**Utility Locator Transmitter Test Procedures**

**Multi-Frequency Locator (MFL), Transmitter Software Validation**

**Department:** Subsite Electronics, Locating

**File Name:** MFL TX Software Verification and Validation V4.docx

**Template:** None

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Validation performed using code files: **Capture the version of UtiliGuard Transmitter software being tested.**

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**Revision History:**

|  |  |  |
| --- | --- | --- |
| **Version** | **Date** | **Description** |
| 1 | 1/15/2015 | Initial version |
| 2 | 11/16/2016 | Added detail to configuring instructions. Updated formatting and wording for clarity. |
| 3 | 3/24/2020 | Updated to new format |
| 4 | 2/8/2023 | TBD, Updated to UtiliGaurd 2 TX specifics |
|  |  |  |
|  |  |  |

Table 1

Changed test procedures in this revision may have some (or all) of their steps highlighted as shown in Table 2. Special attention should be paid to ensure these procedures work correctly, but unchanged procedures should also be retested to confirm their results have not changed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| Setup | Turn ignition switch to ON | POST test runs. | n/a | n/a |  |
| 1 | Go to DIAGNOSTIC CODES line in the EDT to check for any fault codes | No fault codes reported. 300 PWR ON CNT is displayed. |  |  |  |
| Setup | Move test box switch A3 to OFF | Disconnects fluid proportional valve. | n/a | n/a |  |
| Red DLED turns on but blinks off every 3 seconds.  **Sample Only** |  |  |  |
| 2 | Go to DIAGNOSTIC CODES line in the EDT to check for any fault codes | 114 DFLUID VALVE Meaning: LIST reported bad connection to fluid proportional valve. |  |  |  |
| 3 | Press and hold the operator presence button on bottom of tether handle. Turn ignition switch OFF, then ON. | Red DLED turns on but blinks off every 3 seconds. |  |  |  |
| End | Go to DIAGNOSTIC CODES line in the EDT to check for any fault codes | 114 DFLUID VALVE Meaning: POST reported bad connection to fluid proportional valve in Drive mode. |  |  |  |

Table 2

**References:**

|  |  |  |
| --- | --- | --- |
| **Ref.** | **Doc. No.** | **Description** |
| 1 | TBD | Lumberville Map |
| 2 | TBD | GPS Survey Points |
| 3 | ID0321552 | MFL TX TRANSMITTER ASSEMBLY INSTRUCTIONS |
| 4 | 240-0084/ID0334685 | Factory MFL Configuration Utility |
| 5 | 240-0085/ID0334686 | Factory MFL Configuration Wizard |

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# Introduction

The UtiliGaurd 2 T5 and T12 transmitters place signals on target cables to be detected by UtiliGuard 2 Series receivers. These units can be configured to send over 70 frequencies as well as custom frequencies. The transmitters place a signal on the cable through either direct connection, induction clamping, or broadcast modes.

The UtiliGuard 2 Series transmitters can operate the following accessories:

* The Live Power Adapter is intended to protect the transmitter from damage due to connection to live electrical power.
* The Induction clamp accessories are designed be placed around the target line to induce the signal onto the line when direct access to connect to the line is not available.
* The dual output direct connect leads are designed to connect to two different utilities and remotely switch between them from the receiver. This feature is only available on advanced systems.

# Abbreviations and Definitions

|  |  |
| --- | --- |
| **Abbreviation** | **Description** |
| dB | Decibel |
| DE | Direction Enabled |
| LED | Light Emitting Diode |
| Max | Maximum |
| Min | Minimum |
| MFL | Multi-Frequency Locator |
| PCB | Printed Circuit Board |
| RX | Receiver |
| T5 | 5-Watt transmitter |
| T12 | 12-Watt transmitter |
| TBD | To Be Determined |
| TX | Transmitter |
| USB | Universal Serial Bus |
| V2 | Version 2 |
| V3 | Version 3 |

Table 4

# Equipment to Be Tested

The required equipment for this procedure is a UtiliGuard 2 Advanced Transmitter.

**Note:**  Full display illustrations in the following tests are representative of the screen that should be visible, but the state/condition of the indicators may not always match your display under test. Only those indicators specifically applying to the test being performed should be considered for Pass/Fail determination.

Expected test results may include: correct screen is showing, correct popup box and instructions appear, a specific indicator operates correctly, or a correct sequence of events / screen changes occurs.

# Test Equipment

A UtiliGuard 2 Advanced transmitter and accessories will be required to perform some of the tests. The transmitter and accessories should be current production versions. A 200 ohm and 600 ohm test load.

# Code Under Test

The code under test is maintained in archives known as repositories which are stored, retrieved, and version controlled using an application called Tortoise SVN. The details of this mechanism and process is not covered in detail in this document and is mentioned here only as reference.

# Configuration

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Configuration** | | | | | |
| Setup | -- New production unit  -- fresh install of test software version |  | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This verifies the Transmitter can be configured**  Configure unit per MFL TX Transmitter Assembly Work instructions, ID0321552.    The system info screen is the fourth menu item on the main menu. The software version is the first item. | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Update software using the configuration software with embedded loader file from the test server | Configuration software completes successfully, and TX system info screen displays the correct version of software. | x |  |  |
| 2 | Load software using the configuration wizard software with embedded loader file from the test server | Configuration wizard software completes successfully, and TX system info screen displays the correct version of software. | x |  |  |
| 3 | Configure as Advanced, press and hold menu key and select System Info | Check the Bootloader Ver is correct | x |  |  |
| Check the MFG Date is correct | x |  |  |
| Check the Model Number is correct | x |  |  |
| Check the Serial Number is correct | x |  |  |
| Check the Transmitter Type is correct | x |  |  |
| Check the Brand is correct | x |  |  |
| Check the Power Source is correct | x |  |  |
| Check the Source Voltage is correct | x |  |  |
| Check the Runtime Hours is correct | x |  |  |
| 4 | Press and release the down key | Check the Country Exceptions is correct | x |  |  |
| Check the Main PCB version is correct | x |  |  |
| Check the Headstack PCB version is correct | x |  |  |
| Check the Interface PCB version is correct | x |  |  |
| Check the Processor is correct | x |  |  |
| 5 | Press and release volume key | Unit returns to previous menu screen | x |  |  |
| End | Press and release volume key | Unit returns to main display screen | x |  |  |

# Basic Operation

## Splash Screen and Transmitter Display Screen

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Splash Screen and Locate Screen** | | | | | |
| Setup | -- TX configured  -- Default setting  -- Direct connect leads connected to TX | -- TX off  -- 600 Ohm load connected across leads or connect to a known line | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This verifies the splash screen loads properly and the main transmitter display screen is correct and working properly.**   Make sure unit is off Output interrupted Output reached regulation  Plug in direct connect leads and connect across a 600 Ohm load | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Press and hold power ON/OFF key to turn unit on. | Appropriate splash screen appears for x seconds | x |  | 3 seonds |
| Check the battery level icon | x |  | Please |
| Check the output power level icon | x |  | Where is it, 1/5 or about 20% power |
| Check the volume setting | x |  |  |
| Check the output active/interrupted icon | x |  |  |
| Check the direction enable icon | X |  |  |
| Check the frequency name and number | X |  | 263Hz (263) |
| Check the direct connect leads connected icon | X |  |  |
| 2 | Press and release frequency up or down key until set to 8.01k (8010). Values are for bench top test with 600 ohm load. If different load or connected to a line, capture current (mA), watts (W), impedance (Ω), and voltage (V) displayed. | Check the current on the line (14mA) |  | x | 11mA |
| Check the power output (0.11 W) |  | x | .07W |
| Check the line impedance (581Ω) | x |  | 582Ω |
| Check the voltage (8V) |  | x | 6V |
| 3 | Press and release volume key, repeat 2 times | Volume toggles on/off with each key press | x |  |  |
| 4 | Press and release frequency up key, repeat | Frequency changes to next higher one with each key press | x |  |  |
| Output interuppted then regulates | x |  |  |
| 5 | Press and release frequency down key, repeat | Frequency changes to next lower one with each key press | x |  |  |
| Output interuppted then regulates | x |  |  |
| End | Press and release power output key, repeat | Check power output increases with each key press then cycles to off | x |  |  |

