

Operation Manual
for
Transmitter Binary Protocol Tester
Version 1.028 04/02/2019
Supports Quasonix Binary Protocol Version 1.009

Quasonix, Inc.
6025 Schumacher Park Dr.
West Chester, OH 45069
02 February, 2021

*****Revision 1.0.4 *****

Specifications subject to change without notice.

All Quasonix transmitter products are under U.S. Department of Commerce jurisdiction categorized as EAR99; not covered by ITAR.

No part of the document may be circulated, quoted, or reproduced for distribution without prior written approval from Quasonix, Inc.

Copyright Quasonix, Inc., All Rights Reserved.

Table of Contents

1	Getting Started.....	1
1.1	Access the Binary Protocol Tester Software	1
1.2	Connect a Transmitter	1
1.3	Start the Binary Protocol Tester.....	1
1.3.1	BT Comm Port Setup	2
1.3.2	Quick Start Operation	3
2	Binary Protocol Tester Operation	6
2.1	Menu Bar	6
2.1.1	File Menu.....	6
2.1.2	View Menu.....	7
2.1.2.1	Terminal	7
2.1.3	Help Menu	8
2.1.3.1	About.....	8
2.1.3.2	Get Commands List	9
2.1.3.3	Set Commands List.....	9
2.1.3.4	Legacy Commands List	10
2.1.3.5	Color Legend.....	11
2.2	Transmitter Diagnostic Information.....	12
2.3	Comm Port Activity	14
2.3.1	BT Comm Port Setup	14
2.3.2	Message Displays	15
2.4	Tx Binary Protocol Interface	15
2.4.1	Single or Dual Transmitter Get and Set Commands.....	16
2.4.2	Additional Get and Set Commands	20
2.4.3	Legacy Commands	22
2.4.4	ASCII Passthrough.....	25
2.4.5	Save/Recall Setup.....	26

2.5	Regression Tests	26
2.5.1	Basic RT	27
2.5.2	Legacy RT	27
2.5.3	TX RT	27
2.5.4	DTX RT	27
3	Maintenance Instructions	28
4	Product Warranty	29
5	Technical Support	30
6	Appendix A – Troubleshooting	31
7	Appendix B – Acronym List	33

List of Figures

Figure 1: Quasonix Transmitter Binary Protocol Tester	1
Figure 2: BT Comm Port Setup, Rescan Ports Button	2
Figure 3: BT Comm Port Setup Window, Comm Port Drop Down Menu	2
Figure 4: BT Comm Port Setup Window, Connect Button	3
Figure 5: BT Comm Port Setup Window, Disconnect Button	3
Figure 6: Transmitter Binary Protocol Interface, Get BP Ver Command	3
Figure 7: Transmitter Diagnostic Info, BP Version and Log File Check Box	4
Figure 8: Transmitter Diagnostic Info, Get/Set Channel	4
Figure 9: GET BP Version and Channel, DTX Connected—DTX Checked, Legacy BP Only Unchecked ..	5
Figure 10: GET BP Version and Channel, Older BP Transmitter—Legacy BP Only Checked, DTX Unchecked	5
Figure 11: Quasonix Transmitter Binary Protocol Tester User Interface	6
Figure 12: Quasonix Transmitter Binary Protocol Tester User Interface, Menu Bar	6
Figure 13: File Menu	7
Figure 14: View Menu	7
Figure 15: Transmitter Terminal Window	8
Figure 16: Help Menu	8
Figure 17: About Window	9
Figure 18: Example Get Commands List	9

Figure 19: Example Set Commands List	10
Figure 20: Example Partial Legacy Commands List.....	11
Figure 21: Quasonix Transmitter Binary Protocol Tester User Interface, Color Legend	12
Figure 22: Transmitter Diagnostic Information Fields	12
Figure 23: Example Log and Regression Test Files Displayed in Windows Explorer	13
Figure 24: Windows ports found Message.....	14
Figure 25: BT Comm Port Setup.....	14
Figure 26: Transmitted and Received Binary Protocol Message Displays	15
Figure 27: Transmitter Binary Protocol Interface Selections	16
Figure 28: Transmitted and Received Message Status.....	16
Figure 29: Dual Transmitter Get and Set Commands	17
Figure 30: RF On GET/SETs and Additional Get Only Fields	20
Figure 31: Additional Get/Set Commands	20
Figure 32: Additional Get Commands.....	21
Figure 33: Legacy Power Readings	22
Figure 34: Get Legacy Binary Protocol Commands	22
Figure 35: Other Gets	24
Figure 36: ASCII Passthrough Entry Field and Display Window	26
Figure 37: Example ASCII Passthrough Send Fr Command, Display Frequency.....	26
Figure 38: Save/Recall Setup	26
Figure 39: Regression Test Buttons	27

List of Tables

Table 1: LDPC Codes	19
---------------------------	----

1 Getting Started

1.1 Access the Binary Protocol Tester Software

No installation is needed. Copy the **bintest.exe** file to a local PC, then execute the file. The PC must have at least one free serial port to connect to a Quasonix transmitter.

1.2 Connect a Transmitter

Physically connect the transmitter to a heat sink, power supply, and PC. Ensure the power supply meets the specifications for the connected transmitter. A weak power supply may result in resets, or other unpredictable behavior, when performing certain binary protocol tests.

Be sure to use a heat sink which is rated for the transmitter under test.

For standard transmitter questions, refer to the TIMTER™ Multi-mode Digital Telemetry Transmitter Installation and Operation Manual.

For dual transmitter questions, refer to the TIMTER™ Multi-mode Dual Telemetry Transmitter Installation and Operation Manual.

1.3 Start the Binary Protocol Tester

Locate **bintest.exe** on the local PC. Double click on it to execute the file. The Binary Protocol Tester user interface is shown in Figure 1.

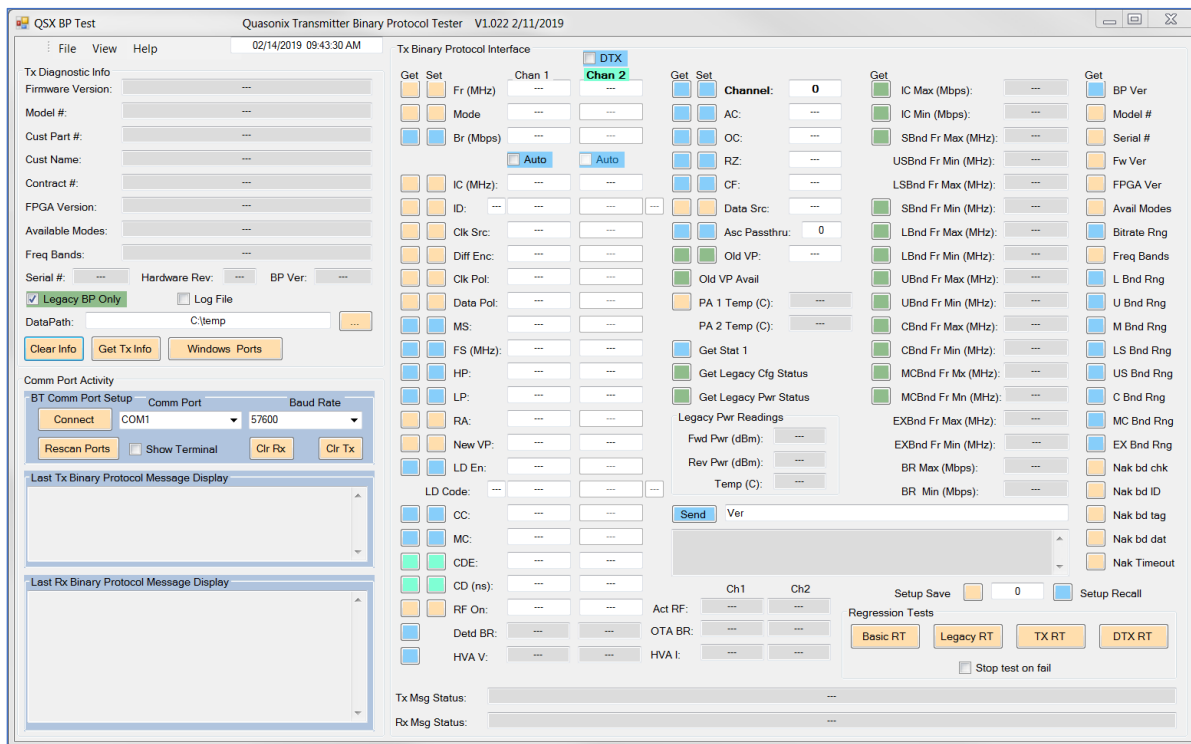


Figure 1: Quasonix Transmitter Binary Protocol Tester

1.3.1 BT Comm Port Setup

In the BT Comm Port Setup window (shown in Figure 2):

1. If ports have changed since Bintest was started, click on the Rescan Ports button to refresh the list.

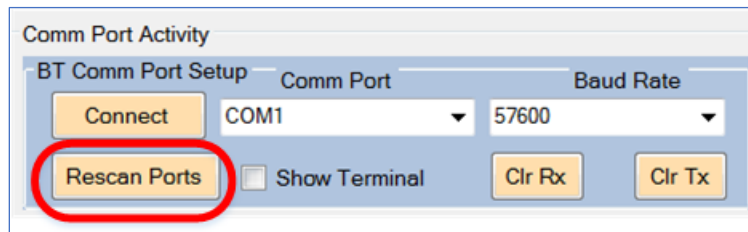


Figure 2: BT Comm Port Setup, Rescan Ports Button

2. Click on the arrow in the Comm Port field to display the drop down list.
3. Select the desired Comm Port from the list.
4. Click on the arrow in the Baud Rate field to set the baud rate to match the transmitter being connected.

