

Operating Instructions
Frequency and Mode Switch Box for TIMTER™ Transmitters
P/N: QSX-AC-SWBX-P9-3B-3M



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1 Introduction

The Quasonix switch box includes a total of five 10-digit switches, four to choose the frequency, in MHz, and one switch to choose the mode, in terms of the ARTM “Tier” number. Included with the switch box is a 36” MDM-9 to MDM-9 cable harness.

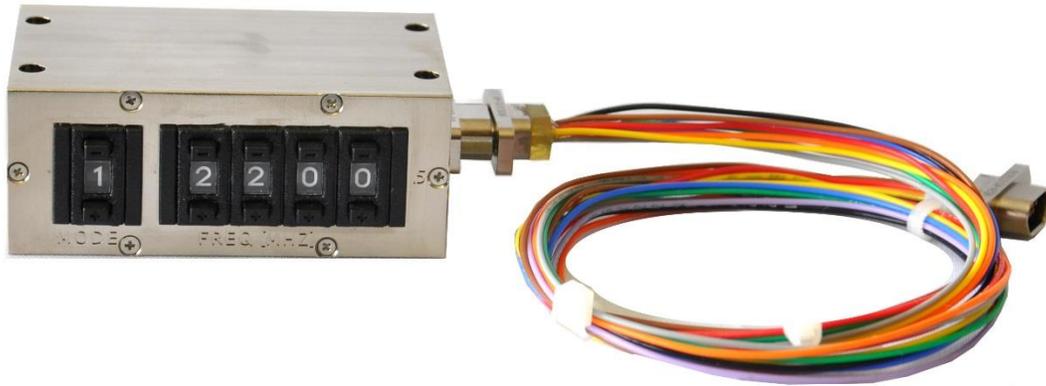


Figure 1: Frequency and Mode Switch Box for TIMTER™ Transmitters with Cable Harness

The transmitter includes a serial command, DD, short for “debounce delay,” that allows the user to adjust the delay incurred after each click. The purpose of this command is to mitigate the risk of inadvertently tuning the transmitter to a disallowed frequency, or mode, while the user is still in the process of clicking through the selections. The minimum debounce delay is 500 mS and the maximum is 9000 mS rounded to the nearest 500 mS. The default delay is three (3) seconds.

2 Frequency

2.1 Switchbox Operation with a Transmitter that Does Not Support C-band

The frequency assigned through the switch box assumes a +0.5 MHz offset. For example, if the digits “2-2-0-0” are dialed, the transmitter will read 2200.5 MHz.

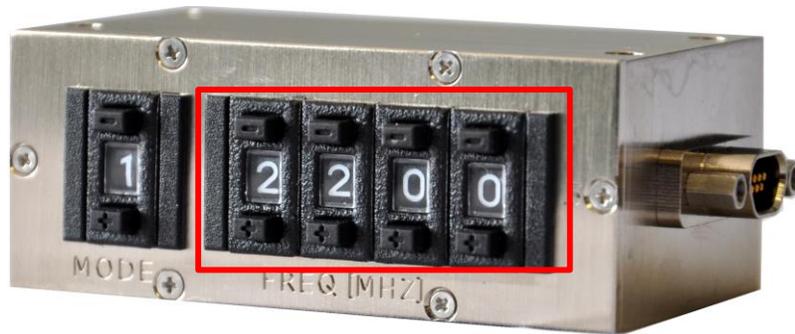


Figure 2: Front Close-up of Switch Box, Frequency Digits Highlighted

This description assumes that the transmitter supports L, U (Upper L), and S bands. Due to the relatively limited frequency range of the transmitter (1435.5 MHz on the low end, 2394.5 MHz on the high end), the switch box’s microprocessor parses only the two least significant binary bits of the most significant digit – the Gigahertz digit.

The parsed binary digits are shown in Table 1:

Table 1: Parsed Digits for L, U (Upper L), and S Bands

Switch Box Digit		First Two Binary Digits	Last Two Binary Digits	What the TX Sees (in GHz)	Comments
0	=	00	00	= 0	Not valid
1	=	00	01	= 1	Depends on lower digits
2	=	00	10	= 2	Depends on lower digits
3	=	00	11	= 3	Not valid
4	=	01	00	= 0	Not valid
5	=	01	01	= 1	Depends on lower digits
6	=	01	10	= 2	Depends on lower digits
7	=	01	11	= 3	Not valid
8	=	10	00	= 0	Not valid
9	=	10	01	= 1	Depends on lower digits

By design, this means that GHz assignments outside of the expected 1 and 2 will result in either no change to the transmitter, or a retune to the equivalent valid number.

For example, if 6200.5 MHz is dialed in, the unit will retune itself to 2200.5 MHz since the frequency is valid for S-band. If a valid frequency is dialed, the transmitter will retune itself accordingly.

