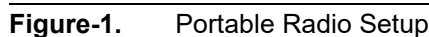


# Radio Test and Alignment Setup

This quick start guide provides an overview of the sequential steps on how to conduct Auto Testing and Alignment of Motorola's portable and mobile radios using the Anritsu S412E LMR Master, MA25211A Auto Test and Alignment kit and MX281000A Auto Test and Alignment software. For complete documentation of the features and test processes refer to the MX281000A User Guide PN: 10580-00498.

1. Install the MX281000A Auto Test and Alignment software on a Windows PC/laptop. Enable the license key using either PC license file format or USB dongle license key.
2. Refer to [Figure 1](#) to connect the MA25211A kit contents of portable radio setup. Refer to [Figure 2](#) to connect the kit contents of mobile radio setup.



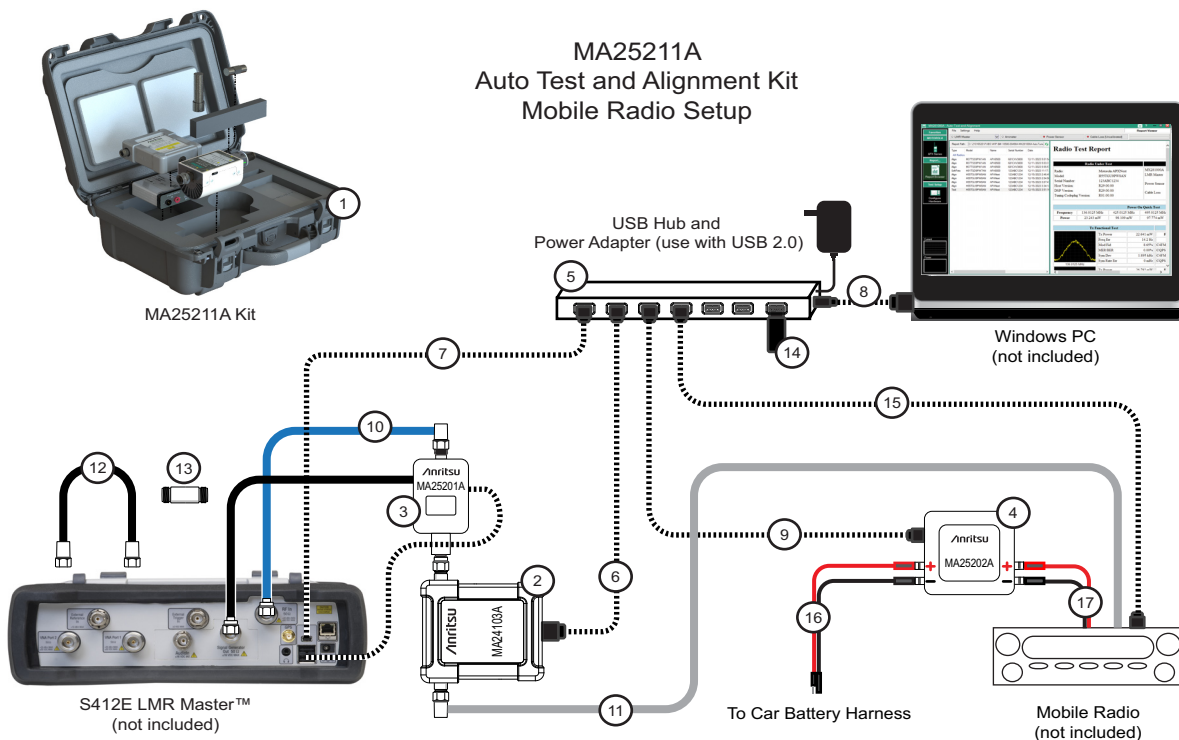


**Figure-2. Mobile Radio Setup**

3. Ensure the power setting on the user-supplied power supply is 7.5 volts for testing the portable radios and is 13.6 volts for testing mobile radios.

**Note**

Using a battery eliminator is recommended with portable radios, especially when performing the alignment process.

4. Open the MX281000A software. Click the APX Series button on the left to display the Motorola Radio Test and Alignment screen.
5. Click LMR Master button on the Test Equipment Status toolbar to manually connect to the S412E. To connect automatically, click Settings > Application Settings and check Automatically connect to LMR Master on program start box. See [Figure 3](#).

