

CONVENTIONAL VOTING RECEIVER

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CONVENTIONAL VOTING RECEIVER

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DO NOT operate the radio near electrical blasting caps or in an explosive atmosphere.

DO NOT operate the radio unless all the radio frequency connectors are secure and any open connectors are properly terminated.

DO NOT allow children to operate transmitter equipped radio equipment.

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SECTION 1 INTRODUCTION

1.1 DESCRIPTION

The Voter System is an additional feature of the Conventional Repeater System that allows receiver voting. The voter system is used in Wide-Area Systems that require simultaneous RF coverage over an area not capable of coverage by a single repeater site. The Voter System is also used to assist the RF coverage of a system using portables where a single receiver cannot cover the area, but a single transmitter site is sufficient for outgoing coverage.

1.2 MAIN COMPONENTS

The Voter System consists of at least one or more of the following modules. See Figures 1-1 and 1-2 for a Local Site and Figures 1-1 and 1-3 for a Remote Site and Figure 1-4 for a 5-channel voter system block diagram.

1.2.1 CONVENTIONAL VOTING RECEIVER

The CVR (Conventional Voting Receiver) is the Receiver and Interface board. The CVR decodes the condition of the squelch line, open or closed, from the receiver. In the Remote site the audio is then passed to the Voter Module. In the Local Site, the CVRs are hard wired to the Voter Module.

1.2.2 VOTER POWER SUPPLY

Each Voter Power Supply (VPS) has the capacity to handle two VSHs (see Section 8). The maximum total of VSHs is 27, divide this by 2 and the total number of VPSs needed is 14. There are two VPSs per power shelf, therefore, 7 power shelves are the maximum number per system.

1.2.3 COMPONENTS OF A VOTER SYSTEM

Component	Part Number	Section
VHF Receiver	023-203x-220	2
UHF Receiver	023-20x4-220	3
800 MHz Receiver	023-2008-220	4
900 MHz Receiver	023-2009220	5
Voter Module		7
Power Supplies	250-3039-xxx	8

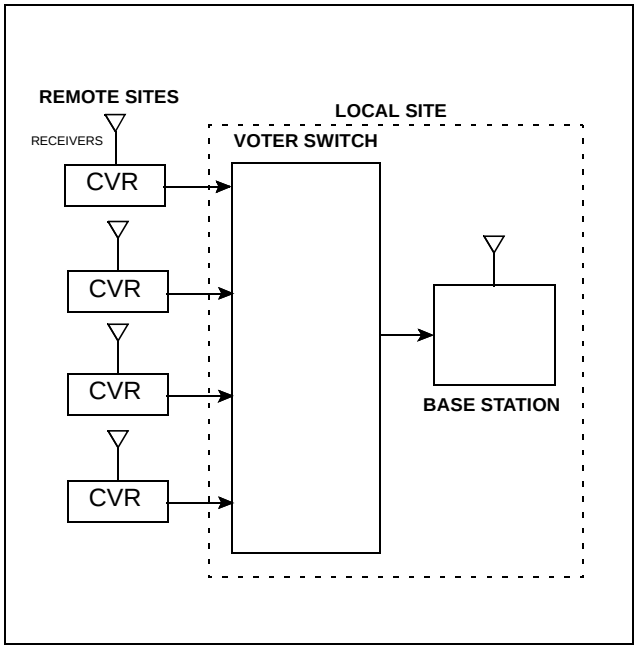


Figure 1-1 VOTER SYSTEM

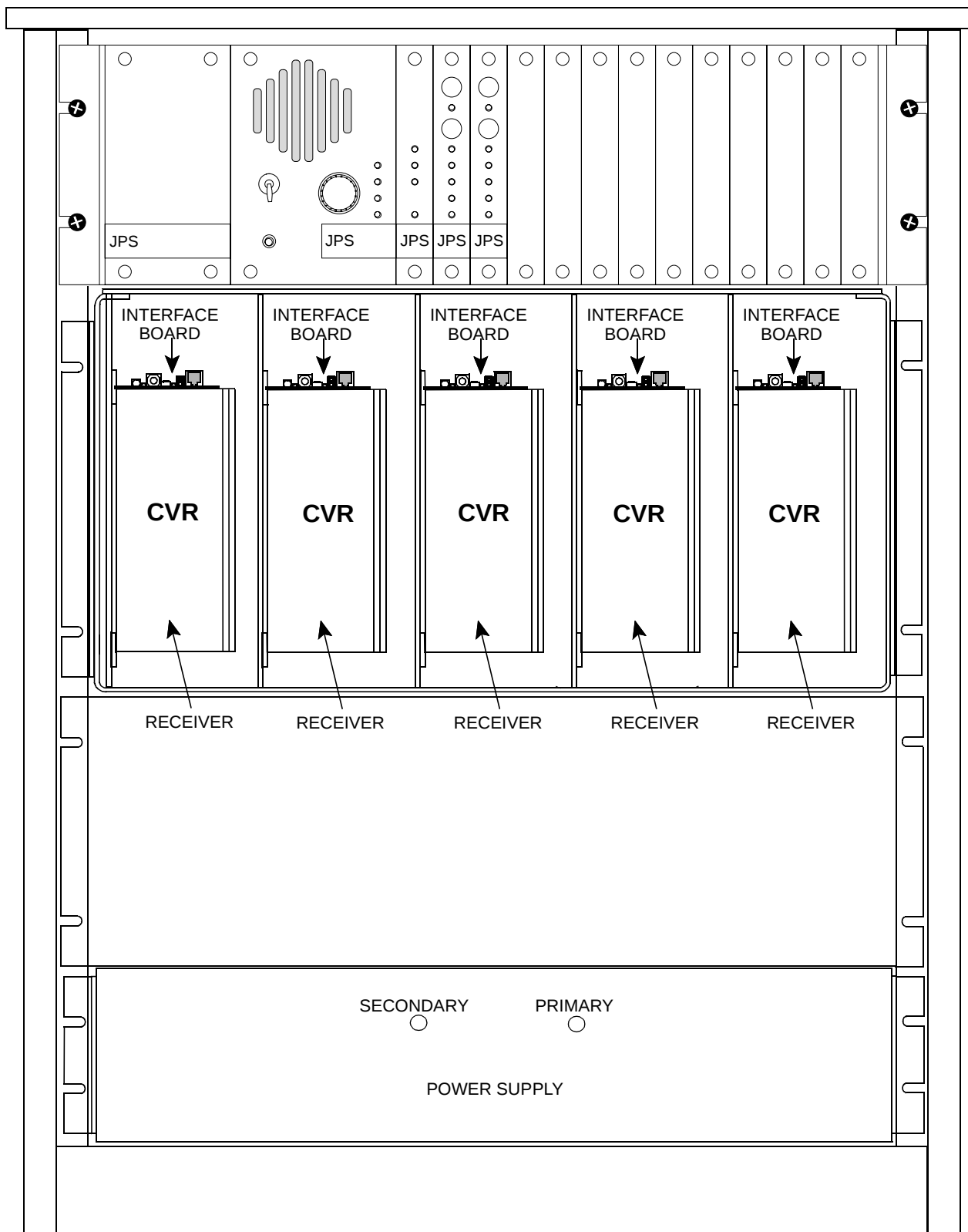


Figure 1-2 5-CHANNEL LOCAL SITE

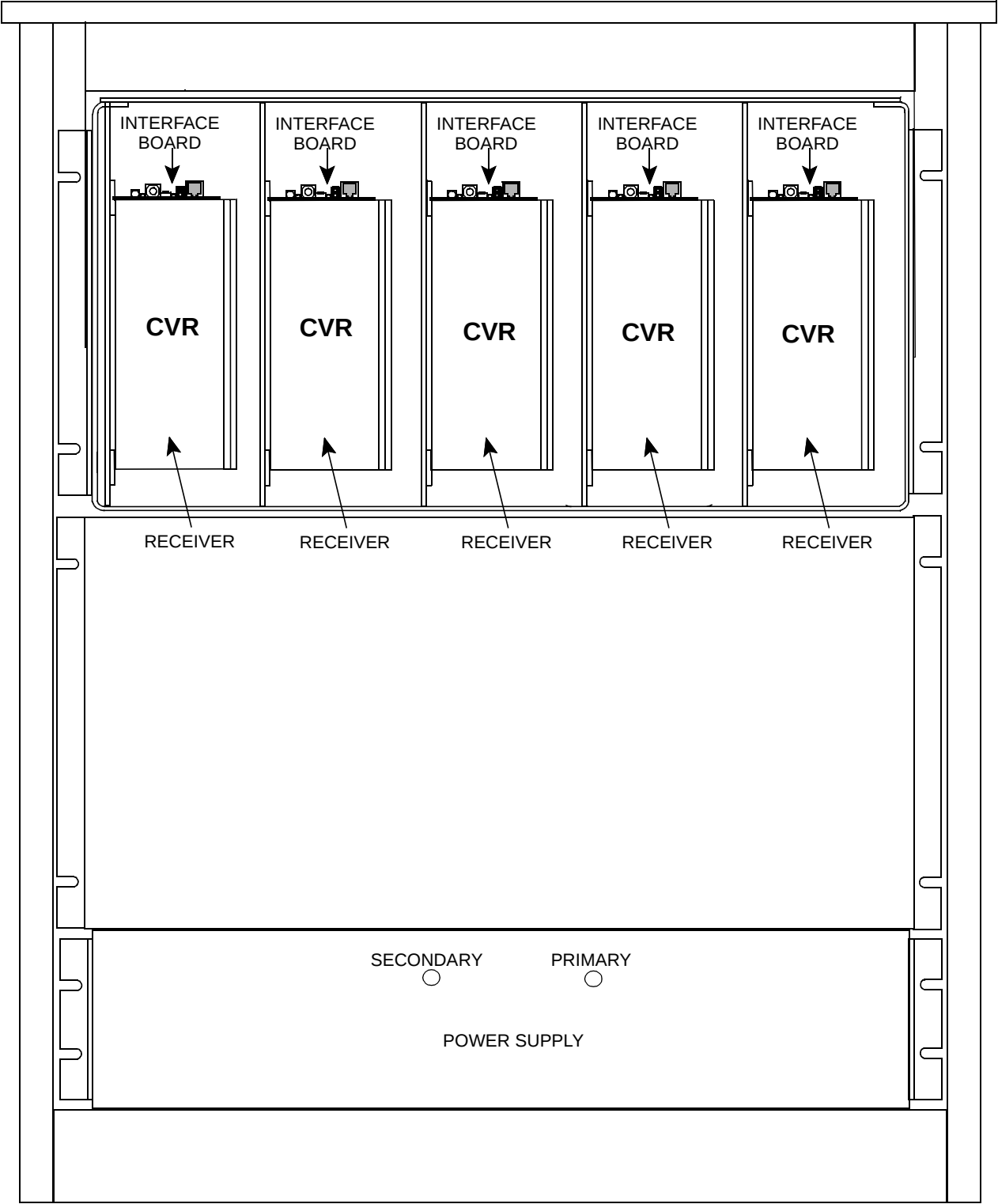


Figure 1-3 5-CHANNEL REMOTE SITE

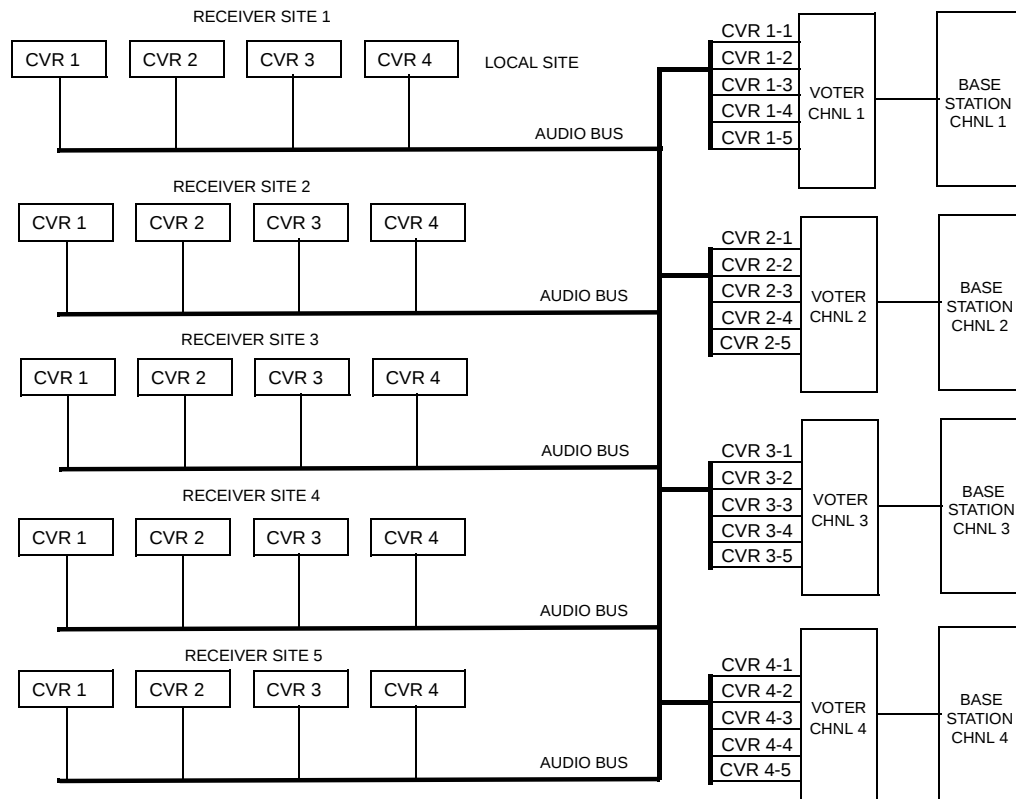


Figure 1-4 5-SITE 4-CHANNEL VOTER SYSTEM BLOCK DIAGRAM

SPECIFICATIONS

VOTER SHELF

Dimensions	21.4" W x 12.5" D x 8.2" H
Environment ing)	-30°C to +60°C (-22°F to +142°F) at 20% to 80% humidity (noncondens-
Average Power	26 modules x 6.1W ÷ 0.7 (efficiency) = 227W
Average Heat	227W x 3.6 = 817 BTU per hour

MODULES

CVR

Dimensions	14.5" W x 17.625" D x 3.5" H
Average Power and Current	+15V DC at 0.5A = 6.9W
Environment ing)	-30°C to +60°C (-22°F to +142°F) at 20% to 80% humidity (noncondens-

SECTION 2 VHF RECEIVER

2.1 RECEIVER PROGRAMMING

2.1.1 2004PGMR PROGRAMMER

When the program is loaded into the computer and executed, the menu shows the files available from the directory. The program is used to Create, Edit, Transfer and Receive the repeater and channel parameters described in Section 2.2.

IMPORTANT

The commands and displays referred to in this Section are for the IBM PC and may differ from IBM compatible. Refer to the computer's operating system manual for command explanations.

2.1.2 ALIGNMENT SOFTWARE

The software for the CVR programs the Interface Board to open and close the audio/data gates necessary for the alignment selected from the Test-Full Rptr/Station/CVR menu. Under the menu heading Test are the alignment procedures for the Receiver, overall Full CVR (see Section 2.4) including the Interface Board (see Figure 2-1).

Refer to Section 2.3 for Alignment Procedures as shown in the program, alignment points diagrams and test setup diagrams.

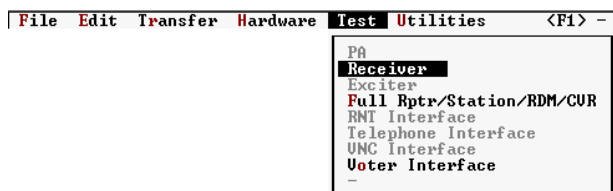


Figure 2-1 CVR TEST MENU

2.1.3 HELP F1

Help screens are available for most parameters and options in this program. Whenever a parameter or options clarification is needed, press F1 and if a help screen is available it will pop-up on the screen. Press Escape <ESC> to exit the pop-up screen.

2.2 PULL DOWN MENUS

2.2.1 MENU DISPLAYS

The menus available are listed at the top of the screen. Move the cursor with the arrow keys to highlight the menu name. Press Enter to view the menu and the arrow keys to scroll through the menu. Call up the highlighted selection by pressing Enter.

2.2.2 FILE MENU

This menu manipulates new or existing files into directories and saves files to be called up at another time.

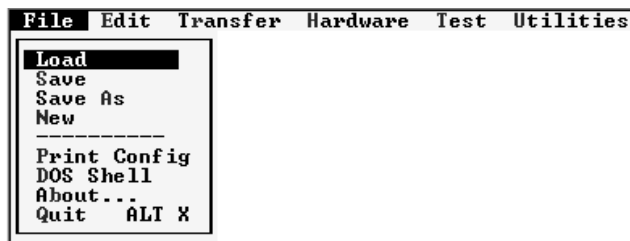


Figure 2-2 FILE MENU

Load

Load reads information from a stored file. The program requests the filename to be loaded into the buffer. The filename from a disk can be entered in the highlighted area. Then move the cursor down with the arrow key and highlight "Ok" and press Enter. To select an existing file, use the arrow keys to move down the menu list and press Enter when the highlighted filename is the file to load.

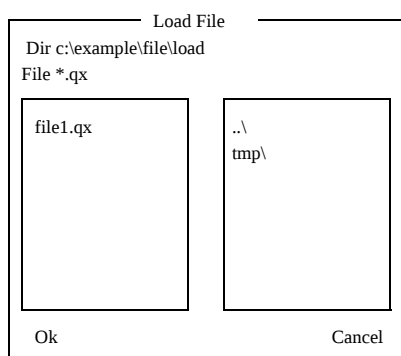


Figure 2-3 LOAD FILE

Save

This saves the edited version of an existing file loaded in the buffer under the same filename in the directory and deletes the old file. Loads a new file created in the Edit menu into the directory.

Save As

Use Save As to edited version of an existing file loaded in the buffer under a new filename or give a new file created in the Edit menu a filename.

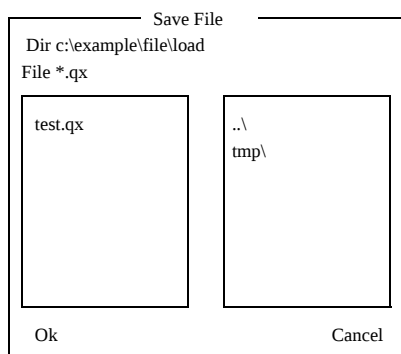


Figure 2-4 SAVE FILE

Print Repeater Configuration

Select the destination for the configurations.

Printer - Prints to printer connected to PC.

File - Writes printable test to selected filename.

Select which CVR data will be printed.

All CVRs - Prints the data for all valid CVRs.

Single CVR - Print the data for the entered CVR number.

NOTE: A list of valid CVRs can be seen under the Edit-Select Repeater menu selection.

DOS Shell

Temporarily suspends the program and returns to DOS. Directories and other DOS commands can be performed. To return to the program from DOS, type EXIT and press Enter.

Quit (ALT X)

Quit exits the CVR program and returns to DOS. Be sure all files are saved before exiting the program.

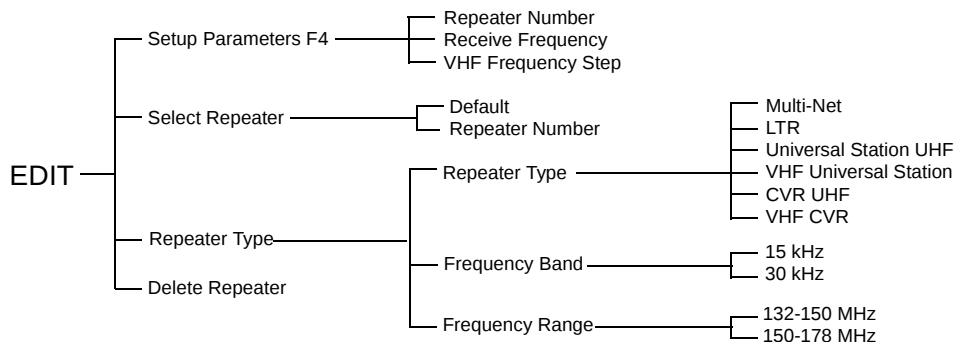


Figure 2-5 EDIT PROGRAMMING FLOWCHART

2.2.3 EDIT

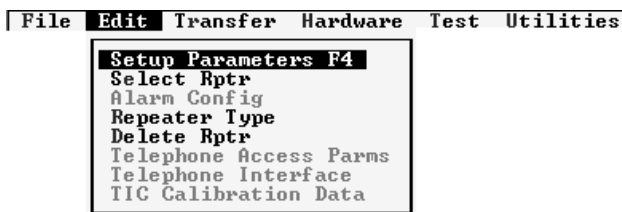


Figure 2-6 EDIT MENU

This menu is used to create new files and set or change the CVR operating parameters. The filename for the CVRs in this file is shown in the lower left corner of the screen.

Setup Parameters

This programs the Receiver parameters and options of each CVR at a Site. The following paragraphs explain the parameters that are set by this screen (see Figure 2-7) and give a brief description of each.

NOTE: The parameters are shown in the lower left of the pop-up screen for reference.

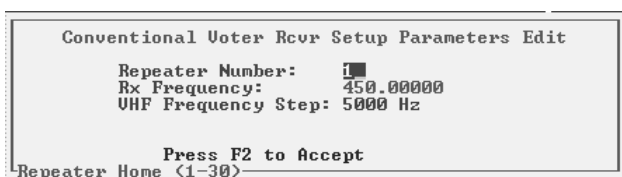


Figure 2-7 SETUP PARAMETERS

Repeater Number

Each CVR is programmed with a repeater number from 1-30 for reference. Number selection can be arbitrary as long as each CVR is assigned a different number.

Receiver Frequency

Each CVR is programmed with the frequency that it is operating on.

VHF Frequency Step

Using the space bar, select either:
5000 Hz or 6250 Hz for allowable frequency spacing.

EXAMPLE 1:

A receive frequency of 163.055 MHz would have a local oscillator (LO) frequency of
 $163.055 \text{ MHz} + 52.95 \text{ MHz} = 216.005 \text{ MHz}$.

Divide 216005000 by 5000 = 43201.00

Divide 216005000 by 6250 = 26088.80

Since 43201 is an integer, select 5000.

EXAMPLE 2:

A receive frequency of 163.0625 MHz would have a local oscillator (LO) frequency of
 $163.0625 \text{ MHz} + 52.95 \text{ MHz} = 216.012500 \text{ MHz}$.

Divide 216012500 by 6250 = 34562.00.

Divide 216012500 by 5000 = 32612.50

Since 34562 is an integer, select 6250.

To eliminate the chance of incorrect synthesizer settings arising from ambiguous frequencies, make sure this setting is correct.

Select Repeater

Select the repeater number to be programmed or edited from the pop-up menu (see Figure 2-8). Move the cursor with the arrow keys to highlight the repeater number and press Enter.

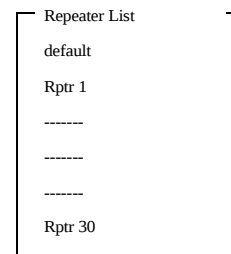


Figure 2-8 REPEATER LIST

Repeater Type Selection

This screen (see Figure 2-9) selects the repeater type and features:

Channel Bandwidth 15 kHz
 30 kHz
Frequency Range 132-150 MHz
 150-178 MHz

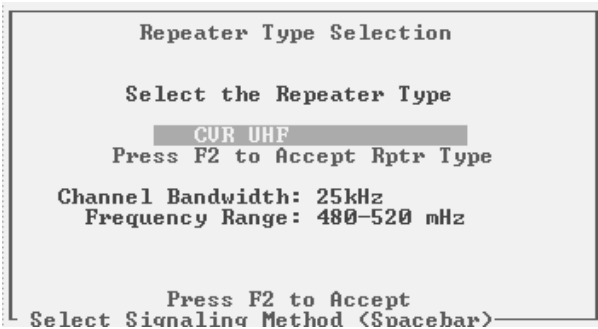


Figure 2-9 REPEATER TYPE SELECTION

Delete Repeater



Figure 2-10 DELETE REPEATER

2.2.4 TRANSFER



Figure 2-11 TRANSFER MENU

Write Setup Parameters

This command sends the contents of a file to the repeater and programs the EEPROM memory in the Interface board.

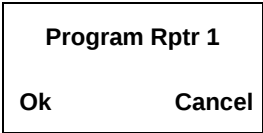


Figure 2-12 WRITE SETUP PARAMETERS

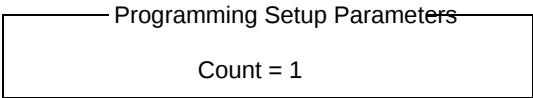


Figure 2-13 PROGRAM WRITE SETUP

Read Setup Parameters

This command reads the contents of the EEPROM memory of the Interface board and loads it into a buffer. The contents of the buffer is then displayed to show the programming of the repeater.

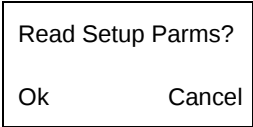


Figure 2-14 READ SETUP PARAMETERS

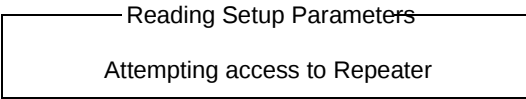


Figure 2-15 READING SETUP

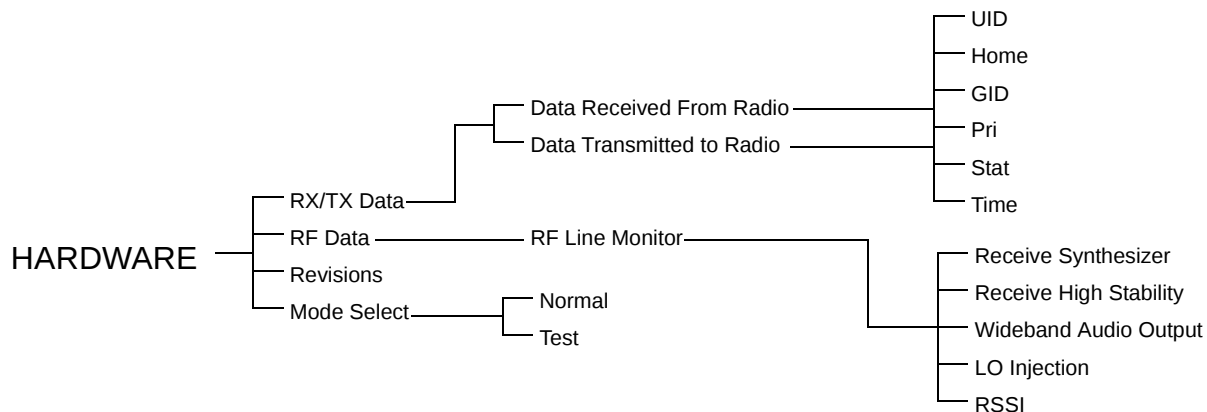


Figure 2-16 HARDWARE PROGRAMMING FLOWCHART

2.2.5 HARDWARE



Figure 2-17 HARDWARE MENU

RF Data

The A/D Monitor Screen shows the state of the lines (see Figure 2-18). These lines are being monitored by the A to D converter on the CVR Interface board. The normal values for each line are defined as follows.

Synthesizer Lock Lines	Yes or No
Wideband Audio Output	approx 200
LO Injection	approx 250
RSSI	20-150

Values with no label are the actual A to D reading.

RF Line Monitor for CVR		
Synthesizer Lock Lines	Receive Parameters	
Receive Synthesizer: Yes	Wideband Audio Output:	0
Receive High Stability: Yes	LO Injection:	0
	RSSI:	0

Figure 2-18 RF LINE MONITOR FOR CVR

Revision/Version

The Revision/Version is displayed for the repeater modules. The format for all modules is R.V. (revision.version). The MPC information also includes the software release date and the repeater serial number (see example in Figure 2-19).

Repeater Version Display	
Repeater Number:	1
HSDB:	00.020 MAC: 0.00 TIC: 0.00
MPC/TPI/CVR:	1.0 02/15/96 21
Serial Number:	1234567891234567

Figure 2-19 REVISION/VERSION

Mode Select

The Mode Select screen places the repeater either in the normal mode or the test mode. In the Normal mode the repeater operates as a normal repeater.

In the Test mode the repeater transmits a test word. This test word is the Test Mode ID set up in the Setup Parameters (see Table 2-1). While in the test mode the repeater is “busy”, therefore it is important to place the repeater in Normal mode when the test mode is no longer required.

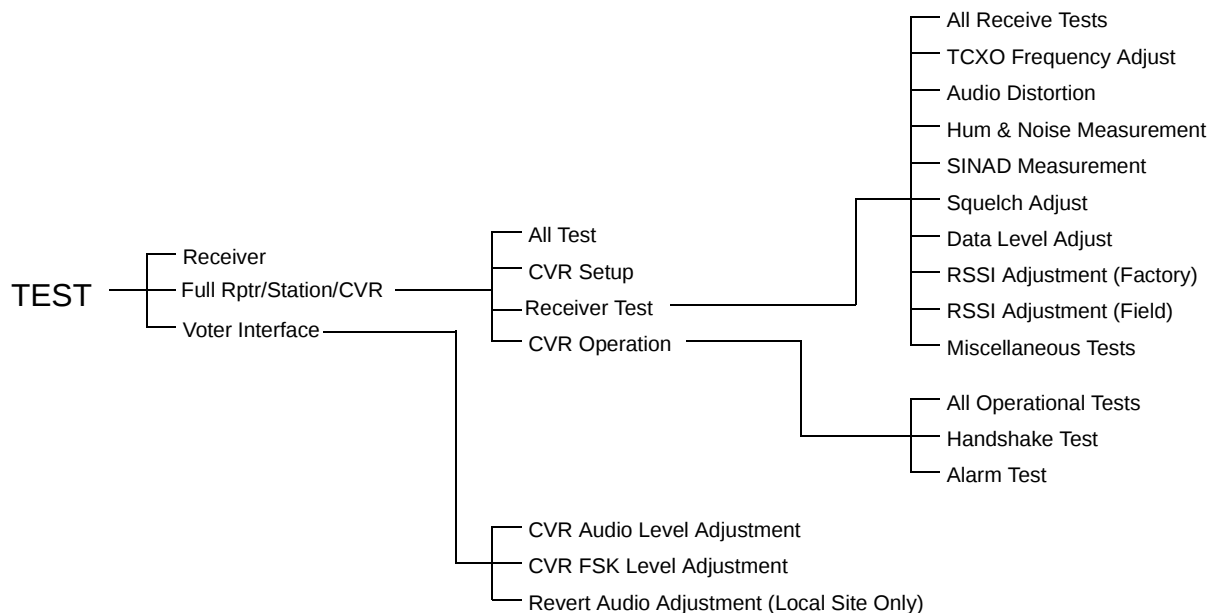
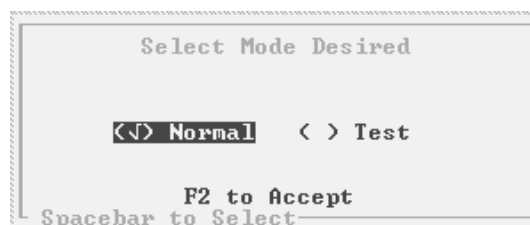


Figure 2-20 TEST PROGRAMMING FLOWCHART

2.2.6 TEST

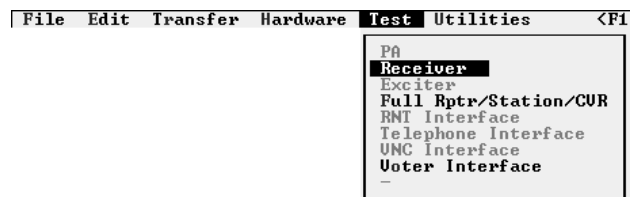


Figure 2-21 TEST MENU

Receiver

This menu selection walks through the alignment of the receiver on the computer screen. Refer to Sections 2.3 and 2.4 for the Receiver alignment in this manual and Figure 2-29 for an alignment points diagram and Figure 2-30 for the Receiver Test Setup.

Full CVR

This menu selection walks through the alignment of the entire CVR. The Receiver portion is a performance test and adjustment. The Audio and Data portions are level adjustments for the CVR Interface Board. Refer to Figure 2-28 for an alignment points diagram for the Interface Board.

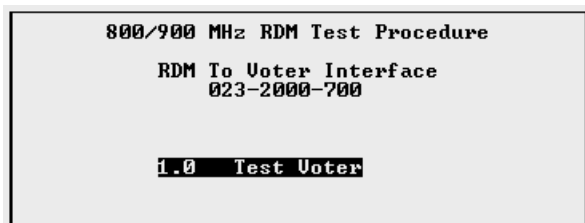
CVR To Voter Interface

Figure 2-22 CVR TO VOTER INTERFACE

This menu selection walks through the alignment of the audio output level setting of the receiver.

2.2.7 UTILITIES



Figure 2-23 UTILITIES MENU

COM Port

This is the COM port used to send and receive data from the Repeater MPC. An interface cable connects the Repeater to the computer (see Figure 2-25).

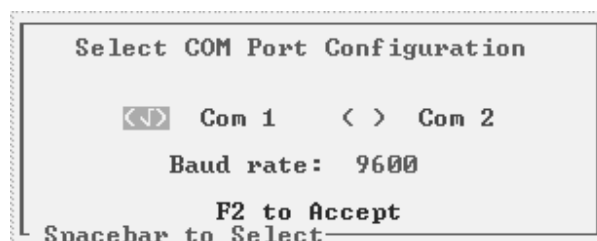


Figure 2-24 COM PORT SELECTION

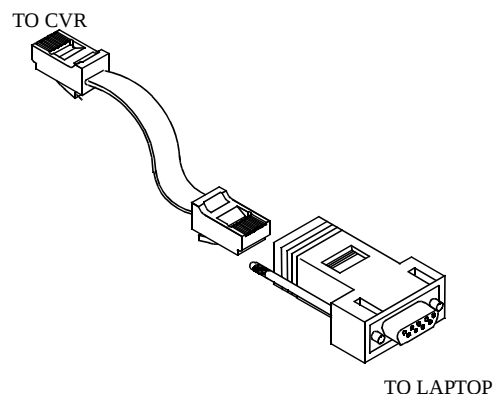


Figure 2-25 LAPTOP INTERCONNECT CABLE

Display Mode

This screen allows the color mode to be selected for color monitors. When using a laptop, monochrome is recommended for better resolution.

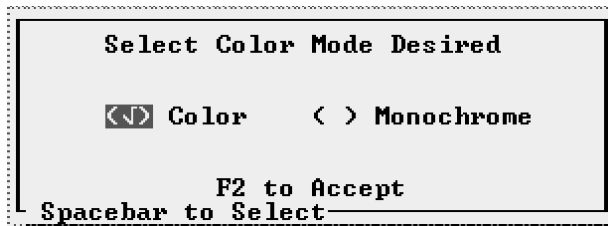


Figure 2-26 COLOR MODE SELECTION

Alarm Display

This screen displays a scrolling list of alarms generated by the repeater.

User Level

There are two levels to choose from, Novice and Advanced. The Novice uses prompts in the Edit-Parameters screens when Escape or F2 keys are pressed that ask "are you sure" before the task is executed. The Advanced selection performs the task without asking the question.

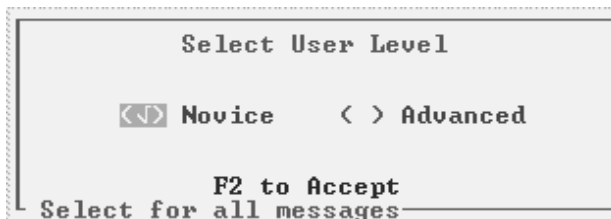


Figure 2-27 USER LEVEL

2.2.8 CVR PROGRAMMING

Creating A New File

An example will be used to show the programming for a new file created for Site 1.

NOTE: At any point in the programming sequence, if F1 is selected, a help screen appears to explain the menu selection highlighted at that point.

Select CVR To Edit

A CVR is selected to program. When no file exists with programmed CVRs, the default is selected and edited.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. Default is the only repeater in this list, press Enter.
4. Highlight EDIT, press Enter.
5. Highlight SETUP PARAMETERS, press Enter.
6. The Setup Parameters screen appears (see Figure 2-30). Fill in the parameters for this repeater. A brief description of the parameters is in Table 2-1. Full descriptions are in Section 2.2.3.
7. Select parameters, press F2 to accept.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Type in a valid DOS filename.
For this example site1.dat is used.
12. The file consists of default and CVR one under the filename of site1.dat.

Adding A CVR To A File

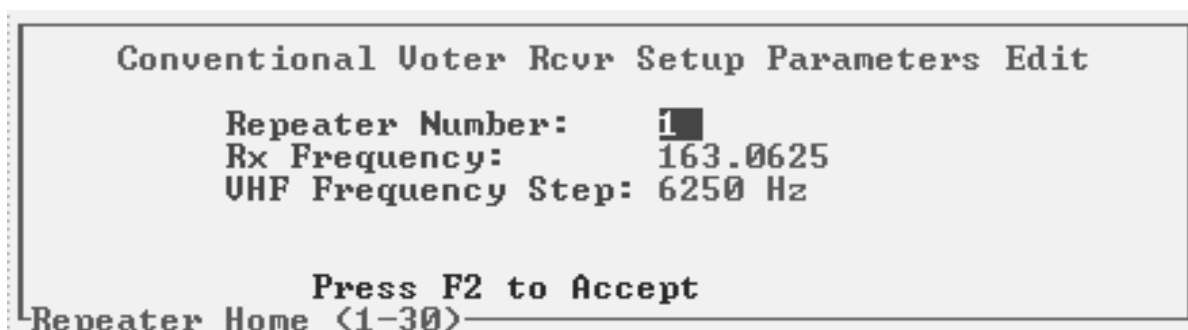
The example used for Site 1 will again be used to add CVRs to the filename site1.dat.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. The repeater list shown for this file includes default and repeater one. These contain the same parameters with the exception that when selected for edit the programmed repeater can be overwritten and the data lost.

4. Highlight DEFAULT, press Enter.
5. Highlight EDIT, press Enter.
6. Highlight SETUP PARAMETERS, press Enter.
7. Change the Repeater number and other parameters as required for this repeater, press F2.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Repeater 2 is added to the Repeater List in file site1.dat.

Table 2-1 CVR SETUP PARAMETERS

Parameter	Response	Description
Repeater Number	1-30	Each receiver is assigned a number from 1-30 for reference.
Receive Frequency	VHF UHF 800 MHz	Each receiver is programmed with a frequency or channel number that it is operating on.
VHF Frequency Step	5000 Hz 6250 Hz	This is the allowable frequency spacing to eliminate the chance of incorrect synthesizer settings arising from ambiguous frequencies.



2.3 VHF RECEIVER ALIGNMENT

CRITICAL ADJUSTMENT

The TCXO must be adjusted within 5 minutes of turning the AC power on to the repeater. Do not under any circumstances try to set frequency later on in any of the tests, as TCXO frequency stability cannot then be guaranteed.

Refer to Figure 2-29 for component locations. Refer to Figure 2-30 for equipment needed and setup diagram. Select "RECEIVER" from the "TEST" menu in the Repeater Software.

2.3.1 PRETEST

For 15 kHz operation, place jumper plugs P203, P204 and P205 across pins 2-3 of J203, J204 and J205.

For 30 kHz operation, place jumper plugs P203, P204 and P205 across pins 1-2 of J203, J204 and J205.

2.3.2 VOLTAGE MEASUREMENTS

Apply power to the Receiver by plugging the 20-pin cable from the RF Interface Board into J201 (see Figure 2-29).

Measure the voltages at the following pins.

U301, pin 3	+6V DC $\pm 0.3V$
U302, pin 3	+12V DC $\pm 0.4V$
U303, pin 3	+12V DC $\pm 0.4V$
U304, pin 3	+12V DC $\pm 0.4V$
R402/R403 junction	+3.5V DC $\pm 0.1V$

2.3.3 PROGRAM TUNE-UP CHANNEL

For Receivers operating between:
132-150 MHz, 150-178 MHz.

1. Using the PC and software, program the Synthesizer for the Receive frequency.

2. Tune the VCO inductor L102 for +7V DC $\pm 0.05V$ at TP401.
Increase the receive frequency by 1 MHz.
The voltage on TP401 shall be less than 15V.
Decrease the receive frequency by 1 MHz.
The voltage on TP401 shall be greater than 2.5V.
3. Alternately tune CV151 and CV152 in small increments until a voltage is measured at TP401. At that time, tune CV151 for a peak, then CV152 for a peak.
4. Retune CV151/CV152 for a peak at TP401.

For Receivers operating within 2 MHz of the top of the receive band (148-150 or 176-178 MHz).

1. Program the Synthesizer for the *Highest* receive frequency (i.e. 150 or 178 MHz).
2. Set the control line voltage for 15V at TP401.
Check 2 MHz *below* the programmed frequency (i.e. 148 or 176 MHz) to verify that the control voltage at TP401 is *greater than* 2V. The repeater receiver can now be programmed for the desired operating frequency.

For Receivers operating within 2 MHz of the bottom of the receive band (132-134 or 150-152 MHz).

1. Program the Synthesizer for the *Lowest* receive frequency (i.e. 132 or 150 MHz).
2. Set the control line voltage for 2V at TP401.
Check 2 MHz *above* the programmed frequency (i.e. 134 or 176 MHz) to verify that the control voltage at TP401 is *less than* 15V. The repeater receiver can now be programmed for the desired operating frequency.

NOTE: The Channel Frequency and Synthesizer Frequency appear at the bottom of the screen.

2.3.4 RECEIVER FREQUENCY ADJUST

1. Place a pick-up loop (sniffer) or RF probe connected to a frequency counter near TP102.
2. Set Y401 (TCXO) for the Injection Frequency ± 50 Hz
(Inj Freq = chnl freq + 52.95 MHz).

2.3.5 VCO TEST

1. The software programs the synthesizer for 1 MHz above the receive channel.
2. The voltage on TP401 should be $< 10V$.
3. Record the voltage on TP401 _____.
4. The software programs the synthesizer for 1 MHz below the receive channel.
5. The voltage on TP401 should be $> 4V$.
6. Record the voltage on TP401 _____.
7. If the voltages recorded in Steps 3 and 6 are not within $\pm 0.2V$, tune L102 as required to balance the voltage readings.
8. The software programs the synthesizer for the receive frequency.

2.3.6 FRONT END ADJUSTMENTS

NOTE: Verify that the appropriate IF jumpers (J203, J204, J205) are selected.

1. Set the signal generator to the receive frequency at a level sufficient to produce an output voltage at TP201 or J201, pin 7 (RSSI Output).
2. Tune CV101, CV102, CV103, CV104, CV105, and CV106, then repeat, for a peak voltage at TP201. Decrease the generator output level to maintain a 2-3V reading at TP201.

FOR 15 kHz CHANNELS:

NOTE: Perform this test if CV211 and CV212 are placed on the board.

1. Set the generator to an RF level sufficient to produce 2V DC at TP201.
2. Remove any modulation from the signal generator.
3. Increase the signal generator RF frequency 2.5 kHz.
4. Adjust CV211 for peak DC voltage at TP201.
5. Adjust CV212 for peak DC voltage at TP201.
6. Reset the signal generator to the tune-up frequency.
7. Set the signal generator to 100 μV into the receiver with a 1 kHz tone at ± 1.5 kHz deviation.
(1000 μV at the generator with 20 dB pad gives 100 μV at the receive antenna.)
8. Tune Z215 for 2V $\pm 0.05V$ at U203, pin 9.
9. Tune RV215 for 387 mV RMS, ± 5 mV RMS, at TP202.
10. Adjust RV212 for 2V $\pm 0.05V$ at TP202.
11. Connect a distortion analyzer to TP202.
12. Tune L211, L213, L214 and L216 for minimum distortion $< 5\%$, (typically $< 3\%$).
13. Repeat Step 12 then Steps 8, 9 and 10.

FOR 30 kHz CHANNELS:

NOTE: Perform this test if CV201 and CV202 are placed on the board.

1. Set the generator to an RF level sufficient to produce 2V DC at TP201.
2. Remove any modulation from the signal generator.
3. Increase the signal generator RF frequency 5 kHz.
4. Adjust CV201 for peak DC voltage at TP201.
5. Adjust CV202 for peak DC voltage at TP201.
6. Reset the signal generator to the tune-up frequency.

7. Set the generator to 100 μV into the receiver with a 1 kHz tone at ± 3 kHz deviation.
(1000 μV at the generator with 20 dB pad gives 100 μV at the receive antenna.)
8. Tune Z205 for 2V $\pm 0.05\text{V}$ at U201, pin 9.
9. Tune RV203 for 387 mV RMS, ± 5 mV RMS, at TP202.
10. Adjust RV202 for 2V $\pm 0.05\text{V}$ at TP202.
11. Connect a distortion analyzer to TP202.
12. Tune L201, L203, L204 and L206 for minimum distortion $< 5\%$, (typically $< 3\%$).
13. Repeat Step 12 then Steps 8, 9 and 10.

2.3.7 AUDIO DISTORTION

1. **On the Interface Board**, plug a 16 ohm load at J104.
2. Connect a distortion analyzer to the 16 ohm load.
3. **On the Interface Board**, measure the distortion of the receive audio at J104 with the local volume control set to 2.8V RMS.
4. The reading shall be less than 3%.
(Typically less than 1%.)
5. **On the Interface Board**, measure receive sensitivity at J104.
6. The reading should be less than 0.35 μV .
(Typically 0.25 μV .)
7. The software programs the synthesizer for 1 MHz above the Receive frequency.
8. Receive sensitivity should be less than 0.35 μV .
(Typically less than 0.30 μV .)
9. The software programs the synthesizer for 1 MHz below the Receive frequency.
10. Receive sensitivity should be less than 0.35 μV .
(Typically less than 0.30 μV .)
11. Adjust the signal generator level to produce 15 dB SINAD.
12. Adjust RV201 for 0.5V $\pm 0.02\text{V}$ at TP201.

2.4 FULL CVR TEST

1. Select TEST - FULL RPTR/STATION/CVR and press Enter.

NOTE: All audio generators and audio voltmeters are unbalanced unless specifically stated otherwise.

2.4.1 VOLTAGE MEASUREMENTS

1. Disconnect the receiver-to-interface cable (20-pin) from J201 of the Interface board.
2. Apply power to the Interface board.
3. Measure the voltages at the following pins.

U221, pin 1	+12V DC $\pm 0.4\text{V}$
U223, pin 2	+9V DC $\pm 0.4\text{V}$
U224, pin 2	+5V DC $\pm 0.2\text{V}$
U204, pin 7	+1.25V DC $\pm 0.06\text{V}$
Junction of L202/C279	-5V DC $\pm 0.4\text{V}$
4. Apply power to the Receiver by plugging the 20-pin cable from the Interface Board into J201 (see Figure 2-29).

2.4.2 RECEIVER FREQUENCY CHECK

1. Check the receiver injection frequency with a "sniffer" pickup loop, or RF probe and a suitable frequency counter placed near TP102.
2. TCXO Adjustment

Set Y401 (TCXO) for the Injection Frequency ± 50 Hz (Inj Freq = chnl freq + 52.95 MHz).

Receiver Audio Distortion Measurement

1. Adjust the RF generator for 100 μV into the receiver with a 1 kHz tone at ± 3 kHz deviation.
2. Adjust R207 for 0 dBm (775 mV RMS) at J210.

3. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
4. Adjust R262 for 2.8V RMS and measure the distortion. Distortion should be < 3%.

Receiver Hum and Noise Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. Remove modulation from the RF generator. The measured level must be ≤ -45 dB.

Receiver SINAD Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. 12 dB SINAD reading should be ≤ 0.35 μ V.

Receiver Squelch Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. Set the RF generator output for 5 dB SINAD.
5. **On the Interface Board**, adjust R222 so the Receiver just squelches.
6. Increase the RF generator output until the Receiver unsquelches. Reading should be ≤ 10 dB SINAD.

Receiver Data Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 100 Hz tone at ± 1 kHz.
2. Insert voltmeter probes into J202 on the Interface Board and connect to an AC voltmeter.
3. Adjust R248 to achieve 340 mV RMS (-7.1 dBm).

Receiver RSSI Adjustment

NOTE: Use this procedure only when an audio analyzer is unavailable.

1. Adjust the RF generator for 0.29 μ V into the Receiver with a 1 kHz tone at ± 3 kHz.
2. Adjust R261 in the Receiver for 0.8V DC (± 0.02 V DC) at TP3.

Receiver Miscellaneous Tests (Optional)

Several additional tests may be performed on the Receiver as listed below:

- Signal Displacement Bandwidth
- Adjacent Channel Rejection
- Offset Channel Selectivity
- Intermodulation Rejection
- Spurious Rejection
- Audio Response
- Audio Sensitivity

Perform the Test desired using the appropriate RF Generators, modulation frequencies, levels, RS-232 levels and test probes following the latest TIA document measurement procedures.

Alarm Test

1. The CVR is now in Normal Operation mode.
2. Verify the front panel display does not indicate any alarms (see Table 2-2).

Table 2-2 ALARMS

Display No.	Definition
0	Test Mode
1	Not Used
2	Normal Operation
3	Revert Operation
4	Receiving Data
5	Not Used
6	Not Used
7	Receive Synthesizer Out of Lock
8	High Stability Synth Out of Lock
9	Data Processor Failure
A	Not Used
B	Not Used
C	Downloading Code
D	Not Used
E	Erasing Code
F	Failure

2.4.3 VOTER INTERFACE

CVR Audio Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 1.5 kHz.
2. Connect a **balanced** AC voltmeter between J205, pin 2 and J206, pin 2. Connect a 600 ohm termination to the meter terminals or across J101, pins 5/6.
3. Adjust R271 on the Interface Board for the type of line.