## Menus

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Menus** | | | | | |
| Setup | -- TX configured  --200 Ohm load connected across leads or  connect to known line | -- Default settings  -- TX On | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Frequency, Settings, and Options menus:**    High power output enabled | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Press and hold menu key, select Frequencies. Toggle one frequency on and another off. Press and release volume key twice and scroll through frequencies | Frequency toggled off no longer appear | x |  |  |
| Frequency toggled on now appears | x |  |  |
| 2 | Press and hold menu key, select Settings/Backlight. Select Off. | Backlight turns off | x |  |  |
| Timer menu item disappears | x |  |  |
| 3 | Select On. | Backlight turns on | x |  |  |
| Timer menu item reappears | x |  |  |
| 4 | Select Timer/10 Seconds | Backlight turns off after 10 seconds | x |  |  |
| Setup | Turn TX off and replace direct connect leads with dual direct connect leads. Connect 200 Ohm loads across both leads or two know lines. Set frequency to 3.14k. |  | x |  |  |
| 5 | Turn TX on. Press and hold menu key, select Settings/Output/Dual Output/Enable. Press and release volume key 4 times. | Dual lead icon appears, and non-active lead will be crossed out | x |  |  |
| 6 | Press and hold menu key, select Settings/ Output/Dual Output/Disable. Press and release volume key 4 times. | Standard lead icon appears | x |  |  |
| 7 | Press and hold menu key. Select Output/High power output/Enable. Press and release volume key 3 times. | High power output enabled icon appears |  | x | Cant find high power output |
| Output power at 12W |  | x |  |
| 8 | Press and hold menu key. Select Settings/ Meter/Simple. Press and release volume key 3 times. | Power, impedance, and voltage measurements disappear | x |  |  |
| 9 | Press and hold menu key. Select Settings/ Meter/Advanced. Press and release volume key 3 times. | Power, impedance, and voltage measurements reappears. Capture values for each. | x |  |  |
| 10 | Press and hold menu Select Options/Languages. | List of languages appears | x |  | Its in *Settings*/Options/Langauges |
| 11 | Select Español. Press and release volume key 2 times. | Menu items appear in Spanish | x |  |  |
| 12 | Select Options/Languages/Italiano. Press and release volume key 2 times. | Menu items appear in Italian | x |  |  |
| 13 | Select Options/Languages/Korean (last options). Press and release volume key 2 times. | Menu items appear in Korean | x |  |  |
| 14 | Select Options/Languages/English. Press and release volume key 2 times. | Menu items appear in English | x |  |  |
| 15 | If testing for specific language change, select Options/Language. Select specific language. Press and release volume key 2 times. | Menu items appear in language selected. Check for specific change. | x |  |  |
| 16 | Select Options/Shutdown timer/4 Hours | Transmitter automatically shuts off after 4 hours | x |  |  |
| 17 | Press and hold menu key. Select Options/Fault Mode/Enable. | TX screen returns in FF mode and icon appears | x |  |  |
| Frequency changes to FF (263) | x |  |  |
| End | Repeat step 17 but select Disable | Transmitter returns to normal operation display | x |  |  |

## Locate in Direction Connect Mode with Direction Enable (DE)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Locate in Direct Connect with and without Direction Enable (DE) Line Mode** | | | | | |
| Setup | -- RX configured and calibrated  -- TX connected to line with Direct Connect Leads or 100k Ohm load  -- Line grounded | -- Depth of line known  -- Default settings  -- RX On  -- Second line parallel to target line | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the transmitter Direction Enable (DE) output mode.**  **Note: frequency in Direction Enable mode may be any frequency below 10k.**  Direction Enable screen | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **Direct Connect Mode with and without Direction Enable** | |  |  |  |
| 1 | Press and hold menu key. Select Settings/ Output/Direction Enable/Enable. Press and release volume key 4 times. | Direction Enable icon appears | x |  |  |
| Capture impedance (Ω) of line | x |  | 577 Ω must be on 600 or 200 |
| 2 | Using the RX, locate line facing away from TX with compass direction vertical, press and hold the RX Frequency key | An arrow appears on the end of the compass direction line | x |  |  |
| 3 | Turn facing the TX | The DE arrow flips to the end opposite the TX | x |  |  |
| 4 | Press and hold menu key. Select Settings/ Output/Direction Enable/Enable. Press and release volume key 4 times. | Direction Enable icon disappears | x |  | Typo in instructions |
| 5 | Press and release RX antenna key and locate line | Antenna icon changes to single | x |  |  |
| Signal strength is higher with same gain | x |  |  |

## Locate in Fault Finding Mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Locate in Direct Connect with and without Direction Enable (DE) Line Mode** | | | | | |
| Setup | -- RX configured and calibrated  -- TX connected with Direct Connect Leads to line with known fault  -- Line disconnected at both ends | -- Default settings  -- RX On  -- Plug fault probe into RX accessory port to enter Fault Mode screen | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the transmitter Direction Enable (DE) output mode.**  **Note: frequency in Direction Enable mode may be any frequency below 10k.**  Fault Mode screen | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **Fault Mode** | |  |  |  |
| 1 | Press and hold menu key. Select Settings/ Options/ Fault Mode/Enable. | Fault mode icon appears | x |  |  |
| Transmitter changes frequency to FF (263) | x |  |  |
| Capture impedance (Ω) of line | x |  | >100k Ω |
| 2 | While over line with RX and probes parallel to line, press probe into ground | On the RX, numbers appear above flashing home symbol | x |  |  |
| 3 | Press and hold RX frequency key | Chime sounds | x |  |  |
| Arrow appears pointing toward fault | x |  |  |
| 4 | Move closer to fault and press probe into ground | Arrow stays in the same direction | x |  |  |
| Signal strength number updates | x |  |  |
| 5 | Move to opposite side of fault keeping probe and receiver in the same orientation | Arrow flips to opposite direction | x |  |  |
| Signal strength number updates | x |  |  |
| End | Press and hold menu key. Select Settings/ Options/Fault Mode/Disable. | Display returns to normal transmitter display screen | x |  |  |

## Locate in Clamp Modes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Locate in Clamp and Broadband Clamp Modes** | | | | | |
| Setup | -- RX configured and calibrated  -- Line grounded  -- TX Off | -- Depth of line known  -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the transmitter 5” Clamp and Broadband Clamp output modes.**  Induction Clamp Orientation of TX Induction | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **5” Clamp Mode** | |  |  |  |
| 1 | Replace direct connect leads with standard 5” clamp. Place clamp around line. Turn TX on. | Inductive clamp connected icon appears in place of direct connect icon | x |  |  |
| 2 | Change freq to? | TX changes to selected frequency | x |  | 3.14 kHz |
| 3 | Locate line facing away from TX with RX in line mode at same frequency as TX. | Signal strength on RX maximum over line. |  |  |  |
| 4 | Change RX to different frequency than TX | Signal strength on RX decreases significantly |  |  |  |
| 5 | Change RX frequency back to same frequency as TX. Press and release power output key | Power level icon increases to next output level |  |  |  |
| Signal strength on RX increases, less gain needed |  |  |  |
| 6 | Press and release power output key until output level cycles back around to zero output (standby mode) | Signal strength on RX decreases significantly |  |  |  |
|  | **Broadband Clamp Mode** | |  |  |  |
| 7 | Turn TX off, replace 5” clamp with broadband clamp and turn TX back on. | Induction active icon appears in place of inductive clamp connected icon |  |  |  |
| 8 | Change frq to? | TX changes to selected frequency |  |  |  |
| 9 | Locate line facing away from TX with RX in line mode at same frequency as TX. | Signal strength on RX maximum over line. |  |  |  |
| 10 | Change RX to different frequency than TX | Signal strength on RX decreases significantly |  |  |  |
| 11 | Change RX frequency back to same frequency as TX. Press and release power output key | Power level icon increases to next output level |  |  |  |
| Signal strength on RX increases, less gain needed |  |  |  |
| End | Press and release power output key until output level cycles back around to zero output (standby mode) | Signal strength on RX decreases significantly |  |  |  |

