DSI

MX2 for Ponemah 5.20

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Revision 01

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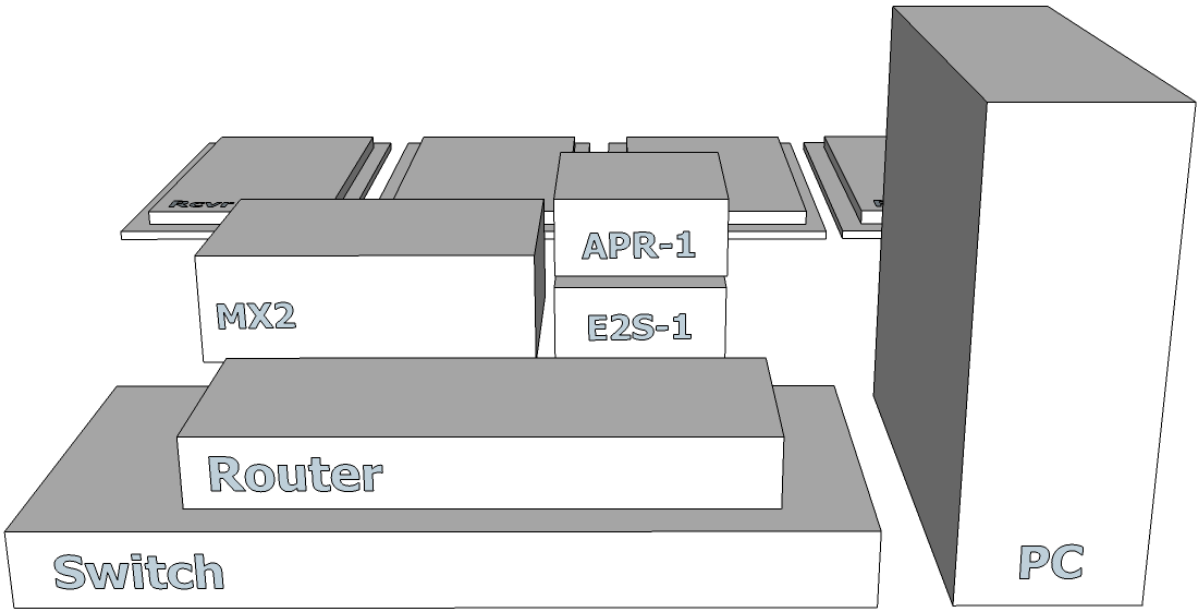
Telemetry Acquisition Hardware

The DSI telemetry collection hardware facilitates the collection of physiologic data via wireless telemetry. The key component of the system, the MX2 (Matrix 2.0) manages communication between PhysioTel™ and PhysioTel HD implants and the data acquisition computer.



Networking Hardware

DSI recommends using a dedicated network to assure uninterrupted data collection. Many configurations are possible; the simplest setup would be to use a router and a network switch to connect all PCs, MX2s, and the E2S-1. In this configuration the router will automatically provide network IP addresses so that manual settings will not be required for the computers, the MX2s, or the E2S-1. A configuration such as this may also be connected to the corporate network via a router to router connection. This can be arranged through your institutional IT group.

Here are some typical examples:

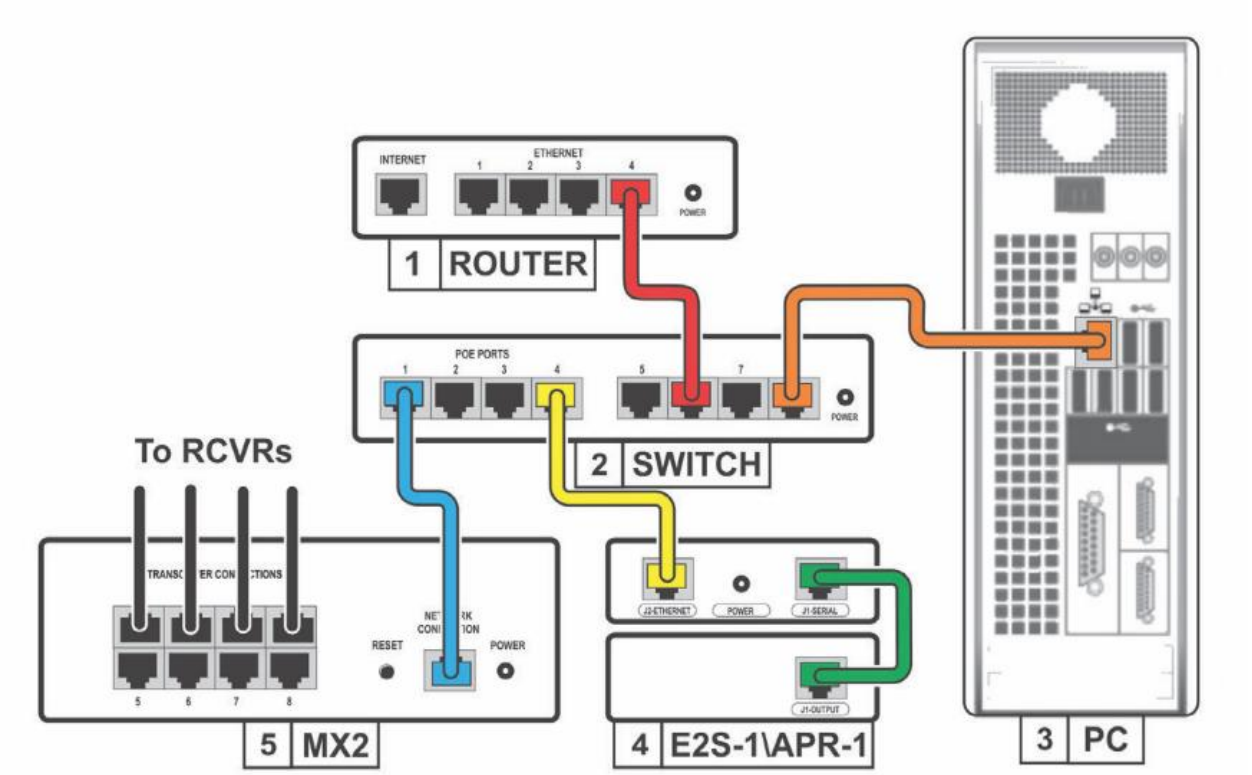
- Router (Small Business Class)
    - Cisco RV130 – 4 port gigabit security router

- Switch (Small Business Class)
    - Cisco SG200-08P – 8 port gigabit with POE on 4 ports

PhysioTel and PhysioTel HD Hardware Setup

Please do not power any devices until directed in the appropriate step. As a convenience colored Cat5e Ethernet cables have been included and are referenced in the instructions below. Colored Cat5e Ethernet cables have been included and are referenced in the instructions below However, any color standard Cat5e or Cat6e Ethernet cables may be used in system set-up.

1. Connect the red Ethernet cable from the output of the router (1) to a non- PoE port on the switch (2).
2. Connect the orange Ethernet cable from the PC (3) to a non-PoE* port on the switch (2).
3. Connect the yellow Ethernet cable from the **J2-Ethernet** jack on the E2S-1 (4) to a PoE port on the switch (2) (If a non-POE port is used, a power supply for the E2S-1 will be needed).
4. Connect the green Ethernet cable from the **J1-Serial** jack on the E2S-1 (4) to the **J1-Output** jack on the APR-1.
5. Power up the Router (1). This may take several minutes.
6. After the router has completed powering up, power up the switch (2). This may take several minutes.
7. After the switch is powered up, connect the blue Ethernet cable from the MX2 (**Network Connection** jack) to one of the PoE ports on the switch (2).
8. The MX2 should power can take up to 5 minutes.
9. Connect the individual receiver (RPC/RSC/RMC) cables to the **Receiver Connections** jacks (RCVR) on the back of the MX2 (5).



PhysioTel and PhysioTel HD hardware set-up utilizing a dedicated network

*Note: If a PoE (Power over Ethernet) switch is not available, the individual components will need their own individual power supplies. If the router and switch are not powered up first, the MX2 will boot up without an IP address which will cause an error. A reboot of the MX2 will need to be performed in order for it to be assigned a proper IP address by the router.

Configuring Firewall Settings

Connecting the router to the PC creates a new Local Area Network connection. Critical communications through this connection may be inhibited if the Windows Firewall is not configured properly. To access the Windows Firewall settings:

1. Click the Start button -> Control Panel -> Windows Firewall
2. Configure the network connection as “Home or work (private) networks”

MX2 (Matrix 2.0)

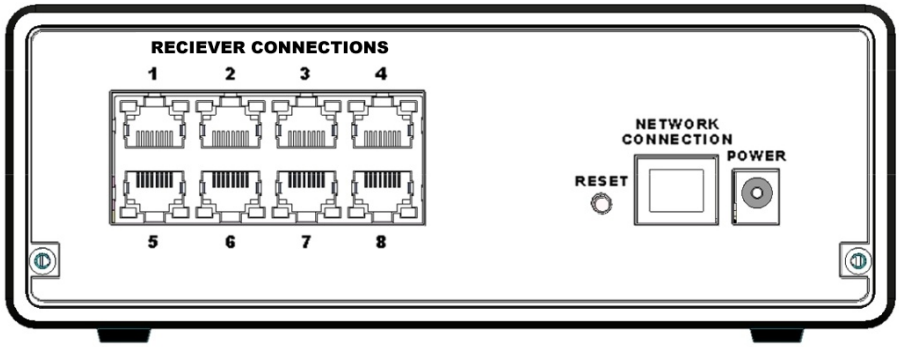
The MX2 directs all of the communications in the system via Ethernet connectivity using DHCP networkability. Up to 8 implants can be configured to a single MX2.

Front Panel

The MX2 has three indicator lights on the front panel.