2.2 Switchbox Operation with a Transmitter that Supports Only C-band and Mid C-band

The frequency assigned through the switch box assumes a +0.5 MHz offset. For example, if the digits “4-4-0-0” are dialed, the transmitter will read 4400.0 MHz.

The frequency range of a C-band transmitter is 4400.0 MHz on the low end, 4940.0 MHz on the high end for standard C-band, and 5091.0 MHz on the low end and 5150.0 MHz on the high end for mid-C. The switch box’s microprocessor for a C-band only transmitter parses only the three least significant binary bits of the most significant digit – the Gigahertz digit.

The parsed binary digits for C-bands are shown in Table 2:

Table 2: Parsed Digits for C and Mid-C Bands

Switch Box Digit		First Binary Digit	Last Three Binary Digits	What the TX Sees (in GHz)	Comments
0	=	0	000	= 0	Not valid
1	=	0	001	= 1	Not valid
2	=	0	010	= 2	Not valid
3	=	0	011	= 3	Not valid
4	=	0	100	= 4	Depends on lower digits
5	=	0	101	= 5	Depends on lower digits
6	=	0	110	= 6	Not valid
7	=	0	111	= 7	Not valid
8	=	1	000	= 0	Not valid
9	=	1	001	= 1	Not valid

By design, this means that GHz assignments outside of the expected digits will result in either no change to the transmitter, or a retune to the equivalent valid number.

For example, if 6200.5 MHz is dialed in, the unit will not retune itself since the frequency is out of C band. If 9200.5 MHz is dialed, it will be read as 1200.5 MHz, which is also out of C band.

2.3 Switchbox Operation with a Transmitter that Supports L/S/C band

The frequency assigned through the switch box assumes a +0.5 MHz offset. For example, if the digits “4-4-0-0” are dialed, the transmitter will read 4400.0 MHz.

This description assumes that the transmitter supports L, U (Upper L), S, and C bands. The frequency range of an L/S/C band transmitter is 1435.5 MHz on the low end, 4940.0 MHz on the high end for standard C-band, and 5091.0 MHz on the low end and 5150.0 MHz on the high end for mid-C. The switch box’s microprocessor for an L/S/C band only transmitter parses only the three least significant binary bits of the most significant digit – the Gigahertz digit.

The parsed binary digits for L/S/C band transmitters are shown in Table 3:

Table 3: Parsed Digits for L/S/C Band

Switch Box Digit		First Binary Digit	Last Three Binary Digits	What the TX Sees (in GHz)	Comments
0	=	0	000	= 0	Not valid
1	=	0	001	= 1	Depends on lower digits
2	=	0	010	= 2	Depends on lower digits
3	=	0	011	= 3	Not valid
4	=	0	100	= 4	Depends on lower digits
5	=	0	101	= 5	Depends on lower digits
6	=	0	110	= 6	Not valid
7	=	0	111	= 7	Not valid
8	=	1	000	= 0	Not valid
9	=	1	001	= 1	Depends on lower digits

By design, this means that GHz assignments outside of the expected digits will result in either no change to the transmitter, or a retune to the equivalent valid number.

For example, if 6200.5 MHz is dialed in, the unit will not retune itself since the frequency is out of all allowed bands. If 9200.5 MHz is dialed, it will be read as 1200.5 MHz, which is also out of band.

3 Mode

The mode switch allows the user to select the ARTM waveform type for transmission. The digits equate to the ARTM “Tier” number, as shown below:

- 0 = ARTM Tier 0, PCM/FM
- 1 = ARTM Tier I, SOQPSK-TG
- 2 = ARTM Tier II, ARTM (Multi-h) CPM
- 3 = Carrier



Figure 3: Front Close-up of Switch Box, Mode Digit Highlighted

As with the frequency implementation, the microprocessor parses only the two least significant digits of the mode. Again, this means that selections made outside of the expected 0, 1, 2, or 3 may reprogram the transmitter to a different mode depending on the mapping of the least significant digits.

For example, if “4” is chosen accidentally then the transmitter would switch to Tier 0, PCM/FM, because both 0 and 4 share the same two least significant digits in binary, 00.

4 Pinouts

The Switch Box has one external connector—a female MDM-9—shown in Figure 4 with pin locations labeled.



Figure 4: Female MDM-9 Connector

The pin assignments for the switch box MDM-9 connector are listed in Table 4.

Table 4: Switch Box Pinout

Pin	Function
1	Ground
2	I/O 1
3	SPI SCLCK
4	SPI MISO
5	Transmitter Replies to Switch Box
6	2.8 V+ Output
7	SPI MOSI
8	SPI CS
9	Switch Box Commands to Transmitter

5 Maintenance Instructions

The Quasonix Switch Box requires no regular maintenance, and there are no user-serviceable parts inside.

6 Product Warranty

The Quasonix Switch Box 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.

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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.