Complete Receiver – RF to Bits
A single-box solution that includes a downconverter, demodulator, and bit synchronizer

Versatile Rack-Mount Enclosure
Custom 1U 19” rack-mount chassis houses one or two receiver channels covering P, lower L, upper L, full S, C, or multiple bands per channel

True Trellis Demodulation in all ARTM Modes
Provides true multi-symbol trellis detection in all three ARTM modes for optimal demodulation

Best SOQPSK-TG Detection in the Industry
RDMS’ trellis detection for SOQPSK-TG yields improvements of 2 dB or more over the competition’s single-symbol detectors

3.5 to 5 dB Improvement in PCM/FM Performance
Improves BER performance by 3.5 to 5 dB over the best single-symbol demodulators, to within 0.2 dB of the theoretical limit

NEW Enhanced Modulation Index Tracking* for PCM/FM
Maintains superior BER performance even if the received signal’s modulation index varies by as much as 500%, a major breakthrough for tracking legacy analog transmitters (*patented)

Phase Noise Compensation
Optimizes demodulator performance for use with legacy TM packs and transmitters with excessive phase noise

Lowest Noise Figure
Typical 3.5 dB noise figure bests all other ARTM receivers on the market, hands down

Rapid Synchronization
Synchronizes up to 100 times faster – and maintains sync at lower signal-to-noise ratios – than any other ARTM demodulator

Optional Diversity Combiner
Available pre-detection diversity combining is performed digitally for superior signal fidelity
Quasonix is the only vendor in the market offering LDPC encoding and decoding for serial streaming telemetry. This approach yields nearly triple the communications range, yet it does so with 22% less bandwidth than conventional PCM/FM.

- **Implements Link Margin by 8.8 to 9.4 dB at BER = 1e-5**
  Link margin improvement is equivalent to nearly tripling the operating distance on your telemetry link.

- **Fully Integrated Forward Error Correction System**
  Transmitter automatically synthesizes expanded over-the-air bit rate for encoded blocks and receiver seamlessly converts back to continuous output at the user bit rate; Operation is completely transparent to data devices.

- **Uses Spectrally Efficient SOQPSK Modulation**
  Even with the LDPC coding overhead (56.25%), bandwidth is 22% less than PCM/FM at the same payload bit rate; Payload bit rates up to 29.44 Mbps are supported.

- **LDPC BER Performance**
  
  ![9.2 dB Coding Gain](image)

- **Already own Quasonix equipment?**
  The LDPC mode can be retrofitted to most Quasonix transmitters and receivers. Contact Quasonix for details.

**Ethernet Via Telemetry System**

- **Redefine the “Local” in Local Area Network.** With the Quasonix Ethernet Via Telemetry (EVTM) system, your test article can be on your ground station LAN, just like any other computer or Ethernet appliance. With an Ethernet switch in your test article, you can connect cameras, Voice over IP, computers, etc. to your network on the ground.

- **High Speed Ethernet Traffic Over Telemetry Links**
  Ethernet telemetry data rates up to 46 Mbps using standard Ethernet protocols (Bidirectional protocols require a bidirectional RF link.)

- **Enables Ethernet Data Transmission for a Wide Variety of Applications**
  Multimedia streaming, data source selection, data source isolation and forwarding, source rate and coding control in reaction to channel impairments, network extension, Voice over IP (VoIP), COTS based Ethernet products such as Industrial Control Sensor Devices and data recorders.

- **Complete Telemetry System**
  An Ethernet solution package that includes a Quasonix TIMTER™ Transmitter and a Quasonix Rack-Mount RDMS™ Telemetry Receiver for the downlink. The optional uplink includes a second TIMTER™ Transmitter and a Quasonix Airborne RDMS™ Telemetry Receiver.

