**ACCESSNET**®-T Cube is a TETRA communications system for mobile applications that is modular in design and thus highly versatile. It can be operated as a standalone system, but also integrated into existing networks. Initial orders were received soon after market launch, and these systems are now already in use. User feedback has been very positive.

Developed to customer specifications

Before developing ACCESSNET®-T Cube, Rohde & Schwarz carried out intensive market research and interviewed potential users from government authorities and organizations with public safety tasks, the military and emergency relief services as well as private network operators. Rohde & Schwarz specifically asked them about their requirements for a mobile TETRA communications system. The responses indicated the following main requirements:

- Easy to transport so that the system can be quickly taken to the site by vehicle or helicopter
- Quick and easy to set up on-site
- Ready to operate within a few minutes
- Designed with configuration or operating parameters that can be easily modified on-site, a must in practical use

These and numerous other requirements were implemented when the TETRA ACCESSNET®-T Cube communications system was developed. The Cube was planned and designed as a commercial off-the-shelf (COTS) system made from standard components.

**Completely modular system components**

The ACCESSNET®-T Cube is completely modular in design; all modules have standardized dimensions and none weighs more than 50 kg (FIGs 1 and 2). Due to these specifications, the logistics aspects involved in transportation and use of this system are easier to plan and to handle. Although the ACCESSNET®-T Cube is primarily designed for mobile use, it can, of course, also be operated as a fixed installation in a vehicle or temporary building.

All modules are installed in standard aluminum housing units with shock-mounted frames that ensure the safe transport and operation of the built-in COTS equipment even under adverse transport and environmental conditions. The modules were developed on the basis of current industrial standards. When necessary, MIL standards have also been taken into account. All connectors, including the RF connectors, are designed as instant plug-in connectors according to the IP 65* protection class. You thus receive a robust and reliable system while saving on the costs that a system developed completely in line with the MIL standard would incur. This method is gaining worldwide acceptance in the development of technical systems, including in the military.

Since different types of missions call for different system colors (systems for peacekeeping missions must be gray-beige, for example), the modules are available in three colors: gray-beige, olive-green and blue.

The ACCESSNET®-T Cube is based on the same components as the “large” ACCESSNET®-T [*]. The standardized basic hardware and software of the TETRA system technology from Rohde & Schwarz help keep costs low, plus they ensure a true synergetic effect in further development.

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* IP: International Protection; labeling of housing using the internationally accepted IP abbreviation.
Base station module

The core of the ACCESSNET®-T Cube is the base station module (BSM) with the TETRA outdoor base station (TOB). If a 48 V DC voltage source and a transmitting and receiving antenna are available, the BSM can be used as a single-cell system. Setting up the BSM and putting it into operation takes no more than approximately ten minutes. After it is connected to the power supply and the antennas, the system is ready for operation. The BSM includes the following components:

- Local exchange
- Network management server
- Transmit and receive unit
- E1 and LAN interfaces for external connection
- Heating and cooling elements

If a high volume of communications is involved, the BSM can also be supplied with two TETRA RF carriers; the second carrier can also be used for (1+1) redundancy. The ACCESSNET®-T Cube can be deployed as a standalone system but also connected to ACCESSNET®-T exchanges, expanding existing networks.

The network management server (NMS) functions as a client/server. The server is located in the BSM and can be connected to a client via a protected LAN connection. Commercially available laptops with a LAN interface meet the system requirements for client controllers. A specially protected laptop is available so that the ACCESSNET®-T Cube can be used under adverse environmental conditions (FIG 3).

The NMS is of special importance for the flexibility of the ACCESSNET®-T Cube. For example, if the frequency that is set...
**Examples of ACCESSNET®-T Cube applications**

**Protests**
Transports of material from the fuel reprocessing plant at La Hague in France to Germany are a regular target for protestors. The forces in the field are responsible for accompanying the transports and ensuring the security of protestors and passers-by. For roughly three years, the authorities responsible for transports have been using an ACCESSNET®-T TETRA radio system from Rohde & Schwarz, which ensures confidential and secure communications. The installed network covers a defined area and has a predefined capacity. However, even the best theoretical plans can go awry. Unanticipated gaps in coverage may occur at any time — for example, if it is not possible to stick to scheduled routes.

