

# TDFM-9000 TRANSCEIVER

P/N 101263-x

## FINAL ACCEPTANCE TEST PROCEDURE

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**REVISION HISTORY**  
[ 136561 ]

| REV | SECTION<br>- PAGE - | DESCRIPTION                                                                                                                                                                   | DATE       | EDITED<br>BY |
|-----|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|
| A   | All                 | Changed max volume level from > 20 V to > 5 V. Changed the volume setting to measure distortion to 35 from 20. Added section to verify the combined mute function. C.R 13228. | OCT. 22/13 | J R          |
| B   | All                 | Add Section to test radio with RC-9000. C.R. 15674.                                                                                                                           | APR. 21/15 | J R          |
| C   | 4                   | Changed minimum Rx level from 5 to 4.5 Vrms.                                                                                                                                  | JUL. 02/15 | J R          |
| D   | 5                   | Changed TX power tolerance to 5.7 to 6.0 watts in Table 2.                                                                                                                    | NOV. 14/15 | J R          |
| E   | 3                   | Changed test frequencies in Table 1.                                                                                                                                          | DEC. 16/15 | S M          |
| F   | 3, 6                | Added instruction to record Front Panel and Main SW versions on TDS. Added Keyloading & FPP Tests.                                                                            | AUG. 14/17 | J R          |
| G   | 3, 4                | Changed max current at power up to 600 ma. Changed Max signal level for deviation test to +6 dBm.                                                                             | JUL. 27/18 | J R          |
| H   | 3                   | Added instruction to use calibrated cables before tuning.                                                                                                                     | OCT. 30/18 | J R          |
| J   | All                 | Added instructions for MCP.                                                                                                                                                   | OCT. 24/19 | A S          |
| K   | All                 | Fixed Text Formatting.                                                                                                                                                        | JUN. 26/20 | J R          |
| L   | All                 | Cleaned up document.                                                                                                                                                          | APR. 23/23 | J R          |

# TDFM-9000 FINAL ACCEPTANCE TEST PROCEDURE

**NOTE:** The radio should be fully assembled with all RF modules installed, lids and screws. This test procedure assumes that the factory codeplugs and test frequencies are programmed into the radio prior to testing. If factory codeplugs are not available, then tune the radio to known analog FM non-trunked Channels. For accurate measurement, ensure that the test set has the RF cable calibrations applied before testing.

## GENERAL:

- 1) Set bench power supply to 28 volts and current limit to 5A.
- 2) Connect the TDFM-9000 to radio test jig (#13T209) or an equivalent fixture.
- 3) Connect Module one antenna of the TDFM-9000 under test to the service monitor.
- 4) Record all test results on Test Data Sheet #136562.

## POWER UP TESTS:

- 1) Turn on the radio by pressing the knob.
- 2) The display should read "TECHNISONIC" and display software version numbers. Record the Main and Front Panel version numbers on the test data sheet (TDS).
- 3) The display should blank and then show what RF modules are installed, record the Model number on the TDS.
- 4) The display will then go into the normal mode. The unit should be drawing less than 600 mA and should not be making any strange squealing sounds. Record the current draw on the TDS.
- 5) Check that the fan is running during boot up and record on the TDS.

## MODULE FUNCTIONS:

- 1) Switch to Module 1 on the test fixture.
- 2) Select Module 1 on the radio.
- 3) Set the test set to generate an RF signal of 1 mV(-47 dBm) with 1 KHz Audio tone and 1.5 KHz deviation. The test frequency to use depends on the RF module installed in the #1 slot.
- 4) Select a known conventional channel that is set to analog, FM with no PL/DPL tone/codes programmed. Any frequency within the supported can be used. See Table 1.

| BAND    | FREQUENCY (MHz) |
|---------|-----------------|
| VHF     | 136 to 174      |
| UHF LO  | 380 to 470      |
| UHF HI  | 450 to 520      |
| UHF     | 380 to 520      |
| 700/800 | 764 to 870      |

**TABLE 1:** Test Frequencies by Band

- 5) Turn the volume all the way up. The audio output level should be above 4.5 Vrms. Record on the TDS.
- 6) Turn the volume to a setting of 35. The distortion should be less than 5%. Record on the TDS.

- 7) Set the test set to 0.28 uV (-116 dBm). Measure the receive Sinad. This should be > 12 dB. Record on TDS
- 8) Confirm the Module 1 Green RX LED is lit, indicating open squelch. Remove the signal to the receiver. Confirm the RX led goes out or flashes for a second then goes out. Record on TDS.
- 9) Press the rotary knob several times until the lower right hand display shows "Chan". Turn the knob to select another channel. Confirm the module changes to the channel dialed. Rotate the knob back to select the first channel. Verify the module follows.  
  
 Press the MUP key momentarily to increment the selected channel. Confirm the radio changes to the desired channel. Press and hold the MUP key and verify the channel number scrolls up. Release the key. Verify the module is now on the selected channel dialed.  
  
 Press the MDN key momentarily to decrement the selected channel. Confirm the radio changes to the desired channel. Press and hold the MUP key and verify the channel number scrolls down. Release the key. Verify the module is now on the selected channel dialed.  
  