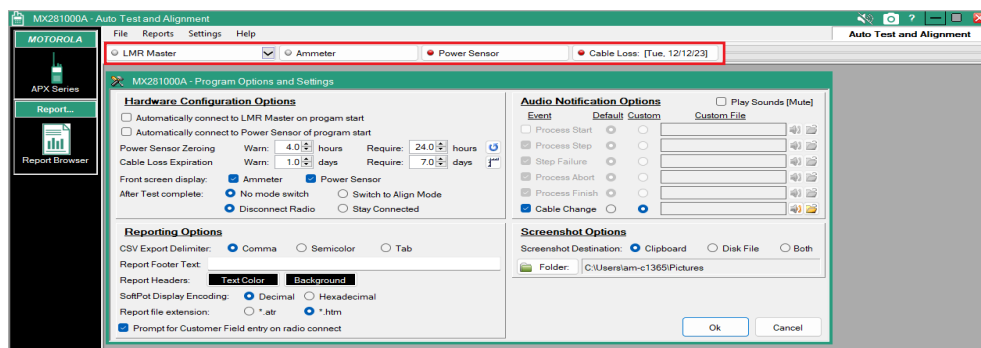


**Figure-3. Test Equipment Toolbar and MX281000A Program and Options Dialog**

- 
- Click the **Power Sensor** button on the Test Equipment status toolbar to manually connect to the MA24103A Inline Power Sensor. To connect automatically, click **Settings > Application Settings** and check **Automatically connect to Power Sensor** on program start box. See [Figure 3](#).

Notice that the application will automatically start zeroing the power sensor in order to reduce zero offset and noise impact caused by temperature changes and sensor drift, etc.

- Ensure the ammeter is connected and the **Ammeter** button is green when testing mobile radios. The ammeter is not required for testing portable radios and this step can be skipped.
- Click the **Cable Loss** button. Select the **Measure Cable Loss** and follow the prompts in the dialog shown in [Figure 4](#) to complete the measurement.

Note that the cable loss measurements are time-stamped. Refer to the user guide for detailed information by accessing **Help > View Help (MX281000A User's Guide)**.

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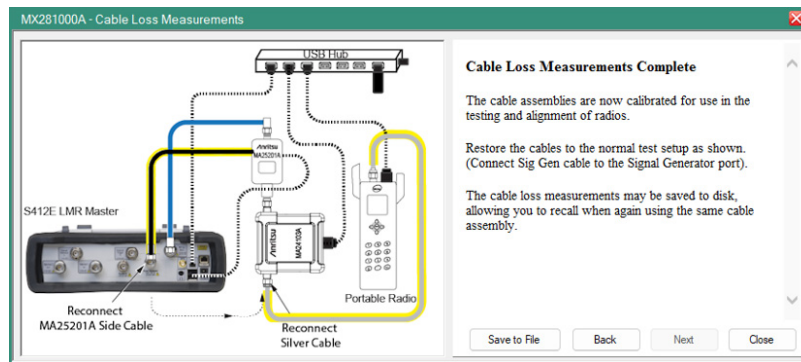


**Figure-4.** MX281000A - Cable Loss Measurements Dialog

- Check if the LMR Master, Ammeter (applicable for mobile radios), **Power Sensor** and **Cable Loss** buttons have turned green. Then click the **Connect** button under Radio Information section.

10. Notice the Connect button is replaced by Disconnect button after establishing a successful connection to the radio under test. See [Figure 5](#).

