TECHNICAL PROPOSAL
OF TACTICAL COMMUNICATION

RF4050 V/UHF
TACTICAL VEHICULAR RADIO

1 Introduction

Company Profile

The MESIT group is as a reliable contractor of high-quality components, advanced systems and extensive technological assemblies for more than 65 years. The MESIT companies have an excellent production and development organization, state-of-the-art technologies available and rely on their quality management system. One of the drivers of our success is also our continuous cooperation with research institutes and schools.

The MESIT excels in own development and testing in difficult conditions, certification for aircraft and military technology, specialized production and service as well as long-term support. 30% of over 1,000 employees of the group have a university background.

Technologically interconnected companies of the MESIT Group are able to offer comprehensive products and services. The companies cooperate in related production operations and share the experience of their experts. This allows us to take the position of general supplier also in large contracts.

The MESIT cooperate with tens of partners on extensive, collaborative projects. We focus on innovations for aerospace, vehicular communication and means of transport. The result is the current portfolio of > 7,000 types of manufactured and supported products.

MESIT Headquarters & Production Plant, Czech Republic

MESIT asd, s.r.o., a technology company, developing and manufacturing highly dependable products for high-profile government entities in the field of military and law enforcement,

aerospace and utilities. The company offers a complete range of leading-edge products for voice and data communications, precise time and frequency equipment and specialized avionics.

Developed and produced in-house in the Czech Republic, in cooperation with world-renowned companies, our solutions boast of the excellent quality, reliability and robustness.

So far, our globally evaluated solutions have been deployed in about 40 countries worldwide. MESIT asd, s.r.o. contracting capability combines key in-depth skills in systems, enabling it to provide a one-stop shop capability and service provision for even the most demanding customers.

1.1. RF13 VHF Tactical Communications Systems

- The system based on the RF13 portable transceiver and the derived mobile sets RF1350 offers fixed frequency radio voice or data communication in VHF band.
- RF13 – 5W Tactical Manpack
- RF1350 – 50W Vehicular/Mobile Transceiver
- AR13 – 50W Tactical Repeater

1.2. RF20 VHF Tactical Communications Systems

- A self-contained set of functionally intertwined transceivers RF23, and RF2350, providing reliable (TRANSEC) and safe (COMSEC) communication under very demanding conditions. The transceivers operate in several frequency bands (multiband), serve several purposes (multirole) and work in several operation modes (multimode).
- Tactical system for ground – ground and ground-air radio communication
- RF23 EPM – 5W Transceiver with GPS (Handheld, Manpack version)
- RF2350 EPM 50W Vehicular/Base Transceiver with GPS
- AR20 EPM 50 Tactical Repeater

1.3. RF40 VHF/UHF Tactical Communications Systems

- The third and most recent comprehensive tactical communication system produced by MESIT asd adds **MANET (IP MESH Networking)** broadband networks for VHF and UHF bandwidth, wide frequency range, satellite navigation using three GNSS systems (GPS, GALILEO, GLONASS), multichannel operation and the concept of Mission Modules to the proven qualities of its predecessors. The core of the system consists in the "RF40 Thoroughbred" multiband transceiver, which can be supplemented with the VA40 compact amplifier and thus form a vehicular/base/repeater set.
- Tactical system for ground – ground and ground-air radio communication
- **RF40** – The multiband transceiver is the core of the RF40 Thoroughbred system. It operates in the frequency range from 30 to 512 MHz with power of up to 10 W. In addition to the existing RF13 and RF20 waveforms, it brings a brand new WF40 true-MANET waveform. This allows you to use broadband data transmission and simultaneous communication in multiple channels.
- **RF4050** By combining the VA40 amplifier with the RF40 transceiver you create the RF4050 radio. It is so designed that the RF40 transceiver is easily removable (Jerk and Run) and can be used, if necessary, as a portable.

1.4. VICM 200 COMBAT Intercom System

- Clear communication is essential for success in any combat mission. The digital intercom system provides reliable communication in dangerous conditions with high levels of noise.

- It is designed for installation in tracked as well as wheeled military and police vehicles. The intercom system consists of units allowing the connection of vehicle radios of various types and from various manufacturers as well as other system units, headsets, loudspeakers, PA systems, field telephone, etc.

1.5. M10, M10A Headsets

- The flexible and durable design meets the most demanding requirements for reliability and comprehensibility. Easy control. For crews of military and police vehicles.
- The unique design of the second generation of headsets enables the use in a wide range of variants. The durable design of the headsets makes them suitable for extremely demanding environments, while providing intelligible communication and maximum user comfort.
- The headsets can be equipped with an ANR and TTC system and various types of connectors, microphones and PPT switches according to the user's specifications and requirements for their connection into the communication system.

