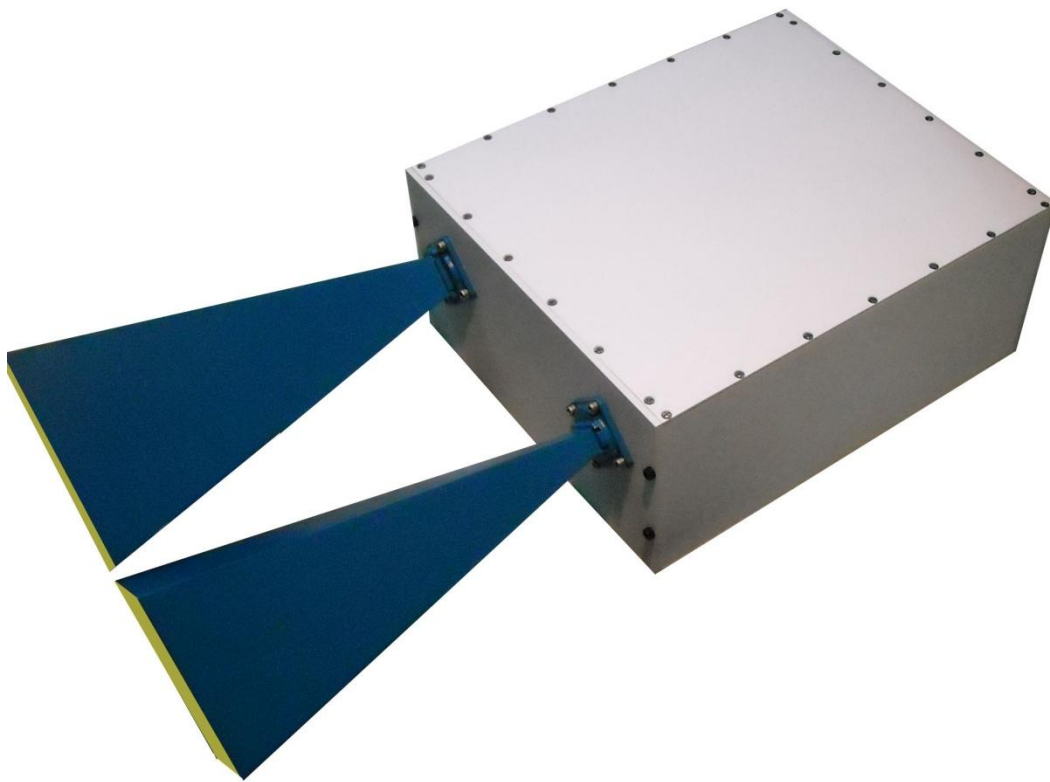


RADAR TARGET GENERATOR ACRTG-X



Operation and maintenance manual

26/10/09

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All configurations and specifications may be subject to changes without previous warning.

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FOREWORD

The Radar Target Generator is designed and constructed to meet the demands of outdoor operation. It is compact and lightweight and it is suitable for use on a wide variety of platforms. Please carefully read and follow the recommended procedures for installation, operation and maintenance.

FEATURES

The Radar Target Generator has a variety of functions all contained in a rugged metal case and it is controlled from a laptop computer (not included). All controls respond immediately to the operator's command and each time a key is pressed the corresponding change can be seen on the screen.

The main features of the Radar Target Generator are:

- Broadband operation 8.2-12.4 GHz.
- Wide angle coverage.
- 31 fixed range delays up to 16350 m.
- Doppler shift up to ± 56214 Hz.
- Synthesized LO, 1 MHz resolution.
- Laptop computer control (RS-485 interface).
- Operation on 12 V DC power.

SYSTEM CONFIGURATION

The Radar Target Generator configuration consists of:

- Antenna Unit.
- Laptop Computer (Display and Control Unit).
- Power Unit.

