Quasonix

MADE IN USA

Third-Generation RDMS™ Rackmount Receivers

The Final Word on Data Integrity

The higest-performing telemetry receiver on the market is available in an elegant, compact 1U rackmount package and a 3U package with dual, 7-inch full color touchscreens. Experience the industry's fastest synchronization, best SOQPSK-TG detection, premier Best-Channel Selector and Apaptive Equalizer, and much more - all in an easy-to-use and highly configurable package. Quasonix is... Reinventing Telemetry™.

Complete Receiver – RF to Bits — A single-box solution that includes downconversion, demodulation, and bit synchronization.

Space Time Coding (STC) with SOQPSK Mode — Space-Time Coding (STC) operates with Quasonix STC-enabled transmitters to eliminate the dropouts caused by transmit antenna pattern nulls due to inter-antenna interference.

Low Density Parity Check (LDPC) Coding with SOQPSK Mode — Low Density Parity Check coding operates with Quasonix LDPC-enabled transmitters to improve link margin by up to 9 dB, while still using 22% less bandwidth than PCM/FM at the same payload data rate.

Data Quality Encapsulation (DQE) and Data Quality Metric (DQM) — Data Quality Encapsulation (DQE) is a process of bundling Data Quality Metric words with payload data, including a sync word to aid BSS time alignment; built-in real-time DQM display.

Best-Channel Selector (BCS) — Combiner data output seamlessly selects the best channel (Channel 1, Channel 2, or Pre-Detection Diversity Combiner) based on DQM.

Built-in Integrated Three-channel Spectrum Analyzer — Spectrum analyzer shows frequency domain view for up to three channels simultaneously.

Optional Adaptive Equalizer — Powerful decision-directed equalizer mitigates multipath distortion.

Pre-Detection Multi-Mode Diversity Combiner — Provides Maximal Ratio Combining with gain virtually indistinguishable from theory. Also features a revolutionary dynamic time alignment function which increases the allowable time skew between channels by over 1300 nanoseconds—more than 60 bits at high bit rates!

Built-in Playback Demodulator — IF Inputs for each channel, 75 kHz to 20 MHz, or 70 MHz with selectable SAW filter.

Simultaneous RS-422 and TTL Outputs with All Units — One RDMS does it all—no need to order separate output options.

Tuning Range from 200 MHz to 5250 MHz — Optional contiguous tuning from 200 MHz through 2500 MHz and 4400 MHz through 5250 MHz.

Versatile Rackmount Enclosures — Legacy 1U or 3U 19" rack-mount chassis houses one or two receiver channels covering P, lower L, upper L, full S, C, or multiple bands per channel.

Easy Field Updates — Software and firmware updates - free for the lifetime of your receiver - can now be installed by the customer on site.

Future-Proofing Simplified — Upgrades such as new DSP and GUI features can be added with a simple file download while your receiver is still in the rack.

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.

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

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.

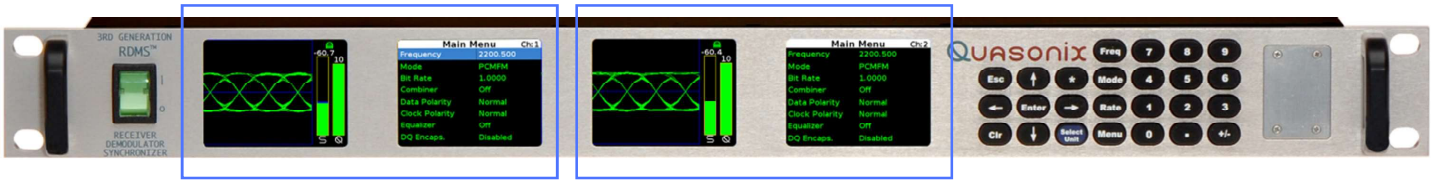
Enhanced Modulation Index Tracking* for PCM/FM — Maintains superior BER performance even if the received signal's modulation index varies by as much as 500%, a major breakthrough for tracking legacy analog transmitters (*patented).

Automatic Phase Noise Compensation — Optimizes demodulator performance for use with legacy TM packs and transmitters with excessive phase noise; can engage automatically, when needed, to provide optimal performance.

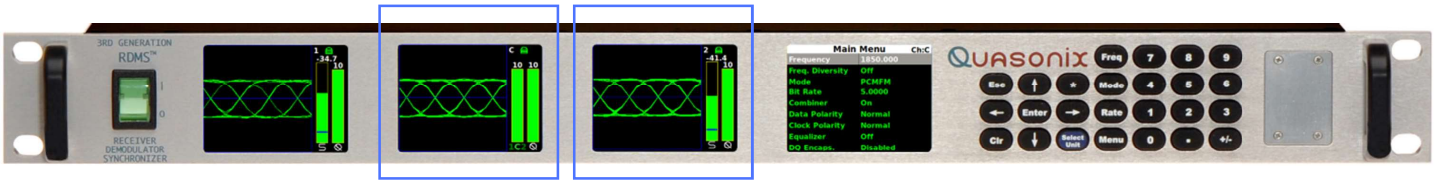
Lowest Noise Figure — Typical 3.5 dB noise figure bests all other ARTM receivers on the market, hands down.

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

Combiner OFF—Two Independent Receivers—Two Control Windows



Combiner ON—Single Control Window



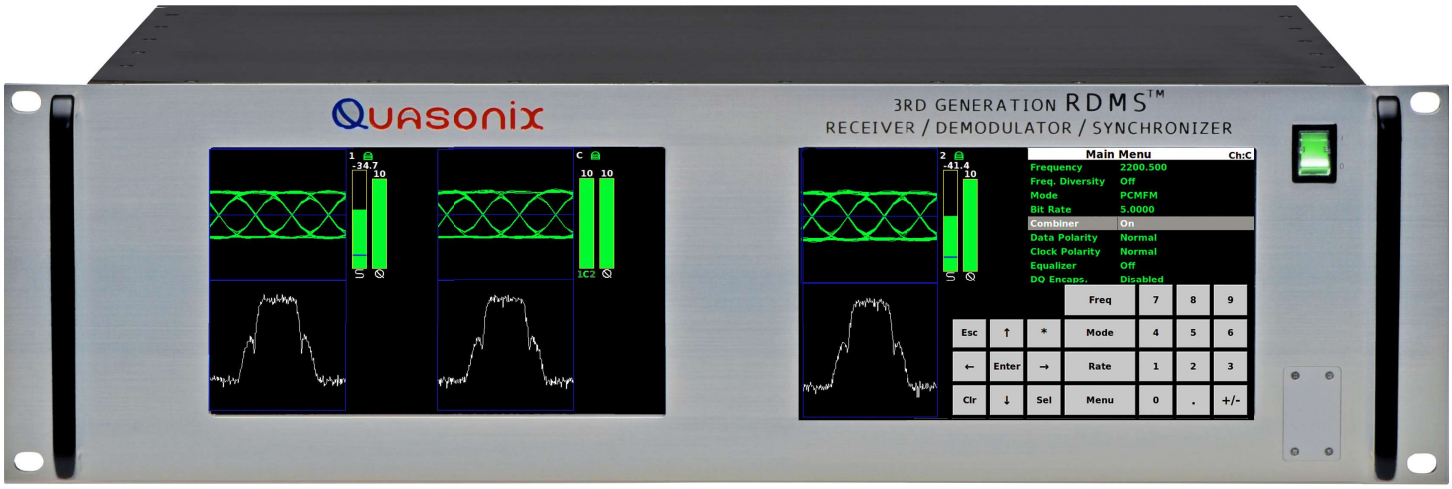
3U Touchscreen Chassis

You haven't seen a telemetry receiver like this!

Intuitive, Full Color, 7-Inch Touchscreens — Dual 7-inch touchscreens allow the operator to display the appropriate eye pattern or constellation for a particular waveform mode, AND the spectrum image associated with the mode.

More Clock and Data Outputs — Twice as many clock and data outputs as a 1U RDMS.