## Locate in Broadcast Modes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Locate in Clamp and Broadcast Modes** | | | | | |
| Setup | -- RX configured and calibrated  -- Line grounded  -- TX Off | -- Depth of line known  -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the transmitter Clamp and Broadcast output modes.**  Orientation of TX Induction (Broadcast) | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **Clamp Mode** | |  |  |  |
|  | **Broadcast Mode** | | x |  |  |
| 1 | With TX off, disconnect clamp from TX, locate TX directly above and parallel to line, and turn TX on. | Induction active icon appears in place of inductive clamp connected icon | x |  | 8.01 kHz |
| 7 | Locate line facing away from TX with RX in line mode at same frequency as TX and at least 30 feet from TX. | Signal strength on RX maximum over line. | x |  |  |
| 8 | Change RX to different frequency than TX | Signal strength on RX decreases significantly | x |  |  |
| 9 | Change RX frequency back to same frequency as TX. Press and release power output key | Power level icon increases to next output level | x |  |  |
| Signal strength on RX increases, less gain needed | x |  | On RX or TX? |
| End | Press and release power output key until output level cycles back around to zero output (standby mode) | Signal strength on RX decreases significantly | x |  |  |

# Engineering Testing

## TX Transformer Taps

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Transformer Taps** | | | | | |
| Setup | -- 200 Ohm load connected across leads or  connect to known line | -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Transmitter transformer taps.**  **Note: if performing test on a line, current, power, impedance, and voltage values may differ. Record values for each.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **TX Low Frequency Tap** | |  |  |  |
| 1 | Change TX frequency to 815Hz | TX display shows 815Hz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Press Power button for full power output | All 5 Power bars are indicated. | x |  |  |
|  | Verify current milliamps on display. | Between 150.0mA and 210.0mA | x |  | 157 mA |
|  | Verify power output on display | Between 4.5 Watts and 7.60 Watts | x |  | 4.75 W |
|  | Verify line impedance on display | Between 190 Ω and 200 Ω | x |  | 191 Ω |
|  | Verify voltage on display | Between 35V and 45V |  | x | 30 V |
| 3 | Turn TX output off |  |  |  |  |
|  | **TX Medium Frequency Tap** | |  |  |  |
| 1 | Change TX frequency to 22.5kHz | TX display shows 22.5kHz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Press Power button for full power output | All 5 Power bars are indicated. | x |  | Max power |
|  | Verify current milliamps on display. | Between 190.0mA and 210.0mA |  | x | 158 mA |
|  | Verify power output on display | Between 7.75 Watts and 8.0 Watts |  | x | 4.84 W |
|  | Verify line impedance on display | Between 190 Ω and 200 Ω | x |  | 193 Ω |
|  | Verify voltage on display | Between 35V and 45V |  | x | 31 V |
| 3 | Turn TX output off |  |  |  |  |

## TX Antenna Tuning

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Antenna Tuning** | | | | | |
| Setup | -- TX connected to line  -- Direct Connect Leads connected 200 Ω load | -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Transmitter antenna tuning.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **TX First Antenna Tuning Band** | |  |  |  |
| 1 | Change TX frequency to 8.01kHz | TX display shows 8.01kHz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Press Power button for full power output | All 5 Power bars are indicated. | x |  |  |
|  | Verify current milliamps on display. | Between 170mA and 210mA |  | x | 160 mA |
|  | Verify power output on display | Between 5.5 Watts and 7.0 Watts |  | x | 4.93 W |
|  | Verify line impedance on display | Between 190 Ω and 200 Ω | x |  | 192 Ω |
|  | Verify voltage on display | Between 35V and 45V |  | x | 31 V |
| 3 | Turn TX output off |  | x |  |  |
|  | **TX Second Antenna Tuning Band** | |  |  |  |
| 1 | Change TX frequency to 44.6kHz | TX display shows 44.6kHz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Adjust Power out to Full Power | All 5 Power bars are indicated. | x |  |  |
|  | Verify current milliamps on display. | Between 180mA and 200mA |  | x | 159 mA |
|  | Verify power output on display | Between 6.5 Watts and 8.0 Watts |  | x | 4.86 W |
|  | Verify line impedance on display | Between 185 Ω and 200 Ω | x |  | 191 Ω |
|  | Verify voltage on display | Between 30V and 45V | x |  | 30 V |
| 3 | Turn TX output off |  |  |  |  |
|  | **TX Third Antenna Tuning Band** | |  |  |  |
| 1 | Change TX frequency to 83.1kHz | TX display shows 83.1kHz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Press Power button for full power output | All 5 Power bars are indicated. | x |  |  |
|  | Verify current milliamps on display. | Between 24mA and 60mA |  | x | 68 mA |
|  | Verify power output on display | Between .50 Watts and .70 Watts |  | x | .88 W |
|  | Verify line impedance on display | Between 185 Ω and 200 Ω | x |  | 191 Ω |
|  | Verify voltage on display | Between 9V and 12V |  | x | 13 V |
| 3 | Turn TX output off |  |  |  |  |
|  | **TX Fourth Antenna Tuning Band** | |  |  |  |
| 1 | Change TX frequency to 121kHz | TX display shows 121kHz | x |  | Using 5W transmitter |
| 2 | Turn TX power output on | TX Shows output power on icon | x |  |  |
|  | Press Power button for full power output | All 5 Power bars are indicated. | x |  |  |
|  | Verify current milliamps on display. | Between 50mA and 70mA | x |  | 65 mA |
|  | Verify power output on display | Between 0.75 Watts and 1 Watts | x |  | .81 W |
|  | Verify line impedance on display | Between 185 Ω and 200 Ω | x |  | 190 Ω |
|  | Verify voltage on display | Between 10V and 15V | x |  | 12 V |
| 3 | Turn TX output off |  | x |  |  |

## TX Automatic Power Output Limits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Automatic Power Output Limits** | | | | | |
| Setup | -- TX connected to line  -- Direct Connect Leads connected 200 Ω load | -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Transmitter automatic power output limits.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **TX 12-Watt Upper Frequency Limit** | |  |  | Using 5W transmitter |
| 1 | Change TX frequency to 8.44kHz | TX display shows 8.44kHz |  |  | Using 5W transmitter |
| 2 | Enable High Power Mode under Settings |  |  |  | Using 5W transmitter |
| 3 | Turn TX power output on | TX Shows output power on icon |  |  | Using 5W transmitter |
| 4 | Press Power button for full power output |  |  |  | Using 5W transmitter |
|  | Verify power output on display | Between 11.0 and 14.0 Watts |  |  | Using 5W transmitter |
| 5 | Turn TX output off |  |  |  | Using 5W transmitter |
| 6 | Change TX frequency to 9.5kHz | TX display shows 9.5kHz |  |  | Using 5W transmitter |
| 7 | Turn TX power output on | TX Shows output power on icon |  |  | Using 5W transmitter |
|  | Press Power button for full power output |  |  |  | Using 5W transmitter |
|  | Verify power output on display | Between 8.0 and 10.0 Watts |  |  | Using 5W transmitter |
| 8 | Turn TX output off |  |  |  | Using 5W transmitter |
|  | **TX 10-Watt & 1-Watt Upper Frequency Limit** | |  |  |  |
| 1 | Change TX frequency to 44.6kHz | TX display shows 44.6kHz |  |  |  |
| 2 | Enable High Power Mode under Settings |  |  |  |  |
| 3 | Turn TX power output on | TX Shows output power on icon |  |  |  |
| 4 | Press Power button for full power output |  |  |  |  |
|  | Verify power output on display | Between 9.75 Watts and 10 Watts |  |  |  |
| 5 | Turn TX output off |  |  |  |  |
| 6 | Change TX frequency to 65.5kHz | TX display shows 65.5kHz |  |  |  |
| 7 | Turn TX power output on | TX Shows output power on icon |  |  |  |
|  | Press Power button for full power output |  |  |  |  |
|  | Verify power output on display | Between 0.80 Watts and 1 Watts |  |  |  |
| 8 | Turn TX output off |  |  |  |  |

