DFR-1000A DUAL-BAND VHF/UHF DF RECEIVER USER FUNCTIONAL TEST PROCEDURE

I DESCRIPTION

This procedure provides users with the means to implement a "closed-box" functional test of the DFR-1000A Dual-Band VHF/UHF DF Receiver to verify essential performance characteristics. It is organized to test as many features as practical in an abbreviated test with a minimum of test equipment and accessories. The procedure requires only basic familiarity with electronic test equipment and procedures, and does not require that the unit be removed from its cabinet. It is suitable both as a user acceptance test procedure as well as a means of performance verification. It is particularly recommended that this procedure be implemented prior to returning a DFR-1000A to the factory for repair, since the results will more rapidly point the factory technician to the source of trouble.

II APPLICABILITY

This procedure is applicable to all DFR-1000A and DFR-1000F DF receivers having serial numbers 120 and above. Note that the DFR-1000F DF receiver is functionally identical to the DFR-1000A, but with a modified front-panel silkscreen. The only silkscreen change having impact on this procedure is the renaming of the **RANGE TONE** label to **RANGE TONE MODE.** Since this is a very minor change, only slight procedural accommodation must be made to account for the difference.

A separate procedure (doc. # dfr1000_tpu_01) is required for earlier DFR-1000 DF receivers with serial numbers 119 and below.

III APPLICABLE DOCUMENTS

A. RF Products DFR-1000A Dual-Band VHF/UHF DF Receiver Operator's Manual (doc. # dfr1000a_oma_01).

B. RF Products DTI-100A DF Bearing Synthesizer Operator's Manual (doc. # dti100a_oma_01).

IV TEST EQUIPMENT REQUIRED

A. RF Products DTI-100/DTI-100A DF Bearing Synthesizer.

B. RF Products DFS-1000 Frequency Synthesizer (required if the DFR-1000A has no installed crystals).

C. VHF/UHF signal generator, 50 ohm RF output, with internal and external AM and FM modulation capability (HP 8640B, HP 8656B, Marconi 2019A, or similar).

D. Regulated DC power supply, +13.8 VDC nominal output with 3 ampere minimum output current capacity (Astron RS-7A or similar).

E. Multi-meter, w/DC current measurement ability up to 3 amperes (Micronta 22-185A or similar).

F. IBM PC/XT/AT-compatible computer w/available COM1 or COM2 serial port and DFDATA test software (required only for units having computer interface option).

G. (Optional.) Oscilloscope (Tektronix 465 or similar).

H. Miscellaneous plugs, cables, and adaptors as required.

V TEST PROCEDURE

A. PHYSICAL INSPECTION, MECHANICAL ALIGNMENT, & PRELIMINARY STEPS

1__ With the DFR-1000A disconnected from its power source, carefully inspect the unit for any signs of physical damage.

2__ Remove the fuse from the fuse-holder (located on the rear-panel) and inspect it to verify that it is a GMA-type 5 mm x 20 mm 2.5 ampere fast-blow fuse. If not, replace it with the correct type. Otherwise, reinstall it in the fuse-holder.

3__ Exercise all front-panel knobs, switches, and push-buttons to verify that all knobs rotate smoothly without binding, the toggle switches can be set to all their positions without excessive force, and the push-buttons can be depressed without sticking.

4__ Verify that the **CRT TRACE LENGTH**, **SQUELCH**, **VOLUME**, and **FREQUENCY FINE TUNE** knobs audibly "click" when rotated fully counter-clockwise to their respective detented positions.

5__ Verify that the CRT bezel can be rotated in both directions without binding. Return it back to its normal detented position with its white alignment marker matching the black front-panel reference index.

6__ Verify that the white alignment marker lines of the **CRT TRACE LENGTH**, **SQUELCH**, and **VOLUME** knobs are aligned with their respective black dots when these knobs are set fully counter-clockwise to their detented positions. Use an Allen wrench as required to loosen the set screws (two per knob) and slip the knobs on the control shafts to restore mechanical alignment. **Do not** attempt mechanical realignment of the **FREQUENCY FINE TUNE** knob *(see cautionary statement below)*.

CAUTION

*Do not attempt to realign the **FREQUENCY FINE TUNE** knob* - this knob has been mechanically aligned at the factory so that the DFR-1000A is tuned to the nominal selected crystal frequency when the white marker index line is set at 12 o'clock.