EQUIPMENT LISTS

The standard supply includes:

- Antenna Unit.
- Power Cable.
- Control Cable.
- Display and Control Software. (User Control Application v2)

1. ACRONYMS

The following acronyms are used in this document:

ACRONYM	DESCRIPTION
ACORDE	ACORDE Technologies S.A.
BITE	Built In Test Equipment
DC	Direct Current
IF	Intermediate Frequency
LO	Local Oscillator
RCS	Radar Cross Section
RF	Radio Frequency
RTG	Radar Target Generator
RX	Reception
TX	Transmission

2. INSTALLATION

This chapter provides the procedures necessary for installation. Installation mainly consists of the following:

- Siting and mounting the Antenna Unit.
- Siting and mounting the Laptop Computer (Display and Control Unit).
- Connection of the Power Cable and the Control Cable.

2.1. Antenna Unit Installation

Place the Antenna Unit where there is a completely clear view in the front direction. Any obstruction will cause shadow and blind sectors.

The mounting surface must be parallel with the ground and clean. No mounting holes are provided.

2.2. Laptop Computer (Display and Control Unit) Installation

Place the Laptop Computer (Display and Control Unit) in a position where it can be viewed and operated conveniently but where there is no danger of radiation.

2.3. Wiring

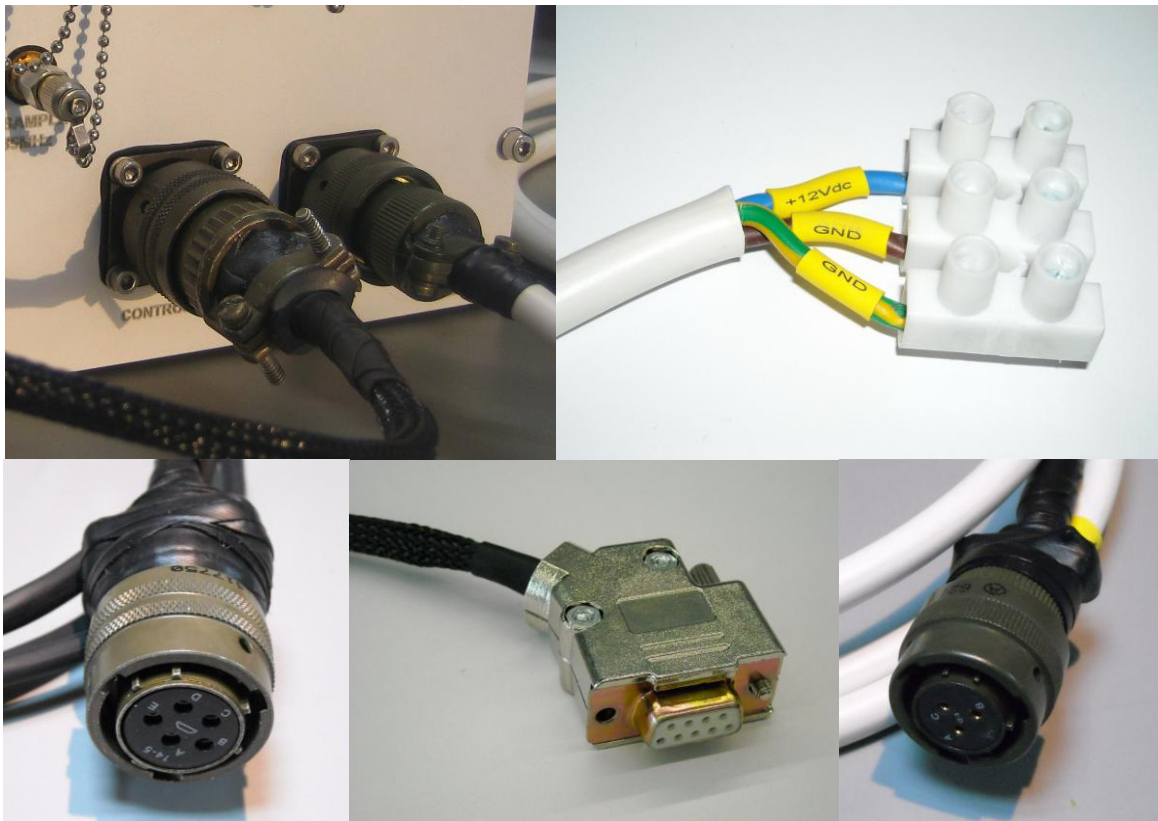
The following tables show the pinout of the Control Cable and the Power Cable.

