit 0
	Bit 1
	Bit 2
	Bit 3
	Bit 4
	Bit 5
	Bit 6
	Bit 7
	Bit 0
	Bit 1
	Bit 2
	Bit 3
	Bit 4
	Bit 5
	Bit 6
	Bit 7
	Bit 0
	Bit 1
	Bit 2
	Bit 3
	Bit 4
	Bit 5
	Bit 6
	Bit 7
	Bit 0
	Bit 1
	Bit 2
	Bit 3
	Bit 4
	Bit 5
	Bit 6
	Bit 7
	Bit 0
	Bit 1
	Bit 2
	Bit 3
	Bit 4
	Bit 5
	Bit 6
	Bit 7



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**Port Mapping**

Fit on PCB





## Chapter 13: Processor Board

### 13.1 Circuit Description

The Processor board includes the Motorola 68HC000 processor that executes front panel control commands and controls the functions of the other boards. It also communicates with remote control heads to control radio functions remotely. Figure 13-3 on page 13-8 provides a block diagram of the Processor board.

The following circuit description discusses the main processor and associated circuitry. The ALE processor and circuitry options are covered in Chapter 16.

#### 13.1.1 Processor

The Motorola MC68HC000 processor (U4), combined with the input/output circuits, forms a special purpose microcomputer that uses the 68000 CMOS microprocessor core to address up to 1 MB of PROM memory and 64 kB of static RAM. The processor controls the RT7000 operation in response to control inputs.

The processor operates at a clock frequency of 7.3728 MHz derived from external oscillator U9. Address lines A1 to A23 and data lines D0 to D15 provide communications with the external EPROM, RAM and analog converter system.

#### 13.1.2 EPROM Program Storage

EPROMs U2 and U3 store the firmware for the RT7000. Each EPROM provides 1 MB of programmable read-only memory installed in a PLCC32 socket. The chip enable (CE) and output enable (OE) signals control access of the firmware code from the EPROM.

#### 13.1.3 RAM Program Storage

RAM chips U5 and U6 provide volatile storage for all the channel and scan group data. Each RAM chip provides 256 kB of static RAM memory organized as 32k words x 8 bits. Chip select 1 (CS1) and output enable (OE) signals control access to the RAM. The write enable (WE) signal controls read/write operations to the RAM.

### 13.1.4 Clock Oscillator Circuit

External oscillator U9 provides a 29.4912 MHz clock to FPGA U8. The FPGA divides the 29.4912 MHz clock to provide the other clocks required by the Processor board. The clocks for the ALE processor are derived from buffered oscillator U76, while the very precise clocks required for the audio CODEC and DSP are derived from buffered oscillator U92.

### 13.1.5 Reset Control and Power Monitor

Reset controller and power monitor U1 includes a voltage detector that monitors the +5V supply. It generates a reset output to hold the microprocessor's reset line low whenever the +5V supply voltage is below 4.65 Vdc. When a power failure occurs, U1 issues a non-maskable interrupt (NMI) to the processor allowing the processor to power down to standby state while retaining data.

U1 also provides power to the RAM chips when source power is lost, preserving the data stored in RAM. This data includes channel frequencies and settings that must be preserved at all times. When a power failure is detected, U1 automatically switches to the 3.3V lithium backup battery BT1 to provide power to the RAM chips to preserve their contents.

U1 also includes a watchdog function that monitors the processor and resets it if the WDI line is not toggled for longer than 1.2 seconds. This function also drives the onboard fault LED (D1). If the fault LED is flashing intermittently, it is a good indication that one of the peripheral chips is not functioning. If the processor internal bus is completely stopped, the fault LED stays lit continuously.

### 13.1.6 Analog Converter System

Analog-to-digital converter (ADC) chip U7 converts analog signals from circuits such as the AGC, ACL and temperature sensor to digital signals to allow precise monitoring of the following functions:

- BITE
- AGC
- ALC
- Output power level
- RF power amplifier temperature sense
- 12 Vdc voltage sense, reverse power
- External BITE

**BITE System** The BITE system checks the status of each board. From the BITE line the processor can determine which boards are installed in the radio and if they are functioning.

---

AGC, ALC and Power Level	The AGC line provides an analog voltage that represents an automatic gain control value which the processor presents as bar graph readings displayed on the front panel LCD in receive mode. The ALC and PWR LVL lines determine bar graph readings displayed on the LCD in transmit mode.
Temperature Protection	The TSENSE line provides an analog voltage that represents the power amplifier heat sink temperature. The processor monitors the TSENSE line. If the temperature exceeds a preset value, the processor begins scaling back the transmit power so the heat sink can cool to a safe temperature.
Overvoltage and Reverse Power Protection	The 12VSENSE line monitors the 12 Vdc line for under or over-voltage conditions. The RVS PWR line provides an analog voltage that represents the amount of reverse power from the VSWR bridge.
External BITE	The EXTBITE line detects the presence and function of the C1021 and RT5830 Pre/post selector.

### 13.1.7 FPGA Control Logic

Field programmable gate array (FPGA) U8 provides control logic for multiple functions for the main processor such as address decoding, interrupt control and serial communications. It also provides control logic for the ALE circuitry.

Address Decoding	The main address control logic is implemented within the FPGA which decodes the addresses for memory devices U2, U3, U5, and U6. The peripheral address decoding for the analog-to-digital converter (ADC) U7 is also handled within the FPGA.
Interrupt Control	The FPGA also implements the interrupt control logic. Priority levels are represented on the IPL0 to IPL2 lines. This allows a higher priority device to override a lower priority interrupt to get servicing immediately. The processor decodes the interrupt request to see where it came from. Once the source is determined, the processor presents an address to the interrupt acknowledge logic in the FPGA. The processor puts a valid code out on the function code (FC0 to FC2) lines back to the FPGA, which signals the interrupting device that the interrupt is serviced and can be cleared.
UARTs	<p>The FPGA includes four internal dual universal asynchronous receiver/transmitters (MC68681) (DUART1 through DUART4).</p> <p>DUART1 (U8D) communicates with the Front Panel Processor board and COM1 transceiver U34. The serial link to the Front Panel Processor board is a 9600 baud TTL/CMOS level data link. The serial link to COM1 varies between 50 and 19200 baud. A computer terminal can control all radio functions through the COM1 port. DUART1 also provides other output functions such as watchdog timer input (WDI), PTT for an external amplifier (AMPPTT), and encryption PTT. (ENCPTT).</p>

DUART2 (U8D) communicates with COM2 transceiver U34, the GPS option module (if present), and the AT7000 antenna tuner through RS-422/485 transceiver U40. When the GPS module is not present, the serial link to COM2 is variable between 50 and 19200 baud. A computer terminal can control all radio functions through COM2. The serial link to the AT7000 is a 9600 baud TTL/CMOS level data link. DUART2 also provides output functions for the AT7000 such as ADATA, ATUINIT, and ACHKTUNE and senses the input states of ATUKEY, ASTROBE, ACLOCK.

DUART3 (U8E) communicates with the DHSL and FSK remote heads. The serial link to the DHSL is a 9600 baud TTL/CMOS level data link. The serial link to the FSK remote is a 1200 baud TTL/CMOS level data link. DUART3 also provides output functions to the remote heads such as RMTA0, RMTA1, RMTA2, RMTWR, RMTCLK, and RMTDATA. It also senses the input states of SYNC.

DUART4 (U8E) communicates with ALE device U53. The serial link to the 7000ALE-141B card is a 9600 baud TTL/CMOS level data link. DUART4 also provides antenna tuner output functions such as ATUSP1 (EXT\_EN1) and ATUSP2 (EXT\_EN2). It also senses the input states of EXTIN1 and JU1.

**Multi-Function Peripheral Device** The FPGA includes an internal multi-function peripheral device (MC68901) that provides all the main interrupt sources and outputs for the RT7000.

Interrupt sources include:

- Squelch INTR (IRQ2)
- EXTCWKEY (IRQ3)
- ENCRPTTI (IRQ4)
- AUXPTT IN (IRQ7)

The outputs include:

- PTT (IRQ0)
- CWKEY (IRQ5)
- AUXPTT OUT (IRQ6)

Schmitt trigger chip U20 squares the incoming interrupt signals to eliminate false interrupts. This device also contains the UART for communications with the 7000ENCR option board.

**SPI Controller** The FPGA includes a synchronous serial peripheral interface (SPI) controller that communicates with various devices on the Processor board as well as other boards. SPI is implemented through port A (PA6, PA7) using U31 and U32.

### 13.1.8 RS-232/422/ 485 Interface

RS-232 serial bus transceiver U34 provides RS-232 communications through serial ports COM1 and COM2. This chip includes an onboard capacitor charge pump for generating the -10 Vdc and +10 Vdc necessary for RS-232

communications. Chip U38 provides RS-422 single point differential communications or RS-485 multipoint differential communications. Configuration resistors R51 (TX), R56 (RX) route serial communications between DUART1 in the FPGA, the RS-232 transceiver and the COM1 port. Configuration resistors R50 (TX), and R57 (RX) route serial communications between DUART1 in the FPGA, the RS-422/485 transceiver and the COM2 port. For the correct jumper placements, refer to Table 21-6 on page 21-25.

### 13.1.9 Miscellaneous Controls

DUART1 OP6 in the FPGA controls transistor Q5 to activate an internal encrypted PTT output signal (ENCRYPTTO). DUART1 OP5 controls transistor Q4 to activate the amplifier PTT signal (AMPPTT) that controls an external amplifier.

#### 13.1.10 Antenna Tuner Interface

The ATU interface provides communication with the R/AT7000B antenna tuner using U40 as a 9600 baud RS-422/485 transceiver for the communications protocol between the radio and the antenna tuner.

Line driver chip U39 provides the interface to the RAT1000C antenna tuners with signals for the ATUINIT, ATUKEY, ADATA, ACHKTUNE, ACLOCK, and ASTROBE lines.

The ATUINIT line initiates the antenna tuner tune cycle with low pulse.

The antenna tuner switches the ATUKEY line low to tell the radio to supply CW at a low power level for the antenna tuner to tune. The ATUKEY line goes high when the tune cycle is complete. The other lines are for the AT/RAT1000 memory and provide channel change information to the antenna tuner.

The ACHKTUNE line provides the interrupt to the antenna tuner to alert it to receive the serial channel data.

The ASTROBE line goes high, briefly indicating the antenna tuner is ready to receive data. The radio sends the BCD channel information to the antenna tuner on the ADATA and ACLOCK lines. The ACHKTUNE goes high when data receive is complete.

#### 13.1.11 Remote Interface

The remote interface provides communication with the DHSL and FSK remote control systems.

**DHSL Interface** The DHSL protocol handles two 9600 baud communication channels. One is for a standard 9600 baud front panel display communication channel and is routed on SER2. The second channel is for control functions routed on SER1.

**FSK Interface**      The FSK remote is a 1200 baud communications channel to accommodate noisy environments such as telephone lines. The FSK remote interface provides address (RMTA0, RMTA1, RMTA2), write/read (RMTWR), clock (RMTCLK) and data (RMTDATA) signals that program the FSK modem on the FSK remote board.

### 13.1.12 Serial Peripheral Interface (SPI)

SPI is the heart of transceiver programming. This synchronous serial data link communicates to all the boards in the RT7000 providing full processor control of the radio. This data link consists of FPGA port A (PA6, PA7) and line driver U19A that provides the SPI enable pulses to each board (refer to Table 13-1 on page 13-9). The enable lines are normally high and pulse low for about 1 ms when programming of the appropriate board is finished. As the boards are programmed, data is sent out on the SPITXD line.

### 13.1.13 Squelch Circuit

The Processor board routes demodulated receive audio (DSPRRXA) from the Audio board to the squelch circuit. The squelch circuit on the Processor board operates by detecting the syllabic rate of change present in the human voice. The squelch is immune to impulse noise, static, carriers and general background noise. The squelch is preset internally and is activated by pressing the control panel **SQUELCH** button.

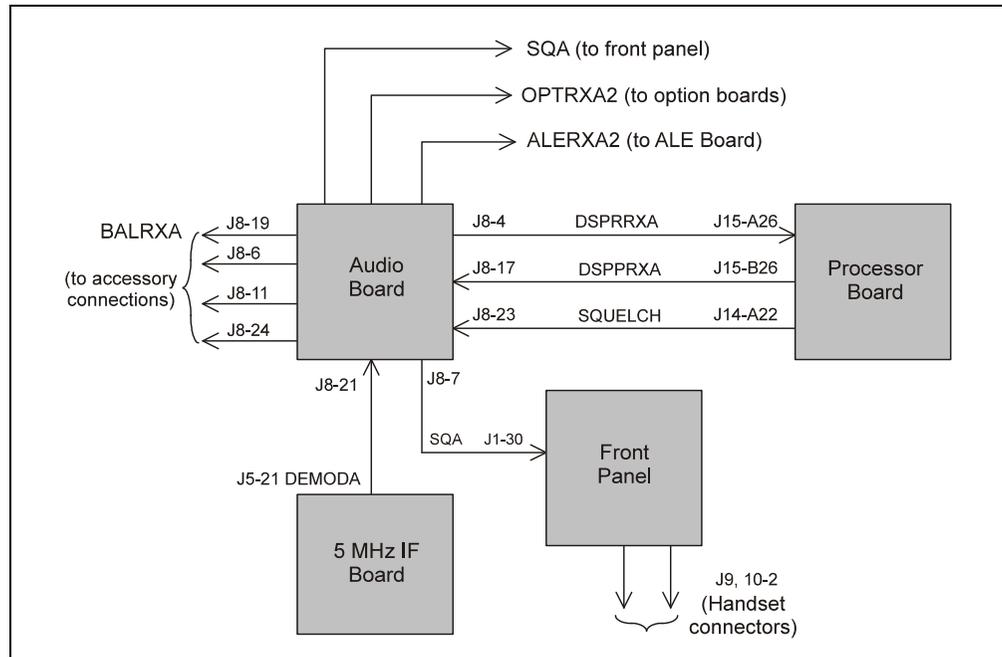
The demodulated receive audio output feeds into the op amps U55A and U55B. These stages are high gain amplifiers that limit (clip) the amplitude of signal or noise. This provides a square wave output to trigger one-shot multivibrators U60A and U60B. The output from the one-shot is a series of pulses that go through the high-pass filter C148, R102, C149, R103, then the low-pass filter R104, C150, R105, and C151. At this point the one-shot presents a DC level signal proportional to the input frequency.

The DC level changes as the frequency shifts, representing the change in frequency of the human voice at a syllabic rate between 0.5 and 2.5 Hz. This signal is AC coupled through C152 to the low frequency differentiation amplifier U56A. The output of U56A is fed into U56B, which pulls down D15 if any signal appears at D13/D14 with a positive or negative amplitude of 0.9V or greater. This unipolar converter enables the squelch to detect the first syllabic rate change at the output of the Audio board.

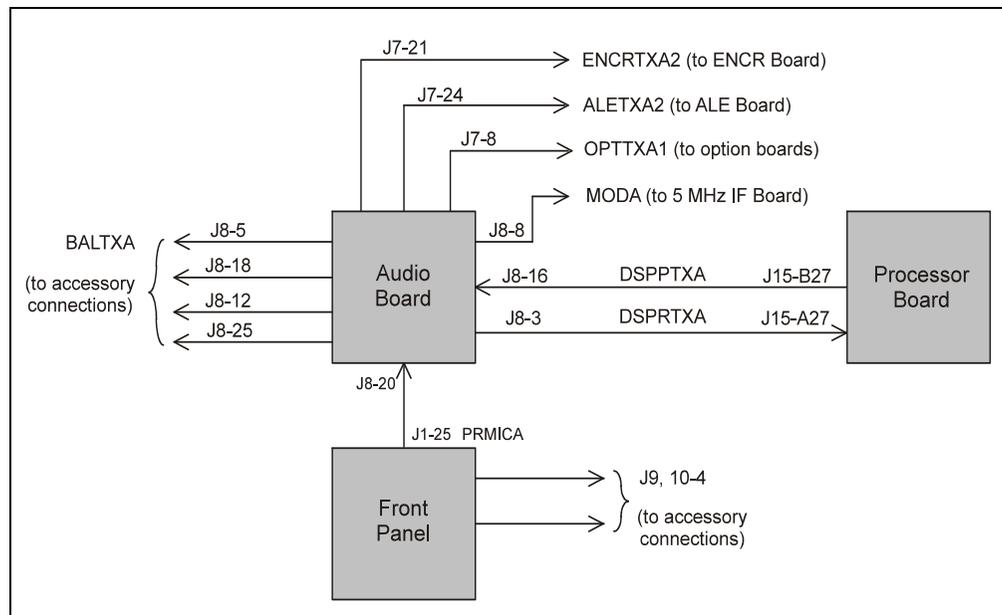
D15 is connected to U60C and U60D which form a timer with C156 and R116 to hold the audio on for approximately four seconds after the last syllabic change is detected. The squelch is turned off when the timer output is grounded through R118.

The squelch circuit sends the output SQIN to the FPGA parallel interface/timer where it is used to generate the squelch signal to the Audio board to control the squelch gate.

Figure 13-1 shows the receive audio distribution for the RT7000. DSPRRXA is the unsquelched receive audio from the Audio board.



**Figure 13-1 RX Audio Distribution Block Diagram**



**Figure 13-2 TX Audio Distribution Block Diagram**

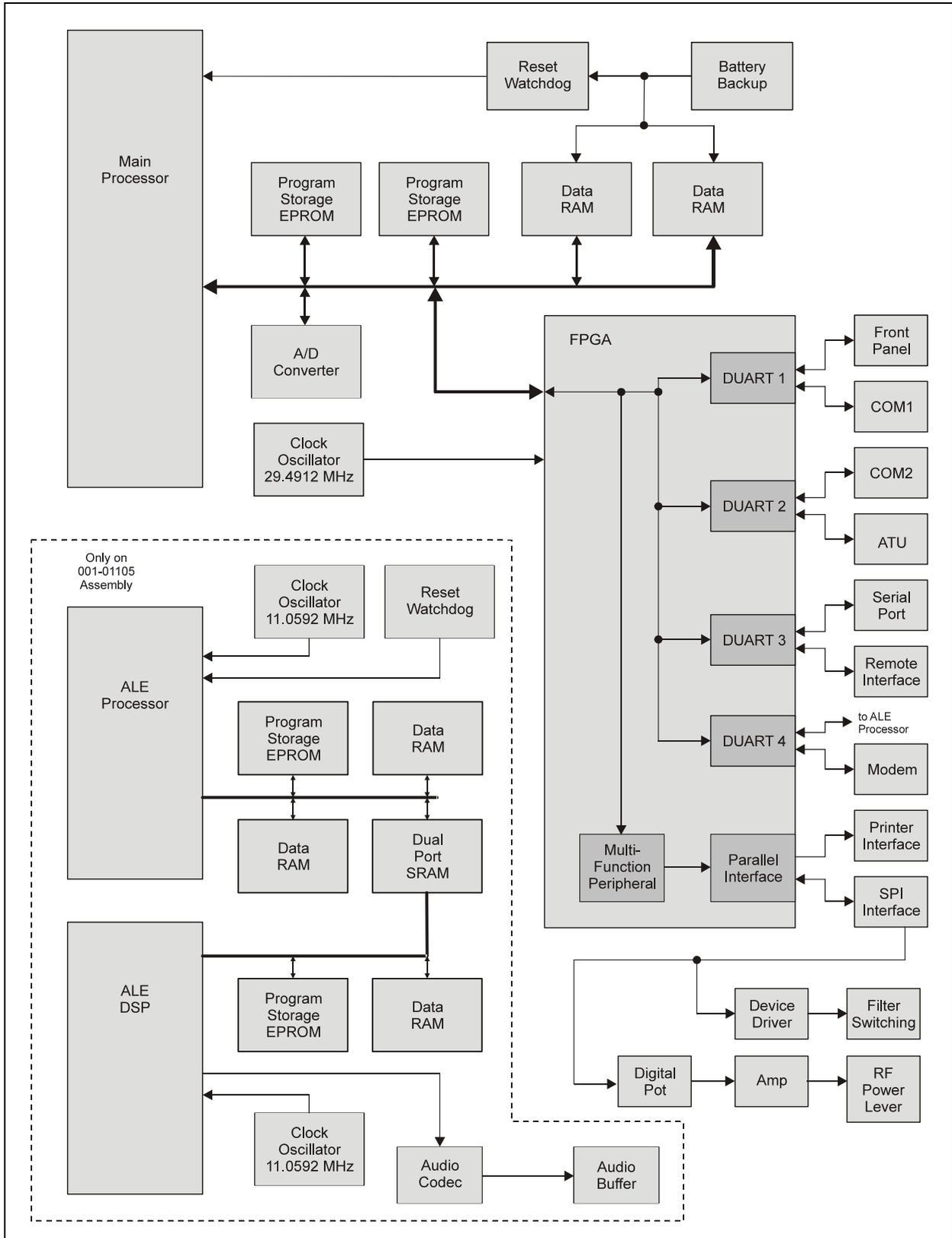


Figure 13-3 Main Processor Block Diagram

### 13.1.14 SPI Enable Lines

Table 13-1 lists the SPI enable lines controlled by the FPGA and routed through J14.

**Table 13-1 SPI Enable Line Descriptions**

Enable	Description
EN1	Main synthesizer - BFO synthesizer
EN2	Main synthesizer - direct digital synthesizer (DDS)
EN3	Main synthesizer - main loop synthesizer
EN4	Main synthesizer - BITE line
EN5	Not used
EN6	5 MHz IF board programming
EN7	Reference/control board programming - filter bands
EN8	Power supply/external amplifier board programming
EN9	Audio board programming
EN10	Reference/control board programming - RF power level
EN11	75 MHz IF board programming
EN12	ECU/RCU interface board programming
EN13	ALE board programming
EN14	Option 1 board programming
EN15	Option 2 board programming
EN16	Serial EEPROM chip programming

## 13.2 Connector Pin Assignments

### 13.2.1 J14 Connector

J14 connects to the Motherboard.

**Table 13-2 J14 Connector Pin Assignments**

A-Pins	Signal	Description
A1	GND	Ground
A2	EN7	Reference/control board programming
A3	EN2	Main synthesizer DDS programming
A4	EN4	Main synthesizer BITE line
A5	EN6	5 MHz IF board programming
A6	EN9	Audio board programming

**Table 13-2 J14 Connector Pin Assignments (Continued)**

A7	EN14	Option 1 slot programming
A8	EN13	ALE board programming (7000ALE option only)
A9	N/C	No connection
A10	ALE RXD	Not used on 001-01107 assembly
A11	RVSPWR	Reverse power line
A12	EXTBITE	C1021 detect
A13	N/C	No connection
A14	N/C	No connection
A15	N/C	No connection
A16	SERRXD	Option slots receive data line
A17	ENCRPTTI	Encryption PTT input line
A18	AGC	Automatic gain control line
A19	FPRXD	Front panel receive data line
A20	PWRLVL	Power level line
A21	N/C	No connection
A22	SQUELCH	Audio board squelch line
<b>A-Pins</b>	<b>Signal</b>	<b>Description</b>
A23	TCRXAI	TA/TC/SC receive audio line
A24	RMTRXD	FSK remote receive data line
A25	SER2RXD	DHSL front panel receive data line
A26	SER1RXD	DHSL second serial channel receive data line
A27	SYNC	DHSL synchronization line
A28	RMTCLK	FSK remote modem clock line
A29	RMTA2	FSK remote modem address 2 line
A30	RMTA0	FSK remote modem address 0 line
A31	+12V	+12 Vdc supply voltage
A32	GND	Ground
<b>B-Pins</b>	<b>Signal</b>	<b>Description</b>
B1	GND	Ground
B2	EN10	Reference/control board programming
B3	EN1	Main synthesizer BFO programming
B4	EN3	Main synthesizer main loop programming

**Table 13-2 J14 Connector Pin Assignments (Continued)**

B5	EN5	Not used
B6	EN11	75 MHz IF board programming
B7	EN15	Option 2 slot programming
B8	EN12	ECU/RCU interface board programming
B9	EN8	Power supply/external amplifier board programming
B10	ALE TXD	Not used on 001-01107 assembly
B11	PTT	Internal radio PTT line
B12	BITE	BITE line
B13	SPICLK	Serial peripheral interface (SPI) clock line
B14	SPITXD	SPI transmit data line
B15	SPIRXD	SPI receive data line
B16	OPPTXD	Option slots transmit data line
B17	ENCRPTTO	Encryption PTT output line
B18	ALCLVL	ALC transmit level line
B19	FPTXD	Front panel transmit data line
B20	VSWRALM	VSWR alarm line
B21	N/C	No connection
<b>B-Pins</b>	<b>Signal</b>	<b>Description</b>
B22	N/C	No connection
B23	CWKEY	Audio board CW key line
B24	TCTXA0	Not used
B25	RMTTXD	FSK remote transmit data line
B26	SER2TXD	DHSL front panel transmit data line
B27	SER1TXD	DHSL second serial channel transmit data line
B28	RMTWR	FSK remote modem write line
B29	RMTDATA	FSK remote modem data line
B30	RMTA1	FSK remote modem address 1 line
B31	+12V	+12V supply voltage
B32	GND	Ground

### 13.2.2 J15 Connector

J15 connects to the Motherboard.

**Table 13-3 J15 Connector Pin Assignments**

<b>A-Pins</b>	<b>Signal</b>	<b>Description</b>
A1	GND	Ground
A2	EXT_EN2	External SPI enable
A3	ASTROBE	AT/RAT100 memory strobe line
A4	ATUKEY	AT/RAT100 tune cycle key line
A5	ACHKTUNE	AT/RAT100 memory check tune line
A6	COM1TXD	COM1 transmit data line
A7	COM1RXD	COM1 receive data line
A8	ACK	Not currently used
A9	DI/OSEL	Data input/output select line
A10	ALE RXD	No connection
A11	TSENSE	Heat sink temperature sense line
A12	EXTBITE	Used on RT7000PP only
A13	ATUTX	AT7000 transmit data line
A14	EXTTXD	Keyboard transmit data line
A15	EXTRXD	Keyboard receive data line
A16	FILTG	Filter G select line
A17	COM2TXD	COM2 transmit data line
<b>A-Pins</b>	<b>Signal</b>	<b>Description</b>
A18	RETX	Re-transmit signal line
A19	N/C	No connection
A20	EXTCWKEY	External CW key line
A21	ATUINIT	AT/RAT100 tune cycle initiate line
A22	DATA0	Not used
A23	DATA2	Not used
A24	DATA4	Not used
A25	DATA6	Not used
A26	DSPRRXA	Squelch receive audio line
A27	DSPRTXA	Audio loop
A28	N/C	No connection

**Table 13-3 J15 Connector Pin Assignments (Continued)**

A29	+5V	+5V supply voltage
A30	+5V	+5V supply voltage
A31	+12V	+12V supply voltage
A32	GND	Ground
<b>B-Pins</b>	<b>Signal</b>	<b>Description</b>
B1	GND	Ground
B2	EXTIN1	Currently unused
B3	EXTEN1	Ext SPI enable 1
B4	ACLOCK	RAT1000 clock line
B5	ADATA	RAT1000 data line
B6	COM1RTS	COM1 RTS line
B7	COM1CTS	COM1 CTS line
B8	STROBE	Not used
B9	SELECT	Not used
B10	BUSY	Not used
B11	AUXPTT	Auxiliary PTT line
B12	N/C	No connection
B13	N/C	No connection
B14	ATURX	AT7000 receive data line
B15	AMPPTT	External amplifier PTT line
B16	EXTCLK	External SPI clock line
B17	N/C	No connection
<b>B-Pins</b>	<b>Signal</b>	<b>Description</b>
B18	COM2RXD	COM2 receive data line
B19	TC/SCALM	TA/TC/SC alarm line
B20	N/C	No connection
B21	N/C	No connection
B22	DATA1	Not used
B23	DATA3	Not used
B24	DATA5	Not used
B25	DATA7	Not used
B26	DSPPRXA	Receive audio line
B27	DSPPTXA	Audio loop

**Table 13-3 J15 Connector Pin Assignments (Continued)**

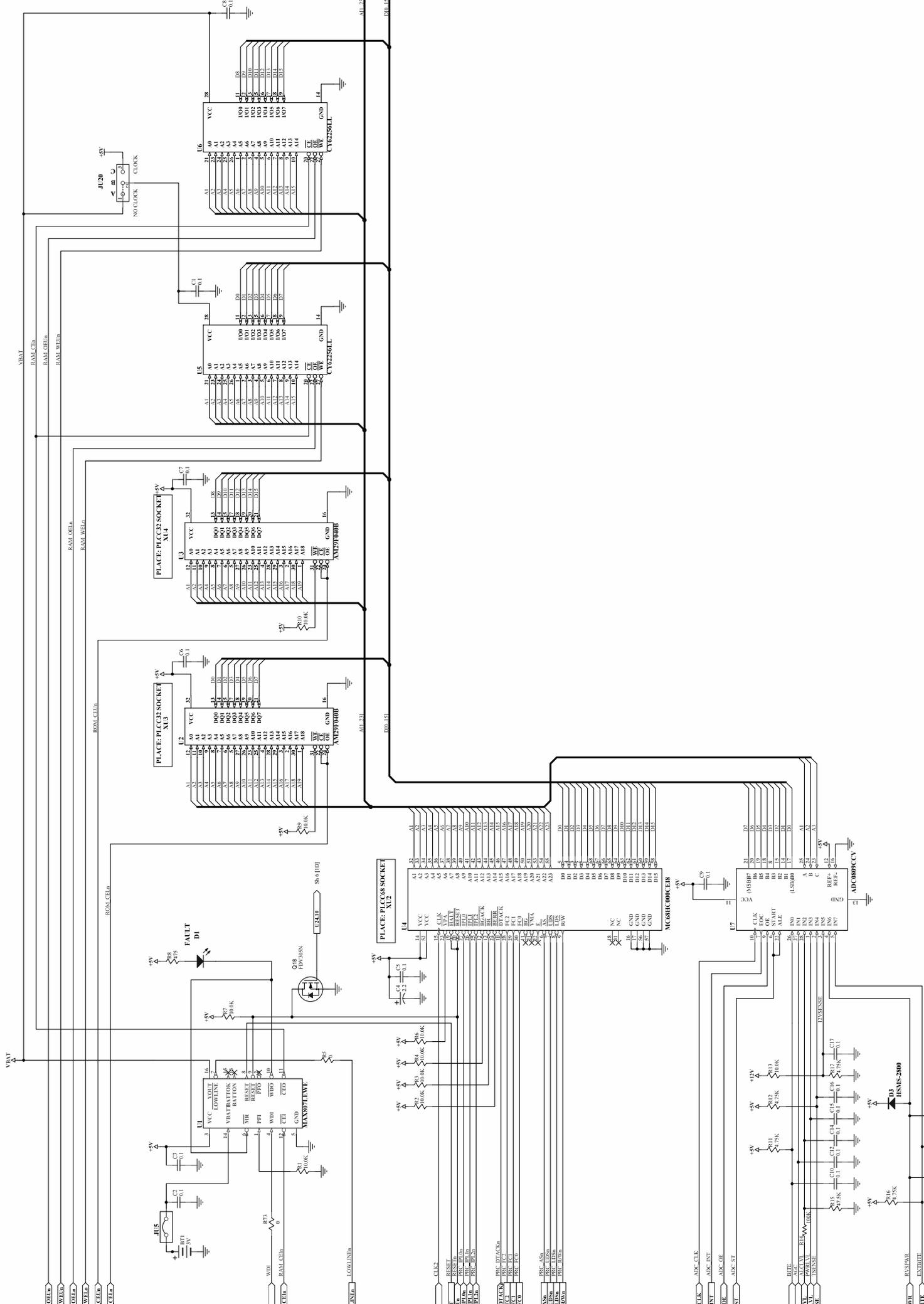
B28	N/C	No connection
B29	+5V	+5V supply voltage
B30	+5V	+5V supply voltage
B31	+12V	+12V supply voltage
B32	GND	Ground

### **13.3 Component Locations, Schematics and Parts List**

This section includes a component location diagram, schematics and a parts list for the Processor board.





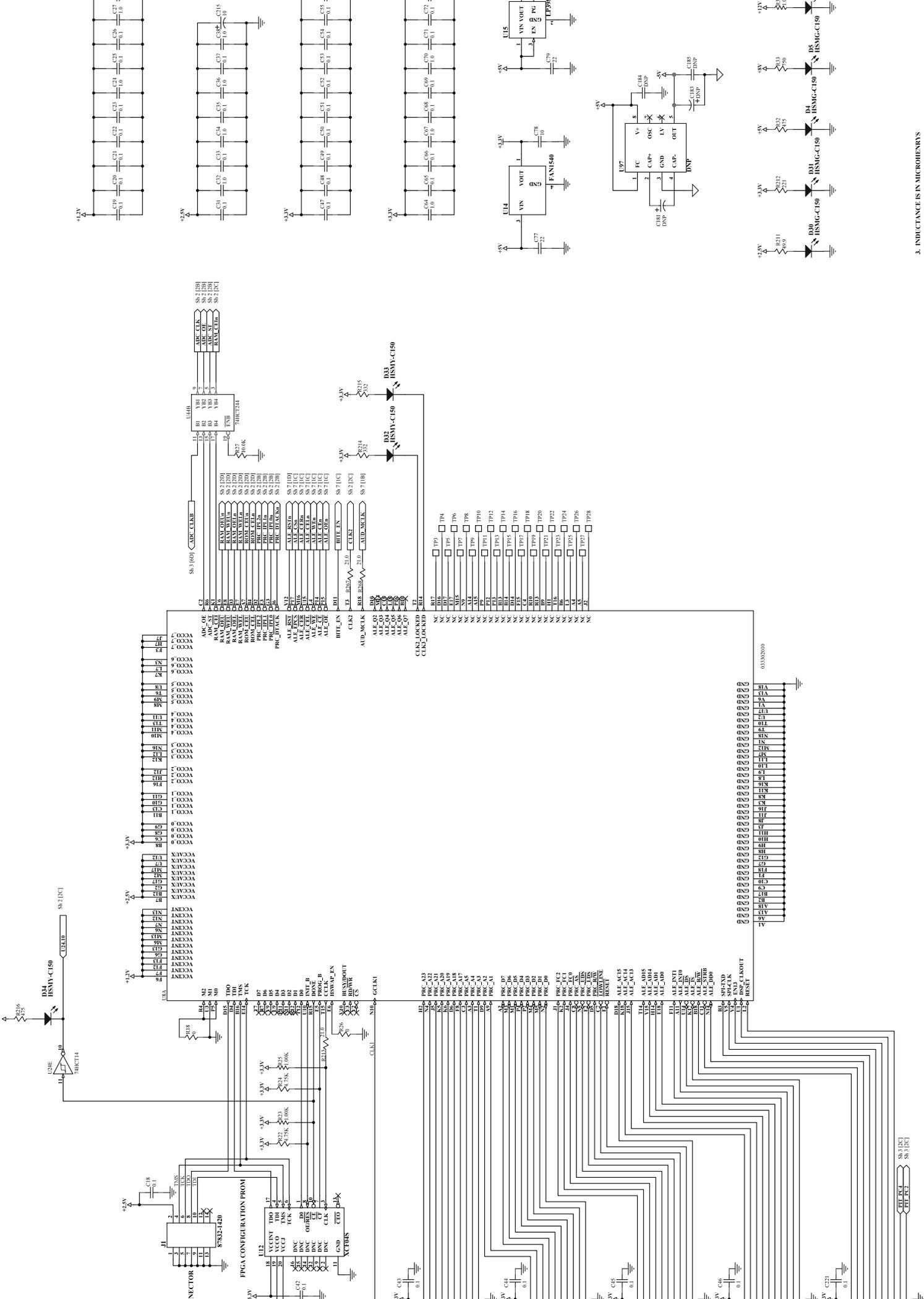


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- 2. CAPACITANCE IS IN MICROFARADS
- 1. RESISTANCE IS IN OHMS



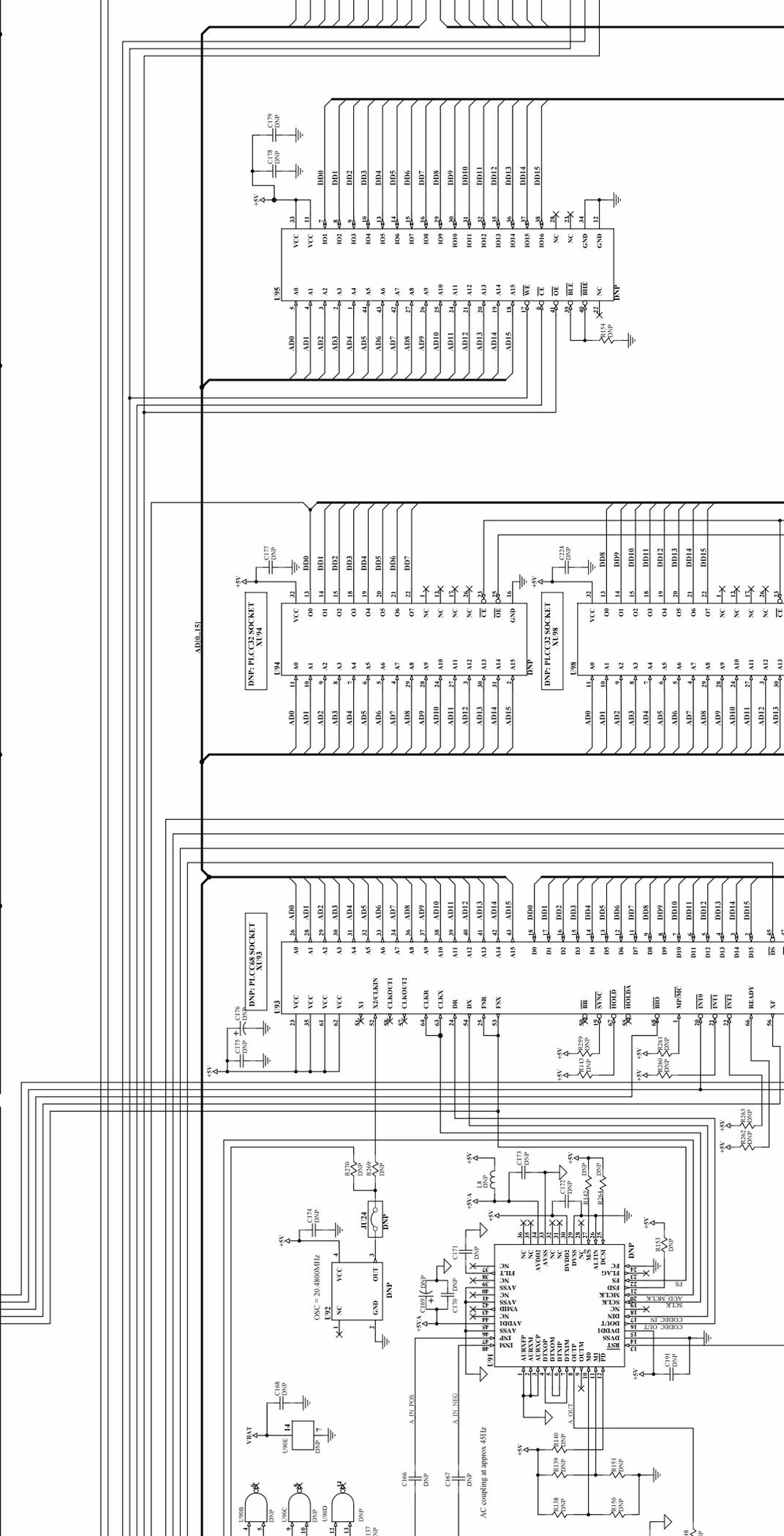
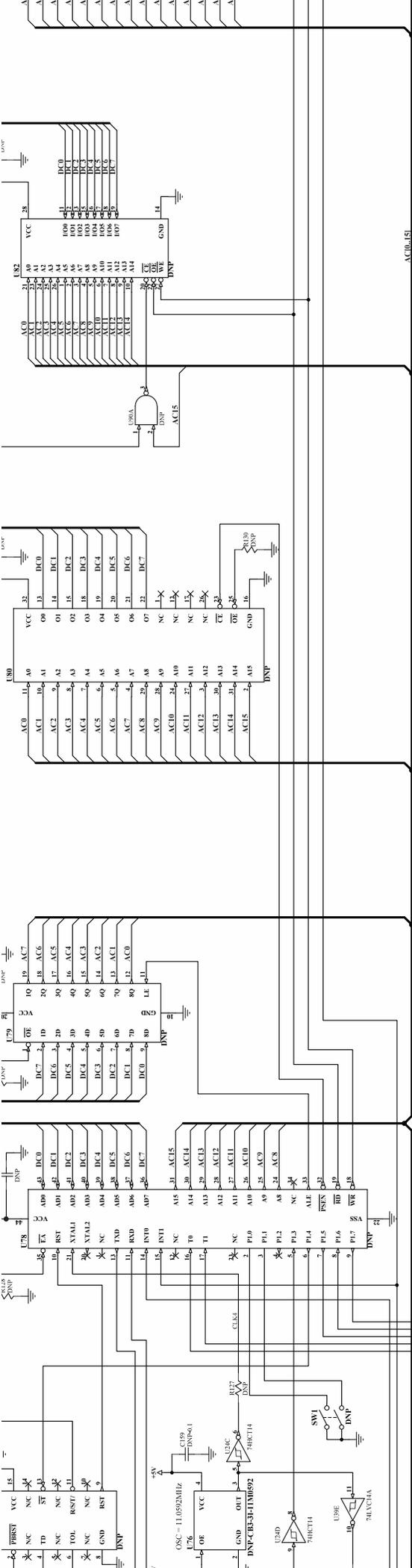


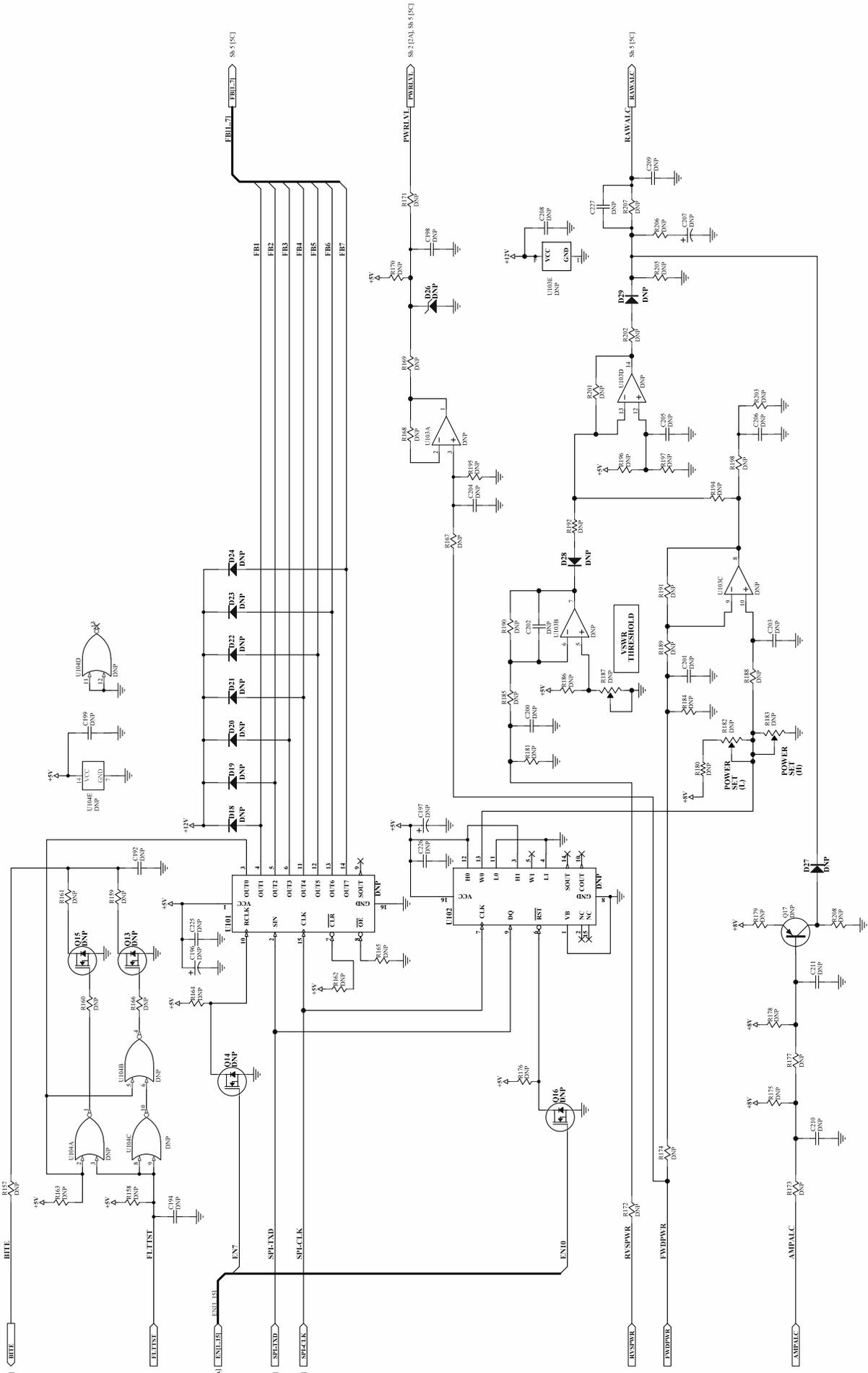




- 3. INDUCTANCE IN MICROHENRYS
- 2. CAPACITANCE IN MICROFARADS
- 1. RESISTANCE IN OHMS

NOTES: UNLESS OTHERWISE SPECIFIED





3. INDUCTANCE IN MICROHENRYS  
 2. CAPACITANCE IN MICROFARADS  
 1. RESISTANCE IN OHMS  
 ES: UNLESS OTHERWISE SPECIFIED

Table 13-4 Processor Board Parts List (001-01107 Rev. K)

Designator	Part Number	Description
BT1	750057	"BATT, CR2450, 0.54AH, 3V, LI, 3-TAB COIN"
C1	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C10	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C100	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C101	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C102	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C103	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C104	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C105	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C106	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C107	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C108	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C109	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C110	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C111	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C112	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C113	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C114	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C115	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C116	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C117	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C118	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C119	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C12	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C120	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C121	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C122	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C123	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C124	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C125	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C126	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C127	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C128	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C129	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C130	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C131	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C132	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C133	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C134	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C135	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C136	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C137	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C138	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C139	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C14	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C140	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C141	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C142	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C143	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C144	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C145	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C146	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C147	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C148	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C149	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C15	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C150	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C151	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C152	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C153	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C154	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C155	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C156	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C157	DNP	"NULL PART, VACANT PCB LOCATION"
C158	DNP	"NULL PART, VACANT PCB LOCATION"
C159	DNP	"NULL PART, VACANT PCB LOCATION"
C16	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C160	DNP	"NULL PART, VACANT PCB LOCATION"
C161	DNP	"NULL PART, VACANT PCB LOCATION"
C162	DNP	"NULL PART, VACANT PCB LOCATION"
C163	DNP	"NULL PART, VACANT PCB LOCATION"
C164	DNP	"NULL PART, VACANT PCB LOCATION"
C165	DNP	"NULL PART, VACANT PCB LOCATION"
C166	DNP	"NULL PART, VACANT PCB LOCATION"
C167	DNP	"NULL PART, VACANT PCB LOCATION"
C168	DNP	"NULL PART, VACANT PCB LOCATION"
C169	DNP	"NULL PART, VACANT PCB LOCATION"
C17	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C170	DNP	"NULL PART, VACANT PCB LOCATION"
C171	DNP	"NULL PART, VACANT PCB LOCATION"
C172	DNP	"NULL PART, VACANT PCB LOCATION"
C173	DNP	"NULL PART, VACANT PCB LOCATION"
C174	DNP	"NULL PART, VACANT PCB LOCATION"
C175	DNP	"NULL PART, VACANT PCB LOCATION"
C176	DNP	"NULL PART, VACANT PCB LOCATION"
C177	DNP	"NULL PART, VACANT PCB LOCATION"
C178	DNP	"NULL PART, VACANT PCB LOCATION"
C179	DNP	"NULL PART, VACANT PCB LOCATION"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C180	DNP	"NULL PART, VACANT PCB LOCATION"
C181	DNP	"NULL PART, VACANT PCB LOCATION"
C182	DNP	"NULL PART, VACANT PCB LOCATION"
C183	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C184	DNP	"NULL PART, VACANT PCB LOCATION"
C185	DNP	"NULL PART, VACANT PCB LOCATION"
C186	DNP	"NULL PART, VACANT PCB LOCATION"
C187	DNP	"NULL PART, VACANT PCB LOCATION"
C188	DNP	"NULL PART, VACANT PCB LOCATION"
C189	DNP	"NULL PART, VACANT PCB LOCATION"
C19	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C191	DNP	"NULL PART, VACANT PCB LOCATION"
C192	DNP	"NULL PART, VACANT PCB LOCATION"
C193	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C194	DNP	"NULL PART, VACANT PCB LOCATION"
C195	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C196	DNP	"NULL PART, VACANT PCB LOCATION"
C197	DNP	"NULL PART, VACANT PCB LOCATION"
C198	DNP	"NULL PART, VACANT PCB LOCATION"
C199	DNP	"NULL PART, VACANT PCB LOCATION"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C200	DNP	"NULL PART, VACANT PCB LOCATION"
C201	DNP	"NULL PART, VACANT PCB LOCATION"
C202	DNP	"NULL PART, VACANT PCB LOCATION"
C203	DNP	"NULL PART, VACANT PCB LOCATION"
C204	DNP	"NULL PART, VACANT PCB LOCATION"
C205	DNP	"NULL PART, VACANT PCB LOCATION"
C206	DNP	"NULL PART, VACANT PCB LOCATION"
C207	DNP	"NULL PART, VACANT PCB LOCATION"
C208	DNP	"NULL PART, VACANT PCB LOCATION"
C209	DNP	"NULL PART, VACANT PCB LOCATION"
C21	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C210	DNP	"NULL PART, VACANT PCB LOCATION"
C211	DNP	"NULL PART, VACANT PCB LOCATION"
C212	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C213	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C214	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C215	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C216	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C217	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C218	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C219	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C22	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C220	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C221	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C222	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C223	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C224	DNP	"NULL PART, VACANT PCB LOCATION"
C225	DNP	"NULL PART, VACANT PCB LOCATION"
C226	DNP	"NULL PART, VACANT PCB LOCATION"
C227	DNP	"NULL PART, VACANT PCB LOCATION"
C23	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C24	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C25	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C26	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C27	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C28	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C29	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C31	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C32	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C33	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C34	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C37	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C38	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C39	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C4	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C40	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C41	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C42	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C43	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C44	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C45	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C46	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C47	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C48	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C49	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C50	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C51	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C52	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C53	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C54	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C55	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C56	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C57	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C58	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C59	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C6	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C60	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C61	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C62	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C63	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C64	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C65	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C66	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 13-4 Processor Board Parts List (001-01107 Rev. K)