Leased Line/Direct Connect (default)
-12 dBm (194 mV RMS)

Microwave/T1 (optional)
-28 dBm (31 mV RMS)

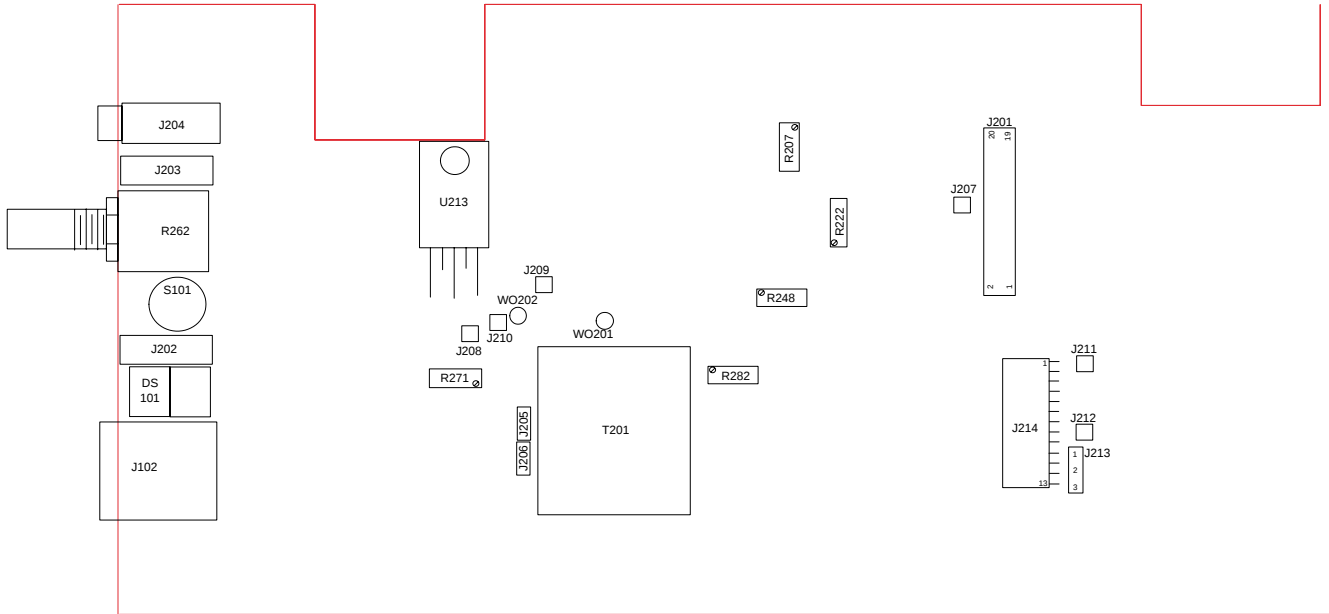


Figure 2-28 INTERFACE BOARD ALGINMENT POINTS

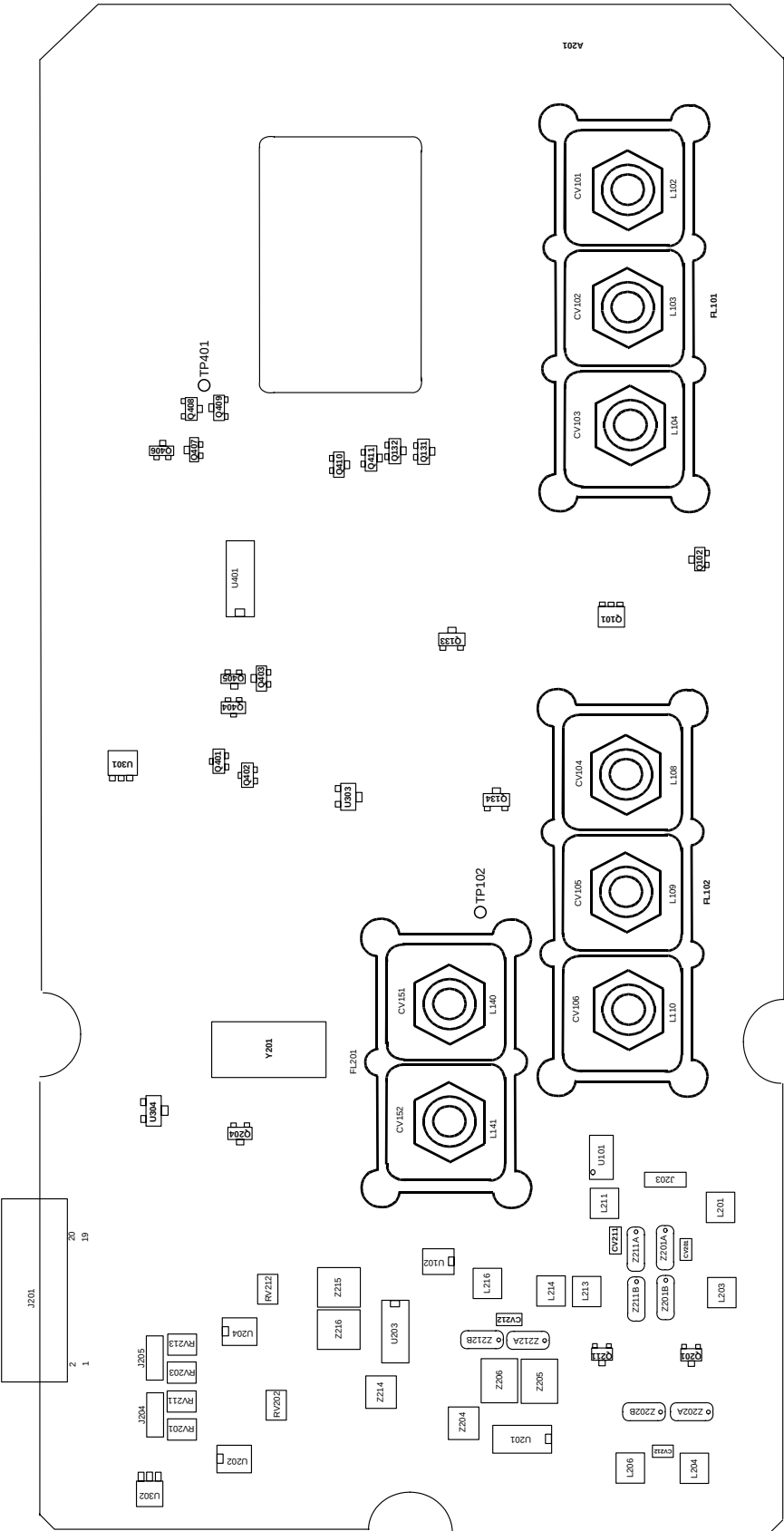


Figure 2-29 RECEIVER ALIGNMENT POINTS

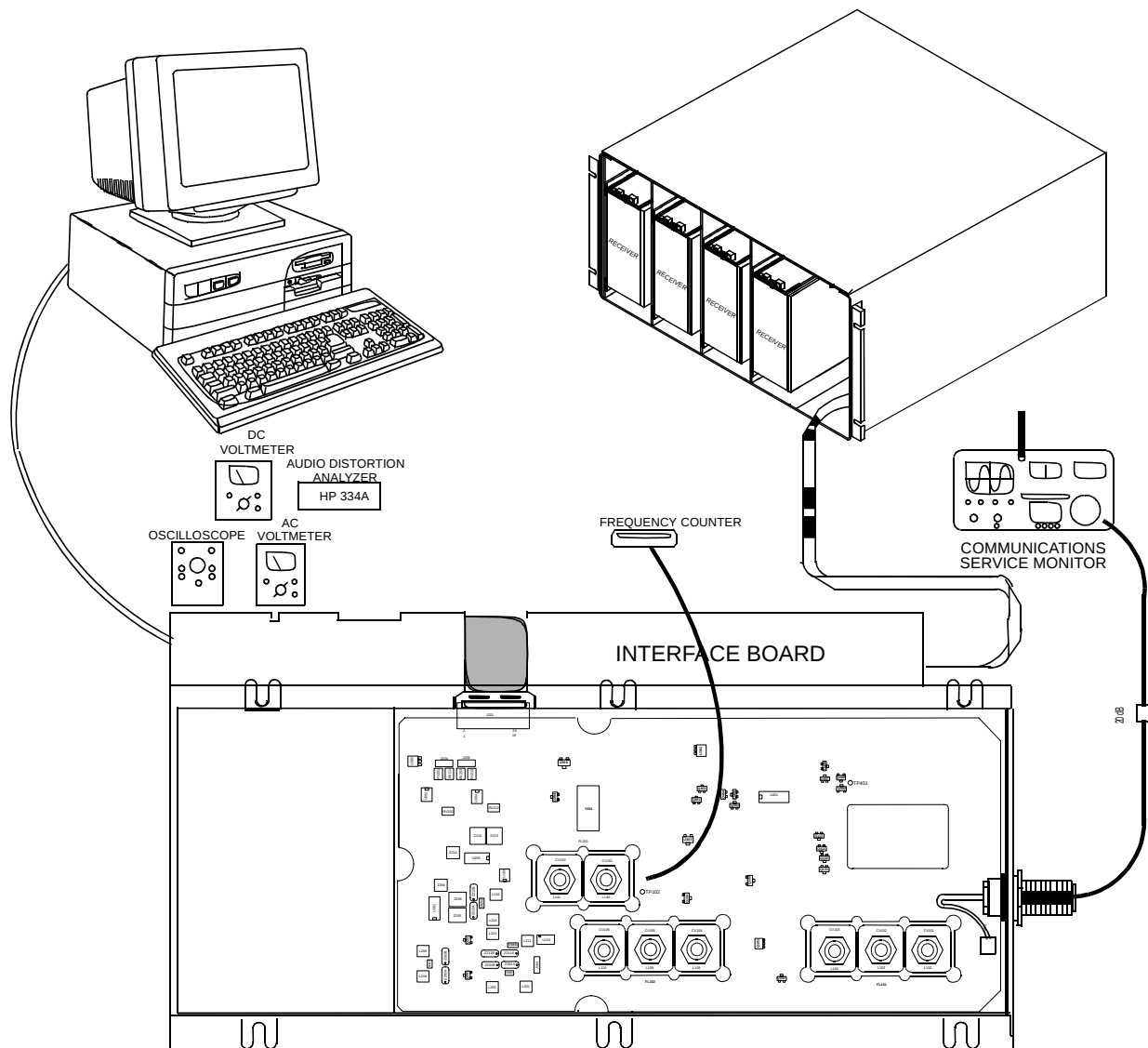


Figure 2-30 RECEIVER TEST SETUP

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
VHF VOTING RECEIVER PART NO. 023-2031-220			C 114	15 pf 50V ceramic chip	022-3908-096
A 200	Audio/Logic Interface Board	023-2000-720	C 115	1000 pf 50V ceramic chip	022-3908-068
A 201	Receiver Board (150-178 MHz)	585-2081-270	C 116	1000 pf 50V ceramic chip	022-3908-068
A 202	20-pin ribbon cable	023-2000-703	C 118	22 μ F 25V electrolytic	022-3908-016
EP200	RF shield gasket 0.156 OD	574-3002-036	D 101	Varactor	022-3908-119
EP201	Heat sink insulator TO-220	574-5005-060	L 101	10 μ H inductor	022-3908-019
HW200	4-40 x 0.063 NPB nut	560-2104-006	L 102	3.5 turn inductor	022-3908-129
HW201	10-32 x 0.375 CPS nut	560-1110-012	L 103	1 μ H inductor	022-3908-020
HW202	6-32 panhead TORX ZPS	575-0006-010	L 104	.1 μ H inductor	022-3908-137
HW203	6-32 mach panhead phil ZPS	575-1606-008	Q 101	NPN SOT-23	022-3908-010
HW204	6-32 mach panhead phil ZPS	575-1606-016	Q 102	NPN SOT-23	022-3908-010
HW205	#4 shakeproof washer	596-1104-008	Q 103	NPN SOT-23	022-3908-010
HW206	6 x 0.018 lockwasher int CPS	596-1106-009	Q 104	NPN SOT-23	022-3908-008
HW207	#10 flat washer	596-1410-016	R 101	10k ohm 1/8W chip	022-3908-029
HW208	4-40 mach panhead phil ZPS	575-1604-012	R 102	22k ohm 1/8W chip	022-3908-040
HW209	5/8 x 0.02 lockwasher int ZPS	596-9119-028	R 103	470 ohm 1/8W chip	022-3908-050
HW210	5/8-24 x 0.094 hex nut NPB	560-9079-028	R 104	47 ohm 1/8W chip	022-3908-049
MP200	Housing	015-0902-011	R 105	100 ohm 1/8W chip	022-3908-027
MP201	Deck cover	015-0902-015	R 106	3.3k ohm 1/8W chip	022-3908-045
MP202	Mounting plate	017-2210-152	R 107	3.3k ohm 1/8W chip	022-3908-045
MP203	1/4 hex brass M/F spacer	312-7483-008	R 108	4.7K ohm 1/8W chip	022-3908-051
MP204	1/4 hex brass M/F spacer	312-7473-008	R 109	560 ohm 1/8W chip	022-3908-057
U 223	+9V regulator TO-220	544-2003-059	R 110	100 ohm 1/8W chip	022-3908-027
U224	+5V regulator TO-220	544-2003-091	R 112	3.3k ohm 1/8W chip	022-3908-045
RECEIVE VCO 132-150 MHz A401			15/30 kHz RECEIVER PART NO. 585-2061-270 (132-150 MHz) PART NO. 585-2081-270 (150-178 MHz)		
C 101	100 pF 50V ceramic chip	022-3908-093	A 201	Cable assembly	023-2000-161
C 102	2 pF 50V ceramic chip	022-3908-112	A 401	VCO Unit	022-3908-186
C 103	5 pF 50V ceramic chip	022-3908-085	C 101	10 pF 50V ceramic chip	022-3908-090
C 104	7 pF 50V ceramic chip	022-3908-088	C 102	10 pF 50V ceramic chip	022-3908-090
C 105	56 pF 50V ceramic chip	022-3908-108	C 103	220 pF 50V ceramic chip	022-3908-100
C 106	56 pf 50V ceramic chip	022-3908-108	C 104	10 pF 50V ceramic chip	022-3908-090
C 107	10 pf 50V ceramic chip	022-3908-092	C 105	4.7 μ F 20V tantalum chip	022-3908-160
C 108	1000 pf 50V ceramic chip	022-3908-068	C 106	470 pF 50V ceramic chip	022-3908-107
C 109	.1 μ F ceramic chip	022-3908-114	C 107	4.7 μ F 20V tantalum chip	022-3908-160
C 110	1000 pf 50V ceramic chip	022-3908-068	C 108	470 pF 50V ceramic chip	022-3908-107
C 111	47 pF 50V ceramic chip	022-3908-105	C 109	10 pF 50V ceramic chip	022-3908-090
C 112	10 pf 50V ceramic chip	022-3908-092	C 130	470 pF 50V ceramic chip	022-3908-107
C 113	1000 pf 50V ceramic chip	022-3908-068	C 131	5 pF 50V ceramic chip	022-3908-085
			C 132	10 pF 50V ceramic chip	022-3908-090

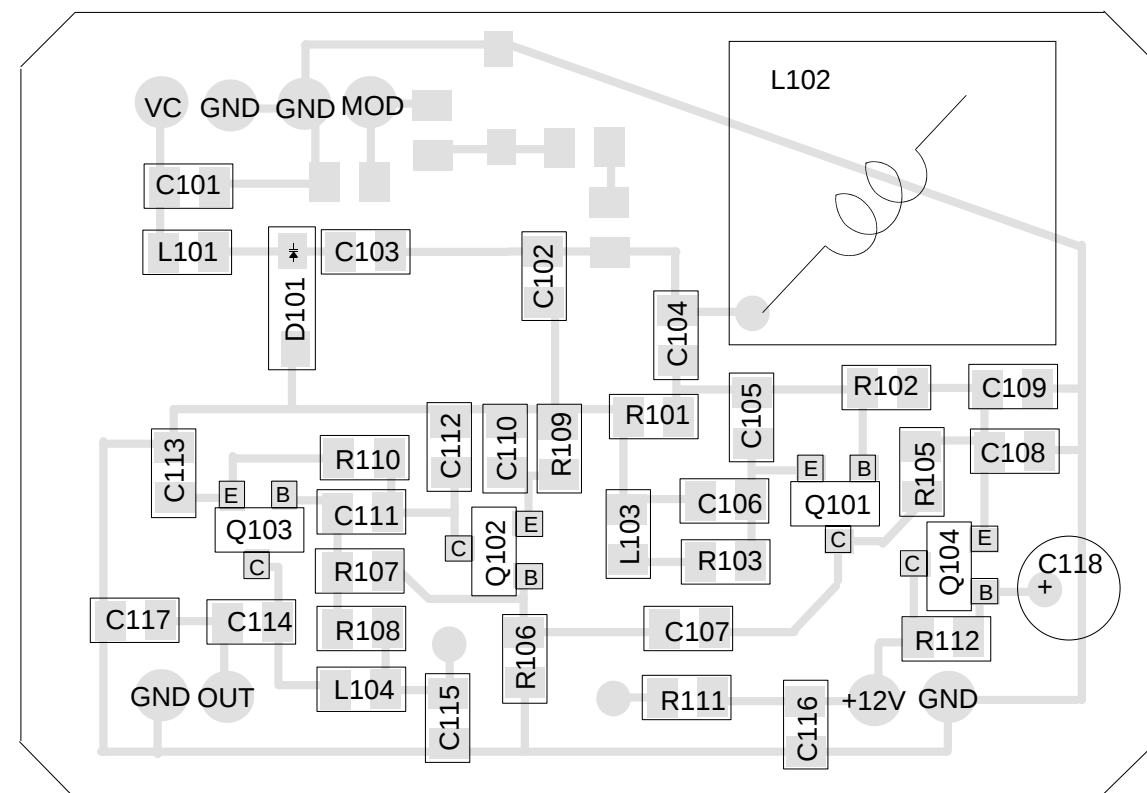
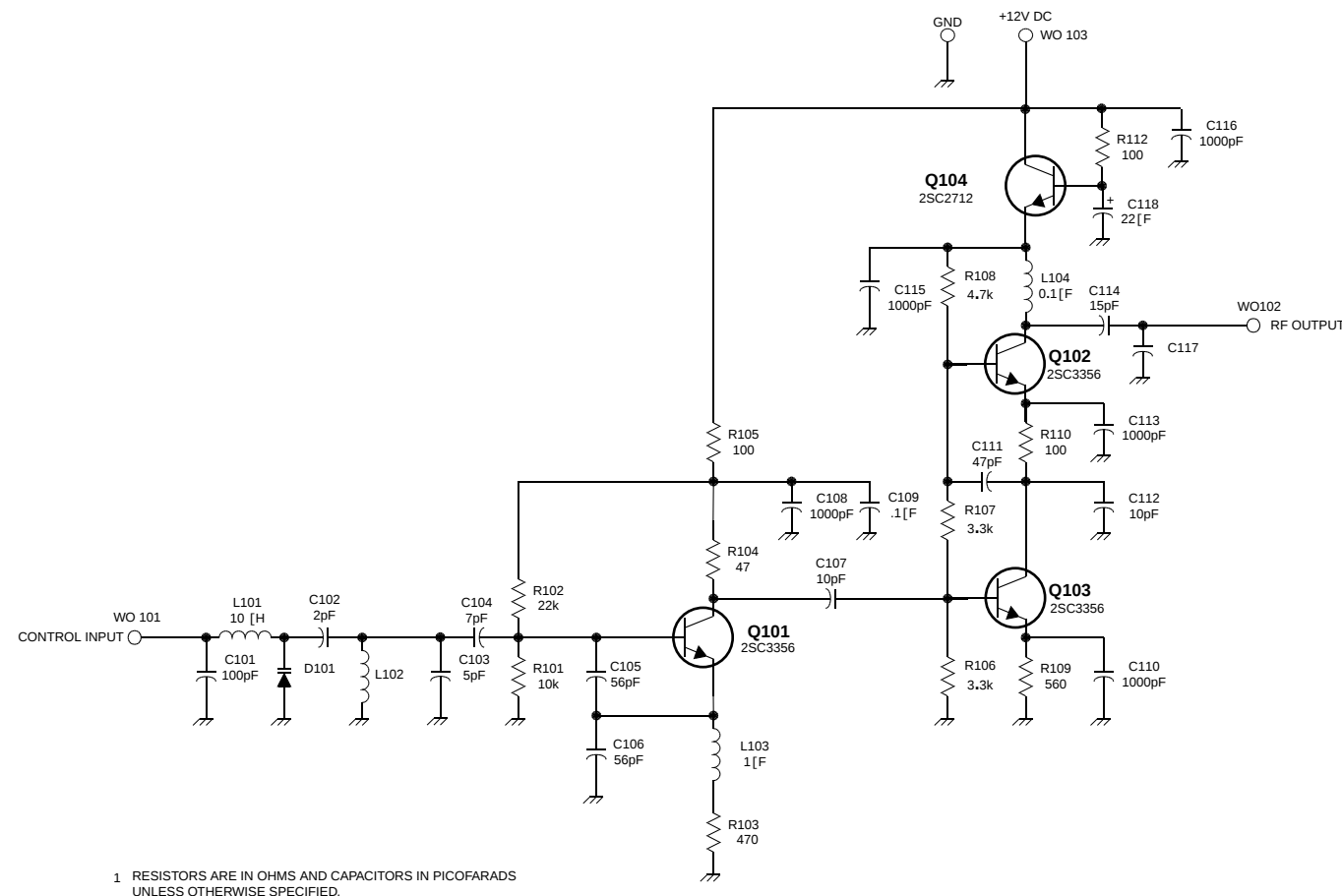
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 133	470 pF 50V ceramic chip	022-3908-107	C 219	.1 μ F 50V ceramic chip	022-3908-114
C 134	.01 μ F 50V ceramic chip	022-3908-070	C 220	.1 μ F 50V ceramic chip	022-3908-114
C 135	.01 μ F 50V ceramic chip	022-3908-070	C 221	1000 pF 50V ceramic chip	022-3908-068
C 136	470 pF 50V ceramic chip	022-3908-107	C 223	1000 pF 50V ceramic chip	022-3908-068
C 137	470 pF 50V ceramic chip	022-3908-107	C 225	.1 μ F 50V ceramic chip	022-3908-114
C 138	470 pF 50V ceramic chip	022-3908-107	C 226	1000 pF 50V ceramic chip	022-3908-068
C 139	470 pF 50V ceramic chip	022-3908-107	C 227	4.7 μ F 20V tantalum chip	022-3908-160
C 140	470 pF 50V ceramic chip	022-3908-107	C 228	27 pF 50V ceramic chip	022-3908-102
C 144	.01 μ F 50V ceramic chip	022-3908-070	C 236	10 pF 50V ceramic chip	022-3908-090
C 145	.01 μ F 50V ceramic chip	022-3908-070	C 237	39 pF 50V ceramic chip	022-3908-103
C 146	12 pF 50V ceramic chip	022-3908-095	C 238	5 pF 50V ceramic chip	022-3908-085
C 147	47 pF 50V ceramic chip	022-3908-105	C 240	39 pF 50V ceramic chip	022-3908-103
C 148	4.7 μ F 20V tantalum chip	022-3908-160	C 241	10 pF 50V ceramic chip	022-3908-090
C 149	1000 pF 50V ceramic chip	022-3908-068	C 242	1000 pF 50V ceramic chip	022-3908-068
C 150	.01 μ F 50V ceramic chip	022-3908-070	C 243	.01 μ F 50V ceramic chip	022-3908-070
C 151	470 pF 50V ceramic chip	022-3908-107	C 244	4.7 μ F 20V tantalum chip	022-3908-160
C 152	15 pF 50V ceramic chip	022-3908-096	C 245	8 pF 50V ceramic chip	022-3908-089
C 153	22 pF 50V ceramic chip	022-3908-099	C 246	.01 μ F 50V ceramic chip	022-3908-070
C 154	1000 pF 50V ceramic chip	022-3908-068	C 247	39 pF 50V ceramic chip	022-3908-103
C 155	1000 pF 50V ceramic chip	022-3908-068	C 248	5 pF 50V ceramic chip	022-3908-085
C 156	1000 pF 50V ceramic chip	022-3908-068	C 250	6 pF 50V ceramic chip	022-3908-086
C 157	100 pF 50V ceramic chip	022-3908-093	C 251	39 pF 50V ceramic chip	022-3908-103
C 158	2.2 μ F 20V tantalum chip	022-3908-159	C 252	3.9 pF 50V ceramic chip	022-3908-083
C 159	1000 pF 50V ceramic chip	022-3908-094	C 253	.01 μ F 50V ceramic chip	022-3908-070
C 160	470 pF 50V ceramic chip	022-3908-107	C 254	1000 pF 50V ceramic chip	022-3908-068
C 161	4.7 μ F 20V tantalum chip	022-3908-160	C 255	.1 μ F 50V ceramic chip	022-3908-114
C 162	10 pF 50V ceramic chip	022-3908-090	C 256	.1 μ F 50V ceramic chip	022-3908-114
C 163	15 pF 50V ceramic chip	022-3908-096	C 257	.1 μ F 50V ceramic chip	022-3908-114
C 164	1000 pF 50V ceramic chip	022-3908-068	C 258	1000 pF 50V ceramic chip	022-3908-068
C 165	1 pF 50V ceramic chip	022-3908-111	C 261	1000 pF 50V ceramic chip	022-3908-068
C 166	1000 pF 50V ceramic chip	022-3908-068	C 262	4.7 μ F 20V tantalum chip	022-3908-160
C 169	12 pF 50V ceramic chip	022-3908-095	C 263	27 pF 50V ceramic chip	022-3908-102
C 201	10 pF 50V ceramic chip	022-3908-090	C 265	100 pF 50V ceramic chip	022-3908-093
C 202	39 pF 50V ceramic chip	022-3908-103	C 266	.01 μ F 50V ceramic chip	022-3908-070
C 203	5 pF 50V ceramic chip	022-3908-085	C 267	4.7 μ F 20V tantalum chip	022-3908-160
C 205	39 pF 50V ceramic chip	022-3908-103	C 268	.01 μ F 50V ceramic chip	022-3908-070
C 206	10 pF 50V ceramic chip	022-3908-090	C 269	1000 pF 50V ceramic chip	022-3908-068
C 207	4.7 μ F 20V tantalum chip	022-3908-160	C 270	6 pF 50V ceramic chip	022-3908-086
C 208	.01 μ F 50V ceramic chip	022-3908-070	C 271	220 pF 50V ceramic chip	022-3908-075
C 209	1000 pF 50V ceramic chip	022-3908-068	C 275	100 pF 50V ceramic chip	022-3908-093
C 210	8 pF 50V ceramic chip	022-3908-089	C 276	.01 μ F 50V ceramic chip	022-3908-070
C 211	.1 μ F 50V ceramic chip	022-3908-114	C 277	4.7 μ F 20V tantalum chip	022-3908-160
C 212	39 pF 50V ceramic chip	022-3908-103	C 278	.01 μ F 50V ceramic chip	022-3908-070
C 213	5 pF 50V ceramic chip	022-3908-085	C 280	220 pF 50V ceramic chip	022-3908-075
C 215	8 pF 50V ceramic chip	022-3908-089	C 281	220 pF 50V ceramic chip	022-3908-075
C 216	4 pF 50V ceramic chip	022-3908-084	C 282	5 pF 50V ceramic chip	022-3908-085
C 218	.01 μ F 50V ceramic chip	022-3908-070	C 283	120 pF 50V ceramic chip	022-3908-074

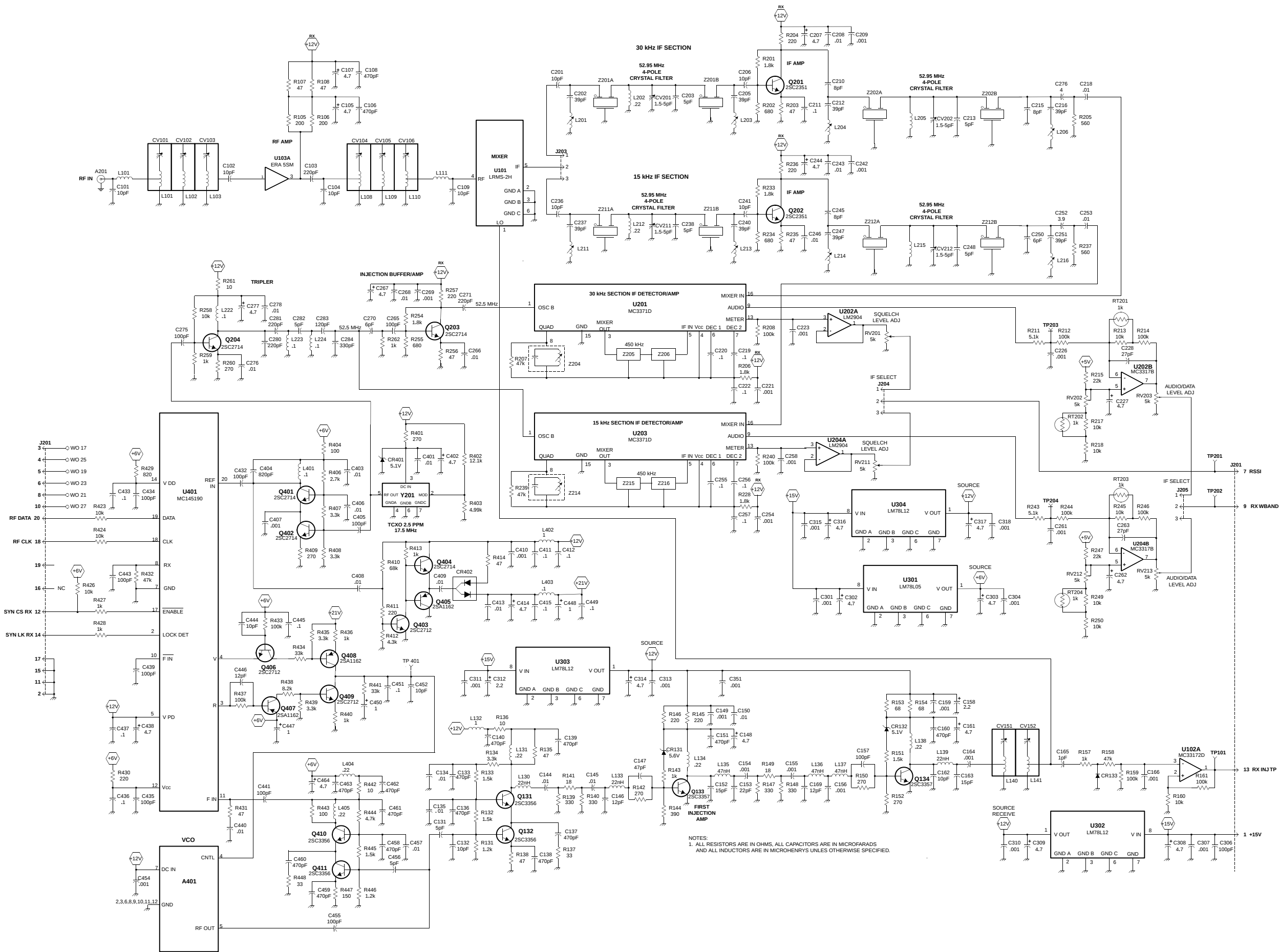
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 284	330 pF 50V ceramic chip	022-3908-077	C 446	12 pF 50V ceramic chip	022-3908-095
C 301	1000 pF 50V ceramic chip	022-3908-068	C 447	1 μ F 16V tantalum chip	022-3908-155
C 302	4.7 μ F 20V tantalum chip	022-3908-160	C 448	1 μ F 16V tantalum chip	022-3908-155
C 303	4.7 μ F 20V tantalum chip	022-3908-160	C 449	.1 μ F 50V ceramic chip	022-3908-114
C 304	1000 pF 50V ceramic chip	022-3908-068	C 450	1 μ F 50V poly film	022-3908-013
C 306	100 pF 50V ceramic chip	022-3908-093	C 451	.1 μ F 50V ceramic chip	022-3908-114
C 307	1000 pF 50V ceramic chip	022-3908-068	C 452	10 pF 50V ceramic chip	022-3908-090
C 308	4.7 μ F 20V tantalum chip	022-3908-160	C 454	1000 pF 50V ceramic chip	022-3908-068
C 309	4.7 μ F 20V tantalum chip	022-3908-160	C 455	100 pF 50V ceramic chip	022-3908-093
C 310	1000 pF 50V ceramic chip	022-3908-068	C 456	5 pF 50V ceramic chip	022-3908-085
C 311	1000 pF 50V ceramic chip	022-3908-068	C 457	.01 μ F 50V ceramic chip	022-3908-070
C 312	2.2 μ F 20V tantalum chip	022-3908-159	C 458	470 pF 50V ceramic chip	022-3908-107
C 313	1000 pF 50V ceramic chip	022-3908-068	C 459	470 pF 50V ceramic chip	022-3908-107
C 314	4.7 μ F 20V tantalum chip	022-3908-160	C 460	470 pF 50V ceramic chip	022-3908-107
C 315	1000 pF 50V ceramic chip	022-3908-068	C 461	470 pF 50V ceramic chip	022-3908-107
C 316	4.7 μ F 20V tantalum chip	022-3908-160	C 462	470 pF 50V ceramic chip	022-3908-107
C 317	4.7 μ F 20V tantalum chip	022-3908-160	C 463	470 pF 50V ceramic chip	022-3908-107
C 318	1000 pF 50V ceramic chip	022-3908-068	C 464	4.7 μ F 20V tantalum chip	022-3908-160
C 351	1000 pF 50V ceramic chip	022-3908-068			
C 401	.01 μ F 50V ceramic chip	022-3908-070	CR131	5.1V zener	022-3908-151
C 402	4.7 μ F 20V tantalum chip	022-3908-160	CR132	5.1V zener	022-3908-151
C 403	.01 μ F 50V ceramic chip	022-3908-070	CR133	Diode chip	022-3908-117
C 404	820 pF 50V ceramic chip	022-3908-080	CR401	5.1V zener	022-3908-151
C 405	100 pF 50V ceramic chip	022-3908-093	CR402	Si diode chip	022-3908-118
C 406	.01 μ F 50V ceramic chip	022-3908-070			
C 407	1000 pF 50V ceramic chip	022-3908-068	CV101	Variable capacitor	022-3908-018
C 408	.01 μ F 50V ceramic chip	022-3908-070	CV102	Variable capacitor	022-3908-018
C 409	.01 μ F 50V ceramic chip	022-3908-070	CV103	Variable capacitor	022-3908-018
C 410	1000 pF 50V ceramic chip	022-3908-068	CV104	Variable capacitor	022-3908-018
C 411	.1 μ F 50V ceramic chip	022-3908-114	CV105	Variable capacitor	022-3908-018
C 412	.1 μ F 50V ceramic chip	022-3908-114	CV106	Variable capacitor	022-3908-018
C 413	.01 μ F 50V ceramic chip	022-3908-070	CV151	Variable capacitor	022-3908-018
C 414	4.7 μ F 20V tantalum chip	022-3908-160	CV152	Variable capacitor	022-3908-018
C 415	.1 μ F 50V ceramic chip	022-3908-114	CV201	5 pF variable capacitor	510-1602-001
C 432	100 pF 50V ceramic chip	022-3908-093	CV202	5 pF variable capacitor	510-1602-001
C 433	.1 μ F 50V ceramic chip	022-3908-114	CV211	5 pF variable capacitor	510-1602-001
C 434	100 pF 50V ceramic chip	022-3908-093	CV212	5 pF variable capacitor	510-1602-001
C 435	100 pF 50V ceramic chip	022-3908-093			
C 436	.1 μ F 50V ceramic chip	022-3908-114	J 201	20-pin connector	022-3908-004
C 437	.1 μ F 50V ceramic chip	022-3908-114	J 203	3-pin connector	515-7100-003
C 438	4.7 μ F 20V tantalum chip	022-3908-160	J 204	3-pin connector	515-7100-003
C 439	100 pF 50V ceramic chip	022-3908-093	J 205	3-pin connector	515-7100-003
C 440	.01 μ F 50V ceramic chip	022-3908-070			
C 441	100 pF 50V ceramic chip	022-3908-093	L 100	Coil	022-3908-187
C 443	100 pF 50V ceramic chip	022-3908-093	L 101	Helical coil	022-3908-187
C 444	10 pF 50V ceramic chip	022-3908-090	L 102	Helical coil	022-3908-187
C 445	.1 μ F 50V ceramic chip	022-3908-114	L 103	Helical coil	022-3908-187

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
L 108	Helical coil	022-3908-187	Q 405	PNP SOT-23	022-3908-005
L 109	Helical coil	022-3908-187	Q 406	NPN SOT-23	022-3908-008
L 110	Helical coil	022-3908-187	Q 407	PNP SOT-23	022-3908-005
L 111	Coil	022-3908-187	Q 408	PNP SOT-23	022-3908-005
L 130	22 nH SMD	022-3908-121	Q 409	NPN SOT-23	022-3908-008
L 131	.22 μ H SMD	022-3908-124	Q 410	NPN SOT-23	022-3908-010
L 132	1 μ H SMD	022-3908-020	Q 411	NPN SOT-23	022-3908-010
L 133	22 nH SMD	022-3908-121			
L 134	.22 μ H SMD	022-3908-124	R 105	200 ohm 1/2W chip	022-3908-142
L 135	47 nH SMD	022-3908-122	R 106	200 ohm 1/2W chip	022-3908-142
L 136	47 nH SMD	022-3908-122	R 107	47 ohm 1/8W chip	022-3908-049
L 137	47 nH SMD	022-3908-122	R 108	47 ohm 1/8W chip	022-3908-049
L 138	.22 μ H SMD	022-3908-124	R 131	1.2k ohm 1/8W chip	022-3908-031
L 139	22 nH SMD	022-3908-121	R 133	1.5k ohm 1/8W chip	022-3908-034
L 201	Variable inductor	022-3908-139	R 134	3.3k ohm 1/8W chip	022-3908-045
L 202	.22 μ H SMD	022-3908-136	R 135	47 ohm 1/8W chip	022-3908-049
L 203	Variable inductor	022-3908-139	R 136	10 ohm 1/8W chip	022-3908-026
L 204	Variable inductor	022-3908-139	R 137	33 ohm 1/8W chip	022-3908-043
L 205	.22 μ H SMD	022-3908-136	R 138	47 ohm 1/8W chip	022-3908-049
L 206	Variable inductor	022-3908-139	R 139	330 ohm 1/8W chip	022-3908-044
L 211	Variable inductor	022-3908-139	R 140	330 ohm 1/8W chip	022-3908-044
L 212	.22 μ H SMD	022-3908-136	R 141	18 ohm 1/8W chip	022-3908-037
L 213	Variable inductor	022-3908-139	R 142	270 ohm 1/8W chip	022-3908-041
L 214	Variable inductor	022-3908-139	R 145	220 ohm 1/8W chip	022-3908-039
L 215	.22 μ H SMD	022-3908-136	R 146	220 ohm 1/8W chip	022-3908-039
L 216	Variable inductor	022-3908-139	R 147	330 ohm 1/8W chip	022-3908-044
L 222	.1 μ H SMD	022-3908-123	R 148	330 ohm 1/8W chip	022-3908-044
L 223	.1 μ H SMD	022-3908-123	R 149	18 ohm 1/8W chip	022-3908-037
L 224	.1 μ H SMD	022-3908-123	R 150	270 ohm 1/8W chip	022-3908-041
L 401	.1 μ H SMD	022-3908-123	R 151	1.5k ohm 1/8W chip	022-3908-034
L 402	1 μ H SMD	022-3908-020	R 152	270 ohm 1/8W chip	022-3908-041
L 403	.1 μ H SMD	022-3908-123	R 153	68 ohm 1/8W chip	022-3908-059
L 404	.22 μ H SMD	022-3908-124	R 154	68 ohm 1/8W chip	022-3908-059
L 405	.22 μ H SMD	022-3908-124	R 157	1k ohm 1/8W chip	022-3908-028
			R 158	47k ohm 1/8W chip	022-3908-052
Q 131	NPN SOT-23	022-3908-010	R 159	100k ohm 1/8W chip	022-3908-030
Q 132	NPN SOT-23	022-3908-010	R 160	10k ohm 1/8W chip	022-3908-029
Q 133	NPN SOT-89	022-3908-011	R 161	100k ohm 1/8W chip	022-3908-030
Q 134	NPN SOT-89	022-3908-011	R 201	1.8k ohm 1/8W chip	022-3908-038
Q 201	NPN SOT-23	022-3908-007	R 202	680 ohm 1/8W chip	022-3908-060
Q 202	NPN SOT-23	022-3908-007	R 203	47 ohm 1/8W chip	022-3908-049
Q 203	NPN SOT-23	022-3908-009	R 204	220 ohm 1/8W chip	022-3908-039
Q 204	NPN SOT-23	022-3908-009	R 205	560 ohm 1/8W chip	022-3908-057
Q 401	NPN SOT-23	022-3908-009	R 206	1.8k ohm 1/8W chip	022-3908-038
Q 402	NPN SOT-23	022-3908-009	R 207	47k ohm 1/8W chip	022-3908-052
Q 403	NPN SOT-23	022-3908-009	R 208	100k ohm 1/8W chip	022-3908-030
Q 404	NPN SOT-23	022-3908-009	R 211	5.1k ohm 1/8W chip	022-3908-055

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 212	100k ohm 1/8W chip	022-3908-030	R 430	220 ohm 1/8W chip	022-3908-039
R 213	10k ohm 1/8W chip	022-3908-029	R 431	47 ohm 1/8W chip	022-3908-049
R 214	100k ohm 1/8W chip	022-3908-030	R 432	47k ohm 1/8W chip	022-3908-052
R 215	22k ohm 1/8W chip	022-3908-040	R 433	100k ohm 1/8W chip	022-3908-030
R 217	10k ohm 1/8W chip	022-3908-029	R 434	33k ohm 1/8W chip	022-3908-046
R 218	10k ohm 1/8W chip	022-3908-029	R 435	3.3k ohm 1/8W chip	022-3908-045
R 228	1.8k ohm 1/8W chip	022-3908-038	R 436	1k ohm 1/8W chip	022-3908-028
R 233	1.8k ohm 1/8W chip	022-3908-038	R 437	100k ohm 1/8W chip	022-3908-030
R 234	680 ohm 1/8W chip	022-3908-060	R 438	8.2k ohm 1/8W chip	022-3908-065
R 235	47 ohm 1/8W chip	022-3908-049	R 439	3.3k ohm 1/8W chip	022-3908-045
R 236	220 ohm 1/8W chip	022-3908-039	R 440	1k ohm 1/8W chip	022-3908-028
R 237	560 ohm 1/8W chip	022-3908-057	R 441	33k ohm 1/8W chip	022-3908-046
R 239	47k ohm 1/8W chip	022-3908-052	R 442	10 ohm 1/8W chip	022-3908-026
R 240	100k ohm 1/8W chip	022-3908-030	R 444	4.7k ohm 1/8W chip	022-3908-051
R 243	5.1k ohm 1/8W chip	022-3908-055	R 445	1.5k ohm 1/8W chip	022-3908-034
R 244	100k ohm 1/8W chip	022-3908-030	R 446	1.2k ohm 1/8W chip	022-3908-031
R 245	10k ohm 1/8W chip	022-3908-029	R 447	150 ohm 1/8W chip	022-3908-033
R 246	100k ohm 1/8W chip	022-3908-030	R 448	33 ohm 1/8W chip	022-3908-043
R 247	22k ohm 1/8W chip	022-3908-040	R 449	1k ohm 1/8W chip	022-3908-028
R 249	10k ohm 1/8W chip	022-3908-029			
R 250	10k ohm 1/8W chip	022-3908-029	RT201	1k ohm thermistor	569-7100-500
R 254	1.8k ohm 1/8W chip	022-3908-038	RT202	1k ohm thermistor	569-7100-500
R 255	680 ohm 1/8W chip	022-3908-060	RT203	1k ohm thermistor	569-7100-500
R 256	47 ohm 1/8W chip	022-3908-049	RT204	1k ohm thermistor	569-7100-500
R 257	220 ohm 1/8W chip	022-3908-039	RV201	5k ohm variable chip	022-3908-144
R 258	10k ohm 1/8W chip	022-3908-029	RV202	5k ohm variable chip	022-3908-144
R 259	1k ohm 1/8W chip	022-3908-028	RV203	5k ohm variable chip	022-3908-144
R 260	270 ohm 1/8W chip	022-3908-041	RV211	5k ohm variable chip	022-3908-144
R 261	10 ohm 1/8W chip	022-3908-026	RV212	5k ohm variable chip	022-3908-144
R 262	1k ohm 1/8W chip	022-3908-028	RV213	5k ohm variable chip	022-3908-144
R 401	270 ohm 1/8W chip	022-3908-041			
R 403	4.99k ohm 1/8W chip	022-3908-024	TP101	Red verticle tip jack 0.08	105-2202-211
R 404	100 ohm 1/8W chip	022-3908-027	TP201	Red verticle tip jack 0.08	105-2202-211
R 406	2.7k ohm 1/8W chip	022-3908-042	TP202	Red verticle tip jack 0.08	105-2202-211
R 407	3.3k ohm 1/8W chip	022-3908-045	TP203	Red verticle tip jack 0.08	105-2202-211
R 408	3.3k ohm 1/8W chip	022-3908-045	TP204	Red verticle tip jack 0.08	105-2202-211
R 409	270 ohm 1/8W chip	022-3908-041	TP401	Red verticle tip jack 0.08	105-2202-211
R 410	68k ohm 1/8W chip	022-3908-062			
R 411	220 ohm 1/8W chip	022-3908-039	U 101	Mixer	022-3908-138
R 412	4.3k ohm 1/8W chip	022-3908-048	U 102	IC Op Amp	022-3908-145
R 414	47 ohm 1/8W chip	022-3908-049	U 103A	MMIC	022-3908-022
R 423	10k ohm 1/8W chip	022-3908-029	U 201	IC IF detector/amp MC3371D	544-2002-031
R 424	10k ohm 1/8W chip	022-3908-029	U 202	IC Op Amp	022-3908-147
R 426	10k ohm 1/8W chip	022-3908-029	U 203	IC IF detector/amp MC3371D	544-2002-031
R 427	1k ohm 1/8W chip	022-3908-028	U 204	IC Op Amp	022-3908-147
R 428	1k ohm 1/8W chip	022-3908-028	U 301	IC 6V regulator	022-3908-149
R 429	820 ohm 1/8W chip	022-3908-064	U 302	IC 12V regulator	022-3908-150

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	
U 303	IC 12V regulator	022-3908-150	
U 304	IC 12V regulator	022-3908-150	
U 401	IC MC145190	544-3954-026	
Y 201	17.5 MHz TCXO	518-7117-500	
Z 201	52.95 MHz crystal filter	532-0009-009	
Z 202	52.95 MHz crystal filter	532-0009-009	
Z 204	450 kHz cer filter SFG4560D	532-2004-013	
Z 205	450 kHz cer filter SFG4560D	532-2004-013	
Z 206	450 kHz variable coil	022-3908-120	
Z 211	52.95 MHz crystal filter	532-0009-011	
Z 212	52.95 MHz crystal filter	532-0009-011	
Z 214	450 kHz cer filter SFG4560D	532-2004-015	
Z 215	450 kHz cer filter SFG4560D	532-2004-015	
Z 216	450 kHz variable coil	022-3908-120	





SECTION 3 UHF RECEIVER

3.1 RECEIVER PROGRAMMING

3.1.1 2004PGMR PROGRAMMER

When the program is loaded into the computer and executed, the menu shows the files available from the directory. The program is used to Create, Edit, Transfer and Receive the repeater and channel parameters described in Section 3.2.

IMPORTANT

The commands and displays referred to in this Section are for the IBM PC and may differ from IBM compatible. Refer to the computer's operating system manual for command explanations.

3.1.2 ALIGNMENT SOFTWARE

The software for the CVR programs the Interface Board to open and close the audio/data gates necessary for the alignment selected from the Test-Full Rptr/Station/CVR menu. Under the menu heading Test are the alignment procedures for the Receiver, overall Full CVR (see Section 3.4) including the Interface Board (see Figure 3-1).

Refer to Section 3.3 for Alignment Procedures as shown in the program, alignment points diagrams and test setup diagrams.

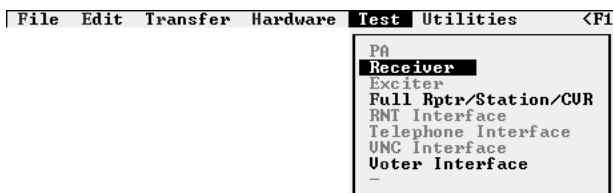


Figure 3-1 CVR TEST MENU

3.1.3 HELP F1

Help screens are available for most parameters and options in this program. Whenever a parameter or options clarification is needed, press F1 and if a help screen is available it will pop-up on the screen. Press Escape <ESC> to exit the pop-up screen.

3.2 PULL DOWN MENUS

3.2.1 MENU DISPLAYS

The menus available are listed at the top of the screen. Move the cursor with the arrow keys to highlight the menu name. Press Enter to view the menu and the arrow keys to scroll through the menu. Call up the highlighted selection by pressing Enter.

3.2.2 FILE MENU

This menu manipulates new or existing files into directories and saves files to be called up at another time.