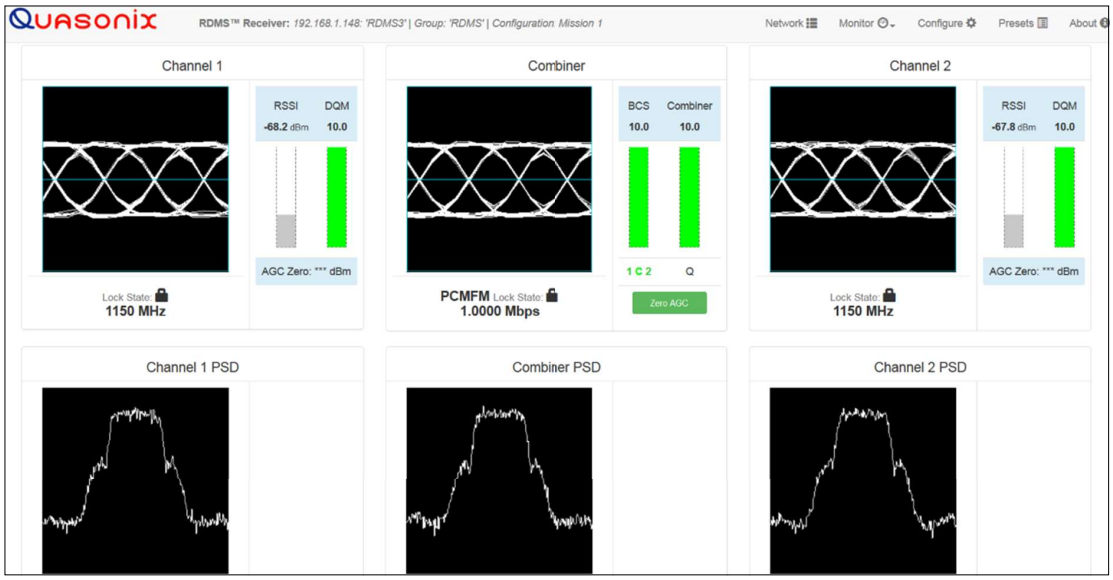
More Analog Outputs — Additional high speed DAC outputs and auxiliary analog outputs on each channel.



7-Inch Touch Screens

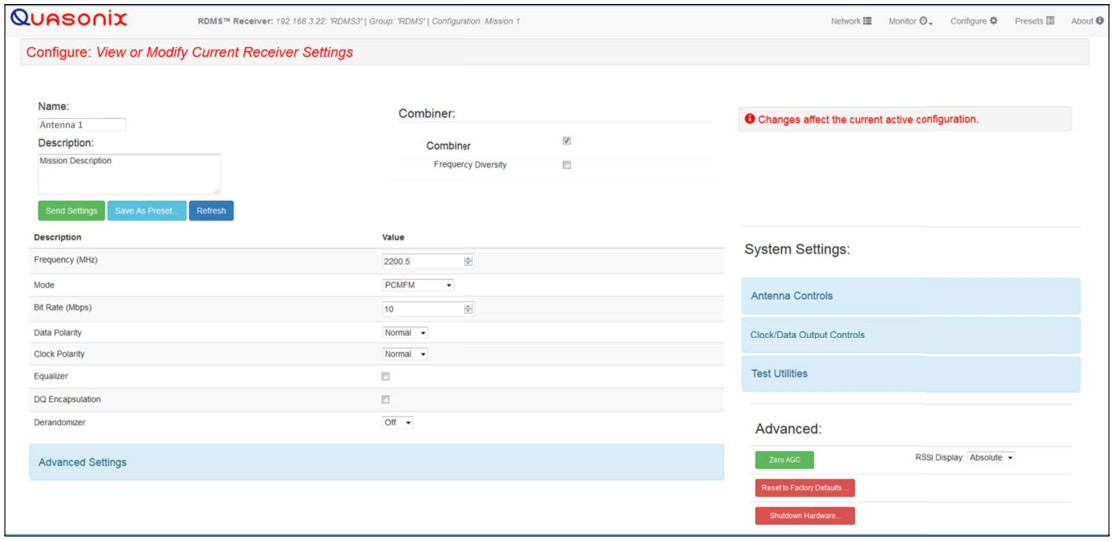
3U Rear Panel

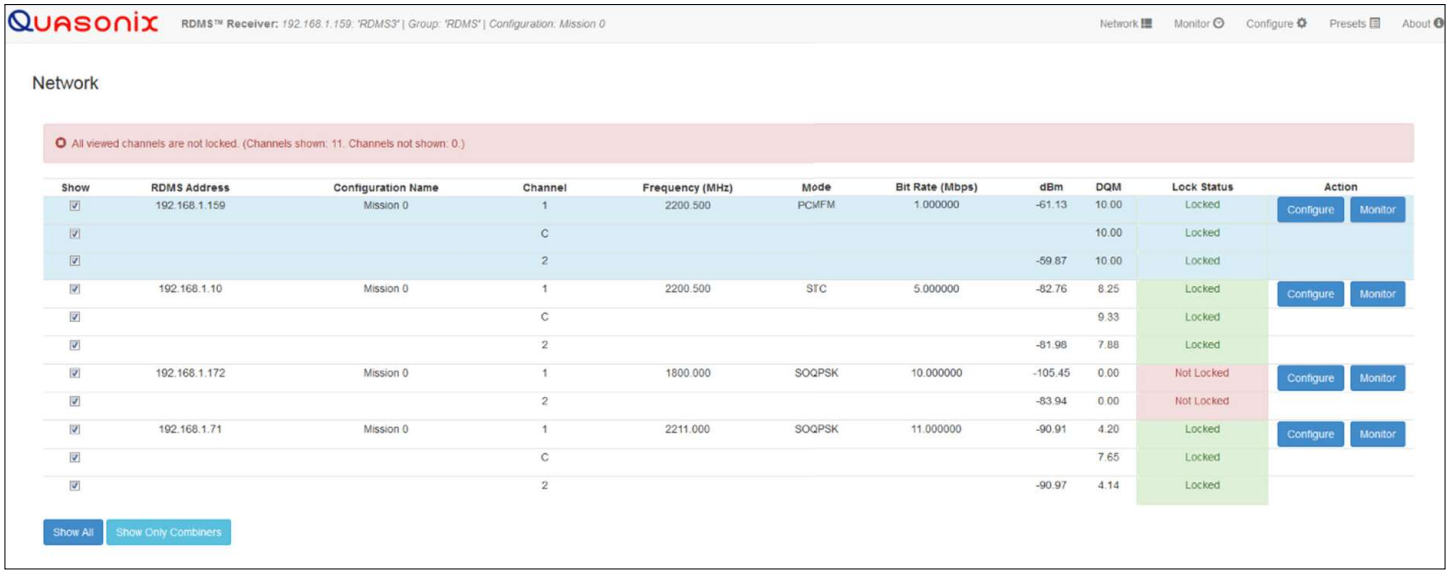
Remote RDMS Client



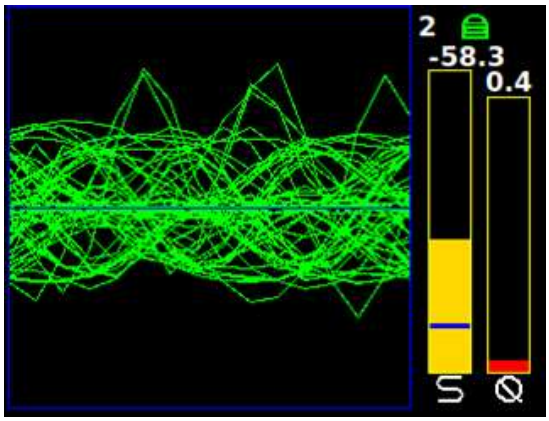
Features

- Browser-based interface—works with common web browsers
- Intuitive layout with all primary control and monitoring functionality for Channel 1, Channel 2, and Combined Channel in one window



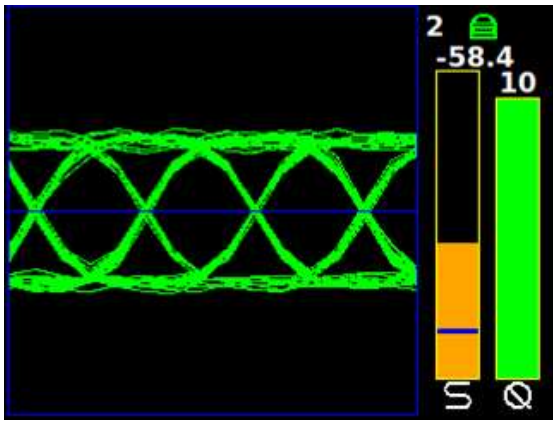


Adaptive Equalizer Option for RDMS Telemetry Receivers



WITH Adaptive Equalizer

WITHOUT Adaptive Equalizer

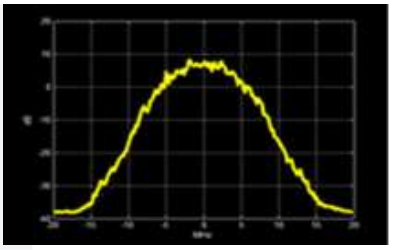


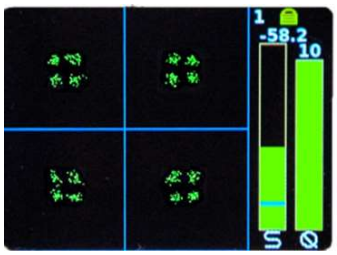
Improves Reception in Multipath Channels

- Adaptive Equalizer combats Multipath Fading with Digital Signal Processing.
- NEW! Uses decision-directed feedback to tackle harsh channels and provide cleaner results.
- Available in Tier 0 (PCM/FM), Tier 1 (SOQPSK-TG), Tier 2 (ARTM CPM/Multi-h CPM), BPSK, QPSK, OQPSK, DPM, and SOQPSK/LDPC modes of operation.
- Works with your existing transmitter, no matter what brand it is.