Designator	Part Number	Description
C67	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C68	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C69	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C7	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C70	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C71	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C72	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C73	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C74	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C75	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C76	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C77	021226000	"CAP, 22UF 10V X5R 20% 1210"
C78	021106001	"CAP, 10UF, X5R, 16V, 10%, 1206"
C79	021226000	"CAP, 22UF 10V X5R 20% 1210"
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C80	021106001	"CAP, 10UF, X5R, 16V, 10%, 1206"
C81	021226000	"CAP, 22UF 10V X5R 20% 1210"
C82	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C83	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C84	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C85	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C86	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C87	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C88	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C89	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C90	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C91	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C92	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C93	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C94	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C95	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C96	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C97	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C98	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C99	021102000	"CAP, 1000PF NP0 100V 5% 0805"
D1	035500003	"LED, RED TOP-V 1206"
D10	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D11	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D12	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D14	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D15	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D16	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D18	DNP	"NULL PART, VACANT PCB LOCATION"
D19	DNP	"NULL PART, VACANT PCB LOCATION"
D2	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D20	DNP	"NULL PART, VACANT PCB LOCATION"
D21	DNP	"NULL PART, VACANT PCB LOCATION"
D22	DNP	"NULL PART, VACANT PCB LOCATION"
D23	DNP	"NULL PART, VACANT PCB LOCATION"
D24	DNP	"NULL PART, VACANT PCB LOCATION"
D26	DNP	"NULL PART, VACANT PCB LOCATION"
D27	DNP	"NULL PART, VACANT PCB LOCATION"
D28	DNP	"NULL PART, VACANT PCB LOCATION"
D29	DNP	"NULL PART, VACANT PCB LOCATION"
D3	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D30	035500002	"LED, GREEN TOP-V 1206"
D31	035500002	"LED, GREEN TOP-V 1206"
D32	035500001	"LED, YELLOW TOP-V 1206"
D33	035500001	"LED, YELLOW TOP-V 1206"
D34	035500001	"LED, YELLOW TOP-V 1206"
D35	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	035500002	"LED, GREEN TOP-V 1206"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
D5	035500002	"LED, GREEN TOP-V 1206"
D6	035500002	"LED, GREEN TOP-V 1206"
D7	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D8	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D9	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
GPS1	DNP	"NULL PART, VACANT PCB LOCATION"
J1	081014000	"HEADER, 2X7 BOX 2MM SMT"
J14	613166	"HEADER,64 PIN RT ANGLE PC MNT"
J15	613166	"HEADER,64 PIN RT ANGLE PC MNT"
J2	620172	"HEADER, 2X6 MLX 0.1"
J3	610675	"HEADER,RECEPT 2X4 0.05 LP SMT"
J6	DNP	"NULL PART, VACANT PCB LOCATION"
JU10	620026	"HEADER,8 PIN DUAL MALE"
JU11	620025	"HEADER, 2X2 MLX 0.1 VERT"
JU12	620026	"HEADER,8 PIN DUAL MALE"
JU13	620026	"HEADER,8 PIN DUAL MALE"
JU20	620030	"HEADER,3 PIN 0.025 SQ POST"
JU21	DNP	"NULL PART, VACANT PCB LOCATION"
JU22	620030	"HEADER,3 PIN 0.025 SQ POST"
JU23	620030	"HEADER,3 PIN 0.025 SQ POST"
JU24	DNP	"NULL PART, VACANT PCB LOCATION"
JU25	DNP	"NULL PART, VACANT PCB LOCATION"
JU26	620025	"HEADER, 2X2 MLX 0.1 VERT"
JU5	650048	"HEADER, PIN 1X2 MLX 0.1 TH"
L1	045104	"IND,100 UH FR 150MA 10% 1210"
L2	045104	"IND,100 UH FR 150MA 10% 1210"
L3	045104	"IND,100 UH FR 150MA 10% 1210"
L4	045104	"IND,100 UH FR 150MA 10% 1210"
L5	045104	"IND,100 UH FR 150MA 10% 1210"
L6	DNP	"NULL PART, VACANT PCB LOCATION"
L7	DNP	"NULL PART, VACANT PCB LOCATION"
L8	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
Q1	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q10	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q11	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q12	DNP	"NULL PART, VACANT PCB LOCATION"
Q13	DNP	"NULL PART, VACANT PCB LOCATION"
Q14	DNP	"NULL PART, VACANT PCB LOCATION"
Q15	DNP	"NULL PART, VACANT PCB LOCATION"
Q16	DNP	"NULL PART, VACANT PCB LOCATION"
Q17	DNP	"NULL PART, VACANT PCB LOCATION"
Q18	031102038	"MOSFET-N, FDV305N 20V SOT-23"
Q2	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q7	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q8	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q9	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
R1	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R10	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R100	013332300	"RES, 332K OHM, 1/8W, 1%, TK, 0805"
R101	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R102	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R103	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R104	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R105	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R106	013332300	"RES, 332K OHM, 1/8W, 1%, TK, 0805"
R107	013274001	"RES, 274K OHM, 1/8W, 1%, TK, 0805"
R108	013335000	"RES, 3.3M OHM, 1/8W, 5%, TK, 0805"
R109	170229	"RES, 10K TRM CER S-ADJ MT TH"
R11	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R110	013105001	"RES, 1M OHM 1/8W 1% TK 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R111	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R112	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R113	013105001	"RES, 1M OHM 1/8W 1% TK 0805"
R114	013274200	"RES, 27.4K OHM, 1/8W, 1%, TK, 0805"
R115	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R116	013475300	"RES, 475K OHM, 1/8W, 1%, TK, 0805"
R117	170333	"TRIMMER, 100K OHM, 12-T, S-ADJ, 1/4IN"
R118	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R119	013681100	"RES, 6.81K OHM 1/8W 1% TK 0805"
R12	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R120	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R121	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R122	DNP	"NULL PART, VACANT PCB LOCATION"
R123	DNP	"NULL PART, VACANT PCB LOCATION"
R124	DNP	"NULL PART, VACANT PCB LOCATION"
R125	DNP	"NULL PART, VACANT PCB LOCATION"
R126	DNP	"NULL PART, VACANT PCB LOCATION"
R127	DNP	"NULL PART, VACANT PCB LOCATION"
R128	DNP	"NULL PART, VACANT PCB LOCATION"
R129	DNP	"NULL PART, VACANT PCB LOCATION"
R13	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R130	DNP	"NULL PART, VACANT PCB LOCATION"
R131	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R132	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R133	DNP	"NULL PART, VACANT PCB LOCATION"
R134	DNP	"NULL PART, VACANT PCB LOCATION"
R135	DNP	"NULL PART, VACANT PCB LOCATION"
R136	DNP	"NULL PART, VACANT PCB LOCATION"
R137	DNP	"NULL PART, VACANT PCB LOCATION"
R138	DNP	"NULL PART, VACANT PCB LOCATION"
R139	DNP	"NULL PART, VACANT PCB LOCATION"
R14	013104001	"RES, 100K OHM 1/8W 1% TK 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R140	DNP	"NULL PART, VACANT PCB LOCATION"
R141	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R142	DNP	"NULL PART, VACANT PCB LOCATION"
R143	DNP	"NULL PART, VACANT PCB LOCATION"
R144	DNP	"NULL PART, VACANT PCB LOCATION"
R145	DNP	"NULL PART, VACANT PCB LOCATION"
R146	DNP	"NULL PART, VACANT PCB LOCATION"
R147	DNP	"NULL PART, VACANT PCB LOCATION"
R148	DNP	"NULL PART, VACANT PCB LOCATION"
R149	DNP	"NULL PART, VACANT PCB LOCATION"
R15	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R150	DNP	"NULL PART, VACANT PCB LOCATION"
R151	DNP	"NULL PART, VACANT PCB LOCATION"
R152	DNP	"NULL PART, VACANT PCB LOCATION"
R153	DNP	"NULL PART, VACANT PCB LOCATION"
R154	DNP	"NULL PART, VACANT PCB LOCATION"
R155	DNP	"NULL PART, VACANT PCB LOCATION"
R156	DNP	"NULL PART, VACANT PCB LOCATION"
R157	DNP	"NULL PART, VACANT PCB LOCATION"
R158	DNP	"NULL PART, VACANT PCB LOCATION"
R159	DNP	"NULL PART, VACANT PCB LOCATION"
R16	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R160	DNP	"NULL PART, VACANT PCB LOCATION"
R161	DNP	"NULL PART, VACANT PCB LOCATION"
R162	DNP	"NULL PART, VACANT PCB LOCATION"
R163	DNP	"NULL PART, VACANT PCB LOCATION"
R164	DNP	"NULL PART, VACANT PCB LOCATION"
R165	DNP	"NULL PART, VACANT PCB LOCATION"
R166	DNP	"NULL PART, VACANT PCB LOCATION"
R167	DNP	"NULL PART, VACANT PCB LOCATION"
R168	DNP	"NULL PART, VACANT PCB LOCATION"
R169	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R17	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R170	DNP	"NULL PART, VACANT PCB LOCATION"
R171	DNP	"NULL PART, VACANT PCB LOCATION"
R172	DNP	"NULL PART, VACANT PCB LOCATION"
R173	DNP	"NULL PART, VACANT PCB LOCATION"
R174	DNP	"NULL PART, VACANT PCB LOCATION"
R175	DNP	"NULL PART, VACANT PCB LOCATION"
R176	DNP	"NULL PART, VACANT PCB LOCATION"
R177	DNP	"NULL PART, VACANT PCB LOCATION"
R178	DNP	"NULL PART, VACANT PCB LOCATION"
R179	DNP	"NULL PART, VACANT PCB LOCATION"
R18	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R180	DNP	"NULL PART, VACANT PCB LOCATION"
R181	DNP	"NULL PART, VACANT PCB LOCATION"
R182	DNP	"NULL PART, VACANT PCB LOCATION"
R183	DNP	"NULL PART, VACANT PCB LOCATION"
R184	DNP	"NULL PART, VACANT PCB LOCATION"
R185	DNP	"NULL PART, VACANT PCB LOCATION"
R186	DNP	"NULL PART, VACANT PCB LOCATION"
R187	DNP	"NULL PART, VACANT PCB LOCATION"
R188	DNP	"NULL PART, VACANT PCB LOCATION"
R189	DNP	"NULL PART, VACANT PCB LOCATION"
R19	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R190	DNP	"NULL PART, VACANT PCB LOCATION"
R191	DNP	"NULL PART, VACANT PCB LOCATION"
R192	DNP	"NULL PART, VACANT PCB LOCATION"
R194	DNP	"NULL PART, VACANT PCB LOCATION"
R195	DNP	"NULL PART, VACANT PCB LOCATION"
R196	DNP	"NULL PART, VACANT PCB LOCATION"
R197	DNP	"NULL PART, VACANT PCB LOCATION"
R198	DNP	"NULL PART, VACANT PCB LOCATION"
R2	013103001	"RES, 10K OHM 1/8W 1% TK 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R20	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R201	DNP	"NULL PART, VACANT PCB LOCATION"
R202	DNP	"NULL PART, VACANT PCB LOCATION"
R203	DNP	"NULL PART, VACANT PCB LOCATION"
R205	DNP	"NULL PART, VACANT PCB LOCATION"
R206	DNP	"NULL PART, VACANT PCB LOCATION"
R207	DNP	"NULL PART, VACANT PCB LOCATION"
R208	DNP	"NULL PART, VACANT PCB LOCATION"
R209	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R21	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R210	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R211	013499900	"RES, 49.9 OHM 1/8W 1% TK 0805"
R212	013221001	"RES, 221 OHM, 1/8W, 1%, TK, 0805"
R213	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R214	013332001	"RES, 332 OHM, 1/8W, 1%, TK, 0805"
R215	013332001	"RES, 332 OHM, 1/8W, 1%, TK, 0805"
R216	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R217	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R218	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R219	DNP	"NULL PART, VACANT PCB LOCATION"
R22	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R220	DNP	"NULL PART, VACANT PCB LOCATION"
R221	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R222	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R223	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R224	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R225	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R226	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R227	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R228	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R229	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R23	013102002	"RES, 1K OHM 1/8W 1% TK 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R230	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R231	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R232	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R233	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R234	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R235	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R236	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R237	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R238	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R239	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R24	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R240	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R241	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R242	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R243	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R244	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R245	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R246	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R247	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R248	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R249	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R25	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R250	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R251	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R252	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R253	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R254	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R255	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R257	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R258	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R259	DNP	"NULL PART, VACANT PCB LOCATION"
R26	013000000	"RES, ZERO OHM, 2A, TK, 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R260	DNP	"NULL PART, VACANT PCB LOCATION"
R261	DNP	"NULL PART, VACANT PCB LOCATION"
R262	DNP	"NULL PART, VACANT PCB LOCATION"
R263	DNP	"NULL PART, VACANT PCB LOCATION"
R264	DNP	"NULL PART, VACANT PCB LOCATION"
R265	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R266	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R267	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R268	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R269	DNP	"NULL PART, VACANT PCB LOCATION"
R27	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R270	DNP	"NULL PART, VACANT PCB LOCATION"
R28	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R29	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R3	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R30	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R31	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R32	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R33	013750001	"RES, 750 OHM, 1/8W, 1%, TK, 0805"
R34	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R35	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R36	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R37	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R38	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R39	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R4	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R40	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R41	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R42	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R43	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R44	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R45	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R46	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R47	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R48	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R49	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R5	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R50	DNP	"NULL PART, VACANT PCB LOCATION"
R51	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R52	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R53	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R54	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R55	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R56	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R57	DNP	"NULL PART, VACANT PCB LOCATION"
R58	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R59	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R6	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R60	013825000	"RES, 825 OHM, 1/8W, 1%, TK, 0805"
R61	013825000	"RES, 825 OHM, 1/8W, 1%, TK, 0805"
R62	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R63	DNP	"NULL PART, VACANT PCB LOCATION"
R64	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R65	DNP	"NULL PART, VACANT PCB LOCATION"
R66	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R67	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R68	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R69	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R7	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R70	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R71	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R72	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R73	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R74	013000000	"RES, ZERO OHM, 2A, TK, 0805"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R75	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R76	DNP	"NULL PART, VACANT PCB LOCATION"
R77	DNP	"NULL PART, VACANT PCB LOCATION"
R78	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R79	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R8	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R80	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R81	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R82	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R83	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R84	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R85	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R86	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R87	013499200	"RES, 49.9K OHM, 1/8W, 1%, TK, 0805"
R88	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R89	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R9	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R90	013499200	"RES, 49.9K OHM, 1/8W, 1%, TK, 0805"
R91	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R92	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R93	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R94	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R95	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R96	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R97	013332100	"RES, 3.32K OHM, 1/8W, 1%, TK, 0805"
R98	013332100	"RES, 3.32K OHM, 1/8W, 1%, TK, 0805"
R99	013335000	"RES, 3.3M OHM, 1/8W, 5%, TK, 0805"
SW1	DNP	"NULL PART, VACANT PCB LOCATION"
TP1	650000	"TEST PNT, BLK 0.125 DIA TH"
TP2	650000	"TEST PNT, BLK 0.125 DIA TH"
U1	033301003	"IC,SM,UP,MAX807LEWE"
U10	033305029	"IC,74CBT3861 BUS SWT TSSOP24"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
U100	034304000	"IC,78L08 VREG 8V 100MA SOT-89"
U101	DNP	"NULL PART, VACANT PCB LOCATION"
U102	DNP	"NULL PART, VACANT PCB LOCATION"
U103	DNP	"NULL PART, VACANT PCB LOCATION"
U104	DNP	"NULL PART, VACANT PCB LOCATION"
U11	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U12	033300015	"IC, PROM XCF04S 4MB TSSOP-20"
U14	034400006	"IC, FAN1540DX VREG 3.3V TO252"
U15	034400008	"IC, LP3988, VREG, 2.5V, 0.15A, SOT23-5"
U16	034400007	"IC, LP3891, VREG, 1.2V, 0.8A, TO263-5"
U17	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U18	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U19	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U20	033303107	"IC,74LVC14A HEX SCH TRIG SO14"
U23	033300016	"IC, EEPROM 93C46C 64X16 SO8"
U24	033035	"IC,74HCT14 HEX SCH TRIG SO-14"
U25	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U26	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U29	033045	"IC,74HCT245 OCT BUS XCVR, SOW20"
U30	033045	"IC,74HCT245 OCT BUS XCVR, SOW20"
U31	033043	"IC, 74HCT138 3-8 DEMUX SOIC-16"
U32	033043	"IC, 74HCT138 3-8 DEMUX SOIC-16"
U34	033305028	"IC, MAX3243E, RS232 XCVR, 5V, SOW-28"
U38	033305027	"IC, MAX3485E, RS-485 XCVR, 3.3V, SOIC-8"
U39	033303107	"IC,74LVC14A HEX SCH TRIG SO14"
U4	001-01140	"DAUGHTER PCA,7000 PROCESSOR"
U40	033305027	"IC, MAX3485E, RS-485 XCVR, 3.3V, SOIC-8"
U43	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U44	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U46	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U48	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U5	033300032	"IC, CY62256LL, SRAM, 32KX8, 5V, SOIC28"

**Table 13-4 Processor Board Parts List (001-01107 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
U53	DNP	"NULL PART, VACANT PCB LOCATION"
U54	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U55	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U56	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U6	033300032	"IC, CY62256LL, SRAM, 32KX8, 5V, SOIC28"
U60	033303056	"IC,MC14001B QUAD 2-IN NOR SO14"
U7	033082	"IC,ADC0809 8-BIT ADC PLCC28"
U70	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U75	DNP	"NULL PART, VACANT PCB LOCATION"
U76	DNP	"NULL PART, VACANT PCB LOCATION"
U78	DNP	"NULL PART, VACANT PCB LOCATION"
U79	DNP	"NULL PART, VACANT PCB LOCATION"
U8	033302010	"IC, FPGA XC3S1000 FBGA-320"
U80	DNP	"NULL PART, VACANT PCB LOCATION"
U82	DNP	"NULL PART, VACANT PCB LOCATION"
U83	DNP	"NULL PART, VACANT PCB LOCATION"
U9	065296000	"OSC,29.4912 MHZ 3.3V"
U90	DNP	"NULL PART, VACANT PCB LOCATION"
U91	DNP	"NULL PART, VACANT PCB LOCATION"
U92	DNP	"NULL PART, VACANT PCB LOCATION"
U93	DNP	"NULL PART, VACANT PCB LOCATION"
U94	DNP	"NULL PART, VACANT PCB LOCATION"
U95	DNP	"NULL PART, VACANT PCB LOCATION"
U96	DNP	"NULL PART, VACANT PCB LOCATION"
U97	DNP	"NULL PART, VACANT PCB LOCATION"
U98	DNP	"NULL PART, VACANT PCB LOCATION"
U99	DNP	"NULL PART, VACANT PCB LOCATION"
XU2	089032000	"SOCKET, PLCC32 SMT"
XU3	089032000	"SOCKET, PLCC32 SMT"



## Chapter 14: Fast ALC and High Stability Options

### 14.1 Fast ALC Option (7000FALC)

The Fast ALC 7000FALC option reduces the reaction time of the automatic level control (ALC) and is designed for linear amplifiers that use peak detecting ALC like Datron's 1000W linear amplifier RA1000D. The ALC attack time is reduced to less than 200  $\mu$ s allowing the suppression of RF transients and providing a peak-detecting ALC loop capable of operation with multiple modulation modes.

The 7000FALC replaces the standard Reference/Control Board and provides the same I/O functionality available in the standard board. For further information, refer to "Chapter 5: Reference/Control Board."

To install the 7000FALC option:

1. Turn the RT7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Locate the standard Reference/Control board and remove it with a board puller. Remove the J61 reference coax connection.
4. Install the new high stability Reference/Control board (001-00207). Reconnect the J61 coax connection and slide the new board into the Ref/Control slot.
5. Turn the RT7000 on and test the transmit operation of the RT7000.
6. Check output power. If an accurate counter/standard is available, check the output frequency.
7. If adjustments are required for power or frequency, adjust as discussed in the the "Reference/Control Board Test" section on page 21-30. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the sticker on the TCXO and set the frequency using the internal adjustment.
8. Reinstall the board retaining bar and top cover.

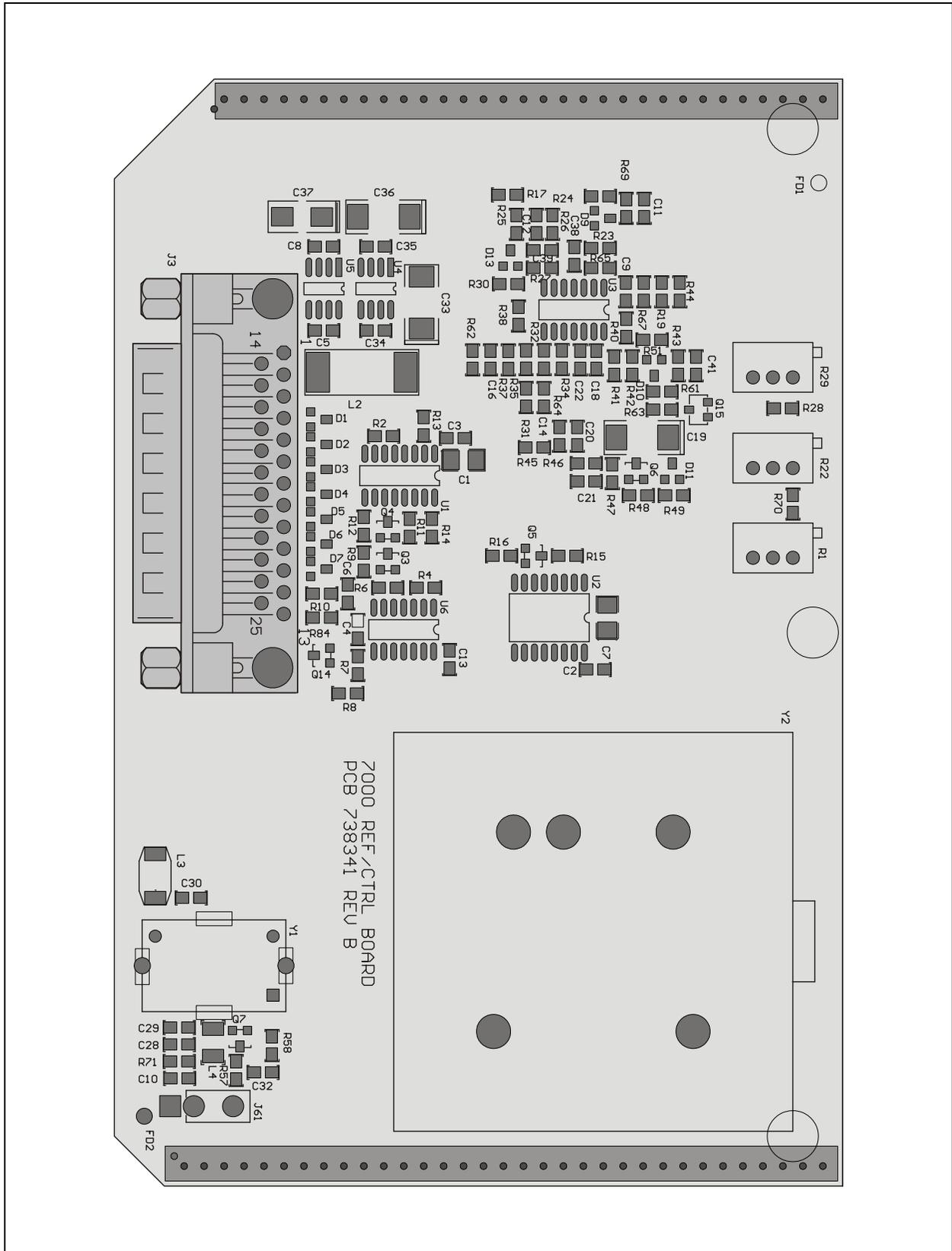
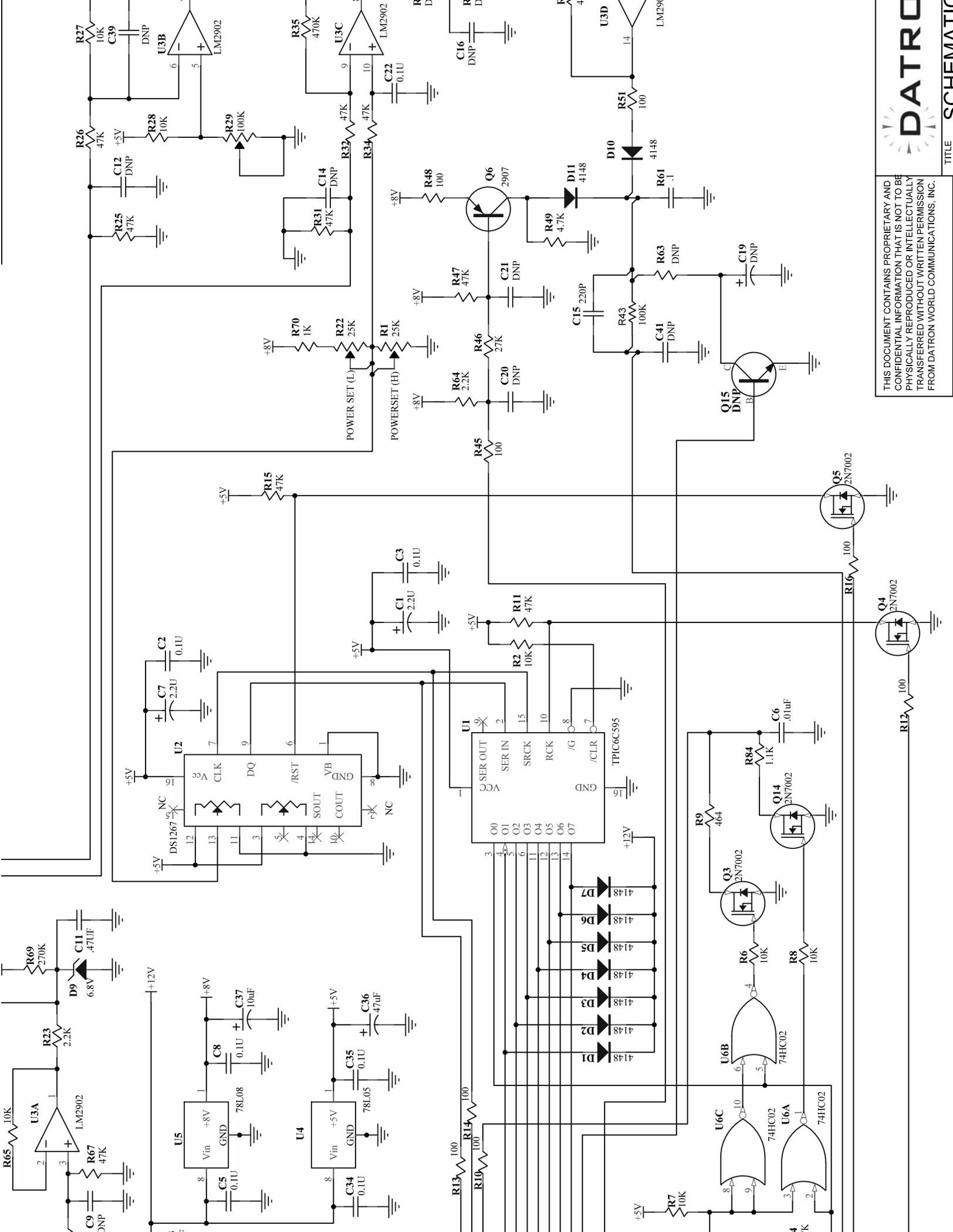


Figure 14-1 Fast ALC Option Component Locations (738341 Rev. B)



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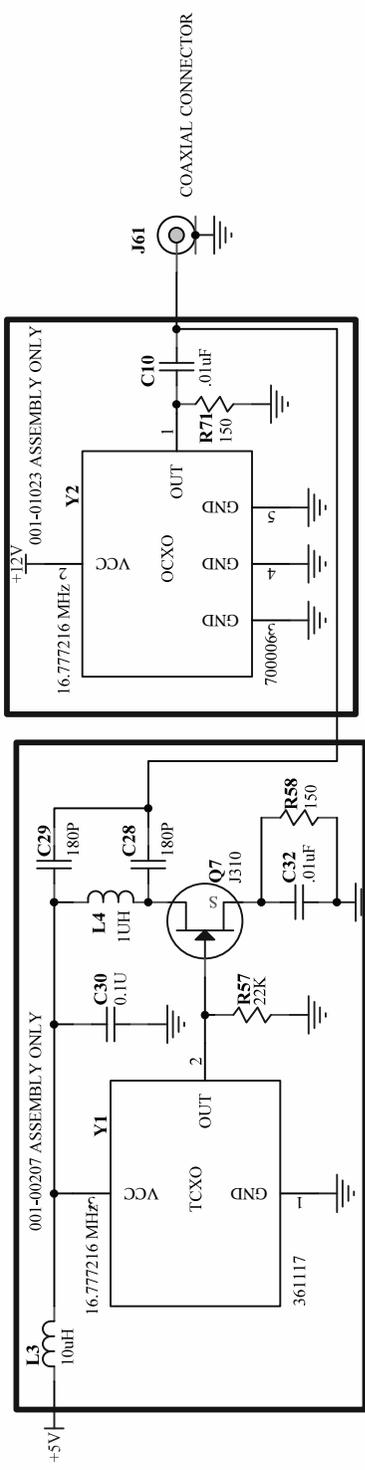


Table 14-1 Fast ALC Option Parts List (001-00207 Rev. F)

Designator	Part Number	Description
C1	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C10	DNP	"NULL PART, VACANT PCB LOCATION"
C11	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C12	DNP	"NULL PART, VACANT PCB LOCATION"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C14	DNP	"NULL PART, VACANT PCB LOCATION"
C15	021221000	"CAP, 220PF NP0 100V 5% 0805"
C16	DNP	"NULL PART, VACANT PCB LOCATION"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C19	DNP	"NULL PART, VACANT PCB LOCATION"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	DNP	"NULL PART, VACANT PCB LOCATION"
C21	DNP	"NULL PART, VACANT PCB LOCATION"
C22	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	021181000	CAP 180PF NP0 100V 5% 0805
C29	021181000	CAP 180PF NP0 100V 5% 0805
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C32	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C33	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C34	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C37	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C38	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C39	DNP	"NULL PART, VACANT PCB LOCATION"
C4	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C41	DNP	"NULL PART, VACANT PCB LOCATION"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C7	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"

Table 14-1 Fast ALC Option Parts List (001-00207 Rev. F)

Designator	Part Number	Description
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	DNP	"NULL PART, VACANT PCB LOCATION"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D11	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D9	037703002	"DIODE,ZENER,6.8V,300MW,SOT-23"
J3	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J61	614024	"CONN,RF PIN FEMALE JACK #45"
L2	041103002	"IND, 10UH FR 15% IHSM-4825"
L3	041103003	"IND,SM,10uH,.7A,DTI608C-103"
L4	041102000	"INDUCTOR,CHIP,1UH,SMT,1210,10%"
Q14	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q15	DNP	"NULL PART, VACANT PCB LOCATION"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q7	032001	"JFET-N,J310, RF AMP, SOT-23"
R1	170335	"RES, 25K TRIM SIDE ADJ"
R10	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R11	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R12	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R13	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R14	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R15	013473000	"RES,47K OHM 1/8W 5% TK 0805"

Table 14-1 Fast ALC Option Parts List (001-00207 Rev. F)

Designator	Part Number	Description
R16	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R17	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R19	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R2	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R22	170335	"RES, 25K TRIM SIDE ADJ"
R23	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R24	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R25	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R26	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R27	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R28	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R29	170334	"RES,100K TRIM SIDE ADJ"
R30	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R31	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R32	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R34	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	DNP	"NULL PART, VACANT PCB LOCATION"
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	"RES, 12K OHM 1/8W 5% TK 0805"
R42	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R43	013104000	"RES,100K OHM 1/8W 5% TK 0805"
R44	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R45	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R46	013273000	"RES,27K OHM 1/8W 5% TK 0805"
R47	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R48	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R49	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R51	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R57	013223000	"RES, 22K OHM 1/8W 5% TK 0805"

**Table 14-1 Fast ALC Option Parts List (001-00207 Rev. F)**

Designator	Part Number	Description
R58	013151000	"RES,150 OHM 1/8W 5% TK 0805"
R6	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R61	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
R62	DNP	"NULL PART, VACANT PCB LOCATION"
R63	DNP	"NULL PART, VACANT PCB LOCATION"
R64	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R65	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R67	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R69	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R7	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R70	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R71	DNP	"NULL PART, VACANT PCB LOCATION"
R8	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R84	013110100	"RES, 1.1K OHM 1/8W 1% TK 0805"
R9	013464000	"RES, 464 OHM 1/8W 1% TK 0805"
U1	033087	"IC, TPIC6C595 8-B S/REG SO-16"
U2	033305003	"IC,DS1267S 10KX2 DIG POT SOW16"
U3	033304000	"IC, LM2902D QUAD-OP AMP SO-14"
U4	033003	"IC,VREG 78L05 5V 5% SOIC-8"
U5	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U6	033081	"IC, 74HC02 QUAD 2-I NOR SO-14"
Y1	361117	"TCXO 16.777216MHz, 0.5PPM"
Y2	DNP	"NULL PART, VACANT PCB LOCATION"

## 14.2 High-Stability Option (7000HS)

The High-Stability 7000HS option provides 0.1 ppm frequency stability to the 7000-series of HF transceivers (3 Hz at 30 MHz). It replaces the standard Reference/Control board with one that has a precision OCXO in place of the standard crystal oscillator.

To install this option:

1. Turn the RT7000 off and remove the top cover.

2. Remove the board retaining bar.
3. Locate the standard Reference/Control board and remove it with a board puller. Remove the J61 reference coax connection.
4. Reinsert the new 7000HS option. Reconnect J61 coax connection and slide the new board into the Reference Control board slot.
5. Turn the RT7000 on and test the transmit operation of the RT7000.
6. Check the output power. Check output frequency only if an accurate counter/standard is available.
7. If adjustments are required for power or frequency, adjust as shown in the the “Reference/Control Board Test” section on page 21-30. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the screw on the OCXO and set the frequency using the internal potentiometer. Replace the screw.

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**CAUTION: When adjusting the frequency of the high-stability oscillator, make sure the standard used for the counter is higher than 0.1 ppm.**

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8. Reinstall the board retaining bar and top cover.

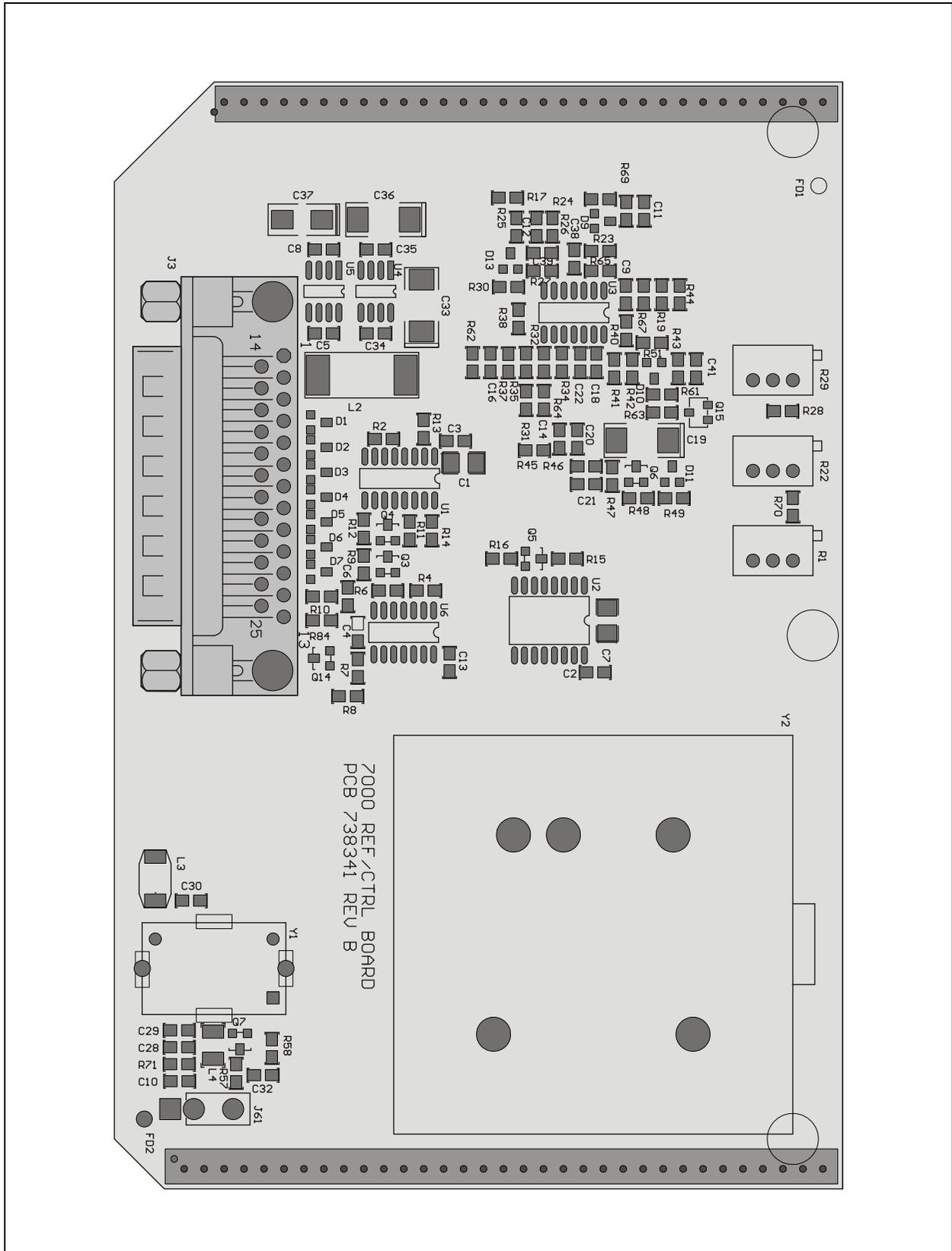
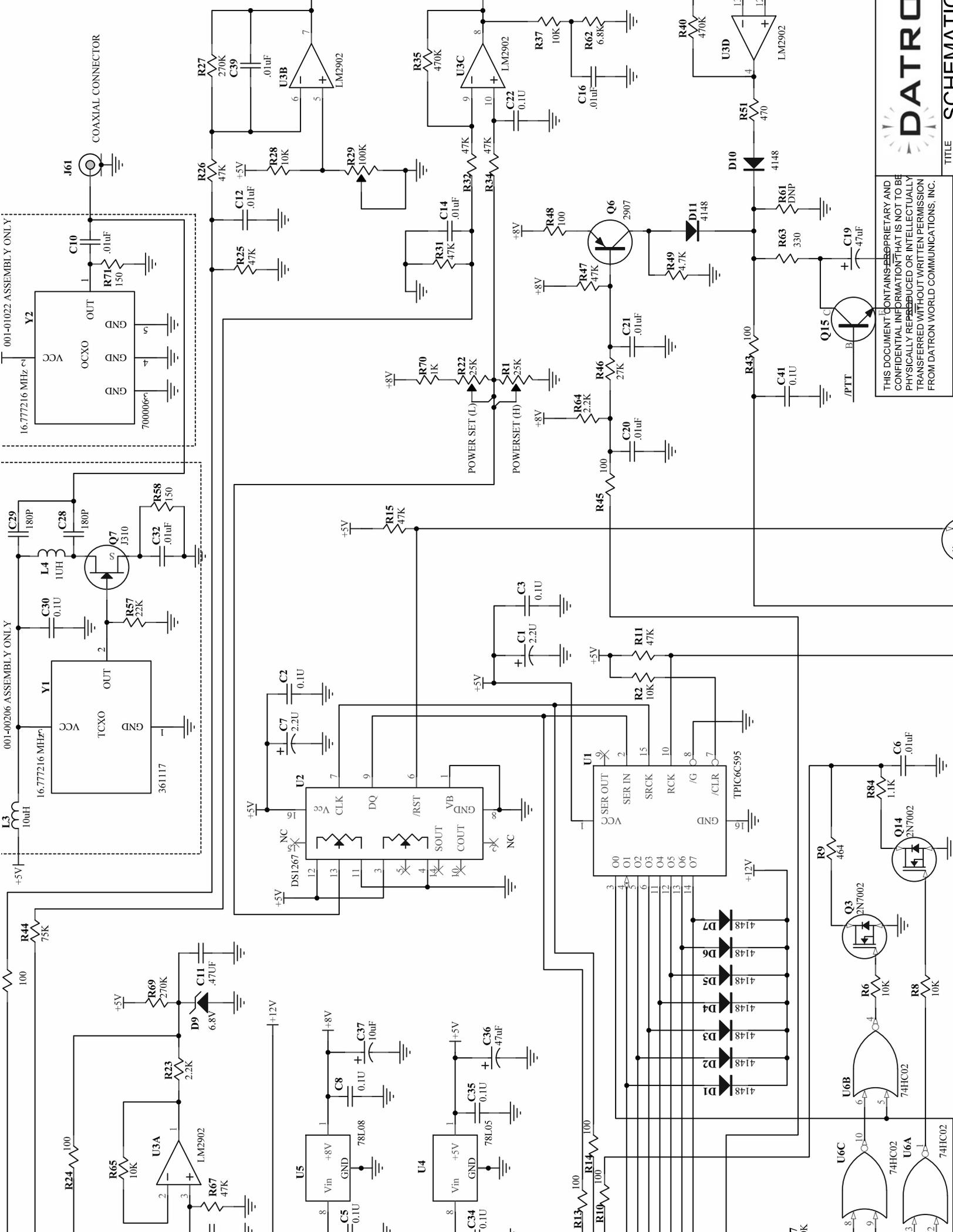


Figure 14-4 High Stability Option Component Locations (738341 Rev. B)



001-00206 ASSEMBLY ONLY

001-01022 ASSEMBLY ONLY

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**Table 14-2 High Stability Option Parts List (001-01022 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C10	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C12	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C14	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C16	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C19	022476000	"CAP, 47UF TA 20V 20% 7343"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C21	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C22	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	DNP	"NULL PART, VACANT PCB LOCATION"
C29	DNP	"NULL PART, VACANT PCB LOCATION"
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	DNP	"NULL PART, VACANT PCB LOCATION"
C32	DNP	"NULL PART, VACANT PCB LOCATION"
C33	022476000	"CAP, 47UF TA 20V 20% 7343"
C34	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	022476000	"CAP, 47UF TA 20V 20% 7343"
C37	022106001	"CAP, 10UF, TA, 16V, 10%, 6032-28"
C38	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C39	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C4	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C41	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C7	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 14-2 High Stability Option Parts List (001-01022 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D10	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D11	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D9	037703002	"DIODE,ZENER,6.8V,350MW,SOT-23"
J3	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J61	614024	"CONN,RF PIN FEMALE JACK #45"
L2	041103002	"IND, 10UH FR 15% IHSM-4825"
L3	DNP	"NULL PART, VACANT PCB LOCATION"
L4	DNP	"NULL PART, VACANT PCB LOCATION"
Q14	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q15	031104003	"XSTR, NPN 10K/10K 50V SC-59"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q7	DNP	"NULL PART, VACANT PCB LOCATION"
R1	170335	"RES, 25K TRIM SIDE ADJ"
R10	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R11	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R12	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R13	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R14	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R15	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R16	013101000	"RES,100 OHM 1/8W 5% TK 0805"

Table 14-2 High Stability Option Parts List (001-01022 Rev. G)

Designator	Part Number	Description
R17	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R19	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R2	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R22	170335	"RES, 25K TRIM SIDE ADJ"
R23	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R24	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R25	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R26	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R27	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R28	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R29	170334	"RES,100K TRIM SIDE ADJ"
R30	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R31	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R32	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R34	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	"RES, 12K OHM 1/8W 5% TK 0805"
R42	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R43	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R44	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R45	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R46	013273000	"RES,27K OHM 1/8W 5% TK 0805"
R47	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R48	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R49	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R51	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R57	DNP	"NULL PART, VACANT PCB LOCATION"
R58	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 14-2 High Stability Option Parts List (001-01022 Rev. G)**

Designator	Part Number	Description
R6	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R61	DNP	"NULL PART, VACANT PCB LOCATION"
R62	013682000	"RES, 6.8K OHM 1/8W 5% TK 0805"
R63	013331000	"RES,330 OHM 1/8W 5% TK 0805"
R64	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R65	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R67	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R69	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R7	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R70	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R71	013151000	"RES,150 OHM 1/8W 5% TK 0805"
R8	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R84	013110100	"RES, 1.1K OHM 1/8W 1% TK 0805"
R9	013464000	"RES, 464 OHM 1/8W 1% TK 0805"
U1	033087	"IC, TPIC6C595 8-B S/REG SO-16"
U2	033305003	"IC,DS1267S 10KX2 DIG POT SOW16"
U3	033304000	"IC, LM2902D QUAD-OP AMP SO-14"
U4	033003	"IC,VREG 78L05 5V 5% SOIC-8"
U5	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U6	033081	"IC, 74HC02 QUAD 2-I NOR SO-14"
Y2	700006	"OCXO,16.777216 MHZ 0.1 PPM"

### 14.3 High Stability Fast ALC Option (7000HS-FALC)

The High-Stability Fast ALC 7000HS-FALC option is the high stability version of the 7000FALC. The 7000HS-FALC provides 0.1ppm frequency stability to the 7000-series of HF transceivers (3 Hz at 30 MHz). It replaces the standard oscillator (Y1) with a precision oscillator OCXO (Y2). The 7000HS-FALC also reduces the reaction time of the ALC and is designed to be used with linear amplifiers that utilize peak detecting ALC like the Datron 1000W linear amplifier RA1000D. The ALC attack time is reduced to less than 200  $\mu$ s, allowing the suppression of RF transients and providing a peak-detecting ALC loop capable of operation with multiple modulation modes.

The 7000HS-FALC replaces the standard Reference/Control Board and provides the same I/O functionality available in the standard board. For more information, refer to “Chapter 5: Reference/Control Board.”

To install this option:

1. Turn the RT7000 off and remove the top cover.
2. Remove the board retaining bars.
3. Locate the standard Reference/Control board and remove it with a board puller. Remove the J61 reference coax connection.
4. Install the new high stability Reference/Control board (001-01023). Reconnect J61 coax connection and slide the new board into the Ref/Control slot.
5. Turn the RT7000 on and test the transmit operation of the RT7000.
6. Check output power. If an accurate counter/standard is available, check the output frequency.
7. If adjustments are required for power or frequency, adjust as shown in the the “Reference/Control Board Test” section on page 21-30. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the screw on the OCXO and set the frequency using the internal potentiometer. Replace the screw.

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**CAUTION: When adjusting the frequency of the high-stability oscillator, make sure the standard used for the counter is better than 0.1 ppm.**

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8. Reinstall the board retaining bar and top cover.

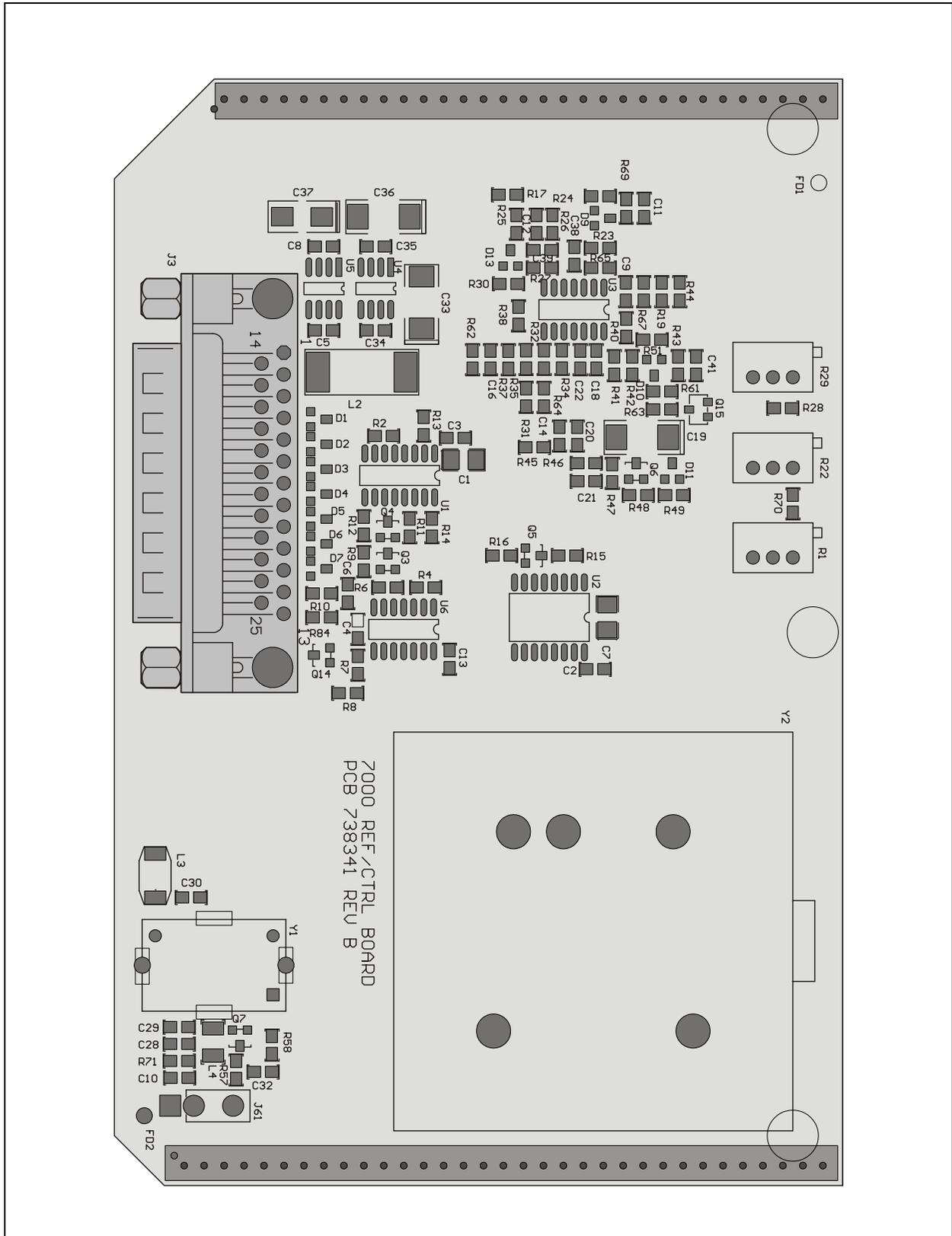


Figure 14-6 High Stability Fast ALC Option Component Locations (738341 Rev. B)



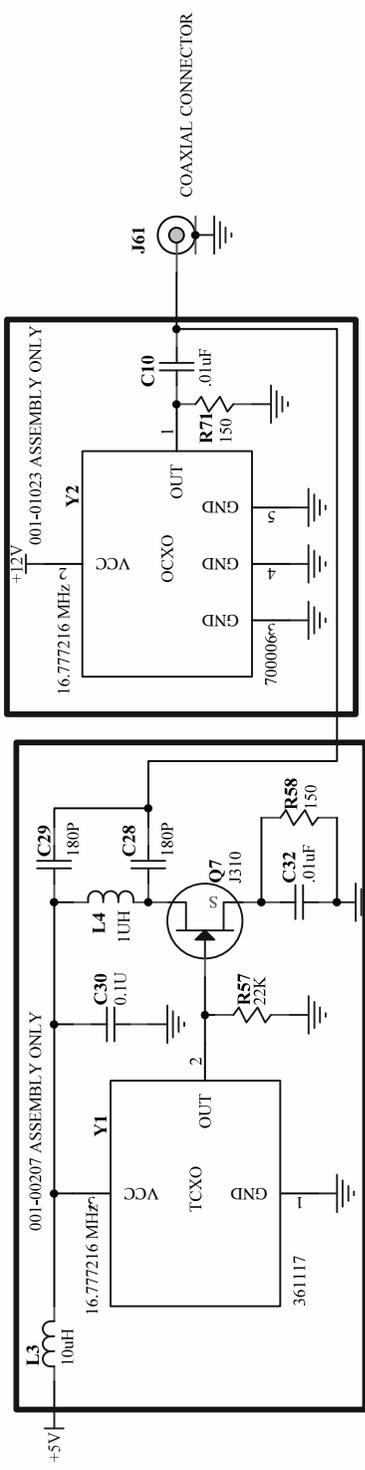


Table 14-3 High Stability Fast ALC Option Parts List (001-01023 Rev. E)

Designator	Part Number	Description
C1	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C10	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021474001	"CAP, 0.47UF X7R 16V 10% 0805"
C12	DNP	"NULL PART, VACANT PCB LOCATION"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C14	DNP	"NULL PART, VACANT PCB LOCATION"
C15	021221000	"CAP, 220PF NP0 100V 5% 0805"
C16	DNP	"NULL PART, VACANT PCB LOCATION"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C19	DNP	"NULL PART, VACANT PCB LOCATION"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	DNP	"NULL PART, VACANT PCB LOCATION"
C21	DNP	"NULL PART, VACANT PCB LOCATION"
C22	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	DNP	"NULL PART, VACANT PCB LOCATION"
C29	DNP	"NULL PART, VACANT PCB LOCATION"
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	DNP	"NULL PART, VACANT PCB LOCATION"
C32	DNP	"NULL PART, VACANT PCB LOCATION"
C33	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C34	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C37	022106001	"CAP,10UF,TA,16V,10%,6032-28"
C38	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C39	DNP	"NULL PART, VACANT PCB LOCATION"
C4	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C41	DNP	"NULL PART, VACANT PCB LOCATION"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C7	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"

**Table 14-3 High Stability Fast ALC Option Parts List (001-01023 Rev. E)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	DNP	"NULL PART, VACANT PCB LOCATION"
D1	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D10	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D11	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D13	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D2	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D3	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D4	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D5	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D6	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D7	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
D9	037703002	"DIODE, ZENER, 6.8V, 300MW, SOT-23"
J3	613163	"CONN, DB-25 RT ANGLE PC PLUG"
J61	614024	"CONN, RF PIN FEMALE JACK #45"
L2	041103002	"IND, 10UH FR 15% IHSM-4825"
L3	DNP	"NULL PART, VACANT PCB LOCATION"
L4	DNP	"NULL PART, VACANT PCB LOCATION"
Q14	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q15	DNP	"NULL PART, VACANT PCB LOCATION"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032006	"XSTR, MMBT2907A PNP SOT-23EBC"
Q7	DNP	"NULL PART, VACANT PCB LOCATION"
R1	170335	"RES, 25K TRIM SIDE ADJ"
R10	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R11	013473000	"RES, 47K OHM 1/8W 5% TK 0805"
R12	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R13	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R14	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R15	013473000	"RES, 47K OHM 1/8W 5% TK 0805"

Table 14-3 High Stability Fast ALC Option Parts List (001-01023 Rev. E)

Designator	Part Number	Description
R16	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R17	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R19	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R2	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R22	170335	"RES, 25K TRIM SIDE ADJ"
R23	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R24	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R25	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R26	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R27	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R28	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R29	170334	"RES,100K TRIM SIDE ADJ"
R30	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R31	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R32	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R34	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	DNP	"NULL PART, VACANT PCB LOCATION"
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	"RES, 12K OHM 1/8W 5% TK 0805"
R42	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R43	013104000	"RES,100K OHM 1/8W 5% TK 0805"
R44	013753000	"RES, 75K OHM 1/8W 5% TK 0805"
R45	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R46	013273000	"RES,27K OHM 1/8W 5% TK 0805"
R47	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R48	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R49	013472000	"RES, 4.7K OHM 1/8W 5% TK 0805"
R51	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R57	DNP	"NULL PART, VACANT PCB LOCATION"

**Table 14-3 High Stability Fast ALC Option Parts List (001-01023 Rev. E)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R58	DNP	"NULL PART, VACANT PCB LOCATION"
R6	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R61	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
R62	DNP	"NULL PART, VACANT PCB LOCATION"
R63	DNP	"NULL PART, VACANT PCB LOCATION"
R64	013222000	"RES,2.2K OHM 1/8W 5% TK 0805"
R65	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R67	013473000	"RES,47K OHM 1/8W 5% TK 0805"
R69	013274000	"RES,270K OHM 1/8W 5% TK 0805"
R7	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R70	013102000	"RES, 1K OHM 1/8W 5% TK 0805"
R71	013151000	"RES,150 OHM 1/8W 5% TK 0805"
R8	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R84	013110100	"RES, 1.1K OHM 1/8W 1% TK 0805"
R9	013464000	"RES, 464 OHM 1/8W 1% TK 0805"
U1	033087	"IC, TPIC6C595 8-B S/REG SO-16"
U2	033305003	"IC,DS1267S 10KX2 DIG POT SOW16"
U3	033304000	"IC, LM2902D QUAD-OP AMP SO-14"
U4	033003	"IC,VREG 78L05 5V 5% SOIC-8"
U5	033002	"IC,VREG 78L08 8V 5% SOIC-8"
U6	033081	"IC, 74HC02 QUAD 2-I NOR SO-14"
Y1	DNP	"NULL PART, VACANT PCB LOCATION"
Y2	700006	"OCXO,16.777216 MHZ 0.1 PPM"



## Chapter 15: ALE Options

### 15.1 7000ALE

The FED-STD-1045 compatible adaptive ALE system provides complete 1045-specification capability including link quality analysis, auto-linking and order wire message transmissions. The following circuit description only covers the ALE circuitry. The main processor and associated circuitry is described in “Chapter 14: Processor Board.”