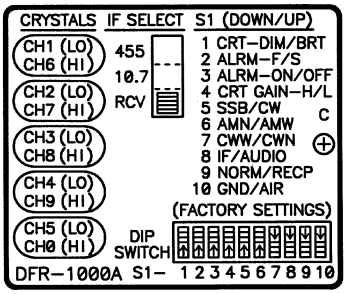
7__ Verify that the **SIGNAL STRENGTH** meter needle points to zero on the meter scale. If it is misaligned, insert a small *non-magnetic* screwdriver into the hole immediately below the meter and carefully rotate the meter adjustment screw to restore mechanical alignment. *Be sure that the DFR-1000A is set normally on a flat horizontal surface before attempting this adjustment.*

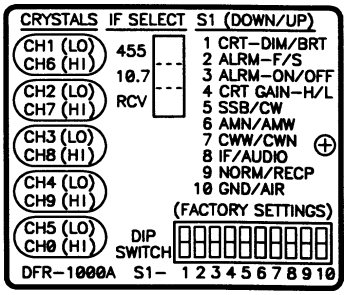
8__ Set the front-panel controls as follows:

TRACK & HOLD - **OFF**
CRT - **MED**
MODE - **CW**
FREQ. FINE TUNE - 12 o'clock

CRT TRACE LENGTH - 8 o'clock
SQUELCH - 8 o'clock
VOLUME - **OFF**

9__ Remove the rear-panel crystal cover plate (by first loosening the four captive thumbscrews) to expose any installed crystals and the configuration setup switches. Carefully verify that all 10 dip-switches and the **IF SELECT** slide switch are positioned as indicated on the *leftmost* configuration setup label illustration below. If any of these switches are not set as per this leftmost configuration setup label, change these switch settings appropriately.





CAUTION

If any of the configuration setup switches need to be changed, *record the original settings now* on the blank rightmost configuration setup label above so that these switches can be restored to their user settings as called for upon completion of this procedure.

B. POWER-UP TESTS

1__ With the **VOLUME** knob still set to **OFF**, connect the DFR-1000A to the +13.8 VDC regulated power source.

2__ Power-up the DFR-1000A by rotating the **VOLUME** knob slightly clockwise until a click is heard. Set the **VOLUME** knob at 8 o'clock.

3__ Set the CRT **INTEN** adjustment fully counter-clockwise.

4__ After a 30 second warm-up, verify with the multi-meter that the current drawn by the DFR-1000A from the +13.8 VDC supply is approximately 1.4 amperes. **Note:** While the DFR-1000A CRT is warming up, current drain can exceed 2 amperes. *Be sure nothing is connected to the* **ANTENNA CONTROL** *or* **REMOTE** *connectors while conducting this measurement.*

5__ Verify that the **SIGNAL STRENGTH** meter illuminates. **Note:** The **SIGNAL STRENGTH** meter backlighting may not be visible in sunlight or bright indoor lighting, so shadow the meter under such circumstances if the backlighting is not visible.

6__ Verify that the **FREQ CHANNEL** indicator displays a valid digit (1, 2, 3, 4, 5, 6, 7, 8, 9, or 0).

7__ Verify that the **FREQ CHANNEL** indicator increments in the proper order when the upper push-button is depressed, and that all ten digits can be obtained in succession (wrap-around occurs from 9 to 0).

8__ Verify that the **FREQ CHANNEL** indicator decrements in the proper order when the lower push-button is depressed, and that all ten digits can be obtained in succession (wrap-around occurs from 0 to 9).

9__ Set the **FREQ CHANNEL** to channel 0 and power-down the unit. After at least 10 seconds, power-up the unit and verify that the **FREQ CHANNEL** indicator still indicates channel 0. Repeat this step for channel 4. This confirms proper operation of the channel memory.

10__ With the unit still powered-up, turn it upside down and remove the cabinet safety interlock screw (located adjacent to the rear rubber mounting foot closest to the 11-16 VDC rear-panel power connector) using a #2 Phillips screwdriver. Verify that the removal of this screw powers-down the unit (this confirms proper operation of the safety interlock mechanism), re-install the screw, and return the unit to its normal upright position.