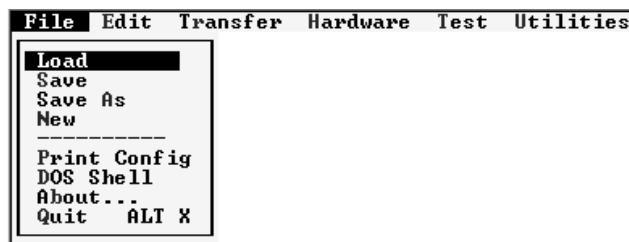


Figure 3-2 FILE MENU

Load

Load reads information from a stored file. The program requests the filename to be loaded into the buffer. The filename from a disk can be entered in the highlighted area. Then move the cursor down with the arrow key and highlight "Ok" and press Enter. To select an existing file, use the arrow keys to move down the menu list and press Enter when the highlighted filename is the file to load.

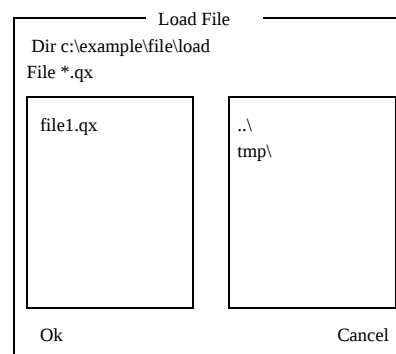


Figure 3-3 LOAD FILE

Save

This saves the edited version of an existing file loaded in the buffer under the same filename in the directory and deletes the old file. Loads a new file created in the Edit menu into the directory.

Save As

Use Save As to edited version of an existing file loaded in the buffer under a new filename or give a new file created in the Edit menu a filename.

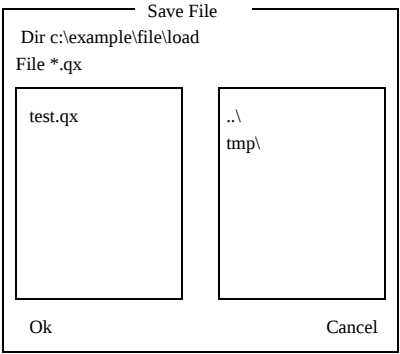


Figure 3-4 SAVE FILE

Print Repeater Configuration

Select the destination for the configurations.

- Printer - Prints to printer connected to PC.
- File - Writes printable test to selected filename.

Select which CVR data will be printed.

- All CVRs - Prints the data for all valid CVRs.
- Single CVR - Print the data for the entered CVR number.

NOTE: A list of valid CVRs can be seen under the Edit-Select Repeater menu selection.

DOS Shell

Temporarily suspends the program and returns to DOS. Directories and other DOS commands can be performed. To return to the program from DOS, type EXIT and press Enter.

Quit (ALT X)

Quit exits the CVR program and returns to DOS. Be sure all files are saved before exiting the program.

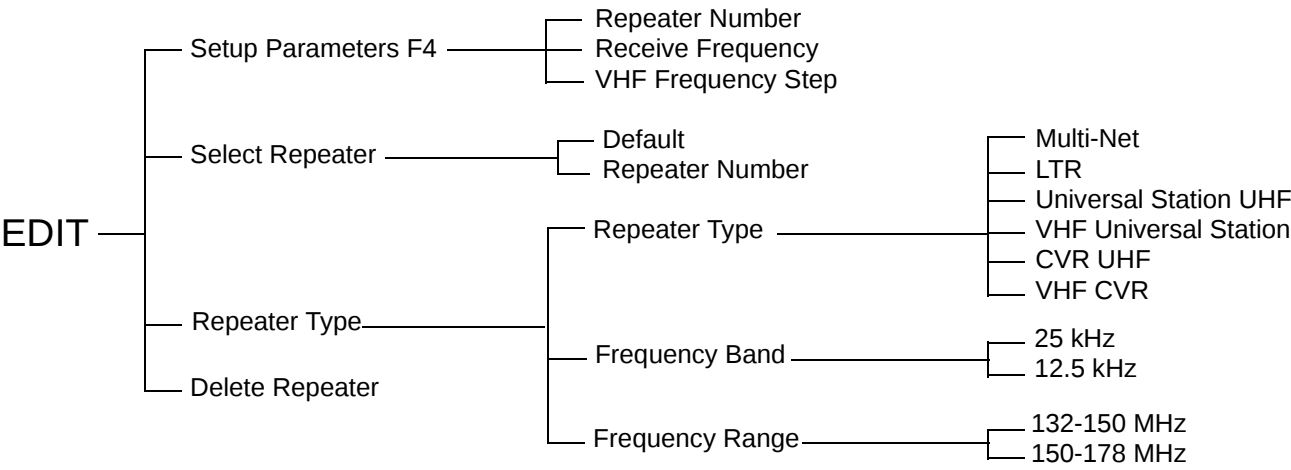


Figure 3-5 EDIT PROGRAMMING FLOWCHART

3.2.3 EDIT

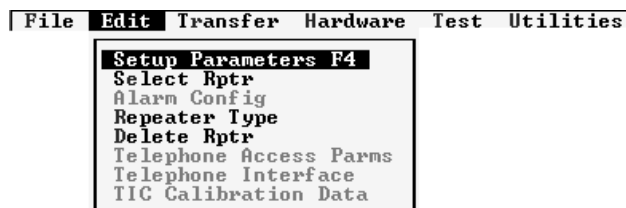


Figure 3-6 EDIT MENU

This menu is used to create new files and set or change the CVR operating parameters. The filename for the CVRs in this file is shown in the lower left corner of the screen.

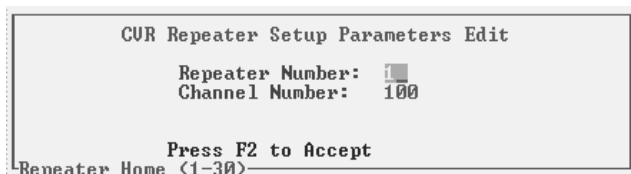


Figure 3-7 SETUP PARAMETERS

Setup Parameters

This programs the Receiver parameters and options of each CVR at a Site. The following paragraphs explain the parameters that are set by this screen (see Figure 3-7) and give a brief description of each.

NOTE: The parameters are shown in the lower left of the pop-up screen for reference.

Repeater Number

Each CVR is programmed with a repeater number from 1-30 for reference. Number selection can be arbitrary as long as each CVR is assigned a different number.

Receiver Frequency

Each CVR is programmed with the frequency that it is operating on.

Select Repeater

Select the repeater number to be programmed or edited from the pop-up menu (see Figure 3-8). Move the cursor with the arrow keys to highlight the repeater number and press Enter.

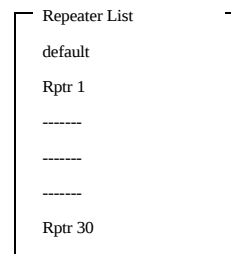


Figure 3-8 REPEATER LIST

Repeater Type Selection

This screen (see Figure 3-9) selects the repeater type and features:

Channel Bandwidth	25 kHz
	12.5 kHz
Frequency Range	370-480 MHz
	480-512 MHz

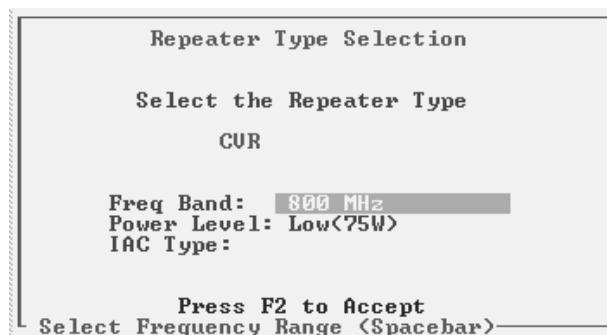


Figure 3-9 REPEATER TYPE SELECTION

Delete Repeater



Figure 3-10 DELETE REPEATER

3.2.4 TRANSFER



Figure 3-11 TRANSFER MENU

Write Setup Parameters

This command sends the contents of a file to the repeater and programs the EEPROM memory in the Interface board.

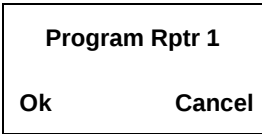


Figure 3-12 WRITE SETUP PARAMETERS

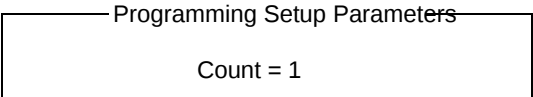


Figure 3-13 PROGRAM WRITE SETUP

Read Setup Parameters

This command reads the contents of the EEPROM memory of the Interface board and loads it into a buffer. The contents of the buffer is then displayed to show the programming of the repeater.

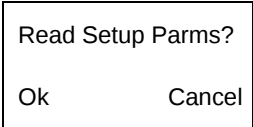


Figure 3-14 READ SETUP PARAMETERS

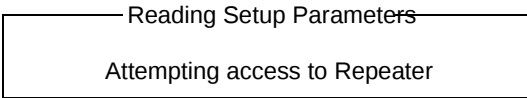


Figure 3-15 READING SETUP

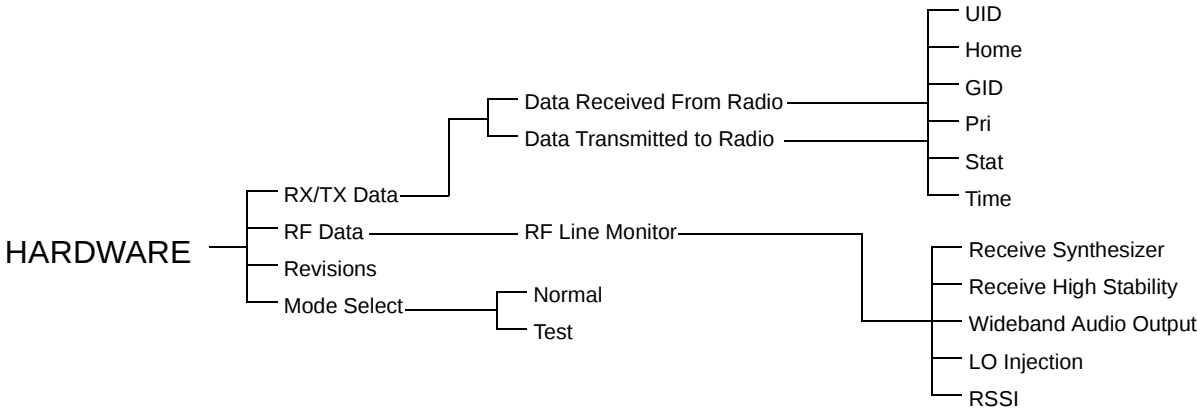


Figure 3-16 HARDWARE PROGRAMMING FLOWCHART

3.2.5 HARDWARE



Figure 3-17 HARDWARE MENU

RF Data

The A/D Monitor Screen shows the state of the lines (see Figure 3-18). These lines are being monitored by the A to D converter on the CVR Interface board. The normal values for each line are defined as follows.

Synthesizer Lock Lines	Yes or No
Wideband Audio Output	approx 200
LO Injection	approx 250
RSSI	20-150

Values with no label are the actual A to D reading.

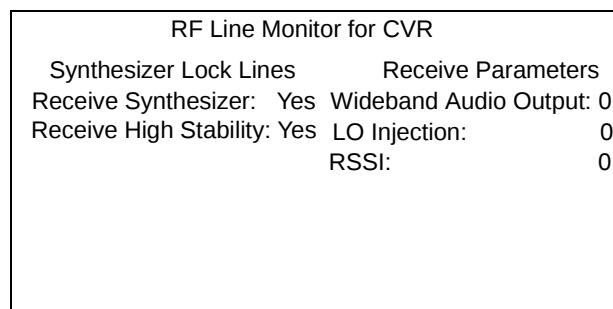


Figure 3-18 RF LINE MONITOR FOR CVR

Revision/Version

The Revision/Version is displayed for the repeater modules. The format for all modules is R.V. (revision.version). The MPC information also includes the software release date and the repeater serial number (see example in Figure 3-19).

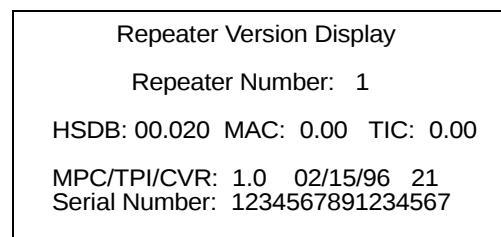


Figure 3-19 REVISION/VERSION

Mode Select

The Mode Select screen places the repeater either in the normal mode or the test mode. In the Normal mode the repeater operates as a normal repeater.

In the Test mode the repeater transmits a test word. This test word is the Test Mode ID set up in the Setup Parameters (see Table 3-1). While in the test mode the repeater is “busy”, therefore it is important to place the repeater in Normal mode when the test mode is no longer required.

3.2.6 TEST

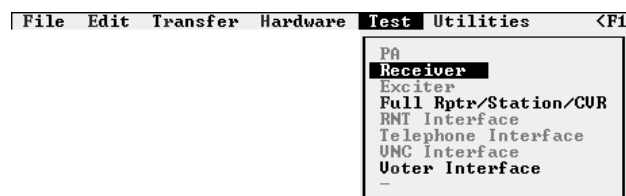


Figure 3-20 TEST MENU

Receiver

This menu selection walks through the alignment of the receiver on the computer screen. Refer to Sections 3.3 and 3.4 for the Receiver alignment in this manual and Figure 3-28 for an alignment points diagram and Figure 3-30 for the Receiver Test Setup.

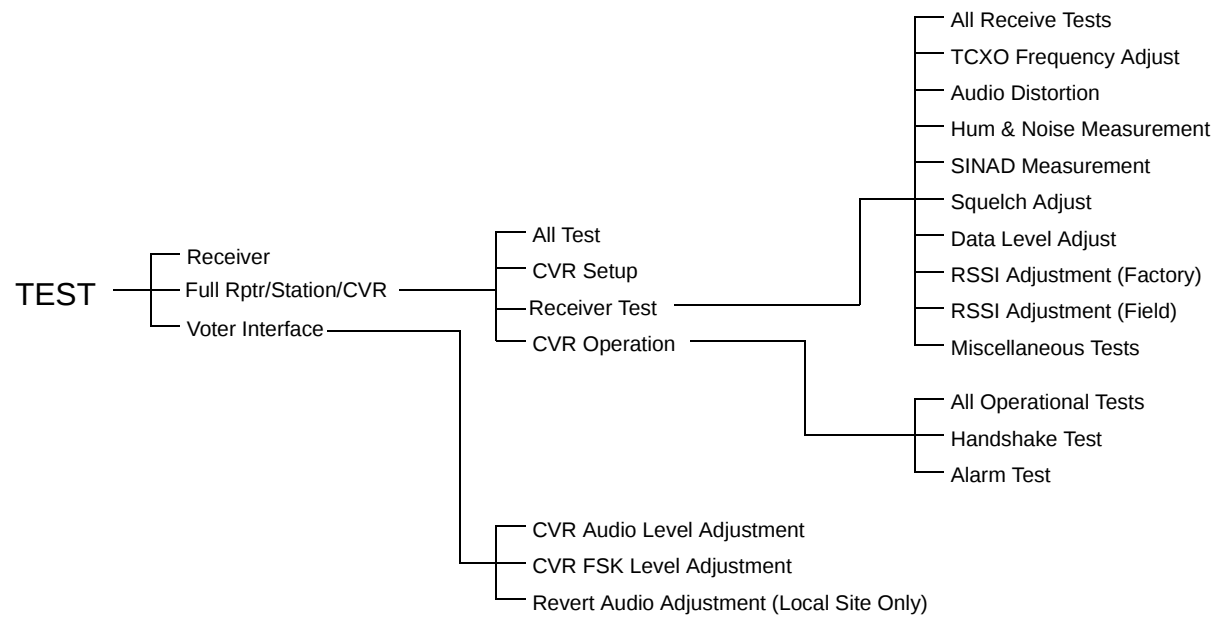


Figure 3-21 TEST PROGRAMMING FLOWCHART

Full CVR

This menu selection walks through the alignment of the entire CVR. The Receiver portion is performance tests and adjustments. The Audio and Data portions are level adjustments for the CVR Interface Board. Refer to Figure 3-29 for an alignment points diagram for the Interface Board.

CVR To Voter Interface

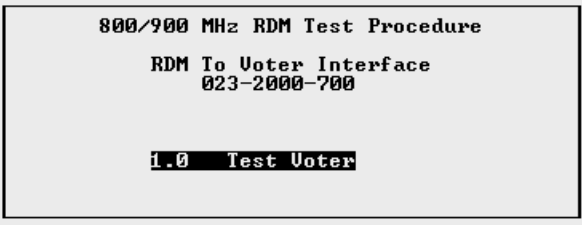


Figure 3-22 CVR TO VOTER INTERFACE

This menu selection walks through the alignment of the audio output level setting of the receiver.

3.2.7 UTILITIES

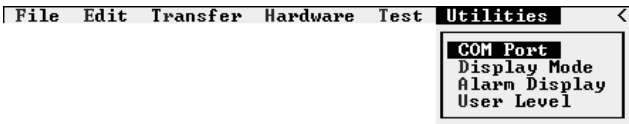


Figure 3-23 UTILITIES MENU

COM Port

This is the COM port used to send and receive data from the Repeater MPC. An interface cable connects the Repeater to the computer (see Figure 3-25).

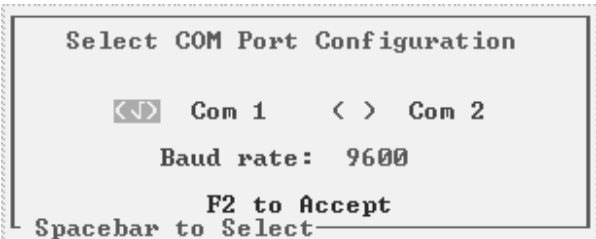


Figure 3-24 COM PORT SELECTION

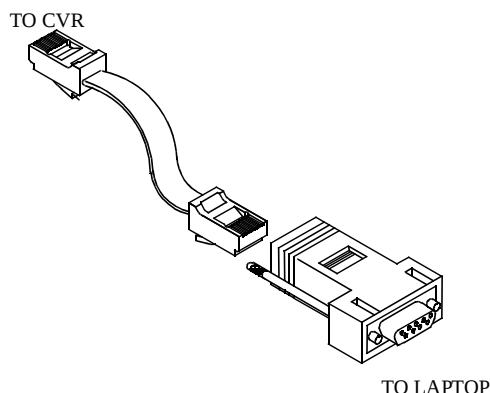


Figure 3-25 LAPTOP INTERCONNECT CABLE

Display Mode

This screen allows the color mode to be selected for color monitors. When using a laptop, monochrome is recommend for better resolution.

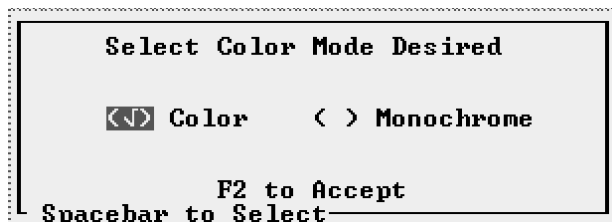


Figure 3-26 COLOR MODE SELECTION

Alarm Display

This screen displays a scrolling list of alarms generated by the repeater.

User Level

There are two levels to choose from, Novice and Advanced. The Novice uses prompts in the Edit-Parameters screens when Escape or F2 keys are pressed that ask "are you sure" before the task is executed. The Advanced selection performs the task without asking the question.

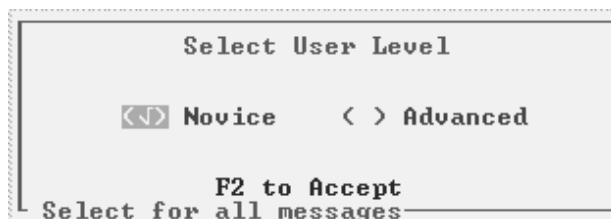


Figure 3-27 USER LEVEL

3.2.8 CVR PROGRAMMING

Creating A New File

An example will be used to show the programming for a new file created for Site 1.

NOTE: At any point in the programming sequence, if F1 is selected, a help screen appears to explain the menu selection highlighted at that point.

Select CVR To Edit

A CVR is selected to program. When no file exists with programmed CVRs, the default is selected and edited.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. Default is the only repeater in this list, press Enter.
4. Highlight EDIT, press Enter.
5. Highlight SETUP PARAMETERS, press Enter.
6. The Setup Parameters screen appears (see Figure 3-7). Fill in the parameters for this repeater. A brief description of the parameters is in Table 3-1. Full descriptions are in Section 3.2.3.

7. Select parameters, press F2 to accept.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Type in a valid DOS filename.
For this example site1.dat is used.
12. The file consists of default and CVR one under the filename of site1.dat.

Adding A CVR To A File

The example used for Site 1 will again be used to add CVRs to the filename site1.dat.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. The repeater list shown for this file includes default and repeater one. These contain the same parameters with the exception that when selected for edit the programmed repeater can be overwritten and the data lost.
4. Highlight DEFAULT, press Enter.
5. Highlight EDIT, press Enter.
6. Highlight SETUP PARAMETERS, press Enter.
7. Change the Repeater number and other parameters as required for this repeater, press F2.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Repeater 2 is added to the Repeater List in file site1.dat.

3.3 UHF RECEIVER ALIGNMENT

CRITICAL ADJUSTMENT

The TCXO must be adjusted within 5 minutes of turning the AC power on to the repeater. Do not under any circumstances try to set frequency later on in any of the tests, as TCXO frequency stability cannot then be guaranteed.

Refer to Figure 3-28 for component locations. Refer to Figure 3-30 for equipment needed and setup diagram. Select "RECEIVER" from the "TEST" menu in the Repeater Software.

3.3.1 PRETEST

Preset L102, L103, L104, L108, L109, L110, L140 and L141 tuning screws about 1/4 inch above the top of the casting.

For 12.5 kHz operation, place jumper plugs P203, P204 and P205 across pins 2-3 of J203, J204 and J205.

For 25 kHz operation, place jumper plugs P203, P204 and P205 across pins 1-2 of J203, J204 and J205.

3.3.2 VOLTAGE MEASUREMENTS

Apply power to the Receiver by plugging the 20-pin cable from the RF Interface Board into J201 (see Figure 3-28).

Measure the voltages at the following pins.

U301, pin 1	+6V DC $\pm 0.2V$
U302, pin 1	+12V DC $\pm 0.4V$
U303, pin 1	+12V DC $\pm 0.4V$
U304, pin 1	+12V DC $\pm 0.4V$
R402/R403 junction	+3.5V DC $\pm 0.1V$

3.3.3 PROGRAM TUNE-UP CHANNEL

1. Using the PC and software, program the Synthesizer for the Receive frequency.

2. Tune the VCO capacitor C803 for +7V DC $\pm 0.05V$ at TP401.

Increase the receive frequency by 1 MHz. The voltage on TP401 shall be less than 10.5V.

Decrease the receive frequency by 1 MHz. The voltage on TP401 shall be greater than 3.5V.

3. Alternately tune L140 and L141 in 1/2-turn to 1-turn increments until a voltage is measured at TP101. At that time, tune L140 for a peak, then L141 for a peak.

4. Retune L140/L141 for a peak at TP101.

For Receivers operating within 3 MHz of the top of the receive band (467-470 MHz).

1. Program the Synthesizer for the *Highest* receive frequency.
2. Set the control line voltage for 12V at TP401. Check 3 MHz *below* the programmed frequency (i.e. 467 MHz) to verify that the control voltage at TP401 is *greater than* 2V. The repeater receiver can now be programmed for the desired operating frequency.

For Receivers operating within 3 MHz of the bottom of the receive band (430-433 MHz).

1. Program the Synthesizer for the *Lowest* receive frequency.
2. Set the control line voltage for 2V at TP401. Check 3 MHz *above* the programmed frequency (i.e. 433 MHz) to verify that the control voltage at TP401 is *less than* 12V. The repeater receiver can now be programmed for the desired operating frequency.

NOTE: The Channel Frequency and Synthesizer Frequency appear at the bottom of the screen.

3.3.4 RECEIVER FREQUENCY ADJUST

1. Place a pick-up loop (sniffer) or RF probe connected to a frequency counter near L139.
2. Set Y401 (TCXO) for the Injection Frequency ± 50 Hz (Inj Freq = chnl freq + 52.95 MHz).

3.3.5 VCO TEST

1. The software programs the synthesizer for 1 MHz above the receive channel.
2. The voltage on TP401 should be $< 10V$.
3. Record the voltage on TP101 _____.
4. The software programs the synthesizer for 1 MHz below the receive channel.
5. The voltage on TP401 should be $> 2V$.
6. Record the voltage on TP101 _____.
7. If the voltages recorded in Steps 3 and 6 are not within $\pm 0.2V$, tune L141 as required to balance the voltage readings.
8. The software programs the synthesizer for the receive frequency.

3.3.6 FRONT END ADJUSTMENTS

NOTE: Verify that the appropriate IF jumpers (J203, J204, J205) are selected.

1. Set the signal generator to the receive frequency at a level sufficient to produce an output voltage at TP201 or J201, pin 7 (RSSI Output).
2. Tune L102, L103, L104, L108, L109 and L110, then repeat, for a peak voltage at TP201. Decrease the generator output level to maintain a 2-3V reading at TP201.

FOR 12.5 kHz CHANNELS:

NOTE: Perform this test if C239 and C249 are placed on the board.

1. Set the generator to an RF level sufficient to produce 2V DC at TP201.
2. Remove any modulation from the signal generator.
3. Increase the signal generator RF frequency 2.5 kHz.
4. Adjust C239 for peak DC voltage at TP201.

5. Adjust C249 for peak DC voltage at TP201.
6. Reset the signal generator to the tune-up frequency.
7. Set the signal generator to 100 μ V into the receiver with a 1 kHz tone at ± 1.5 kHz deviation.
(1000 μ V at the generator with 20 dB pad gives 100 μ V at the receive antenna.)
8. Tune Z215 for 2V ± 0.05 V at U203, pin 9.
9. Tune R253 for 387 mV RMS, ± 5 mV RMS, at TP202.
10. Adjust R248 for 2V ± 0.05 V at TP202.
11. Connect a distortion analyzer to TP202.
12. Tune L211, L213, L214 and L216 for minimum distortion $< 5\%$, (typically $< 3\%$).
13. Repeat Step 12 then Steps 8, 9 and 10.

3.3.7 AUDIO DISTORTION

1. On the Interface Board, plug a 16 ohm load at J204.
2. Connect a distortion analyzer to the 16 ohm load.
3. On the Interface Board, measure the distortion of the receive audio at J204 with the local volume control set to 2.8V RMS.
4. The reading shall be less than 3%.
(Typically less than 1%).

3.4 FULL CVR TEST

1. Select TEST - FULL RPTR/STATION/CVR and press Enter.

NOTE: All audio generators and audio voltmeters are unbalanced unless specifically stated otherwise.

3.4.1 VOLTAGE MEASUREMENTS

1. Disconnect the receiver-to-interface cable (20-pin) from J201 of the Interface board.
2. Apply power to the Interface board.

3. Measure the voltages at the following pins.

U221, pin 1	+12V DC ± 0.4 V
U223, pin 2	+9V DC ± 0.4 V
U224, pin 2	+5V DC ± 0.2 V
U204, pin 7	+1.25V DC ± 0.06 V
Junction of L202/C279	-5V DC ± 0.4 V

4. Apply power to the Receiver by plugging the 20-pin cable from the Interface Board into J201 (see Figure 3-28).

3.4.2 RECEIVER FREQUENCY CHECK

1. Check the receiver injection frequency with a "sniffer" pickup loop, or RF probe and a suitable frequency counter placed near TP102.

2. TCXO Adjustment

Set Y401 (TCXO) for the Injection Frequency ± 90 Hz at 12.5 kHz or ± 50 Hz at 25 kHz
(Inj Freq = chnl freq + 52.95 MHz).

Receiver Audio Distortion Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz deviation.
2. Adjust R207 for 0 dBm (775 mV RMS) at J210.
3. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
4. Adjust R262 for 2.8V RMS and measure the distortion. Distortion should be $< 3\%$.

Receiver Hum and Noise Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. Remove modulation from the RF generator.
The measured level must be ≤ -45 dB.

Receiver SINAD Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. 12 dB SINAD reading should be ≤ 0.35 μ V.

Receiver Squelch Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
3. Adjust R262 for 2.8V RMS.
4. Set the RF generator output for 5 dB SINAD.
5. **On the Interface Board**, adjust R222 so the Receiver just squelches.
6. Increase the RF generator output until the Receiver unsquelches. Reading should be ≤ 10 dB SINAD.

Receiver Data Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 100 Hz tone at ± 1 kHz.
2. Insert voltmeter probes into J202 on the Interface Board and connect to an AC voltmeter.
3. Adjust R248 to achieve 340 mV RMS (-7.1 dBm).

Receiver RSSI Adjustment

NOTE: Use this procedure only when an audio analyzer is unavailable.

1. Adjust the RF generator for 0.29 μ V into the Receiver with a 1 kHz tone at ± 3 kHz.
2. Adjust R261 in the Receiver for 0.8V DC (± 0.02 V DC) at TP3.

Receiver Miscellaneous Tests (Optional)

Several additional tests may be performed on the Receiver as listed below:

- Signal Displacement Bandwidth
- Adjacent Channel Rejection
- Offset Channel Selectivity
- Intermodulation Rejection
- Spurious Rejection
- Audio Response
- Audio Sensitivity

Perform the Test desired using the appropriate RF Generators, modulation frequencies, levels, RS-232 levels and test probes following the latest TIA document measurement procedures.

Alarm Test

1. The CVR is now in Normal Operation mode.
2. Verify the front panel display does not indicate any alarms (see Table 3-1).

Table 3-1 ALARMS

Display No.	Definition
0	Test Mode
1	Not Used
2	Normal Operation
3	Revert Operation
4	Receiving Data
5	Not Used
6	Not Used
7	Receive Synthesizer Out of Lock
8	High Stability Synth Out of Lock
9	Data Processor Failure
A	Not Used
B	Not Used
C	Downloading Code
D	Not Used
E	Erasing Code
F	Failure

3.4.3 VOTER INTERFACE

CVR Audio Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 1.5 kHz.
2. Connect a **balanced** AC voltmeter between J205, pin 2 and J206, pin 2. Connect a 600 ohm termination to the meter terminals or across J101, pins 5/6.
3. Adjust R271 on the Interface Board for the type of line.

Leased Line/Direct Connect (default)
-12 dBm (194 mV RMS)

Microwave/T1 (optional)
-28 dBm (31 mV RMS)

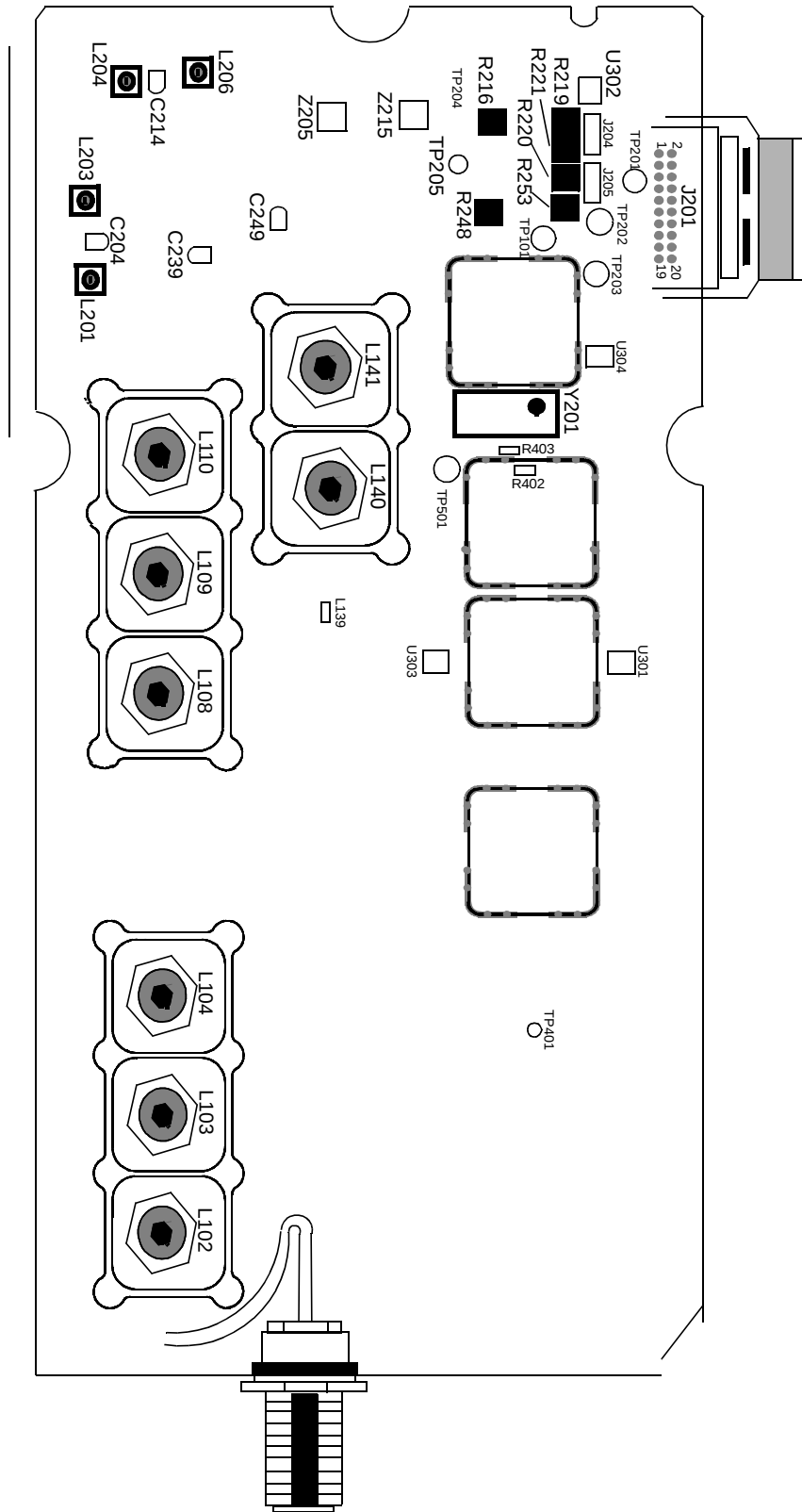


Figure 3-28 RECEIVER ALIGNMENT POINTS

4. On the Interface Board, measure receive sensitivity at J204.
5. The reading should be less than $0.35\ \mu\text{V}$. (Typically $0.25\ \mu\text{V}$)
6. The software programs the synthesizer for 1 MHz above the Receive frequency.
7. Receive sensitivity should be less than $0.35\ \mu\text{V}$. (Typically less than $0.30\ \mu\text{V}$)
8. The software programs the synthesizer for 1 MHz below the Receive frequency.
9. Receive sensitivity should be less than $0.35\ \mu\text{V}$. (Typically less than $0.30\ \mu\text{V}$)
10. The software programs the synthesizer for the Receive frequency.
11. Adjust the signal generator level to produce 15 dB SINAD.
12. Adjust R221 for $0.5\text{V} \pm 0.02\text{V}$ at TP201.

FOR 25 kHz CHANNELS:

NOTE: Perform this test if C204 and C214 are placed on the board.

1. Set the generator to an RF level sufficient to produce 2V DC at TP201.
2. Remove any modulation from the signal generator.
3. Increase the signal generator RF frequency 5 kHz.
4. Adjust C204 for peak DC voltage at TP201.
5. Adjust C249 for peak DC voltage at TP201.
6. Reset the signal generator to the tune-up frequency.
7. Set the generator to $100\ \mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\ \text{kHz}$ deviation. ($1000\ \mu\text{V}$ at the generator with 20 dB pad gives $100\ \mu\text{V}$ at the receive antenna.)
8. Tune Z205 for $2\text{V} \pm 0.05\text{V}$ at U201, pin 9.

9. Tune R220 for 387 mV RMS, $\pm 5\ \text{mV}$ RMS, at TP202.
10. Adjust R216 for $2\text{V} \pm 0.05\text{V}$ at TP202.
11. Connect a distortion analyzer to TP202.
12. Tune L201, L203, L204 and L206 for minimum distortion $< 5\%$, (typically $< 3\%$).
13. Repeat Step 12 then Steps 8, 9 and 10.

3.4.4 AUDIO DISTORTION

1. On the Interface board, plug a 16 ohm load into J204.
2. Connect a distortion analyzer to the 16 ohm load.
3. On the Interface board, measure the distortion of the receive audio at J204 with the local volume control set to 2.8V RMS.
4. The reading shall be less than 3%. (Typically less than 1%.)
5. On the Interface board, measure receive sensitivity at J204.
6. The reading should be less than $0.35\ \mu\text{V}$. (Typically $0.25\ \mu\text{V}$.)
7. The software programs the synthesizer for 1 MHz above the Receive frequency.
8. Receive sensitivity should be less than $0.35\ \mu\text{V}$. (Typically less than $0.30\ \mu\text{V}$.)
9. The software programs the synthesizer for 1 MHz below the Receive frequency.
10. Receive sensitivity should be less than $0.35\ \mu\text{V}$. (Typically less than $0.30\ \mu\text{V}$.)
11. Adjust the signal generator level to produce 15 dB SINAD.
12. Adjust R219 for $0.5\text{V} \pm 0.02\text{V}$ at TP201.

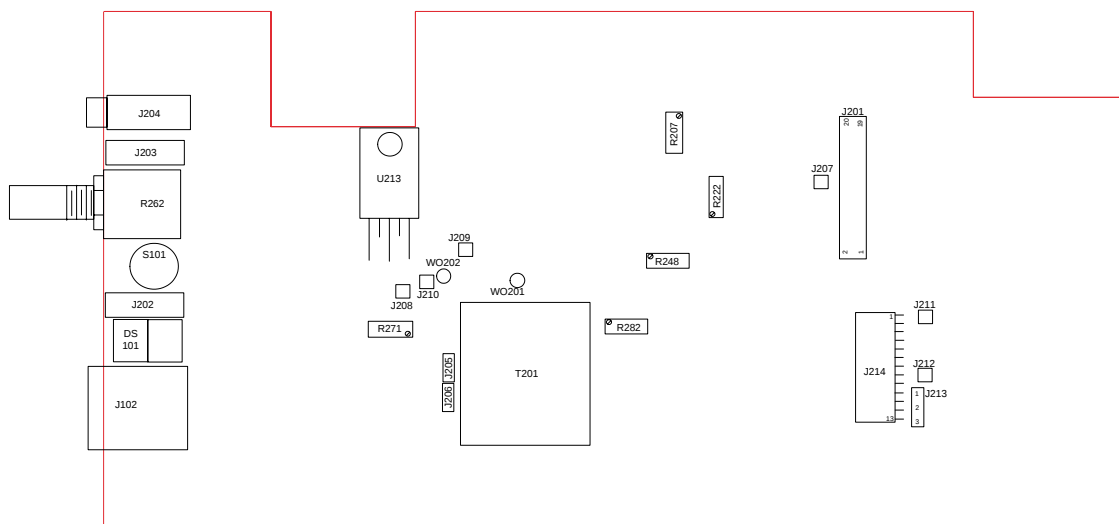


Figure 3-29 INTERFACE BOARD ALIGNMENT POINTS

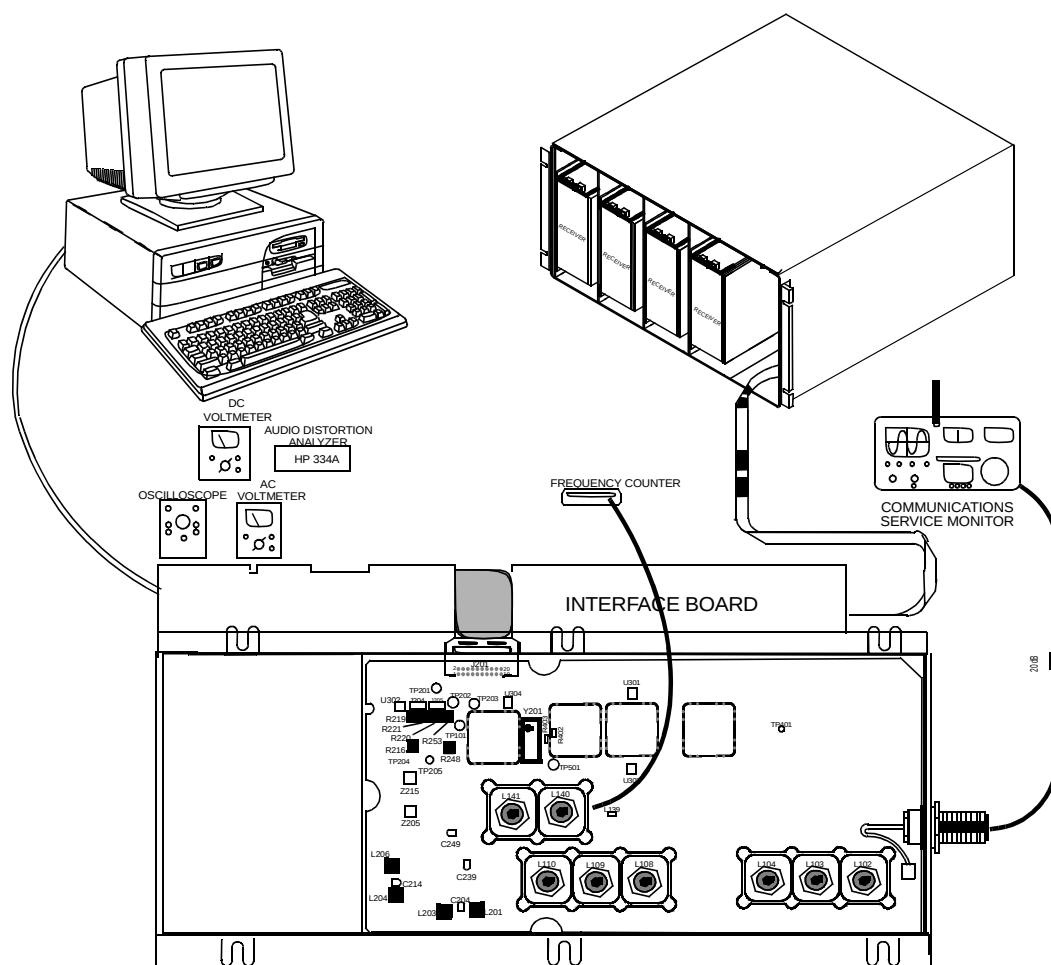


Figure 3-30 RECEIVER TEST SETUP

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
UHF VOTING RECEIVER PART NO. 023-2044-220			CR801	Varactor SOD-323 BB535	523-5005-022
			CR802	Varactor SOD-323 BB535	523-5005-022
A 200	Audio/Logic Interface Board	023-2000-720	J 001	2-pin PC mount wafer	515-9031-101
A 201	Receiver Board (430-470 MHz)	585-2044-270	J 002	2-pin PC mount wafer	515-9031-101
A 202	20-pin ribbon cable	023-2000-703	J 003	4-pin PC mount wafer	515-9031-103
EP200	RF shield gasket 0.156 OD	574-3002-036	L 801	150 nH $\pm 10\%$ 0805 SMD	542-9003-158
EP201	Heat sink insulator TO-220	574-5005-060	L 802	150 nH $\pm 10\%$ 0805 SMD	542-9003-158
HW200	4-40 x 0.063 NPB nut	560-2104-006	L 803	150 nH $\pm 10\%$ 0805 SMD	542-9003-158
HW201	10-32 x 0.375 CPS nut	560-1110-012	L 804	150 nH $\pm 10\%$ 0805 SMD	542-9003-158
HW202	6-32 panhead TORX ZPS	575-0006-010	L 805	12mm resonator SMD	542-9006-004
HW203	6-32 mach panhead phil ZPS	575-1606-008	MP400	UHF VCO shield	017-2226-044
HW204	6-32 mach panhead phil ZPS	575-1606-016	PC800	PC board	035-2044-800
HW205	#4 shakeproof washer	596-1104-008	Q 801	Si NPN gen purp switch/amp	576-0001-300
HW206	6 x 0.018 lockwasher int CPS	596-1106-009	Q 802	NPN UHF low noise SOT-23	576-0003-636
HW207	#10 flat washer	596-1410-016	R 803	10 ohm $\pm 5\%$ 0805 chip	569-0105-100
HW208	4-40 mach panhead phil ZPS	575-1604-012	R 804	3.6k ohm $\pm 5\%$ 0805 chip	569-0105-362
HW209	5/8 x 0.02 lockwasher int ZPS	596-9119-028	R 805	10 ohm $\pm 5\%$ 0805 chip	569-0105-100
HW210	5/8-24 x 0.094 hex nut NPB	560-9079-028	R 806	5.1k ohm $\pm 5\%$ 0805 chip	569-0105-512
MP200	Housing	015-0902-011	R 807	6.2k ohm $\pm 5\%$ 0805 SMD	569-0105-622
MP201	Deck cover	015-0902-015	R 808	200 ohm $\pm 5\%$ 1206 SMD	569-0115-201
MP202	Mounting plate	017-2210-152	12.5/25 kHz RECEIVER PART NO. 023-2034-270 (400-430 MHz) PART NO. 023-2044-270 (430-470 MHz) PART NO. 023-2054-270 (470-512 MHz)		
MP203	1/4 hex brass M/F spacer	312-7483-008	A 201	RF input coax	023-2000-161
MP204	1/4 hex brass M/F spacer	312-7473-008	A 203	Top Shield	023-2000-199
U 223	+9V regulator TO-220	544-2003-059	A 401	VCO 430-470 MHz	023-2044-800
U224	+5V regulator TO-220	544-2003-091	C 101	7.5 pF $\pm 5\%$ NPO 1206 chip	510-3602-759
RECEIVE VCO 403-470 MHz PART NO. 023-2044-800			C 103	12 pF $\pm 5\%$ NPO 1206 chip	510-3602-120
C 803	0.6-4.5 pF vertical SMT	512-0006-011	C 104	6.2 pF $\pm 5\%$ NPO 1206 chip	510-3602-629
C 804	1.5 pF $\pm 5\%$ NPO 0805 chip	510-3601-159	C 105	4.7 μ F 16V tantalum SMD	510-2625-479
C 805	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680	C 106	150 pF $\pm 5\%$ NPO 1206 chip	510-3602-151
C 806	0.5 pF ± 0.1 pF high Q	510-3710-508	C 107	4.7 μ F 16V tantalum SMD	510-2625-479
C 807	7.5 pF $\pm 5\%$ NPO 0805 chip	510-3601-759	C 108	150 pF $\pm 5\%$ NPO 1206 chip	510-3602-151
C 808	7.5 pF $\pm 5\%$ NPO 0805 chip	510-3601-759	C 109	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 809	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680	C 110	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 810	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680	C 111	4.7 μ F 16V tantalum SMD	510-2625-479
C 811	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680	C 112	150 pF $\pm 5\%$ NPO 1206 chip	510-3602-151
C 812	15 μ F 20V tantalum SMD	510-2626-150			
C 813	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680			
C 814	68 pF $\pm 5\%$ NPO 0805 chip	510-3601-680			

