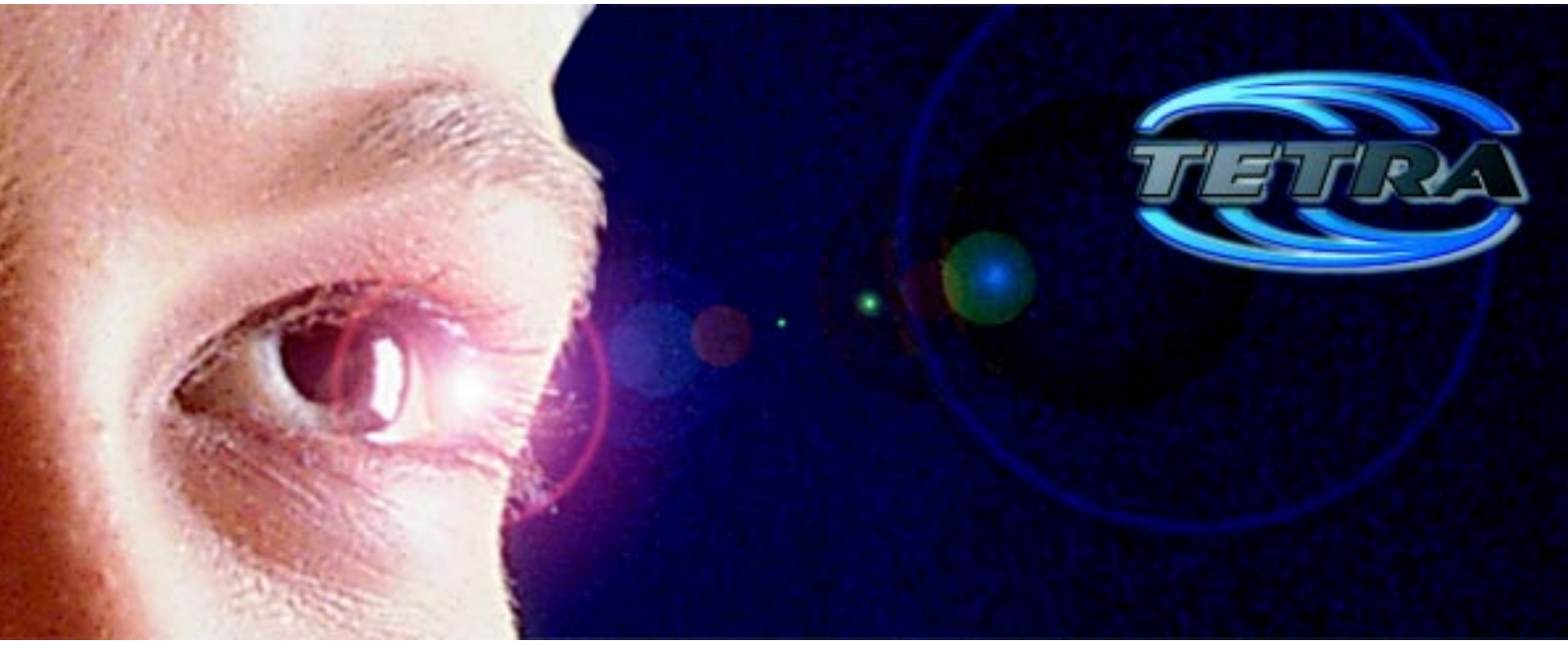

TETRA

Terrestrial Trunked Radio for Professional Cellular Systems

TETRA, the European standard for Trunked Radio Systems, is primarily intended for users in the public security sphere, transport, utilities and operators of public Trunked Radio networks.

As fully digital radio system, TETRA is hallmarked by improved transmission quality and higher frequency economy. The comprehensive functionality additionally ensures high flexibility in professional mobile communications.

The European Institute for Telecommunications Standards (ETSI) has developed this standard in co-operation with the leading manufacturers, system operators and users.

TETRA has been conceived for high frequency economy, reliable voice and data transmission and versatile operating features. In addition to the central standard for speech and data (TETRA “Voice and Data”) there is also a special variant which optimally supports the packet oriented transmission of data via the radio channel (TETRA PDO = “Packet Data Optimized”).

Thus the system platform is able to combine the two radio services, mobile data transmission and paging, which were up to now only offered by separate infrastructures. This improves the flexibility and economic viability of the ystem for the network operator, service providers, and not least for the end user.

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New Features

The proven advantages of analogue Trunked Radio Systems + fast call set-up ("Push-to-talk"-mode), group oriented communication and the utilisation of control stations + have been extended through the addition of further features, like encryption, "Late Entry", economic duplex option, etc.

Digitisation reduces the costs for operators and users, and offers access to the modern telecommunications world (ISDN, DECT, GSM), with all the performance features of a state-of-the-art private exchange, for example caller identification, call diversion, short-dialing, call waiting and call-holding.