#### 15.1.1 Circuit Description

The ALE option includes the main ALE processor and DSP. Figure 15-1 on page 15-4 provides a block diagram of the ALE/Processor board.

##### ALE Processor

ALE processor U78, combined with the input/output circuits, forms a special purpose microcomputer. The ALE processor controls ALE data as it comes from the DSP. It also prepares the ALE data before it is sent to the DSP for transmission.

The ALE processor addresses up to 64 kilobytes of static RAM (SRAM). It includes 1 UART, 2 timers, 32 bidirectional input/output lines, and 6 external interrupt sources. The ALE processor operates at a clock frequency of 11.0592 MHz provided by external oscillator U76. The UART communicates with the main radio processor through serial buffers.

Port 1 is used for the following miscellaneous control functions:

Port	Function
P1.0	Selects the communications mode for the external serial-control interface which is strictly for processor control or control through an external dumb terminal.
P1.1	Sets the serial control interface baud rate of 9600 or 19200 baud.
P1.2	Keyline output drive for keying the PTT line of an external device.
P1.3	Input that reads the current status of the PTT line.

Port	Function
P1.4	Provides the microprocessor watchdog output to reset controller chip U1.
P1.5	Provides a control input into the DSP.
P1.6	Interrupt line 1 to the DSP and dual port SRAM chip.
P1.7	Provides the DSP reset pulse for a controlled power-up of the DSP.

Port 3 is for interrupt functions that have high priority:

Port	Function
P3.0	No connection.
P3.1	Transmit driver pin for the serial-control interface.
P3.2	Receive pin for the serial-control interface.
P3.3	Interrupt from the dual port RAM that indicates the DSP has left data that must be retrieved for processing.
P3.4	External timing input from the DSP.
P3.5	External timing input from the DSP.
P3.6	No connection.

The ALE, PSEN, RD, WR, address/data lines AD0-AD7 and address lines A8-A15 are for communications with program memory EPROM U80, data RAM U82, data memory EEPROM U83 and DSP U93 that support the ALE processor.

**Reset Controller** Controller U75 provides three functions. The first function is a reset pulse generator that monitors the +5V line. It generates a reset output to hold the microprocessor's reset line low whenever the +5V line is below 4.65 Vdc. On power-up, an internal monostable multivibrator holds the reset line low for 250 ms, allowing the power supply to stabilize before generating the reset pulse. This also prevents repeated toggling of the reset line.

The second function is a debounced reset input line used as an external push button to reset the microprocessor. It is available on the JTAG connector J1 pin 7.

The third function of U75 is a microprocessor watchdog that requires the microprocessor to toggle the STB input at least once every 500 ms. If the microprocessor fails to do so, the reset controller assumes the processor is locked up and provides a reset pulse to start it again. This is a rare occurrence and the ALE circuitry is able to recover from it without external help.

---

Clock Oscillator	Clock oscillator U76 provides the internal clock for the ALE processor. Clock oscillator U92 is a high-stability oscillator that provides the internal clock and timing for the DSP.
Buffers	Inverter/buffer chip U24 provides protection for the main processor from the outside world. U22D buffers the PTT input line. U24C and U39E buffer the output of the 11.0592 MHz oscillator.
EPROM Program Storage	EPROM chip U80 stores the main software operating program for the ALE board. DSP EPROM chips U94 and U98 store the high-speed DSP.
RAM Program Storage	RAM chip U82 stores all the current operating data. DSP RAM chip U95 executes the high-speed DSP.
Memory Backup	If the RT7000's DC power source (+12 Vdc) fails, voltage detector U1 switches to the onboard 3V Lithium backup battery to maintain power to the RAM chips (main and ALE). It is only designed to provide backup power to the memory chips for a few days.
EEPROM Data Storage	EEPROM chip U83 provides long term operating data and parameters storage.
Dual Port SRAM	Dual port SRAM (DPSRAM) chip U96 provides an easy interface between the ALE processor and the DSP. Each time the DSP receives ALE data, it stores it in the DPSRAM, then sends an interrupt to the main processor to indicate data is waiting. The main processor retrieves and processes the data. Conversely, when the microprocessor wants to transmit, it stores the data in DPSRAM. The DPSRAM sends an interrupt to the DSP. The DSP then retrieves the data and transmits it.
Control Logic	Field-programmable gate-array chip (FPGA) U8 contains all the interface logic between the ALE processor and its memories, and the DSP and its memories. It also provides the control interface between the ALE and DSPs.  Bus multiplex chip U79 multiplexes the address and data lines coming from the main processor. The address is first presented to the lower address bus and then is latched with the ALE signal from the main microprocessor. The bus is then able to read or write data on AD0-AD8.
Digital Signal Processor	Digital signal processor (DSP) U93 is a special purpose processor optimized for fast math functions. Digital processing enables the DSP to distinguish ALE tones from normal background noise in noisy environments. It also generates transmit tones with superb quality enhancing the likelihood of detection at the receiving end.  The DSP operates at a clock frequency of 20.736 MHz provided by high-stability oscillator U92. This high-stability clock is necessary for providing precise ALE tone generation and decoding.

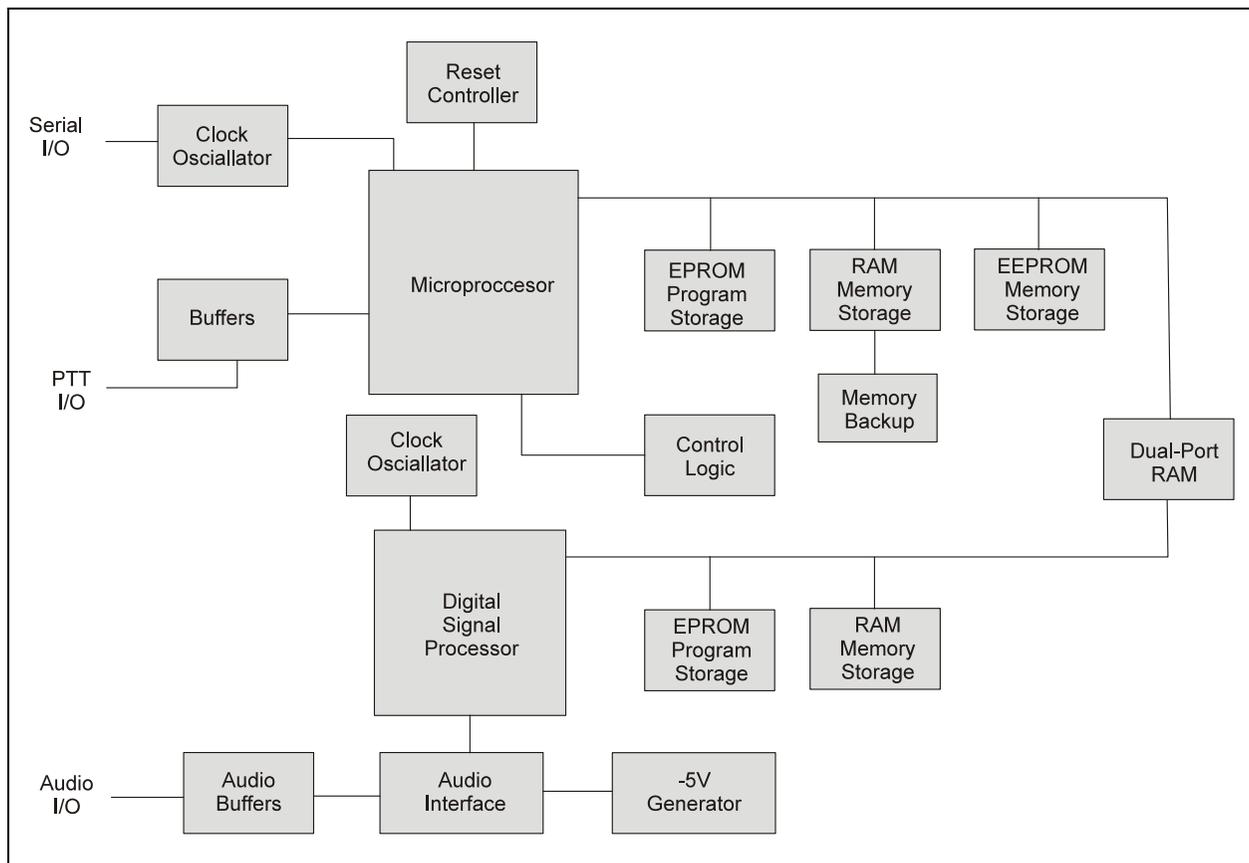
The DS, PS, IS, STAB, and RW lines (all active-low) provide the switching logic for external EPROM chips U94 and U98, SRAM U95, and Dual Port SRAM U96. Address lines A0 to A15 and data lines D0 to D15 communicate with the EPROM, SRAM, and DPRAM chips.

The DSP interfaces with audio CODEC chip U91 that processes all the incoming receive audio and digitizes it for the DSP. It also generates the ALE transmit tones from the digital data the DSP sends.

#### Audio Interface

Audio interface chip U91 is responsible for generating and decoding ALE tones. U91 is divided into two parts: receive circuitry and transmit circuitry. The receive circuitry consist of a 14-bit analog-to-digital converter (ADC) that converts the incoming signal into a digital sequence applied to the DSP. The transmit circuitry uses a 14-bit digital-to-analog converter (DAC) to convert the incoming digital sequence from the DSP into a precise transmit audio (analog) tone.

The audio buffer chips buffer the receive audio input (U99A) and transmit audio output (U99B). They allow adjustment of the input (R134) and output (R147) levels. For location of adjustment points, refer to Figure 15-2 on page 15-5.



**Figure 15-1 7000ALE Option Block Diagram**

## 15.1.2 Installation

The 7000ALE option consists of the Processor board with 1045 ALE circuitry populated on the board (001-01105). It is installed in the Processor board slot and uses a DB25 ribbon cable connected to the Motherboard to communicate ALE information with the RT7000.

To install the 7000ALE option:

1. Turn the radio off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107) and remove it with a board puller using correct anti-static procedures.
3. Verify the jumpers on JU13A and JU24 on the new 7000ALE option board (001-01105) are installed as shown in Figure 15-2 below.
4. Reinsert the 7000ALE option board and plug the ribbon cable in the ALE option slot (J13) next to the 7000ALE option board.
5. Replace the retaining bar and the cover of the radio.
6. When powered up, the **ALE** icon is displayed.

For operational information on ALE, refer to the ALE operator manual (7000ALE-MSOP).

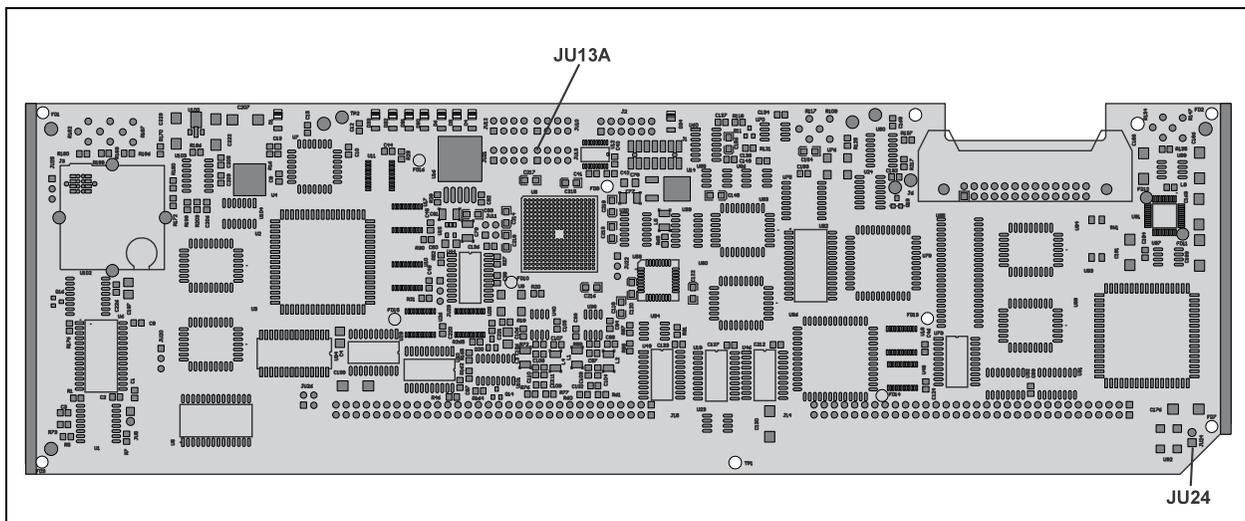
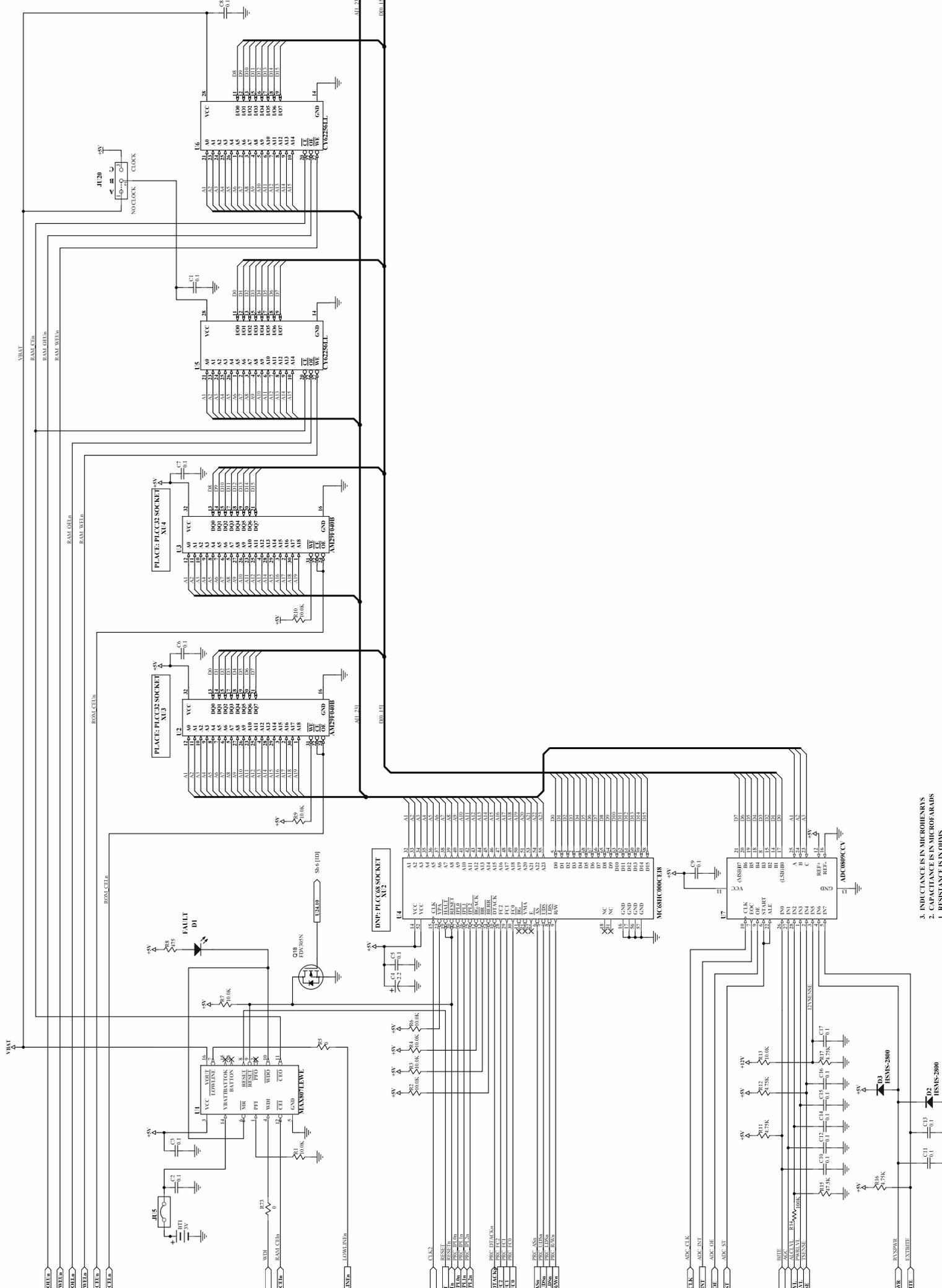


Figure 15-2 7000ALE Option Jumper Placement

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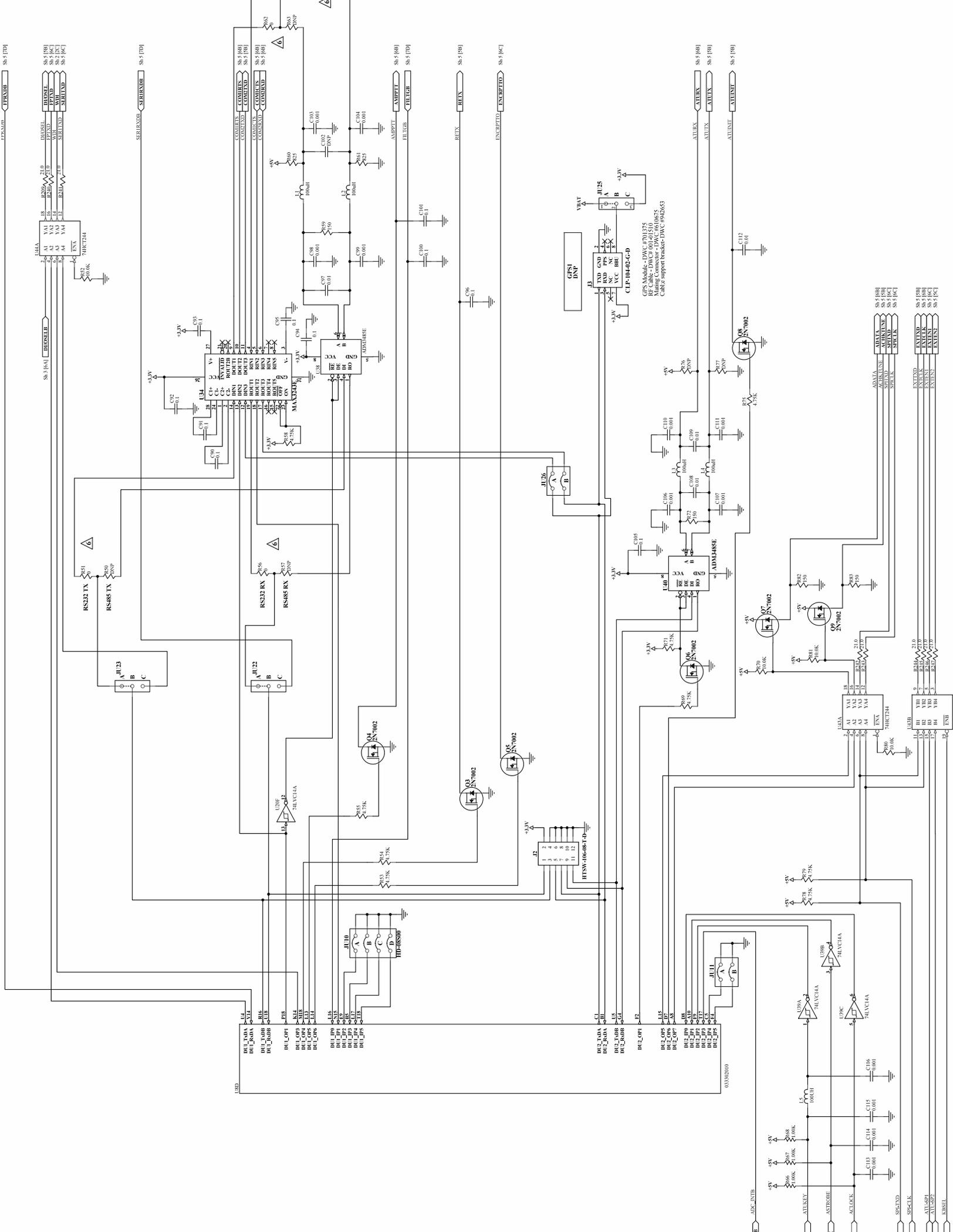


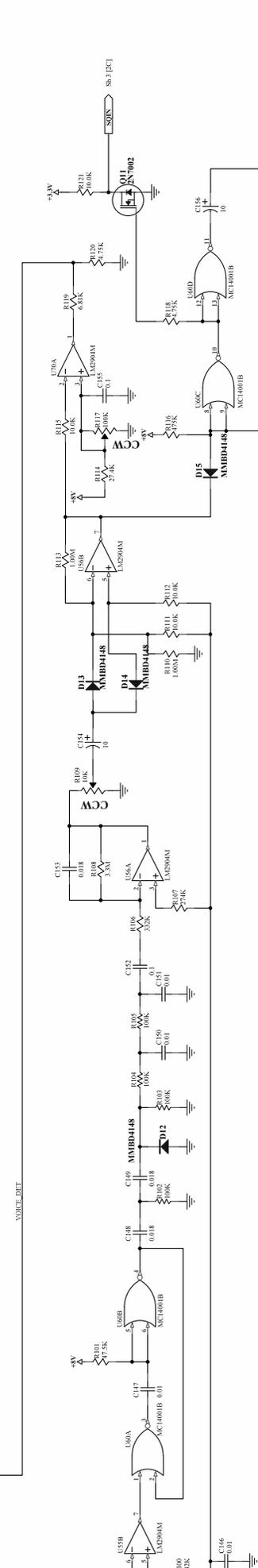
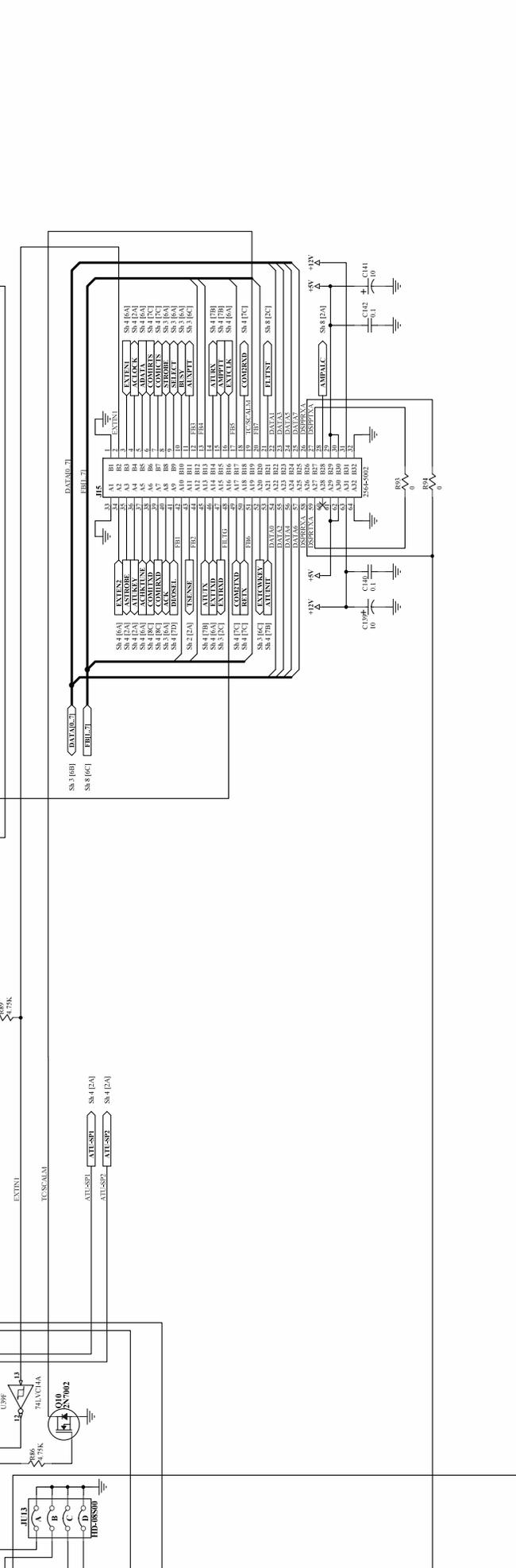
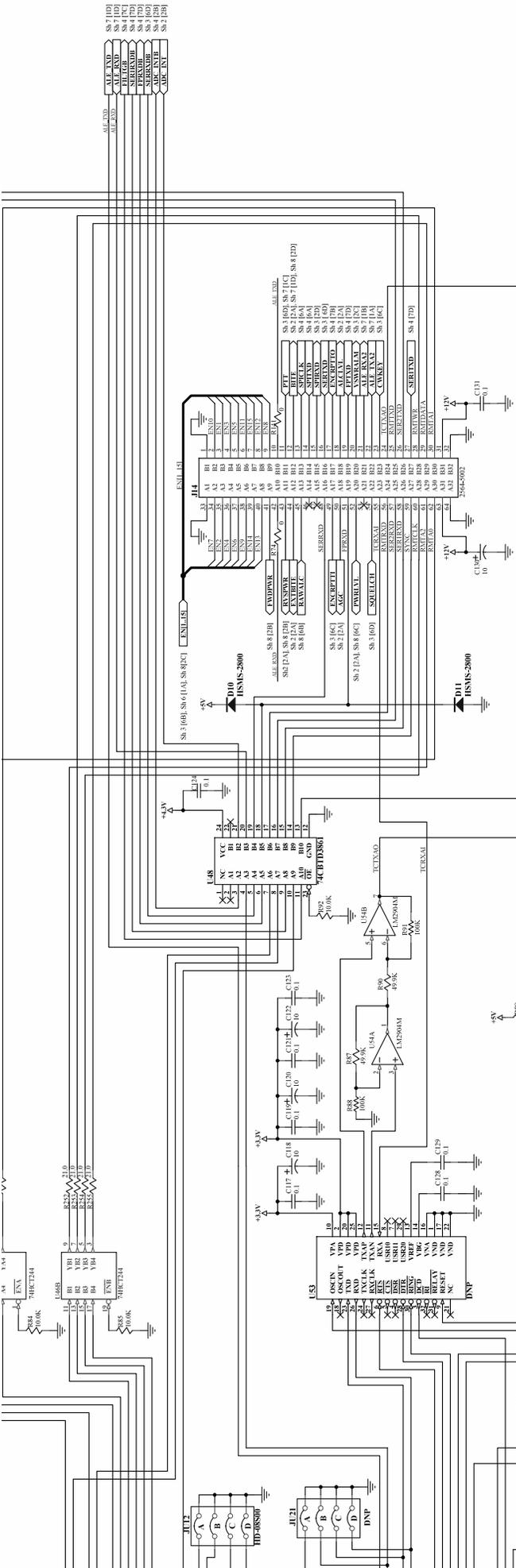




3. INDUCTANCE IS MICROHENRYS
2. CAPACITANCE IS MICROFARADS
1. RESISTANCE IS OHMS

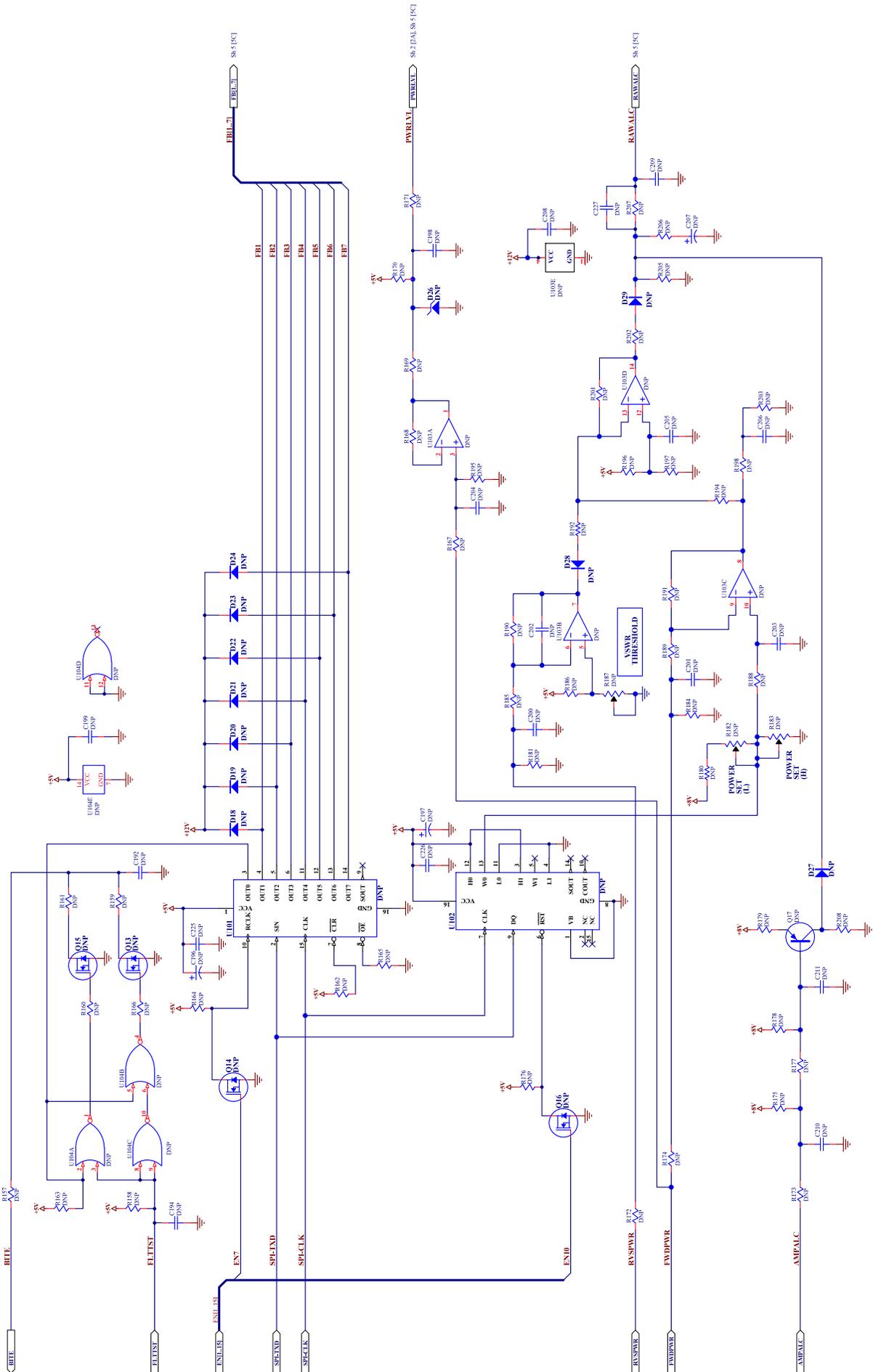












3. INDUCTANCE IN MICROHENRS  
 2. CAPACITANCE IN MICROFARADS  
 1. RESISTANCE IN OHMS  
 ES: UNLESS OTHERWISE SPECIFIED

**Table 15-1 ALE Option Parts List (001-01105 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
BT1	750057	"BATT, CR2450, 0.54AH, 3V, LI, 3-TAB COIN"
C1	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C10	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C100	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C101	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C102	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C103	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C104	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C105	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C106	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C107	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C108	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C109	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C110	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C111	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C112	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C113	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C114	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C115	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C116	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C117	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C118	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C119	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C12	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C120	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C121	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C122	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C123	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C124	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C125	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C126	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C127	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C128	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C129	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C130	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C131	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C132	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C133	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C134	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C135	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C136	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C137	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C138	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C139	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C14	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C140	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C141	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C142	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C143	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C144	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C145	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C146	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C147	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C148	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C149	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C15	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C150	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C151	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C152	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C153	021183002	"CAP, 0.018UF, X7R, 50V, 10%, 0805"
C154	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C155	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C156	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C157	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C158	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C159	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C16	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C160	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C161	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C162	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C163	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C164	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C165	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C166	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C167	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C168	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C169	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C17	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C170	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C171	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C172	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C173	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C174	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C175	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C176	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C177	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C178	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C179	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C18	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C180	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C181	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"
C182	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C183	022476000	"CAP, 47UF, TA, 20V, 20%, 7343-31"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C184	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C185	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C186	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C187	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C188	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C189	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C19	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C191	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C192	DNP	"NULL PART, VACANT PCB LOCATION"
C193	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C194	DNP	"NULL PART, VACANT PCB LOCATION"
C195	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C196	DNP	"NULL PART, VACANT PCB LOCATION"
C197	DNP	"NULL PART, VACANT PCB LOCATION"
C198	DNP	"NULL PART, VACANT PCB LOCATION"
C199	DNP	"NULL PART, VACANT PCB LOCATION"
C2	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C20	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C200	DNP	"NULL PART, VACANT PCB LOCATION"
C201	DNP	"NULL PART, VACANT PCB LOCATION"
C202	DNP	"NULL PART, VACANT PCB LOCATION"
C203	DNP	"NULL PART, VACANT PCB LOCATION"
C204	DNP	"NULL PART, VACANT PCB LOCATION"
C205	DNP	"NULL PART, VACANT PCB LOCATION"
C206	DNP	"NULL PART, VACANT PCB LOCATION"
C207	DNP	"NULL PART, VACANT PCB LOCATION"
C208	DNP	"NULL PART, VACANT PCB LOCATION"
C209	DNP	"NULL PART, VACANT PCB LOCATION"
C21	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C210	DNP	"NULL PART, VACANT PCB LOCATION"
C211	DNP	"NULL PART, VACANT PCB LOCATION"
C212	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C213	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C214	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C215	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C216	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C217	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C218	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C219	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C22	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C220	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C221	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C222	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C223	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C224	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C225	DNP	"NULL PART, VACANT PCB LOCATION"
C226	DNP	"NULL PART, VACANT PCB LOCATION"
C227	DNP	"NULL PART, VACANT PCB LOCATION"
C23	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C24	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C25	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C26	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C27	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C28	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C29	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C30	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C31	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C32	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C33	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C34	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C37	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C38	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C39	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C4	022225000	"CAP, 2.2UF TA 20V 10% 3528-21"
C40	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C41	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C42	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C43	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C44	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C45	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C46	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C47	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C48	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C49	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C5	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C50	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C51	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C52	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C53	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C54	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C55	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C56	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C57	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C58	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C59	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C6	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C60	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C61	021104006	"CAP,0.1UF,X7R,25V,10%,0603"
C62	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C63	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C64	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C65	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C66	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C67	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C68	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C69	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C7	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C70	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C71	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C72	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C73	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C74	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C75	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C76	021105007	"CAP, 1.0UF 16V X7R 10% 0805"
C77	021226000	"CAP, 22UF 10V X5R 20% 1210"
C78	021106001	"CAP, 10UF, X5R, 16V, 10%, 1206"
C79	021226000	"CAP, 22UF 10V X5R 20% 1210"
C8	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C80	021106001	"CAP, 10UF, X5R, 16V, 10%, 1206"
C81	021226000	"CAP, 22UF 10V X5R 20% 1210"
C82	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C83	022106003	"CAP, 10UF, TA, 16V, 20%, 3216-18"
C84	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C85	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C86	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C87	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C88	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C89	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C90	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C91	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C92	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C93	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C94	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C95	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
C96	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C97	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C98	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C99	021102000	"CAP, 1000PF NP0 100V 5% 0805"
D1	035500003	"LED, RED TOP-V 1206"
D10	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D11	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D12	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D13	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D14	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D15	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D16	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D18	DNP	"NULL PART, VACANT PCB LOCATION"
D19	DNP	"NULL PART, VACANT PCB LOCATION"
D2	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D20	DNP	"NULL PART, VACANT PCB LOCATION"
D21	DNP	"NULL PART, VACANT PCB LOCATION"
D22	DNP	"NULL PART, VACANT PCB LOCATION"
D23	DNP	"NULL PART, VACANT PCB LOCATION"
D24	DNP	"NULL PART, VACANT PCB LOCATION"
D26	DNP	"NULL PART, VACANT PCB LOCATION"
D27	DNP	"NULL PART, VACANT PCB LOCATION"
D28	DNP	"NULL PART, VACANT PCB LOCATION"
D29	DNP	"NULL PART, VACANT PCB LOCATION"
D3	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D30	035500002	"LED, GREEN TOP-V 1206"
D31	035500002	"LED, GREEN TOP-V 1206"
D32	035500001	"LED, YELLOW TOP-V 1206"
D33	035500001	"LED, YELLOW TOP-V 1206"
D34	035500001	"LED, YELLOW TOP-V 1206"
D35	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	035500002	"LED, GREEN TOP-V 1206"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
D5	035500002	"LED, GREEN TOP-V 1206"
D6	035500002	"LED, GREEN TOP-V 1206"
D7	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D8	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
D9	031006	"DIODE,HSMS-2800 SCHOT SOT-23AK"
GPS1	DNP	"NULL PART, VACANT PCB LOCATION"
J1	081014000	"HEADER, 2X7 BOX 2MM SMT"
J14	613166	"HEADER,64 PIN RT ANGLE PC MNT"
J15	613166	"HEADER,64 PIN RT ANGLE PC MNT"
J2	620172	"HEADER, 2X6 MLX 0.1"
J3	610675	"HEADER,RECEPT 2X4 0.05 LP SMT"
J6	620013	"HEADER, 2X13 4-WALL RT EJC 0.1"
JU10	620026	"HEADER,8 PIN DUAL MALE"
JU11	620025	"HEADER, 2X2 MLX 0.1 VERT"
JU12	620026	"HEADER,8 PIN DUAL MALE"
JU13	620026	"HEADER,8 PIN DUAL MALE"
JU20	620030	"HEADER,3 PIN 0.025 SQ POST"
JU21	DNP	"NULL PART, VACANT PCB LOCATION"
JU22	620030	"HEADER,3 PIN 0.025 SQ POST"
JU23	620030	"HEADER,3 PIN 0.025 SQ POST"
JU24	650048	"HEADER, PIN 1X2 MLX 0.1 TH"
JU25	620030	"HEADER,3 PIN 0.025 SQ POST"
JU26	620025	"HEADER, 2X2 MLX 0.1 VERT"
JU5	650048	"HEADER, PIN 1X2 MLX 0.1 TH"
L1	045104	"IND,100 UH FR 150MA 10% 1210"
L2	045104	"IND,100 UH FR 150MA 10% 1210"
L3	045104	"IND,100 UH FR 150MA 10% 1210"
L4	045104	"IND,100 UH FR 150MA 10% 1210"
L5	045104	"IND,100 UH FR 150MA 10% 1210"
L6	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L7	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L8	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
Q1	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q10	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q11	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q12	032004	"XSTR,MMBT2222A NPN SOT23"
Q13	DNP	"NULL PART, VACANT PCB LOCATION"
Q14	DNP	"NULL PART, VACANT PCB LOCATION"
Q15	DNP	"NULL PART, VACANT PCB LOCATION"
Q16	DNP	"NULL PART, VACANT PCB LOCATION"
Q17	DNP	"NULL PART, VACANT PCB LOCATION"
Q18	031102038	"MOSFET-N, FDV305N 20V SOT-23"
Q2	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q3	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q4	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q5	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q6	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q7	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q8	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
Q9	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
R1	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R10	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R100	013332300	"RES, 332K OHM, 1/8W, 1%, TK, 0805"
R101	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R102	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R103	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R104	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R105	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R106	013332300	"RES, 332K OHM, 1/8W, 1%, TK, 0805"
R107	013274001	"RES, 274K OHM, 1/8W, 1%, TK, 0805"
R108	013335000	"RES, 3.3M OHM, 1/8W, 5%, TK, 0805"
R109	170229	"RES, 10K TRM CER S-ADJ MT TH"
R11	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R110	013105001	"RES, 1M OHM 1/8W 1% TK 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R111	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R112	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R113	013105001	"RES, 1M OHM 1/8W 1% TK 0805"
R114	013274200	"RES, 27.4K OHM, 1/8W, 1%, TK, 0805"
R115	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R116	013475300	"RES, 475K OHM, 1/8W, 1%, TK, 0805"
R117	170333	"TRIMMER, 100K OHM, 12-T, S-ADJ, 1/4IN"
R118	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R119	013681100	"RES, 6.81K OHM 1/8W 1% TK 0805"
R12	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R120	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R121	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R122	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R123	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R124	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R125	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R126	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R127	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R128	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R129	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R13	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R130	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R131	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R132	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R133	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R134	170229	"RES, 10K TRM CER S-ADJ MT TH"
R135	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R136	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R137	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R138	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R139	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R14	013104001	"RES, 100K OHM 1/8W 1% TK 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R140	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R141	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R142	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R143	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R144	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R145	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R146	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R147	170229	"RES, 10K TRM CER S-ADJ MT TH"
R148	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R149	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R15	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R150	DNP	"NULL PART, VACANT PCB LOCATION"
R151	DNP	"NULL PART, VACANT PCB LOCATION"
R152	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R153	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R154	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R155	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R156	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R157	DNP	"NULL PART, VACANT PCB LOCATION"
R158	DNP	"NULL PART, VACANT PCB LOCATION"
R159	DNP	"NULL PART, VACANT PCB LOCATION"
R16	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R160	DNP	"NULL PART, VACANT PCB LOCATION"
R161	DNP	"NULL PART, VACANT PCB LOCATION"
R162	DNP	"NULL PART, VACANT PCB LOCATION"
R163	DNP	"NULL PART, VACANT PCB LOCATION"
R164	DNP	"NULL PART, VACANT PCB LOCATION"
R165	DNP	"NULL PART, VACANT PCB LOCATION"
R166	DNP	"NULL PART, VACANT PCB LOCATION"
R167	DNP	"NULL PART, VACANT PCB LOCATION"
R168	DNP	"NULL PART, VACANT PCB LOCATION"
R169	DNP	"NULL PART, VACANT PCB LOCATION"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R17	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R170	DNP	"NULL PART, VACANT PCB LOCATION"
R171	DNP	"NULL PART, VACANT PCB LOCATION"
R172	DNP	"NULL PART, VACANT PCB LOCATION"
R173	DNP	"NULL PART, VACANT PCB LOCATION"
R174	DNP	"NULL PART, VACANT PCB LOCATION"
R175	DNP	"NULL PART, VACANT PCB LOCATION"
R176	DNP	"NULL PART, VACANT PCB LOCATION"
R177	DNP	"NULL PART, VACANT PCB LOCATION"
R178	DNP	"NULL PART, VACANT PCB LOCATION"
R179	DNP	"NULL PART, VACANT PCB LOCATION"
R18	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R180	DNP	"NULL PART, VACANT PCB LOCATION"
R181	DNP	"NULL PART, VACANT PCB LOCATION"
R182	DNP	"NULL PART, VACANT PCB LOCATION"
R183	DNP	"NULL PART, VACANT PCB LOCATION"
R184	DNP	"NULL PART, VACANT PCB LOCATION"
R185	DNP	"NULL PART, VACANT PCB LOCATION"
R186	DNP	"NULL PART, VACANT PCB LOCATION"
R187	DNP	"NULL PART, VACANT PCB LOCATION"
R188	DNP	"NULL PART, VACANT PCB LOCATION"
R189	DNP	"NULL PART, VACANT PCB LOCATION"
R19	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R190	DNP	"NULL PART, VACANT PCB LOCATION"
R191	DNP	"NULL PART, VACANT PCB LOCATION"
R192	DNP	"NULL PART, VACANT PCB LOCATION"
R194	DNP	"NULL PART, VACANT PCB LOCATION"
R195	DNP	"NULL PART, VACANT PCB LOCATION"
R196	DNP	"NULL PART, VACANT PCB LOCATION"
R197	DNP	"NULL PART, VACANT PCB LOCATION"
R198	DNP	"NULL PART, VACANT PCB LOCATION"
R2	013103001	"RES, 10K OHM 1/8W 1% TK 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R20	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R201	DNP	"NULL PART, VACANT PCB LOCATION"
R202	DNP	"NULL PART, VACANT PCB LOCATION"
R203	DNP	"NULL PART, VACANT PCB LOCATION"
R205	DNP	"NULL PART, VACANT PCB LOCATION"
R206	DNP	"NULL PART, VACANT PCB LOCATION"
R207	DNP	"NULL PART, VACANT PCB LOCATION"
R208	DNP	"NULL PART, VACANT PCB LOCATION"
R209	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R21	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R210	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R211	013499900	"RES, 49.9 OHM 1/8W 1% TK 0805"
R212	013221001	"RES, 221 OHM, 1/8W, 1%, TK, 0805"
R213	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R214	013332001	"RES, 332 OHM, 1/8W, 1%, TK, 0805"
R215	013332001	"RES, 332 OHM, 1/8W, 1%, TK, 0805"
R216	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R217	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R218	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R219	013604000	"RES, 604 OHM, 1/8W, 1%, TK, 0805"
R22	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R220	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R221	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R222	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R223	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R224	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R225	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R226	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R227	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R228	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R229	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R23	013102002	"RES, 1K OHM 1/8W 1% TK 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R230	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R231	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R232	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R233	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R234	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R235	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R236	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R237	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R238	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R239	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R24	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R240	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R241	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R242	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R243	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R244	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R245	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R246	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R247	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R248	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R249	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R25	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R250	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R251	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R252	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R253	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R254	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R255	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R257	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R258	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R259	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R26	013000000	"RES, ZERO OHM, 2A, TK, 0805"

**Table 15-1 ALE Option Parts List (001-01105 Rev. K)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R260	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R261	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R262	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R263	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R264	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R265	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R266	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R267	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R268	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R269	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R27	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R270	013210900	"RES, 21 OHM, 1/8W, 1%, TK, 0805"
R28	013473001	"RES, 47.5K OHM 1/8W 1% TK 0805"
R29	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R3	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R30	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R31	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R32	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R33	013750001	"RES, 750 OHM, 1/8W, 1%, TK, 0805"
R34	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R35	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R36	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R37	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R38	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R39	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R4	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R40	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R41	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R42	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R43	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R44	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R45	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R46	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R47	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R48	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R49	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R5	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R50	DNP	"NULL PART, VACANT PCB LOCATION"
R51	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R52	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R53	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R54	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R55	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R56	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R57	DNP	"NULL PART, VACANT PCB LOCATION"
R58	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R59	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R6	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R60	013825000	"RES, 825 OHM, 1/8W, 1%, TK, 0805"
R61	013825000	"RES, 825 OHM, 1/8W, 1%, TK, 0805"
R62	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R63	DNP	"NULL PART, VACANT PCB LOCATION"
R64	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R65	DNP	"NULL PART, VACANT PCB LOCATION"
R66	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R67	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R68	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R69	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R7	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R70	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R71	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R72	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R73	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R74	013000000	"RES, ZERO OHM, 2A, TK, 0805"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
R75	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R76	DNP	"NULL PART, VACANT PCB LOCATION"
R77	DNP	"NULL PART, VACANT PCB LOCATION"
R78	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R79	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R8	013475001	"RES, 475 OHM, 1/8W, 1%, TK, 0805"
R80	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R81	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R82	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R83	013150000	"RES, 150 OHM 1/8W 1% TK 0805"
R84	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R85	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R86	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R87	013499200	"RES, 49.9K OHM, 1/8W, 1%, TK, 0805"
R88	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R89	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R9	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R90	013499200	"RES, 49.9K OHM, 1/8W, 1%, TK, 0805"
R91	013104001	"RES, 100K OHM 1/8W 1% TK 0805"
R92	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R93	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R94	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R95	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R96	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R97	013332100	"RES, 3.32K OHM, 1/8W, 1%, TK, 0805"
R98	013332100	"RES, 3.32K OHM, 1/8W, 1%, TK, 0805"
R99	013335000	"RES, 3.3M OHM, 1/8W, 5%, TK, 0805"
SW1	053001	"SWITCH, 2-SPST, 0.1LS, DIP-4"
TP1	650000	"TEST PNT, BLK 0.125 DIA TH"
TP2	650000	"TEST PNT, BLK 0.125 DIA TH"
U1	033301003	"IC,SM,UP,MAX807LEWE"
U10	033305029	"IC,74CBT3861 BUS SWT TSSOP24"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
U100	034304000	"IC,78L08 VREG 8V 100MA SOT-89"
U101	DNP	"NULL PART, VACANT PCB LOCATION"
U102	DNP	"NULL PART, VACANT PCB LOCATION"
U103	DNP	"NULL PART, VACANT PCB LOCATION"
U104	DNP	"NULL PART, VACANT PCB LOCATION"
U11	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U12	033300015	"IC, PROM XCF04S 4MB TSSOP-20"
U14	034400006	"IC, FAN1540DX VREG 3.3V TO252"
U15	034400008	"IC, LP3988, VREG, 2.5V, 0.15A, SOT23-5"
U16	034400007	"IC, LP3891, VREG, 1.2V, 0.8A, TO263-5"
U17	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U18	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U19	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U20	033303107	"IC,74LVC14A HEX SCH TRIG SO14"
U23	033300016	"IC, EEPROM 93C46C 64X16 SO8"
U24	033035	"IC,74HCT14 HEX SCH TRIG SO-14"
U25	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U26	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U29	033045	"IC,74HCT245 OCT BUS XCVR, SOW20"
U30	033045	"IC,74HCT245 OCT BUS XCVR, SOW20"
U31	033043	"IC, 74HCT138 3-8 DEMUX SOIC-16"
U32	033043	"IC, 74HCT138 3-8 DEMUX SOIC-16"
U34	033305028	"IC, MAX3243E, RS232 XCVR, 5V, SOW-28"
U38	033305027	"IC, MAX3485E, RS-485 XCVR, 3.3V, SOIC-8"
U39	033303107	"IC,74LVC14A HEX SCH TRIG SO14"
U4	001-01140	"DAUGHTER PCA,7000 PROCESSOR"
U40	033305027	"IC, MAX3485E, RS-485 XCVR, 3.3V, SOIC-8"
U43	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U44	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U46	033047	"IC,74HCT244 OCT BUS XCVR SOW20"
U48	033305029	"IC,74CBT3861 BUS SWT TSSOP24"
U5	033300032	"IC, CY62256LL, SRAM, 32KX8, 5V, SOIC28"

Table 15-1 ALE Option Parts List (001-01105 Rev. K)

Designator	Part Number	Description
U53	DNP	"NULL PART, VACANT PCB LOCATION"
U54	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U55	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U56	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U6	033300032	"IC, CY62256LL, SRAM, 32KX8, 5V, SOIC28"
U60	033303056	"IC,MC14001B QUAD 2-IN NOR SO14"
U7	033082	"IC,ADC0809 8-BIT ADC PLCC28"
U70	033304020	"IC, LM2904M, DUAL OP-AMP, SOIC-8"
U75	033305030	"IC, DS1232LPSN, UP-MONITOR, SOW16"
U76	065116000	"OSC, 11.0592MHZ 5V 7X5MM"
U78	033301021	"IC,P80C31SFAA UCTL PLCC44"
U79	033058	"IC,74HC573A OCTAL LATCH SOW-20"
U8	033302010	"IC, FPGA XC3S1000 FBGA-320"
U82	033300032	"IC, CY62256LL, SRAM, 32KX8, 5V, SOIC28"
U83	033300017	"IC,28C256N 32KX8 EEPROM PLCC32"
U9	065296000	"OSC,29.4912 MHZ 3.3V"
U90	033057	"IC, 74HC00 QUAD 2-I NAND SOIC14"
U91	033303100	"IC, TLV320AIC CODEC PQFP-48"
U92	065206000	"TCXO, 20.480 MHZ 5V 7X5MM"
U93	033301009	"IC,TMS320C25FNA DSP CTL PLCC68"
U95	033300027	"IC, CY7C1021D, 64KX16 SRAM, 5V, SOJ44"
U96	033300031	"IC, SRAM, 1KX8 DUAL PORT, PLCC-52"
U97	034402010	"IC, MAX660, DC-DC CNVTR, 0.1A, SO-8"
U99	033304057	"IC, LMC6492A, DUAL OP-AMP, SOIC-8"
XU2	089032000	"SOCKET, PLCC32 SMT"
XU3	089032000	"SOCKET, PLCC32 SMT"
XU80	089032000	"SOCKET, PLCC32 SMT"
XU94	089032000	"SOCKET, PLCC32 SMT"
XU98	089032000	"SOCKET, PLCC32 SMT"

## 15.2 7000ALE-141B

The 7000ALE-141B board supports the MIL-STD 188-141B ALE specification. It is mounted on a Carrier board which is installed in the second slot next to the Processor board.