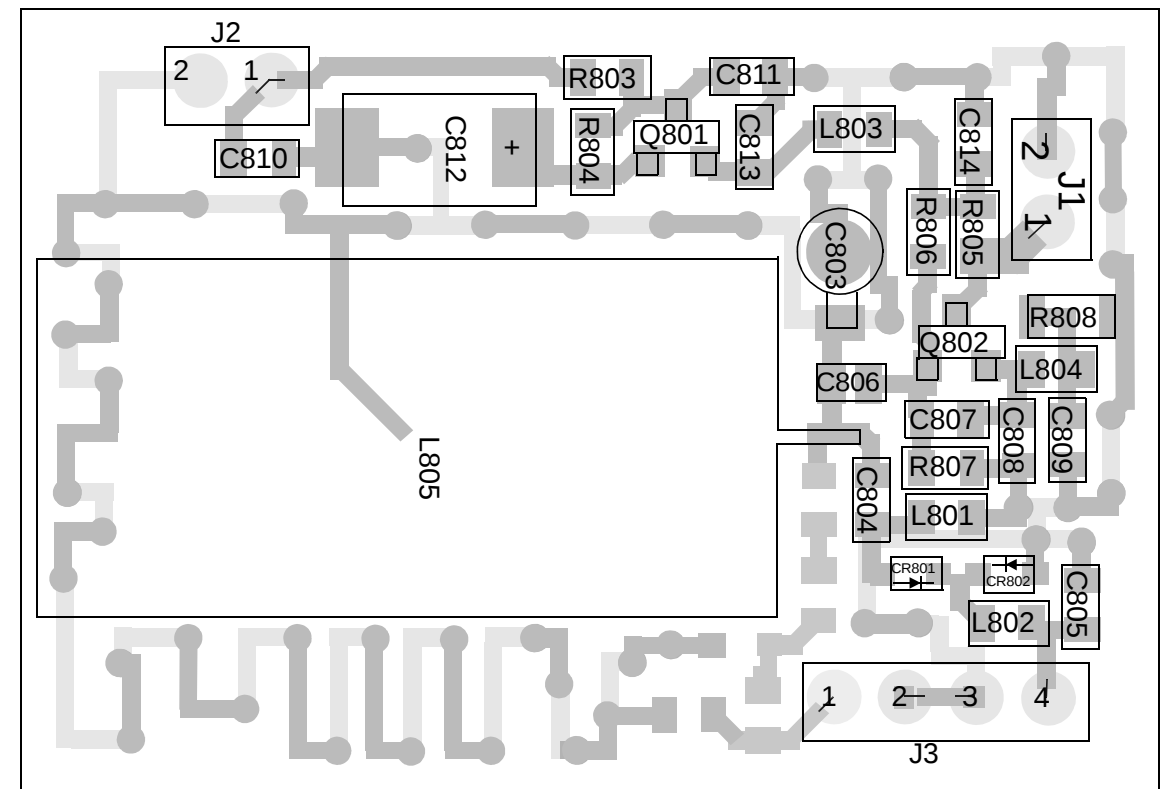
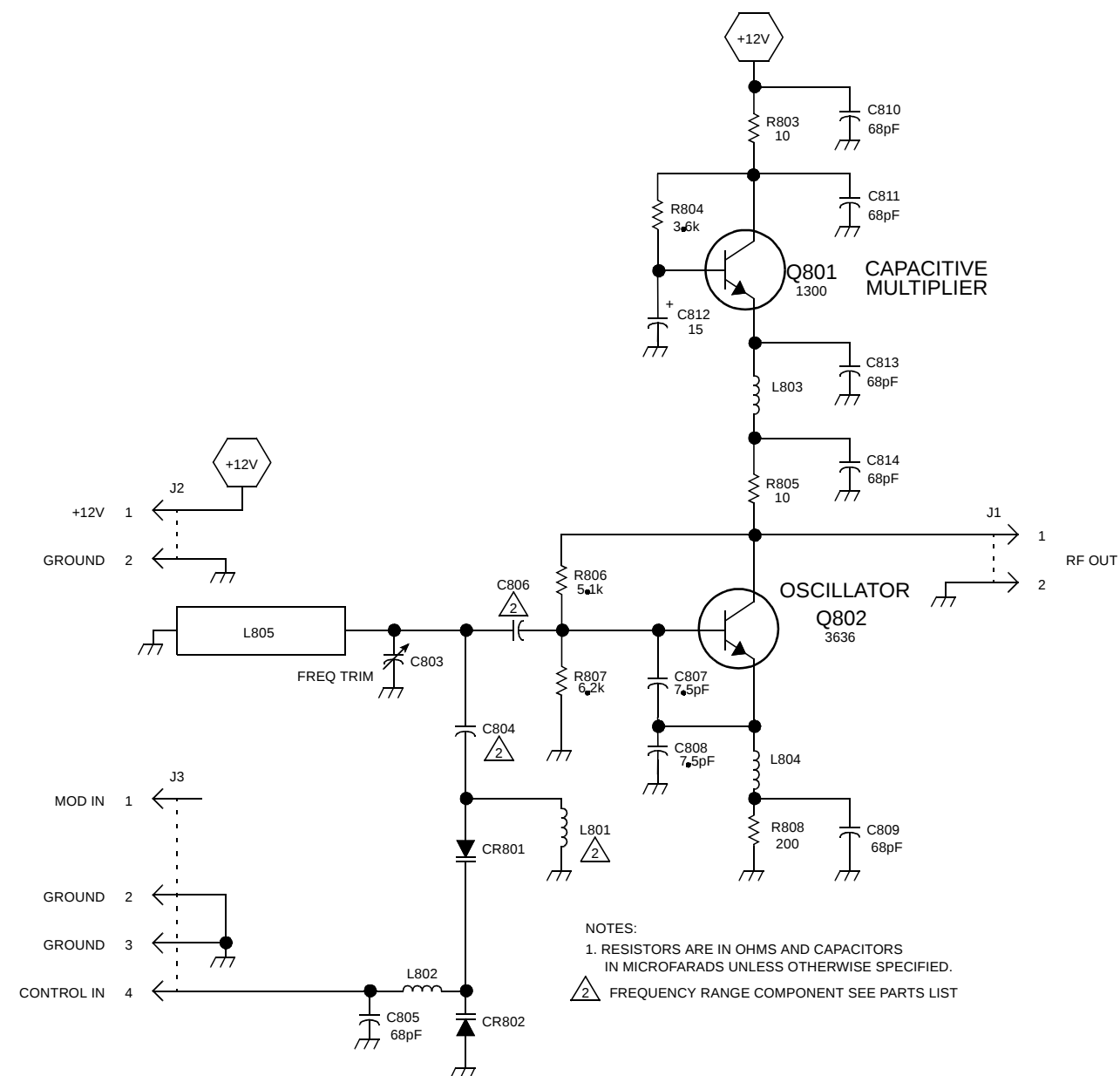
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 113	150 pF $\pm 5\%$ NPO 1206 chip	510-3602-151	C 207	.01 μ F $\pm 10\%$ X7R chip	510-3606-103
C 114	6.8 pF $\pm 5\%$ NPO 1206 chip	510-3602-689	C 208	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 115	7.5 pF $\pm 5\%$ NPO 1206 chip	510-3602-759	C 209	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 131	3.9 pF $\pm 5\%$ NPO 1206 chip	510-3602-399	C 210	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100
C 132	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100	C 211	.01 μ F $\pm 10\%$ X7R chip	510-3606-103
C 133	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 212	39 pF $\pm 5\%$ NPO 1206	510-3602-390
C 134	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 213	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 135	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 214	1.5-5 pF ceramic SMD	510-1602-001
C 136	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 215	6.8 pF $\pm 5\%$ NPO 1206	510-3602-689
C 137	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 216	39 pF $\pm 5\%$ NPO 1206	510-3602-390
C 138	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 217	3.9 pF $\pm 5\%$ NPO 1206 chip	510-3602-399
C 139	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 218	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103
C 140	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 219	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 141	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 220	.1 μ F $\pm 10\%$ X7R chip	510-3606-104
C 142	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 221	.1 μ F $\pm 10\%$ X7R chip	510-3606-104
C 143	.1 μ F $\pm 10\%$ X7R 1210	510-3607-104	C 222	.1 μ F $\pm 10\%$ X7R chip	510-3606-104
C 144	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 223	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 145	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 225	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 146	7.5 pF $\pm 5\%$ NPO 1206 chip	510-3602-759	C 226	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 147	22 pF $\pm 5\%$ NPO 1206 chip	510-3602-220	C 227	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 148	4.7 μ F 16V tantalum SMD	510-2625-479	C 228	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270
C 149	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 236	8.2 pF $\pm 5\%$ NPO 1206	510-3602-829
C 150	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 237	39 pF $\pm 5\%$ NPO 1206	510-3602-390
C 151	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 238	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 152	3.9 pF $\pm 5\%$ NPO 1206 chip	510-3602-399	C 239	1.5-5 pF ceramic SMD	510-1602-001
C 153	5.6 pF $\pm 5\%$ NPO 1206 chip	510-3602-569	C 240	100 pF $\pm 5\%$ NPO 1206 chip	510-3602-101
C 154	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 241	6.8 pF $\pm 5\%$ NPO 1206	510-3602-689
C 155	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 242	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 156	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100	C 243	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103
C 157	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 244	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 158	1.5 μ F 25V tantalum SMD	510-2627-159	C 245	7.5 pF $\pm 5\%$ NPO 1206 chip	510-3602-759
C 159	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 246	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103
C 160	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680	C 247	39 pF $\pm 5\%$ NPO 1206 chip	510-3602-390
C 161	4.7 μ F 16V tantalum SMD	510-2625-479	C 248	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479
C 162	5.6 pF $\pm 5\%$ NPO 1206	510-3602-569	C 249	1.5-5 pF ceramic SMD	510-1602-001
C 163	8.2 pF $\pm 5\%$ NPO 1206 chip	510-3602-829	C 250	5.6 pF $\pm 5\%$ NPO 1206 chip	510-3602-569
C 164	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183	C 251	39 pF $\pm 5\%$ NPO 1206	510-3602-390
C 165	1 pF $\pm 5\%$ NPO 1206 chip	510-3602-109	C 252	5.6 pF $\pm 5\%$ NPO 1206 chip	510-3602-569
C 166	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 253	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103
C 167	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 254	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 169	6.8 pF $\pm 5\%$ NPO 1206	510-3602-689	C 255	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 201	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100	C 256	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 202	39 pF $\pm 5\%$ NPO 1206	510-3602-390	C 257	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 203	4.7 pF $\pm 5\%$ NPO 1206	510-3602-479	C 258	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102
C 204	1.5-5 pF ceramic SMD	510-1602-001	C 260	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102
C 205	39 pF $\pm 5\%$ NPO 1206	510-3602-390	C 261	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102
C 206	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100	C 262	4.7 μ F 16V tantalum SMD	510-2625-479

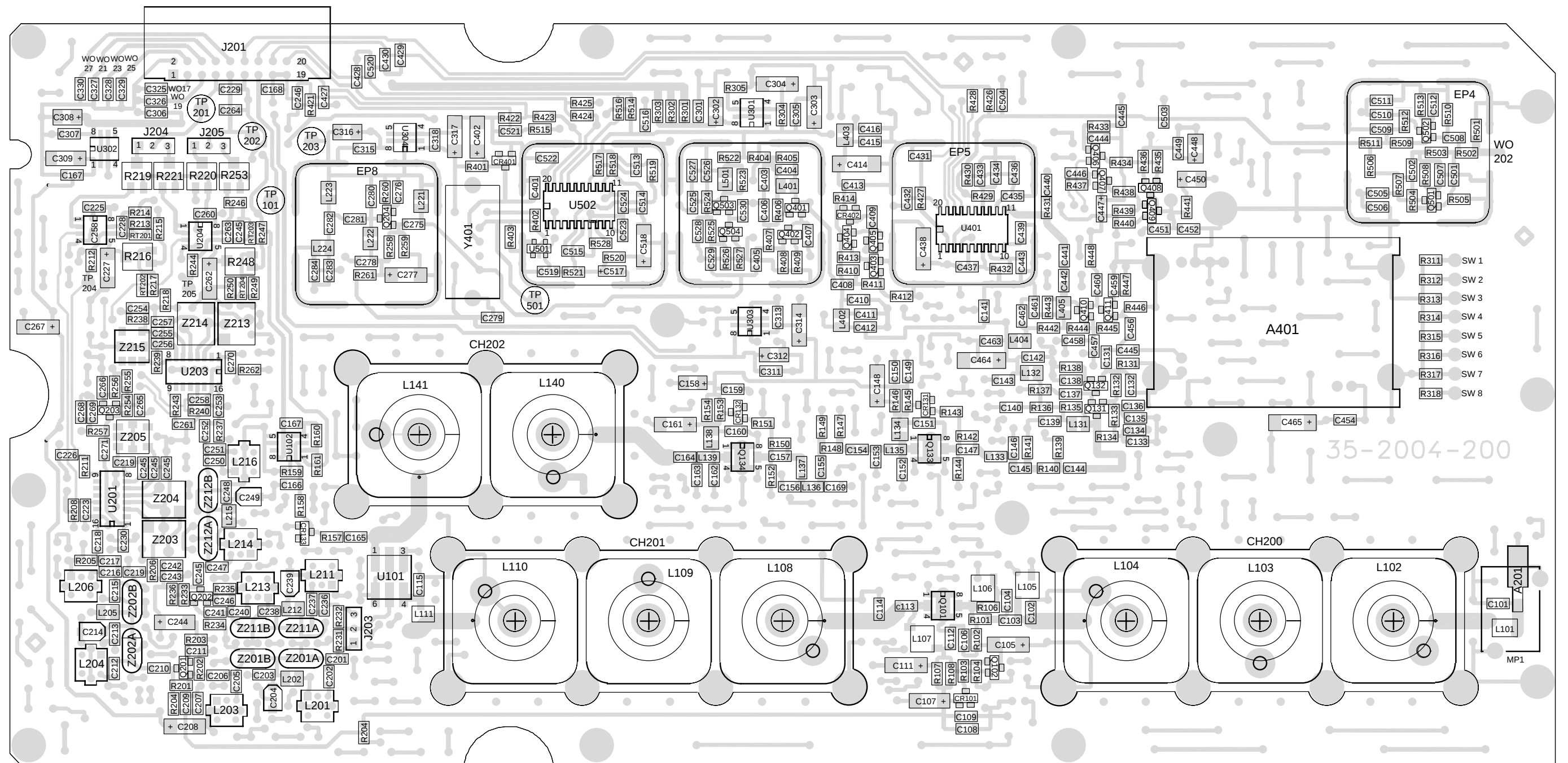
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 263	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	C 412	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 265	100 pF $\pm 5\%$ NPO 1206	510-3602-101	C 413	.01 μ F $\pm 10\%$ X7R 1206	510-3606-103
C 266	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103	C 414	6.8 μ F 35V tantalum SMD	510-2628-689
C 267	4.7 μ F 16V tantalum SMD	510-2625-479	C 415	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 268	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103	C 416	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 269	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102	C 431	100 pF $\pm 5\%$ NPO 1206 chip	510-3602-101
C 270	5.6 pF $\pm 5\%$ NPO 1206 chip	510-3602-569	C 432	100 pF $\pm 5\%$ NPO 1206 chip	510-3602-101
C 271	220 pF $\pm 5\%$ NPO 1206 chip	510-3602-221	C 433	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 275	100 pF $\pm 5\%$ NPO 1206 chip	510-3602-101	C 434	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 276	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103	C 435	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 277	4.7 μ F 16V tantalum SMD	510-2625-479	C 436	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 278	.01 μ F $\pm 10\%$ X7R 1206 chip	510-3606-103	C 437	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 279	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102	C 438	4.7 μ F 16V tantalum SMD	510-2625-479
C 280	220 pF $\pm 5\%$ NPO 1206 chip	510-3602-221	C 439	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 281	220 pF $\pm 5\%$ NPO 1206 chip	510-3602-221	C 440	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183
C 282	5.6 pF $\pm 5\%$ NPO 1206 chip	510-3602-569	C 441	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 283	120 pF $\pm 5\%$ NPO 1206 chip	510-3602-121	C 442	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183
C 284	390 pF $\pm 5\%$ NPO 1206 chip	510-3602-391	C 443	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 301	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102	C 444	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100
C 302	1.5 μ F 25V tantalum SMD	510-2627-159	C 445	.1 μ F $\pm 5\%$ X7R 1206	510-3609-104
C 303	4.7 μ F 16V tantalum SMD	510-2625-479	C 446	5.1 pF $\pm 5\%$ NPO 1206 chip	510-3602-519
C 304	4.7 μ F 16V tantalum SMD	510-2625-479	C 447	1 μ F 16V tantalum SMD	510-2625-109
C 305	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 448	1 μ F 16V tantalum SMD	510-2625-109
C 306	56 pF $\pm 5\%$ NPO 1206 chip	510-3602-560	C 449	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 307	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 450	1.5 μ F 25V tantalum SMD	510-2627-159
C 308	1.5 μ F 25V tantalum SMD	510-2627-159	C 451	.1 μ F $\pm 10\%$ X7R	510-3606-104
C 309	4.7 μ F 16V tantalum SMD	510-2625-479	C 452	10 pF $\pm 5\%$ NPO 1206 chip	510-3602-100
C 310	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 454	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102
C 311	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 455	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 312	1.5 μ F 25V tantalum SMD	510-2627-159	C 456	3.3 pF $\pm 5\%$ NPO 1206 chip	510-3602-339
C 313	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 457	.018 μ F $\pm 10\%$ X7R 0805 chip	510-3605-183
C 314	4.7 μ F 16V tantalum SMD	510-2625-479	C 458	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 315	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 459	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 316	1.5 μ F 25V tantalum SMD	510-2627-159	C 460	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 317	4.7 μ F 16V tantalum SMD	510-2625-479	C 461	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 318	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	C 462	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 401	.01 μ F $\pm 10\%$ X7R 1206	510-3606-103	C 463	68 pF $\pm 5\%$ NPO 1206 chip	510-3602-680
C 402	4.7 μ F 16V tantalum SMD	510-2625-479	C 464	15 μ F 20V tantalum SMD	510-2626-150
C 403	.01 μ F $\pm 10\%$ X7R 1206	510-3606-103			
C 404	820 pF $\pm 5\%$ NPO 1206 chip	510-3602-821	CH200	3-cavity helical front end	015-0901-038
C 405	100 pF $\pm 5\%$ NPO 1206 chip	510-3602-101	CH201	3-cavity helical front end	015-0901-038
C 406	.01 μ F $\pm 10\%$ X7R 1206	510-3606-103	CH202	2-cavity helical front end	015-0901-028
C 407	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102			
C 408	.01 μ F $\pm 5\%$ NPO 1206 chip	510-3602-103			
C 409	.01 μ F $\pm 5\%$ NPO 1206 chip	510-3602-103	CR101	Switching diode SOT-23	523-1504-002
C 410	.001 μ F $\pm 5\%$ NPO 1206 chip	510-3602-102	CR131	5.6V zener SOT-23	523-2016-569
C 411	.1 μ F $\pm 10\%$ X7R	510-3606-104			

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
CR132	5.6V zener SOT-23	523-2016-569	L 214	1 μ H $\pm$ 6% variable inductor	542-1012-015
CR133	Hot carrier diode SOT-23	523-1504-016	L 215	.82 μ H SMD inductor	542-9001-828
CR401	Si 9.1V zener SOT-23	523-2016-919	L 216	1 μ H $\pm$ 6% variable inductor	542-1012-015
CR402	Dual switching diode SOT-23	523-1504-023	L 222	.1 μ H inductor SMD	542-9001-108
EP200	Crystal pin cer insulator mini	010-0345-280	L 223	.1 μ H inductor SMD	542-9001-108
HW201	Helical screw	013-1563-001	L 224	.1 μ H inductor SMD	542-9001-108
HW202	Tension lock nut CPS	560-1810-022	L 401	.1 μ H inductor SMD	542-9001-108
HW203	6-32 panhead 1/4" taptite	575-0606-008	L 402	.1 μ H inductor SMD	542-9001-108
HW205	Polarizing key box cnt	515-7109-010	L 403	.1 μ H inductor SMD	542-9001-108
J 201	20-pin right angle header	515-9031-375	L 404	.1 μ H inductor SMD	542-9001-108
J 203	3-pin single inline header	515-7100-003	L 405	.1 μ H inductor SMD	542-9001-108
J 204	3-pin single inline header	515-7100-003	MP204	Bottom shield	017-2210-101
J 205	3-pin single inline header	515-7100-003	P 203	2-pos shorting socket	515-5010-001
L 101	2T 22 AWG 0.05 ID SMD	542-0015-002	P 204	2-pos shorting socket	515-5010-001
L 102	4.8125T helical coil	016-1929-159	P 205	2-pos shorting socket	515-5010-001
L 103	4.8125T helical coil	016-1929-159	PC200	PC board	035-2004-200
L 104	4.8125T helical coil	016-1929-158	Q 101	NPN .2-2 GHz SO-8 amp	576-0003-604
L 106	6T 22 AWG 0.05 ID SMD	542-0015-006	Q 102	Si PNP low noise SOT-23	576-0003-657
L 107	6T 22 AWG 0.05 ID SMD	542-0015-006	Q 131	NPN UHF low noise SOT-23	576-0003-636
L 108	4.8125T helical coil	016-1929-158	Q 132	NPN UHF low noise SOT-23	576-0003-636
L 109	4.8125T helical coil	016-1929-159	Q 133	NPN .2-2 GHz SO-8 amp	576-0003-604
L 110	4.8125T helical coil	016-1929-158	Q 134	NPN 750 mW UHF/800 MHz	576-0004-098
L 111	4T 22 AWG 0.05 ID SMD	542-0015-004	Q 201	Si NPN RF amp SOT-23	576-0003-602
L 131	.1 μ H SMD inductor	542-9001-108	Q 202	Si NPN RF amp SOT-23	576-0003-602
L 132	.1 μ H SMD inductor	542-9001-108	Q 203	Si NPN amp	576-0003-658
L 133	5.6 nH ceramic inductor	542-9003-566	Q 204	Si NPN amp	576-0003-658
L 134	.068 μ H SMD inductor	542-9001-687	Q 401	Si NPN amp	576-0003-658
L 135	15 nH inductor LL2012 F15N	542-9003-157	Q 402	Si NPN amp	576-0003-658
L 136	18 nH inductor LL2012 F18N	542-9003-187	Q 403	Si NPN amp	576-0003-658
L 137	6.8 nH inductor LL2012 F6N8	542-9003-686	Q 404	Si NPN amp	576-0003-658
L 138	.068 μ H SMD inductor	542-9001-687	Q 405	Si PNP low noise SOT-23	576-0003-657
L 139	12 nH inductor LL2012 F12N	542-9003-127	Q 406	Si NPN GP sw/amp SOT-23	576-0001-300
L 140	4.375T helical coil	016-1929-153	Q 407	Si PNP low noise SOT-23	576-0003-650
L 141	4.375T helical coil	016-1929-153	Q 408	Si PNP low noise SOT-23	576-0003-650
L 201	1 μ H $\pm$ 6% variable inductor	542-1012-015	Q 409	Si NPN GP sw/amp SOT-23	576-0001-300
L 202	.82 μ H SMD inductor	542-9001-828	Q 410	NPN UHF low noise SOT-23	576-0003-636
L 203	1 μ H $\pm$ 6% variable inductor	542-1012-015	Q 411	NPN UHF low noise SOT-23	576-0003-636
L 204	1 μ H $\pm$ 6% variable inductor	542-1012-015	R 101	24 ohm $\pm$ 5% 1206 SMD	569-0115-240
L 205	.82 μ H SMD inductor	542-9001-828	R 102	10k ohm $\pm$ 5% 1206 SMD	569-0115-103
L 206	1 μ H $\pm$ 6% variable inductor	542-1012-015	R 103	1.8k ohm $\pm$ 5% 1206 SMD	569-0115-182
L 211	1 μ H $\pm$ 6% variable inductor	542-1012-015	R 104	10k ohm $\pm$ 5% 1206 SMD	569-0115-103
L 212	.82 μ H SMD inductor	542-9001-828	R 106	1k ohm $\pm$ 5% 1206 SMD	569-0115-102
L 213	1 μ H $\pm$ 6% variable inductor	542-1012-015			

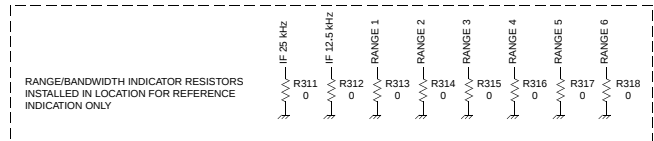
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 107	43 ohm $\pm 5\%$ 1206 SMD	569-0115-430	R 219	5k ohm SMD top adjust	562-0135-502
R 108	43 ohm $\pm 5\%$ 1206 SMD	569-0115-430	R 220	5k ohm SMD top adjust	562-0135-502
R 131	1.3k ohm $\pm 5\%$ 1206 SMD	569-0115-132	R 221	5k ohm SMD top adjust	562-0135-502
R 132	1.5k ohm $\pm 5\%$ 1206 SMD	569-0115-152	R 233	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182
R 133	1.3k ohm $\pm 5\%$ 1206 SMD	569-0115-132	R 234	680 ohm $\pm 5\%$ 1206 SMD	569-0115-681
R 134	3k ohm $\pm 5\%$ 1206 SMD	569-0115-302	R 235	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510
R 135	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	R 236	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 136	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	R 237	560 ohm $\pm 5\%$ 1206 SMD	569-0115-561
R 137	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360	R 238	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182
R 138	75 ohm $\pm 5\%$ 1206 SMD	569-0115-750	R 239	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513
R 139	300 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 240	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 140	18 ohm $\pm 5\%$ 1206 SMD	569-0115-180	R 243	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512
R 141	300 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 244	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 142	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 245	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 143	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	R 246	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 144	390 ohm $\pm 5\%$ 1206 SMD	569-0115-391	R 247	20k ohm $\pm 5\%$ 1206 SMD	569-0115-203
R 145	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241	R 248	5k ohm SMD top adjust	562-0135-502
R 146	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241	R 249	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 147	300 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 250	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 148	18 ohm $\pm 5\%$ 1206 SMD	569-0115-180	R 253	5k ohm SMD top adjust	562-0135-502
R 149	300 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 254	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182
R 150	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 255	680 ohm $\pm 5\%$ 1206 SMD	569-0115-681
R 151	1.2k ohm $\pm 5\%$ 1206 SMD	569-0115-122	R 256	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510
R 152	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 257	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 153	68 ohm $\pm 5\%$ 1206 SMD	569-0115-680	R 258	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 154	68 ohm $\pm 5\%$ 1206 SMD	569-0115-680	R 259	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 157	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	R 260	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
R 158	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513	R 261	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100
R 159	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 262	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 160	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 301	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 161	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 302	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 201	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182	R 303	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 202	680 ohm $\pm 5\%$ 1206 SMD	569-0115-681	R 304	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241
R 203	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	R 305	43 ohm $\pm 5\%$ 1206 SMD	569-0115-430
R 204	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221	R 311	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001
R 205	560 ohm $\pm 5\%$ 1206 SMD	569-0115-561	R 312	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001
R 206	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182	R 315	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001
R 207	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513	R 401	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
R 208	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 402	12.1k ohm $\pm 1\%$ 1206 SMD	569-0111-409
R 211	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512	R 403	4.99k ohm $\pm 1\%$ 1206 SMD	569-0111-368
R 212	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 404	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100
R 213	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 406	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272
R 214	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 407	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332
R 215	20k ohm $\pm 5\%$ 1206 SMD	569-0115-203	R 408	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332
R 216	5k ohm SMD top adjust	562-0135-502	R 409	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
R 217	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 410	68k ohm $\pm 5\%$ 1206 SMD	569-0115-683
R 218	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 411	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 412	4.3k ohm $\pm 5\%$ 1206 SMD	569-0115-432	TP101	Red vertical tip jack 0.08	105-2202-211
R 413	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	TP201	Red vertical tip jack 0.08	105-2202-211
R 414	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	TP202	Red vertical tip jack 0.08	105-2202-211
R 421	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	TP203	Red vertical tip jack 0.08	105-2202-211
R 423	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101			
R 424	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	U 101	Mixer LRMS-2H	544-0007-013
R 426	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 102	Op amp SO-8 MC33172D	544-2019-017
R 427	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 201	FM IF MC3371D SO-16	544-2002-031
R 428	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 202	Dual op amp SO-8	544-2019-004
R 429	910 ohm $\pm 5\%$ 1206 SMD	569-0115-911	U 203	FM IF MC3371D SO-16	544-2002-031
R 430	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241	U 204	Dual op amp SO-8	544-2019-004
R 431	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	U 301	+5V regulator 78L05 SO-8	544-2603-039
R 432	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473	U 302	+12V regulator 78L12 SO-8	544-2603-032
R 433	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	U 303	+12V regulator 78L12 SO-8	544-2603-032
R 434	30k ohm $\pm 5\%$ 1206 SMD	569-0115-303	U 304	+12V regulator 78L12 SO-8	544-2603-032
R 435	3k ohm $\pm 5\%$ 1206 SMD	569-0115-302	U 401	Synthesizer MC145190F SOIC	544-3954-026
R 436	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102			
R 437	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	Y 401	17.5 MHz crystal 1 PPM	518-7117-500
R 438	9.1k ohm $\pm 5\%$ 1206 SMD	569-0115-912			
R 439	3.6k ohm $\pm 5\%$ 1206 SMD	569-0115-362	Z 201	52.95 MHz 4-pole 15 kHz BW	532-0009-009
R 440	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	Z 202	52.95 MHz 4-pole 15 kHz BW	532-0009-009
R 441	15k ohm $\pm 5\%$ 1206 SMD	569-0115-153	Z 203	450 kHz cer filter 20 kHz BW	532-2004-013
R 442	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	Z 204	450 kHz cer filter 20 kHz BW	532-2004-013
R 443	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	Z 205	680 μ H quad coil	542-5102-001
R 444	4.3k ohm $\pm 5\%$ 1206 SMD	569-0115-432	Z 211	52.95 MHz 4-pole 8 kHz BW	532-0009-011
R 445	1.5k ohm $\pm 5\%$ 1206 SMD	569-0115-152	Z 212	52.95 MHz 4-pole 8 kHz BW	532-0009-011
R 446	1.3k ohm $\pm 5\%$ 1206 SMD	569-0115-132	Z 213	450 kHz cer filter 9 kHz BW	532-2004-015
R 447	150 ohm $\pm 5\%$ 1206 SMD	569-0115-151	Z 214	450 kHz cer filter 9 kHz BW	532-2004-015
R 448	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360	Z 215	680 μ H quad coil	542-5102-001
RT202	1k ohm $\pm 5\%$ chip thermistor	569-3013-002			
RT204	1k ohm $\pm 5\%$ chip thermistor	569-3013-002			





RECEIVER COMPONENT LAYOUT
FIGURE 3-33



SECTION 4 800 MHz RECEIVER

4.1 RECEIVER PROGRAMMING

4.1.1 2000PGMR PROGRAMMER

When the program is loaded into the computer and executed, the menu shows the files available from the directory. The program is used to Create, Edit, Transfer and Receive the repeater and channel parameters described in Section 4.2.

IMPORTANT

The commands and displays referred to in this Section are for the IBM PC and may differ from IBM compatible. Refer to the computer's operating system manual for command explanations.

4.1.2 ALIGNMENT SOFTWARE

The software for the CVR programs the Interface Board to open and close the audio/data gates necessary for the alignment selected from the Test-Full Rptr/Station/CVR menu. Under the menu heading Test are the alignment procedures for the Receiver, overall Full CVR (see Section 4.4) including the Interface Board (see Figure 4-1).

Refer to Section 4.3 for Alignment Procedures as shown in the program, alignment points diagrams and test setup diagrams.

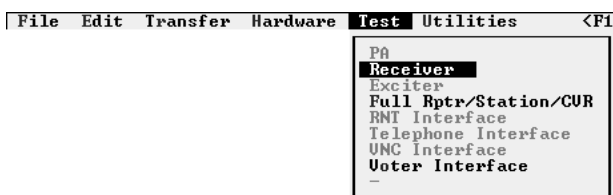


Figure 4-1 CVR TEST MENU

4.1.3 HELP F1

Help screens are available for most parameters and options in this program. Whenever a parameter or options clarification is needed, press F1 and if a help screen is available it will pop-up on the screen. Press Escape <ESC> to exit the pop-up screen.

4.2 PULL DOWN MENUS

4.2.1 MENU DISPLAYS

The menus available are listed at the top of the screen. Move the cursor with the arrow keys to highlight the menu name. Press Enter to view the menu and the arrow keys to scroll through the menu. Call up the highlighted selection by pressing Enter.

4.2.2 FILE MENU

This menu manipulates new or existing files into directories and saves files to be called up at another time.

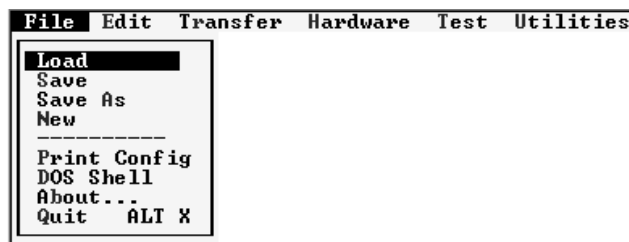


Figure 4-2 FILE MENU

Load

Load reads information from a stored file. The program requests the filename to be loaded into the buffer. The filename from a disk can be entered in the highlighted area. Then move the cursor down with the arrow key and highlight "Ok" and press Enter. To select an existing file, use the arrow keys to move down the menu list and press Enter when the highlighted filename is the file to load.

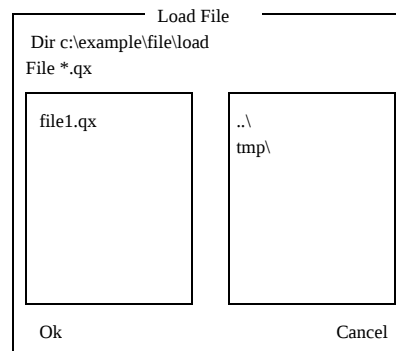


Figure 4-3 LOAD FILE

Save

This saves the edited version of an existing file loaded in the buffer under the same filename in the directory and deletes the old file. Loads a new file created in the Edit menu into the directory.

Save As

Use Save As to edited version of an existing file loaded in the buffer under a new filename or give a new file created in the Edit menu a filename.

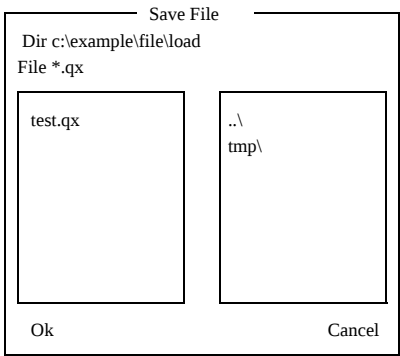


Figure 4-4 SAVE FILE

Print Repeater Configuration

Select the destination for the configurations.

- Printer - Prints to printer connected to PC.
- File - Writes printable test to selected filename.

Select which CVR data will be printed.

- All CVRs - Prints the data for all valid CVRs.
- Single CVR - Print the data for the entered CVR number.

NOTE: A list of valid CVRs can be seen under the Edit-Select Repeater menu selection.

DOS Shell

Temporarily suspends the program and returns to DOS. Directories and other DOS commands can be performed. To return to the program from DOS, type EXIT and press Enter.

Quit (ALT X)

Quit exits the CVR program and returns to DOS. Be sure all files are saved before exiting the program.

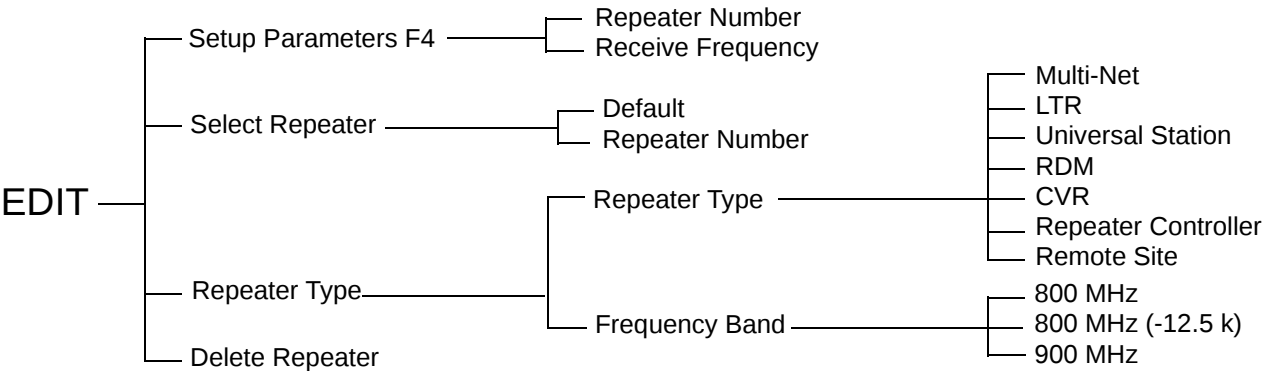


Figure 4-5 EDIT PROGRAMMING FLOWCHART

4.2.3 EDIT

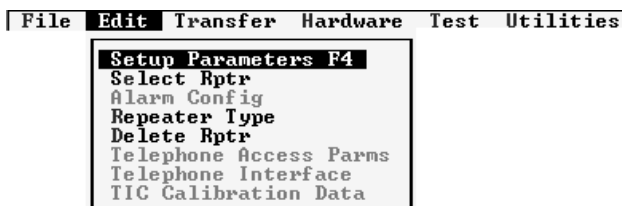


Figure 4-6 EDIT MENU

This menu is used to create new files and set or change the CVR operating parameters. The filename for the CVRs in this file is shown in the lower left corner of the screen.

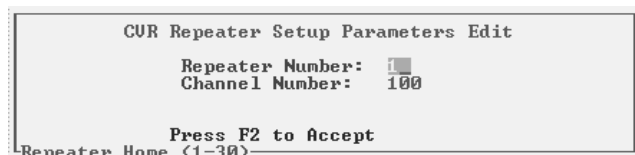


Figure 4-7 SETUP PARAMETERS

Setup Parameters

This programs the Receiver parameters and options of each CVR at a Site. The following paragraphs explain the parameters that are set by this screen (see Figure 4-7) and give a brief description of each.

NOTE: The parameters are shown in the lower left of the pop-up screen for reference.

Repeater Number

Each CVR is programmed with a repeater number from 1-30 for reference. Number selection can be arbitrary as long as each CVR is assigned a different number.

Channel Number

Each repeater is programmed with a channel number (1-920).

NOTE: Repeater program channel numbers 1-599 increment in 25 kHz steps. Program channel numbers 600-920 increment in 12.5 kHz steps. See Appendix A to determine the correct operating frequency.

Select Repeater

Select the repeater number to be programmed or edited from the pop-up menu (see Figure 4-8). Move the cursor with the arrow keys to highlight the repeater number and press Enter.

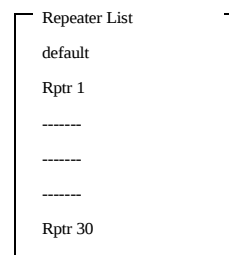


Figure 4-8 REPEATER LIST

Repeater Type Selection

This screen (see Figure 4-9) selects the repeater type and features:

Frequency Band	800 MHz
	800 MHz (-12.5 k)

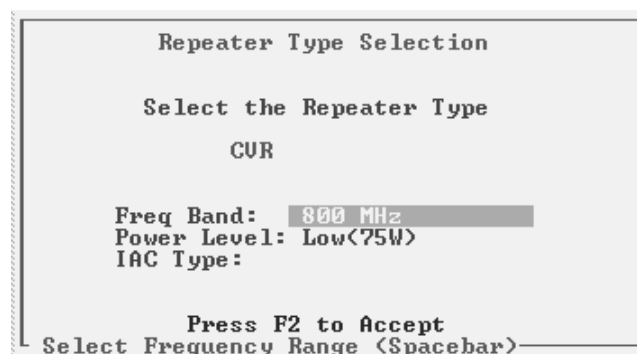


Figure 4-9 REPEATER TYPE SELECTION

Delete Repeater



Figure 4-10 DELETE REPEATER

4.2.4 TRANSFER



Figure 4-11 TRANSFER MENU

Write Setup Parameters

This command sends the contents of a file to the repeater and programs the EEPROM memory in the Interface board.

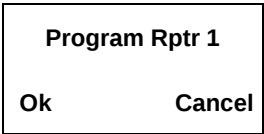


Figure 4-12 WRITE SETUP PARAMETERS

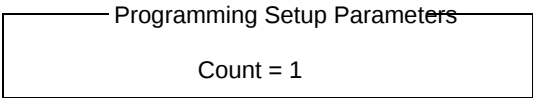


Figure 4-13 PROGRAM WRITE SETUP

Read Setup Parameters

This command reads the contents of the EEPROM memory of the Interface board and loads it into a buffer. The contents of the buffer is then displayed to show the programming of the repeater.

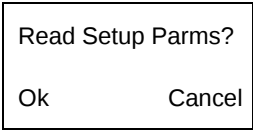


Figure 4-14 READ SETUP PARAMETERS

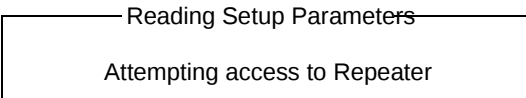


Figure 4-15 READING SETUP

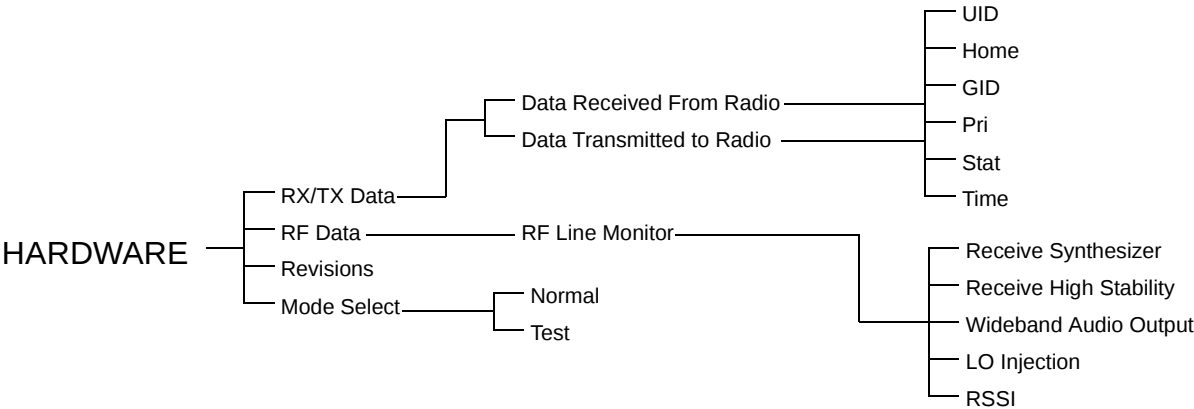


Figure 4-16 HARDWARE PROGRAMMING FLOWCHART

4.2.5 HARDWARE



Figure 4-17 HARDWARE MENU

RF Data

The A/D Monitor Screen shows the state of the lines (see Figure 4-18). These lines are being monitored by the A to D converter on the CVR Interface board. The normal values for each line are defined as follows.

Synthesizer Lock Lines	Yes or No
Wideband Audio Output	approx 200
LO Injection	approx 250
RSSI	20-150

Values with no label are the actual A to D reading.

RF Line Monitor for CVR			
Synthesizer Lock Lines		Receive Parameters	
Receive Synthesizer:	Yes	Wideband Audio Output:	0
Receive High Stability:	Yes	LO Injection:	0
		RSSI:	0

Figure 4-18 RF LINE MONITOR FOR CVR

Revision/Version

The Revision/Version is displayed for the repeater modules. The format for all modules is R.V. (revision.version). The MPC information also includes the software release date and the repeater serial number (see example in Figure 4-19).

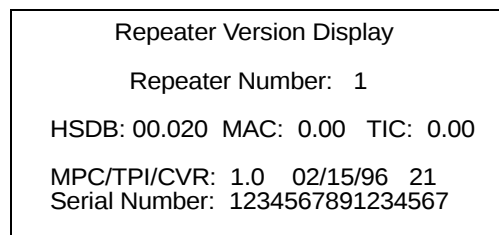
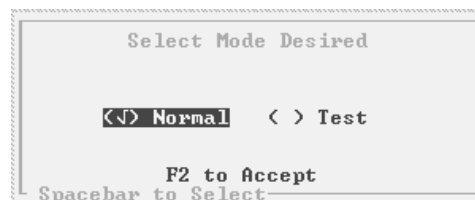


Figure 4-19 REVISION/VERSION

Mode Select

The Mode Select screen places the repeater either in the normal mode or the test mode. In the Normal mode the repeater operates as a normal repeater.

In the Test mode the repeater transmits a test word. This test word is the Test Mode ID set up in the Setup Parameters (see Table 4-1). While in the test mode the repeater is “busy”, therefore it is important to place the repeater in Normal mode when the test mode is no longer required.



4.2.6 TEST

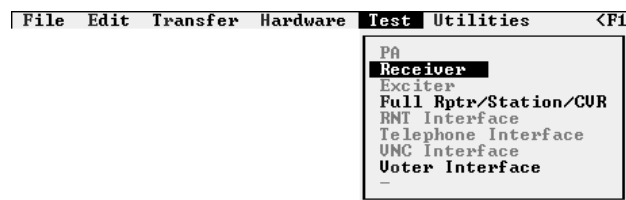


Figure 4-20 TEST MENU

Receiver

This menu selection walks through the alignment of the receiver on the computer screen. Refer to Sections 4.3 and 4.4 for the Receiver alignment in this manual and Figure 4-28 for an alignment points diagram and Figure 4-30 for the Receiver Test Setup.

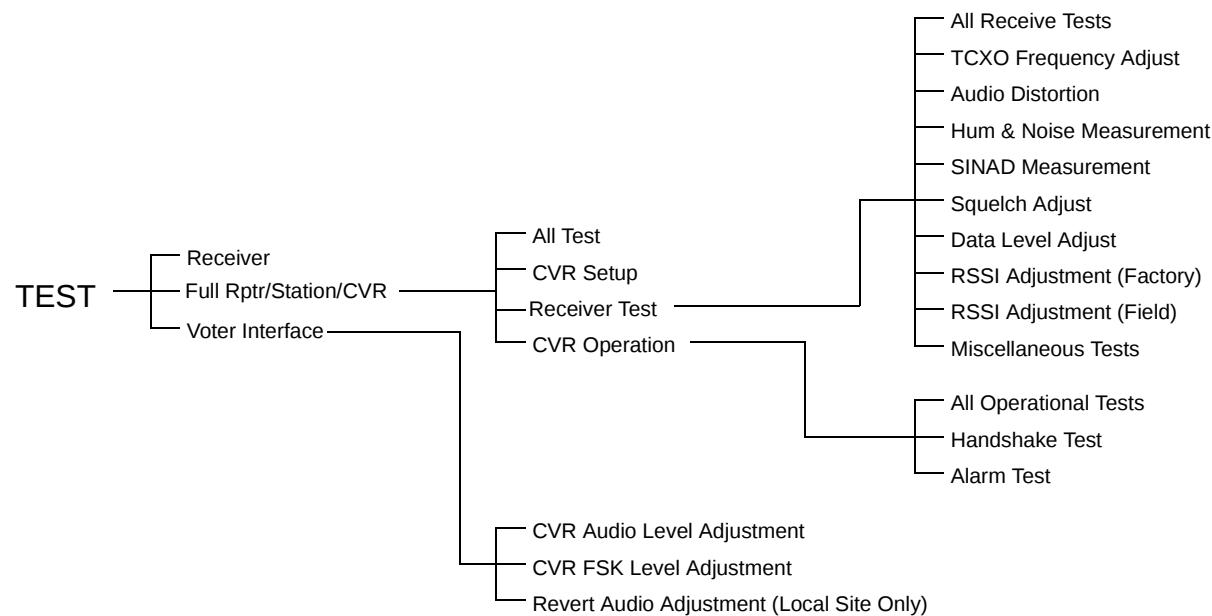


Figure 4-21 TEST PROGRAMMING FLOWCHART

Full CVR

This menu selection walks through the alignment of the entire repeater. The Receiver and Exciter portions are performance tests and adjustments. The Audio and Data portions are level adjustments for the CVR Interface Board. Refer to Figure 4-29 for an alignment points diagram for the Interface Board.

4.2.7 UTILITIES



Figure 4-23 UTILITIES MENU

CVR To Voter Interface

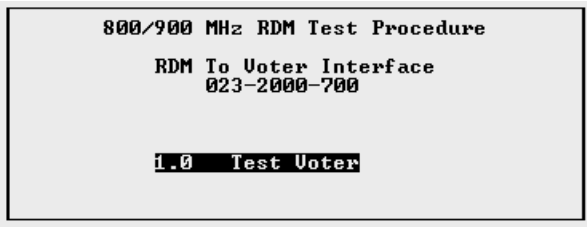


Figure 4-22 CVR TO VOTER INTERFACE

This menu selection walks through the alignment of the audio output level setting of the receiver.

COM Port

This is the COM port used to send and receive data from the Repeater MPC. An interface cable connects the Repeater to the computer (see Figure 4-25).

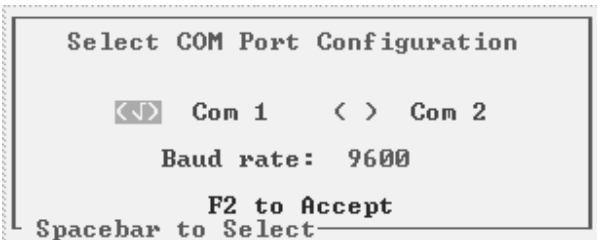


Figure 4-24 COM PORT SELECTION

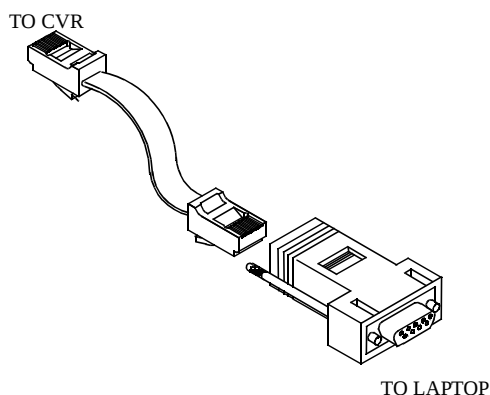


Figure 4-25 LAPTOP INTERCONNECT CABLE

Display Mode

This screen allows the color mode to be selected for color monitors. When using a laptop, monochrome is recommended for better resolution.

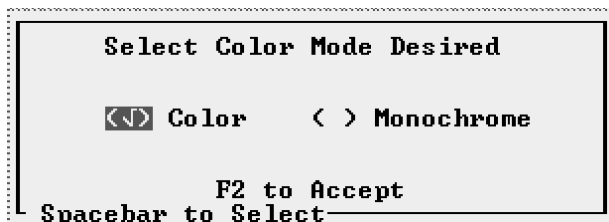


Figure 4-26 COLOR MODE SELECTION

Alarm Display

This screen displays a scrolling list of alarms generated by the repeater.

User Level

There are two levels to choose from, Novice and Advanced. The Novice uses prompts in the Edit-Parameters screens when Escape or F2 keys are pressed that ask "are you sure" before the task is executed. The Advanced selection performs the task without asking the question.

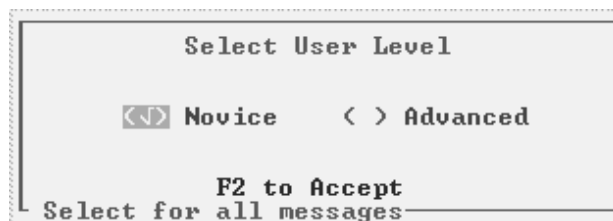


Figure 4-27 USER LEVEL

4.2.8 CVR PROGRAMMING

Creating A New File

An example will be used to show the programming for a new file created for Site 1.

