

ERS1380NB Maintaenance Manual

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ERS, Inc.
MODEL: ERS1380NB
Test #: 010529
Test to: FCC Parts 2, 74 and 90



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SECTION 4 MAINTENANCE

4.1 DISASSEMBLY

Disassemble only to the extent necessary to accomplish repair and testing. Reverse the procedure to reassemble the unit.

4.1.1 UNIT DUST COVERS

Remove three pan-head Phillips screws from the top and eight flat-head Phillips screws from the sides. Remove the bottom cover first and then the top cover. If the top cover is difficult to remove, loosen the three pan-head Phillips screws at the top of the Rear Panel. After top cover is removed, re-tighten these three screws.

4.1.2 SYNTHESIZER MODULE

Remove four pan-head Phillips screws from Front and Rear Panels. If necessary, pry up module evenly with a flat-blade screwdriver at front and back ends of module bottom. Avoid scratching the card-edge connectors.

4.1.2.1 SYNTHESIZER LOGIC BOARD

Remove seven flat-head Phillips screws from cover on longer side of Synthesizer and remove cover. Remove five hex spacers. Printed circuit assembly is then removable.

4.1.2.2 SYNTHESIZER MODULATOR BOARD

Remove seven flat-head Phillips screws from cover on smaller side of Synthesizer and remove cover. Remove four hex spacers. Printed circuit assembly is then removable.

4.1.2.3 SYNTHESIZER VCO SUBASSEMBLY

Remove Modulator Board as in 4.1.2.2. Remove Logic subassembly cover as in 4.1.2.1. Remove five pan-head Phillips screws from side opposite the VCO.

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4.1 DISASSEMBLY (cont.)

4.1.3 R/T MODULE

Remove four pan-head Phillips screws from Front and Rear Panels. Beneath the Chassis, pull the guard RF cable from connector on R/T and remove.

4.1.3.1 R/T SUBASSEMBLY

Remove twelve flat-head Phillips screws from cover and remove. Remove seven 2-56 flat-head Phillips screws holding case bottom to heatsink. Do not remove larger screws. Remove three hex spacers and five pan-head Phillips screws from the printed circuit assembly and lift out.

4.1.4 AUDIO BOARD

The board pulls straight up out of the Chassis. No screws, use holes at top for prying or pulling.

4.1.5 GUARD MODULE

Remove three pan-head Phillips screws, one from Rear Panel, two from under the Chassis. Pull the connector from the Guard RF input jack, then remove the module. Pushing the module with a screwdriver (inserted through the jack clearance hole) will ease module removal. Be careful not to damage the jack.

4.1.5.1 GUARD SUBASSEMBLY

Remove eleven flat-head Phillips screws and remove the lid. Remove four hex spacers and four pan-head Phillips screws and lift out.

4.1.6 GUARD TONE MODULE (If installed)

Remove two pan-head Phillips screws and module can be lifted for inspection and testing. Unsolder five wires to remove the module.

4.1.7 POWER SUPPLY MODULE

Remove three pan-head Phillips screws, one from Front Panel and two from under the Chassis. Remove module.

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4.1 DISASSEMBLY (cont.)

4.1.8 REGULATOR ASSEMBLY (15 VDC)

Remove four pan-head Phillips screws from module cover corners and remove assembly from Rear Panel.

4.2 TEST EQUIPMENT

The following test equipment, or equivalent, is required to properly align the RT-138. All test equipment must be properly calibrated before alignment is started.

| <u>ITEM</u> | <u>DESCRIPTION</u> | <u>CHARACTERISTICS REQUIRED</u> | <u>REPRESENTATIVE TYPE</u> |
|-------------|------------------------|--|--|
| A. | D.C. Voltmeter | -Input Impedance: 2.0 Megohms or greater -Accuracy: 0.1% full scale | Weston Model 4440 Keithley 178 |
| B. | A.C. Voltmeter | -Input Impedance: 2.0 Megohms or greater -Voltage Range: 1 Millivolt to 100 volts | Triplett Model 801, Type 2 |
| C. | RF Signal Generator | -Freq. Range: 1-200 MHz -Freq. Accuracy: 0.0001% -Modulation: FM (0-10 kHz dev) AM (0-50%) -Output Level: 0-1,000 μ V Calibrated | Wavetek Model 3000 Wavetek Model 3001 Wavetek Model 3002 Hewlett Packard 8640A IFR Model 1000S Cushman Model CE-50A-1 |
| D. | Deviation Meter | -Freq. Range: 138-174 MHz -Freq. Accuracy: \pm 0.0001% -Freq. Set: within 500 Hz of all 10 kHz channels -FM Detector: \pm 10% from \pm 200 Hz to \pm 10 kHz dev. -FM Detector Output | Boonton 82AD Marconi TF 2300B IFR Model 1000S Cushman Model CE-50A-1 |
| E. | Audio Signal Generator | -Freq. Range: 300 Hz to 10 kHz -Output Level: 0-2.5 VRMS | Hewlett-Packard Model 651A IFR Model 1000S Cushman Model CE-50A-1 |