1.6. M20 Communication Headset - Hearing Protector

- The M20 is an innovative communication and hearing protection platform with individual customization and upgradeable performance.
- The M20 is suitable for the users exposed to peak impulse and steady state noise. It gives optimum hearing protection along with the ability to hear the surrounding environment provided by two forward facing and two rear facing Talk-Through microphones enabling enhanced accurate directional sound perception (high-fidelity full 360° situational awareness) and improved command and control.
- Harmful sounds are compressed down to a safe level while low level sounds are amplified.

1.7. Time and Frequency

- Precise time and frequency equipment, devices that compare time and frequency via the GPS system are used in metrology or in communication and measuring systems.
- **GTR51** and **GTR52** are multisystem/multifrequency GNSS (Global Navigation Satellite System) receivers intended for time and frequency transfer. The receivers support both code and phase measurements using signals of several systems in several frequency channels.

1.8. Aircraft board electronic

- Qualified technologists, along with technical support provided by designers, are involved in the manufacturing process. We test products under simulated extreme conditions in our own laboratories.
- In the area of avionics, MESIT asd, s.r.o. produces board intercoms for L159 fighters and communication sets for helicopters. For civilian aviation, we make LUN5224 electronic parameter limiter.
- VHF radio communication in airplanes is provided by RF1325L, a set consisting of standard and dedicated elements of RF13 radio system.

2 Proposed Concept RF40 Multiband tactical radios family

MESIT asd, s.r.o. proposes a concept based on the RF40 radio family.

The third and most recent comprehensive tactical communication system adds **MANET (IP MESH Networking)** broadband networks for VHF and UHF bandwidth, wide frequency range, satellite navigation using three GNSS systems (GPS, GALILEO, GLONASS), multichannel operation and the concept of Mission Modules to the proven qualities of its predecessors. The core of the system consists in the "RF40 Thoroughbred" multiband transceiver, which can be supplemented with the VA40 compact amplifier

MESIT products marketed under the DICOM brand are renowned for their top quality, reliability and endurance. They are used in many countries in five continents. RF40 is the latest additions to the DICOM family of tactical radios.

RF40 Tactical Communication System (a.k.a. Thoroughbred), is the elite of the current tactical radio communication. While retaining interoperability with existing radios in use around the world and incorporating highly secure crypto algorithms and excellent radio parameters, it brings completely new features, answering the requirements of the contemporary tactical operations.

These include narrowband, wideband and broadband IP data capabilities in autonomous self-configurable ad-hoc networks, bandwidth saving waveforms, efficient utilization of the available frequency spectrum, high level of security, multi-channel operation, simultaneous voice and data streams.

Satellite navigation using GPS, Galileo and Glonass systems, 10 W power output, optional Mission Module and SATCOM-on-the-move communication module expanding its capabilities yet further. Vehicle-mounted form factor is attained by simple docking of the RF40 transceiver into 50 W power amplifier with jerk-and-run capability.

Many other features, all included in the standard delivery (no hidden paid software options), Long battery life, low life-cycle cost of the whole system and excellent price/performance ratio are the basic characteristics of the RF40 Tactical Radicommunication System.

RF40 family of terminals are built around the same electronic architecture, and that such technology cascades down to the different configurations. All configurations (handheld, manpack, vehicular, base station, mobile repeater, stationary repeater and link repeater) share the same electronics in the part of the transceiver. The main advantages of such a solution are as follows:

-RF40 tactical communication system-wide compatibility

-the core of the system, the RF40 transceiver is integral part of Handheld/ Manpack/ Vehicular/ Base/ Repeaters and can be easily replaced in another type of radio station

- Maintenance management:
- a small number of different types of spare parts for complete RF40 system
- a simple way to repair by replacing modules
- Ease of operation – once trained, the operator can control all types of radios

Key features of RF40 system

- 30 MHz to 512 MHz frequency range
- Multi-channel radio system
- Simultaneous voice and IP data including video support
- Decentralized, auto-forming, multi-hop MANET network for voice and data (IP MESH)
- Virtual voice channels (multiple voice streams in one channel)
- Multiple waveforms support
- Position reporting system (GPS, Galileo, Glonass)
- Highly secure AES based COMSEC
- Compact and robust design
- 50W amplifier with Jerk-and-Run support
- Mission Modules support – simple integration of different technologies
- Secure and reliable communication
- Backlight display (ON/OFF)

  feature of setting the brightness in 3 levels will be available in new release

True **MANET** (Mobile Ad Hoc Network) for voice and data communication in **VHF** and **UHF** with automatic rebroadcasting capability

Dual voice stream with data in one channel

Broadband data in **both** VHF and UHF (up to 270 kbit/s)

GNSS Built-in GNSS receiver for GPS, Glonass and Galileo systems with automatic dispatch of positional reports (PLI) on the background of voice or data communication - **N-Track system situational awareness feature**.