TDMA Access Method

TETRA is defined as a time multiplexed system (TDMA = "Time Division Multiple Access") with four independent transmission channels per carrier. The spacing between the individual carriers is 25kHz. This provides, in comparison to analogue Trunked Radio System, which operate with 12.5 kHz spacing according to the MPT standard, a doubling of the frequency utilisation together with a considerable improvement in speech transmission quality. Compared to GSM networks, which currently offer 8 communication channels in 200 kHz channel spacing TETRA-systems offer a quadrupling of the frequency utilisation.

The transmission rate on the TETRA carrier frequencies is 36kBit/s. In addition to the message content to be transmitted the data includes the protocol-information and codes necessary for the securing of the radio link between subscriber radio and radio base station. The maximum user data rate per communication channel is 7.2kBit/s (per time slot). The TETRA CODEC digitises and compresses the speech so that a continuous two-way conversation is possible, using two corresponding time slots. The CODEC output delivers 4.8kBit/s, which is transmitted within in a time slot of 7.2kBit, including the securing code.

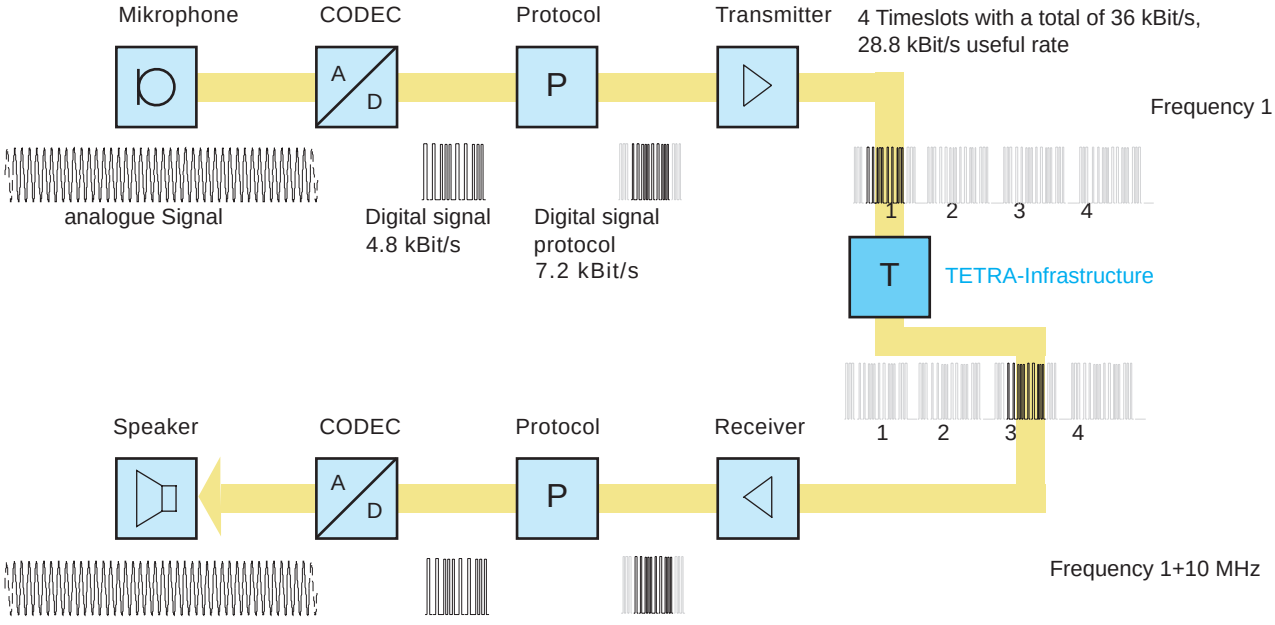
The duplex offset is 10 MHz in "Time Division Duplex" mode. This means that the user terminal constantly switches between the transmit and receive frequencies, in synchronism with the allocated time slots. In this way complex filter systems, which would be necessary for simultaneous transmission and reception, can be avoided.

TETRA Packet Data Optimized

TETRA allows the adjustment of the transmission rate and the reliability functions to the specific application. The data rate can be varied between 2.4 kBit/s, for extremely high security requirements, using one time slot, and 28.8kBit/s if the data protection protocol is disabled, and four time slots are used.