The 7000ALE-141B option is implemented on the Carrier board (001-01302). Connector J13 connects to the Motherboard and J1 connects to the 7000ALE-141B board.

To install the 7000ALE-141B option:

1. Turn the radio off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107) and remove it using a board puller following correct anti-static procedures.
3. Install jumpers on JU13A and JU24 on the Processor board (refer to Figure 15-2 on page 15-5).
4. Reinsert the Processor board.
5. Install the 7000ALE-141B board on the Carrier board, then install the Carrier board in the ALE option slot (J13) next to the Processor board.
6. Replace the retaining bar and the cover of the radio.
7. When powered up, the **ALE** icon displays.

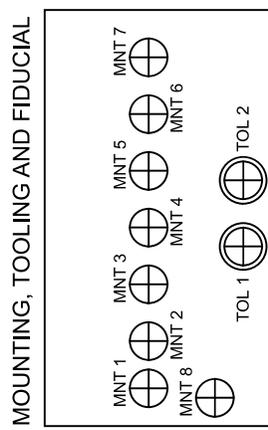
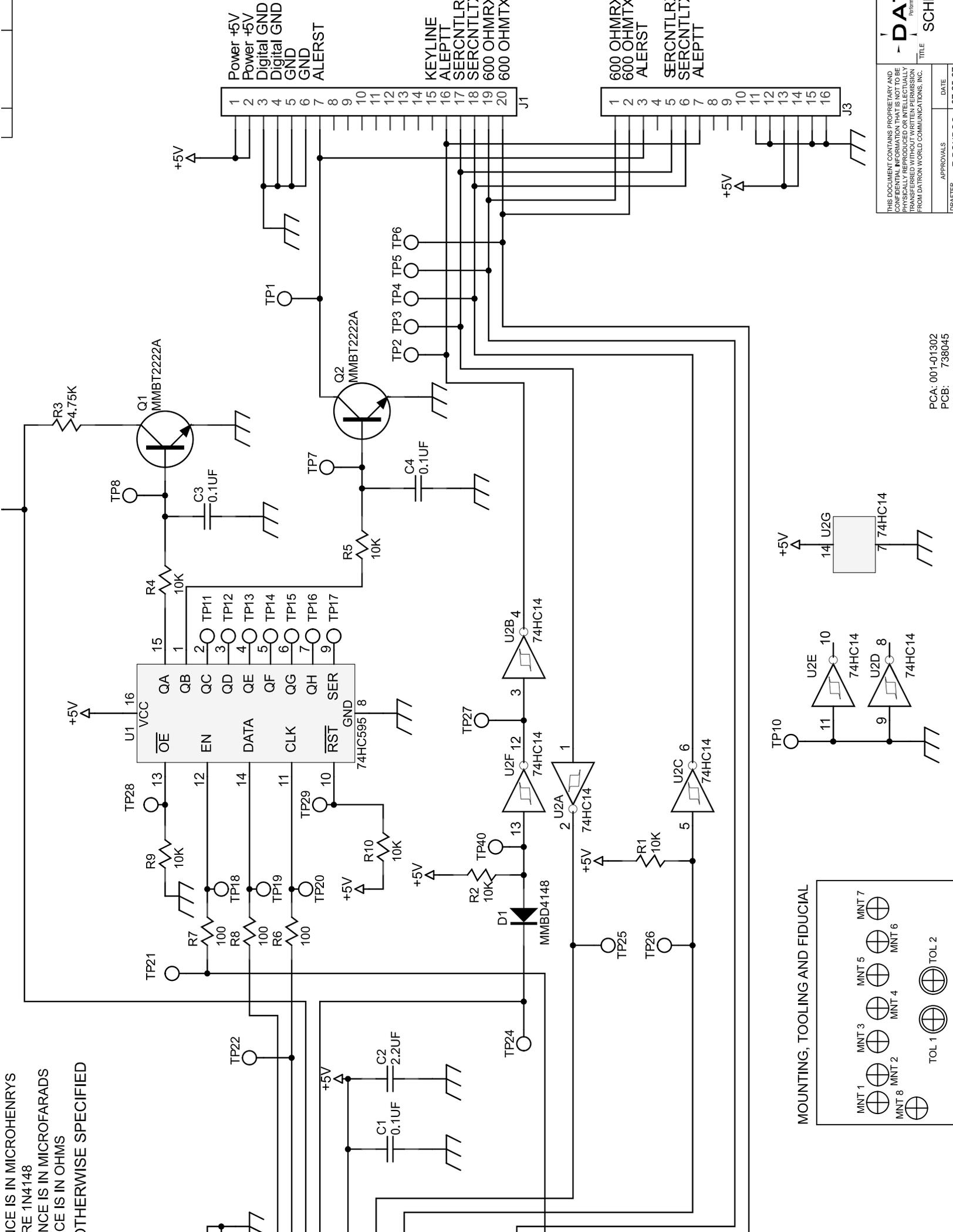
For operational information on ALE, refer to the ALE operator manual (7000ALE-MSOP).

### 15.2.1 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the 7000ALE-141B option.



RESISTANCE IS IN MICROHENRIES  
 CAPACITANCE IS IN MICROFARADS  
 DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED



**Table 15-2 Carrier Board Parts List (001-01302 Rev. E)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C2	021225003	"CAP, 2.2UF X7R 25V 10% 0805"
C3	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C4	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
J1	610292	"CONN,2X10 LOW PROFILE SOCKET"
J13	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J3	610206	"CONN,2X8 LOW PROFILE SOCKET"
Q1	032004	"XSTR,MMBT2222A NPN SOT23"
Q2	032004	"XSTR,MMBT2222A NPN SOT23"
R1	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R10	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R2	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R3	013475100	"RES, 4.75K OHM, 1/8W, 1%, TK, 0805"
R4	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R5	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R6	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R7	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R8	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R9	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
U1	033007	"IC,74HC595 8-BIT SIPO SOIC-16"
U2	033303001	"IC,SM,DIG,74HC14,SOIC-14"





## Chapter 16: Remote Control Options

### 16.1 FSK Remote Control Option (7000RF)

The FSK Remote Control 7000RF option provides complete remote voice and data operation of the RT7000 over a 2-wire or 4-wire audio pair. It is implemented on assembly board 001-01402. This option requires use of the RT7201F Remote Control Head and the 7000RF internal FSK modem for the RT7000. The following configuration is standard:

#### **Remote/Local Control**

Transceiver: RT7000

Internal FSK modem: 7000RF

Remote control head: RT7201F

Interface cable: C992307

The RT7201F is microprocessor-controlled and shares the interface line between audio and data control. The 7000RF modem allows remote operation in conjunction with local radio operation with the radio as master in the system. A custom LCD provides channel, frequency data, feedback as well as other front-panel control functions, BITE information, and orderwire text messages. For a more detailed technical description, refer to the RT7201F operator/technical manual (RT7201F-MS).

To install the 7000RF option:

1. Turn the RT7000 off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107 or 001-01105) and remove it using the board puller.
3. Using proper antistatic procedures, install a jumper at JU12 position B (refer to Figure 16-1 on page 16-2).
4. Reinsert the Processor board.
5. Install the 7000RF modem board in the FSK/DHSL slot (refer to Figure 21-1 on page 21-5). Verify that the board configuration is correct for the line configuration (2-wire or 4-wire).
6. Reinstall the board retaining bar and the top cover.

For more information on the RT7201F FSK Remote Control Head, refer to the RT7201F operator/technical manual (RT7201F-MS).

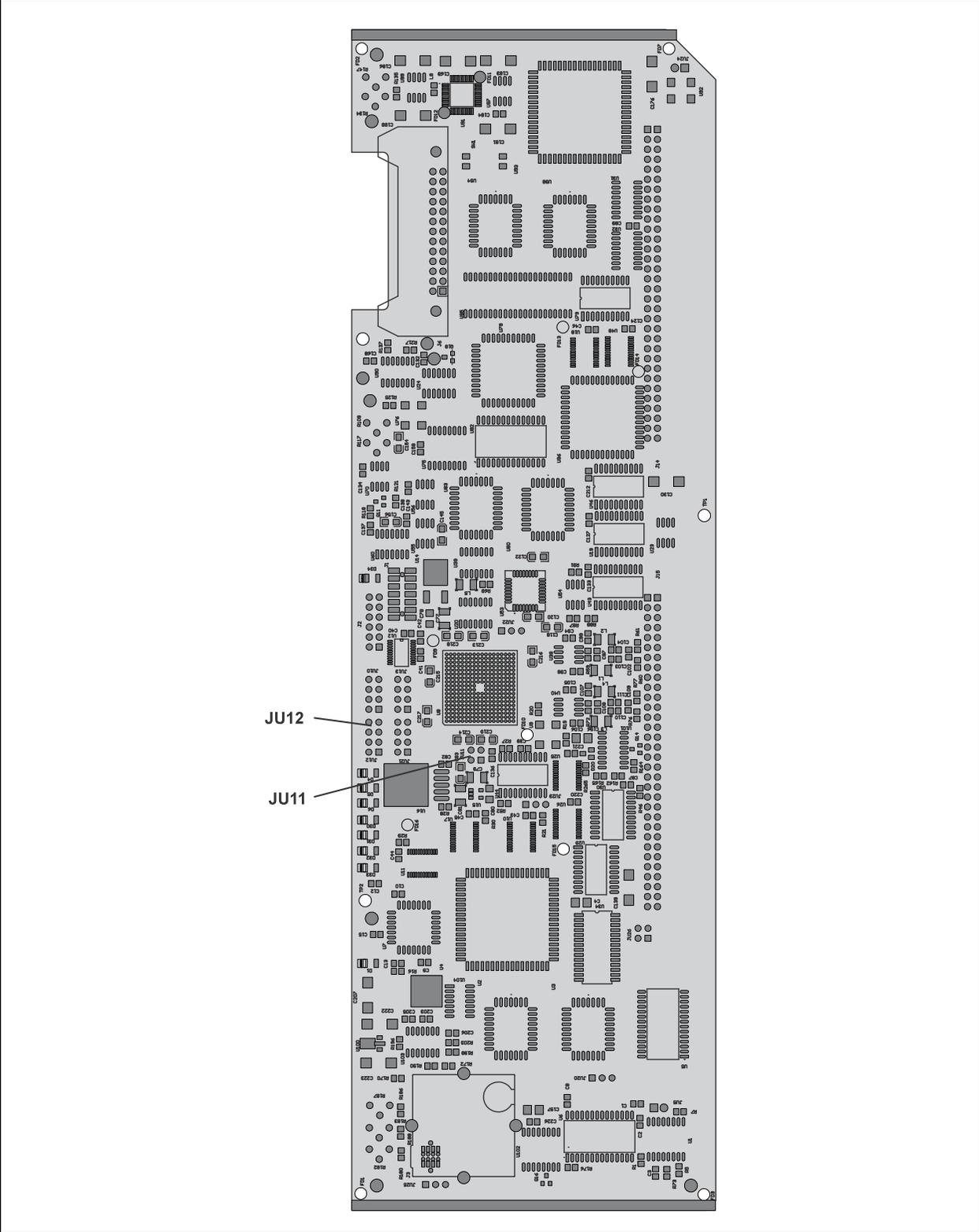


Figure 16-1 FSK Remote Control Jumper Placement

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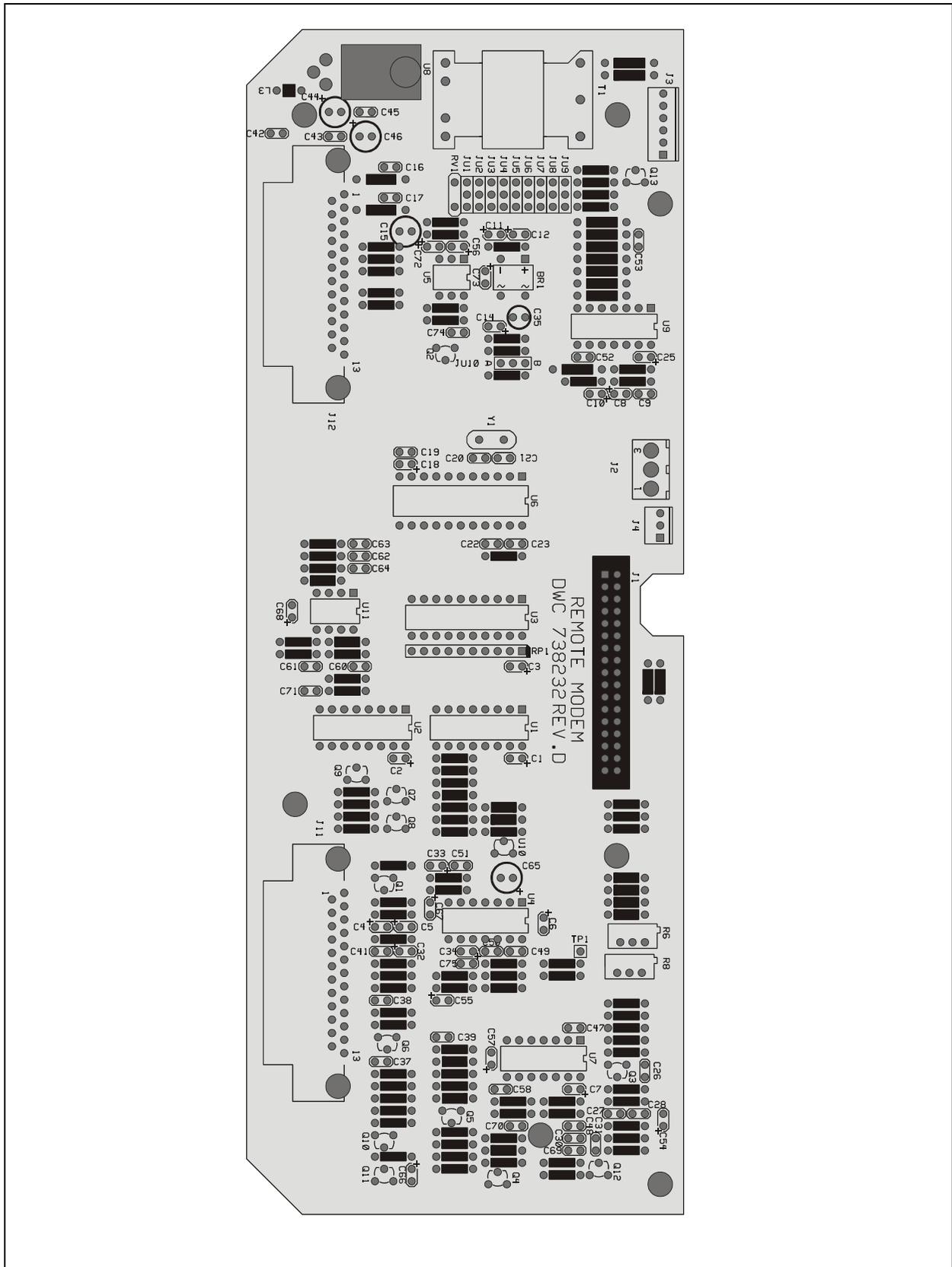


Figure 16-2 FSK Remote Control Component Locations (738232 Rev. D)



**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
(U8)_	831403	WASHER INTERNAL LOCK #4 SS
BR1	320424	"DIODE BRIDGE, DB102"
C1	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C10	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C11	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C12	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C14	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C15	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C16	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C17	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C18	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C19	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C2	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C20	210330	"CAP,33 PF DISC NPO"
C21	210330	"CAP,33 PF DISC NPO"
C22	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C23	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C25	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C26	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C27	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C28	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C3	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C30	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C31	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C32	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C33	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C34	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C35	230010	"CAP, 1UF AL 50V 20% NON-PLR 5X11"
C37	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C38	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C39	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"

**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C4	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C41	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C42	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C43	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C44	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C45	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C46	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C47	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C48	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C49	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C5	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C50	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C51	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C52	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C53	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C54	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C55	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C56	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C57	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C58	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C6	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C60	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C61	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C62	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C63	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C64	210151	"CAP, 150PF Y5V 50V 10% DISC 0.1LS"
C65	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C66	241226	"CAP,T,22UF,25V,20%,RA, 0.1SP"
C67	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C68	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C69	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C7	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"

Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)

Designator	Part Number	Description
C70	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C71	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C72	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C73	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C74	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C75	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C8	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C9	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
D1	320202	"DIODE, ZENER 8.2V 1N5237B"
D10	320002	"DIODE, 1N4148/1N4150 DO-35"
D11	320002	"DIODE, 1N4148/1N4150 DO-35"
D12	320002	"DIODE, 1N4148/1N4150 DO-35"
D13	320002	"DIODE, 1N4148/1N4150 DO-35"
D14	320002	"DIODE, 1N4148/1N4150 DO-35"
D15	320002	"DIODE, 1N4148/1N4150 DO-35"
D16	320002	"DIODE, 1N4148/1N4150 DO-35"
D2	320202	"DIODE, ZENER 8.2V 1N5237B"
D3	320002	"DIODE, 1N4148/1N4150 DO-35"
D4	320002	"DIODE, 1N4148/1N4150 DO-35"
D5	320002	"DIODE, 1N4148/1N4150 DO-35"
D6	320002	"DIODE, 1N4148/1N4150 DO-35"
D7	320002	"DIODE, 1N4148/1N4150 DO-35"
D8	320002	"DIODE, 1N4148/1N4150 DO-35"
D9	320002	"DIODE, 1N4148/1N4150 DO-35"
J1	620038	CONN HDR 2X17 SHROUDED PC MNT
J11	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J12	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J2	610209	"HEADER,MLX,3PIN,.156,POLAR"
J3	610103	"HEADER,MLX,6PIN, 0.100"
J4	610285	"HEADER,PIN 1X3 MLX 0.1 W/LOCK"
JU1	620040	MALE HEADER 15 PIN 3X5
JU10	620030	"HEADER,3 PIN 0.025 SQ POST"

Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)

Designator	Part Number	Description
JU2	620040	MALE HEADER 15 PIN 3X5
JU3	620040	MALE HEADER 15 PIN 3X5
JU4	620040	MALE HEADER 15 PIN 3X5
JU5	620040	MALE HEADER 15 PIN 3X5
JU6	614004	HEADER 3X4 0.1 LEAD SPACING
JU7	614004	HEADER 3X4 0.1 LEAD SPACING
JU8	614004	HEADER 3X4 0.1 LEAD SPACING
JU9	614004	HEADER 3X4 0.1 LEAD SPACING
L1	430029	"INDUCTOR,10 UH 10% FIXED MOLD"
L2	430029	"INDUCTOR,10 UH 10% FIXED MOLD"
L3	459032	"IND ASY,3T#30 MAGNET 1-490201"
Q1	310046	"XISTOR,JFET,NCH,MPF4393,TO92"
Q10	310057	"XISTOR,NPN,PN2222A,TO92"
Q11	310057	"XISTOR,NPN,PN2222A,TO92"
Q12	310057	"XISTOR,NPN,PN2222A,TO92"
Q13	310052	"XSTR, PN2907A PNP TO92"
Q2	310057	"XISTOR,NPN,PN2222A,TO92"
Q3	310052	"XSTR, PN2907A PNP TO92"
Q4	310057	"XISTOR,NPN,PN2222A,TO92"
Q5	310052	"XSTR, PN2907A PNP TO92"
Q6	310046	"XISTOR,JFET,NCH,MPF4393,TO92"
Q7	310057	"XISTOR,NPN,PN2222A,TO92"
Q8	310057	"XISTOR,NPN,PN2222A,TO92"
Q9	310046	"XISTOR,JFET,NCH,MPF4393,TO92"
R1	113101	"RES,100 OHM 1/8W CF 5%"
R10	113273	"RES,27K OHM 1/8W CF 5%"
R100	113104	"RES,100K OHM 1/8W CF 5%"
R101	113152	"RES,1.5K OHM 1/8W CF 5%"
R102	113104	"RES,100K OHM 1/8W CF 5%"
R103	113103	"RES, 10K OHM 1/8W CF 5%"
R104	113152	"RES,1.5K OHM 1/8W CF 5%"
R105	113103	"RES, 10K OHM 1/8W CF 5%"

**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R106	113103	"RES, 10K OHM 1/8W CF 5%"
R11	113823	"RES,82K OHM 1/8W 5% CF"
R12	113474	"RES,470K OHM 1/8W CF 5%"
R13	113474	"RES,470K OHM 1/8W CF 5%"
R14	113104	"RES,100K OHM 1/8W CF 5%"
R15	1111002	"RES,10K 1/8W 1% FILM"
R16	1111002	"RES,10K 1/8W 1% FILM"
R17	1111003	"RES,100K 1/8W 1% FILM"
R18	1115492	"RES,54.9K 1/8W METAL FILM"
R19	113100	"RES,10 OHM 1/8W 5% FILM"
R2	113101	"RES,100 OHM 1/8W CF 5%"
R20	1112490	"RES,249 OHM 1/8W 1% FILM"
R21	1113012	"RES,30.1K 1/4W 1% FILM"
R22	1116042	"RES,60.4K 1/8W 1%"
R23	113103	"RES, 10K OHM 1/8W CF 5%"
R24	113103	"RES, 10K OHM 1/8W CF 5%"
R27	113272	"RES,2.7K OHM 1/8W CF 5%"
R28	113272	"RES,2.7K OHM 1/8W CF 5%"
R29	113621	"RES,620 OHM 1/8W CF 5%"
R3	113101	"RES,100 OHM 1/8W CF 5%"
R30	113103	"RES, 10K OHM 1/8W CF 5%"
R31	113225	"RES, 2.2M OHM 1/8W 5% CF"
R32	113104	"RES,100K OHM 1/8W CF 5%"
R33	113103	"RES, 10K OHM 1/8W CF 5%"
R34	113152	"RES,1.5K OHM 1/8W CF 5%"
R35	113103	"RES, 10K OHM 1/8W CF 5%"
R36	113103	"RES, 10K OHM 1/8W CF 5%"
R37	113273	"RES,27K OHM 1/8W CF 5%"
R38	113152	"RES,1.5K OHM 1/8W CF 5%"
R39	113104	"RES,100K OHM 1/8W CF 5%"
R40	113272	"RES,2.7K OHM 1/8W CF 5%"
R42	113272	"RES,2.7K OHM 1/8W CF 5%"

**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R43	113473	"RES, 47K OHM 1/8W CF 5%"
R44	113154	"RES, 150K OHM 1/8W CF 5%"
R45	113102	"RES, 1K OHM 1/8W CF 5%"
R46	113103	"RES, 10K OHM 1/8W CF 5%"
R47	113103	"RES, 10K OHM 1/8W CF 5%"
R48	113621	"RES, 620 OHM 1/8W CF 5%"
R49	113272	"RES, 2.7K OHM 1/8W CF 5%"
R5	113103	"RES, 10K OHM 1/8W CF 5%"
R50	113473	"RES, 47K OHM 1/8W CF 5%"
R51	113103	"RES, 10K OHM 1/8W CF 5%"
R52	113472	"RES, 4.7K OHM 1/8W CF 5%"
R53	113104	"RES, 100K OHM 1/8W CF 5%"
R54	113103	"RES, 10K OHM 1/8W CF 5%"
R55	113103	"RES, 10K OHM 1/8W CF 5%"
R56	113474	"RES, 470K OHM 1/8W CF 5%"
R57	113474	"RES, 470K OHM 1/8W CF 5%"
R58	113474	"RES, 470K OHM 1/8W CF 5%"
R59	113621	"RES, 620 OHM 1/8W CF 5%"
R6	170334	"RES, 100K TRIM SIDE ADJ"
R60	113823	"RES, 82K OHM 1/8W 5% CF"
R61	113104	"RES, 100K OHM 1/8W CF 5%"
R62	113103	"RES, 10K OHM 1/8W CF 5%"
R63	113103	"RES, 10K OHM 1/8W CF 5%"
R64	113474	"RES, 470K OHM 1/8W CF 5%"
R65	1111212	"RES, 12.1Kohm 1% 1/8W MF"
R66	113104	"RES, 100K OHM 1/8W CF 5%"
R67	113104	"RES, 100K OHM 1/8W CF 5%"
R68	113473	"RES, 47K OHM 1/8W CF 5%"
R69	113101	"RES, 100 OHM 1/8W CF 5%"
R7	113103	"RES, 10K OHM 1/8W CF 5%"
R70	113101	"RES, 100 OHM 1/8W CF 5%"
R71	113473	"RES, 47K OHM 1/8W CF 5%"

**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R72	113103	"RES, 10K OHM 1/8W CF 5%"
R73	113103	"RES, 10K OHM 1/8W CF 5%"
R74	113103	"RES, 10K OHM 1/8W CF 5%"
R75	113621	"RES,620 OHM 1/8W CF 5%"
R76	113103	"RES, 10K OHM 1/8W CF 5%"
R77	113103	"RES, 10K OHM 1/8W CF 5%"
R78	113103	"RES, 10K OHM 1/8W CF 5%"
R79	113104	"RES,100K OHM 1/8W CF 5%"
R8	170334	"RES,100K TRIM SIDE ADJ"
R80	113154	"RES,150K OHM 1/8W CF 5%"
R81	113474	"RES,470K OHM 1/8W CF 5%"
R82	113474	"RES,470K OHM 1/8W CF 5%"
R83	113104	"RES,100K OHM 1/8W CF 5%"
R84	113103	"RES, 10K OHM 1/8W CF 5%"
R85	113103	"RES, 10K OHM 1/8W CF 5%"
R86	113103	"RES, 10K OHM 1/8W CF 5%"
R87	113473	"RES, 47K OHM 1/8W CF 5%"
R88	113153	"RES,15K OHM 1/8W CF 5%"
R89	113433	"RES,43K 1/8W 5% CARBON FILM"
R9	113103	"RES, 10K OHM 1/8W CF 5%"
R90	113103	"RES, 10K OHM 1/8W CF 5%"
R91	113104	"RES,100K OHM 1/8W CF 5%"
R92	113104	"RES,100K OHM 1/8W CF 5%"
R93	113225	"RES, 2.2M OHM 1/8W 5% CF"
R94	113332	"RES,3.3K OHM 1/8W CF 5%"
R95	113104	"RES,100K OHM 1/8W CF 5%"
R96	113332	"RES,3.3K OHM 1/8W CF 5%"
R97	113621	"RES,620 OHM 1/8W CF 5%"
R98	113103	"RES, 10K OHM 1/8W CF 5%"
R99	113103	"RES, 10K OHM 1/8W CF 5%"
RP1	182015	"RES,10K X 9 BUSSED 2% TK SIP10"
RV1	350003	VARISTOR 18 VOLT

**Table 16-1 FSK Remote Control Parts List (001-01402 Rev. P)**

Designator	Part Number	Description
T1	410060	"XFMR,DATA MODEM COUPLING"
U1	330273	"IC, 74HC595"
U10	330018	"IC,VREG,78L08,TO94,8V"
U11	330368	"IC, MC33078 DUAL OP-AMP DIP8"
U2	330273	"IC, 74HC595"
U3	330504	"IC, BUFFER"
U4	330322	"IC, MC33079 QUAD OP-AMP DIP-14"
U5	320701	COUPLER OPTO DIP
U6	330394	"IC,73K302SL-1P MODEM"
U7	330322	"IC, MC33079 QUAD OP-AMP DIP-14"
U8	330015	"IC, 7805 VREG 5V 1A 4% TO-220"
U9	330322	"IC, MC33079 QUAD OP-AMP DIP-14"
Y1	361086	"XTAL,11.0592 MHZ"

## 16.2 DHSL Remote Control Option (7000RI)

The 7000RI provides complete voice and data service operation of the RT7000 over a 2-wire DHSL pair. This option is implemented on assembly board 001-01403. It requires the RT7201I remote control head and the 7000RI internal DHSL modem for the RT7000. The following configuration is standard:

### Remote/Local Control

Transceiver: RT7000

Internal DHSL modem: 7000RI

Remote control head: RT7201I

Interface cable: C992307

The RT7201I is microprocessor controlled and features two full-duplex data channels as well as a full-duplex digitized voice channel. The 7000RI modem allows high-speed remote operation in conjunction with local radio operation.

To install the 7000RI option:

1. Turn the RT7000 off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107 or 001-01105) and remove it using the board puller.
3. Using proper anti-static procedures, install jumper JU12 position A (refer to Figure 16-4 on page 16-16).

4. Reinsert the Processor board into the guide.
5. Install the 7000RI Modem board in the FSK/DHSL slot (refer to Figure 21-1 on page 21-5).
6. Replace the retaining bar and the cover of the RT7000.
7. If COM1 is used at the 7201I **ACCESSORY 1** connector, move JU22 and JU23 to position B-C.

For a more information about the RT7201I DHSL Remote Control Head, refer to the RT7201I operator/technical manual (RT7201I-MS).

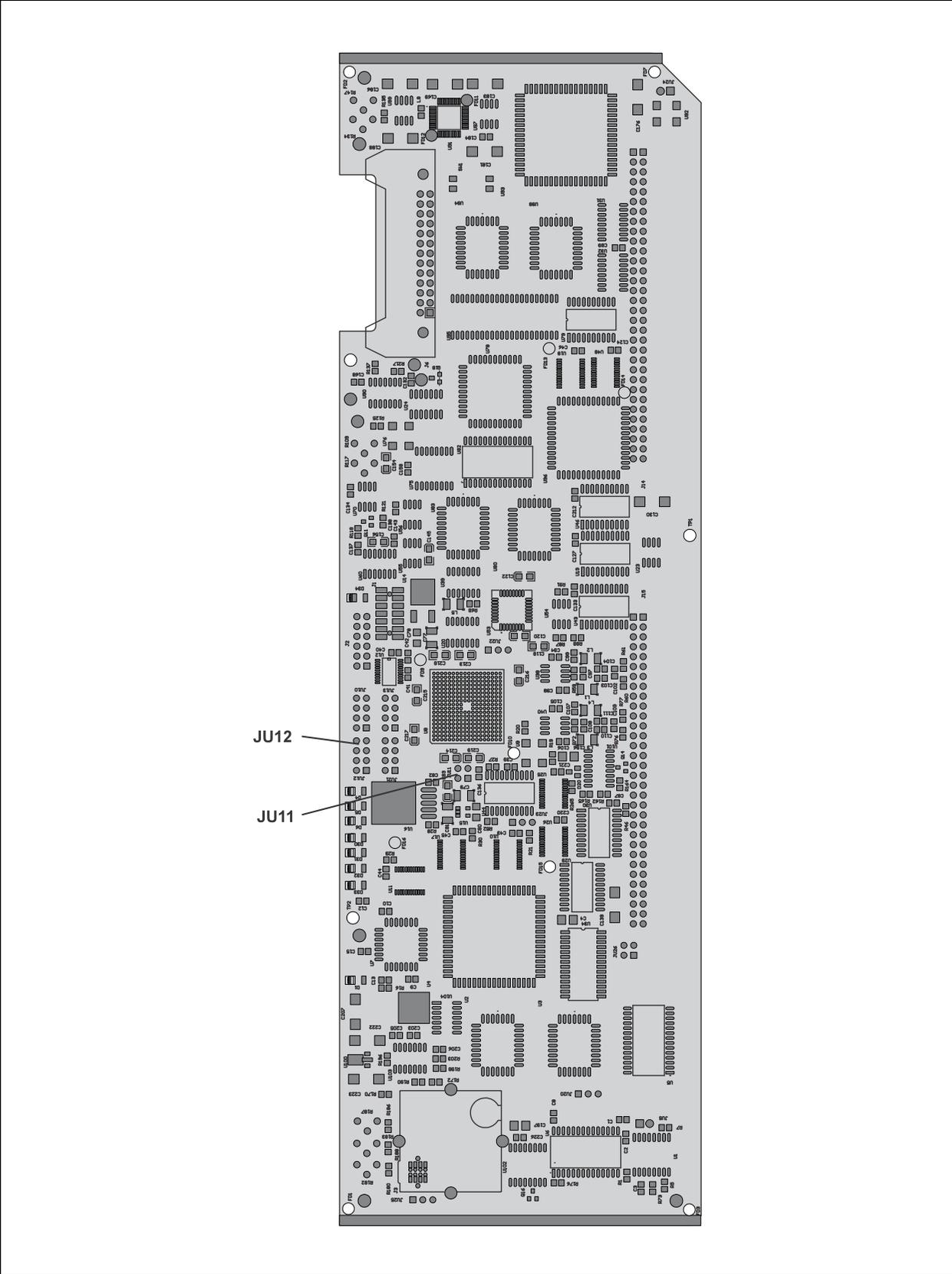


Figure 16-4 DHSL Remote Control Component Placement

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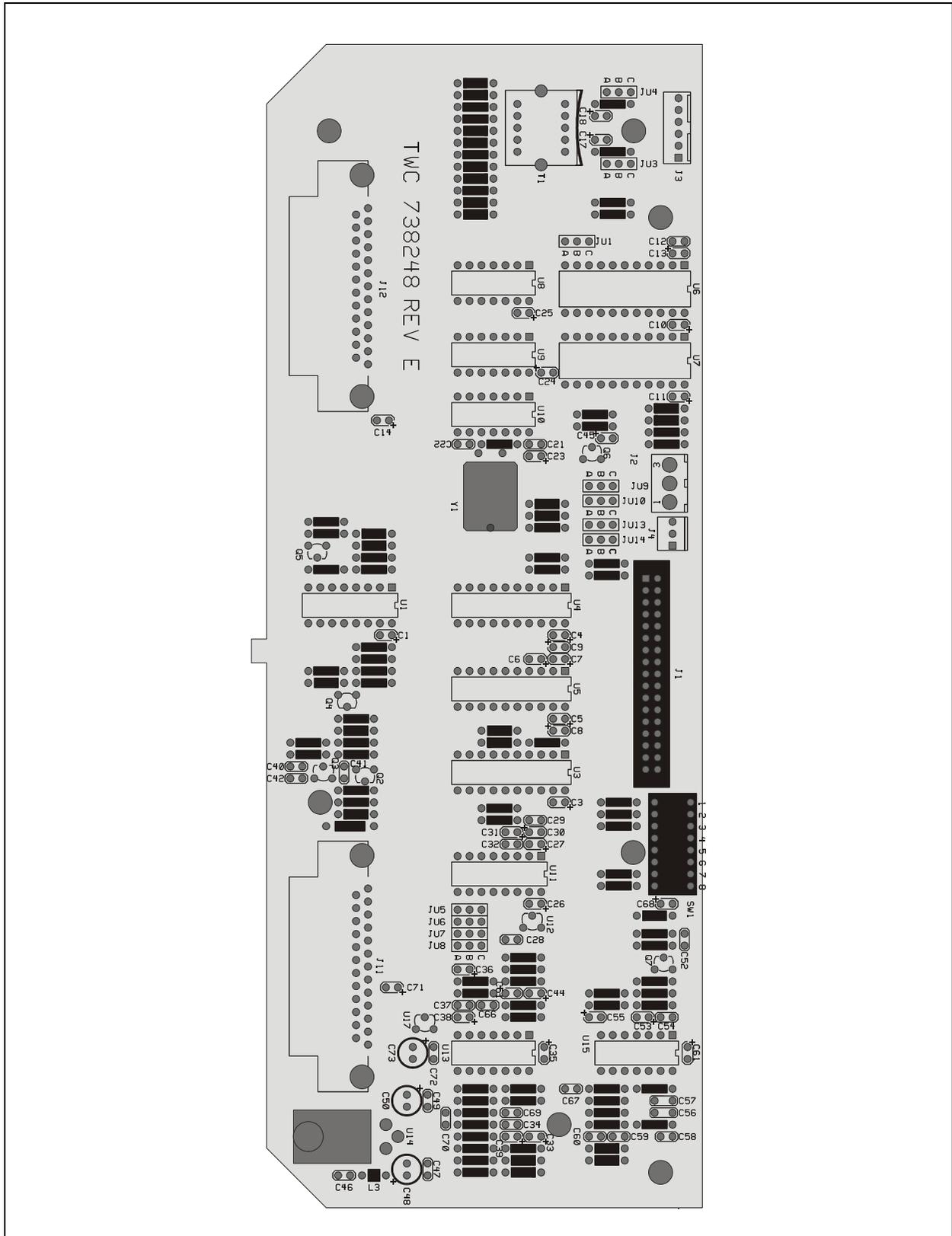
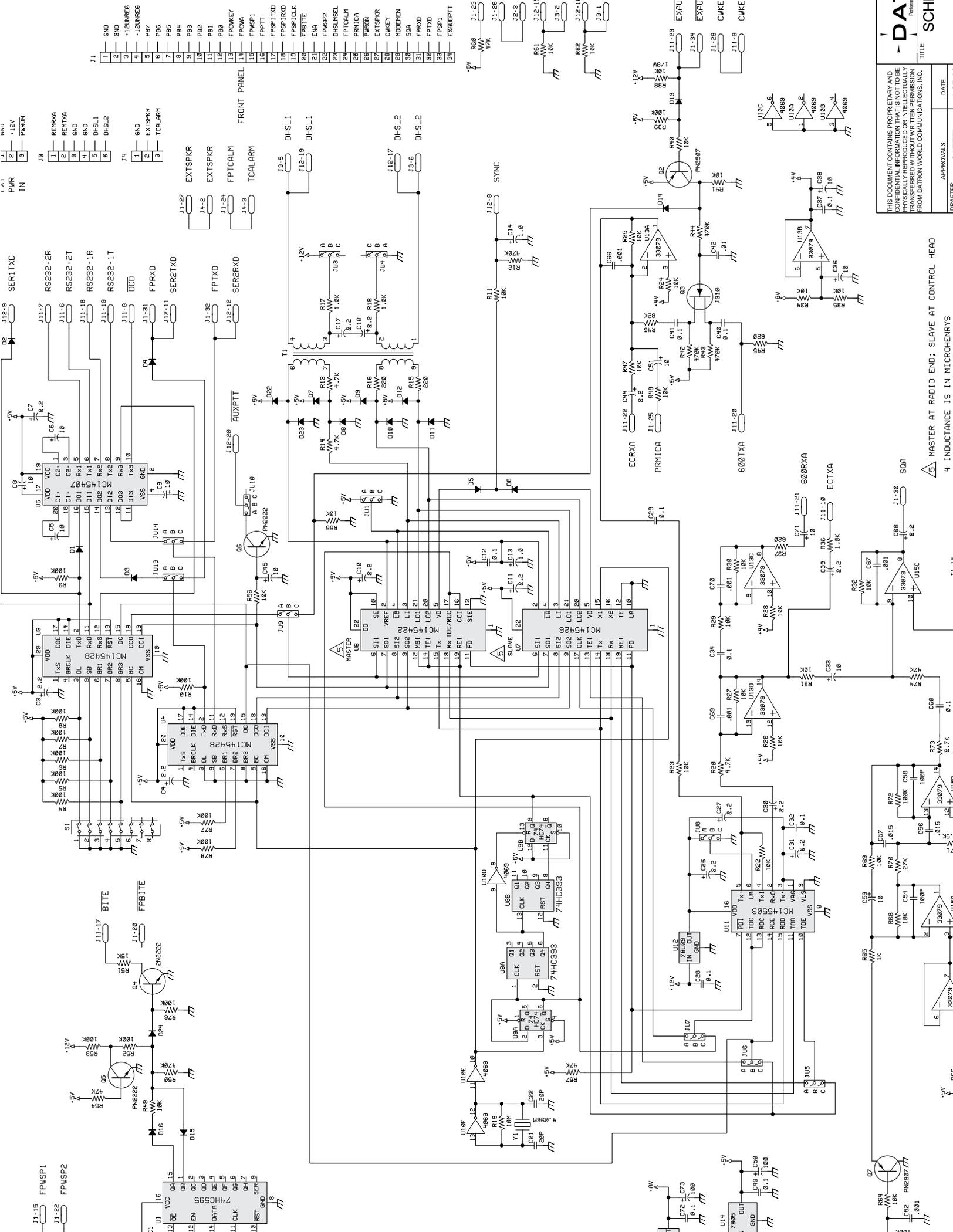
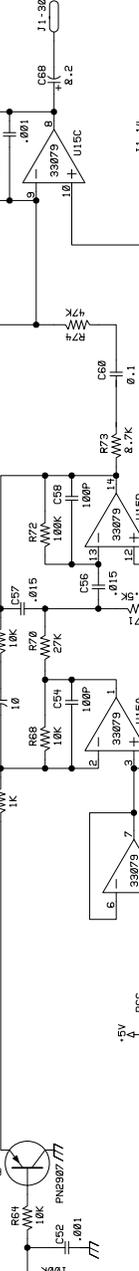


Figure 16-5 DHSL Remote Control Component Locations (738248 Rev. E)



5 MASTER AT RADIO END; SLAVE AT CONTROL HEAD  
 4 INDUCTANCE IS IN MICROHENRY



**Table 16-2 DHSLS Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C10	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C11	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C12	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C13	241010	"CAP, 1UF TA 35V 20% DIP 0.1LS"
C14	241010	"CAP, 1UF TA 35V 20% DIP 0.1LS"
C17	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C18	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C21	210220	"CAP,22PF NPO 50V 5% 0.1LS DISC"
C22	210220	"CAP,22PF NPO 50V 5% 0.1LS DISC"
C23	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C24	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C25	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C26	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C27	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C28	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C29	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C3	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C30	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C31	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C32	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C33	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C34	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C35	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C36	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C37	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C38	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C39	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C4	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C40	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C41	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

Designator	Part Number	Description
C42	214103	"CAP, 0.01UF X7R 50V 10% 0.1LS"
C44	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C45	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C46	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C47	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C48	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C49	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C5	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C50	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C51	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C52	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C53	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C54	275101	"CAP, 100PF NPO 100V 5% RAD 0.2S"
C55	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C56	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C57	254153	"CAP, 0.015UF MYLAR 10% 100V 3.5LS"
C58	275101	"CAP, 100PF NPO 100V 5% RAD 0.2S"
C6	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C60	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C61	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C66	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C67	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C68	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C69	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C7	241020	"CAP, 2.2UF, TA, 16V, 20%, DIP, 0.1LS"
C70	210102	"CAP,.001UF Y5P 50V 20% 0.1LS"
C71	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C72	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C73	231101	"CAP,100U,16V,20%,RADIAL, 0.1SP"
C8	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C9	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
D1	320002	"DIODE, 1N4148/1N4150 DO-35"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
D10	320002	"DIODE, 1N4148/1N4150 DO-35"
D11	320002	"DIODE, 1N4148/1N4150 DO-35"
D12	320002	"DIODE, 1N4148/1N4150 DO-35"
D13	320002	"DIODE, 1N4148/1N4150 DO-35"
D14	320002	"DIODE, 1N4148/1N4150 DO-35"
D15	320002	"DIODE, 1N4148/1N4150 DO-35"
D16	320002	"DIODE, 1N4148/1N4150 DO-35"
D17	320002	"DIODE, 1N4148/1N4150 DO-35"
D18	320002	"DIODE, 1N4148/1N4150 DO-35"
D19	320002	"DIODE, 1N4148/1N4150 DO-35"
D2	320002	"DIODE, 1N4148/1N4150 DO-35"
D20	320002	"DIODE, 1N4148/1N4150 DO-35"
D21	320002	"DIODE, 1N4148/1N4150 DO-35"
D22	320002	"DIODE, 1N4148/1N4150 DO-35"
D23	320002	"DIODE, 1N4148/1N4150 DO-35"
D24	320002	"DIODE, 1N4148/1N4150 DO-35"
D3	320002	"DIODE, 1N4148/1N4150 DO-35"
D4	320002	"DIODE, 1N4148/1N4150 DO-35"
D5	320002	"DIODE, 1N4148/1N4150 DO-35"
D6	320002	"DIODE, 1N4148/1N4150 DO-35"
D7	320002	"DIODE, 1N4148/1N4150 DO-35"
D8	320002	"DIODE, 1N4148/1N4150 DO-35"
D9	320002	"DIODE, 1N4148/1N4150 DO-35"
J1	620038	CONN HDR 2X17 SHROUDED PC MNT
J11	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J12	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J2	610209	"HEADER,MLX,3PIN,.156,POLAR"
J3	610197	"HEADER,MLX,6PIN,.100"
J4	610285	"HEADER,PIN 1X3 MLX 0.1 W/LOCK"
JU1	620030	"HEADER,3 PIN 0.025 SQ POST"
JU10	620030	"HEADER,3 PIN 0.025 SQ POST"
JU13	620030	"HEADER,3 PIN 0.025 SQ POST"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
JU14	620030	"HEADER,3 PIN 0.025 SQ POST"
JU3	620030	"HEADER,3 PIN 0.025 SQ POST"
JU4	620030	"HEADER,3 PIN 0.025 SQ POST"
JU5	614004	HEADER 3X4 0.1 LEAD SPACING
JU6	614004	HEADER 3X4 0.1 LEAD SPACING
JU7	614004	HEADER 3X4 0.1 LEAD SPACING
JU8	614004	HEADER 3X4 0.1 LEAD SPACING
JU9	620030	"HEADER,3 PIN 0.025 SQ POST"
L3	459032	"IND ASY,3T#30 MAGNET 1-490201"
Q2	310052	"XSTR, PN2907A PNP TO92"
Q3	310033	"XSTR, J310 N-JFET TO92"
Q4	310057	"XISTOR,NPN,PN2222A,TO92"
Q5	310057	"XISTOR,NPN,PN2222A,TO92"
Q6	310057	"XISTOR,NPN,PN2222A,TO92"
Q7	310052	"XSTR, PN2907A PNP TO92"
R1	113101	"RES,100 OHM 1/8W CF 5%"
R10	113104	"RES,100K OHM 1/8W CF 5%"
R11	113103	"RES, 10K OHM 1/8W CF 5%"
R12	113474	"RES,470K OHM 1/8W CF 5%"
R13	113472	"RES, 4.7K OHM 1/8W CF 5%"
R14	113472	"RES, 4.7K OHM 1/8W CF 5%"
R15	113221	"RES,220 OHM 1/8W 5% CF"
R16	113221	"RES,220 OHM 1/8W 5% CF"
R17	113102	"RES, 1K OHM 1/8W CF 5%"
R18	113102	"RES, 1K OHM 1/8W CF 5%"
R19	113106	"RES,10M 1/8W 5% CARBON FILM"
R2	113101	"RES,100 OHM 1/8W CF 5%"
R20	113472	"RES, 4.7K OHM 1/8W CF 5%"
R22	113103	"RES, 10K OHM 1/8W CF 5%"
R23	113103	"RES, 10K OHM 1/8W CF 5%"
R24	113103	"RES, 10K OHM 1/8W CF 5%"
R25	113103	"RES, 10K OHM 1/8W CF 5%"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R26	113103	"RES, 10K OHM 1/8W CF 5%"
R27	113103	"RES, 10K OHM 1/8W CF 5%"
R28	113103	"RES, 10K OHM 1/8W CF 5%"
R29	113103	"RES, 10K OHM 1/8W CF 5%"
R3	113101	"RES,100 OHM 1/8W CF 5%"
R30	113103	"RES, 10K OHM 1/8W CF 5%"
R31	113103	"RES, 10K OHM 1/8W CF 5%"
R32	113103	"RES, 10K OHM 1/8W CF 5%"
R34	113103	"RES, 10K OHM 1/8W CF 5%"
R35	113103	"RES, 10K OHM 1/8W CF 5%"
R36	113102	"RES, 1K OHM 1/8W CF 5%"
R37	113621	"RES,620 OHM 1/8W CF 5%"
R38	113103	"RES, 10K OHM 1/8W CF 5%"
R39	113104	"RES,100K OHM 1/8W CF 5%"
R4	113104	"RES,100K OHM 1/8W CF 5%"
R40	113103	"RES, 10K OHM 1/8W CF 5%"
R41	113103	"RES, 10K OHM 1/8W CF 5%"
R42	113474	"RES,470K OHM 1/8W CF 5%"
R43	113474	"RES,470K OHM 1/8W CF 5%"
R44	113474	"RES,470K OHM 1/8W CF 5%"
R45	113621	"RES,620 OHM 1/8W CF 5%"
R46	113823	"RES,82K OHM 1/8W 5% CF"
R47	113103	"RES, 10K OHM 1/8W CF 5%"
R48	113103	"RES, 10K OHM 1/8W CF 5%"
R49	113103	"RES, 10K OHM 1/8W CF 5%"
R5	113104	"RES,100K OHM 1/8W CF 5%"
R50	113474	"RES,470K OHM 1/8W CF 5%"
R51	1111502	RESISTOR 15K 1/8W 1%
R52	113104	"RES,100K OHM 1/8W CF 5%"
R53	113104	"RES,100K OHM 1/8W CF 5%"
R54	113473	"RES, 47K OHM 1/8W CF 5%"
R55	113103	"RES, 10K OHM 1/8W CF 5%"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R56	113103	"RES, 10K OHM 1/8W CF 5%"
R57	113473	"RES, 47K OHM 1/8W CF 5%"
R58	113101	"RES,100 OHM 1/8W CF 5%"
R59	113101	"RES,100 OHM 1/8W CF 5%"
R6	113104	"RES,100K OHM 1/8W CF 5%"
R60	113473	"RES, 47K OHM 1/8W CF 5%"
R61	113103	"RES, 10K OHM 1/8W CF 5%"
R62	113103	"RES, 10K OHM 1/8W CF 5%"
R63	113104	"RES,100K OHM 1/8W CF 5%"
R64	113103	"RES, 10K OHM 1/8W CF 5%"
R65	113102	"RES, 1K OHM 1/8W CF 5%"
R66	113103	"RES, 10K OHM 1/8W CF 5%"
R67	113103	"RES, 10K OHM 1/8W CF 5%"
R68	113103	"RES, 10K OHM 1/8W CF 5%"
R69	113103	"RES, 10K OHM 1/8W CF 5%"
R7	113104	"RES,100K OHM 1/8W CF 5%"
R70	113273	"RES,27K OHM 1/8W CF 5%"
R71	113152	"RES,1.5K OHM 1/8W CF 5%"
R72	113104	"RES,100K OHM 1/8W CF 5%"
R73	113272	"RES,2.7K OHM 1/8W CF 5%"
R74	113473	"RES, 47K OHM 1/8W CF 5%"
R76	113104	"RES,100K OHM 1/8W CF 5%"
R77	113104	"RES,100K OHM 1/8W CF 5%"
R78	113104	"RES,100K OHM 1/8W CF 5%"
R8	113104	"RES,100K OHM 1/8W CF 5%"
R9	113104	"RES,100K OHM 1/8W CF 5%"
S1	530010	"SWITCH,DIP SPSTX8 DIP-16"
T1	410062	"TRANSFORMER,DHSL"
U1	330273	"IC, 74HC595"
U10	330482	"IC,4069 HEX INVERTER"
U11	330485	"IC, MC145503P"
U12	330484	"IC,78L09 9VOLT REGULATOR TO92"

**Table 16-2 DHSL Remote Control Parts List (001-01403 Rev. N)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
U13	330322	"IC, MC33079 QUAD OP-AMP DIP-14"
U14	330015	"IC, 7805 VREG 5V 1A 4% TO-220"
U15	330322	"IC, MC33079 QUAD OP-AMP DIP-14"
U17	330018	"IC,VREG,78L08,TO94,8V"
U3	330489	"IC,MC145428P"
U4	330489	"IC,MC145428P"
U5	330488	"IC,MC145407P RS232 XCVR DIP20"
U6	330486	"IC,MC145422 80KBPS UDLT MASTER"
U6	621007	"SOCKET, IC DIP-22 PIN"
U7	621007	"SOCKET, IC DIP-22 PIN"
U8	330305	"IC,74HC393 DBL RIPL CNTR DIP14"
U9	330483	"IC,74HC74 DUAL D FLIP FLOP"
Y1	360037	CRYSTAL HC18/U HOLDER 4.096MH





## Chapter 17: RF Filter Options

This chapter covers the RF filter options consisting of different configurations of the 5 MHz IF board. The RF filter options include:

- 7000CW
- 7000WB1
- 7000CW1

These filter options are variations of the 5 MHz IF board. The standard 5 MHz IF board includes a standard voice crystal installed in XF1. The 7000CW option has a 500 Hz (1 kHz center frequency) narrowband crystal filter installed in XF2. The 7000WB1 option has a 300 to 3300 Hz wideband crystal filter installed in XF2. The CW1 option is a combination of the 7000CW option and the 7000WB1 option with the narrowband crystal installed in XF1 and the wide band crystal installed in XF2.