Indicator	Color	Status
ERROR	RED	ERROR (usually caused by Power-On self-test error) – repeat the power ON procedure
STATUS	AMBER	Illuminated during the boot sequence
POWER	GREEN	Power ON

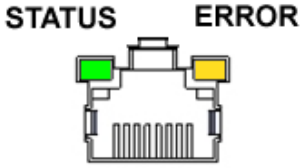
Back Panel



All of the connections (RJ45 jacks) on the back panel of the MX2 are equipped with indicator lights.

Receiver Connections

Plug the receiver cables into the numbered **RECEIVERCONNECTIONS** jacks on back panel of the MX2 to establish a power and data connection. The RPC-3 model receiver has two "J" output jacks while the RPC-1 and RSC-1 model receivers have only one. The RSC-1 also has an "AUX" and an "ANT" jack on the back. The "AUX" is used in manufacturing to test the product. The "ANT" is where customers can plug in a custom made antenna.



STATUS – Green colored light on the left of each jack

MODE	DESCRIPTION
ON	Valid receiver connected
OFF	No connection

ERROR – Yellow colored light on the right of each jack

MODE	DESCRIPTION
ON	Invalid device connected
OFF	No connection

Reset Switch

The reset switch allows the user to manually reboot the MX2. The reset can also be used to assign a new IP address to the MX2 if the MX2 is currently set to a static IP address. The Reset switch is a recessed button on the back panel of the MX2 found next to the **Network Connection** jack.

Function	Directions
Reboot	Press and release within 5 seconds
Requests a new IP address and reboots	Press and hold 5 – 15 seconds

Network Connection

The Network Connection jack is the Ethernet port that is to be connected to the one of the PoE ports on the switch.

Power

The MX2 is the source of electrical power to all of the connected telemetry receivers; that power is supplied to the MX2 in one of two ways. The preferred configuration is to have all of the power supplied by the PoE (Power over Ethernet) connection from the network switch. The Power input connection is supplied in case a PoE switch is not available, an AC power supply will need to be purchased separately. The MX2 does not have an on/off switch.

APR-1/E2S-1

The APR-1, Ambient Pressure Reference, is a special type of barometer that measures atmospheric pressure providing dynamic corrections via a digital signal to the computer. An APR-1 is required when measuring pressure via pressure implants in order to compensate for the absolute (relative to a vacuum) pressure measurements taken by the implants.

E2S is an acronym for Ethernet to Serial converter. The E2S-1 allows the APR-1 to be used in a network environment.

APR-1 Ambient Pressure Reference

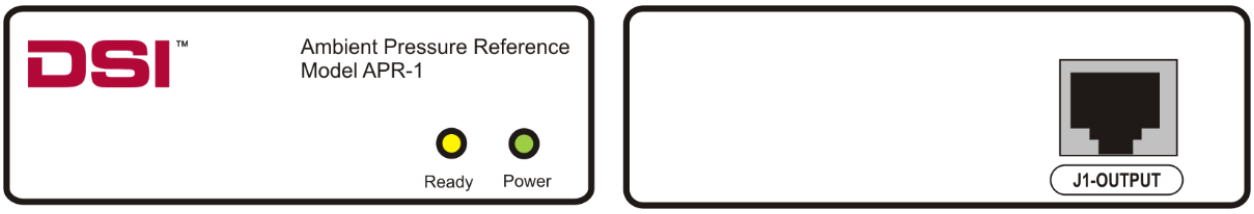
The Ambient Pressure Reference Monitor (APR-1) is a special type of barometer that measures atmospheric pressure providing dynamic corrections via a digital signal to the computer. An APR-1 is required when measuring pressure via pressure transmitters in order to compensate for the absolute (relative to a vacuum) measurements taken by the transmitters. All local environmental pressure fluctuations and changes in ambient barometric pressure are automatically corrected against measurements obtained by the telemetry system. Thus, the APR-1 is a necessary component of each telemetry system where accurate pressure measurements are required.

APR-1 Front Panel

The front panel contains two indicator lights. The function of these indicators is described below:

Ready – A yellow indicator light illuminates when the pressure-sensing module is actively monitoring pressure. This will light shortly after power is applied to the APR-1.

Power – A green indicator light illuminates when power is applied to **J1-OUTPUT** jack of the back panel of the APR-1. The APR-1 does not have a separate on/off switch, the power is delivered via the E2S-1.



Front panel of APR-1 (left), rear panel (right)

J1-OUTPUT – This is the communication port to the E2S-1.

E2S-1

E2S is an acronym for Ethernet to Serial converter. The E2S-1 allows the APR-1 to be used in a network environment.

Front Panel

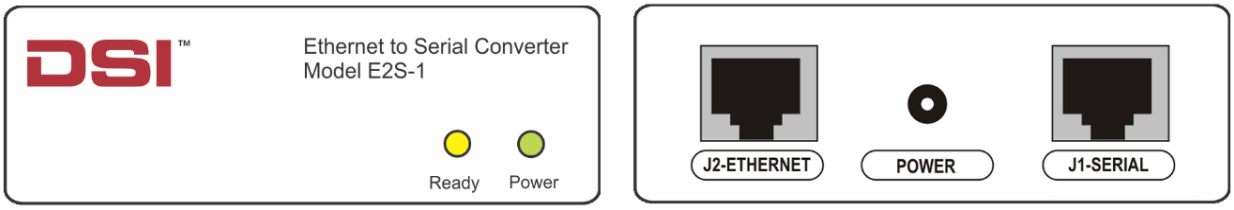
The front panel contains two indicator lights. The function of these is described below:

Ready – yellow indicator light

MODE	DESCRIPTION
ON (continuous)	Power is on and the E2S-1 is functioning normally
ON (blinking)	the E2S-1 has been located by a

	software command
OFF	No power IP address cannot be found IP address conflict

Power – A green indicator light illuminates when power is supplied via the J2-ETHERNET jack from a PoE switch.



Front panel of E2S-1 (left), rear panel (right)

E2S-1 Rear panel

J1-Serial

Plug the cable from the APR-1 into this jack. It provides a path for the barometric pressure signal to pass to the E2S-1 and also for the power from the E2S-1 to the APR-1.

> WARNING: Do Not mistake the "J2 Ethernet" port with "J1 Serial" port. Incorrectly plugging the wrong Ethernet cable into the wrong port may cause serious damage to your network devices.

J2-Ethernet

Plug the cable from the Ethernet network into this jack. It provides a path for the barometric pressure signal to pass to the E2S-1 and also for the power from a POE capable network (if available) to pass into the E2S-1.

Power

The Power input connection is supplied in case a PoE switch is not available. An AC power supply can be purchased separately. The E2S-1 does not have an on/off switch.

Telemetry Receivers

Multiple receiver options exist and selection depends on the implant model and the caging setup. Listed below are the receivers that are compatible with the MX2.

Information about maximum receiver range, antenna capability, application and frequency is detailed for each receiver.

Receiver	Maximum Signal Range*	Antenna Capability	Frequency	Application
RPC-1	Sufficient coverage for up to 16 in (or 41cm)	Single Internal	455kHz	Typical Cage Setup
RPC-3		Dual Internal	455kHz & 18MHz	Multiple implants in the same animal or paired housing use cases
RSC-1		Single Internal **or** Auxiliary External	455kHz	Supplementary for larger cage sizes or for unique cage configurations
RLA3000	Axis dependent	Single Internal	455kHz	Operating Room or Special Caging

*Range is highly dependent on telemetry model. The miniature implant size typically has a 20cm range, the small animal implant size typically has a 25cm range, and the large animal implant size typically has a 1.5m range.

Receiver Functionality

The receivers are all powered by the connection with the MX2. When connected, the configuration software will detect the model and serial number and configure the software appropriately for all telemetry hardware. All receivers have similar jacks and indicator lights.

RPC-1

The Receiver Plastic Cage (RPC-1) is used to collect data from any 455 kHz associated PhysioTel implant. The RPC-1 can pick up the signal from the implant or from a neighboring cage so it is important to put enough distance between them so the signals do not interfere. The RPC-1 specifications are as follows:

Pickup Frequency	455kHz
Size	12.9 x 8.9 x 1.3 inches (328 x 227 x 33 mm)
Power Requirements	Powered by the MX2

Illustration of the of the front (top) and back (bottom) panels of the RPC-1

J1-OUTPUT – The receiver output connection to the MX2.

RPC-3

The RPC-3 is a dual frequency receiver. It contains two antennas and is used to collect signals from 2 animals simultaneously which are pair housed or from two implants in one animal. One of the signals must be from an 18 MHz PhysioTel implant and the other from a 455 kHz PhysioTel implant.

The RPC-3 can still pick up the signal from the implant or from a neighboring cage so it is important to put enough distance between them so the signals do not interfere. This receiver is different from the RPC-1 in that is has additional antennas that enable it to monitor two separate frequencies.

The RPC-3 specifications are as follows:

Pickup Frequency	18Mhz and 455kHz
Size	12.9 x 8.9 x 1.3 inches (328 x 227 x 33 mm)
Power Requirements	Powered by the MX2

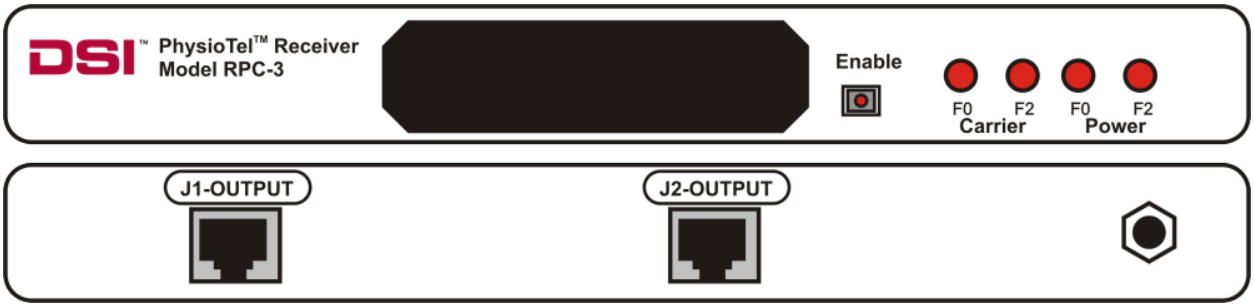


Illustration of the of the front (top) and back (bottom) panels of the RPC-3

Enable Button

The enable button on the front of the RPC-3 allows the user to turn off the receiver. Power will still be provided to the receiver, it temporarily disrupts the connection between the receiver and the MX2. This feature prevents the receiver from detecting information when an animal or cage is removed from a rack.