CONTROL CABLE		
DB9	Signal	MS3116F14-5S
1	RS485 - TX-	A
2	RS485 - TX+	B
3	RS485 - RX+	C
4	RS485 - RX-	D
5	GND	E
6,7,8,9	No Connect	

POWER CABLE		
MS3116F12-3S	Signal	Colour
A	12V DC	Blue
B	GND	Brown
C	GND	Yellow/Green

Connect the Control Cable from the Antenna Unit at the back of the Laptop Computer (Display and Control Unit). If the Laptop Computer doesn't have a RS-485 interface, an interface adapter will be needed (not provided).

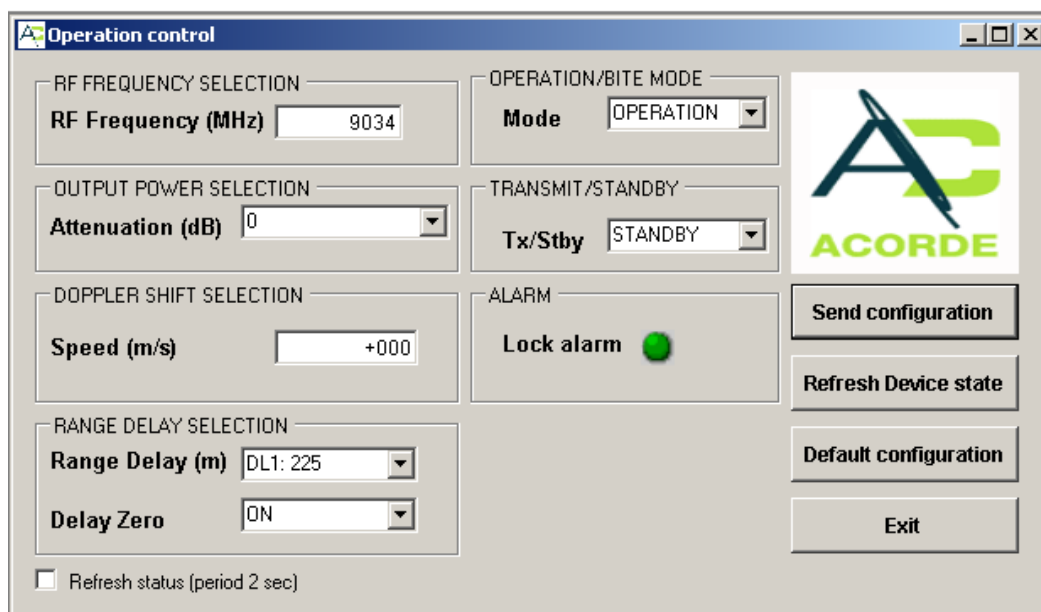
Connect the Power Cable from the Antenna Unit to the +12 VDC Power Supply as shown below.



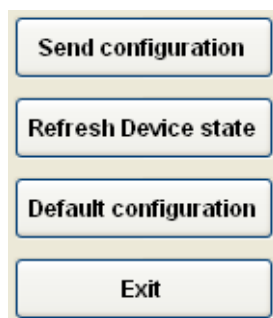
3. OPERATION

The Radar Target Generator is Laptop Computer operated. The control panel is functional and its user friendly layout makes this unit easy and instinctive to use. When you change a control setting you will see the associated reaction almost immediately on the screen. Most of the controls carry abbreviated names to show their functions.

The illustration below shows the location and meaning of the on-screen indications.



After pressing the SEND CONFIGURATION key the selected configuration will be active.



3.1. Description of Controls

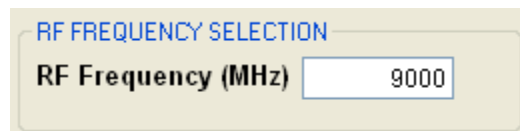
- RF Frequency, sets the RF carrier frequency of the radar under test.
- Range Delay, selects output pulse range delay.
- Delay Zero ON/OFF, outputs input pulse.
- Doppler Shift, sets output RF frequency Doppler shift.
- Output Power, sets the output RCS.
- Operation/BITE CW/BITE IMP, chooses between Operation and Bite modes.
- TX/Standby, sets the unit to transmit or standby.