C. RECEIVER LISTEN-THROUGH TESTS

1__ Verify that the DFR-1000A front-panel controls are still set as per step V-A-8 (with the exception that the **VOLUME** control should be set at 8 o'clock).

2__ Set the **FREQ CHANNEL** selector to a channel number for which a crystal has been

installed. If no crystals are installed, connect the DFS-1000 synthesizer to the DFR-1000A, power it up, and set it to any legitimate frequency within the specified frequency range(s) of the DFR-1000A (frequency coverage information can be found on the serial number label affixed to the rear-panel located to the immediate right of the crystal cover plate). **Note:** See DFR-1000A Operator's Manual Appendix C or DFS-1000 Product Data Sheet as required for information regarding installation and operation of the DFS-1000.

3__ With the **MODE** switch still set to **CW**, advance the **VOLUME** control to 9 o'clock and verify that a "hissing" sound is audible from the speaker. Re-adjust the **VOLUME** control as required for a comfortable listening level.

4__ Verify that the hissing sound can be squelched by rotating the **SQUELCH** control clockwise. The squelch should activate at approximately 9-11 o'clock. Set the **SQUELCH** control back to 8 o'clock to restore the hissing sound.

5__ Set rear-panel dip-switch #7 to **CWN** (up) and verify that the hissing sound becomes lower in pitch as a result. This verifies proper operation of the wide and narrow IF filters in **CW**.

6__ Return dip-switch #7 to **CWW** (down).

7__ Without changing the setting of the **VOLUME** control, set the **MODE** switch to **AM** and verify that the hissing sound is similar in volume to what it was in **CW,** but higher in pitch. Again verify that the hissing sound can be squelched with a **SQUELCH** setting of approximately 9-11 o'clock. Set the **SQUELCH** control back to 8 o'clock to restore the hissing sound.

8__ Set rear-panel dip-switch #6 to **AMN** (down) and verify that the hissing sound becomes lower in pitch as a result. This verifies proper operation of the wide and narrow IF filters in **AM**.

9__ Return dip-switch #6 to **AMW** (up).

10__ Without changing the setting of the **VOLUME** control, set the **MODE** switch to **FM** and verify that the hissing sound becomes noticeably louder than it was in **AM**. Again verify that the hissing sound can be squelched with a **SQUELCH** setting of approximately 9-11 o'clock, and then set the **SQUELCH** control back to 8 o'clock.

11__ With the **MODE** switch still in **FM** and the **FREQUENCY FINE TUNE** control still set at 12 o'clock, set up the signal generator for a -55 dBm CW signal and connect the signal generator RF output to the DFR-1000A **RF/IF** input through a short (4' or less) length of 50 ohm coaxial cable. Set the signal generator frequency to match that of the selected DFR-1000A crystal channel frequency (or the selected DFS-1000 synthesizer frequency).

12__ Verify that the application of the RF signal to the DFR-1000A fully quiets the FM hissing sound and results in an approximately full-scale **SIGNAL STRENGTH** meter indication. If the signal is not detected (as indicated by the absence of full quieting or full-scale

SIGNAL STRENGTH meter deflection), adjust the DFR-1000A **FREQUENCY FINE TUNE** control until the correct results are obtained. **Note 1:** Some DFR-1000As are factory set for less **SIGNAL STRENGTH** meter deflection to provide more meter dynamic range. If this is the case, a full-scale deflection will not be obtained at -55 dBm signal input. This does not affect either listen-through or DF sensitivity, as should be confirmed in a subsequent Section when DF sensitivity is checked. **Note 2:** If the DFS-1000 synthesizer is used in lieu of crystals for DFR-1000A frequency control, the **FREQUENCY FINE TUNE** control has no effect. Required frequency adjustments must therefore be done using the synthesizer 1 kHz digit or at the signal generator.

13__ Set the signal generator for 3 kHz deviation internal FM at a 1 kHz modulation rate. A clean-sounding 1 kHz tone should be plainly audible. Adjust the **VOLUME** control as required for a comfortable listening level.

14__ Verify that the **SIGNAL STRENGTH** meter is still at approximately full-scale.