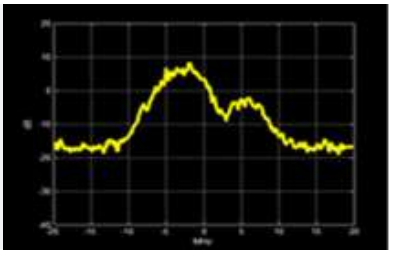
Available as a programming upgrade to most Quasonix RDMS Telemetry Receivers

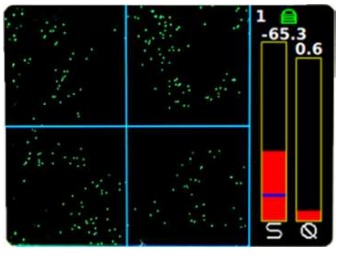
WITHOUT Multipath



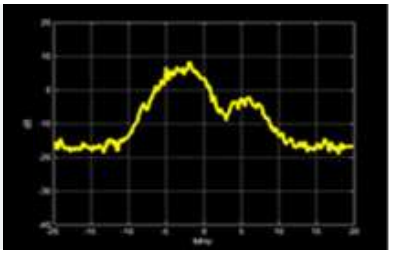


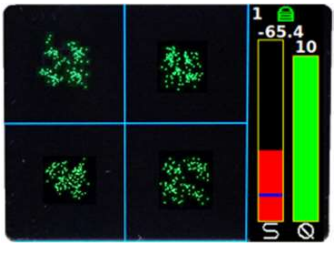
WITH Multipath





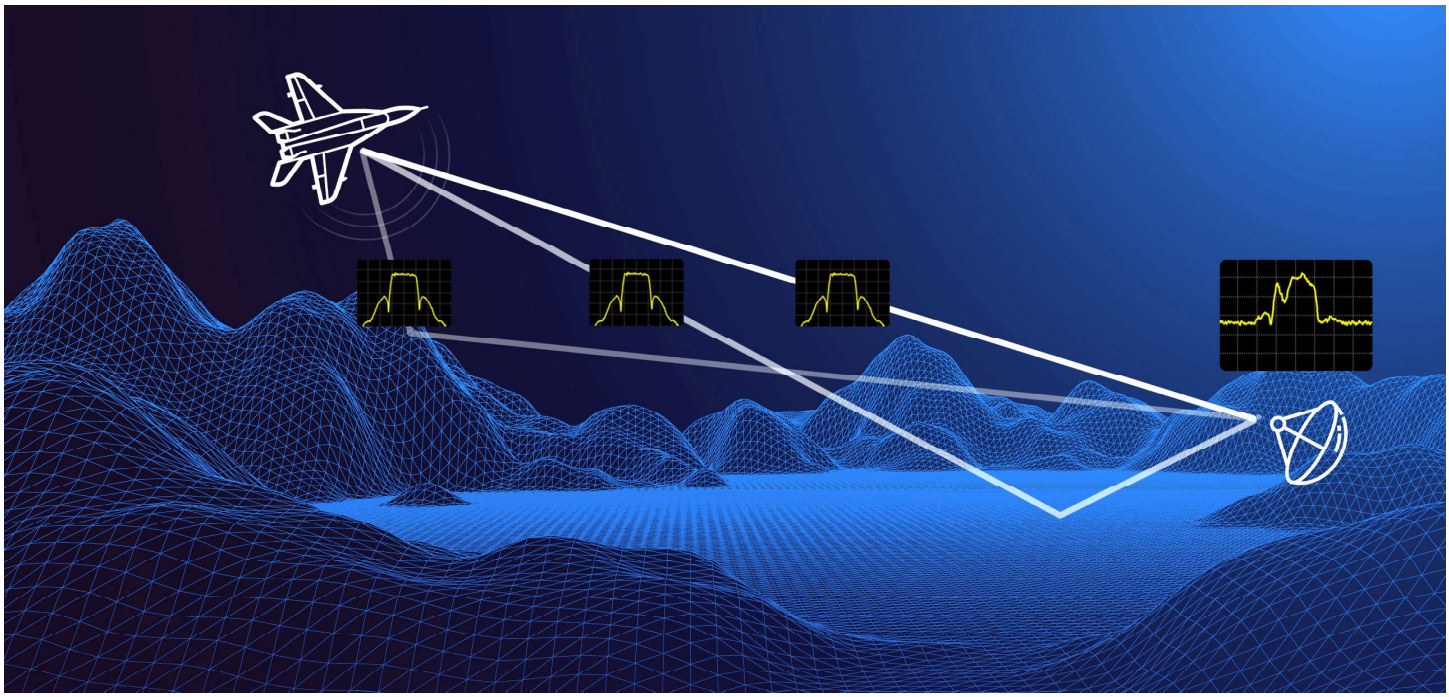
WITH Multipath and Adpative Equalizer turned on



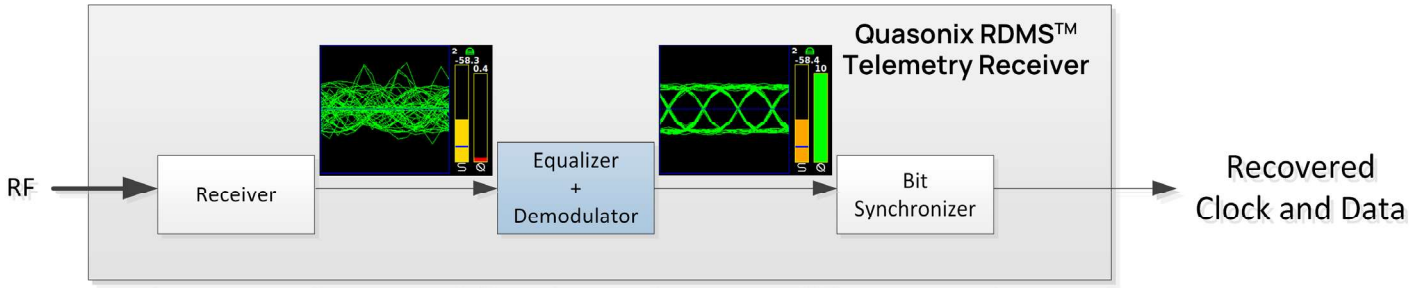


Adaptive Equalizer Solution

Problem: Signal Distortion due to Multipath Fading	Solution: Reduce Distortion with Adaptive Equalizer
• Reflections can add or subtract to create multipath fading • Cannot be solved with more power	**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



Reflected signals corrupt the received signal



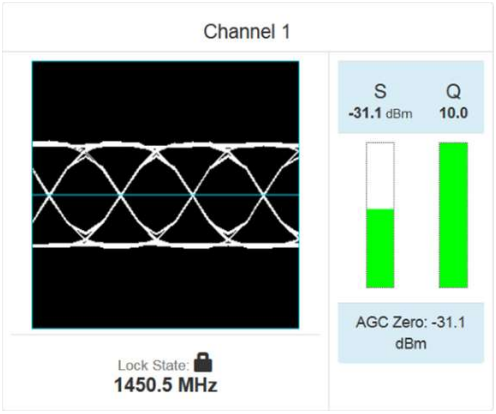
The adaptive equalizer uses digital signal processing, including decision-directed feedback, to provide clean, usable results

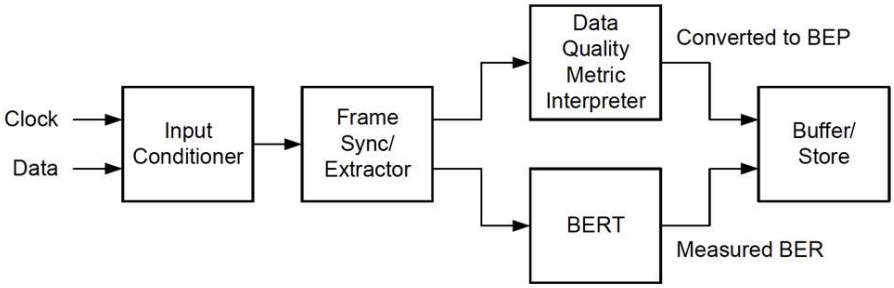
Data Quality Metric (DQM) with Real-Time Display

DQM is a measure of received signal quality that is embedded in the PCM stream and based on statistics developed deep inside the demodulator. DQM encodes an estimate of bit error probability (BEP) in a form optimally usable by best source selectors (BSS) such as the Quasonix Maximum Likelihood Stream Combiner™ (MLSC™).

The displayed DQM value (Q on the Signal Graph) ranges from zero to ten. A zero means there is no confidence that the bits were received correctly, while a ten indicates that the probability of bit errors is less than one in ten billion.

