

Maintenance Manual

EcoSyn Lite™ MG36021A

Microwave Frequency Synthesizer
10 MHz to 20 GHz



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Table of Contents

Chapter 1—General Information

1-1	Introduction	1-1
	Additional Documentation	1-1
1-2	Contacting Anritsu	1-1
1-3	Required Test Equipment	1-2
1-4	Replaceable Parts	1-2
1-5	Firmware Updates	1-2

Chapter 2—Performance Verification

2-1	Introduction	2-1
2-2	Frequency Accuracy Verification	2-2
2-3	Power Level Accuracy Verification	2-4
2-4	Phase Noise Verification	2-5

Chapter 3—Frequency Accuracy Adjustment

3-1	Introduction	3-1
3-2	DAC Adjustment	3-1

Chapter 4—Assembly Replacement

4-1	Introduction	4-1
4-2	Replaceable Parts List	4-1
4-3	Removing the MG36021A Outer Housing	4-2
4-4	Digital Board Replacement	4-3
4-5	RF Board Replacement	4-4

Chapter 5—Troubleshooting

5-1	Introduction	5-1
5-2	Turning On Problems	5-1

Appendix A—Test Records

A-1	Introduction	A-1
A-2	Uncertainty Specifications	A-1
A-3	Adapter, Attenuator and Cable Insertion Loss	A-1
A-4	Technical Reference	A-1
A-5	Test Records	A-2

Chapter 1 — General Information

1-1 Introduction

This manual provides the recommended test equipment and tools, replaceable parts list, verification procedures, part replacement procedures, maintenance instructions, and test record templates for the MG36021A EcoSyn Lite Synthesizer.

This manual includes:

- General information including:
 - Recommended Test Equipment listed in [Table 1-2 on page 1-2](#).
 - Replaceable Parts listed in [Table 1-3 on page 1-2](#).
- Performance verification procedures included in [Chapter 2, “Performance Verification”](#).
- Assembly replacement and troubleshooting procedures:
 - [Chapter 4, “Assembly Replacement”](#)
 - [Chapter 5, “Troubleshooting”](#)
- Blank test records are included in [Appendix A](#).
 - Copy the blank test records from [Appendix A](#) and use them to record measured values. Anritsu recommends making a copy of the blank test records to document measurements each time a performance verification is performed. Continuing to document this process each time provides a detailed history of the instrument performance.

Caution	Before making any measurement, verify that all equipment has warmed up for at least 30 minutes.
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Additional Documentation

Table 1-1. Related Manuals

Document Part Number	Description
10100-00070	Important Product Information, Compliance, and Safety Notices
11410-02959	MG36021A EcoSyn Lite Technical Data Sheet
10370-10387	MG36021A EcoSyn Lite User Guide
10370-10388	MG36021A EcoSyn Lite Quick Start Guide

Updates, if any, can be downloaded from the Library tab on the Anritsu product page:

<https://www.anritsu.com/en-us/test-measurement/products/mg36021a>

1-2 Contacting Anritsu

To contact Anritsu, visit the following URL and select the services in your region:

<http://www.anritsu.com/contact-us>

1-3 Required Test Equipment

Table 1-2 provides a list of the test equipment used for the performance verification tests and maintenance of MG26021A. The test equipment is critical in making accurate measurements. In some cases, you may substitute certain test equipment having the same critical specifications as the test equipment indicated in the test equipment list.

Table 1-2. Required Test Equipment

Instrument / Component	Critical Specification	Recommended Manufacturer / Model
Frequency Counter	20 GHz	Pendulum CNT-90XL
Phase Noise Analyzer	DC to 26.5 GHz or higher	Rohde and Schwarz FSWP26
Power Divider	DC to 26.5 GHz	Anritsu K240B
Spectrum Analyzer	9 kHz to 20 GHz	Anritsu MS2090A-0720
2.92 mm Adapter	DC to 40 GHz, K(f) to K(m), 50 Ω	Anritsu K224B
RF Coaxial Cable	DC to 40 GHz, K(f) to K(m), 50 Ω	Anritsu 3670K
Thermal Power Sensor	DC to 33 GHz, 3.5 mm	Rohde and Schwarz NRP33T
Fixed Attenuator	DC to 26.5 GHz, K(f) to K(m), 6 dB	Anritsu 41KC-6
Frequency Reference	10 MHz, 5×10^{-12} parts/day	Symmetricon (Datum) model 9390-9600

1-4 Replaceable Parts

The MG26021A replacement parts and their description are listed below in Table 1-3.

Table 1-3. List of Replaceable Parts

Part Number	Description
3-ND88979-RFB	Digital Module Assembly
3-ND88934-RFB	RF Module Assembly

1-5 Firmware Updates

Refer to the MG36021A EcoSyn Lite User Guide (P/N-10370-10387) for the procedure on updating the firmware.