3.2. Basic Operation

When the power is turned on the unit is in OPERATION MODE and STANDBY MODE. After five minutes, warm up time, the unit is ready to receive (OPERATION MODE) and transmit (TRANSMIT MODE).

3.2.1. RF FREQUENCY SELECTION

The unit can be tuned to any RF frequency from 8.2 GHz to 12.4 GHz with a 1 MHz frequency resolution.



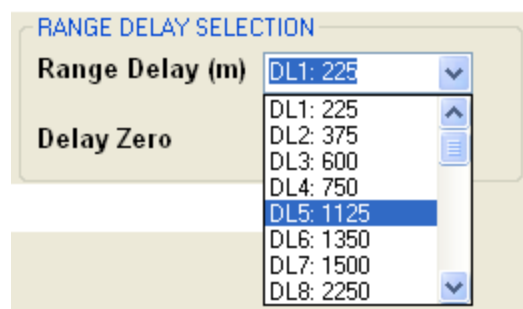
3.2.2. RANGE DELAY SELECTION

The incoming RF pulse can be delayed from 225 m to 16350 m in 31 fixed range delays. Delay 32 outputs no pulse.

The available range delays are:

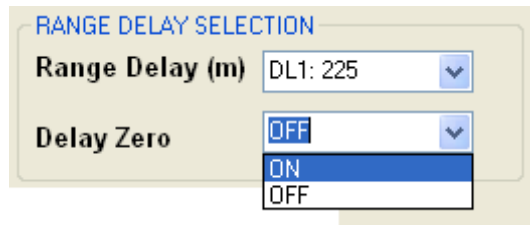
- Delay 1: 225 m.
- Delay 2: 375 m.
- Delay 3: 600 m.
- Delay 4: 750 m.
- Delay 5: 1125 m.
- Delay 6: 1350 m.
- Delay 7: 1500 m.

- Delay 8: 2250 m.
- Delay 9: 2625 m.
- Delay 10: 2850 m.
- Delay 11: 3000 m.
- Delay 12: 3750 m.
- Delay 13: 4500 m.
- Delay 14: 4875 m.
- Delay 15: 5100 m.
- Delay 16: 5250 m.
- Delay 17: 6750 m.
- Delay 18: 7500 m.
- Delay 19: 7875 m.
- Delay 20: 8100 m.
- Delay 21: 8250 m.
- Delay 22: 9000 m.
- Delay 23: 10500 m.
- Delay 24: 11250 m.
- Delay 25: 11625 m.
- Delay 26: 11850 m.
- Delay 27: 13500 m.
- Delay 28: 15000 m.
- Delay 29: 15750 m.
- Delay 30: 16125 m.
- Delay 31: 16350 m.
- Delay 32: none.



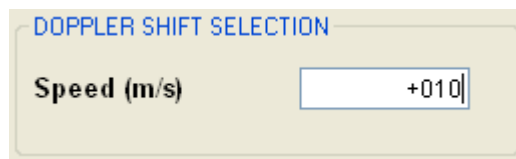
3.2.3. DELAY ZERO ON/OFF.

The unit can output input pulse (range delay 0 m).



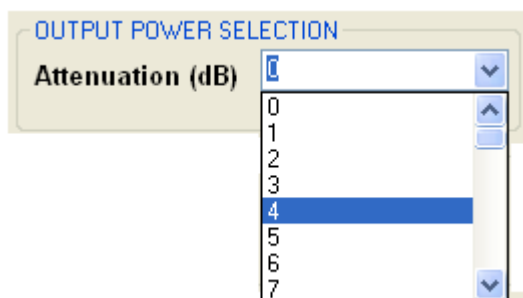
3.2.4. DOPPLER SHIFT SELECTION.

The RF output frequency can be offset from DC to ± 56214 Hz (mach 2 at 12.4 GHz) with a minimum step of 55 Hz (1 m/s at 8.2 GHz). Speed data is a three digit number (m/s) plus sign. The Doppler shift is rounded to the nearest discrete frequency.