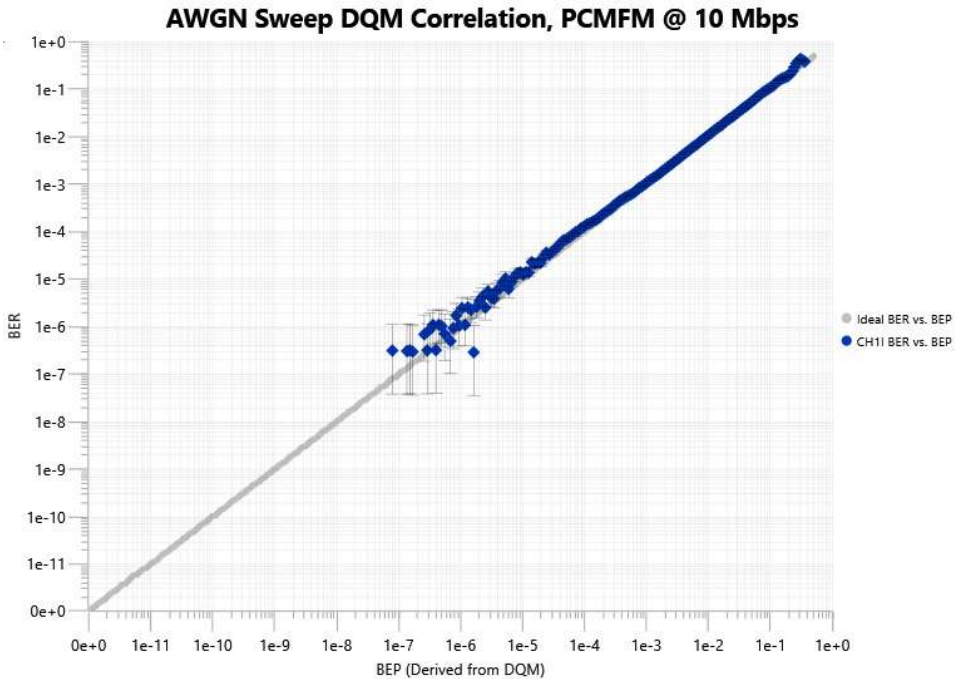
In Quasonix RDMS, DQM is calibrated to BER and has been validated by measuring its correlation with BER. This simplified flowchart summarizes the process:





To ensure DQM faithfully reflects BER in real-world conditions, it has been verified to be accurate under a wide variety channel impairments:

- AWGN - static level
- AWGN - dynamic level (step response)
- Dropouts
- In-band and adjacent channel interference
- Phase noise
- Timing jitter
- Static multipath
- Dynamic multipath (similar to break frequency test)



Data Quality Encapsulation (DQE)

DQM is embedded in the PCM stream and based on statistics developed deep inside the demodulator. Data Quality Encapsulation (DQE) bundles payload data with its DQM to give the Best Source Selectors a valid basis for "Best!"

IRIG DQE Format

Header

- 16-bit sync pattern (0xFAC4)
  - MSB first: 1111101011000100
- 16-bit ID word (format TBD)
- 16-bit DQM = min(round(-log10(LR) / 12 * (2^16)), 2^16 -1)
  - 16-bit unsigned integer, ranges from 0 to 65,535
  - Likelihood Ratio (LR) = BEP / (1-BEP)
  - Easily reversed:

    LR = 10^(-12 * DQM / 2^16)

    BEP = LR / (1 + LR)
  - Q is defined as the "User's DQM":

    Q = 12 * DQM / 65536

    Represents the exponent of 10 in the LR, which approximates the BEP

BEP	LR	DQM	Q
0.5	1.00	0	0.00
1E-01	1.11111E-01	5211	0.95
1E-02	1.01010E-02	10899	2.00
1E-03	1.00100E-03	16382	3.00
1E-04	1.00010E-04	21845	4.00
1E-05	1.00001E-05	27307	5.00
1E-06	1.00000E-06	32768	6.00
1E-07	1.00000E-07	38229	7.00
1E-08	1.00000E-08	43691	8.00
1E-09	1.00000E-09	49152	9.00
1E-10	1.00000E-10	54613	10.00
1E-11	1.00000E-11	60075	11.00
1E-12	1.00000E-12	65535	12.00

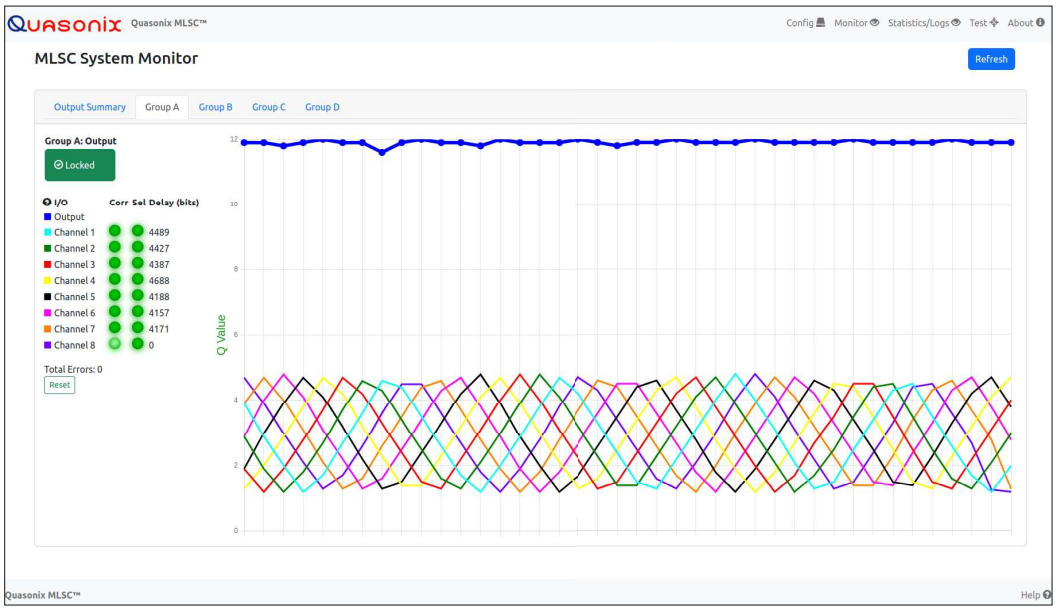
Payload Data

User selectable length, defaults to 4096, except for STC mode, where the default is 3200 bits, and SOQPSK/LDPC or STC/LDPC mode, where the default is the selected LDPC block size.

Network BW Expansion of ~1%

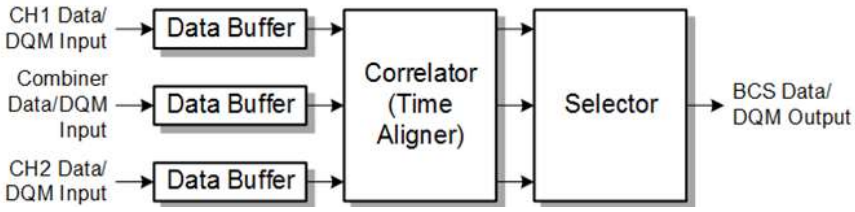
Better BSS

The Quasonix MLSC uses DQE to provide up to six orders of magnitude improvement over the **best** input stream.



The Power of Diversity

Quasonix makes great receivers, but even the best receiver may be limited by range, obstacles/shading, multipath, interference, etc. That's where diversity comes in. Using multiple copies of the transmitted signal—arriving via separate pathways—can dramatically reduce the likelihood of "data dropouts." The RDMS supports diversity at two levels: within each rackmount receiver through our innovative Best Channel Selector (BCS), and between multiple rackmount receivers connected to a Best Source Selector (BSS), through Data Quality Encapsulation (DQE).



Quasonix Best Channel Selector (BCS)

The BCS selects the best data from Channel 1, Channel 2, and the Combiner on a bit-by-bit basis, based on data quality.

Preserves Combiner gain when possible, remedies Combiner issues if they occur — Diversity combining in the RDMS provides polarization, frequency, or small-scale spatial diversity, depending on the system/antenna configuration. The Combiner uses pre-detection maximal ratio combining to synthesize a composite signal from the Channel 1 and Channel 2 input signals.

This approach provides up to 3 dB performance gain when the only channel impairment is noise. But the Combiner may struggle in the face of other common channel impairments like multipath and interference. Since the BCS selects the channel with the highest data quality, it provides a receiver output that is the best possible data the RDMS can provide, regardless of channel conditions.

Time correlation allows "hit-less" source channel switching — No dropped or duplicated data. Correlation is exceptionally fast and robust, due to small and predictable delays between internal receiver channels. The result is superior dynamic performance, handling dropouts and fast fading with ease.

