



# PhysioTel™ Digital Signal Simulator Manual

## OVERVIEW

This manual provides an overview of the use of PhysioTel Digital's telemetry signal simulator. It will outline the configuration process and provide the expected derived outputs from the Ponemah™ software platform.



**Data Sciences International**

**119 14TH STREET NW**

**SUITE 100**

**ST. PAUL, MN 55112 USA**

**(651)481-7400 • 1(800)262-9687**

**[www.datasci.com](http://www.datasci.com)**

**PN: 006776 REV04**

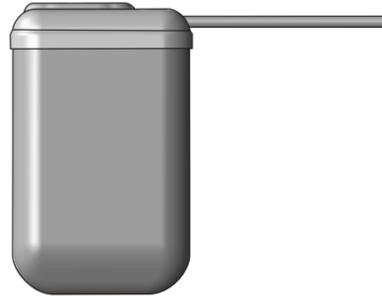
# Table of Contents

Specifications .....	3
Overview .....	3
Using the PTD-SIM .....	3
PTD-SIM indicator LED patterns .....	3
Signal Simulation.....	4
System Configuration .....	4
Define Ambient Pressure Value .....	9
Start Acquisition .....	9
Calibrated Printouts .....	9
Simulation 1: Blood Pressure, and ECG .....	10
Simulation 2: L21 LV Pressure, Blood Pressure, and ECG .....	10
PTD-SIM Large Animal Simulations, Derived Parameters from Ponemah .....	11
Analysis Attribute Settings .....	11
Contacting Technical Support.....	12
Contact Details .....	12
DSI Technical Support—North America .....	12
DSI Technical Support—Europe .....	12
DSI Technical Support—All Other Countries .....	12
Online Resources.....	12

## SPECIFICATIONS

### PTD-SIM

RF Range:	3-5 meters
Signal Simulations:	LV Pressure Blood Pressure ECG Temperature
Dimensions:	59 x 38 x 15 mm
Battery Life:	11 weeks continuous



## OVERVIEW

The PTD-SIM telemetry signal simulator is an invaluable tool for system setup, user training, demonstration, and system validation. The device provides simulated telemetry output representing stereotypical physiologic signals from a PhysioTel Digital telemetry implant. The PTD-SIM can be used to simulate the telemetry signal from the PhysioTel Digital L and M series implants.

## USING THE PTD-SIM

The PTD-SIM signal simulator is very similar to a PhysioTel Digital telemetry implant. Essentially, the PTD-SIM is an implant that transmits pre-recorded canine data\* instead of collecting it from an animal. The housing is the same as an implant without the leads and pressure catheters. It also has a shortened external antenna.

**\*Data downloadable from the DSI Support Center.**



**CAUTION.** *The PhysioTel Digital Signal Simulator is not an implantable device. Under no circumstances should this device be implanted in an animal.*

## ACTIVATION

The PTD-SIM can be turned on and off with a strong magnet. The signal simulator can be also be turned off using the strong magnet or remotely using the implant management software.

## PTD-SIM INDICATOR LED PATTERNS

The SIM has a single blue LED which features various flashing patterns depending upon the state of communication with the Com Link Controller (CLC). These flashing patterns can be useful in diagnosing RF range issues and demonstrating the operational modes of a PhysioTel Digital telemetry implant.



Modes:

- Off LEDs are all off
- Power up Power on sequence
- Search Implant is searching for a CLC on the implant’s designated frequency
- Joining CLC detected, implant attempting to join
- Standby Implant is successfully joined to CLC, implant placed in standby mode
- Active mode Implant sending data

Mode	1 sec	1 sec	1 sec	1 sec	1 sec
Power up	 .....		 .....		
Search	  				  
Joining	  	  	  	  	  
Standby					
Active	 	 	 	 	 

 indicates steady on,  indicates a flash

## SIGNAL SIMULATION

The simulator is configured like an implant in the configuration hardware and the output is collected and analyzed by the system software.

The default data output of the signal simulator is that of a L21 model implant. To simulate another device, deactivate the channel corresponding to the signals that will not be collected in the device configuration software, as outlined in the System Configuration section below.

## SYSTEM CONFIGURATION

The PTD-SIM is configured in the same manner as a live implant. Therefore, a system configuration must have at least one transceiver (TRX) connected to a networked CLC. Follow the instructions below to configure the PTD-SIM device.