3.2.5. OUTPUT POWER SELECTION.

The RF output power can be adjusted from 0 dB to -52 dB with a minimum step of 1 dB to output the required RCS.



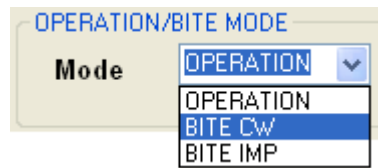
3.2.6. OPERATION/BITE CW/BITE IMP.

The OPERATION MODE selects the antenna input to receive the radar pulses.

The unit can also run an internal check at the IF frequency (832 MHz), BITE MODE, to verify its correct operation.

When BITE CW is selected, a continuous wave signal is present at the input. The result of this auto-check is shown lighting the two green LED indicators, RX and TX.

When BITE IMP is selected, a pulsed signal is present at the input. This mode is useful to check the range delay. The delay between the received and transmitted pulse can be seen at the RX/TX VIDEO connectors.



3.2.7. TX/STANDBY.

After the power is turned on the unit is in STANDBY MODE. To go to TRANSMIT MODE select the key TRANSMIT after making sure there is no crew near the Antenna Unit.



3.3. AUXILIARY OUTPUTS

3.3.1. MONITORING OUTPUTS.

The unit provides auxiliary outputs and LED indicators for monitoring purposes. The Monitoring Outputs allow the user to connect external test equipment, spectrum analyzer and oscilloscope, in order to check the time delay and frequency offset configured in the unit.

- RX SAMPLE.
This signal is an IF sample, 835 MHz, of the incoming RF.
- TX SAMPLE.
This signal is an IF sample, 835 MHz, of the output RF.
- VIDEO RX.
This signal is a detected video sample of the incoming RF.
- VIDEO TX.
This signal is a detected video sample of the output RF.



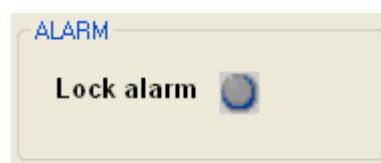
3.3.2. LED INDICATORS.

Two LED indicators allow the user to know when the unit is receiving and transmitting RF signals.

- RX.
This green LED indicates the unit is receiving IF signals.
- TX.
This green LED indicates the unit is transmitting IF signals.

3.3.3. ALARMS.

The unit continuously monitors the state of the Local Oscillator. In case of a synthesizer failure the LCK LED indicator will light red, back panel, and the LOCK ALARM will light red, Display and Control Unit.



4. MAINTENANCE

4.1. General

Regular maintenance is important for good performance. Following the procedures prescribed in this chapter will help keep your unit in good working order.

Always keep the unit as free as possible from dirt, dust and water splashes. Make sure that all screws securing the unit are properly tightened.

4.2. Antenna Unit.

The unit surface should be kept free of dirt and salt deposits. Clean the unit with a clean soft cloth. Do not use chemical cleaners except for alcohol.

4.3. Fuse Replacement.

To protect the unit from serious damage, a 5 A fuse is provided in the power supply of the Antenna Unit. The fuse protects against overvoltage/reverse polarity of the power supply or internal fault of the unit. If the fuse blows, first find the problem before replacing it with a new one. Never use a fuse rated for more than 5 A, since it may cause serious damage to the unit. The fuse is accessible in the back panel.

5. SPECIFICATIONS

5.1. General

- Frequency Range.
 - o RF input: 8200-12400 MHz.
 - o RF output: 8200-12400 MHz.
- Pulse Width.
 - o Minimum: 30 ns.
 - o Maximum: CW.

5.2. Antennas.

- RX HORN.
 - o Gain: 20 dB.
 - o Azimuth coverage: $\pm 16^\circ$.
 - o Elevation coverage: $\pm 16^\circ$.
 - o Polarization: linear, slant -45° .
- TX HORN.
 - o Gain: 20 dB.
 - o Azimuth coverage: $\pm 16^\circ$.
 - o Elevation coverage: $\pm 16^\circ$.
 - o Polarization: linear, slant $+45^\circ$.