J1-OUTPUT – The receiver output connection to the MX2. The J1 jack is intended to be used with transmitters using the 455 kHz transmission frequency.

J2-OUTPUT – The receiver output connection to the MX2. The J2 jack is intended to be used with transmitters using the 18 Mhz transmission frequency.

RSC-1

The Receiver Special Cage (RSC-1) has the same functionality as the RPC-1 but has a much smaller profile. The RSC-1 is used in special situations where the RPC-1 is too large or will not fit close to the animal. Applications that are considered special situations could be adding a running wheel to the existing cage setup, using a metabolic cage or a large maze.

The RSC-1 also has the function to attach any external antenna. Some researchers may have interest in developing their own custom antenna. An engineering based manual is available by request to instruct users on how to interface their design to the RSC-1.

Photo of RSC-1 as viewed from the front

Photo of back of RSC-1

The RSC-1 specifications are as follows:

Pickup Frequency	455Hz
Size	3.3 x 1.2 x 5.25 inches (84 x 30 x 132 mm)

Power Requirements Powered by the MX2

Indicator Lights

POWER – The power light indicates that the receiver is connected to the MX2 and powered appropriately. The light is either on or off.

CARRIER – The carrier light indicates when the receiver can detect an implant signal. The light is either on or off, so depending on the quality of the signal users may observe what appears to be blinking if the quality of the signal is poor.

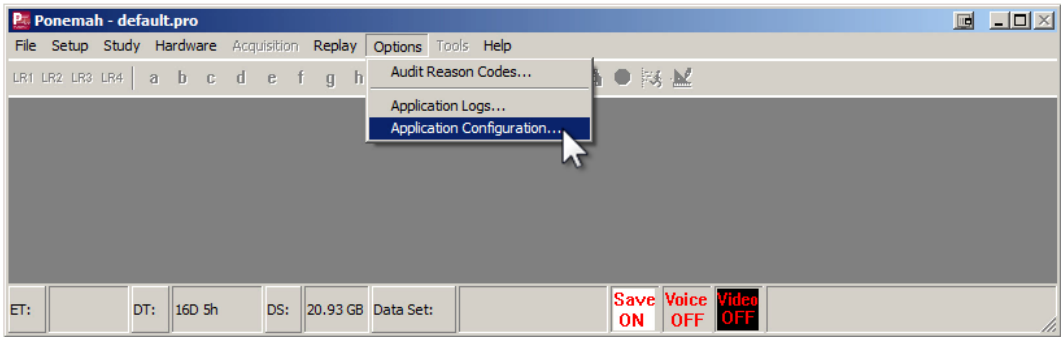
SIGNAL – The signal light is only available on the RSC-1. It has a more gradual transition from off to on which is useful in tuning remote antennas for custom antenna work.

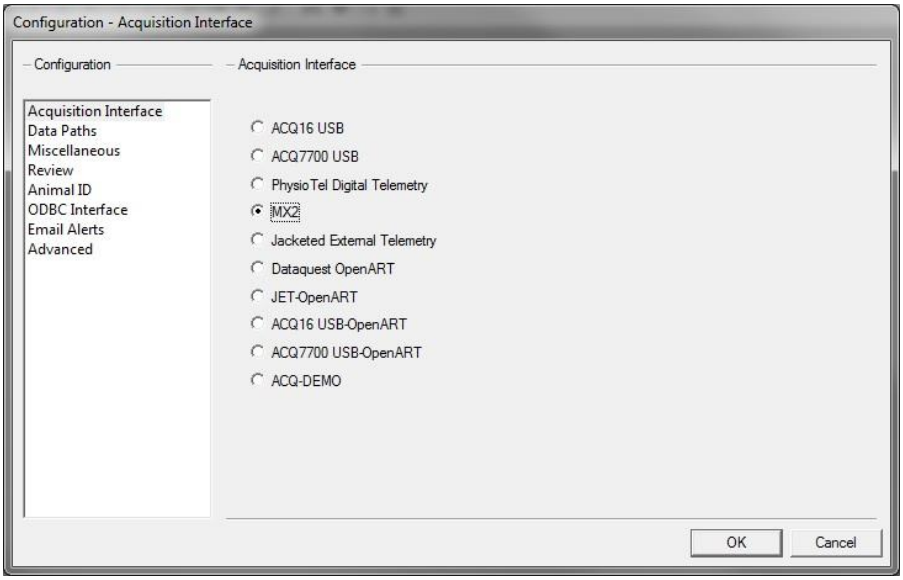
J1-OUTPUT – The receiver output connection to the MX2.

Telemetry Acquisition Interface

Telemetry Hardware Selection

The PhysioTel and PhysioTel HD Telemetry system is a specific Application Interface within the Ponemah software. Select the **Application Configuration** function from the **Options** menu. Select **MX2** and click **OK**.



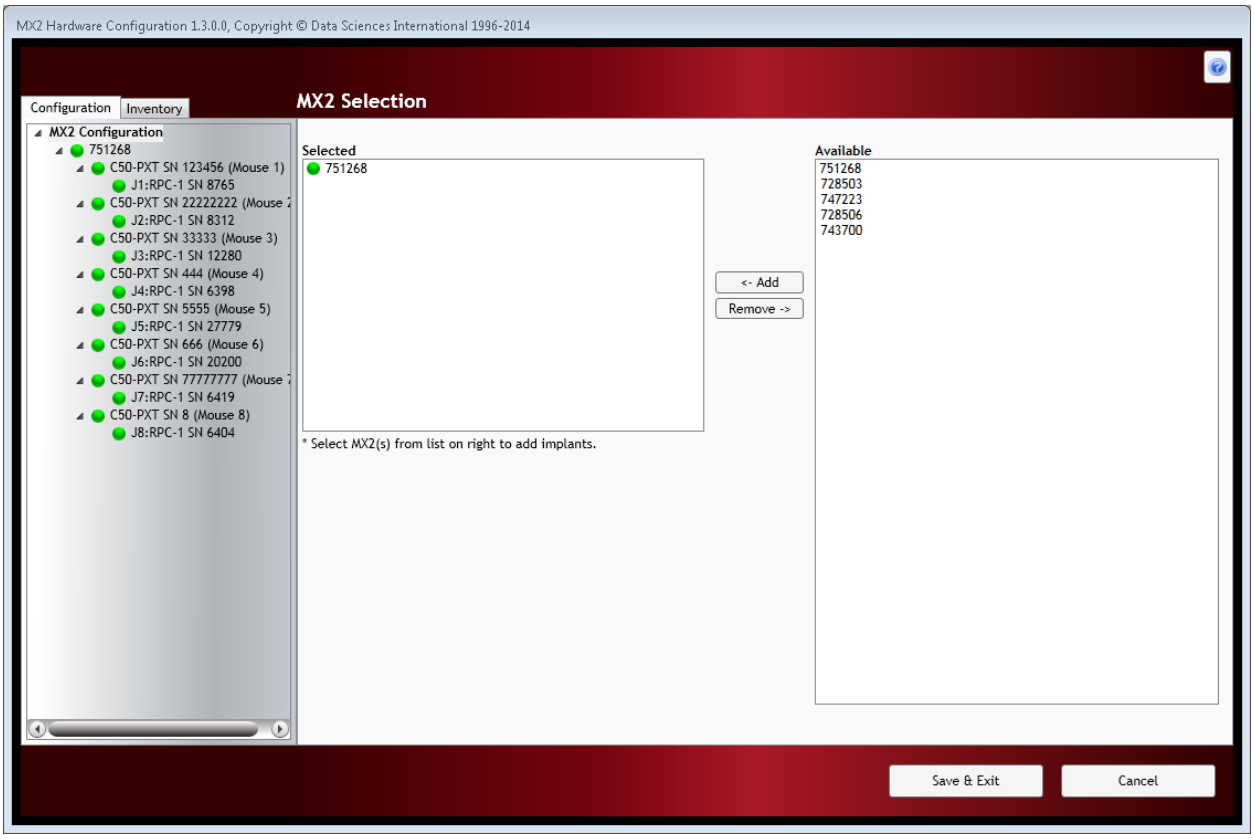


MX2 Hardware Configuration

The MX2 Configuration Process allows the user to add PhysioTel and PhysioTel HD implants to the protocol and associate them with the appropriate receivers for data collection.