Chapter 2 — Performance Verification

2-1 Introduction

This chapter includes the following performance verification procedures for MG36021A:

- [Section 2-2 “Frequency Accuracy Verification” on page 2-2](#)
- [Section 2-3 “Power Level Accuracy Verification” on page 2-4](#)
- [Section 2-4 “Phase Noise Verification” on page 2-5](#)

2-2 Frequency Accuracy Verification

Use the following procedures to verify the CW frequency accuracy of the MG36021A

Equipment Required

- Pendulum CNT-90XL, 20 GHz Frequency Counter
- Anritsu 41KC-6 (characterized), 6 dB Attenuator
- Anritsu 3670K50A-2 (characterized) DC to 40 GHz, K(m) to K(f), 50 Ω , RF Coaxial Cable

Test Setup

1. Connect the 10 MHz frequency reference from the CNT-90XL 10 MHz IN to the MG36021A Ref Out port.
2. Connect the 41KC-6 fixed attenuator to the output of the MG36021A.
3. Connect the other end of the 41KC-6 attenuator to the input port C of the CNT-90XL using an RF coaxial cable. See [Figure 2-1](#) for completed setup.

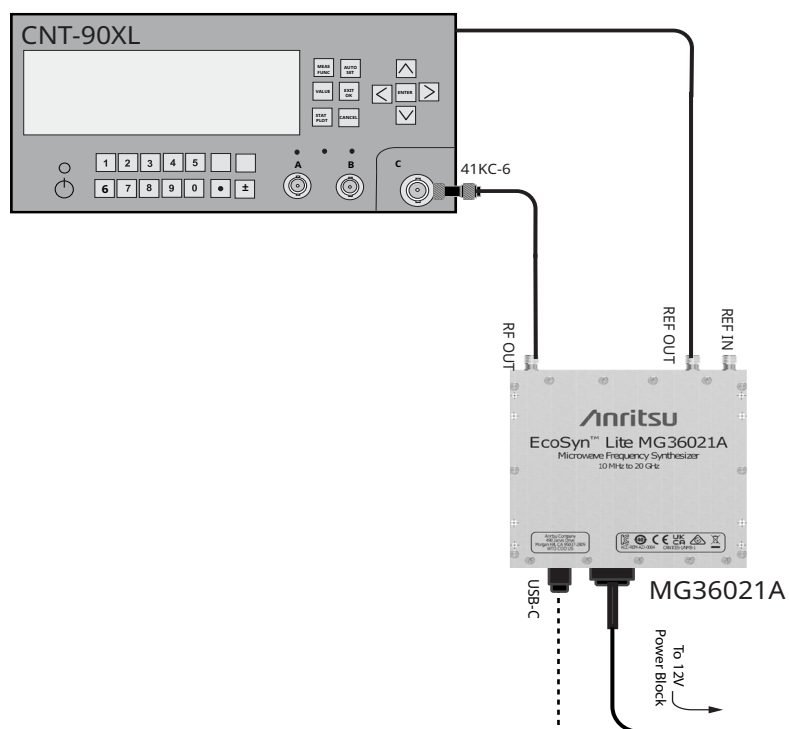


Figure 2-1. Frequency Accuracy Measurement Setup with MG36021A and CNT-90XL

Instrument Setup

Perform the following actions on the CNT-9-XL:

1. Preset the instrument and press the AUTOSSET key twice within 2 seconds.
2. Set input to Channel C.
 - Select the MEAS FUNC button on the front panel and do the following:
 - Press FREQ (button #1), set to C (button #5) and press ENTER.
3. Set reference oscillator to external.
 - Select the SETTINGS (button #8) on the front panel and do the following:
 - Press TIMEBASE, set to EXT (button #3) and press ENTER.

4. Set gate aperture time to 500 ms.
 - Select the SETTINGS button on the front panel and do the following:
 - Select MEAS TIME (button #1), set to 500 ms and press ENTER.
5. Set statistics average count to 16.
 - Select the SETTINGS button on the front panel and do the following:
 - Select STAT (button #5), set # of SAMPLES (button #2) to 16 and press ENTER.
6. Set statistics function to MEAN. If not, set the measurement type to MEAN.
 - Select STAT/PLOT button on the front panel and do the following:
 - Select NUMERICAL, set to MEAN and press ENTER.
7. Set the frequency counter acquisition.
 - Select the HOLD/RUN button on the front panel and ensure the CNT-90XL is on HOLD.

Perform the following actions on the MG36021A EcoSyn Lite:

1. Set the RF power to 0 dBm.
2. Set the Frequency to 15,000 MHz.

Procedure

1. In the EcoSyn Lite graphical user interface, press the OUTPUT button below the Synthesizer Power knob.
2. On the CNT-90XL, press the STAT/PLOT button to the display that show the following parameters: Max Frequency, Min Frequency, P-P, ADev, and Std measurements.
3. Press the HOLD/RUN button to RUN enabling continuous measurements.

Note: The CNT-90XL will now run 16 samples

4. When sample number has completed 16, press the HOLD/RUN button to HOLD.
5. Subtract 15,000,000 Hz from the final value presented on the CNT-90XL screen and record that value in the Measured Value field in [Table A-1](#).
6. Compare the value against the specification stated.