## TX Shutdown Timer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Shutdown Timer** | | | | | |
| Setup | -- MFL TX connected to line  -- Direct Connect Leads connected 200 Ω load  -- Install 12 Volt external power cable  -- Install logging Volt/Current meter  -- Setup logging date/time | -- Hook up 12-volt power supply and meter cabling.  -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **Test for TX 2-hour Shutdown Timer Feature** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **2-Hour Shutdown Timer** | |  |  |  |
| 1 | Select any TX frequency |  |  |  |  |
| 2 | Turn TX power output on | TX Shows output power on icon |  |  |  |
|  | Press Power button for high or 5th power level power output | All 5 Power bars are indicated. |  |  |  |
| 3 | Enter the Menu | Configuration Menu appears |  |  |  |
| 4 | Arrow down to Options selection, select menu button to select. |  |  |  |  |
| 5 | Arrow down to Shutdown Timer, press menu button to select. |  |  |  |  |
| 6 | Arrow down Highlight 2 Hours and press menu button to select. |  |  |  |  |
| 7 | Backout to TX display and note start time |  |  |  |  |
| 8 | After 2 hours. | Verify the TX has shutdown, pull the log from the meter and verify the time stamps from the initial current draw to the last current draw reading was 2 hours elapsed. |  |  |  |
| **Test for TX 4-hour Shutdown Timer Feature** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **4-Hour Shutdown Timer** | |  |  |  |
| 1 | Select any TX frequency |  |  |  |  |
| 2 | Turn TX power output on | TX Shows output power on icon |  |  |  |
|  | Press Power button for high or 5th power level power output | All 5 Power bars are indicated. |  |  |  |
| 3 | Enter the Menu | Configuration Menu appears |  |  |  |
| 4 | Arrow down to Options selection, select menu button to select. |  |  |  |  |
| 5 | Arrow down to Shutdown Timer, press menu button to select. |  |  |  |  |
| 6 | Arrow down Highlight 4 Hours and press menu button to select. |  |  |  |  |
| 7 | Backout to TX display and note start time |  |  |  |  |
| 8 | After 4 hours. | Verify the TX has shutdown, pull the log from the meter and verify the time stamps from the initial current draw to the last current draw reading was 4 hours elapsed. |  |  |  |
| **Test for TX 8-hour Shutdown Timer Feature** | | | | | |
| 1 | Select any TX frequency |  |  |  |  |
| 2 | Turn TX power output on | TX Shows output power on icon |  |  |  |
|  | Press Power button for high or 5th power level power output | All 5 Power bars are indicated. |  |  |  |
| 3 | Enter the Menu | Configuration Menu appears |  |  |  |
| 4 | Arrow down to Options selection, select menu button to select. |  |  |  |  |
| 5 | Arrow down to Shutdown Timer, press menu button to select. |  |  |  |  |
| 6 | Arrow down Highlight 8 Hours and press menu button to select. |  |  |  |  |
| 7 | Backout to TX display and note start time |  |  |  |  |
| 8 | After 8 hours. | Verify the TX has shutdown, pull the log from the meter and verify the time stamps from the initial current draw to the last current draw reading was 8 hours elapsed. |  |  |  |

## TX High Power Output Timer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Shutdown Timer** | | | | | |
| Setup | -- MFL TX connected to line  -- Direct Connect Leads connected 600 Ω load  -- Install logging Volt/Current meter  -- Setup logging date/time | -- Hook up 15-volt power supply and meter cabling to Li-Ion simulator.  -- Default settings | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **Test for TX High Power Output Timer** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **20 minute High Power Output Timer** | |  |  |  |
| 1 | Select 8.19KHz TX frequency |  |  |  |  |
| 2 | Hold Menu button. Press Frequency – twice and select Output Menu. Press Frequency – button to highlight Timer selection, then select the 20-minute timer. |  |  |  |  |
|  | Press Speaker button once then select the Enable selection. |  |  |  |  |
| 3 | Start logging capture. |  |  |  |  |
| 4 | Let test run 21 minutes. |  |  |  |  |
| 5 | Stop Logging capture. |  |  |  |  |
| 6 | Open csv capture log and verify the timer shut down after 20 minutes. | Verify 20-minute timer capture indicates 20 minutes. |  |  |  |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **15 minute High Power Output Timer** | |  |  |  |
| 1 | Select 8.19KHz TX frequency |  |  |  |  |
| 2 | Hold Menu button. Press Frequency – twice and select Output Menu. Press Frequency – button to highlight Timer selection, then select the 15-minute timer. |  |  |  |  |
|  | Press Speaker button once then select the Enable selection. |  |  |  |  |
| 3 | Start logging capture. |  |  |  |  |
| 4 | Let test run 16 minutes. |  |  |  |  |
| 5 | Stop Logging capture. |  |  |  |  |
| 6 | Open csv capture log and verify the timer shut down after 15 minutes. | Verify 15-minute timer capture indicates 15 minutes. |  |  |  |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **10 minute High Power Output Timer** | |  |  |  |
| 1 | Select 8.19KHz TX frequency |  |  |  |  |
| 2 | Hold Menu button. Press Frequency – twice and select Output Menu. Press Frequency – button to highlight Timer selection, then select the 10-minute timer. |  |  |  |  |
|  | Press Speaker button once then select the Enable selection. |  |  |  |  |
| 3 | Start logging capture. |  |  |  |  |
| 4 | Let test run 11 minutes. |  |  |  |  |
| 5 | Stop Logging capture. |  |  |  |  |
| 6 | Open csv capture log and verify the timer shut down after 10 minutes. | Verify 10-minute timer capture indicates 10 minutes. |  |  |  |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **5 minute High Power Output Timer** | |  |  |  |
| 1 | Select 8.19KHz TX frequency |  |  |  |  |
| 2 | Hold Menu button. Press Frequency – twice and select Output Menu. Press Frequency – button to highlight Timer selection, then select the 5-minute timer. |  |  |  |  |
|  | Press Speaker button once then select the Enable selection. |  |  |  |  |
| 3 | Start logging capture. |  |  |  |  |
| 4 | Let test run 6 minutes. |  |  |  |  |
| 5 | Stop Logging capture. |  |  |  |  |
| 6 | Open csv capture log and verify the timer shut down after 5 minutes. | Verify 10-minute timer capture indicates 10 minutes. |  |  |  |

## User Display Backlight Auto Shutdown Timer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| User Display Backlight Auto Shutdown Timer | | | | | |
| Setup | -- TX configured  -- Default setting | -- Logging Current/Voltmeter  -- 12 Volt external power cable. | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| To test the User display auto shutdown timers consisting of 5, 10, 20, and 40 seconds. | | | | | |
| **5 Second Timer Test** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Install Voltmeter and Current sensing leads between power source and external power lead to TX, start logging. |  |  |  |  |
| 2 | Press and hold menu button A picture containing icon  Description automatically generated until menu appears. |  |  |  |  |
| 3 | Press the frequency down button Icon  Description automatically generated once, select Setting, then press menu A picture containing icon  Description automatically generated button. | Verify Backlight is highlighted. |  |  |  |
| 4 | Press menu A picture containing icon  Description automatically generated to enter the backlight dialog. |  |  |  |  |
| 5 | The very first menu item has a check mark for the ON selection, if not highlight and select Menu. |  |  |  |  |
| 6 | Press frequency down Icon  Description automatically generatedtwice to highlight the Timer Selection then press Menu. |  |  |  |  |
| 7 | The first item in the list is 5 seconds, verify check mark in box if not highlight selection and press menu. |  |  |  |  |
| 8 | Use the speaker button to backout to the TX display. Wait 10 seconds then press speaker button to activate backlighting, do this a few times. |  |  |  |  |
| 9 | Stop the logging program and calculate the time of High current draw is 5 second. | Verify the 5-second high current draw of the backlighting appears twice in the log. |  |  |  |
| **10 Second Timer Test** | | | | | |
| 1 | Install Voltmeter and Current sensing leads between power source and external power lead to TX, start logging. |  |  |  |  |
| 2 | Press and hold menu button A picture containing icon  Description automatically generated until menu appears. |  |  |  |  |
| 3 | Press the frequency down button Icon  Description automatically generated once, select Setting, then press menu A picture containing icon  Description automatically generated button. | Verify Backlight is highlighted. |  |  |  |
| 4 | Press menu A picture containing icon  Description automatically generated to enter the backlight dialog. |  |  |  |  |
| 5 | The very first menu item has a check mark for the ON selection, if not highlight and select Menu. |  |  |  |  |
| 6 | Press frequency down Icon  Description automatically generatedtwice to highlight the Timer Selection then press Menu. |  |  |  |  |
| 7 | The 2nd item in the list is 10 seconds, verify check mark in box if not highlight selection and press menu. |  |  |  |  |
| 8 | Use the speaker button to backout to the TX display. Wait 20 seconds then press speaker button to activate backlighting, do this a few times. |  |  |  |  |
| 9 | Stop the logging program and calculate the time of High current draw is 10 second. | Verify the 10-second high current draw of the backlighting appears twice in the log. |  |  |  |
| **20 Second Timer Test** | | | | | |
| 1 | Install Voltmeter and Current sensing leads between power source and external power lead to TX, start logging. |  |  |  |  |
| 2 | Press and hold menu button A picture containing icon  Description automatically generated until menu appears. |  |  |  |  |
| 3 | Press the frequency down button Icon  Description automatically generated once, select Setting, then press menu A picture containing icon  Description automatically generated button. | Verify Backlight is highlighted. |  |  |  |
| 4 | Press menu A picture containing icon  Description automatically generated to enter the backlight dialog. |  |  |  |  |
| 5 | The very first menu item has a check mark for the ON selection, if not highlight and select Menu. |  |  |  |  |
| 6 | Press frequency down Icon  Description automatically generatedtwice to highlight the Timer Selection then press Menu. |  |  |  |  |
| 7 | The 3rd item in the list is 20 seconds, verify check mark in box if not highlight selection and press menu. |  |  |  |  |
| 8 | Use the speaker button to backout to the TX display. Wait 30 seconds then press speaker button to activate backlighting, do this a few times. |  |  |  |  |
| 9 | Stop the logging program and calculate the time of High current draw is 20 second. | Verify the 20-second high current draw of the backlighting appears twice in the log. |  |  |  |
| **40 Second Timer Test** | | | | | |
| 1 | Install Voltmeter and Current sensing leads between power source and external power lead to TX, start logging. |  |  |  |  |
| 2 | Press and hold menu button A picture containing icon  Description automatically generated until menu appears. |  |  |  |  |
| 3 | Press the frequency down button Icon  Description automatically generated once, select Setting, then press menu A picture containing icon  Description automatically generated button. | Verify Backlight is highlighted. |  |  |  |
| 4 | Press menu A picture containing icon  Description automatically generated to enter the backlight dialog. |  |  |  |  |
| 5 | The very first menu item has a check mark for the ON selection, if not highlight and select Menu. |  |  |  |  |
| 6 | Press frequency down Icon  Description automatically generatedtwice to highlight the Timer Selection then press Menu. |  |  |  |  |
| 7 | The 4th item in the list is 40 seconds, verify check mark in box if not highlight selection and press menu. |  |  |  |  |
| 8 | Use the speaker button to backout to the TX display. Wait 50 seconds then press speaker button to activate backlighting, do this a few times. |  |  |  |  |
| 9 | Stop the logging program and calculate the time of High current draw is 10 second. | Verify the 40-second high current draw of the backlighting appears twice in the log. |  |  |  |