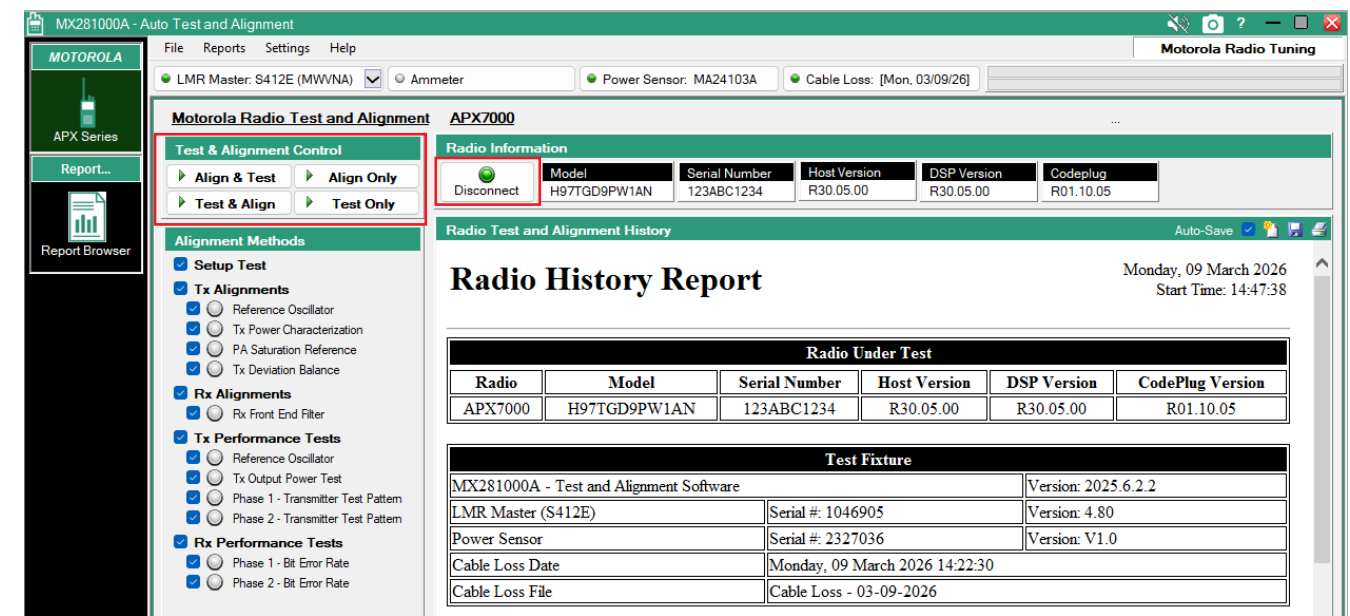


**Figure-5.** Disconnect Button and Test & Alignment Control Section

11. Select the desired option under Test & Alignment Control section. You can choose Align Only if only alignment needs to be performed, or choose Align & Test if both alignment and test are required. See [Figure 5](#). Refer to the user guide for detailed information.
  12. All the alignment methods are selected by default, unless one or more must be skipped. Uncheck a specific method to skip it. See [Figure 5](#).
- Note that the list of alignment methods may not be the same for all radios.
13. Some radios operating in the UHF band may require a setup change for the Rx Front End Filter (FEF) alignment. The MX281000A software will display Cable Changed Required dialog prompting you to change the setup by connecting the radio directly to the S412E as shown in [Figure 6](#). Refer to the user guide for detailed information.

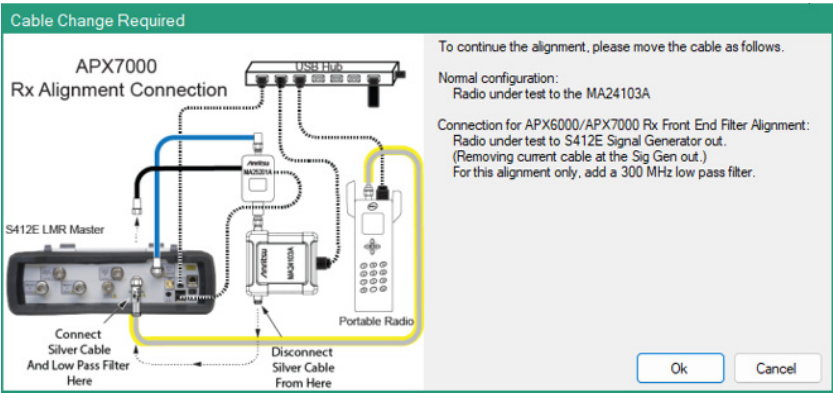


**Figure-6.** Cable Change Required Dialog - Connect Low Pass Filter

14. Connect a 1030-328-R Low Pass Filter to prevent unwanted signals from causing a misalignment during Rx FEF alignment for testing only APX7000 radios.

15. After the Rx FEF alignment is completed, disconnect the Low Pass Filter and restore the cable connections as shown in [Figure 7](#).