This type of problem can be easily solved with the ACCESSNET®-T Cube. The Cube can be quickly transported to the new site and put into operation, and it is just as quickly integrated into the stationary TETRA system. To do this, an S₀ line (128 kbit/s) is connected to the ISM, which instantly makes it possible for users to place calls to and from the radio cell of the Cube system. For the security forces, it is especially crucial that their control center be included in communications. With these measures, a cell is added to the existing TETRA network without compromising its features.

**Large events**
During large events, the security of thousands of visitors needs to be ensured. This is no easy task for the event organizers and especially not for police squads, rescue services, emergency relief services, fire brigades, etc, that are involved. If these events are held in remote parts of the country — such as done with rallye competitions in order to minimize the level of noise that non-participants are exposed to — gaps in coverage or insufficient network capacity are not uncommon. Setting up a stationary network solely for such events is usually just too costly. In such a scenario, the ACCESSNET™-T Cube is ideal for companies that specialize in lending communications systems.

The basic model is a good solution at such events. It features a power supply module (PSM), a base station module (BSM) for two TETRA RF carriers and a branching equipment module (BEM) for operation with a transmitting and receiving antenna. If a connection to the control center or the telephone network is necessary, an ISM is simply added to the communications system. If there is a connection to the telephone network, calls can also be made from TETRA terminals to GSM networks, for example.

Before an event starts, the terminals are distributed to the various organizations involved; if problems occur, coordination and mission directives can be handled via the control center. TETRA functions such as dynamic group number assignment (DGNA), where groups are created by the control center according to the task at hand and where the terminals are assigned via the TETRA system, are, of course, supported. DGNA eliminates the loss of valuable time for coordination activities. Assignment is handled in the background without involving the group participants. The existing groups remain intact, and they are integrated into the communications only in the case of a group call to the new group. Confidentiality is ensured at all times; if necessary, the various groups can communicate with each other.

**Out-of-area missions**
This term refers to missions at locations where radiocommunications is not possible either because there is no infrastructure or the existing infrastructure is no longer available, e.g. after catastrophic floods or earthquakes as well as during military peacekeeping missions.

In such situations, it must be possible to set up a radiocommunications infrastructure and put it into operation within a minimum amount of time. But it must also be possible to connect various external systems — to the extent available. These are all challenges where the ACCESSNET®-T Cube excels. It takes only a few minutes to set up a radio network and put it into operation. External systems with transitions to other radio or telephone networks can quickly be integrated using the ISM. If broad areas need to be covered by radio, several BSMs can be connected to the exchange via microwave links or, if possible, via E1 lines. Thus, a multicell mobile TETRA system for communications among the forces in the field is available in no time at all.
at the site is already occupied by other systems, this might prevent operation of the Cube system. However, you can modify the on-site configuration within a few minutes by using the client for the configuration and error management in the NMS. For example, you can enter the transmit and receive frequencies in the client, which are then transferred to the Cube system. After a restart, the BSM operates at the new frequencies. The terminals do not have to be set since they scan the frequency range for a system channel, provided that they have been programmed to do so.

Antenna coupling

Using more than one TETRA RF carrier would require up to six antennas. However, the branching equipment module (BEM) makes this unnecessary. It contains an antenna coupling network that supports two antennas installed at least six meters apart, ideally on two antenna masts.

Exchange

Special requirements also demand special solutions, such as when you need to set up a complete mobile system with multiple cells or provide transitions to other communications networks. In this case, the answer is the interconnection & switching module (ISM), which makes it possible to implement a transportable multicell TETRA network for mobile use. In addition to featuring a powerful exchange, it also provides interfaces and gateways. Various interface cards allow analog or digital systems or networks to be connected; they provide S0 or S2/M/E1 interfaces, for example. An A-CAPI software interface that permits customer-specific applications to be connected to the Cube system is implemented by using a gateway controller in the ISM. The A-CAPI interface is also available in ACCESSNET™-T radio systems, making it possible to use the same applications in the Cube system.

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