To verify the transmitter baud rate, type TXBR in the Transmitter Terminal window.

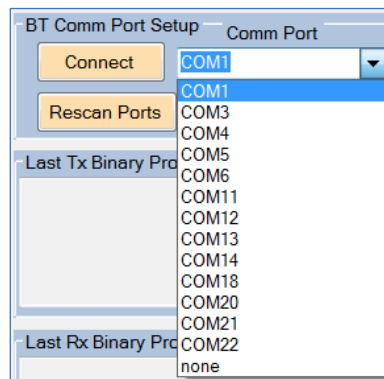


Figure 3: BT Comm Port Setup Window, Comm Port Drop Down Menu

5. Click on the Connect button (Figure 4). Upon connection, the Connect button changes to a Disconnect button (Figure 5).

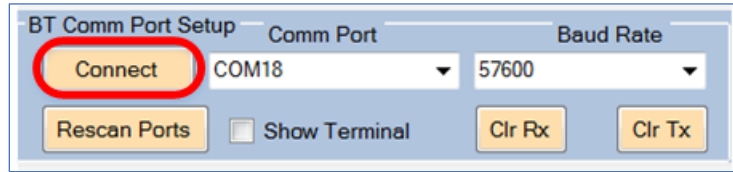


Figure 4: BT Comm Port Setup Window, Connect Button

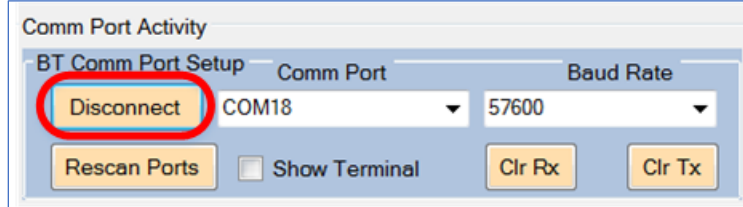


Figure 5: BT Comm Port Setup Window, Disconnect Button

1.3.2 Quick Start Operation

Click on the Log File check box, as shown in Figure 7, to keep a running log of the session. This is *optional*, but handy to have. You may open or close a log file at any time.

Click on (Get) BP Ver, as shown in Figure 6, to display the Binary Protocol version, shown in Figure 7. If the version is less than, or equal to, 1.005, then only Legacy Binary Protocol commands are valid. The Legacy BP Only check box (which defaults to checked) remains checked.

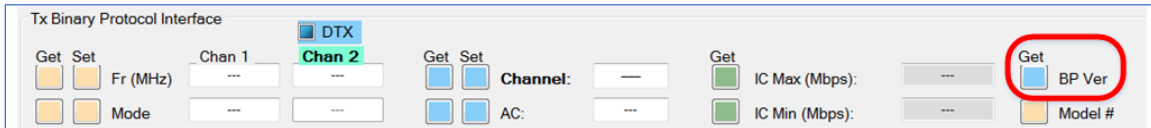


Figure 6: Transmitter Binary Protocol Interface, Get BP Ver Command

If the binary protocol version is 1.006 or greater, the Legacy BP Only check box is unchecked, and the binary protocol version displays in the BP Ver field.

Tx Diagnostic Info

Firmware Version: ---

Model #: ---

Cust Part #: ---

Cust Name: ---

Contract #: ---

FPGA Version: ---

Available Modes: ---

Freq Bands: ---

Serial #: --- Hardware Rev: --- BP Ver: 1.006

☐ Legacy BP Only ☒ Log File

Figure 7: Transmitter Diagnostic Info, BP Version and Log File Check Box

You may verify the Channel setting by clicking on Get (Channel), which sends a BP_DTX_GET_CHANNEL message. Channel 0 indicates a standard transmitter (single channel). If the connected unit is a Dual Transmitter, the DTX check box is checked, as shown in Figure 9.

To change the channel on a Dual Transmitter, type the desired channel (1, 2, or 3 for both) in the Channel field, then click on the Set button.

Get Set

Channel: 3

Figure 8: Transmitter Diagnostic Info, Get/Set Channel

Examples of the binary protocol version, channel, and check box settings after a GET BP VER and GET Channel are shown for a connected Dual Transmitter (Figure 9) and a connected single transmitter having an old binary protocol version (Figure 10).

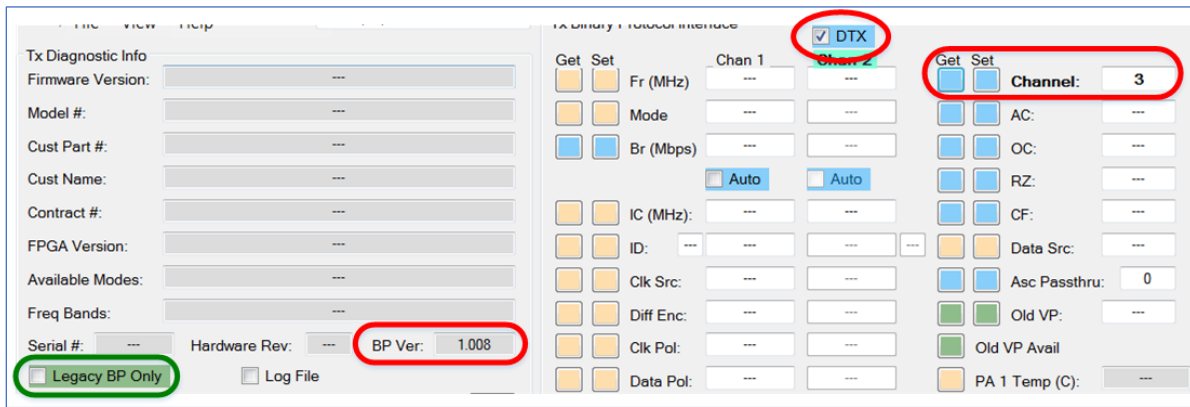


Figure 9: GET BP Version and Channel, DTX Connected—DTX Checked, Legacy BP Only Unchecked

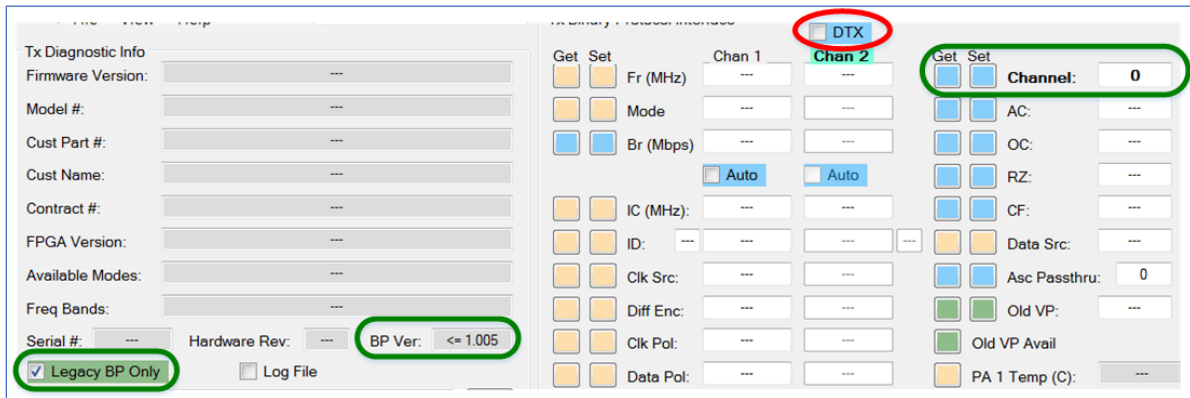


Figure 10: GET BP Version and Channel, Older BP Transmitter—Legacy BP Only Checked, DTX Unchecked

The default settings are:

- DTX = Unchecked
- Channel = 0
- Legacy BP Only = Checked

For specific questions about transmitter binary protocol tags, refer to the Quasonix Binary Protocol for Transmitters manual.

For further questions about the Binary Protocol Tester, contact Quasonix.

2 Binary Protocol Tester Operation

The Quasonix Transmitter Binary Protocol Tester user interface is a Windows-based graphical user interface that enables configuration of a Quasonix transmitter via a serial port connection. The Tester provides status information to the user. It also provides Sent and Received binary protocol message displays. This is particularly useful for users writing and testing their own binary protocol transmitter interface.