The MX2 Configuration Process is composed of four major steps:

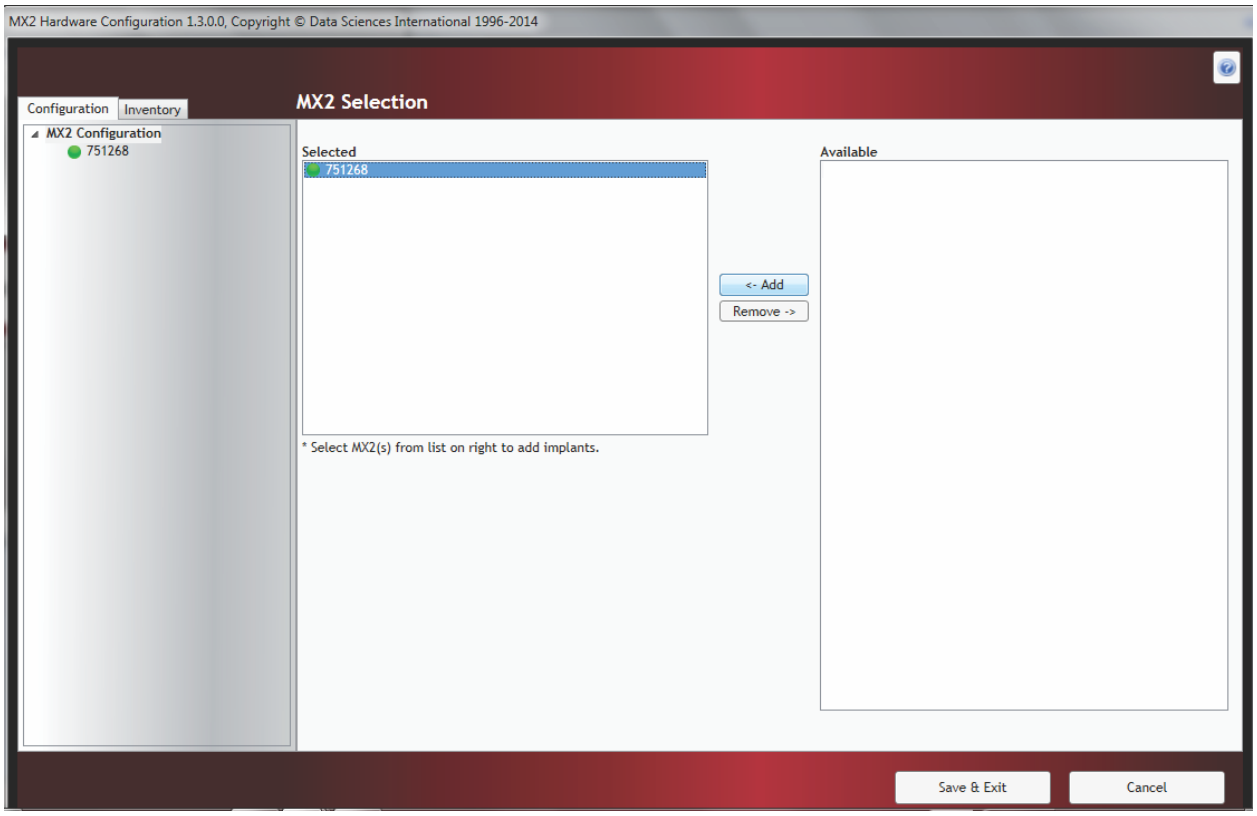
- Select MX2s to be configured in the Experiment
- Add implants to the individual MX2s
- Associate receivers with specific implants
- Managing transmitter inventory



Fully configured MX2

MX2 Selection

1. From the **Configuration** dialog, the **MX2 Selection** view will display a list of MX2s which are **Available** on the network. The **Selected** column lists the MX2s that the user has selected for configuration in the current Experiment. Click-and-drag the MX2(s) from the **Available** column to the **Selected** column.



2. Once a MX2 is listed in the **Selected** column it will also be added to the **MX2 Configuration** in the **Configuration** tab on the far left. It will also be accompanied by a colored light next to name:

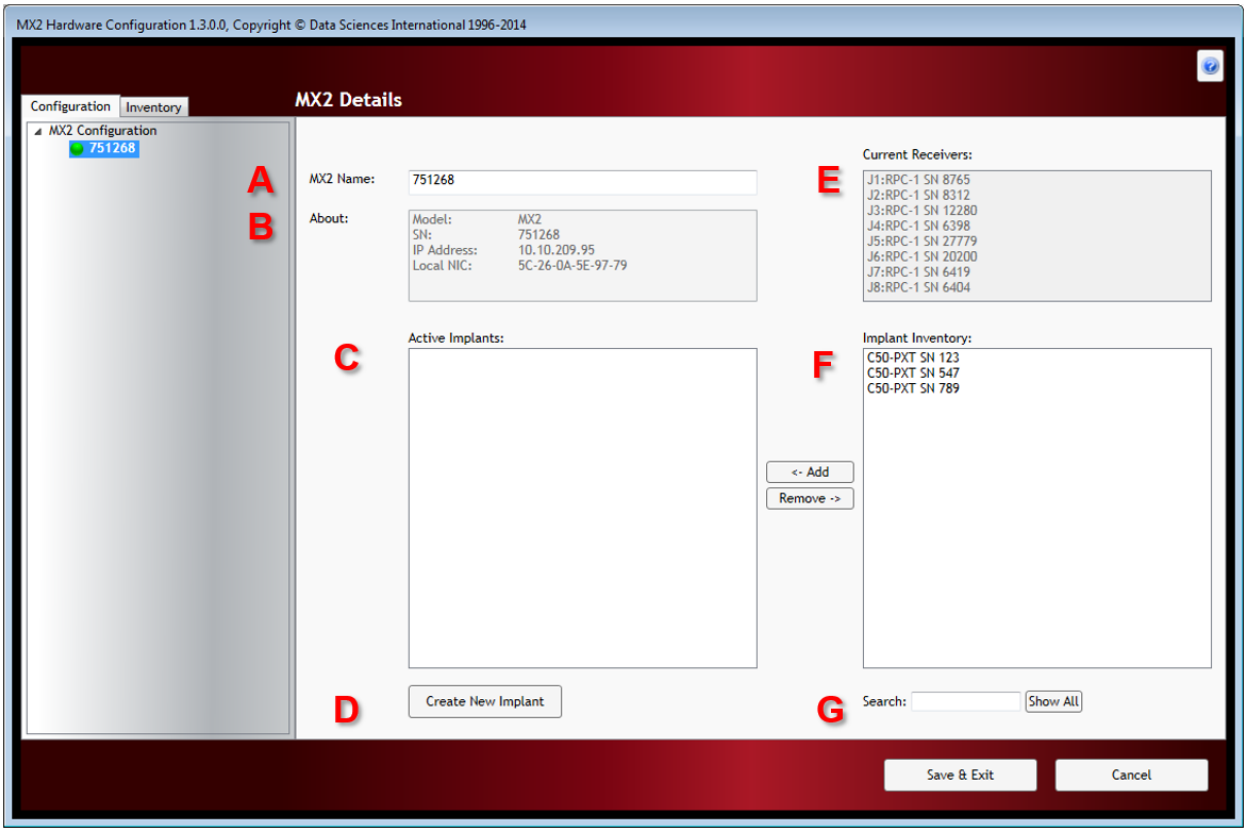
   Enabled – a green colored light indicates that the MX2 is not currently configured in an Experiment on another system.

   Disabled – a red colored light indicates that this particular MX2 is currently configured in an Experiment on another system.

   NOTE: An individual MX2 can only be configured by one system at a time. The MX2 will be visible on the network but, as long as it remains part of a configured Experiment, it will not be available to any other system on the network. To free up a configured MX2 the Experiment which holds its configuration must be closed.

MX2 Details

1. After adding a MX2 to the **MX2 Configuration** tab, click on the MX2 name to open the **MX2 Details** dialog.



2. The following features are available in the MX2 Selection Dialog:
   A. **MX2 Name**: Allows the user to create or change the name of the MX2
   B. **About:** Lists information pertinent to the MX2
   C. **Active Implants**: list of the implants that are to be configured for the MX2
   D. **Create New Implant:** clicking the button will create a blank implant and open a new Implant Details dialog
   E. **Current Receivers**: list of the receivers that are connected to the MX2 sorted by jack number
   F. **Implant Inventory**: List of implants currently configured in the Inventory
   G. **Search**: search function for the Implant Inventory

Add Implants

Once a MX2 is selected, telemetry implants can be added to the configuration. Implant configurations can either reused from previous experiments or new implants can configured in the system using the **Create New Implants** button located at the bottom of the "**Details"** windows.

Add Existing Implants

1. Select an MX2 from the **Configuration** tab in the left panel of the **MX2 Hardware Configuration** window.

2. All of the pre-configured implants in the Inventory will be listed in the **Implant Inventory** box on the right side of the **MX2 Details** panel.
3. Highlight the desired implant names in the inventory and click the **"<- Add**" button to move the selected implants to the **Active Implants** box on the left side of the **MX2 Details** panel. This will assign the implants to the specific MX2 and add them to the "tree" structure in the **Configuration** tab on the left side of the hardware configuration window.

Edit Implant Details

Once individual implants have been assigned to an MX2, the implant details can be edited.

1. Select an implant from the listing in the **Configuration** tab on the left side of the hardware configuration window. The implant name will be displayed in bold text and the **Implant Details** panel will display the configuration information for that implant.
2. Adjust the implant details as necessary
3. Associate the implant with a receiver
4. Select another implant to edit

Create New Implants

New implants will need to be brought into the system and configured before they can be utilized. There are two classes of telemetry implants that are compatible with the MX2: PhysioTel transmitters and PhysioTel "HD" transmitters. The HD stands for Hybrid Digital and the two classes of devices are configured in slightly different ways.