Direct-Mode

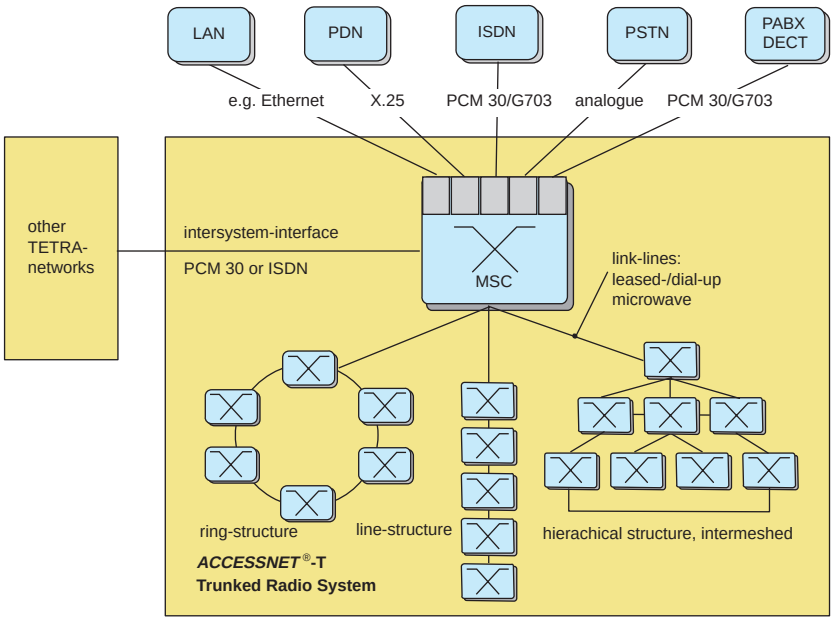
Important measures for increasing the flexibility for TETRA users are embedded in the Direct Mode. The Direct Mode enables communication between subscriber radios independent of the radio-network. Thus TETRA subscriber radios can be used as "walkie-talkies" within and without the network. It is also possible to operate a subscriber radio as a repeater for another radio, in



order to temporarily improve, or extend, the network coverage. For example, a watchman can, on leaving his vehicle, switch his vehicle radio to Direct Mode and then use the extended coverage thus provided by means of a hand-held radio, e.g. during his round within a factory building or grounds. In addition "Dual-Watch" operation is also offered, which in Direct Mode ensures the accessibility of a subscriber through the network.

R&S BICK Mobilfunk: Your power partner

As the Centre of Competence for mobile communication, within the Rohde &Schwarz group of companies, R&S BICK Mobilfunk has for many years been a trend-setter for professional analogue and digital networks.
Right from the start R&S BICK Mobilfunk has played a competent role in the creation of the TETRA standard, through working together with ETSI, and has considerably influenced the implementation of user friendly and state-of-the-art solutions. Market leader in Germany for public MPT-1327 trunked radio systems, thanks to the acceptance of our ACCESSNET® product, we have also achieved a commanding position in the world market for special networks for public transport companies and despatcher networks.



The decision to co-operate within the Memorandum of Understanding for TETRA (TETRA MoU) was a logical step forward. The TETRA MoU group is an European meeting of interests for the promotion and rapid implementation of TETRA. Trial systems are in operation, common information events are being presented, and technical discussions about interoperability are being organised.
R&S BICK Mobilfunk offers particular advantages: the already implemented MPT-1327 technology of our product *ACCESSNET*® was conceived with interoperability in mind. Thus it will be possible, within a single network, to provide both MPT and TETRA channels. Within mixed fleets an MPT subscriber can communicate with TETRA subscribers directly. The Soft-Migration from *ACCESSNET*®, the analogue Trunked Radio System to the digital MPT-1327 System *ACCESSNET*®-D, and ultimately to the TETRA Trunked Radio System *ACCESSNET*®-T is our commitment.

Abbreviations

CODEC	Coder-Decoder
DECT	Digital European Cordless Telecommunication
ETSI	European Telecommunications Standard Institute
GSM	Global System for Mobile Communication
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MSC	Mobile Switching Centre
PABX	Private Automatic Branch Exchange
PDN	Public Data Network
PDO	Packed Data Optimized
PSTN	Public Switched Telephone Network
TDMA	Time Division Multiple Access
TETRA	Terrestrial Trunked Radio

TETRA Services

TETRA Basic Services	
Speech Transmission (encrypted)	Single call
	Group call
	Group call with acknowledgment
	Broadcast call
Data Transmission (encrypted)	Plain data transmission, up to 28.8 kBit/s
	Reliable data transmission, up to 19.2 kBit/s
	Line switching
	Packet switching

TETRA Extra Services	
Authorisation through dispatcher	Call request via dispatcher
Area selection	The geographic operating area can be defined for each subscriber
Access priority	Improves access to the network for authorised subscribers at times of high network load
Priority call	Call connection with waiting list priority
Late entry	Automatic including of belated subscribers into calls
Emergency call	Call with highest priority
Monitoring function	Allows authorised subscribers monitoring
Ambience listening	Enables in special cases monitoring by the dispatcher
Dynamic groups	Enables the variable definition of groups
Transfer of group responsibility	Enables to transfer the responsibility for the call to another subscriber, without interruption

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