RBS4000

CYBER SECURITY DIVISION

ECOS-D Radio Base Station A2T series

LEONARDO

ECOS-D RBS4000 25W is a modular voice and data Radio Base Stations (RBS) designed to meet and exceed the requirements of professional and land mobile radio systems.

Its high quality, combined with state-of-the-art reliability and outstanding modularity makes the ECOS-D RBS4000 25W a digital based equipment, able to support analogue FM, digital DMR conventional Tier II and digital DMR trunking Tier III.
RBS4000 can be used in both real-time dual mode Analog FM/Digital DMR conventional Tier II and in digital DMR trunking Tier III mode; the change of operating mode from Tier II to Tier III does not need any FW change, but it is just a matter of configuration.
In addition, with ECOS-D base stations, Tier II terminals can communicate with Tier III terminals in inteconnected networks.

All the modes of operation of the ECOS-D RBS4000 25W support natively the flagship simulcast technology by the company without any external ancillary. The ECOS-D RBS4000 25W can support configuration ranging from stand-alone repeater to conventional simulcast or multi-site trunking with a configuration change only.
ECOS-D RBS4000 25W can be connected to build a system natively with IP, 4W+E/M links.

MAIN FEATURES

- 3 RU device designed to be hosted in 19-inch rack
- Available in Low-VHF, VHF, UHF, High-UHF frequency bands at 12.5kHz/25kHz programmable channel spacing
- RBS and stand-alone repeater mode of operation:
  - Conventional analog FM only
  - Digital DMR conventional Tier II only
  - Real Time automatic dual-mode conventional analog FM/Digital DMR conventional Tier II with priority mode setting.
  - Digital DMR Trunking Tier III (embedded trunking controller).
- Designed to natively support Simulcast technology:
  - Multi-site simulcast support: available for both conventional and trunking operations
  - Simulcast Master, Sub-Master, Slave mode within the same device (virtually no limits in the number of RBS per simulcast channel)
  - Reliable fall-back mode: Slave in-cabinet repeating and Backup Master automatic reconfiguration
  - Synchronization: GPS and/or Precise Time Protocol IEEE 1588v2 with fall-back
  - Voting: analog FM and digital DMR best in class voting
  - Auto Adaptive Technology (A2T): each RBS “adapts” itself to the time and frequency response of the backbone and automatically compensate time variant differences
  - Multiple-link support: IP (SoIP–Simulcast over IP–technology), 4W+E&M link interfaces
  - Redundant link management between RBSs (4W+E&M and IP)
- Provides high levels of protection from access by unauthorised radio users, via the Unauthorised Access Protection procedure
- Embedded AMBE+2 vocoder for DMR Tier II clear or encrypted (ARC4) voice communications from a local microphone (embedded loudspeaker).
- DMR Data transmission ports (RS232/RS485/LAN), digital I/O and analog inputs available.

MAINTENANCE

- Display and keypad for easy local maintenance and fault handling.
- Modular structure for easy front and back cards replacement. In the event of failure, all modules are individually removable.
- Digital I/O, analog inputs, power supply, antenna connectors and backbone interfaces hosted on dedicated back-cards, easily removable from the back and insulated from voltage overload.
- Remote Firmware upgrade over LAN with integrity control (embedded dual-flash memory for storage of two firmwares).
- SNMPv2c Network Management System (each RBS is a SNMP agent) and MIB availability for integration with third party NMS system.

INTEROPERABILITY

Interoperability (IOP) certificates with DMR major terminals vendors in Tier II and Tier III modes of operation.
For further details, please visit the DMR Association website at: www.dmrassociation.org.