2-3 Power Level Accuracy Verification

The following test outlines the procedure for evaluating the level accuracy of the MG36021A across multiple frequencies and power levels.

Equipment Required

- PC with R&S NRP33T Power Sensor
- Anritsu 41KC-6 (characterized) 6 dB Attenuator
- Anritsu 3670K50A-2 (characterized) DC to 40 GHz, K(m) to K(f), 50 Ω , RF Coaxial Cable

Test Setup

1. Connect the NRP33T to the PC and open R&S Power Viewer Software.
2. Ensure the MG36021A RF Output is Off.
3. Connect the 41KC-6 fixed attenuator to the output of the MG36021A.
4. Connect the NRP33T to the 41KC-6 open side using an adapter and/or test cable.
5. Loss of adapters, cable, and attenuator will need to be entered Test Data Table Offset column for each frequency.

Procedure

1. In R&S Power Viewer Software do the following:
 - Set Measurement to Continuous
 - Set Averaging to Auto
 - Set Count to 256
 - Set Duty Cycle to 10%
 - Set Aperture to 10 ms
 - Set Level Offset to 0
2. Set Signal Frequency to frequency indicated in the test record.
3. Set up the MG36021A as follows:
 - Preset the instrument choosing SYSTEM > RESET > PRESET APPLICATION.
 - Set FREQUENCY to the frequency indicated in the test record.
 - Set LEVEL to the power level indicated in the test record.
 - With RF Output set to Off in R&S Power Viewer, Zero the NRP67T sensor.
 - Set RF Output ON.
4. Measure the output power level using the NRP67T sensor by selecting Measurement, then Start.
5. Repeat steps for each of the CW frequencies listed in the test record tables [Table A-2](#) through [Table A-9](#) for power level ranging from +20 to –20 dBm. It is necessary to zero the sensor at each frequency being tested.

2-4 Phase Noise Verification

The section below contains the information to perform the verification of Phase Noise using a Rohde and Schwarz FSWP26 or higher.

Equipment Required

- Rohde and Schwarz Phase Noise Analyzer (Options B61, B80), FSWP26
- Anritsu 3670K50A-2 (characterized) DC to 40 GHz, K(m) to K(f), 50 Ω , RF Coaxial Cable
- Anritsu 41KC-6 (characterized) 6 dB Attenuator

Test Setup

1. Set up the MG36201A graphical user interface and do the following:
 - Navigate to the Synthesizer Frequency input.
 - Set the Synthesizer frequency indicated in the test record by either manually entering in the frequency in the text field or by using the software implemented knob.
 - Navigate to the Synthesizer Power input.
 - Set the Synthesizer Power to +10 dBm by either manually entering in the frequency in the text field or by using the software implemented knob.
 - Connect the MG36021A as shown in [Figure 2-2](#).

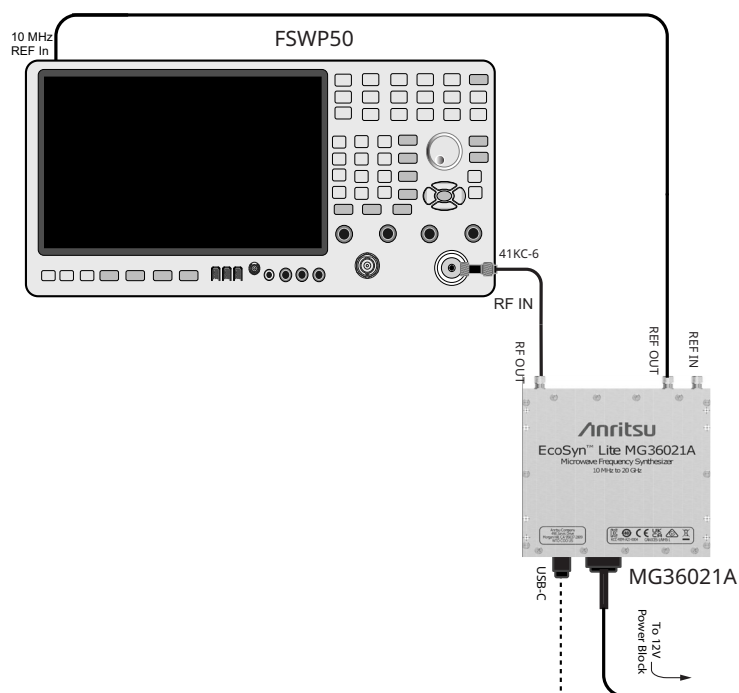


Figure 2-2. Phase Noise Measurement with MG36021A and FSWP26

Instrument Setup

Perform the following actions on Phase Noise Analyzer FSWP26:

1. Press the green Preset button to preset the FSWP26.
2. Press the white MODE button and select Phase Noise button.
3. Press the Run Cont button to turn off the measurement.

