

Installation and Operation Manual

RDMS™ Status Logger

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1 Status Logger Interface to the RDMS

1.1 1U Status Logger Interface

A 1U Interface unit is also available, as shown in Figure 1. This unit integrates a controller (does not require an external PC) and provides for up to four (4) RDMS connections simultaneously. The internal security device activates available licenses (one to four).



Figure 1: 1U RDMS Status Logger

1.2 RDMS Serial Interface Module (SIM)

The RDMS Serial Interface Module (SIM), shown in Figure 2, provides an interface between an available USB port on your PC to the 25 pin control port on the rear panel of the RDMS receiver. The RDMS SIM integrates a security device that activates a license to use the Status Logger application.



Figure 2: Serial Interface Module

2 Initial Set Up

2.1 1U Integrated Controller Set Up

Connect up to four 25 pin cable(s) from the Status Logger to the RDMS receiver(s). Power up the Status Logger and the connected receivers.

No software installation is necessary. The 1U unit is shipped with software preinstalled. To upgrade software, or add licenses, contact Quasonix.

Skip to section 2.3, Identify RDMS Rack.

2.2 RDMS Serial Interface Module (SIM) Set Up

2.2.1 Install the Windows Application

1. Insert the installation disk.
2. Click on the Setup folder.
3. Double click on **install_win.exe**.
4. In the \setup\install.exe screen, shown in Figure 3, type Y (for ok to install), then press the Enter key.

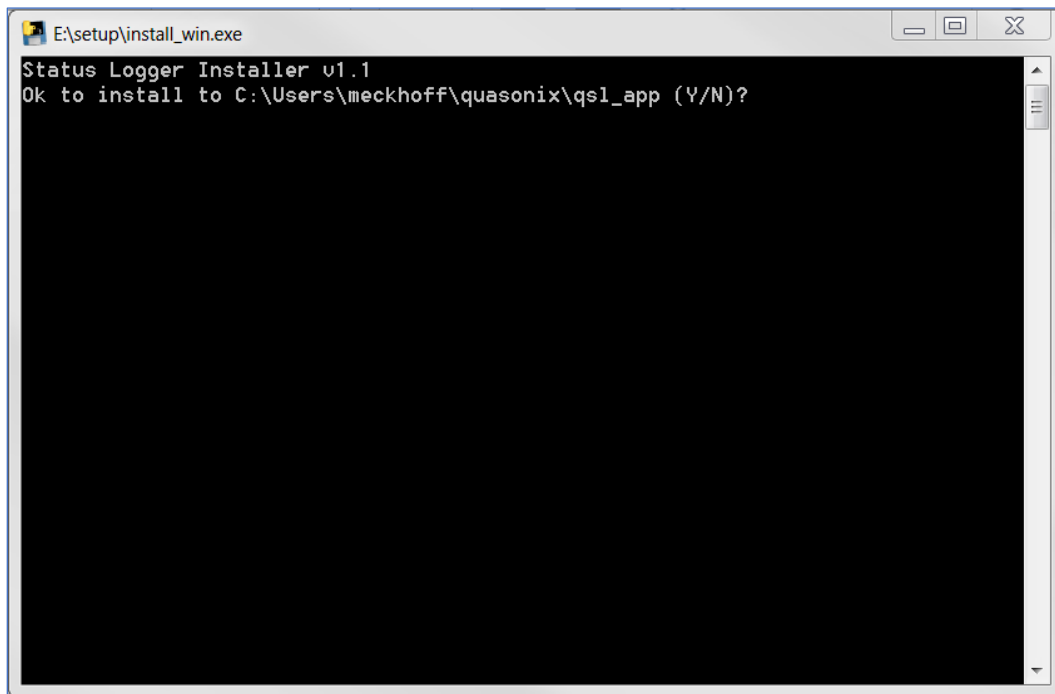


Figure 3: Status Logger Installer

Note: The software installs the RDMS Status Logger and drivers from FTDI.

5. When the install is complete, press the Enter key on the PC keyboard to continue.
6. On the PC desktop, click on the StatusLogger shortcut to open the application.

7. The RDMS Connection Manager screen displays, as shown in Figure 4.

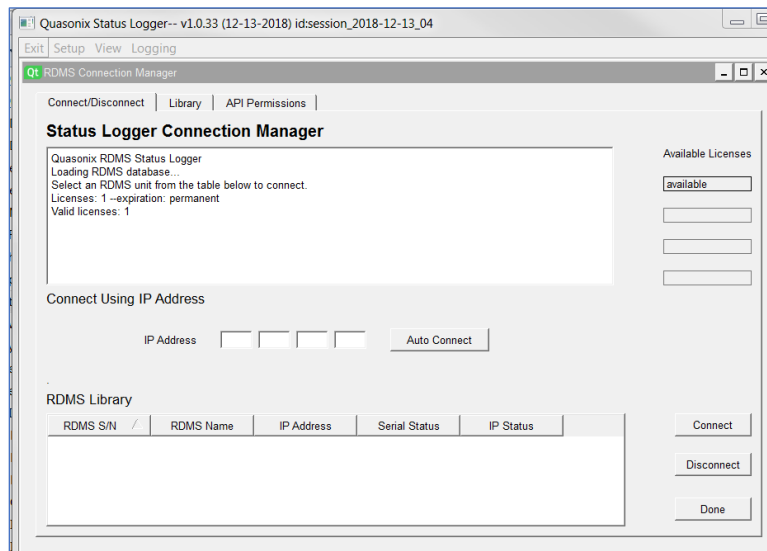


Figure 4: RDMS Connection Manager

2.2.1.1 Hardware Connection

2.2.1.1.1 SIM Connection

After the application has been installed, connect the supplied USB cable from the PC to the SIM. Then connect the 25 pin cable from the SIM to the back of the RDMS.



Figure 5: Serial Interface Module with Supplied 25 pin Cable

If a network connection is possible, connect the RDMS Ethernet port to the same network as the Windows PC.

2.2.1.1.2 First Time Install

When the Windows software is installed for the first time, the SIM must detect the license information.

1. Click on the Setup Menu in the Quasonix Status Logger application.
2. Select Refresh License Info from the drop down menu, as shown in Figure 6.

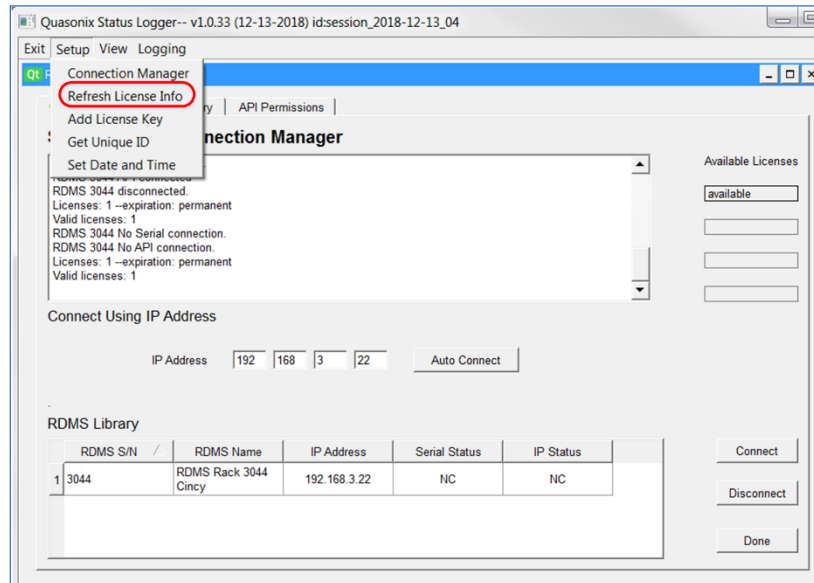


Figure 6: Quasonix Status Logger Setup Menu

The Status Logger Connection Manager displays available licenses, as shown in Figure 7. You can connect to one receiver per license. Upon connection to a receiver, the Available Licenses list is populated with the number(S) in the RDMS S/N field(s) for the connected receiver(s).

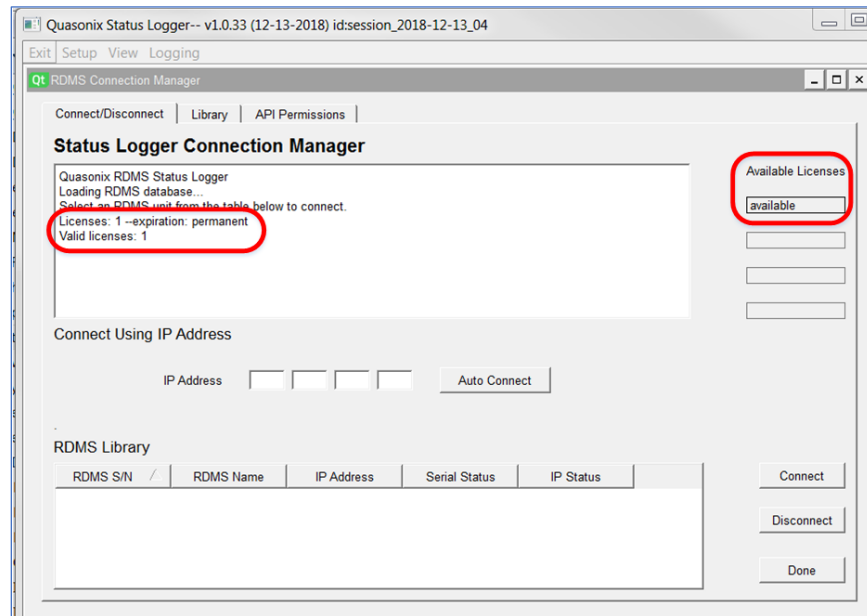


Figure 7: Quasonix Status Logger Connection Manager, Licenses Available

3. Skip to section 2.3, Identify RDMS Rack.

2.3 Identify RDMS Rack

1. On power up, the Status Logger Connection Manager displays, as shown in Figure 8. If the window is closed, open the RDMS Connection Manager by clicking on the shortcut on your PC desktop.

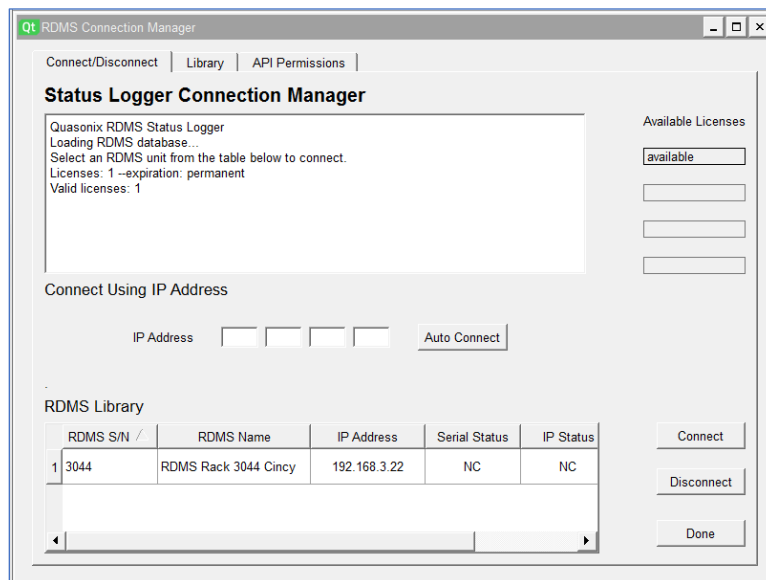


Figure 8: RDMS Connection Manager, Connect/Disconnect Status Logger Connection Manager

2. If the desired receiver and IP Address display in the RDMS Library list, proceed to Chapter 3, Status Logger Operation.

Note: The IP Address is optional (not required for logging), but it allows control of the RDMS using the Quasonix API. Generally, this should only be used when the RDMS is configured with a fixed IP address. When the RDMS IP address is assigned by DHCP, the assignment is dynamic, and the IP address will not match after the system is powered down. Quasonix recommends NOT using DHCP to assign the IP address.

If the receiver is not shown as an available system, add the serial number to the library, as described in section 2.3.1.

2.3.1 Add An RDMS Receiver to the Library

If the RDMS is not available in the RDMS Library list, you may add it to the library. Click on the Library tab, as shown in Figure 9.

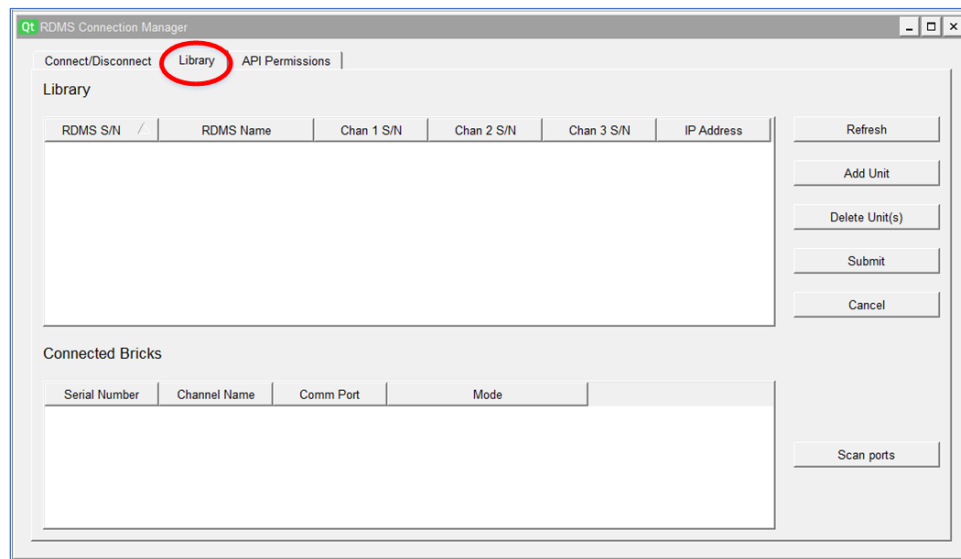


Figure 9: RDMS Connection Manager, Library Tab Selection

The top window of the Library screen provides the ability to add, delete, or edit RDMS receivers in the local library list. The fields in the table can be edited, but will not be written to disk until the Submit button is clicked.

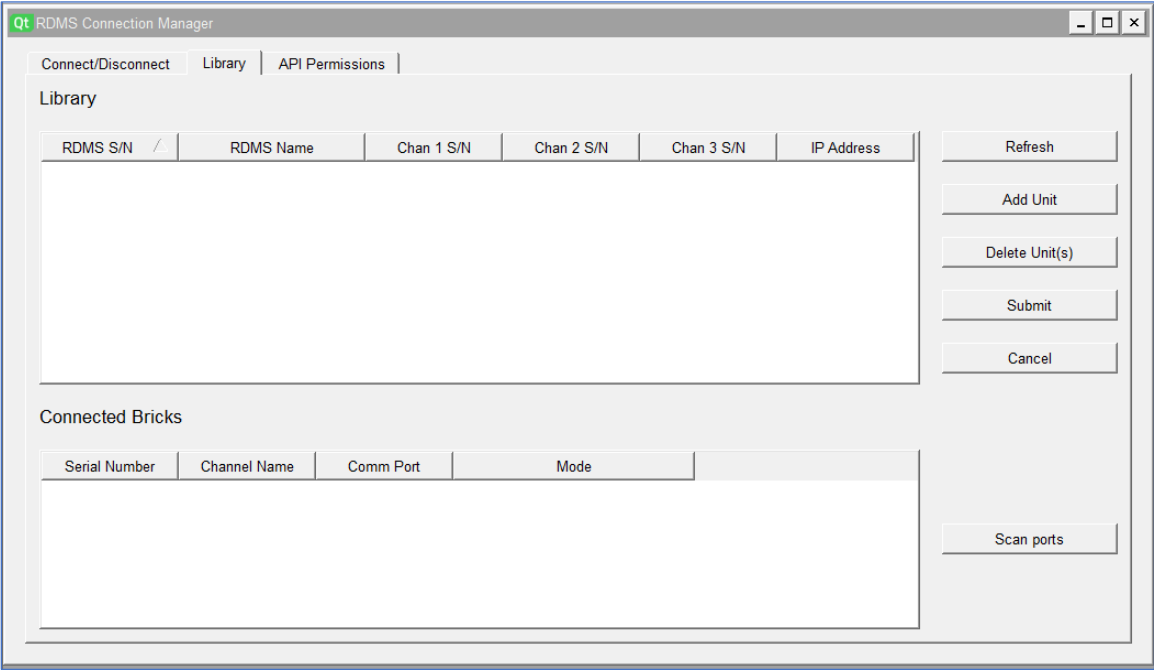


Figure 10: RDMS Connection Manager, Library Tab

1. To add an RDMS, click on the Add Unit button. A new row displays in the Library window, as shown in Figure 11. If the Library already contains entries, a new row displays at the bottom of the list, as shown in Figure 12.

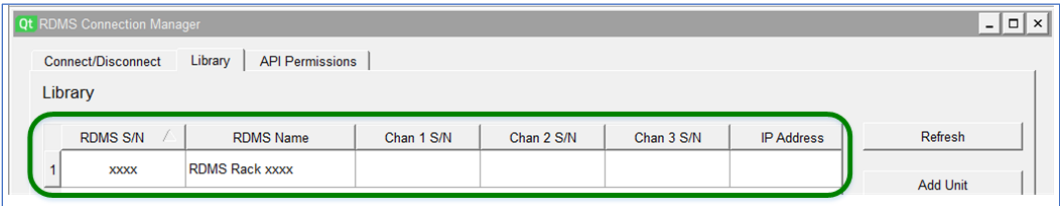


Figure 11: Library Tab, New Row Added to Empty Library List

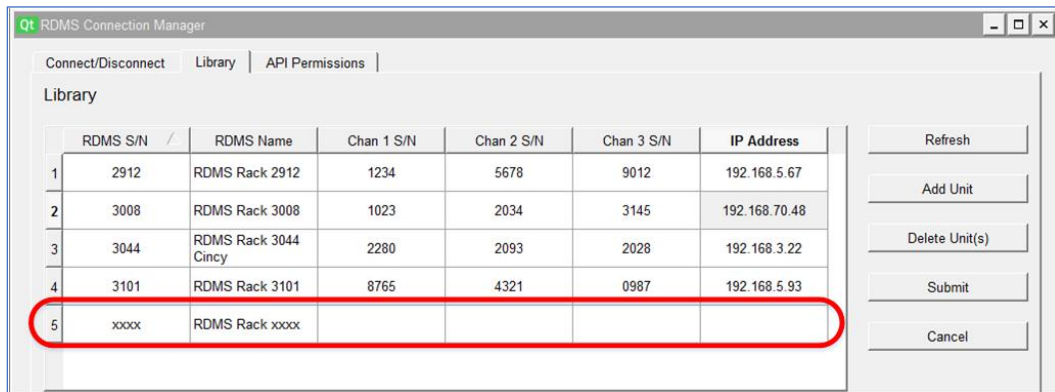


Figure 12: Library Tab, New Row Added to the Bottom of Existing Library List

2. Type the serial number of the RDMS unit in the first column, RDMS S/N, as shown in Figure 13. The digits must match the receiver exactly. To check this, go to System Settings > System Info on the receiver. The Serial Number and IP address display on the screen.

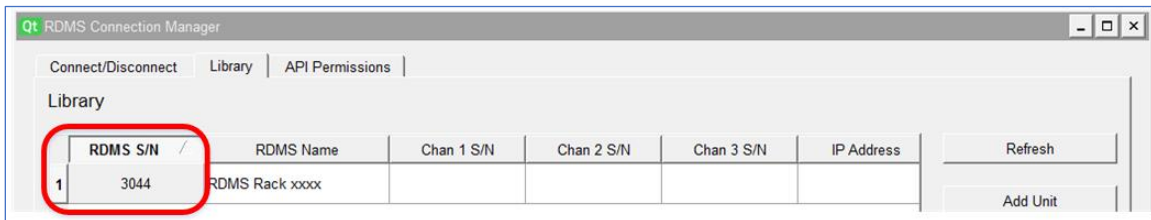


Figure 13: Library Tab, New Serial Number Typed in Library List

3. Type a name for the RDMS that makes it easily identifiable, as shown in Figure 14. This field can be any alphanumeric text.

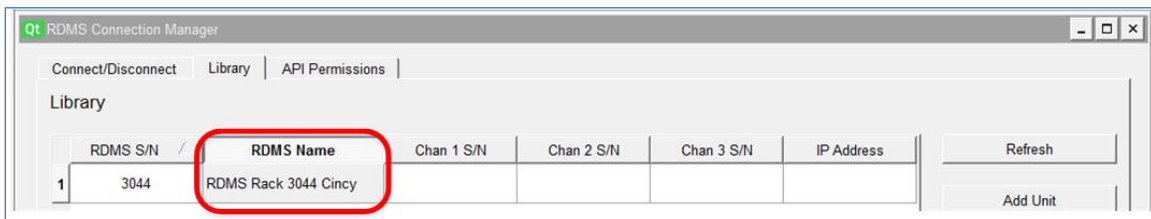


Figure 14: Library Tab, RDMS Name Typed in Library List

4. Type in the serial numbers for Channel 1, Channel 2, and Combiner (Chan 3 S/N), as shown in Figure 15. These can be supplied by Quasonix or detected using the Scan Ports function. Refer to section 2.3.1.1.

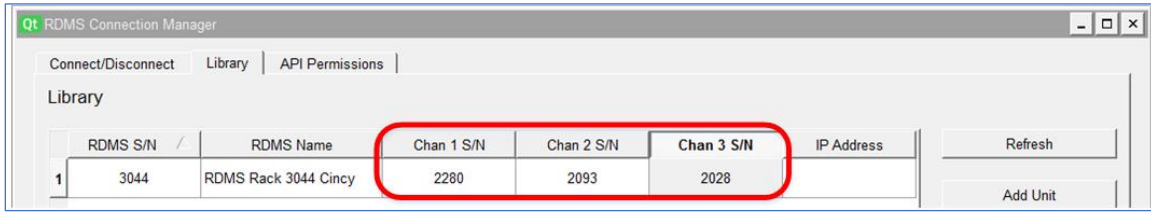


Figure 15: Library Tab, Channel Serial Numbers Added to Library List

5. Type the IP Address for the RDMS, as shown in Figure 16. This is optional (not required for logging), but it allows control of the RDMS using the Quasonix API. You **MUST** include the periods between the digits, such as “192.168.3.22”. The software will accept an entry without them, such as “192168322” and will save the entry when submitted. However, it is treated as an invalid number. If the IP address is invalid or blank, the Status Logger is connected to the RDMS, but the RDMS Control selection is greyed out. If your facility does not allow Internet access, then leave the IP Address field blank. It prevents the software from spending a long time searching for an IP Address it cannot access.