- **Supports all TCP/IP Packet Types**
  Streaming UDP packets, TCP connections, ICMP and SNMP messages are all passed over the air. Connection-oriented traffic requires a bidirectional link.
NEW RACK-MOUNT RECEIVER OPTIONS AND FEATURES

Space Time Coding Solution

Illustrations and flight test data used with permission of the authors—originally published in “Space-Time Coding for Aeronautical Telemetry: Part II” - Experimental Results by Michael Rice, Brigham Young University, and Kip Temple, Air Force Flight Test Center, Edwards AFB, California, USA, in Proceedings of the International Telemetering Conference, Las Vegas, NV, October, 2011.

Advantages of the Quasonix Space Time Coding Solution:

- Eliminates link outages caused by the “two-antenna problem”
- Improves behavior of received signal power
- Improves overall link availability
- Two transmit/One receive configuration
  - Compatible with standard telemetry applications and installations
- STC signal spectrum is the same as SOQPSK, with minimal bandwidth expansion (4%)
- Available as a software upgrade to Quasonix RDMS™ Telemetry Receivers.
  Note: Quasonix dual transmitter required.

Problem: “Two-antenna interference”

- Upper and lower antennas are required to provide LOS path during aircraft maneuvers
- Signals can cancel each other, creating antenna pattern nulls

Solution: Space Time Coding (STC)

IF Signal to Noise Ratio

Bit Errors

Problem: “Two-antenna interference”

- Upper and lower antennas are required to provide LOS path during aircraft maneuvers
- Signals can cancel each other, creating antenna pattern nulls