Optimized selection accounts for statistically dependent errors — The optimal selection strategy for statistically independent sources may backfire if sources have correlated errors, which is inevitable with the Combiner and its source channels (Channel 1 and Channel 2). The BCS—unlike an external BSS—"knows" this and simply selects the best channel. This strategy guarantees the RDMS output will always be the best data available.

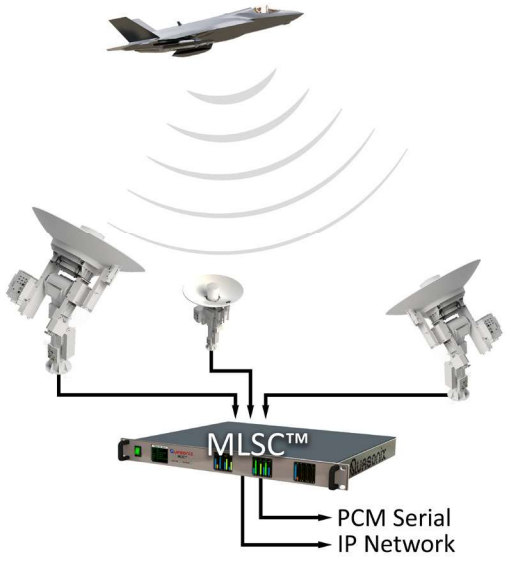
Outputs composite RDMS DQM and data, via DQE — Facilitates range-wide spatial diversity, using a single data stream per receiver (on the Combiner clock and data signals).

Quasonix Maximum Likelihood Stream Combiner (MLSC)

The MLSC (sold separately) creates the best signal source from multiple receivers—outputting data that is better than any individual input source, automatically and transparently.

Correlates sources across almost unlimited range — A wide range of source arrival delays are handled, potentially up to multiple seconds.

Optimal selection using DQM removes bit errors anywhere in the data stream — All correlated input sources contribute information to the output data. This results in a large improvement in data quality because most bit errors are uncorrelated across diverse sources. Typical improvement is a factor of 1000x in bit error rate with three sources. Best of all, it does not require any input source to be error free!



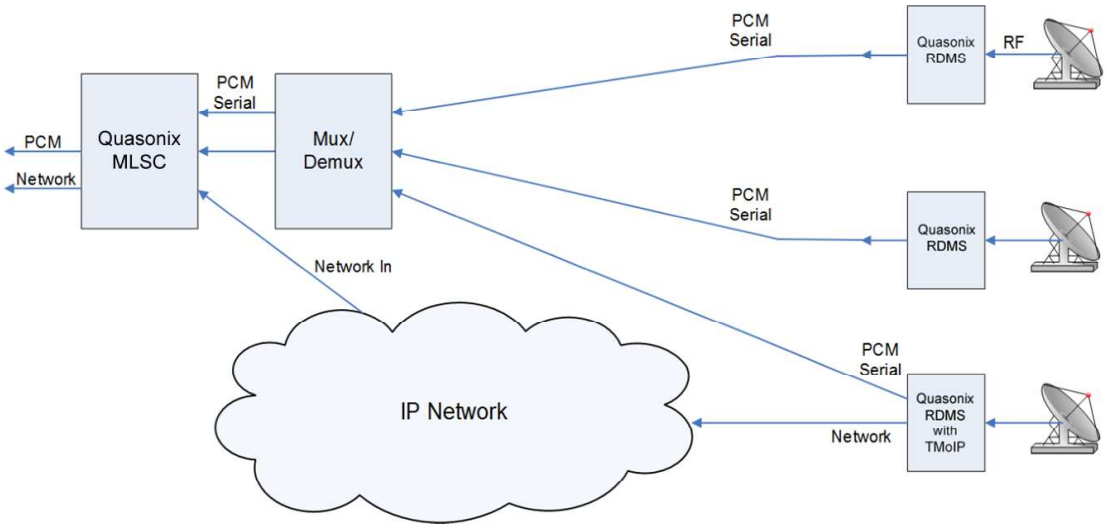
Telemetry over IP (TMoIP) Option

The Quasonix TMoIP Processor (QTP™) core provides IRIG 218-20 compliant telemetry transport in a 3-channel integrated solution embedded in a 1U or 3U RDMS receiver (RDMS with the IP2 option). It provides accurate, reliable transport of all received telemetry data streams from the RDMS to the range network, while offering a multitude of features.

PCM Telemetry Interface	
Integrated Solution	RDMS integrated solution supports 3 channels of PCM input, one each for Channel 1, Channel 2, and Combiner
PCM Telemetry Clock and Data Rates of 100 kbps to 46 Mbps Per Channel	Each channel supports an independent clock rate; bit rate detected automatically—no configuration needed
Configurable TX/RX Clock and Data Polarity with Auto Clock Edge Detection	Clocking edge can be automatically determined via relationship with data (most reliable edge is selected)

Network Interface	
Two 1000 Base-T Gigabit Ethernet RJ45 Ports	Separate ports for configuration and data
IRIG 218-20 Packet Format	Support for the latest standard with first bit timestamping
Per Channel Configuration	Each channel is independently configurable for maximum flexibility
Configurable DQE Frame Alignment	TMoIP packet starts with a DQE frame and contains its full payload

User Interface	
Local and Remote Management for Configuration and Monitoring	Web Browser Based UI for Command, Control, Health, and Status
BER Test Mode with Generator and Analyzer	Allows full testing of system configuration and cabling prior to mission start
Easy Field Updates	Software updates may be installed by the customer on-site



Fielded 1U and 3U RDMS are factory upgradable to add 3-channel TMoIP capability (IP2 option).

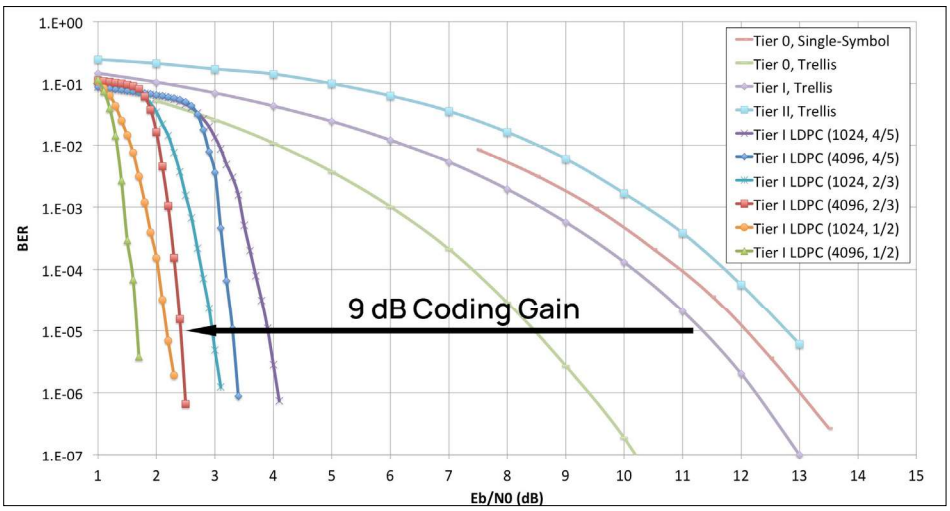
Rackmount Receiver Features

Low Density Parity Check (LDPC) Error Correction

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 can do so with 22%, or even 34%, less bandwidth than conventional PCM/FM. Payload bit rates up to 35 Mbps are supported.

Improves 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



The IRIG standard calls out six variants of LDPC codes—all combinations of two different information block sizes (k=4096 bits and k=1024 bits) and three different code rates (r=1/2, r=2/3, and r=4/5). The larger block size offers better decoding performance in a static channel, but may work less well in a dynamic channel with fast fading or other impairments. Lower code rates also provide better decoding performance at the cost of increased occupied bandwidth.

Already own Quasonix equipment? The LDPC feature can be retrofitted to most Quasonix transmitters and receivers.

LDPC Error Correction has been adopted by the Range Commander's Council, IRIG 106-17, Appendix 2-D

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 40 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 an integrated Quasonix TIMTER™ Transmitter and a Quasonix Compact RDMS Telemetry Receiver for the downlink. The uplink includes a TIMTER Transmitter and a Quasonix Rackmount RDMS Telemetry Receiver.

