

Installation and Operation Manual EVTM Stand-alone Encoder/Decoder



**Quasonix, Inc.
6025 Schumacher Park Dr.
West Chester, OH 45069
05 August, 2019**

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1 Introduction

1.1 Description

This document describes the installation and operation of the Quasonix EVTM Stand-alone Encoder/Decoder. The EVTM (Ethernet Via Telemetry) hardware is designed to translate Ethernet packet data to serial streaming clock and data, for input to transmitters. It also translates recovered serial clock and data from a telemetry receiver back to original Ethernet packets.

EVTM encoding and decoding is required at both ends of a link for operation. The Encoder/Decoder can support bidirectional data from a single piece of hardware.

Quasonix EVTM Stand-alone Encoder/Decoders are compatible with any transmitter or receiver.



Figure 1: EVTM Stand-alone Encoder/Decoder for Airborne Applications



Figure 2: EVTM Stand-alone Encoder/Decoder for Rack Mount Applications

The EVTM Stand-alone Encoder/Decoder is manufactured by:

**Quasonix, Inc.
6025 Schumacher Park Drive
West Chester, OH 45069
CAGE code: 3CJA9**

1.2 Part Numbers

The part numbers for Quasonix EVTM Encoder/Decoders are listed in Table 1.

Table 1: EVTM Encoder/Decoder Part Numbers

Part Number	Description
QSX-EVTM-SED-AT	EVTM Encoder/Decoder, Airborne chassis, TTL
QSX-EVTM-SED-AR	EVTM Encoder/Decoder, Airborne chassis, RS-422
QSX-EVTM-1URX	EVTM Encoder/Decoder, 2 Channels, 1U rack mount chassis

2 Installation Instructions

2.1 Mechanical

2.1.1 1U Rack Mount Encoder/Decoder

The 1U Rack Mount Encoder/Decoder's enclosure fits in a standard 19" rack, occupying only 1U of rack space. Mechanical layouts are provided in Figure 3 and Figure 4.