Solution: Space Time Coding (STC)
## RACK-MOUNT RECEIVER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receiver Section</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Dual-conversion superheterodyne</td>
</tr>
<tr>
<td>Input RF Frequency</td>
<td>Refer to page 6</td>
</tr>
<tr>
<td>Tuning resolution</td>
<td>Tunes in 62.5 kHz increments, to the 70 MHz IF output; after the 70 MHz IF output, receiver tunes in increments of less than 1 Hz</td>
</tr>
<tr>
<td>Frequency stability</td>
<td>1 ppm over temperature; 1 ppm per year aging</td>
</tr>
<tr>
<td>Reference oscillator</td>
<td>20 MHz</td>
</tr>
<tr>
<td>Noise figure</td>
<td>3.5 dB (typical), 5 dB (maximum)</td>
</tr>
<tr>
<td>LO phase noise, measured at 70 MHz IF output</td>
<td>-115 dBc/Hz @ 1 MHz offset</td>
</tr>
<tr>
<td>Maximum RF input</td>
<td>+20 dBm (+10 dBm for C-band)</td>
</tr>
<tr>
<td>Available gain (to 70 MHz IF output)</td>
<td>114 dB</td>
</tr>
<tr>
<td>Gain control</td>
<td>128 dB control range; User selectable: AGC or MGC (AGC freeze)</td>
</tr>
<tr>
<td>AGC time constant</td>
<td>Adjustable to any value from 0.1 ms to 1000 ms</td>
</tr>
<tr>
<td>First IF bandwidth</td>
<td>60 MHz (nominal)</td>
</tr>
<tr>
<td>IF rejection</td>
<td>&gt; 90 dB</td>
</tr>
<tr>
<td>Image rejection</td>
<td>70 dB</td>
</tr>
<tr>
<td>RF input impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>VSWR</td>
<td>3:1 Max; 2.5:1 Typical</td>
</tr>
<tr>
<td><strong>Second IF Section</strong></td>
<td></td>
</tr>
<tr>
<td>IF frequency</td>
<td>70 MHz</td>
</tr>
<tr>
<td>IF output level</td>
<td>0 dBm nominal (AGC mode)</td>
</tr>
<tr>
<td>IF output impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>VSWR</td>
<td>2:1 Max; 1.5:1 Typical</td>
</tr>
<tr>
<td>IF bandwidths</td>
<td>250 kHz, 500 kHz, 1 MHz, 2 MHz, 4.5 MHz, 10 MHz, 20 MHz, 40 MHz. Automatic selection based on modulation type and data rate, with manual override. Optional: 70 kHz, 1.4 MHz, 3 MHz, 6 MHz, 14 MHz, 28 MHz</td>
</tr>
<tr>
<td><strong>Demodulator Section</strong></td>
<td></td>
</tr>
<tr>
<td>Demodulator type</td>
<td>ARTM Tier 0 (PCM/FM), Tier I (SOQPSK-TG), Tier II (Multi-h CPM) Legacy suite: Analog FM, BPSK, QPSK, Offset QPSK (OQPSK), Asymmetric QPSK (AQPSK), Unbalanced QPSK (UQPSK), Asymmetric Unbalanced QPSK (AUQPSK), Digital PM</td>
</tr>
<tr>
<td>Bit Rates</td>
<td>Tier 0: 24 kbps to 23 Mbps in 1 bps steps Tier I: 100 kbps to 46 Mbps in 1 bps steps Tier II: 1 Mbps to 46 Mbps in 1 bps steps Legacy: 25 kbps to 20 Mbps in Analog FM, 50 kbps to 10 Mbps in BPSK, 20 Mbps in QPSK in 1 bps steps</td>
</tr>
<tr>
<td>Synchronization time (Average, at BER = 1e-5)</td>
<td>Tier 0: 250 bits, Tier I: 385 bits, Tier II: 2,800 bits</td>
</tr>
<tr>
<td>Synchronization threshold</td>
<td>Tier 0: -8.0 dB Eb/N0; RF Input (dBm): -118.0 (1 Mbps), -108.0 (10 Mbps) Tier I: -6.0 dB Eb/N0; RF Input (dBm): -116.0 (1 Mbps), -106.0 (10 Mbps) Tier II: -7.0 dB Eb/N0; RF Input (dBm): -117.0 (1 Mbps), -107.0 (10 Mbps)</td>
</tr>
<tr>
<td>Sensitivity (BER = 1e-5)</td>
<td>Tier 0: 8.6 dB Eb/N0; RF Input (dBm): -101.4 (1 Mbps), -91.4 (10 Mbps) Tier I: 11.2 dB Eb/N0; RF Input (dBm): -98.8 (1 Mbps), -88.8 (10 Mbps) Tier II: 13.0 dB Eb/N0; RF Input (dBm): -97.0 (1 Mbps), -87.0 (10 Mbps)</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice
### RACK-MOUNT RECEIVER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bit Synchronizer Section</strong></td>
<td></td>
</tr>
<tr>
<td>Input codes</td>
<td>NRZ-L/M/S, BÎ±-L/M/S</td>
</tr>
<tr>
<td>Output codes</td>
<td>NRZ-L/M/S, BÎ±-L/M/S</td>
</tr>
<tr>
<td>Data and clock out</td>
<td>TTL (BNC) or RS-422 (Triax)</td>
</tr>
<tr>
<td>Lock detector out</td>
<td>TTL</td>
</tr>
<tr>
<td>Derandomizer</td>
<td>Standard IRIG 15-stage polynomial, selectable On/Off</td>
</tr>
<tr>
<td><strong>Video Section</strong></td>
<td></td>
</tr>
<tr>
<td>Video out</td>
<td>Dual wideband outputs, DC to 35 MHz</td>
</tr>
<tr>
<td>Video filter bandwidth</td>
<td>User programmable</td>
</tr>
<tr>
<td>Output level</td>
<td>1 Vp-p nominal, 4 Vp-p maximum</td>
</tr>
<tr>
<td>NTSC de-emphasis</td>
<td>Selectable On/Off</td>
</tr>
<tr>
<td><strong>Environmental Section</strong></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C to +50°C</td>
</tr>
<tr>
<td>Non-operating Temperature</td>
<td>0°C to +70°C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>0 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Altitude</td>
<td>Up to 30,000 ft. (with the no displays options)</td>
</tr>
<tr>
<td><strong>Physical Section</strong></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>1U rack-mount chassis; 19&quot; wide, 1.75&quot; tall, 14-5/16&quot; rack depth, 15-11/16&quot; overall depth</td>
</tr>
<tr>
<td>Weight</td>
<td>10.4 lbs. (dual-channel)</td>
</tr>
<tr>
<td>Connectors – per RF channel</td>
<td>RF In: Type-N female</td>
</tr>
<tr>
<td></td>
<td>I Out, Q Out, Clock Out, Data Out, IF Out, AGC Out, AM Out: BNC female</td>
</tr>
<tr>
<td></td>
<td>Status/SDI Out: DB-15 High Density female</td>
</tr>
<tr>
<td>Connectors – combined channel</td>
<td>Clock Out, Data Out, AGC Out, AM Out: BNC female</td>
</tr>
<tr>
<td>Connectors – per chassis</td>
<td>Ethernet: RJ-45; Data: USB; Programming: MDM-25 male</td>
</tr>
<tr>
<td>Power</td>
<td>100 to 240 VAC, 50/60 Hz</td>
</tr>
</tbody>
</table>