5.3. Receiver.

- Sensitivity: -40 dBm min.
- Dynamic range: 60 dB min.
- Maximum input level (no damage): 1 watt CW, 100 watt $1\mu\text{s}$ 0.1% duty cycle.
- Instantaneous bandwidth: ± 15 MHz min.
- IF input frequency band: 835 ± 15 MHz min.
- IF output frequency band: 835 ± 40 MHz max.
- Base band: DC ± 40 KHz max.
- Range delay pulse/CW radar: 31 fixed delays plus input pulse reference.
225 m min, 16350 m max.
- Doppler shift: ± 56214 Hz max (mach 2 at 12.4 GHz) at 55 Hz resolution (1 m/s at 8.2 GHz).
- Frequency stability: 50 Hz for 1 ms.
- LO frequency select: 835 MHz down required RF radar carrier.
- BITE: internal.

5.4. Transmitter.

- Output power: 0dBm approx.
- Output power control: 55 dB min.

- Spurious/harmonics: -15 dBc max.
- Output modulator isolation: 45 dB min.
- Output modulator switching time: 15 ns max.

5.5. Power Supply.

- DC Input voltage: +12 VDC.
- Power consumption: 25 watt.

5.6. Mechanical.

- CONFIGURATION.
 - o Size: 550x260x120 mm (antennas included).
 - o Weight: 8.5 Kg.
 - o Finish: aluminium.
 - o Colour: white.
- RF CONNECTORS.
 - o RX SAMPLE output: SMA female.
 - o TX SAMPLE output: SMA female.
 - o VIDEO RX output: BNC female.
 - o VIDEO TX output: BNC female.
- POWER CONNECTOR.
 - o DC input power: MS3112E12-3P.
- DIGITAL CONNECTOR.
 - o RS485 serial interface: MS3112E14-5P.

5.7. Environmental.

- Storage temperature: -20 to + 65°C.
- Operating temperature: 0 to + 50°C.
- Relative humidity: up to 95%.

6. PACKING LIST

The Radar Target Generator supply includes:

- Antenna Unit: qty. 1.
- Control Cable Assembly: qty. 1.
- Power Cable Assembly: qty. 1.
- Control and Display Software: qty. 1.

7. GUARANTEE AND SERVICE INFORMATION

All the equipment supplied or manufactured by **ACORDE** fulfils the following guarantee conditions except when other conditions are specified at the moment of purchasing.

Guarantee limit: The seller guarantees that every item supplied by the manufacturer is free of mistakes or human manipulation. This guarantee is not applied to those materials or components that are not supplied by the manufacturer or those that have been exposed to possible damaging situations or those that are not manipulated under the security conditions described in the user manual.

The standard length of the guarantee is two years, except if otherwise established at the time of purchase.

Repair conditions: Items returned will be tested in order to determine the fault in the equipment, and the best repair procedure. The replacement or return will be established once **ACORDE** has determined the cause of the fault. All the equipment returned is subject to a charge for its evaluation when the guarantee cover is not applicable for any reason or when the client authorizes the repair out of guarantee.

Return procedure: All **ACORDE's** equipment can only be repaired in factory and it must be sent to ACORDE for this service. Please, pay attention to the following instructions in order to keep the guarantee cover.

- Contact **ACORDE** to receive a return number (RMA).
- Attach all the following information:
 - Model and series number of **ACORDE**.
 - Number and date of the original purchase order.
 - Full description of the failure.
- Once the return number (RMA) is known, you must send the item to the technical service of **ACORDE** at the following address:



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Remember that if a failure in the equipment is not found the client will be the responsible for paying the cost of testing the item.

Delivery charges: Clients will be responsible for the delivery charges, except if there is a previous agreement.

8. REVISIONS AND HISTORY OF THE DOCUMENT

Edition:	Comments:	Date:
0.0	- First edition	30/10/2008
1.0	- Second edition supersedes first edition	03/02/2009
2.0	- LO sample removed. Standard edition	29/09/2009
2.1	- Wiring section revised.	26/10/2009