15__ (Optional.) Monitor the **HEADSET** audio output with the oscilloscope using an appropriate interface cable with a male phone plug at one end. Partially insert the phone plug into the **HEADSET** jack so that it is sufficiently inserted to view the 1 kHz tone waveform on the oscilloscope, but not sufficiently inserted to disconnect the speaker audio. Verify that a reasonably undistorted 1 kHz sine wave is visible on the oscilloscope. Apply hearing protection (see cautionary statement below) and slowly rotate the **VOLUME** control clockwise until the waveform begins peak clipping. Clipping should occur at a waveform amplitude of roughly 10 VPP (volts peak-to-peak). Return the **VOLUME** control to a setting that results in a comfortable listening level.

CAUTION

This step results in a speaker volume level that is uncomfortably loud. Use hearing protection for safety.

16__ Fully insert a phone plug into the **HEADSET** jack to verify that the speaker audio is disabled. Remove the phone plug and set it aside.

17__ Set the DFR-1000A **MODE** switch to **AM**, do not disturb the setting of the **FREQUENCY FINE TUNE** control, and reconfigure the signal generator for 50% internal AM at a 1 kHz modulation rate (be sure to disable signal generator FM). A clean-sounding 1 kHz tone should again be plainly audible. Adjust the **VOLUME** control as required for a comfortable listening level.

18__ Verify that the **SIGNAL STRENGTH** meter is still at approximately full-scale.

19__ (Optional.) Repeat step V-C-15.

20__ Set the DFR-1000A **MODE** switch to **CW** and reconfigure the signal generator for a CW (unmodulated) output.

21__ Adjust the **FREQUENCY FINE TUNE** control for an audible tone of approximately 1 kHz. This tone should sound clean and undistorted. **Note:** If a synthesizer is used for

DFR-1000A frequency control, make any necessary frequency adjustments with the synthesizer 1 kHz digit or the signal generator.

22__ (Optional.) Repeat step V-C-15.

23__ If the tests so far have been conducted at a low-band frequency, repeat steps V-C-21,22 at a high-band frequency. If the tests so far have been conducted at a high-band frequency, repeat steps V-C-21,22 at a low-band frequency. If the DFR-1000A under test is a single-band unit, disregard this step.

24__ Leave the test setup intact and proceed to the next Section.

D. DFS-1000 SYNTHESIZER COMPATIBILITY TEST

__ If a DFS-1000 synthesizer is available whose frequency coverage is compatible with that of the DFR-1000A, connect it to the DFR-1000A and verify that the DFR-1000A performs satisfactorily under synthesizer frequency control on both a low- and high-band frequency. This is most conveniently accomplished by performing the FM quieting test as described in steps V-C-11,12. If the DFR-1000A is already equipped with a DFS-1000, use that accompanying synthesizer. Omit this step if the DFR-1000A has no installed crystals and the preceding steps were already performed with a synthesizer. **Note:** Since the **FREQUENCY FINE TUNE** control has no effect when the DFR-1000A is under synthesizer control, fine frequency adjustment must be accomplished either with the synthesizer 1 kHz digit or at the signal generator.

E. CRT DISPLAY PRELIMINARY TESTS

1__ Verify that the **CRT TRACE LENGTH** control is still set at 8 o'clock.

2__ Rotate the **INTEN** control clockwise until a moderately bright dot appears on the CRT face and confirm that it can be sharply converged with the **FOCUS** control. **Note:** If the dot is not visible or hard to see, this may be caused by a burn spot at the center of the CRT face. To improve dot visibility in such cases, adjust either the **VERT** or **HORZ** positioning control slightly to move the dot away from the center of the CRT face.

3__ Exercise the **VERT** and **HORZ** positioning controls to verify that the dot can be moved both vertically and horizontally along the CRT face.

4__ Once proper operation of the **VERT** and **HORZ** positioning controls has been confirmed, set these controls to center the dot on the CRT face and proceed to the next Section.

F. CRT DISPLAY AND INDICATOR TESTS

1__ Verify that the DFR-1000A front-panel controls are still set as per V-A-8 (with the exception that **VOLUME** control should be set near 9 o'clock, the **CRT TRACE**

LENGTH control to 12 o'clock, and the **MODE** switch to **FM**).

2__ Verify that the signal generator and DFR-1000A are still set in tandem to any convenient channel frequency with the signal generator set for a -55 dBm output.

3__ Connect the DTI-100A DF Bearing Synthesizer to the signal generator and DFR-1000A (refer to the DTI-100A Operator's Manual as required for details regarding this test setup). Set the DTI-100A **AZIMUTH** selector to 0° and the signal generator for 50% external AM (note that the DTI-100A **GAIN** control must be appropriately set in coordination with any relevant signal generator modulation gain controls to establish the required 50% modulation level).

