The TeleOS product line from ABB Wireless provides a power efficient SCADA communications solution as well as connectivity to remote endpoints at low to medium speeds. TeleOS radios can operate in point-to-multipoint (PTMP) and point-to-point (PTP) configurations. Additionally, TeleOS radios can be used as repeaters to extend the range of radio links in both PTMP and PTP modes.

TeleOS is a dual band ISM/MAS 902-960 MHz software defined radio. TeleOS radios support data transfer rates from 9.6 kbps to 4.4 Mbps, power output from 10mW to 3W, and channel sizing from 12.5 kHz to 1.2 MHz. TeleOS selectively switches modulation schemes to ensure highest throughput based on link quality and environmental noise.

### Enclosed products

<table>
<thead>
<tr>
<th>Product name</th>
<th>Radios</th>
<th>Ethernet ports</th>
<th>Serial ports</th>
<th>I/O ports</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TeleOS 9222-IO</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>Dual 900 MHz radios, Ethernet, serial and I/O</td>
</tr>
<tr>
<td>TeleOS 9222</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>Dual 900 MHz radios, Ethernet and serial; no I/O</td>
</tr>
<tr>
<td>TeleOS 9122-IO</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>Single 900 MHz radio, Ethernet, serial and I/O</td>
</tr>
<tr>
<td>TeleOS 9122</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>Single 900 MHz radio, Ethernet and serial; no I/O</td>
</tr>
<tr>
<td>TeleOS X022-IO</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>I/O expansion unit, Ethernet and serial; no radio</td>
</tr>
</tbody>
</table>

### Board-level products

<table>
<thead>
<tr>
<th>Product name</th>
<th>Radios</th>
<th>Ethernet ports</th>
<th>Serial ports</th>
<th>I/O ports</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TeleOS 9111B</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Single 900 MHz radio, Ethernet and serial; no I/O</td>
</tr>
</tbody>
</table>

Note: TeleOs 9111B supports ISM band operation only. It does not support MAS operation.

### Transmitter

- **Frequency range**: 902-928 MHz ISM FHSS & DTS 928-960 MHz MAS
- **Conducted output power**: ISM: 50mW to 1W, step size 10mW MAS: 50mW to 3W, step size 10mW
- **Max. radiated power**: ISM: 36 dBm EIRP MAS: dependent on license
- **Range - Line of sight**: 70+ miles
- **Modulation**: MSK, 2-FSK, 4-FSK, BPSK, QPSK, 8-PSK, 16-PSK 16-QAM, 32-QAM, 64-QAM
- **RF Data Rate**: 9.6 kbps to 4.4 Mbps (57 kbps to 2.6 Mbps for TeleOS 9111B)
- **Occupied bandwidth**: 12.5 KHz to 1.2 MHz
- **Frequency stability**: 1.0 ppm
- **Duty cycle**: Continuous
- **Output impedance**: 50 Ohms

### Data transmission

- **Error detection**: Up to 32-bit CRC, retransmit on error
- **Data encryption**: AES 128/256
- **Data interfaces**: 2 x 10/100 Ethernet, 2 x RS232/422/485 serial
- **Data connector**: 4 x RJ45
- **Serial interface speed**: Up to 230.4 kbps
Receiver sensitivity - ISM (dBm)

<table>
<thead>
<tr>
<th>Channel width (kHz)</th>
<th>Modulation</th>
<th>Data rate (kbps)</th>
<th>Sensitivity (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHSS 7.645</td>
<td>MSK</td>
<td>57</td>
<td>-110</td>
</tr>
<tr>
<td>154.29</td>
<td>MSK</td>
<td>114</td>
<td>-107</td>
</tr>
<tr>
<td>207.11</td>
<td>MSK</td>
<td>153</td>
<td>-106</td>
</tr>
<tr>
<td>309.97</td>
<td>MSK</td>
<td>229</td>
<td>-103</td>
</tr>
<tr>
<td>DTS 600</td>
<td>BPSK</td>
<td>530</td>
<td>-99</td>
</tr>
<tr>
<td>900</td>
<td>2FSK</td>
<td>663</td>
<td>-98</td>
</tr>
<tr>
<td>1200</td>
<td>BPSK</td>
<td>884</td>
<td>-98</td>
</tr>
<tr>
<td>600</td>
<td>QPSK</td>
<td>1061</td>
<td>-97</td>
</tr>
<tr>
<td>600</td>
<td>8PSK</td>
<td>1541</td>
<td>-91</td>
</tr>
<tr>
<td>1200</td>
<td>QPSK</td>
<td>1768</td>
<td>-95</td>
</tr>
<tr>
<td>600</td>
<td>16QAM</td>
<td>2121</td>
<td>-87</td>
</tr>
<tr>
<td>1200</td>
<td>8PSK</td>
<td>2651</td>
<td>-90</td>
</tr>
<tr>
<td>600</td>
<td>32QAM</td>
<td>2651</td>
<td>-81</td>
</tr>
<tr>
<td>1200</td>
<td>16QAM</td>
<td>3535</td>
<td>-86</td>
</tr>
<tr>
<td>1200</td>
<td>16PSK</td>
<td>3535</td>
<td>-83</td>
</tr>
<tr>
<td>1200</td>
<td>32QAM</td>
<td>4419</td>
<td>-81</td>
</tr>
</tbody>
</table>

Receiver sensitivity - MAS (dBm)