NOTE: At any point in the programming sequence, if F1 is selected, a help screen appears to explain the menu selection highlighted at that point.

Select CVR To Edit

A CVR is selected to program. When no file exists with programmed CVRs, the default is selected and edited.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. Default is the only repeater in this list, press Enter.
4. Highlight EDIT, press Enter.
5. Highlight SETUP PARAMETERS, press Enter.
6. The Setup Parameters screen appears (see Figure 4-7). Fill in the parameters for this repeater. A brief description of the parameters is in Table 4-1. Full descriptions are in Section 4.2.3.
7. Select parameters, press F2 to accept.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.

11. Type in a valid DOS filename.
For this example site1.dat is used.
12. The file consists of default and CVR one under the filename of site1.dat.

Adding A CVR To A File

The example used for Site 1 will again be used to add CVRs to the filename site1.dat.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. The repeater list shown for this file includes default and repeater one. These contain the same parameters with the exception that when selected for edit the programmed repeater can be overwritten and the data lost.
4. Highlight DEFAULT, press Enter.
5. Highlight EDIT, press Enter.
6. Highlight SETUP PARAMETERS, press Enter.
7. Change the Repeater number and other parameters as required for this repeater, press F2.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Repeater 2 is added to the Repeater List in file site1.dat.

4.3 800 MHz RECEIVER ALIGNMENT

CRITICAL ADJUSTMENT

The TCXO must be adjusted within 5 minutes of turning the power on to the RDM. Do not under any circumstances try to set frequency later on in any of the tests, as TCXO frequency stability cannot then be guaranteed.

Refer to Figure 4-28 or 4-29 for component locations. Refer to Figure 4-30 for equipment needed and setup diagram.

4.3.1 PRE-TEST

1. Preset L201, L203, L204, L206, L223 and L224 tuning screws about 1/4 inch above the top of the casting.
2. Preset L202 and L205 tuning screws just barely above the tightening lock nuts.

Apply power to the Receiver by plugging the 20-pin cable from the RF Interface Board into J201 (see Figure 4-28 or 4-29).

Measure the voltages at the following pins.

U206, pin 1 - +12V DC $\pm 0.4V$
U207, pin 1 - +12V DC $\pm 0.4V$
U208, pin 1 - +6V DC $\pm 0.2V$
R309/R310 junction - +3.5V DC $\pm 0.1V$

4.3.2 PROGRAM TUNE-UP CHANNEL

1. Using the PC and software, program the Synthesizer for the Receive channel number.
2. Tune the VCO helical L220 for +4.5V DC $\pm 0.05V$ on U209, pin 6 or TP2.
3. Alternately tune L223 and L224 in 1/2-turn to 1-turn increments until a voltage is measured on J201, pin 13 or TP5. At that time, tune L223 for a peak, then L224 for a peak.
4. Retune L223 and L224 for a peak at TP5.

NOTE: The Channel Number, Channel Frequency and Synthesizer Frequency appear at the bottom of the screen.

4.3.3 TCXO FREQUENCY ADJUST

1. Place a pick-up loop (sniffer) or RF probe connected to a frequency counter near L210.
2. Set Y201 (TCXO) for the Injection Frequency ± 50 Hz (Inj Freq = chnl freq - 52.95 MHz).

4.3.4 VCO TEST

1. The software programs the synthesizer for 3 MHz **above** the Receive Channel.
2. The voltage on TP2 should be $< 7.5\text{V}$.
3. Record the voltage on J201, pin 13 _____.
4. The software programs the synthesizer for 3 MHz **below** the Receive Channel.
5. The voltage on TP2 should be $> 2\text{V}$.
6. Record the voltage on J201, pin 13 _____.
7. If the voltages recorded in Steps 3 and 6 are not within $\pm 0.2\text{V}$, tune L224 as required to balance the voltage readings.
8. The software programs the synthesizer for the Receive Channel.

4.3.5 FRONT END ADJUSTMENTS (REV. 5)

REVISION 5 OR EARLIER BOARDS

1. Set the signal generator to the Receive Channel at a level sufficient to produce an output voltage on J201, pin 7 (RSSI Output).
2. Tune L204, L205, L206, L201, L202, L203 and L204 for a peak voltage on J201, pin 7. Decrease the generator output level to maintain a 2-3V reading at J201, pin 7.
3. Set the generator for $1000\text{ }\mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\text{ kHz}$ deviation ($100\text{ }\mu\text{V}$ at the receive antenna with 20 dB pad at the generator).
4. Tune Z213 for $2\text{V} \pm 0.05\text{V}$ on J201, pin 9.
5. Tune R264 for 387 mV RMS, $\pm 5\text{ mV RMS}$, on TP4.
6. Repeat Steps 4 and 5.
7. Measure the distortion on TP4.
8. Tune L207, L209, L211 and L225 for minimum distortion $< 5\%$, (typically $< 3\%$).
9. Repeat Step 8 then Steps 4, 5 and 6.

4.3.6 FRONT END ADJUSTMENTS (REV. 6)

REVISION 6 BOARDS

1. Set the signal generator to the Receive Channel at a level sufficient to produce an output voltage on J201, pin 7 (RSSI Output).
2. Tune L204, L205, L206, L201, L202, L203 and L204 for a peak voltage on J201, pin 7. Decrease the generator output level to maintain a 2-3V reading at J201, pin 7.
3. Set the generator for $1000\text{ }\mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\text{ kHz}$ deviation ($100\text{ }\mu\text{V}$ at the receive antenna with 20 dB pad at the generator).
4. Adjust the Quad Detector Coil Z213 for 2V DC on U202, pin 9.
5. Adjust R264 for 387 mV RMS on J201, pin 9 (TP4).
6. Adjust R282 for 2V DC $\pm 0.05\text{V}$ on J201, pin 9 (TP4).
7. Measure the distortion on TP4.
8. Tune L207, L209, L211, L225, C373 and C375 for minimum distortion $< 5\%$, (typically $< 3\%$).
9. Repeat Step 8 then Steps 4, 5 and 6.

4.3.7 AUDIO DISTORTION

1. Plug a 16 ohm load at J204 on the RDM.
2. Connect a distortion analyzer to the 16 ohm load.
3. Measure the distortion of the receive audio at J204 on the RDM with the local volume control set to 2.8V RMS.
4. The reading should be $< 3\%$ (typically $< 1\%$).
5. Measure receive sensitivity at J204 on the RDM.
6. The reading should be $< 0.35\text{ }\mu\text{V}$ (typ. $0.25\text{ }\mu\text{V}$).
7. The software programs the synthesizer for 3 MHz **above** the Receive Channel.
8. Receive sensitivity should be less than $0.35\text{ }\mu\text{V}$ (typically less than $0.30\text{ }\mu\text{V}$).

9. The software programs the synthesizer for 3 MHz **below** the Receive Channel.
10. Receive sensitivity should be less than $0.35\ \mu\text{V}$ (typically less than $0.30\ \mu\text{V}$).
11. The software programs the synthesizer for the Receive Channel.

4.4 FULL CVR TEST

1. Select TEST - FULL RPTR/STATION/CVR and press Enter.

NOTE: All audio generators and audio voltmeters are unbalanced unless specifically stated otherwise.

4.4.1 VOLTAGE MEASUREMENTS

1. Disconnect the receiver-to-interface cable (20-pin) from J201 of the Interface board.
2. Apply power to the Interface board.
3. Measure the voltages at the following pins.

U109, pin 1	+12V DC $\pm 0.4\text{V}$
U223, pin 2	+9V DC $\pm 0.4\text{V}$
U224, pin 2	+5V DC $\pm 0.2\text{V}$
U204, pin 7	+1.25V DC $\pm 0.06\text{V}$
Junction of L202/C279	-5V DC $\pm 0.4\text{V}$

4. Apply power to the Receiver by plugging the 20-pin cable from the Interface Board into J201 (see Figure 4-28).

4.4.2 RECEIVER FREQUENCY CHECK

1. Check the receiver injection frequency with a "sniffer" pickup loop, or RF probe and a suitable frequency counter placed near L210.
2. TCXO Adjustment

Set Y201 (TCXO) for the Injection Frequency $\pm 50\ \text{Hz}$ (Inj Freq = chnl freq - 52.95 MHz).

Receiver Audio Distortion Measurement

1. Adjust the RF generator for $100\ \mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\ \text{kHz}$ deviation.

2. Adjust R207 for 0 dBm (775 mV RMS) at J210.
3. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
4. Adjust R262 for 2.8V RMS and measure the distortion. Distortion should be $< 3\%$.

Receiver Hum and Noise Measurement

1. Adjust the RF generator for $100\ \mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\ \text{kHz}$.
2. *On the Interface Board*, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. Remove modulation from the RF generator. The measured level must be $\leq -45\ \text{dB}$.

Receiver SINAD Measurement

1. Adjust the RF generator for $100\ \mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\ \text{kHz}$.
2. *On the Interface Board*, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. 12 dB SINAD reading should be $\leq 0.35\ \mu\text{V}$.

Receiver Squelch Adjustment

1. Adjust the RF generator for $100\ \mu\text{V}$ into the receiver with a 1 kHz tone at $\pm 3\ \text{kHz}$.
2. **On the Interface Board**, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. Set the RF generator output for 5 dB SINAD.
5. *On the Interface Board*, adjust R222 so the Receiver just squelches.
6. Increase the RF generator output until the Receiver unsquelches. Reading should be $\leq 10\ \text{dB SINAD}$.

Receiver Data Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 100 Hz tone at ± 1 kHz.
2. Insert voltmeter probes into J202 on the Interface Board and connect to an AC voltmeter.
3. Adjust R248 to achieve 340 mV RMS (-7.1 dBm).

Receiver RSSI Adjustment

NOTE: Use this procedure only when an audio analyzer is unavailable.

1. Adjust the RF generator for 0.29 μ V into the Receiver with a 1 kHz tone at ± 3 kHz.
2. Adjust R261 in the Receiver for 0.8V DC (± 0.02 V DC) at TP3.

Receiver Miscellaneous Tests (Optional)

Several additional tests may be performed on the Receiver as listed below:

- Signal Displacement Bandwidth
- Adjacent Channel Rejection
- Offset Channel Selectivity
- Intermodulation Rejection
- Spurious Rejection
- Audio Response
- Audio Sensitivity

Perform the Test desired using the appropriate RF Generators, modulation frequencies, levels, RS-232 levels and test probes following the latest TIA document measurement procedures.

Handshake Test

1. Program a portable or mobile for the following parameters.

Home Repeater - Same as repeater number.
 System Key - Same as repeater
 Status Channel - Same as repeater channel.
 Home Channel - Same as repeater channel.
 Encode ID = 1
 Decode ID = 1
 UID = 1
 Site = 1

2. The repeater is now in Normal Operation mode.
3. Key the radio several times on the programmed System/Group. Display shall indicate "4" every time. (Proper Tx/Rx antenna connections are assumed.)

Alarm Test

1. The CVR is now in Normal Operation mode.
2. Verify the front panel display does not indicate any alarms (see Table 4-1).

Table 4-1 ALARMS

Display No.	Definition
0	Test Mode
1	Not Used
2	Normal Operation
3	Revert Operation
4	Receiving Data
5	Not Used
6	Not Used
7	Receive Synthesizer Out of Lock
8	High Stability Synth Out of Lock
9	Data Processor Failure
A	Not Used
B	Not Used
C	Downloading Code
D	Not Used
E	Erasing Code
F	Failure

4.4.3 VOTER INTERFACE

CVR Audio Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 1.5 kHz.
2. Connect a **balanced** AC voltmeter between J205, pin 2 and J206, pin 2. Connect a 600 ohm termination to the meter terminals or across J101, pins 5/6.
3. *On the Interface Board*, adjust R271 for the type of line.

Leased Line/Direct Connect (default)
 -12 dBm (194 mV RMS)

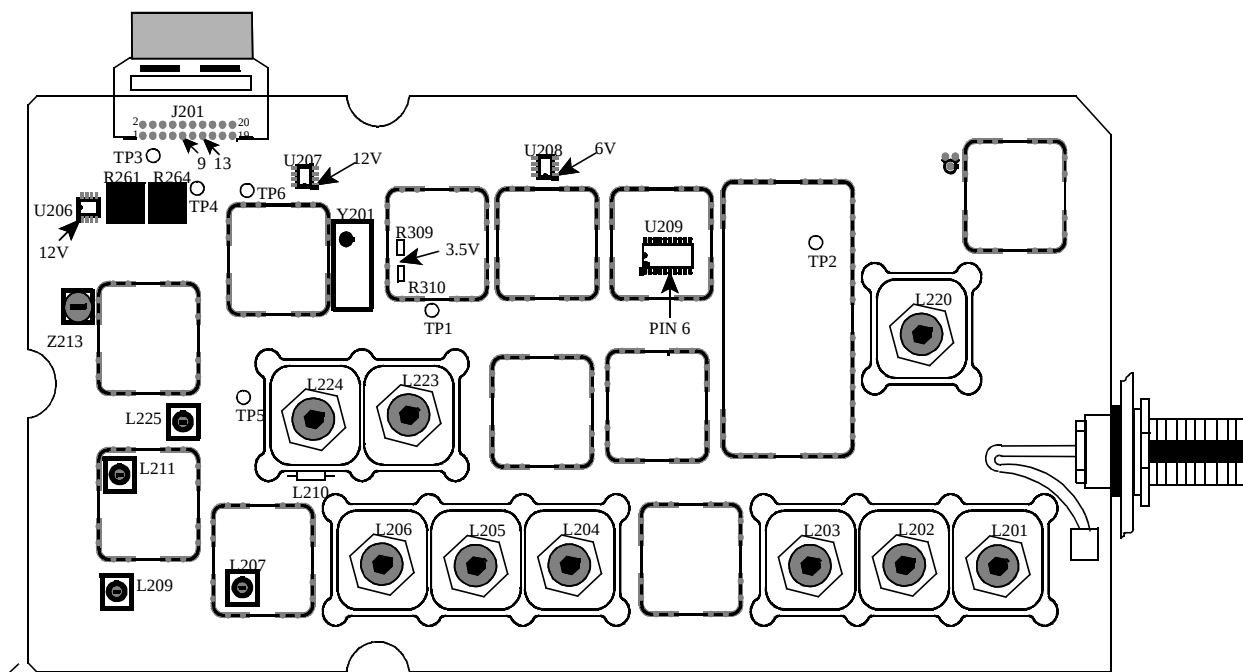


Figure 4-28 800 MHz RECEIVER ALIGNMENT POINTS (REVISION 5 OR EARLIER)

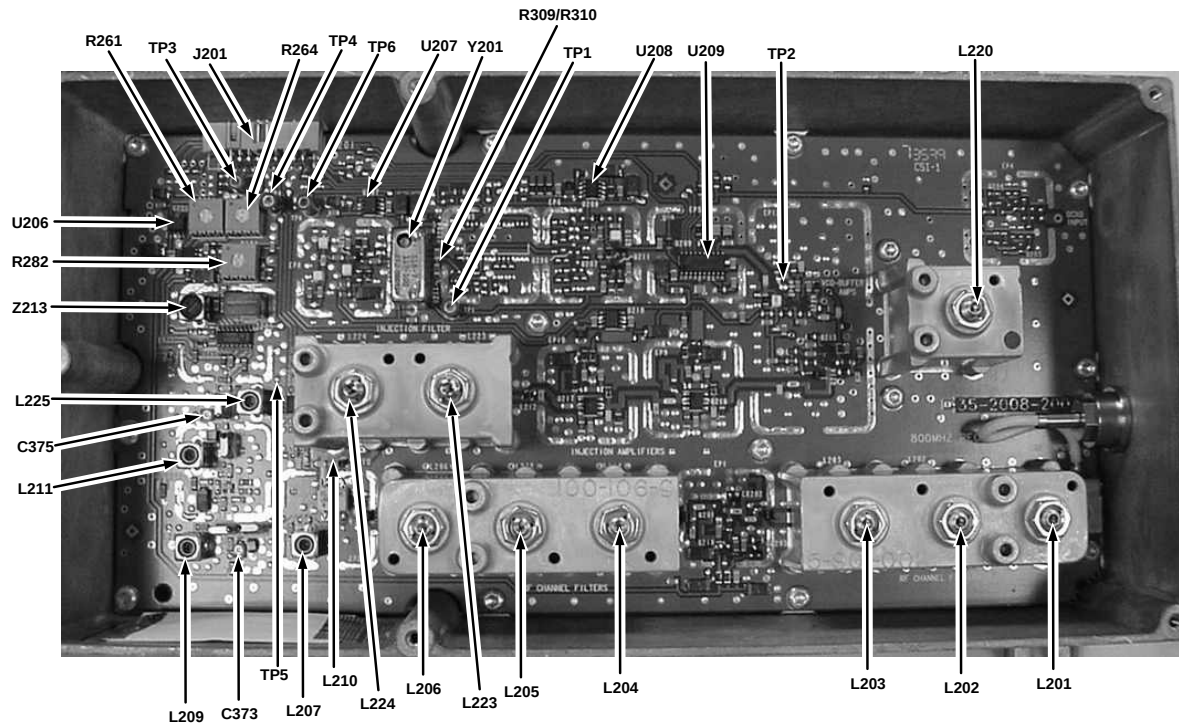


Figure 4-29 800 MHz RECEIVER ALIGNMENT POINTS (REVISION 6)

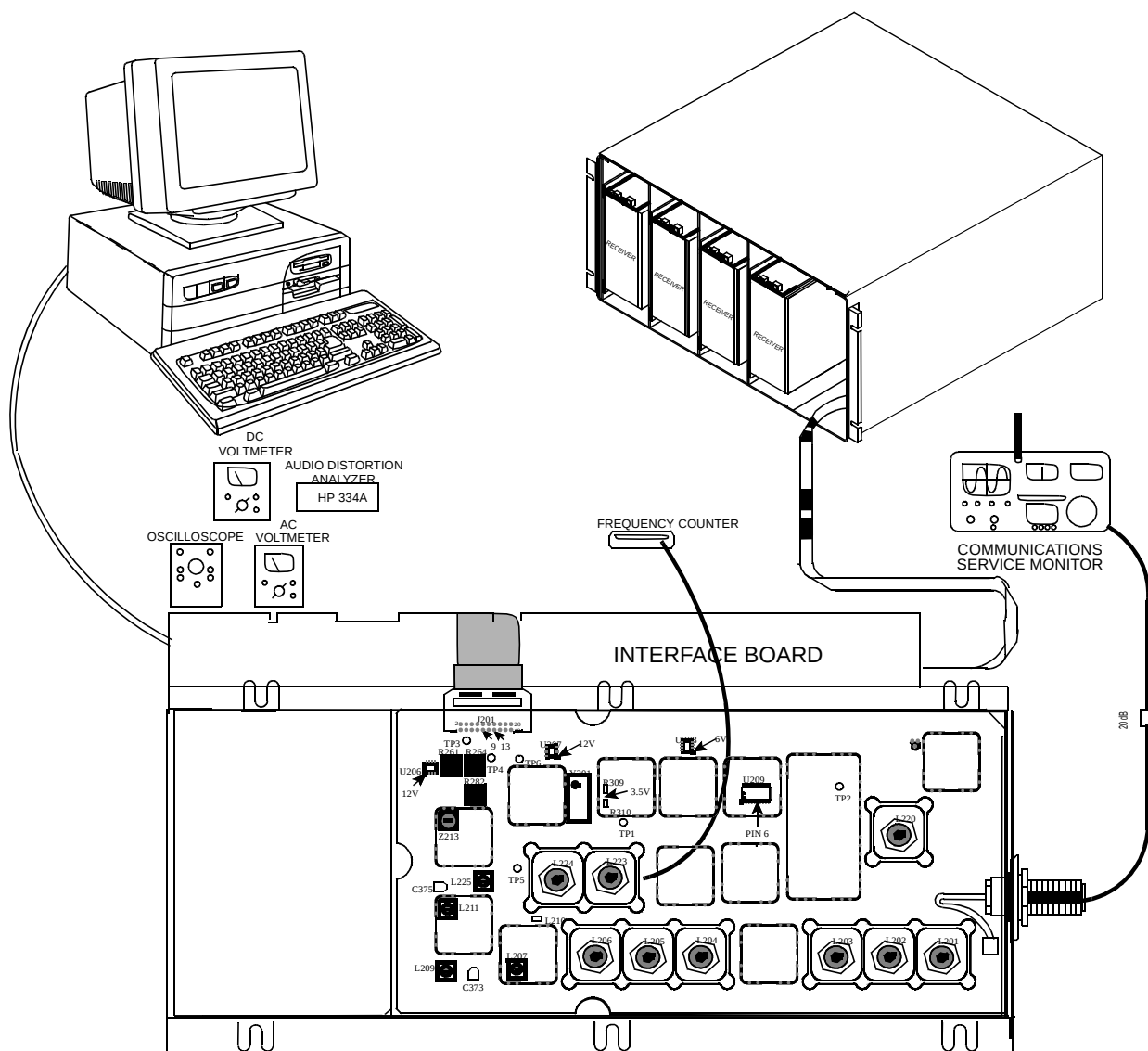


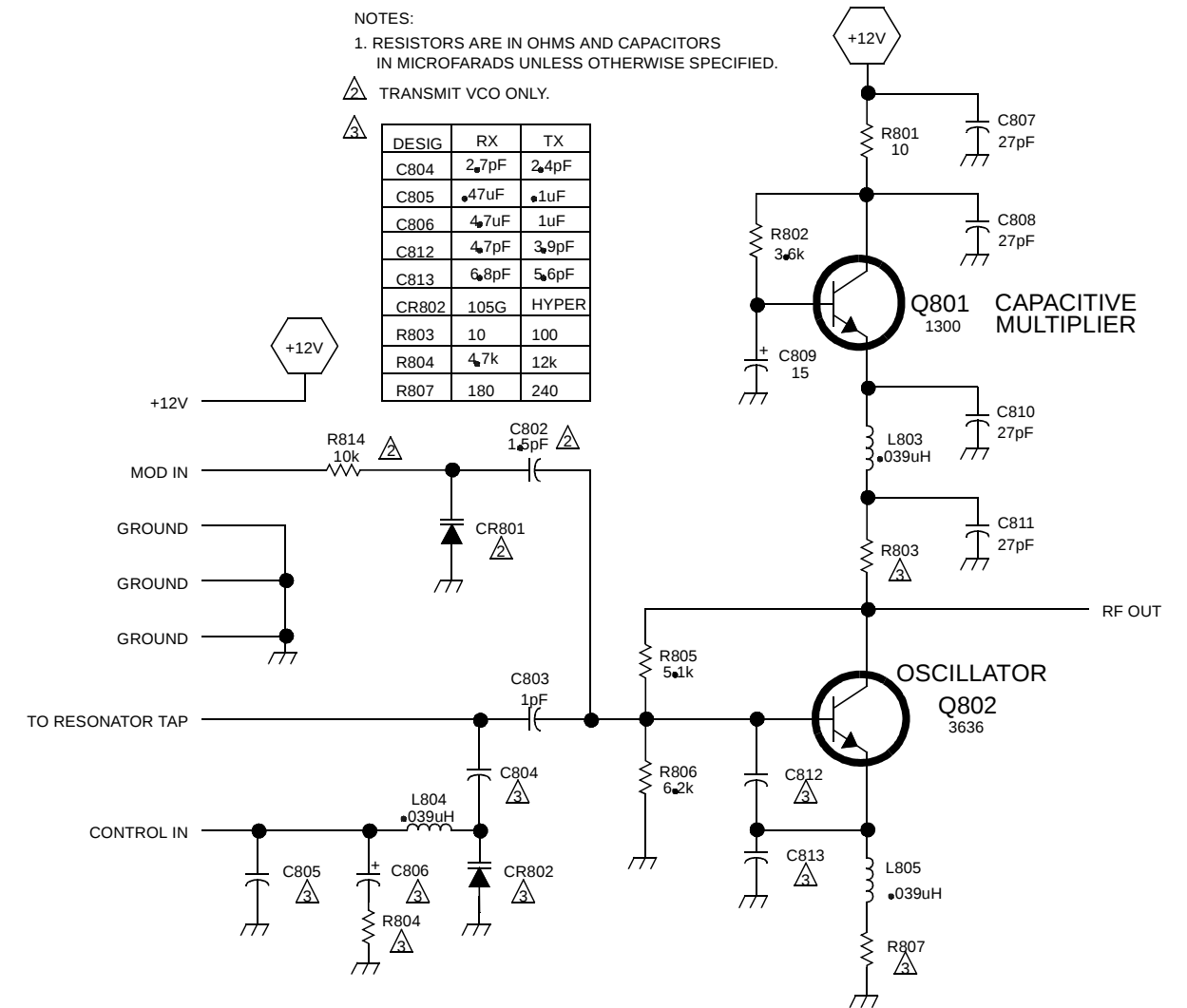
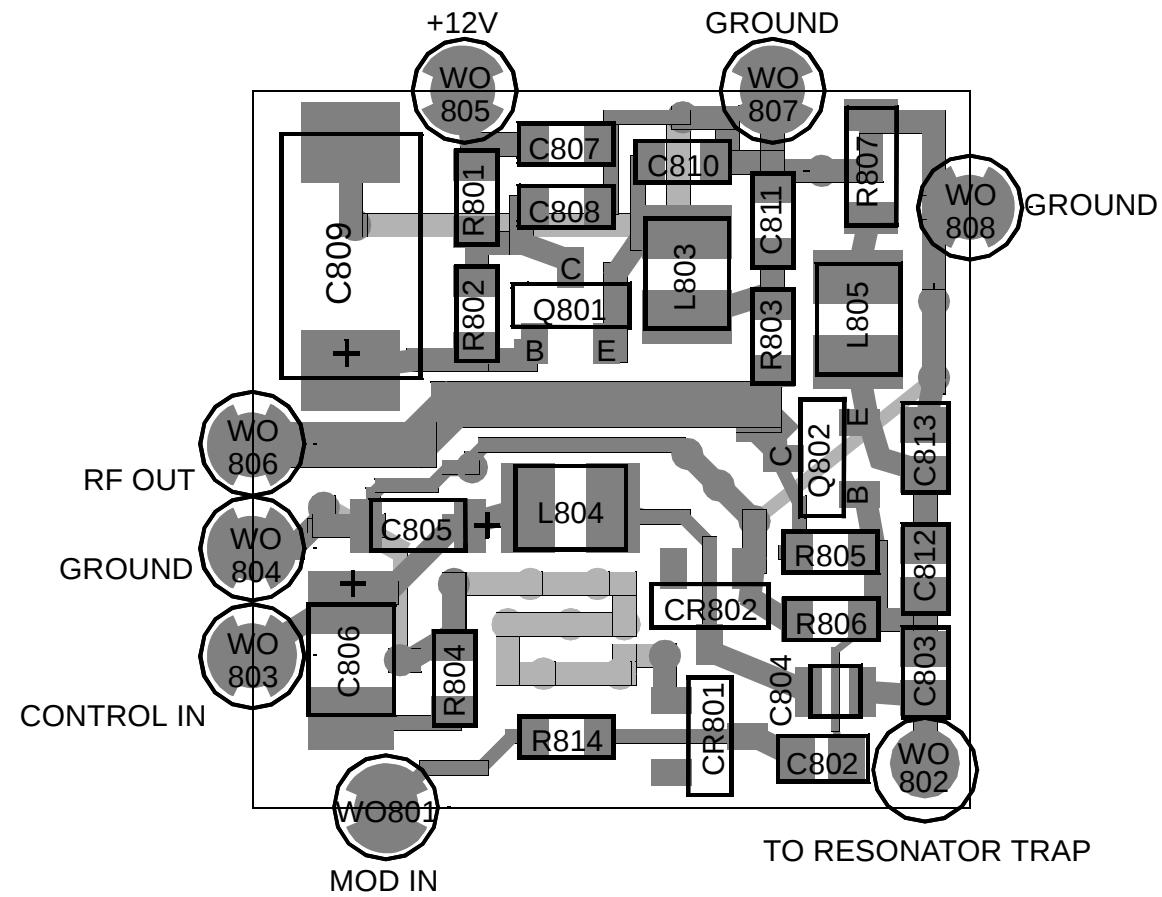
Figure 4-30 800 MHz RECEIVER TEST SETUP

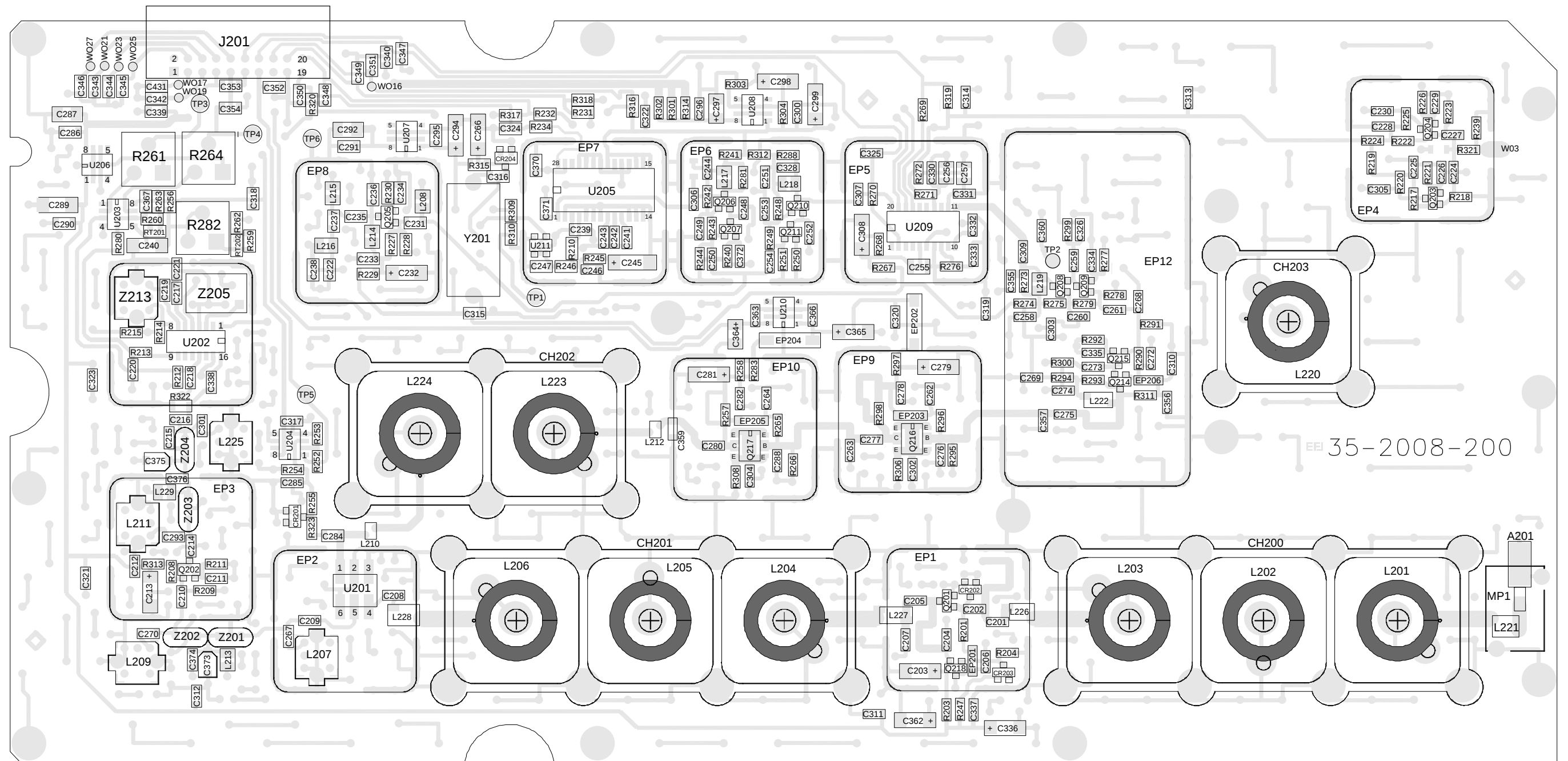
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
800 MHz VOTING RECEIVER PART NO. 023-2008-220			L 803	.039 μ H inductor SMD	542-9001-397
A 200	Audio/Logic Interface Board	023-2000-720	L 804	.039 μ H inductor SMD	542-9001-397
A 201	Receiver Board 800 MHz	585-2081-270	L 805	.039 μ H inductor SMD	542-9001-397
A 202	20-pin ribbon cable	023-2000-703	PC800	PC board	035-2008-800
EP200	RF shield gasket 0.156 OD	574-3002-036	Q 801	Si NPN gen purp switch/amp	576-0001-300
EP201	Heat sink insulator TO-220	574-5005-060	Q 802	NPN UHF low noise SOT-23	576-0003-636
HW2004-40 x 0.063 NPB nut		560-2104-006	R 801	10 ohm $\pm$ 5% 0805 chip	569-0105-100
HW201 10-32 x 0.375 CPS nut		560-1110-012	R 802	3.6k ohm $\pm$ 5% 0805 chip	569-0105-362
HW202 6-32 panhead TORX ZPS		575-0006-010	R 803	10 ohm $\pm$ 5% 0805 chip	569-0105-100
HW203 6-32 mach panhead phil ZPS		575-1606-008	R 804	4.7k ohm $\pm$ 5% 0805 chip	569-0105-472
HW204 6-32 mach panhead phil ZPS		575-1606-016	R 805	5.1k ohm $\pm$ 5% 0805 chip	569-0105-512
HW205 #4 shakeproof washer		596-1104-008	R 806	6.2k ohm $\pm$ 5% 0805 chip	569-0105-622
HW206 6 x 0.018 lockwasher int CPS		596-1106-009	R 807	180 ohm $\pm$ 5% 0805 SMD	569-0115-181
HW207 #10 flat washer		596-1410-016	RECEIVER PART NO. 023-2008-200		
HW208 4-40 mach panhead phil ZPS		575-1604-012	A 006	800 MHz VCO	023-2008-800
HW209 5/8 x 0.02 lockwasher int ZPS		596-9119-028	A 201	RF input coax	023-2000-161
HW210 5/8-24 x 0.094 hex nut NPB		560-9079-028	A 203	Receiver board top shield	023-2000-199
MP200 Housing		015-0902-011	C 201	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689
MP201 Deck cover		015-0902-015	C 202	6.2 pF $\pm$ 5% NPO 1206 chip	510-3602-629
MP202 Mounting plate		017-2210-152	C 203	4.7 μ F 16V tantalum SMD	510-2625-479
MP203 1/4 hex brass M/F spacer		312-7483-008	C 204	56 pF $\pm$ 5% NPO 1206 chip	510-3602-560
MP204 1/4 hex brass M/F spacer		312-7473-008	C 205	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689
U 223	+9V regulator TO-220	544-2003-059	C 206	56 pF $\pm$ 5% NPO 1206 chip	510-3602-560
U224	+5V regulator TO-220	544-2003-091	C 207	6.2 pF $\pm$ 5% NPO 1206 chip	510-3602-629
RECEIVE VCO 800 MHz PART NO. 023-2008-800			C 208	24 pF $\pm$ 5% NPO 1206 chip	510-3602-240
C 803	1 pF 150V chip	510-3656-109	C 209	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100
C 804	2.7 pF 150V chip	510-3656-279	C 210	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100
C 805	.47 μ F 16V tantalum SMD	510-2625-478	C 211	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 806	4.7 μ F 10V tantalum SMD	510-2624-479	C 212	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 807	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 213	4.7 μ F 16V tantalum SMD	510-2625-479
C 808	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 214	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100
C 809	15 μ F 20V tantalum SMD	510-2626-150	C 215	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689
C 810	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 216	3.9 pF $\pm$ 5% NPO 1206 chip	510-3602-399
C 811	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 217	.1 μ F $\pm$ 10% X7R 1210	510-3607-104
C 812	4.7 pF 150V chip	510-3656-479	C 218	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 813	6.8 pF 150V chip	510-3656-689	C 219	.1 μ F $\pm$ 10% X7R 1210	510-3606-104
CR802	Varactor	523-1504-915	C 220	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
			C 221	.1 μ F $\pm$ 10% X7R 1210	510-3606-104
			C 222	120 pF $\pm$ 5% NPO 1206 chip	510-3602-121
			C 231	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 232	4.7 μ F 16V tantalum SMD	510-2625-479	C 294	4.7 μ F 16V tantalum SMD	510-2625-479
C 233	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 295	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 234	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 296	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 235	220 pF $\pm$ 5% NPO 1206 chip	510-3602-221	C 297	1.5 μ F 25V tantalum SMD	510-2627-159
C 236	220 pF $\pm$ 5% NPO 1206 chip	510-3602-221	C 298	4.7 μ F 16V tantalum SMD	510-2625-479
C 237	5.6 pF $\pm$ 5% NPO 1206	510-3602-569	C 299	4.7 μ F 16V tantalum SMD	510-2625-479
C 238	390 pF $\pm$ 5% NPO 1206	510-3602-391	C 300	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 240	4.7 μ F 16V tantalum SMD	510-2625-479	C 301	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390
C 251	.01 μ F $\pm$ 10% X7R 1206 chip	510-3606-103	C 302	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 252	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 303	.1 μ F $\pm$ 10% X7R 1206	510-3606-104
C 253	.01 μ F $\pm$ 10% X7R 1206 chip	510-3606-103	C 304	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390
C 254	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 307	100 pF $\pm$ 5% NPO 1206	510-3602-101
C 255	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 308	4.7 μ F 16V tantalum SMD	510-2625-479
C 256	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 309	1 pF $\pm$ 5% NPO 1206 chip	510-3602-109
C 257	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 310	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 258	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 311	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 259	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 312	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 260	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 315	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 261	3.3 pF $\pm$ 5% NPO 1206 chip	510-3602-339	C 316	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 262	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 317	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 263	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-569	C 318	.001 μ F $\pm$ 10% X7R 1206	510-3606-102
C 264	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 319	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 266	4.7 μ F 16V tantalum SMD	510-2625-479	C 320	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 267	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390	C 321	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 268	1.5 pF $\pm$ 5% NPO 1206 chip	510-3602-159	C 323	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 269	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 325	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101
C 270	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390	C 326	3 pF $\pm$ 5% NPO 1206 chip	510-3602-309
C 272	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 328	820 pF $\pm$ 5% NPO 1206 chip	510-3602-821
C 273	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 330	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 274	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 331	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 275	2.4 pF $\pm$ 5% NPO 1206 chip	510-3602-249	C 332	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 276	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689	C 333	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 277	4.3 pF $\pm$ 5% NPO 1206 chip	510-3602-439	C 334	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 278	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 335	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 279	4.7 μ F 16V tantalum SMD	510-2625-479	C 336	4.7 μ F 16V tantalum SMD	510-2625-479
C 280	12 pF $\pm$ 5% NPO 1206 chip	510-3602-120	C 337	56 pF $\pm$ 5% NPO 1206 chip	510-3602-560
C 281	4.7 μ F 16V tantalum SMD	510-2625-479	C 338	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 282	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 356	2 pF $\pm$ 5% NPO 1206 chip	510-3602-209
C 284	1.5 pF $\pm$ 5% NPO 1206 chip	510-3602-159	C 357	1.5 pF $\pm$ 5% NPO 1206 chip	510-3602-159
C 285	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 358	3.9 pF $\pm$ 5% NPO 1206 chip	510-3602-399
C 286	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 359	2.4 pF $\pm$ 5% NPO 1206 chip	510-3602-249
C 287	1.5 μ F 25V tantalum SMD	510-2627-159	C 362	4.7 μ F 16V tantalum SMD	510-2625-479
C 288	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100	C 363	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 289	4.7 μ F 16V tantalum SMD	510-2625-479	C 364	1.5 μ F 25V tantalum SMD	510-2627-159
C 290	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 365	4.7 μ F 16V tantalum SMD	510-2625-479
C 291	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 366	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 292	1.5 μ F 25V tantalum SMD	510-2627-159	C 367	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 293	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390	C 373	1.5-15 pF ceramic SMD	512-1602-001

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 374	4.7 pF $\pm 5\%$ NPO 1206 chip	510-3602-479	L 220	2 3/8 turn helical coil	016-2186-254
C 375	1.5-15 pF ceramic SMD	512-1602-001	L 221	3T 22 AWG 0.05 ID SMD air	542-0015-003
C 376	4.7 pF $\pm 5\%$ NPO 1206 chip	510-3602-479	L 222	2T 22 AWG 0.05 ID SMD air	542-0015-002
CH200	3-cavity helical front end	015-0901-038	L 223	Helical coil	016-2186-201
CH201	3-cavity helical front end	015-0901-038	L 224	Helical coil	016-2186-201
CH202	2-cavity helical front end	015-0901-028	L 225	0.9 μ H variable inductor 7mm	542-1012-008
CH203	1-cavity helical front end	015-0901-010	L 226	3T 22 AWG 0.05 ID SMD air	542-0015-003
CR201	Hot carrier diode SOT-23	523-1504-016	L 227	3T 22 AWG 0.05 ID SMD air	542-0015-003
CR002	Switching diode SOT-23	523-1504-002	L 228	3T 22 AWG 0.05 ID SMD air	542-0015-003
CR203	Switching diode SOT-23	523-1504-002	L 229	.82 μ H inductor SMD	542-9001-828
CR204	Si 9.1V zener SOT-23	523-2016-919	MP200	Helical coil form	013-1627-100
EP200	Crystal pin cer insulator mini	010-0345-280	MP201	Helical coil form	013-1627-110
EP201	Ferrite bead SMD 1206	517-2503-002	MP203	Damped washer 0.125	018-1132-152
EP202	Ferrite bead SMD 1206	517-2503-010	MP204	Bottom shield	017-2210-101
EP203	Ferrite bead SMD 1206	517-2503-001	PC200	PC board	035-2008-200
EP204	Ferrite bead SMD 1206	517-2503-010	Q 201	NPN UHF low noise SOT-23	576-0003-636
EP205	Ferrite bead SMD 1206	517-2503-001	Q 202	Si NPN RF amp SOT-23	576-0003-602
EP206	Ferrite bead SMD 1206	517-2503-002	Q 205	Si NPN amp	576-0003-658
HW200	10-32 hex set screw NPB	575-9059-032	Q 208	NPN UHF low noise SOT-23	576-0003-636
HW201	10-32 hex set screw NPB	575-9059-024	Q 209	NPN UHF low noise SOT-23	576-0003-636
HW202	Tension lock nut CPS	560-1810-022	Q 210	Si NPN amp SOT-23	576-0003-658
HW203	6-32 panhead Torx ZPS	575-0006-008	Q 211	Si NPN amp SOT-23	576-0003-658
HW204	4-40 panhead slot nylon	575-4504-008	Q 214	NPN UHF low noise SOT-23	576-0003-636
HW205	Polarizing key box cnt	515-7109-010	Q 215	NPN UHF low noise SOT-23	576-0003-636
J 201	20-pin right angle header	515-9031-375	Q 216	NPN .2-2 GHz SO-8 amp	576-0003-604
L 201	Helical coil	016-2186-201	Q 217	NPN 750 mW UHF/800 MHz	576-0004-098
L 202	2.25T helical coil	016-2186-205	Q 218	Si PNP low noise SOT-23	576-0003-657
L 203	Helical coil	016-2186-201	R 201	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
L 204	Helical coil	016-2186-201	R 203	62 ohm $\pm 5\%$ 1206 SMD	569-0115-620
L 205	2.25T helical coil	016-2186-205	R 204	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
L 206	Helical coil	016-2186-201	R 208	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182
L 207	0.9 μ H variable inductor 7mm	542-1012-008	R 209	680 ohm $\pm 5\%$ 1206 SMD	569-0115-681
L 209	0.9 μ H variable inductor 7mm	542-1012-008	R 211	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510
L 210	1.5T coil 22 AWG	542-0010-015	R 212	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
L 211	0.9 μ H variable inductor 7mm	542-1012-008	R 213	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512
L 212	1.5T coil 22 AWG	542-0010-015	R 214	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513
L 213	.82 μ H inductor SMD	542-9001-828	R 215	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182
L 214	.1 μ H inductor SMD	542-9001-108	R 227	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
L 215	.1 μ H inductor SMD	542-9001-108	R 228	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
L 216	.1 μ H inductor SMD	542-9001-108	R 229	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100
L 218	.1 μ H inductor SMD	542-9001-108	R 230	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
L 219	.018 μ H inductor SMD	542-9001-187	R 231	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
			R 232	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
			R 247	2.2k ohm $\pm 5\%$ 1206 SMD	569-0115-222

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 248	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272	R 304	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241
R 249	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 306	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510
R 250	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 308	22 ohm $\pm 5\%$ 1206 SMD	569-0115-220
R 251	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 309	12.1k ohm $\pm 1\%$ 1206 SMD	569-0111-409
R 252	330k ohm $\pm 5\%$ 1206 SMD	569-0115-334	R 310	4.99k ohm $\pm 1\%$ 1206 SMD	569-0111-368
R 253	6.8k ohm $\pm 5\%$ 1206 SMD	569-0115-682	R 311	4.3k ohm $\pm 5\%$ 1206 SMD	569-0115-432
R 254	330k ohm $\pm 5\%$ 1206 SMD	569-0115-334	R 312	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101
R 255	27k ohm $\pm 5\%$ 1206 SMD	569-0115-273	R 313	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 256	20k ohm $\pm 5\%$ 1206 SMD	569-0115-203	R 314	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 257	470 ohm $\pm 5\%$ 1206 SMD	569-0115-471	R 315	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
R 258	150 ohm $\pm 5\%$ 1206 SMD	569-0115-151	R 319	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 259	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 320	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 260	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001	R 322	560 ohm $\pm 5\%$ 1206 SMD	569-0115-561
R 261	5k ohm single turn trimmer	562-0112-502	R 323	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 262	7.5k ohm $\pm 5\%$ 1206 SMD	569-0115-752	RT202	1k ohm $\pm 5\%$ thermistor chip	569-3013-002
R 263	120k ohm $\pm 5\%$ 1206 SMD	569-0115-124	TP001	Red vertical tip jack 0.08	105-2202-211
R 264	5k ohm single turn trimmer	562-0112-502	TP003	Red vertical tip jack 0.08	105-2202-211
R 265	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182	TP004	Red vertical tip jack 0.08	105-2202-211
R 266	470 ohm $\pm 5\%$ 1206 SMD	569-0115-471	TP005	Red vertical tip jack 0.08	105-2202-211
R 267	294 ohm $\pm 1\%$ 1206 SMD	569-0111-246	TP006	Red vertical tip jack 0.08	105-2202-211
R 268	1k ohm $\pm 1\%$ 1206 SMD	569-0111-301	U 201	Mixer LRMS-2H	544-0007-013
R 269	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 202	FM IF MC3371D SO-16	544-2002-031
R 270	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 203	Dual op amp SOIC MC33178	544-2019-018
R 271	910 ohm $\pm 5\%$ 1206 SMD	569-0115-911	U 204	Op amp SO-8 MC33172D	544-2019-017
R 272	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241	U 206	+12V regulator 78L12 SO-8	544-2603-032
R 273	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	U 207	+12V regulator 78L12 SO-8	544-2603-032
R 274	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	U 208	+5V regulator 78L05 SO-8	544-2603-039
R 275	6.8k ohm $\pm 5\%$ 1206 SMD	569-0115-682	U 209	Synthesizer MC145190F SOIC	544-3954-026
R 276	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473	U 210	+12V regulator 78L12 SO-8	544-2603-032
R 277	150 ohm $\pm 5\%$ 1206 SMD	569-0115-151	Y 201	17.5 MHz crystal 1 PPM	518-7117-500
R 278	1.6k ohm $\pm 5\%$ 1206 SMD	569-0115-162	Z 201	52.95 MHz 4-pole 15 kHz BW	532-0009-009
R 279	1.6k ohm $\pm 5\%$ 1206 SMD	569-0115-162	Z 203	52.95 MHz 4-pole 15 kHz BW	532-0009-009
R 280	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	Z 205	450 kHz cer filter 15 kHz BW	532-2006-032
R 282	5k ohm single turn trimmer	562-0112-502	Z 213	455 kHz var inductor w/cap	542-1012-010
R 283	150 ohm $\pm 5\%$ 1206 SMD	569-0115-151			
R 290	1.5k ohm $\pm 5\%$ 1206 SMD	569-0115-152			
R 291	1.3k ohm $\pm 5\%$ 1206 SMD	569-0115-132			
R 292	75 ohm $\pm 5\%$ 1206 SMD	569-0115-750			
R 293	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510			
R 294	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100			
R 295	470 ohm $\pm 5\%$ 1206 SMD	569-0115-471			
R 296	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182			
R 297	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101			
R 299	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360			
R 300	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360			
R 301	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 302	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 303	43 ohm $\pm 5\%$ 1206 SMD	569-0115-430			





800 MHz RECEIVER COMPONENT LAYOUT
FIGURE 4-32

SECTION 5 900 MHz RECEIVER

5.1 RECEIVER PROGRAMMING

5.1.1 2000PGMR PROGRAMMER

When the program is loaded into the computer and executed, the menu shows the files available from the directory. The program is used to Create, Edit, Transfer and Receive the repeater and channel parameters described in Section 5.2.

IMPORTANT

The commands and displays referred to in this Section are for the IBM PC and may differ from IBM compatible. Refer to the computer's operating system manual for command explanations.