*Note: The following process is for Ponemah v5.20-SP9+ and Ponemah v6.33+. If using earlier versions of Ponemah or Ponemah ECG Analysis Module earlier than v5.30, please contact DSI Technical Support.*

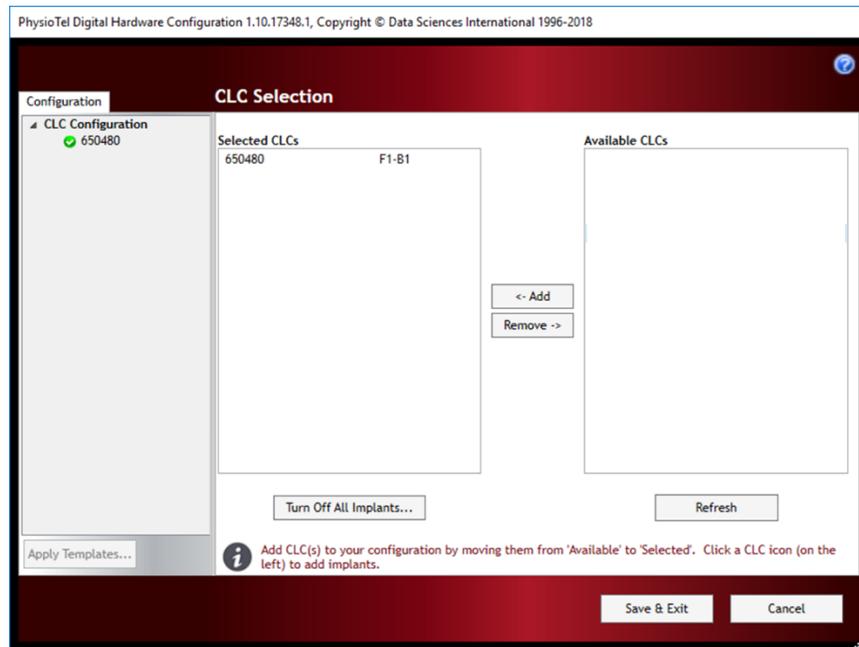
To begin your configuration process:

1. Activate the PTD-SIM on by bringing a strong magnet within proximity (1-2 inches) of the device for 2 seconds.
2. In Ponemah v5.20, select **Hardware | Edit Configuration**.

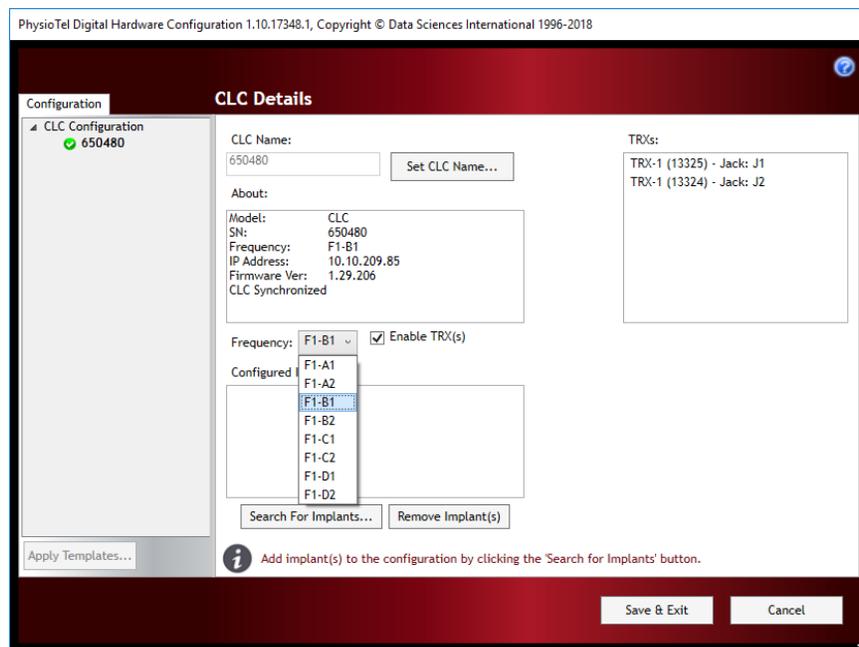
*Note:* If using Ponemah v6.x, select **Hardware | Edit PhysioTel Digital Configuration**.