## TX Broadcast Board Tuning Capacitor/Relay Test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TX Broadcast Board Tuning Capacitor/Relay Test** | | | | | |
| Setup | -- MFL TX  - Li-Ion Battery Pack  -- 5: Induction Clamp  - AirSpy R2 SDR Receiver  - SDR# Studio SDR control software, under radio tab, select CW, offset 100MHz, Filter Blackman-Harris 4, Bandwidth 2MHz, 10th order filter, CW shift 660Hz. Under Source select linear with gain set to zero, 2.5 MSPS Complex and decimation of 32 | - 100 MHz upconverter  - Wire Loop Test Antenna  -- Enable the following frequencies in TX with induction clamp 8.01k, 8.19k, 8.44k, 9.82k, 29.4k, 32.8k, 38k, 44.6k, 65.5k, 78.1k, 80.4k, 82.5k, 83.1k, 89k, 131k, 200k | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Transmitter Broadcast Board Tuning Capacitor/Relay Test** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **8.01kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.01k (8010). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8010Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 70.1dB) |
|  | **8.19kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.19k (8192). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8192Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.1dB) |
|  | **8.44kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.44k (8440). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8440Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 70.1dB) |
|  | **9.82kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 9.82k (9820). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 9820Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.1dB) |
|  | **29.4kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 29.4k (29430). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 29430Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 72.9dB) |
|  | **32.8kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 32.8k (32768). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 32768Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.8dB) |
|  | **38kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 38k (38000). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 38000Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 74.8dB) |
|  | **44.6kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 44.6k (44624). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 44624Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.2dB) |
|  | **65.5kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 65.5k (65536). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 65536Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 70.1dB) |
|  | **78.1kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 78.1k (78125). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 78125Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 72.2dB) |
|  | **80.4kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 80.4k (80430). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 80430Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.9dB) |
|  | **82.5kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 82.5k (82488). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 82488Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.2dB) |
|  | **83.1kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 83.1k (83078). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 83078Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 71.7dB) |
|  | **89kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 891k (89000). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 89000Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 70.0dB) |
|  | **131kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 131k (131072). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 131072Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 74.0dB) |
|  | **200kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 200k (200000). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 200000Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 72.4dB) |

## TX Broadcast Induction Antenna (Internal)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TX Broadcast Induction Antenna (Internal) | | | | | |
| Setup | -- MFL TX  - Li-Ion Battery Pack  -- 5: Induction Clamp  - AirSpy R2 SDR Receiver  - SDR# Studio SDR control software, under radio tab, select CW, offset 100MHz, Filter Blackman-Harris 4, Bandwidth 2MHz, 10th order filter, CW shift 660Hz. Under Source select linear with gain set to zero, 2.5 MSPS Complex and decimation of 32 | - 100 MHz upconverter  - Wire Loop Test Antenna  -- Enable the following frequencies in TX with induction clamp 8.01k, 8.19k, 8.44k, 29.4k, 32.8k,44.6k, 65.5k, 78.1k, 80.4k, 83.1k, 131k | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| TX Broadcast Induction Antenna (Internal) | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **8.01kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.01k (8010). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8010Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 70.1dB) |
|  | **8.19kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.19k (8192). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8192Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 75.3dB) |
|  | **8.44kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 8.44k (8440). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 8440Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 74.8dB) |
|  | **29.4kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 29.4k (29430). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 29430Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.2dB) |
|  | **32.8kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 32.8k (32768). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 32768Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 72.5dB) |
|  | **44.6kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 44.6k (44624). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 44624Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.8dB) |
|  | **65.5kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 65.5k (65536). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 65536Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.5dB) |
|  | **80.4kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 80.4k (80430). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 80430Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 74.1dB) |
|  | **83.1kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 83.1k (83078). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 83078Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.5dB) |
|  | **131kHz Signal to Noise Ratio** | |  |  |  |
| 1 | Set TX to the frequency 131k (131072). |  |  |  |  |
| 2 | Press TX Power button for full output |  |  |  |  |
| 3 | Set SDR to 131072Hz. |  |  |  |  |
| 4 | In SDR Studio Hover mouse pointer over selected frequency and read SNR in db. | Verify Signal to Noise Ratio ≈ -70dB. |  |  | (Tested 73.8dB) |

## TX Battery State-of-Charge Display

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Battery State-of-Charge Display | | | | | | |
| -- MFL TX connected to line  -- ‘D’ Cell Battery Pack  - Two discharged ‘D’ cell batteries | | -- Default settings | | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the Transmitter Battery State-of-Charge Display.** | | | | | | |
| **Action** | | **Results** | | **Pass** | **Fail** | **Description of Failure/Comments** |
| **Battery State-of-Charge Display** | | | |  |  |  |
| 1 | Install battery tray in TX and turn on power | |  |  |  |  |
| 2 | Verify Battery State of Charge displays a full charge. | |  |  |  |  |
| 3 | Turn TX power off and remove battery tray | |  |  |  |  |
| 4 | Install two discharge cells in to tray and reinstall in TX | |  |  |  |  |
| 5 | Power TX on and verify State of Charge display | |  |  |  |  |
| 6 | Turn TX output power on and verify Battery display show a discharged state. | |  |  |  |  |