4. Press the Trace button and do the following:
 - Select Trace 2.
 - Press Mode and select Blank from the drop-down menu
5. Press the Sweep button and set to Single Sweep.
6. Press the Run Single button to turn off the measurement.
7. Press the MEAS Config button.
8. Select Noise Config menu located in the right side of the display screen and do the following:
 - Under Measurement Configuration section set the Start Offset to 10 Hz.
 - Set the Stop Offset to 100 MHz.
 - Set the RBW to 3.0%.
 - Set the XCORR Factor to 100.
 - Set XCORR to ON.
9. Press the Integrated Measurements tab and do the following for Range 1:
 - In the Ranges 1-5 tab select Trace 1 under Show for Range 1.
 - Select Manual button under Range column.
 - Set the Range Start to 50 Hz.
 - Set the Range Stop to 15 kHz.
10. Go to Spot Noise tab and do the following:
 - Turn off Decade Edges button.
 - Turn on User Defined button.
 - Check the Offset 1 button and set it to 10 MHz.
 - Check the Offset 2 button and set it to 100 MHz.
 - Check the Offset 3 button and set it to 1 kHz.
 - Check the Offset 4 button and set it to 10 kHz.
 - Check the Offset 5 button and set it to 100 kHz.
 - Check the Offset 6 button and set it to 1 MHz.
11. Go to Frequency Stability tab and set the Tau Start to 100 ns and Tau Stop to 100 ms.

Procedure

1. Set the MG36021A to the frequencies included in Phase Noise Verification test results shown in [Table A-10](#).
2. Turn the MG36021A output On.
3. On the FSWP26 instrument, press Run Single button.
4. Record the spot noise measurements for each frequency in [Table A-10](#).
5. Refer to the next frequency in the Single Sideband Phase Noise Test
6. Return to [Step 1](#) and repeat this test until all test frequencies are verified.

Chapter 3 — Frequency Accuracy Adjustment

3-1 Introduction

This chapter contains the procedure for adjusting the Digital-to-Analog Converter (DAC) responsible for the frequency accuracy. This procedure is used to carry out an adjustment as a result of an out-of-tolerance condition occurring while performing the frequency accuracy verification of EcoSyn Lite MG36021A.

3-2 DAC Adjustment

Equipment Required

- Windows 10 or 11 PC equipped with Intel i5 processor and 1 GB RAM or higher
- National Instruments NI Max software program
- Pendulum CNT-90XL, 20 GHz Frequency Counter
- Anritsu 3670K50A-2 (characterized) DC to 40 GHz, K(m) to K(f), 50 Ω , RF Coaxial Cable
- Anritsu 41KC-6 DC to 40 GHz, 50 Ω , 6 dB Fixed Attenuator

Test Setup

1. Connect the 10 MHz frequency reference from the CNT-90XL 10 MHz IN to the MG36021A Ref Out port.
2. Connect the 41KC-6 Fixed Attenuator to the RF Out port of the MG36021A.
3. Connect the other end of the 41KC-6 attenuator to the input port C of CNT-90XL using an RF coaxial cable. See [Figure 3-1](#).

Note

Do not launch the EcoSyn Lite software. This procedure requires sending a SCPI command and will not work if the EcoSyn GUI is active.