4__ A 0° bearing should now be visible with a full-length CRT trace (be sure that the **CRT TRACE LENGTH** control is set at 12 o'clock). Verify that the green **SIGNAL PRESENT** indicator is illuminated and the yellow **FINE TUNE ON** indicator is slowly blinking (it should illuminate once every four seconds or so).

5__ Rotate the **FREQUENCY FINE TUNE** control fully counter-clockwise to its detented **OFF** position and verify that the yellow **FINE TUNE ON** indicator stops blinking and remains extinguished.

6__ Set rear-panel dip-switch #1 to **DIM** (down) to enable the CRT screen-saver circuitry.

7__ Set the **CRT TRACE LENGTH** control at 8 o'clock (be sure not to set it fully counter-clockwise to **RANGE TONE**). The **SIGNAL PRESENT** indicator should extinguish. The CRT trace should also disappear or dim, indicating proper operation of the CRT screen-saver circuitry (allow at least 30 seconds for the screen saver to activate).

8__ Set the **CRT TRACE LENGTH** control back to 12 o'clock. The CRT trace should immediately reappear (or at least undim).

9__ Set the **TRACK & HOLD** switch to **ON** (labeled **HOLD** on some units).

10__ Disconnect the coaxial cable from the signal generator to interrupt the signal input to the DFR-1000A. The CRT bearing should remain "frozen" for approximately 2.5 seconds before the trace collapses. **Note 1:** Since the signal must be interrupted suddenly for the track & hold to function properly, the coaxial cable should be disconnected rapidly. If the signal generator has a carrier on/off switch, this may also be used, but it is important that the activation of such a switch result in complete disabling of the signal generator RF output (with some signal generators, these switches only partially disable the output). **Note 2:** Some units may be customized for hold times other than 2.5 seconds.

11__ Set the **TRACK & HOLD** switch to **OFF**, restore the signal generator RF output, rotate the DTI-100A **AZIMUTH** selector to 90°, and repeat the previous two steps.

12__ Repeat the above step for a DTI-100A **AZIMUTH** selection of 45°. Observe the bearing carefully to make sure that it does not change during the 2.5 second “hold” period.

13__ Return the **TRACK & HOLD** switch to **OFF**, restore the signal generator RF output**,** reset rear-panel dip-switch #1 to **BRT** (up), and set the DTI-100A **AZIMUTH** selector back to 0°.

14__ Set rear-panel dip-switch #4 to **CRT GAIN - HIGH** (down) and then carefully adjust the **CRT TRACE LENGTH** control so that the 0° bearing trace displayed on the CRT extends only to the *inner* ring. This step guarantees that the CRT gain is sufficiently low to prevent the video step-AGC from being activated so that there will be no confusion in the following two steps.

15__ Carefully rotate the **CRT GAIN** control clockwise so that the displayed bearing is approximately full-screen (but not so long that the outer tip of the trace is not visible).

16__ Return dip-switch #4 back to **CRT GAIN - LOW** (up) and confirm that the CRT trace diminishes in length to approximately 25% of that observed in the previous step.

17__ Leave the test setup intact and proceed to the next Section.

G. BEARING AND SENSITIVITY TESTS

1__ Verify that the DFR-1000A front-panel controls are still set as per step V-A-8 (with the exception that **VOLUME** control should be set at 9 o'clock, the **CRT TRACE LENGTH** control at 12 o'clock, and the **MODE** switch to **FM**).

2__ Verify that the DFR-1000A is correctly tuned to the signal generator frequency, the signal generator RF output is set to -55 dBm, the signal generator and DTI-100A are properly configured for a 0° bearing using 50% modulation, and a full-length 0° CRT trace is visible.

3__ Verify that the **CRT** switch is still in **MED** and rotate the DTI-100A **AZIMUTH** selector from 0° to 315°. The CRT bearing should correspondingly move from 0° to 315° in just over half a second.

4__ Set the **CRT** switch to **FAST** and verify that the CRT bearing is still 315° (important). Once verified, rotate the DTI-100A **AZIMUTH** selector from 315° back to 0°. The CRT bearing should correspondingly move from 315° to 0° in well under half a second (the response should be visibly much faster than that observed in step V-G-3 above with the **CRT** switch in **MED**).