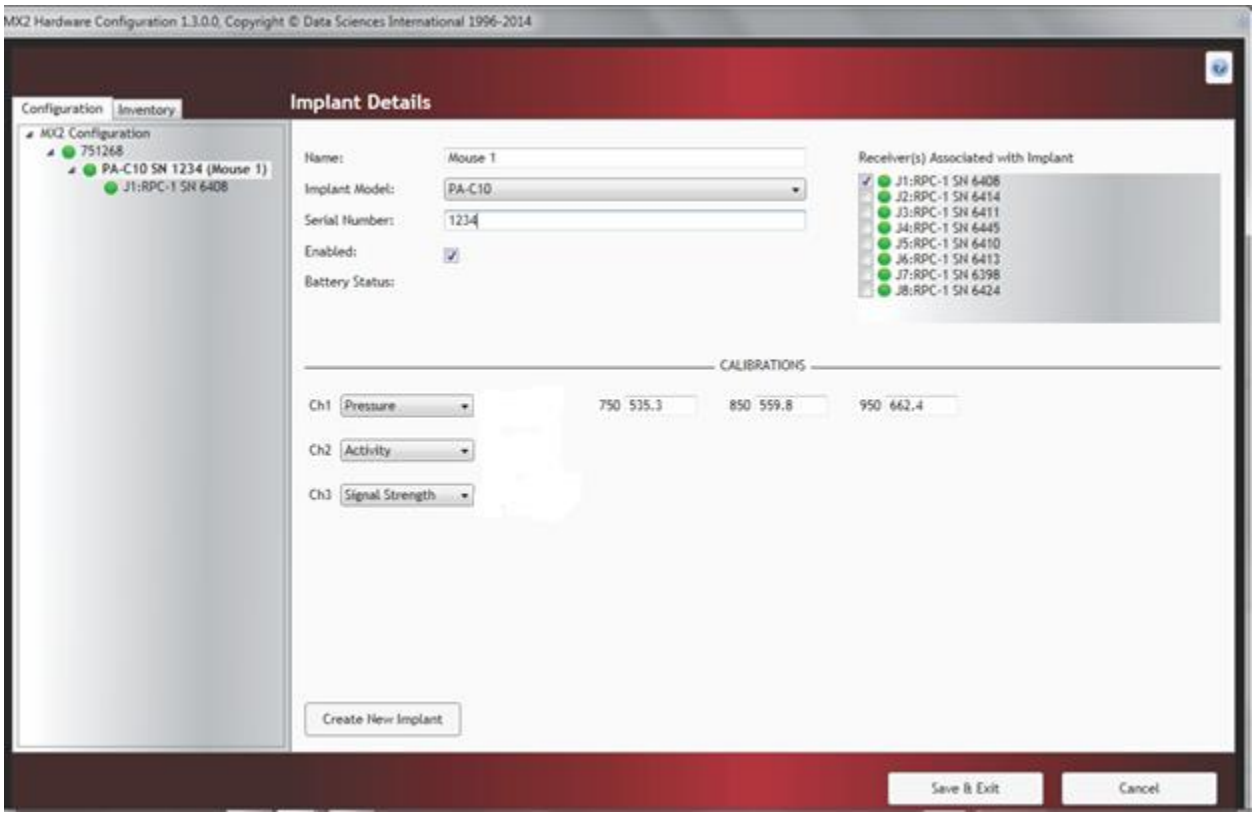
1. Select an MX2 from the **Configuration** tab on the left side of the **MX2 Hardware Configuration** window by left-clicking the mouse. This will open the MX2 Details pane on the right side of the screen.
2. Left-click the **Create New Implant** button below the **Active Implants** box. This adds a default implant to the MX2 in the **Configuration** pane and opens the **Implant Details** pane on the right side of the window. The default implant name in the configuration pane will have a disabled icon (🔴) until the configuration is completed.
3. Enter a Name (Subject ID) in the **Name:** field at the top of the **Implant Details** pane. This will be the Subject ID and filename for the data collected from this implant.
4. Select the **Implant Model** for the new implant using the drop-down field. This is the implant model name listed on the implant package.
    - For implant models beginning with "HD" proceed to the section titled: **Configure PhysioTel HD implants**
    - For all other implant models proceed to the section titled: **Configure PhysioTel Implants**

Configure PhysioTel Implants

5. Enter the implant serial number from the label on the back of the implant packaging.
6. Enable the implant by making sure there is a check mark in the checkbox. This checkbox simply toggles the implant as enabled or disabled.
7. Enter the calibration values that correspond with the appropriate channels. The implant calibration values are printed on the implant label located on the back of the implant packaging.
8. Associate receiver(s) with the implant. You must perform this step before continuing. Associate receiver(s) with the implant(s) by clicking in the checkbox corresponding to desired receiver(s) listed in the box in the upper right hand corner: **Receiver(s) Associated with implant.**

    NOTE: This should change the status of the implant in the **Configuration** tab from disabled (🔴) to enabled (🟢)

NOTE: multiple receivers may be associated with the implant.



9. Use the dropdown menu to assign the appropriate **Channel Type** for each channel. This will default to typical values based on the Implant Model selected.*
10. Once all implants have been configured, select **Save & Exit**.

***Please Note:**

- The signal type should be updated to appropriately represent the signal you are acquiring as it is used by the system to automatically assign the analysis module used to calculate physiologic values from the signal.
- The sampling rate should be set high enough to capture all significant changes in the signal, but low enough to avoid excessive over-sampling.

Configure PhysioTel HD implants

The PhysioTel "HD" model transmitters feature automatic entry of serial numbers and calibration information. Follow the steps below to utilize this feature.

5. Associate receiver(s) with the implant. You must perform this step before continuing. Associate receiver(s) with the implant(s) by clicking in the checkbox corresponding to desired receiver(s) listed in the box in the upper right hand corner: **Receiver(s) Associated with implant.**

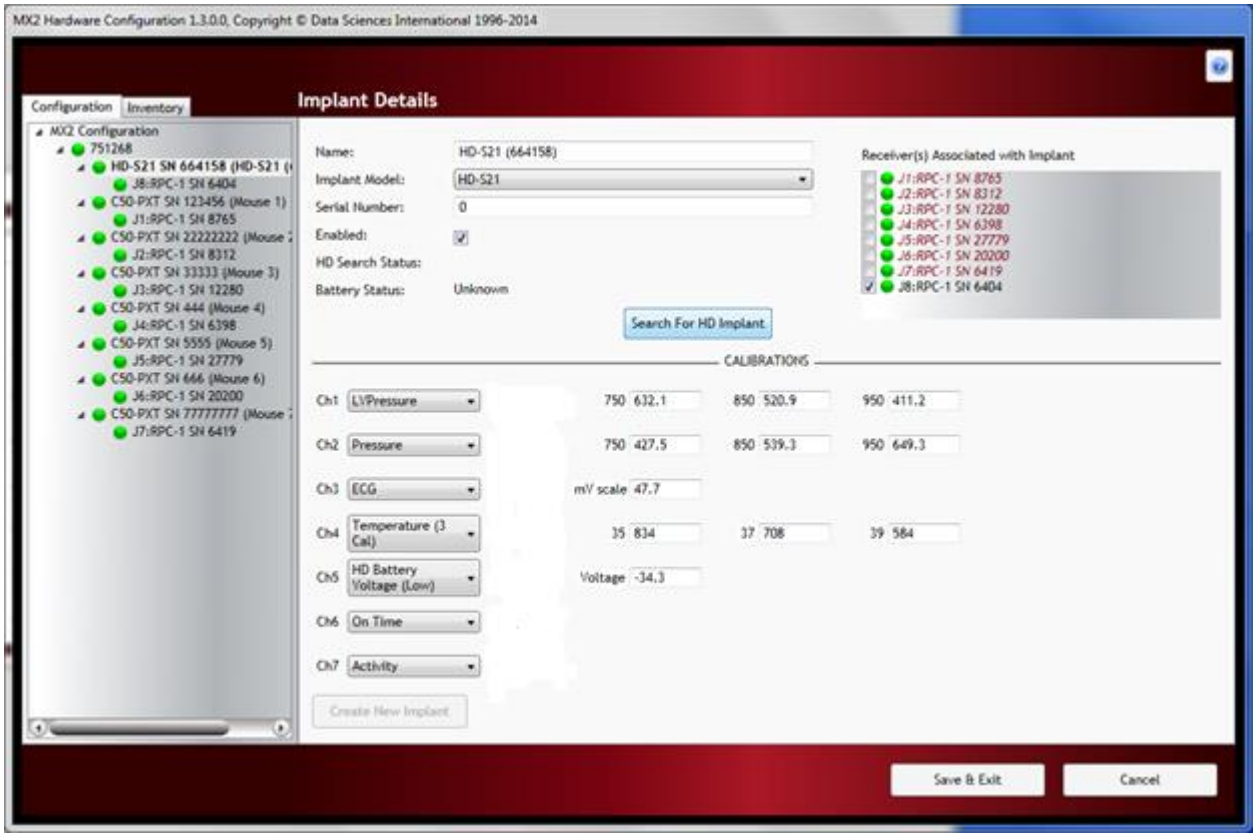
   NOTE: multiple receivers may be associated with the implant.
6. **Search for HD Implant**: Once a receiver is associated with an implant, a button will appear labeled **Search for HD Implant**. This initiates the auto-calibration feature for the HD implants.

6.1. Take the implant package and place it on top of the associated receiver (at least within a few inches).
6.2. Click the **Search For HD Implant** button in the **Implant Details** pane on the screen. This will display the message "Searching Please Wait…" in the field labeled **HD Search Status:**
6.3. Power on an AM radio and tune it to 550 kHz (the lowest end of the AM band) and place it in close proximity to the implant package.
6.4. Bring a strong magnet in close proximity to the implant in the package to turn ON the implant.
6.5. A tone should be heard on the radio within two to five seconds of the magnet swipe indicating that the device has been turned on.
6.6. The serial number and calibration values will be automatically downloaded from the HD implant and will populate the calibration fields.

7. Successful auto-calibration will populate the **Serial Number** field as well as all of the calibration fields in the **Implant Details** pane. A successful calibration will also change the status of the implant in the **Configuration** tab from disabled (🔴) to enabled (🟢).

8. If the calibration procedure is not successful follow this procedure:

8.1. Click the button labeled **Cancel HD Search**. This will display the message "Search Failed – Canceled" in the field labeled **HD Search Status:**
8.2. Turn the Implant OFF by bringing a strong magnet in close proximity to the implant in the package.
8.3. Repeat the **Search for HD Implant** procedure outlined above (step 10).



9. Use the dropdown menu to assign the appropriate **Channel** for each channel. This will default to typical values based on the Implant Model selected.*
10. Once all implants have been configured, select **Save & Exit**.

