

OTE D100 SERIES  
OTE MGS100 SERIES

# OTE D100 SERIES OTE MGS100 SERIES

## OTE D100 SERIES ATC SOFTWARE DEFINED RADIO EQUIPMENT SERIES

The OTE D100 radio series is a multi-mode digital radio family which can implement all communication standards foreseen by ICAO Annex 10 without modifying hardware and modules.

The OTE D100 waveform can be easily configured for:

- Voice networks with traditional analogue AM-DSB modulation with channel spacing options of 25kHz or 8.33 kHz for VHF band, and 25kHz for UHF band
- AM-MSK modulation for digital ACARS functions and operations (2,400 bit/sec) on VHF range
- D8PSK modulation (31.5kbit/sec) for VHF datalink Mode 2 sub-networks: OTE D100 implements an ARINC 750 – compliant with VDL2 protocol stack.



## BEST-IN-CLASS RADIO EQUIPMENT

Intelligibility of voice communications is the most important requirement for ATC communications. The OTE D100 radio series offers outstanding performances in terms of reduced broad band noise radiation and unwanted emissions. These features, together with the high grade of immunity to external interference of the receiver, enable users to meet challenging co-siting requirements under EMC-critical equipment arrangement. In addition, intermodulation rejection exceeds by at least 10 dB the ETSI figures.

This fact, together with the availability of the integrated TxRx OTE D100 configuration, allows deployed integrated TxRx ground station sites to handle multiple frequencies. The customer can save space and power consumption on each site, without any degradation of voice intelligibility.

OTE D100 radios offer guaranteed performances throughout the whole frequency band and operating temperature range.

The radios cover both extended VHF (108 to 156 MHz) and standard UHF (225 to 400 MHz) frequency ranges without performance degradation. OTE D100 radio series is also able to provide continuously transmission at full power (100% duty cycle) on overall -20°C to +55 °C operating temperature for ATIS and VOLMET applications.

## UNLIMITED ACCESS

OTE D100 radio series offers the maximum flexibility in terms of network integration, by easy configuring its interfaces, without adding external access devices.

OTE D100 provides the following interfaces for Analog applications:

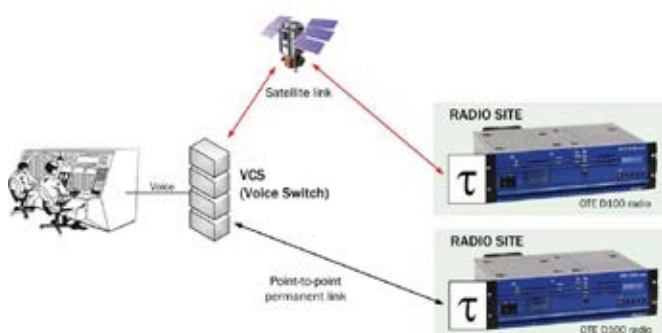
- 2 x 4W/4W E&M standard ANSI connection (according to customer needs)
- In-Band-Tone for PTT & Squelch signals (selectable via SW)
- Mixed configurations (one 4W E&M plus one 4W with inband tones, simultaneously active)



The OTE D100 can be completely configured and managed by the new Network Management System (ONM100) through:

- Redundant Ethernet 10/100BaseT IEEE802.3 standard for remote O&M operations. This solution makes the z maintenance the ideal solution for the maintenance on unmanned sites
- Additionally, the equipment can be configured and managed through RS232/USB interfaces

The OTE D100 provides interfaces for data link and digital applications by using a double Ethernet 10/100BaseT IEEE802.3 standard (configurable) for VoIP, VDL2 and Digital ACARS. Thanks to the



implementation of the EUROCAE ED-137 A standard VoIP protocol, radio equipment can be directly interfaced to an IP network to transport voice.

## EMBEDDED RADIO SOLUTIONS

The OTE D100 series offers a variety of system architecture options, without using external devices. These include embedded radio changeover and a dual backbone capability, as well as an embedded line delay tuning.

The embedded changeover function (patent pending), combined with the “dual backbone” feature, allows paired equipment’s, configured in mainstandby mode of operation, to operate as a failure-tolerant system without the support of any other external device.

The system can guarantee uninterrupted operations even in the case of failure of one of the radio equipment composing the pair.

The transmission changeover also takes place on counting the PTT transactions. This function realises a uniform assignment of the service between the two managed radio sets, in order to have uniform equipment aging.



It is also possible to extend the redundancy scheme to audio frequency lines connecting radio equipment to operator, by having primary and backup audio connections together with line changeover (dual backbone) facility.