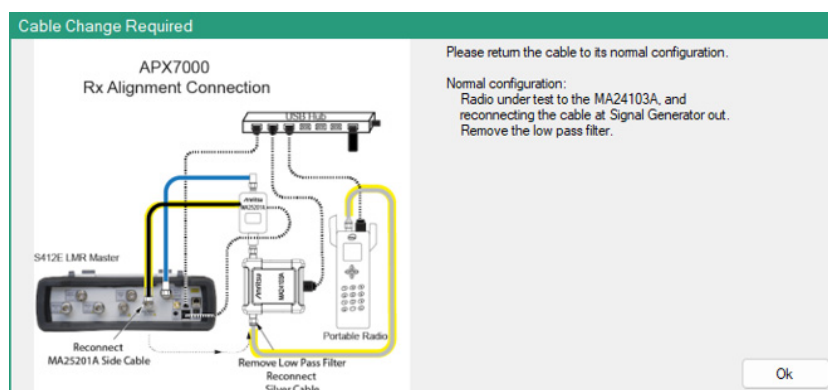


**Figure-7.** Cable Change Required Dialog - Disconnect Low Pass Filter

16. The Frequencies & Bands section at the bottom left displays the radio under test's supported frequencies and bands, keep in mind that they will vary based on the radio's options. See [Figure 8](#).
17. You can determine the progress of the test/alignment from the two bars at the top-right corner of the display screen. The top bar indicates the progress of the current alignment method. The bottom bar indicates the overall progress of the test and alignment. See [Figure 8](#).
18. Notice that while the test/alignment is still in process, the Radio Align & Test Report is generated. Typically the report includes details such as Radio Under Test, Test Fixture, Setup Check, Tx/Rx Alignment, etc. See [Figure 8](#).

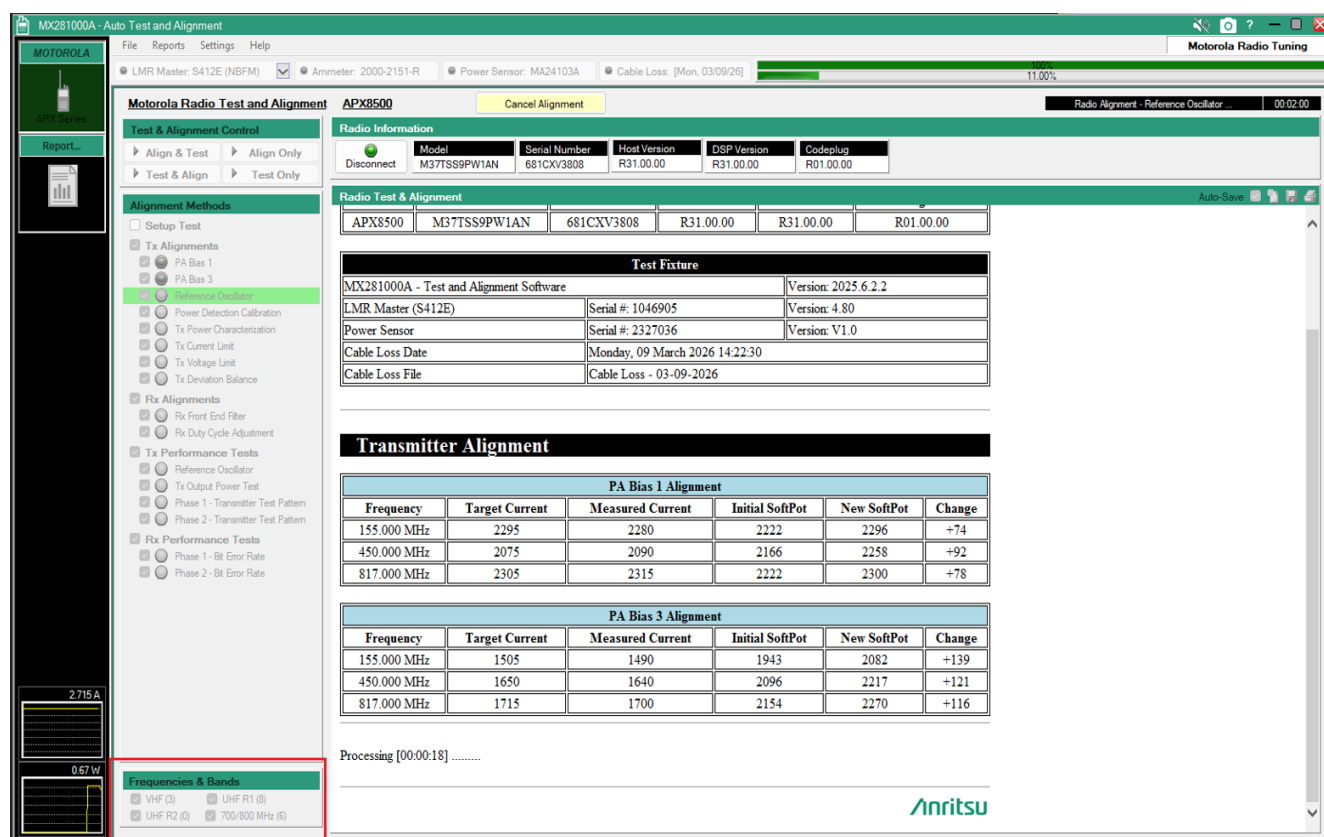


**Figure-8.** MX281000 Auto Test and Alignment Screen

19. Use the Radio Align & Test Report to verify the target power vs. measured power, the BER percentage, and the pass/fail status of the specific frequency in that band. The Pass status is indicated in green and Fail status will be highlighted in yellow. See [Figure 9](#).