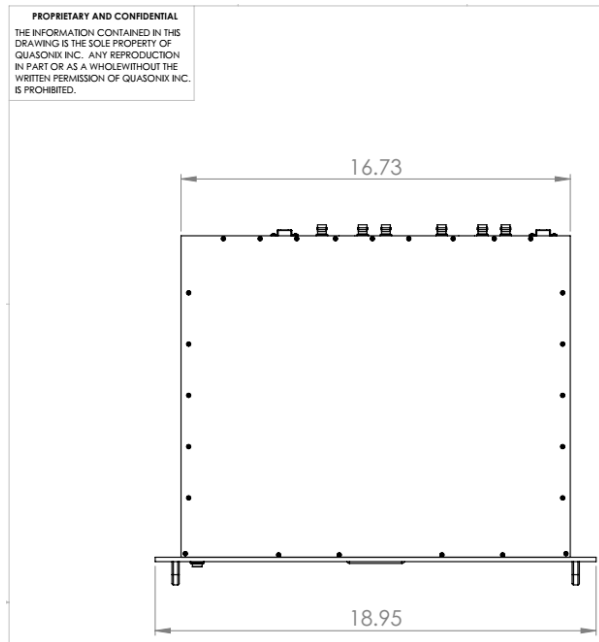


Figure 3: Mechanical Drawing – 1U Top View - EVTM 1U Rack Mount Encoder/Decoder

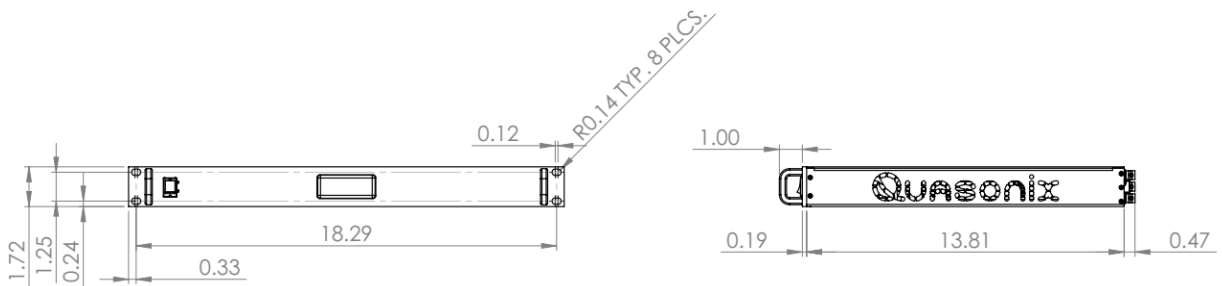


Figure 4: Mechanical Drawing – 1U Front and Side Views - EVTM 1U Rack Mount Encoder/Decoder

2.1.2 Airborne Encoder/Decoder

The 4.2 cubic inch Airborne Encoder/Decoder is designed to be mounted by four (4) 6-32 screws through the holes in the four corners, as shown in Figure 5.



Figure 5: 4.2 in3 Airborne Encoder/Decoder

Mechanical layouts for the Airborne Encoder/Decoder are provided in Figure 6.