If the IP Address is not added when the Library entry is first created, it may be added later. Go back to the Library tab, click inside the IP Address field, then type the IP address. Click on the Submit button when finished.

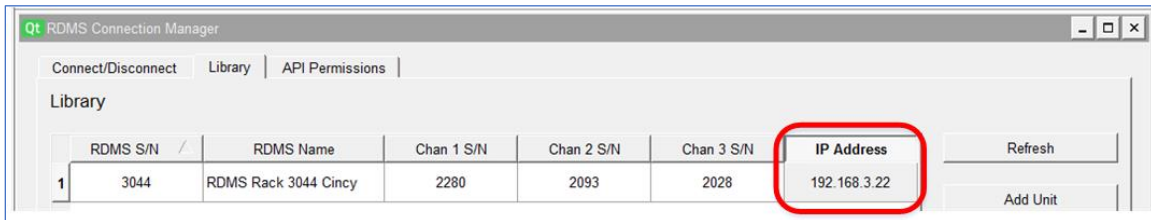


Figure 16: Library Tab, IP Address Added to Library List

Generally, the IP Address should only be used when the RDMS is configured with a fixed IP address. When the RDMS IP address is assigned by DHCP, the assignment is dynamic, and the IP address will not match after the system is powered down. Quasonix recommends **NOT** using DHCP to assign the IP address.

6. When all edits, additions, or deletions to the Library list are complete, click on the Submit button to save the changes to disk.
7. Click on the Connect/Disconnect tab. The RDMS Library displays the new entry, as shown in Figure 17.

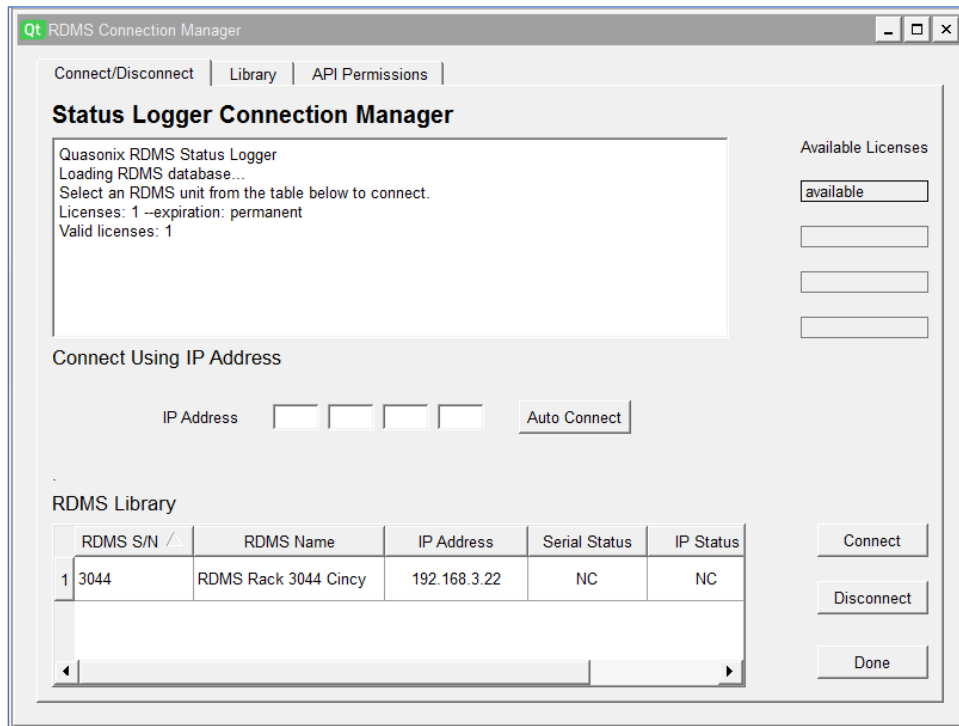


Figure 17: Connect/Disconnect Tab, RDMS Library Entry Added

Note that this library information is a local database for this Status Logger System. To use the RDMS on other Status Logger systems, the information must be added to their local Libraries. If the Library contains many receivers, contact Quasonix for assistance copying the Library to another system.

2.3.1.1 Scan Ports Function

If the serial numbers for the three channels (receiver bricks) are not available, they can be discovered using the Scan Ports function.

With the RDMS connected to the Status Logger and powered on, click on the Scan Ports button on the Library screen, as shown in Figure 18.

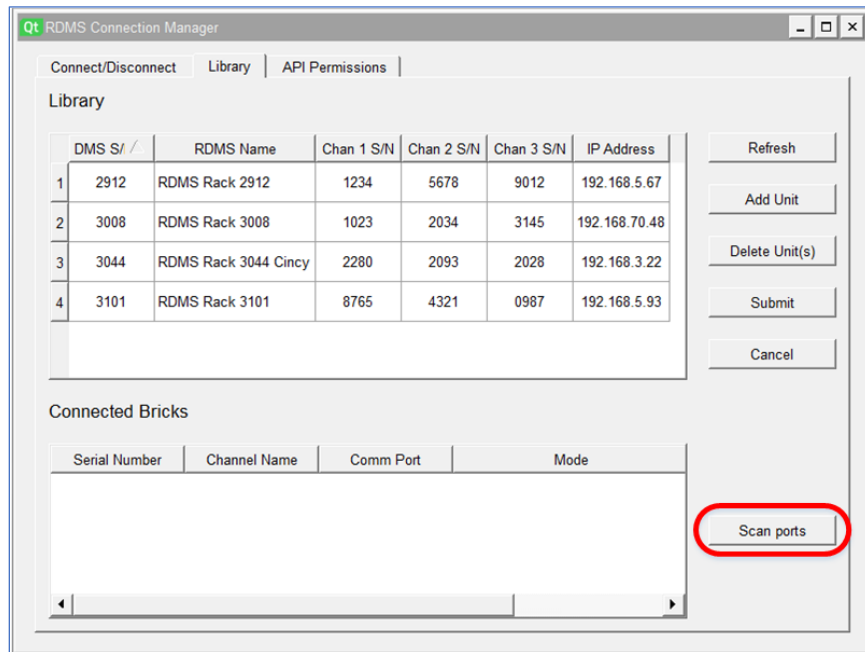


Figure 18: RDMS Connection Manager, Library Tab, Scan Ports Button

The application attempts to communicate with any connected channels and provide basic state information. The RDMS receiver serial number is not known at the channel level. To properly associate the channel “bricks” with the RDMS if multiple receivers are connected, it is helpful to set the receivers to different modes, bit rates, or frequencies. When the receiver channels are detected, they display in the Connected Bricks list, as shown in Figure 19. Look for the brick entries that match the Mode parameters for the receiver to be connected. Copy the serial numbers for Channel 1, Channel 2, and Half Brick to the Chan 1 S/N, Chan 2 S/N, and Chan 3 S/N fields in the Library list, as described in 2.3.1.

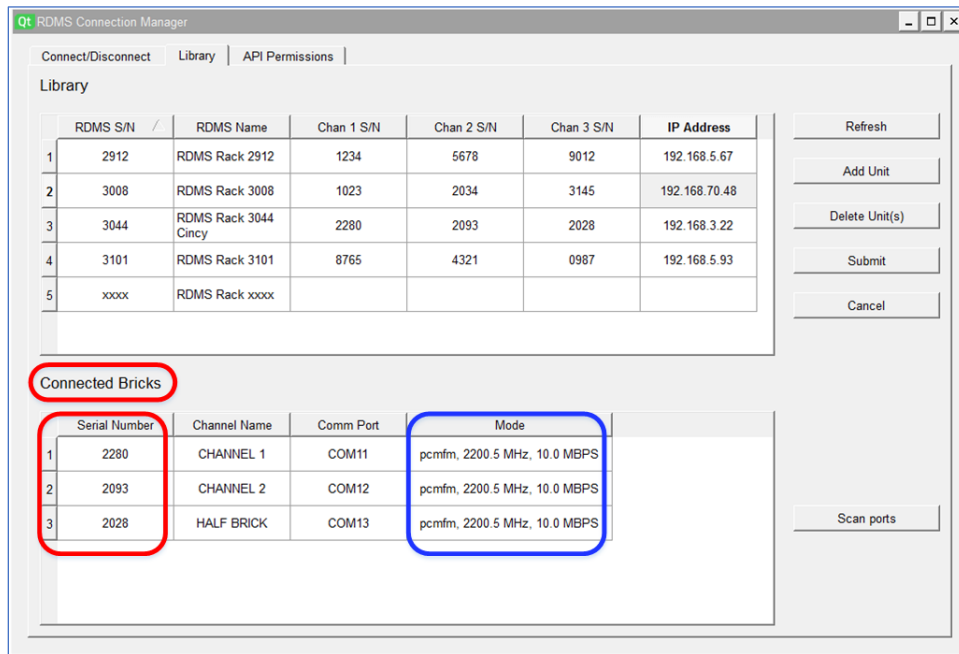


Figure 19: Library Screen, Connected Bricks Displayed

2.4 Set Up API Permissions

The API Permissions tab, shown in Figure 20, enables a user to control (make setting changes) on a connected RDMS receiver by providing a specific IP Address (or address range for multiple receivers). Normally, a connected Status Logger may only read data from a receiver. These permissions apply to Auto Connect IP addresses and to the RDMS Control screen (accessed via IP address).

Disable API control check box – Disables API control for all addresses, even if the address is included in the permission range; Note that disabling control does not prevent reading the API information from a connected receiver-- only the ability to change the receiver settings is disabled.

IP Address field(s) – Type a single IP address for an RDMS receiver to be controlled by tabbing from field to field. Use the Add button to include the IP address in the Enabled Addresses list. Pay close attention to the numbers typed for the IP address since it will accept invalid addresses.

IP Address Range – Type the IP address at the beginning of the range and the last digit(s) for the IP address at the end of the range. This enables all IP addresses within a range to be enabled at the same time. Use the Add button to include all IP addresses in the range to the Enabled Addresses list.

Clear Selected button – Deletes selected IP addresses from the Enabled Addresses list

Save Changes button – Saves added or changed IP addresses, as well as any deletions from the Enabled Addresses list; Note: if you don't save the changes, they exist **only** for the current session. When the Status Logger software is closed, then reopened, unsaved API Permissions parameters revert back to their last saved state.

Refresh button – Sets the Enabled Addresses list on this page back to the last saved state on the connected PC; works like an “undo” if IP addresses were added or changed during this session

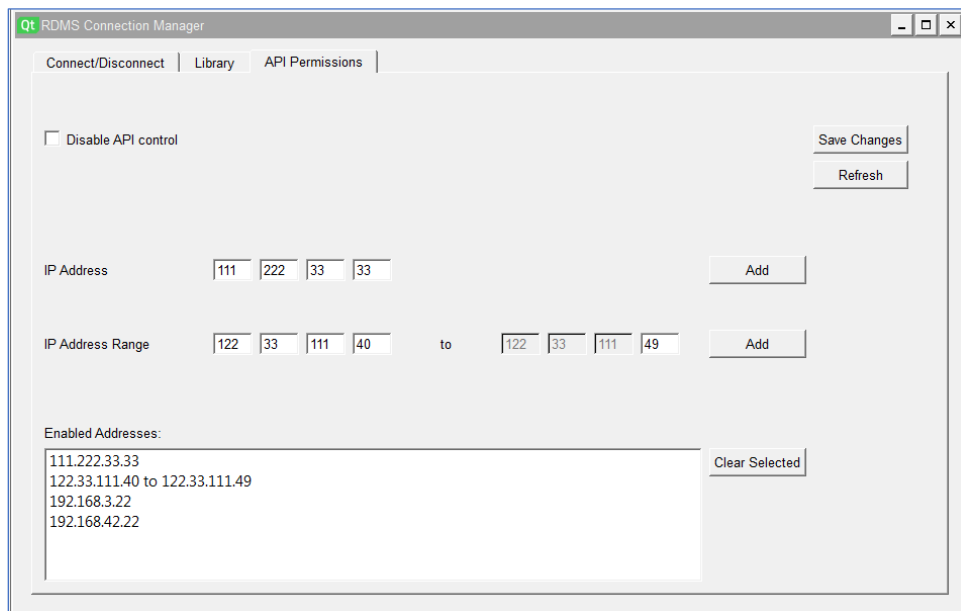


Figure 20: API Permissions Tab with IP Addresses Added

If API Control is disabled (checked), and if a connection attempt was made (from the Status Logger Connection Manager) with an IP Address that was **not** added to the Enabled Addresses list on the API Permissions tab, an Auto connect error message displays, as shown in Figure 21. To use the IP address, it must be added to the Enabled Addresses list, or uncheck the Disable API Control box, then retry the connection.

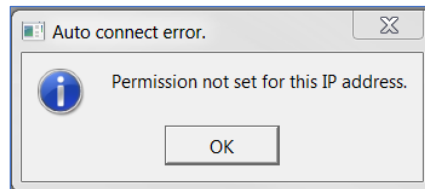


Figure 21: Auto Connect Error Message-No Permission

3 Status Logger Operation

3.1 Launch the Status Logger

To launch the status logger, at least one license must be detected. For the PC based system, the license is contained in a hardware device in the Serial Interface Module (SIM). If a 1U Integrated Controller Status Logger is connected, up to four licenses are configured within the Status Logger hardware. The number of active licenses is indicated in the upper right section of the Status Logger Connection Manager, as shown in Figure 22.

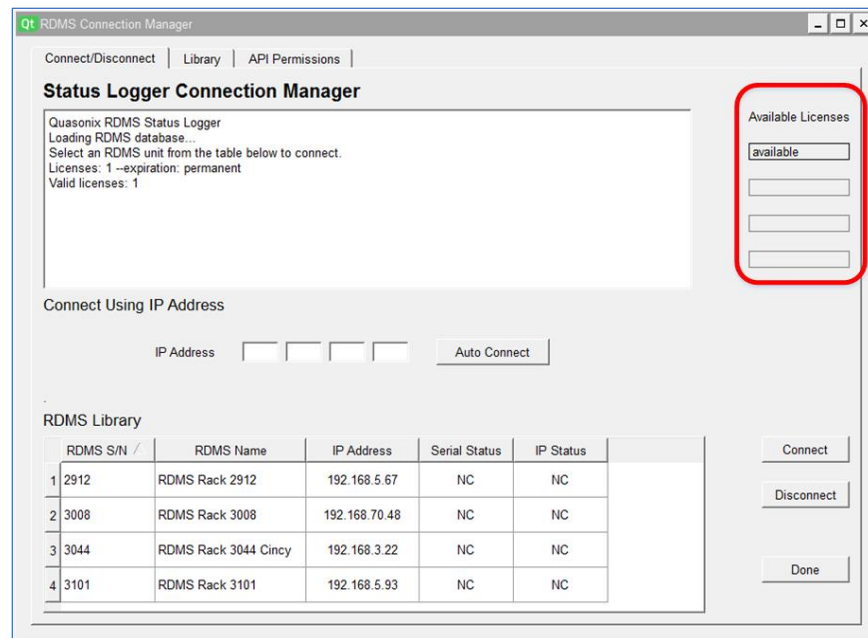


Figure 22: Status Logger Connection Manager, Available Licenses

In the RDMS Library list, click anywhere in a line for the RDMS receiver to be connected, as shown in Figure 23. For example, if the user clicks on the IP Address, the row number changes to bold text to show it is selected. The Serial Status and the IP Status both indicate “NC” for no connection. Click on the Connect button. The Status fields change to Ok, highlighted in green, when an RDMS is connected.

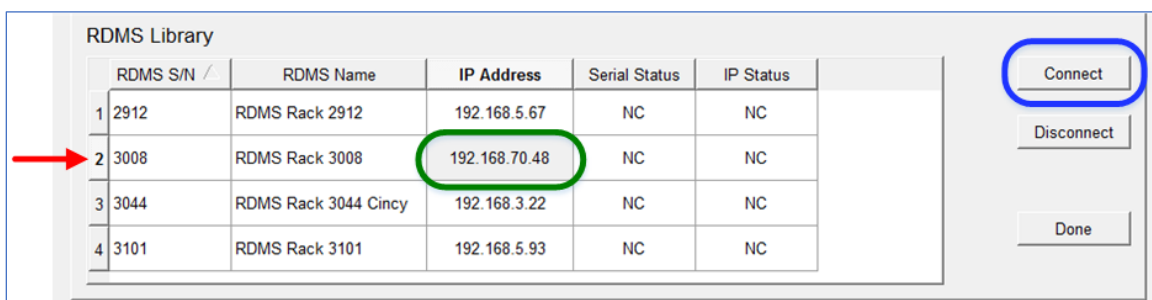


Figure 23: Connect/Disconnect Status Logger Connection Manager, RDMS Library

When the RDMS is connected (to the Status Logger) and powered on, the Status Logger graphical user interface displays an RDMS Rack screen for the connected RDMS, as shown in Figure 24.

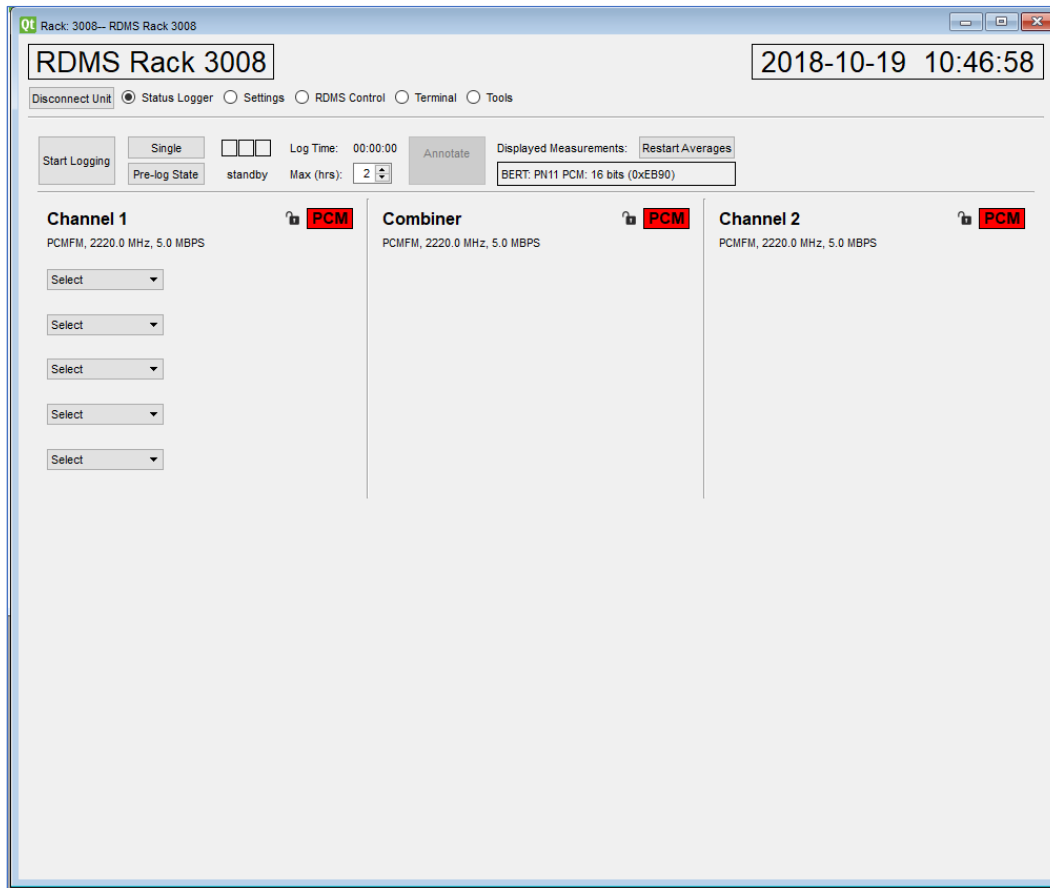


Figure 24: RDMS Rack Connection Screen

3.1.1 Rack Connection Error

If an invalid RDMS Receiver serial number was added when the Library list was created for that receiver, the software attempts to connect. If an IP address was not entered for the receiver, the serial connection finds the associated bricks, and the Status Logger connects to the RDMS receiver. It doesn't know what the receiver serial number is, but it doesn't have to.

In the example in Figure 25, someone typed 2044 instead of 3044 in the RDMS S/N field. Since there is no IP address for the receiver, the Status Logger software searched for valid Channel 1, 2, and 3 bricks. Upon finding them, a serial connection was made, the Serial Status field in the Library list item changed to "Ok," and was highlighted in green. The information from the RDMS S/N field displays in the Available Licenses field even though the serial number is incorrect. It simply identifies the receiver.

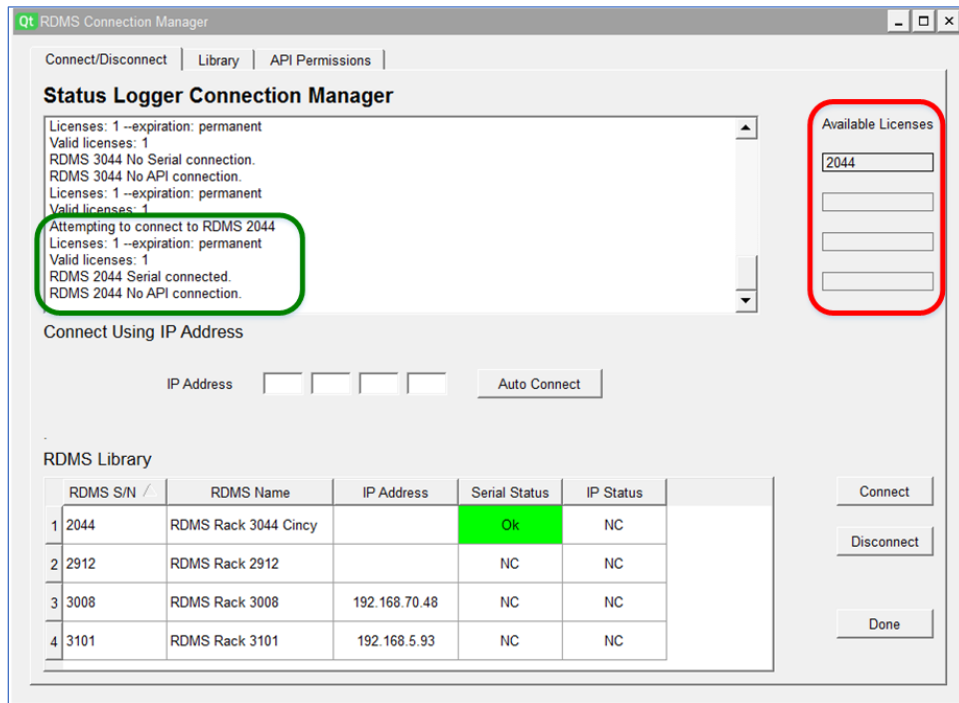


Figure 25: Status Logger Connection Manager with Valid Serial Connection, Bad Serial Number

Using the same example, if a valid IP address was added to the Library list for the receiver, it discovers a mismatch in the RDMS serial number. An error message displays in the Status Logger Connection screen, as shown in Figure 26.

