KAIROS
Base Station/Repeater

Professional infrastructure for Digital Mobile Radios
“Kairos” is an ancient Greek word meaning the right moment in which everything happens. Perfect timing is the secret of Radio Activity digital simulcast technology. Years of research and field experience enabled us to fix the right moment in the core of our KAIROS series of radio base stations.

Designing mobile radio infrastructures is an art that requires thorough knowledge. Our products result from our vast experience and the best Italian tradition, for which all details, also the hidden ones, are important.

This professional transceiver was conceived and designed as the right building block for a number of applications, ranging from a simple stand-alone repeater to a nation-wide system. We increased its versatility to accommodate your creativity.

Main Characteristics

KAIROS is a multi-protocol repeater that implements all demodulation and filtering processes via software by a Digital Signal Processor (DSP), following the “soft radio” concept. This technique provides repeatability, perfect matching among repeaters, and can handle different types of protocols, depending on the incoming type of signal. The initial economic investment has a great return, since the addition of a new protocol or standard just consists in a software upgrade.

KAIROS’ sophisticated software and hardware platforms make it a powerful embedded workstation. It is based on a LINUX core which, thanks to the continuous development from thousands of users around the world, naturally interfaces IP devices and networks and easily allows a high level of customization, without heavily impacting development efforts.

KAIROS radio performance is at the highest level in the market. It is designed for infrastructure applications where radio frequency pollution is a well-known issue: KAIROS’ excellent resistance to adjacent channels and blocking, its noiseless transmitter, and soft diversity reception reduce in-field problems, thus providing excellent coverage and clean communications.
Key Features

**DUAL MODE**
It performs the automatic switching between analog and digital modulation, according to the type of incoming signal.

**IP MULTISITE MULTICAST AND SIMULCAST**
It integrates all the necessary algorithms (such as, IP interfaces, voting system, automatic equalization, protocol coherence, synchronization recovery, network managing, etc.) to realize professional multisite networks.

**UHF LINKING**
It provides RF interconnections among sites where the IP backbone is not available, carrying analog and digital signals. It is a mixed linking network (IP+UHF).

**SYSTEM REDUNDANCY**
It can be assembled as 1+1 (Main + Stand-by) and it can support the backup Master functionality (a Slave station that automatically replaces the failed main Master, restoring all network functions). Its LINUX platform allows a distributed elaboration in the system, thus increasing its flexibility and reliability.

**SOFT DIVERSITY RECEPTION**
It is a receiving technique based on the vectorial treatment of two or more incoming signals. It strongly enhances the covering range and the clearness of a digital mobile communication system, removing fading holes.

**SIP/RTP-IP PORTS**
This direct connection with the radio network offers a wide range of benefits to Control Rooms, such as SIP/RTP-IP dispatching systems; automatic roaming between different networks and/or repeaters (mobility); automatic phone/radio bridging, etc.

**POWERFUL REMOTE CONTROL**
Thanks to its remote detailed monitoring and configuration tool, setup and network maintenance operations are simplified and sped up. The remote control tool also ensures secure software upgrades, IP backbone diagnosis and a continuous assessment of the entire radio system. KAIROS also supports the SNMP protocol for direct reporting to a generic surveillance system.

**LIGHT AND RUGGEDIZED**
The power supply input is protected from short circuit, under/over/inversion voltage and transient. Its RF power devices are protected from reverse power, over temperature and over current, allowing a 100% duty cycle.

**RELIABLE**
The power supply input is protected from short circuit, under/over/inversion voltage and transient. Its RF power devices are protected from reverse power, over temperature and over current, allowing a 100% duty cycle.
Main Applications

All configurations shown below are available both in multicast and in simulcast technology. They all support dual mode (analog/digital) functionality; an IP-connected or a conventional dispatcher; a phone patching, and SIP mobility.

Dual Timeslots Fixed Station/Repeater
KAIROS can manage two DMR timeslots, using a single antenna. From a dispatching point, it can be configured to supply access to an external radio network. By simply adding a duplexer, KAIROS can be configured as a standalone repeater.