The Embedded Line Delay Tuning function allows transport networks with different propagation characteristics to be managed. An adjustable delay (up to 500ms, with 20ms steps) can be applied on the Tx and Rx voice paths of both primary and backup AF lines when climax mode of operation and double audio line are used.

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## FAST AND EASY MIGRATION FROM ANALOGUE TO DIGITAL

The “dual backbone” feature allows a smooth migration between legacy VCS - radio 4W or 4WE&M connections to new VoIP networks without any manual intervention on the remote sites and without any external device.

During the VoIP network setup and tuning phase, the ATC Controller will have both legacy and VoIP interfaces available, falling back to the analogue one as needed.

## OPTIMISES MAINTENANCE, LOGISTIC AND STORAGE OPERATIONS

The OTE D100 radio series is designed with a modular architecture in order to provide the following benefits:

- Simplification of logistic and storage operations reducing the number of modules to the maximum extent (common modules and cards for transmitter, receiver and integrated transmitter-receiver)
- Easy upgrade by single module improvement
- Rapid insertion/removal of the single module (MTIR <15 min.)
- Maximum degree of configuration, according to all possible modes of operation (VoIP, D-ACARS, VDL2)

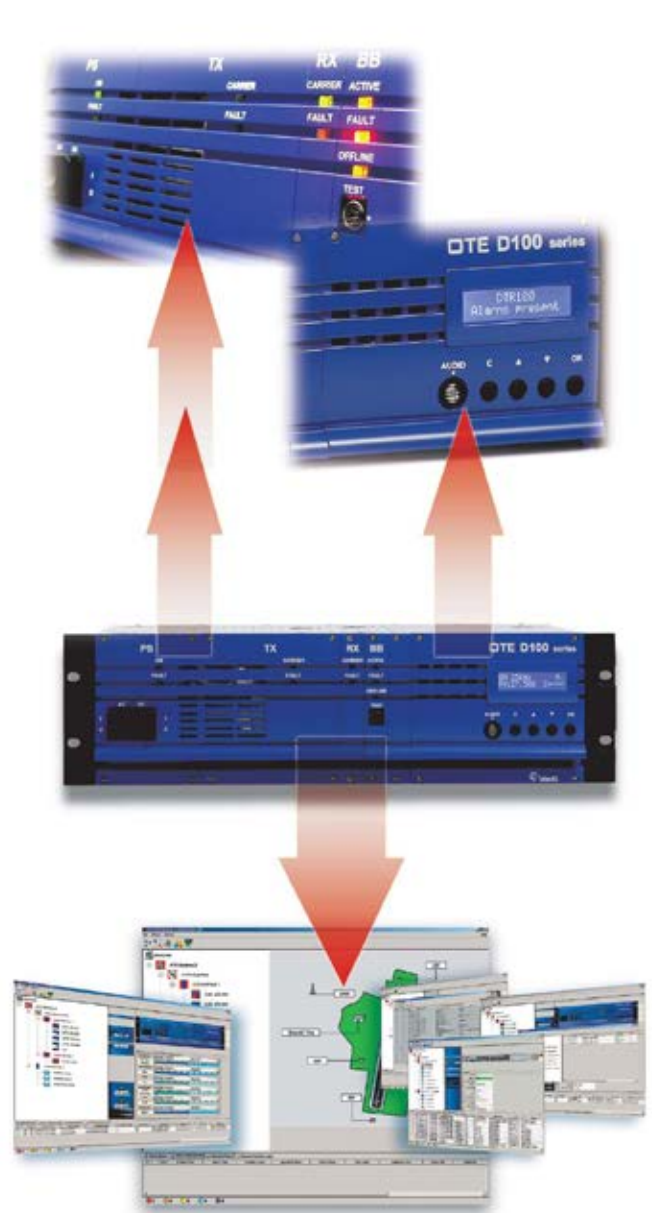
The radio series provides alarm/alert warnings, which are readily recognised to reduce to a maximum maintenance operations. When an alarm/alert occurs, the faulty module shows a red light and the OTE D100 display indicates a symptom immediately.

These warning events are always shown and stored on OTE ONM100 Network Management System for remote diagnostic, recording and statistic purposes.

## THE OTE MGS 100 MULTI-MODE GROUND STATION

Based on OTE D100 software-defined radio technology, the OTE MGS100 Multi-mode Ground Station meets all the challenging requirements for ground-air-ground communications, supporting present and future civil and military OTE applications.

Different datalink technologies can be provided in a unique, integrated and cost-effective approach.



## SOLUTION FOR VOICE COMMUNICATIONS

The MGS100 Multi-mode Ground Station exceeds ICAO and ETSI standards for AM-OSB mode for ATC ground-to-air voice communication systems.