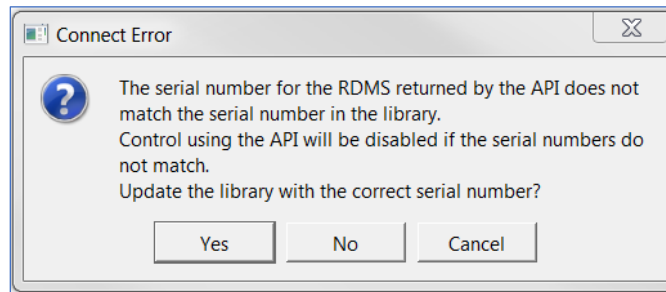


Figure 26: Bad Serial Number, Add the Correct One Message

This error may be resolved by clicking on the Yes button in the Connect Error message. The Status Logger software automatically searches for the serial number, and updates the RDMS Serial Number in the Library list. After the correction is made, the software connects to the selected RDMS receiver.

If No is clicked in the Connect Error message, the Status Logger software attempts to connect using the serial port, but displays an error message noting the mismatched RDMS serial number in the status window, as shown in Figure 27. To fix the serial number, click on the Library tab, edit the RDMS S/N field, and click on the Submit button. When the Connect/Disconnect tab is selected, it displays the updated RDMS Library list item. Click on the item number next to the corrected serial number to highlight the line, then click on the Connect button.

RDMS Library					
	RDMS S/N /	RDMS Name	IP Address	Serial Status	IP Status
1	1234	RDMS Rack 1234 Test		NC	NC
2	2008	RDMS Rack 2008 Imbad	192.167.3.1	NC	NC
3	2044	RDMS Rack 3044 Cincy	192.168.3.22	Ok	SN Err

Figure 27: Status Logger Connection Manager with Serial Number Error

3.2 Connect Using IP Address

The Status Logger may be connected to an RDMS receiver via the Connect Using IP Address fields on the Status Logger Connection Manager.

Type the IP address into the IP Address fields, as shown in Figure 28. The size of the entry boxes may vary depending on the screen resolution. Even if the fields look like check boxes, you may still type the numbers into each box.

Click on the Auto Connect button to locate and connect to the receiver.

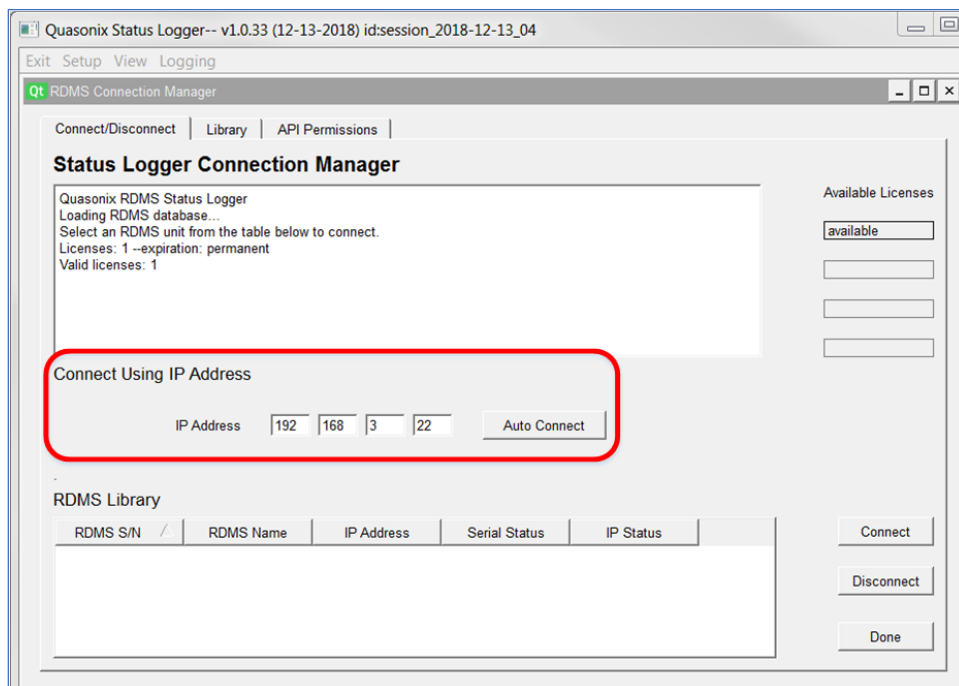


Figure 28: Status Logger Connection Manager, Connect Using IP Address

If an invalid IP address was added, an error message displays, as shown in Figure 29. Check the IP Address, make corrections as needed, then click on the Auto Connect button again.

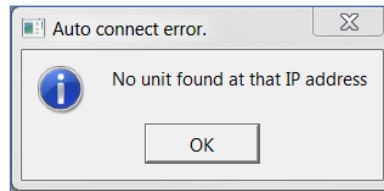


Figure 29: Auto Connect Error Message-No Unit

An Auto Connect message displays, as shown in Figure 30. It indicates the serial number and location alias for the RDMS receiver to be connected. This message is an attempt to keep users from appropriating a receiver that someone else is using, possibly resulting in mission delays.

Click on the Yes button if it is ok to continue. A status message displays the state of the receiver search.

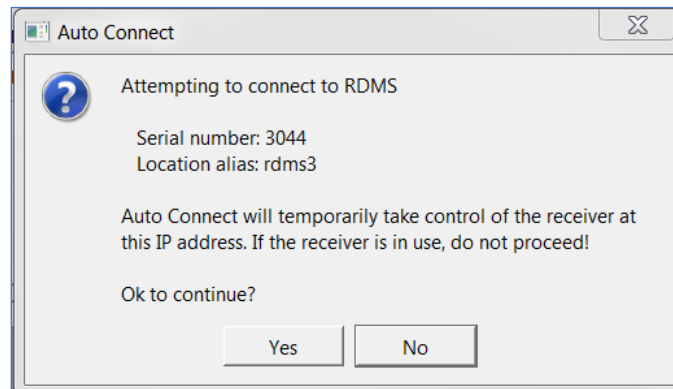


Figure 30: Attempting to Connect Message

When the appropriate RDMS is located, another message displays confirming the information associated with the found receiver, as shown in Figure 31. Click on the Yes button to connect.

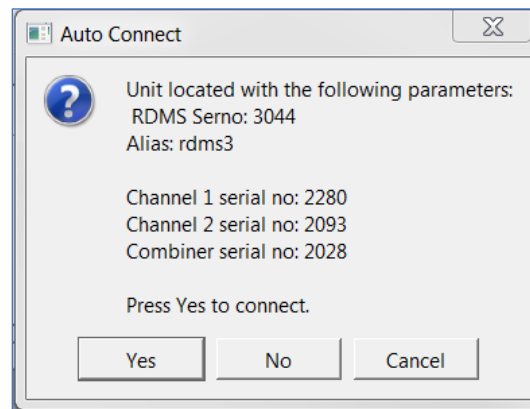


Figure 31: Auto Connect, Unit Located Message

If the desired receiver was not originally added to the RDMS Library list, as shown in Figure 32, but is found during the Auto Connect process, a message displays asking whether to add it to the Library, as shown in Figure 33.

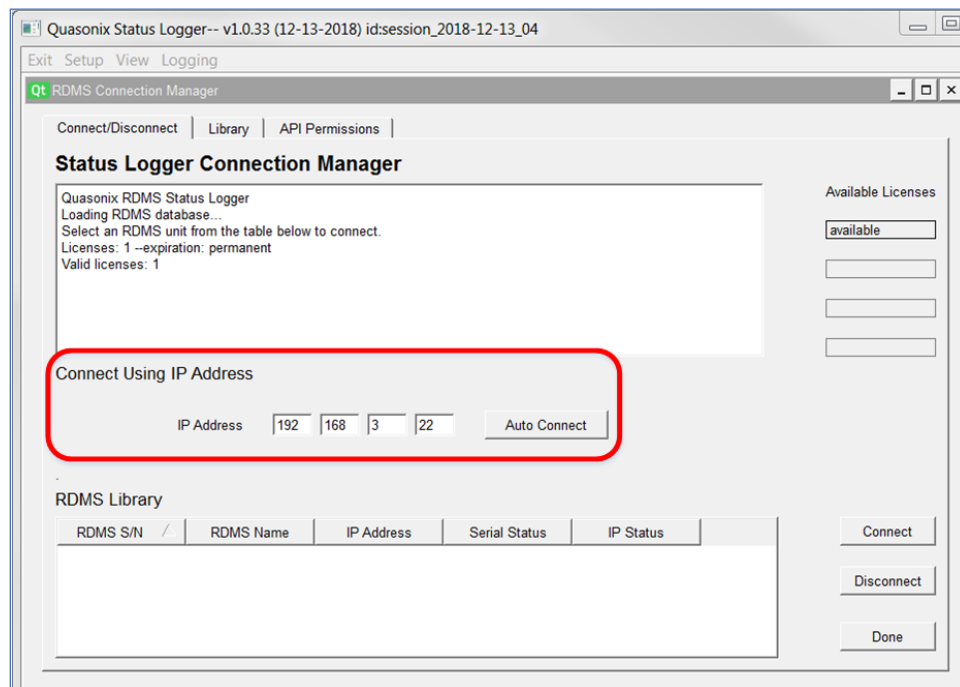


Figure 32: Status Logger Connection Manager, Connect Using IP Address-RDMS Not in Library

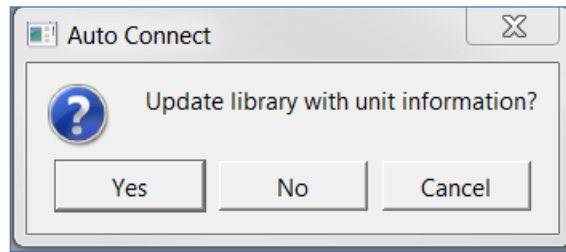


Figure 33: Connect Using IP Address, Add RDMS to Library List Message

After the RDMS receiver is connected to the Status Logger, the RDMS Library displays the “found” receiver in the list. The RDMS Name is listed as “rdms3.” This should be edited on the Library tab to provide a more descriptive name. The Serial Status and IP Status display “Ok” and are highlighted in green. Lastly, the Available Licenses list shows the serial number of the found receiver, 3044.

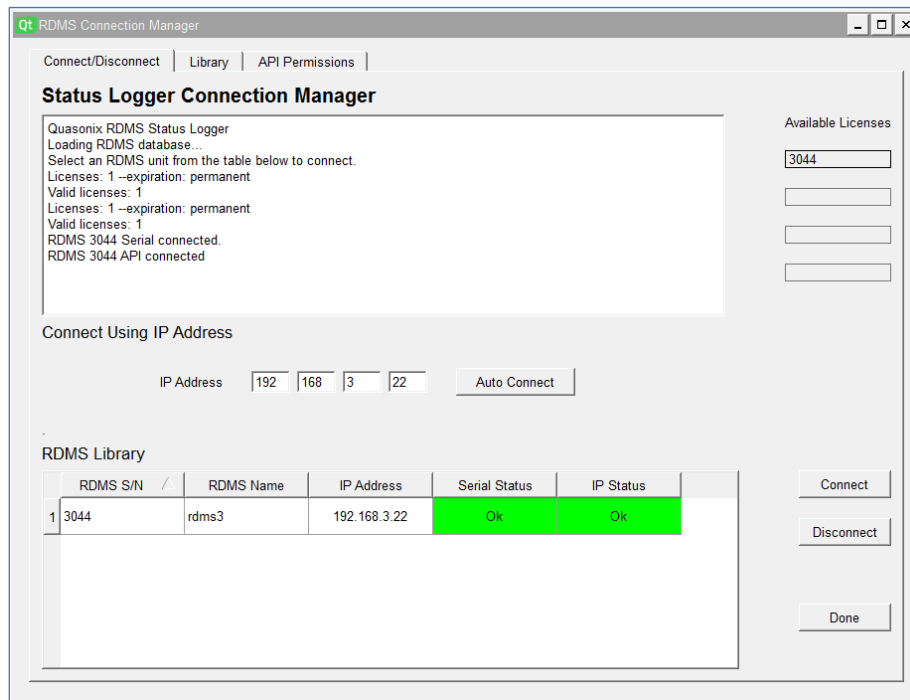


Figure 34: Status Logger Connection Manager, RDMS Added to Library

The RDMS Rack Status Logger screen also displays when the receiver connects, as shown in Figure 35.

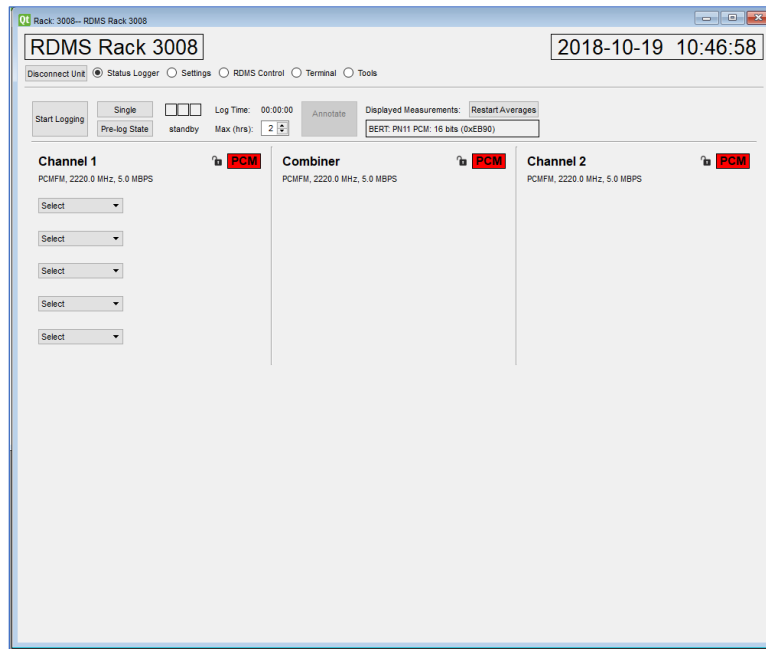


Figure 35: RDMS Rack Status Logger Screen

3.3 RDMS Rack Connection Screen

For each connected RDMS (up to four), a Rack Connection screen is controlled. These primarily operate independently within the application, though some limited functionality, such as Start/Stop logging, can be accessed from the main Rack screen.

The RDMS Rack Connection screen is made up of two sections. The top section shows the RDMS name, date, and time, and provides clickable buttons to select functions, as shown in Figure 36. Since the top section displays the RDMS name, it is helpful to have descriptive names for the receivers, especially for multi-unit applications.

The time and date is derived from the system clock in the PC or integrated controller. It is often useful to use GMT format, such that the clock can be correlated to IRIG time sources. In fact, synchronization with a system time source is highly recommended as this will enable direct correlation of logged data with events.

The lower section of the screen (most of the displayed area) changes depending on the selected function.

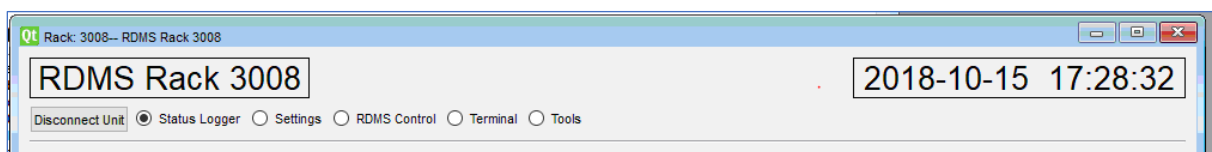


Figure 36: RDMS Rack Connection Screen, Top Section

The clickable buttons on the RDMS Rack Connection screen provide access to the following functionality: Status Logger, Settings, RDMS Control, Terminal, and Tools.

3.3.1 RDMS Rack Status Logger

The first selection button accesses the RDMS Rack Status Logger main screen. This is clearly the primary function of the Status Logger application.

3.3.1.1 Status Logger Control Section

A control section contains buttons and log operation status information. This section contains buttons to start and stop logging, indicators to confirm logging is being performed, a max log time setting, annotation controls, and settings information.

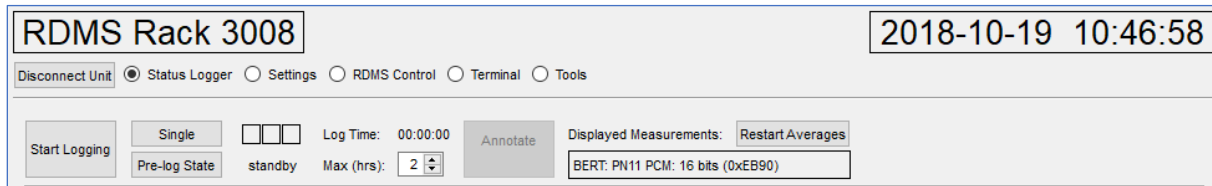


Figure 37: Status Logger Control Section

3.3.1.2 Status Logger Real-time Measurements Section

The lower section of the screen contains drop down menus for up to five (5) real-time measurements. The first time the software is run, no graphics are selected, as shown in Figure 38.

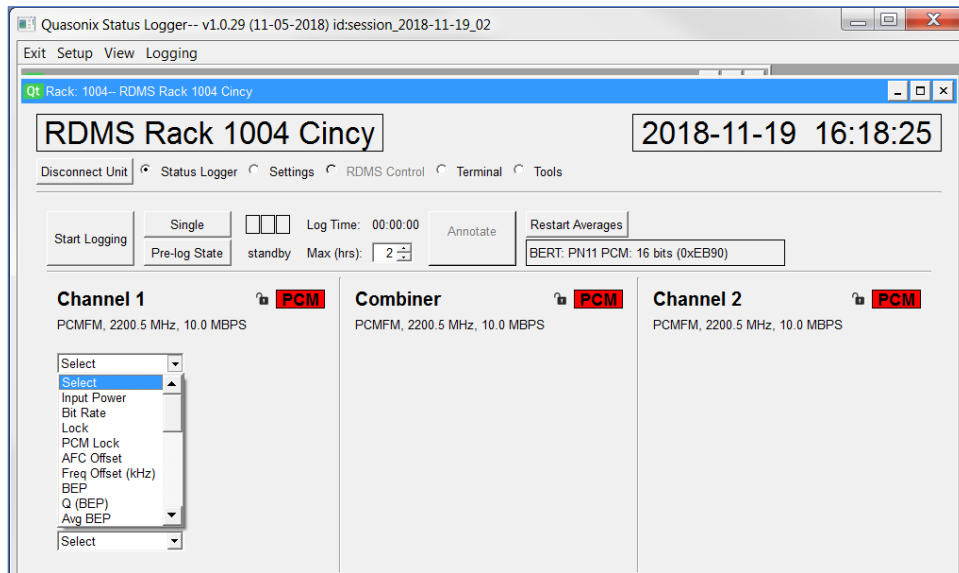


Figure 38: RDMS Rack Connection Screen with Open Drop Down Menu

It does show the Channel number, mode, frequency, and bit rate for each channel. The padlock icon functions like the signal lock icon on the RDMS receiver. PCM is short for PCM Framelock. If detected, the indicator turns green. It will not detect encrypted data. For detailed information about the PCM Framer/Deframer, refer to the Installation and Operation Manual for the 3rd Generation Rack Mount RDMS™ Telemetry Receiver, Appendix D.

In Figure 39, three measurements are open. Some of the measurements are text values only, while some include a graphic. For those measurements that provide a graphic, the graphic may be shown or hidden using the Chart check box. In some cases, especially in multi-unit logging, hiding the graphic can improve performance.

When the application is closed, the measurement selections are stored, so that the next time the application is opened, the same combination displays.

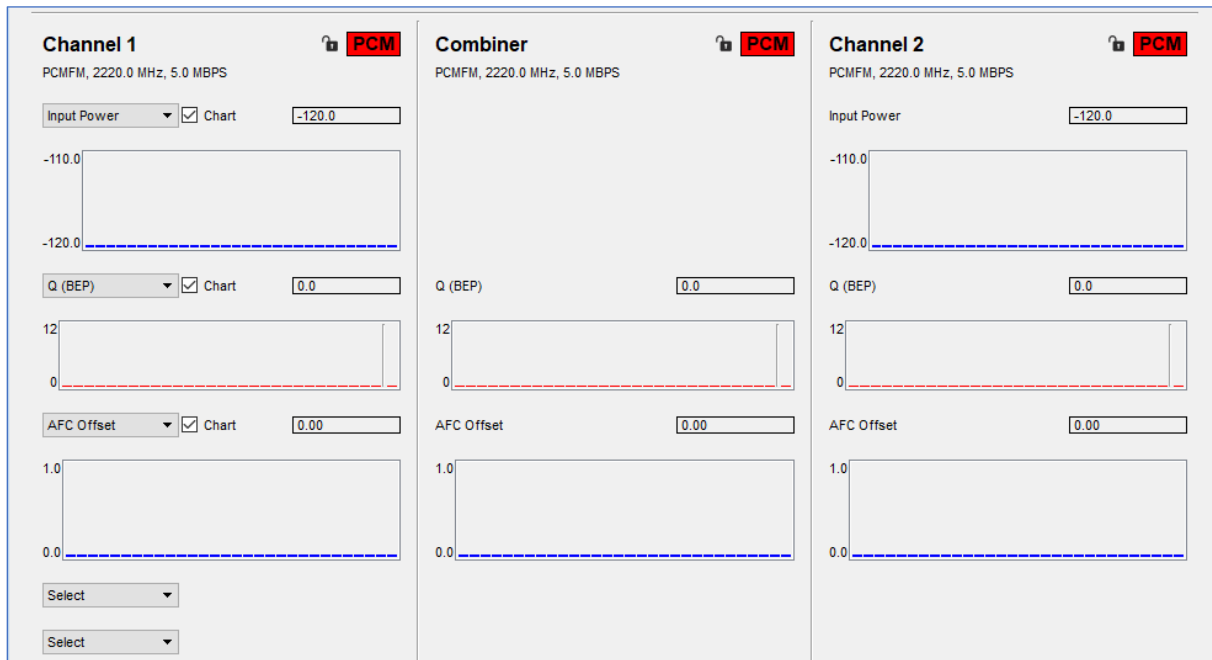


Figure 39: Status Logger Real-time Measurements Section

3.3.2 RDMS Rack Settings

The second selection button accesses the RDMS Rack Settings screen. This screen enables changes to the Setup Name, Channels, Bit Error Rate Tester (BERT), PCM Frame Detection, and Advanced Control, as shown in Figure 40.