<table>
<thead>
<tr>
<th>Channel width (kHz)</th>
<th>Modulation</th>
<th>Data rate (kbps)</th>
<th>Sensitivity (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5</td>
<td>MSK</td>
<td>10</td>
<td>-115</td>
</tr>
<tr>
<td>4FSK</td>
<td>19</td>
<td>-102</td>
<td></td>
</tr>
<tr>
<td>QPSK</td>
<td>23</td>
<td>-103</td>
<td></td>
</tr>
<tr>
<td>8PSK</td>
<td>34</td>
<td>-97</td>
<td></td>
</tr>
<tr>
<td>16QAM</td>
<td>45</td>
<td>-93</td>
<td></td>
</tr>
<tr>
<td>32QAM</td>
<td>57</td>
<td>-89</td>
<td></td>
</tr>
<tr>
<td>64QAM</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>MSK</td>
<td>19</td>
<td>-112</td>
</tr>
<tr>
<td>4FSK</td>
<td>39</td>
<td>-100</td>
<td></td>
</tr>
<tr>
<td>QPSK</td>
<td>36</td>
<td>-106</td>
<td></td>
</tr>
<tr>
<td>8PSK</td>
<td>52</td>
<td>-100</td>
<td></td>
</tr>
<tr>
<td>16QAM</td>
<td>70</td>
<td>-97</td>
<td></td>
</tr>
<tr>
<td>32QAM</td>
<td>87</td>
<td>-83</td>
<td></td>
</tr>
<tr>
<td>64QAM</td>
<td>105</td>
<td>-86</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>MSK</td>
<td>39</td>
<td>-109</td>
</tr>
<tr>
<td>4FSK</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>QPSK</td>
<td>71</td>
<td>-102</td>
<td></td>
</tr>
<tr>
<td>8PSK</td>
<td>101</td>
<td>-97</td>
<td></td>
</tr>
<tr>
<td>16QAM</td>
<td>137</td>
<td>-94</td>
<td></td>
</tr>
<tr>
<td>32QAM</td>
<td>175</td>
<td>-90</td>
<td></td>
</tr>
<tr>
<td>64QAM</td>
<td>210</td>
<td>-84</td>
<td></td>
</tr>
</tbody>
</table>

Power/physical

<table>
<thead>
<tr>
<th>Operating voltage</th>
<th>10–32 VDC with reverse polarity protection</th>
</tr>
</thead>
</table>
| Transmit Current (1W/3W) | Average mA @ 12 VDC  
Single radio: 335/495 mA  
Dual radio: 385/580 mA  
Single radio (board): 204 mA  |
| RF connector | TNC  |
| Dimensions (LxWxH) | Enclosed: 6.625” x 3.45” x 1.835”  
Board: 5.125” x 3.75” x 1.00”  |
| Weight | Single radio: 1.54 lbs/700 grams  
Dual radio: 1.61 lbs/730 grams  
Single radio (board): 0.37 lbs/170 grams  |

Environmental specifications

| Temperature | -40°C to +75°C ISM  
-40°C to +60°C MAS  |
| Humidity | 95% operating humidity @ 40°C non-condensing  |
| Location | Class I, Division 2, Groups A, B, C and D; T3C  |

I/O ports

TeleOS radios with the -IO suffix have 8 multi-use I/O ports. These can be configured for different types of operation. TeleOS expansion modules add an additional 8 ports with the same flexibility. TeleOS radios without the -IO suffix have no I/O ports.

<table>
<thead>
<tr>
<th>Type</th>
<th>Accuracy</th>
<th>Maximum number of ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog, 1-5 VDC</td>
<td>0.5%</td>
<td>4</td>
</tr>
<tr>
<td>Analog, 1-5 VDC</td>
<td>2.5%</td>
<td>4</td>
</tr>
<tr>
<td>Analog, 4-20 mA</td>
<td>0.5%</td>
<td>4</td>
</tr>
<tr>
<td>Digital (contact closure, wet or dry)</td>
<td>N/A</td>
<td>8</td>
</tr>
<tr>
<td>Digital (contact closure, 2A to ground)</td>
<td>N/A</td>
<td>4</td>
</tr>
</tbody>
</table>

Management

- SNMP V3
- SuprOS carrier-class NMS support

Security

- Integrated firewall
- AES 256-bit encryption
- Password authentication
- VLAN network segmentation

Unique capabilities

- High Speed: 5.6 kbps–4.4 Mbps over-the-air throughput. TeleOS's DSM technology offers the industry's highest throughput in a 12.5 kHz channel at 57 kbps
- Dual Band: 902–960 MHz frequency support plus FHSS and single carrier capabilities enable both unlicensed and licensed operation with a single radio
- Dual Radio: Supports optional second RF module in a single enclosure (TeleOS 9222). Provides enhanced repeater functionality, higher throughput and multiband/multifrequency operation
- Spatially Diverse Redundant Masters: Conventional redundant master schemes locate both the primary master radio and its backup at the same tower. While this approach offers some added reliability, communication fails if the entire tower is disabled. With spatially diverse redundant masters, the master and backup radios are placed at different towers. If an endpoint’s primary master fails, it will connect to a backup master at a different location ensuring continuous communication
- Mobility: By programming endpoint radios to connect to multiple masters, devices connected to TeleOS endpoint radios can roam throughout the RF coverage area, connecting to the master that offers the best RF link
- Link Adaptation: Dynamic data rate automatically adapts communication parameters to achieve optimal link performance
- Multi-Speed: Unique to TeleOS, a single radio can have multi-logical data channels with different speeds. This allows for the prioritization/trade off of reliability versus speed
- Ethernet Switch: Two Ethernet ports with full VLAN support and configurable as access ports, trunks, or mixed
- Serial Bridge: Seamless integration for hybrid networks utilizing both Ethernet and legacy serial devices
- Multi Master Sync: Avoid interference between multiple masters with MMS time syncing