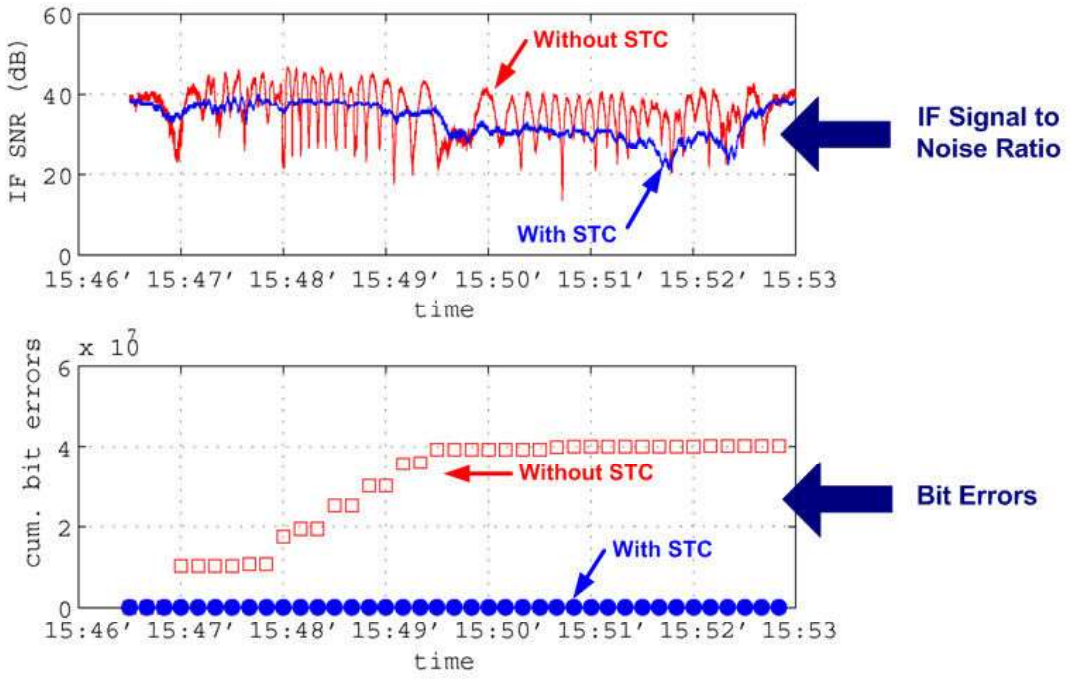
Supports all TCP/IP Packet Types — Streaming UDP packets, TCP connections, ICMP and SNMP messages are all passed over the air. Connection-oriented traffic requires a bidirectional link.

Rackmount Receiver Features (Continued)

Space Time Coding Solution

Problem: "Two-antenna interference"	Solution: Space Time Coding (STC)
• Upper and lower antennas are required to provide LOS path during aircraft maneuvers. • Signals can cancel each other, creating antenna pattern nulls.	**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.

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.



Space Time Coding has been adopted by the Range Commander's Council, IRIG 106-17, Appendix 2-E

Rackmount Receiver Features (Continued)

Bit Error Rate Testing (BERT)

User-selectable Pattern

- PN6, PN9, PN11, PN15, PN17, PN20, PN23, PN31
- Any fixed-length pattern from 2 to 32 bits

Standard Operating Modes

- Continuous
- Single
- Repeating

Accurate measurement even above 40% bit error rate

Test Termination Selection

- Bit count limit
- Error count limit
- Time limit

Loggable text results

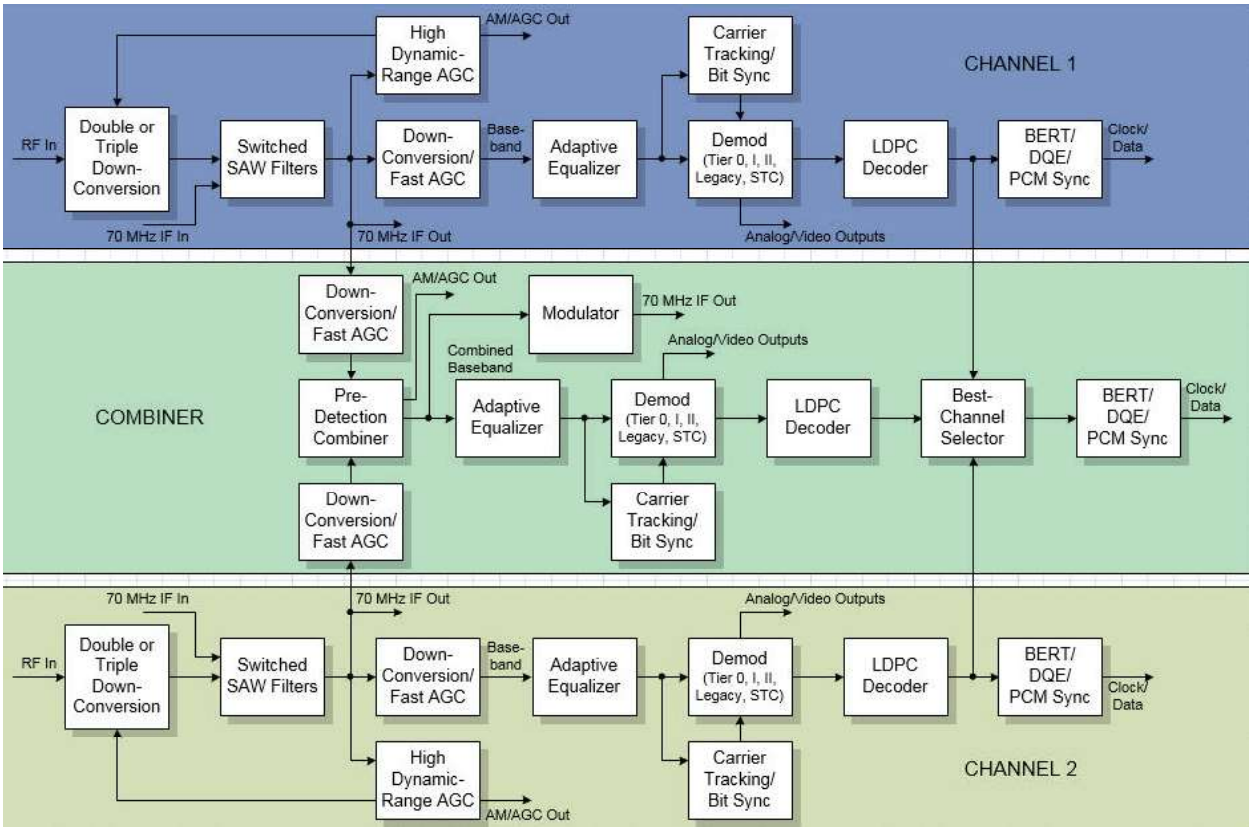
- Human-friendly
- Excel-friendly

Automatic data inversion detection

E R	Time	Bit Count	Error Count	Error Rate
# !	0:00:00:03.772	3.773e+07	2	5.301e-08*
# !	0:00:00:04.023	4.023e+07	2	4.971e-08*
# !	0:00:00:04.276	4.276e+07	2	4.677e-08*
# !	0:00:00:04.527	4.528e+07	2	4.417e-08*
# !	0:00:00:04.779	4.780e+07	2	4.184e-08*
› › ›	0:00:00:05.000	5.000e+07	2	4.000e-08*
# !	0:00:00:00.251	2.512e+06	0	0.000e+00*
# !	0:00:00:00.503	5.032e+06	0	0.000e+00*
# !	0:00:00:00.757	7.574e+06	2	2.641e-07*
# !	0:00:00:01.011	1.011e+07	2	1.978e-07*
# !	0:00:00:01.263	1.264e+07	2	1.582e-07*

Example display with a five (5) second repeating test. An asterisk * after the Error Rate indicates the data is inverted.

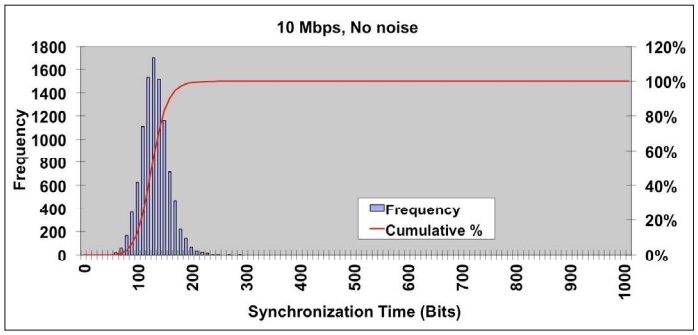
Simplified Block Diagram

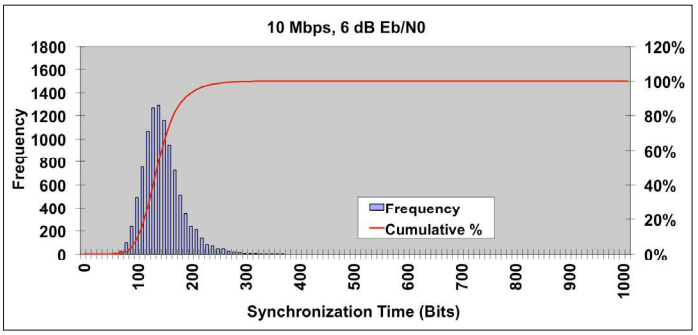


Demodulator Synchronization Performance

Synchronization Overview

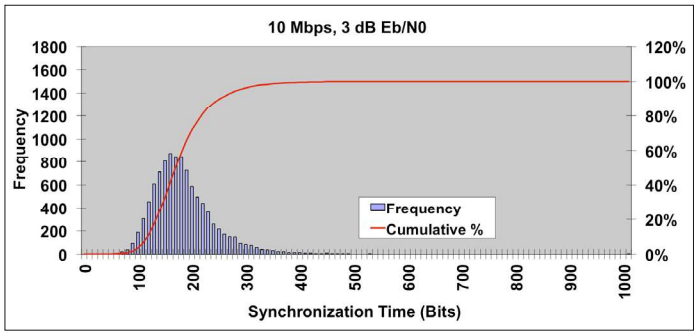
Quasonix is the only vendor in the telemetry market offering trellis demodulation in all ARTM modes. Not only does this approach yield BER results that are less than 0.2 dB from the theoretical limits, but it brings unprecedented synchronization performance.