| Radio Tx/Rx Testing                        |                   |              |                               |                                    |         |        |
|--------------------------------------------|-------------------|--------------|-------------------------------|------------------------------------|---------|--------|
| Tx Power Output (High Power)               |                   |              |                               |                                    |         |        |
| Frequency                                  | Cable Loss        | Target Power | Measure Power                 | Difference                         |         | Status |
|                                            |                   |              |                               | dB                                 | Watts   |        |
| 136.025 MHz                                | 0.33 dB           | 6.30 ±0.70 W | 6.25 W                        | -0.04 dB                           | -0.05 W | Pass   |
| 160.125 MHz                                | 0.35 dB           | 6.30 ±0.70 W | 6.26 W                        | -0.03 dB                           | -0.04 W | Pass   |
| 173.975 MHz                                | 0.37 dB           | 6.30 ±0.70 W | 6.27 W                        | -0.02 dB                           | -0.03 W | Pass   |
| 775.9875 MHz                               | 0.76 dB           | 2.65 ±0.30 W | 2.65 W                        | 0.00 dB                            | 0.00 W  | Pass   |
| 794.0125 MHz                               | 0.71 dB           | 2.65 ±0.30 W | 2.65 W                        | -0.01 dB                           | 0.00 W  | Pass   |
| 809.0125 MHz                               | 0.75 dB           | 3.30 ±0.40 W | 3.30 W                        | 0.00 dB                            | 0.00 W  | Pass   |
| 851.0125 MHz                               | 0.76 dB           | 3.30 ±0.40 W | 3.31 W                        | 0.01 dB                            | 0.01 W  | Pass   |
| 869.8875 MHz                               | 0.80 dB           | 3.30 ±0.40 W | 3.31 W                        | 0.01 dB                            | 0.01 W  | Pass   |
| Tx Power Output (Low Power)                |                   |              |                               |                                    |         |        |
| Frequency                                  | Cable Loss        | Target Power | Measure Power                 | Difference                         |         | Status |
|                                            |                   |              |                               | dB                                 | Watts   |        |
| 136.025 MHz                                | 0.33 dB           | 1.00 ±0.20 W | 0.97 W                        | -0.14 dB                           | -0.03 W | Pass   |
| 160.125 MHz                                | 0.35 dB           | 1.00 ±0.20 W | 0.97 W                        | -0.12 dB                           | -0.03 W | Pass   |
| 173.975 MHz                                | 0.37 dB           | 1.00 ±0.20 W | 0.97 W                        | -0.12 dB                           | -0.03 W | Pass   |
| 775.9875 MHz                               | 0.76 dB           | 1.00 ±0.20 W | 1.00 W                        | 0.01 dB                            | 0.00 W  | Pass   |
| 794.0125 MHz                               | 0.71 dB           | 1.00 ±0.20 W | 1.00 W                        | 0.01 dB                            | 0.00 W  | Pass   |
| 809.0125 MHz                               | 0.75 dB           | 1.00 ±0.20 W | 1.00 W                        | -0.02 dB                           | 0.00 W  | Pass   |
| 851.0125 MHz                               | 0.76 dB           | 1.00 ±0.20 W | 1.00 W                        | 0.00 dB                            | 0.00 W  | Pass   |
| 869.8875 MHz                               | 0.80 dB           | 1.00 ±0.20 W | 1.00 W                        | 0.01 dB                            | 0.00 W  | Pass   |
| Tx Pattern Transmission Test - P25 Phase 2 |                   |              |                               |                                    |         |        |
| Frequency                                  | Rx Power on S412E | BER          | Modulation Fidelity<br>[< 5%] | Symbol Deviation<br>[3000 ±300 Hz] | Status  |        |
| 136.025 MHz                                | 0.217 mW          | 51.65%       | 29.56%                        | 3.086 kHz                          | Fail    |        |
| 160.125 MHz                                | 0.210 mW          | 48.26%       | 25.38%                        | 3.093 kHz                          | Fail    |        |
| 173.975 MHz                                | 0.189 mW          | 49.69%       | 27.48%                        | 3.1 kHz                            | Fail    |        |
| 775.9875 MHz                               | 0.197 mW          | 51.21%       | 24.63%                        | 3.033 kHz                          | Fail    |        |
| 794.0125 MHz                               | 0.198 mW          | 2.32%        | 21.01%                        | 3.019 kHz                          | Fail    |        |
| 809.0125 MHz                               | 0.187 mW          | 16.05%       | 28.40%                        | 3.064 kHz                          | Fail    |        |
| 851.0125 MHz                               | 0.180 mW          | 50.23%       | 28.57%                        | 3.052 kHz                          | Fail    |        |
| 869.8875 MHz                               | 0.186 mW          | 52.66%       | 29.48%                        | 3.003 kHz                          | Fail    |        |