It is not necessary to modify the setup to begin logging. However, for BER testing, or to set the PCM framing parameters, setup information is required.

Figure 40: RDMS Rack Settings Screen

3.3.2.1 Buttons

The Save Settings button saves a group of settings so they may easily be reused.

Previously saved settings can be retrieved using the Load Settings button. Note that saving to Location 0 loads the settings at initial connection to the receiver.

The OK button closes the Settings screen, then redisplay the Status Logger screen.

The Cancel button closes the Settings screen without making changes, then redisplay the Status Logger screen.

3.3.2.2 Setup Name

The Setup Name provides a way to identify a particular group of settings. It is useful when saving the settings if they will be used in future sessions. It is also a shortcut to share the same settings across several instances of the logger in a multi-unit application.

To save a setup, click on the Save Settings button. A Select Settings window displays, as shown in Figure 41. Up to eight setting profiles may be saved, as shown in the drop down menu in Figure 42.

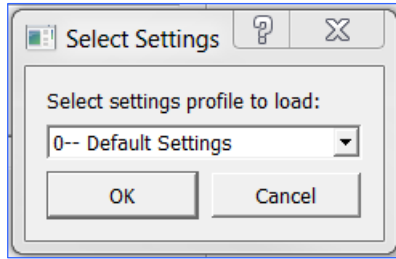


Figure 41: Select Settings

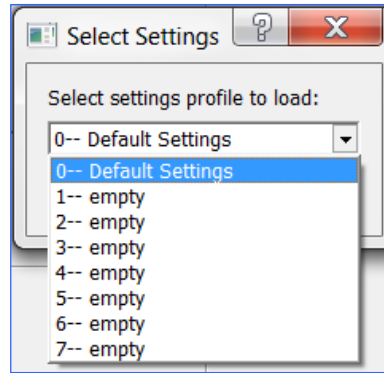


Figure 42: Select Settings Drop Down Menu

To add a new profile name, select one of the empty lines, then click on the OK button, as shown in Figure 43. The name changes to Settings #, depending on the profile slot, as shown in Figure 44.

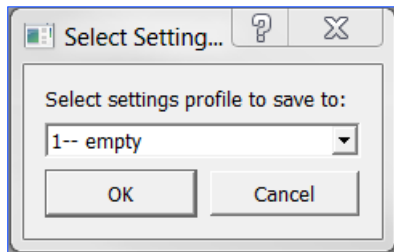


Figure 43: Select Settings, Empty

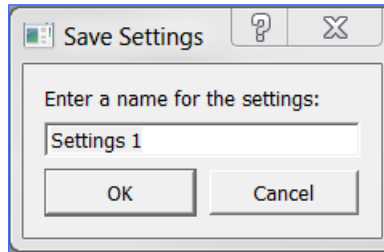


Figure 44: Select Settings Drop Down Menu

Overtyping Settings # to add a more descriptive name, as shown in Figure 45. Click on the OK button to save. To see the new Setup Name in the list, click on the Load Settings button, then click on the drop down arrow to see the updated list, as shown in Figure 46.

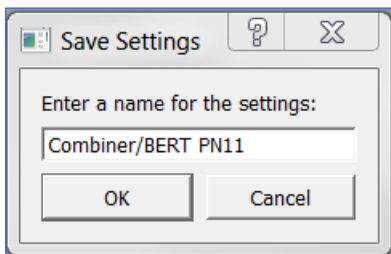


Figure 45: Select Settings, New

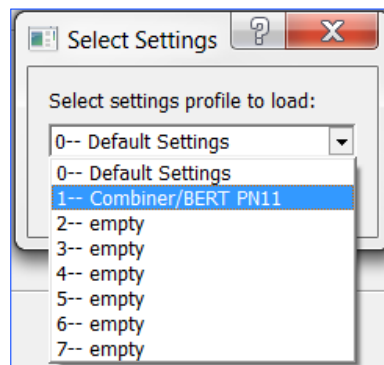


Figure 46: Select Settings Updated Drop Down Menu

3.3.2.3 Channels

In the Channels window, shown in Figure 47, each channel can be given a unique name, such as LHCP, RHCP, or Combined. Check boxes are also provided to enable or hide channels. Selection buttons (Center parameter) change the layout in the graphical view.

Enabled	Center Name
<input checked="" type="checkbox"/> Channel 1	Channel 1
<input checked="" type="checkbox"/> Channel 2	Channel 2
<input checked="" type="checkbox"/> Combiner	Combiner

Figure 47: Settings, Channels

3.3.2.4 Bit Error Rate Tester (BERT)

The RDMS integrates an internal BERT. In order to log information for this BERT, setup information is necessary to identify the PN sequence. Use the drop down menu to select the desired pattern, as shown in Figure 48. The check box enables or disables the BERT option.

Bit Error Rate Tester (BERT)

☒ Enable BERT

PN Sequence

- PN11
- PN6
- PN9
- PN11**
- PN15
- PN17
- PN20
- PN23
- PN31

PCM Frame Detection

☒ Enable PCM Frame Detection

Figure 48: Settings, BERT with Drop Down PN Sequence Menu

3.3.2.5 PCM Frame Detection

The RDMS integrates internal PCM frame detection, including statistics regarding frame drops. In order to enable PCM Frame detection, setup information is required to identify the frame header and size, as shown in Figure 49. The check box enables or disables PCM frame detection. Use the Pattern (Figure 50), Frame Length, and Advanced fields to set up the desired parameters. Note this functionality only works when data is unencrypted.

For detailed information about the PCM Framer/Deframer, refer to the Installation and Operation Manual for the 3rd Generation Rack Mount RDMS™ Telemetry Receiver, Appendix D.

PCM Frame Detection

☒ Enable PCM Frame Detection

Pattern (Bits, Hex, Binary) 16 bits-- 0xEB90-- 111 010 111 001 000 0

Frame Length 1024 bits

Advanced 0, 0, 16, 16 slip, errors, lock thresh, unlock thresh

Figure 49: Settings, PCM Frame Detection

PCM Frame Detection

☒ Enable PCM Frame Detection

Pattern (Bits, Hex, Binary) 16 bits-- 0xEB90-- 111 010 111 001 000 0

Frame Length 1024 bits

Advanced 0, 0, 16, 16 slip, errors, lock thresh, unlock thresh

Advanced Control

Figure 50: Settings, PCM Frame Detection, Pattern Drop Down Menu

3.3.2.6 Advanced Control

Advanced Control functions include the ability to skip the Pre and Post log State Report, using the check box. This is NOT recommended, as very valuable information is contained in these reports to troubleshoot mission issues. Also, the Status Period, or the time between log samples, is selectable. The Status Period can be changed if more frequent or less frequent status updates are required, as shown in Figure 51. Good performance has been achieved as low as 500 ms, but may be limited by PC performance. One second (1000 ms) is recommended.

Advanced Control

☒ State Report

Status period 1000 milliseconds

Figure 51: Settings, Advanced Control with Status Period Drop Down Menu

3.3.3 RDMS Rack RDMS Control

The third selection button accesses the RDMS Rack RDMS Control screen, if a successful Ethernet connection is made, as shown in Figure 52.

RDMS Rack 1004 Cincy 2018-11-20 14:40:11

Disconnect Unit Status Logger Settings **RDMS Control** Terminal Tools

RDMS Identification More/Less

Model	3rd gen rdms: 1u1u	DHCP	ON
Serial	3044	IP Address	192.168.3.22
Version	16rc7	Netmask	255.255.0.0
Alias	rdms3	Gateway	192.168.0.1
		MAC Address	70:b3:d5:23:c0:42
		HTTPS	OFF

Settings Refresh

Presets: preset_0: empty Load Preset Save Preset Clear Preset Submit

<p>Channel 1 More/Less</p> <p>Mode: PCMF</p> <p>LDPC Mode: K=4096 R=2/3</p> <p>Frequency: 2200.5</p> <p>Bitrate: 10.0</p> <p>Measured Bitrate: 10.0</p> <p>Equalizer: OFF</p> <p>Data Quality Encap: OFF</p> <p>Derandomizer: OFF</p> <p>Differential Decoding: ON</p>	<p>Combiner</p> <p>Combiner: ON</p> <p>Freq Diversity: OFF</p> <p>Mode: Maximal Ratio</p> <p>BCS: ON</p> <p>Time Aligner: OFF</p>	<p>Channel 2</p> <p>Mode: PCMF</p> <p>LDPC Mode: K=4096 R=2/3</p> <p>Frequency: 2200.5</p> <p>Bitrate: 10.0</p> <p>Measured Bitrate: 10.0</p> <p>Equalizer: OFF</p> <p>Data Quality Encap: OFF</p> <p>Derandomizer: OFF</p> <p>Differential Decoding: ON</p>
---	--	---

Figure 52: RDMS Control Screen

RDMS Control screen uses the Quasonix API communication over the IP connection. It allows the Status Logger to access and modify basic, essential parameters in the RDMS, such as mode, frequency, bit rate, and combiner control. For the most part, features that are available from the RDMS front panel, or via the Browser Interface are accessible. This provides a lightweight control interface.

Of significant importance, the API interface is a primary, regulated means of controlling the RDMS. The Status Logger serial connection is effectively a “back door” means of communicating directly with the channel “bricks” in the RDMS. The controller in the RDMS receiver is unable to manage the “back door” communication with the bricks. So, while it is possible to modify settings using the serial ports, either in the logging software, or using the Terminal (explained later), this is not recommended, as the RDMS controller will be unaware of changes in the brick parameters, and these will not be reflected in the front panel display.

3.3.3.1 RDMS Identification

The RDMS Identification section is read only information that is also found on the receiver System Info screen.

3.3.3.2 Settings

The Settings section, shown in Figure 53, enables preset functionality. Drop down menus provide the ability to change some settings for receiver Channel 1, Channel 2, and the Combiner. Other settings may be changed by typing directly into the field.

Refresh button – Refreshes all connected receivers with updated settings

Submit button – While all of the preset information described in this section display on the Status Logger Settings screen immediately, they **do not** take effect on the connected receiver(s) until the user clicks on the Submit button.

Figure 53: RDMS Control, Settings

3.3.3.2.1 Presets

The Presets drop down menu contains a list of eight (8) possible saved setup files, as shown in Figure 54.

Save Presets

After changing receiver settings as desired, use the drop down menu to select a specific preset slot, or use the default empty position. Click on the Save Preset button.

Figure 54: RDMS Control, Settings-Preset Drop Down Menu

In the Preset Name window, shown in Figure 55, type a name for the new preset. Click on the OK button. The name in the Presets drop down menu now shows the slot number and the new name.

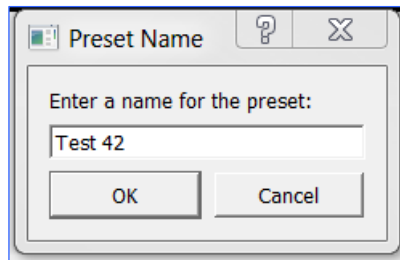


Figure 55: Preset Name

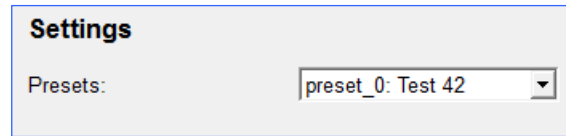


Figure 56: Preset 0 Changed

Load Presets

To load a preset, use the Presets drop down menu to select the preset to load. Click on the Load Preset button. The Channel 1, Channel 2, and Combiner parameters redisplay with the parameters from the preset.

Click on the Submit button to update the connected receiver with the new settings.

If you get the error message shown in Figure 57, it means that the RDMS serial number (shown in the RDMS Identification section, Figure 58) does not match the serial number of the RDMS selected from the Library list (Figure 59).

1. Disconnect from the RDMS.
2. Go back to the RDMS Connection Manager, Library Tab, then edit the RDMS S/N field.
3. Click on the Submit button.
4. Click on OK in the Save message.
5. Click on the Connect/Disconnect Tab, then check the box for the RDMS with the corrected serial number.
6. Click on the Connect button, then select RDMS Control.

The serial number should match the one from the Library list. Follow the Load Presets instructions as before.

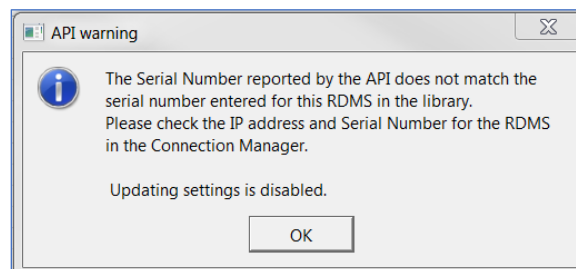


Figure 57: API Serial Number Mismatch Warning Message

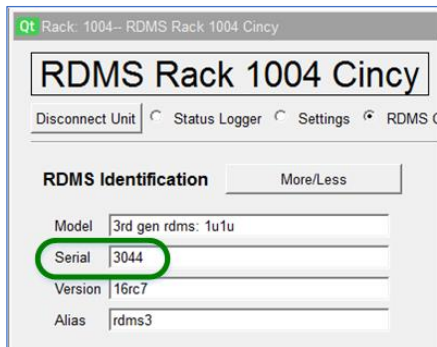


Figure 58: RDMS Rack Serial Number



Figure 59: RDMS Serial Number Typed Into Library List

Refresh Button

Click on the Refresh button to update multiple connected receivers.

Clear Presets

The Clear Preset button deletes saved presets. To clear/delete a preset, use the Presets drop down menu to select the preset to remove, as shown in Figure 60. Click on the Clear Preset button. The Clear Preset message, shown in Figure 61, provides one last chance to be sure you want to delete the preset. If so, click on the Yes button. The preset reverts to empty as shown in Figure 63.

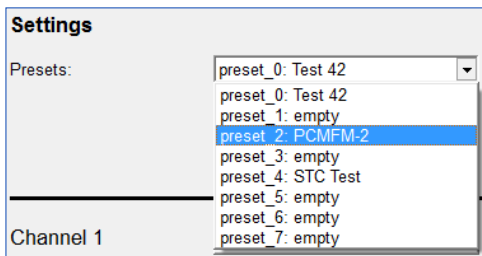


Figure 60: Preset 2 in Drop Down Menu

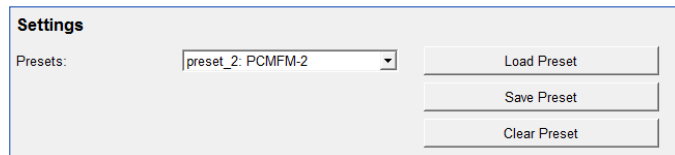


Figure 61: Preset 2 Selected to Clear

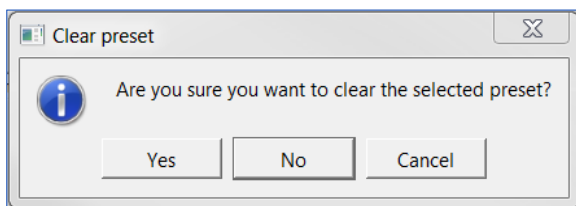


Figure 62: Clear Preset, Are You Sure Message

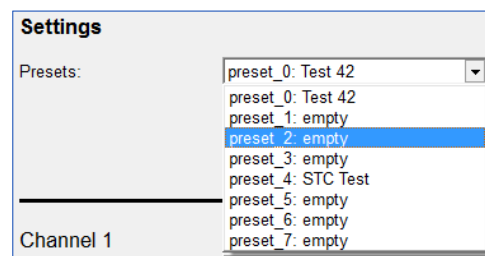


Figure 63: Preset 2 Empty

3.3.4 RDMS Rack Terminal

The fourth selection button accesses the RDMS Rack Terminal screen, as shown in Figure 64.

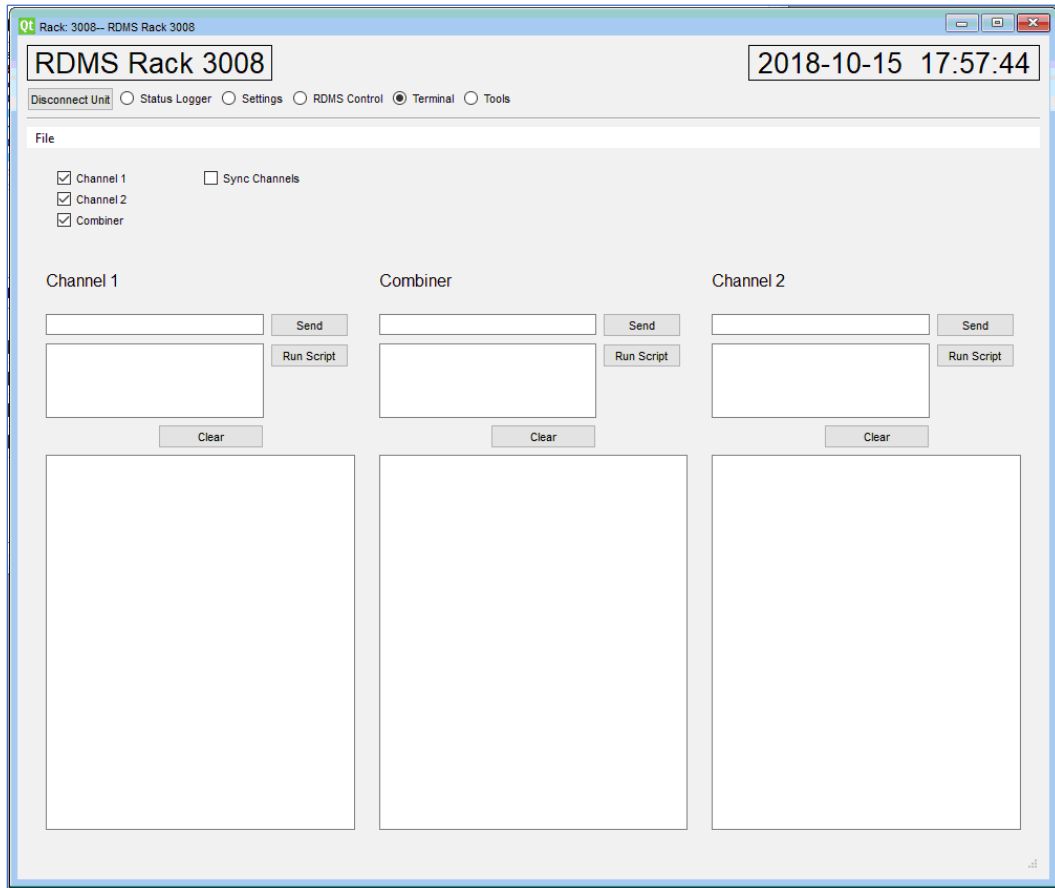


Figure 64: RDMS Rack, Terminal Screen

The Status Logger direct serial connection to the receiver channel bricks provides a low level communication path for commanding and getting status from the bricks. Similar to the transmitter product control, a complete set of (generally) two-letter commands communicates directly with the controller running in the channel brick. This exposes a wide range of extended functions and capability, which is sometimes helpful in troubleshooting or specific field applications. In fact, the Status Logger makes use of this protocol to obtain status.

The Terminal provides a simple means to achieve this communication when necessary. Keep in mind that the terminal exposes advanced capability, that if done incorrectly, can render a channel of the RDMS inoperable until the state is restored or power is cycled. Further, the controller at the RDMS unit level is unaware of commands or mode changes sent to the bricks using the serial interface. It is NOT recommended that the Terminal be used unless the user has some experience with the protocol.

3.3.5 RDMS Rack Tools

The fifth selection button accesses the RDMS Rack Tools screen, as shown in Figure 65.

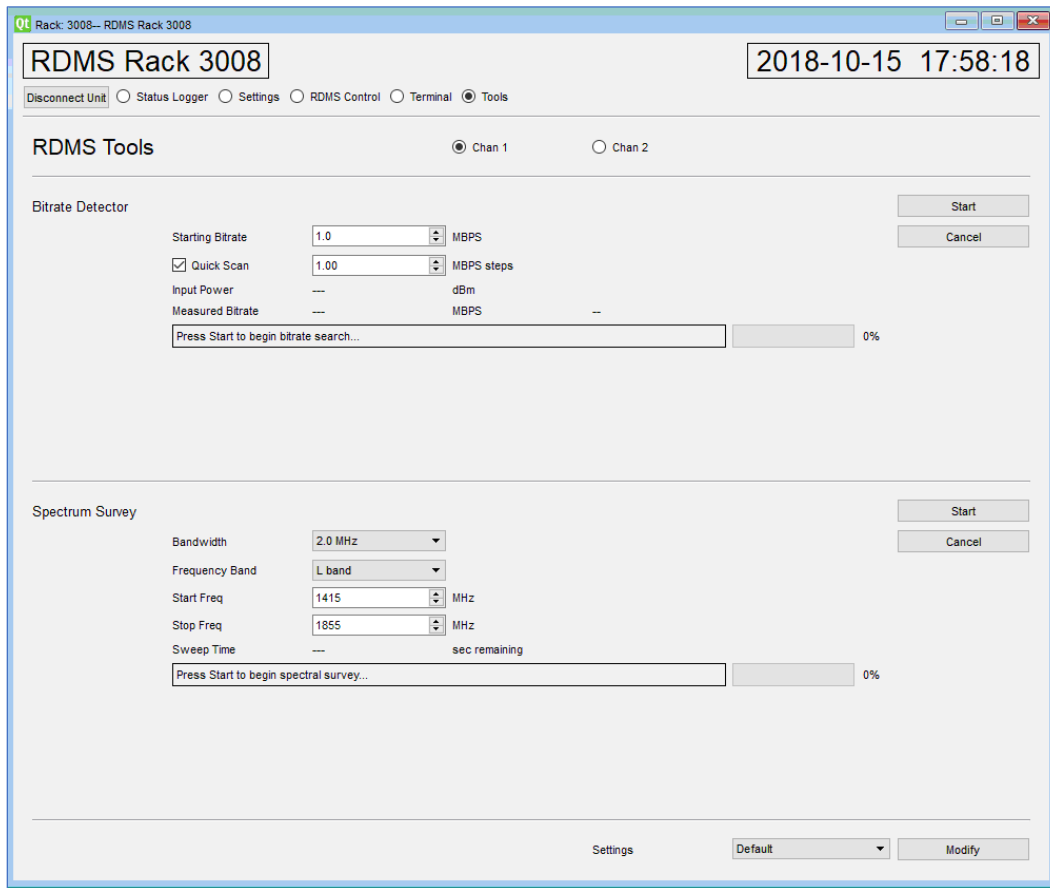


Figure 65: RDMS Rack Tools Screen

In some mission environments, bit rates are sometimes not communicated accurately between the mission specialists who set up the target transmitter and the specialists responsible for setting up the receiver equipment. Users have requested the ability to automatically detect the bit rate, given the mode and frequency. The RDMS Tools screen incorporates an automatic bit rate detection function.