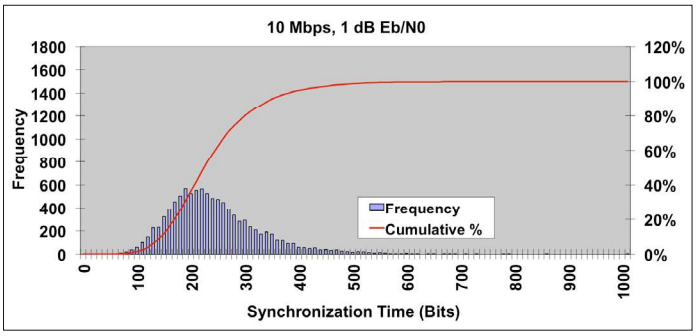




Synchronization Time

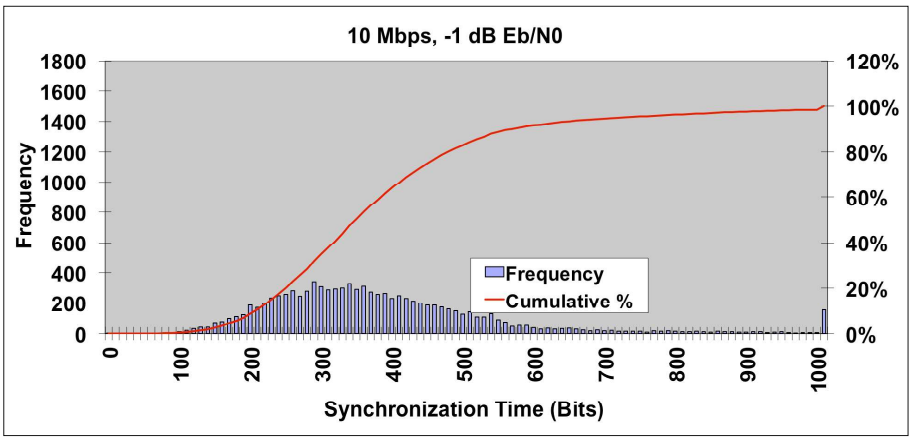
The entire Quasonix receiver and demodulator product line offers extremely fast synchronization in all modes. Our trellis-based synchronization engine provides sync times as short as 100 bits on average.





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.



Rear Panel Connectors

	1 U			3 U		
	Channel 1	Channel 2	Channel 3	Channel 1	Channel 2	Channel 3
Receiver Nomenclature	Connector Number/pin					
Clock A	J1	J15	J25	J1	J26	J51
Data A	J2	J16	J26	J2	J27	J52
Clock B	J9/14	J9/19	J9/25	J6	J31	J56
Data B	J9/15	J9/20	J9/24	J7	J32	J57
Clock C	-	-	-	J11	J36	J61
Data C	-	-	-	J12	J37	J62
Clock D	-	-	-	J16	J41	J66
Data D	-	–	-	J17	J42	J67
DAC A	J5	J19	J29	J3	J28	J53
DAC B	J6	J20	J30	J8	J33	J58
DAC C	J11	J13	-	J13	J38	J63
DAC D	J12	J14	-	J18	J43	J68
AGC OUT	J3	J17	J27	J9	J34	J59
AM OUT	J4	J18	J28	J4	J29	J54
AUX ANALOG A Out	-	-	-	J14	J39	J64
AUX ANALOG B Out	-	-	-	J19	J44	J69
IF IN	J7	J21	-	J21	J46	-
IF Out	J8	J22	J32	J24	J49	J72
70MHz Mod Out	-	-	-	J22	J47	J72
Sync Detect	J9/16	J9/21	J9/23	J5	J30	J55
Demod Lock	J9/3	J9/8	J9/11	J10	J44	J60
No Connection	J9/4	J9/9	J9/10	J15/1	J40/1	J65/1
RS422/Clock A_p	J23/1	J23/5	J23/9	J20/1	J45/1	J70/1
RS422/Clock A_n	J23/14	J23/18	J23/22	J20/14	J45/14	J70/14
RS422/Data A_p	J23/2	J23/6	J23/10	J20/2	J45/2	J70/2
RS422/Data A_n	J23/15	J23/19	J23/23	J20/15	J45/15	J70/15
RS422/Clock B_p	J23/3	J23/7	J23/11	J20/3	J45/3	J70/3
RS422/Clock B_n	J23/16	J23/20	J23/24	J20/16	J45/16	J70/16
RS422/Data B_p	J23/4	J23/8	J23/12	J20/4	J45/4	J70/4
RS422/Data B_n	J23/17	J23/21	J23/25	J20/17	J45/17	J70/17
RS422/Clock C_p	-	-	-	J20/5	J45/5	J70/5
RS422/Clock C_n	-	-	-	J20/18	J45/18	J70/18
RS422/Data C_p	-	-	-	J20/6	J45/6	J70/6
RS422/Data C_n	-	-	-	J20/19	J45/19	J70/19
RS422/Clock D_p	-	-	-	J20/7	J45/7	J70/7
RS422/Clock D_n	-	-	-	J20/20	J45/20	J70/20
RS422/Data D_p	-	-	-	J20/8	J45/8	J70/8
RS422/Data D_n	-	-	-	J20/21	J45/21	J70/21

Color Legend	75 Ω BNC	MDM-25	50 Ω M MCX	50 Ω BNC	DB-9

Rackmount Receiver Ordering Information

You CAN have it all!

Imagine five frequency bands all in a compact 1U package OR in a 3U package with touchscreen—and with Quasonix's Extended Tuning Range option, our receivers will tune from 200 MHz to 2500 MHz and 4.4 GHz to 5.25 GHz, meeting or exceeding the range of the competition.

Third Generation 1U Chassis the reliable, premium performance you've come to expect from Quasonix

3U Touchscreen Chassis— Same RDMS functionality as the 1U with the convenience of touchscreens and unparalleled output capability

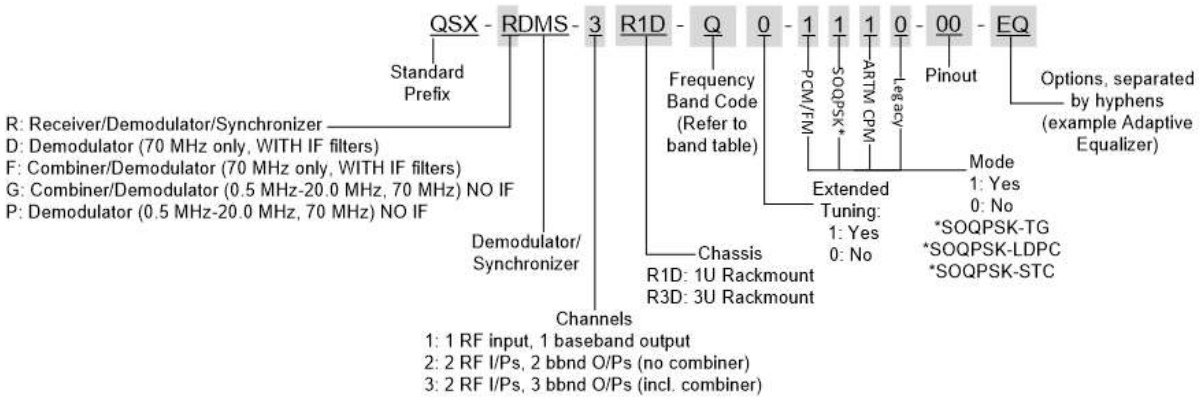
Available Options	
Option	Option Description
14	14 SAW filters (adds 70 kHz, 1.4, 3, 6, 14, and 28 MHz filters)
CS	Cybersecurity
EQ	Adaptive Equalizer
K7	K7 Viterbi Decoder (k=7 rate 1/2)
IP2	Telemetry Over IP