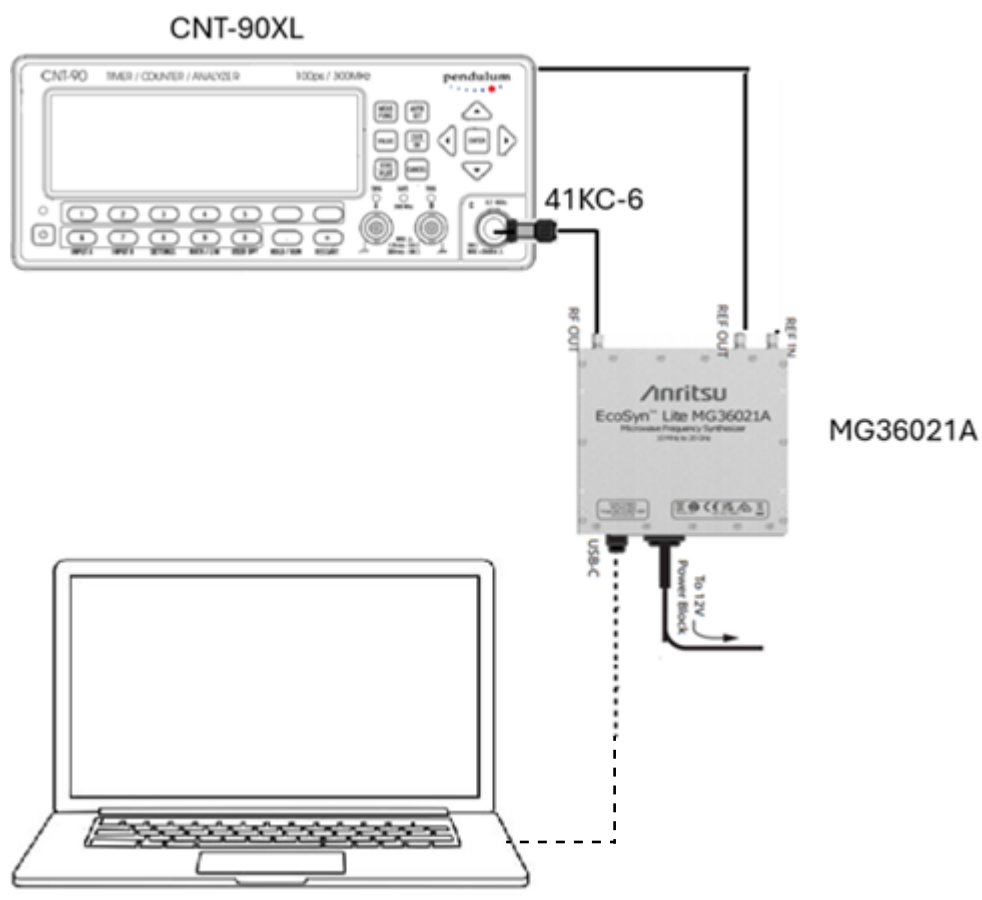


Figure 3-1. DAC Adjustment Setup with MG36021A and CNT-90XL

Test Program Setup

1. Open the NI MAX program on the computer.
2. Double click Devices and Interfaces under My System and click ASRLX::INSTR "COMX" where X is the instrument number.

Note

Instrument number can be found by opening Device Manager and opening the Ports (COM & LPT) pull-down.

3. Select the Open VISA Test Panel as shown in [Figure 3-2](#).
4. In Configuration menu enter the following parameters under Serial Settings tab:
 - Set the Baud Rate to 115200.
 - Click Apply Changes button in the bottom of the window.
5. Click I/O Settings tab in the Configuration menu and do the following:
 - Check Enable Termination Character box.
 - Click Apply Changes button in the bottom of the window.
6. Go to Input/Output menu and press the Query button to display the serial number of MG36021A. This verifies the establishment of the connection between the NI Max software and the MG36021A.

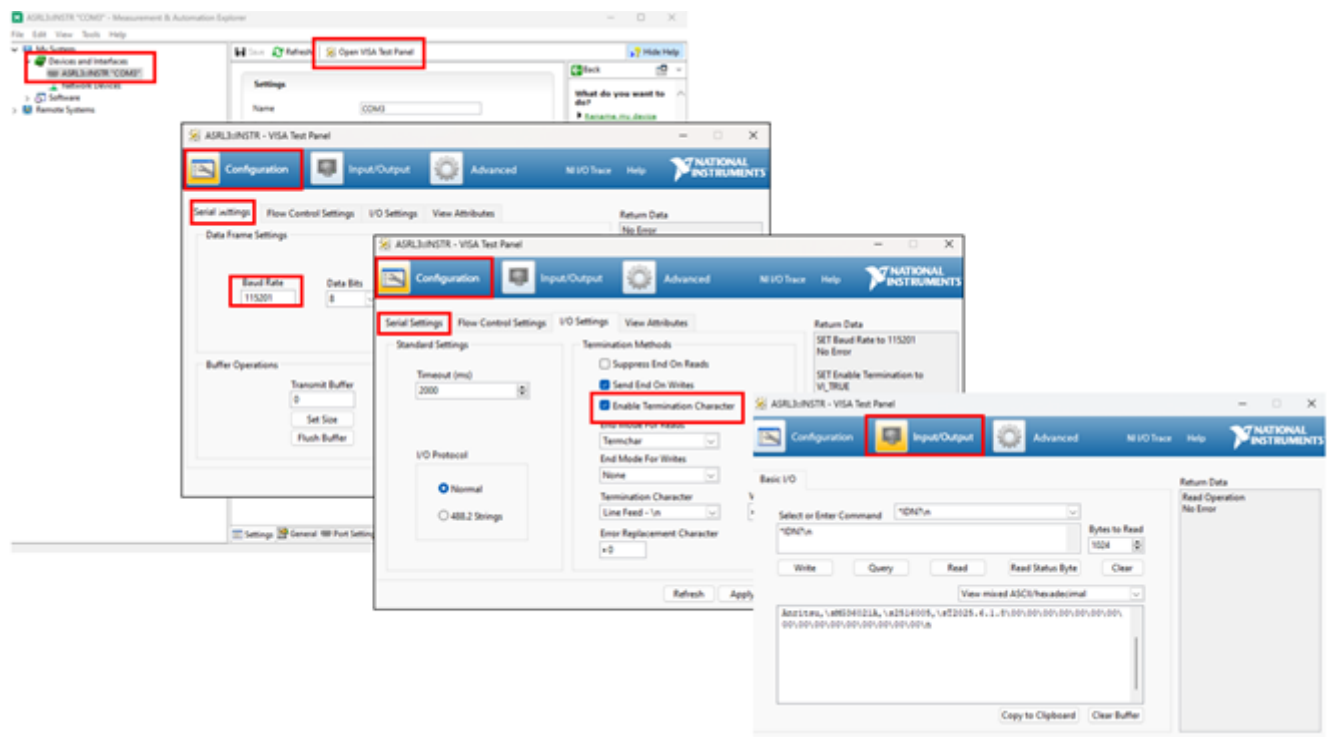


Figure 3-2. Setting Parameters in NI Max Software

Procedure

1. Enter the following commands in Select or Enter Command field:
 - a. `FREQ 15000000000\n` (this will set the frequency to 15 GHz) and click Write button.
 - b. `POW 0\n` (this will set the output power to +0 dBm) and click Write button.
 - c. `OUTP 1\n` (this will turn on the RF power) and click Write button.
2. Take a note of the frequency reading on the CNT-90XL and compare with the specification.
3. If the frequency accuracy is not within 75 Hz, do the following in Select or Enter command field:
 - a. Enter the command `ROSC:DAC?\n` to observe the current DAC value for the given frequency measurement.
 - b. Enter `ROSC:DAC (new value)\n` and observe the change in frequency and adjust the new value until the frequency is within the specified tolerance.