5.1.2 ALIGNMENT SOFTWARE

The software for the CVR programs the Interface Board to open and close the audio/data gates necessary for the alignment selected from the Test-Full Rptr/Station/CVR menu. Under the menu heading Test are the alignment procedures for the Receiver, overall Full CVR (see Section 5.4) including the Interface Board (see Figure 5-1).

Refer to Section 5.3 for Alignment Procedures as shown in the program, alignment points diagrams and test setup diagrams.

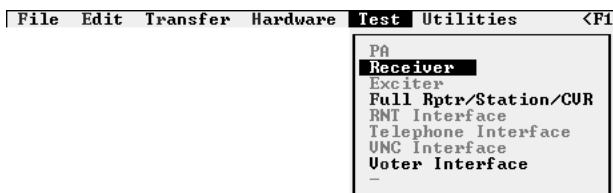


Figure 5-1 CVR TEST MENU

5.1.3 HELP F1

Help screens are available for most parameters and options in this program. Whenever a parameter or options clarification is needed, press F1 and if a help screen is available it will pop-up on the screen. Press Escape <ESC> to exit the pop-up screen.

5.2 PULL DOWN MENUS

5.2.1 MENU DISPLAYS

The menus available are listed at the top of the screen. Move the cursor with the arrow keys to highlight the menu name. Press Enter to view the menu and the arrow keys to scroll through the menu. Call up the highlighted selection by pressing Enter.

5.2.2 FILE MENU

This menu manipulates new or existing files into directories and saves files to be called up at another time.

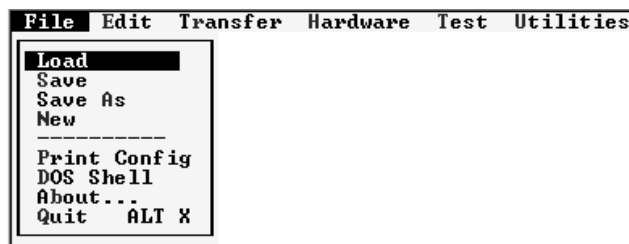


Figure 5-2 FILE MENU

Load

Load reads information from a stored file. The program requests the filename to be loaded into the buffer. The filename from a disk can be entered in the highlighted area. Then move the cursor down with the arrow key and highlight "Ok" and press Enter. To select an existing file, use the arrow keys to move down the menu list and press Enter when the highlighted filename is the file to load.

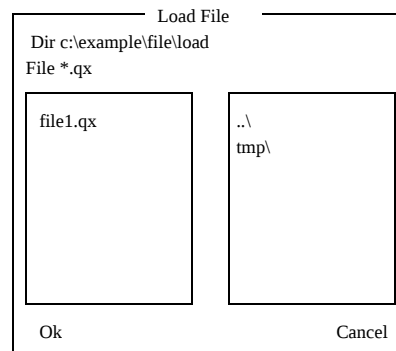


Figure 5-3 LOAD FILE

Save

This saves the edited version of an existing file loaded in the buffer under the same filename in the directory and deletes the old file. Loads a new file created in the Edit menu into the directory.

Save As

Use Save As to edited version of an existing file loaded in the buffer under a new filename or give a new file created in the Edit menu a filename.

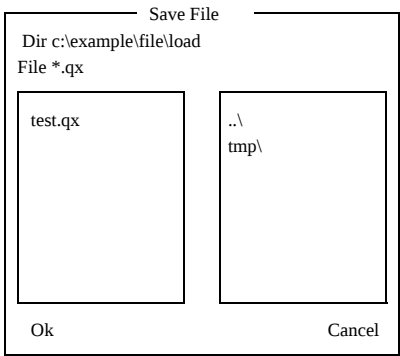


Figure 5-4 SAVE FILE

Print Repeater Configuration

Select the destination for the configurations.

- Printer - Prints to printer connected to PC.
- File - Writes printable test to selected filename.

Select which CVR data will be printed.

- All CVRs - Prints the data for all valid CVRs.
- Single CVR - Print the data for the entered CVR number.

NOTE: A list of valid CVRs can be seen under the Edit-Select Repeater menu selection.

DOS Shell

Temporarily suspends the program and returns to DOS. Directories and other DOS commands can be performed. To return to the program from DOS, type EXIT and press Enter.

Quit (ALT X)

Quit exits the CVR program and returns to DOS. Be sure all files are saved before exiting the program.

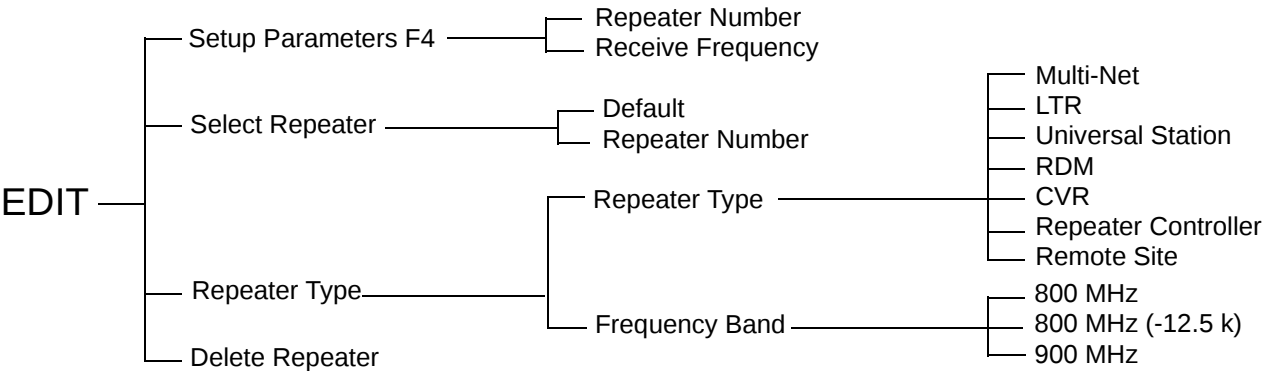


Figure 5-5 EDIT PROGRAMMING FLOWCHART

5.2.3 EDIT

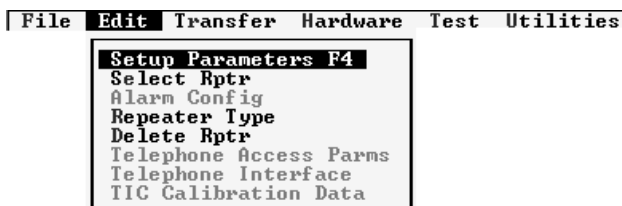


Figure 5-6 EDIT MENU

This menu is used to create new files and set or change the CVR operating parameters. The filename for the CVRs in this file is shown in the lower left corner of the screen.

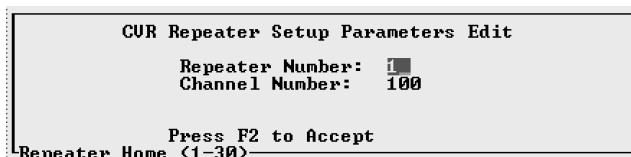


Figure 5-7 SETUP PARAMETERS

Setup Parameters

This programs the Receiver parameters and options of each CVR at a Site. The following paragraphs explain the parameters that are set by this screen (see Figure 5-7) and give a brief description of each.

NOTE: The parameters are shown in the lower left of the pop-up screen for reference.

Repeater Number

Each CVR is programmed with a repeater number from 1-30 for reference. Number selection can be arbitrary as long as each CVR is assigned a different number.

Channel Number

Each repeater is programmed with a channel number (1-920).

NOTE: Repeater program channel numbers 1-599 increment in 25 kHz steps. Program channel numbers 600-920 increment in 12.5 kHz steps. See Appendix A to determine the correct operating frequency.

Select Repeater

Select the repeater number to be programmed or edited from the pop-up menu (see Figure 5-8). Move the cursor with the arrow keys to highlight the repeater number and press Enter.

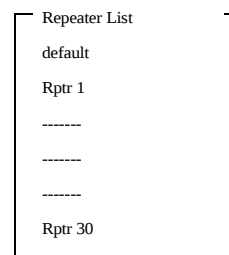


Figure 5-8 REPEATER LIST

Repeater Type Selection

This screen (see Figure 5-9) selects the repeater type and features:

Frequency Band	800 MHz
	800 MHz (-12.5 k)

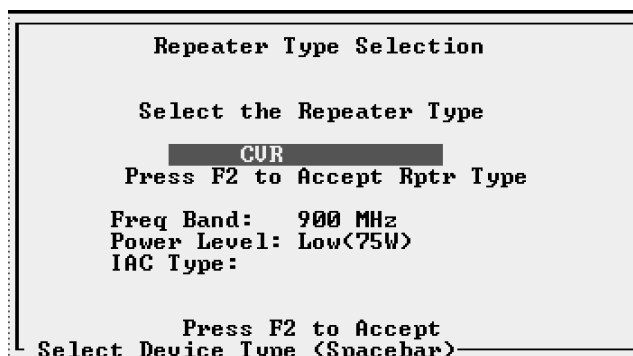


Figure 5-9 REPEATER TYPE SELECTION

Delete Repeater



Figure 5-10 DELETE REPEATER

5.2.4 TRANSFER



Figure 5-11 TRANSFER MENU

Write Setup Parameters

This command sends the contents of a file to the repeater and programs the EEPROM memory in the Interface board.

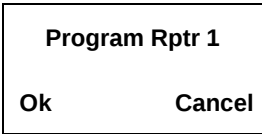


Figure 5-12 WRITE SETUP PARAMETERS

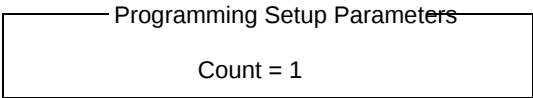


Figure 5-13 PROGRAM WRITE SETUP

Read Setup Parameters

This command reads the contents of the EEPROM memory of the Interface board and loads it into a buffer. The contents of the buffer is then displayed to show the programming of the repeater.

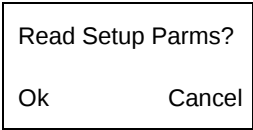


Figure 5-14 READ SETUP PARAMETERS

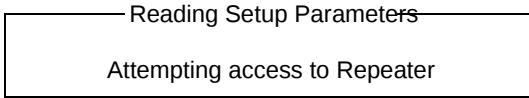


Figure 5-15 READING SETUP

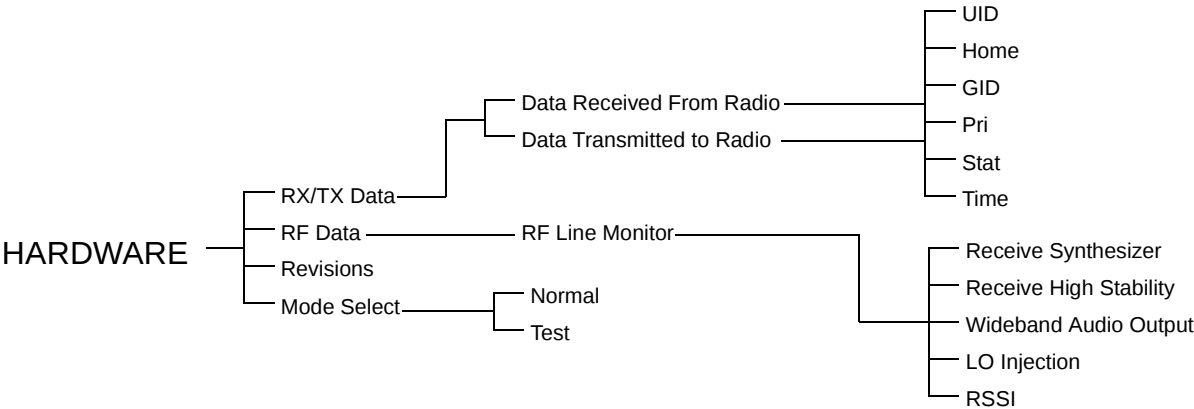


Figure 5-16 HARDWARE PROGRAMMING FLOWCHART

5.2.5 HARDWARE



Figure 5-17 HARDWARE MENU

RF Data

The A/D Monitor Screen shows the state of the lines (see Figure 5-18). These lines are being monitored by the A to D converter on the CVR Interface board. The normal values for each line are defined as follows.

Synthesizer Lock Lines	Yes or No
Wideband Audio Output	approx 200
LO Injection	approx 250
RSSI	20-150

Values with no label are the actual A to D reading.

RF Line Monitor for CVR			
Synthesizer Lock Lines		Receive Parameters	
Receive Synthesizer:	Yes	Wideband Audio Output:	0
Receive High Stability:	Yes	LO Injection:	0
		RSSI:	0

Figure 5-18 RF LINE MONITOR FOR CVR

Revision/Version

The Revision/Version is displayed for the repeater modules. The format for all modules is R.V. (revision.version). The MPC information also includes the software release date and the repeater serial number (see example in Figure 5-19).

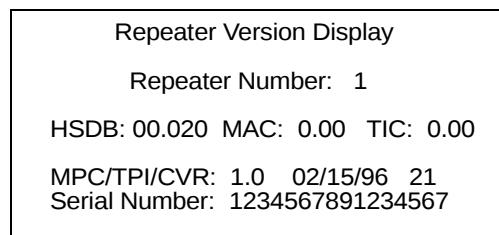
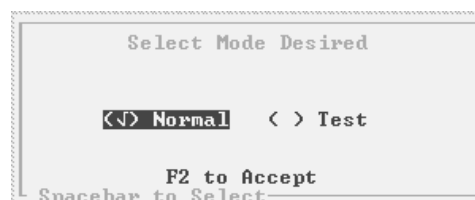


Figure 5-19 REVISION/VERSION

Mode Select

The Mode Select screen places the repeater either in the normal mode or the test mode. In the Normal mode the repeater operates as a normal repeater.

In the Test mode the repeater transmits a test word. This test word is the Test Mode ID set up in the Setup Parameters (see Table 5-1). While in the test mode the repeater is “busy”, therefore it is important to place the repeater in Normal mode when the test mode is no longer required.



5.2.6 TEST

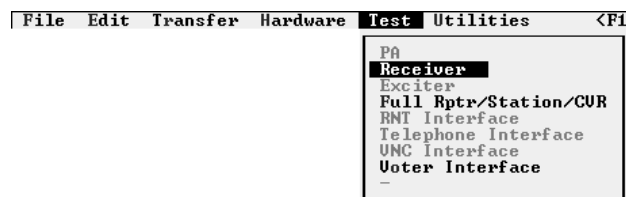


Figure 5-20 TEST MENU

Receiver

This menu selection walks through the alignment of the receiver on the computer screen. Refer to Sections 5.3 and 5.4 for the Receiver alignment in this manual and Figure 5-28 for an alignment points diagram and Figure 5-29 for the Receiver Test Setup.

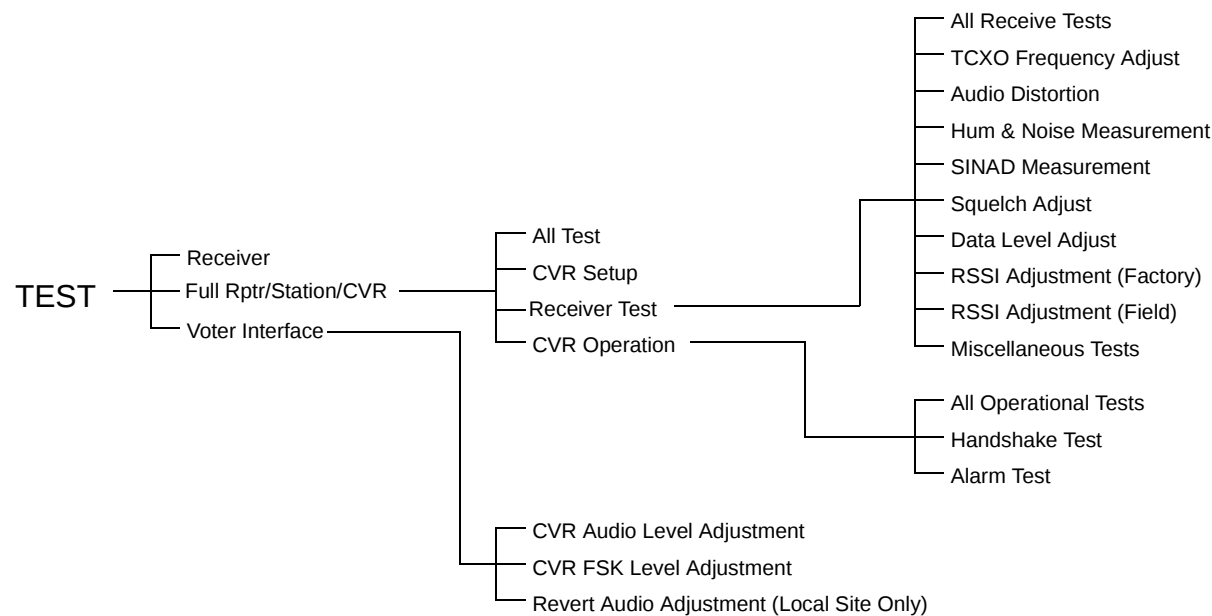


Figure 5-21 TEST PROGRAMMING FLOWCHART

Full CVR

This menu selection walks through the alignment of the entire repeater. The Receiver and Exciter portions are performance tests and adjustments. The Audio and Data portions are level adjustments for the CVR Interface Board. Refer to Figure 2-28 for an alignment points diagram for the Interface Board.

5.2.7 UTILITIES



Figure 5-23 UTILITIES MENU

CVR To Voter Interface

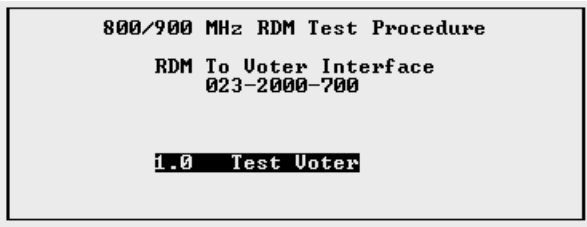


Figure 5-22 CVR TO VOTER INTERFACE

This menu selection walks through the alignment of the audio output level setting of the receiver.

COM Port

This is the COM port used to send and receive data from the Repeater MPC. An interface cable connects the Repeater to the computer (see Figure 5-25).

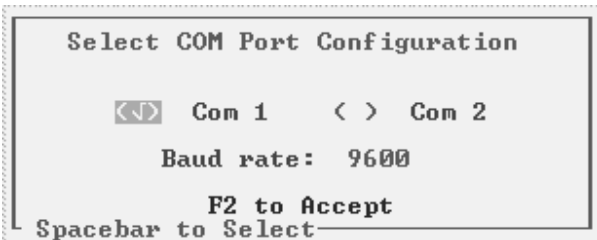


Figure 5-24 COM PORT SELECTION

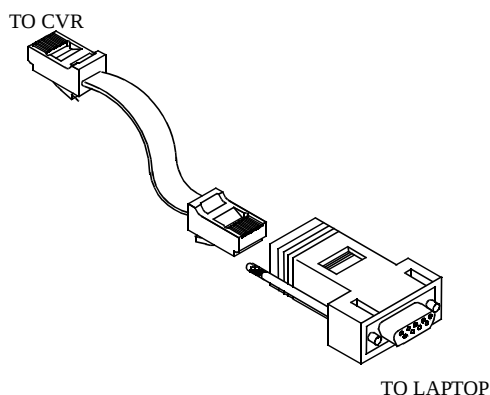


Figure 5-25 LAPTOP INTERCONNECT CABLE

Display Mode

This screen allows the color mode to be selected for color monitors. When using a laptop, monochrome is recommended for better resolution.

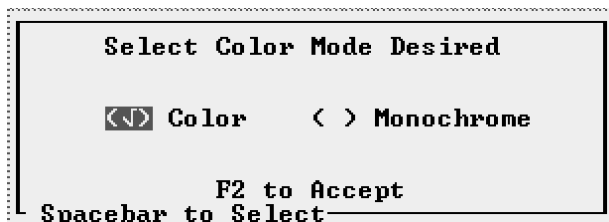


Figure 5-26 COLOR MODE SELECTION

Alarm Display

This screen displays a scrolling list of alarms generated by the repeater.

User Level

There are two levels to choose from, Novice and Advanced. The Novice uses prompts in the Edit-Parameters screens when Escape or F2 keys are pressed that ask "are you sure" before the task is executed. The Advanced selection performs the task without asking the question.

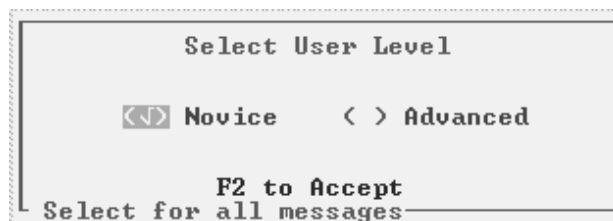


Figure 5-27 USER LEVEL

5.2.8 CVR PROGRAMMING

Creating A New File

An example will be used to show the programming for a new file created for Site 1.

NOTE: At any point in the programming sequence, if F1 is selected, a help screen appears to explain the menu selection highlighted at that point.

Select CVR To Edit

A CVR is selected to program. When no file exists with programmed CVRs, the default is selected and edited.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. Default is the only repeater in this list, press Enter.
4. Highlight EDIT, press Enter.
5. Highlight SETUP PARAMETERS, press Enter.
6. The Setup Parameters screen appears (see Figure 5-7). Fill in the parameters for this repeater. A brief description of the parameters is in Table 5-1. Full descriptions are in Section 5.2.3.
7. Select parameters, press F2 to accept.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.

11. Type in a valid DOS filename.
For this example site1.dat is used.

12. The file consists of default and CVR one under the filename of site1.dat.

Adding A CVR To A File

The example used for Site 1 will again be used to add CVRs to the filename site1.dat.

1. Highlight EDIT, press Enter.
2. Highlight SELECT REPEATER, press Enter.
3. The repeater list shown for this file includes default and repeater one. These contain the same parameters with the exception that when selected for edit the programmed repeater can be overwritten and the data lost.
4. Highlight DEFAULT, press Enter.
5. Highlight EDIT, press Enter.
6. Highlight SETUP PARAMETERS, press Enter.
7. Change the Repeater number and other parameters as required for this repeater, press F2.
8. Highlight EDIT, press Enter.
9. Highlight FILES, press Enter.
10. Highlight SAVE, press Enter.
11. Repeater 2 is added to the Repeater List in file site1.dat.

5.3 RECEIVER ALIGNMENT

Refer to Figure 5-28 for component locations.
Refer to Figure 5-29 for equipment needed and setup diagram.

5.3.1 PRE-TEST

1. Preset L201, L202, L203, L204, L205, L206, L223 and L224 tuning screws about 1/4 inch above the top of the casting.

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5.3.2 VOLTAGE MEASUREMENTS

Apply power to the Receiver by plugging the 20-pin cable from the RF Interface Board into J201 (see Figure 5-28).

Measure the voltages at the following pins.

U206, pin 1	+12V DC $\pm 0.4V$
U207, pin 1	+12V DC $\pm 0.4V$
U208, pin 1	+6V DC $\pm 0.2V$
U210, pin 1	+12V DC $\pm 0.4V$

5.3.3 PROGRAM TUNE-UP CHANNEL

1. Using the PC and software, program the Synthesizer for the Receive channel number.
2. Tune the VCO helical L220 for +4.5V DC $\pm 0.05V$ on U209, pin 6 or TP2.
3. Alternately tune L223 and L224 in 1/2-turn to 1-turn increments until a voltage is measured on J201, pin 13 or TP5. At that time, tune L223 for a peak, then L224 for a peak.
4. Retune L223 and L224 for a peak at J201, pin 13.

NOTE: The Channel Number, Channel Frequency and Synthesizer Frequency appear at the bottom of the screen.

5.3.4 TCXO FREQUENCY ADJUST

1. Set Y201 (TCXO) for 3.5V DC $\pm 0.05V$ DC at TP1 (response time is very slow).

5.3.5 VCO TEST

1. The Synthesizer is programmed for 199 channels **above** the Receive Channel.
2. The voltage on U209, pin 6 (TP2) should be $< 7.5V$ DC.
3. Record the voltage on J201, pin 13 (TP5) ____.
4. The Synthesizer is programmed for 199 channels **below** the Receive Channel.

5. The voltage on U209, pin 6 (TP2) should be > 2V DC.
6. Record the voltage on J201, pin 13 (TP5) ____.
7. If the voltages recorded in Steps 3 and 6 are not within $\pm 0.2V$, tune L224 as required to balance the voltage readings.
8. The Synthesizer is reprogrammed for the Receive Channel.
8. Tune C207, L209, L211 and L225 for peak voltage on J201, pin 7 (TP3). Decrease the generator output level to maintain 2-3V. Distortion should be <5% (typically < 3%).
9. Repeat Steps 4, 5 and 6.

5.3.6 FRONT END ADJUSTMENTS

1. Set the signal generator to the Receive Channel at a level sufficient to produce an output voltage on J201, pin 7 (TP3) (RSSI Output).
2. Tune L204, L205, L206, L201, L202, L203 and L204 for a peak voltage on J201, pin 7 (TP3). Decrease the generator output level to maintain a 2-3V reading at J201, pin 7.
3. Set the generator to 1000 μV with a 1 kHz tone at ± 1.5 kHz deviation (100 μV at the Rx antenna with 20 dB pad on the generator).
4. Tune the Quadrature detector coil Z213 for maximum AC voltage on J201, pin 9 (TP4).
5. Adjust R264 for 387 mV RMS, ± 5 mV RMS, on J201, pin 9.
6. Adjust R284 for 2V DC $\pm 0.05V$ DC on J201, pin 9 (TP4).
7. Measure the distortion on pin J201, pin 9 (TP4) (analog tuning meter is preferred).

5.3.7 AUDIO DISTORTION

1. Plug a 16 ohm load at J204 on the RDM.
2. Connect a distortion analyzer to the 16 ohm load.
3. Measure the distortion of the receive audio at J204 on the RDM with the local volume control set to 2.8V RMS.
4. The reading should be < 3% (typically <1%).
5. Measure receive sensitivity at J204 on the RDM.
6. The reading should be < 0.35 μV (typ. 0.25 μV).
7. The software programs the synthesizer for 3 MHz **above** the Receive Channel.
8. Receive sensitivity should be less than 0.35 μV (typically less than 0.30 μV).
9. The software programs the synthesizer for 3 MHz **below** the Receive Channel.
10. Receive sensitivity should be less than 0.35 μV (typically less than 0.30 μV).
11. The software programs the synthesizer for the Receive Channel.

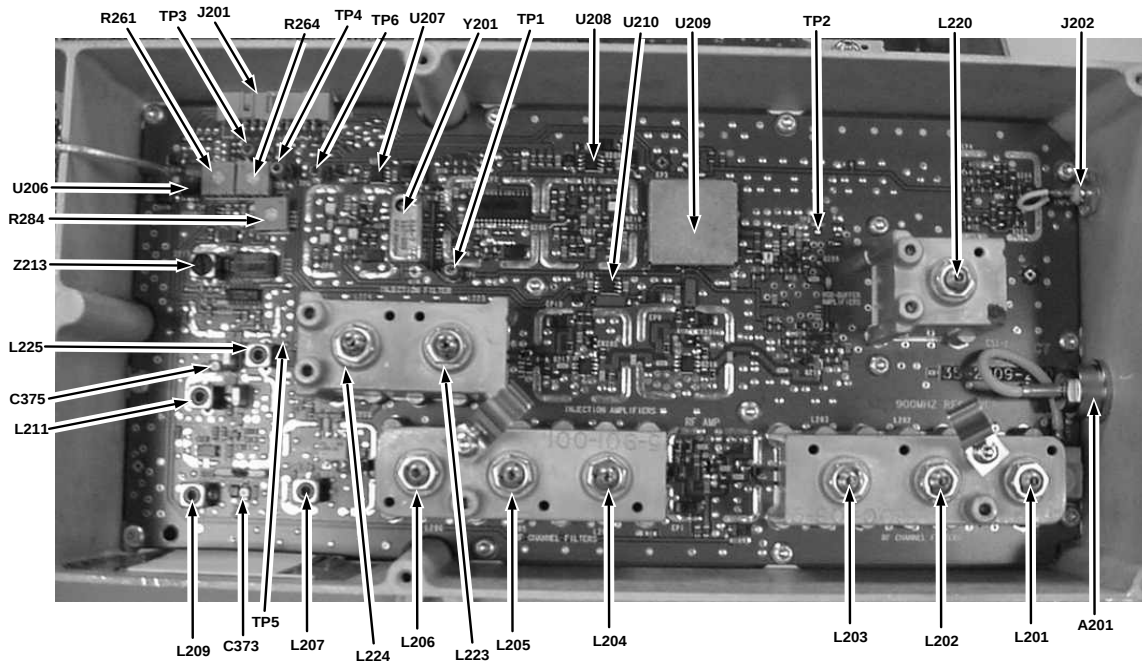


Figure 5-28 RECEIVER ALIGNMENT POINTS

5.4 FULL CVR TEST

1. Select TEST - FULL RPTR/STATION/CVR and press Enter.

NOTE: All audio generators and audio voltmeters are unbalanced unless specifically stated otherwise.

5.4.1 VOLTAGE MEASUREMENTS

1. Disconnect the receiver-to-interface cable (20-pin) from J201 of the Interface board.
2. Apply power to the Interface board.
3. Measure the voltages at the following pins.

U109, pin 1	+12V DC $\pm 0.4V$
U223, pin 2	+9V DC $\pm 0.4V$
U224, pin 2	+5V DC $\pm 0.2V$
U204, pin 7	+1.25V DC $\pm 0.06V$
Junction of L202/C279	-5V DC $\pm 0.4V$

4. Apply power to the Receiver by plugging the 20-pin cable from the Interface Board into J201 (see Figure 5-29).

5.4.2 RECEIVER FREQUENCY CHECK

1. Check the receiver injection frequency with a "sniffer" pickup loop, or RF probe and a suitable frequency counter placed near L210.
2. TCXO Adjustment

Set Y201 (TCXO) for the Injection Frequency ± 50 Hz (Inj Freq = chnl freq - 52.95 MHz).

Receiver Audio Distortion Measurement

1. Adjust the RF generator for 100 μV into the receiver with a 1 kHz tone at ± 3 kHz deviation.
2. Adjust R207 for 0 dBm (775 mV RMS) at J210.
3. Connect a 16 ohm load and distortion analyzer to J204 of the Interface Board.
4. Adjust R262 for 2.8V RMS and measure the distortion. Distortion should be $< 3\%$.

Receiver Hum and Noise Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. *On the Interface Board*, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. Remove modulation from the RF generator. The measured level must be ≤ -45 dB.

Receiver SINAD Measurement

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. *On the Interface Board*, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. 12 dB SINAD reading should be ≤ 0.35 μ V.

Receiver Squelch Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 3 kHz.
2. **On the Interface Board**, connect a 16 ohm load and distortion analyzer to J204.
3. Adjust R262 for 2.8V RMS.
4. Set the RF generator output for 5 dB SINAD.
5. *On the Interface Board*, adjust R222 so the Receiver just squelches.
6. Increase the RF generator output until the Receiver unsquelches. Reading should be ≤ 10 dB SINAD.

Receiver Data Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 100 Hz tone at ± 1 kHz.
2. Insert voltmeter probes into J202 on the Interface Board and connect to an AC voltmeter.
3. Adjust R248 to achieve 340 mV RMS (-7.1 dBm).

Receiver RSSI Adjustment

NOTE: Use this procedure only when an audio analyzer is unavailable.

1. Adjust the RF generator for 0.29 μ V into the Receiver with a 1 kHz tone at ± 3 kHz.
2. Adjust R261 in the Receiver for 0.8V DC (± 0.02 V DC) at TP3.

Receiver Miscellaneous Tests (Optional)

Several additional tests may be performed on the Receiver as listed below:

- Signal Displacement Bandwidth
- Adjacent Channel Rejection
- Offset Channel Selectivity
- Intermodulation Rejection
- Spurious Rejection
- Audio Response
- Audio Sensitivity

Perform the Test desired using the appropriate RF Generators, modulation frequencies, levels, RS-232 levels and test probes following the latest TIA document measurement procedures.

Handshake Test

1. Program a portable or mobile for the following parameters.

Home Repeater - Same as repeater number.
 System Key - Same as repeater
 Status Channel - Same as repeater channel.
 Home Channel - Same as repeater channel.
 Encode ID = 1
 Decode ID = 1
 UID = 1
 Site = 1

2. The repeater is now in Normal Operation mode.
3. Key the radio several times on the programmed System/Group. Display shall indicate "4" every time. (Proper Tx/Rx antenna connections are assumed.)

Alarm Test

1. The CVR is now in Normal Operation mode.
2. Verify the front panel display does not indicate any alarms (see Table 5-1).

Table 5-1 ALARMS

Display No.	Definition
0	Test Mode
1	Not Used
2	Normal Operation
3	Revert Operation
4	Receiving Data
5	Not Used
6	Not Used
7	Receive Synthesizer Out of Lock
8	High Stability Synth Out of Lock
9	Data Processor Failure
A	Not Used
B	Not Used
C	Downloading Code
D	Not Used
E	Erasing Code
F	Failure

5.4.3 VOTER INTERFACE

CVR Audio Level Adjustment

1. Adjust the RF generator for 100 μ V into the receiver with a 1 kHz tone at ± 1.5 kHz.
2. Connect a **balanced** AC voltmeter between J205, pin 2 and J206, pin 2. Connect a 600 ohm termination to the meter terminals or across J101, pins 5/6.
3. *On the Interface Board*, adjust R271 for the type of line.

Leased Line/Direct Connect (default)
-12 dBm (194 mV RMS)

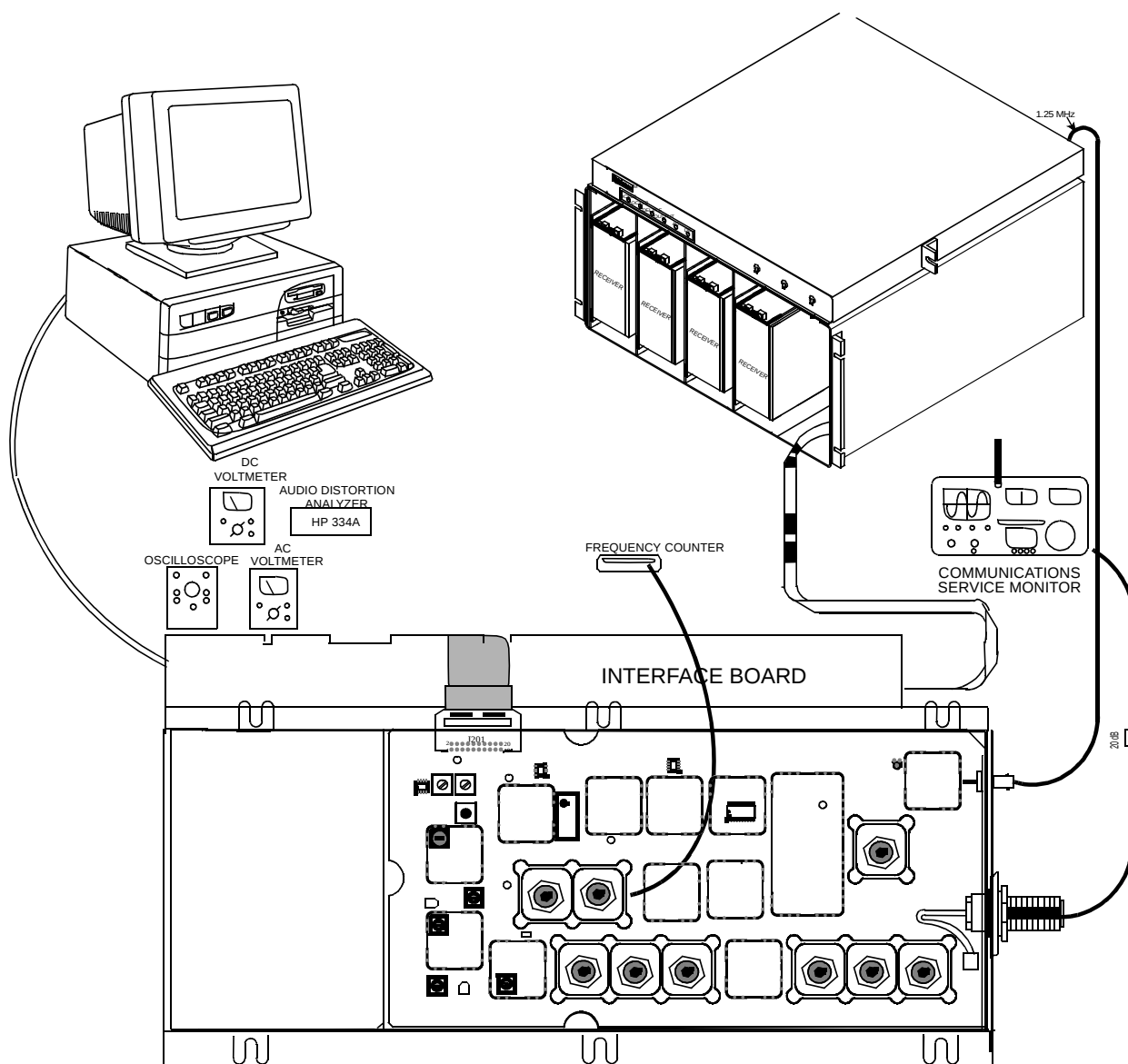


Figure 5-29 900 MHz RECEIVER TEST SETUP

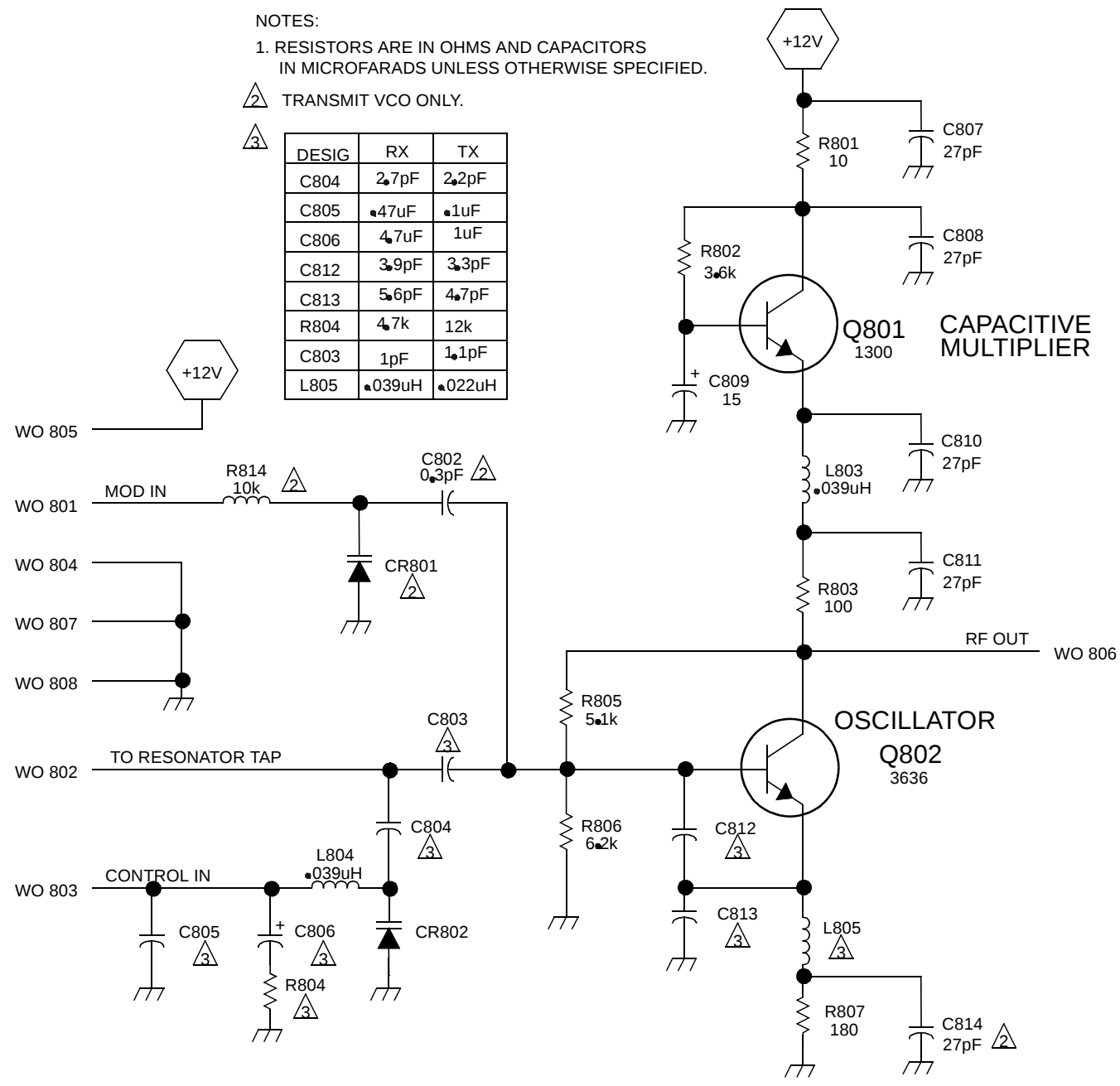
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
900 MHz VOTING RECEIVER PART NO. 023-2009-230			L 803	.039 μ H inductor SMD	542-9001-397
A 200	Audio/Logic Interface Board	023-2000-700	L 804	.039 μ H inductor SMD	542-9001-397
A 201	Receiver Board 900 MHz	023-2009-200	L 805	.039 μ H inductor SMD	542-9001-397
A 202	20-pin ribbon cable	023-2000-703	PC801	PC board	035-2009-800
EP200	RF shield gasket 0.156 OD	574-3002-036	Q 801	Si NPN gen purp switch/amp	576-0001-300
EP201	Heat sink insulator TO-220	574-5005-060	Q 802	NPN UHF low noise SOT-23	576-0003-636
HW200	4-40 x 0.063 NPB nut	560-2104-006	R 801	10 ohm $\pm$ 5% 0805 chip	569-0105-100
HW201	10-32 x 0.375 CPS nut	560-1110-012	R 802	3.6k ohm $\pm$ 5% 0805 chip	569-0105-362
HW202	6-32 panhead TORX ZPS	575-0006-010	R 803	100 ohm $\pm$ 5% 0805 chip	569-0105-101
HW203	6-32 mach panhead phil ZPS	575-1606-008	R 804	4.7k ohm $\pm$ 5% 0805 chip	569-0105-472
HW204	6-32 mach panhead phil ZPS	575-1606-016	R 805	5.1k ohm $\pm$ 5% 0805 chip	569-0105-512
HW205	#4 shakeproof washer	596-1104-008	R 806	6.2k ohm $\pm$ 5% 0805 chip	569-0105-622
HW206	6 x 0.018 lockwasher int CPS	596-1106-009	R 807	180 ohm $\pm$ 5% 1206 SMD	569-0115-181
HW207	#10 flat washer	596-1410-016	900 MHz RECEIVER PART NO. 023-2009-200		
HW208	4-40 mach panhead phil ZPS	575-1604-012	A 006	900 MHz VCO assembly	023-2009-800
HW209	5/8 x 0.02 lockwasher int ZPS	596-9119-028	A 201	RF input coax assembly	023-2000-161
HW210	5/8-24 x 0.094 hex nut NPB	560-9079-028	A 202	OCXO coax cable assembly	597-3001-215
J 200	BNC panel mount no flange	515-3005-002	A 203	Top shield assembly	023-2000-199
MP200	Housing	015-0902-011	C 201	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-569
MP201	Deck cover	015-0902-015	C 202	4.3 pF $\pm$ 5% NPO 1206 chip	510-3602-439
MP202	Mounting plate	017-2210-152	C 203	4.7 μ F 16V tantalum SMD	510-2625-479
MP203	1/4 hex brass M/F spacer	312-7483-008	C 204	33 pF $\pm$ 5% NPO 1206 chip	510-3602-330
MP204	1/4 hex brass M/F spacer	312-7473-008	C 205	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100
U 223	+9V regulator TO-220	544-2003-059	C 207	3 pF $\pm$ 5% NPO 1206 chip	510-3602-309
U224	+5V regulator TO-220	544-2003-091	C 208	33 pF $\pm$ 5% NPO 1206 chip	510-3602-330
RECEIVE VCO PART NO. 023-2009-800			C 209	8.2 pF $\pm$ 5% NPO 1206 chip	510-3602-829
C 803	1 pF $\pm$ 0.1 pF 150V chip	510-3356-109	C 210	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689
C 804	2.7 pF $\pm$ 0.1 pF 150V chip	510-3656-279	C 211	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 805	.47 μ F 16V tantalum SMD	510-2625-478	C 212	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 806	4.7 μ F 10V tantalum SMD	510-2624-479	C 213	4.7 μ F 16V tantalum SMD	510-2625-479
C 807	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 214	7.5 pF $\pm$ 5% NPO 1206 chip	510-3602-759
C 808	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 215	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-759
C 809	15 μ F 20V tantalum SMD	510-2626-150	C 216	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-759
C 810	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 217	.1 μ F $\pm$ 10% X7R 1210	510-3607-104
C 811	27 pF $\pm$ 5% NPO 0805 chip	510-3601-270	C 218	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 812	3.9 pF 150V chip	510-3656-399	C 219	.1 μ F $\pm$ 10% X7R 1210	510-3607-104
C 813	5.6 pF 150V chip	510-3656-569	C 220	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
CR802	Varactor 105G SOT-23	523-1504-015	C 221	.1 μ F $\pm$ 10% X7R 1210	510-3607-104
			C 222	120 pF $\pm$ 5% NPO 1206 chip	510-3602-121
			C 224	.01 μ F $\pm$ 10% X7R chip	510-3606-103
			C 225	.01 μ F $\pm$ 10% X7R chip	510-3606-103
			C 226	.01 μ F $\pm$ 10% X7R chip	510-3606-103