### OPTIONAL FEATURES

- 14 SAW filters (adds 70 kHz, 1.4, 3, 6, 14, and 28 MHz filters)
- Continuous Tuning
- Pre-detection diversity combiner for a dual-channel receiver
- Adaptive Equalizer
- K7 Viterbi Decoder (k=7 rate 1/2)
- LDPC Decoder
- Blank front panel with no displays or keypad
- RS-422 clock and data outputs on 3-lug triax connectors

> 14 Configure-Channel 2 the same as Channel 1 (bands and modes)
> CT Extended C band
> DC Extended frequency range for all enabled bands
> EQ Extended Lower L band
> K7 Extended P band
> LD Extended S band
> ND Extended Upper L band
> RS
**Band Selection**

You can have it all! Imagine five frequency bands all in a compact 1U package—and with Quasonix’ new Extended Tuning Range option, our receivers will tune from 200.0 MHz to 5250.0 MHz, meeting or exceeding the range of the competition.

### Single-Band Configurations

<table>
<thead>
<tr>
<th>Band Code</th>
<th>Band</th>
<th>Standard Tuning Range (in MHz)</th>
<th>Optional Extended Tuning Range (in MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>P</td>
<td>P band</td>
<td>400.0</td>
<td>1150.0</td>
</tr>
<tr>
<td>L</td>
<td>Lower L band</td>
<td>1435.5</td>
<td>1534.5</td>
</tr>
<tr>
<td>U</td>
<td>Upper L band</td>
<td>1755.0</td>
<td>1850.0</td>
</tr>
<tr>
<td>S</td>
<td>S band</td>
<td>2200.5</td>
<td>2394.5</td>
</tr>
<tr>
<td>C</td>
<td>C band</td>
<td>4400.0</td>
<td>5150.0</td>
</tr>
</tbody>
</table>

### Multi-Band Configurations

<table>
<thead>
<tr>
<th>Band Code</th>
<th>Number of Bands</th>
<th>Bands</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>2</td>
<td>P and S</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>S and C</td>
</tr>
<tr>
<td>M</td>
<td>3</td>
<td>L, U, and S</td>
</tr>
<tr>
<td>R</td>
<td>4</td>
<td>P, L, U, and S</td>
</tr>
<tr>
<td>Q</td>
<td>4</td>
<td>L, U, S, and C</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>P, L, U, S, and C</td>
</tr>
</tbody>
</table>

**Rack-Mount Receiver Specifications**

**Racks-Mount Numbers**

Rack Mount RDMS™ Part Numbering Example

- **QSX-RDMS-RM**
- **S**
- **T**
- **T**
- **0**
- **X2**
- **M**
- **T**
- **T**
- **0**
- **XF**

Options, separated by hyphens (example extended frequency)