5__ Set the **CRT** switch to **SLOW** and rotate the DTI-100A **AZIMUTH** selector from 0° back to 315°. The CRT bearing should correspondingly move from 0° to 315° in approximately 2 seconds (the response should be visibly much slower than that observed in step V-G-3 above with the **CRT** switch in **MED**).

6__ Set the **CRT** switch to **MED** and confirm that the CRT bearing display is correct for all 12 DTI-100A azimuth selections. When completed, set the DTI-100A **AZIMUTH** selector to 45°.

7__ Set rear-panel dip-switch #9 to **RECP** (up) and verify that this causes the CRT bearing

display to indicate a bearing of approximately 225°. This confirms proper operation of the reciprocal bearing function.

8__ Return rear-panel dip-switch #9 to **NORM** (down) to restore the 45° bearing.

9__ Set rear-panel dip-switch #10 to **AIR** (up) and verify that this causes the CRT bearing display to indicate a bearing of approximately 315°. This confirms proper operation of the ground/air function.

10__ Set rear-panel dip-switch #4 to **CRT GAIN - HIGH** (down) and change the **CRT** switch setting from **MED** to **FAST**. Verify that the displayed CRT bearing does not significantly change from its nominal 45° value.

11__ With the DTI-100A **AZIMUTH** selector still at 45°, carefully adjust the **CRT TRACE LENGTH** control so that the 45° CRT bearing trace extends only to the *inner* ring. Next, carefully rotate the **CRT TRACE LENGTH** control clockwise so that the displayed bearing is approximately full-screen (but not so long that the outer tip of the trace is not visible).

12__ Change the **CRT** switch setting from **MED** to **FAST** and verify that both the bearing azimuth and CRT trace length do not significantly change.

13__ Set the **MODE** switch to **AM,** rear-panel dip-switch #6 to **AMN** (down) and similarly verify that both the bearing azimuth and CRT trace length do not significantly change. Once done, return dip-switch #6 to **AMW** (up) and set the **CRT** switch back to **MED**.

14__ Set the DTI-100A **AZIMUTH** selector to 22.5° then carefully adjust the **CRT TRACE LENGTH** control so that the 22.5° CRT bearing trace extends only to the *inner* ring.

15__ Slowly rotate the **CRT TRACE LENGTH** control clockwise to maximum which watching the CRT bearing. Aside from some slight jitter when the video AGC activates, the azimuth should remain constant.

16__ Once done, return dip-switch #4 to **CRT GAIN - LOW** (up) and set the DTI-100A **AZIMUTH** selector to 0°.

17__ With the **CRT TRACE LENGTH** control still set fully clockwise for maximum gain, reduce the signal generator RF output to -127 dBm, and confirm that a 3/16" long (approximate) 0° CRT bearing is visible (a 3/16" long CRT trace length corresponds approximately to the radius of the inner circle). Although bearing jitter will be present, the bearing should still be recognizable as being approximately 0° (to verify this, rotate the DTI-100A **AZIMUTH** selector back and forth between 0° and 22.5° - the resulting change in the CRT bearing should be clearly discernable). This step confirms DFR-1000A DF sensitivity.

18__ Note the CRT trace length and then set the **CRT TRACE LENGTH** control fully counter-clockwise to its detented **RANGE TONE** position. The CRT trace length should still be nearly the same.

19__ If the DFR-1000A is configured for dual-band operation, repeat the above DF sensitivity

test (steps V-G-17,18) at any convenient frequency in the other band.

20__ Leave the test setup intact and proceed to the next Section.

H. ANTENNA BANDSWITCHING TESTS

1__ If a DFS-1000 synthesizer is connected to the DFR-1000A, leave it connected, but power it down (i.e., set it to **CRYSTAL/SYNTH** switch to **CRYSTAL**).

2__ Exercise the DFR-1000A **FREQ CHANNEL** push-buttons appropriately to select in succession channels 1, 2, 3, 4, and 5 on the **FREQ CHANNEL** indicator. The DTI-100A yellow **HI/LO BAND** indicator should remain extinguished for all these channels. This confirms that the DFR-1000A is sending the appropriate low-band antenna bandswitch code.

