

COVERAGE SOLUTIONS FOR CRITICAL COMMUNICATIONS

Based on Software Defined Radio



AVOIDING COVERAGE GAPS IN TETRA NETWORKS



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TETRA REPEATERS: Line RIT-Optical

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The European Union has established the standard TETRA (Terrestrial Trunked Radio) with the goal of satisfying the needs of voice and data radio services. The standard regulates the radio-communication systems of security forces: police, fire-fighters and civil defence. The regulation assures the compatibility between radio networks in different countries. That enables the collaboration between squads of different countries in emergency situations.

The standard requires the presence of signal in all the public areas and those susceptible of requiring the help of security forces in case of accident or catastrophe. It is then required the presence of TETRA signal in road tunnels, metro, high-capacity parking and sport facilities among many others. AD TELECOM has developed a broad range of TETRA Repeaters to cover the needs of coverage enhancement. The networks mentioned below have been chosen AD TELECOM's equipment to enhance their area of coverage:

- RESCAT networks covering the whole territory of Catalonia.
- AIRPORT OF BARAJAS, in Madrid
- FERROCARRILS DE LA GENERALITAT DE CATALUNYA, the suburban train of Catalonia.
- DEPARTAMENTO DE INTERIOR DEL PAÍS VASCO: Internal Security of the Basque Country.
- CIRCUIT OF JEREZ: Racing circuit located close to Jerez de la Frontera.



The product developed by AD TELECOM stands out for the digital processing of the transported signal. The digital processing is used for the operations traditionally carried out by analogue modules (filtering, silencing...), and also for the transport of the signal through the fibre. The advantages of the product in front of other repeaters are listed below:

- No losses at system level due to optical transmission.
- The digital optical transmissions permit to transport the full dynamic range from master to slave and vice versa.
- Configurable filtering with low latency.
- The silencing based on digital techniques avoids the degradation of the base station sensibility.
- The digital system benefits from traditional analogue systems in terms of sensibility. When receiving different analogue uplink signals in a network, the different noise power of each remote signal contributes to increase the resulting noise and reduce the sensibility proportionally to the number of remote signals. This effect is avoided with the digital system developed by AD TELECOM.

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SPECIFICATIONS			
Frequency bands		<i>Uplink Band</i>	<i>Downlink Band</i>
		380—385 MHz	390—395 MHz
		385—390 MHz	395—400 MHz
		410—415 MHz	420—425 MHz
		415—420 MHz	425—430 MHz
		450—455 MHz	460—465 MHz
		455—460 MHz	465—470 MHz
Duplex distance between carrier frequencies		5 MHz	
Number of channels		From 1 to 4 channels	
Bandwidth of the channel filter		90 kHz, 45KHz and 30KHz, OFF	
Delay	Without filter	3.5us	
	90KHz	12us	
	45KHz	20us	
	30KHz	27us	
Gain (OMR-OSR)		Configurable from 50 dB to 85 dB	
Antenna to antenna (RX-TX) isolation		>60 dB	
Maximum input power		-20 dBm	
Output repeater power (downlink) According to ETSI TS 101789-1		<i>1 channel</i>	+36dBm
		<i>2 channels</i>	+33dBm
		<i>4 channels</i>	+30dBm
Output repeater power (uplink) (Master equipment only) According to ETSI TS 101789-1		<i>1 channel</i>	+20dBm
		<i>2 channels</i>	+17dBm
		<i>4 channels</i>	+14dBm
Spurious emission level		< -36 dBm	
Noise figure		<6 dB	
Remote control system		WEB Server, SNMP agent	
Local maintenance		USB, Ethernet	
Working temperature range		-25°C to +55°C	
Cooling		Convection	
Power Supply		90 - 240 VAC 50Hz/60 Hz	
Consumption		< 70 W	
Protection		IP65	
Dimensions		450 x 380 x 200 mm	
Weight		20 Kg	
EQUIPMENT		FUNCTIONALITY	
Master Equipment, RIT-OMR-TETRA		Downlink Reception	
		Uplink Transmission	
Slave Equipment. RIT-OSR-TETRA		Uplink Reception	
		Downlink Transmission	