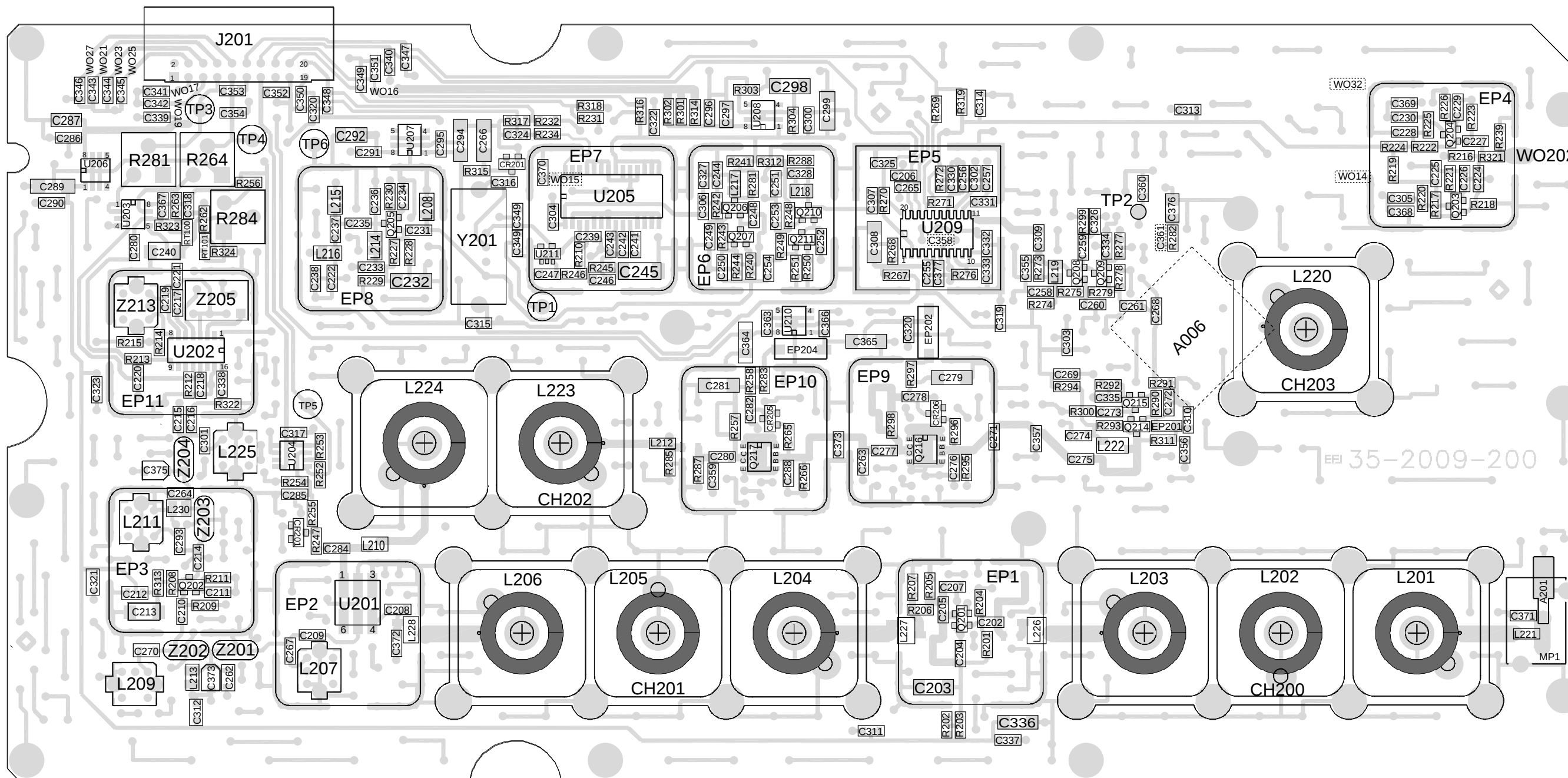
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 227	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 279	4.7 μ F 16V tantalum SMD	510-2625-479
C 228	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 280	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-569
C 229	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 281	4.7 μ F 16V tantalum SMD	510-2625-479
C 230	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 282	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 231	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 284	1 pF $\pm$ 5% NPO 1206 chip	510-3602-109
C 232	4.7 μ F 16V tantalum SMD	510-2625-479	C 285	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 233	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 286	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 234	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 287	1.5 μ F 25V tantalum SMD	510-2627-159
C 235	220 pF $\pm$ 5% NPO 1206 chip	510-3602-221	C 288	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689
C 236	220 pF $\pm$ 5% NPO 1206 chip	510-3602-221	C 289	4.7 μ F 16V tantalum SMD	510-2625-479
C 237	5.6 pF $\pm$ 5% NPO 1206	510-3602-569	C 290	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 238	390 pF $\pm$ 5% NPO 1206	510-3602-391	C 291	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 240	4.7 μ F 16V tantalum SMD	510-2625-479	C 292	1.5 μ F 25V tantalum SMD	510-2627-159
C 241	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 293	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 242	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 294	4.7 μ F 16V tantalum SMD	510-2625-479
C 243	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 295	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 244	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 296	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 245	33 μ F 10V tantalum SMD	510-2524-330	C 297	1.5 μ F 25V tantalum SMD	510-2627-159
C 246	1 μ F 16V tantalum SMD	510-2625-109	C 298	4.7 μ F 16V tantalum SMD	510-2625-479
C 247	56 pF $\pm$ 5% NPO 1206 chip	510-3602-560	C 299	4.7 μ F 16V tantalum SMD	510-2625-479
C 248	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 300	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 249	.01 μ F $\pm$ 10% X7R 1206 chip	510-3606-103	C 301	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390
C 250	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 303	.1 μ F $\pm$ 10% X7R 1206	510-3606-104
C 251	.01 μ F $\pm$ 10% X7R 1206 chip	510-3606-103	C 304	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 252	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	C 305	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 253	.01 μ F $\pm$ 10% X7R 1206 chip	510-3606-103	C 306	18 pF $\pm$ 5% NPO 1206	510-3602-180
C 254	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 307	100 pF $\pm$ 5% NPO 1206	510-3602-101
C 255	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 308	4.7 μ F 16V tantalum SMD	510-2625-479
C 256	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 309	1 pF $\pm$ 5% NPO 1206 chip	510-3602-109
C 257	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 310	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270
C 258	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 311	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 259	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 312	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 260	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 313	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 261	3.3 pF $\pm$ 5% NPO 1206 chip	510-3602-339	C 314	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 262	7.5 pF $\pm$ 5% NPO 1206 chip	510-3602-759	C 315	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 264	7.5 pF $\pm$ 5% NPO 1206 chip	510-3602-759	C 316	.01 μ F $\pm$ 10% X7R 1206	510-3606-103
C 266	4.7 μ F 16V tantalum SMD	510-2625-479	C 317	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 267	39 pF $\pm$ 5% NPO 1206 chip	510-3602-390	C 318	.001 μ F $\pm$ 10% X7R 1206	510-3606-102
C 268	1.5 pF $\pm$ 5% NPO 1206 chip	510-3602-159	C 319	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 269	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 320	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 270	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 321	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 271	5.6 pF $\pm$ 5% NPO 1206 chip	510-3602-569	C 322	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 272	18 pF $\pm$ 5% NPO 1206 chip	510-3602-180	C 323	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 273	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 324	100 pF $\pm$ 5% NPO 1206	510-3602-101
C 274	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 325	100 pF $\pm$ 5% NPO 1206	510-3602-101
C 275	3.3 pF $\pm$ 5% NPO 1206 chip	510-3602-339	C 326	3 pF $\pm$ 5% NPO 1206 chip	510-3602-309
C 277	6.8 pF $\pm$ 5% NPO 1206 chip	510-3602-689	C 328	820 pF $\pm$ 5% NPO 1206 chip	510-3602-821
C 278	27 pF $\pm$ 5% NPO 1206 chip	510-3602-270	C 329	.1 μ F $\pm$ 10% X7R 1210	510-3607-104

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 330	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 201	Helical coil 2 1/16 turns	016-2186-208
C 331	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 202	Helical coil 2 1/16 turns	016-2186-209
C 332	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 203	Helical coil 2 1/16 turns	016-2186-208
C 333	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 204	Helical coil 2 1/16 turns	016-2186-208
C 334	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 205	Helical coil 2 1/16 turns	016-2186-209
C 335	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 206	Helical coil 2 1/16 turns	016-2186-208
C 336	4.7 μ F 16V tantalum SMD	510-2625-479	L 207	0.9 μ H variable inductor 7mm	542-1012-008
C 337	33 pF $\pm 5\%$ NPO 1206 chip	510-3602-330	L 209	0.9 μ H variable inductor 7mm	542-1012-008
C 338	.01 μ F $\pm 10\%$ X7R 1206	510-3606-103	L 210	2.5T coil 22 AWG	542-0010-025
C 356	2 pF $\pm 5\%$ NPO 1206 chip	510-3602-209	L 211	0.9 μ H variable inductor 7mm	542-1012-008
C 358	3.9 pF $\pm 5\%$ NPO 1206 chip	510-3602-399	L 212	1.5T coil 22 AWG	542-0010-015
C 360	120 pF $\pm 5\%$ NPO 1206 chip	510-3602-121	L 213	0.82 μ H inductor SMD	542-9001-828
C 363	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102	L 214	.1 μ H inductor SMD	542-9001-108
C 364	1.5 pF $\pm 5\%$ NPO 1206 chip	510-3602-159	L 215	.1 μ H inductor SMD	542-9001-108
C 365	4.7 μ F 16V tantalum SMD	510-2625-479	L 216	.1 μ H inductor SMD	542-9001-108
C 366	.001 μ F $\pm 10\%$ X7R 1206	510-3606-102	L 217	10 μ H inductor SMD	542-9001-100
C 367	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 218	.1 μ H inductor SMD	542-9001-108
C 368	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 219	.018 μ H inductor SMD	542-9001-187
C 369	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 220	2 1/4 turn helical coil	016-2186-252
C 370	27 pF $\pm 5\%$ NPO 1206 chip	510-3602-270	L 221	4T 22 AWG 0.05 ID SMD air	542-0015-004
C 371	1.3 pF $\pm 5\%$ NPO 1206 chip	510-3602-139	L 222	2T 22 AWG 0.05 ID SMD air	542-0015-002
C 372	1.3 pF $\pm 5\%$ NPO 1206 chip	510-3602-139	L 223	Helical coil	016-2186-204
C 373	3.9 pF $\pm 5\%$ NPO 1206 chip	510-3602-399	L 224	Helical coil	016-2186-204
CH200	3-cavity helical front end	015-0901-038	L 225	0.9 μ H variable inductor 7mm	542-1012-008
CH201	3-cavity helical front end	015-0901-038	L 226	3T 22 AWG 0.05 ID SMD air	542-0015-003
CH202	2-cavity helical front end	015-0901-028	L 227	3T 22 AWG 0.05 ID SMD air	542-0015-003
CH203	1-cavity helical front end	015-0901-010	L 228	4T 22 AWG 0.05 ID SMD air	542-0015-004
CR201	Hot carrier diode SOT-23	523-1504-016	L 230	0.82 μ H inductor SMD	542-9001-828
CR204	Si 9.1V zener SOT-23	523-2016-919	MP200	Helical coil form	013-1627-102
CR205	5.6V zener SOT-23	623-2016-569	MP201	Helical core	013-1627-105
CR206	5.6V zener SOT-23	623-2016-569	MP203	Damped washer 0.125	018-1132-152
EP200	Mini ceramic crystal pin insul	010-0345-280	MP204	Bottom shield	017-2210-101
EP202	Ferrite bead SMD 1206	517-2503-010	MP206	Grounding clip	537-5001-002
EP204	Ferrite bead SMD 1206	517-2503-010	MP210	Receive shield	017-2210-019
EP206	Ferrite bead SMD 1206	517-2503-002	PC201	PC board	035-2009-200
HW200	10-32 hex set screw NPB	575-9059-032	Q 201	NPN RF amp low noise	576-0003-610
HW201	10-32 hex set screw NPB	575-9059-024	Q 202	Si NPN RF amp SOT-23	576-0003-602
HW202	Tension lock nut CPS	560-1810-022	Q 203	Si NPN amp SOT-23	576-0003-658
HW203	6-32 panhead torx	575-0006-008	Q 204	Si NPN amp SOT-23	576-0003-658
HW204	4-40 panhead slot nylon screw	575-4504-008	Q 205	Si NPN amp	576-0003-658
HW205	Polarizing key box cnt	515-7109-010	Q 206	Si NPN amp SOT-23	576-0003-658
HW206	6-32 pan torx ZPS	575-0006-008	Q 207	Si NPN amp SOT-23	576-0003-658
J 201	20-pin right angle header	515-9031-375	Q 208	NPN UHF low noise SOT-23	576-0003-636
			Q 209	NPN UHF low noise SOT-23	576-0003-636
			Q 210	Si NPN amp SOT-23	576-0003-658

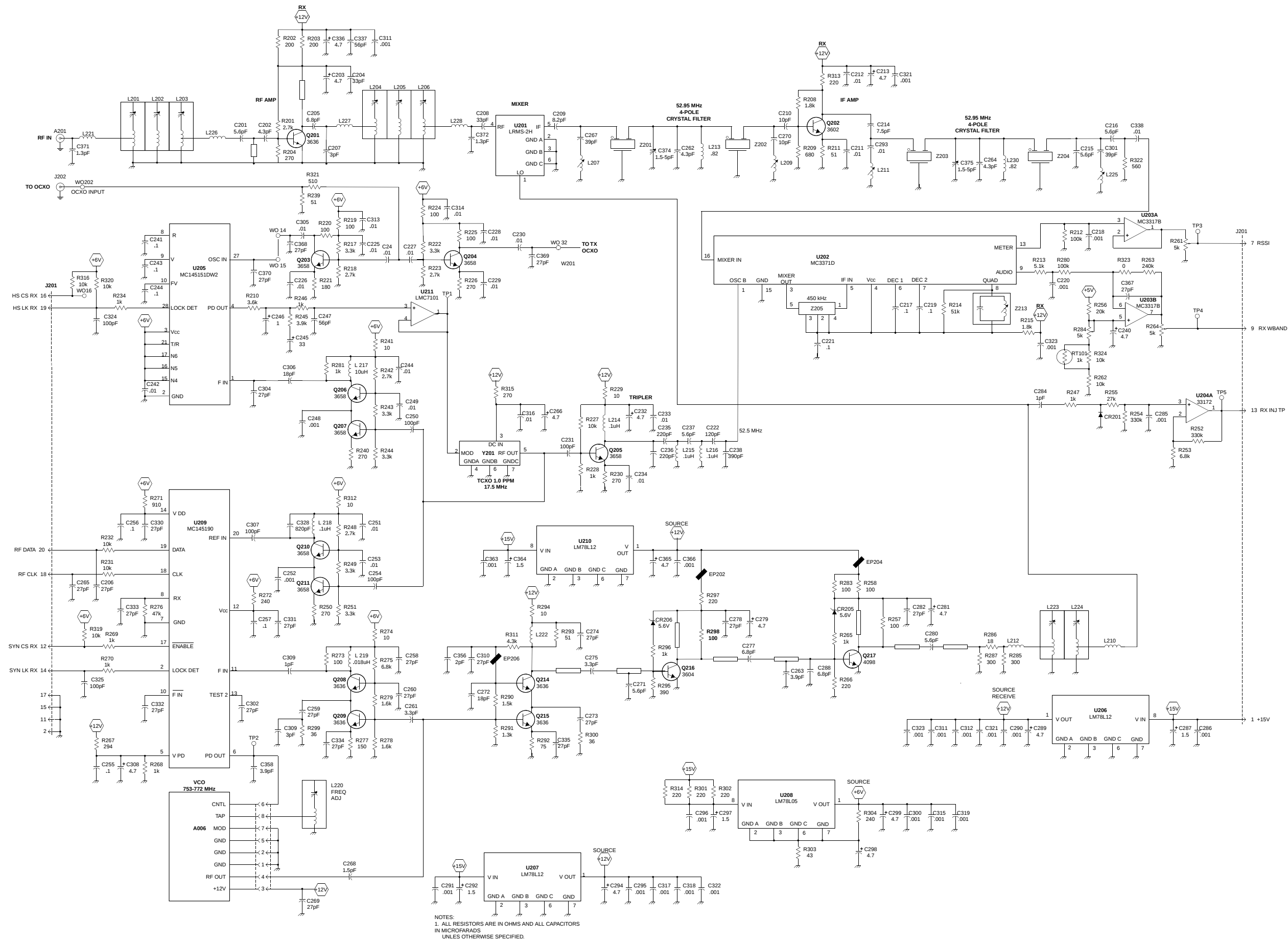
SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
Q 211	Si NPN amp SOT-23	576-0003-658	R 245	16k ohm $\pm 5\%$ 1206 SMD	569-0115-163
Q 214	NPN UHF low noise SOT-23	576-0003-636	R 246	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
Q 215	NPN UHF low noise SOT-23	576-0003-636	R 248	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272
Q 216	NPN .2-2 GHz SO-8 amp	576-0003-604	R 249	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332
Q 217	NPN 750 mW UHF/800 MHz	576-0004-098	R 250	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271
			R 251	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332
R 201	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272	R 252	36k ohm $\pm 5\%$ 1206 SMD	569-0115-363
R 202	200 ohm $\pm 5\%$ 1206 SMD	569-0115-201	R 253	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 203	200 ohm $\pm 5\%$ 1206 SMD	569-0115-201	R 254	240k ohm $\pm 5\%$ 1206 SMD	569-0115-244
R 204	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 255	27k ohm $\pm 5\%$ 1206 SMD	569-0115-273
R 205	510 ohm $\pm 5\%$ 1206 SMD	569-0115-511	R 256	20k ohm $\pm 5\%$ 1206 SMD	569-0115-203
R 206	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	R 257	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101
R 207	510 ohm $\pm 5\%$ 1206 SMD	569-0115-511	R 258	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101
R 208	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182	R 260	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001
R 209	680 ohm $\pm 5\%$ 1206 SMD	569-0115-681	R 261	5k ohm single turn trimmer	562-0112-502
R 211	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	R 262	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 212	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 263	240k ohm $\pm 5\%$ 1206 SMD	569-0115-244
R 213	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512	R 264	5k ohm single turn trimmer	562-0112-502
R 214	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513	R 265	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 215	1.8k ohm $\pm 5\%$ 1206 SMD	569-0115-182	R 266	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221
R 217	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 267	294 ohm $\pm 1\%$ 1206 SMD	569-0111-246
R 218	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272	R 268	1k ohm $\pm 1\%$ 1206 SMD	569-0111-301
R 219	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 269	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 220	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 270	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 221	180 ohm $\pm 5\%$ 1206 SMD	569-0115-181	R 271	910 ohm $\pm 5\%$ 1206 SMD	569-0115-911
R 222	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 272	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241
R 223	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272	R 273	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101
R 224	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 274	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100
R 225	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 275	6.8k ohm $\pm 5\%$ 1206 SMD	569-0115-682
R 226	180 ohm $\pm 5\%$ 1206 SMD	569-0115-181	R 276	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 227	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 277	150 ohm $\pm 5\%$ 1206 SMD	569-0115-151
R 228	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	R 278	1.6k ohm $\pm 5\%$ 1206 SMD	569-0115-162
R 229	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	R 279	1.6k ohm $\pm 5\%$ 1206 SMD	569-0115-162
R 230	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 280	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 231	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 281	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 232	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 283	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101
R 233	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	R 284	5k ohm single turn trimmer	562-0112-502
R 234	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	R 285	300 ohm $\pm 5\%$ 1206 SMD	569-0115-301
R 235	20k ohm $\pm 5\%$ 1206 SMD	569-0115-203	R 286	18 ohm $\pm 5\%$ 1206 SMD	569-0115-180
R 236	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101	R 287	300 ohm $\pm 5\%$ 1206 SMD	569-0115-301
R 237	3.9k ohm $\pm 5\%$ 1206 SMD	569-0115-392	R 290	1.5k ohm $\pm 5\%$ 1206 SMD	569-0115-152
R 238	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241	R 291	1.3k ohm $\pm 5\%$ 1206 SMD	569-0115-132
R 239	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510	R 292	75 ohm $\pm 5\%$ 1206 SMD	569-0115-750
R 240	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271	R 293	51 ohm $\pm 5\%$ 1206 SMD	569-0115-510
R 241	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100	R 294	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100
R 242	2.7k ohm $\pm 5\%$ 1206 SMD	569-0115-272	R 295	390 ohm $\pm 5\%$ 1206 SMD	569-0115-391
R 243	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 296	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 244	3.3k ohm $\pm 5\%$ 1206 SMD	569-0115-332	R 297	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 298	100 ohm $\pm 5\%$ 1206 SMD	569-0115-101			
R 299	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360			
R 300	36 ohm $\pm 5\%$ 1206 SMD	569-0115-360			
R 301	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 302	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 303	43 ohm $\pm 5\%$ 1206 SMD	569-0115-430			
R 304	240 ohm $\pm 5\%$ 1206 SMD	569-0115-241			
R 311	4.3k ohm $\pm 5\%$ 1206 SMD	569-0115-432			
R 312	10 ohm $\pm 5\%$ 1206 SMD	569-0115-100			
R 313	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 314	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221			
R 315	270 ohm $\pm 5\%$ 1206 SMD	569-0115-271			
R 316	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103			
R 319	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103			
R 321	510 ohm $\pm 5\%$ 1206 SMD	569-0115-511			
R 322	560 ohm $\pm 5\%$ 1206 SMD	569-0115-561			
R 323	Zero ohm $\pm 10\%$ 1206 SMD	569-0115-001			
R 324	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103			
RT101	1k ohm $\pm 5\%$ thermistor chip	569-3013-002			
TP001	Red tip jack, vert. 0.08	105-2002-211			
TP003	Red tip jack, vert. 0.08	105-2002-211			
TP004	Red tip jack, vert. 0.08	105-2002-211			
TP005	Red tip jack, vert. 0.08	105-2002-211			
TP006	Red tip jack, vert. 0.08	105-2002-211			
U 201	Mixer LRMS-2H	544-0007-013			
U 202	FM IF MC3371D SO-16	544-2002-031			
U 203	Dual op amp SO-8	544-2019-004			
U 204	Op amp SO-8 MC33172D	544-2019-017			
U 206	+12V regulator 78L12 SO-8	544-2603-032			
U 207	+12V regulator 78L12 SO-8	544-2603-032			
U 208	+5V regulator 78L05 SO-8	544-2603-039			
U 209	Synthesizer MC145190F SOIC	544-3954-026			
U 210	+12V regulator SOIC 78L12	544-2603-032			
U 211	Single op amp LMC7101	544-2016-001			
W 201	Cable assembly	597-3003-290			
Y 201	17.5 MHz crystal 1 PPM	518-7117-500			
Z 201	52.95 MHz 4-pole 8 kHz BW	532-0009-011			
Z 203	52.95 MHz 4-pole 8 kHz BW	532-0009-011			
Z 205	450 kHz cer filter 9 kHz BW	532-2006-034			
Z 213	455 kHz var inductor w/cap	542-1012-010			





900 MHz RECEIVE SCHEMATIC
FIGURE 5-31



SECTION 6 INTERFACE BOARD

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
AUDIO/LOGIC INTERCONNECT BOARD PART NO. 023-2000-720			C 212	.022 μ F $\pm$ 5% X7R 1210	510-3610-224
C 101	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100	C 213	2200 pF $\pm$ 2% NPO 1206	510-3616-222
C 102	10 pF $\pm$ 5% NPO 1206 chip	510-3602-100	C 214	4700 pF $\pm$ 2% NPO 1206	510-3616-472
C 103	62 pF $\pm$ 5% NPO 1206 chip	510-3602-620	C 215	.047 μ F $\pm$ 5% X7R 1206	510-3609-473
C 104	62 pF $\pm$ 5% NPO 1206 chip	510-3602-620	C 216	.1 μ F $\pm$ 5% X7R 1206	510-3609-104
C 105	.1 μ F $\pm$ 10% X7R 1210	510-3607-104	C 217	.022 μ F $\pm$ 5% X7R 1206	510-3609-223
C 106	150 pF $\pm$ 5% NPO 1206 chip	510-3602-151	C 218	6800 pF $\pm$ 2% NPO 1210	510-3617-682
C 109	1.5 μ F 25V SMD tantalum	510-2627-159	C 219	.068 μ F $\pm$ 5% X7R 1206	510-3609-683
C 110	1 μ F 16V SMD tantalum	510-2625-109	C 220	.1 μ F $\pm$ 5% X7R 1206	510-3609-104
C 111	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101	C 221	.022 μ F $\pm$ 5% X7R 1206	510-3609-223
C 113	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 222	.022 μ F $\pm$ 5% X7R 1206	510-3609-223
C 114	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 223	.01 μ F $\pm$ 5% X7R 1206	510-3609-103
C 115	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 224	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101
C 116	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 225	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101
C 117	.1 μ F $\pm$ 10% X7R chip	510-3606-104	C 226	100 pF $\pm$ 5% NPO 1206 chip	510-3602-101
C 118	.1 μ F $\pm$ 10% X7R chip	510-3606-104	C 227	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102
C 119	.1 μ F $\pm$ 10% X7R chip	510-3606-104	C 228	20 pF $\pm$ 5% NPO 1206 chip	510-3602-200
C 120	.1 μ F $\pm$ 10% X7R chip	510-3606-104	C 229	.01 μ F $\pm$ 5% X7R 1206	510-3609-103
C 121	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 230	.01 μ F $\pm$ 5% X7R 1206	510-3609-103
C 122	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 231	.1 μ F $\pm$ 5% X7R 1206	510-3609-104
C 123	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 232	.1 μ F $\pm$ 5% X7R 1206	510-3609-104
C 124	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 233	1 μ F 16V SMD tantalum	510-2625-109
C 125	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 234	.022 μ F $\pm$ 5% X7R 1206	510-3609-223
C 126	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 235	.01 μ F $\pm$ 5% X7R 1206	510-3609-103
C 127	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 236	.047 μ F $\pm$ 5% X7R 1206	510-3609-473
C 128	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 237	.0068 μ F $\pm$ 10% X7R chip	510-3606-682
C 129	10 μ F 16V SMD tantalum	510-2625-100	C 238	15 μ F 20V SMD tantalum	510-2626-150
C 130	10 μ F 16V SMD tantalum	510-2625-100	C 239	15 μ F 20V SMD tantalum	510-2626-150
C 131	10 μ F 16V SMD tantalum	510-2625-100	C 240	.001 μ F $\pm$ 2% NPO 1206	510-3616-102
C 133	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 241	470 μ F 16V radial low temp	510-4216-471
C 134	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 242	10 μ F 16V SMD tantalum	510-2625-100
C 135	10 μ F 16V SMD tantalum	510-2625-100	C 243	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 136	.01 μ F $\pm$ 10% X7R chip	510-3606-103	C 244	.1 μ F $\pm$ 5% X7R 1206	510-3609-104
C 137	10 μ F 16V SMD tantalum	510-2625-100	C 245	15 μ F 20V tantalum SMD	510-2626-150
C 201	.1 μ F $\pm$ 10% X7R chip	510-3606-104	C 246	.1 μ F $\pm$ 10% X7R chip	510-3606-104
C 202	.0022 μ F $\pm$ 10% X7R chip	510-3606-222	C 247	.1 μ F $\pm$ 10% X7R chip	510-3606-104
C 203	.001 μ F $\pm$ 2% NPO 1206	510-3616-102	C 248	470 μ F 16V radial low temp	510-4216-471
C 204	820 pF $\pm$ 2% NPO 1206	510-3616-821	C 249	470 μ F 16V radial low temp	510-4216-471
C 205	.001 μ F $\pm$ 2% NPO 1206	510-3616-102	C 250	300 pF $\pm$ 5% NPO 1206	510-3602-301
C 206	100 pF $\pm$ 2% NPO 1206	510-3616-101	C 251	300 pF $\pm$ 5% NPO 1206	510-3602-301
C 207	68 pF $\pm$ 5% NPO 1206 chip	510-3602-680	C 252	4.7 μ F 16V tantalum SMD	510-2625-479
C 208	.033 μ F $\pm$ 5% X7R 1210	510-3610-333	C 253	4.7 μ F 16V tantalum SMD	510-2625-479
C 209	.22 μ F $\pm$ 5% X7R 1210	510-3610-224	C 260	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 210	.033 μ F $\pm$ 5% X7R 1210	510-3610-333	C 261	.01 μ F $\pm$ 10% X7R chip	510-3606-103
C 211	.068 μ F $\pm$ 5% X7R 1206	510-3609-683	C 262	15 μ F 20V tantalum SMD	510-2626-150
			C 263	.01 μ F $\pm$ 10% X7R chip	510-3606-103
			C 264	15 μ F 20V tantalum SMD	510-2626-150

INTERFACE BOARD

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
C 265	.01 μ F $\pm$ 10% X7R chip	510-3606-103	CR208	Switching diode SOT-23	523-1504-002
C 266	15 μ F 20V tantalum SMD	510-2626-150	CR209	3A ultra-fast diode sw	523-1507-004
C 267	.01 μ F $\pm$ 10% X7R chip	510-3606-103			
C 268	.001 μ F $\pm$ 5% NPO 1206 chip	510-3602-102	DS101	7-segment display green 0.3"	549-4002-020
C 269	1.5 μ F 25V tantalum SMD	510-2627-159			
C 270	4.7 μ F 16V tantalum SMD	510-2625-479	EP101	2-hole crystal pin insulator	018-1080-001
C 271	.001 μ F $\pm$ 5% NPO 1206	510-3602-102			
C 272	15 μ F 20V tantalum SMD	510-2626-150	F 201	2A/250V subminiature fuse	534-0017-017
C 273	82 pF $\pm$ 5% NPO 1206	510-3602-820			
C 275	15 μ F 20V tantalum SMD	510-2626-150	FH201	PC board mount fuse holder	534-1017-001
C 276	.1 μ F $\pm$ 10% X7R chip	510-3606-104			
C 277	47 μ F 10V tantalum SMD	510-2624-470	HW101	4-40 mach panhead ZPS	575-1604-010
C 278	.1 μ F $\pm$ 10% X7R chip	510-3606-104	HW102	#4 shakeproof washer	596-1104-008
C 279	47 μ F 10V tantalum SMD	510-2624-470	HW103	4-40 x 0.094 nut NPB	560-2104-008
C 280	47 μ F 10V tantalum SMD	510-2624-470	HW104	0.142 dia snap rivet	574-9015-050
C 281	.01 μ F $\pm$ 10% X7R chip	510-3606-103	HW105	Jack screw	537-9016-020
C 282	.01 μ F $\pm$ 10% X7R chip	510-3606-103			
C 283	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 101	15-pos D-sub rt angle PC mt	515-0506-102
C 284	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 102	8-con modular jack PC mt	515-2006-040
C 285	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 103	3-pin single inline header	515-7100-003
C 286	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 104	3-pin single inline header	515-7100-003
C 287	47 μ F 10V tantalum SMD	510-2624-470	J 105	14-pin double row header	515-7101-407
C 288	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 107	2-pin single inline header	515-7100-002
C 289	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 108	2-pin single inline header	515-7100-002
C 290	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 201	20-pin straight header	515-9031-376
C 291	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 202	Horizontal tip jack	105-2204-105
C 292	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 203	Horizontal tip jack	105-2203-101
C 293	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 204	3.6mm enclosed jack	515-2001-011
C 295	47 μ F 10V tantalum SMD	510-2624-470	J 205	2-pin single inline header	515-7100-002
C 296	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 206	2-pin single inline header	515-7100-002
C 297	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 207	1-pin single inline header	515-7100-001
C 298	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 208	1-pin single inline header	515-7100-001
C 299	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 209	1-pin single inline header	515-7100-001
C 300	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 210	1-pin single inline header	515-7100-001
C 301	.1 μ F $\pm$ 5% X7R 1206	510-3609-104	J 211	1-pin single inline header	515-7100-001
C 302	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 212	1-pin single inline header	515-7100-001
C 303	.01 μ F $\pm$ 10% X7R chip	510-3606-103	J 213	3-pin single inline header	515-7100-003
C 304	10 μ F 63V axial low temp	510-4363-100	J 214	13-pos horizontal SMD	515-7111-262
C 305	10 μ F 63V axial low temp	510-4363-100			
CR201	Dual switch diode SOT-23	523-1504-023	L 201	20 μ H 1A choke	542-5010-011
CR202	Dual switch diode SOT-23	523-1504-023	L 202	20 μ H 1A choke	542-5010-011
CR203	4.3V zener SOT-23	523-2016-439			
CR204	Switching diode SOT-23	523-1504-002	MP101	Control knob	032-0792-010
CR205	UHF/VHF band sw SOT-23	523-1504-012			
CR206	UHF/VHF band sw SOT-23	523-1504-012	P 103	2-post shorting socket	515-5010-001
CR207	UHF/VHF band sw SOT-23	523-1504-012	P 104	2-post shorting socket	515-5010-001
			P 105	2-post shorting socket	515-5010-001

SYMBOL NUMBER	PART DESCRIPTION	NUMBER	SYMBOL NUMBER	PART DESCRIPTION	NUMBER
P 107	2-post shorting socket	515-5010-001	R 209	15k ohm $\pm 1\%$ 1206 SMD	569-0111-418
P 108	2-post shorting socket	515-5010-001	R 210	100 ohm $\pm 1\%$ 1206 SMD	569-0111-201
P 205	2-post shorting socket	515-5010-001	R 211	1.07M ohm $\pm 1\%$ 1206 SMD	569-0111-604
P 206	2-post shorting socket	515-5010-001	R 212	110 ohm $\pm 1\%$ 1206 SMD	569-0111-205
P 213	2-post shorting socket	515-5010-001	R 213	1.07M ohm $\pm 1\%$ 1206 SMD	569-0111-604
PC700	PC board	035-2000-700	R 214	110 ohm $\pm 1\%$ 1206 SMD	569-0111-205
Q 101	PNP switching transistor	576-0115-001	R 215	1.07M ohm $\pm 1\%$ 1206 SMD	569-0111-604
Q 102	Si NPN gen purp sw/amp	576-0001-300	R 216	18.2k ohm $\pm 1\%$ 1206 SMD	569-0111-426
R 101	Zero ohm $\pm 5\%$ 1206 SMD	569-0115-001	R 217	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 102	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 218	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 103	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 219	18k ohm $\pm 5\%$ 1206 SMD	569-0115-183
R 104	4.7k ohm $\pm 5\%$ 1206 SMD	569-0115-472	R 220	150k ohm $\pm 5\%$ 1206 SMD	569-0115-154
R 105	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 221	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512
R 106	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 222	100k ohm trim pot	562-0110-104
R 107	4.7k ohm $\pm 5\%$ 1206 SMD	569-0115-472	R 223	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 108	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 224	1.5k ohm $\pm 5\%$ 1206 SMD	569-0115-152
R 109	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 225	6.2k ohm $\pm 5\%$ 1206 SMD	569-0115-622
R 110	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 226	12k ohm $\pm 5\%$ 1206 SMD	569-0115-123
R 111	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 227	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 112	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 228	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 113	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 229	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 114	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 230	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 115	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	R 231	330k ohm $\pm 5\%$ 1206 SMD	569-0115-334
R 116	10M ohm $\pm 5\%$ 1206 SMD	569-0115-106	R 232	1M ohm $\pm 5\%$ 1206 SMD	569-0115-105
R 117	2k ohm $\pm 5\%$ 1206 SMD	569-0115-202	R 233	7.5k ohm $\pm 5\%$ 1206 SMD	569-0115-752
R 118	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 234	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 119	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 235	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 120	10k ohm $\pm 1\%$ 1206 SMD	569-0111-401	R 236	470k ohm $\pm 5\%$ 1206 SMD	569-0115-474
R 121	10k ohm $\pm 1\%$ 1206 SMD	569-0111-401	R 237	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 122	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 238	3.9k ohm $\pm 5\%$ 1206 SMD	569-0115-392
R 123	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 239	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102
R 124	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 240	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 125	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 241	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 126	Zero ohm $\pm 5\%$ 1206 SMD	569-0115-001	R 242	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
R 131	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 243	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
R 132	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	R 244	7.5k ohm $\pm 5\%$ 1206 SMD	569-0115-752
R 201	29.4k ohm $\pm 1\%$ 1206 SMD	569-0111-446	R 245	56k ohm $\pm 5\%$ 1206 SMD	569-0115-563
R 202	54.9k ohm $\pm 1\%$ 1206 SMD	569-0111-472	R 246	56k ohm $\pm 5\%$ 1206 SMD	569-0115-563
R 203	1M ohm $\pm 5\%$ 1206 SMD	569-0115-105	R 247	51k ohm $\pm 5\%$ 1206 SMD	569-0115-513
R 204	147k ohm $\pm 1\%$ 1206 SMD	569-0111-517	R 248	100k ohm trim pot	562-0110-104
R 205	69.8k ohm $\pm 1\%$ 1206 SMD	569-0111-482	R 249	270k ohm $\pm 5\%$ 1206 SMD	569-0115-274
R 206	43k ohm $\pm 5\%$ 1206 SMD	569-0115-433	R 250	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 207	100k ohm trim pot	562-0110-104	R 251	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104
R 208	390k ohm $\pm 5\%$ 1206 SMD	569-0115-394	R 252	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473
			R 253	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103
			R 254	18k ohm $\pm 5\%$ 1206 SMD	569-0115-183
			R 255	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512

INTERFACE BOARD

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
R 256	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	S 101	SPST momentary switch	583-4005-002
R 257	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	T 201	600 ohm modem transformer	592-1015-008
R 258	5.1k ohm $\pm 5\%$ 1206 SMD	569-0115-512	U 101	BCD-7 latch MC14495	544-3014-495
R 259	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 102	Micro monitor SO-8 SOIC	544-2003-085
R 260	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 103	+12V regulator 78L12 SOIC	544-2603-032
R 261	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473	U 104	RDM boot code	023-9998-365
R 262	10k ohm volume/audio switch	562-0018-044	U 105	16-bit CMOS CPU ROMless	544-5002-016
R 263	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 106	32k x 8 SCRAM SO-28	544-5001-412
R 264	39 ohm $\pm 5\%$ 1206 SMD	569-0115-390	U 107	38V64 32 PLCC	544-5002-412
R 265	1 ohm $\pm 1\%$ 1206 SMD	569-0115-109	U 108	Quad 2-in NAND 74HC00	544-3766-000
R 266	2.2 ohm $\pm 5\%$ 1206 SMD	569-0115-229	U 109	Driver/Rcvr RS-232C/v.28	544-2023-014
R 267	220 ohm $\pm 5\%$ 1206 SMD	569-0115-221	U 110	Prog comm interface 82C5	544-5001-319
R 268	51 ohm $\pm 5\%$ 2512 SMD	569-0175-510	U 111	7-stage binary counter 4024	544-3016-024
R 269	Zero ohm $\pm 5\%$ 1206 SMD	569-0115-001	U 112	Hex inverter 74HC04 SOIC	544-3766-004
R 270	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 113	1 of 16 demux 74HC154 SOIC	544-3766-154
R 271	100k ohm trim pot	562-0110-104	U 114	D-flip-flop 74HC574 SOIC	544-3766-574
R 272	2.2k ohm $\pm 5\%$ 1206 SMD	569-0115-222	U 115	D-flip-flop 74HC574 SOIC	544-3766-574
R 273	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	U 116	D-flip-flop 74HC574 SOIC	544-3766-574
R 274	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	U 117	D-flip-flop 74HC574 SOIC	544-3766-574
R 275	300 ohm $\pm 5\%$ 1206 SMD	569-0115-301	U 118	8-bit A/D converter	544-2031-001
R 276	300 ohm $\pm 5\%$ 1206 SMD	569-0115-301	U 119	1 of 16 demux 74HC154 SOIC	544-3766-154
R 277	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 120	Quad 2-in NAND 74HC00	544-3766-000
R 278	910 ohm $\pm 5\%$ 1206 SMD	569-0115-911	U 121	Quad 2-in OR 74HC32	544-3766-032
R 279	1M ohm $\pm 5\%$ 1206 SMD	569-0115-105	U 201	Dual op amp SO-8	544-2019-004
R 280	100k ohm $\pm 5\%$ 1206 SMD	569-0115-104	U 203	Quad op amp SOIC	544-2020-008
R 281	36k ohm $\pm 5\%$ 1206 SMD	569-0115-363	U 204	Dual op amp SO-8	544-2019-004
R 282	100k ohm trim pot	562-0110-104	U 205	Dual op amp SO-8	544-2019-018
R 283	36k ohm $\pm 5\%$ 1206 SMD	569-0115-363	U 207	Quad op amp SOIC	544-2020-008
R 284	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 208	Dual op amp SO-8	544-2019-004
R 285	43k ohm $\pm 5\%$ 1206 SMD	569-0115-433	U 210	Quad op amp SOIC	544-2020-008
R 286	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 211	Quad analog sw SPST SOIC	544-3003-001
R 287	43k ohm $\pm 5\%$ 1206 SMD	569-0115-433	U 212	Quad analog sw SPST SOIC	544-3003-001
R 288	10k ohm $\pm 5\%$ 1206 SMD	569-0115-103	U 213	10W audio pentawatt IC	544-2006-013
R 289	22k ohm $\pm 5\%$ 1206 SMD	569-0115-223	U 215	Dual op amp SO-8	544-2019-018
R 290	22k ohm $\pm 5\%$ 1206 SMD	569-0115-223	U 217	Quad analog sw SPST SOIC	544-3003-001
R 291	22k ohm $\pm 5\%$ 1206 SMD	569-0115-223	U 218	FSK modem 7911 28-DIP	544-3988-004
R 292	6.2k ohm $\pm 5\%$ 1206 SMD	569-0115-622	U 219	Hex non-inverter buffer 4050	544-3016-050
R 293	1k ohm $\pm 5\%$ 1206 SMD	569-0115-102	U 220	8-channel mux/demux	544-3016-051
R 294	130k ohm $\pm 5\%$ 1206 SMD	569-0115-134	U 221	+12V regulator 78L12 SOIC	544-2603-032
R 295	300k ohm $\pm 5\%$ 1206 SMD	569-0115-304	U 222	-5V DC 175 mA supply	544-2003-096
R 298	47k ohm $\pm 5\%$ 1206 SMD	569-0115-473	X 101	10-post right angle IC socket	515-5008-250
RT201	10k ohm $\pm 5\%$ chip thermistor	569-3013-007	X 104	32-pin IC socket	515-5008-108
RV201	Varistor 250V V275LAY	523-2090-005	X 105	84-post PLCC socket	515-5020-100
RV202	Varistor 250V V275LAY	523-2090-005	X 110	28-pin IC socket	515-5008-018
RV203	Varistor 250V V275LAY	523-2090-005			

SYMBOL NUMBER	DESCRIPTION	PART NUMBER
Y 101	10 MHz crystal HC-18	521-0010-000
Y 102	2.4576 MHz crystal HC-18U	521-0002-458
Z 201	EMI suppression filter	532-3003-002

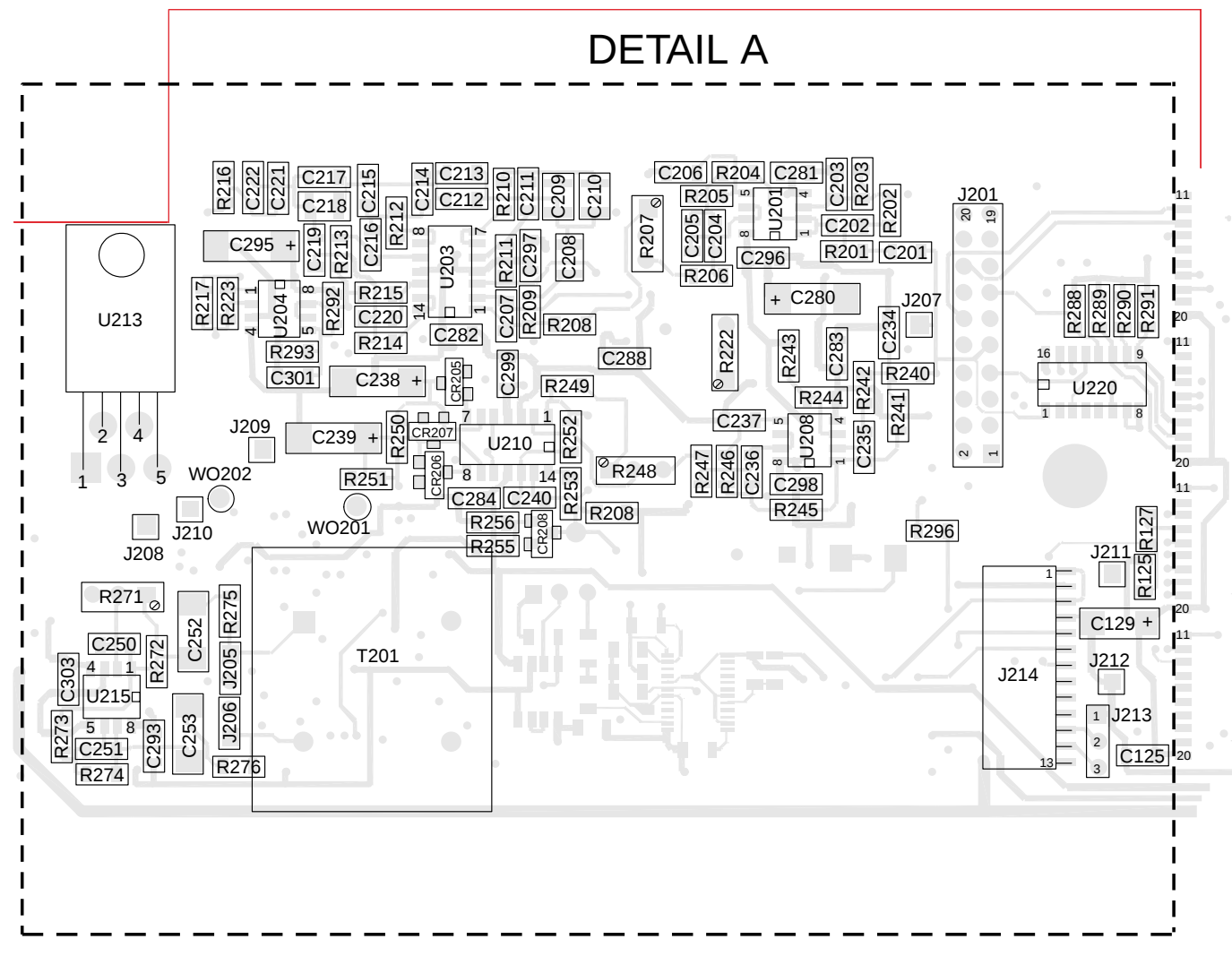
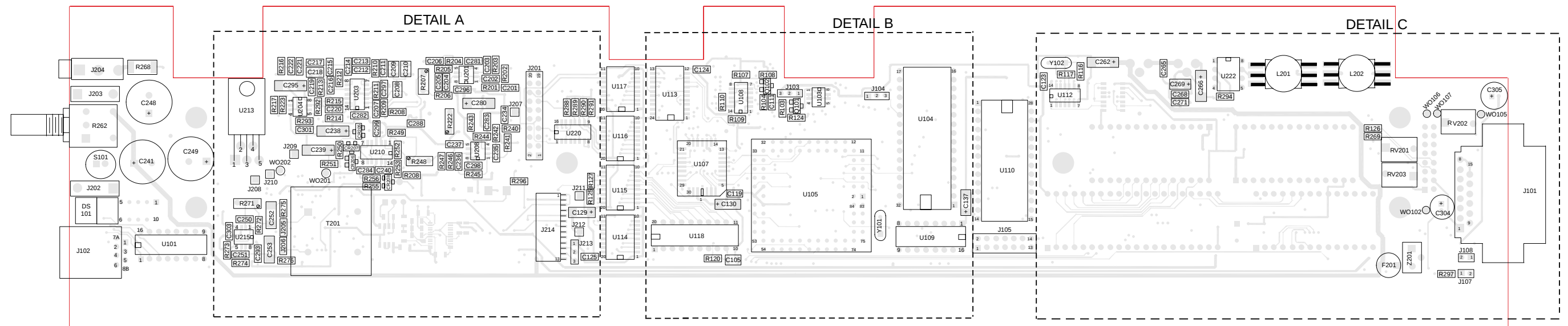
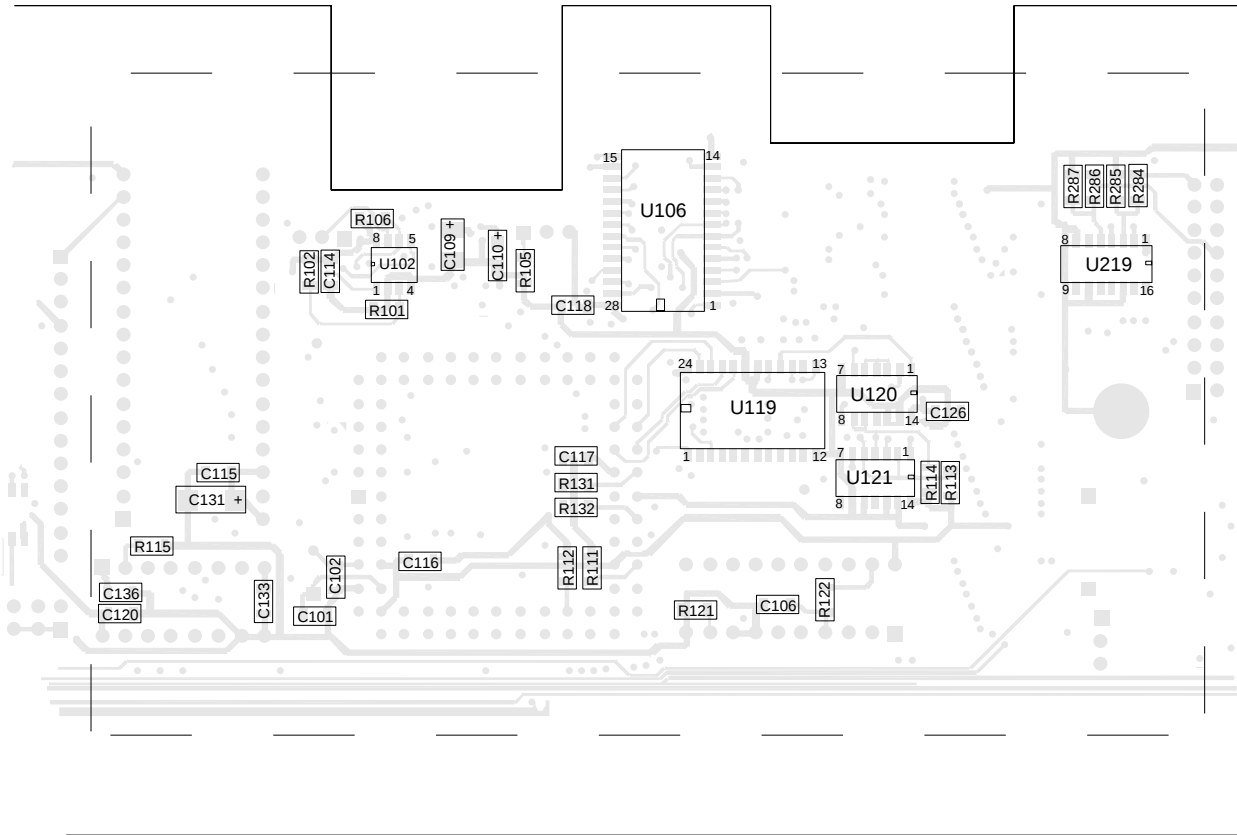