*Please Note:

- The signal type should be updated to appropriately represent the signal you are acquiring as it is used by the system to automatically assign the analysis module used to calculate physiologic values from the signal.
- The sampling rate should be set high enough to capture all significant changes in the signal, but low enough to avoid excessive over-sampling.

Channel Type

Subjects will be automatically created upon clicking Save and Exit from the MX2 Configuration dialog. Subjects will be named with the Name defined while configuring the implant in the MX2 configuration and will have that specific implant automatically associated with it.

Associate Receivers with Implants

Once a MX2 is populated with Implants, the User must associate at least one connected receiver with each of the configured implants. If large animal enclosures are used, it is possible to associate more than one receiver to each implant.

1. From the MX2 Configuration window, select an MX2 from the Available column on the right. It will be added to the hierarchy list in the Configuration Tab in the column on the left.
2. Click on a MX2 in the Configuration tab to access the MX2 Details dialog on the right.
3. Add Implants to the MX2 configuration by adding or dragging implants from the Implant Inventory to the Active Implants list. These Implants will be added to the hierarchy list in the Configuration Tab in the column on the left.
4. Click on an Implant in the Configuration tab to access the Implant Details dialog on the right.
5. To "associate" a receiver with an Implant, click the checkbox corresponding to desired receiver(s) listed in the box in the upper right hand corner: **Receiver(s) Associated with implant**

   NOTE: This should change the status of the implant in the **Configuration** tab from disabled to Enabled ()

   NOTE: multiple receivers may be associated with the one implant.
6. The "checked" receiver(s) will be added to the Implant listed in the Configuration Tab in the column on the left.

Managing Inventory

The Experiment inventory is a saved repository which allows storage and retrieval of implant details which have been configured in the current Experiment, or previously configured Experiments.

The implants contained within the Experiment inventory can be imported and exported between Experiments.

Inventory is available to all experiments started from the PC. This allows Implants to be held in the inventory for use in multiple experiments without having to re-configure the implant within a new Experiment.

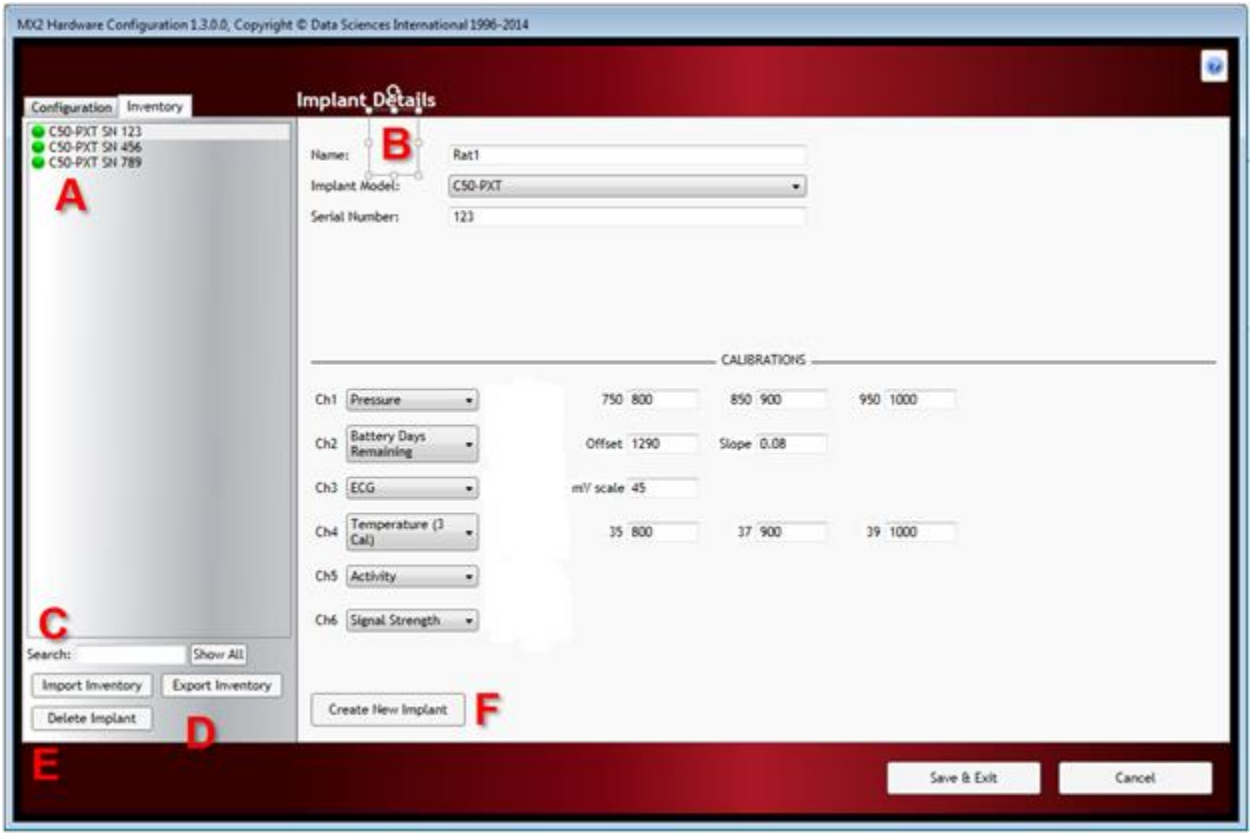
Users can export their Implant Inventory and import them on different acquisition PC's. This allows the User to add implants previously configured on one PC to another for use in new experiments without having to re-enter calibration values.

The Inventory for the current Experiment can be viewed in two locations within the MX2 Hardware Configuration:

- The **Implant Inventory**: dialog box within the **MX2 Details** page.
- The **Inventory** tab on the left side of the **MX2 Hardware Configuration** window

Inventory Management

The Implant Inventory is managed through the **Inventory** tab located on the on the left side of the **MX2 Hardware Configuration** window.



Features of the Inventory tab include:

A. **List of Implants**: List of the current implants which are configured in within the Experiment.

B. **Implant Details**: Interface which allows the User to custom configure individual implants.

C. **Search**: Searches the Inventory within the PC. User can locate implants by model or serial number to configure to an MX2.

D. **Import / Export Inventory**: Saves and retrieves inventory information in *.xml file format

E. **Delete Implant**: Removes implants from the Inventory

F. **Create New Implant:** This button adds a new implant to the **Configuration** list.

Exporting/Importing Inventory

Users can import and export their Implant Inventory from one Experiment to another or from one PC to another. This allows the User to add implants previously configured on one PC to another for use in new experiments without having to re-enter calibration values.

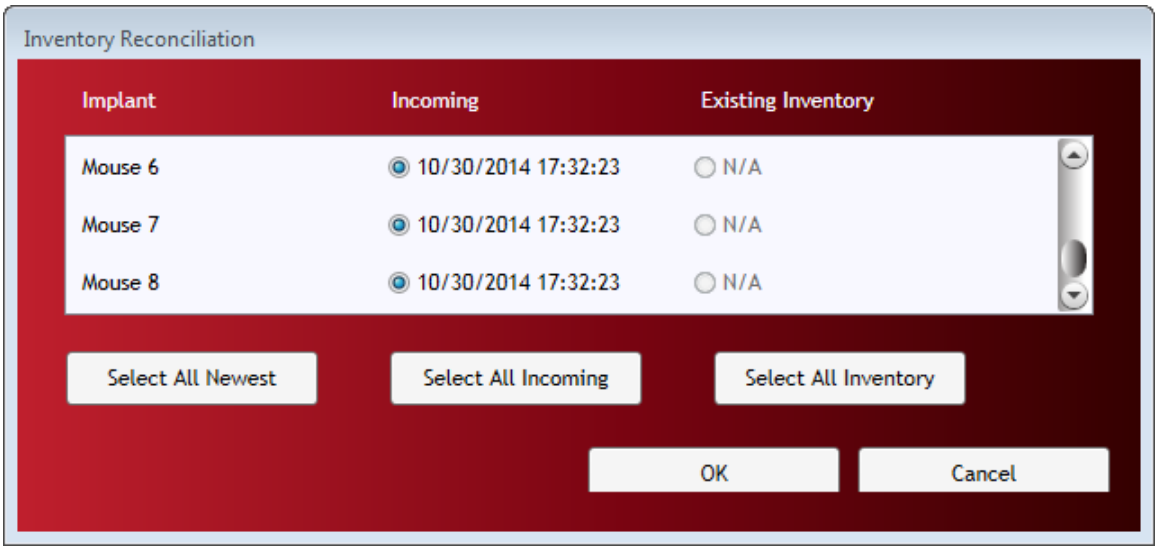
Exporting configured Implants:

1. From the **Inventory** tab in the **MX2 Hardware Configuration** window, click the **Export Inventory** Button. This opens the **Export Inventory** dialog.
2. The default filename is **MyInventory.xml** but the User may use any filename with an .xml file extension.
3. Click **Save**.

   NOTE: **Export Inventory** will export all of the implants listed in the **Inventory** tab, regardless of which implant names are selected.

Importing configured Implants:

1. From the **Inventory** tab in the **MX2 Hardware Configuration** window, click the **Import Inventory** button. This opens the **Import Inventory** dialog.
2. Locate the saved inventory file (*.xml) you wish to import and click **Open**. This opens the **Inventory Reconciliation** dialog.



3. Select the implant configurations you wish to import by selecting the appropriate radio buttons in the **Incoming** column. *****
4. Click **OK** to import. The selected implant names will be added to the list in the **Inventory** tab.

   *****NOTE: Some of the features of the **Inventory Reconciliation** dialog may not yet be implemented.

Delete Implants from Inventory

Configured implants can be removed from the **Inventory** tab in the **MX2 Hardware Configuration** window.