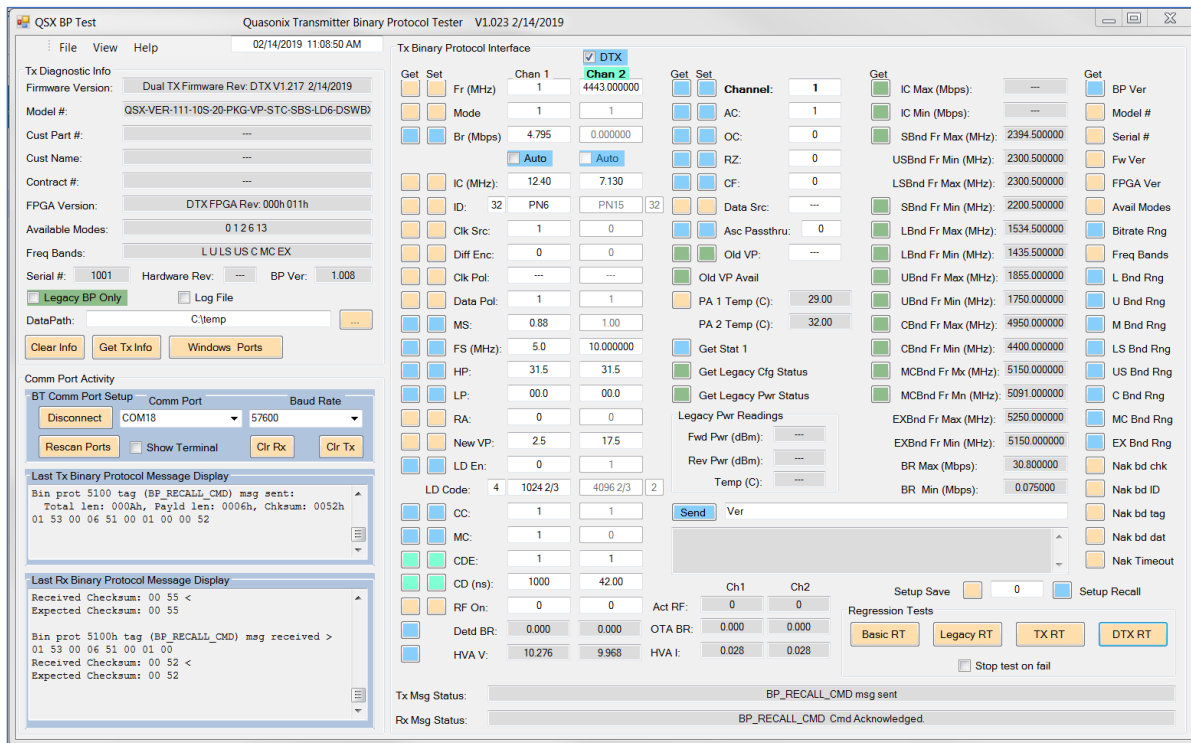


Figure 11: Quasonix Transmitter Binary Protocol Tester User Interface

2.1 Menu Bar

The Menu bar at the top of the interface provides three options: File, View, and Help, as shown in Figure 12.

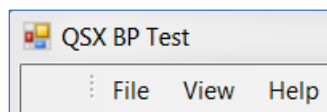


Figure 12: Quasonix Transmitter Binary Protocol Tester User Interface, Menu Bar

2.1.1 File Menu

Currently, the File menu contains only one option, Exit, as shown in Figure 13.

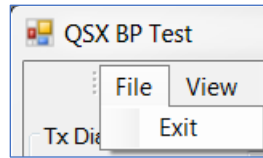


Figure 13: File Menu

2.1.2 View Menu

Currently, the View menu contains one option, Terminal, as shown in Figure 14.

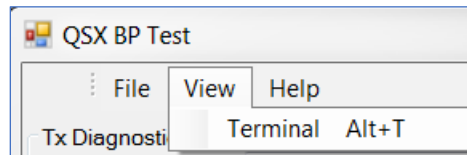


Figure 14: View Menu

2.1.2.1 Terminal

Checking the Show Terminal check box displays a Transmitter Terminal window, as shown in Figure 15. This window provides a direct interface to a connected Quasonix transmitter. Commands are sent to the transmitter by typing them into the Sent Data field. Responses from the transmitter display in the Received Raw Data Display window. For more information about user commands, refer to the appropriate Quasonix transmitter manual.

Rather than scroll through the whole data display, users may search for specific text by using the Search field. Click on the Match Case box to match search criteria by case. Use the Search button to initiate a search, and the Find Next button to locate the next instance of the search parameter(s).

In general, if changes are made via the Transmitter Terminal window, it is up to the user to issue the appropriate binary protocol GET commands to keep the data displays in the Binary Protocol Tester screen up to date. Changes made via the Terminal window are NOT automatically reflected in the Binary Protocol Tester screen.

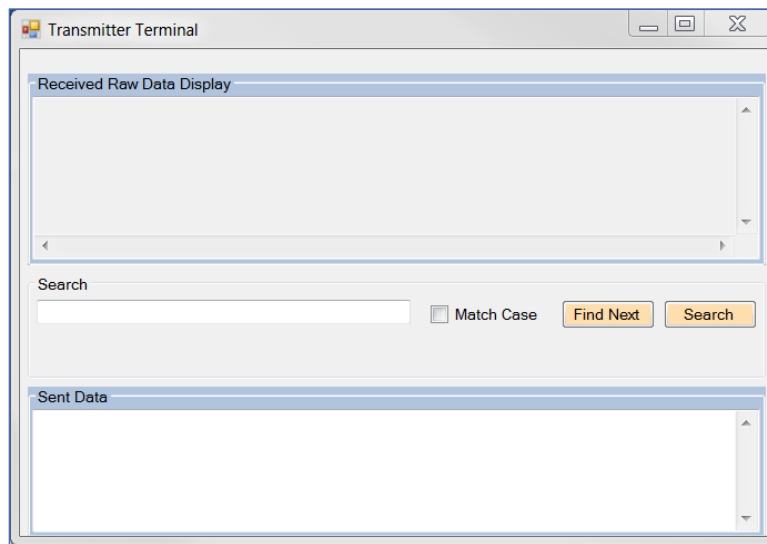


Figure 15: Transmitter Terminal Window

2.1.3 Help Menu

The Help menu contains five options: About, GetCmds List, SetCmds List, Legacy Cmds List, and Color Legend, as shown in Figure 16.

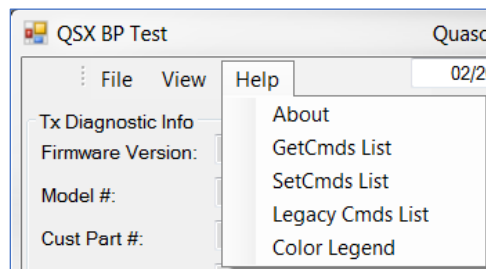


Figure 16: Help Menu

2.1.3.1 About

The About window displays the current version number and creation date of the Binary Protocol Tester, as shown in Figure 17.

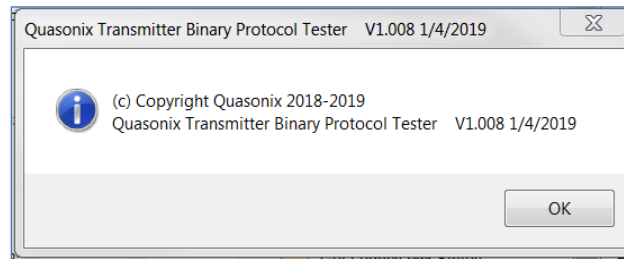


Figure 17: About Window

2.1.3.2 Get Commands List

The GetCmds List displays the current list of Get binary protocol commands, as shown in Figure 18.

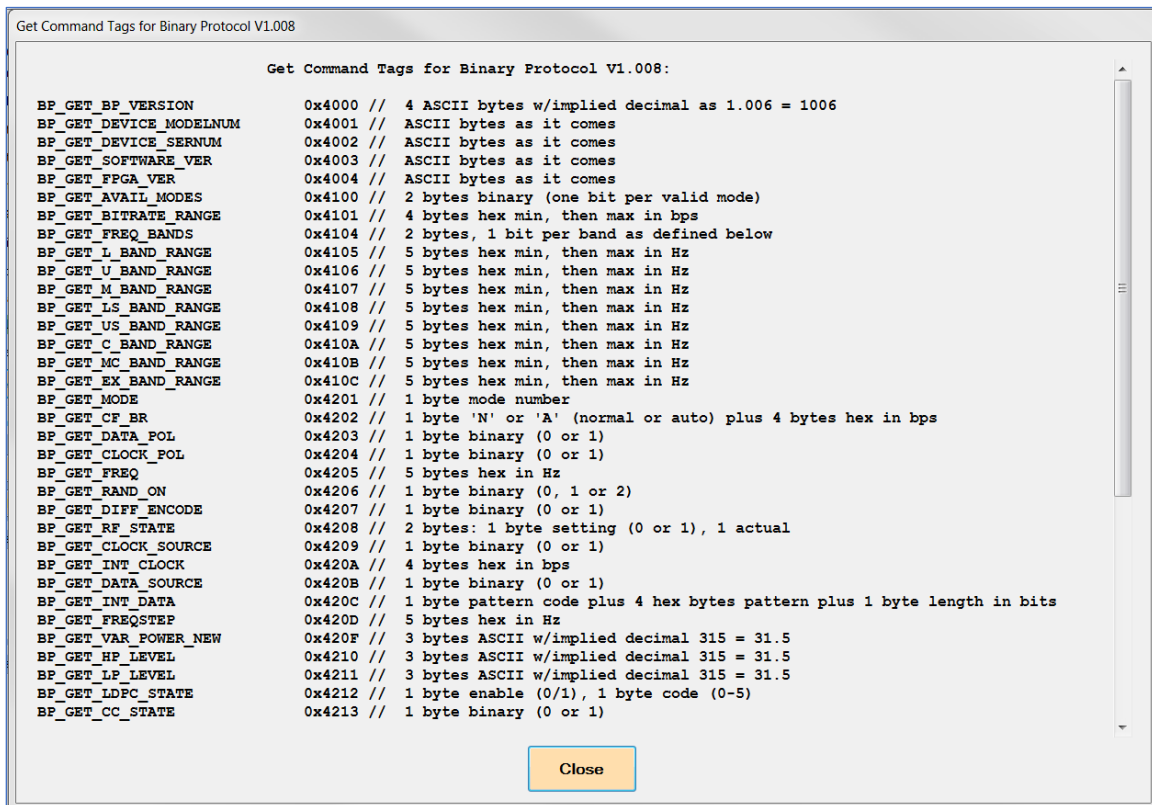


Figure 18: Example Get Commands List

2.1.3.3 Set Commands List

The SetCmds List displays the current list of Set binary protocol commands, as shown in Figure 19.