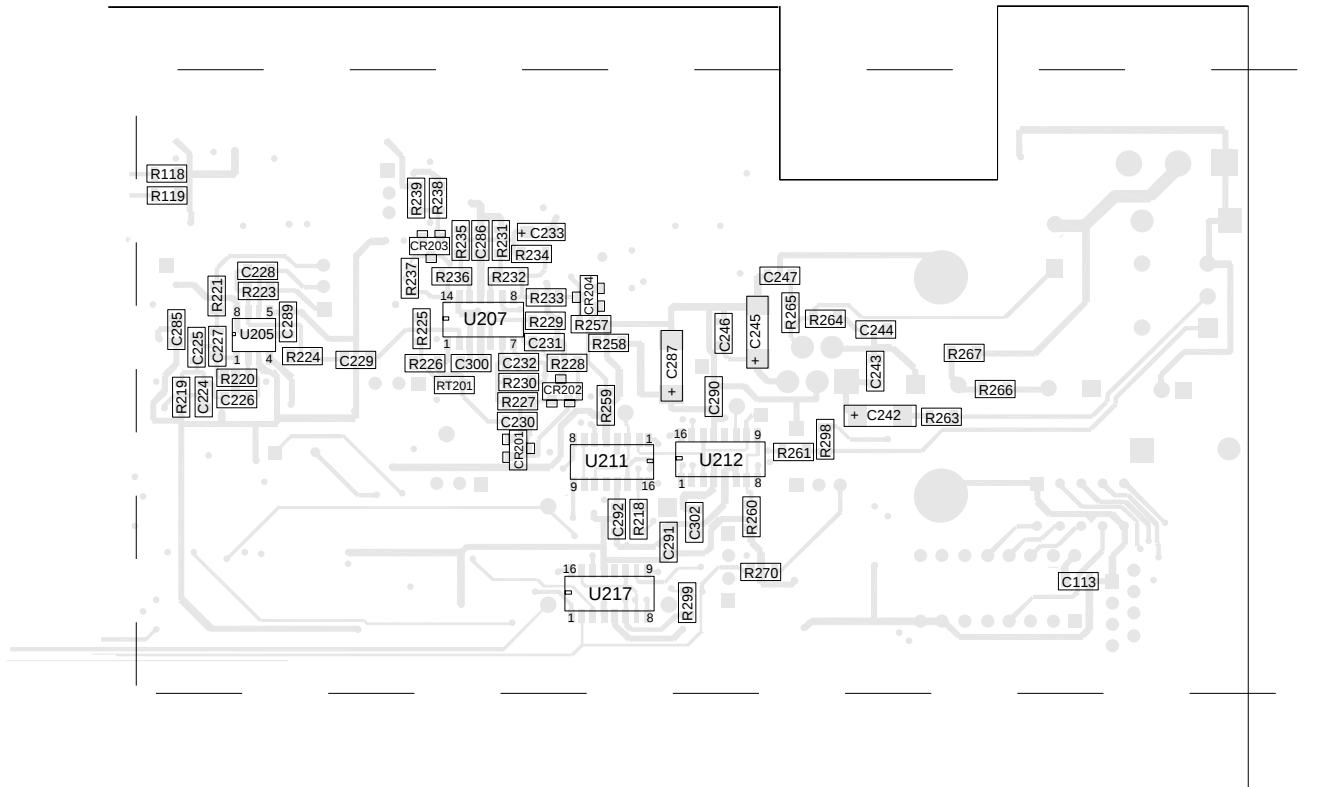
Figure 6-3 RDM INTERFACE BOARD SCHEMATIC (1 OF 2)

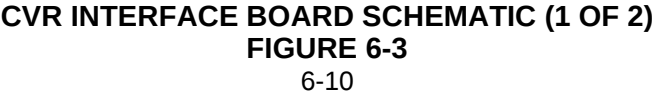
Figure 6-4 RDM INTERFACE BOARD SCHEMATIC (2 OF 2)

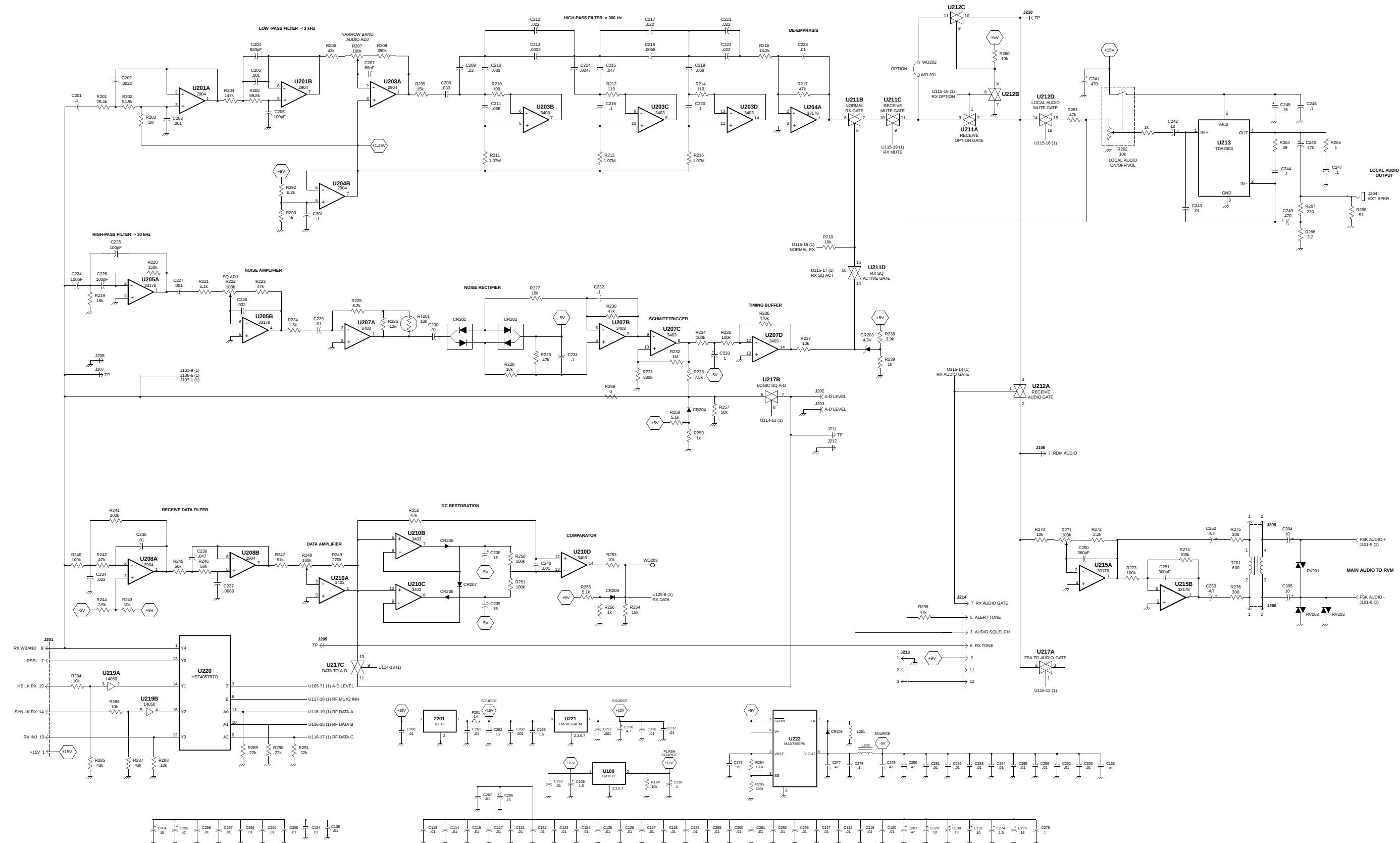
DETAIL B



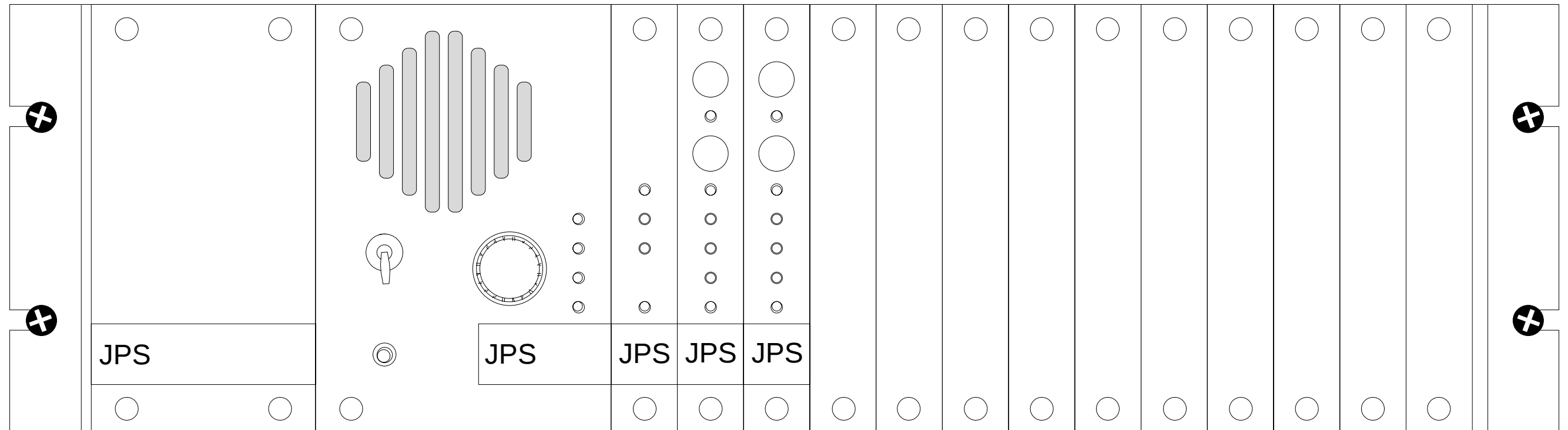
DETAIL C



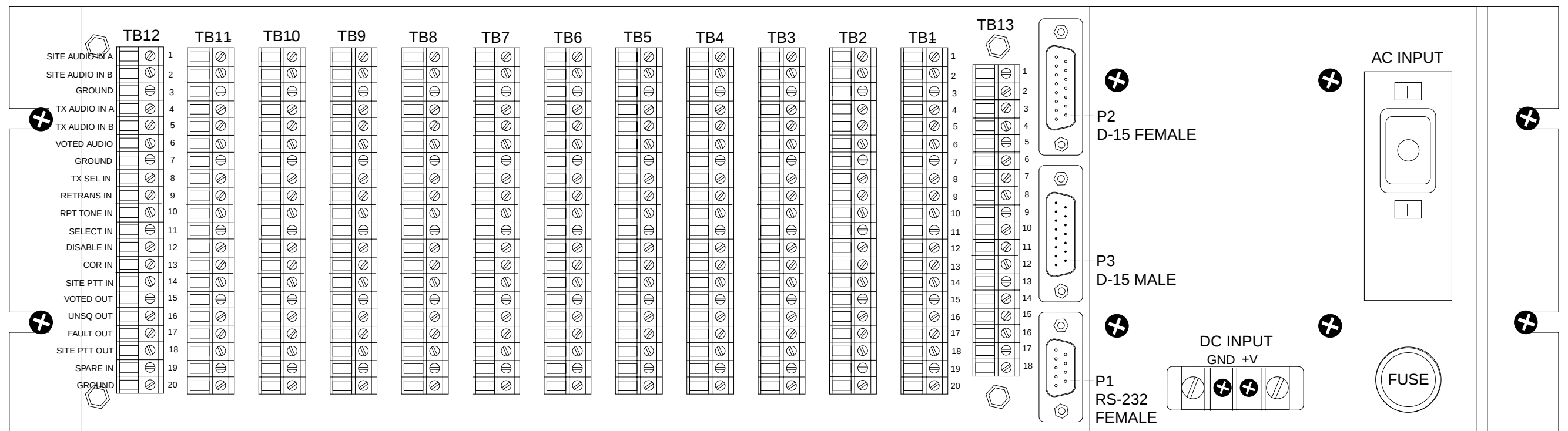




SECTION 6 VOTER MODULE



SNV-12



SECTION 8 POWER SUPPLIES

8.1 RECEIVER SITE POWER SUPPLY (-490)

The -490 Receiver Site Power Supply has a 110V AC 50/60 Hz, 5A maximum input and 10 separate 15V DC/ground output connections.

8.2 RECEIVER SITE REDUNDANT KIT (-495)

The -495 Receiver Site Redundant Supply Kit allows two power supplies to share the load.

SYMBOL NUMBER	DESCRIPTION	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	PART NUMBER
RECEIVER SITE POWER SUPPLY PART NO. 023-3039-490			RECEIVER SITE REDUNDANT DIODE PART NO. 023-3039-495		
A 002	Power supply	585-4001-120	CR001	Bridge rectifier 200V 25A	523-4004-008
HW001	#4 shakeproof washer	596-1104-008	EP001	1/4" 2 AWG ring terminal	586-0001-028
HW003	4-40 panhead philips ZPS	575-1604-008	EP002	1/4" 2 AWG ring terminal	586-0001-028
HW004	Self clinching fastener	537-9047-002	EP003	1/4" 2 AWG ring terminal	586-0001-028
HW005	6-32 panhead philips ZPS	575-1606-009	EP004	1/4" 2 AWG ring terminal	586-0001-028
HW006	6 x .018 lockwasher NPB	596-2106-009	EP005	1/4" 2 AWG ring terminal	586-0001-028
F 001	10A 32V fastblow AGC	534-0003-036	EP006	1/4" heat shrink tubing	042-0241-555
FH001	Fuse clip	534-1007-001	EP007	1/4" heat shrink tubing	042-0241-555
J 001	Power connector	023-4110-001	EP008	1/4" heat shrink tubing	042-0241-555
J 002	Latch header right angle	515-7100-840	EP009	1/4" heat shrink tubing	042-0241-555
MP001	Power supply shelf	017-2222-217	EP010	1/4" heat shrink tubing	042-0241-555
MP002	Challenger power supply cover	017-2222-219	HW001	8-32 pan head ZPS philips	575-1608-032
MP001	Left latching arm	515-6010-011	HW002	8 x .02 lockwasher int. CPS	596-1108-011
MP002	Right latching arm	515-6010-012	HW003	8-32 x .125 nut CPS	560-1108-011
P 001	10-pos vertical connector	515-1502-030	HW004	4-40 pan head ZPS philips	575-1604-012
P 002	10-pos vertical connector	515-1502-030	HW005	No. 4 shakeproof washer	596-1104-008
PC001	PC board	035-3039-490	HW006	No. 4 shakeproof washer	596-1104-008
			HW007	4-40 x .094 NPB nut	560-2104-008
			W 001	#12 red stranded	597-7021-202
			RECEIVER SITE REDUNDANT POWER SUPPLY WITH DIODE KIT PART NO. 023-0226-141 (Factory Installed) 239-0226-141 (Field Installed)		

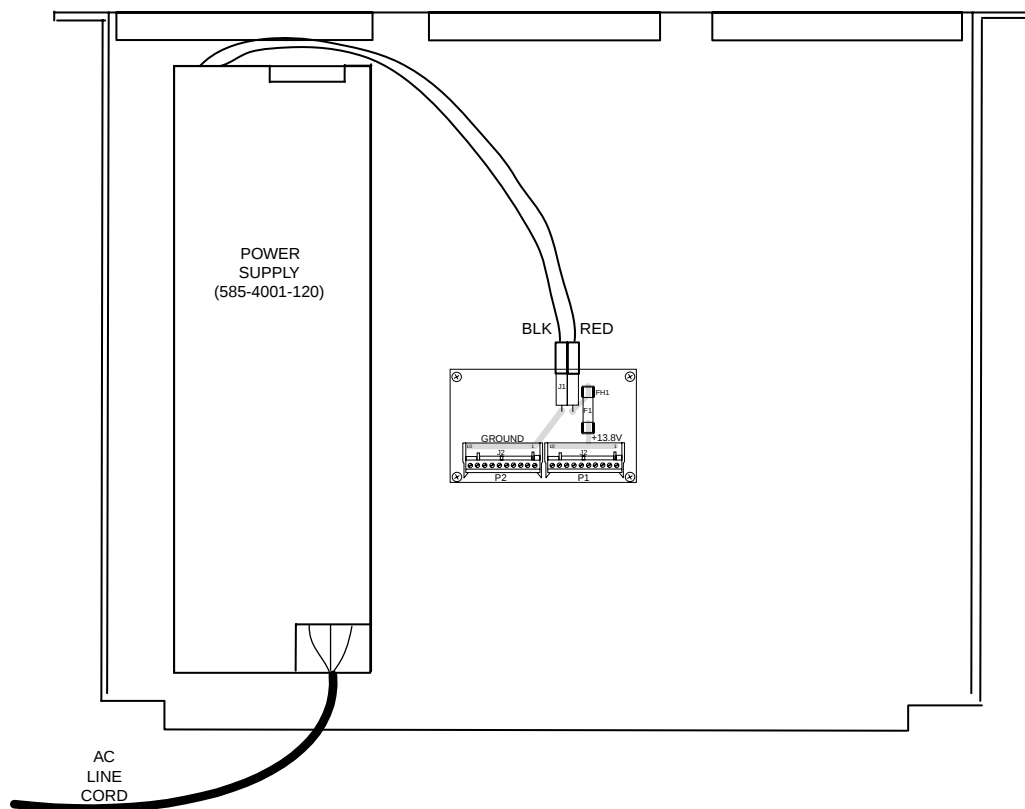


Figure 8-1 RECEIVER SITE POWER SUPPLY (-490)

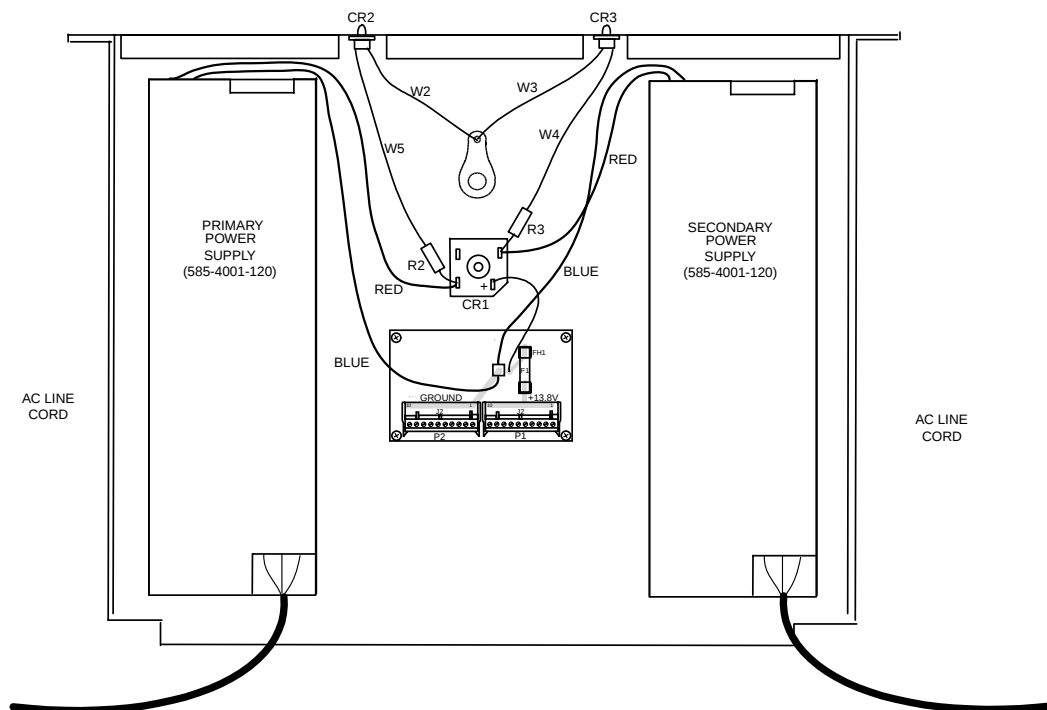


Figure 8-2 RECEIVER SITE REDUNDANT KIT (-495)



APPENDIX A 800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
1	1	851.0125	806.0125	45	45	852.1125	807.1125
2	2	851.0375	806.0375	46	46	852.1375	807.1375
3	3	851.0625	806.0625	47	47	852.1625	807.1625
4	4	851.0875	806.0875	48	48	852.1875	807.1875
5	5	851.1125	806.1125	49	49	852.2125	807.2125
6	6	851.1375	806.1375	50	50	852.2375	807.2375
7	7	851.1625	806.1625	51	51	852.2625	807.2625
8	8	851.1875	806.1875	52	52	852.2875	807.2875
9	9	851.2125	806.2125	53	53	852.3125	807.3125
10	10	851.2375	806.2375	54	54	852.3375	807.3375
11	11	851.2625	806.2625	55	55	852.3625	807.3625
12	12	851.2875	806.2875	56	56	852.3875	807.3875
13	13	851.3125	806.3125	57	57	852.4125	807.4125
14	14	851.3375	806.3375	58	58	852.4375	807.4375
15	15	851.3625	806.3625	59	59	852.4625	807.4625
16	16	851.3875	806.3875	60	60	852.4875	807.4875
17	17	851.4125	806.4125	61	61	852.5125	807.5125
18	18	851.4375	806.4375	62	62	852.5375	807.5375
19	19	851.4625	806.4625	63	63	852.5625	807.5625
20	20	851.4875	806.4875	64	64	852.5875	807.5875
21	21	851.5125	806.5125	65	65	852.6125	807.6125
22	22	851.5375	806.5375	66	66	852.6375	807.6375
23	23	851.5625	806.5625	67	67	852.6625	807.6625
24	24	851.5875	806.5875	68	68	852.6875	807.6875
25	25	851.6125	806.6125	69	69	852.7125	807.7125
26	26	851.6375	806.6375	70	70	852.7375	807.7375
27	27	851.6625	806.6625	71	71	852.7625	807.7625
28	28	851.6875	806.6875	72	72	852.7875	807.7875
29	29	851.7125	806.7125	73	73	852.8125	807.8125
30	30	851.7375	806.7375	74	74	852.8375	807.8375
31	31	851.7625	806.7625	75	75	852.8625	807.8625
32	32	851.7875	806.7875	76	76	852.8875	807.8875
33	33	851.8125	806.8125	77	77	852.9125	807.9125
34	34	851.8375	806.8375	78	78	852.9375	807.9375
35	35	851.8625	806.8625	79	79	852.9625	807.9625
36	36	851.8875	806.8875	80	80	852.9875	807.9875
37	37	851.9125	806.9125	81	81	853.0125	808.0125
38	38	851.9375	806.9375	82	82	853.0375	808.0375
39	39	851.9625	806.9625	83	83	853.0625	808.0625
40	40	851.9875	806.9875	84	84	853.0875	808.0875
41	41	852.0125	807.0125	85	85	853.1125	808.1125
42	42	852.0375	807.0375	86	86	853.1375	808.1375
43	43	852.0625	807.0625	87	87	853.1625	808.1625
44	44	852.0875	807.0875	88	88	853.1875	808.1875

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
89	89	853.2125	808.2125	135	135	854.3625	809.3625
90	90	853.2375	808.2375	136	136	854.3875	809.3875
91	91	853.2625	808.2625	137	137	854.4125	809.4125
92	92	853.2875	808.2875	138	138	854.4375	809.4375
93	93	853.3125	808.3125	139	139	854.4625	809.4625
94	94	853.3375	808.3375	140	140	854.4875	809.4875
95	95	853.3625	808.3625	141	141	854.5125	809.5125
96	96	853.3875	808.3875	142	142	854.5375	809.5375
97	97	853.4125	808.4125	143	143	854.5625	809.5625
98	98	853.4375	808.4375	144	144	854.5875	809.5875
99	99	853.4625	808.4625	145	145	854.6125	809.6125
100	100	853.4875	808.4875	146	146	854.6375	809.6375
101	101	853.5125	808.5125	147	147	854.6625	809.6625
102	102	853.5375	808.5375	148	148	854.6875	809.6875
103	103	853.5625	808.5625	149	149	854.7125	809.7125
104	104	853.5875	808.5875	150	150	854.7375	809.7375
105	105	853.6125	808.6125	151	151	854.7625	809.7625
106	106	853.6375	808.6375	152	152	854.7875	809.7875
107	107	853.6625	808.6625	153	153	854.8125	809.8125
108	108	853.6875	808.6875	154	154	854.8375	809.8375
109	109	853.7125	808.7125	155	155	854.8625	809.8625
110	110	853.7375	808.7375	156	156	854.8875	809.8875
111	111	853.7625	808.7625	157	157	854.9125	809.9125
112	112	853.7875	808.7875	158	158	854.9375	809.9375
113	113	853.8125	808.8125	159	159	854.9625	809.9625
114	114	853.8375	808.8375	160	160	854.9875	809.9875
115	115	853.8625	808.8625	161	161	855.0125	810.0125
116	116	853.8875	808.8875	162	162	855.0375	810.0375
117	117	853.9125	808.9125	163	163	855.0625	810.0625
118	118	853.9375	808.9375	164	164	855.0875	810.0875
119	119	853.9625	808.9625	165	165	855.1125	810.1125
120	120	853.9875	808.9875	166	166	855.1375	810.1375
121	121	854.0125	809.0125	167	167	855.1625	810.1625
122	122	854.0375	809.0375	168	168	855.1875	810.1875
123	123	854.0625	809.0625	169	169	855.2125	810.2125
124	124	854.0875	809.0875	170	170	855.2375	810.2375
125	125	854.1125	809.1125	171	171	855.2625	810.2625
126	126	854.1375	809.1375	172	172	855.2875	810.2875
127	127	854.1625	809.1625	173	173	855.3125	810.3125
128	128	854.1875	809.1875	174	174	855.3375	810.3375
129	129	854.2125	809.2125	175	175	855.3625	810.3625
130	130	854.2375	809.2375	176	176	855.3875	810.3875
131	131	854.2625	809.2625	177	177	855.4125	810.4125
132	132	854.2875	809.2875				
133	133	854.3125	809.3125				
134	134	854.3375	809.3375				

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
178	178	855.4375	810.4375	221	221	856.5125	811.5125
179	179	855.4625	810.4625	222	222	856.5375	811.5375
180	180	855.4875	810.4875	223	223	856.5625	811.5625
181	181	855.5125	810.5125	224	224	856.5875	811.5875
182	182	855.5375	810.5375	225	225	856.6125	811.6125
183	183	855.5625	810.5625	226	226	856.6375	811.6375
184	184	855.5875	810.5875	227	227	856.6625	811.6625
185	185	855.6125	810.6125	228	228	856.6875	811.6875
186	186	855.6375	810.6375	229	229	856.7125	811.7125
187	187	855.6625	810.6625	230	230	856.7375	811.7375
188	188	855.6875	810.6875	231	231	856.7625	811.7625
189	189	855.7125	810.7125	232	232	856.7875	811.7875
190	190	855.7375	810.7375	233	233	856.8125	811.8125
191	191	855.7625	810.7625	234	234	856.8375	811.8375
192	192	855.7875	810.7875	235	235	856.8625	811.8625
193	193	855.8125	810.8125	236	236	856.8875	811.8875
194	194	855.8375	810.8375	237	237	856.9125	811.9125
195	195	855.8625	810.8625	238	238	856.9375	811.9375
196	196	855.8875	810.8875	239	239	856.9625	811.9625
197	197	855.9125	810.9125	240	240	856.9875	811.9875
198	198	855.9375	810.9375	241	241	857.0125	812.0125
199	199	855.9625	810.9625	242	242	857.0375	812.0375
200	200	855.9875	810.9875	243	243	857.0625	812.0625
201	201	856.0125	811.0125	244	244	857.0875	812.0875
202	202	856.0375	811.0375	245	245	857.1125	812.1125
203	203	856.0625	811.0625	246	246	857.1375	812.1375
204	204	856.0875	811.0875	247	247	857.1625	812.1625
205	205	856.1125	811.1125	249	249	857.2125	812.2125
206	206	856.1375	811.1375	250	250	857.2375	812.2375
207	207	856.1625	811.1625	251	251	857.2625	812.2625
208	208	856.1875	811.1875	252	252	857.2875	812.2875
209	209	856.2125	811.2125	253	253	857.3125	812.3125
210	210	856.2375	811.2375	254	254	857.3375	812.3375
211	211	856.2625	811.2625	255	255	857.3625	812.3625
212	212	856.2875	811.2875	256	256	857.3875	812.3875
213	213	856.3125	811.3125	257	257	857.4125	812.4125
214	214	856.3375	811.3375	258	258	857.4375	812.4375
215	215	856.3625	811.3625	259	259	857.4625	812.4625
216	216	856.3875	811.3875	260	260	857.4875	812.4875
217	217	856.4125	811.4125	261	261	857.5125	812.5125
218	218	856.4375	811.4375	262	262	857.5375	812.5375
219	219	856.4625	811.4625	263	263	857.5625	812.5625
220	220	856.4875	811.4875	264	264	857.5875	812.5875

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
265	265	857.6125	812.6125	308	308	858.6875	813.6875
266	266	857.6375	812.6375	309	309	858.7125	813.7125
267	267	857.6625	812.6625	310	310	858.7375	813.7375
268	268	857.6875	812.6875	311	311	858.7625	813.7625
269	269	857.7125	812.7125	312	312	858.7875	813.7875
270	270	857.7375	812.7375	313	313	858.8125	813.8125
271	271	857.7625	812.7625	314	314	858.8375	813.8375
272	272	857.7875	812.7875	315	315	858.8625	813.8625
273	273	857.8125	812.8125	316	316	858.8875	813.8875
274	274	857.8375	812.8375	318	318	858.9375	813.9375
275	275	857.8625	812.8625	319	319	858.9625	813.9625
276	276	857.8875	812.8875	320	320	858.9875	813.9875
277	277	857.9125	812.9125	321	321	859.0125	814.0125
278	278	857.9375	812.9375	322	322	859.0375	814.0375
279	279	857.9625	812.9625	323	323	859.0625	814.0625
280	280	857.9875	812.9875	324	324	859.0875	814.0875
281	281	858.0125	813.0125	325	325	859.1125	814.1125
282	282	858.0375	813.0375	326	326	859.1375	814.1375
283	283	858.0625	813.0625	327	327	859.1625	814.1625
284	284	858.0875	813.0875	328	328	859.1875	814.1875
285	285	858.1125	813.1125	329	329	859.2125	814.2125
286	286	858.1375	813.1375	330	330	859.2375	814.2375
287	287	858.1625	813.1625	331	331	859.2625	814.2625
288	288	858.1875	813.1875	332	332	859.2875	814.2875
289	289	858.2125	813.2125	333	333	859.3125	814.3125
290	290	858.2375	813.2375	334	334	859.3375	814.3375
291	291	858.2625	813.2625	335	335	859.3625	814.3625
292	292	858.2875	813.2875	336	336	859.3875	814.3875
293	293	858.3125	813.3125	337	337	859.4125	814.4125
294	294	858.3375	813.3375	338	338	859.4375	814.4375
295	295	858.3625	813.3625	339	339	859.4625	814.4625
296	296	858.3875	813.3875	340	340	859.4875	814.4875
297	297	858.4125	813.4125	341	341	859.5125	814.5125
298	298	858.4375	813.4375	342	342	859.5375	814.5375
299	299	858.4625	813.4625	343	343	859.5625	814.5625
300	300	858.4875	813.4875	344	344	859.5875	814.5875
301	301	858.5125	813.5125	345	345	859.6125	814.6125
302	302	858.5375	813.5375	346	346	859.6375	814.6375
303	303	858.5625	813.5625	347	347	859.6625	814.6625
304	304	858.5875	813.5875	348	348	859.6875	814.6875
305	305	858.6125	813.6125	349	349	859.7125	814.7125
306	306	858.6375	813.6375	350	350	859.7375	814.7375
307	307	858.6625	813.6625	351	351	859.7625	814.7625

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
352	352	859.7875	814.7875	398	398	860.9375	815.9375
353	353	859.8125	814.8125	399	399	860.9625	815.9625
354	354	859.8375	814.8375	400	400	860.9875	815.9875
355	355	859.8625	814.8625	401	401	861.0125	816.0125
356	356	859.8875	814.8875	402	402	861.0375	816.0375
357	357	859.9125	814.9125	403	403	861.0625	816.0625
358	358	859.9375	814.9375	404	404	861.0875	816.0875
359	359	859.9625	814.9625	405	405	861.1125	816.1125
360	360	859.9875	814.9875	406	406	861.1375	816.1375
361	361	860.0125	815.0125	407	407	861.1625	816.1625
362	362	860.0375	815.0375	408	408	861.1875	816.1875
363	363	860.0625	815.0625	409	409	861.2125	816.2125
364	364	860.0875	815.0875	410	410	861.2375	816.2375
365	365	860.1125	815.1125	411	411	861.2625	816.2625
366	366	860.1375	815.1375	412	412	861.2875	816.2875
367	367	860.1625	815.1625	413	413	861.3125	816.3125
368	368	860.1875	815.1875	414	414	861.3375	816.3375
369	369	860.2125	815.2125	415	415	861.3625	816.3625
370	370	860.2375	815.2375	416	416	861.3875	816.3875
371	371	860.2625	815.2625	417	417	861.4125	816.4125
372	372	860.2875	815.2875	418	418	861.4375	816.4375
373	373	860.3125	815.3125	419	419	861.4625	816.4625
374	374	860.3375	815.3375	420	420	861.4875	816.4875
375	375	860.3625	815.3625	421	421	861.5125	816.5125
376	376	860.3875	815.3875	422	422	861.5375	816.5375
377	377	860.4125	815.4125	423	423	861.5625	816.5625
378	378	860.4375	815.4375	424	424	861.5875	816.5875
379	379	860.4625	815.4625	425	425	861.6125	816.6125
380	380	860.4875	815.4875	426	426	861.6375	816.6375
381	381	860.5125	815.5125	427	427	861.6625	816.6625
382	382	860.5375	815.5375	428	428	861.6875	816.6875
383	383	860.5625	815.5625	429	429	861.7125	816.7125
384	384	860.5875	815.5875	430	430	861.7375	816.7375
385	385	860.6125	815.6125	431	431	861.7625	816.7625
386	386	860.6375	815.6375	432	432	861.7875	816.7875
387	387	860.6625	815.6625	433	433	861.8125	816.8125
388	388	860.6875	815.6875	434	434	861.8375	816.8375
389	389	860.7125	815.7125	435	435	861.8625	816.8625
390	390	860.7375	815.7375	436	436	861.8875	816.8875
391	391	860.7625	815.7625	437	437	861.9125	816.9125
392	392	860.7875	815.7875	438	438	861.9375	816.9375
393	393	860.8125	815.8125	439	439	861.9625	816.9625
394	394	860.8375	815.8375	440	440	861.9875	816.9875
395	395	860.8625	815.8625	441	441	862.0125	817.0125
396	396	860.8875	815.8875	442	442	862.0375	817.0375
397	397	860.9125	815.9125	443	443	862.0625	817.0625

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
444	444	862.0875	817.0875	490	490	863.2375	818.2375
445	445	862.1125	817.1125	491	491	863.2625	818.2625
446	446	862.1375	817.1375	492	492	863.2875	818.2875
447	447	862.1625	817.1625	493	493	863.3125	818.3125
448	448	862.1875	817.1875	494	494	863.3375	818.3375
449	449	862.2125	817.2125	495	495	863.3625	818.3625
450	450	862.2375	817.2375	496	496	863.3875	818.3875
451	451	862.2625	817.2625	497	497	863.4125	818.4125
452	452	862.2875	817.2875	498	498	863.4375	818.4375
453	453	862.3125	817.3125	499	499	863.4625	818.4625
454	454	862.3375	817.3375	500	500	863.4875	818.4875
455	455	862.3625	817.3625	501	501	863.5125	818.5125
456	456	862.3875	817.3875	502	502	863.5375	818.5375
457	457	862.4125	817.4125	503	503	863.5625	818.5625
458	458	862.4375	817.4375	504	504	863.5875	818.5875
459	459	862.4625	817.4625	505	505	863.6125	818.6125
460	460	862.4875	817.4875	506	506	863.6375	818.6375
461	461	862.5125	817.5125	507	507	863.6625	818.6625
462	462	862.5375	817.5375	508	508	863.6875	818.6875
463	463	862.5625	817.5625	509	509	863.7125	818.7125
464	464	862.5875	817.5875	510	510	863.7375	818.7375
465	465	862.6125	817.6125	511	511	863.7625	818.7625
466	466	862.6375	817.6375	512	512	863.7875	818.7875
467	467	862.6625	817.6625	513	513	863.8125	818.8125
468	468	862.6875	817.6875	514	514	863.8375	818.8375
469	469	862.7125	817.7125	515	515	863.8625	818.8625
470	470	862.7375	817.7375	516	516	863.8875	818.8875
471	471	862.7625	817.7625	517	517	863.9125	818.9125
472	472	862.7875	817.7875	518	518	863.9375	818.9375
473	473	862.8125	817.8125	519	519	863.9625	818.9625
474	474	862.8375	817.8375	520	520	863.9875	818.9875
475	475	862.8625	817.8625	521	521	864.0125	819.0125
476	476	862.8875	817.8875	522	522	864.0375	819.0375
477	477	862.9125	817.9125	523	523	864.0625	819.0625
478	478	862.9375	817.9375	524	524	864.0875	819.0875
479	479	862.9625	817.9625	525	525	864.1125	819.1125
480	480	862.9875	817.9875	526	526	864.1375	819.1375
481	481	863.0125	818.0125	527	527	864.1625	819.1625
482	482	863.0375	818.0375	528	528	864.1875	819.1875
483	483	863.0625	818.0625	529	529	864.2125	819.2125
484	484	863.0875	818.0875	530	530	864.2375	819.2375
485	485	863.1125	818.1125	531	531	864.2625	819.2625
486	486	863.1375	818.1375	532	532	864.2875	819.2875
487	487	863.1625	818.1625	533	533	864.3125	819.3125
488	488	863.1875	818.1875	534	534	864.3375	819.3375
489	489	863.2125	818.2125	535	535	864.3625	819.3625

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
536	536	864.3875	819.3875	582	582	865.5375	820.5375
537	537	864.4125	819.4125	583	583	865.5625	820.5625
538	538	864.4375	819.4375	584	584	865.5875	820.5875
539	539	864.4625	819.4625	585	585	865.6125	820.6125
540	540	864.4875	819.4875	586	586	865.6375	820.6375
541	541	864.5125	819.5125	587	587	865.6625	820.6625
542	542	864.5375	819.5375	588	588	865.6875	820.6875
543	543	864.5625	819.5625	589	589	865.7125	820.7125
544	544	864.5875	819.5875	590	590	865.7375	820.7375
545	545	864.6125	819.6125	591	591	865.7625	820.7625
546	546	864.6375	819.6375	592	592	865.7875	820.7875
547	547	864.6625	819.6625	593	593	865.8125	820.8125
548	548	864.6875	819.6875	594	594	865.8375	820.8375
549	549	864.7125	819.7125	595	595	865.8625	820.8625
550	550	864.7375	819.7375	596	596	865.8875	820.8875
551	551	864.7625	819.7625	597	597	865.9125	820.9125
552	552	864.7875	819.7875	598	598	865.9375	820.9375
553	553	864.8125	819.8125	599	599	865.9625	820.9625
554	554	864.8375	819.8375	600	600	865.9875	820.9875
555	555	864.8625	819.8625	601	-	866.0000	821.0000
556	556	864.8875	819.8875	602	601	866.0125	821.0125
557	557	864.9125	819.9125	603	-	866.0250	821.0250
558	558	864.9375	819.9375	604	602	866.0375	821.0375
559	559	864.9625	819.9625	605	603	866.0500	821.0500
560	560	864.9875	819.9875	606	604	866.0625	821.0625
561	561	865.0125	820.0125	607	605	866.0750	821.0750
562	562	865.0375	820.0375	608	606	866.0875	821.0875
563	563	865.0625	820.0625	609	607	866.1000	821.1000
564	564	865.0875	820.0875	610	608	866.1125	821.1125
565	565	865.1125	820.1125	611	609	866.1250	821.1250
566	566	865.1375	820.1375	612	610	866.1375	821.1375
567	567	865.1625	820.1625	613	611	866.1500	821.1500
568	568	865.1875	820.1875	614	612	866.1625	821.1625
569	569	865.2125	820.2125	615	613	866.1750	821.1750
570	570	865.2375	820.2375	616	614	866.1875	821.1875
571	571	865.2625	820.2625	617	615	866.2000	821.2000
572	572	865.2875	820.2875	618	616	866.2125	821.2125
573	573	865.3125	820.3125	619	617	866.2250	821.2250
574	574	865.3375	820.3375	620	618	866.2375	821.2375
575	575	865.3625	820.3625	621	619	866.2500	821.2500
576	576	865.3875	820.3875	622	620	866.2625	821.2625
577	577	865.4125	820.4125	623	621	866.2750	821.2750
578	578	865.4375	820.4375	624	622	866.2875	821.2875
579	579	865.4625	820.4625	625	623	866.3000	821.3000
580	580	865.4875	820.4875	626	624	866.3125	821.3125
581	581	865.5125	820.5125	627	625	866.3250	821.3250

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
628	626	866.3375	821.3375	674	670	866.9125	821.9125
629	627	866.3500	821.3500	675	671	866.9250	821.9250
630	628	866.3625	821.3625	676	672	866.9375	821.9375
631	629	866.3750	821.3750	677	673	866.9500	821.9500
632	630	866.3875	821.3875	678	674	866.9625	821.9625
633	631	866.4000	821.4000	679	675	866.9750	821.9750
634	632	866.4125	821.4125	680	676	866.9875	821.9875
635	633	866.4250	821.4250	681	-	867.0000	822.0000
636	634	866.4375	821.4375	682	677	867.0125	822.0125
637	635	866.4500	821.4500	683	-	867.0250	822.0250
638	636	866.4625	821.4625	684	678	867.0375	822.0375
639	637	866.4750	821.4750	685	679	867.0500	822.0500
640	638	866.4875	821.4875	686	680	867.0625	822.0625
641	-	866.5000	821.5000	687	681	867.0750	822.0750
642	639	866.5125	821.5125	688	682	867.0875	822.0875
643	-	866.5250	821.5250	689	683	867.1000	822.1000
644	640	866.5375	821.5375	690	684	867.1125	822.1125
645	641	866.5500	821.5500	691	685	867.1250	822.1250
646	642	866.5625	821.5625	692	686	867.1375	822.1375
647	643	866.5750	821.5750	693	687	867.1500	822.1500
648	644	866.5875	821.5875	694	688	867.1625	822.1625
649	645	866.6000	821.6000	695	689	867.1750	822.1750
650	646	866.6125	821.6125	696	690	867.1875	822.1875
651	647	866.6250	821.6250	697	691	867.2000	822.2000
652	648	866.6375	821.6375	698	692	867.2125	822.2125
653	649	866.6500	821.6500	699	693	867.2250	822.2250
654	650	866.6625	821.6625	700	694	867.2375	822.2375
655	651	866.6750	821.6750	701	695	867.2500	822.2500
656	652	866.6875	821.6875	702	696	867.2625	822.2625
657	653	866.7000	821.7000	703	697	867.2750	822.2750
658	654	866.7125	821.7125	704	698	867.2875	822.2875
659	655	866.7250	821.7250	705	699	867.3000	822.3000
660	656	866.7375	821.7375	706	700	867.3125	822.3125
661	657	866.7500	821.7500	707	701	867.3250	822.3250
662	658	866.7625	821.7625	708	702	867.3375	822.3375
663	659	866.7750	821.7750	709	703	867.3500	822.3500
664	660	866.7875	821.7875	710	704	867.3625	822.3625
665	661	866.8000	821.8000	711	705	867.3750	822.3750
666	662	866.8125	821.8125	712	706	867.3875	822.3875
667	663	866.8250	821.8250	713	707	867.4000	822.4000
668	664	866.8375	821.8375	714	708	867.4125	822.4125
669	665	866.8500	821.8500	715	709	867.4250	822.4250
670	666	866.8625	821.8625	716	710	867.4375	822.4375
671	667	866.8750	821.8750	717	711	867.4500	822.4500
672	668	866.8875	821.8875	718	712	867.4625	822.4625
673	669	866.9000	821.9000	719	713	867.4750	822.4750

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
720	714	867.4875	822.4875	767	757	868.0750	823.0750
721	-	867.5000	822.5000	768	758	868.0875	823.0875
722	715	867.5125	822.5125	769	759	868.1000	823.1000
723	-	867.5250	822.5250	770	760	868.1125	823.1125
724	716	867.5375	822.5375	771	761	868.1250	823.1250
725	717	867.5500	822.5500	772	762	868.1375	823.1375
726	718	867.5625	822.5625	773	763	868.1500	823.1500
727	719	867.5750	822.5750	774	764	868.1625	823.1625
728	720	867.5875	822.5875	775	765	868.1750	823.1750
729	721	867.6000	822.6000	776	766	868.1875	823.1875
731	723	867.6250	822.6250	777	767	868.2000	823.2000
732	724	867.6375	822.6375	778	768	868.2125	823.2125
733	725	867.6500	822.6500	779	769	868.2250	823.2250
734	726	867.6625	822.6625	780	770	868.2375	823.2375
735	727	867.6750	822.6750	781	771	868.2500	823.2500
736	728	867.6875	822.6875	782	772	868.2625	823.2625
737	729	867.7000	822.7000	783	773	868.2750	823.2750
738	730	867.7125	822.7125	784	774	868.2875	823.2875
739	731	867.7250	822.7250	785	775	868.3000	823.3000
740	732	867.7375	822.7375	786	776	868.3125	823.3125
741	733	867.7500	822.7500	787	777	868.3250	823.3250
742	734	867.7625	822.7625	788	778	868.3375	823.3375
743	735	867.7750	822.7750	789	779	868.3500	823.3500
744	736	867.7875	822.7875	790	780	868.3625	823.3625
745	737	867.8000	822.8000	791	781	868.3750	823.3750
746	738	867.8125	822.8125	792	782	868.3875	823.3875
747	739	867.8250	822.8250	793	783	868.4000	823.4000
748	740	867.8375	822.8375	794	784	868.4125	823.4125
749	741	867.8500	822.8500	795	785	868.4250	823.4250
750	742	867.8625	822.8625	796	786	868.4375	823.4375
751	743	867.8750	822.8750	797	787	868.4500	823.4500
752	744	867.8875	822.8875	798	788	868.4625	823.4625
753	745	867.9000	822.9000	799	789	868.4750	823.4750
754	746	867.9125	822.9125	800	790	868.4875	823.4875
755	747	867.9250	822.9250	801	791	868.5000	823.5000
756	748	867.9375	822.9375	802	792	868.5125	823.5125
757	749	867.9500	822.9500	803	793	868.5250	823.5250
758	750	867.9625	822.9625	804	794	868.5375	823.5375
759	751	867.9750	822.9750	805	795	868.5500	823.5500
760	752	867.9875	822.9875	806	796	868.5625	823.5625
761	-	868.0000	823.0000	807	797	868.5750	823.5750
762	753	868.0125	823.0125	808	798	868.5875	823.5875
763	-	868.0250	823.0250	809	799	868.6000	823.6000
764	754	868.0375	823.0375	810	800	868.6125	823.6125
765	755	868.0500	823.0500	811	801	868.6250	823.6250
766	756	868.0625	823.0625	812	802	868.6375	823.6375

800 MHz RECEIVER CHANNEL FREQUENCY CHART

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency
813	803	868.6500	823.6500	859	-	869.2250	824.2250
814	804	868.6625	823.6625	860	-	869.2375	824.2375
815	805	868.6750	823.6750	861	-	869.2500	824.2500
816	806	868.6875	823.6875	862	-	869.2625	824.2625
817	807	868.7000	823.7000	863	-	869.2750	824.2750
818	808	868.7125	823.7125	864	-	869.2875	824.2875
819	809	868.7250	823.7250	865	-	869.3000	824.3000
820	810	868.7375	823.7375	866	-	869.3125	824.3125
821	811	868.7500	823.7500	867	-	869.3250	824.3250
822	812	868.7625	823.7625	868	-	869.3375	824.3375
823	813	868.7750	823.7750	869	-	869.3500	824.3500
824	814	868.7875	823.7875	870	-	869.3625	824.3625
825	815	868.8000	823.8000	871	-	869.3750	824.3750
826	816	868.8125	823.8125	872	-	869.3875	824.3875
827	817	868.8250	823.8250	873	-	869.4000	824.4000
828	818	868.8375	823.8375	874	-	869.4125	824.4125
829	819	868.8500	823.8500	875	-	869.4250	824.4250
830	820	868.8625	823.8625	876	-	869.4375	824.4375
831	821	868.8750	823.8750	877	-	869.4500	824.4500
832	822	868.8875	823.8875	878	-	869.4625	824.4625
833	823	868.9000	823.9000	879	-	869.4750	824.4750
834	824	868.9125	823.9125	880	-	869.4875	824.4875
835	825	868.9250	823.9250	881	-	869.5000	824.5000
836	826	868.9375	823.9375	882	-	869.5125	824.5125
837	827	868.9500	823.9500	883	-	869.5250	824.5250
838	828	868.9625	823.9625	884	-	869.5375	824.5375
839	829	868.9750	823.9750	885	-	869.5500	824.5500
840	830	868.9875	823.9875	886	-	869.5625	824.5625
841	-	869.0000	824.0000	887	-	869.5750	824.5750
842	-	869.0125	824.0125	888	-	869.5875	824.5875
843	-	869.0250	824.0250	889	-	869.6000	824.6000
844	-	869.0375	824.0375	890	-	869.6125	824.6125
845	-	869.0500	824.0500	891	-	869.6250	824.6250
846	-	869.0625	824.0625	892	-	869.6375	824.6375
847	-	869.0750	824.0750	893	-	869.6500	824.6500
848	-	869.0875	824.0875	894	-	869.6625	824.6625
849	-	869.1000	824.1000	895	-	869.6750	824.6750
850	-	869.1125	824.1125	896	-	869.6875	824.6875
851	-	869.1250	824.1250	897	-	869.7000	824.7000
852	-	869.1375	824.1375	898	-	869.7125	824.7125
853	-	869.1500	824.1500	899	-	869.7250	824.7250
854	-	869.1625	824.1625	900	-	869.7375	824.7375
855	-	869.1750	824.1750	901	-	869.7500	824.7500
856	-	869.1875	824.1875	902	-	869.7625	824.7625
857	-	869.2000	824.2000	903	-	869.7750	824.7750
858	-	869.2125	824.2125	904	-	869.7875	824.7875

Program Channel Number	FCC Channel Number	Repeater Transmit Frequency	Repeater Receive Frequency	
905	-	869.8000	824.8000	
906	-	869.8125	824.8125	
907	-	869.8250	824.8250	
908	-	869.8375	824.8375	
909	-	869.8500	824.8500	
910	-	869.8625	824.8625	
911	-	869.8750	824.8750	
912	-	869.8875	824.8875	
913	-	869.9000	824.9000	
914	-	869.9125	824.9125	
915	-	869.9250	824.9250	
916	-	869.9375	824.9375	
917	-	869.9500	824.9500	
918	-	869.9625	824.9625	
919	-	869.9750	824.9750	
920	-	869.9875	824.9875	

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