# Advanced Features

## RX/TX Communications

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **RX/TX Communications** | | | | | |
| Setup | -- RX configured and calibrated  -- TX connected to line  -- Line grounded  -- Dual Direct Connect Leads connected | -- Depth of line known  -- Default settings  -- Receiver On  -- TX On | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the radio linking and communication of receiver and the transmitter.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **RX/TX Communications** | |  |  |  |
| 1 | Press and hold RX menu key, select Configuration/Settings/ Communications/Link Info | RX display shows Not Linked |  |  |  |
| 2 | Press and release RX mode key, select Link TX | RX display shows ”Turn on Transmitter and enter Link Mode Press any key to continue” |  |  |  |
|  | Press and hold TX menu key. Select Settings/Communication/Link RX | TX displays “Initializing…”  “Waiting for RX Link…”  “Press any key to cancel…” |  |  |  |
| 3 | Follow instructions on RX display | RX starts Searching for Devices |  |  |  |
| 4 | Find TX in list of devices and select device | RX displays “Linking” |  |  |  |
| Once connected TX displays “Link Successful” and returns to main screen |  |  |  |
| 5 | Press and release RX volume key | RX display returns to locate screen |  |  |  |
| Link icon appears in lower left corner of RX display |  |  |  |
| 6 | Press and release frequency key | RX changes to next higher frequency |  |  |  |
| TX changes to same frequency |  |  |  |
| 7 | Press and hold RX menu key, select TX Control | RX display changes to TX Control screen |  |  |  |
| TX power level icon flashing on RX screen |  |  |  |
| 8 | Press and release RX frequency key | TX power level increases each key press |  |  |  |
| 9 | Press and release RX down key | TX power level icon stops flashing |  |  |  |
| TX leads icon starts flashing |  |  |  |
| 10 | Press and release RX frequency key | Active lead toggles each key press |  |  |  |
| End | Press and release RX volume key | Display returns to locate screen |  |  |  |

# Accessories

## External Power

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **External Power** | | | | | |
| Setup | -- RX configured and calibrated  -- TX connected to line  -- Line grounded  -- Direct Connect Leads connected | -- Depth of line known  -- Default settings  -- Receiver On  -- TX Off  -- 12V power source with cigarette adapter | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the external power functionality of the transmitter.**  Output interrupted Output reached regulation | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Connect 12V Adapter Cable Accessory to TX and then to 12V power source cigarette adapter. Turn on power source and then TX. | TX displays external power connected icon in upper left corner in place of battery level |  |  |  |
| 2 | Press and release Power output key 3 times | Output power level increases to power level 4 |  |  |  |
| Output interuppted then regulates |  |  |  |
| 3 | Press and hold menu key. Press and release volume key 3 times. | Current and power decreases on TX display |  |  |  |
| Output interuppted then regulates |  |  |  |
| 4 | Press and hold menu key. Select Output/High power output/Enable. Press and release volume key 3 times. | High power output enabled icon appears |  |  |  |
| Output power at 12W |  |  |  |
| End | Turn TX off, disconnect external power adapter, and turn TX back on | Battery level icon reappears |  |  |  |

## Live Power Adapter (LPA)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Live Power Adapter** | | | | | |
| Setup | -- RX configured and calibrated  -- Line with live power  -- Access to line conductor  -- No leads connected to TX | -- Depth of line known  -- Default settings  -- TX Off | NOTE: Read procedures and expected results for all  steps before beginning this test.  **To help avoid injury:**  • Read and follow all safety precautions.  • Do not work with this device unless you are properly qualified to work on live power conductors.  • Use proper personal protective equipment for voltage and current of power conductor being  connected to as defined by OSHA standards.  • Do not work with this device unless you have completed proper training and have read the  operator’s manual.  • Do not connect to a conductor with a voltage greater than 480V.  • Connect this device to the transmitter before connecting to the live power conductor. Connect only one clamp at a time to live power conductor.  • Inspect cables for damage. Replace accessory if cables are damaged. | | |
| **This tests the radio linking and communication of receiver and the transmitter.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
|  | **LPA** | |  |  |  |
| 1 | Connect LPA to TX output connector, connect black lead to ground stake, and red lead to live power conductor. Turn on TX | TX display appears as normal |  |  |  |
| 2 | Hook to live power without LPA? | TX displays lightning bolt and shuts off |  |  |  |
| End | Other steps/tests? | TBD |  |  |  |

# MFL Factory Config Wizard

## Connecting to TX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Connecting to TX** | | | | | |
| Setup | -- New production TX unit  -- fresh install of current production software | -- TX connector to PC with USB cable  -- PC with internet connection | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the wizard to connect to the TX.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Download and install MFL Factory Config Wizard from http://subsitedesign/apps/MFLFactoryConfigWizardTEST/ | MFL Factory Config Wizard installs and a shortcut is added to the PC desktop |  |  |  |
| 2 | Launch wizard | Wizard opens and Connect box appears |  |  |  |
| 3 | With TX off select Connect | Message: “No MFL device detected. Connect USB cable and try again.” appears. |  |  |  |
| 4 | Select OK | Message disappears |  |  |  |
| 5 | TX on. Select Connect | Connecting appears in lower left |  |  |  |
|  | Wizard connects successfully | Step 1 – Firmware Update screen appears. |  |  |  |
| End | MFL TX Connected in lower left corner |  |  |  |
| Serial number in box 2nd from left at the bottom, check s/n is correct |  |  |  |
| Firmware Version in box 3rd from left at the bottom, check version is correct |  |  |  |

## Firmware Update

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Firmware Update** | | | | | |
| Setup | -- Fresh install of current production software  -- MFL Factory Wizard installed on PC  -- TX on | -- TX connector to PC with USB cable  -- PC with internet connection | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the wizard to update the TX firmware.**  Programming status box | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch wizard | Wizard opens and Connect box appears |  |  |  |
| 2 | Select Connect | Step 1 – Firmware Update screen appears. Note the Current Available Version and the Device Version |  |  |  |
| 3 | Select Update | Programming status bar appears and progress shown in green |  |  |  |
| Program information shown in box on right side of window |  |  |  |
| 4 | Update completed | Successful! and Done appear in programming status box |  |  |  |
| TX automatically shuts off |  |  |  |
| 7 | Select update again with TX still off | Message: “No MFL device detected. Connect USB cable and try again.” appears in the programming status box |  |  |  |
| 8 | Turn TX on and select Update. While updating unplug USB cable | Unhandled exception warning appears |  |  |  |
| TX shuts off |  |  |  |
| 9 | Select continue | Unhandled exception warning window closes |  |  |  |
| Progress bars stops |  |  |  |
| 11 | Press and hold f- and Right key and plug in USB cable. Select Update | Programming status bar appears and progress shown in green |  |  |  |
| Program information shown in box on right side of window |  |  |  |
| 12 | Update completed | Successful! and Done appear in programming status box |  |  |  |
| TX automatically shuts off |  |  |  |
| 13 | Turn TX on and select Update. While updating unplug USB cable | Unhandled exception warning appears |  |  |  |
| TX shuts off |  |  |  |
| 14 | Select Quit | Utility closes |  |  |  |
| 15 | Press and hold f- and Right key and plug in USB cable. Launch utility, select Connect, and select Update | Programming status bar appears and progress shown in green |  |  |  |
| Program information shown in box on right side of window |  |  |  |
| End | Update completed | Successful! and Done appear in programming status box |  |  |  |
| TX automatically shuts off |  |  |  |

