TELERAD

Aeronautical and Maritime Radiocommunication Systems

VHF SOFTWARE DEFINED RADIOS

EM9000-2G | RE9000-2G

EM9000-2G TRANSMITTER

- 50 W RF output power
- Low power consumption
- High reliability
- Outstanding ACP performance
- Built-in-test

RE9000-2G RECEIVER

- Outstanding sensitivity and cositing, performance
- High reliability
- Built-in-test

OVERVIEW

The TELERAD Series 9000-2G radio systems are specifically designed to meet the operational requirements of air traffic control centers, commercial airports, and range installations. Fully scalable and with growth capacity, they feature high reliability, and remote control and maintenance capability.

MAIN FEATURES

- Multimode functionality in one Software Defined Radio
- AM, FM, ACARS, upgradable VDL Mode 2
- Wide band 118-144 MHz, with option to extend to 108-156 MHz; 156-163 MHz (FM)
- 2 to 50 W RF Output Power
- Remote control and maintenance capability, Built-in test
- SNMP, JBUS
- VoIP conform to EUROCAE ED-137
- 2 Ethernet ports for redundancy

GENERAL DATA

Frequency range:
- AM: 118-144 MHz, (108-156 MHz as option)
- FM: 156-163 MHz
- VDL2: 118-136.975 MHz

Frequency stability:
≤ 0.3 ppm

Channel spacing:
25 kHz, 8.33 kHz

Modulation:
- A3E / F3E / G3E (voice)
- AM-MSK 2400 bits/s (ACARS)
- D8PSK 31500 bits/s (VDL2)

Data interface:
RS485 up to 115.2 Kbps

Maintenance:
- Local (RS232) or remote (RS485)
- Maintenance: Built-In Test, software loading
- Setup functions: frequency, operation, parameters
- Measurements: Tx output power, VSWR, DC voltage, Rx AGC voltage...

Temperature:
- Operating: -20 °C to +55 °C
- Relative humidity: 95 % at +40 °C (non-condensing)
- Storage:-40 °C to +80 °C

Power supply:
- EM9000A-2G / RE9000A-2G versions:
  - AC: 85-265 V, 50-60 Hz
  - DC : 24 V_{DC} (21-31 V_{DC})
  - Automatic switching from AC to DC input
- EM9000C-2G / RE9000C-2G versions:
  - DC: 24 V_{DC} (21-31 V_{DC})

IP technology:
- VoIP (according to ED-137-1)
- SNMP V1, V2c, V3 (according to ED-137-4)
- 2 Ethernet ports IPv4, IPv6

Standards:
- ICAO SARPS
- ETSI EN 300 676: AM
- ETSI EN 301 841 - 1: VDL2
- ETSI EN 301 489 (-1/-22)
- EUROCAE ED-137: VoIP

EM9000-2G SPECIFICATIONS

Mechanical characteristics:
- Width: 483 mm
- Overall depth: 430 mm
- Height: 132 mm, 3 U
- Weight: < 14 kg

Power consumption (50 W AM - 1 kHz 80 %):
- 24 V_{DC}: 14 A (Typ.)
- 230 V_{AC}: 2.2 A (Typ.),
- 115 V_{AC}: 3.9 A (typ.)

Carrier Offset (ICAO Annex 10):
25 kHz channels: up to 5 carriers, 8.33 kHz: 2 carriers only

RF output power:
2-50 W in 0.5 dB steps

VSWR:
Up to a VSWR of 2: 1 without power reduction

Protections:
Power reduction on overheating, low voltage and high VSWR

Duty cycle:
100 % (with external fan)

A3E modulation:
- Modulation rate > 85 %
- Threshold: < 3 % (m = 85 %)
- Audio input adjustable from -30 to 0 dBm (max. +10 dBm)
- Audio input impedance: 600 Ω
- AFC AGC regulation: < 0.5 dB for +30 dB
- Audio bandwidth at 25 kHz channel spacing: > -3 dB 300-3400 Hz, < -40 dB at 5000 Hz
- Audio bandwidth at 8.33 kHz channel spacing: > -3 dB 300-2500 Hz, < -40 dB at 3200 Hz

Data Mode:
ACARS: > -3 dB 200-3400 Hz

Tx Time Out:
Adjustable from 5 to 300 s in 5 s steps (can be disabled)

Spectral purity:
- Harmonics: < -36 dBm (< -83 dBc)
- Spurious: < -54 dBm (< -101 dBc)
- Noise at 1 % of the carrier: < -150 dBc/Hz

Adjacent channel power (ACP):
AM 8.33 and 25 kHz: < -70 dBc
- D8PSK: 1st channel: < -18 dBm (16 kHz)
- D8PSK: 2nd channel: < -28 dBm (25 kHz)
- D8PSK: 4th channel: < -38 dBm (25 kHz)

RE9000-2G SPECIFICATIONS

Mechanical characteristics:
- Width: 483 mm
- Overall depth: 430 mm
- Height: 44.5 mm, 1 U
- Weight: < 4 kg

Power consumption (receiving):
- 24 V_{DC}: 500 mA (Typ.)
- 230 V_{AC}: 180 mA (Typ.)
- 115 V_{AC}: 270 mA (Typ.)

Sensitivity:
- A3E: ≤ -105 dBm (SINAD 12 dB, 1 kHz 30 %)
- ACARS: -102 dBm (> 99% of messages)
- VDL2: -98 dBm (BER < 10^{-3} w/o FEC)

Distortion (1 kHz, 90 %):
≤ 5%

AF Bandwidth (A3E):
- 25 kHz channel spacing: ≥ 300-3400 Hz
- 8.33 kHz channel spacing: ≥ 300-2500 Hz

AF Noise (-13 dBm, 1 kHz, 90 %):
> 50 dB

Effective Bandwidth at 6 dB:
- 25 kHz channel spacing: > ± 8.5 kHz
- 8.33 kHz channel spacing: > ± 2.8 kHz

Adjacent channel rejection:
≥ 70 dB

Spurious rejection:
≥ 70 dB

3rd order Intermodulation (SINAD 12 dB, 100 and 200 kHz)
≥ 80 dB

Desensitizing:
≥ 100 dB

Cross Modulation:
≥ 85 dB

AGC Response (A3E voice):
- Dynamic range: 100 dB (Variation ≤ 3 dB)
- Attack time: < 20 ms
- Release time: < 25 ms

Audio Line Output:
Adjustable from -11 to +10 dBm in 0.5 dB step
Impedance: 600 Ω

Squelch:
- Attenuation: ≥ 60 dB
- Type: Carrier detection or Signal/Noise ratio

2, avenue de la Butte aux Cailles - BP 302 - 64 603 ANGLET CEDEX - FRANCE
Tel.: +33 (0)5 59 58 55 00 - Fax: +33 (0)5 59 58 55 01 - Email: courrier@telerad.fr

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