Further, though most mission systems employ a spectrum analyzer, it is sometimes helpful to view the spectrum specifically viewed at the receiver input. The Tools screen incorporates a spectral survey function that operates similar to a spectrum analyzer to view the spectrum seen at the receiver input. This may be helpful to view interference and other anomalies that could affect mission telemetry effectiveness.

3.4 Log Status

As mentioned in section 3.3.1.1, the main screen contains a control section with buttons and log operation status information. This section contains buttons to start and stop logging, indicators to confirm logging is being performed, a max log time setting, annotation controls, and settings information, as shown in Figure 66.

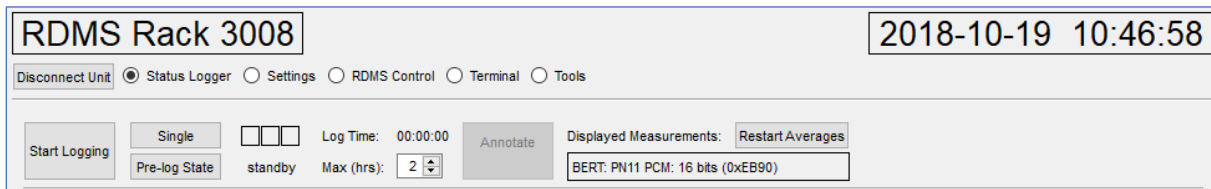


Figure 66: Status Logger Control Section

The Status Logger provides two options for logging. The first, called “Single” simply obtains status information for a single point. This status is not saved to disk, but does update the displayed measurements. It is provided to confirm proper receiver and logger setup.



Figure 67: RDMS Rack Main Screen, Start Logger and Single Buttons

The Start Logging button starts a regular logging operation, as shown in Figure 68. The three indicator lights display green as data is captured from each channel. The timing for available data from each channel is asynchronous, so the indicators may not light simultaneously. After logging starts, the text on the Start Logging button changes to Stop Logging.



Figure 68: Regular Logging Started, Indicator Lights Green

A normal logging operation starts by running a pre-log state report that captures important state information for each of the three channels. This report contains simple state information such as mode, frequency, and bit rate, but also includes a wealth of other receiver settings. This is very useful to precisely capture the complete state of the receiver to document the mission setup, and to troubleshoot issues if they arise. The state report receives a lot of information from each channel. It takes approximately 15 seconds for each connected receiver, which delays the start of logging. Although this is usually not an issue, if it is preferable to begin logging immediately, use the Pre-log State button to queue the receiver for immediate logging, as shown in Figure 69.



Figure 69: RDMS Rack Main Screen, Pre-log State Button

To stop logging, click on the Stop Logging button, as shown in Figure 68. The Status Logger runs a post-log state report and saves all files for the log operation.

The Status Logger uses the same serial bus to each receiver channel that the rack controller (front panel and Browser Interface) uses. As the mux to this interface is unmanaged, collisions are possible. To avoid collisions with the rack controller, the Status Logger sends minimal query and/or setup information. The Status Logger uses the timing in each brick to produce the logged samples at a constant rate. These timers do not share a common reference and so are asynchronous. The logged samples are timestamped, but subject to the initial time setting of the channel, as well as to the timing precision of the channel hardware (generally better than 1 ppm).

The Annotate button, as shown in Figure 70, is provided to allow the user to mark a “footnote” in the log file. Often while observing a mission, it is necessary to make note of significant events. The annotation value (sequential number) is recorded in the log file with the corresponding sample. This “footnote” is very helpful when reviewing data for the mission. Be sure to make detailed notes for the footnote indicators (1 is mission event xyz, 2 is event abc, and so forth). An example of annotations in the log file is shown in Figure 71.

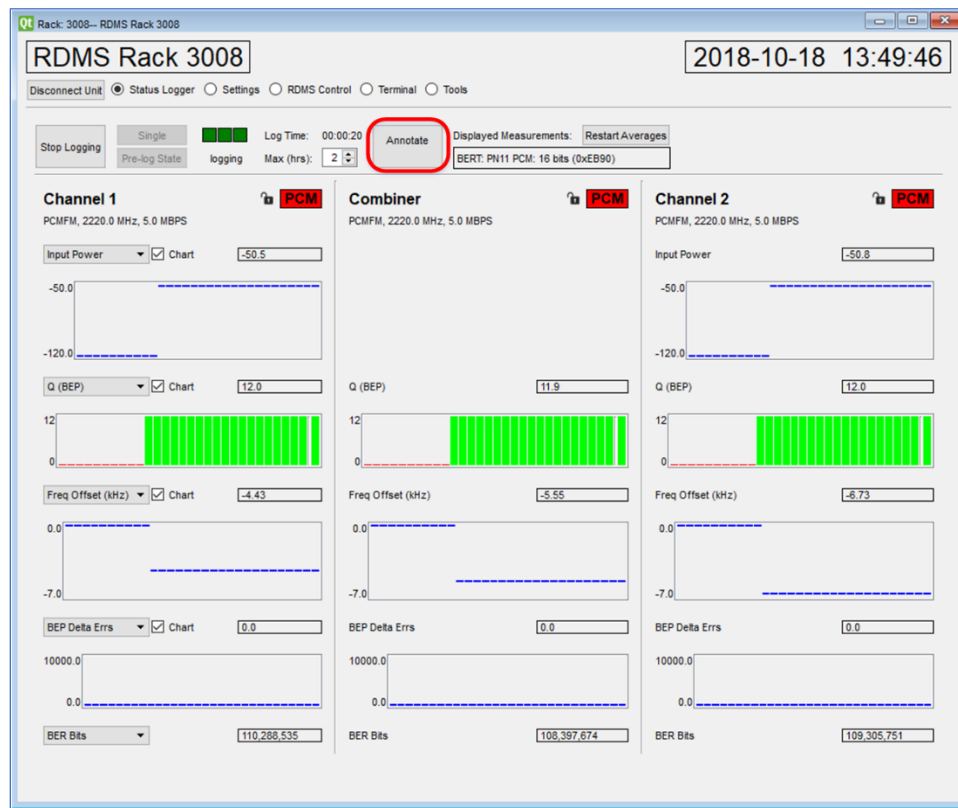


Figure 70: RDMS Rack Main Screen, Annotate Button Circled

	A	B	C	D	E	F	G	H	I	J	K	L
1	channel	sys_time	sys_date	time_of_c	test_time	annotate	input_pwr	bitrate	lock	ebno	afc_detec	afc_comp
2	1	23:55:28.4	2018/11/7	11:58:13.4	0:00:00:0	0	-68.11	9.999982	1	20.89	-11.488	0
3	2	20:37:32.4	2018/11/7	11:58:13.4	0:00:00:0	0	-68.09	9.999985	1	18.3	0.378	0
4	3	23:12:29.4	2018/11/7	11:58:13.4	0:00:00:0	0	-138.31	9.999981	1	20.15	-8.378	0
5	1	23:55:29.4	2018/11/7	11:58:14.4	0:00:00:0	1	-68.05	9.999982	1	19.77	15.426	0
6	2	20:37:33.4	2018/11/7	11:58:14.4	0:00:00:0	1	-67.96	9.999983	1	20.18	3.788	0
7	3	23:12:30.4	2018/11/7	11:58:14.4	0:00:00:0	1	-138.31	9.999979	1	20.04	7.071	0
8	1	23:55:30.4	2018/11/7	11:58:15.4	0:00:00:0	0	-67.99	9.999982	1	21.01	4.05	0
9	2	20:37:34.4	2018/11/7	11:58:15.4	0:00:00:0	0	-68.09	9.999983	1	21.02	2.57	0
10	3	23:12:31.4	2018/11/7	11:58:15.4	0:00:00:0	0	-138.31	9.999981	1	19.95	-8.539	0
11	1	23:55:31.4	2018/11/7	11:58:16.4	0:00:00:0	0	-68.11	9.999982	1	22.07	-2.186	0
12	2	20:37:35.4	2018/11/7	11:58:16.4	0:00:00:0	0	-68.02	9.999983	1	19.74	2.515	0
13	3	23:12:32.4	2018/11/7	11:58:16.4	0:00:00:0	0	-138.31	9.999979	1	21.4	-9.63	0
14	1	23:55:32.4	2018/11/7	11:58:17.4	0:00:00:0	0	-67.93	9.999982	1	19.79	21.974	0
15	2	20:37:36.4	2018/11/7	11:58:17.4	0:00:00:0	0	-67.96	9.999983	1	20.13	2.476	0
16	3	23:12:33.4	2018/11/7	11:58:17.4	0:00:00:0	0	-138.31	9.999981	1	19.45	-22.764	0
17	1	23:55:33.4	2018/11/7	11:58:18.4	0:00:00:0	0	-68.11	9.999983	1	20.35	7.455	0
18	2	20:37:37.4	2018/11/7	11:58:18.4	0:00:00:0	0	-68.09	9.999985	1	20.59	24.617	0
19	3	23:12:34.4	2018/11/7	11:58:18.4	0:00:00:0	0	-138.31	9.999979	1	18.95	-5.825	0
20	1	23:55:34.4	2018/11/7	11:58:19.4	0:00:00:0	2	-68.05	9.999982	1	21.86	-19.488	0
21	2	20:37:38.4	2018/11/7	11:58:19.4	0:00:00:0	2	-67.9	9.999983	1	19.65	15.988	0
22	3	23:12:35.4	2018/11/7	11:58:19.4	0:00:00:0	2	-138.31	9.999981	1	21.24	-12.923	0
23	1	23:55:35.4	2018/11/7	11:58:20.4	0:00:00:0	0	-68.05	9.999982	1	20.19	11.065	0

Figure 71: Example status_log.csv File with Event Annotations

The diagram in Figure 72 shows the files and folders created for each session. For additional details about session log management, refer to section 3.7.3.4.

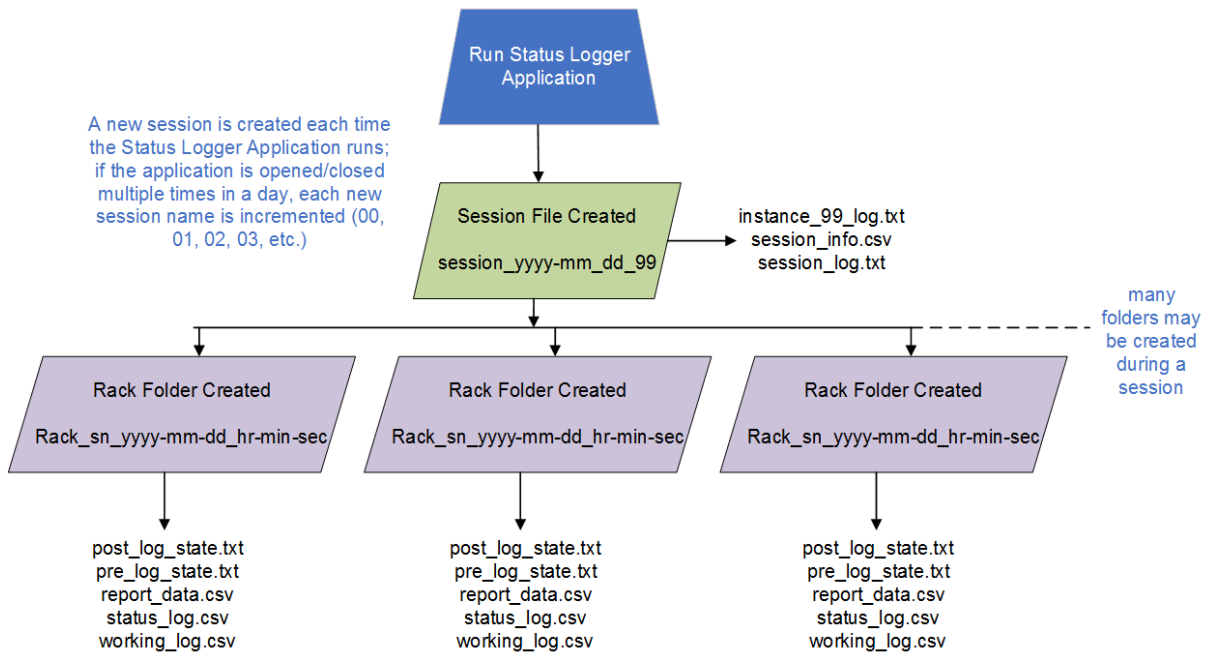


Figure 72: Session File and Folder Creation

3.5 Real-time Measurements

The graphics and measurement values described in section 3.3.1.2 are useful to monitor telemetry progress as the mission occurs. An example for one channel is shown in Figure 73.

The channel title is located at the top of the section. Below the title, the mode, frequency, and bit rate display. These are only updated at the starting of logging.

To the right of the title are icons for Lock and PCM lock. The lock indicator mirrors the bit lock indication on the front panel of the RDMS receiver. The PCM lock indicator turns green if the PCM frame header is found, as set on the RDMS Rack Settings screen.

The measurements (up to five) show the last measured value, and if a chart is available and shown, the graphic shows history for the last 30 status readings, with the most current reading at the right edge.

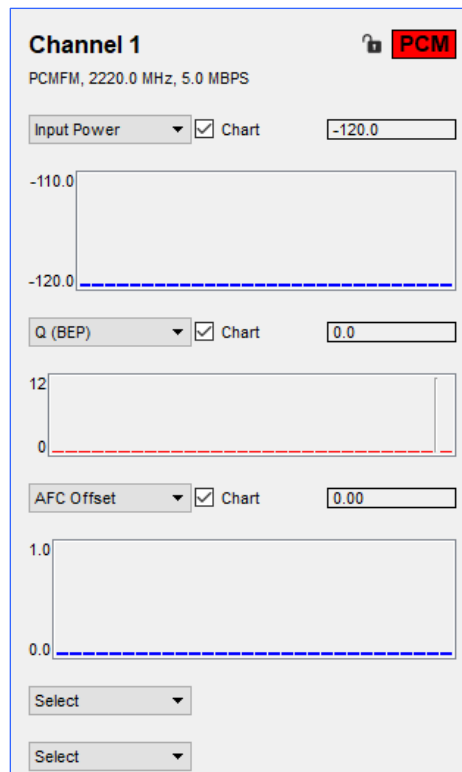


Figure 73: RDMS Rack Main Screen, Channel 1 Measurements

Most of the measured values are self explanatory. Two measurements, BEP (bit error probability) and BER, have a Q value display. This value for BEP is the same Q value displayed on the RDMS front panel or in the Browser Interface. This value is effectively the exponent x if the BEP is expressed as:

$$BEP=1x \left[10 \right] ^x$$

For example, a value of 10 indicates a BER of 10e-10. The BER Q display is designed to show BER using the same units.

It is important to note that the selections in these displays do not affect what is being logged.

In the drop down menus, two of the selections are Average BER and Average DQM. These measurements are locally calculated in the application using delta values from the status update process. To reset these values, select the Restart Averages button, as shown in Figure 74. The average values are for observation only and have no impact on the status information being logged.

The BERT and DQM averaging in the Status Logger can also be restarted by clicking on the Restart Averages button. This averaging is local to the Status Logger and does not affect the internal RDMS BERT values.

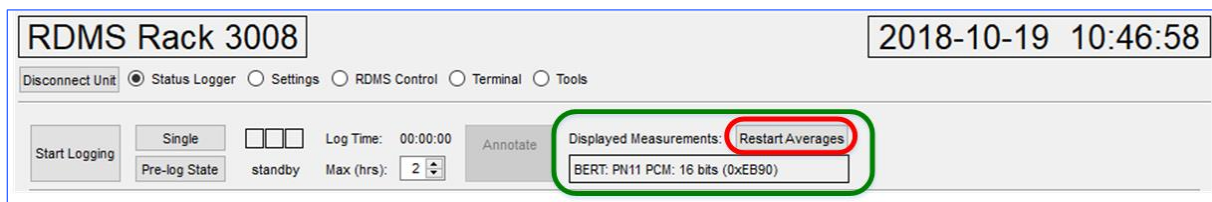


Figure 74: Restart Averages for BERT DQM Button

3.6 Terminal Mode

The Status Logger provides a means to communicate directly with the receiver channels over the serial communications bus. On the menu bar select Terminal -> User Terminal. The Terminal screen displays, as shown in Figure 75. Commands or queries can be sent directly to the receiver brick, bypassing the RDMS front panel controls. This gives access to a large number of commands and queries that are not available through the browser or front panel. **This functionality is considered an advanced user capability, so it is not recommended that random commands be sent without training or assistance.**

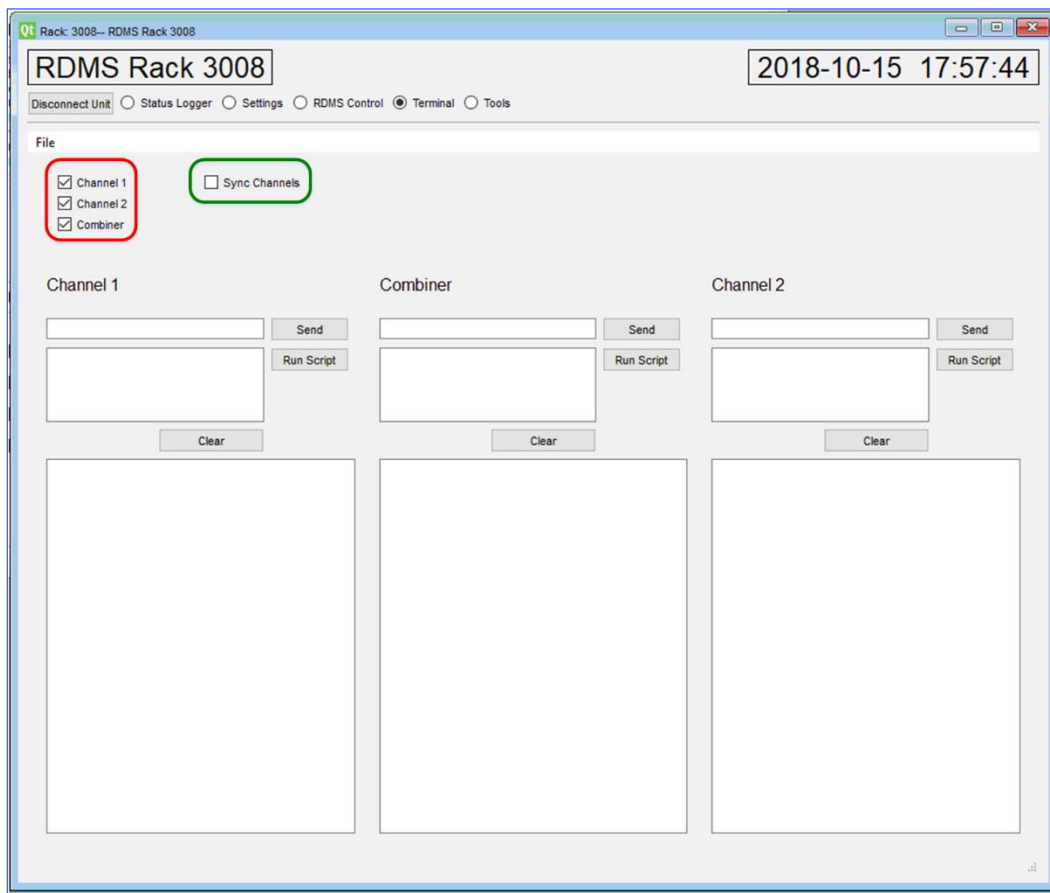


Figure 75: RDMS Rack Terminal Screen

Check boxes are provided to show/hide channels in the terminal. Click on the Sync Channels check box to send the same command to displayed channels.

To send a single command:

1. Type the command for the appropriate channel using the single line text box beneath the channel title, as shown in Figure 76.
2. Click on the Send button.

The response from the channel brick displays in the large text box below the Clear button.

For example, the result from “fr”, which queries the brick carrier frequency, is shown in Figure 77.