Converting the 5 MHz IF board to one of these options involves installing the crystal filter and changing the jumper positions on jumper block JU1 (refer to the respective component locations diagram). It may also involve replacing a resistor.

### 17.1 Narrowband CW Filter Option (7000CW)

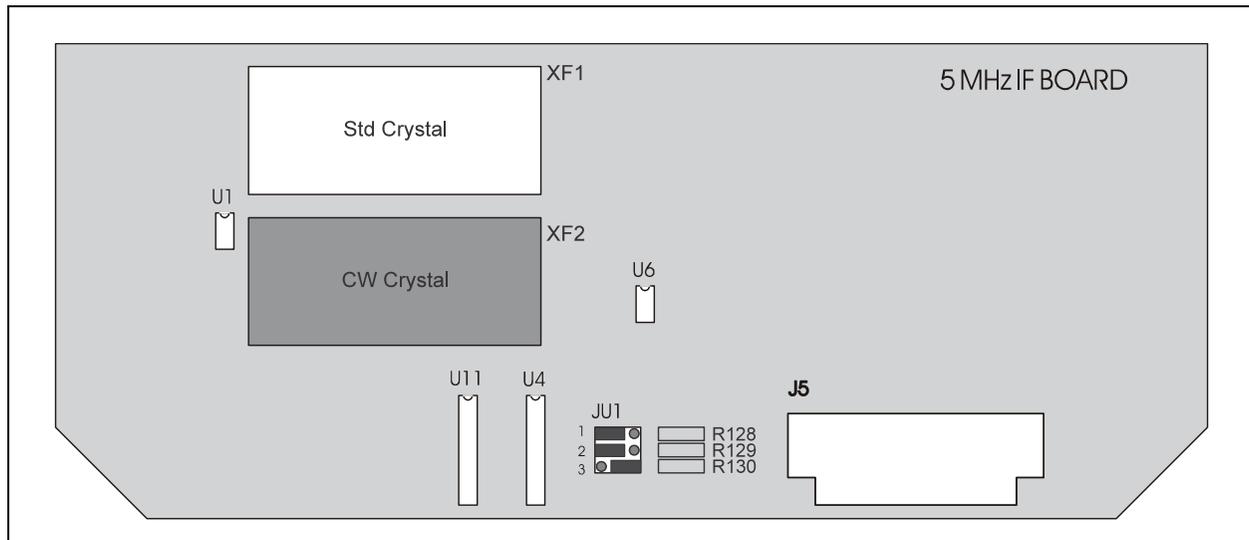
The 7000CW RF filter option provides a narrowband filter with 500 Hz bandwidth for CW operation. Figure 17-1 below shows where the CW narrowband filter is placed.

**Note:** If it is necessary to perform a field installation, a soldering iron and wire cutters are required.

To install the 7000CW crystal filter:

1. Turn the RT7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Remove the 5 MHz board (refer to Figure 21-1 on page 21-5).

4. Remove the coaxial cables connected to the board. With the insulation washers under the filter, mount the filter to the board in position XF2. Solder the filter leads, trimming any excess.
5. If XF1 is a standard voice crystal, change resistor R130 to 1% 1/8W 3.92k ohm (1113921).
6. Change the JU1 jumper on position 3 as shown in Figure 17-1.
7. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
8. Reinstall the retaining bar and the top cover.



**Figure 17-1 Narrowband CW Option Component Placement**

## 17.2 Wideband 1 Filter Option (7000WB1)

The 7000WB1 RF Filter option provides a 300 to 3300 Hz wideband filter with tailored group delay characteristics for data operation (USB/LSB).

**Note:** 7000WB1 requires the 5 MHz IF board is revision U or higher.

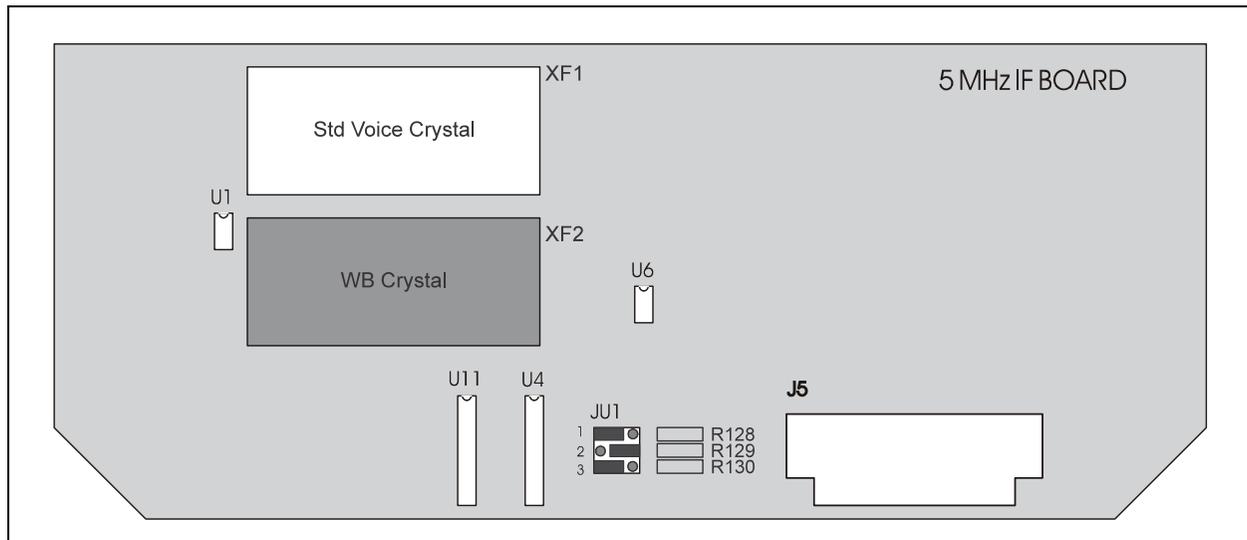
**Note:** If it is necessary to perform a field installation, a soldering iron and wire cutters are required.

To install the 7000WB1 option:

1. Turn the RT7000 off and remove the cover. Remove the board retaining bar.
2. Locate and remove the 5 MHz IF board using a board puller (refer to Figure 21-1 on page 21-5).
3. Remove the coaxial cables connected to the board. With the insulation washers under the crystal, mount the filter to the board in position XF2. Solder the crystal leads, trimming any excess.

4. If the 5 MHz IF board has a standard voice crystal installed in XF1, change jumper JU1 as shown in Figure 17-2 below.
5. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
6. Reinstall the retaining bar and the top cover.

**Note:** When powered up, the filter band modes **USB DATA** and **LSB DATA** (wideband) are displayed on the front panel LCD. For information on selecting a mode, refer to the RT7000-MSOP operator manual.



**Figure 17-2 Wideband WB1 Filter Option Component Placement**

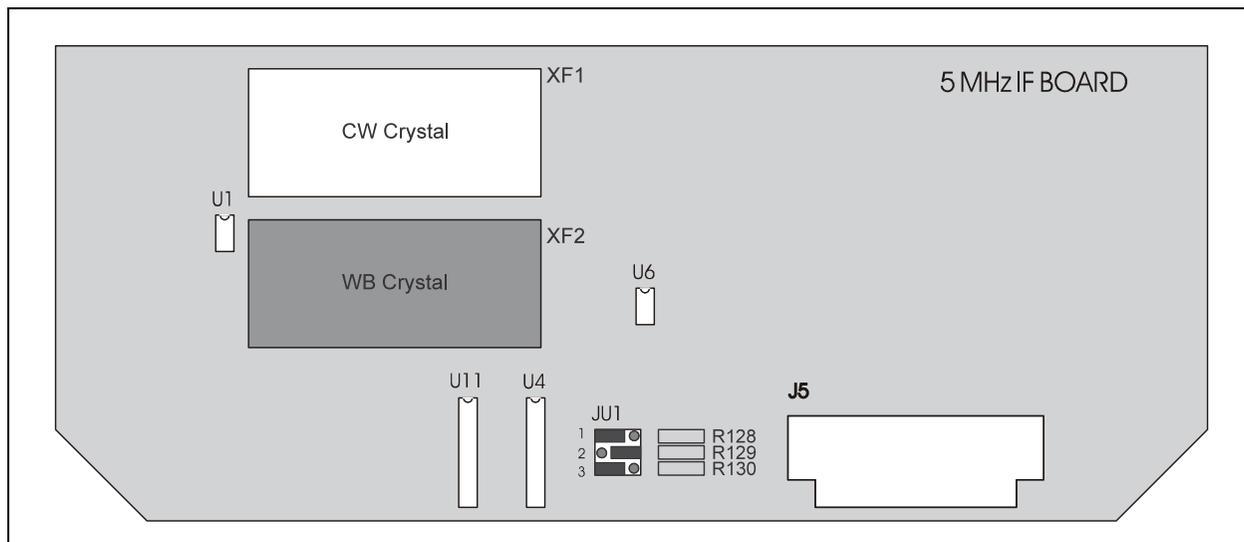
### 17.3 Narrow and Wideband Filter Option (7000CW1)

The 7000CW1 RF Filter option combines the narrowband filter of the 7000CW option for CW operation and the wideband filter of the 7000WB1 option for data operation. The standard voice filter is eliminated.

If it is necessary to perform a field installation, a soldering iron and cutters are required. Follow the steps below. For component placement, refer to the figure below.

1. Turn the RT7000 off and remove the cover. Remove the board retaining bar.
2. Locate and remove the 5 MHz IF board using a board puller (refer to Figure 21-1 on page 21-5).
3. Remove the coaxial cables connected to the board.
4. With the insulation washers under the filter, remove the standard voice crystal in XF1 and install the CW filter in its place (the wideband filter is installed in XF2). Solder the crystal leads, trimming any excess.
5. Replace R129 with a 1% 1/8W 10k ohm resistor (1111002).

6. JU1 jumpers should be configured as shown in Figure 17-3 below.
7. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
8. Reinstall the retaining bar and the cover.



**Figure 17-3 Combination Narrow and Wideband CW1 Filter Component Placement**



## Chapter 18: Voice Enhancement Board

### 18.1 Circuit Description

The Voice Enhancement board provides superior voice recognition and signal-quality improvement in noisy environments. It was offered as an option but is now included as standard equipment in newer radios.

**Note:** For legacy RT7000 radios, the Voice Enhancement option (7000VEM) is available as an upgrade.

The Voice Enhancement board is installed in the Option 1 slot and connects to the J9 connector on the Motherboard that connects to the Processor board for programming and BITE and to the Audio board for output audio at the front panel or remote control head.

The Voice Enhancement board includes the following devices:

- Audio CODEC
- DSP processor
- 64k x 16 SRAM
- 1 Mbit of flash memory
- CPLD
- +5V, -5V, and 3.3V voltage regulator devices.

The Voice Enhancement board receives demodulated analog audio (AUDIO\_IN) from the Audio board on J1, pin 7. The analog audio input signal is converted to differential signals at op amp U8B and applied to audio CODEC U2 where it is sampled and converted to a digital signal (CODEC\_OUT). It is then routed to the DSP processor where special algorithms stored in flash memory U7 filter noise and inducted impulse tones from the digital audio signal. After filtering, the digital audio (CODEC\_IN) is routed back to the audio CODEC where it is converted back into analog audio.

The filtered analog audio is output in differential signals to op amp U8A where they are combined to a single audio signal (AUDIO\_OUT) and sent back to the Audio board at J1 pin 6 (J9 pin 6 on the Motherboard).

The CPLD contains the *glue* logic that performs the following functions:

- SRAM read/write control signal generation
- Serial to parallel shift register for the backplane interface
- Chip select decoder for the shift register
- Buffer between the DSP bus and the shift register
- PEAK LED inverter

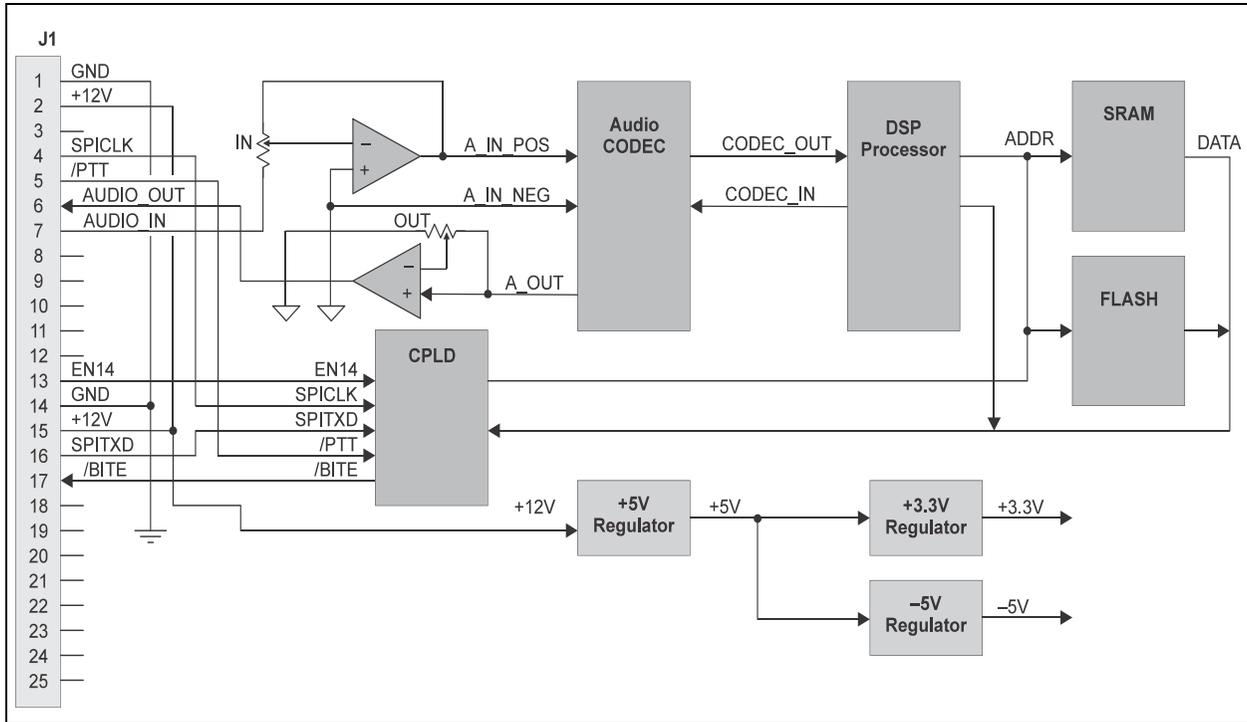


Figure 18-1 Voice Enhancement Board Block Diagram

## 18.2 Connector Pin Assignments

The Voice Enhancement board has a single connector (J1) that connects to J9 on the Motherboard.

Table 18-1 J1 Connector Pin Assignments

Pins	Signal	Description
1	GND	Chassis ground
2	+12V	+12 VDC supply voltage from the Interface/Power Supply board
3	NC	No connection
4	SPICLK	SPI serial clock line from the Processor board (programming)
5	PTT	(active low)
6	AUDIO_OUT	Filtered audio output to the Audio board

**Table 18-1 J1 Connector Pin Assignments (Continued)**

<b>Pins</b>	<b>Signal</b>	<b>Description</b>
7	AUDIO_IN	Demodulated audio input from the Audio board
8 to 12	NC	No connection
13	EN14	Programming enable signal from the Processor board
14	GND	Chassis ground
15	+12V	+12 VDC supply voltage from the Interface/Power Supply board
16	SPITXD	SPI serial transmit data line from the Processor board (programming)
17	BITE	BITE signal (active low) to the Processor board
18 to 25	NC	No connection

### 18.3 Component Locations, Schematics, and Parts List

This section includes the component locations diagram, schematics and parts list for the Voice Enhancement board.

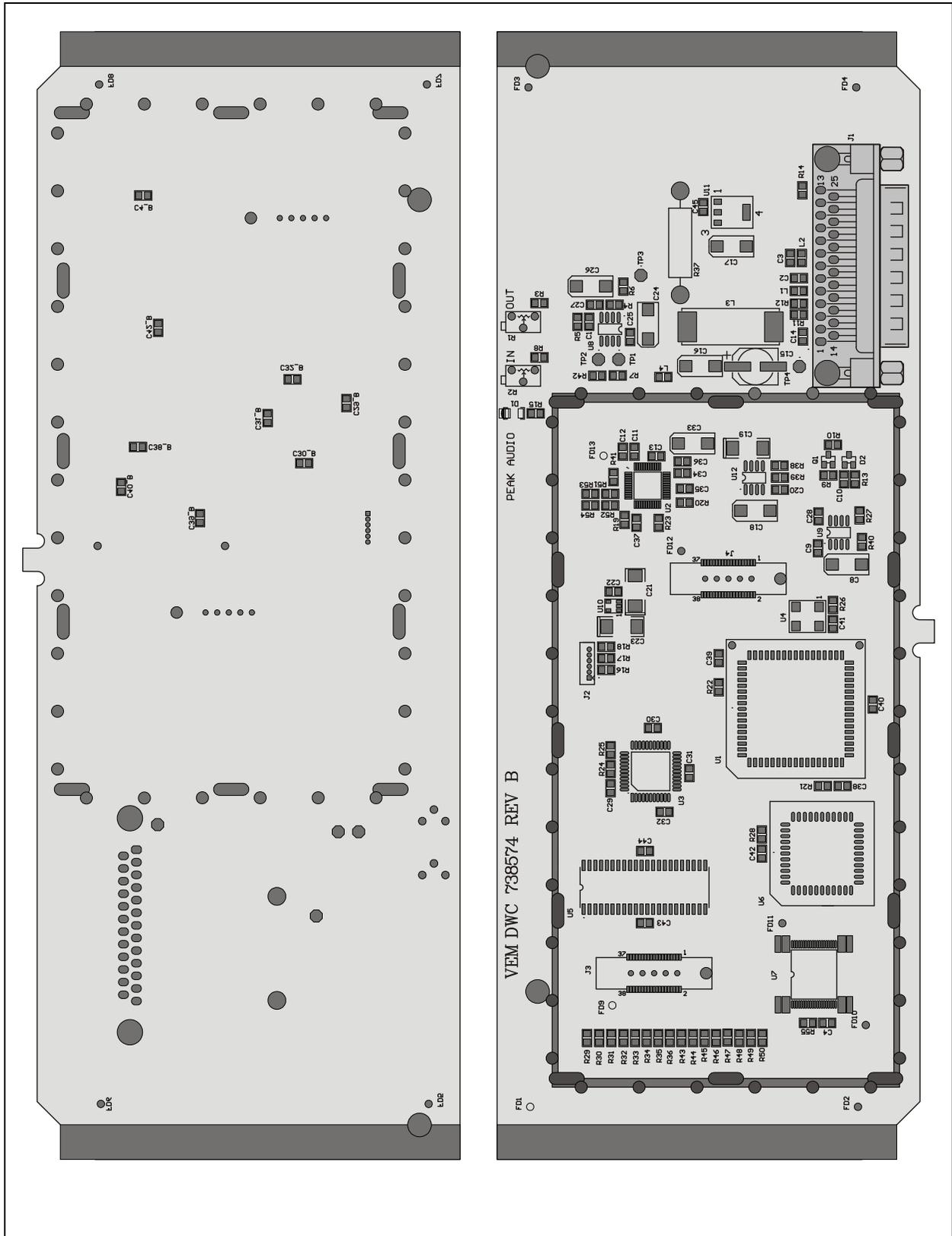
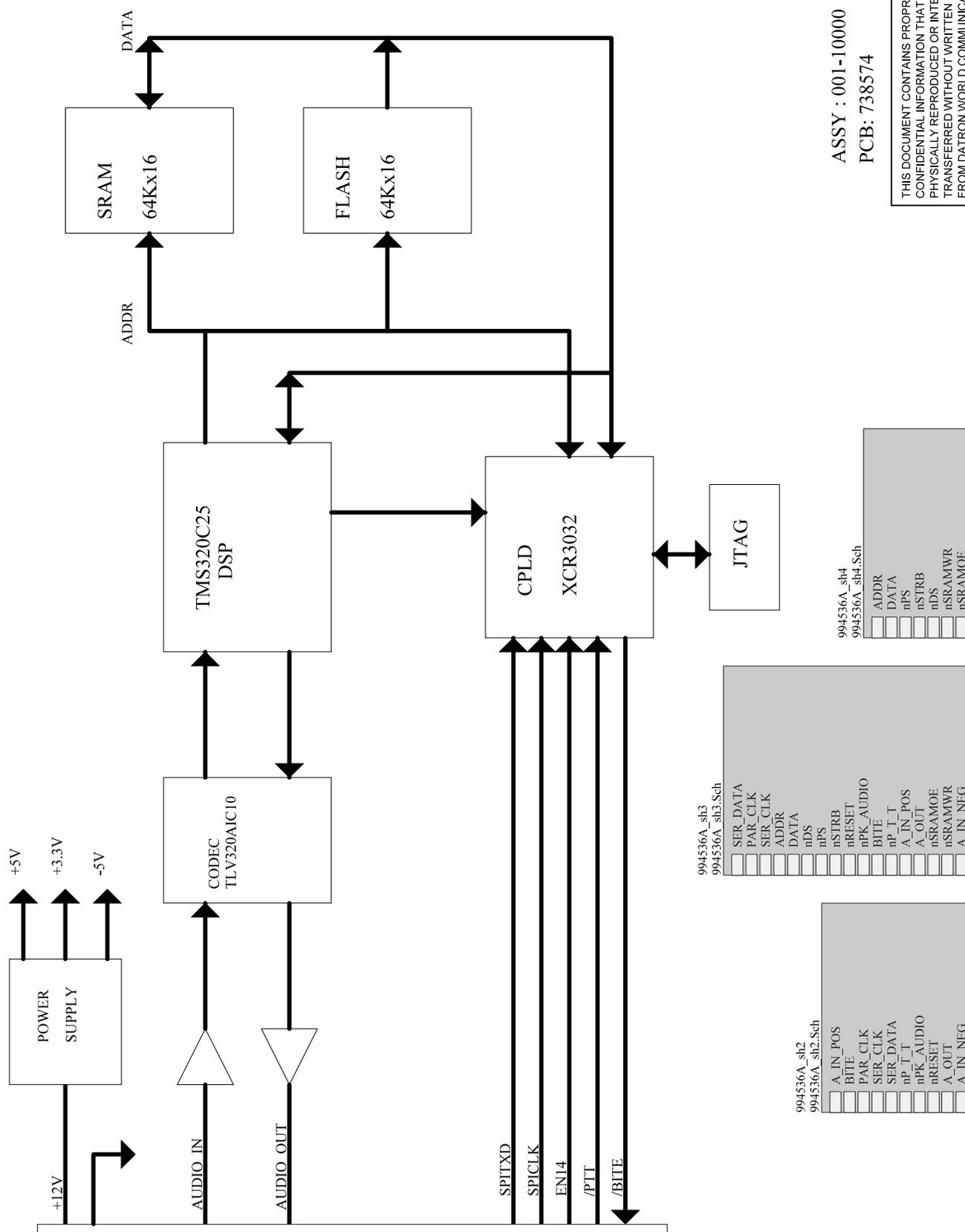


Figure 18-2 Voice Enhancement Board Component Locations  
(738574 Rev. B)



ASSY : 001-10000  
 PCB: 738574

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994536A\_sh2  
 994536A\_sh2.Sch

<input type="checkbox"/>	A_IN_POS
<input type="checkbox"/>	BITE
<input type="checkbox"/>	PAR_CLK
<input type="checkbox"/>	SER_CLK
<input type="checkbox"/>	SER_DATA
<input type="checkbox"/>	nP_T_T
<input type="checkbox"/>	nPK_AUDIO
<input type="checkbox"/>	nRESET
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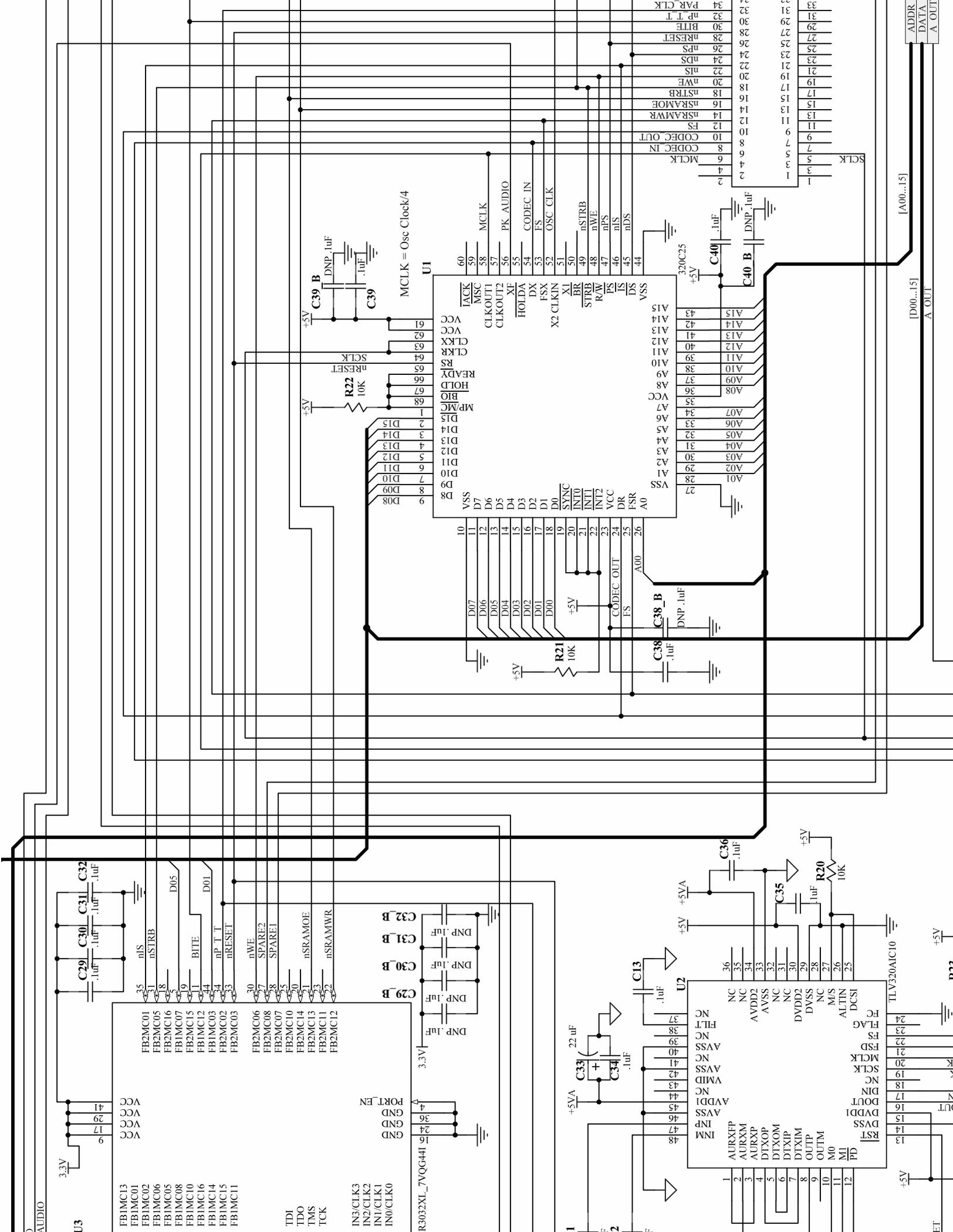
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 994536A\_sh3.Sch

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<input type="checkbox"/>	ADDR
<input type="checkbox"/>	DATA
<input type="checkbox"/>	nDS
<input type="checkbox"/>	nPS
<input type="checkbox"/>	nSTRB
<input type="checkbox"/>	nRESET
<input type="checkbox"/>	nPK_AUDIO
<input type="checkbox"/>	BITE
<input type="checkbox"/>	nP_T_T
<input type="checkbox"/>	A_IN_POS
<input type="checkbox"/>	A_OUT
<input type="checkbox"/>	nSRAMOE
<input type="checkbox"/>	nSRAMWR
<input type="checkbox"/>	A_IN_NEG

994536A\_sh4  
 994536A\_sh4.Sch

<input type="checkbox"/>	ADDR
<input type="checkbox"/>	DATA
<input type="checkbox"/>	nPS
<input type="checkbox"/>	nSTRB
<input type="checkbox"/>	nDS
<input type="checkbox"/>	nSRAMWR
<input type="checkbox"/>	nSRAMOE







**Table 18-2 Voice Enhancement Board Parts List (001-10000 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C10	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C11	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C12	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C13	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C14	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C15	023471002	"CAP, 470UF AL 16V 20% 8X10MM"
C16	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C17	022226002	"CAP, 22UF TA LESR 25V 20% 7343-31"
C18	022226002	"CAP, 22UF TA LESR 25V 20% 7343-31"
C19	022107000	"CAP,100UF TA LESR 10V 10% 7343"
C2	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C20	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C21	022106002	"CAP,10UF TA L-ESR 35V 10% 7343"
C22	021103000	"CAP, 0.01UF X7R 50V 5% 0805"
C23	022106002	"CAP,10UF TA L-ESR 35V 10% 7343"
C24	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C25	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C26	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C27	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C28	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C29	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C3	021102000	"CAP, 1000PF NP0 100V 5% 0805"
C30	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C31	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C32	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C33	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C34	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C35	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C36	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C37	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 18-2 Voice Enhancement Board Parts List (001-10000 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C38	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C39	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C4	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C40	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C41	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C42	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C43	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C44	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C45	021105000	"CAP, 1UF Y5V 16V -20/+80% 0805"
C8	022226000	"CAP, 22UF TA 16V 10% 7343-31"
C9	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	035500003	"LED, RED TOP-V 1206"
D2	037700005	"DIODE, BAS16, 75V, 0.2A, SOT-23"
J1	613163	"CONN, DB-25 RT ANGLE PC PLUG"
J2	080004001	"CONN, 1.25MM, HEADER, 6PIN"
L1	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L2	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
L3	041104001	IND SM 100UH 15% 7832
L4	045000000	"BEAD, FERRITE, Z=600, 0.2A, 25%, 0805"
Q1	032005	"XSTR, 2N7002 N-MOSFET SOT-23"
R1	170229	"RES, 10K TRM CER S-ADJ MT TH"
R10	013203500	"RES, 20K OHM 1/8W 5% TK 0805"
R11	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R12	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R13	013104000	"RES, 100K OHM 1/8W 5% TK 0805"
R14	013101000	"RES, 100 OHM 1/8W 5% TK 0805"
R15	013249000	"RES, 249 OHM 1/8W 1% TK 0805"
R16	013103000	"RES, 10K OHM 1/8W 5% TK 0805"
R17	013103000	"RES, 10K OHM 1/8W 5% TK 0805"
R18	013103000	"RES, 10K OHM 1/8W 5% TK 0805"
R19	013103000	"RES, 10K OHM 1/8W 5% TK 0805"
R2	170229	"RES, 10K TRM CER S-ADJ MT TH"

**Table 18-2 Voice Enhancement Board Parts List (001-10000 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R20	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R21	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R22	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R23	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R24	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R25	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R26	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R27	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R28	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R29	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R3	013242000	"RES,2.4K OHM 1/8W 5% TK 0805"
R30	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R31	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R32	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R33	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R34	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R35	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R36	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R37	155100	"RES,10 OHM 3W 5% FP MOX"
R38	013393000	"RES,39K OHM 1/8W 5% TK 0805"
R39	013204000	"RES, 200K OHM 1/8W 1% TK 0805"
R4	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R40	013471000	"RES, 470 OHM 1/8W 5% TK 0805"
R41	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R42	013000000	"RES, ZERO OHM, 2A, TK, 0805"
R43	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R44	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R45	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R46	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R47	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R48	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R49	013103000	"RES,10K OHM 1/8W 5% TK 0805"

**Table 18-2 Voice Enhancement Board Parts List (001-10000 Rev. G)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
R5	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R50	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R51	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R52	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R55	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R6	013101000	"RES,100 OHM 1/8W 5% TK 0805"
R7	013242000	"RES,2.4K OHM 1/8W 5% TK 0805"
R8	013103000	"RES,10K OHM 1/8W 5% TK 0805"
R9	013103000	"RES,10K OHM 1/8W 5% TK 0805"
U1	033301009	"IC,TMS320C25FNA DSP CTL PLCC68"
U10	033304070	"IC,LP2982 3.3V VR ULDO SOT23-5"
U11	034400003	"IC,SM,VR,1A,LOW DROPOUT SOT223"
U12	034402008	"IC, LT1054 SWITCH V CNVTR SO-8"
U2	033303100	"IC, TLV320AIC CODEC PQFP-48"
U3	033302011	"IC, XCR3032XL-7 CPLD VQFP-44"
U4	361122	"OSCILLATOR,40.000 MHZ SMT"
U5	033300027	"IC, CY7C1021D, 64KX16 SRAM, 5V, SOJ44"
U7	001-11001	VEM PGM IC FLASH MEMORY
U8	033304057	"IC, LMC6492A, DUAL OP-AMP, SOIC-8"
U9	033303101	"IC, TL7705 VOLT SUPVR SO-8"



## Chapter 19: Other Options

This chapter covers internal options that can be added to the RT7000. They are generally factory installed. If added in the field, installation requires a #2 Phillips-head screwdriver and a board puller included in the following maintenance kits.

- 7000EXT extender kit
- RT7000TK tool kit

Internal Option	Part Number	Page
Additional Channel	7000ACH	19-2
Data Interface RS422/423/485	7000RS	19-3
Encryption	7000ENCR	19-4
Noise Blanker	7000NB	19-5
Recorder	7000RCDR	19-11
Voice Enhancement Module	7000VEM	19-12
SELCALL Enable	RT7000AIRSELCALL	19-12

For information on changing the on or off status of these options, refer to the RT7000-MSOP operator manual.

## 19.1 Additional Channels Option (7000ACH)

The Additional Channels 7000ACH option increases the number of programmable channels of the 7000-series transceiver to 1000 channels. It is compatible with revision D and later processor boards.

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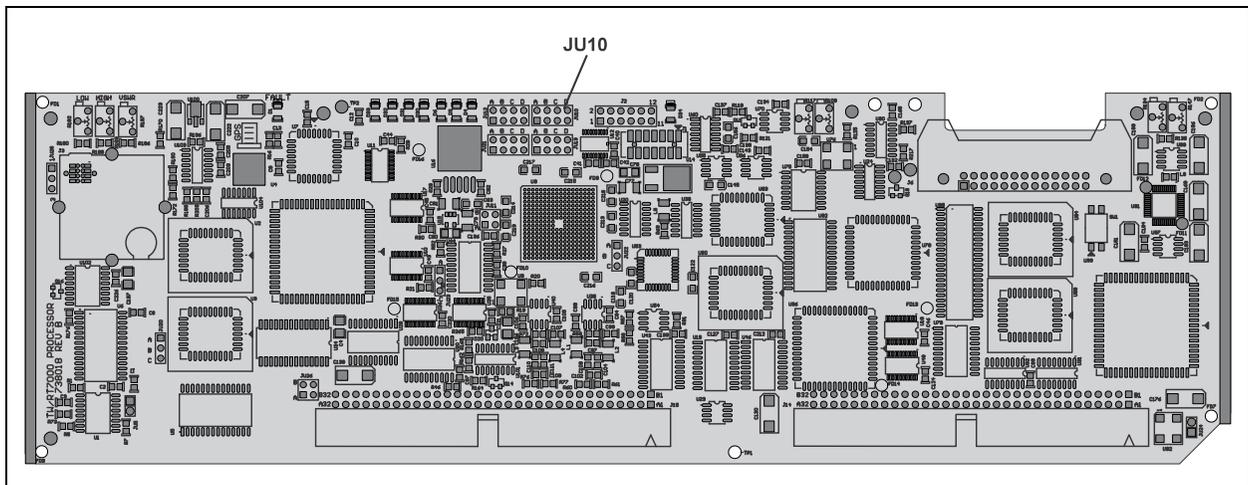
**CAUTION: This option involves clearing RAM; any programmed information is over-written.**

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To install the 7000ACH option:

1. Turn the RT7000 off and remove the cover. Remove the board retaining bar.
2. Using the correct antistatic procedures and board puller, locate and remove the Processor board (001-01107 or 001-01105).
3. Install a jumper at JU10-A (refer to Figure 19-1 on page 19-2).
4. Reinsert the Processor board into its slot. Turn on the RT7000, and verify the channels range from 000-999 for a total of 1000 channels. Turn the RT7000 off and remove jumper JU10-D.
5. Reinstall the board retaining bar and the top cover on the radio.

When powered up, the RT7000 operates with up to 1000 channels.



**Figure 19-1 Additional Channel Jumper Placement**

## 19.2 Data Interface Option (7000RS)

Serial communications through COM1 use standard RS-232 protocol. With the Data Interface 7000RS option, COM1 can also be configured for RS422/423/485 protocol. Only COM1 is changed; COM2 remains RS-232.

To install the 7000RS option:

1. Turn the radio off and remove the cover. Remove the board retaining bar.
2. Using proper antistatic procedures, locate and remove the Processor board (001-01107 or 001-01105) using a board puller.
3. Set jumpers JU22 and JU23 to the A-B position (refer to Table 21-6 on page 21-25).
4. Reinsert the Processor board and reinstall the board retaining bar and cover.

The selected interface standard is now available as COM1 at the rear panel **ACCESSORY 1** connector.

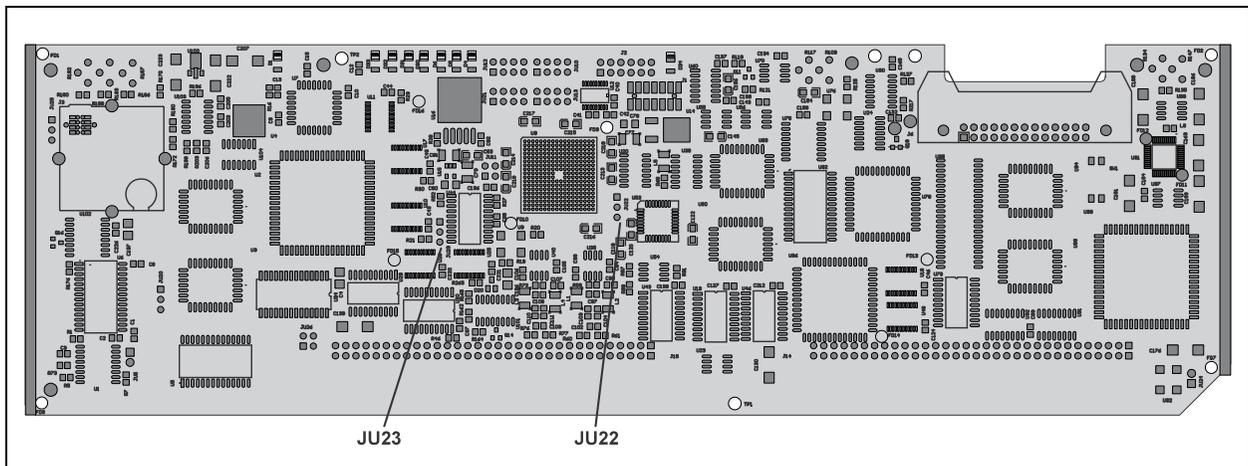


Figure 19-2 Data Interface Component and Jumper Placement

### 19.3 Encryption Option (7000ENCR)

The Encryption 7000ENCR option provides an extremely secure voice encryption capability. It is compatible with revision F and later Processor boards, and with software revision N or later. For installation into radios with Processor boards of an earlier revision, contact Datron's Customer Service.

**Note:** If the system has a narrowband antenna with a tuner, encryption must be turned off before attempting to tune the radio.

To install the 7000ENCR option:

1. Turn the RT7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Carefully insert the 7000ENCR board into the OPT2 slot (refer to Figure 21-1 on page 21-5).
4. Reinstall the retaining bar and the cover.

Operational procedures for the RT7000 remain the same with this option installed. The only noticeable difference is the ability to turn encryption on and off. For complete operating instructions, refer to the 7000ENCR operator manual (7000ENCR-MSOP).

Component locations diagram, schematic and parts list for the 7000ENCR option are not available.

## 19.4 Noise Blanker Option (7000NB)

The Noise Blanker 7000NB option reduces background noise on the 7000-series radios. It minimizes interference caused by certain types of impulse noise, such as ignition noise in a vehicle.

To install this option:

1. Turn the RT7000 off and remove the top and bottom covers. Remove the board retaining bar.
2. Run the cables from the 5 MHz IF board J56 and J58, to the appropriate connectors on the Noise Blanker board.
3. Install the 7000NB in the NB slot (refer to Figure 21-1 on page 21-5).
4. Reinstall the board retaining bar and the top and bottom covers.
5. When powered up, the **NB** icon displays on the front panel LCD.
6. To activate this option, refer to the RT7000-MSOP operator manual.

When activated, the 5 MHz IF is sampled through connector J56. The IF signal is applied to U2 pin 2 where the rising edge of noise pulses are detected and used to trigger the gates of U4 and U6. This causes attenuation of the IF signal for a duration of time specified by R16. The timing is factory-set for a blanking pulse of approximately 80 ms. The IF signal is routed out of the noise blanker through control J58.