It is easily configured in terms of:

- Antenna and multi-coupling systems
- OTE D100 radio configurations
  - Transceivers, transmitters, or receivers
- Channel spacing
  - 25kHz and 8.33kHz
- Single channel and multi-channel operation. For multichannel mode, automatically-tunable cavity filters are available
- Frequency band
  - VHF or UHF
- Operating modes
  - Analog Voice
  - Voice over IP (compliant with EUROCAE EO 137A)
- Meets stringent ANSP availability requirements
  - Embedded changeover operation (1+1 without external changeover devices)
  - “Dual backbone” support: OTE0100 equipment provides native redounded interfaces to VCS
- Network interfaces for ATC Voice service
  - 4WE&M, 4W with in-band tones;
  - 2 x IEEE802.3 interface with IP protocol;
  - E1 interface for PCM voice
- Network interfaces for O&M
  - IEEE 802.3 10/100 BaseT

## COMPACT MGS FOR VOICE COMMUNICATIONS

The company offers solutions to integrate radio channels inside the same ground station for saving space in radio site.

The new OTE D100-4 radio series provides double equipment completely separated in the same chassis. The new models are:

- OTE D2TR100-4 (double transceiver)
- OTE D2T100-4 (double transmitter)
- OTE D2R100-4 (double receiver)

According to the above radio models, the MGS100 can host up to sixteen equipment (eight radio channels in 1+1 configuration) with cavity filters.



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## SOLUTION FOR DATALINK APPLICATIONS (VDL2 AND ACARS)

The provision of ground-air-ground datalink support for current and future ATM applications is a challenging integration problem that cannot be solved by the use of simple radio equipment.



The OTE MGS100 has been successfully tested and deployed with the following capability:

- MGS100 fully implements of VDL2 protocol stack according to ARINC 631-6 specification and ETSI-EN 303 214 “Community Specification on Datalink Services, under the SES Interoperability Regulation IR 552/2004”
- MGS100 is integrated with ATN sub-network for CPDLC applications. Various ATN AGR interfaces are available
  - XoT
  - Proprietary
  - XoT over Multicast IP
- MGS100 is integrated within ACSP networks for ACARS operations, supporting two modes of operation
  - ACARS over AVLC
  - Plain Old ACARS
- Redundant and modular design, in order to satisfy future VDL2 growth (up to four frequencies) and to meet the ANSP availability stringent requirements (“five nine” Ground Station networks)
- Data and event logging capability - together with sophisticated network management functionality, they keep all MGS100 hardware and processes under control to constantly verify and manage performance, according to defined Service Level Agreements (SLA).
- Based on full IP architecture and OTE D100 equipment configured for VDL2 and Digital-ACARS modes of operation



## TECHNICAL DATA

General		VHF	UHF
Frequency range		108 to 156 MHz	225 to 400 MHz
Frequency stability		< 1 ppm / <0.3 ppm (on demand)	< 1 ppm
Operating temperature range		-20° to +55°C	
Supply voltage	AC	88 to 265 VAC 50/60 Hz (full range)	
	DC	21.6 to 31.2 VDC (automatic changeover on AC source failure)	
Channel spacing		25 kHz / 8.33kHz	25 kHz
Modulation types		AM (A3E)	AM (A3E)
		AM-MSK @ 2.4 kbit/s	/
		D8PSK @ 31.5 kbit/s	/
Co-location performances (Tx-Rx distance)		<280m @ 300 kHz	<25 @ 1%
Offset operation		Up to 5 carriers (AM 25kHz)	Up to 4 carriers
		Up to 2 carriers (AM 8.33kHz)	/
Preset channel		Up to 100	Up to 100
Dimensions		19" standard rack, 3 HU, 330mm depth	19" standard rack, 3 HU, 330mm depth
Weight		13kg maximum	15kg maximum
<b>Transmitter features</b>			
RF output power		10 to 50W	10 to 30W
Duty cycle		100% at any operating conditions	
Output impedance		50 ohm	
VSWR		>2:1 at full power; no damage with open/short circuit	
Emissions (active mode)	Spurious	< -93 dBc	< -90 dBc
	Harmonics	< -83 dBc	< -80 dBc
<b>Receiver features</b>			
Input impedance		50 ohm	
Squelch types		Carrier to Noise or RSSI based, carrier override feature selectable	
Sensitivity	AM	< -107dBm @ 1kHz mod. and 10dB S/N weighted to ITU-T	< -101dBm @ 1kHz mod. and 10dB S/N weighted to ITU-T
	D8PSK	< -102 dBm with uncoded BER=10 <sup>-3</sup>	/





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