Note

The valid range of DAC is between 0 to 65535. Lowering the DAC value from the current value will lower the frequency and raising the DAC value will increase the frequency.

- c. Upon successful adjustment of the DAC, enter `ROSC:DAC:SAVE\n` to save the new DAC value.
4. If the frequency accuracy cannot match the specification even after adjusting the value within 0 to 65535 range, the RF Module Assembly needs to be replaced. Once the valid adjustment is completed follow [Section 2-2 “Frequency Accuracy Verification” on page 2-2](#) to perform frequency accuracy verification and enter the test records in [Table A-1](#).

Chapter 4 — Assembly Replacement

4-1 Introduction

This chapter provides a list of tools and procedures to replace the sub-assemblies within the MG36021A. The sections included in the chapter are as follows:

- [“Removing the MG36021A Outer Housing”](#)
- [“Digital Board Replacement”](#)
- [“RF Board Replacement”](#)

4-2 Replaceable Parts List

Refer to [Table 1-3, “List of Replaceable Parts” on page 1-2](#) for the list of replacement parts.

Refer to the following sections for basic replacement instructions.

Caution

Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. All work should be performed in a static-safe work area.

Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in [Table 1-3](#) are typically the only items that may be replaced. The assemblies are highly fragile, items that must be soldered may not be replaced without specialized training.

The MG36201A contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that can conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the instrument.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

4-3 Removing the MG36021A Outer Housing

This section provides instructions for removing the MG36021A case.

1. Remove the screws from the top and bottom of the MG36021A. There are 15 screws on the top side and 28 screws on the bottom side of the MG36021A housing. See [Figure 4-2](#).

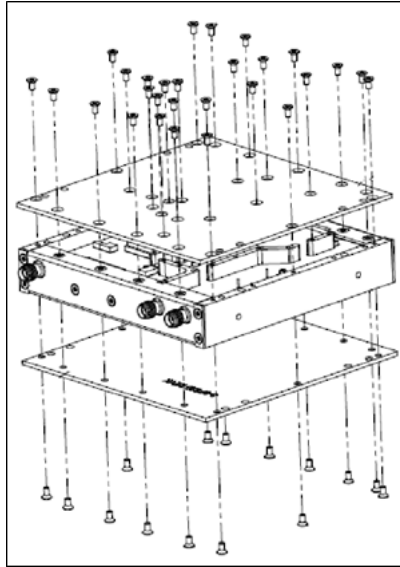


Figure 4-1. Top and Bottom Covers Removal

2. Remove I/O side panel screws on both sides. There are seven screws on each side. See [Figure 4-2](#).

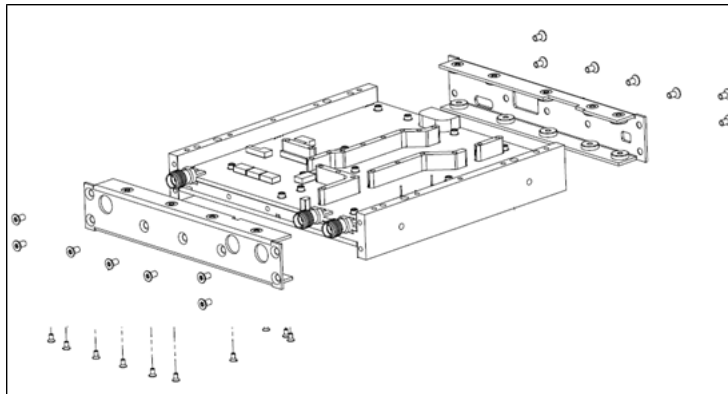


Figure 4-2. I/O Covers Removal

4-4 Digital Board Replacement

The procedure below provides instructions for removing the bumpers of the instrument:

1. Remove the MG36021A housing as described in [Section 4-3 “Removing the MG36021A Outer Housing”](#). See [Figure 4-3](#).
2. The digital board is located on the top side of the MG36021A.
3. Using a 1.27 mm Hex wrench, remove the ten screws that hold the digital board into the MG36021A inner housing.