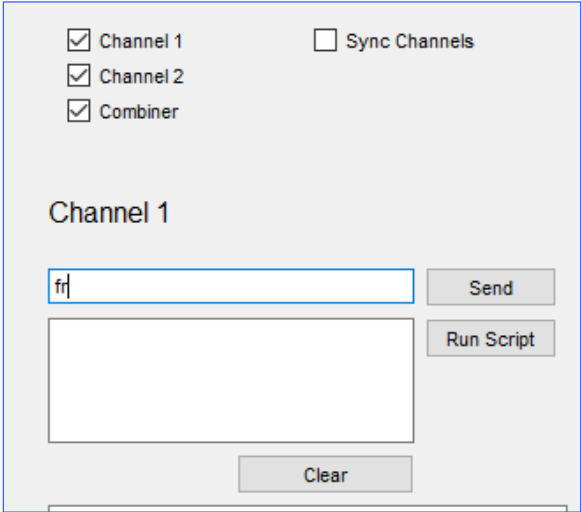


Figure 76: Terminal Screen, Text Command

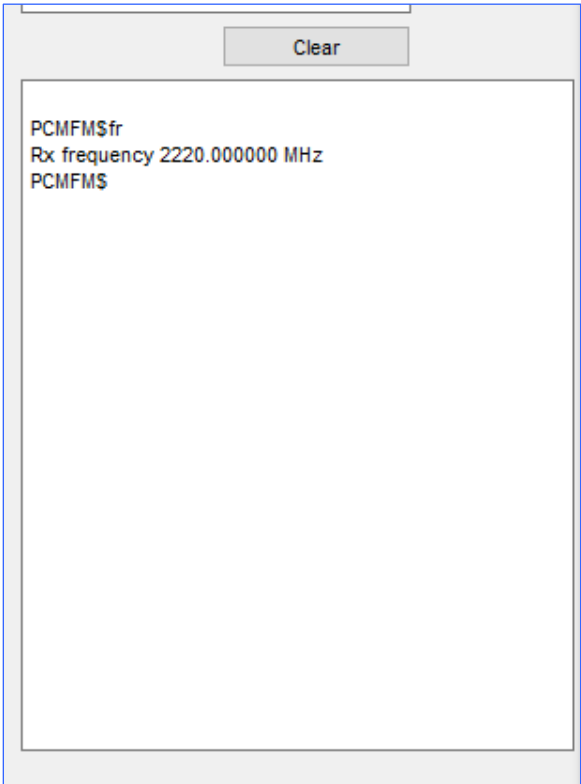


Figure 77: Terminal Screen, Text Command with Response

The Terminal maintains a stack of previously entered commands that can be recalled using the up and down arrows or scroll bar, similar to many terminal applications. For example, the command “fr” in the previous example can be recalled by clicking on the up arrow or scrolling up, as shown in Figure 78.

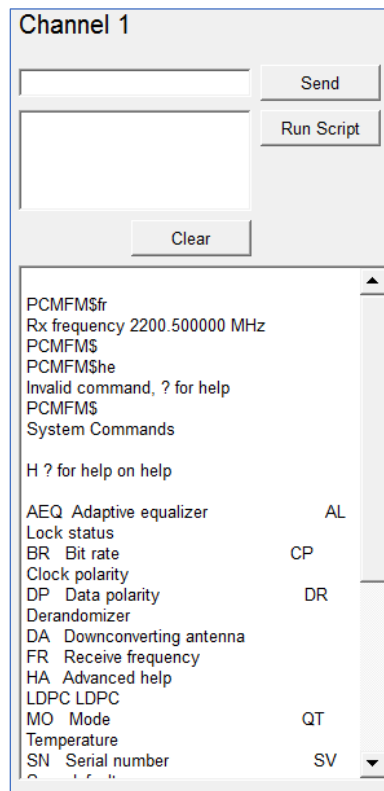


Figure 78: Terminal Screen, Full Response Window with Scroll Bar

3.6.1 Scripting Mode

The RDMS Rack Terminal screen also supports scripting. To run a script:

1. Type the script into the larger text box below the channel title, as shown in Figure 79.
2. Click on the Run Script button. (The keyboard Enter button will not send the script as it is used to enter a new line in the script).

The channel brick response displays in the large text box below the Clear button.

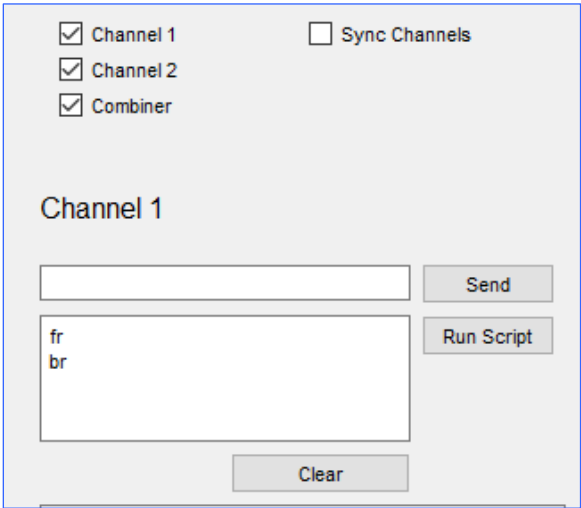


Figure 79: Rack RDMS Terminal Screen with Script Command Window

An example script to display the frequency and bit rate is shown in Figure 80.

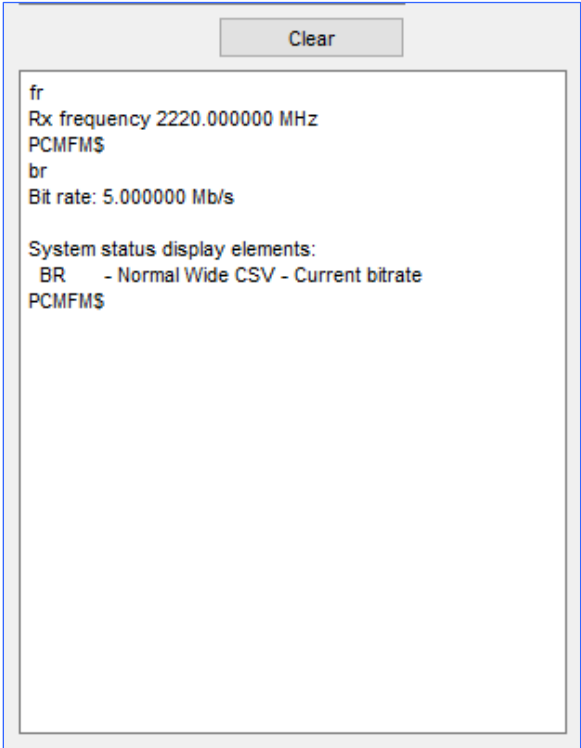


Figure 80: Terminal Screen with Example Response

3.7 Additional Main Menu Options

The Main Menu bar provides the following options: Exit, Setup, View, and Logging, as shown in Figure 81.

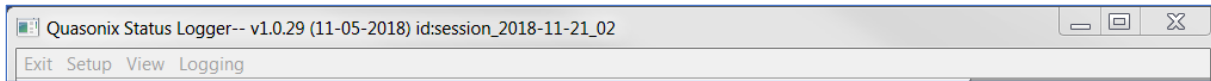


Figure 81: Main Menu Bar

3.7.1 Exit Menu

The Exit Menu consists of one selection, Exit Application, as shown in Figure 82. Select Exit Application to close the Status Logger software.

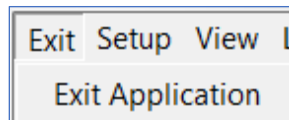


Figure 82: Exit Menu

3.7.2 Setup Menu

The Setup Menu provides five menu options: Connection Manager, Refresh License Info, Add License Key, Get Unique ID, and Set Date and Time.

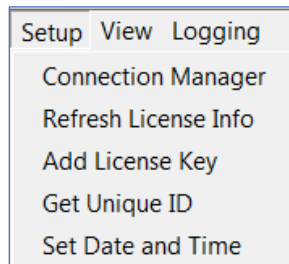


Figure 83: Setup Menu

3.7.2.1 Connection Manager

The Connection Manager, shown in Figure 84, is discussed in detail in section 3.

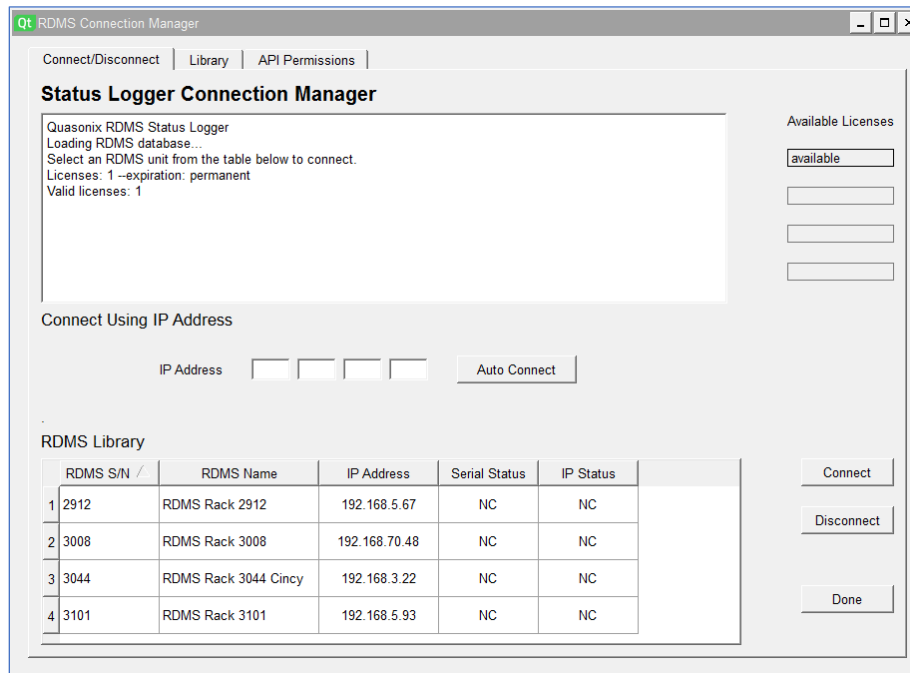


Figure 84: Status Logger Connection Manager

3.7.2.2 Refresh License Info

Refresh License Info updates the contents of the Status Logger Connection Manager status window, as shown in Figure 85. This selection is discussed in section 2.2.1.1.2 in the context of a first time install, however it may be used at any time to display available license information.

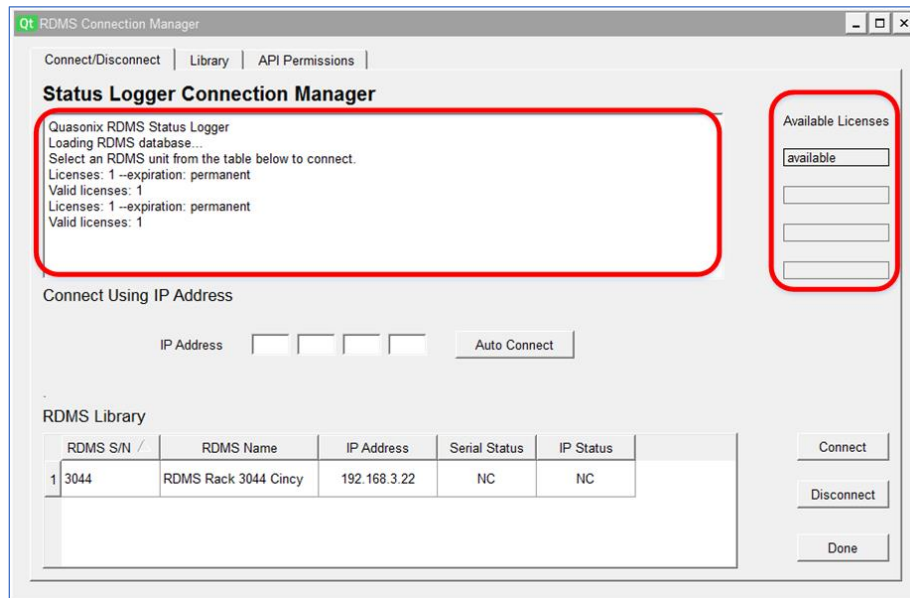


Figure 85: Status Logger Connection Manager, Refresh License Status Windows

3.7.2.3 Add License Key

Some license keys have expiration dates, such as those provided for a demo Status Logger. The Add License Key option enables the user to enter a permanent license key into the Status Logger, such as when someone with a demo wants to buy the Status Logger, or when someone using a 1U Status Logger only purchased one channel license and wants to add more licenses. Upon purchase, Quasonix provides the license key to type in the License Key window.

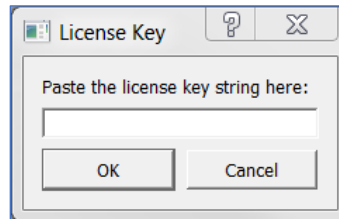


Figure 86: Setup, License Key Window

3.7.2.4 Get Unique ID

Get Unique ID displays the license ID numbers for all valid Status Logger licenses. All licenses must match the purchased Status Logger. This is useful for someone who wants to extend a license but doesn't remember the ID number for a particular Status Logger. This screen provides the unique license ID number that can be provided to Quasonix.

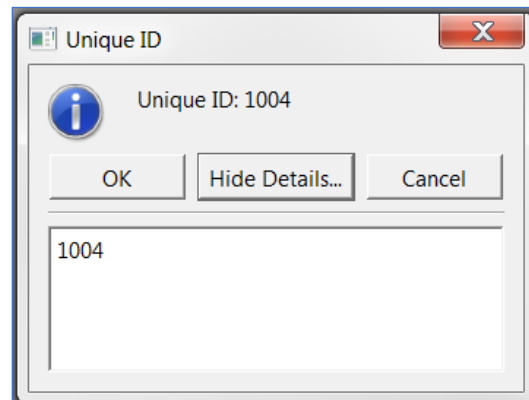


Figure 87: Setup, Get Unique ID Window

3.7.2.5 Set Date and Time

The Set Date and Time option are greyed out for Windows users. The time setting may be adjusted via the Windows operating system date and time settings. The screen shown in Figure 88, is used for the 1U internal controller version.

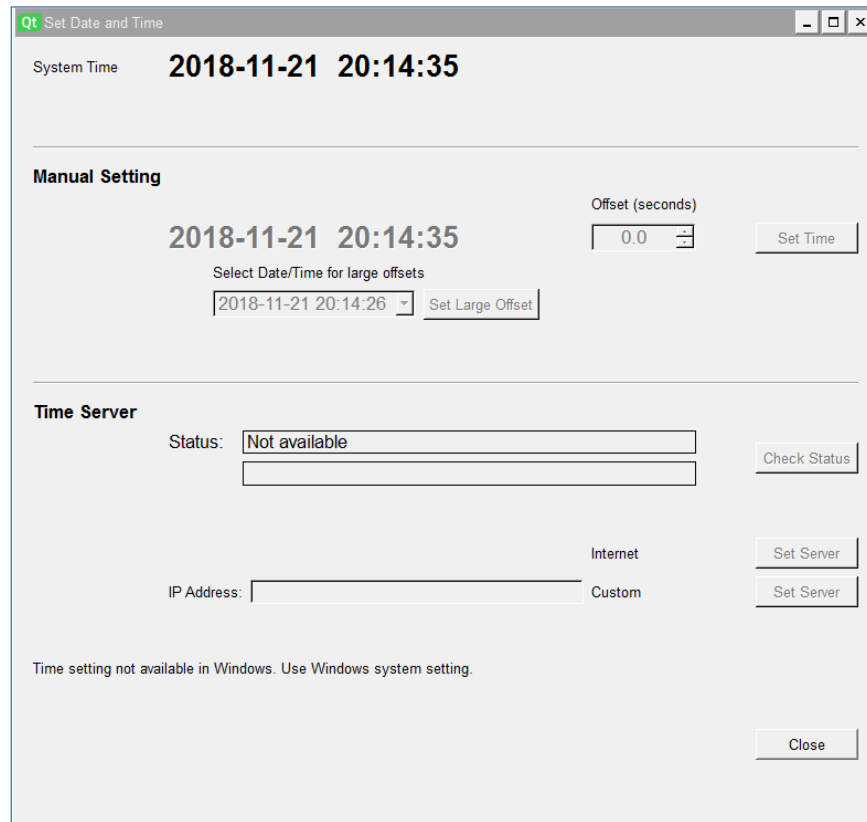


Figure 88: Setup, Set Date and Time Window

3.7.3 View Menu

The View Menu provides five options: Tile Windows, Cascade Windows, Show Connection Manager, Show Session Manager, and Show Chart.

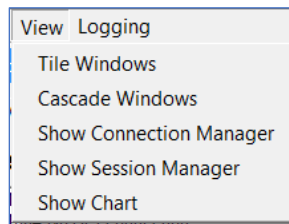


Figure 89: View Menu

3.7.3.1 Tile Windows

The Tile Windows option is only used when multiple receivers are connected. It allows multiple windows to be viewed simultaneously.

3.7.3.2 Cascade Windows

The Cascade Windows option displays all open Status Logger windows so that the title of each window is visible, as shown in Figure 90.

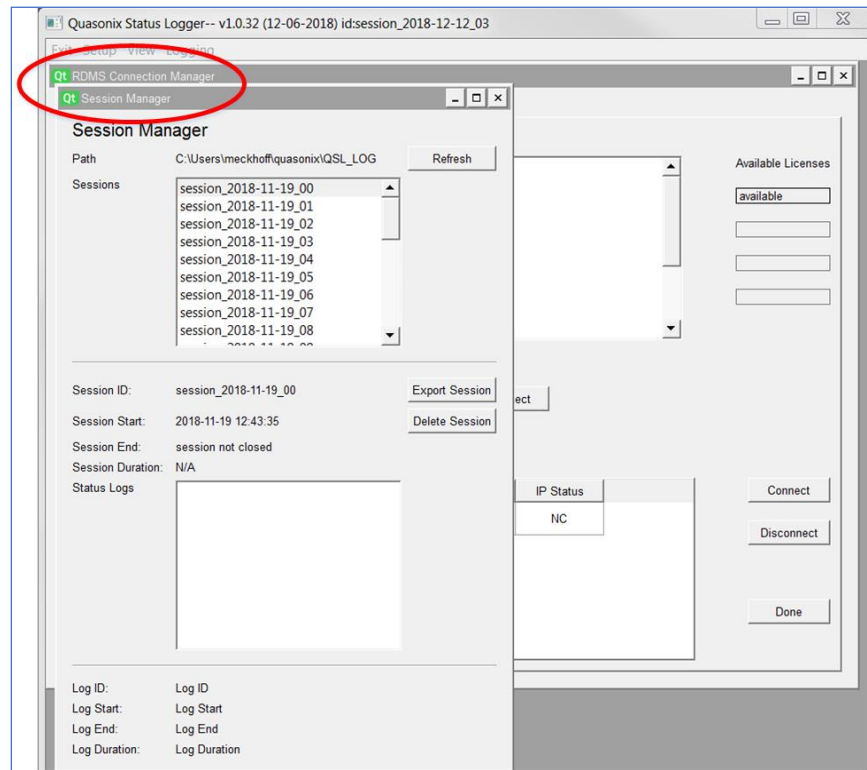


Figure 90: Status Logger with Cascade Windows Selected

3.7.3.3 Show Connection Manager

The Show Connection Manager option enlarges a minimized Connection Manager window or moves it to the front of the Status Logger application desktop (displaying the window on top of other open windows).

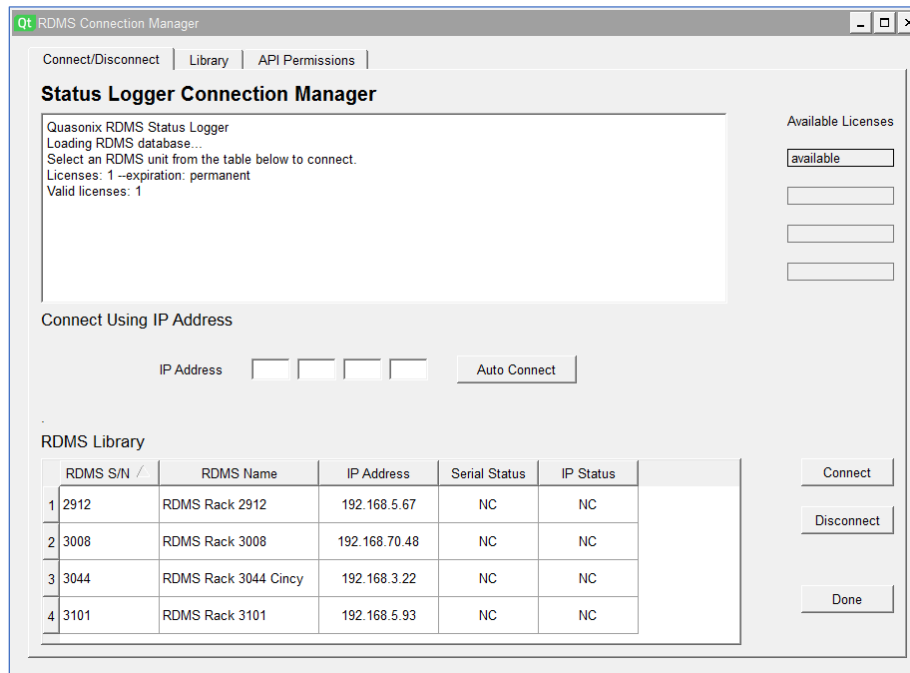


Figure 91: Status Logger Connection Manager

3.7.3.4 Show Session Manager

The Show Session Manager option opens the Session Manager screen, as shown in Figure 92. This screen shows names of the logged session folders and their storage location on the connected PC.

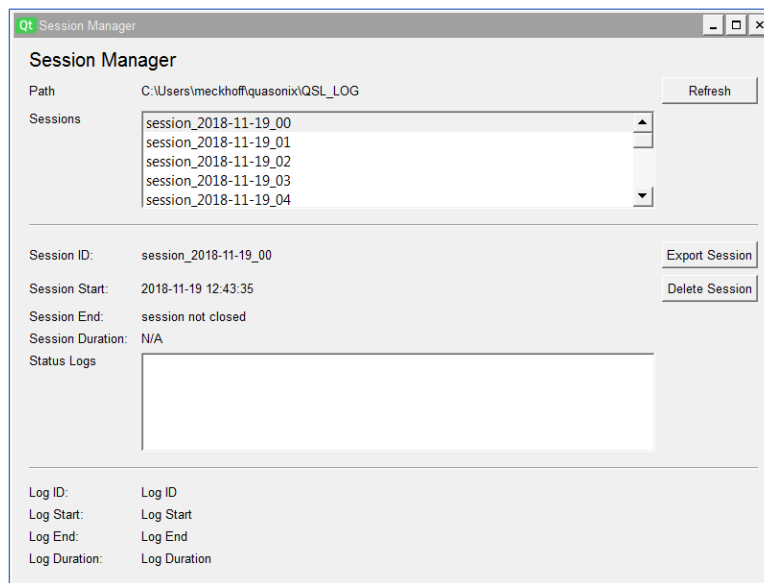


Figure 92: Session Manager

3.7.3.4.1 Session File and Folder Hierarchy

Files and folders are created for each session, as shown in Figure 93.