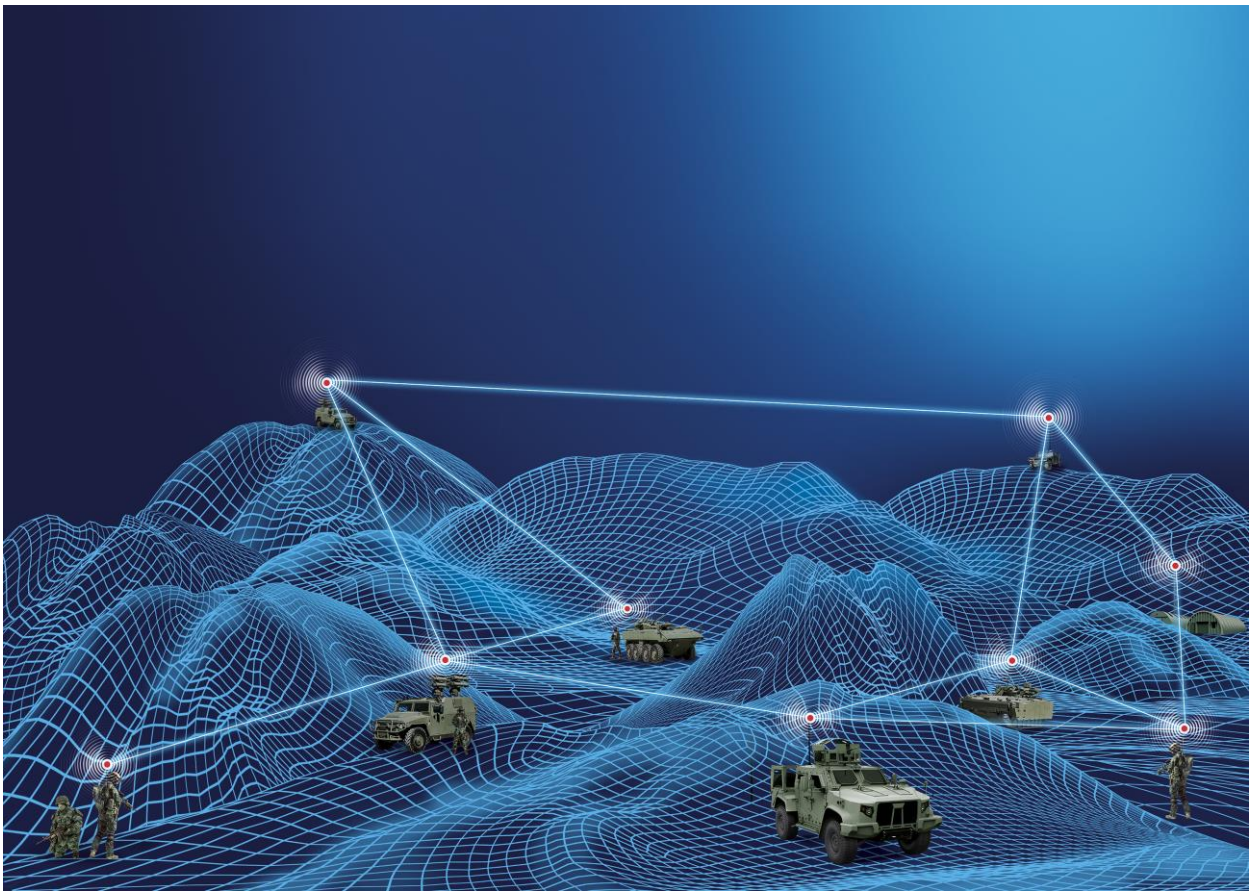
Mission Module Expands the radio features according to actual mission needs. Open platform for installation of custom specific devices of different types.

Rebroadcasting Fully fledged MANET network capable of automatic multiple rebroadcasting of voice and data.

Modular system the RF40 family of terminals are built around the same electronic architecture, and that such technology cascades down to the different configurations.
The core of the system is the RF40 transceiver. It can be easily set up as a handheld, manpack or vehicular/base station with appropriate accessories (power amplifier, antennas, audio accessories etc.)

"Jerk-and-run" system
The vehicular/base/repeater station can be used as a handheld radio with appropriate accessories (antenna and battery pack in case of emergency situation, dismounted soldier etc.

AES-256 secured voice and data. Communication using WF40 waveform takes place in a true Mobile Ad-Hoc Networking (MANET) type of network - a network that is maintained automatically with no central node. Each transceiver in the network is capable of automatic rebroadcasting of voice and IP data.