## Configure TX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Configure TX** | | | | | |
| Setup | -- Fresh install of current production software  -- Test version of MFL Factory Wizard installed on PC  -- TX on | -- TX connector to PC with USB cable  -- PC with internet connection | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the wizard to configure the TX unit.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch wizard | Wizard opens and Connect box appears |  |  |  |
| 2 | Select Connect | Step 1 – Firmware Update screen appears. |  |  |  |
| 3 | Confirm correct Device Version of firmware is on the TX. | Note the version of the device firmware |  |  |  |
| 4 | Select Next | Step 2 – Device Setup screen appears |  |  |  |
| 5 | Select the desired Top Number from the dropdown menu | Enter Serial Number box appears |  |  |  |
|  | **102-1483, TX General 5W Basic Base Unit** | |  |  |  |
| 6 | Check the specific model and default information below the 102 number | Brand: General |  |  |  |
| Model: Hotspot |  |  |  |
| SubModel: 5WB |  |  |  |
| Language: English |  |  |  |
| Volume: Off |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |
|  | **102-1516, TX ULT-T12 ADV** | |  |  |  |
| 6 | Check the specific model and default information below the 102 number | Brand: Cable Detection |  |  |  |
| Model: Ultra |  |  |  |
| SubModel: 12W+ |  |  |  |
| Language: English |  |  |  |
| Volume: Off |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |
|  | **102-1520, TX ULT-T12 STD** | |  |  |  |
| 6 | Check the specific model and default information below the 102 number | Brand: Cable Detection |  |  |  |
| Model: Ultra |  |  |  |
| SubModel: 12W |  |  |  |
| Language: English |  |  |  |
| Volume: Off |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |
|  | **102-1521, TX ULT-T5 STD** | |  |  |  |
|  |  | Brand: Cable Detection |  |  |  |
|  |  | Model: Ultra |  |  |  |
|  |  | SubModel: 5W |  |  |  |
|  |  | Language: English |  |  |  |
|  |  | Volume: Off |  |  |  |
|  |  | Meter: Advanced |  |  |  |
|  |  | Backlight: On |  |  |  |
|  |  | Backlight Timer: 5 Seconds |  |  |  |
|  |  | Shutdown Timer: 2 Hours |  |  |  |
|  |  | Direction Enabled: Enabled |  |  |  |
|  |  | High Power Timer: 5 Minutes |  |  |  |
|  |  | Dual Output: Disabled |  |  |  |
|  |  | Output Select: Red Lead |  |  |  |
|  |  | Radio: On |  |  |  |
|  | **102-1661, TX SPARTAN 5W BASIC BASE UNIT" EN** | |  |  |  |
|  |  | Brand: Spartan |  |  |  |
|  |  | Model: Spartan |  |  |  |
|  |  | SubModel: 5WB |  |  |  |
|  |  | Language: English |  |  |  |
|  |  | Volume: Off |  |  |  |
|  |  | Meter: Advanced |  |  |  |
|  |  | Backlight: On |  |  |  |
|  |  | Backlight Timer: 5 Seconds |  |  |  |
|  |  | Shutdown Timer: 2 Hours |  |  |  |
|  |  | Direction Enabled: Enabled |  |  |  |
|  |  | High Power Timer: 5 Minutes |  |  |  |
|  |  | Dual Output: Disabled |  |  |  |
|  |  | Output Select: Red Lead |  |  |  |
|  |  | Radio: On |  |  |  |
|  | **102-1777, UTG2 Advanced** | |  |  |  |
| 6 | Check the specific model and default information below the 102 number | Brand: Subsite |  |  |  |
| Model: UtiliGuard2 |  |  |  |
| SubModel: 12W+ |  |  |  |
| Language: English |  |  |  |
| Volume: Off |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |
| 7 | Enter Serial Number | Set Manufactured Date options appear |  |  |  |
| 8 | Select Today or Date from Device | MFG Date: updates |  |  |  |
| Device Hours, Reset Device Hours? Options appear |  |  |  |
| 9 | Select Yes or No for Reset Device Hours | Select PCB Versions box appears |  |  |  |
| Default Main PCB Version 1 |  |  |  |
| Default Headstack PCB Version 3 |  |  |  |
| Default Interface PCB Version 5 |  |  |  |
| 10 | Update any PCB versions if needed and select Versions Correct | Send selection box becomes active |  |  |  |
| 11 | Select Send | Sending Data… status bar appears and progress shown in green |  |  |  |
| When sending data complete, changes to Sending Splash… and progress shown in green |  |  |  |
| Once sending splash complete, changes to Success!!! |  |  |  |
| End | Select Done | Step 2 – Device Setup window closes and returns to Connect screen |  |  |  |

## Shipping Setup

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Configure TX** | | | | | |
| Setup | -- Fresh install of current production software  -- Test version of MFL Factory Wizard installed on PC  -- TX on | -- TX connector to PC with USB cable  -- PC with internet connection | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the shipping setup functionality of the wizard.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch wizard | Wizard opens and Connect box appears |  |  |  |
| 2 | Select Connect | Step 1 – Firmware Update screen appears. |  |  |  |
| 3 | Confirm correct Device Version of firmware is on the TX. | Note the version of the device firmware |  |  |  |
| 4 | Select Shipping Setup | Shipping Setup screen appears |  |  |  |
| 5 | Select the desired TX Country Exception: None, China, Saudi Arabia, UAE, or Singapore and select Send | Status bar appears and progress shown in green. |  |  |  |
| When complete Success!!! Appears and Done selection box becomes active |  |  |  |
| 6 | Select Done | Shipping Setup window closes and returns to Connect screen |  |  |  |
| 7 | Select Connect then Shipping Setup | Previous country exception is still selected |  |  |  |
| 8 | Repeat step 5 thru 7 for all other country exceptions | Status bar appears and progress shown in green. |  |  |  |
| When complete Success!!! Appears and Done selection box becomes active |  |  |  |
| End | Select Done | Shipping Setup window closes and returns to Connect screen |  |  |  |

# Locator Configuration Utility

## Connecting to TX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Connecting to TX** | | | | | |
| Setup | -- New production TX unit  -- Fresh install of current production software | -- TX connector to PC with USB cable  -- PC with internet connection | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the wizard to connect to the TX.**  Programming status box | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Download and install Locator Configuration Utility from http://subsitedesign/apps/MFLConfigTEST | Utility installs and a shortcut is added to the PC desktop | x |  |  |
| 2 | Launch utility | Utility opens in the Software Update tab | x |  |  |
| 3 | With TX off select Connect | Message: “No MFL device detected. Connect USB cable and try again.” appears. | X |  |  |
| 4 | Select OK | Message disappears | X |  |  |
| 5 | Turn TX on. Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter | X |  |  |
| Below Device Version updates to: | Green circle with check and software version | X |  | 15.6 |
| Device Information Box updates: | Locked Status: Unlocked or Locked | X |  | Unlocked |
| Serial Number: matches s/n of unit | X |  |  |
| Device Type: matches type of TX | X |  |  |
| Manufacture Date: matches date in unit | X |  |  |
| Calibration Date: matches date in unit |  | X | Could not find |
| Hour Count: matches device hours in unit |  | X | Computer: 15.03, TX: 15.12 |
| End |  |  |  |  |  |

## Firmware Update

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Firmware Update** | | | | | |
| Setup | -- Fresh install of current production TX firmware | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the configuration utility to update the TX firmware.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab | X |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter | X |  |  |
| 3 | Select Update | Programming and programming status bar appear below the versions | X |  |  |
| 4 | Update complete | Programming Succerssful! appears below status bar | X |  |  |
| Setup | -- Version V36.4 or earlier of Locator Configuration Utility installed on PC |  |  | | |
|  | **Unit with 216-1338 – Original MK10 Processor** | |  |  |  |
| 5 | Select Update | Programming and programming status bar appear below the versions |  |  |  |
| 6 | Update complete | Programming Succerssful! appears below status bar |  |  |  |
|  | **Unit with 216-10037 - MK50 Processor (was MK30, 50 needs to be added)** | |  |  |  |
| 5 | Select Update | TX shuts off | X |  |  |
| 6 | Update completed | n/a | X |  |  |
| Setup | -- Update Locator Configuration Utility to the latest test version |  |  | | |
| 1 | Launch utility | Utility opens in the Software Update tab |  |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter |  |  |  |
| 3 | Select Update | Programming and programming status bar appear below the versions |  |  |  |
| 4 | Update complete | Programming Succerssful! appears below status bar |  |  |  |
|  | **Unit with 216-1338 – Original MK10 Processor** | |  |  |  |
| 5 | Select Update | Programming and programming status bar appear below the versions |  |  |  |
| 6 | Update complete | Programming Succerssful! appears below status bar |  |  |  |
|  | **Unit with 216-10037 - MK30 Processor** | |  |  |  |
| 5 | Select Update | Programming and programming status bar appear below the versions |  |  |  |
| 6 | Update completed | Programming Succerssful! appears below status bar |  |  |  |

## Password Settings

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Password Setting** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the functionality of the configuration utility to password protect device.** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab | x |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter | x |  |  |
| 3 | Check Device Information, Locked Status | Unit is unlocked | x |  |  |
| 4 | Select Password Protect Device box | Please Ented New Password window appears | x |  |  |
| 5 | Enter password twice | OK box becomes active | x |  |  |
| 6 | Select OK | Password Set! Message window appears | x |  |  |
| 7 | Select OK | Password Set! Message window disappears | x |  |  |
| 8 | Unplug USB cable, cycle power on TX, plug USB cable back in, and select Connect | Please Enter Password windoe appears | x |  |  |
| 9 | Enter wrong password | Device Information: Locked and Incorrect Password! message appears | x |  |  |
| 10 | Select OK | Incorrect Password! message disappears | x |  |  |
| 11 | Select Connect | Please Enter Password windoe appears | x |  |  |
| 12 | Enter password and select OK | Device Information: Unlocked | x |  |  |
| Password Settings, Unlock Device inactive | x |  |  |
| Password Settings, Remove Password Protection active | x |  |  |
| 13 | Select Remove Password Protection | Password Disabled! Message appears | x |  |  |
| 14 | Select OK | Password Disabled! Message disappears | x |  |  |
|  |  |  |  |  |  |