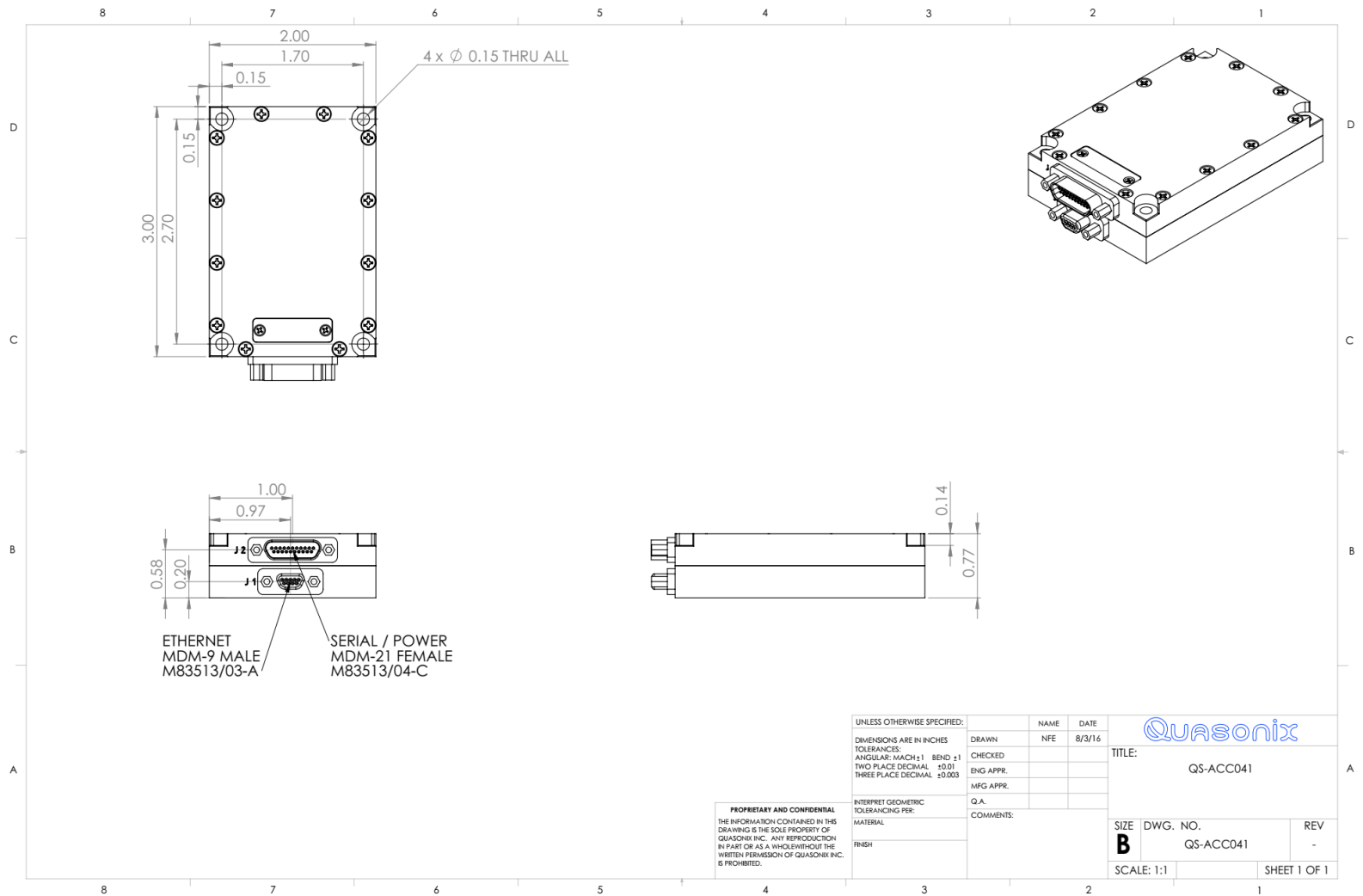


Figure 6: Airborne EVTM Stand-alone Encoder/Decoder

2.2 Thermal

The storage temperature of the Airborne unit is rated for -55°C to $+100^{\circ}\text{C}$, while the operating temperature is rated for -40°C to $+70^{\circ}\text{C}$. It is recommended that the unit be kept in a temperature controlled environment to minimize the risk of operating (or storing) outside the ranges specified.

While the Airborne unit does not dissipate much power, it is recommended that it be mounted on top of associated transmitter or receiver hardware, or mounted adjacent to the hardware on the same heat sink surface.

The storage temperature of the Rack Mount unit is rated for -20°C to $+70^{\circ}\text{C}$, while the operating temperature is rated for 0°C to $+50^{\circ}\text{C}$. It is recommended that the unit be kept in a temperature controlled environment to minimize the risk of operating (or storing) outside the ranges specified.

The Rack Mount unit features cooling vents on both sides of its aluminum chassis. These vents must be kept entirely unobstructed in order to allow for maximum airflow through the system. Whenever feasible, it is helpful to leave an open rack space above and below the Rack Mount unit for additional heat dissipation.

2.3 Electrical

2.3.1 Airborne Encoder/Decoder

The Airborne Encoder/Decoders uses a female MDM-21 Socket (M83513/04-C) and a male MDM-9 (M83513/03-A), as shown in Figure 7. Pin assignments for the MDM-21 connector are described in Table 2. Pin assignments for the MDM-9 connector are described in Table 3.

Pre-assembled MDM-9 Male to RJ-45 (T568A) cables are available from Molex:

- 83421-9224 Micro-D 9 to RJ-45 (T568A), 1.2m
- 83421-9225 Micro-D 9 to RJ-45 (T568A), 10.0m
- 83421-9226 Micro-D 9 to RJ-45 (T568A), 3.0m

Co-location of encoder/decoder and associated transmitter/receiver should be minimized for maximum signal integrity