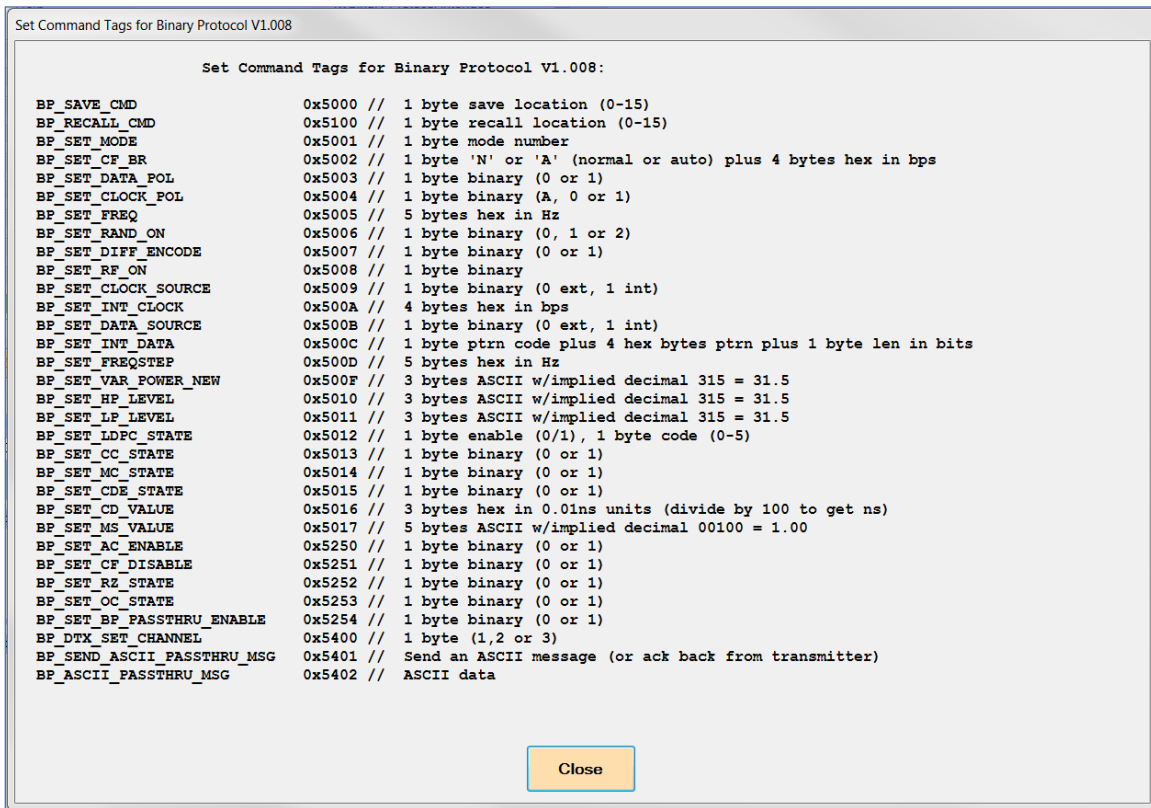


Figure 19: Example Set Commands List

2.1.3.4 Legacy Commands List

The Legacy Cmds List displays the current list of Legacy binary protocol commands, as shown in Figure 20.

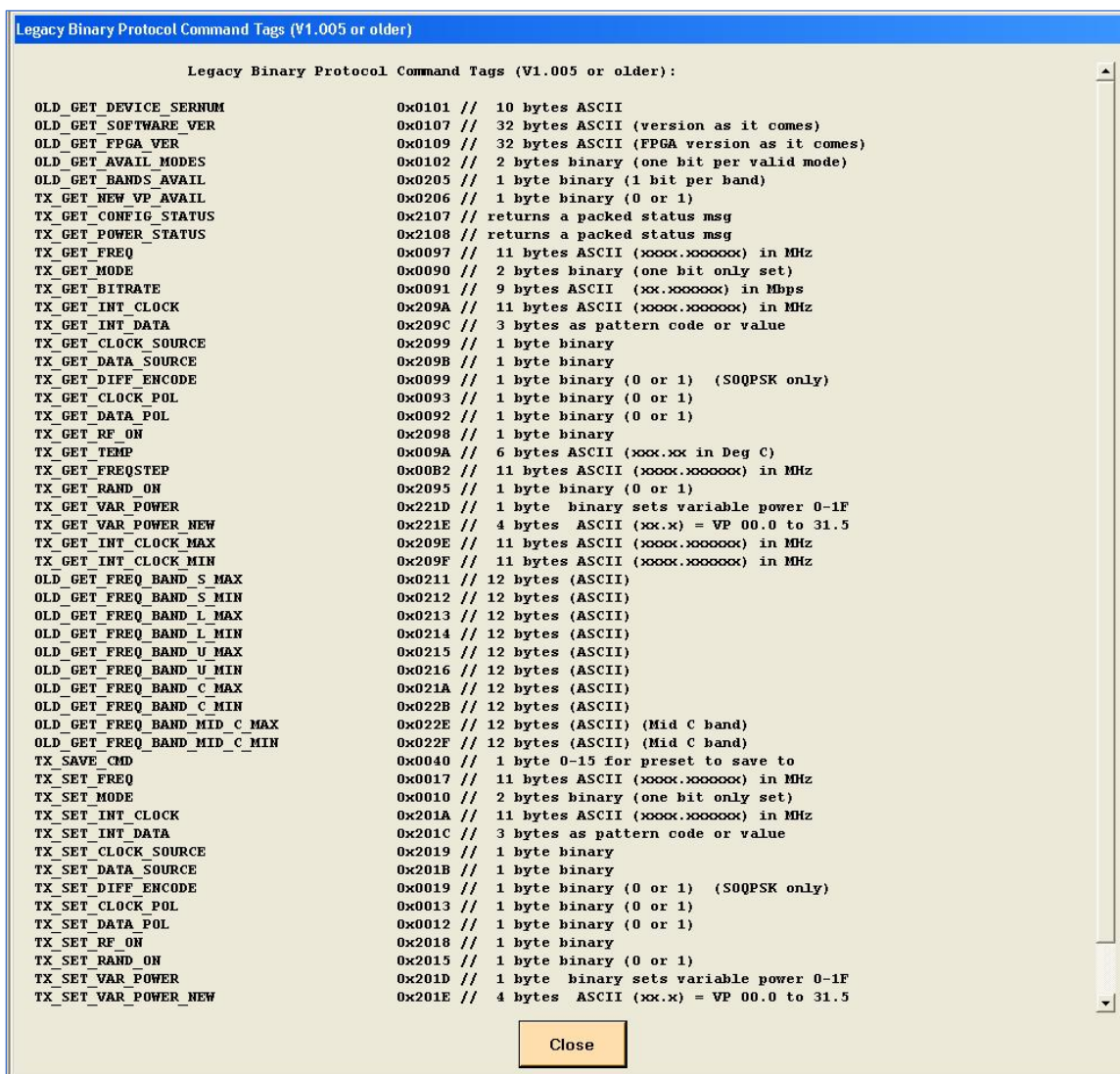


Figure 20: Example Partial Legacy Commands List

2.1.3.5 Color Legend

The Get/Set message buttons are color coded for easy identification. All standard binary protocol buttons are tan in color. The Color Legend option, provides a short description of each binary protocol specific color for easy referral, as shown in Figure 21.

- Dark Green – Legacy binary protocol commands only (before version V1.006)
- Light Blue – Current command protocol (V1.006 or newer) (for single or Dual Transmitters)
- Aquamarine – Defined in the new protocol but only apply to Dual Transmitters (V1.006 or newer)

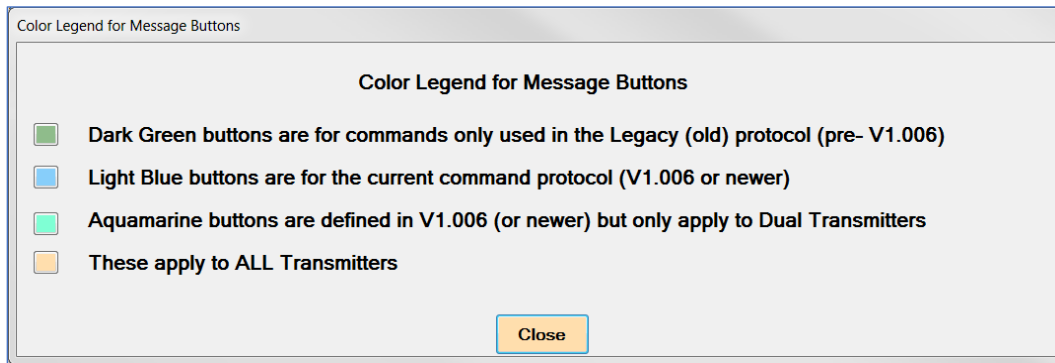


Figure 21: Quasonix Transmitter Binary Protocol Tester User Interface, Color Legend

2.2 Transmitter Diagnostic Information

The transmitter data in this section is filled in by receipt of normal string data, such as from the VE command, or by executing the appropriate binary protocol requests using the GET/SET buttons, such as BP_GET_Firmware_Version. The interface defaults to Legacy BP Only checked upon open.