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OPTICAL INTERFACE

The optical interface is based on a high-performance digital optical transceiver (bit rate up to 1.25Gbps and a transmission distance with SMF fibre of 20km). The transceiver consists of a FP laser transmitter, an integrated PIN pre-amplified photo-diode and a MCU. It is a single fibre full-duplex solution, transmission and reception operating at different wavelength (1310nm and 1550nm), but transmitted through a single mono-mode fibre SMF using WDM (Wavelength Division Multiplexor). All modules comply with security laser requirement of Class I.

Table – Optical parameter of the system

PARAMETER	VALUE
Wavelength	Downlink: 1550nm
	Uplink: 1310nm
Sensibility	-25dBm
Power	0dBm
Full-duplex	WDM Uplink-Downlink Multiplexing (in a single fibre)
Number of optical input / output	Master equipment: 4 + 1
	Slave equipment: 2
Connector	LC/APC
Optical Fibre SMF	G652 – G655



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LOCAL CONFIGURATION / SUPERVISION

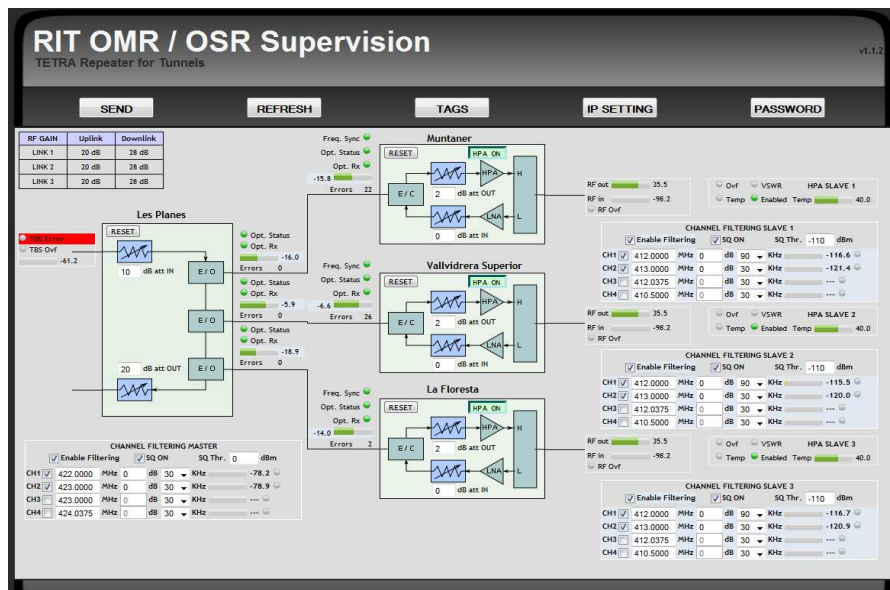
The local configuration/ supervision are carried out by means of a USB connection to a computer. All system parameter can be configured with the provided control software, as well as monitoring the state and alarm information of the equipment, for both master and remote equipment. Those data are multiplexed and sent through the fibre.

REMOTE SUPERVISION

Remote supervision of coverage enhancers is done by Ethernet connection provided by the master. The system incorporates a Web Server (which permits the configuration and monitoring of all parameter of the equipment using a Web Navigator) and agent SNMP (which permits the integration in a SNMP manager). The SNMP agent enables the configuration and monitoring of the system parameter, as well as sending asynchronous TRAPS alarms to the SNMP manager.

PARAMETER	VALUE
Remote control system	Web Server, SNMP Agent (Master)
Local maintenance	USB (Master and Slave)

Both local and remote control of the equipment permit to control and monitoring the master equipment and the slave equipment connected through an optical fibre.



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