3__ Exercise the **FREQ CHANNEL** push-buttons appropriately to select in succession channels 6, 7, 8, 9, and 0 on the **FREQ CHANNEL** indicator. The DTI-100A yellow **HI/LO BAND** indicator should illuminate for all these channels. This confirms that the DFR-1000A is sending the appropriate high-band antenna bandswitch code.

4__ Connect a DFS-1000 synthesizer if available (or use the one already connected) and set the **CRYSTAL/SYNTH** switch to **SYNTH** (up) and the **FREQUENCY/CHANNEL** switch to **FREQUENCY** (up). Set the 100 MHz (leftmost) digit to "1" and verify that the DTI-100A yellow **HI/LO BAND** indicator is extinguished. Exercise the DFR-1000A channel select push-buttons appropriately to select in succession all 10 channels. The DTI-100A yellow **HI/LO BAND** indicator should remain extinguished for all 10 selected channels. Skip this step if a synthesizer is not available.

5__ Set the DFS-1000 synthesizer 100 MHz digit to "4" and verify that the DTI-100A yellow **HI/LO BAND** indicator illuminates. Exercise the DFR-1000A channel select push-buttons appropriately to select in succession all 10 channels. The DTI-100A yellow **HI/LO BAND** indicator should remain illuminated for all 10 selected channels. This step (along with the immediately preceding step) verifies that the DFS-1000 synthesizer seizes control of DFR-1000A bandswitching functions and sends the appropriate code to the antenna. Skip this step if a synthesizer is not available.

6__ **Note:** If an older DTI-100 or DFA-400 DF bearing synthesizer is used in lieu of the DTI-100A, the above steps cannot be directly implemented as a consequence of the fact that these earlier units do not have the **HI/LO BAND** indicator. In such a case, the antenna bandswitch line can be verified by directly monitoring the **HI/LO** band pin on the DFR-1000A rear-panel **ANTENNA CONTROL** connector with a voltmeter or oscilloscope. For units employing the standard 7-pin microphone connector, monitor pin 7 (the center pin). For units employing the 6-pin Bendix connector, monitor pin E (located at approximately 4 o'clock). In either case, a 0 VDC output corresponds to low-band and a 5 VDC output corresponds to high-band.

*** CAUTION ***

When probing pin 7 or pin E, *be careful not to short-circuit adjacent pins.*

7__ The DFR-1000A is capable of controlling RF Products DF antennas having up to eight bands if configured with the optional Antenna Controller Board (ACB1). If it is necessary to confirm that a DFR-1000A equipped with this Antenna Controller Board is sending correct antenna bandswitch codes for DF antennas having more than two bands, refer to Appendix I of the DFR-1000A Operator's Manual.

8__ Disconnect the DTI-100A from the signal generator and DFR-1000A and set it aside.

I. RANGE TONE TESTS

1__ Restore the test setup so that the DFR-1000A is again properly receiving a -55 dBm CW signal with a full-scale **SIGNAL STRENGTH** meter indication. Use a low-band frequency if possible.

2__ With the **MODE** switch still set to **FM**, verify that the **CRT TRACE LENGTH** control is still set fully counter-clockwise to its detented **RANGE TONE** position.

3__ Disconnect the coaxial cable from the signal generator to interrupt the signal input to the DFR-1000A. A single high-pitched, short-duration "beep" should be heard (adjust the **VOLUME** control as required for a comfortable listening level).

4__ Reconnect the coaxial cable to the signal generator and set the signal generator RF output to -110 dBm. Wait approximately 20 seconds and again disconnect the coaxial cable. The short-duration beep should again be heard, but at a much lower pitch. This confirms proper range tone operation.

5__ Repeat the above step with the **MODE** switch in **AM** and then again with the **MODE** switch in **CW**.

6__ Leave the test setup intact and proceed to the next Section.

J. MOTION SENSOR ALARM TESTS (Optional - May Be Omitted If Use Of Motion Sensor Alarm Is Not Anticipated)

1__ Set the DFR-1000A **CRT TRACE LENGTH** control to 12 o'clock, the **MODE** switch to **FM**, and set the signal generator RF output level to -80 dBm.

2__ Rotate the **SQUELCH** control fully counter-clockwise to its detented **ALARM SET** position. Wait 30 seconds and confirm that the motion sensor alarm (a continuous high-pitched tone) does not sound.