Tx Diagnostic Info

Firmware Version: ---

Model #: ---

Cust Part #: ---

Cust Name: ---

Contract #: ---

FPGA Version: ---

Available Modes: ---

Freq Bands: ---

Serial #: --- Hardware Rev: --- BP Ver: ---

☒ Legacy BP Only ☐ Log File

DataPath: C:\temp ...

Clear Info Get Tx Info Windows Ports

Figure 22: Transmitter Diagnostic Information Fields

Tx Diagnostic Info

These fields display stored data retrieved from a connected transmitter.

- Firmware Version – Describes the hardware type and the firmware revision with date/time stamp
- Model # - Quasonix internal product model number
- Cust Part # - Customer part number

- Cust Name – Customer name
- Contract # - Contract number
- FPGA Version – FPGA version installed in the transmitter
- Available Modes – Modes enabled in this transmitter
- Freq Bands – Frequency bands enabled in this transmitter
- Serial # - Quasonix product serial number for the transmitter
- Hardware Rev – Hardware revision
- BP Ver – Binary Protocol Version

Check Boxes:

- Legacy BP Only – This forces use of the Legacy Binary Protocol. All of these are color coded in green for easy identification. The default value for this field is checked. This box is set whenever a GET BP Ver message is sent, but may be manually overridden.
- Log File – When checked, continuously logs transmitter activity; Two files are generated when the Log File check box is unchecked:

Tx_BP_log_year_mo_da_hr_mn_ss.txt – All binary protocol commands and responses from the log session

Tx_log_year_mo_da_hr_mn_ss.txt – All terminal commands and responses (as viewed in the Terminal window) from the log session

Buttons:

- DataPath with Browse – Location used to store session log files and regression test files; this location may be typed into the field or searched/selected using the Browse (...) button at the end of the field









 Tx_BP_log_2019_01_08_12_32_31.txt	1/8/2019 4:17 PM	Text Document	69 KB
 Tx_log_2019_01_08_12_32_31.txt	1/8/2019 4:17 PM	Text Document	32 KB
 BP_TX_RT_Reg_Test_2019_01_08_16_04_47.log	1/8/2019 4:04 PM	LOG File	1 KB
 BP_Basic_Reg_Test_2019_01_08_15_50_43.log	1/8/2019 3:50 PM	LOG File	1 KB
 BP_Basic_Reg_Test_2019_01_08_15_49_44.log	1/8/2019 3:49 PM	LOG File	1 KB
 BP_TX_RT_Reg_Test_2019_01_08_15_47_23.log	1/8/2019 3:47 PM	LOG File	1 KB
 BP_TX_RT_Reg_Test_2019_01_08_15_47_14.log	1/8/2019 3:47 PM	LOG File	1 KB
 BP_Legacy_Reg_Test_2019_01_08_14_59_12.log	1/8/2019 2:59 PM	LOG File	5 KB

Figure 23: Example Log and Regression Test Files Displayed in Windows Explorer

- Clear Info – Deletes information currently displayed in all of the diagnostic fields
- Get Tx Info – Displays current version and revision information for the transmitter (Binary Protocol version, Channel, BP Tester version, FPGA version, Customer Part Number, Serial number, available modes, available bands)
- Windows Ports – Displays a message containing a list of all available Windows ports, whether they are in use or not, as shown in Figure 24

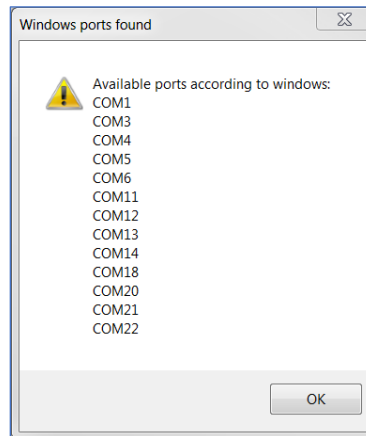


Figure 24: Windows ports found Message

2.3 Comm Port Activity

2.3.1 BT Comm Port Setup

Selections in the BT Comm Port Setup window enable changes to the transmitter communication port settings and connection to a transmitter.

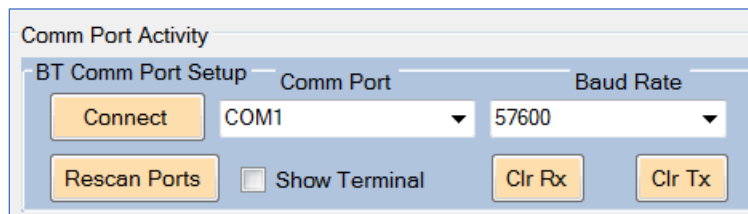


Figure 25: BT Comm Port Setup

Buttons

- Connect/Disconnect – Connects or disconnects comm port
- Rescan Ports – Detects available comm ports that are not in use and updates the list in the Comm Port field
- Clr Rx – Clears the received message display of the Transmitter Terminal window, the Last Tx Binary Protocol Message Display, and Last Rx Binary Protocol Message Display
- Clr Tx – Clears the transmit message display

Drop Down Menus

- Comm Port – Use the drop down menu to select a new communications port
- Baud Rate – Use the drop down menu to select the baud rate; the Quasonix transmitter default is 57600, for most transmitters

If a baud rate change is desired, change and verify the baud rate on the transmitter, then click on the Disconnect button on the Binary Protocol Tester. Change the baud rate using the drop down menu, then reconnect to the transmitter.

Check Box

- Show Terminal – Displays a Transmitter Terminal window; refer to section 2.1.2.1

2.3.2 Message Displays

- Last Tx Binary Protocol Message Display – Shows transmitted binary protocol command message data
- Last Rx Binary Protocol Message Display – Shows received binary protocol command message data

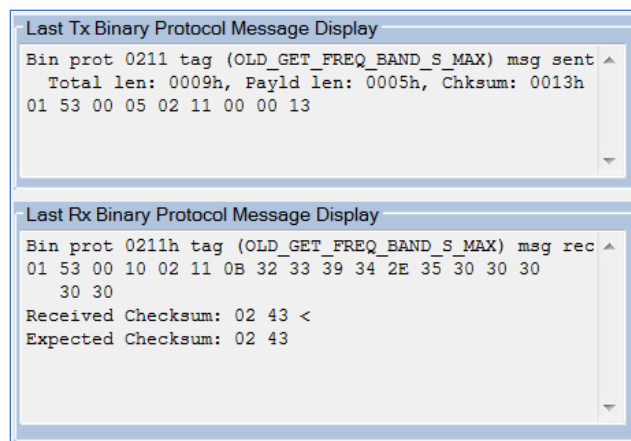


Figure 26: Transmitted and Received Binary Protocol Message Displays

2.4 Tx Binary Protocol Interface

The Tx Binary Protocol Interface section contains buttons and parameter fields to enable transmitter set up using the binary protocol. The DTX check box indicates whether a Dual Transmitter is connected. DTX is set by a response to a GET Channel command, but may be manually overridden for test purposes.

The Channel field values are:

- Channel = 0 for single output (or non-Dual) Transmitters
- Channel = 1 for Dual Transmitter Channel 1
- Channel = 2 for Dual Transmitter Channel 2
- Channel = 3 for Dual Transmitter Channel 1 and Channel 2

Binary protocol commands do not explicitly recognize specific channels. Only the Get/Set Channel command does. SET commands use the data from the Channel 1 field, but the GET command on a Dual Transmitter, populates both channel fields correctly. The channel command is not continuously read back from the transmitter. If the transmitter was saved on a different channel, or someone made a change using Terminal, the Channel shown on the Binary Protocol Tester may not match the connected transmitter. Use the GET command in the Binary Protocol Tester to get and display the current transmitter channel.

The Tx Binary Protocol Interface part of the Tester is shown in Figure 27.

The screenshot displays the 'Tx Binary Protocol Interface' window. It features two main columns for 'Chan 1' and 'Chan 2' (highlighted in green). Each column has 'Get' and 'Set' buttons for various parameters like Frequency (Fr), Mode, Bandwidth (Br), IC, ID, Clock Source (Clk Src), Diff. Enc., Clk Pol., Data Pol., MS, FS, HP, LP, RA, New VP, LD En, LD Code, CC, MC, CDE, CD, RF On, Detd BR, and HVA V. A central section contains 'Channel' (set to 0), 'AC', 'OC', 'RZ', 'CF', 'Data Src', 'Asc Passthru' (set to 0), 'Old VP Avail', 'PA 1 Temp', 'PA 2 Temp', 'Get Stat 1', 'Get Legacy Cfg Status', and 'Get Legacy Pwr Status'. Below this is a 'Legacy Pwr Readings' box with 'Fwd Pwr', 'Rev Pwr', and 'Temp' fields. To the right, there are 'Get' buttons for various frequency and power limits (e.g., IC Max, IC Min, SBnd Fr Max, USBnd Fr Min, LSBnd Fr Max, SBnd Fr Min, LBnd Fr Max, LBnd Fr Min, UBnd Fr Max, UBnd Fr Min, CBnd Fr Max, CBnd Fr Min, MCBnd Fr Mx, MCBnd Fr Mn, EXBnd Fr Max, EXBnd Fr Min, BR Max, BR Min). Further right are 'Get' buttons for device information (BP Ver, Model #, Serial #, Fw Ver, FPGA Ver, Avail Modes, Bitrate Rng, Freq Bands, L Bnd Rng, U Bnd Rng, M Bnd Rng, LS Bnd Rng, US Bnd Rng, C Bnd Rng, MC Bnd Rng, EX Bnd Rng, Nak bd chk, Nak bd ID, Nak bd tag, Nak bd dat, Nak Timeout). At the bottom, there are 'Tx Msg Status' and 'Rx Msg Status' fields, a 'Send' button, a 'Ver' field, and a 'Regression Tests' section with buttons for 'Basic RT', 'Legacy RT', 'TX RT', and 'DTX RT', along with a 'Stop test on fail' checkbox.