1. From the **Inventory** tab in the **MX2 Hardware Configuration** window, select the implant names you wish to delete from the Experiment. Multiple implant names may be selected.
2. Click **Delete Implant**. This triggers an "Are you sure…" **Delete Implant From Inventory** dialog.
3. Click **Yes** if appropriate. A separate Delete **Implant From Inventory** dialog will appear for each implant selected for deletion.

   NOTE: This option permanently removes the implant information from the system unless it has been used to collect data. The **Delete Implant** option will remove the implant configuration from the system but the data files will remain in the data folders until the files are moved or deleted.

Creating New Implants

New Implants may be configured in the Experiment and thereby added to the Inventory. The Create New Implant button adds a generic implant to the implant list in the **Inventory** tab. The new implant will not be completely configured until its **Implant Details** are complete and it is associated with a receiver.

The implant configuration procedure can be found in the section entitled: **Creating New Implants**

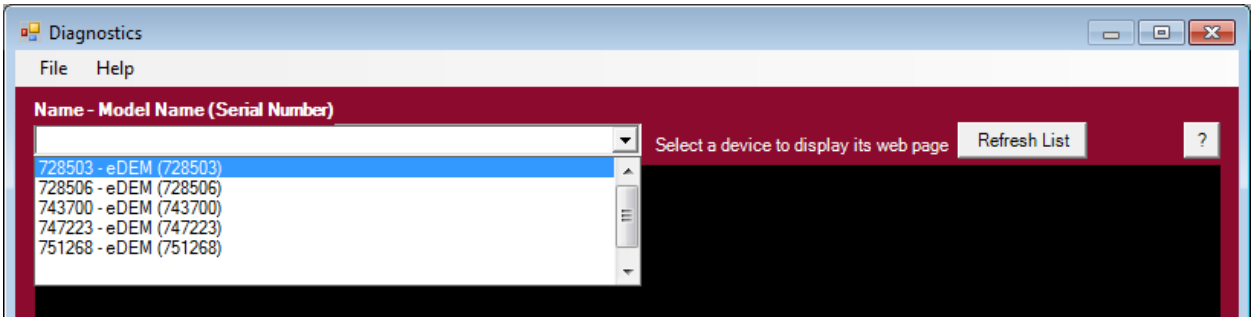
MX2 Diagnostics…

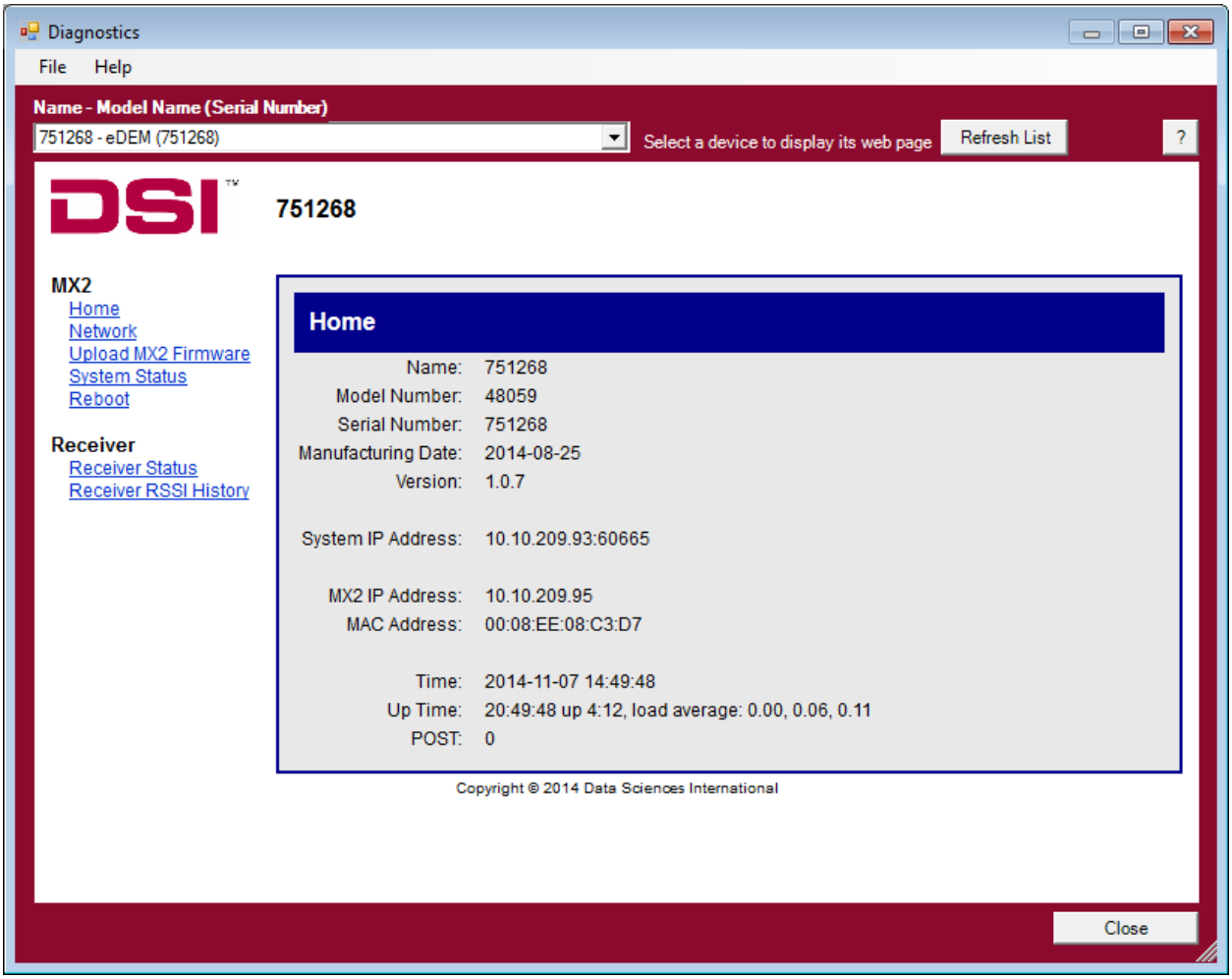
Selecting **MX2 Diagnostics…** from the Hardware menu will open the MX2 **Diagnostics** web browser.

Diagnostics

The Diagnostics user interface is a browser based webpage that allows the user to check the status of the MX2, Check network connections, update firmware, and perform diagnostic tests to optimize the performance of the system components.

To select a specific MX2 click on the drop-down menu located in the top left corner of the diagnostics window. All of the configured MX2s that are connected to the system will appear in this list.





The Diagnostics interface features a similar layout to the other Ponemah windows: there is a menu list on the left and an interactive information window on the right.

The hyperlinks in the menu list are as follows:

MX2

Home:	Lists all of the information pertinent to the Selected MX2
Network:	Interface allowing changes in the network addresses
Upload MX2 Firmware:	Search bar to facilitate uploading new Firmware
System Status:	Accesses the system log
Reboot:	Reboots the MX2

Receiver

Receiver Status:	Lists of the information pertinent for each of

	the receivers connected to the MX2
Receiver RSSI History:	Tracks strength of received signals from the implants

Home

The view pane of the **Home** page is purely informational, there is no interactivity.

The MX2 name appears just to the right of the DSI logo.

The information listed on the **Home** page is as follows:

Name :	User-selected name
Model Number:	
Serial Number:	
Manufacturing Date:	(Format = YYYY-MM-DD)
Version:	
System IP Address:	Internet Protocol address of the acquisition computer
MX2 IP Address	Internet Protocol address of the MX2
MAC Address	Unique identifier for the MX2 network interface
Time:	Current Date & Time (Format = YYYY-MM-DD HR:MN:SC)
Up Time:	Status information since last reboot
POST:	Power On Self-Test (0 = Passed, OK …)

Network

The **Network** page allows the User to adjust the network communication settings.

There are two options available:

- Obtain an IP address automatically
- Use the following IP address (manually entered)

Obtain an IP address automatically

This is the normal operating mode for the MX2. With this option selected the MX2 is queried and the values that it reports back are displayed in the appropriate text boxes:

- IP v4 Address:
- Subnet Mask:
- Default Gateway:

NOTE: A new IP address can be generated by performing an "extended" reset: push and hold the reset button on the back of the MX2 for 5-15 seconds.

Use the following IP address

Select this option if the user wishes to manually assign a specific IP address to the MX2.

1. Click the radio button for **Use the following IP address**
2. Enter the desired values in the text boxes labeled:
   - IP v4 Address:
   - Subnet Mask:
   - Default Gateway:
3. Click Apply

   NOTE: A reboot of the system will have to be performed in order for the new IP Address to activate.

   CAUTION: In the event that the user-assigned IP address is not accessible, this diagnostics tool will lose contact with the MX2. To generate a new IP address, the user will have to perform an "extended" reset: push and hold the reset button on the back of the MX2 for 5-15 seconds.