**Figure-9.** Radio Align & Test Report

20. Go to the Reports menu and click Generate Service Report to generate service reports. See [Figure 10](#). In the Service Report Generator dialog, you can add the user-defined fields, specify the sort order, font and start/end dates, etc. Refer to the user guide for detailed information.

MX281000A - Service Report Generator

Begin date: 9/ 9/2024
End Date: 9/ 9/2024

Automatic Fields
☒ Report Type
☐ Test Location
☐ Radio Firmware Ver.
☐ Codeplug Version
☐ User name
☐ Host PC

Customer Input Fields
☐ Push-To-Talk ID

Sort Order:
☒ Earliest First
☐ Most Recent First

File Types:
☒ Test Reports
☐ Alignment Reports

☒ Create CSV
Delimiter:
☐ Comma
☒ Semicolor
☐ Tab

Font Size: A

Create Report
Close

**Figure-10.** MX281000A Service Report Generator Dialog

21. To save or print the current report, go to the Reports menu and choose a corresponding option.
22. Click the Report Browser button to view reports saved on the computer. If necessary, click Report Path in the upper-left corner of the screen to change the location where the reports are saved. Remember to click the green Refresh icon to refresh the list and display the most current reports on the top, as shown in Figure 11.

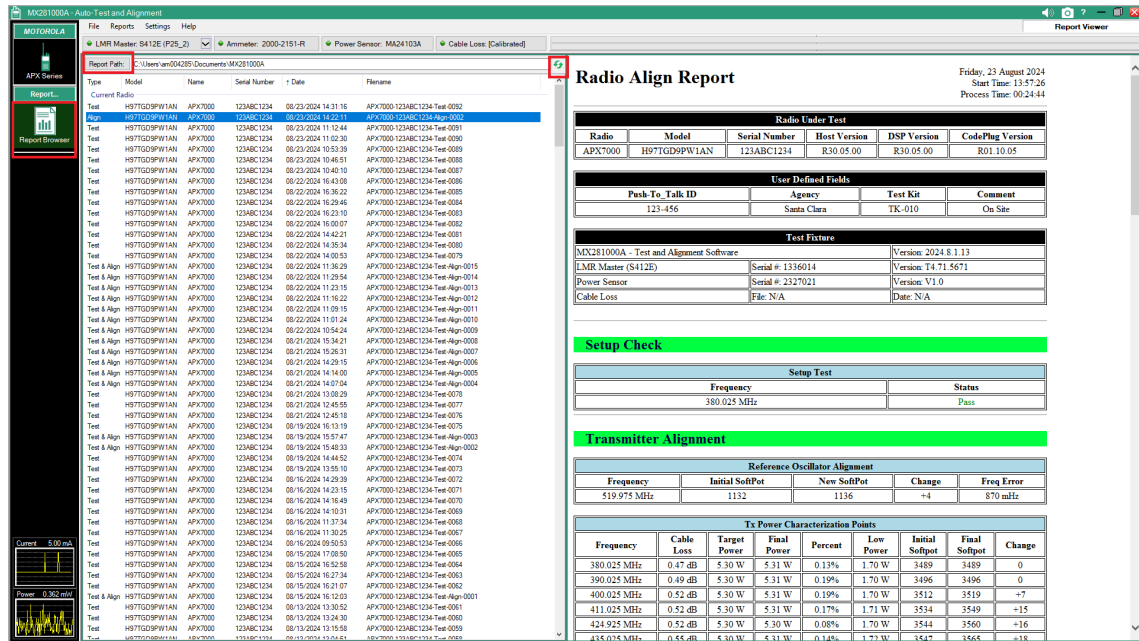


Figure-11. Report Browser Screen



10580-00512



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Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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