 Set the Chan/Band SW to Channel position on the test Jig. Toggle the "UP Switch" on the radio test jig. Confirm the radio increments the channel. Toggle the "DOWN Switch". Confirm radio decrements the channel.  
  
 Put the Chan/Band switch into Band mode on the test jig. Toggle the "UP Switch" on the radio test jig. Confirm the Module selector moves up on the display. Toggle the "DOWN Switch". Confirm the Module selector moves down on the display.  
  
 Record on TDS that channel selector works.
- 10) Press and hold the DIM and BRT buttons. Confirm the display dims and brightens. Set dimming to 31. Press and hold the BRT key. Confirm the display brightens to "Daylight Mode" release the BRT key. Confirm the dimming reverts to normal max brightness (31). Record on TDS.
- 11) Press the knob a few more times to get back into volume mode.
- 12) Go through some of the soft menus to confirm the soft keys and the home key function. Change zones. Verify the zone and channel has changed. Toggle the function keys F1-F4 ESW and TSW switches.  
  
 Press the knob several times to put the radio into Recall Mode. Enter a zone & channel. Verify the radio goes to the desired channel. Set the Knob menu back to default "VOL" Mode. Record on TDS.
- 13) Disconnect the TX audio cable from the test set.
- 14) Press PTT on the test jig.
- 15) Confirm the RED TX LED lights on the selected Module.
- 16) Record the transmit frequency on the TDS. It should be the frequency previously selected
- 17) Press each of the number keys (0-9) and the # and \* keys to check for DTMF and number key operation. Verify and record on the TDS the DTMF pad works.
- 18) Connect the TX audio cable to the test set audio generator.
- 19) Set the audio generator to +6 dBm at 1 KHz.
- 20) Check the deviation level and record on the TDS. It should not be more than +/-2.5 KHz.
- 21) Set the audio generator to -13 dBm.
- 22) Check the deviation to be between 1.25 and 2 KHz (NARROW FM). Record on the TDS.
- 23) Check the TX distortion and record on the TDS. It should be less than 5%.

- 24) Set the Module to low power. Key up and measure the TX power. Check the RF power output (all bands) to be between 0.8 – 1.2 watts. Record on TDS.
- 25) Set the Module to HI power. Key up and measure the TX power. Check that the Hi power is within the specs as shown in Table 2. Record power of test frequency from Table 1 on the TDS.

| BAND    | FREQUENCY     | NOMINAL (W) | RANGE (W) |
|---------|---------------|-------------|-----------|
| VHF     | 136.0 - 174.0 | 6           | 5.7 - 6.0 |
| UHF LO  | 380.0 - 470.0 | 5           | 4.8 - 5.2 |
| UHF HI  | 450.0 - 520.0 | 5           | 4.8 - 5.2 |
| 700 MHz | 764.0 - 794.0 | 2.5         | 2.4 - 2.6 |
| 800 MHz | 795.0 - 870.0 | 3           | 2.9 - 3.1 |

**TABLE 2:** Transmit HI Power Settings

- 26) Connect the test set to the Module 2 antenna connector.
- 27) Switch to 2 on the test panel and select Module 2 on the radio. Perform the above tests again for Modules 2 through 6 if installed.

### **COMBINED OUTPUT TEST:**

- 1) Select any Module on the radio, connecting the appropriate antenna connector to the service monitor. Set Rx audio switch to “COMBINED 1” setting on the test panel. Select “User 1” with the MODE button. In TX mode – toggle the PTT COMB 1 switch. Verify the radio is transmitting on the Module selected.
- 2) In Rx mode – type the selected frequency. Verify the radio is receiving that frequency in the combined mode. Press the current Module selector button to toggle the combined mute. Verify with the “X” displayed that the audio is not muted. Move the selector to another Module. Verify that the audio on the "X tagged" Module is now muted. Move the selector back to the muted Module. Verify audio is heard on the original Module. Press the selector again to unmute and remove the "X".
- 3) Set the RX audio switch on the jig to “COMBINED 2”, Select “User 2” with the MODE button. Repeat the above steps.

## KEYLOADING TEST:

**NOTE:** This is a factory only requirement. Test Keyloading only if a keyloader is available.

- 1) Connect a KVL 3000+ or KVL 4000 keyloader to the programming connector. Select Module 1.
- 2) Verify the selected RF module displays "Keyloading".
- 3) Load an ADP key.
- 4) Switch to the next RF module. Repeat loading an ADP key to each module installed.
- 5) Disconnect the keyloader. Reboot the radio. Set all modules to an encrypted channel – (Zone 1 Channel 6).
- 6) Toggle the ESW to the Encrypted mode. Verify the display shows the "Ⓢ" symbol and is not displaying "Key Fail" on any of the modules.
- 7) Connect the keyloader. Zeroize all keys in each Module. Disconnect the keyloader. Reboot the radio.
- 8) Verify all modules in encrypted mode show "Key Fail". Set each module to clear mode by toggling the ESW SW. Verify the "Ⓢ" symbol goes out.