Upload MX2 Firmware

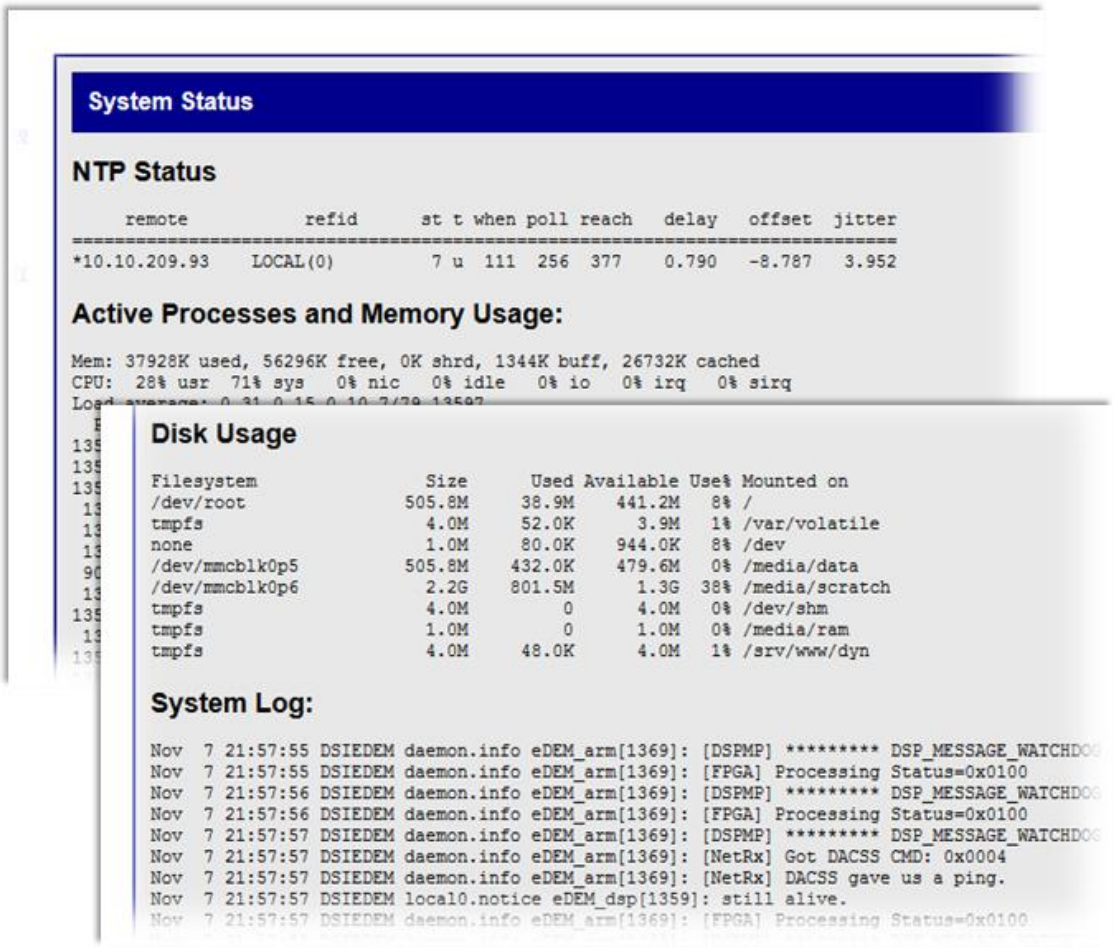
This page allows the user to update the MX2 firmware. From time to time it may be advantageous to upgrade the internal read-only program instructions through a firmware upgrade. This often results in improved performance.
To update or change the firmware version in the MX2, follow this procedure:

1. Click on the **Browse** button and use the file upload window to locate the firmware file.
2. Navigate to the specific filename and click **Open**
3. Message 1: Uploaded, Validating
4. Message 2: Validated. Upgrade will be applied during reboot.

   NOTE: A reboot of the system will have to be performed in order for the update to activate.

System Status

The System Status is a continuously updating "log" file of the MX2's communication activity. It can be used to monitor communication issues in the event of discontinuities.



Contents:

- NTP Status – Reports the last time the MX2 received an update from the NTP Server
- Active Processes and Memory Usage
- Disk Usage
- System Log

Reboot

This function allows the user to perform a complete reboot of the MX2. A Reboot of the system is required to:

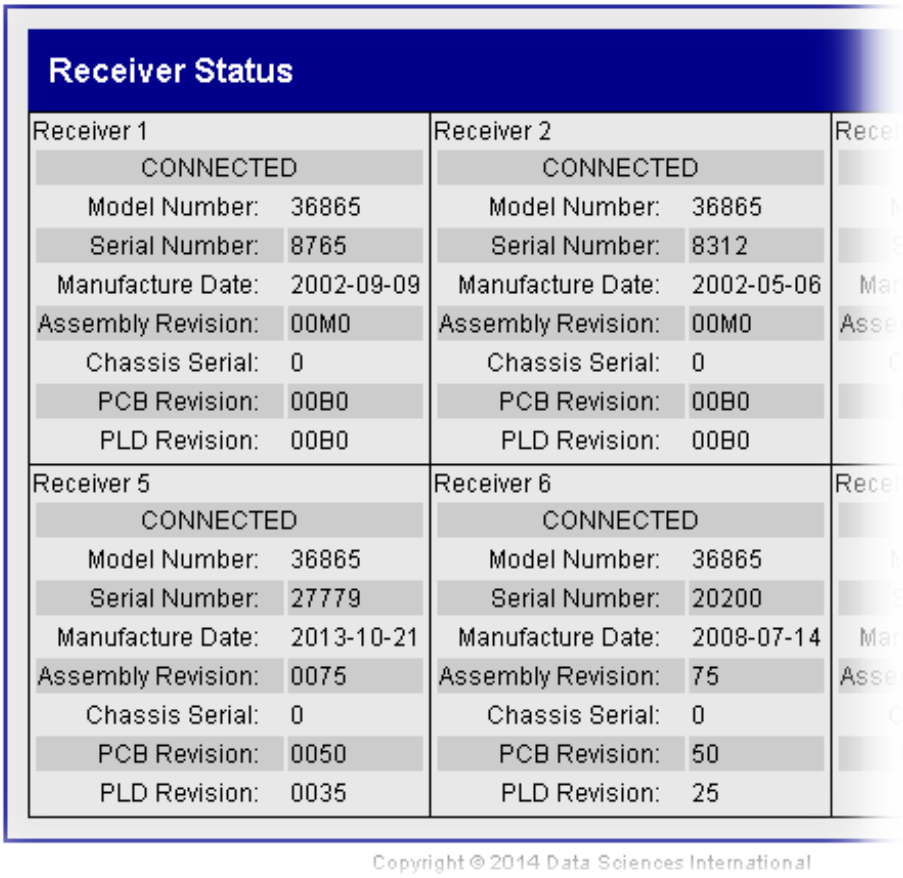
- Activate a firmware upgrade
- Change the IP settings

- To reboot the MX2 left click the **Reboot** button

NOTE: the Reboot process may take several minutes to complete. There are no progress indicators that appear on this page, However there are indicator lights on the back of the MX2 box itself.

Receiver Status

The **Receiver Status** screen is a non-interactive snapshot of the current status of the receivers that are connected to the MX2. Each MX2 is capable of interfacing with eight receivers. This arrangement follows the layout on the rear panel of the MX2 unit.



Receiver Status screen

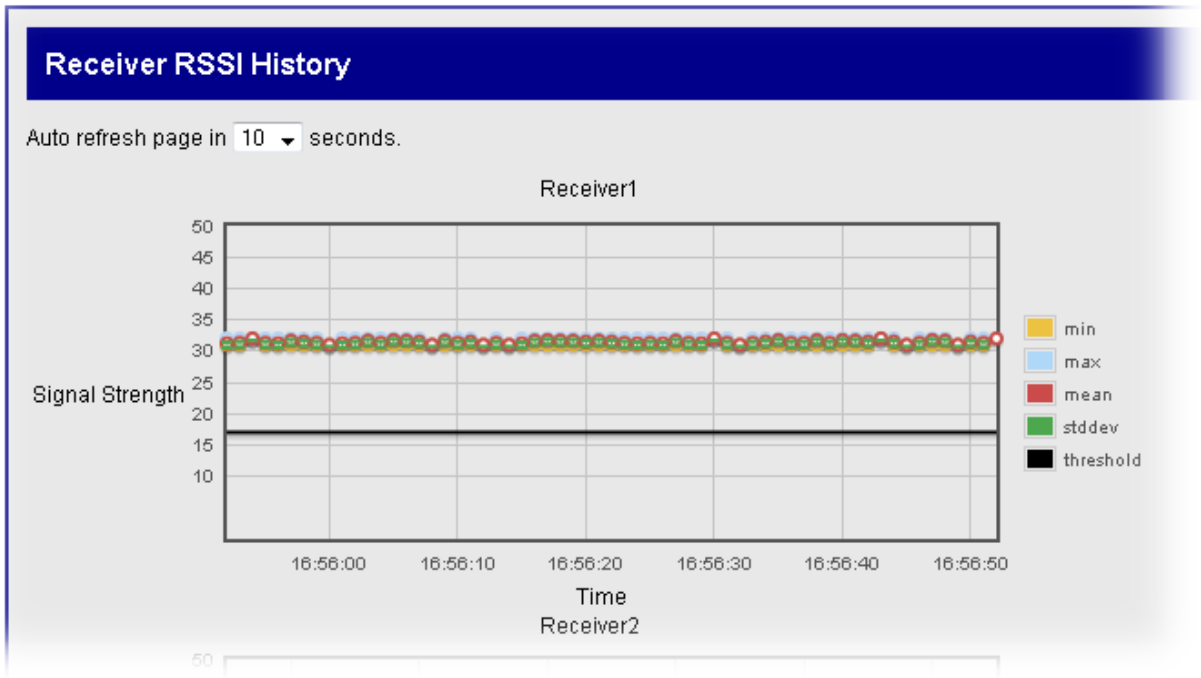
The line items are as follows:

Receiver (#):	Number 1-8
CONNECTED:	Indicates whether the receiver is physically CONNECTED or NOT CONNECTED to the MX2
Model Number:	
Serial number:	
Manufacture Date:	YYYY-MM-DD
Assembly Revision:	
Chassis Serial:	
PCB Revision:	(Printed Circuit Board)
PLD Revision:	(Programmable Logic Device)

Receiver RSSI History

This option allows the user to view how well the receivers are receiving RF signals from the implants. In an actively running system these graphs continually update according to a user prescribed auto refresh rate.

There will be one RSSI graph displayed for each of the receivers connected to the MX2.


Receiver RSSI History
Auto refresh page in 10 seconds.
Receiver1
Signal Strength
50
45
40
35
30
25
20
15
10
16:56:00
16:56:10
16:56:20
16:56:30
16:56:40
16:56:50
Time
min
max
mean
stddev
threshold
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