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4.2 TEST EQUIPMENT (cont.)

| ITEM | DESCRIPTION | CHARACTERISTICS REQUIRED | REPRESENTATIVE TYPE |
|------|-----------------------------------|---|---|
| F. | EIA Tone Generator | -Freq. Range: 67.0 (203.5) Hz -Freq. Accuracy: ± 0.1 Hz | Automated Industrial Electronics DTG-1 IFR Model 1000S Cushman Model CE-50A-1 |
| G. | RF Power Meter | -Impedance: 50 ohms -Range: 0 to 20 watts | Bird Electronics Corp. Termaline Model 611 Coaxial Dynamics 85 |
| H. | Oscilloscope | -Sensitivity: 5 mVP-P Per div. -Time Base: 0.05 μ sec/div. to 5 sec/div. -Dual trace -Horizontal Input | Tektronix, Inc. Type 475 or 465 |
| I. | Audio Distortion Analyzer | -Freq. Range: 300 Hz - 15 kHz -Distortion Levels: 0.1% to 100% | Hewlett-Packard Model 332A Marconi TF 2337A Sinadder No. 3 |
| J. | Frequency Counter | -Freq. Range: 24 to 174 MHz -Sensitivity: 100 mVRMS | Fluke Model 1952A Hewlett-Packard 5382A IFR Model 1000S Cushman Model CE-50A-1 |
| K. | Regulated D.C. | -Volt Range: 0-40 VDC -Volt Regulation: ± 0.25 VDC From 0.5-10A | Trygon Model HR40-7C |
| L. | R.F. Isolation Pad | See Figure 4.2-1 for schematic | Wulfsberg Part Number 300-2069-000 |
| M. | FLEXCOMM Test Set or Control Unit | | Appropriate WEI Control Unit or PR-200 Test Set |
| N. | FLEXCOMM Test Harness | See Figure 7.1-2 for the schematic | WEI TSH-200 |

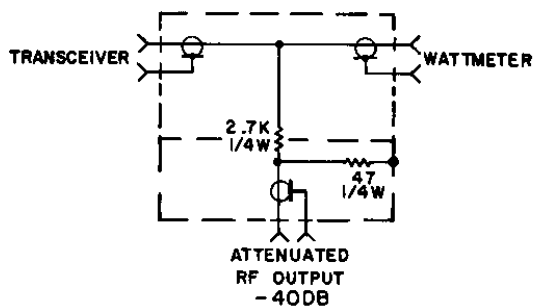
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4.2 TEST EQUIPMENT (cont.)

| ITEM | DESCRIPTION | CHARACTERISTICS REQUIRED | REPRESENTATIVE TYPE |
|------|-------------------------------------|--|---|
| O. | Multimeter | -Ohmmeter Function | Triplett Model 630 |
| P. | Head Phones | -Impedance: 600 ohms | Telex Communications Model MR-6 |
| Q. | 600 Ohm Load | -Value: $\pm 10\%$ 1 watt | |
| R. | EC-200 Extender Cable | Power Supply/Guard Module Extender | Wulfsberg Part Number 149-0061-000 |
| S. | EC-202 Extender Cable | Audio Board Extender | Wulfsberg Part Number 149-0063-000 |
| T. | EC-203 Extender Cable | Synthesizer Extender | Wulfsberg Part Number 149-0068-000 |
| U. | EC-1 Test Coax, BNC to 2-Pos Socket | | Wulfsberg Part Number 149-0069-000 |
| V. | Coaxial Fuse | 50 Ohm DC - 480 MHz Insertion loss ≤ 1 dB | Hewlett-Packard Model 11509A (optional) |
| W. | Spectrum Analyzer | 10 - 512 MHz | IFR Model 1000S Cushman Model CE-50A-1 |



R.F. ISOLATION PAD SCHEMATIC
FIGURE 4.2-1

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4.3 RT-138 OVERALL PERFORMANCE TESTS

The following procedures determine the overall performance of the RT-138. Follow the steps in sequence. Should requirements not be met, refer to the alignment procedures. If alignment specifications cannot be met, refer to the troubleshooting section.