TECHNICAL DATA

GENERAL

Dimensions	3 RU compatible with 19" rack mounts
Weight	From 13 kg [28.6 lbs][1]
Supported modulations	› FM/PM for analogue mode › 4FSK/C4FM for digital mode with I&Q mo/demodulator
Frequency generation	Synthesized
Channel spacing	12.5 and 25 KHz
Channel step	5 kHz - 6.25 KHz
Mode of operation	Simplex / Half-Duplex / Duplex
Modulation type	Dual mode: › Analog: » FM/PM (EN 300 086; 12.5, 25 kHz). Emission designators (voice & data); – 8K50F3E/8K50G3E – 11K0F3E/11K0G3E – 16K0F3E/ 16K0G3E › Digital: » 4FSK 9600 bit/s (EN 300 113) (DMR: TS 102 361-1, 2, 3, 4, 12.5 kHz). Emission designators (voice & data); 7K60FXD/7K60FXE » C4FM 9600 bit/s (APCO25; 12.5 kHz). Emission designators (voice & data); 8K10F1D/8K10F1E
Emission mode	Full-Duplex (with external filters)
Digital data gross bit rate	9600 bps with 4FSK/C4FM digital modulation in 12.5 kHz channel
Temperature range	From -30° to +60°C [-22°F to +140°F]
CTCSS	67-254.1 Hz (step 0,1 Hz)
DCSS (Tx/Rx split-tones)	Yes
Backbone interface	› From 4x4W+E/M › 1xLAN port 10/100 Base T (SoIP Link, remote firmware upgrade and SNMP NMS)
I/O ports	LAN, RS-232, 4 digital inputs, 4 digital outputs, 2 analog inputs
Antenna connectors	50 Ohm

SYNCHRONIZATION

RBS main clock	OCXO (Oven Controlled Crystal Oscillator), 50 ppb temperature stability with programmable zero-offset compensation
Simulcast synchronization	› From built-in GPS (1+1 option available on request) › From incoming IP GMC/BC/OC PTP IEEE 1588V2 › From 4W Out of Band tone (3400 Hz)

TIER II CONVENTIONAL / ANALOG FM CONVENTIONAL

Configuration mode	Stand-alone repeater
Simulcast configuration wide coverage Virtual repeater	Radio Base Station: macro-cell Master/ sub-Master/slave

TIER III TRUNKING

Configuration mode	Radio Base Station with embedded Trunking Controller: control channel RBS/Traffic channel RBS
Simulcast configuration wide coverage Virtual repeater	Radio Base Station macro-cell Master with embedded Trunking Controller/ macro-cell Master for Traffic Channel/ sub-master/slave

TRANSMITTER

Frequency bands	66-88 MHz or 136-174 MHz or 400-470 MHz or 854-921 MHz
Output impedance	50 Ohms
RF power	From 2 to 25 Watt
Maximum Deviation (RSD) 12.5/25 kHz	± 2.5/± 5 kHz
Adjacent channel power	<-60 dB@12.5 kHz <-70 dB@25 kHz (ETSI)
Intermod. attenuation	>40dB (ETSI)
Spurious and harmonic	<-36 dBm < 1 GHz
Emissions	<-30 dBm > 1 GHz (ETSI)
Audio response	+1, -3dB; 300-3000 Hz
Audio distortion	< 3% @ 1000Hz; 60% RSD
S/N	>45dB (12.5 kHz) / >50dB (25 kHz)
Frequency stability	± 0.02 ppm

RECEIVER

Frequency bands	66-88 MHz or 136-174 MHz or 400-470 MHz or 854-921 MHz
RF input impedance	50 Ohms
Receiver sensitivity	› Analog FM (12.5 kHz): ≤ -109,5 dBm @ 20 dB SINAD psofo › Digital 4FSK (12.5 kHz): ≤ -115 dBm @ BER = $1x10^{-2}$ › Digital C4FM (12.5 kHz): ≤ -115 dBm @ BER = $1x10^{-2}$
Adjacent channel selectivity 12.5/25 kHz	>60 dB/70 dB (ETSI)
Intermodulation rejection 12.5/25 kHz	>70 dB (ETSI)
Spurious and image response rejection	>70 dB (ETSI)
Audio response	+1, -3dB; 300-3000 Hz
Audio distortion	< 3% @ 1000Hz; 60% RSD
S/N	>45dB (12.5 kHz) / >50dB (25 kHz)
Line output	-10 dBm

POWER SUPPLY

Input voltage	13.2 Vdc (10.8-15.6 Vdc - negative grounded)
Current drain	› Stand-by: 3 A max @13.2 Vdc › Transmit: 8.5 A max @13.2 Vdc
Current drain	› Stand-by: 1 A max @48 Vdc › Transmit: 2.5 A max @48 Vdc

NOTE: current drain values are for fully equipped devices.