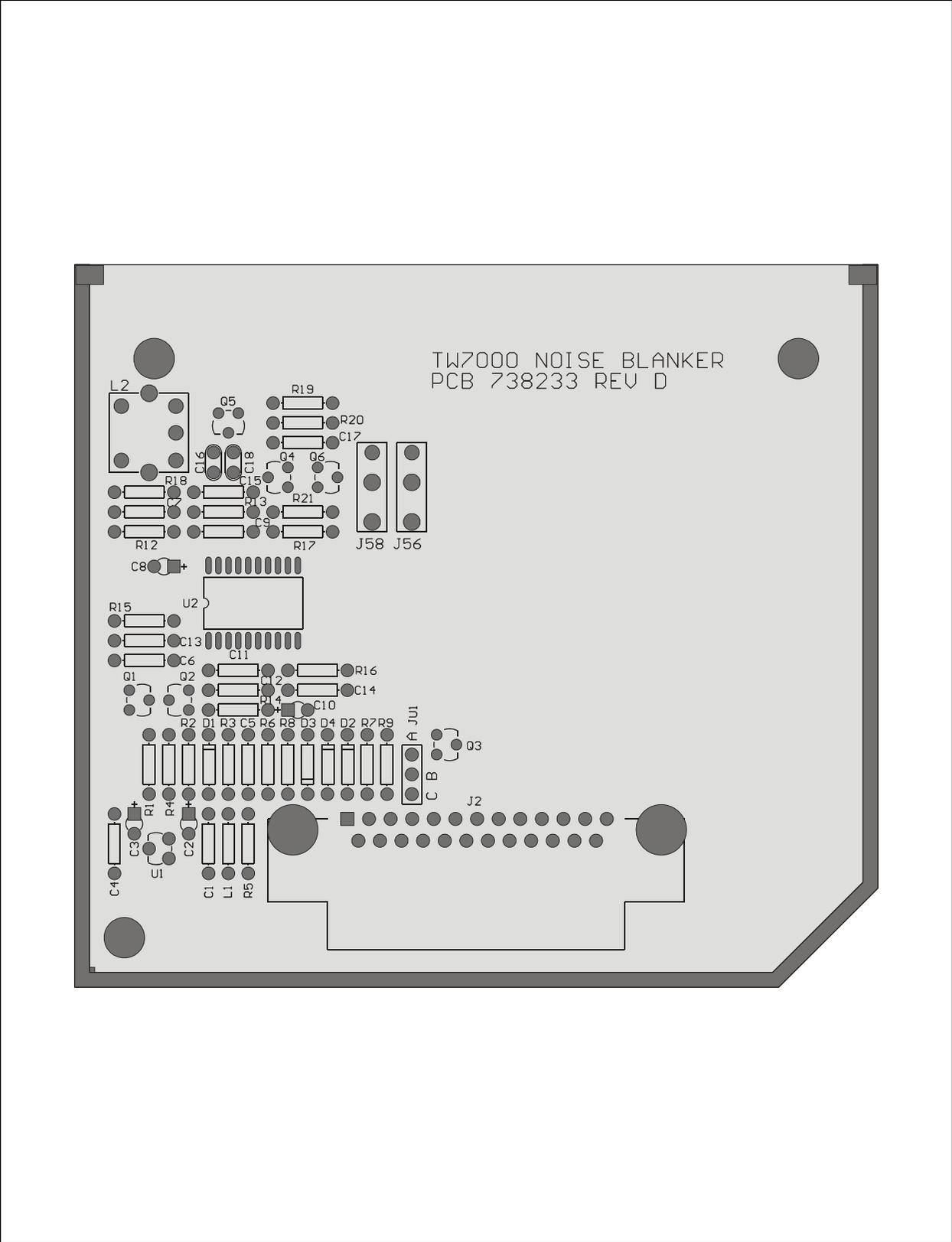


Figure 19-3 Noise Blanker Component Locations (738233 Rev. D)

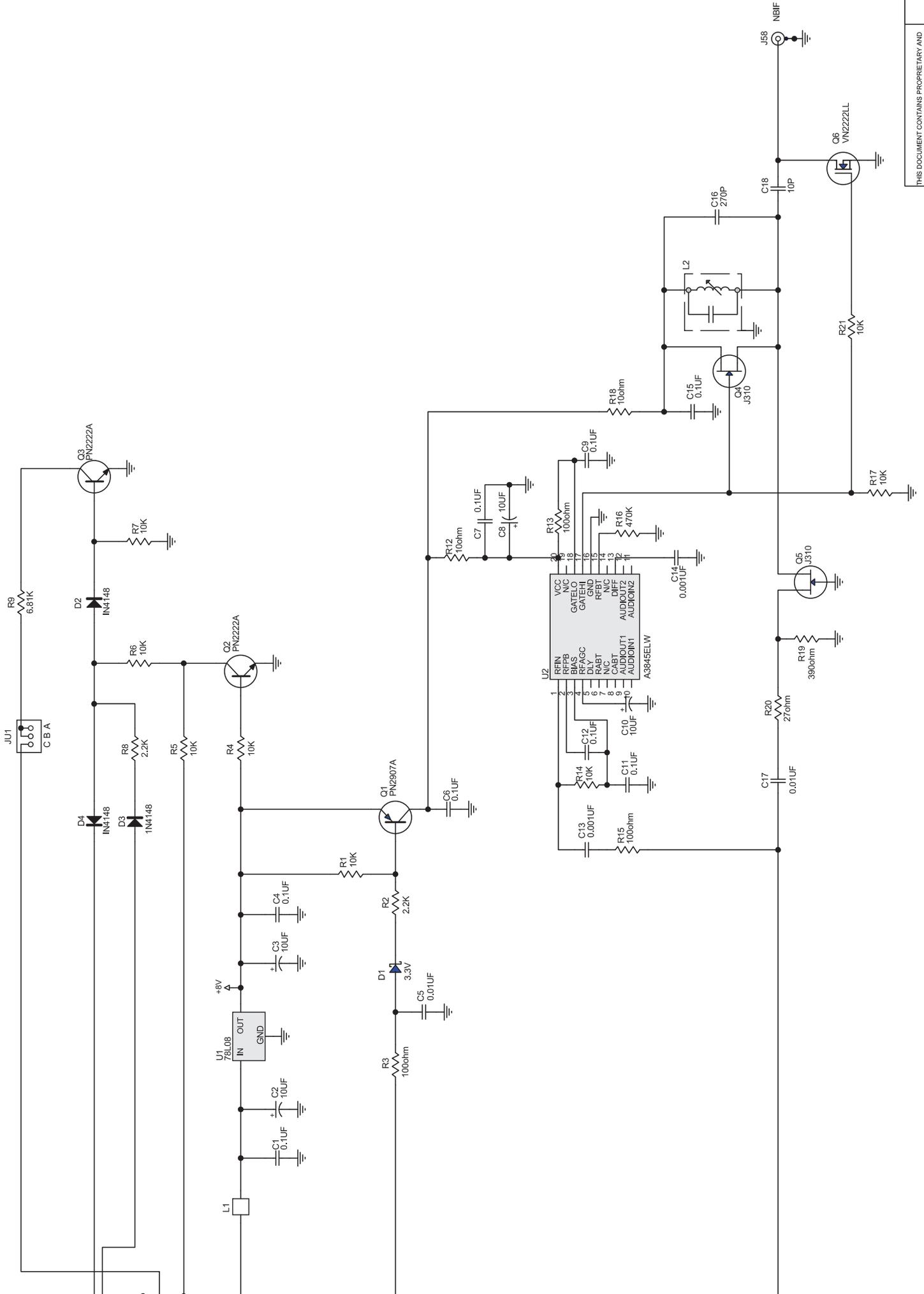


Table 19-1 Noise Blanker Parts List (001-01202 Rev. H)

Designator	Part Number	Description
C1	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C10	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C11	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C12	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C13	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C14	277102	"CAP,C,1000P,100,10%,X,AX,.25SP"
C15	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C16	275271	"CAP, 270PF NPO 100V 5% 0.2LS"
C17	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C18	210100	"CAP,10 PF NPO 50V 5% 0.1LS DSK"
C2	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C3	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C4	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C5	277103	"CAP, 0.01UF X7R 100V 10% AX 2.54 X 4.3"
C6	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C7	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
C8	241100	"CAP, 10UF TA 16V 20% DIP 0.1LS"
C9	277104	"CAP,C,0.1U,50,10%,X,AX,.25SP"
D1	320210	"DIODE,ZENER 3.3V 1N746A"
D2	320002	"DIODE, 1N4148/1N4150 DO-35"
D3	320002	"DIODE, 1N4148/1N4150 DO-35"
D4	320002	"DIODE, 1N4148/1N4150 DO-35"
J2	613163	"CONN,DB-25 RT ANGLE PC PLUG"
J56	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J58	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
JU1	620030	"HEADER,3 PIN 0.025 SQ POST"
JU1	621105	"MICRO SHUNT, 0.10 IN 1.5A SN"
L1	459032	"IND ASY,3T#30 MAGNET 1-490201"
L2	420017	INDUCTOR IF 10.7MHZ
Q1	310052	"XSTR, PN2907A PNP TO92"
Q2	310057	"XISTOR,NPN,PN2222A,TO92"

**Table 19-1 Noise Blanker Parts List (001-01202 Rev. H)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
Q3	310057	"XISTOR,NPN,PN2222A,TO92"
Q4	310033	"XSTR, J310 N-JFET TO92"
Q5	310033	"XSTR, J310 N-JFET TO92"
Q6	310138	"XISTOR,N-CHANNEL MOSFET,VN2222L,TO92"
R1	113103	"RES, 10K OHM 1/8W CF 5%"
R12	113100	"RES,10 OHM 1/8W 5% FILM"
R13	113101	"RES,100 OHM 1/8W CF 5%"
R14	113103	"RES, 10K OHM 1/8W CF 5%"
R15	113101	"RES,100 OHM 1/8W CF 5%"
R16	113474	"RES,470K OHM 1/8W CF 5%"
R17	113103	"RES, 10K OHM 1/8W CF 5%"
R18	113100	"RES,10 OHM 1/8W 5% FILM"
R19	113331	"RES,330 OHM 1/8W CF 5%"
R2	113222	"RES,2.2K OHM 1/8W CF 5%"
R20	113270	"RES,27 OHM 1/8W 5% CARBON FILM"
R21	113103	"RES, 10K OHM 1/8W CF 5%"
R3	113101	"RES,100 OHM 1/8W CF 5%"
R4	113103	"RES, 10K OHM 1/8W CF 5%"
R5	113103	"RES, 10K OHM 1/8W CF 5%"
R6	113103	"RES, 10K OHM 1/8W CF 5%"
R7	113103	"RES, 10K OHM 1/8W CF 5%"
R8	113222	"RES,2.2K OHM 1/8W CF 5%"
R9	1116811	"RES, 6.8K 1/8W 1% FILM"
U1	330018	"IC,VREG,78L08,TO94,8V"
U2	033304028	"IC,SM,LIN,A3845ELW, SOW-20"

## 19.5 Recorder Option (7000RCDR)

The Recorder 7000RCDR option provides the capability of recording transmit and receive audio from **ACCESSORY 2** for split site purposes.

To install the 7000RCDR option:

1. Turn the RT7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Using the proper antistatic procedures and a board puller, locate and remove the Audio board (refer to Figure 21-1 on page 21-5).
4. Install a jumper on JP1 as shown in Figure 19-5 below.
5. Reinsert the Audio board.
6. Reinstall the board retaining bar and top cover.
7. Turn on the RT7000 and operate normally.

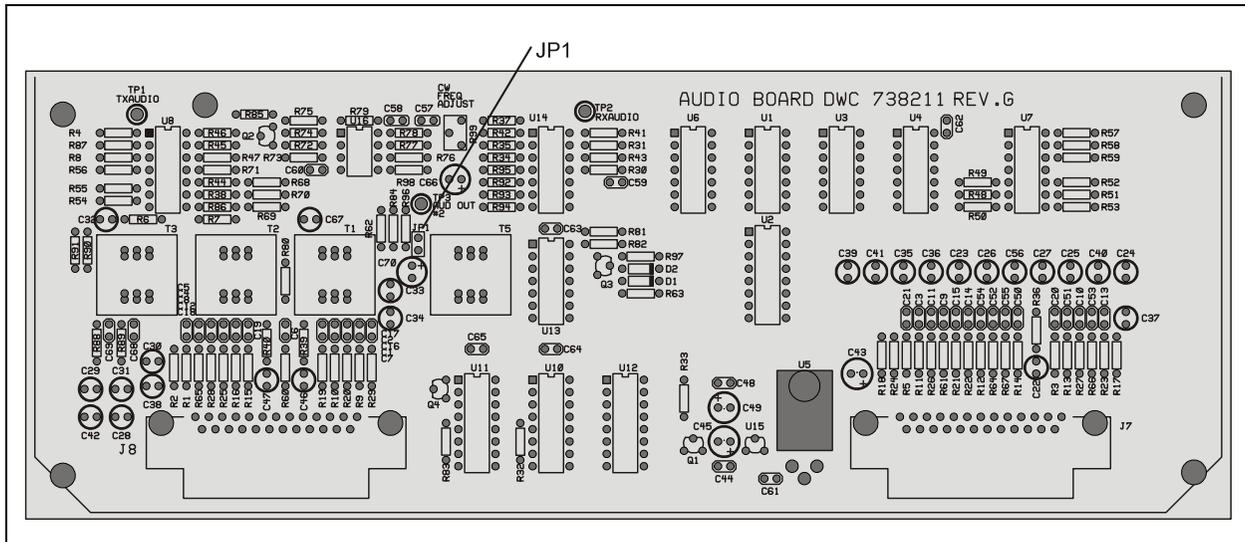


Figure 19-5 Recorder Option Jumper Placement

## 19.6 N1304A Encoder Option (RT7000AIRSELCALL)

The N1304A AIRSELCALL option provides an interface with Motorola® N1304 SELCALL or compatible devices. This option adds a secondary control line (AME EN) from the 5 MHz IF board to the rear panel **ACCESSORY 2** connector that enables the RT7000 to use the ICAO-mandated ground-to-air SELCALL 3-tone system.

To call an aircraft, the operator enters the 4-digit calling code, then presses the send button. The RT7000 automatically switches to AME mode and sends the SELCALL. After the RT7000 transmits the calling tone sequence, it returns to normal SSB mode.

The RT7000AIRSELCALL option involves adding a bipolar transistor on the component side of the 5 MHz IF board, and adding an extra line from the Motherboard J5 solder pattern to the **ACCESSORY 2** ribbon cable.

**Note:** The RT7000AIRSELCALL option cannot be installed in the field nor is it field-servicable. It is installed in the radio as a special order.



## Chapter 20: Alternate Configurations

### 20.1 Computer Control Version (RT7000C)

The RT7000C is a computer-controlled version of the RT7000. The front panel consists of an on/off switch and a LED power indicator.

### 20.2 28V Version (RT7000-28)

The RT7000-28 is a 28 Vdc input version of the RT7000. It is similar to the 12V radio with the exception that the rear panel (inside) has a 28V RF Power Amplifier and a DC-to-DC Power Converter. The RF Power Amplifier is powered by the 28V source power. The rest of the radio uses 12V provided by the DC-DC Converter that converts the 28V source power to 12 Vdc.

#### 20.2.1 DC-to-DC Converter

U1 is a control circuit containing the primary functions of the DC-DC Converter. Q1 is the main switching transistor. L2 and L3 filter the output while R2 and R3 provide feedback for voltage regulation. Zener diode D2 provides overvoltage protection in case the DC-DC Converter fails.

#### 20.2.2 28V RF Amplifier Board

The 28V RF Amplifier is a two-stage, broadband power amplifier module capable of producing 125W of RF power. Power for the module is provided by the 28V DC power source. Input power to the module is applied to J10 (approximately 100 mW), split by transformer T3, then filtered and applied to drivers Q1 and Q2. Q7 sets the driver stage bias current at 150 mA. Transformer T1 couples the driver stage to the final amplifier stage consisting of power transistors Q3 and Q4. Q5 and Q6 set the final amplifier stage current at 250 mA. Transformer T2 provides output coupling for the final amplifier stage.

#### 20.2.3 28V RF Filter Board

The 28V RF Filter board is exactly the same as the 12V RF Filter except for one capacitor (C49) in Band 1. Refer to Chapter 8 on page 8-1 for a circuit description.

#### **20.2.4 28V Mainframe**

This section includes a mainframe wiring diagram for the 28V version of the RT7000.



## **20.3 DC/DC Converter**

This section includes a component locations diagram, schematic and parts list for the 28V DC/DC Converter.

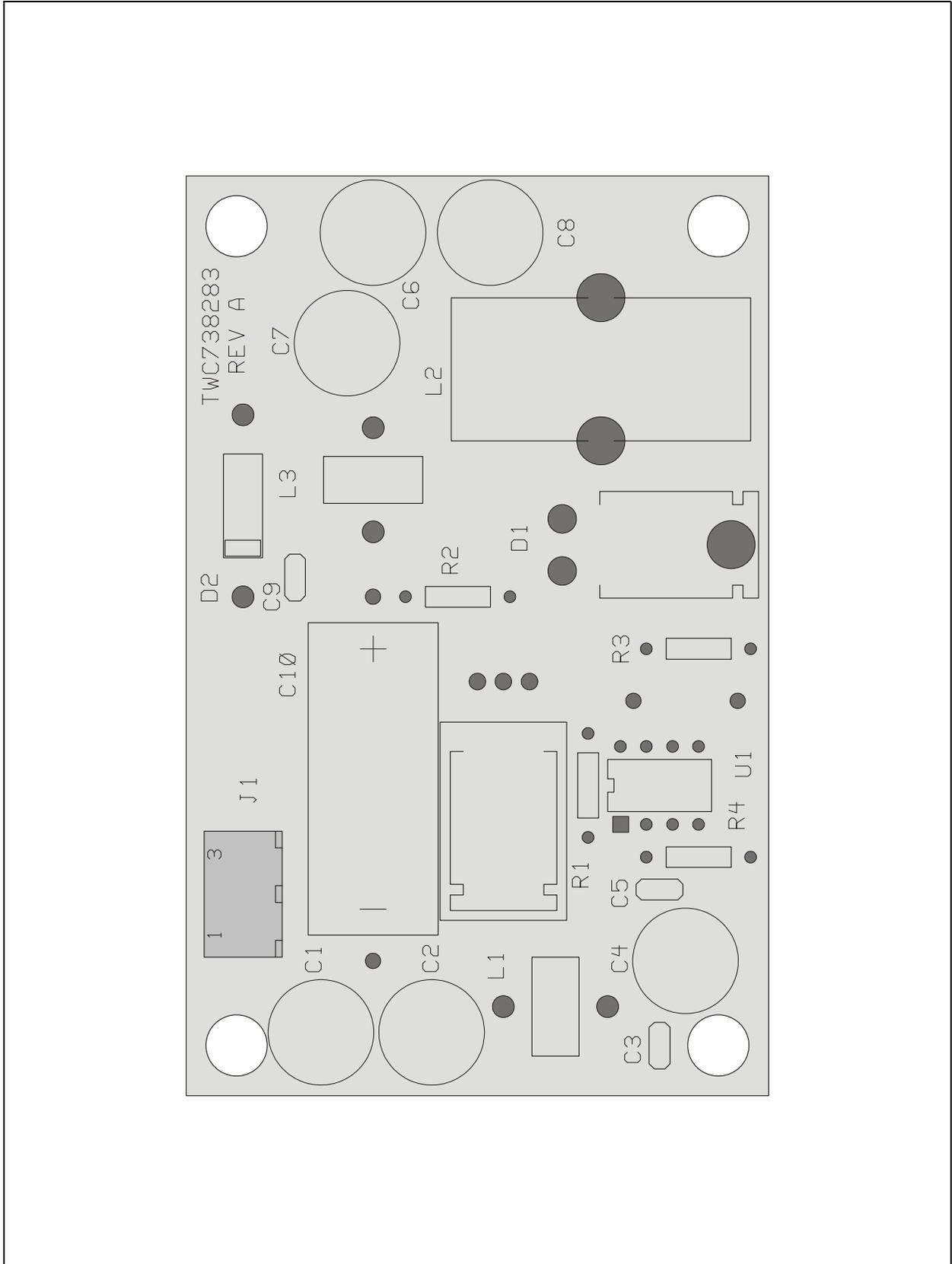


Figure 20-2 DC-DC Converter Component Locations (738283 Rev. A)

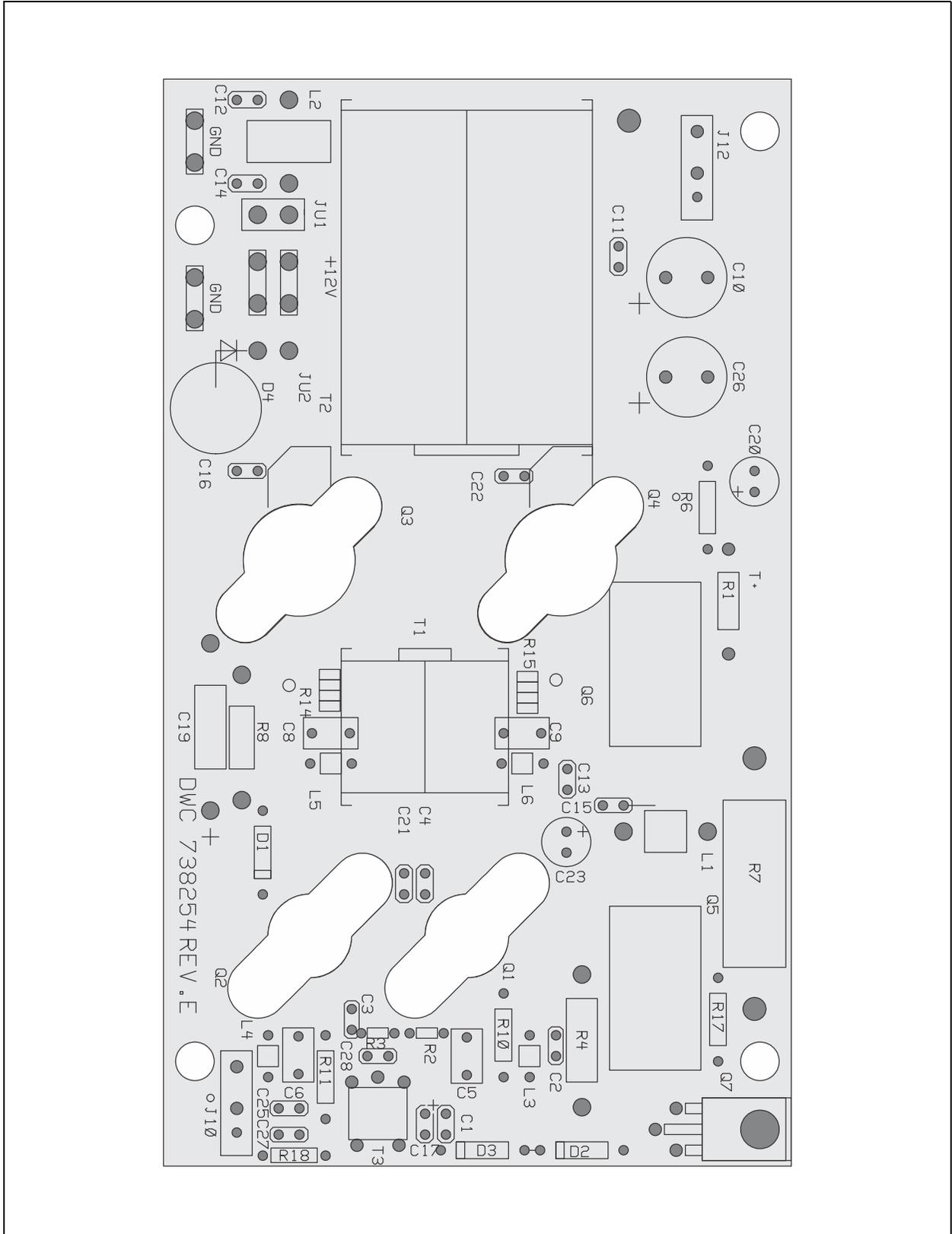


**Table 20-1 DC-DC Converter Parts List (004-28300 Rev. G)**

Designator	Part Number	Description
C1	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C10	230202	"CAP, 2200UF AL 16V 20% AX 13X26"
C2	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C3	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C4	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C5	275471	"CAP,470PF NP0 50V 10% 0.1LS"
C6	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C7	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C8	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C9	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
D1	320126	"DIODE, MBR1645 SCHTKY 16A TO220"
D2	320437	DIODE 1N6276A 16V TVS DO-204
J1	610209	"HEADER, MLX, 3PIN, .156, POLAR"
L1	459141	"IND ASSY, 4T#20 AWG 1-490302"
L2	459320	IND ASSY 35T#20AWG 490014 VERT
L3	459141	"IND ASSY, 4T#20 AWG 1-490302"
R1	124101	"RES, 100 OHM 1/4W 5% CF"
R2	1114751	RES 4.75K 1/8W 1% MF
R3	1114750	"RES, 475 ohm 1/8W 1% MF"
R4	124471	"RES, 470 OHM 1/4W 5% CF"
U1	330191	"IC, MC34063PI, SWPS CTRLR, DIP8"

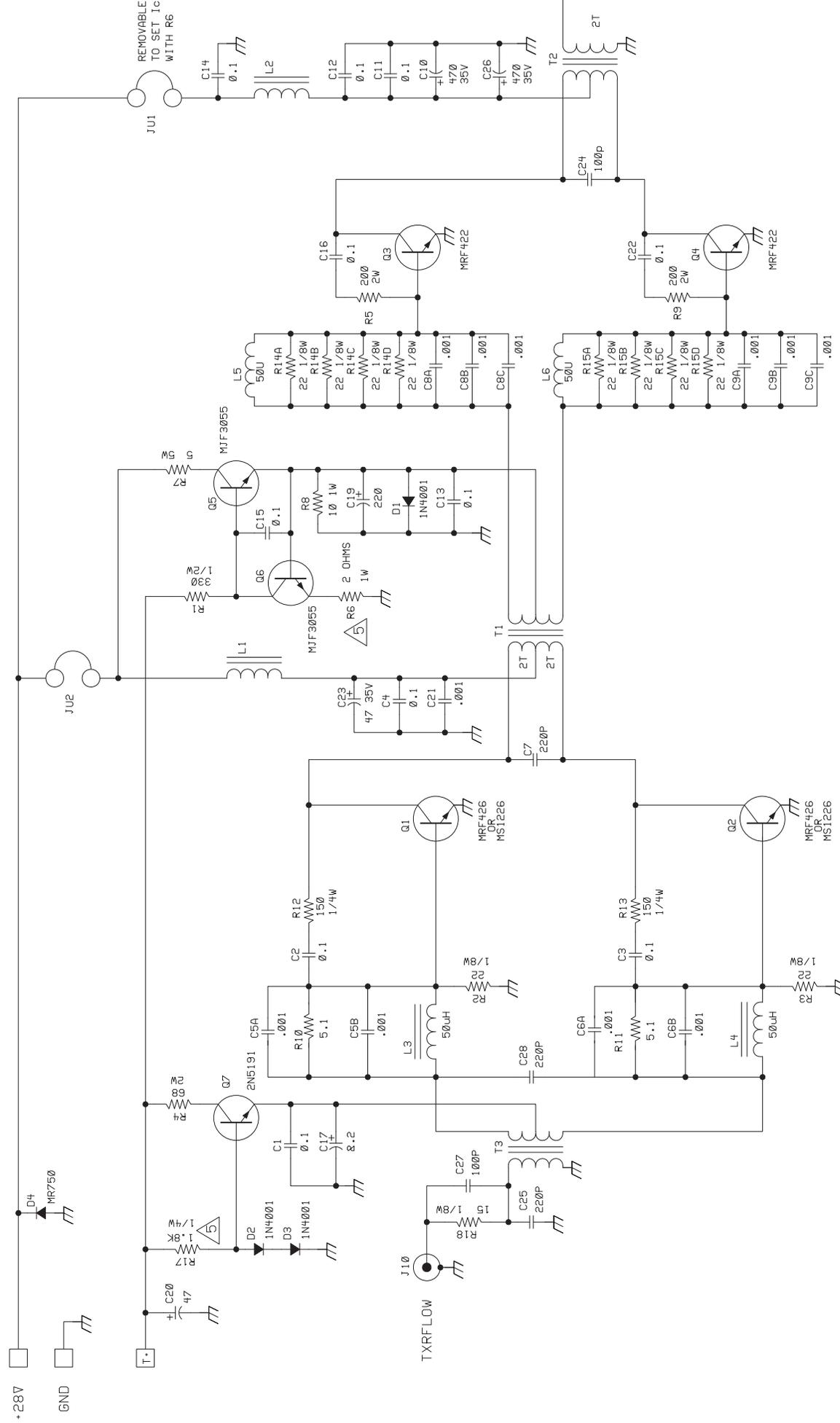
## 20.4 28V RF Amplifier Assembly

This section includes a component locations diagram, schematic and parts list for the 28V RF Amplifier assembly.



**Figure 20-4 RF Power Amplifier Board Component Locations (738254 Rev. E)**

1	R	1
2	R	2
3	R	3
4	R	4
5	R	5
6	R	6
7	R	7
8	R	8
9	R	9
10	R	10
11	R	11
12	R	12
13	R	13
14	R	14
15	R	15
16	R	16
17	R	17
18	R	18
19	R	19
20	R	20
21	R	21
22	R	22
23	R	23
24	R	24
25	R	25
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27	R	27
28	R	28
29	R	29
30	R	30
31	R	31
32	R	32
33	R	33
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88	R	88
89	R	89
90	R	90
91	R	91
92	R	92
93	R	93
94	R	94
95	R	95
96	R	96
97	R	97
98	R	98
99	R	99
100	R	100



REFER TO SELECTION PROCEDURE  
IN TECHNICAL MANUAL.

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**Table 20-2 28V RF Amplifier Board Parts List (004-00310 Rev. V)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C10	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C11	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C12	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C13	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C14	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C15	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C16	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C17	231020	"CAP, 2.2UF AL 50V 20% 2MM LS"
C19	230201	"CAP, 220UF AL 16V 20% AX 8X16"
C2	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C20	231500	"CAP, 47UF AL 16V 20% 5X11X0.1"
C21	210102	"CAP, .001UF Y5P 50V 20% 0.1LS"
C22	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C23	234470	"CAP, 47UF, AL, 35V, 20%, 6.3X11X2.5"
C25	221221	"CAP, 220PF MICA 50V 5% DM5"
C26	233471	"CAP, 470UF AL 35V 20% 10X20X5"
C27	221101	"CAP, 100PF MICA 300V 5% DM5"
C28	221221	"CAP, 220PF MICA 50V 5% DM5"
C3	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C4	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C5A	216102-1	"CAP,1000PF 10% CHIP CER"
C5B	216102-1	"CAP,1000PF 10% CHIP CER"
C6A	216102-1	"CAP,1000PF 10% CHIP CER"
C6B	216102-1	"CAP,1000PF 10% CHIP CER"
C7	224221	"CAP, 220PF MICA 500V 5% DM19"
C8A	216102-1	"CAP,1000PF 10% CHIP CER"
C8B	216102-1	"CAP,1000PF 10% CHIP CER"
C8C	216102-1	"CAP,1000PF 10% CHIP CER"
C9A	216102-1	"CAP,1000PF 10% CHIP CER"
C9B	216102-1	"CAP,1000PF 10% CHIP CER"

**Table 20-2 28V RF Amplifier Board Parts List (004-00310 Rev. V)**

Designator	Part Number	Description
C9C	216102-1	"CAP,1000PF 10% CHIP CER"
D2	320102	"DIODE, 1N4001 1A 50V DO-41"
D3	320102	"DIODE, 1N4001 1A 50V DO-41"
D4	320421	"DIODE, MR750 6A 50V AXIAL"
J10	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J12	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
L1	459113	"IND ASSY,3T,#18,1-490302"
L2	459113	"IND ASSY,3T,#18,1-490302"
L3	459114	"IND ASSY,6T#30GA RED 1-490201"
L4	459114	"IND ASSY,6T#30GA RED 1-490201"
L5	459114	"IND ASSY,6T#30GA RED 1-490201"
L6	459114	"IND ASSY,6T#30GA RED 1-490201"
R1	134331	"RES,330 OHM 1/2W 5% CF"
R10	124050	"RES,5.1 OHM 1/4W 5% CF"
R11	124050	"RES,5.1 OHM 1/4W 5% CF"
R14A	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14B	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14C	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R14D	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15A	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15B	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15C	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R15D	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R17	124XXX	"RESISTOR 1/4W, TBD"
R18	113150	"RES,15 OHM 1/8W 5% CARBON FILM"
R2	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R3	014220900	"RES, 22 OHM 1/4W 1% TK 1206"
R4	154680	"RES, 68 OHM MOX 2W 5%"
R6	144XXX	"RES,TBD,OHMS 1W 5%"
R7	161050	"RES, 5 OHM 5W 5% WW SQR CERMET"
R8	144100	"RES,10 OHM 1W 5% CF"
T1	459311	"XFMR ASSY,2T2T#20 AWG 6-490302"

**Table 20-2 28V RF Amplifier Board Parts List (004-00310 Rev. V)**

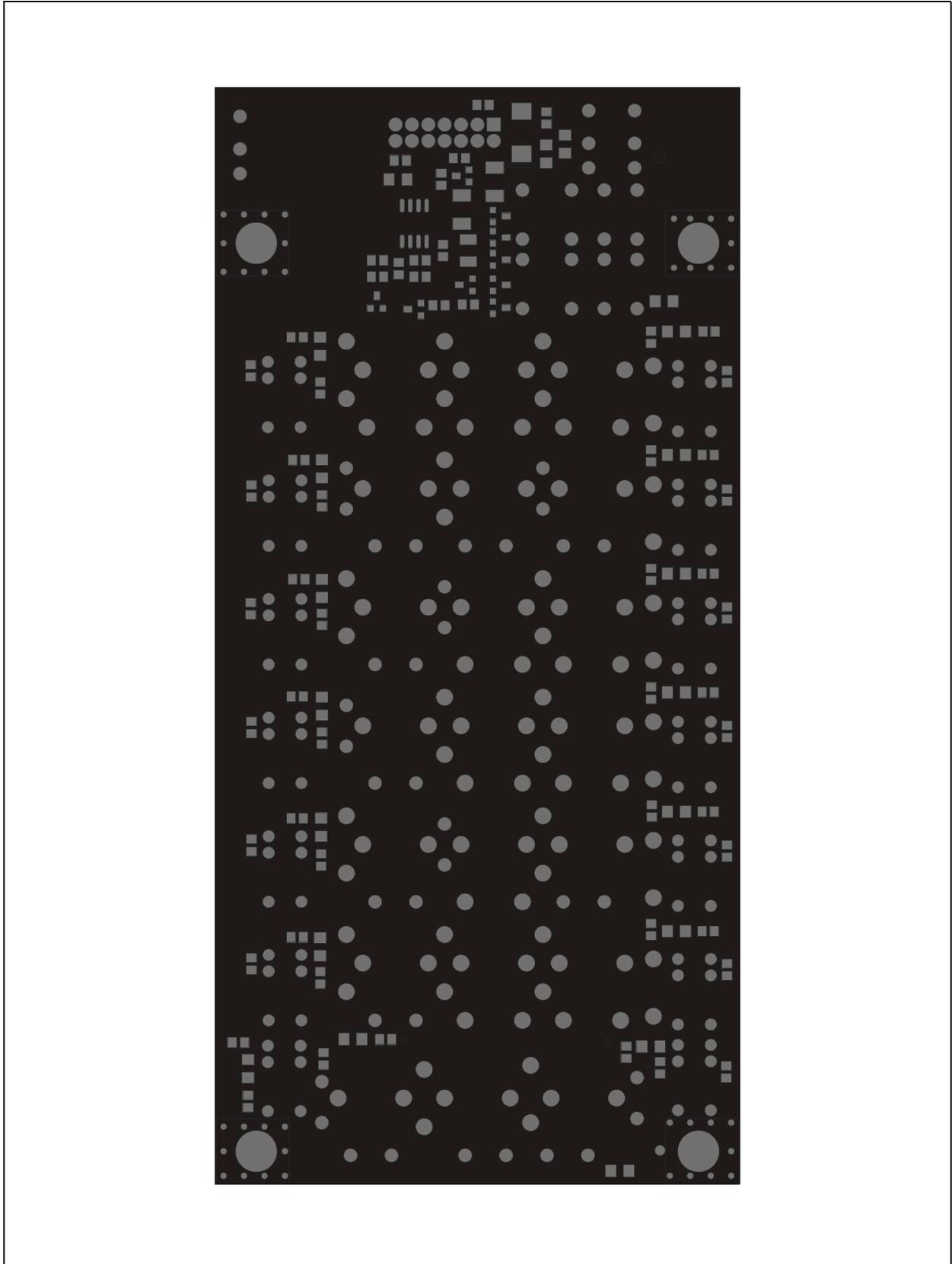
Designator	Part Number	Description
T2	459312	"XFMR ASSY, 2T#20 AWG 4-490502"
T3	451136-1	"XFMR ASSY,4T2T#32 GA 1-490303"

**Table 20-3 28V RF Amplifier Assembly Parts List (004-28260 Rev. T)**

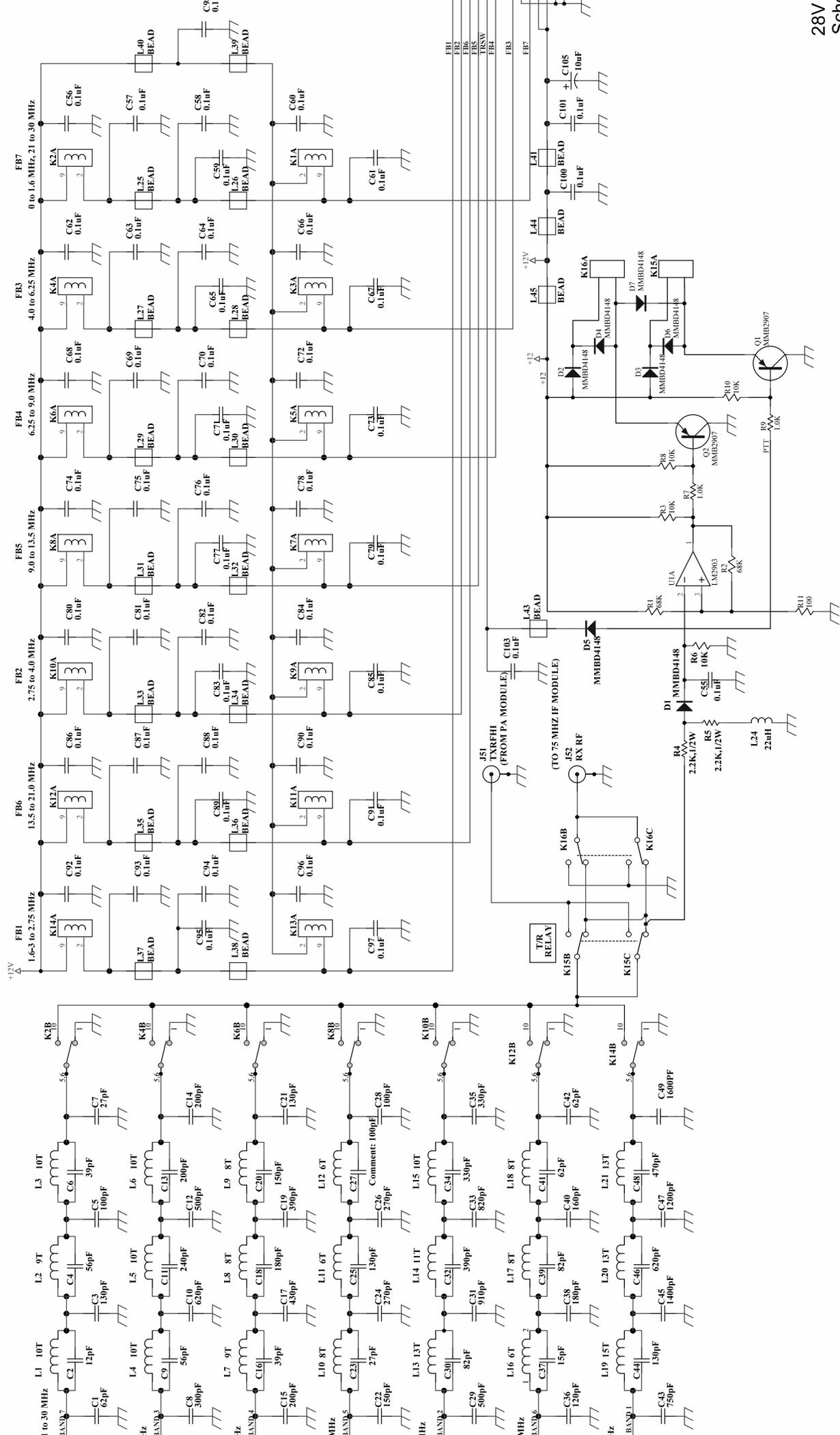
Designator	Part Number	Description
Q1	310158	"XSTR, MRF426 NPN RF PWR 28V"
Q2	310158	"XSTR, MRF426 NPN RF PWR 28V"
Q3	310049	"XSTR, MRF422 NPN RF PWR 28V"
Q4	310049	"XSTR, MRF422 NPN RF PWR 28V"
Q5	310133	"XSTR, MJF3055 NPN TO-220 INS"
Q6	310133	"XSTR, MJF3055 NPN TO-220 INS"
Q7	310055	"XSTR,2N5191 NPN 4A 60V TO225"
Q7	870078	INSUL SILPAD TO220 K4AC-58
R12	124151	"RES,150 OHM 1/4W 5% CF"
R13	124151	"RES,150 OHM 1/4W 5% CF"
R5	153201	"RES, 200 OHM MOX 2W 5% FP"
R9	153201	"RES, 200 OHM MOX 2W 5% FP"

## 20.5 28V RF Filter Board

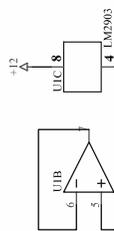
This section includes a component locations diagram, schematic and parts list for the 28V RF Filter board.



**Figure 20-6 28V RF Filter Board Component Locations (738228 Rev. L)**



SPARE GATES



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**Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C1	220620	"CAP, 62PF MICA 500V 5% DM15"
C10	224621	"CAP, 620PF MICA 500V 5% DM19"
C100	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C101	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C103	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C105	022106000	"CAP, 10UF TA 35V 10% 7343-31"
C11	224241	"CAP, 240PF MICA 500V 5% DM19"
C12	224501	"CAP, 500PF MICA 500V 5% DM19"
C13	224201	"CAP, 200PF MICA 500V 5% DM19"
C14	224201	"CAP, 200PF MICA 500V 5% DM19"
C15	224201	"CAP, 200PF MICA 500V 5% DM19"
C16	220390	"CAP, 39PF MICA 500V 5% DM15"
C17	220431	"CAP, 430PF MICA 500V 5% DM15"
C18	224181	"CAP, 180PF MICA 500V 5% DM19"
C19	224391	"CAP, 390PF MICA 500V 5% DM19"
C2	220120	"CAP, 12PF MICA 500V 5% DM15"
C20	220151	"CAP, 150PF MICA 500V 5% DM15"
C21	224131	"CAP, 130PF MICA 500V 5% DM19"
C22	220151	"CAP, 150PF MICA 500V 5% DM15"
C23	220270	"CAP, 27PF MICA 500V 5% DM15"
C24	224301	"CAP, 300PF MICA 500V 5% DM19"
C25	224131	"CAP, 130PF MICA 500V 5% DM19"
C26	224271	"CAP, 270PF MICA 500V 5% DM19"
C27	220101	"CAP, 100PF MICA 500V 5% DM15"
C28	220101	"CAP, 100PF MICA 500V 5% DM15"
C29	224501	"CAP, 500PF MICA 500V 5% DM19"
C3	224131	"CAP, 130PF MICA 500V 5% DM19"
C30	220820	"CAP, 82PF MICA 500V 5% DM15"
C31	220911	"CAP, 910PF MICA 100V 5% DM15"
C32	224391	"CAP, 390PF MICA 500V 5% DM19"
C33	224821	"CAP, 820PF MICA 500V 5% DM19"

**Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C34	224331	"CAP, 330PF MICA 500V 5% DM19"
C35	224331	"CAP, 330PF MICA 500V 5% DM19"
C36	220121	"CAP, 120PF MICA 500V 5% DM15"
C37	220150	"CAP, 15PF MICA 500V 5% DM15"
C38	224181	"CAP,180PF MICA 500V 5% DM19"
C39	220820	"CAP, 82PF MICA 500V 5% DM15"
C4	220560	"CAP, 56PF MICA 500V 5% DM15"
C40	220161	"CAP, 160PF MICA 500V 5% DM15"
C41	220620	"CAP, 62PF MICA 500V 5% DM15"
C42	220620	"CAP, 62PF MICA 500V 5% DM15"
C43	224751	"CAP, 750PF MICA 500V 5% DM19"
C44	224131	"CAP, 130PF MICA 500V 5% DM19"
C45	224142	"CAP, 1400PF MICA 500V 5% DM19"
C46	224621	"CAP, 620PF MICA 500V 5% DM19"
C47	224122	"CAP, 1200PF MICA 500V 5% DM19"
C48	224471	"CAP, 470PF MICA 500V 5% DM19"
C49	224162	"CAP, 1600PF MICA 500V 5% DM19"
C5	220101	"CAP, 100PF MICA 500V 5% DM15"
C55	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C56	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C57	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C58	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C59	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C6	220390	"CAP, 39PF MICA 500V 5% DM15"
C60	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C61	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C62	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C63	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C64	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C65	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C66	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C67	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C68	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C69	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C7	220270	"CAP, 27PF MICA 500V 5% DM15"
C70	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C71	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C72	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C73	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C74	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C75	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C76	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C77	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C78	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C79	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C8	224301	"CAP, 300PF MICA 500V 5% DM19"
C80	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C81	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C82	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C83	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C84	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C85	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C86	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C87	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C88	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C89	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C9	220560	"CAP, 56PF MICA 500V 5% DM15"
C90	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C91	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C92	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C93	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C94	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C95	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C96	021104000	"CAP, 0.1UF X7R 25V 5% 0805"

**Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)**

<b>Designator</b>	<b>Part Number</b>	<b>Description</b>
C97	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
C98	021104000	"CAP, 0.1UF X7R 25V 5% 0805"
D1	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D2	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D3	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D4	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D5	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D6	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
D7	037700005	"DIODE,BAS16,75V,0.2A,SOT-23"
J22	620017	"HEADER, 2X7 MLX 0.1"
J50	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J51	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
J52	614026	"CONN,RF FEMALE LOW-TYPE RECEPT"
K1	540077	"RELAY, SPDT 12V 1A PCB"
K10	540077	"RELAY, SPDT 12V 1A PCB"
K11	540077	"RELAY, SPDT 12V 1A PCB"
K12	540077	"RELAY, SPDT 12V 1A PCB"
K13	540077	"RELAY, SPDT 12V 1A PCB"
K14	540077	"RELAY, SPDT 12V 1A PCB"
K15	540080	"RELAY,DPDT 2 AMP SEALED"
K16	540080	"RELAY,DPDT 2 AMP SEALED"
K2	540077	"RELAY, SPDT 12V 1A PCB"
K3	540077	"RELAY, SPDT 12V 1A PCB"
K4	540077	"RELAY, SPDT 12V 1A PCB"
K5	540077	"RELAY, SPDT 12V 1A PCB"
K6	540077	"RELAY, SPDT 12V 1A PCB"
K7	540077	"RELAY, SPDT 12V 1A PCB"
K8	540077	"RELAY, SPDT 12V 1A PCB"
K9	540077	"RELAY, SPDT 12V 1A PCB"
L1	459325	"IND ASSY,10T,#20,1-490006"
L10	451122	"IND ASSY,8T#20 1-490008"
L11	459424	"IND ASSY,6T#20 1-490008 COMPRS"

Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)

Designator	Part Number	Description
L12	459424	"IND ASSY,6T#20 1-490008 COMPRS"
L13	459119	"IND ASSY, 13T#22 1-490009"
L14	459103	"IND ASSY,11T#22,AWG,1-490009"
L15	459174	"IND ASSY,10T#22 AWG 1-490009"
L16	459131	"IND ASSY, 6T#20 AWG 1-490008"
L17	451127	"IND ASSY, 8T#20 1-490010"
L18	459425	"IND ASSY,8T#20 1-490010 COMPRS"
L19	451115	"IND ASSY,15T#22 1-490009"
L2	459326	"IND ASSY,9T,#20,2-490104"
L20	459119	"IND ASSY, 13T#22 1-490009"
L21	459119	"IND ASSY, 13T#22 1-490009"
L24	041223000	IND SM 22UH 1210 10%
L25	045000001	"BEAD, FERRITE Z=120 1206"
L26	045000001	"BEAD, FERRITE Z=120 1206"
L27	045000001	"BEAD, FERRITE Z=120 1206"
L28	045000001	"BEAD, FERRITE Z=120 1206"
L29	045000001	"BEAD, FERRITE Z=120 1206"
L3	459325	"IND ASSY,10T,#20,1-490006"
L30	045000001	"BEAD, FERRITE Z=120 1206"
L31	045000001	"BEAD, FERRITE Z=120 1206"
L32	045000001	"BEAD, FERRITE Z=120 1206"
L33	045000001	"BEAD, FERRITE Z=120 1206"
L34	045000001	"BEAD, FERRITE Z=120 1206"
L35	045000001	"BEAD, FERRITE Z=120 1206"
L36	045000001	"BEAD, FERRITE Z=120 1206"
L37	045000001	"BEAD, FERRITE Z=120 1206"
L38	045000001	"BEAD, FERRITE Z=120 1206"
L39	045000001	"BEAD, FERRITE Z=120 1206"
L4	459134	"IND ASSY, 10T#22 AWG 1-490008"
L40	045000001	"BEAD, FERRITE Z=120 1206"
L41	045000001	"BEAD, FERRITE Z=120 1206"
L43	045000001	"BEAD, FERRITE Z=120 1206"

**Table 20-4 28V RF Filter Board Parts List (004-28320 Rev. F)**

Designator	Part Number	Description
L44	045000001	"BEAD, FERRITE Z=120 1206"
L45	045000001	"BEAD, FERRITE Z=120 1206"
L5	459134	"IND ASSY, 10T#22 AWG 1-490008"
L6	459134	"IND ASSY, 10T#22 AWG 1-490008"
L7	459120	"IND ASSY,9T#22 1-490008"
L8	459105	"IND ASSY, 8T#22 AWG 1-490008"
L9	459105	"IND ASSY, 8T#22 AWG 1-490008"
Q1	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
Q2	032006	"XSTR,MMBT2907A PNP SOT-23EBC"
R1	013683000	"RES,SM,CF,68K 0.1W 5% 0805"
R10	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R11	013101002	"RES, 100 OHM 1/8W 1% TK 0805"
R2	013683000	"RES,SM,CF,68K 0.1W 5% 0805"
R3	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R4	019222002	"RES, 2.2K 1/2W 5% TK 2010"
R5	019222002	"RES, 2.2K 1/2W 5% TK 2010"
R6	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R7	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
R8	013103001	"RES, 10K OHM 1/8W 1% TK 0805"
R9	013102002	"RES, 1K OHM 1/8W 1% TK 0805"
U1	033304061	"IC,SM,LIN,COMPAR,DUAL,LM2903MX"

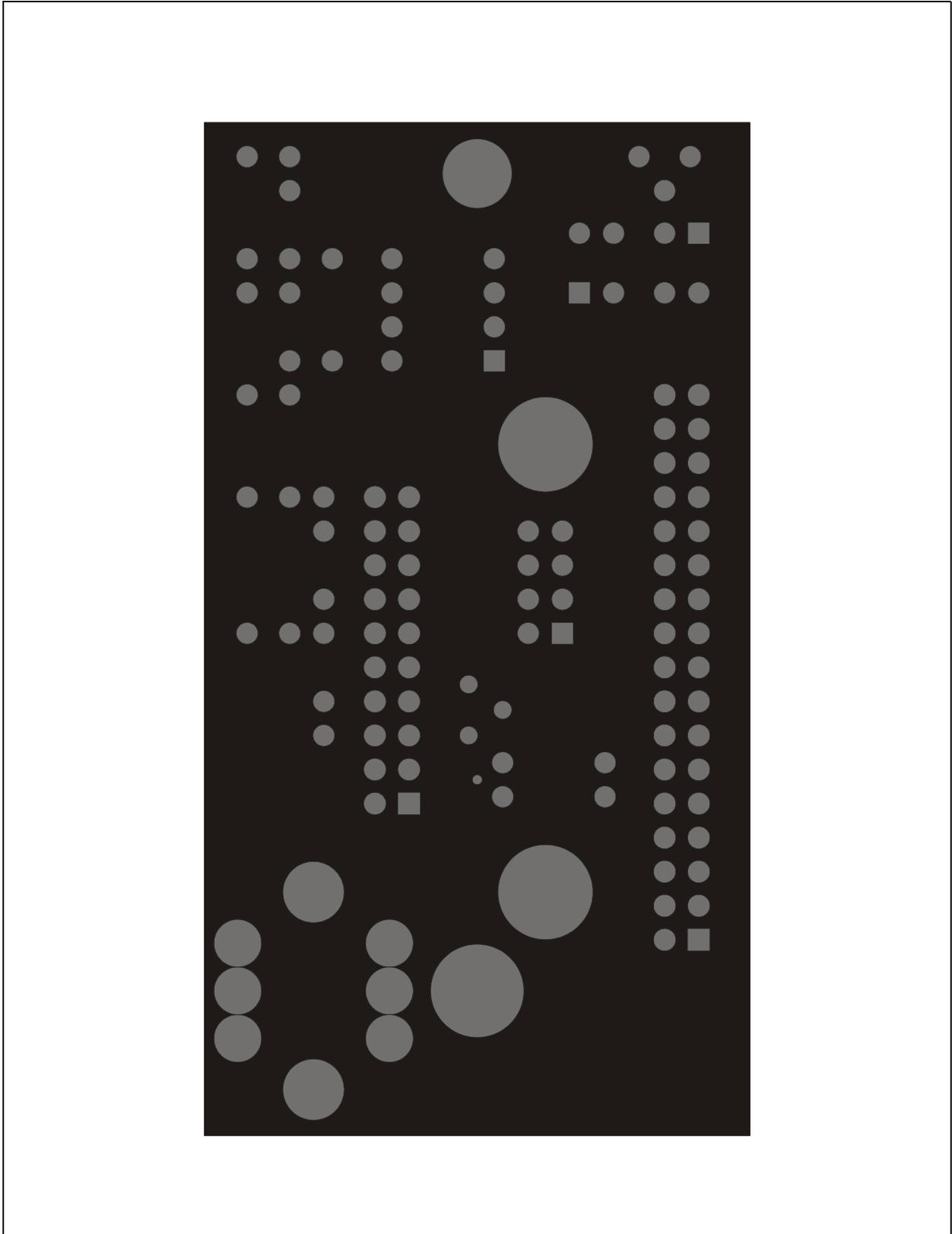
## 20.6 Extended Front Panel Control (RT7000E)

The RT7000E is an extended control version of the RT7000. It includes a front panel containing a single connector. The front panel contains an Interface board and connector transition. The Interface board converts the serial communications to differential RS-485 format. At the radio end, jumpers JU1 C and D are installed.

The RT7000E is used with the RT7201E control console which attaches to the connector using control cable C991943. The console can be up to 50 feet (15.24 meters) away.