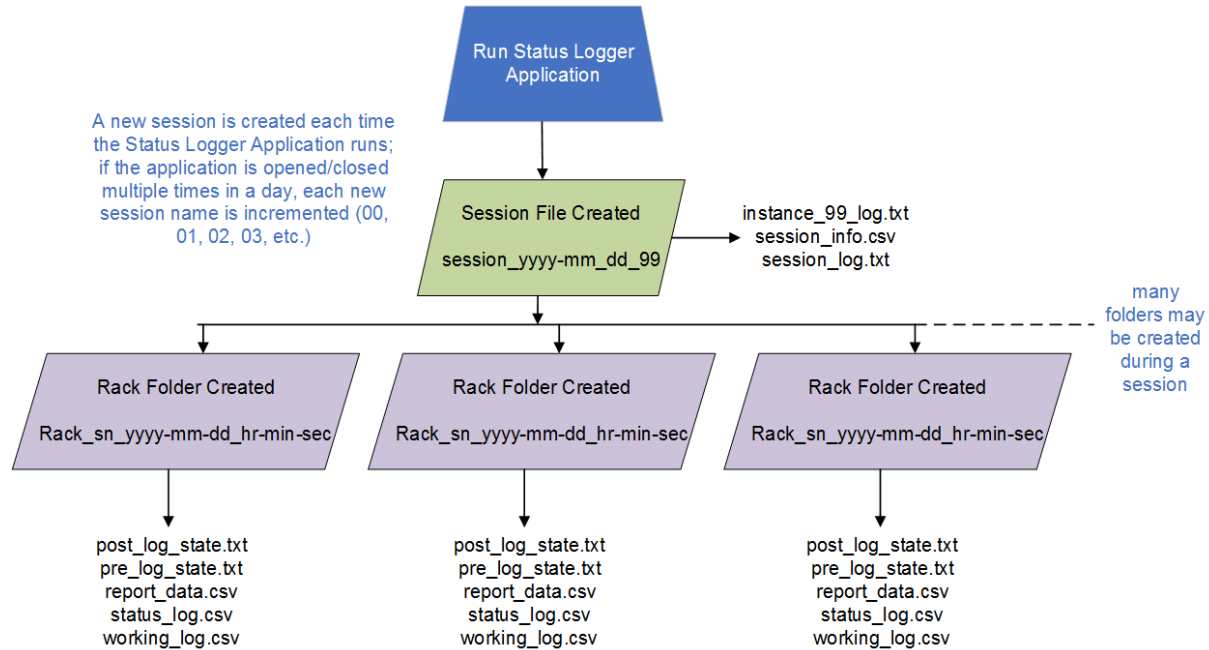


Figure 93: Session File and Folder Creation

The status files are saved to a folder on the selected drive (default is C:\Quasonix\RDMS Status Logger\log). Note the folder with the Rack Serial Number and date stamp. The folder contains the log files shown in Table 1.

Table 1: Status Logger Files

File Name	File Description
pre_log_state.txt	All receiver settings at the start of logging
post_log_state.txt	All receiver settings at the end of logging
status_log.csv	Comprehensive status log file
working_log.csv	Log file with most frequently used
report_data.csv	Report data to import into Linkview application

In Figure 94, session ID folder “session_2018-11-19_02” is selected. This causes the display in the middle of the screen to show basic details about the session, including the folder name (Session ID), start and stop time of the session, duration of the session, and any available status logs for the session, as shown in Figure 95.

A “session” is established (opened) at the time the Status Logger application starts. The session closes (ends) when the Status Logger application is closed.

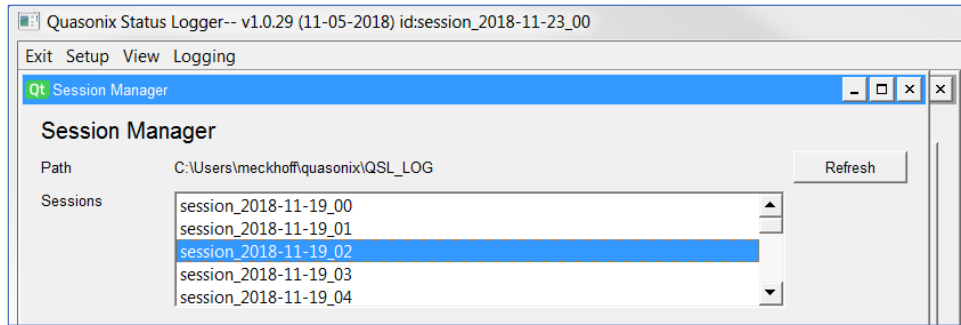


Figure 94: Session Manager, Session ID File Selected

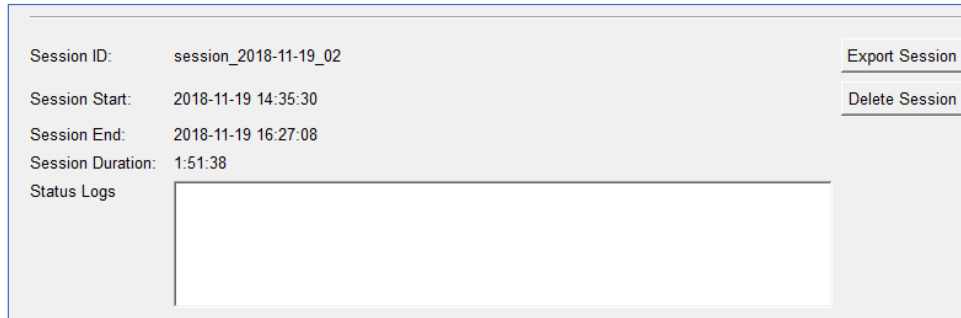


Figure 95: Session Manager, Session Details

The Export Session button provides the ability to save the contents of a session folder in a different location. The Delete Session button completely removes a session folder and its contents. A Delete Session message allows the user to verify deletion or cancel without deleting anything.

The Path parameter, shown in Figure 94, provides the location of the files associated with the session. Figure 96 shows an example Windows Explorer screen with the files and subfolder related to the session.

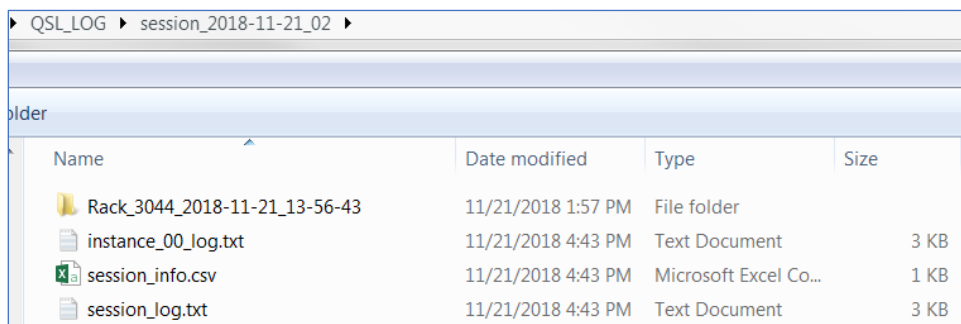


Figure 96: Session Folder with Associated Files Shown in Windows Explorer

The Rack_3044 folder (named with the receiver serial number, date, and time of the session) contains files describing Pre- and Post- log states, and spreadsheet files containing logs and other report data, as shown in Figure 97.

Name	Date modified	Type	Size
post_log_state.txt	11/21/2018 1:57 PM	Text Document	214 KB
pre_log_state.txt	11/21/2018 1:56 PM	Text Document	214 KB
report_data.csv	11/21/2018 1:57 PM	Microsoft Excel Co...	1 KB
status_log.csv	11/21/2018 1:57 PM	Microsoft Excel Co...	12 KB
working_log.csv	11/21/2018 1:57 PM	Microsoft Excel Co...	9 KB

Figure 97: Session Rack Folder with Associated Files Shown in Windows Explorer

A fragment of an example status log file is shown in Figure 98.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	channel	sys_time	sys_date	time_of_day	test_time	annotate	input_pwr	bitrate	lock	ebno	afc_detec	afc_comp	afc_mode	dqm_avg_	dqm_avg_	dqm_avg_	dqm_bits	dqm_errs
2	1	1:54:13.9	2018/11/21	13:56:56.96	0:00:00:0	0	-68.18	9.999982	1	21	-9.93	0	12	1.01E-12	1.01E-12	1.01E-12	1.38E+08	0.000139
3	2	22:36:17.	2018/11/21	13:56:56.76	0:00:00:0	0	-68.09	9.999983	1	18.6	-4.934	0	12	1.01E-12	1.01E-12	1.01E-12	1.35E+08	0.000136
4	3	1:11:14.9	2018/11/21	13:56:56.97	0:00:00:0	0	-138.25	9.999979	1	20.5	-5.19	0	12	1.01E-12	1.01E-12	1.14E-12	1.31E+08	0.000132
5	1	1:54:14.9	2018/11/21	13:56:57.97	0:00:00:0	0	-68.24	9.999982	1	20.3	-19.137	0	12	1.01E-12	1.01E-12	1.01E-12	10001920	1.01E-05
6	2	22:36:18.	2018/11/21	13:56:57.77	0:00:00:0	0	-68.03	9.999983	1	20.4	-20.25	0	12	1.01E-12	1.01E-12	1.01E-12	10001920	1.01E-05
7	3	1:11:15.9	2018/11/21	13:56:57.98	0:00:00:0	0	-138.31	9.999979	1	20.7	-2.175	0	12	1.01E-12	1.01E-12	1.14E-12	10001920	1.01E-05

Figure 98: Example Status Log File Fragment

Refer to Appendix A – Status File Definitions for additional details.

3.7.3.5 Show Chart

The Show Chart option opens the Mission Response screen, as shown in Figure 99. This screen provides a graph of selected log data for a specific session folder.

The Log Folders field enables selection using the drop down arrow, as does the Log Data field. An example of the Log Data drop down menu is shown in Figure 100.

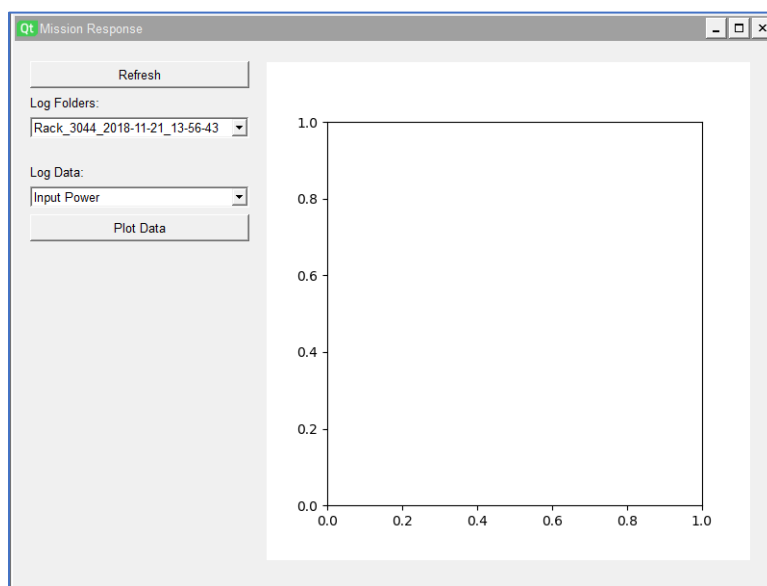


Figure 99: Mission Response Screen

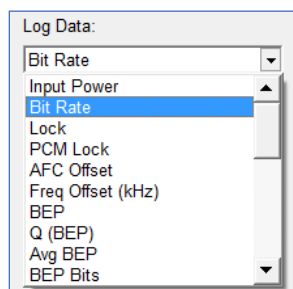


Figure 100: Mission Response, Log Data Drop Down Menu

After selecting the desired Log Folder and Log Data, click on the Plot Data button to create a graph, as shown in Figure 101.

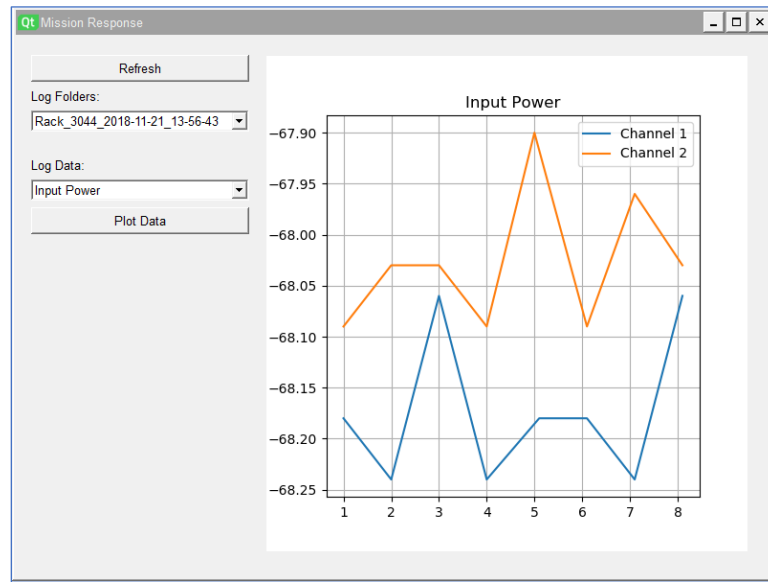


Figure 101: Mission Response Screen with Example Graph

3.7.4 Logging Menu

The Logging Menu provides four options: Start All Connected, Stop All Active, PreState All Connected, and Annotate All. For detailed information about all of the log status functions, refer to section 3.4.

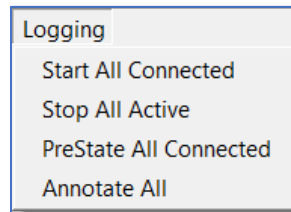


Figure 102: Logging Menu

3.7.4.1 Start All Connected

The Start All Connected option starts logging activity for all connected RDMS receivers (one or many). Logging for single RDMS receivers is accomplished via the Start Logging button on the RDMS Rack Status Logger screen.

3.7.4.2 Stop All Active

The Stop All Active option stops all active RDMS logging. Logging for a single RDMS receiver may be stopped by using the Stop Logging button on the RDMS Rack Status Logger screen.

3.7.4.3 PreState All Connected

The PreState All Connected option creates a text document detailing the state of all connected channels prior to logging. After the PreState runs, the status changes to Queued. Functionality of the PreState option is discussed in detail in section 3.4.

3.7.4.4 Annotate All

The Annotate All option allows the user to mark a “footnote” in the log file for each logged RDMS receiver. Often while observing a mission, it is necessary to make note of significant events. The annotation value (sequential number) is recorded in the log file with the corresponding sample. This “footnote” is very helpful when reviewing data for the mission. Be sure to make detailed notes for the footnote indicators (1 is mission event xyz, 2 is event abc, and so forth). An example of annotations in the log file is shown in Figure 103.

	A	B	C	D	E	F	G	H	I	J	K	L
1	channel	sys_time	sys_date	time_of_c	test_time	annotate	input_pwr	bitrate	lock	ebno	afc_detec	afc_comp
2	1	23:55:28.4	2018/11/1	11:58:13.4	0:00:00:0	0	-68.11	9.999982	1	20.89	-11.488	0
3	2	20:37:32.4	2018/11/1	11:58:13.4	0:00:00:0	0	-68.09	9.999985	1	18.3	0.378	0
4	3	23:12:29.4	2018/11/1	11:58:13.4	0:00:00:0	0	-138.31	9.999981	1	20.15	-8.378	0
5	1	23:55:29.4	2018/11/1	11:58:14.4	0:00:00:0	1	-68.05	9.999982	1	19.77	15.426	0
6	2	20:37:33.4	2018/11/1	11:58:14.4	0:00:00:0	1	-67.96	9.999983	1	20.18	3.788	0
7	3	23:12:30.4	2018/11/1	11:58:14.4	0:00:00:0	1	-138.31	9.999979	1	20.04	7.071	0
8	1	23:55:30.4	2018/11/1	11:58:15.4	0:00:00:0	0	-67.99	9.999982	1	21.01	4.05	0
9	2	20:37:34.4	2018/11/1	11:58:15.4	0:00:00:0	0	-68.09	9.999983	1	21.02	2.57	0
10	3	23:12:31.4	2018/11/1	11:58:15.4	0:00:00:0	0	-138.31	9.999981	1	19.95	-8.539	0
11	1	23:55:31.4	2018/11/1	11:58:16.4	0:00:00:0	0	-68.11	9.999982	1	22.07	-2.186	0
12	2	20:37:35.4	2018/11/1	11:58:16.4	0:00:00:0	0	-68.02	9.999983	1	19.74	2.515	0
13	3	23:12:32.4	2018/11/1	11:58:16.4	0:00:00:0	0	-138.31	9.999979	1	21.4	-9.63	0
14	1	23:55:32.4	2018/11/1	11:58:17.4	0:00:00:0	0	-67.93	9.999982	1	19.79	21.974	0
15	2	20:37:36.4	2018/11/1	11:58:17.4	0:00:00:0	0	-67.96	9.999983	1	20.13	2.476	0
16	3	23:12:33.4	2018/11/1	11:58:17.4	0:00:00:0	0	-138.31	9.999981	1	19.45	-22.764	0
17	1	23:55:33.4	2018/11/1	11:58:18.4	0:00:00:0	0	-68.11	9.999983	1	20.35	7.455	0
18	2	20:37:37.4	2018/11/1	11:58:18.4	0:00:00:0	0	-68.09	9.999985	1	20.59	24.617	0
19	3	23:12:34.4	2018/11/1	11:58:18.4	0:00:00:0	0	-138.31	9.999979	1	18.95	-5.825	0
20	1	23:55:34.4	2018/11/1	11:58:19.4	0:00:00:0	2	-68.05	9.999982	1	21.86	-19.488	0
21	2	20:37:38.4	2018/11/1	11:58:19.4	0:00:00:0	2	-67.9	9.999983	1	19.65	15.988	0
22	3	23:12:35.4	2018/11/1	11:58:19.4	0:00:00:0	2	-138.31	9.999981	1	21.24	-12.923	0
23	1	23:55:35.4	2018/11/1	11:58:20.4	0:00:00:0	0	-68.05	9.999982	1	20.19	11.065	0

Figure 103: Example status_log.csv File with Event Annotations

4 Maintenance Instructions

The RDMS Status Logger requires no regular maintenance, and there are no user-serviceable parts inside.

5 Product Warranty

The RDMS Status Logger carries a standard parts and labor warranty of one (1) year from the date of delivery.

5.1 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.

5.1.1 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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6 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.

7 Appendix A – Status File Definitions

This section defines the outputs generated by the RDMS Status Logger. Each time a log is started, the following files are generated.

Table 2: Status Logger Files

File Name	File Description
pre_log_state.txt	All receiver settings at the start of logging
post_log_state.txt	All receiver settings at the end of logging
status_log.csv	Comprehensive status log file
working_log.csv	Log file with most frequently used
report_data.csv	Report data to import into Linkview application

7.1 State Report

The State Report is a human readable text file generated by the status logger, preceding and succeeding a status log. The State Report is intended to capture the receiver state in detail, primarily to document the settings in the receiver for the mission. In addition to establishing evidence of the receiver state, the report can be extremely helpful in troubleshooting technical issues when telemetry performance is not meeting expectations.

7.1.1 Pre- and Post- Logging State Reports

To document the entry and exit states of the receiver for a status log, the State Report is generated before and after the log.

Table 3: Status Logger State Report Files

File Name	File Description
pre_log_state.txt	All receiver settings at the start of logging
post_log_state.txt	All receiver settings at the end of logging

7.1.2 State Report Format

The State Report is a text document, readable by a text editor. (In order to view the report in wide format, a program such as Notepad++ is recommended.) The report is presented with (up to) three channel responses side by side. The file format is shown in Figure 104.

Channel 1	Channel 2	Combiner
Command	Command	Command
Response	Response	Response
Command	Command	Command
Response	Response	Response

Figure 104: Example State Report Format

7.1.3 State Report Queries

- The State Report queries a variety of states directly from the receiver bricks. The list of queries include:
 - Description of this Serno
 - Version Detail
 - Time of Day
 - Mode
 - LDPC State
 - Frequency
 - Bitrate
 - Automatic Gain Control State
 - Automatic Frequency Control State
 - RF Path State
 - Downconverting Antenna State
 - Baseband Filter State
 - Synthesizer State
 - Derandomizer State
 - Adaptive Equalizer State
 - Combiner State
 - Data Quality Encapsulation State
 - Power Level Detail
 - System Temperature
 - TED Loop State
 - FED Loop State
 - Modulation Index State
 - Space Time Coding State
 - Phase Noise Compensation
 - IF Settings
 - IF Path State
 - Bit Error Rate Test State
 - PCM Framing Status
 - Differential Decoder State
 - PCM Decode State
 - Data Polarity
 - Fwd Error Correction State
 - Datapath Baseband Filter State
 - Register Dump

7.2 Status Logger Status File

The Status Logger captures metrics from the three bricks in the RDMS receiver. These are stored in a file named `status_log.csv`. The data in this file are the values as they are received, with very little formatting or calculation. The values in the Working Log are determined from these data.

7.2.1 Receiver Block Diagram

The standard Quasonix RDMS receiver is made up of three blocks (sometimes referred to as “bricks”). Channel 1 and Channel 2 bricks are identical and contain a full RF downconverter, as well as a DSP based demodulator. The Combiner is a half-brick, containing only the DSP demodulator. The diagram in Figure 105 shows a simplified block diagram of the standard RDMS.