## Configuration/Frequencies

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Firmware Update** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the frequency functionality of the configuration utility** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab | x |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter | x |  |  |
| 3 | Select Configuration tab | Configuration screen appears on the Frequencies tab | x |  |  |
| 4 | Select Load Factory Defaults in lower left | Table updates to the factory defaults (see separate document for correct settings) | x |  |  |
| Total Frequency Count updates to 77 of 100 | x |  |  |
| 5 | Deselect Show All, upper left of table. “Show All” box should default selected | Table updates to show only frequencies available | x |  |  |
| 6 | Select “**Show All “** | Table updates to show all frequencies | x |  | Hard to understand |
| 7 | Select **“Select All”** box | All Availble frequncies selected in table | x |  |  |
| 8 | Select De-Select All box | All Available frequncies except 263Hz de-selected in table | X |  |  |
| 9 | Select Read Configuration From Device | Status bars (2) at lower left show progress in green, when complete table updates to match device | x |  |  |
| 10 | Select Save Configuration To Disk | Save Settings To Disk window appears | x |  |  |
| 11 | Select file location and enter file name | .LocDat files saved to selected location | x |  |  |
| 12 | Select De-Select All. Select 9.5k Available, Enabled, Direct Connect, Clamp, and Broadband Clamp. Select Write Configuration to Device | Progress bars shows progress of writing to unit in green. Unit updated to only have 9.5K Direct Connect, Clamp and Broadband Clamp | x |  | Only one progress bar is green, the one on the very left side |
| 13 | Unplug USB, cycle power and plug USB back in | Unit updated to only have 9.5K Direct Connect, Clamp and Broadband Clamp | x |  |  |
| 13 | Select Load Configuration From Disk and load the file saved in step 11 | Table updates to match saved settings | x |  |  |
| 14 | Select Write Configuration To Device | Progress bars shows progress of writing to unit in green | x |  | Only one progress bar is green, the one on the left |
| 15 | Unplug USB, cycle power and plug USB back in | Unit updated to match settings in table | x |  |  |
| 16 | Select Write Configuration to Device and unplug USB while writing | Unhandled exception error message appears | x |  |  |
| 17 | Plug USB back in and select Continue | Error message disappears, progress does not continue | x |  |  |
| 18 | Select Write Configuration to Device | Progress bars shows progress of writing to unit in green | x |  |  |
| 19 | Select Write Configuration to Device and unplug USB while writing | Unhandled exception error message appears | x |  |  |
| End | Plug USB back in and select Quit | Utility closes | x |  |  |
|  |  |  |  |  |  |

## Configuration/Custom Frequencies

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Configuration/Custom Frequencies** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the custom frequency functionality of the configuration utility** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab |  |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter |  |  |  |
| 3 | Select Configuration tab | Configuration screen appears on the Frequencies tab |  |  |  |
| 4 | Select Read Configuration From Device | Status bars (2) at lower left show progress in green, when complete table updates to match device |  |  |  |
| Total Frequency Count updates to XX of 100, where XX was the number freq in TX |  |  |  |
| 5 | Select Custom Frequencies tab | Updates to custom frequencies screen |  |  |  |
| Note the number of Custom Frequncy Slots Available |  |  |  |
| 6 | Select Add Custom Frequency box | Add Custom Frequency window appears |  |  |  |
| 7 | Enter desired frequency below 540 in Hz | Name updated in xxxHz format |  |  |  |
| Available, Line, and Direct Connect checked |  |  |  |
| Clamp and Induction gray out and are unavailble to check |  |  |  |
| 8 | Check all available boxes and select OK | Frequency added to table with all availble boxes checked |  |  |  |
| Number show after Custom Frequency Slots Available:, reduced by 1 |  |  |  |
| 9 | Select Write Configuration To Device | Frequency added to TX and enabled with Direct Connect and Clamp |  |  |  |
| 10 | Select custom frequency in list and select Remove Selected Frequency box | Frequency selected disappears from list |  |  |  |
| 11 | Select Write Configuration To Device | TX updated minus the custom frequency |  |  |  |

## Configuration/Settings

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Configuration/Settings** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the settings functionality of the configuration utility** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab |  |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter |  |  |  |
| 3 | Select Configuration tab | Configuration screen appears on the Frequencies tab |  |  |  |
| 4 | Select Settings tab | Updates to settings screen |  |  |  |
| All selections are blank |  |  |  |
| 5 | Select Read Configuration From Device box, check the settings loaded. | Green checkmark appears |  |  |  |
| Language: English |  |  |  |
| Volume: Mute |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Output Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |
| 6 | Select Save Configuration To Disk | Save Settings To Disk window appears |  |  |  |
| 7 | Select file location and enter file name | .LocDat files saved to selected location |  |  |  |
| 8 | Deselect Volume: Mute | Green checkmark changes to red X |  |  |  |
| 9 | Select Write Configuration To Device | Left Progress bar turns green but right progress bar does not change, nothing written to device |  |  | Need to add some indication that nothing is written |
| 10 | Select Volume: Mute | Green checkmark changes to red X, then back to green checkmark |  |  |  |
| 11 | Change each of the items. Drop downs select the next item down. Select Write Configuration to Device | Progress bars shows progress of writing to unit in green |  |  |  |
| 12 | Unplug USB, cycle power of TX, plug in USB. Close config utility, relaunch, connect, and select Configuration/Settings tab | Updates to settings screen and all selections are blank |  |  |  |
| 13 | Select Read Configuration From Device | Green checkmark appears |  |  |  |
| Language: Espanol |  |  |  |
| Volume: On |  |  |  |
| Meter: Simple |  |  |  |
| Backlight: Off |  |  |  |
| Backlight Timer: 10 Seconds |  |  |  |
| Shutdown Timer: 4 Hours |  |  |  |
| Direction Enabled: Disabled |  |  |  |
| High Power Output Timer: 10 Minutes |  |  |  |
| Dual Output: Enabled |  |  |  |
| Output Select: White Lead |  |  |  |
| Radio: Off |  |  |  |
| 14 | Select Load Configuration From Disk | Open window appears |  |  |  |
| 15 | Select file saved in step x and Open | Green checkmark appears |  |  |  |
| Language: English |  |  |  |
| Volume: Mute |  |  |  |
| Meter: Advanced |  |  |  |
| Backlight: On |  |  |  |
| Backlight Timer: 5 Seconds |  |  |  |
| Shutdown Timer: 2 Hours |  |  |  |
| Direction Enabled: Enabled |  |  |  |
| High Power Output Timer: 5 Minutes |  |  |  |
| Dual Output: Disabled |  |  |  |
| Output Select: Red Lead |  |  |  |
| Radio: On |  |  |  |

## Screen Capture

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Screen Capture** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the screen capture functionality of the configuration utility** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab |  |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter |  |  |  |
| 3 | Select Screen Capture tab | Screen Capture screen appears |  |  |  |
| 4 | Select Save Image | No image to save message appears |  |  |  |
| 5 | Select OK | Message disappears |  |  |  |
| 6 | Select Capture Screen | Image of TX screen appears in box |  |  |  |
| 7 | Select Save Image | Save As window appears |  |  |  |
| End | Select location, enter file name, and select save | Save As window disappears and file saved to selected location |  |  |  |

## Splash Screen

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Splash Screen** | | | | | |
| Setup | -- Fresh install of current production TX firmware  -- Test version of Locator Configuration Utility | -- TX connector to PC with USB cable  -- PC with internet connection  -- TX on | NOTE: Read procedures and expected results for all  steps before beginning this test. | | |
| **This tests the splash screen functionality of the configuration utility** | | | | | |
| **Step** | **Action** | **Results** | **Pass** | **Fail** | **Description of Failure/Comments** |
| 1 | Launch utility | Utility opens in the Software Update tab |  |  |  |
| 2 | Select Connect | Next to Connect box changes to connecting…, then Connected to Transmitter |  |  |  |
| 3 | Select Splash Screen tab | Splash Screen screen appears |  |  |  |
| 4 | Select Save Image | No image to save message appears |  |  |  |
| 5 | Select OK | Message disappears |  |  |  |
| 6 | Select Capture Screen | Image of TX screen appears in box |  |  |  |
| 7 | Select Save Image | Save As window appears |  |  |  |
| End | Select location, enter file name, and select save | Save As window disappears and file saved to selected location |  |  |  |