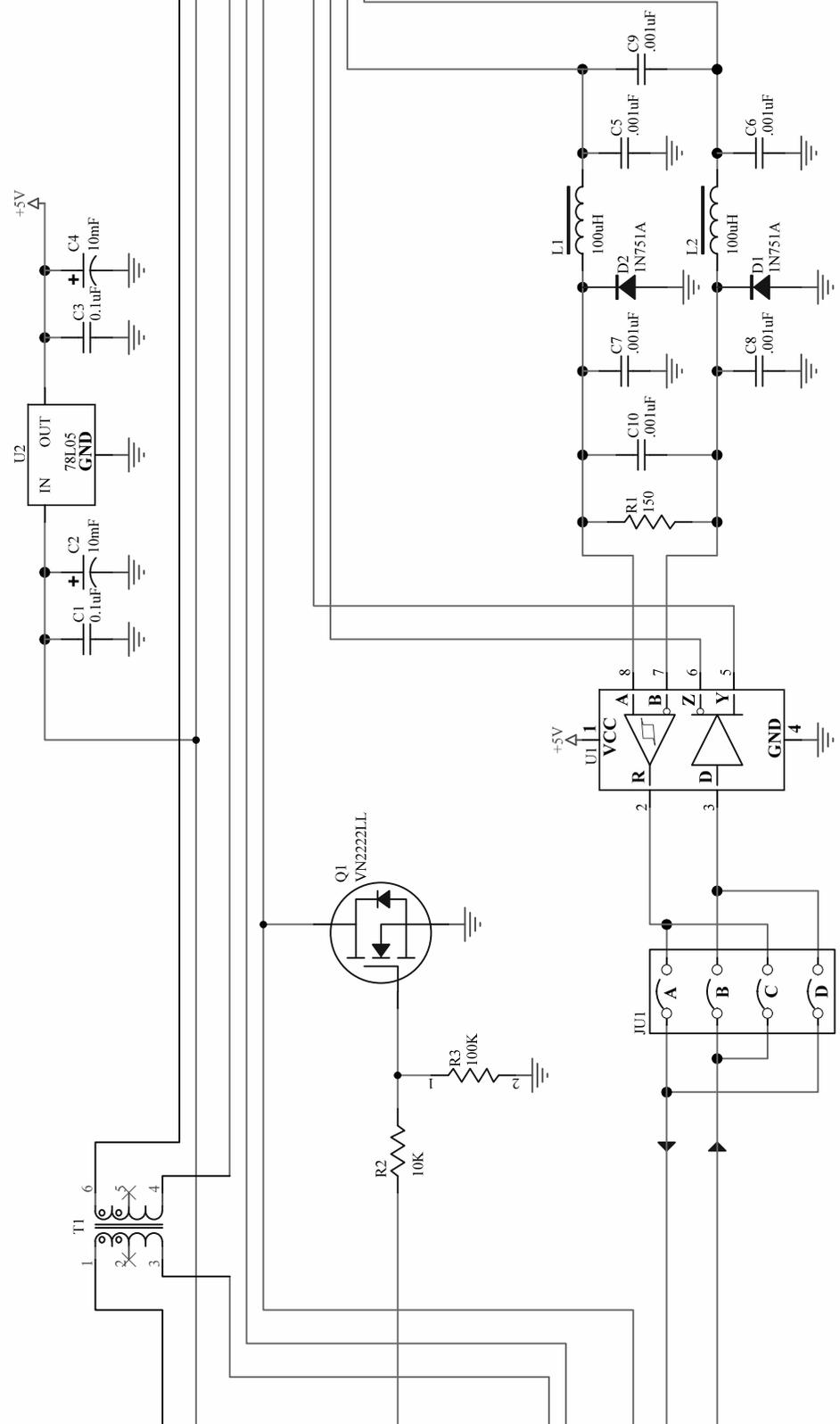
The RT7201E consists of the standard RT7000 front panel and an extended control interface board. Operation from the RT7201E is identical to that of the standard RT7000.

The RT7201E uses the same Interface board as the RT7000E front panel and is installed with jumpers JU1 A and B (refer to Figure 20-8 on page 20-26). The RT7201E chassis consists of a housing and base mount plate.



**Figure 20-8 RT7000E Connector Transition Component Locations  
(738281 Rev. H)**

A	TW7000F-001	RELEASE
B	TW7000F-004	ADD JUMPER
C	7000F-010	REM REC'Y
D	7000F-020	ADDED Q1 A
E	RT7000-083	ADD JUMPE
F	TW7000F-021	ADDED R3
G	07-0203	ADDED XFR



CONTROL HEAD  
CONNECT JUMPER A&B  
RADIO  
CONNECT JUMPER C&D

RT7C

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**Table 20-5 RT7000E Extended Control Interface Board Parts List  
(003-01003 Rev. L)**

Designator	Part Number	Description
C1	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C10	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C2	231100	"CAP,10UF AL 16V 20% 4X7X1.5"
C3	275104	"CAP, 0.1UF X7R 50V 10% RAD 0.1S"
C4	231100	"CAP,10UF AL 16V 20% 4X7X1.5"
C5	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C6	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C7	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C8	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
C9	275102	"CAP, 1000PF NPO 100V 5% RAD 0.1S"
D1	320204	"DIODE, ZENER 5.1V"
D2	320204	"DIODE, ZENER 5.1V"
J1	620036	"HEADER,34 PIN DUAL ROW MALE"
JU1	620026	"HEADER,8 PIN DUAL MALE"
JU2	620034	"CONN,2X10 STRAIGHT HEADER"
L1	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
L2	430014	"IND, 100UH, FR, 84MA, 10%, IM-2"
Q1	310138	"XISTOR,N-CHANNEL MOSFET,VN2222L,TO92"
R1	113151	"RES,150 OHM 1/8W 5% CF"
R2	113103	"RES, 10K OHM 1/8W CF 5%"
R3	113104	"RES,100K OHM 1/8W CF 5%"
T1	410019	"XFMR, AUDIO MINI 600CT - 600CT"
U1	330495	"IC, RS-485 TRANSCEIVER"
U2	330025	"IC, 78L05 VREG 5V 5% TO-92"

## 20.7 Pre/Post Selector (RT7000PP)

This section describes the interface requirements between the 7000-series radios and the 5830-series pre/postselectors.

The RT5830 provides sharp band-pass filtering of both transmit and receive RF signals. It is most frequently used in split-site installations. The radio communicates frequency information to the RT5830 that responds by inserting the proper filters and conditioning circuits.

To use the RT5830 pre/postselector, the RT7000PP version is used in conjunction with the C1021 interface device. The following modifications are factory installed:

- Rear panel assembly replaced by new PP version
- Internal RF wiring changed
- Jumper JU11-B inserted on Processor board

The transmit RF path is broken between the 75 MHz IF board and the RF Power Amplifier board as shown in Figure 20-10 on page 20-31. The RF lines are routed to the new BNC connectors on the rear panel of the radio while the control and BITE lines are routed to **ACCESSORY 3**. Transmit RF flows from the 75 MHz IF board through the postselector portion of the RT5830, and back to the RF Power Amplifier board.

The receive signal is automatically filtered by the RT5830. This section is placed in bypass mode when the system is in transmit mode.

The RT5830 requires frequency information from the radio. The serial-to-parallel converter C1021 interface converts serial data from **ACCESSORY 3** to parallel data. It also provides BITE information back to the radio.

The only selectable feature in the C1021 is the device address. By placing the jumper in position 1 or 2, the radio can selectively address the RT5830. Normally, it comes preconfigured as device 1.

The C1021 provides an interface between the RT7000PP and the RT5830 for both the control signals and BITE diagnostics. On power-up and during a forced BITE (refer to RT7000-MSOP), the radio's processor reads the BITE resistor located in the C1021 (R1). The valid voltage range is between 0.5 Vdc (low range) and 5.0 Vdc (high range).

If the proper levels fail, the radio displays **BAD OR NONE PRESELECTOR 1** or **BAD OR NONE PRESELECTOR 2**, depending on the device addressed.

In addition to detecting the presence of C1021, the RT7000 responds to an internal RT5830 failure. This same BITE line indicates a fault; the radio does not send any data to the RT5830 until it is cleared. There is also a visual indication by the **FAULT** LED on the RT5830.

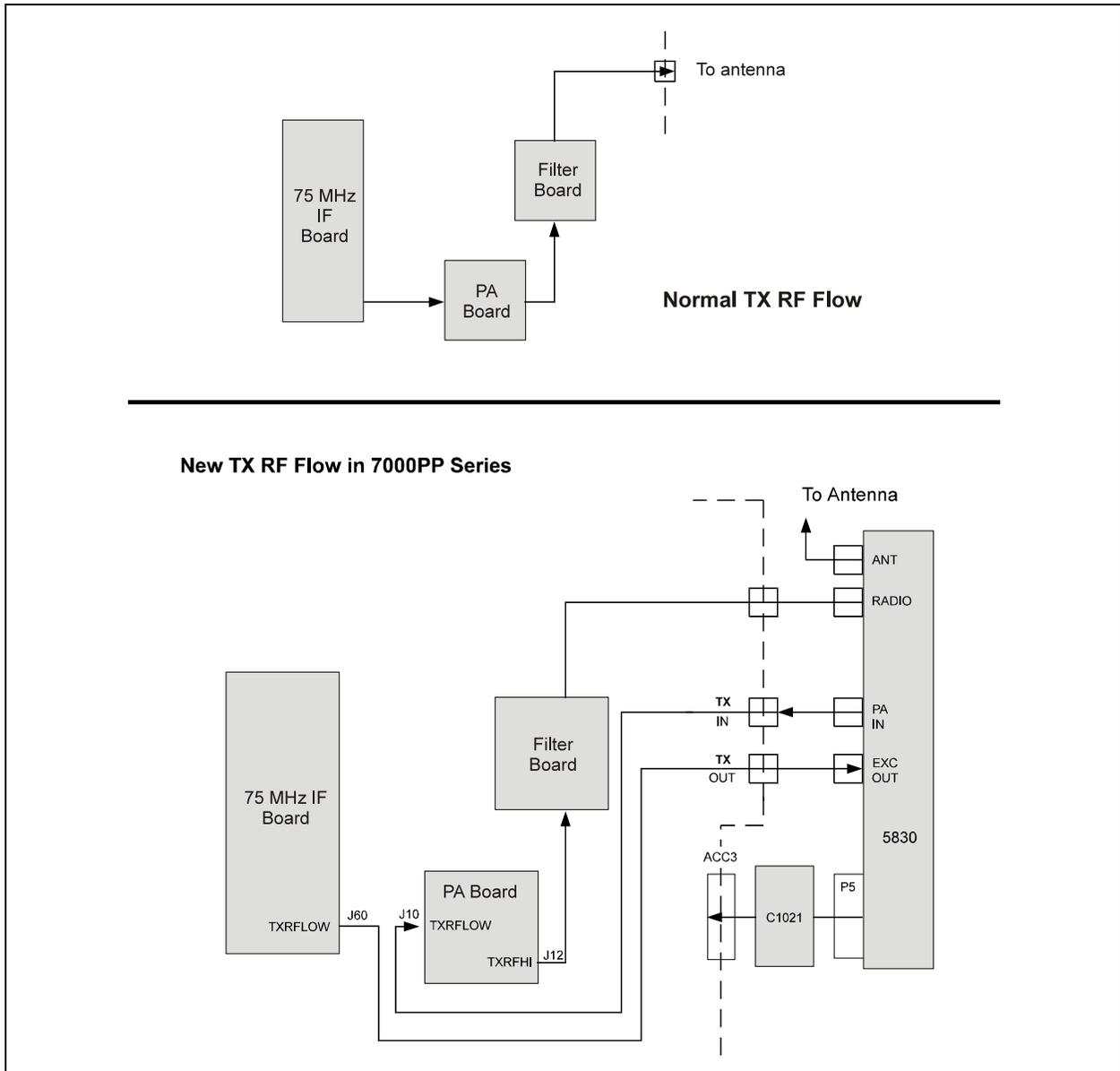


Figure 20-10 RT7000PP Internal Wiring Diagram

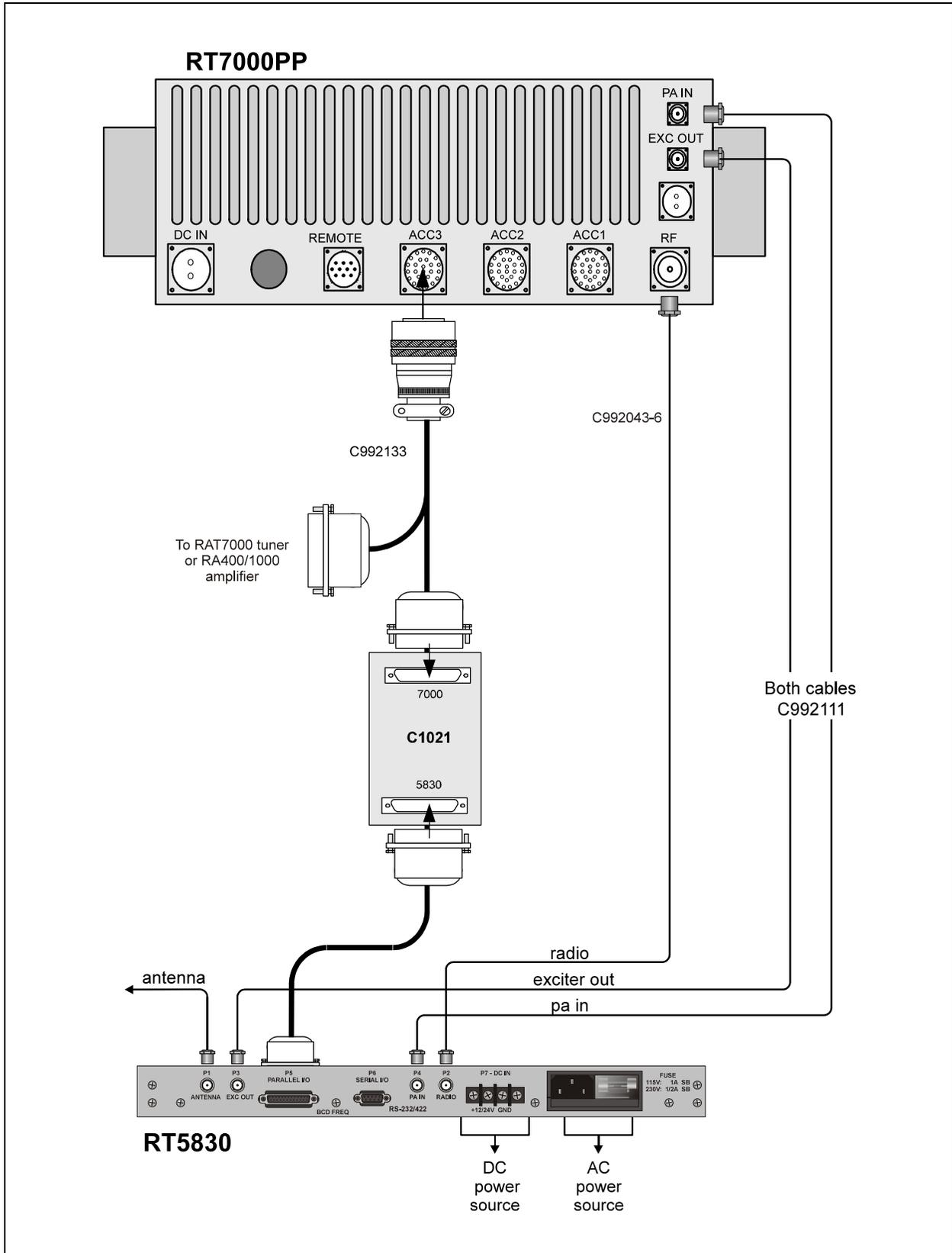


Figure 20-11 RT7000PP Cabling Connections

## **20.8 FSK Remote Control (RT7000RF)**

The RT7000RF is the standard RT7000 transceiver with a blank front panel designed for long-range remote control from a RT7201F control console. It includes the internal 7000RF modem.

## **20.9 DHSL Remote Control (RT7000RI)**

The RT7000RI is the standard RT7000 transceiver with a blank front panel designed for up to 2 km remote control from a RT7201I control console. It includes the internal 7000RI modem.

## **20.10 Receiver Only (RT7000RX)**

The RT7000RX is a receiver-only variation of the RT7000 with full features of the RT7000, without the capability to transmit.

## **20.11 Transmitter Only (RT7000TX)**

The RT7000TX is a transmitter-only variation with full features of the RT7000, without the capability to receive transmissions.





## Chapter 21: Maintenance

This chapter provides information and procedures for testing and troubleshooting the RT7000. These procedures provide a quick and accurate way of evaluating the essential operating characteristics of the RT7000. If a fault is indicated, these procedures aid in determining intermediate maintenance solutions.

### 21.1 Subassembly Breakdown

The RT7000 consists of a final assembly and an accessory kit. The accessory kit consists of one cable (C991556) and two slow blow fuses (25A). The main functional subassemblies of the standard RT7000 and their respective boards and cables, are listed in Table 21-1 on page 21-9. Figure 21-2 on page 21-6 shows the RT7000 final assembly.

### 21.2 Internal Layout

The RT7000 is a modular design concept. It features plug-in boards that permit simple field repair as well as field upgrades. Major internal options, such as ALE and remote control, are field-installable by inserting the new circuit board in the appropriate slot.

For the location of each board, refer to Figure 21-1 on page 21-5.

Most boards in the RT7000 have dedicated slots that plug into the Motherboard. These include the following:

- Reference/Control board
- Synthesizer board
- 5 MHz IF board
- 75 MHz IF board
- Audio board
- Processor board/7000ALE option
- Noise blanker (option)
- Remote Control Unit (RCU) interface (option)

## 21.3 Board Access

To access these boards, remove the top cover of the RT7000. The top cover (and bottom) is held in place by 20 screws. To remove a board, carefully pull it out of its card slot. To service a board in the radio, remove it from the card slot, mount it on the appropriate extender card and make the appropriate adjustment or repair, then reinstall it in the radio. Use the following kits to assist in servicing and adjusting these boards.

- 7000EXT extender kit
- RT7000TK tool kit

### 21.3.1 Front Panel Disassembly

Remove the front panel from the main body of the radio by removing the four large hex bolts (3/16 in.) on each side securing it to the side panels (after first removing the top and bottom covers). The entire panel connects electrically to the main body by a single ribbon cable.

### 21.3.2 Rear Panel Disassembly

Access the rear panel by removing the four hex bolts (3/16 in.) securing the rear panel to the two side panels. Connectors mounted to the rear panel are wired to the Interface/Power Supply board as well as the RF Power Amplifier and RF Filter boards. On 28V versions the DC to DC converter is also mounted on the inside of the rear panel. Figure 21-3 on page 21-7 provides an exploded view of the front panel assembly. Figure 21-4 on page 21-9 provides an exploded view of the rear panel assembly.

### 21.3.3 Interface/Power Supply Board Removal

The Interface/Power Supply board includes the power supply circuitry, an interface between the Motherboard and rear panel **ACCESSORY** connectors and VSWR circuitry. It mounts flat to the Motherboard inside the rear panel.

To access the Interface/Power Supply board,

1. Remove the top and bottom covers of the radio.
2. Remove the four large hex bolts (3/16 in.) holding the side rails to the rear panel.
3. Pull the rear panel away from the main body of the radio, exposing the Interface/Power Supply board. The Motherboard connects to the rear panel **ACCESSORY** and **REMOTE** connectors through individual cables (J16, J17, J18 and 25). The Interface/Power Supply board connects to the Motherboard through J29).
4. To remove the Interface/Power Supply board from the Motherboard, remove the six mounting screws on top of the board. Disconnect the J16, J17, J18 and J25 connectors on the board.

5. Disconnect voltage supply cables at E1, E2, E3 and E4. Use a right-angle scribe to loosen the connectors.
6. Disconnect RF coax cables at J49 and J50.
7. Carefully rock the circuit board back and forth to loosen J29 from the Motherboard. Lift the Interface/Power Supply board from the Motherboard.
8. To reinstall a new Interface/Power Supply board, reverse the removal process. Be careful to align the J29 pins to the Motherboard socket. A good way to align the pins is to align the mounting screw holes in the Interface/Power Supply board with the holes in the Motherboard.

#### 21.3.4 RF Filter Board Removal

The RF Filter board is mounted to the rear panel. To remove the RF Filter board from the radio:

1. Unscrew the four mounting hex nuts (3/16 in.) on each side of the radio chassis to remove the rear panel.
2. Access the RF Filter board by removing the four screws (two on top and two on the bottom) holding its shield to the shield for the RF Power Amplifier (refer to Figure 21-4 on page 21-9).
3. Remove the shield.
4. Remove the four mounting screws on the RF Filter board and disconnect J22, the RF TX output cable at J50, RF TX input cable at J51 and the RF RX out at J52.
5. Remove the RF Filter board.

#### 21.3.5 RF Power Amplifier Board Removal

The RF Power Amplifier board is mounted to the rear panel. To remove the RF Power Amplifier board from the radio:

1. Access the RF Power Amplifier board by removing the four screws (two on top and two on the bottom) holding its shield to the RF Amplifier cooling plate (refer to Figure 21-4 on page 21-9).
2. Remove the five mounting screws (one in the center of the board) on the RF Amplifier board. Disconnect the coax cables J12, J10 and ground wires. Remove the RF Amplifier board.
3. Clip the wire-tie on the J12 coax cable and the JU2 jumper cable.
4. Disconnect the temperature control cable that plugs into the rear panel (J23).

**Note:** To access the center mounting screw, carefully bend the capacitor soldered to the large transformer T2 out of the way.

This capacitor must be bent back over on the replacement RF Power Amplifier assembly to accommodate the RF shield.

**Note:** Make sure to install a wire-tie on the J12 coax cable and JU2 jumper wire. Failure to install this wire-tie can cause damage to the J12 coax cable when the shield is installed.

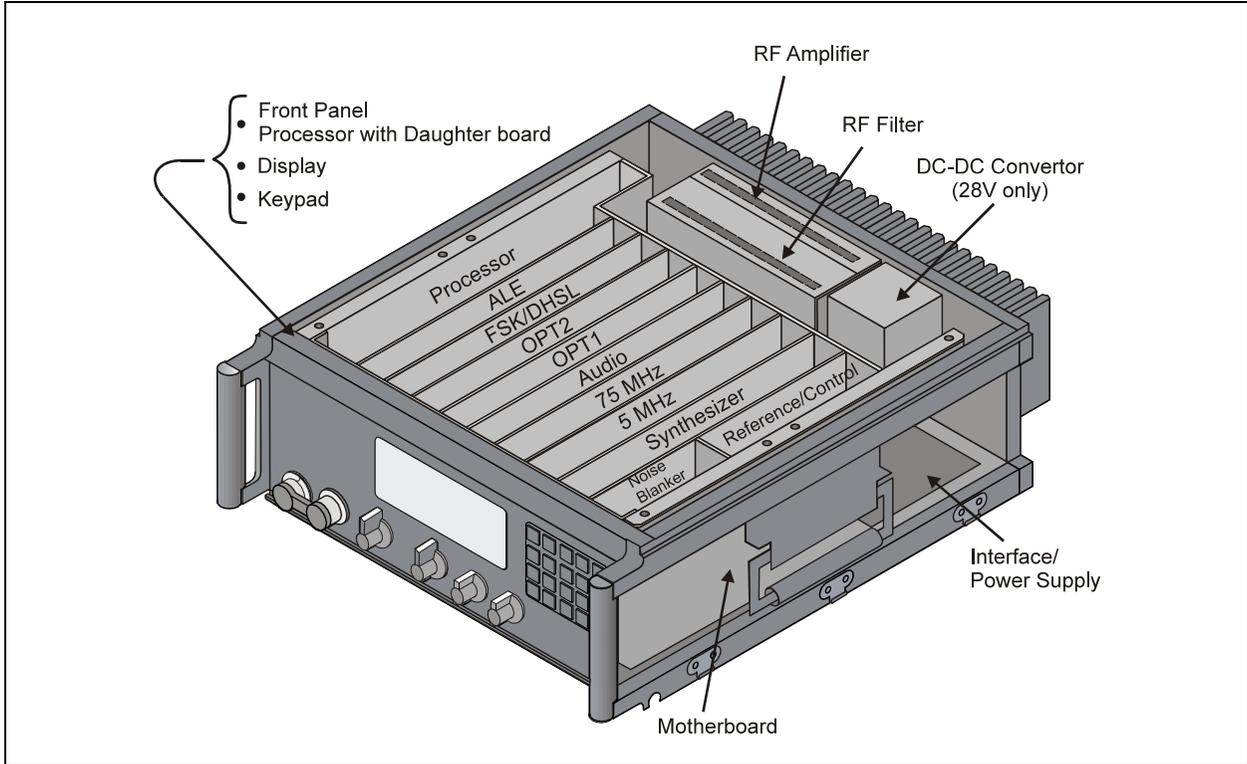
### 21.3.6 DC/DC Converter Removal

The RT7000-28 includes a DC to DC Converter that converts the 28V supply voltage to 13.8 Vdc that the Interface/Power Supply board uses to supply power to the other boards.

To remove the DC/DC Converter board:

1. After the top and bottom covers are removed, remove the rear panel by removing the four hex bolts (3/16 in.).
2. Remove the four mounting screws that secure the DC/DC Converter RF shield to the rear panel.
3. Disconnect J1 and disconnect the ground cable.
4. Remove the four mounting screws and remove the DC/DC Converter board.
5. To install the replacement board the reverse of the disassembly procedure.

Figure 21-3 on page 21-7 provides an exploded view of the front panel assembly. Figure 21-4 on page 21-9 provides an exploded view of the rear panel assembly.



**Figure 21-1 Board Locations**

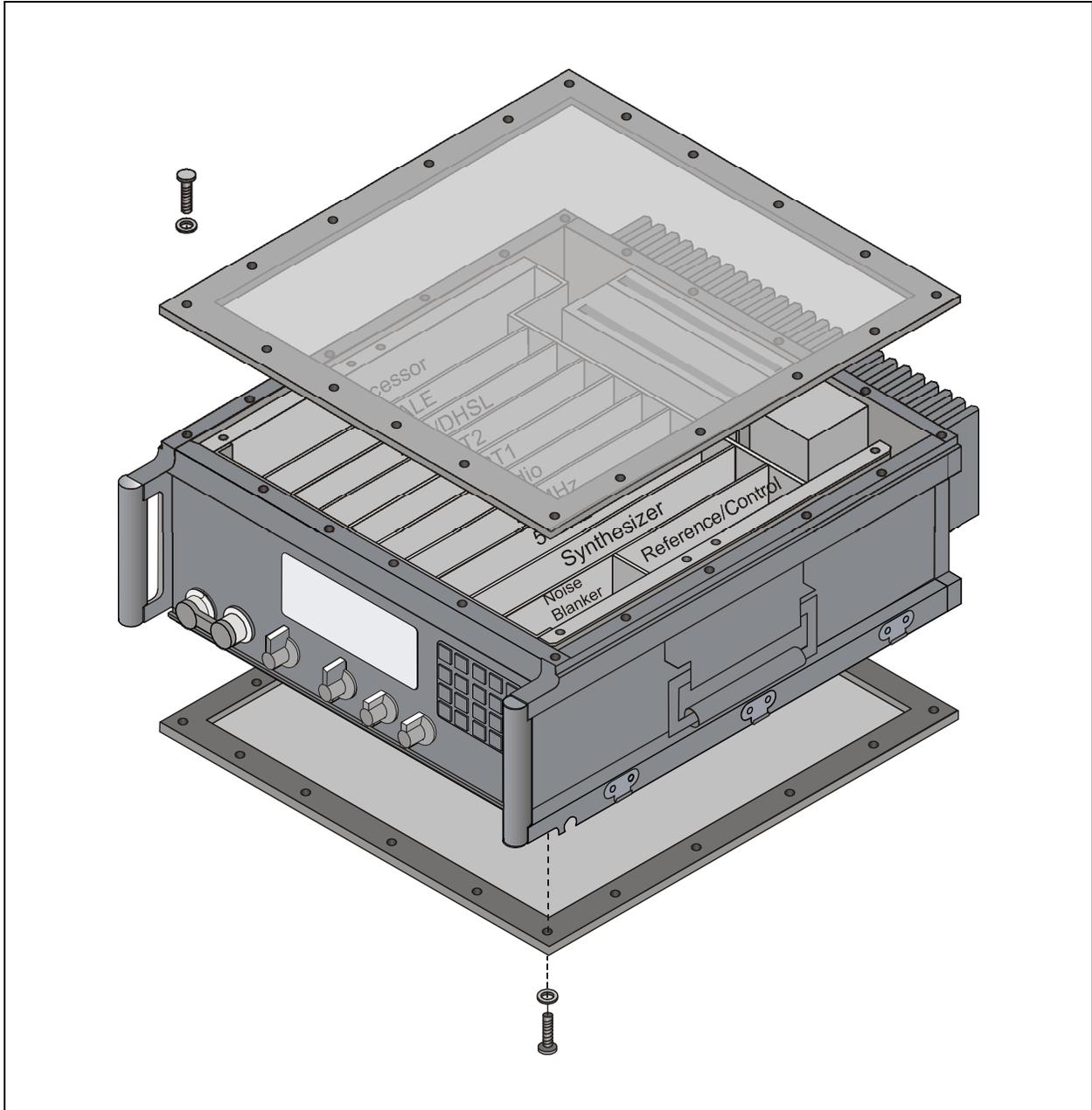
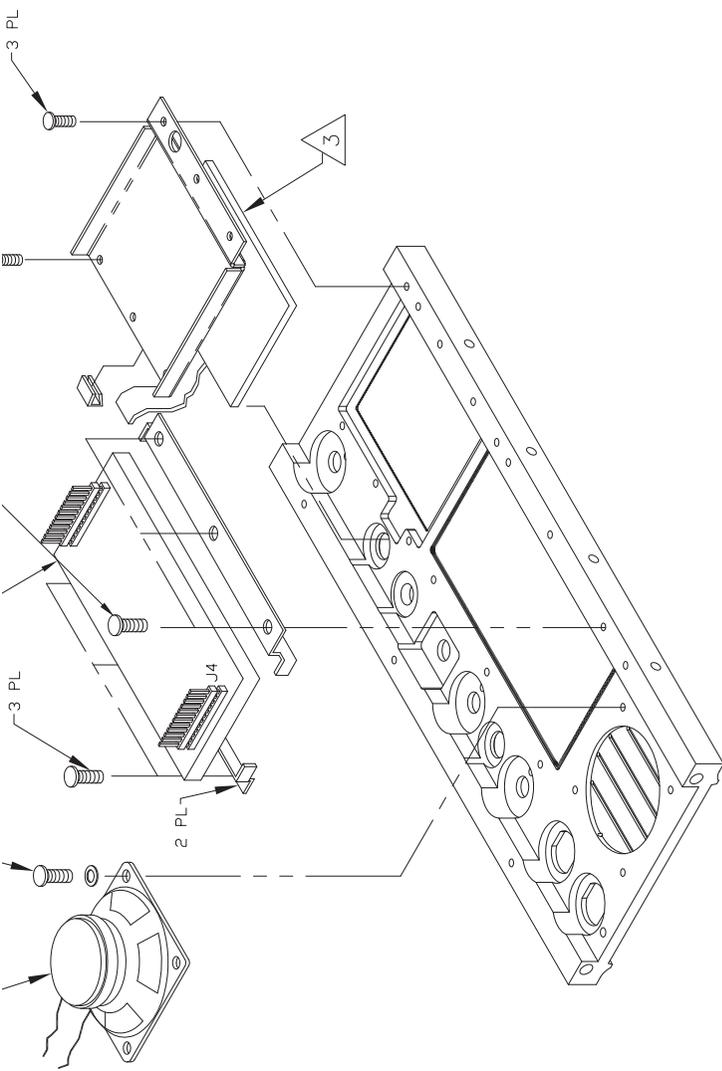


Figure 21-2 Final Assembly

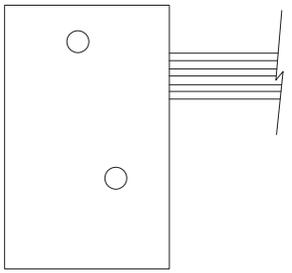
R	REVISED PER ECO
S	REVISED PER ECO
T	REVISED PER ECO
U	REVISED PER ECO
V	REVISED PER ECO
W	REVISED PER ECO
Y	REVISED PER ECO
AA	REVISED PER ECO
AB	REVISED PER ECO



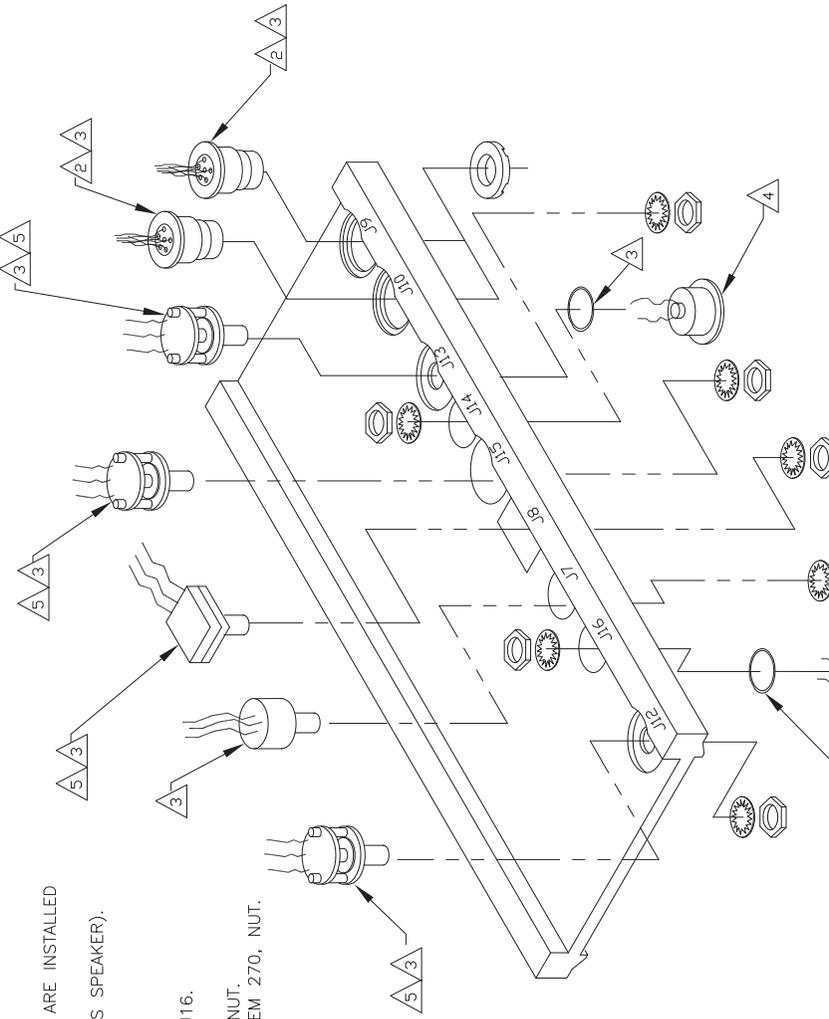
IN END CLOSEST TO SPEAKER.

FINGER TIGHT BEFORE FINAL TORQUE. REFER TO VENT HOLES ON SPEAKER. PER DETAIL A TO 7 IN.

TO VENT HOLES ON ASSY. PER DETAIL B.

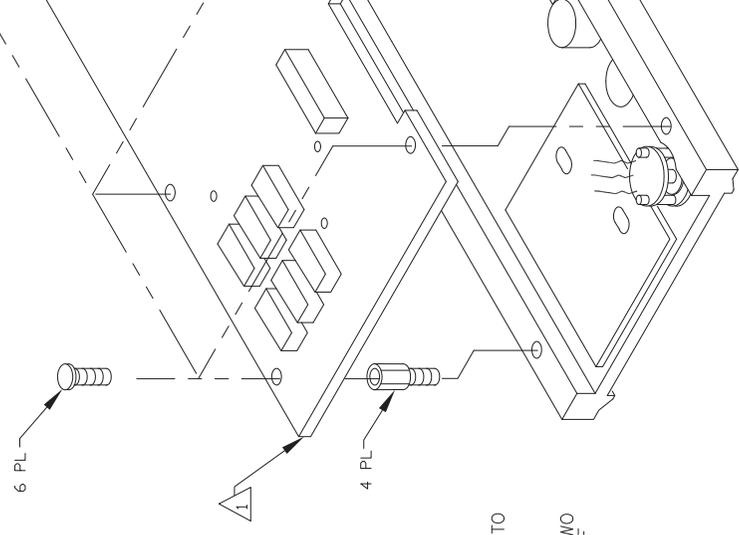


**DETAIL B**  
ITEM 140 PREP



WHEN THEY ARE INSTALLED (TOWARDS SPEAKER).

O-RINGS J14 & J16. WASHER AND NUT. REFER TO DETAIL C, R, AND ITEM 270, NUT.



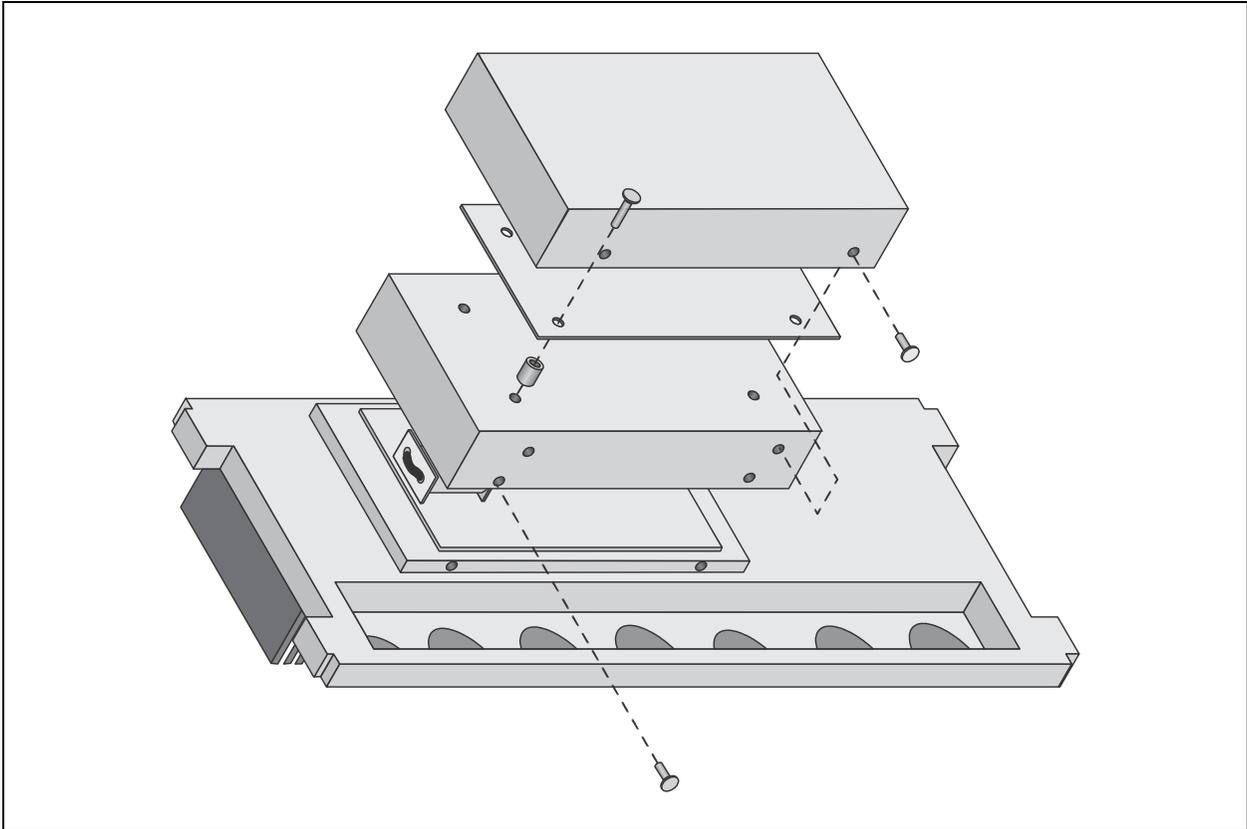
NOTES: UNLESS OTHERWISE SPECIFIED

- 1 ALIGN CONNECTORS FROM LCD INTO PC ASSEMBLY.
- 2 TRIM PINS OF J3 & J4 DOWN TO TOP OF BROWN CONNECTOR
- 3 INSTALL ITEM 107 IN CENTER TWO LOCATIONS TOP AND BOTTOM OF FRONT PANEL.

INTERPRET DIMENSIONS AND TOLERANCES PER DWG S991901 INTERPRET HOLE TOLERANCES PER DWG S995072 UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. METRIC DIMENSIONS SHOWN IN PARENTHESES ARE TOLERANCES ARE:

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APPROVALS \_\_\_\_\_ DATE \_\_\_\_\_



**Figure 21-4 Rear Panel Assembly**

**Table 21-1 Subassemblies**

Assembly	Part Number	Subassemblies	
Front panel assembly	004-00100	004-01111 004-00120 941560 004-01110 004-00110 004-00150 004-01140 004-00175 004-00130 004-00160	Daughter board LCD assembly Keypad board Front Panel Processor board Front panel software Volume cable assembly Clarifier cable assembly Speaker assembly Mic connector cable assembly Power switch

**Table 21-1 Subassemblies (Continued)**

<b>Assembly</b>	<b>Part Number</b>	<b>Subassemblies</b>	
Rear panel assembly (+12V)	004-12200	001-00320 004-12260 004-00230  004-00220  004-00250 004-00240 004-00017	RF Filter assembly 12V RF Amplifier assembly Accessory connection assembly (26-pin) Remote connection assembly (10-pin) Power Amplifier cable assembly DC cable assembly Coax cable assembly
Rear panel assembly (+28V)	004-28200	004-00236 004-00270 004-00340 004-28320 004-28260 004-28100	Accessory 2 connector assembly Coax cable assembly Ribbon cable assembly RF Filter assembly 28V RF Amplifier assembly DC to DC Converter
Interface/Power supply assembly	004-12401	Interface/Power supply/VSWR detection circuit	
Chassis assembly	004-00500	004-00510	Motherboard
Audio board	001-00600		
75 MHz IF board	001-00710		
5 MHz IF board	001-00800		
Synthesizer board	001-00901		
Reference/Control board	001-00206	TCXO	
Reference/Control board	001-01022	High Stability option	
7000ALE option	001-01105	001-01114  001-01321	Programmed chip, RT7000 processor Programmed chip set, 001-01105
Processor board	001-01107	001-01114	Programmed chip, RT7000 processor

## 21.4 Test Equipment

The following equipment is required to test and troubleshoot the RT7000. If the specified test equipment is not available, equivalent items can be substituted.

Item	Model Recommended	Specification
Attenuator	Bird 8323	30 dB, 100W, 50 ohms
Wattmeter	Bird 43	50W and 250W elements
Signal generator	Marconi 2022D	10k to 500 MHz
Counter	Leader LDC-824S	
SINAD meter	Helper Sinadder 3	
Oscilloscope	Kikusui	100 MHz/analog/dual trace
12V Power supply	Astron 35M	15 Vdc 25A
28V Power supply	Astron 25M	28 Vdc 15A
Multimeter	Fluke 85	
Test set	Hewlett Packard 8920	
Microphone	MHS/MDR/MRR	
CW key	KYR	
DC power cable (C991556)		
Broadband 50 ohm antenna		
Two-tone test box	Datron	

## 21.5 Basic Performance Test

A brief test checks the overall operation of the RT7000. Perform the test on initial inspection of the equipment, after the equipment is repaired, or any time you suspect a degradation in performance.

The basic performance test requires the following equipment:

- Power supply: 0 to 15 Vdc, 25A
- RT7000 DC power cable (C991556)
- Microphone
- Broadband 50 ohm antenna

To perform the basic performance test:

1. Attach the power supply to the RT7000 using the C991556 power cable. Connect the antenna and the microphone to the RT7000.
2. Turn the RT7000 on. The internal BITE circuit activates automatically on power-up. If there is a BITE fault, the faulty subassembly is identified on the LCD. If there is no BITE fault, the channel number and frequency of the last channel used is displayed.
3. Turn the speaker switch on and the volume control up. You should hear noise in the speaker.
4. Select a WWV frequency and listen to the tone. The tone at approximately 1 kHz should be recognizable.
5. Select an appropriate TX frequency. Press PTT and speak into the microphone. On the LCD, the receive audio bar graph clears, and the bar graph indicates the RF output power proportional to the transmit audio input from the microphone.

## 21.6 Detailed Performance Test

When detailed performance data is needed, or if performance degradation is suspected in certain areas, refer to Table 21-2 on page 21-13. The tests are arranged in 3 groups.

**General Operational Tests:** Check all power-supply voltages and verify all display and front panel switch functions. The general operational tests require:

- DC power supply
- Multimeter.

**Receiver Tests:** Check all standard receiver parameters. The receiver tests require:

- DC power supply
- RF signal generator (connected to the antenna terminal)

- SINAD meter
- Audio voltmeter

**Transmitter Tests:** Check all standard transmitter parameters. The transmitter tests require:

- Power supply
- 50 ohm load (connected to the antenna terminal)
- In-line wattmeter between the 50 ohm load
- Oscilloscope

**Table 21-2 Detailed Performance Test Parameters**

<b>General Operational Tests</b>	
Regulated Power Supply Voltages (on Interface/Power Supply board)	Main +12V $\pm 0.6V$ ACC +12V $\pm 0.6V$ 5V +5V $\pm 0.25V$
Keypad Functions	Verify channel, frequency, alpha, and arrow keypad entry
LCD Display	Verify all display functions and icons are visible and operational.
Button/Icon Operations	Verify that ALPHA, SPKR, SQ, EXT AMP, ATTN, RF PWR, SCAN GROUP, MODE, and OPTION buttons/icons operate
<b>Receiver Tests</b>	
Receiver Current	2A maximum (volume at minimum)
Audio Output/Distortion	2.8 $\pm 0.25$ Vrms at microphone jack with -100 dBm input
SINAD	10 dB at -113 dBm input
AGC Operation	3 dB change over input range of -103 dBm to +13 dBm
Squelch Operation	Operational at -110 dBm
Pass Band Response	300 to 2700 Hz $\pm 3$ dB with standard 5 MHz filter
Clarifier Operation	$\pm 600$ Hz in 10 Hz steps
Attenuator Operation	Verify attenuator is functioning
Bar Graph Operation	Verify bar graph is functioning
<b>Transmitter Tests</b>	
Transmit Current	3A maximum at idle, 23A maximum at 100W
Power Output	All tests use -10 dBm 1 kHz audio into the microphone audio pin of the microphone jack. Low: 10 $\pm 2W$ with <b>ALPHA 5*</b> set to 10 Medium: 25 $\pm 5W$ with <b>ALPHA 5*</b> set to 30 High: 100 $\pm 20W$ with <b>ALPHA 5*</b> set to 200

**Table 21-2 Detailed Performance Test Parameters (Continued)**

CW Mode Operation	Low: 10 $\pm$ 2W with <b>ALPHA 5*</b> set to 10 Medium: 25 $\pm$ 5W with <b>ALPHA 5*</b> set to 30 High: 100 $\pm$ 20W with <b>ALPHA 5*</b> set to 200
AME Mode Operation	Verify carrier is 10 to 80W in LSB at 14.75 MHz
Carrier Suppression	Verify that a PTT key with no audio input is less than 200 mVpp at the RF output
Two-Tone Distortion	Verify waveform linearity and freedom from distortion (flat-topping). Use 1 kHz and 1.8 kHz tones at 50 mV each into microphone jack
Microphone Operation	Verify operation of both front panel microphone jacks
Bar Graph Operation	Verify bar graph is functioning
VSWR (Power Reduction)	Verify power reduction at 3:1 VSWR
Frequency Calibration	$\pm$ 15 Hz at 30 MHz
* Refer to the RT7000-MSOP for information on using the Alpha menu.	

## 21.7 Subassembly Troubleshooting

This section contains RT7000 troubleshooting information down to the subassembly level. The objective is to identify the faulty board by using logical diagnostic procedures along with the internal BITE system. After replacing the suspect board, proper performance is verified as below.

### 21.7.1 Internal BITE System

The BITE system aids in troubleshooting the equipment down to the board level. The BITE routine performs the following:

1. Checks that each board is in its proper location.
2. Checks for the presence of option boards.
3. Checks the performance of certain key parameters on the following boards.
  - **75 MHz IF:** Verifies that the injection level of the 1st LO into the first mixer is correct.
  - **5 MHz IF:** Verifies that injection levels of the 2nd and 3rd LOs into the second and third mixers are correct.
  - **Synthesizer:** Verifies that all PLLs are locked and operating properly.

**Note:** Failure of the Synthesizer PLL may be caused by no reference frequency from the Reference/Control board. Check Reference/Control board and coax cables.

  - **Reference/Control:** Verifies connection to filter assembly.

The BITE system activates automatically at power up, or manually using the keypad (refer to the RT7000-MSOP). If a fault is detected, a coded fault message is displayed. If faults in several boards are identified, the fault codes for each board are displayed.

All of the boards have special circuitry to control the BITE line. The BITE line is controlled by the SPI bus. Table 21-3 below provides descriptions for the BITE line. The values are approximate with a  $\pm 0.1$  Vdc of the stated voltage.

**Table 21-3 BITE Line Descriptions**

<b>Board</b>	<b>Type of BITE</b>	<b>BITE Voltage</b>
Reference/Control	Receiver overload, RF Filter board and reference oscillator	0.53* Vdc
Reference/Control VSWR	Receiver overload, RF Filter board and reference oscillator	1.08* Vdc
Synthesizer	First local oscillator, BFO	0.84 Vdc
Synthesizer 2	Second local oscillator, BFO	2.06 Vdc
5 MHz IF (STD)	Second local oscillator, BFO and standard filter	1.08 Vdc
5 MHz IF (STD + WB)	Second local oscillator, BFO, standard and wideband filter	1.53 Vdc
5 MHz IF (STD + WB1)	Second local oscillator, BFO, standard and wideband 1 filter	4.63 Vdc
5 MHz IF (STD + CW)	Second local oscillator, BFO, standard and CW filter	2.29 Vdc
5 MHz IF (CW and WB1)	Second local oscillator, BFO, CW and wideband 1 filter	3.41 Vdc
75 MHz IF	First local oscillator	1.88 Vdc
Audio	Audio board installed	2.29 Vdc
ALE	ALE board installed	2.50 Vdc
ALE GPS	ALE board installed	2.73 Vdc
Encryption	Encryption board installed	2.71 Vdc
Noise Blanker	Noise blanker installed	2.95 Vdc
FSK Remote	FSK remote board installed	3.59 Vdc
DHSL Remote	DHSL remote board installed	3.80 Vdc
Option 1	Option 1 board installed	4.04 Vdc
Option 2	Option 2 board installed	4.26 Vdc
Option 3	Option 3 board installed	4.42 Vdc
Option 4	Option 4 board Installed	4.61 Vdc
* Result is 0.53 Vdc when filter board bad or missing, 5 Vdc when good		

### 21.7.2 Other Diagnostics

While the BITE system is extremely useful in troubleshooting down to the board level, there are other diagnostics that can be performed on the RT7000. Identifying faulty boards in a malfunctioning transceiver is one of logical deduction and analysis. For example, if the BITE system indicates a fault in a particular board, replace the board and run BITE again. If there is no BITE fault indication and the RT7000 is still not functioning properly, other diagnostics can pinpoint the problem.

The most frequent transceiver symptoms are listed below and offer logical troubleshooting techniques to identify a faulty board.

RT7000 Doesn't Turn On

1. Check the external power source. Its voltage under load should be between 11 and 16 Vdc; otherwise the radio does not turn on because the high/low voltage protection circuit inhibits it.
2. Check the DC power cable. Measure the DC voltage at the **+12VDC INPUT** terminal on the rear panel.
3. Check the rear panel fuse. Replace a blown fuse *only* if you have resolved the reason for its occurrence.
4. Check the front panel **POWER ON/OFF** switch. Ground the PWRON line to verify proper switch operation.
5. Check the Interface/Power Supply board voltages:
  - +12V: J29, A1, A2, A3, B1, B2, B3
  - +12 UNREG: J29, A4, A5, B4, B5
  - +12V ACC: J16-25, J17-26, J25-26, J18-10
  - +5V: J29, A9, A18, B9, B10
  - +12 VPA: E2

Chapter 4 describes where each of these generated DC voltages are used in the RT7000.

No Front Panel Control

If the RT7000 does not respond to input from the keypad or front panel controls, this is an indication that the main Processor board has a problem and must be reset.