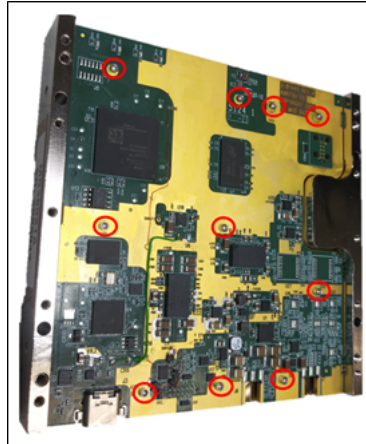


Figure 4-3. Digital Board Assembly with Mounting Screw Locations

4. Carefully remove the digital board from the inner housing.

4-5 RF Board Replacement

The procedure below provides instructions for removing the rear case of the instrument:

1. Remove the MG36021A housing as described in [Section 4-3 “Removing the MG36021A Outer Housing”](#). See [Figure 4-3](#).

Note: Upon removing the outer housing from the RF board side during RF board replacement, there is Ecosorb located in a very precise pattern that must be maintained.

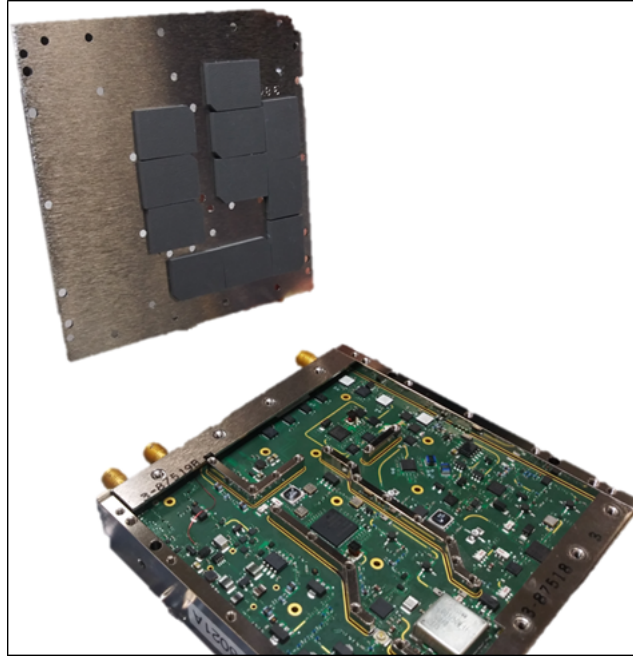


Figure 4-4. Ecosorb Location on Outer Housing

2. The RF board is located at the bottom side of the MG36021A.
3. Using a 1.27 mm Hex wrench, remove the 12 screws that hold the RF board into the MG36021A inner housing.
4. Carefully remove the RF board from the inner housing.

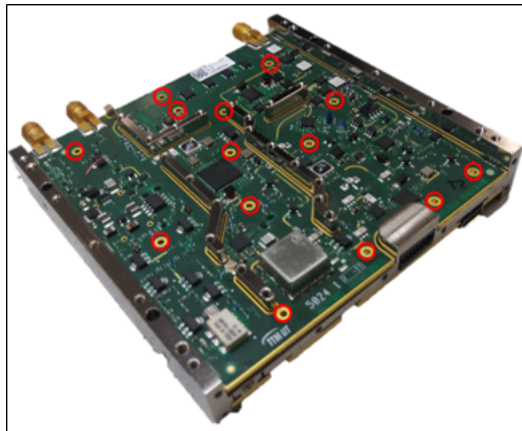


Figure 4-5. RF board Assembly with Mounting Screw Locations

Chapter 5 — Troubleshooting

5-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu service centers. Perform the troubleshooting suggestions in the order they are listed.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in [Table 1-3](#) are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special training. Removal of RF shields from PC boards or adjustment of screws on or near the shields will detune sensitive RF circuits and will result in degraded instrument performance.

5-2 Turning On Problems

No Hardware Detected Prompt:

1. Open the Device Manager on the PC and look at the Ports (COM & LPT).
 - USB Serial Port (COMX), where X is the port number, should be present. If not present, check the USB cable between the PC and the EcoSyn Lite.
 - Close the application and re-launch.
 - Re-install the EcoSyn Lite graphical user software.
 - Check the 2100-43-R development cable for damage. If damaged, replace this cable.
 - Check the SPI Connector on the MG36021A for bent pins.
 - Replace the digital board.
2. Check the power supply for 12V DC.
 - Use a multi-meter to verify 12V DC output.
 - If no output from power supply, replace the 40-187-R AC/DC power supply.

No RF Output from the MG36021A:

1. Inspect the MG36021A RF connector for obstructions.
2. Inspect the 40-187-R power supply.
3. Inspect the 2100-43-R.
4. Ensure the instrument is still detected on the graphical user interface. If the instrument's identification does not show the SW version and Serial Number, the MG36021A has lost communication and needs to have the graphical user interface reset.

Appendix A — Test Records

A-1 Introduction

This appendix provides tables for recording the results of the performance verification tests. They jointly provide the means for maintaining an accurate and complete record of instrument performance. These records contain references to frequency parameters and power levels that are applicable to the instrument with that option or set of options. When a test record is customized, it is labeled with the specific option list that it covers. Test records which are not customized do not specify an option list. These test records are generic and may contain specific references to frequency parameters and power levels that exceed the operational limits of the instrument being tested. When using generic test records, use only the parameters that fall within the operational limits of the instrument being tested. Refer to the MG36021A Technical Data Sheet (PN:11410-02959) when referencing the specifications for the model being tested and the included options installed.