Figure 27: Transmitter Binary Protocol Interface Selections

- Tx Msg Status – Shows the status of the last sent command attempt
- Rx Msg Status – Shows the status of the last receive attempt (timeout counts)

The screenshot shows the 'Tx Msg Status' field containing the text 'OLD_GET_FREQ_BAND_S_MAX msg sent' and the 'Rx Msg Status' field containing the text 'OLD_GET_FREQ_BAND_S_MAX = 2394.500000'.

Figure 28: Transmitted and Received Message Status

2.4.1 Single or Dual Transmitter Get and Set Commands

These commands may apply to single or Dual Transmitters.

Dual Transmitter Get and Set Commands are on the left side of the Tx Binary Protocol Interface section, as shown in Figure 29. When a single channel transmitter is in use, only Channel 1 applies. Some commands are only valid for dual transmitters, as indicated by the color-coded buttons.

SET values always use Channel 1 data.

The screenshot displays the 'Tx Binary Protocol Interface' window. At the top right, there is a checked checkbox for 'DTX' and a dropdown menu currently set to 'Chan 2'. Below this, the interface is organized into two columns for 'Chan 1' and 'Chan 2'. Each parameter has a 'Get' button (orange) and a 'Set' button (blue). Parameters include: Fr (MHz), Mode, Br (Mbps) with 'Auto' buttons, IC (MHz), ID, Clk Src, Diff Enc, Clk Pol, Data Pol, MS, FS (MHz), HP, LP, RA, New VP, LD En, LD Code, CC, MC, CDE, CD (ns), RF On, Detd BR, and HVA V. The 'Set' buttons for MS, CDE, and CD (ns) are highlighted in green, indicating they are valid for the selected 'Chan 2'.

Figure 29: Dual Transmitter Get and Set Commands

Some commands require a specific option. If the option is not enabled on the transmitter (check the Model number), an attempt to set a value results in a Missing Option message being returned by the transmitter. A subsequent GET command displays the last valid Set value for the field or a missing option message.

For example, if the current value in the MS (Modulation Scaling) field is 1.00, and the user attempts to set MS to 2.50 without the MS option enabled on the transmitter, a BP_MISSING_OPTION message is received. A GET results in 1.00.

- Fr (MHz) – Current transmitter frequency setting in MHz
- Mode – Current transmitter mode (waveform)

- BR – Clock Free Bit Rate; in Mbps; valid range is 0.1-35 Mbps for all waveform modes (limited by bit rate achievable for the current mode); Requires CF option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message

Auto check boxes for Channel 1 and Channel 2 – When set to automatic, tracks the bit sync rate (exact, if locked) rather than the clock free estimated rate; Channel 2 defaults to zero (0) until Dual Transmitter independent mode becomes available

- IC (MHz) – Internal Clock rate
- ID – Internal Data pattern; This is a fixed pattern or a pseudorandom pattern that repeats based on the chosen pattern/sequence

Type a fixed pattern or a user pattern, if applicable to the transmitter, in the second (larger) field. The byte field (smaller field) requires an integer between 0 and 255. When a fixed pattern (such as PN11) is entered, the byte is not used by the transmitter, but the Tester may require a value in the field, depending on the transmitter. For PNs, the byte field is typically 32. When a user pattern is entered (not a PN pattern), the byte field does require an entry, so the software knows how to parse the bits.

Patterns available in all transmitters:

- PN6 - Pseudorandom pattern 2^6-1 bits in length
- PN11 - Pseudorandom pattern $2^{11}-1$ bits in length
- PN15 - Pseudorandom pattern $2^{15}-1$ bits in length
- PN23 - Pseudorandom pattern $2^{23}-1$ bits in length
- User Pattern (binary or hex) – A unique pattern specified by the person running the test; Type the numbers directly into the field; Dual Transmitters use a 32-bit pattern, non-dual transmitters use 16-bit patterns

Patterns only available in Dual Transmitters:

- Mark (all 1s) - A pattern of all ones (1111)
- Space (all 0s) - A pattern of all zeroes (0000)
- Alt01 - A pattern alternating zeroes and ones (0101)
- PN9 - Pseudorandom pattern 2^9-1 bits in length
- PN17 - Pseudorandom pattern $2^{17}-1$ bits in length
- PN20 - Pseudorandom pattern $2^{20}-1$ bits in length
- PN31 - Pseudorandom pattern $2^{31}-1$ bits in length

- Clk Src – Clock Source; 0 = clock source external; 1 = clock source internal
- Diff Enc – Differential Encoding for *PSK modes; 0 = Off, 1 = On
- Clk Pol – Clock Polarity, 0 = not inverted, 1 = inverted; A = Auto which automatically selects the most reliable clock edge; Dual Transmitter operation only supports Auto
- Data Pol – Data Polarity, 0 = not inverted, 1 = inverted
- MS – Modulation Scaling; Valid range is 0.09 to 128.01; Default value is 1.0; Requires MS option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message

- FS (MHz) – Frequency Step in MHz; 0.5 MHz is smallest available step
- HP – High Power level; valid range is 0 to 31, or 31.5, depending on the transmitter
- LP – Low Power level; valid range is 0 to 31, or 31.5, depending on the transmitter
- RA – Randomizer; 0 = Off, 1 = IRIG-106 randomizer On, 2 = CCSDS randomizer On (2 requires LD6 option and LDPC enabled--not available on some transmitters)
- New VP – Variable power; Requires VP option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message
- LD En – Low Density Parity Check (LDPC) Encoding Enable; 0 = disable LDPC encoder, 1 = enable the LDPC encoder; If the LD6 option is not included on the transmitter, the block size and coding rate are always 4096 2/3. Requires LD or LD6 option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message; also requires a *PSK mode
- LD Code – With the LD6 option on the transmitter, use 0-5 to indicate the LDPC code, as shown in Table 1. The block size and code rate display in the adjacent field. Use the Set LD En button to send the code. A code value of 2 is valid with the LD option.

Table 1: LDPC Codes

LD6 Code	Block Size and Code Rate
0	k=4096, r=1/2
1	k=1024, r=1/2
2	k=4096, r=2/3
3	k=1024, r=2/3
4	k=4096, r=4/5
5	k=1024, r=4/5

- CC – Convolutional Encoding; Requires CE option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION received” message
- MC – NRZ-M Encoding; Requires CE option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION received” message
- CDE – Channel Delay Enable – Only valid on a Dual Transmitter
- CD (ns) – Channel Delay in nanoseconds; Valid range is 0-5000 ns – Only valid on a Dual Transmitter
- RF On – Sets RF to 0 = Off, or 1 = On

Actual RF State (shown on the same line as RF On in Figure 30) – Shows RF status (0 for disabled, 1 for enabled) for Channel 1 and Channel 2; The actual RF state may or may not be the same as the RF On setting. For example, RF On may be set to 1 (enabled) but if there is no clock, clock out of range, or an RF On/Off pin in the wrong state, the actual RF state may be Off (0).

<input type="checkbox"/>	<input type="checkbox"/>	CD (ns):	---	---		Ch1	Ch2
<input type="checkbox"/>	<input type="checkbox"/>	RF On:	---	---	Act RF:	---	---
<input type="checkbox"/>		Detd BR:	---	---	OTA BR:	---	---
<input type="checkbox"/>		HVA V:	---	---	HVA I:	---	---

Figure 30: RF On GET/SETs and Additional Get Only Fields

- Detd BR – Get Detected Baseband Bit Rate for Channel 1 and Channel 2; reflects the actual clock source whether internal, external, or clock free; Channel 2 will always be zero until independent mode is implemented on the Dual Transmitter
- OTA BR – Displays Over the Air Bit Rate for Channel 1 and Channel 2; Channel 2 will always be zero until independent mode is implemented on the Dual Transmitter
- HVA V – PA Voltage; Displays PA drain voltage in volts
- HVA I – PA Voltage Current; Displays PA current in amps

2.4.2 Additional Get and Set Commands

The second grouping of Get and Set Commands are not specific to any channel.