3__ Set the **SQUELCH** control to 8 o'clock.

4__ Enable the motion sensor alarm first by setting rear-panel dip-switch #3 to **ALRM ON** (down) and then again rotating the **SQUELCH** control fully counter-clockwise to its detented **ALARM SET** position. After 15-20 seconds, the motion sensor alarm should sound.

5__ When the motion sensor alarm sounds, rotate the **SQUELCH** control back to 8 o'clock and verify that the motion sensor alarm quiets.

6__ Disable the signal generator RF output and again set the **SQUELCH** control to **ALARM SET.** After 15-20 seconds, the motions sensor alarm should again sound. When it does, rotate the **SQUELCH** control back to 8 o'clock to disable the alarm.

7__ Return the **SQUELCH** control to **ALARM SET** and manually pulse the signal generator RF output at the rate of one short pulse (less than one second in duration) every 4 to 6 seconds using a watch or clock to establish accurate timing. This simulates a vehicle beacon pulsing slowly in its "rest" mode where the motion sensor is not activated. Although this is most conveniently done with the signal generator carrier on/off switch, it can also be done (with greater difficulty) by connecting and disconnecting the coaxial cable if the signal generator does not have a carrier on/off switch. The motion sensor alarm should not sound as long as the signal generator RF output is pulsed at the prescribed rate (once every 4-6 seconds).

8__ If the motion sensor alarm does sound because of operator error (i.e., incorrectly pulsing the signal generator), repeat the previous two steps as required until it is confirmed that the motion sensor alarm will not sound at the prescribed pulse rate. Once this has been established, increase the pulse rate to once every 2 seconds, again using a watch or clock to establish accurate timing. This simulates a vehicle beacon pulsing rapidly in its "motion" mode where the motion sensor is activated. The motion sensor alarm should then sound after a few seconds.

9__ When the motion sensor alarm sounds, quiet it by rotating the **SQUELCH** control back to 8 o'clock.

10__ Set dip-switch #2 to **ALRM FAST** (down) and repeat the above three steps. For this test, however, pulse the signal generator RF output at a rate of *one pulse every 2 to 3 seconds* (rather than 4 to 6) to simulate the "rest" mode and *once per second* (rather than once every 2 seconds) to simulate the "motion" mode.

11__ Rotate the **SQUELCH** control back to 8 o'clock, return dip-switch #2 to **ALRM SLOW** (up) and dip-switch #3 to **ALRM OFF** (up).

K. MISCELLANEOUS

1__ If the DFR-1000A is equipped with a computer interface, appropriately exercise this feature to confirm proper operation. **Note:** To obtain the specified 0.5° RMS bearing accuracy, set the **CRT** switch to **SLOW**.

2__ Disconnect all test equipment and *restore all the DFR-1000A rear-panel configuration setup switches to their original positions* (recorded in step V-A-9). If it is believed that some of these original switch settings are in error, resolve this matter first. Once these switches have been properly set, re-install the rear-panel crystal cover plate using the four captive thumbscrews (unless the optional crystal calibration procedure described in the following section is to be performed).

L. CRYSTAL CALIBRATION (OPTIONAL)

__ When testing the DFR-1000A, it is good practice to trim any installed crystals precisely onto their nominal frequencies to counteract any possible crystal or oscillator circuitry aging. The procedure is straightforward for any user having a basic understanding of and familiarity with electronic test equipment. The adjustments are readily accessible without the need for removing the DFR-1000A outer cabinet. A detailed test procedure is provided in Appendix C of the DFR-1000A Operator's Manual. Note that the procedure requires a signal generator having a rated frequency accuracy of 1 ppm (part per million) or better.

VI RETURNING EQUIPMENT TO FACTORY FOR REPAIR

When returning equipment to the factory for repair, it is very important that the equipment be accompanied by a detailed report listing all symptoms, along with any background information regarding the circumstances that may have led to the failure. If a problem occurs intermittently or only in specific modes of operation, this should be noted as well. If the above user functional test procedure has been performed, the specific test(s) the unit failed should be listed. Before returning any equipment, please contact RF Products at (619) 583-2024 (Tel/Fax) or via e-mail at rfprodsdc@juno.com to obtain return authorization.

****

Rev B02/08-99/dfr1000a_tpu_01

August, 1999