A-2 Uncertainty Specifications

All test records are provided with a measurement uncertainty, which consists of the type-B¹ components. The measurement uncertainty listed in each test record includes the best estimate of the errors contributed by the measurement, test equipment, standards, and other correction factors. The error contributions are measurement method, test equipment, standards, and other correction factors (for example, calibration factors and mismatch error) per the prescribed test procedure. The statement(s) of compliance with specification² is based on a 95% coverage probability for the expanded uncertainty of the measurement results on which the decision of compliance is based. Other values of coverage probability for the expanded uncertainty may be reported, where practicable, for some of the measured values it is not possible to make a statement of compliance with specification².

A-3 Adapter, Attenuator and Cable Insertion Loss

To achieve the most accurate measurements, the insertion loss of adapters, attenuators and cables must be added to each measurement for the test records that require it. The process is to add up the insertion loss of the adapters, attenuators and cables and enter the results in the column labeled "Offset Value". Then add this value to the "Measured Value" and enter the result in the "Final Value". In some cases, the total insertion loss must be converted from dB into linear %. See the conversion formula below.

$$\text{Percentage} = 10^{(\text{dB})/10} - 1$$

Where dB = the value to be converted to percentage.

A-4 Technical Reference

For MG36021A specifications that apply to the specific model and option installed, refer to the technical data sheet (11410-02959).

-
1. BIPM JCGM 100:2008 Evaluation of measurement data- Guide to the expression of uncertainty in measurement.
 2. LAC-G8:03/2009: Guidelines on the Reporting of Compliance with Specification

A-5 Test Records

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-1. Frequency Accuracy Verification

Frequency	Measured Value	Specification
15 GHz (15000 MHz)	MHz	15 GHz $\pm$ 75 Hz ($\pm$ 5 ppb)

Note Not all frequencies can meet +20 dBm output power. Please refer to the technical data sheet for frequencies that can meet +20 dBm.

Table A-2. Power Level Accuracy Verification (Power set to +20 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				$\pm$ 1.5 dB			
0.1				$\pm$ 1.5 dB			
0.5				$\pm$ 1.5 dB			
1				$\pm$ 1.5 dB			
2				$\pm$ 1.5 dB			
3				$\pm$ 1.5 dB			
4				$\pm$ 1.5 dB			
5				$\pm$ 1.5 dB			
6				$\pm$ 1.5 dB			
7				$\pm$ 1.5 dB			
8				$\pm$ 1.5 dB			
9				$\pm$ 1.5 dB			
10				$\pm$ 1.5 dB			
11				$\pm$ 1.5 dB			
12				$\pm$ 1.5 dB			
13				$\pm$ 1.5 dB			
14				$\pm$ 1.5 dB			
15				$\pm$ 1.5 dB			

Table A-2. Power Level Accuracy Verification (Power set to +20 dBm)

16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-3. Power Level Accuracy Verification (Power set to +15 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Table A-4. Power Level Accuracy Verification (Power set to +10 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-5. Power Level Accuracy Verification (Power set to +0 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-6. Power Level Accuracy Verification (Power set to -5 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-7. Power Level Accuracy Verification (Power set to -10 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-8. Power Level Accuracy Verification (Power set to –15 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-9. Power Level Accuracy Verification (Power set to –20 dBm)

Frequency	NRP33T Measured Power (dBm)	Enter offset of cables or adapters at each frequency tested	Calculated value *Add measured power + offset	Level accuracy specification	Measurement Uncertainty	Pass	Fail
0.01				±1.5 dB			
0.1				±1.5 dB			
0.5				±1.5 dB			
1				±1.5 dB			
2				±1.5 dB			
3				±1.5 dB			
4				±1.5 dB			
5				±1.5 dB			
6				±1.5 dB			
7				±1.5 dB			
8				±1.5 dB			
9				±1.5 dB			
10				±1.5 dB			
11				±1.5 dB			
12				±1.5 dB			
13				±1.5 dB			
14				±1.5 dB			
15				±1.5 dB			
16				±1.5 dB			
17				±1.5 dB			
18				±1.5 dB			
19				±1.5 dB			
20				±1.5 dB			

MG36021A Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Table A-10. Phase Noise Verification

Frequency Offset	Measured Value (dBc)	Measurement Uncertainty (dB)
Test Frequency: 1 GHz		
100 Hz		
1 kHz		
10 kHz		
100 kHz		
1 MHz		
10 MHz		
Test Frequency: 5 GHz		
100 Hz		
1 kHz		
10 kHz		
100 kHz		
1 MHz		
10 MHz		
Test Frequency: 10 GHz		
100 Hz		
1 kHz		
10 kHz		
100 kHz		
1 MHz		
10 MHz		
Test Frequency: 20 GHz		
100 Hz		
1 kHz		
10 kHz		
100 kHz		
1 MHz		
10 MHz		



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