Get	Set		
<input type="checkbox"/>	<input type="checkbox"/>	Channel:	0
<input type="checkbox"/>	<input type="checkbox"/>	AC:	---
<input type="checkbox"/>	<input type="checkbox"/>	OC:	---
<input type="checkbox"/>	<input type="checkbox"/>	RZ:	---
<input type="checkbox"/>	<input type="checkbox"/>	CF:	---
<input type="checkbox"/>	<input type="checkbox"/>	Data Src:	---
<input type="checkbox"/>	<input type="checkbox"/>	Asc Passthru:	0
<input type="checkbox"/>	<input type="checkbox"/>	Old VP:	---

Figure 31: Additional Get/Set Commands

- **Channel** – Indicates the current channel:
 0 = not a dual transmitter
 1 = channel 1
 2 = channel 2
 3 = channel 1 AND channel 2
 Get Channel causes the DTX check box to be set based on whether or not a Dual Transmitter is connected
- AC – Automatic Carrier Output; 0 = Off, 1 = On; Requires AC option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION received” message
- OC – Overtemperature Control; 0 = disable, 1 = enable
- RZ – RF On/Off Pin Polarity; 0 = On when pin is low, 1 = On when pin is high

- CF – Clock Free; 0 = Enable clock free operation, 1 = Enable normal operation with an external clock; Requires CF option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message
- Data Src – Data Source; 0 = external data source, 1 = internal data source; transmitter always reverts to 0 (external) at power-up; Not valid on a Dual Transmitter
- ASC Passthru – ASCII Passthrough Enable; 0 = disable, 1 = enable; This option is disabled by the software before running regression tests. Use GET Asc Passthru to verify the current state.
- Old VP – Legacy Variable Power; Legacy binary protocol only; Requires VP option—attempting to use a Set command without the option present on the transmitter results in a “BP_MISSING_OPTION” received message

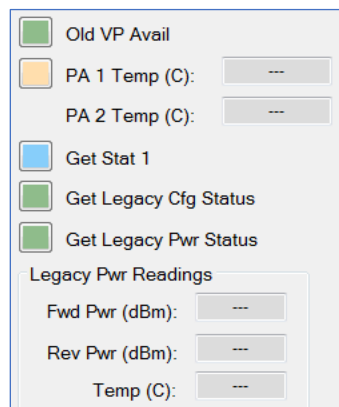


Figure 32: Additional Get Commands

- Old VP Avail – Checks a legacy transmitter and determines whether or not the VP option is available
- PA 1 Temp (°C) - Reads the latest digital board temperature for PA 1 and displays it in degrees Centigrade
- PA 2 Temp (°C) - Reads the latest digital board temperature for PA 2 and displays it in degrees Centigrade
- Get Stat 1 – Displays the status of the following parameters, if they are set:

Mode, Clock Source, Data Source, Data Polarity, Differential Encoding, Randomizer, Convolutional Encoding, NRZ Encoding, RF, Actual RF State, Clock Free, Automatic Carrier Output, Low Density Parity Check, Detected Baseband Bit Rate, and Over the Air Bit Rate

If a Dual Transmitter is connected, Channel 1 and Channel 2 values are displayed where appropriate.

- Get Legacy Cfg Status – Displays the status of the following parameters:
Mode, Clock Source, Data Source, Data Polarity, Differential Encoding, Randomizer, Convolutional Encoding, NRZ Encoding, RF, Variable Power, and Frequency
- Get Legacy Pwr Status – Reads the forward power, reverse power, and temperature in degrees C; Power readings are only valid on certain older transmitters

Legacy Pwr Readings

Fwd Pwr (dBm):

Rev Pwr (dBm):

Temp (C):

Figure 33: Legacy Power Readings

- Fwd Pwr (dBm) – Forward power—current power into the load (antenna plus cable)
- Rev Pwr (dBm) – Reverse power—reflected power due to impedance mismatch between the RF output and the antenna plus cable, or load termination; when matched, there is no reflected power
- Temp (C) – (integer temperature—rounded, in degrees Centigrade)

2.4.3 Legacy Commands

This section provides legacy Get commands. These are only valid when the Legacy BP Only box (in the Tx Diagnostic Info section) is checked.

However, the Get Range commands in the last column use these fields to display bit rate and frequency range values.

Get

☒ IC Max (Mbps):

☒ IC Min (Mbps):

☒ SBnd Fr Max (MHz):

USBnd Fr Min (MHz):

LSBnd Fr Max (MHz):

☒ SBnd Fr Min (MHz):

☒ LBnd Fr Max (MHz):

☒ LBnd Fr Min (MHz):

☒ UBnd Fr Max (MHz):

☒ UBnd Fr Min (MHz):

☒ CBnd Fr Max (MHz):

☒ CBnd Fr Min (MHz):

☒ MCBnd Fr Mx (MHz):

☒ MCBnd Fr Mn (MHz):

EXBnd Fr Max (MHz):

EXBnd Fr Min (MHz):

BR Max (Mbps):

BR Min (Mbps):

Figure 34: Get Legacy Binary Protocol Commands

- IC Max (Mbps) – Maximum internal clock rate in Mbps

- IC Min (Mbps) – Minimum internal clock rate in Mbps
- SBnd Fr Max (MHz) – Maximum S band frequency in MHz
- USBnd Fr Min (MHz) – Minimum upper S band frequency in MHz
- LSBnd Fr Max (MHz) – Maximum lower S band frequency in MHz
- SBnd Fr Min (MHz) – Minimum S band frequency in MHz
- LBnd Fr Max (MHz) – Maximum L band frequency in MHz
- LBnd Fr Min (MHz) – Minimum L band frequency in MHz
- UBnd Fr Max (MHz) – Maximum upper L band frequency in MHz
- UBnd Fr Min (MHz) – Minimum upper L band frequency in MHz
- CBnd Fr Max (MHz) – Maximum C band frequency in MHz
- CBnd Fr Min (MHz) – Minimum C band frequency in MHz
- MCBnd Fr Max (MHz) – Maximum Mid-C band frequency in MHz
- MCBnd Fr Min (MHz) – Minimum Mid-C band frequency in MHz
- EXBnd Fr Max (MHz) – Maximum extended C (Euro-C) band frequency in MHz
- EXBnd Fr Min (MHz) – Minimum extended C (Euro-C) band frequency in MHz
- BR Max (Mbps) – Maximum transmitter bit rate setting in Mbps
- BR Min (Mbps) – Minimum transmitter bit rate setting in Mbps

The Get selections in the last column return standard values for each command issued. They include basic transmitter information, band frequency ranges, and NAK test messages.

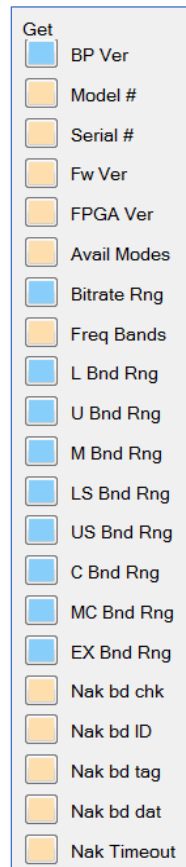


Figure 35: Other Gets

- BP Ver – Binary Protocol version
- Model # - Quasonix model number
- Serial # - Quasonix serial number for the transmitter
- Fw Ver - The firmware revision with date/time stamp
- FPGA Ver - FPGA version installed in the transmitter
- Avail Modes – Waveform modes installed on the transmitter; Mode 6, Carrier only, is present on every transmitter; Possible Modes (depending on modes ordered):
 - 0 - PCM/FM
 - 1 - SOQPSK-TG
 - 2 - MULTI-h CPM
 - 3 - BPSK
 - 4 - QPSK
 - 5 - AQPSK
 - 6 - Carrier only, no modulation
 - 7 - OQPSK

- 8 - UQPSK
- 9 - AUQPSK
- 10 - STDN
- 11 - SQPN
- 12 - Analog_FM
- 13 - STC, Space Time Coding (Dual Transmitter only)
- 14 - DPM

- Bitrate Rng – Displays the minimum and maximum bit rate in Mbps
- Freq Bands – Available frequency bands on the transmitter
- L Bnd Rng – Displays the L band maximum and minimum frequencies in the LBnd Fr Max (MHz) and LBnd Fr Min (MHz) fields
- U Bnd Rng - Displays the U band (upper L) maximum and minimum frequencies in the UBnd Fr Max (MHz) and UBnd Fr Min (MHz) fields
- M Bnd Rng – MA band range 2025.000 MHz – 2110.000 MHz
- LS Bnd Rng - Displays the lower S band maximum and minimum frequencies in the LSBnd Fr Max (MHz) and SBnd Fr Min (MHz) fields
- US Bnd Rng - Displays the upper S band maximum and minimum frequencies in the SBnd Fr Max (MHz) and UBnd Fr Min (MHz) fields
- C Bnd Rng - Displays the C band maximum and minimum frequencies in the CBnd Fr Max (MHz) and CBnd Fr Min (MHz) fields
- MC Bnd Rng - Displays the mid-C band maximum and minimum frequencies in the MBnd Fr Max (MHz) and MBnd Fr Min (MHz) fields
- EX Bnd Rng - Displays the Extended (or Euro mid-C) band maximum and minimum frequencies in the EXBnd Fr Max (MHz) and EXBnd Fr Min (MHz) fields
- Nak bd chk – Sends a message intended to cause a NAK bad checksum
- Nak bd ID – Sends a message intended to cause a NAK bad ID
- Nak bd tag – Sends a message intended to cause a NAK bad tag
- Nak bd dat – Sends a message intended to cause a NAK bad tag data
- Nak Timeout – Sends a message intended to cause a NAK timeout

2.4.4 ASCII Passthrough

When BP_SET_BP_PASSTHRU_ENABLE is set to 1, transmitter terminal commands may be typed into this field (Figure 36). Click on the Send button (not the Enter key) to send the command encapsulated as a binary protocol message. All terminal responses display in the window below. Commands must be sent one at a time. Use the up/down arrows in the display window to scroll through the commands and responses.

Note: When ASCII Passthrough is enabled, the Transmitter Terminal window Received Raw Data Display (displayed by checking the Show Terminal box in the BT Comm Port Setup window) won't show anything, since all output is encapsulated as binary protocol messages and sent that way. **All binary protocol responses display in the read only ASCII passthrough window.**

There are two ways to disable binary passthrough mode: Press the Esc key on the PC keyboard *while the cursor is in the Transmitter Terminal send window*, or SET the Asc Passthru parameter to 0 to disable the command.