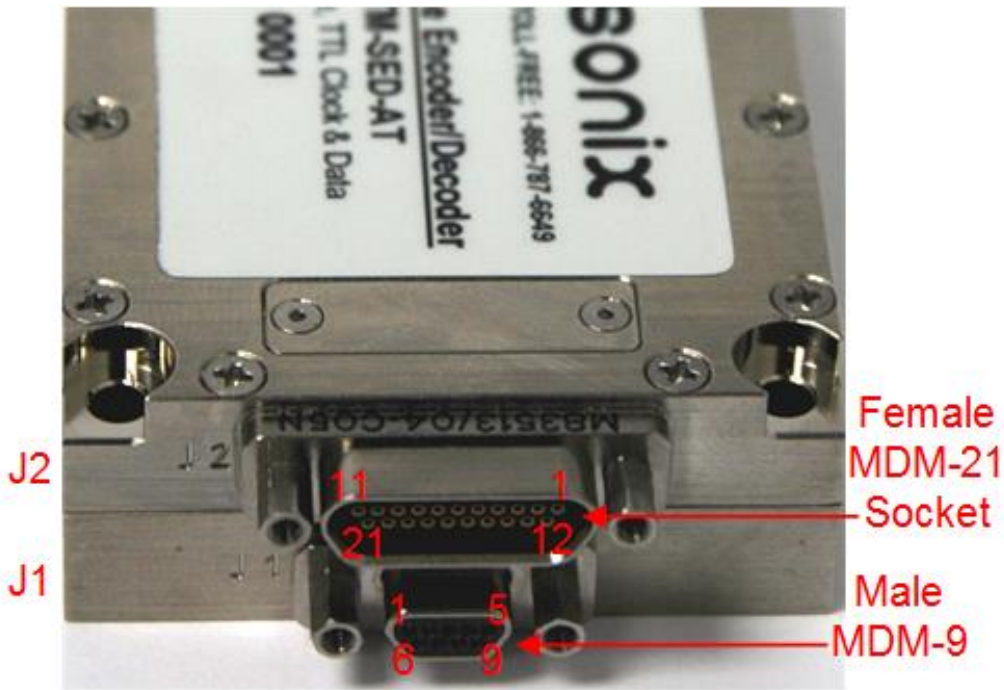


Figure 7: Airborne Encoder/Decoder Connectors Labeled

Table 2: MDM-21 Socket Pin Assignments (J2)

Position	Signal	Description
1	Transmit Clock +	Serial streaming synchronous clock from encoder to telemetry transmitter
2	Transmit Data +	Serial streaming data from encoder to telemetry transmitter
3	System Clock +	Encoder data buffer drain rate clock Signal sets telemetry transmitter data rate
4	TXD	Factory Use Only
5	No Connection	
6	Power	DC power into device +10-32 VDC
7	No Connection	
8	No Connection	
9	No Connection	
10	Receive Data +	Serial streaming data from telemetry receiver to decoder
11	Receive Clock +	Serial streaming synchronous clock from telemetry receiver to decoder

Position	Signal	Description
12	Transmit Clock -	Serial streaming synchronous clock from encoder to telemetry transmitter
13	Transmit Data -	Serial streaming data from encoder to telemetry transmitter
14	System Clock -	Encoder data buffer drain rate clock Signal sets telemetry transmitter data rate
15	RXD	Factory Use Only
16	Ground	DC power ground
17	Ground	DC power ground
18	No Connection	
19	No Connection	
20	Receive Data -	Serial streaming data from telemetry receiver to decoder
21	Receive Clock -	Serial streaming synchronous clock from telemetry receiver to decoder

Table 3: MDM-9 Pin Assignments (J1)

Position	Signal	Description
1	Transmit +	Positive leg of a differential pair, transmit data onto Ethernet network Pin 1 on a standard (T568A) RJ-45
2	No Connection	
3	No Connection	
4	No Connection	
5	Receive +	Positive leg of a differential pair, receive data from Ethernet network Pin 3 on a standard (T568A) RJ-45
6	Transmit -	Negative leg of a differential pair, transmit data onto Ethernet network Pin 2 on a standard (T568A) RJ-45
7	No Connection	
8	No Connection	
9	Receive -	Negative leg of a differential pair, receive data from Ethernet network Pin 6 on a standard (T568A) RJ-45

2.3.2 1U Rack Mount Rear Panel Connections

The Rack Mount EVTM Encoder/Decoder has two identical channels, as shown in Figure 8. Ethernet ports are standard (T568A) RJ-45 connectors. All other connectors are 75 ohm BNCs. Descriptions for rear panel connectors are listed in Table 4.