4.4 PERFORMANCE TESTS

Remove the dust cover (Section 4.1.1) and connect the RT-138 to its test harness (WEI TSH-200). Apply power and measure the Power Supply voltages. The test pins are found on the underneath side of the Chassis.

| <u>Voltage</u> | <u>Should Be</u> | <u>Test Point</u> |
|---------------------------|---------------------|-------------------|
| Input Bus Voltage | $+27.5 \pm 2.0$ VDC | A1J2 Pin 5 |
| 28 Volt Regulator Output | $+28 \pm 2.5$ VDC | A1J2 Pin 9 |
| -28 Volt Regulator Output | -28 ± 2.5 VDC | A1J2 Pin 8 |
| 5 Volt Regulator Output | $+5 \pm 0.5$ VDC | A1J2 Pin 2 |
| 15 Volt Regulator Outputs | $+14.5 \pm 1.5$ VDC | A1E5, A1E8 |

NOTE: All voltage measurements should be made with respect to Chassis ground. The pin numbers refer to the Power Supply connector except for the 15V outputs.

The performance tests will be made under the following conditions. Unless otherwise specified, the Signal Generator will be modulated at ± 3 kHz deviation, 1000 Hz modulating frequency. The audio output will be terminated with a 600 ohm load and the receiver volume shall be adjusted to produce 4.5 VRMS TYP with normal modulation.

All tests are configured assuming the use of a TSH-200 Wulfsberg Electronics Custom Test Harness and a FLEXCOMM Control Unit for channeling and tone control. The Transceiver antenna port should be connected through a DB-1 coupler (WEI P/N 300-2069-000) to a power dummy load. The -40 dB coupled output may be used to sample the transmitter output with a spectrum analyzer, frequency counter or modulation meter. The receiver tests may be performed by connecting the signal generator to the -40 dB coupled port of the DB-1.

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4.4 PERFORMANCE TESTS (cont.)

CAUTION

Signal generators are subject to costly burnout if the transmitter is inadvertently keyed while the signal generator is connected directly to the Transceiver antenna port. Wulfsberg Electronics recommends the use of a WEI DB-1 40 dB coupler for isolation of the generator or use of a Hewlett-Packard 11509A, 50 ohm coaxial fuse between the signal generator and transceiver.

Unless otherwise specified, the transmitter output will be terminated with a 50 ohm load.

4.4.1 RECEIVER SENSITIVITY

The Main Receiver sensitivity should be tested at three frequencies. When a Test Set or Thumbwheel Control Unit is available, the following frequencies should be checked; 138.000, 156.000 and 173.997 MHz. Set the RF signal generator output level to 0.5 μ V with standard modulation. The SINAD ratio should be greater than 12 dB at those channels tested. Repeat the procedure at the Guard Receiver frequency.

NOTE: It may be necessary to disable the squelch during the receiver sensitivity tests.

4.4.2 RECEIVER AUDIO OUTPUT

Using a 1000 μ V signal with standard modulation, the audio output shall be typically 4.5 VRMS across 600 ohms. The test should be performed at one channel for the Main Receiver and at one channel for the Guard Receiver.

4.4.3 RECEIVER TIGHT SQUELCH

Make this measurement at one Main Receiver frequency and at one Guard Receiver frequency. Slowly increase the RF signal generator output level until the squelch light glows. Measured "SINAD" shall be between 14 and 18 dB.

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4.4 PERFORMANCE TESTS (cont.)

4.4.4 RECEIVER CTCSS SQUELCH

Select a tone number on the Test Set or a preset channel with receiver CTCSS tone. Modulate the RF signal generator at the tone frequency with 300 Hz deviation. Apply 1000 μ V level and verify that audio is present.

4.4.5 TRANSMITTER POWER OUTPUT

The transmitter shall produce between 8 and 12 watts. This test should be performed at the same frequencies as that for Section 4.4.1.

4.4.6 TRANSMITTER DEVIATION CAPABILITY

With an input of 0.25 VRMS at 1000 Hz, the transmitter shall produce a deviation greater than ± 3.0 kHz. This test should be performed at the same frequencies as that for Section 4.4.1.

4.4.7 TRANSMITTER DEVIATION LIMITER

A 2.5 VRMS audio input shall produce not greater than ± 5 kHz deviation at all modulation frequencies between 300 and 2500 Hz. This test need be performed at one frequency only.

4.4.8 TRANSMITTER CTCSS

Selection of a tone from either a Test Set or a Control Unit shall produce a tone deviation of between ± 550 and ± 950 Hz (± 750 Hz nominal). The frequency shall be within 0.1 Hz of specified. This test need be performed at only one transmit channel.

4.4.9 FINAL RT-138 SETTINGS

When the following adjustments have been made, or verified, the unit should be ready to return to service.

1. Guard Receiver Frequency: The Guard Receiver local oscillator shall be within ± 750 Hz of the desired frequency. See Section 4.6.10 for the test procedure.
2. Sidetone Output: With an input of 0.25 VRMS at 1000 Hz the sidetone shall produce 1.4 VRMS.
3. CTCSS Frequency: Each CTCSS tone shall be within 0.1 Hz of specified tone frequency.
4. Carrier Frequency: Frequency error shall not exceed $\pm 0.0005\%$ on any channel.

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