1. Remove the radio's top cover and observe the LEDs mounted on the Processor board (refer to Figure 21-5 on page 21-26). If it is flashing, the Processor board is out of lock.
2. Turn the RT7000 off.
3. Verify the connectors on the Front Panel Assembly are secure.
4. On the Processor board, place the jumper provided at JU10 across the two pins at JU10-D. If a jumper is unavailable, substitute a metal object such as a screw driver.

---

**CAUTION: Placing a jumper across JU10-D resets all data stored in RAM including channel and scan group settings to the default settings.**

---

5. Turn the RT7000 on and allow it to go through its power-up sequence.
6. Turn the radio off and remove the jumper at JU10D.

If these steps don't solve the problem, change out the Front Panel Processor board to see if this solves the problem.

#### No Front Panel Display

If the LEDs on the Processor board are flashing or continuously lit, perform the following steps:

1. Reset the processor by placing the jumper provided at JU10 across the two pins at JU10 position D. If a jumper is unavailable, substitute a metal object such as a screw driver.
2. Check the +12 UNREG to the front panel on J1 pins 3 and 4. The Front Panel Processor board is powered by the unregulated +12V and has its own onboard +5 and +12V regulators.
3. Check the main processor data lines (J1 pins 31, 32). Toggling between 0 and +5V indicates data passing between the Front Panel Processor board and the main Processor board.

#### No Receive Audio Output

You can easily check the receiver path with a DC multimeter, a signal generator, and an RF voltmeter.

1. Connect the frequency generator to the antenna port with an input level of -50 dBm and the frequency set to generate a 1 kHz tone.
2. On the 75 MHz IF board, verify the onboard regulated voltages (+12V, +8V, +R8). The input RF signal level at J52 should be -51 dBm nominal at the channel frequency. The RF output level at J53 should be -41 dBm, nominal, at 75 MHz.
3. On the 5 MHz IF board, verify the onboard regulated voltages (+12, +8, +R8). The input RF signal level at J53 should be -41 dBm nominal, at 75 MHz. The output audio level at J5 pin 21 should be 2.6 Vpp nominal.
4. On the Audio board, verify the onboard regulated voltages are +10 Vdc and +5 Vdc. The input audio at J8 pin 21 should be 2.6 Vpp nominal, and the output audio level at J8-7 should be 1.2 Vpp.
5. On the Front Panel Processor board, verify the audio input at J1 pin 30 (SQA). It should be 1.2 Vpp nominal. Turn the volume to maximum with the speaker on and check for speaker noise; you may have to replace the speaker or it may have a bad connection to the Front Panel Processor board. If input to the front panel and the speaker is correct,

the problem is probably in the audio amplifier U14 on the Front Panel Processor board.

#### No Transmit Audio Output

The transmit path is checked in a similar manner to the receiver but in the opposite direction.

1. Apply a 1 kHz tone to the microphone input (J9, J10 pin 4).
2. On the Front Panel Processor board, verify the microphone input (J9, J10 pin 4). Check the audio output (PRIMICA) at J1 pin 25; it should be about 0.2 Vpp nominal. If the microphone input is correct but the audio output is bad, the problem is probably with the compressor amplifier U17.
3. On the Audio board, verify the audio input level at J8 pin 20; it should be 0.2 Vpp nominal, and the output (MODA) at J8 pin 8 should be 0.2 Vpp nominal.
4. On the 5 MHz board, verify the output of the +T8 onboard regulator. The audio input at J5 pin 8 should be 0.25 Vpp nominal, and the 75 MHz output at J53 should be -15 dBm, nominal.
5. On the 75 MHz board, verify the outputs of the +T12 and +T8V onboard regulators. The 75 MHz input at J53 should be -14 dBm nominal, and the channel frequency output at J60 should be +20 dBm nominal.
6. On the RF Power Amplifier board, verify the T12 and +12V PA input lines. The RF input at J10 should be +23 dBm nominal, and the output at J12 should be 200 Vpp nominal.

Other areas to check in the transmit path (if above tests are normal) include the input (J51) and output (J50) of the RF Filter board, and the antenna connector on the rear panel.

**Note:** If the RT7000 doesn't go into transmit mode when you activate PTT, the problem could be the main transmit/receive relay on the RF Filter board, the PTT connection (pin 3) on the microphone jack, or Alpha 8 (Receive set RX only) is activated for that channel.

#### Frequency Generation Problems

The BITE system checks the injection levels of the local oscillators and the reference oscillator, so if it indicates a fault in the Synthesizer or either of the IF boards, it is possible the faulty board is the Synthesizer or the Reference/Control board. For example, if replacing either IF board did not clear the fault indication, then the Synthesizer board is likely the problem.

To verify the Synthesizer board is faulty, replace the synthesizer, or take the following measurements:

1. On the Synthesizer board, verify the output of the onboard +5 Vdc and +8 Vdc supply voltages. Verify the LO levels: LO1 at J59 (75 to 105 MHz), LO2 at J54 (70 MHz), LO3 at J55 (5.003 MHz) should be

0 dBm nominal, and the reference input level (J61) should be 1 Vpp, nominal at 16.777216 MHz.

**Note:** The LO frequencies should be stable, not changing. If any of the LO frequencies are drifting, the PLL on the Synthesizer is not locked.

2. On the Ref/Control board, verify the output of the onboard regulated +5, +8 Vdc, and +12 Vdc. The reference output signal level at J61 should be 1 Vpp nominal with J61 disconnected, and +0.5 Vpp nominal with J61 connected.

It is also possible the master oscillator is out of adjustment causing speech to sound garbled and the clarifier to offset needlessly. If this is the case, recalibrate the oscillator (refer to “Alignment Procedures” on page 21-24).

## 21.8 Main Processor Troubleshooting

The Processor board is not intended for repaired on site. The board is complicated and constructed with surface mount technology (SMT), requiring specialized soldering/desoldering equipment. Any troubleshooting should be performed by personnel experienced with these types of circuits. This section does not attempt to explain 68000 microprocessor operation. For processor troubleshooting suggestions, refer to Table 21-4 below and Table 21-5 on page 21-20.

### 21.8.1 Onboard LEDs

The onboard LEDs provide the following indications (refer to Figure 21-5 on page 21-26):

**Table 21-4 Processor Board LED Indications**

Diode	Indication
D1 (red)	<p>Indicates the processor is locked up and not responding to commands or interrupts.</p> <p>This may also indicate a low supply voltage to the Processor board forcing the processor into reset.</p> <p>This LED should only be lit during power up. If lit, verify D4 LED is lit.</p>
D4 (green)	<p>Indicates the +5 Vdc supply is present.</p> <p>This LED should be lit during normal operation; if not, check J15 pins A29 (61), B29 (29), A30 (62) and B30 for +5V.</p> <p>If +5 Vdc is present at any of the J15 connector pins mentioned above, but the D4 LED is not lit, replace the Processor board.</p>

**Table 21-4 Processor Board LED Indications**

<b>Diode</b>	<b>Indication</b>
D5 (green)	Indicates the +8 Vdc supply is present.  This LED should be lit during normal operation; if not, verify D6 LED is lit.
D6 (green)	Indicates the +12 Vdc supply is present.  This LED should be lit during normal operation; if not, check J14 pins A31, B31; also check J15 pins A31 and B31 for +12V.  If +12 Vdc is present at any of the J14 or J15 connector pins mentioned above, but the D6 LED is not lit, replace the Processor board.
D30 (green)	Indicates the +2.5 Vdc supply is present.  This LED should be lit during normal operation; if not, verify D5 LED is lit.
D31 (green)	Indicates the +3.3 Vdc supply is present.  This LED should be lit during normal operation; if not, verify D5 LED is lit.
D32 (yellow)	Indicates the FPGA (U8) CLK2 output is present and locked. This clock supplies the processor chip.  This LED should be lit during normal operation; if not, replace the Processor board.
D33 (yellow)	FPGA (U8) CLK3 output is locked. CLK3 is not used.
D34 (yellow)	Indicates the FPGA is programmed.  This LED should be lit during normal operation; if not, replace the Processor board.

**Table 21-5 Troubleshooting the Processor Board**

<b>Indication</b>	<b>Action</b>
Before troubleshooting the Processor board: <ul style="list-style-type: none"> <li>• Verify the LEDs described in Table 21-4 above are correct (D1 should not be lit; the other LEDs should be lit).</li> <li>• Verify the jumpers described on Table 21-6 on page 21-25 are correctly installed.</li> </ul>	
<b>FAULT</b> LED (D1)	Is D4 lit? Is D32 lit? Is D34 lit?  These LEDs should be lit during normal operation; if not, replace the Processor board.

**Table 21-5 Troubleshooting the Processor Board**

Indication	Action
No front panel display	<p>Same action as <b>FAULT</b> LED above.</p> <p>Verify the Front Panel Processor board connectors (J1, J3 and J4) are secure.</p>
No transmit or receive on COM1 (RS-232 and RS-485)	<p>Verify jumpers JU22 and JU23 are installed on pins A and B.</p> <p><b>For RS-232:</b> verify configuration resistors R51, R56, R62 and R64 are installed and R50, R57, R63 and R65 are not installed.</p> <p><b>For RS-485:</b> verify configuration resistors, R50, R57, R63 and R65 are installed and R51, R56, R62 and R64 are not installed.</p> <p><b>Note:</b> R50, R51, R56, R57, R62, R63, R64 and R65 are located next to the solder pads for J15 on the PCB. This is the side opposite from the side with most of the IC chips.</p> <p>Verify transmit signal (COM1TXD) on J15 pin 38 (A16). If there is no transmit signal, replace the Processor board.</p>
No transmit or receive on COM2	<p>Verify jumper A and B on JU26 are installed.</p> <p>Verify transmit signal (COM2TXD) on J15 pin 49 (A17).</p> <p>If there is no transmit signal, replace the Processor board.</p>
RAT7000B not tuning RT7000 to the antenna	<p>Verify DC (12 Vdc) and RF power (125W) connections to the RAT7000B.</p> <p>Press <b>TUNE</b> and verify a signal is present on the ATUTX line (pin M) at <b>ACCESSORY 3</b> or at pin A13 on Processor board J15.</p> <p>Does the LCD display <b>BAD TUNE</b>?</p> <p>If there is no signal present on J15 pin A13 when <b>TUNE</b> is pressed, replace the Processor board.</p>

**Table 21-5 Troubleshooting the Processor Board**

Indication	Action
RAT1000C not tuning RT7000 to the antenna	<p>Verify the DC (28 Vdc) and RF power (1000W) connections to the RAT1000C.</p> <p>Press <b>TUNE</b> and verify a signal is present on the ATUINIT line (pin L) at <b>ACCESSORY 2</b> or at pin A21 on Processor board J15.</p> <p>Does the LCD display <b>BAD TUNE</b>?</p> <p>If there is no signal present on J15 pin A21 when <b>TUNE</b> is pressed, replace the Processor board.</p>
No external amplifier PTT operation	<p>Verify a low on the AMPPTT line at J15 pin B15.</p> <p>If the AMPPTT line does not go low when PTT is pressed, replace the Processor board.</p>
No AUXPTT operation	<p>Verify a low on the AUXPTT line at J15 pin B11.</p> <p>If the AMPPTT line does not go low when PTT is pressed, replace the Processor board.</p>
No internal PTT operation	<p>Verify the PTT (low) on J14 pin B11.</p> <p>If the PTT signal at J14 is not low when PTT is pressed, replace the Processor board.</p>
No external CW operation	<p>Verify the EXTCWKEY signal at J15 pin A20.</p> <p>If the EXTCWKEY signal at J15 does not go low when CW key is pressed, replace the Processor board.</p>
No radio board programming (SPI bus)	<p>Verify the SPICLK (pin B13), SPITXD (pin B14) and SPIRXD (pin B15) on J14.</p>
No receiver bar graph display on LCD	<p>Verify the AGC input signal at J14 pin A18.</p> <p>If the AGC signal is present but there is no bar graph display on the LCD, replace the Processor board.</p>
No transmit bar graph display on LCD	<p>Verify the PWRLVL input signal at J14 pin A20.</p> <p>If the PWRLVL signal is present but there is no bar graph display on the LCD, replace the Processor board.</p>
BITE does not run	<p>Verify the BITE signal at J14 pin B12.</p>

**Table 21-5 Troubleshooting the Processor Board**

Indication	Action
<b>Optional Parts</b>	
Remote DHSL head RT7201I is not controlling RT7000.	<p>Verify the AC or DC power and remote cable connections to the RT7201I Remote Head.</p> <p>Verify jumpers JU11A and JU12A are installed.</p> <p>Verify the DHSL receive signal (SER2RXD) at J14 pin B25 and transmit signal (SER2TXD) at J14 B26.</p> <p>If the remote head is functioning properly and the jumpers are properly installed, and if there is a receive signal at J14 pin B25 but no output (FPTXD) to the Front Panel Assembly at J14 B19, replace the Processor board.</p>
Remote FSK head RT7201F is not controlling RT7000	<p>Verify the AC or DC power and remote cable connections to the RT7201F Remote Head.</p> <p>Verify jumpers JU11A and JU12B are installed.</p> <p>If the remote head is functioning properly and the jumpers are properly installed, and if there is a receive signal at J14 pin B25 but no output (FPTXD) to the Front Panel Assembly at J14 B19, replace the Processor board.</p>
7000ALE is not functioning	Replace the Processor/7000ALE board.
7000ALE-141B option is not working	<p>Make sure the 7000ALE-141B is securely mounted on the Carrier board and the Carrier board is securely installed in the ALE option slot (next to the Processor board).</p> <p>Make sure jumpers JU11B and JU13A are installed.</p> <p>If the jumpers are installed correctly but there is no ALE functionality, replace the Processor board.</p>

## 21.9 Alignment Procedures

Alignment procedures (after the replacement of a board) include the transmitter ALC adjustment and master oscillator calibration on the Reference/Control board, and the option jumper settings on the Processor board.

### 21.9.1 Transmit ALC Adjustment

The transmit ALC adjustments are located on the Reference/Control board.

1. Measure the regulator voltage, U2 pin 16; U2 should be  $+5 \pm 0.25V$  and U5 should be  $8.0 \pm 0.4V$ .
2. Make the following adjustments to R1 and R22 (located close to the non-beveled edge of the board) until no further adjustment is required:
  - Adjust R1 (high power set) for a transmit output power of 100W average, single tone at 14.75 MHz.
  - Adjust R22 (low power set) for 10W average, single tone at 14.75 MHz.
3. Remove the load from the wattmeter. Key the radio in high power and adjust R29 (reverse power set) for 12W of reflected power using a 3:1 load (three 50 ohm loads connected in parallel).

### 21.9.2 Master Oscillator Calibration

The master oscillator is also located on the Reference/Control board.

1. Terminate the radio into a 50 ohm load and monitor the RF output with a frequency counter.
2. Set the radio to 30.0 MHz.
3. Set the radio to AME mode and key PTT.
4. Adjust the reference oscillator TCXO until the output frequency reads the same as the selected channel frequency (as displayed on the front panel).
5. Verify the transmit frequency at 2.0 MHz (low end) and at 15.0 MHz (high end). The frequency error should not exceed the specification for the installed oscillator option.

## 21.10 Jumper Settings

The Processor board includes multiple configuration jumpers to accommodate a wide variety of system functions and options. Table 21-6 below provides an overview of the jumper settings and their functions. Figure 21-5 on page 21-26 shows the location of the various jumpers as well as adjustment potentiometers and indicator diodes.

**Table 21-6 RT7000 Option Enable Assignments**

Jumper	Function	A to B/ Installed	B to C/ Not Installed	Default Position
JU5	RAM BATT	BATT	NO BATT	Installed
JU10A	ACH OPT	ACH OPT	No connect	Not installed
JU10B	None	None	No connect	Not installed
JU10C	S/W UPGRD	S/W UPGRD	No connect	
JU10D	RAM CLR	RAM CLR	No connect	
JU11A	DUART3 SEL (REM)	DUART3 SEL	No connect	Not installed
JU11B	DUART4 SEL (ALE)	DUART4 SEL	No connect	Installed
JU12A	DHSL SEL	DHSL SEL	No connect	Not installed
JU12B	FSK SEL	FSK SEL	No connect	Not installed
JU12C	None	None	No connect	Not installed
JU12D	None	None	No connect	Not installed
JU13A	ALE OPT	ALE OPT	No connect	Installed
JU13B	None	None	No connect	Not installed
JU13C	None	None	No connect	
JU13D	ALE LOAD	ALE LOAD	No connect	
JU20	None	Installed	No connect	Not installed
JU22	COM1 SEL	COM1/COM2 ACC1 RX	REM RX	A to B
JU23	COM1 SEL	COM1/COM2 ACC1 TX	REM TX	A to B
JU24	ALE DSP CLK	DSP OSC	NO DSP OSC	Installed
JU25	GPS BATT	GPS BATT	NO GPS BATT	Not installed
JU26A	COM2	COM2 TXD	GPS TXD	Installed
JU26B	COM2	COM2 RXD	GPS RXD	Installed

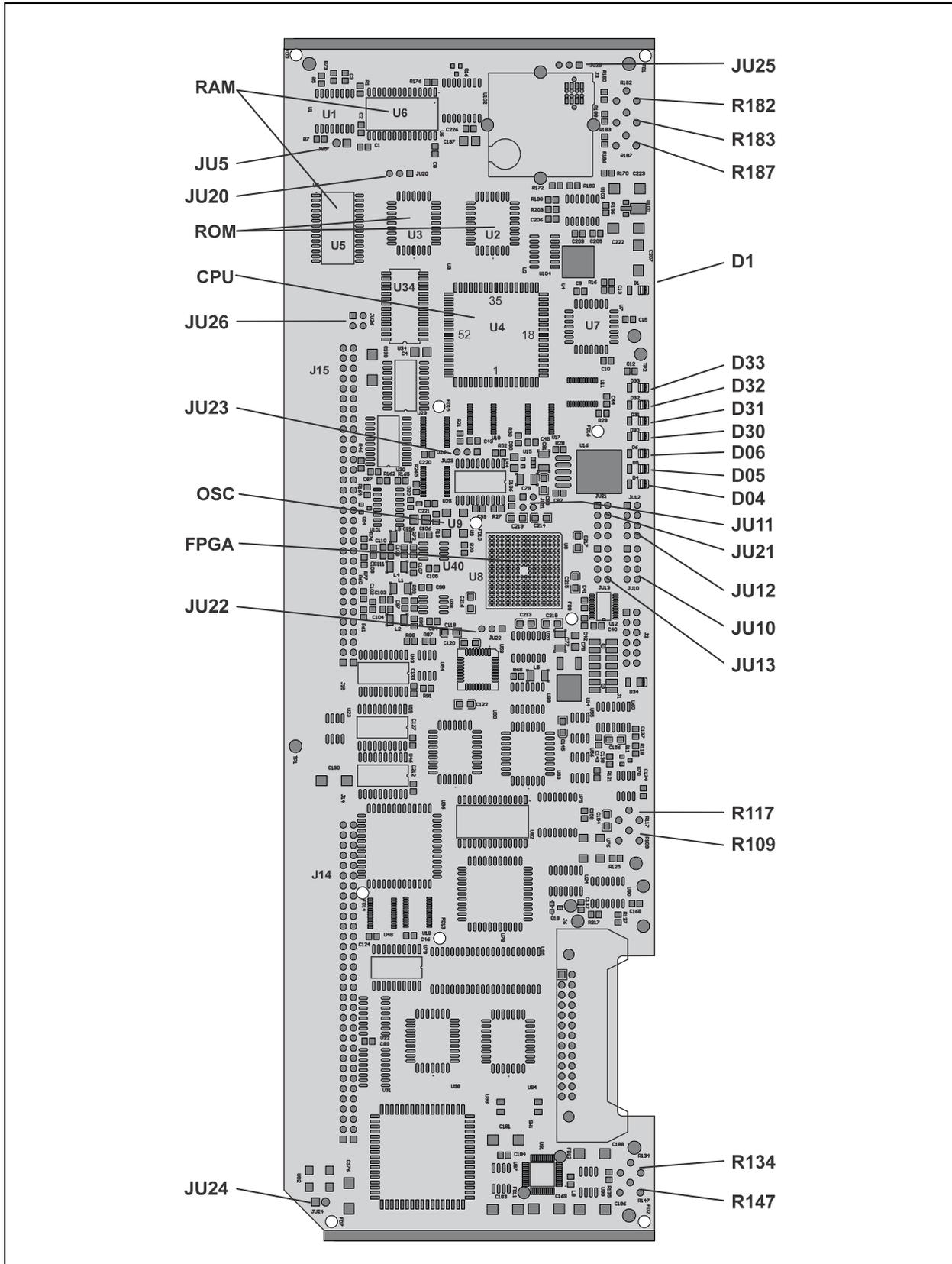


Figure 21-5 RT7000 Jumpers and Adjustments Locations

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JU5 - RAM Battery Jumper	The JU5 jumper enables the RAM backup battery. The default setting is the A-B position. This jumper is for voltage and current checking on the RAM backup battery.
COM2 Source Select Jumpers	The JU26 jumpers route the COM2 serial communications through the RS-232 driver U34 connected to <b>ACCESSORY 2</b> .
JU10 - DUART1 Configuration Jumpers	<p>The JU10 jumper bank configures the RT7000 for upgrading firmware and clearing RAM.</p> <p><b>JU10A</b> activates the ACH option that gives the radio 1000 channels. This is only used with the 32K x 8 RAM (62256 or 62257) for U5 and U6.</p> <p><b>JU10B</b> is not currently used.</p> <p><b>JU10C</b> clears only the necessary RAM variables to enable a software upgrade. This does not disturb any of the channel or scan group programming.</p> <p><b>JU10D</b> clears the entire RAM space and loads all default channel information and scan groups.</p>
JU11 - DUART2 Configuration Jumpers	<p>The JU11 jumper bank selects optional DUART3 and DUART4 installations.</p> <p><b>JU11A</b> enables DUART2. For DUART2 configuration information, refer to the JU12-DUARTE3 Configuration Jumper section below.</p> <p><b>JU11B</b> enables DUART4. It lets the processor know the chip is installed and ready for programming. For DUART4 configuration information, refer to the JU13-DUART4 Configuration Jumpers section below.</p>
JU12 - DUART3 Configuration Jumper	<p>The JU12 jumper bank enables the selected UART for the DHSL or FSK remote options.</p> <p><b>JU12A</b> enables DUART3 DHSL remote UART. Enable this jumper with JU11A to establish communications with the ECU/RCU board.</p> <p><b>JU12B</b> enables DUART3 FSK remote UART. Enable this jumper along with JU11A to establish communications with the ECU/RCU board.</p> <p><b>JU12C</b> is not currently used.</p> <p><b>JU12D</b> is not currently used.</p>
JU13 - DUART4 Configuration Jumpers	<p>The JU13 jumper bank enables the selected UART for ALE options.</p> <p><b>JU13A</b> enables the DUART4 ALE UART. Enable this jumper with JU11B to establish communications with the ALE board.</p> <p><b>JU13B</b> is not currently used.</p> <p><b>JU13C</b> is not currently used.</p>

**JU13D** loads the ALE card with default configurations.

To perform a default load:

1. Make sure the ALE option is installed and turned on.
2. Turn the radio off and install a jumper on JU13D, then turn on the radio. **LOADING ALE** displays. It may take up to 90 seconds to load ALE.
3. When loading is finished, the front panel LCD displays **LOAD DONE** and the radio starts scanning.
4. Remove jumper JU13D and put it in a safe place.

JU20                      JU20 jumper is not currently used.

JU22 and JU23            The JU22 and JU23 jumpers enable the RT7000 to be controlled by a remote  
COM1 Source            computer terminal using the serial RS-232 or RS-422/423/485 protocol  
Select Jumpers           through **ACCESSORY 1**.

This collection of jumpers and configuration resistors route the COM1 serial communications through the RS-232 driver to **ACCESSORY 1**, or through the RS-422/485 driver also connected to **ACCESSORY 1**.

**Note:** Configuring the Processor board for RS-422/423/485 protocol involves removing configuration resistors R51, R56, R62 and R64 and installing resistors R50, R57, R63 and R65. Contact Datron Customer Service for details and resistors for converting from RS-232 protocol to RS-422/423/485 protocol.

**Note:** The Processor board cannot be configured for use of both RS-232 and RS-422/423/485 protocols.

## 21.11 Board Functional Tests

### 21.11.1 Interface/Power Supply Board Test

This test procedure requires the following equipment:

- Multimeter
- Power supply 0 to 20 Vdc minimum
- 3 Jumper cables

Ohmmeter Test            1. Check the following points for shorts to ground: J26 pin 2, J20 pin 9, J20 pin 4, J20 pin 6, J20 pin 12, and J20 pin 11 (if shorted, repair before applying power).

2. Check the following points for resistance; all readings should be 100 ohms  $\pm$ 5 ohms:

J25 pin 5 to J21 pin 25	J25 pin 12 to J21 pin 22
J25 pin 6 to J21 pin 12	J25 pin 14 to J21 pin 9
J25 pin 7 to J21 pin 24	J25 pin 16 to J21 pin 21
J25 pin 8 to J21 pin 11	J25 pin 18 to J21 pin 8
J25 pin 9 to J21 pin 23	J25 pin 20 to J21 pin 20
J25 pin 10 to J21 pin 10	

### Voltage Measurements

1. Apply 13.8 Vdc to the radio. Turn the radio on and check the following points for correct voltages:

J26 pin 2	13.8 $\pm$ 0.2 Vdc
J26 pin 1	13.8 $\pm$ 0.2 Vdc
J20 pin 9	13.8 $\pm$ 0.2 Vdc
J20 pin 10	13.8 $\pm$ 0.2 Vdc
J22 pin 21	13.8 $\pm$ 0.2 Vdc
J20 pin 4	12.0 $\pm$ 0.6 Vdc
J20 pin 5	12.0 $\pm$ 0.6 Vdc
J20 pin 16	12.0 $\pm$ 0.6 Vdc
J20 pin 17	12.0 $\pm$ 0.6 Vdc
J24 pin 2	13.8 $\pm$ 0.5 Vdc

J20 pin 6	12.0 $\pm$ 0.6 Vdc
J20 pin 7	12.0 $\pm$ 0.6 Vdc
J20 pin 18	12.0 $\pm$ 0.6 Vdc
J20 pin 19	12.0 $\pm$ 0.6 Vdc
J20 pin 22	13.8 $\pm$ 0.2 Vdc
J20 pin 12	5.0 $\pm$ 0.25 Vdc
J20 pin 13	5.0 $\pm$ 0.25 Vdc
J20 pin 24	5.0 $\pm$ 0.25 Vdc
J20 pin 25	5.0 $\pm$ 0.25 Vdc

2. Check the voltage protect circuit. Connect the voltmeter to J20 pin 4. 12.0  $\pm$ 0.6 Vdc should be present. Vary the power supply from 10.5 to 16 Vdc. The voltage at the test point should drop to zero when the power supply is at or below 10.0 Vdc and at or above 15.8 Vdc.

### 21.11.2 Audio Board Test

These test procedures require the following equipment:

- SINAD meter/AC voltmeter
- RF signal generator
- Oscilloscope
- Two-tone test box
- Multimeter
- 12V power supply
- Wattmeter

- RT7000 test radio
- Extender card set

RX Test

1. Install the Audio board on the extender card. Turn the radio on. Measure the input of U15  $10.0 \pm 0.5$  Vdc, output  $5.0 \pm 0.25$  Vdc.
2. Set the USB mode to 15.59 MHz. Set the signal generator to 15.591 MHz, -113 dBm. RX tone should be present. SINAD should measure 10 dB or higher.
3. Turn the speaker off and the volume to maximum. Set the signal generator to -95 dBm. Press the SINAD meter AC volts button. It should measure approximately 3 Vdc or higher. Turn the volume to its middle level and turn the speaker on.
4. Turn squelch on. The RX tone should mute. Vary the signal generator up, then back, by 1000 Hz. Squelch should open, then close. Turn off the squelch.

TX Test

1. Set the RT7000 to 14.75 MHz. With the two-tone test box set to single tone, key the radio. Check for  $100 \pm 20$ W output. Unkey the radio.
2. Turn off the single tone and key the radio with CW. Check for  $100 \pm 20$ W.

### 21.11.3 Reference/Control Board Test

These test procedures require the following equipment:

- Frequency counter
- 100W Dummy load
- Wattmeter with 250W slug
- Two-tone test box
- Extender card set

Input/Output Signals

1. Reference the signal output at J61; frequency = 16.777216 MHz  
Level = 1 Vpp.
2. Forward power input (FWDPWR) at J3 pin 15.
3. Reverse power input (RVSPWR) at J3 pin 14.
4. External amplifier ALC input (AMPALC) at J3 pin 10.
5. ALC output (RAWALC) at J3 pin 12.
6. Power level output (PWRLVL) at J3 pin 23.

## Adjustments and Measurements

1. Measure the regulator voltage, U2 pin 16. U2 should output  $+5.0 \pm 0.25\text{V}$ ; U5 should output  $8.0 \pm 0.4\text{V}$ .
2. Verify that the oscillator is stabilized.
3. Set the radio transmit frequency to 30.0 MHz and the radio mode to USB AME.
4. Key the PTT.
5. Measure the RF output of the radio and adjust the oscillator for 30.0 MHz.
6. Verify the transmit frequency at 15.0 MHz and 2.0 MHz. The frequency error should not exceed the specification for the installed oscillator option.
7. Repeat the following adjustments to R1 and R22 until no further adjustment is required:
  - Adjust R1 (high power set) for a transmit output power of 100W average, single tone at 14.75 MHz.
  - Adjust R22 (low power set) for 10W average, single tone at 14.75 MHz.
8. Remove the load from the wattmeter. Key the radio in high power and adjust R29 (reverse power set) for 12W of reflected power using a 3:1 load (three 50 ohm loads connected in parallel).

## Miscellaneous Test

1. Verify the radio's low pass filter select by setting the radio to the following frequencies. The pin for the filter should be logic low with all other RF Filter board pins logic high.

Pin	Filter	Frequency
18	FB1	1.6 MHz
18	FB1	2.74 MHz
6	FB2	2.75 MHz
6	FB2	3.99 MHz
19	FB3	4.0 MHz
19	FB3	6.24 MHz
7	FB4	6.25 MHz
7	FB4	8.99 MHz
20	FB5	9.0 MHz
20	FB5	13.49 MHz
8	FB6	13.5 MHz
8	FB6	20.99 MHz

Pin	Filter	Frequency
21	FB7	21.0 MHz
21	FB7	30.0 MHz

2. Key the radio at 30 MHz and ground J3 pin 10. The power out should decrease.

#### Digital TX Power Adjustment

1. Key the radio in high power at 14.75 MHz.
2. Check for low power at approximately 10W, medium power at approximately 25W, and high-power at approximately 100W with **ALPHA 5** set to the default settings for each power level (refer to the RT7000-MSOP operator manual for information on the Alpha menu and function 5).

#### 21.11.4 Synthesizer Board Test

These test procedures require the following equipment:

- Oscilloscope
- SINAD meter
- Frequency counter
- Spectrum Analyzer
- Multimeter
- Power supply 0-20 Vdc
- Wattmeter
- -30 dBm Attenuator dummy load
- Two-tone test box
- Signal generator
- Extender card set

#### Alignment

1. Set the power supply to 13.8 Vdc.
2. Connect the DMM to the junction of C28 and R71. Adjust L7 for a nominal tuning voltage of  $2.5 \pm 0.25$  Vdc.
3. Connect the oscilloscope probe on J54 and verify the output voltage is  $1.3 \pm 0.02$  Vpp. The output should be clean and stable.
4. Place the oscilloscope probe on the bottom of R15 above J55 and adjust L1 for exactly 3 Vdc (ensure the oscilloscope is set for DC).
5. Place the oscilloscope probe on U3 pin 3 (set the oscilloscope to a 10 mV scale, 20 ms time). Adjust L13 through L17 for a maximum signal (approximately 130 mVpp minimum).

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- |                      |   |
|----------------------|---|
| Miscellaneous Test   | <ol style="list-style-type: none"> <li>6. Set the radio frequency to 30.0 MHz. Carefully adjust L5 for 10 Vdc <math>\pm</math>0.25 measured at U5 pin 1.</li> </ol> <ol style="list-style-type: none"> <li>1. Measure the voltage at U5 pin 8. It should read 9.0 <math>\pm</math>0.5Vdc.</li> <li>2. Verify that the RX tone is present with the signal generator set at -113 dBm and 8.001 MHz, and the radio at 8 MHz USB. SINAD should be approximately 10 dB or higher. At -75 dBm level, the audio should be approximately 3 Vdc or higher with maximum volume and the radio's speaker off.</li> <li>3. At -113 dBm input, check SINAD at various frequencies from 1.6 to 30 MHz (this verifies that the synthesizer is locking).</li> <li>4. With the signal generator set to 8.001 MHz +6 dBm level, turn the carrier off, then on. The RX tone should sound normal.</li> </ol> |
| TX Test              | <ol style="list-style-type: none"> <li>1. Connect the dummy load to the oscilloscope (2V scale, 0.5ms time). At 8 MHz, key the radio with the test box (set to +10 dBm). The TX wave should be approximately 100W with no distortion.</li> <li>2. Key the radio again at 2 MHz and 29.999 MHz. TX wave should be approximately 100W with no distortion.</li> </ol>  |
| Input/Output Signals | <ol style="list-style-type: none"> <li>1. The reference input signal at J61 should read 16,777,216 Hz. The level should be 1 Vpp.</li> <li>2. The first LO output signal at J59 should read 75 to 105 MHz. The level should be 0 <math>\pm</math>2 dBm.</li> <li>3. The third LO (BFO) output signal at J55 should read 5.000 MHz (LSB) and 5.003 MHz (USB). The level should be 0 <math>\pm</math>2 dBm.</li> <li>4. The second LO output signal at J54 should read approximately 70.000 MHz. The level should be 0 <math>\pm</math>2 dBm.</li> </ol>  |

### 21.11.5 75 MHz IF Board Test

These test procedures require the following equipment:

- Oscilloscope
- SINAD meter
- Multimeter
- 0 to 20 Vdc power supply
- Wattmeter
- 50 ohm, -30 dBm attenuator dummy load
- Two-tone test box
- Signal generator

- Extender card set

RX Test

1. Turn on the radio and check the input and output of U8. The input should be  $8.0 \pm 0.4$  Vdc; the output should be  $5.0 \pm 0.25$  Vdc.
2. Set the radio to 8 MHz and the signal generator to 8.001 MHz, -113 dBm. Turn the volume control to the maximum clockwise position with the speaker off, and peak both variable inductors (L35, L36) for maximum audio as indicated on the two-tone test box. The level should be approximately 3 Vdc or higher. Set the volume to the 12:00 position.
3. Set the radio to 15.59 MHz USB and set the RF signal generator for 15.591 MHz with -113 dBm output. Test the radio at 1.65 MHz. The SINAD reading should be 10 dB or higher.
4. Change the signal generator output to -93 dBm. Select **ATTN** on the RT7000 front panel to turn the attenuator on. The SINAD reading should be 10 dB or higher. Select **ATTN** to turn the attenuator off.

TX Test

**Note:** While keying the radio, the two-tone test box should be +10 dBm, 1 tone, and the reference potentiometer in the 2:00 position.

1. Key the radio at 14.75 MHz. The output on the wattmeter should be approximately  $100 \pm 20$ W.
2. Verify that the low and medium TX power is functioning.

### 21.11.6 5 MHz IF Board Test

These test procedures require the following equipment:

- RT7000
- Oscilloscope
- Voltmeter
- SINAD meter
- RF signal generator
- Two-tone test box
- Wattmeter with a 250W element
- 12V power supply
- Extender card set

RX Test

1. Turn the radio on and check the voltage at U5. Input should be  $8 \pm 0.4$  Vdc and output  $5 \pm 0.25$ Vdc.
2. Set the radio to 15.59 MHz (USB). Turn the speaker off. Turn the volume control to its maximum clockwise position.

3. Set the signal generator to 15.591 MHz. Adjust the signal generator to a level just below clipping of the wave form on the scope.
4. Adjust L1 and L3 for maximum output, lowering the level of the signal generator to maintain no clipping.
5. Set the volume to its middle position.
6. Set the signal generator to -113 dBm and check the SINAD on both USB and LSB. They should be 10 dBm or higher.
7. Check the AGC.
8. Put the oscilloscope probe on J5 pin 21. Set the signal generator to -20 dBm.
9. Observing the oscilloscope, set R52 for maximum audio just before clipping occurs. Change the signal generator to +6 dBm. If there is clipping, slightly readjust R52.
10. Vary the signal generator from +6 dBm to -70 dBm. There should be no more than 3 dB of change on the AC voltmeter.

## TX Test

1. Set the radio to 14.75 MHz USB.
2. Key the radio on single tone. Power out should be  $100 \pm 20$ W.
3. With the two-tone box off (no tone), and the radio set to USB AME, key the radio.
4. Adjust R102 for 25W.
5. Unkey and set the radio to LSB AME.
6. Key the radio. Power out should be  $40 \pm 10$ W. Unkey the radio.  
**Note:** The power out value can be adjusted to maintain 10 to 80W at 2 to 30 MHz
7. Set the reference potentiometer to the maximum counterclockwise position and the selector switch to off.
8. Set the RT7000 to USB PCS mode.
9. Key the PTT and adjust R101 for 2.5W.
10. Set the RT7000 to USB.
11. Key the transceiver without modulation input and read the residual carrier output. The reading should be -50 dBm or lower (more negative).

### 21.11.7 Squelch Test Procedure

This test requires the following equipment:

- RT7000
  - RF signal generator
  - 12 Vdc power supply
1. Connect the generator and dummy load to the test radio.
  2. Turn the RT7000 on.
  3. On the Processor board, measure the regulator output at U60 pin 11. The voltage should be  $8.0 \pm 0.4$  Vdc.
  4. Set the squelch potentiometer R117 so the radio stays squelched without receive audio input.
  5. Set the RT7000 to 15.59 MHz (USB mode) with the squelch and speaker on. Set the signal generator to 15.590 MHz at  $-95$  dBm.
  6. Vary the generator up by 1 kHz. Vary the generator frequency down by 1 kHz. Squelch should open, then close.
  7. Turn off squelch and verify that it is disabled.



# Index

## Numerics

- 28V RF amplifier assembly, 20-9
  - 28V version (RT7000-28)
    - 28V RF amplifier assembly, 20-9
      - Component locations diagram (738254), 20-10
      - Parts list (004-00310), 20-13
      - Schematic diagram (994235), 20-11
    - 28V RF filter board, 20-15
      - Component locations diagram (738228), 20-16
      - Parts list (004-28320), 20-19
      - Schematic diagram (994532), 20-17
  - Configuration description, 20-1
    - 28V mainframe, 20-2
    - 28V RF amplifier board, 20-1
    - 28V RF filter board, 20-1
    - DC-to-DC converter, 20-1
  - DC-DC converter, 20-5
    - Component locations diagram (738283), 20-6
    - Parts list (004-28300), 20-9
    - Schematic diagram (994226), 20-7
  - Schematic diagram (994234), 20-3
- 5 MHz Board
- Circuit description
    - Block diagram, 10-3
    - Receive mode, 10-1
    - Transmit mode, 10-2
  - Component locations diagram (738208), 10-6
  - Connector pin assignments
    - J5 connector, 10-4
  - Parts list (001-00800), 10-13
  - Schematic diagrams (994136), 10-7
- 7000ALE option

- Circuit description
    - ALE processor, 15-1
    - Audio interface, 15-4
    - Block diagram, 15-4
    - Buffers, 15-3
    - Clock oscillator, 15-3
    - Control logic, 15-3
    - Digital signal processor, 15-3
    - Dual port SRAM, 15-3
    - EEPROM data storage, 15-3
    - EEPROM program storage, 15-3
    - Memory backup, 15-3
    - RAM program storage, 15-3
    - Reset controller, 15-2
  - Component locations diagram (738018), 15-7
  - Installation, 15-5
  - Jumper placement diagram, 15-5
  - Parts list (001-01105), 15-25
  - Schematic diagrams (994081), 15-9
- 7000ALE-141B option
- Circuit description, 15-45
  - Component locations diagram (738045), 15-46
  - Parts list (001-01302), 15-49
  - Schematic diagrams (994089), 15-47
- 75 MHz IF board
- Circuit description
    - Block diagram, 9-3
    - Board programming, 9-1
    - Receive mode, 9-1
    - Transmit mode, 9-2
    - Voltage regulation, 9-1
  - Component locations diagram (738332), 9-4
  - Connector pin assignments

---

J6 connector, 9-2  
Parts list (001-00710), 9-7  
Schematic diagram (994292), 9-5

## A

### Accessory connectors

ACCESSORY 1 connector pin  
assignments, 2-6

ACCESSORY 2 connector pin  
assignments, 2-7

ACCESSORY 3 connector pin  
assignments, 2-8

### Additional channels option (7000ACH)

Jumper placement diagram, 19-2

Option description, 19-2

### Audio board

#### Circuit description

Block diagram, 11-2

Receive mode, 11-1

Transmit mode, 11-2

Voltage regulation, 11-1

Component locations diagram (738211),  
11-6

#### Connector pin assignments

J7 connector, 11-3

J8 connector, 11-3

Parts list (001-00600), 11-9

Schematic diagram (994157), 11-7

## B

Board locations diagram, 21-5

## C

### Computer control version (RT7000C)

Configuration description, 20-1

## D

### Data interface option (7000RS)

Jumper placement diagram, 19-3

Option description, 19-3

### DHSL remote control option (7000RI)

001-01403), 16-21

Circuit description, 16-14

Component locations diagram (738248),  
16-18

Jumper placement diagram, 16-16

Schematic diagram (994184), 16-19

DHSL remote control version (RT7000RI)  
, 20-33

## E

### Encryption option (7000ENCR)

Option description, 19-4

### Extended front panel control version (RT7000E)

Component locations diagram (738281),  
20-26

Parts list (003-01003), 20-29

Schematic diagram (994225), 20-27

Version description, 20-24

## F

### Fast ALC option (7000FALC), 14-1

Component locations diagram (738341),  
14-2

Parts list (001-00207), 14-7

Schematic diagrams (994074), 14-3

### Frequency generation, 3-6

### Front Panel assembly

#### Circuit description

Front Panel Processor board, 12-1

LCD/Driver board, 12-3

Component locations diagram (738261),  
12-8

#### Connector pin assignments

J1 connector, 12-4

J3 connector, 12-5

J4 connector, 12-5

J6 connector, 12-6

J7 connector, 12-6

J8 connector, 12-7

J9, J12 connectors, 12-7

Parts list (004-01110), 12-11

Schematic diagram (994198), 12-9

### Front panel connections, 2-2

Audio accessories, 2-2

Front panel audio connector pin  
assignments, 2-3

### FSK remote control option (7000RF)

Circuit description, 16-1

Component locations diagram (738232),

---

- 16-4
- Jumper placement diagram, 16-2
- Parts list (001-01402), 16-7
- Schematic diagram (994162), 16-5
- FSK remote control version (RT7000RF)
- Version description, 20-33

## H

- High-stability Fast ALC option (7000HS-FALC), 14-18
  - Component locations diagram (738341), 14-20
  - Parts list (001-01023), 14-25
  - Schematic diagrams (994074), 14-21
- High-stability option (7000HS), 14-10
  - Component locations diagram (738341), 14-12
  - Parts list (001-01022), 14-15
  - Schematic diagram (994487), 14-13

## I

- Installation
  - Fixed station applications, 2-2
  - location considerations, 2-1, 2-2
  - Pre-installation check, 2-1
  - Unpacking and inspection, 2-1
- Interface/Power Supply board
  - Circuit description
    - Accessory interface, 4-1
    - Block diagram, 4-3
    - Harmonic filter band switching, 4-1
    - Power distribution, 4-1
    - Voltage protection, 4-2
    - VSWR circuit, 4-2
  - Component locations diagram (738299), 4-12
  - Connector pin assignments
    - Direct connections, 4-11
    - J16 connector, 4-4
    - J17 connector, 4-5
    - J18 connector, 4-6
    - J25 connector, 4-6
    - J29 connector, 4-7
    - RF connections, 4-11
  - Parts list (004-12401), 4-17
  - Schematic diagrams (994247), 4-13

## M

- Mainframe wiring diagram (994200 rev. J), 3-13
- Maintenance
  - Alignment procedures
    - Master oscillator calibration, 21-24
    - Transmit ALC adjustment, 21-24
  - Basic performance test, 21-12
  - Board access
    - Board locations diagram, 21-5
    - DC/DC converter removal, 21-4
    - Final assembly diagram, 21-6
    - Front panel assembly diagram, 21-7
    - Front panel disassembly, 21-2
    - Internal/Power supply board removal, 21-2
    - Rear panel assembly diagram, 21-9
    - Rear panel disassembly, 21-2
    - RF filter board removal, 21-3
    - RF power amplifier board removal, 21-3
    - Subassemblies table, 21-9
  - Board functional test
    - 5 MHz IF board test
      - Rx test, 21-34
      - Tx test, 21-35
    - 75 MHz IF board test
      - Rx test, 21-34
      - Tx test, 21-34
    - Audio board test
      - Rx test, 21-30
      - Tx test, 21-30
    - Interface/Power supply board test
      - Ohmmeter test, 21-28
      - Voltage measurements, 21-29
    - Reference/Control board test
      - Adjustments and measurements, 21-31
      - Digital Tx power adjustment, 21-32
      - Input/output signals, 21-30
      - Miscellaneous test, 21-31
    - Squelch test procedure, 21-36
    - Synthesizer board test
      - Alignment, 21-32
      - Input/output signals, 21-33

---

- Miscellaneous test, 21-33
  - Tx test, 21-33
- Detailed performance test, 21-12
- Detailed performance test parameters table, 21-13
- Internal layout, 21-1
- Jumper settings
  - COM2 source select jumpers, 21-27
  - J20, 21-28
  - JU10 - DUART1 configuration jumpers, 21-27
  - JU11 - DUART2 configuration jumpers, 21-27
  - JU12 - DUART3 configuration jumpers, 21-27
  - JU13 - DUART4 configuration jumpers, 21-27
  - JU22 and JU23 - COM1 source select jumpers, 21-28
  - JU5 RAM battery jumper, 21-27
  - RT7000 jumpers and adjustments locations table, 21-26
  - RT7000 option enable assignments table, 21-25
- Main processor troubleshooting
  - Onboard LEDs, 21-19
  - Processor board LED indications table, 21-19
  - Processor board troubleshooting table, 21-20
- Subassembly breakdown, 21-1
- Subassembly troubleshooting
  - BITE line descriptions table, 21-15
  - Internal BITE system, 21-14
  - Other diagnostics
    - Frequency generation problems, 21-18
    - No front panel control, 21-16
    - No front panel display, 21-17
    - No receive audio output, 21-17
    - No transmit audio output, 21-18
    - RT7000 doesn't turn on, 21-16
- Test equipment, 21-11

## N

N1304A Encoder option

- (RT7000AIRSELCALL)
  - Option description, 19-12
- Narrow and wideband filter option (7000CW1)
  - Circuit description, 17-3
  - Component location diagram, 17-4
- Narrowband CW filter option (7000CW)
  - Circuit description, 17-1
  - Component placement diagram, 17-2
- Noise blanker option (7000NB)
  - Component locations diagram (738233), 19-6
  - Option description, 19-5
  - Parts list (001-01202), 19-9
  - Schematic diagram (994163), 19-7

## P

- Power distribution, 3-1
- Power distribution diagram, 3-3
- Pre/Post selector version (RT7000PP)
  - Cabling connections, 20-32
  - Internal wiring diagram, 20-31
  - Version description, 20-30
- Processor board
  - Circuit description
    - Analog converter system
      - AGC, ALC, and power level, 13-3
      - BITE system, 13-2
      - External BITE, 13-3
      - Overvoltage and reverse power protection, 13-3
      - Temperature protection, 13-3
    - Antenna tuner interface, 13-5
    - Clock oscillator circuit, 13-2
    - EPROM program storage, 13-1
    - FPGA control logic
      - Address decoding, 13-3
      - Interrupt control, 13-3
      - Multi-function peripheral device, 13-4
    - SPI controller, 13-4
    - UARTs, 13-3
  - Main processor block diagram, 13-8
  - Miscellaneous controls, 13-5
  - Processor, 13-1
  - RAM program storage, 13-1

---

- Receive audio distribution block diagram, 13-7
- Remote interface
  - DHSL interface, 13-5
  - FSK interface, 13-6
- Reset control and power monitor, 13-2
- RS-232/422/485 interface, 13-4
- Serial peripheral interface (SPI), 13-6
- SPI enable lines, 13-9
- Squelch circuit, 13-6
- Transmit audio distribution block diagram, 13-7
- Component locations diagram (738018), 13-15
- Connector pin assignments
  - J14 connector, 13-9
  - J15 connector, 13-12
- Parts list (001-01107), 13-33
- Schematic diagrams (994088), 13-17

## R

- Rear panel connections, 2-4
  - Accessory connectors, 2-5
    - Automatic antenna tuners, 2-9
    - Control cabling accessories, 2-12
    - Data terminal interface, 2-9
    - EIA data interface standards, 2-9
    - External Encryption, 2-5, 2-9
    - External high-power RF amplifiers, 2-9
    - External speaker, 2-9
    - Power cabling accessories diagram, 2-10
    - RF cabling accessories diagram, 2-11
  - Antenna connector, 2-5
  - External fan connector, 2-5
  - Power to the RT7000, 2-4
  - Remote control, 2-13
    - Extended front panel control, 2-13
    - FSK and DHSL remote control, 2-13
- Receive path diagram, 3-9
- Receive signal flow, 3-8
  - Transceiver receive path diagram, 3-9
- Receiver-only version (RT7000RX)
  - Version description, 20-33
- Recorder option

- Jumper placement diagram, 19-11
- Option description, 19-11
- Reference/Control board
  - Circuit description
    - Automatic level control (ALC), 5-1
    - Block diagram, 5-2
    - High stability option, 5-2
    - Reference oscillator, 5-1
  - Component locations diagram (738341), 5-4
  - Connector pin assignments
    - J3 connector, 5-3
  - Parts list (001-00206), 5-7
  - Schematic diagram (994487), 5-5
- RF Filter board
  - Circuit description
    - Block diagram, 7-2
    - Harmonic filter bands, 7-1
    - Receive overload switch, 7-2
    - T/R relay, 7-2
  - Component locations diagram (738228), 7-4
  - Connector pin assignments
    - J22 connector, 7-3
  - Parts list (001-00320), 7-7
  - Schematic diagram (994139), 7-5
- RF Power Amplifier board
  - Circuit description
    - Block diagram, 8-2
    - RF amplifier thermal control, 8-2
    - RF amplifiers, 8-2
  - Component locations diagram (738587), 8-4
  - Parts list (004-00311), 8-7
  - Schematic diagram (994182), 8-5

## S

- Synthesizer board
  - Circuit description, 6-1
    - Block diagram, 6-2
  - Component locations diagram (738351), 6-4
  - Connector pin assignments
    - J4 connector, 6-3
  - Parts list (001-00901), 6-7
  - Schematic diagram (994304), 6-5

---

System diagram, 3-2

## **T**

Transceiver control path, 3-11  
Transceiver frequency generation diagram,  
3-5  
Transceiver frequency mixing schematic, 3-5  
Transceiver power distribution table, 3-4  
Transmit signal flow, 3-9  
Transmit signal path, 3-11  
    Transceiver transmit path, 3-11  
Transmitter-only version (RT7000TX)  
    Version description, 20-33

## **V**

Voice enhancement board  
    Circuit description, 18-1  
        Block diagram, 18-2  
    Component locations diagram (738574),  
        18-4  
    Connector pin assignments  
        J1 connector, 18-2  
    Parts list (001-10000), 18-13  
    Schematic diagrams (994536), 18-5

## **W**

Wideband 1 filter option (7000WB1)  
    Circuit description, 17-2  
    Component placement diagram, 17-3

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