Figure 8: Rack Mount EVTM Encoder/Decoder with Channels Labeled

Table 4: Rear Panel Connector Descriptions

Function	Description
Channel 1, Ethernet	Ethernet format data from network to transmitter, and from receiver to network Ethernet ports are not connected to each other internally
Channel 1, Clock to Transmitter	Serial streaming synchronous clock from encoder to telemetry transmitter
Channel 1, Data to Transmitter	Serial streaming data from encoder to telemetry transmitter
Channel 1, System Clock to Transmitter	Encoder data buffer drain rate clock Signal sets the telemetry transmitter data rate
Channel 1, Clock from Receiver	Serial streaming synchronous clock from telemetry receiver to decoder
Channel 1, Data from Receiver	Serial streaming data from telemetry receiver to decoder
Channel 2, Clock to Transmitter	Serial streaming synchronous clock from encoder to telemetry transmitter
Channel 2, Data to Transmitter	Serial streaming data from encoder to telemetry transmitter
Channel 2, System Clock to Transmitter	Encoder data buffer drain rate clock Signal sets the telemetry transmitter data rate
Channel 2, Clock from Receiver	Serial streaming synchronous clock from telemetry receiver to decoder
Channel 2, Data from Receiver	Serial streaming data from telemetry receiver to decoder

Function	Description
Channel 2, Ethernet	Ethernet format data from network to transmitter, and from receiver to network Ethernet ports are not connected to each other internally
Main Power	100-240 VDC, 50-60 Hz

3 Operating Instructions

3.1 Airborne Encoder/Decoder

The unit automatically begins operation upon application of DC power. IP addressing is not required.

The telemetry transmit data rate is set by the encoder data buffer drain rate clock connected to pins 3 and 14 of J2. The receiver data rate is automatically set by the incoming clock from the telemetry receiver.

3.2 1U Rack Mount Encoder/Decoder

The unit automatically begins operation upon application of DC power. IP addressing is not required.

The telemetry transmit data rate is set by the encoder data buffer drain rate clock connected to the System Clock inputs for each channel. The receiver data rate is automatically set by the incoming clock from the telemetry receiver.

The rack mount unit will support two separate channels at the same time, as the functionality of the airborne encoder/decoder is duplicated inside the chassis.

5 Maintenance Instructions

The EVTM Stand-alone Encoder-Decoder requires no regular maintenance, and there are no user-serviceable parts inside.

6 Product Warranty

The EVTM Stand-alone Encoder-Decoder carries a standard parts and labor warranty of one (1) year from the date of delivery.

6.1 Quasonix Limited Warranty Statement

This Limited Warranty Statement (this “Limited Warranty”) applies to all hardware and software products and internal components of such products (the “Products”) sold by Quasonix, or its representatives, authorized resellers, or country distributors (collectively referred to herein as “Quasonix”). EXCEPT AS EXPRESSLY SET FORTH IN THIS LIMITED WARRANTY, QUASONIX MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ANY PRODUCTS SOLD BY IT. Quasonix expressly disclaims all warranties and conditions not stated in this limited warranty. There are no warranties which extend beyond the description on the face hereof. Capitalized terms not otherwise defined herein shall have the meaning set forth in those certain General Terms and Conditions of Sale for Standard Product, as amended from time to time.

Quasonix warrants to customer that for one (1) year from the date of shipment of the Products by Quasonix (the “Warranty Period”), such Products purchased from Quasonix or its authorized affiliate will materially conform to the specifications set forth in the applicable Quasonix Specifications, if any, and are free from defects in materials and workmanship under normal use during the Warranty Period. As used herein, “normal use” means the intended use of the Products for which it was designed by Quasonix.

This Limited Warranty extends only to the original purchaser of the Products and is not transferable to anyone who obtains ownership of the Products from the original purchaser.