AUXILIARY POWER SUPPLY

Output voltage	13.2 Vdc (10-14.8 Vdc with ambient temperature range = -30° to +60°C with Iload = 2A max)
Output current	2A max

RF SPLITTER

Output level attenuation	0-3 dB (with ambient temperature range = -30° to +60°C)

GPS

GPS receiver model	LEA-6T-0-001

ENVIRONMENTAL CONDITIONS

Operating temperature	-30°C to +60°C [-22° to +140 °F] *This is the temperature measured in close proximity to the device. If the device is mounted in a cabinet, the temperature within the cabinet is measured*
Equipment ventilation	A minimum of ½ RU (4,4 cm – 1,7 inches) must be left among devices installed in the same cabinet

[1]Depending on RBS equipment

COMPLIANCIES

CE	RED Directive 2014/53/EU
FCC	CFR Title 47 - Part 90, Part 15B, Part 22

Not all variants and features might be available in all countries or in all geographic areas

CONFORMITY

The of ECOS-D A2T family products are FM/4FSK/C4FM two way repeater suitable for use in private mobile radio (PMR) systems. It utilises operating frequencies not harmonised in intended country of use.
A license must be obtained before using the product in intended country of use. Ensure specific country licensing requirements are fulfilled. Limitations of use can apply in respect of operating frequency, transmitter power and/or channel spacing.
The equipment is CE marked according to the requirements specified in the “Radio Equipment” 2014/53/EU Directive.
The ECOS-D A2T radio equipment is Class 2 and can be used in any European Union countries subject to authorization by the competent authority for the type of service in each country.

BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK.

This device can be used in any country not belonging to the European Union that has approved its use.

The ECOS-D A2T family products complies with relevant Standards listed here.

- **Safety - Art. 3.1a**
  - EN 62368-1
  - EN 62232
  - EN 50385
- **EMC - Art. 3.1b**
  - EN 301 489-1
  - EN 301 489-5
  - EN 301 489-19
- **Radio - Art. 3.2**
  - EN 300 086
  - EN 300 113
  - EN 303 413
- **DMR**
  - TS 102 361-1
  - TS 102 361-2
  - TS 102 361-3
  - TS 102 361-4

ROHS COMPLIANCY

The equipment is compliant to the RoHS 2011/65/CE Directive and following revisions.

ENCODING CRITERIA

The following legend defines the coding rules for the products derived from the archetypes. It is specific for an ECOS-D A2T equipment fitted with the 25W PA.
The model name for each product derived from the archetype, is obtained by assigning to the variables (lowercase letters) one of the values listed here.

Models available

ECOS-D RBS4000C aabbbwAcde4WgE100SnVpGr-ads	
Frequency band	**aa** aa = V1 (66 - 88 MHz) aa = V3 (136 - 174 MHz) aa = U1 (400 - 470 MHz) aa = U3 (854 - 921 MHz) aa = 00 - no radio part
RF configuration (power, antenna commutation and Rx diversity)	**bbbw** bbb = 025 - Pout 25W bbb = 000 - indicates no Power Amplifier module w = W - Configuration without RX Diversity w = D - Configuration with RX Diversity w = 0 - no receiver
Power supply	**Acde** c = 0 - does not provide +12Vdc power supply c = 1 - provides +12Vdc power supply d = 0 - absence of alternatives to +12Vdc p. supply d = C - +48Vdc power supply e = 1 - one (1) power supply module e = 0 - no power supply modules
4 Wires interfaces	**4Wg** g = 1 - one (1) Line interface module g = 2 - two (2) Line interface module g = 0 - no Line Interface modules
Option board IP/ DSP3 - SOIP	**Sn** n = 1 - one (1) SOIP on one (1) CORE module n = 2 - two (2) SOIP on two (2) CORE modules n = 0 - no SOIP
Option board - VOCODER	**Vp** p = 1 - one (1) ‘single’ VOCODER on one (1) CORE module p = 2 - two (2) ‘single’ VOCODERS on two (2) CORE modules (in case of RGW) and one (1) ‘multi’ VOCODER on one (1) CORE modules (in case of RBS) p = 0 - no VOCODER
Synchronization - GPS receiver	**Gr** r = 1 - one (1) RX GPS on one (1) CORE module (Master) r = 2 - two (2) RX GPS on one (1) CORE module (Master) r = 0 - no RX GPS
Ancillaries	**ads** a = 0 - no +12Vdc auxiliary output a = 1 - one +12Vdc auxiliary output is present d = 0 - no door open cables d = 1 - two door open cables are present s = 0 - no GPS Splitter module nor associated back-RFSPL s = 1 - one GPS Splitter module and associated back-RFSPL with four outputs SMA, are present

Leonardo S.p.a. is Chair of DMR Association and member of DMR Technical Working Group (TWG)

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