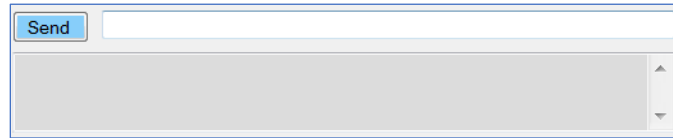


Figure 36: ASCII Passthrough Entry Field and Display Window

An example of ASCII passthrough is shown in Figure 37. The FR command was typed in the parameter field. After clicking on the Send button, the current frequency displayed in the response window. This window works just like the Transmitter Terminal window, except for the limitation of one command per send. Responses only display in the passthrough window. For example, the Fr command displays the frequency in the passthrough window, not in the GET/SET Fr (MHz) field.

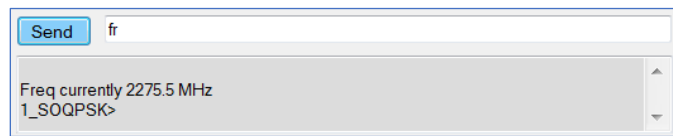


Figure 37: Example ASCII Passthrough Send Fr Command, Display Frequency

2.4.5 Save/Recall Setup

These buttons enable transmitter configuration saves and loads.

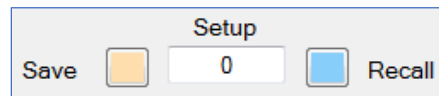


Figure 38: Save/Recall Setup

- Save Setup - Saves the current transmitter configuration to a user-selected preset number, from 0 to 15 where 0 is the power-on default
- Recall Setup - Load a saved configuration into the active configuration if the configuration number entered is valid; If the selected configuration has no valid data, the transmitter is initialized with the default data and saved.

2.5 Regression Tests

The Binary Protocol Tester provides the ability to run four pre-programmed regression tests: Basic binary protocol test, Legacy regression test, a regression test specific to single channel transmitters with binary protocol 1.006 or newer, and a Dual Transmitter regression test. These tests are mainly used by Quasonix to test specific functionality in a transmitter. They do not include all possible binary protocol commands.

Note: ASCII Passthrough is disabled by the software before running regression tests.

- Stop test on fail check box – When checked, a running regression test will stop if one of the tests fails

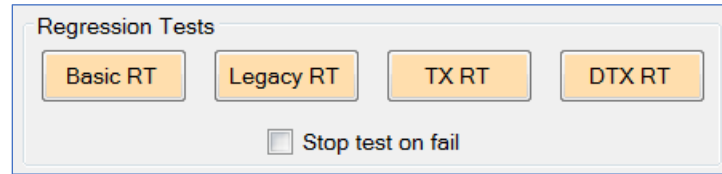


Figure 39: Regression Test Buttons

2.5.1 Basic RT

The Basic Regression Test sends a series of preprogrammed commands to test for faults—ways the protocol can fail. For example, a short or incomplete message can be sent to provoke a timeout response.

The “Stop test on fail” option is not valid with the Basic test, since all of the tests are intended to cause failures.

Results of the test are logged in the PC location specified in the DataPath field with a file name:
BP_Basic_Reg_Test_year_mo_da_HR_mn_ss.log.

2.5.2 Legacy RT

The Legacy Regression Test sends a series of supported legacy binary protocol commands. The Legacy BP Only box is checked automatically when the Legacy RT button is clicked on. This test works for all non-Dual Transmitters.

Results of the test are logged in the PC location specified in the DataPath field with a file name:
BP_Legacy_Reg_Test_year_mo_da_HR_mn_ss.log.

2.5.3 TX RT

The Transmitter Regression Test sends most supported binary protocol commands at least once. The Legacy BP Only box is unchecked automatically when the TX RT button is clicked on.

Results of the test are logged in the PC location specified in the DataPath field with a file name:
BP_TX_RT_Reg_Test_year_mo_da_HR_mn_ss.log.

2.5.4 DTX RT

The Dual Transmitter Regression Test sends a series of Dual Transmitter binary protocol commands. A Dual Transmitter having binary protocol 1.006, or newer, is required.

This test checks for the Binary Protocol version (1.006 or newer) and then issues a Channel command. A valid Dual Transmitter channel code (1, 2, or 3) allows the test to continue. If it finds a zero, indicating a single channel transmitter, the test aborts.

Results of the test are logged in the PC location specified in the DataPath field with a file name:
BP_DTX_Reg_Test_year_mo_da_HR_mn_ss.log.

3 Maintenance Instructions

The Quasonix Transmitter Binary Protocol Tester software requires no regular maintenance, and there are no user-serviceable components.

4 Product Warranty

The Quasonix Transmitter Binary Protocol Tester software carries no warranty.

NO WARRANTIES

The Author of this Software expressly disclaims any warranty for the SOFTWARE PRODUCT. The SOFTWARE PRODUCT and any related documentation is provided “as is” without warranty of any kind, either express or implied, including, without limitation, the implied warranties or merchantability, fitness for a particular purpose, or noninfringement. The entire risk arising out of use or performance of the SOFTWARE PRODUCT remains with the user.

NO LIABILITY FOR DAMAGES

In no event shall the author of this Software be liable for any special, consequential, incidental or indirect damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use this product, even if the Author of this Software is aware of the possibility of such damages and known defects.

5 Technical Support

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.

6 Appendix A – Troubleshooting

This section explains some common Binary Protocol Tester errors, and the possible cause(s) and solution(s).

Problem 1:

Receive error messages such as “BP_INVALID_TAG_DATA” or “Tx & Rx message tags don’t match” when attempting to change the Mode

Solution 1:

Is the Legacy BP Only check box checked?

and

Is the Binary Protocol Tester connected to a transmitter with a Binary Protocol version greater than 1.005?

Uncheck the Legacy BP only check box. The BP Tester is sending a legacy command and expecting a newer command.

Send a Get BP version command. This will set the check box automatically.

Problem 2:

Receive “BP_INVALID_TAG_DATA” message when attempting to change the Mode

Solution 2:

Click on Get Avail Modes, then view the Available Modes in the Tx Diagnostic Info section of the BP Tester. The Mode probably is not in the list.

Set an available mode, or contact Quasonix about upgrading the transmitter to enable the desired mode.

Problem 3:

Receive a BP_MISSING_OPTION message

Solution 3:

This message indicates that a command was issued for an option that is not available on the transmitter, such as Clock Free (CF) or Variable Power (VP).

Check the transmitter model number for the missing option. If it is not listed, contact Quasonix about upgrading the transmitter with the desired option.

Problem 4:

Attempted to set a fixed ID pattern but received a “Bad testapp data entered, Byte field needs 0-255 only” message

Solution 4:

While using a fixed internal data pattern, such as PN6 or PN11, does not require a byte length to function, the field requires an entry for the binary protocol to parse properly. Type a number in the byte field, then click on the SET button.

Problem 5:

Attempted to set an internal data pattern (SET ID) and received “Bad testapp data entered, Dword field needs a valid pattern name or hex digits only” message

Solution 5:

As described in section 2.4.1, GET/SET ID command, some pattern settings are only valid for Dual Transmitters. Choose a pattern that is valid for the connected transmitter. Valid selections are:

Patterns available in all transmitters:

- PN6 - Pseudorandom pattern 2^6-1 bits in length
- PN11 - Pseudorandom pattern $2^{11}-1$ bits in length
- PN15 - Pseudorandom pattern $2^{15}-1$ bits in length
- PN23 - Pseudorandom pattern $2^{23}-1$ bits in length
- User Pattern (binary or hex) – A unique pattern specified by the person running the test; Type the numbers directly into the field; Legacy and single transmitters use 16 bit, Dual Transmitters use 32 bit

Patterns only available in Dual Transmitters:

- Mark (all 1s) - A pattern of all ones (1111)
- Space (all 0s) - A pattern of all zeroes (0000)
- Alt01 - A pattern alternating zeroes and ones (0101)
- PN9 - Pseudorandom pattern 2^9-1 bits in length
- PN17 - Pseudorandom pattern $2^{17}-1$ bits in length
- PN20 - Pseudorandom pattern $2^{20}-1$ bits in length
- PN31 - Pseudorandom pattern $2^{31}-1$ bits in length

Problem 6:

Attempted to set LDPC encoding but received “BP_INVALID_TAG_DATA” message

Solution 6:

Assuming the LD or LD6 option is present on the transmitter (refer to Problem 3), the SET LD En command also requires a *PSK mode.

Click on Get Avail Modes, then view the Available Modes in the Tx Diagnostic Info section of the BP Tester. *PSK modes include SOQPSK (Mode 1), BPSK (3), QPSK (4), OQPSK (7), and UQPSK (8), or STC (13) on a Dual Transmitter.

Set an available *PSK mode, or contact Quasonix about upgrading the transmitter to enable the desired mode.

7 Appendix B – Acronym List

Acronym	Description
AM	Amplitude Modulation
AQPSK	Asynchronous Quadrature Phase Shift Keying
ARTM	Advanced Range Telemetry
AUQPSK	Asynchronous Unbalanced Quadrature Phase Shift Keying
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
CD	Channel Delay
CPM	Continuous Phase Modulation
DB-9	D-subminiature 9 pin Serial Connector
DC	Diversity Combiner/Direct Current
DPM	Digital Phase Modulation
FPGA	Field Programmable Gate Array
kbps	Kilobits per second
KHz	Kilohertz
Mbps	Megabits per second
MHCPM	multi-h Continuous Phase Modulation
MHz	Megahertz
OQPSK	Offset Quadrature Phase Shift Keying
PCMFM	Pulse Code Modulation/Frequency Modulation
PM	Phase Modulation
PSK	Phase Shift Keying
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RS-232	Recommended Standard 232 (Serial Communications)
SOQPSK	Shaped Offset Quadrature Phase Shift Keying
UQPSK	Unbalanced Quadrature Phase Shift Keying
USB	Universal Serial Bus