Quasonix’s software, whether incorporated into the Products or sold separately, is warranted solely to the extent that problems or “bugs” are found in the software and affect the functional operation of the Products. At no time shall requests for changes in the software architecture or visual esthetics be considered a warranty item.

The Products are manufactured using new materials only. Replacement parts may be new or equivalent to new. Replacement parts are warranted to be free from defects in material or workmanship for thirty (30) days or for the remainder of the Warranty Period of the Products in which they are installed, whichever is longer.

During the Warranty Period, Quasonix will repair or replace the defective Products. All components or hardware products removed from the Products under this Limited Warranty become the property of Quasonix. All warranties are limited to the repair or replacement of the Products.

In no event shall Quasonix be liable for any special, consequential, incidental or indirect damages of any kind, including, without limitation, loss of profits, loss of data, “down-time,” loss of use or damage to other equipment, or personal injury or death, whether or not Quasonix has been advised of the possibility of such loss.

Notwithstanding anything to the contrary herein, Quasonix’s entire liability hereunder from any cause whatsoever and regardless of the form of action shall be limited to the amount actually received by Quasonix.

Quasonix shall not be liable for a breach of the warranty set forth in this Limited Warranty unless: (i) the customer gives written notice of the defect, reasonably described, to Quasonix’s Contracts Administrator within thirty (30) days of the time when customer discovers or ought to have discovered the defect and obtains a Return Materials Authorizations (“RMA”) number; (ii) Quasonix is given a reasonable opportunity after receiving the notice to examine such Products and customer (if requested to do so by Quasonix) returns such Products to Quasonix’s facility in Moorpark, CA, unless otherwise approved by Quasonix; and (iii) Quasonix reasonably verifies customer’s claim that the Products are defective.

Subject to the foregoing, with respect to any such Products during the Warranty Period, Quasonix shall, in its sole discretion, either: (i) repair or replace such Products (or the defective part) or (ii) credit or refund the price of such

Products at the pro rata contract rate provided that, if Quasonix so requests, customer shall, at Quasonix's expense, return such Products to Quasonix.

The customer is responsible for all costs associated with packaging and shipping of the defective Products to Quasonix's facility and clearly marking or affixing the given RMA number on the shipping label. Quasonix is not responsible for any loss or damage during shipment to Quasonix's facility. Following repair or replacement of covered Products, Quasonix will assume responsibility for the costs associated with the return of the material to the customer to an address provided by the customer. Notwithstanding the foregoing, items returned to Quasonix's facility and found to be operational or otherwise not covered by this Limited Warranty shall be returned to the customer at the customer's expense.

This Limited Warranty does not apply to expendable parts, such as cables, lamps, fuses, connectors, etc. This Limited Warranty does not extend to any Products which have been damaged or rendered defective (a) as a result of accident, misuse, abuse, or external causes; (b) by operation outside the usage parameters stated in the user documentation that shipped with the Products; (c) as a result of a failure to follow the instructions in the Operations & Maintenance Manual (d) by the use of parts not manufactured or sold by Quasonix; or (e) by modification or service by anyone other than (i) Quasonix, (ii) an Quasonix authorized service provider, or (iii) your own installation of end-user replaceable Quasonix or Quasonix approved parts if available for the Products in the servicing country.

THE TERMS OF THE WARRANTIES CONTAINED HEREIN DO NOT IN ANY WAY EXTEND TO ANY PRODUCT OR PART THEREOF OR SOFTWARE MATERIALS WHICH WERE NOT MANUFACTURED BY SELLER OR PREPARED BY SELLER OR ANY OF ITS AFFILIATES.

These terms and conditions constitute the complete and exclusive warranty agreement between the customer and Quasonix regarding the Products purchased. This Limited Warranty is applicable in all countries and may be enforced in any country where Quasonix or its authorized affiliates offer warranty service subject to the terms and conditions set forth in this Limited Warranty.