- Mode: 0 = Not enabled
- Frequency Band Code (if different Channel 2)
- Frequency Band Code (Refer to band tables)
- Copy Channel 1 modes (both channels configured the same) (X2 or blank)
REMOTE RDMS CLIENT

Features

⇒ Ethernet-based application
⇒ Intuitive layout with all primary control and monitoring functionality for Channel 1, Channel 2, and Combined Channel in one window
⇒ Scalable to 255 networked units
⇒ Field upgradeable

System Requirements

⇒ Windows XP or newer OS
⇒ Microsoft .NET Framework

REMOTE RDMS CLIENT- MULTIPLE RDMS PERFORMANCE MONITOR

**Features**

- Ethernet-based application
- Intuitive layout with all primary control and monitoring functionality for Channel 1, Channel 2, and Combined Channel in one window
- Scalable to 255 networked units
- Field upgradeable

**System Requirements**

- Windows XP or newer OS
- Microsoft .NET Framework
Synchronization Overview

Quasonix is the only vendor in the telemetry market offering trellis demodulation in all ARTM modes. Not only does this approach yield BER results that are less than 0.2 dB from the theoretical limits, but it brings unprecedented synchronization performance.

Synchronization Time

The entire Quasonix receiver and demodulator product line offers extremely fast synchronization in all modes. Our trellis-based synchronization engine provides sync times as short as 100 bits on average.

Synchronization Threshold

Only Quasonix can show synchronization times at negative Eb/N0 values because we’re the only vendor with trellis demodulators that can operate in this region. Our ability to achieve synchronization at such low signal to noise ratios means that we can maintain bit count integrity through extremely deep fades. This allows the user’s crypto devices to stay synchronized under the most severe fading conditions, thereby eliminating the long data outages that occur when the crypto devices lose sync.
**ADAPTIVE EQUALIZER MODE FOR RDMS™ TELEMETRY RECEIVERS**

**WITHOUT Adaptive Equalizer**

**WITH Adaptive Equalizer**

Improves Reception in Multipath Channels

- Adaptive Equalizer combats Multipath Fading with Digital Signal Processing
- Available in Tier 0 (PCM/FM), Tier 1 (SOQPSK-TG), and Tier 2 (ARTM CPM/Multi-h CPM) modes of operation
- Works with your existing transmitter, no matter what brand it is
- Available in any new Quasonix RDMS™ Telemetry Receiver

Available as a programming upgrade to most Quasonix RDMS™ Telemetry Receivers
**Advantages of the Quasonix Adaptive Equalizer Solution:**

- Reduces effects of Multipath Fading
  - Improves overall link availability
- Receiver Configuration
  - Compatible with standard telemetry applications and installations
  - No training sequences are required

**Problem: Signal Distortion due to Multipath Fading**

- Reflections can add or subtract to create multipath fading
- Cannot be solved with more power

**Solution: Reduce Distortion with Adaptive Equalizer**

Available as a programming upgrade to most Quasonix RDMS™ Telemetry Receivers
New Rack Mount RDMS™ Telemetry Receivers

**New 1U Chassis!**
- Aux Analog Outputs
- Combiner I and Q Outputs
- HDMI Output
- Combiner IF Output
- 70 MHz IF INPUTS for Each Channel

Combiner OFF—Two Independent Receivers—Two Control Windows

Channel 1

Channel 2

Combiner ON—Single Control Window

Channel 1

Combiner

Channel 2

**New 3U Chassis!**
- You haven’t seen a telemetry receiver like this!
  - Intuitive touch screens
  - Simultaneous RS-422 and TTL output

**NEW!**

New: Aux Analog Outputs

New: Combiner I & Q Outputs

New: HDMI Output

New: 70 MHz IF Inputs for each Channel

New: Combiner IF Output

7-Inch Touch Screens
With razor-sharp focus on the aeronautical telemetry market and a team rich in talent, experience, and sheer determination, Quasonix is able to consistently design, develop and manufacture what our customers regard as market-leading telemetry products.

Quasonix is...Reinventing Telemetry™