MDM-25 Cables

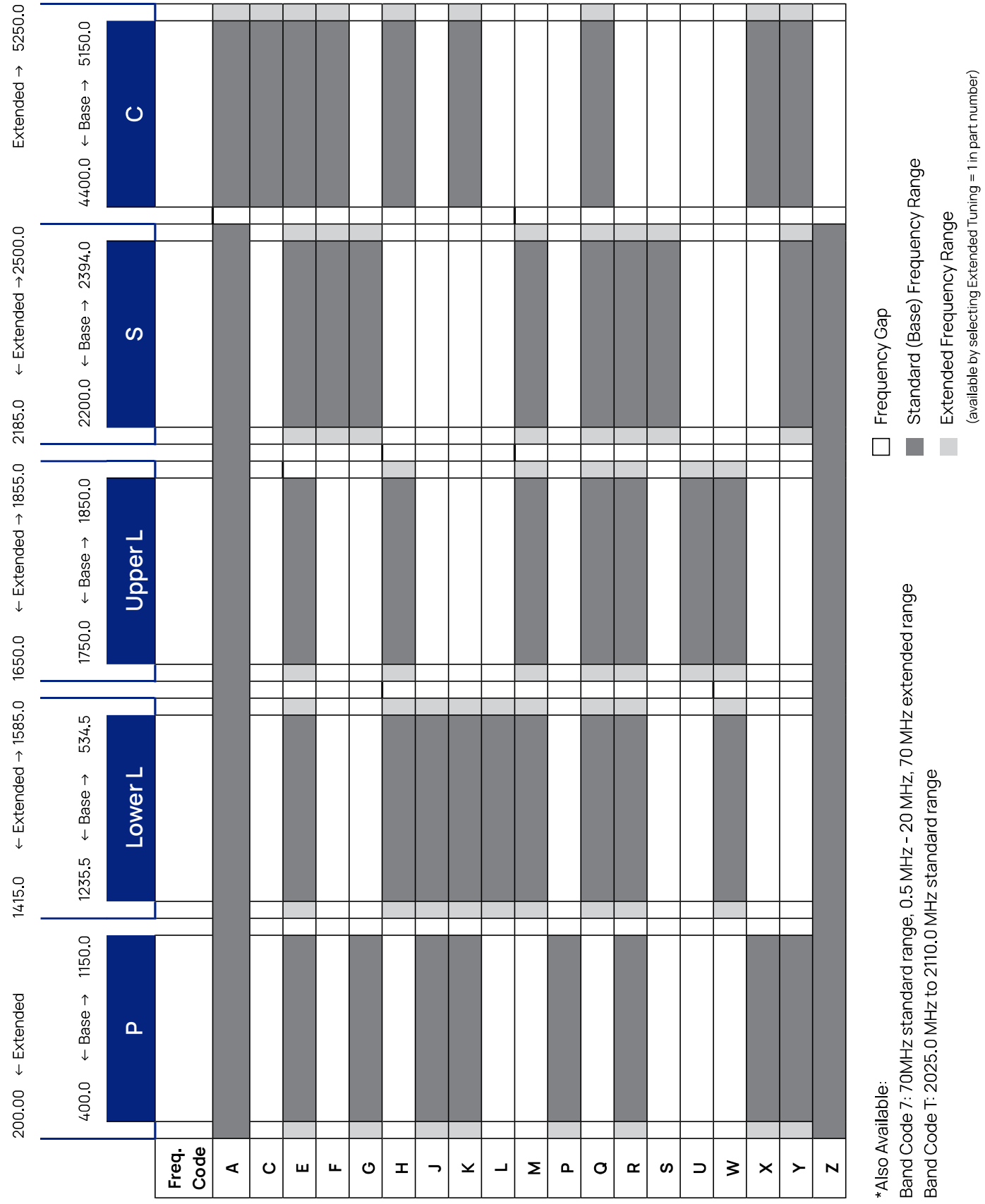
The RS-422 connectors must be connected to a 12 twisted pair shielded cable, such as a Glenair 177-740-2-25CS4K1-36MCN. This particular cable is 36 inches or 3 feet long. Other lengths are available.

Note: Only 8 twisted pairs are used per 3U RDMS connector. The 1U RDMS uses all 12 twisted pairs.

Rackmount RDMS Part Numbering Example



Rackmount Receiver Band Configurations



*Also Available:
Band Code 7: 70MHz standard range, 0.5 MHz - 20 MHz, 70 MHz extended range
Band Code T: 2025.0 MHz to 2110.0 MHz standard range

Receiver

Type	Dual-conversion superheterodyne
Input RF Frequency	Refer to page 17
Tuning resolution	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
Frequency stability	1 ppm over temperature; 1 ppm per year aging
Reference oscillator	20 MHz
Noise figure	3.5 dB (typical), 5 dB (maximum)
LO phase noise, measured at 70 MHz IF output	-115 dBc/Hz @ 1 MHz offset
Maximum RF input	+20 dBm (+10 dBm for C-band)
Available gain (to 70 MHz IF output)	114 dB
Gain control	128 dB control range; User selectable: AGC or MGC (AGC freeze)
AGC load impedance	1 KOhm
AGC time constant	Adjustable to any value from 0.1 ms to 1000 ms
First IF bandwidth	60 MHz (nominal)
IF rejection	> 90 dB
Image rejection	70 dB
RF input impedance	50 ohms
VSWR	3:1 Max; 2:1 Typical

Second IF

IF frequency	70 MHz	
IF output level, nominal (AGC mode)	Channel 1 and 2: 70 and 250 kHz bandwidths:	-15 dBm
	0.5 – 4.5 MHz bandwidths:	-10 dBm
	6 and 10 MHz bandwidths:	-5 dBm
	14 - 40 MHz bandwidths:	-15 dBm
	Combiner:	-5 dBm
	Channel 1 and 2 Mod Out:	-5 dBm (3U RDMS only)
IF output impedance	50 ohms	
VSWR	2:1 Max; 1.5:1 Typical	
IF bandwidths	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	

Playback Demodulator IF In, Channel 1 and 2

Input Center Frequency	.075-20 MHz, 70 MHz through any SAW filter
Input Level	-30 dBm ±10 dB
Input Impedance	50 ohms, nominal

Demodulator

Demodulator type	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, Space Time Coding (STC)
Bit Rates (after LDPC encoding, if applicable)	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 STC: 5 Mbps to 22 Mbps in 1 bps steps Legacy: 25 kbps to 23 Mbps in Analog FM, 25 kbps to 23 Mbps in BPSK, 50 kbps to 46 Mbps in QPSK in 1 bps steps
Synchronization time (Average, at BER = 1e-5)	Tier 0: 250 bits, Tier I: 385 bits, Tier II: 2,800 bits
Synchronization acquisition threshold	Tier 0: -5.0 dB Eb/N0; RF Input (dBm): -115.0 (1 Mbps), -105.0 (10 Mbps) Tier I: -4.0 dB Eb/N0; RF Input (dBm): -114.0 (1 Mbps), -104.0 (10 Mbps) Tier II: -8.0 dB Eb/N0; RF Input (dBm): -118.0 (1 Mbps), -108.0 (10 Mbps)
Synchronization dropout threshold	Tier 0: -10.0 dB Eb/N0; RF Input (dBm): -120.0 (1 Mbps), -110.0 (10 Mbps) Tier I: -6.0 dB Eb/N0; RF Input (dBm): -116.0 (1 Mbps), -106.0 (10 Mbps) Tier II: -15.0 dB Eb/N0; RF Input (dBm): -125.0 (1 Mbps), -115.0 (10 Mbps)
Sensitivity (BER = 1e-5)	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)

Bit Synchronizer

Input codes	NRZ-L/M/S, BIΦ-L/M/S, RZ, DM-M/S, M2-M/S
Output codes	NRZ-L; or input code unaltered
Data and clock out	TTL (BNC) or RS-422
Lock detector out	TTL
Derandomizer	Standard IRIG 15-stage polynomial, selectable On/Off

Video

Video out (DC to 35 MHz)	1U—Quad wideband outputs: Ch1 and Ch2; Dual wideband outputs, Combiner 3U—Quad wideband outputs: Ch1, Ch2, and Combiner
Video filter bandwidth	User programmable
Output level	1 Vp-p nominal, 4 Vp-p maximum
Video de-emphasis	Selectable Off/NTSC/PAL

Environmental

Operating Temperature	0°C to +50°C
Non-operating Temperature	-20 C to +70°C
Operating Humidity	0 to 95% (non-condensing)
Altitude	Up to 30,000 ft. (with the no displays options)

Physical

Size	1U rackmount chassis: 18.95" wide, 1.72" tall, 14.0" rack depth, 14.74" overall depth 3U rackmount chassis: 18.95" wide, 5.22" tall, 14.06" rack depth, 14.80" overall depth
Weight	1U: 11.4 lbs. (dual-channel) 3U: 16.0 lbs
Power	100 to 240 VAC, 50/60 Hz

Reinventing Telemetry™

With a 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

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