WF40 MANET Waveform Unique Features:

- true MANET (Mobile Ad-hoc Network) for voice and data (IP MESH network)
- fully decentralized network, no infrastructure needed
- auto-relay over several hops (Voice 5, Data unlimited)
- **N-Track** built-in position reporting for Blue Force Tracking (**situational awareness feature**)
- 250 kHz wide bandwidth saving radio channel
- full band usage from 30 to 512 MHz (VHF and UHF)
- up to 270 kbit/s shared capacity for user data
- adaptive data rate according to link condition
- unicast and broadcast IP data

• both UDP and TCP/IP supported

• support for video

WF40 MANET Waveform Encryption Feature

Securing the content of radio communication against unwanted eavesdropping (COMSEC) is secured in the **WF40 waveform** using the AES block cipher according to the **FIPS 197 standard**.

Specifically, the **AES-256** cipher is implemented for security, which works with a key length of 256 bits. The key is inserted into the radio station either together with the operating configuration or separately.

Up to **9 different keys** can be stored in the radio at one time and the programmed presets refer to them by index. The encryption keys can be programmed into the radio station via a PC (web interface) or via the FG40 Fillgun.

WF40 MANET waveform Repeater Feature

One of the very important features of **MANET**-type networks (**IP MESH**) is the multi-hop automatic rebroadcasting ability (hop = section with direct radio visibility), i.e. rebroadcasting using other nodes towards target nodes without direct radio visibility with the source node.

This significantly increases the resulting real ranges. The WF40 waveform has an automatic rebroadcasting capability for voice (automatic rebroadcasting depth up to 5 hops) as well as data. With a suitable node topology, vehicular radios can then be connected over tens to hundreds of kilometers.

Network Interconnection

Two (or more) different data networks (either **MANET** or other available waveforms) running on RF40 radios can be easily interconnected with an Ethernet cable between two radios and configuring the routing of the network, so no PPP is needed.

The radios also allow for bridging of voice communication between the two networks at the same time, using an RTP stream. No other equipment except an Ethernet cable is needed, it is a native function of the radio, a matter of configuration only.

If the customer would require PPP anyway, the functionality can be programmed into the radio on demand, the radio allows for that.

Nevertheless, the mentioned situation can be yet more easily solved with the Infantry soldier directly logging-in into the Artillery network

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1.9. RF40 Transceiver

RF40 description

Core of the system is RF40 transceiver. This multi-band transceiver allows secure data and voice communication in VHF and UHF bands.

The transceiver has excellent RF parameters, efficient use of available frequency spectrum, high data throughput even in low VHF band, voice and data transmission in true MANET network.

Two independent voice connections along with parallel data transmission in one channel, connectable Mission Module forming a second physical radio channel with tactical Ethernet for broadband data and voice, GNSS receiver and more.

RF40 technical parameters

Frequency range	30 MHz to 512 Mhz
Modulation	FM, AM, CPM
Transmission power	0.2W/5 W/10 W burst
Channel bandwidth	25 kHz, 250 kHz
Waveforms	LOS FM/AM (STANAG 4204/4205)
	WF40 (V/UHF MANET WF, IP data)
Communication encryption	AES-256
GNSS receiver	built in (GPS/Glonass/Galileo)
Data interfaces	Ethernet, USB, Serial
Mechanical and climatic resistance, EMC	
Dimensions including battery pack	75 mm x 202 mm x 41 mm
Weight including battery pack	0.9 kg
Operating temperature range	-30 °C to +70 °C
Environmental specification	MIL-STD-810G
EMC specification	MIL-STD-461F

1 VA40 Power Amplifier 50W

VA40 description

VA40 Amplifier allows to increase power output up to 50 W after connection with RF40 transceiver. The whole system is designed so that the RF40 transceiver is easily removable (Jerk and Run) and can be used, if necessary, as a portable.

RF40 transceiver with VA40 technical parameters

Frequency range		30 MHz to 512 Mhz
Modulation		FM, AM, CPM
Transmission power		Max. 50 W
Supply voltage range		10 V to 33 V (MIL-STD-1275E)
Channel bandwidth		25 kHz, 250 kHz
Current consumption 24 V	Transmission 50 W	max. 12 A
	Reception	max. 0.8 A
Waveforms		LOS FM/AM (STANAG 4204/4205)
		WF40 (V/UHF MANET WF, IP data)
Communication encryption		AES-256
GNSS receiver		built in (GPS/Glonass/Galileo)
Data interfaces		Ethernet, USB, Serial
Mechanical and climatic resistance, EMC		
Dimensions including battery pack		202 mm x 220 mm x 226 mm
Weight including battery pack		max. 10 kg
Operating temperature range		-40 °C to +70 °C
Environmental specification		MIL-STD-810G
EMC specification		MIL-STD-461F