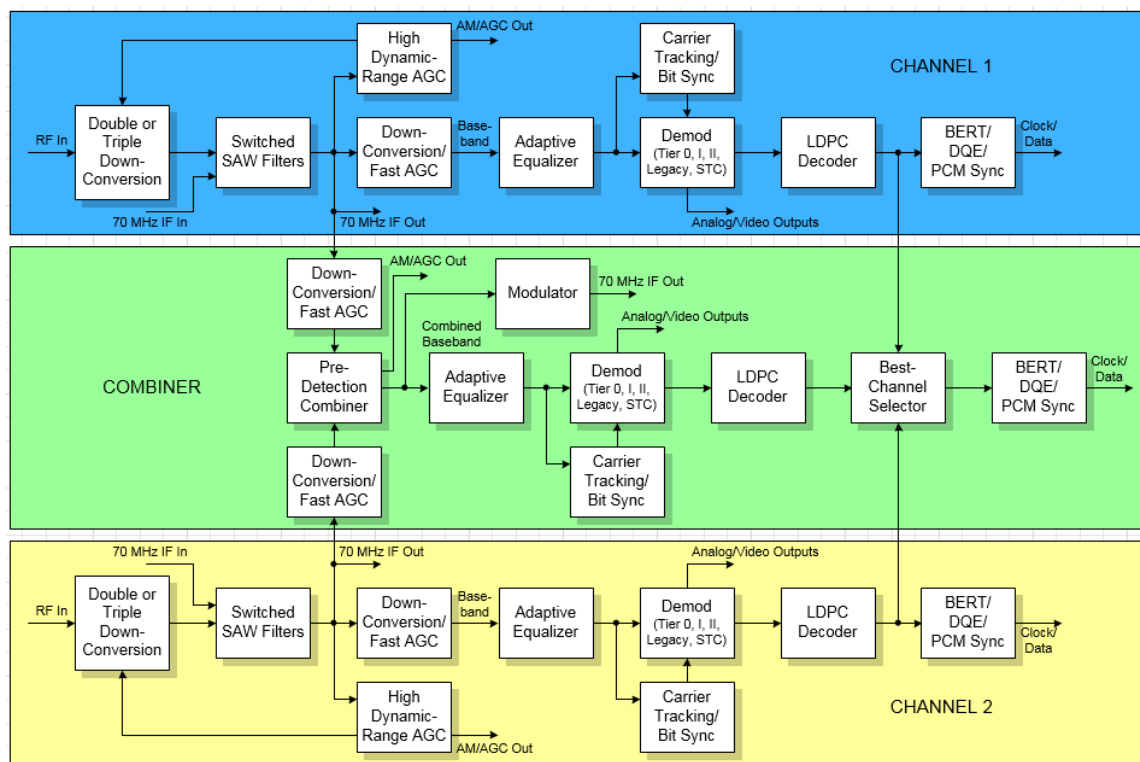


Figure 105: RDMS Simplified Block Diagram

7.2.2 Bit Error Probability (BEP) Measurements

The RDMS implements a state-of-the-art Data Quality Metric, wherein a real-time estimate of Bit Error Probability is calculated in the demodulator. This measurement is always available, regardless of the data received. The RDMS also implements advanced functions, including LDPC decoding (if the data is encoded) and Best Channel Selection (BCS). To have a complete view of the receiver performance, status for these measurements is provided at three points in the receiver demodulator chain. In Figure 106, a snippet from the Simplified Block Diagram (Figure 105) is shown for Channel 1 (Channel 2 is identical) and the Combiner. Measurements for BEP are made at points A, B, and C in each of the bricks.

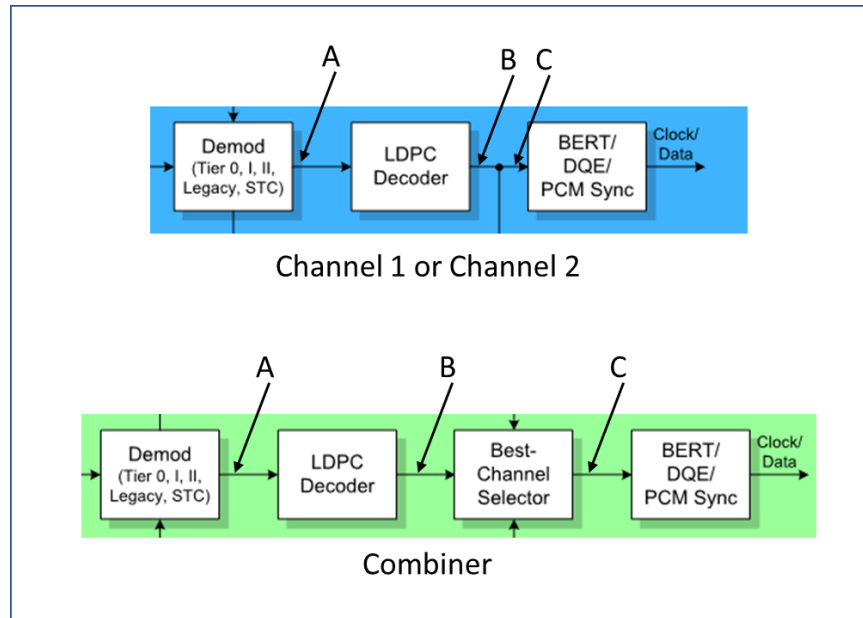


Figure 106: BEP Measurements

The measurement at point A appears in the status log as the name with the suffix “_dp”, for example “dqm_errs_dp”. The measurement at point B appears in the status log as the name with the suffix “_decode”, for example “dqm_errs_decode”. The measurement at point C appears in the status log as the name with the suffix “_out”, for example “dqm_errs_out”.

For the Channel 1 and Channel 2 case, the B and C measurements are the same (subject to Note 2 below). For the combiner, the BEP is calculated at the output of the Best Channel Selector. In both cases, if the signal is not encoded (encoding includes LDPC, Viterbi, and differential encoding), the measurement at A is the same as the measurement at B. Keep in mind that for each status sample (default period is 1 second), the counted bits and errors may be different at A, B, and C due to the interrupt timing and block timing in the brick processor. Over a number of samples, the values will balance.

The measurements at A, B, and C with the notation “_avg_” (for example “dqm_avg_out”) are an internally averaged BEP. This can be used to quickly assess the data quality, but the most accurate method to calculate BEP for each interval is done using:

$$\text{bep} = \text{dqm_errs} / \text{dqm_bits}$$

From BEP, you can calculate DQM via the formulas in IRIG 106:

$$\text{lr} = \text{bep} / (1 - \text{bep}) \quad \text{-- likelihood ratio}$$

$$\text{dqm} = -\log_{10}(\text{lr}) / 12 * 65536 \quad \text{-- data quality metric (0 to 65535)}$$

The Quality display on the front of the receiver is the negative of the exponent on likelihood ratio, or

$$\text{BEP_Q} = -\log_{10}(\text{lr})$$

This is closely approximated by

$$\text{BEP_Q} = -\log_{10}(\text{bep})$$

Note 1: The receiver Q display is limited to a value of 10, while the BEP reported by the brick can result in a BEP_Q as high as 12.

Note 2: Although the measurements at “_dp”, “_decode” and “_out” are the same in some cases, block timing may result in different values for a given interval. Similarly, the “_avg” values may differ significantly for a particular interval.

Note 3: In the Working Log, the BEP values are calculated using the “_out” values.

7.2.3 Bit Error Rate (BER) Measurements

The RDMS implements a fast-acquisition BERT (Bit Error Rate Tester) to measure Bit Error Rate when a standard PN sequence is transmitted and received (for test purposes). Referring to Figure 107, the Bit Error Rate is measured at point D for RDMS Release 16 and earlier, and point E for Release 17 and later.

The measurement at point D is at the output of the decoder for Channel 1 and Channel 2, and at the output of the Best Channel Selector for the combiner. For Release 17 and later, the measurement at point E follows the PCM Frame Sync (deframer), which allows the detection of the PN sequence inserted as payload in the PCM frame.

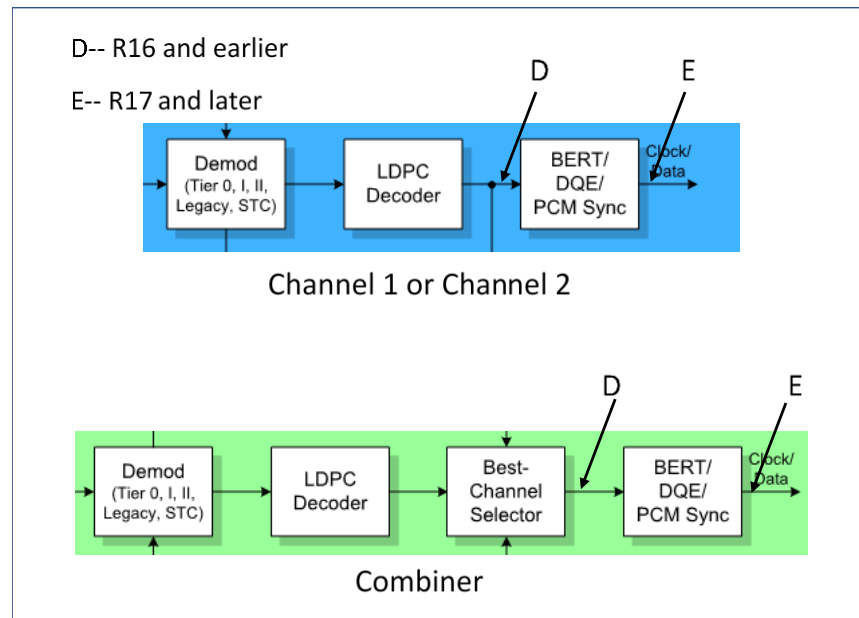


Figure 107: BER Measurements

7.2.4 PCM Framing Measurements

If the proper header information and minor frame size is declared prior to logging, the RDMS bricks perform frame metrics. Frame counts and the number of frames meeting the lock criteria are logged. The appearance of the PCM lock indication is an excellent indication that the telemetry is being properly received. For Release 16 and earlier,

the PCM Frame information must be entered in the Logger Setup, or the PCM Framing measurements will not be useful. For Release 17 and later, the receiver bricks will automatically detect IRIG standard PCM Frames.

7.2.5 Best Channel Selector (BCS) Metric

The RDMS Best Channel Selector determines the channel(s) with the highest probability of good data using the BEP calculated for the three channels. The brick firmware produces a metric to determine the state of the BCS correlator. The BCS metric is not useful for the channel 1 brick or the channel 2 brick. In the combiner, three values are generated to indicate the state of the BCS correlator for each of the three inputs (Channel 1, Channel 2, and the Combiner). Keep in mind that the status is a snapshot, and not necessarily indicative of the correlator state throughout the interval. The states are Off, Uncorrelated, Correlated, and Reference. Generally, the Reference is the channel currently selected by the BCS. Correlated means that a channel is correlated to the reference and could be selected as well. Uncorrelated means that the channel is not correlated to the reference and will not be chosen.

7.2.6 Status Log Format

The status log is recorded in the popular “.csv” format (comma separated values). This file can be viewed a text editor, or opened directly in a spreadsheet, such as Excel. This format can also be imported directly into MATLAB™.

7.2.6.1 Status Log Column Definitions

Table 4: Status Log Column Definitions

Column	Definition	Notes
channel	Channel number-- 1, 2 or 3 (Combiner)	
sys_time	Internal time for the receiver brick (i.e. time since power start)	
sys_date	Date of status log in YYYY/mm/dd format. The brick internal clocks are synchronized to the status logger time (i.e. computer time) on the start of a new status log	
time_of_day	Time of Day in HH:MM:ss.sss format. Synchronized to the status logger at the start of a new status log	
posix_time	Posix time format. Synchronized to the status logger at the start of a new status log	
excel_time	Excel time format. Synchronized to the status logger at the start of a new status log	
fpga_temp	RDMS FPGA temperature in Celsius	
demod_temp	RDMS Demodulator temperature in Celsius	
test_time	Test time in D:HH:MM:ss.sss format-- restarts on log start	
annotate	Annotation index-- inserted when button is clicked on GUI, zero otherwise	
input_pwr	Channel input power in dBm	Input power for the combiner is displayed, but is not useful

Column	Definition	Notes
bitrate	Measured bitrate in MBPS	
lock	Bit sync Lock state, 0 = unlocked, 1 = locked	
ebno	Estimated EbN0 in dB. Note that this is quite accurate for AWGN, but it not as reliable with other impairments.	
afc_detected	AFC offset in kHz	
afc_compensated	The AFC compensation applied	
afc_mode	AFC mode—Off, Hold, Track, Acquire	
dqm_avg_dp	Internally generated BEP value for the data path	Refer to Figure 106—Point A
dqm_avg_decode	Internally generated BEP value for the decoder output	Refer to Figure 106—Point B
dqm_avg_out	Internally generated BEP value for the final output. For Ch1 and Ch2, this is the same as dqm_avg_decode, for Combiner, this is the BCS output	Refer to Figure 106—Point C
dqm_bits_dp	BEP bit count for this interval for the data path	Refer to Figure 106—Point A
dqm_errs_dp	BEP error count for this interval for the data path	Refer to Figure 106—Point A
dqm_bits_decode	BEP bit count for this interval for the decoder	Refer to Figure 106—Point B
dqm_errs_decode	BEP error count for this interval for the decoder	Refer to Figure 106—Point B
dqm_bits_out	BEP bit count for this interval for the output	Refer to Figure 106—Point C
dqm_errs_out	BEP error count for this interval for the output	Refer to Figure 106—Point C
bert_enabled	0 = disabled, 1 = enabled	
bert_running	0 = not running, 1 = running	
bert_restart	0 = normal, 1 = BERT was restarted	
bert_data_inverted	0 = normal, 1 = data inverted	
bert_resync	0 = normal, 1 = BERT resync occurred in interval	
bert_sync_loss	0 = normal, 1 = sync loss detected in interval	
bert_bits	Number of accumulated bits since restart	Restart occurs on log start
bert_errors	Number of accumulated errors since restart	

Column	Definition	Notes
bert_delta_errs	Number of errors in this interval	
bert_error_rate	The calculated BER based on accumulated values	
bert_error_seconds	The number of intervals (accumulated) where at least one error occurred	Not particularly useful since the threshold is very high. Will be settable in future version.
pcm_lock	PCM Framing lock state, 0=unlocked, 1=locked	
pcm_subframe	PCM Sub Frame-- not used	
pcm_frame_count	PCM Frame count-- kept by RDMS	
pcm_frame_locks	PCM Frame locks-- kept by RDMS	
mod_index	Modulation Index	PCM/FM only
mod_index_mode	Modulation Index mode (off, hold, track, acquire)	PCM/FM only
ted_offset	The timing loop offset in ppm (relative to bitrate)	
fed_offset	The frequency loop offset in kHz	
cmb_time_offset_ns	The combiner time offset in nanoseconds	
cmb_time_offset_bits	The combiner time offset in bits	
cmb_aligner_state	The combiner time aligner state (0 = disabled, 1 = enabled)	
cmb_freq_offset	The combiner frequency offset in MHz	
agc_atten	Internal use only	
agc_bulk_atten	Internal use only	
signal_power	Internal use only	
adjusted_power	Internal use only	
saturation_count	Internal use only	
agc_dsp_snr	Internal use only	
agc_snr	Internal use only	
agc_external_zero	The AGC zero value set by the user	
agc_internal_zero	Internal use only	

Column	Definition	Notes
bcs_ch1	State of the BCS input for channel 1; 0 = Off, 1 = Uncorrelated, 2 = Correlated, 3 = Reference	Combiner only-- Not useful for Ch1 or Ch2 bricks
bcs_int	State of the BCS input for combiner; 0 = Off, 1 = Uncorrelated, 2 = Correlated, 3 = Reference	Combiner only-- Not useful for Ch1 or Ch2 bricks
bcs_ch2	State of the BCS input for channel 2; 0 = Off, 1 = Uncorrelated, 2 = Correlated, 3 = Reference	Combiner only-- Not useful for Ch1 or Ch2 bricks
ted_q_mu	Internal use only	
avg_trl	Internal use only	
stc_h1_real	Real part of H1 magnitude	STC mode only
stc_h1_imag	Imaginary part of H1 magnitude	STC mode only
stc_h1_mag	H1 magnitude	STC mode only
stc_h2_real	Real part of H2 magnitude	STC mode only
stc_h2_imag	Imaginary part of H2 magnitude	STC mode only
stc_h2_mag	H2 magnitude	STC mode only
stc_h1_tau	Delay for H1	STC mode only
stc_h2_tau	Delay for H2	STC mode only
stc_delta_tau	Delay difference (H2 – H1)	STC mode only
stc_fed	Frequency offset in STC FED loop	STC mode only
stc_clock_err	Timing error for STC (Bit rate error)	STC mode only
stc_trellis_err	Trellis error for STC Trellis	STC mode only
cma_mean_sq_err	Internal use only	
dd_mean_sq_err	Internal use only	
eq_avg_confidence	Internal use only	
eq_dd_err	Internal use only	
eq_auto_reset	Internal use only	

7.3 Working Log File

The Working Log is generated from the status log data and includes metrics that are most often used. These include calculated values for BER, BEP, and FER, and variations of these (e.g. BEP, DQM, and BEP_Q). It is also notable that the Working Log values are those selectable in the graphic displays on the status logger.

7.3.1 Working Log Calculations

7.3.1.1 User Reset Function

To facilitate BER (bit error rate), BEP (bit error probability), and FER (PCM frame error rate) long-term averages, the Working Log calculations include accumulated totals for bits, bit errors, probable bit errors, PCM frames, and PCM frame errors. These counters can be reset in the application by pressing the Restart Averages button on the Main Logger screen. Restarting in this manner has no impact on the values recorded in the Status Log.

7.3.1.2 BEP Calculation

The BEP calculations are done as follows for each interval measurement:

```
bep = dqm_errs/dqm_bits
lr = bep/(1 - bep)          # likelihood ratio
dqm = round(-log10(lr) / 12 * 65536)
q = 12 * dqm / 65536      # BEP_Q
```

The long-term average BEP calculation is done as follows, using the accumulated values:

```
bep_avg = dqm_errs_accum/dqm_bits_accum
```

7.3.1.3 BER Calculations

The BER calculations are done as follows for each interval measurement:

```
ber = bert_errors/bert_bits
lr = ber/(1 - ber)          # likelihood ratio
ber_q = -log10(lr)
```

The long-term average BER calculation is done as follows, using the accumulated values:

```
ber_avg = bert_errs_accum/bert_bits_accum
```

7.3.1.4 FER (Frame Error Rate) Calculations

The FER calculations are done as follows for each interval measurement:

```
pcm_fer = frame_errors/frame_counts
```

The long-term average FER calculation is done as follows, using the accumulated values:

```
pcm_fer_avg = bert_errs_accum/bert_bits_accum
```

7.3.1.5 Frequency Offset Calculations

The frequency offset is calculated by summing the offset compensated by the AFC function and the offset detected by the frequency tracking loop.

```
afc_offset = afc_compensated
```

```
freq_offset = afc_compensated + fed_offset
```

7.3.1.6 Link Availability Calculation

The link availability is often used as a figure of merit to determine usability of the link. In the past, BER was the only reliable method to measure and calculate link availability. This was only possible when testing a link using a PN sequence (or other known transmission). With the introduction of an effective Data Quality Metric, the link availability can be estimated during any mission.

Typically, the link availability is calculated over each sample interval, using a threshold, such as 1E-5 for bit error probability. The intervals that do not meet the criteria are considered “errored intervals.” The link availability is then:

```
link_avail = (total_intrvls - errored_intrvls)/total_intrvls * 100%
```

7.3.1.7 Working Log Format

Similar to the Status Log, the Working Log is stored in .csv format.

7.3.1.7.1 Working Log Column Definitions

Table 5: Working Log Column Definitions

Column	Definition	Notes
channel	Channel number-- 1, 2 or 3 (Combiner)	
log_date	Date of status log in YYYY/mm/dd format	
time_of_day	Time of Day in HH:MM:ss.sss format. Synchronized to the status logger at the start of a new status log	
posix_time	Posix time format. Synchronized to the status logger at the start of a new status log	
test_time	Test time in D:HH:MM:ss.sss format-- restarts on log start	
annotate	Annotation index-- inserted when button is clicked on GUI, zero otherwise	
input_pwr	Channel input power in dBm	Only Ch1 and Ch2
bitrate	Bitrate in MBPS	
lock	Bit sync Lock state, 0 = unlocked, 1 = locked	
ebno	Estimated EbN0 in dB. Note that this is quite accurate for AWGN, but it not as reliable with other impairments.	
afc_offset	AFC offset in kHz	
pcm_lock	PCM lock state, 0=unlocked, 1=locked	

Column	Definition	Notes
pcm_frame_count	PCM Frame count - reset to zero on Restart	
pcm_frame_locks	PCM Frame locks - reset to zero on Restart	
pcm_fer	PCM Frame Error Rate	
bep	Bit Error Probability, based on DQM, e.g. 1e-5 for this interval	Uses "dqm_bits_out" and "dqm_errs_out"
bep_q	BEP Quality (same as front panel display) for this interval	
dqm	Data Quality Metric, 0 to 65535 for this interval	
bep_delta_errs	Number of errors for this interval	This is a real, not an integer
bep_avg	Average Bit Error Probability, since last reset	
bep_bits	Number of bits since last reset	
bep_errors	Number of errors since last reset	This is a real, not an integer
ber	Bit Error Rate, based on PN pattern transmitted/received for this interval	
ber_q	BER Quality, comparable to BEP Q, for this interval	
ber_delta_errs	Number of errors for this interval	
ber_avg	Average BER, since last reset	
ber_bits	Number of bits since last reset	
ber_errors	Number of errors since last reset	
freq_offset	Frequency offset, in kHz	
timing_offset	Timing offset, in kHz	
link_avail	Link Availability since reset in %, using 1e-5 threshold	
errored_seconds	Errored seconds since reset, using 1e-5 threshold	
total_seconds	Total seconds since last reset	
stc_h1_mag	H1 magnitude for STC mode	
stc_h2_mag	H2 magnitude for STC mode	
stc_delta_tau	Delta tau for STC mode	

8 Appendix B – 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
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
FPGA	Field Programmable Gate Array
IF	Intermediate Frequency
IP	Internet Protocol
kbps	Kilobits per second
KHz	Kilohertz
LCD	Liquid Crystal Display
mbps	Megabits per second
MCX	Snap on subminiature connector
MHCPM	multi-h Continuous Phase Modulation
MHz	Megahertz
N	(connector type) Threaded RF connector
OQPSK	Offset Quadrature Phase Shift Keying
PCMFM	Pulse Code Modulation/Frequency Modulation
PM	Phase Modulation

Acronym	Description
PSK	Phase Shift Keying
QPSK	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	Sawtooth Wave
SDI	System Degradation Indication
SOQPSK	Shaped Offset Quadrature Phase Shift Keying
SOQPSK-TG	Shaped Offset Quadrature Phase Shift Keying –Telemetry Group
TRL	Tracking Loop
TTL	Transistor Logic
UDP	User Datagram Protocol
UQPSK	Unbalanced Quadrature Phase Shift Keying
USB	Universal Serial Bus
VAC	Voltage Alternating Current
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network