These terms and conditions supersede any prior agreements or representations (including representations made in Quasonix sales literature or advice given to the customer by Quasonix or an agent or employee of Quasonix) that may have been made in connection with the purchase of the Products. No change to the conditions of this Limited Warranty is valid unless it is made in writing and signed by an authorized representative of Quasonix.

6.1.1 Extended Warranties

Extended warranties or extra coverage are available upon request. Please contact Quasonix for details and pricing.

THE REMEDIES SET FORTH IN THIS LIMITED WARRANTY STATEMENT SHALL BE THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH HEREIN.

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7 Technical Support and RMA Requests

In the event of a product issue, customers should contact Quasonix via phone (1-513-942-1287) or e-mail (support@quasonix.com) to seek technical support. If the Quasonix representative determines that the product issue must be addressed at Quasonix, a returned materials authorization (RMA) number will be provided for return shipment.

Authorized return shipments must be addressed in the following manner:

**Quasonix, Inc.
ATTN: Repair, RMA #
6025 Schumacher Park Drive
West Chester, OH 45069**

To ensure that your shipment is processed most efficiently, please include the following information with your product return:

- Ship To – Company name, address, zip code, and internal mail-drop, if applicable
- Attention/Contact person – Name, Title, Department, Phone number, email address
- Purchase Order Number – If applicable
- RMA Number – provided by the Quasonix representative

Please note that Quasonix reserves the right to refuse shipments that arrive without RMA numbers.

8 Appendix A – Acronym List

Acronym	Description
AGC	Automatic Gain Control
AM	Amplitude Modulation
AQPSK	Variant of Quadrature Phase Shift Keying
ARTM	Advanced Range Telemetry
AUQPSK	Variant of Quadrature Phase Shift Keying
BER	Bit Error Rate
BNC	Bayonet Neill-Concelman Connector (RF Connector)
BPSK	Binary Phase Shift Keying
CCSDS	Consultative Committee for Space Data Systems (coding standard)
CD	Compact Disk
CPM	Continuous Phase Modulation
DB-9	D-subminiature 9 pin Serial Connector
DC	Diversity Combiner
DHCP	Dynamic Host Configuration Protocol
DPM	Digital Phase Modulation
DQE	Data Quality Encapsulation
DQM	Data Quality Metric
FPGA	Field Programmable Gate Array
IF	Intermediate Frequency
IP	Internet Protocol
kbps	Kilobits per second
KHz	Kilohertz
LCD	Liquid Crystal Display
LDPC	Low Density Parity Check
Mbps	Megabits per second
MCX	Snap on subminiature connector
MHCPM	multi-h Continuous Phase Modulation
MHz	Megahertz

Acronym	Description
N	(connector type) Threaded RF connector
OQPSK	Offset Quadrature Phase Shift Keying
PCMFm	Pulse Code Modulation/Frequency Modulation
PM	Phase Modulation
PSK	Phase Shift Keying
QPSK	Offset Quadrature Phase Shift Keying
RDMS	Receiver DeModulator Synchronizer
RF	Radio Frequency
RJ-45	Ethernet Connection Jack
RM	Rack Mount
RRC	Remote RDMS Client
RS-232	Recommended Standard 232 (Serial Communications)
SAW	Surface Acoustic Wave
SDI	System Degradation Indication
SOQPSK	Shaped Offset Quadrature Phase Shift Keying
SOQPSK-TG	Shaped Offset Quadrature Phase Shift Keying –Telemetry Group
STC	Space-Time Coding
TRL	Tracking Loop
TTL	Transistor Transistor Logic
UDP	User Datagram Protocol
UQPSK	Unbalanced Quadrature Phase Shift Keying
USB	Universal Serial Bus
VAC	Voltage Alternating Current
VDC	Voltage, Direct Current
WAN	Wide Area Network