## MCP MOD 14 TESTS:

- 1) Enable External Transceiver 1 and 2 in configuration menu.
- 2) Set S13 and S14 to Band 7. Also set S15 and S16 to Band 8. This switches audio and PTT lines on the Main radio test jig - Module 5 to Module 7 and Module 6 to Module 8.
- 3) Check if Module 7 and Module 8 PTT works.
- 4) On Mod 14 Test Jig (19T286) set all switches to Band 7 and 8. Select position 5 on Main test jig. Key PTT switch on Main test jig to test Module 7 PTT. Set Main jig to position 6 to test Module 8 PTT.
- 5) When PTT 5 is keyed on the Main test Jig, the Band 7 LED on 19T286 should light up as well as TX indicator for External Transceiver #1 on the TDFM-9000 front display. When PTT 6 is keyed, Band 8 LED on 19T286 should light up as well as TX indicator for External Transceiver #2 on the TDFM-9000 front display.
- 6) Record on TDS.
- 7) Check if Module 7 RX Audio works:
  - A) Select External Transceiver 1 on Radio
  - B) Set Radio Test Jig to Module 5
  - C) Set Mod 14 Test Jig Switches: S9-UP, S10-DN, S13 & S14 to UP.
  - D) Set Audio generator to -7 dBm
  - E) Turn volume level to 40 on radio
  - F) Verify audio level is 5 Vrms nominal, 4.8 to 5.2V.
  - G) Record on TDS
- 8) Check if Module 8 RX Audio works:
  - A) Select External Transceiver 2 on Radio
  - B) Set Radio Test Jig to Module 6
  - C) Set Mod 14 Test Jig Switches: S11-UP, S12-DN, S15 & S16 to UP.
  - D) Set Audio generator to -7 dBm
  - E) Turn volume level to 40 on radio
  - F) Verify audio level is 5 Vrms nominal, 4.8 to 5.2V.
  - G) Record on TDS

- 9) Check if Module 7 Mic Audio works.
  - A) Select External Transceiver 1 on Radio
  - B) Set Radio Test jig to Module 5
  - C) Set Mod 14 Test Jig Switches: S9-DN, S10-UP, S13 & S14 to UP.
  - D) Set audio generator to -13 dBm
  - E) Key Module 5 on Main test jig to key Module 7(Transceiver 1)
  - F) Verify TX audio level is 30 to 50mVrms.
  - G) Record on TDS
- 10) Check if Module 8 Mic Audio works.
  - A) Select External Transceiver 2 on Radio
  - B) Set Radio Test jig to Module 6
  - C) Set Mod 14 Test Jig Switches: S11-DN, S12-UP, S15 & S16 to UP.
  - D) Set audio generator to -13 dBm
  - E) Key Module 6 on Main test jig to key Module 8(Transceiver 2)
  - F) Verify TX audio level is 30 to 50mVrms.
  - G) Record on TDS
- 11) Check if Module 7 Sidetone Audio works.
  - A) Select External Transceiver 1 on Radio
  - B) Set Main Radio Test jig to Module 5
  - C) Set Mod 14 Test jig Switches S9, 10, 13 & 14 to UP.
  - D) Key Transceiver 1.
  - E) Verify Side tone level is 1 V nominal, 0.8 to 1.2 Vrms with 600 ohm load.
  - F) Record on TDS
- 12) Check if Module 8 Sidetone Audio works.
  - A) Select External Transceiver 2 on Radio
  - B) Set Main Radio Test jig to Module 6
  - C) Set Mod 14 Test jig Switches S11, 12, 15 & 16 to UP.
  - D) Key Transceiver 2.
  - E) Verify Side tone level is 1 V nominal, 0.8 to 1.2 Vrms with 600 ohm load.
  - F) Record on TDS
- 13) Check if Remote RXD/TXD is working using S200 Simulator software. Record on TDS

### **FPP TESTS:**

**NOTE:** *This is a factory only requirement. Test the FPP option only if the radio is equipped.*

- 1) Pick a module with the FPP option and select an FPP enabled Zone.
- 2) Edit a channel. Program an RX and TX frequency, RX & TX PL tone and change the channel name.
- 3) Verify the radio transmits and receive on the modified channel. Record on TDS.

### **RC-9000 TEST:**

**NOTE:** *This is a factory only requirement. Test with an RC unit if one is available.*

- 1) Connect a RC-9000 to the radio.
- 2) Confirm the RC display shows the same as the radio's display.
- 3) Press buttons on the RC unit and confirm that the functions are working on the radio.

### **FINAL CHECKS:**

- 1) Go into the Configuration Menu and set the knob default to VOL. Make sure the Recall Mode is turned ON. Set the "Always On" Mode to disabled and set Dual User to disabled. For MOD 14 radios, disable both External Transceivers.
- 2) Test backlighting at 28 volts and 5V. The back lighting brightness and profile should be similar to the TDFM-6000. Set all the volumes to 35 and all modules to Zone 1 Channel 1.
- 3) Turn off radio and confirm it really shuts off (wait 30 seconds to be sure).
- 4) Disconnect from test equipment.
- 5) Check for good appearance of radio and that all stickers and labels are properly installed.
- 6) Shake the unit to confirm there is no loose hardware inside.