IP-linked Base Station
KAIROS supports IP connections among base stations to achieve multisite hierarchical systems. The role of a device can be set as Master, Secondary Master, Slave or Backup Master. A Master manages up to 32 Slaves/Secondary Masters, allowing unlimited expansion of a radio network.

RF-linked Base Station
KAIROS can be configured as a “LAN extender” supporting the RF narrowband connection among different sites. It is the perfect solution when the connecting distance is very large, or when the radio link path is not in line of sight.

Single site TIER III Trunking System
In adding a Tier III Controller Agent into a group of KAIROS, channels can be efficiently shared among all users, according to the ETSI standard Tier III Trunking protocol.

Multisite Simulcast TIER III Trunking System
The TIER III Controller can manage a group of IP-linked simulcast networks, thus realizing a multisite, multicarrier (simulcast or multi-frequency) system.
Built-in Signaling & Protocols

- DMR TIER II and TIER III protocols for group/individual calls, late entry, text messaging, GPS positioning, raw data collection, encryption, registration, etc.
- IP protocols with optimized bandwidth to link all the repeaters
- Synchronized CTCSS and DCS codecs
- FFSK modem
- 1Hz programmable tone-key options
- SIP/RTP-IP protocol for direct connection to a dispatching system
- SNMP protocol for remote monitoring
- Multi-standard analog SELCAL codec (ZVEI, CCIR, EIA, EEA, DTMF)
- Squelch tail cutting

Mounting Options

Accessories:
- Standard 19” - 6U rack for vertical mounting;
- Proprietary 19” - 2U rack for horizontal mounting.

Technical Specifications

<table>
<thead>
<tr>
<th>Available Models</th>
<th>Model</th>
<th>KA-080</th>
<th>KA-160</th>
<th>KA-350</th>
<th>KA-450</th>
<th>KA-500</th>
<th>KA-900</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHz</td>
<td>66-88</td>
<td>136-174</td>
<td>350-400</td>
<td>400-470</td>
<td>450-527</td>
<td>806-941</td>
<td></td>
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<tr>
<td>Channelization</td>
<td>25/20/12,5/6,25 KHz</td>
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<tr>
<td>RF output power</td>
<td>1-25 W / 100% duty cycle / selectable per channel</td>
<td></td>
<td></td>
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<tr>
<td>Synthesis step</td>
<td>50Hz</td>
<td></td>
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<tr>
<td>Frequency stability</td>
<td>0,5 p.p.m. (without GPS)</td>
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<tr>
<td>Synchronization sources from</td>
<td>Internal, GPS/GLONASS, Ethernet, 2-wire, Digital RX, External</td>
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<tr>
<td>Operating temperature</td>
<td>-30°c ÷ +60°c</td>
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<tr>
<td>Power supply (negative ground)</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
<td></td>
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<tr>
<td>11V</td>
<td>13,8V</td>
<td>15V</td>
<td></td>
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<tr>
<td>Power consumption</td>
<td>TX: 60 W @25W RF / RX: 5 W @Main+Div enabled</td>
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<tr>
<td>Dimensions &amp; weight</td>
<td>160x200x45mm / 1.35 Kg</td>
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<tr>
<td>Audio lines</td>
<td>2 x 4-wire + E&amp;M</td>
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<tr>
<td>LAN port</td>
<td>Ethernet 10BT/100TX (auto MDI/MDI X) on an RJ45 socket</td>
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<td>IP multisite traffic</td>
<td>70 kb/s in analog to/from Master</td>
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<td></td>
<td>24 kb/s in DMR to/from Master (both DMR timeslots)</td>
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<td>Maximus tolerable IP delay</td>
<td>1,14 s (round trip)</td>
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<td>Aux I/O</td>
<td>3xIO + 2xAnalog input</td>
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Some specifications may change without prior notice.