3. Configure the PTD-SIM.
  - a. Select the **CLC Configuration** line from the **Configuration** tab’s **List View**.

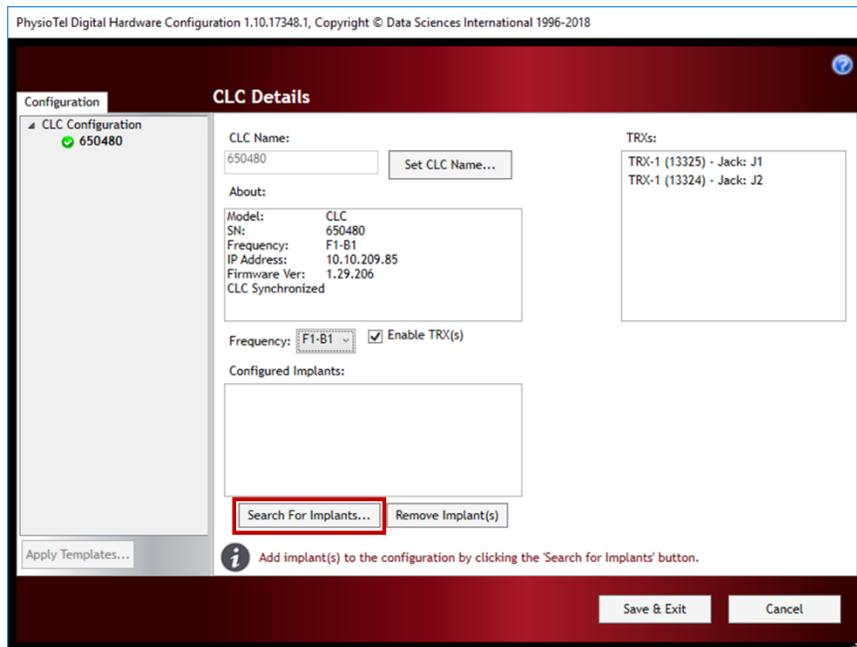
- b. The **CLC Selection** view will display a list of CLCs which are **Available** on the network. The **Selected** column lists the CLC(s) the user has selected for configuration in the current Experiment. Click-and-drag the CLC(s) from the **Available** column to the **Selected** column.



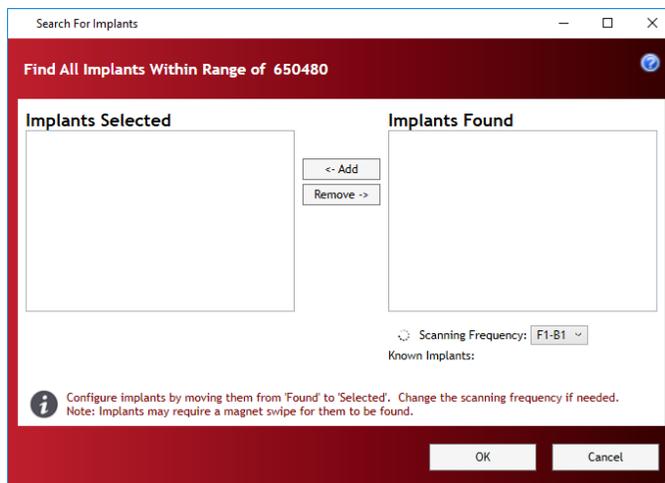
- c. Select the first CLC in the List View to display its Details page. Use the **Frequency** dropdown to define it to a unique frequency (e.g. F1-D1).



- d. Select the **Search for Implants...** button.

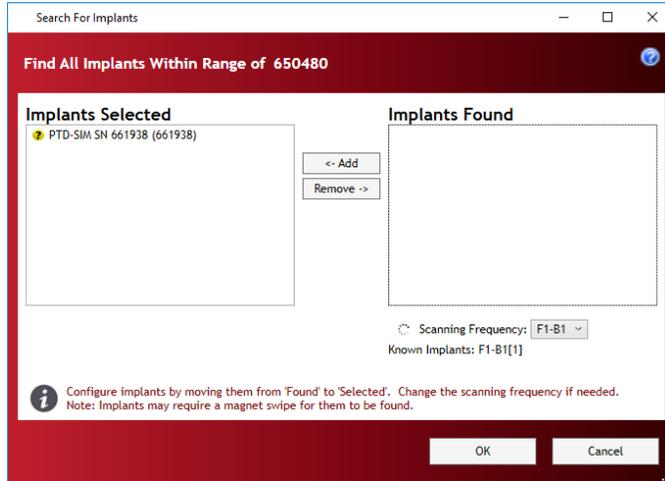


- e. The *Search for Implants* dialog will display and automatically begin searching for implants and PTD-SIMs across all supported frequencies if they are powered ON and within transmitter range. Any implants/PTD-SIM in Standby Mode and on the CLC's current frequency will be displayed in the **Implants Found** column.

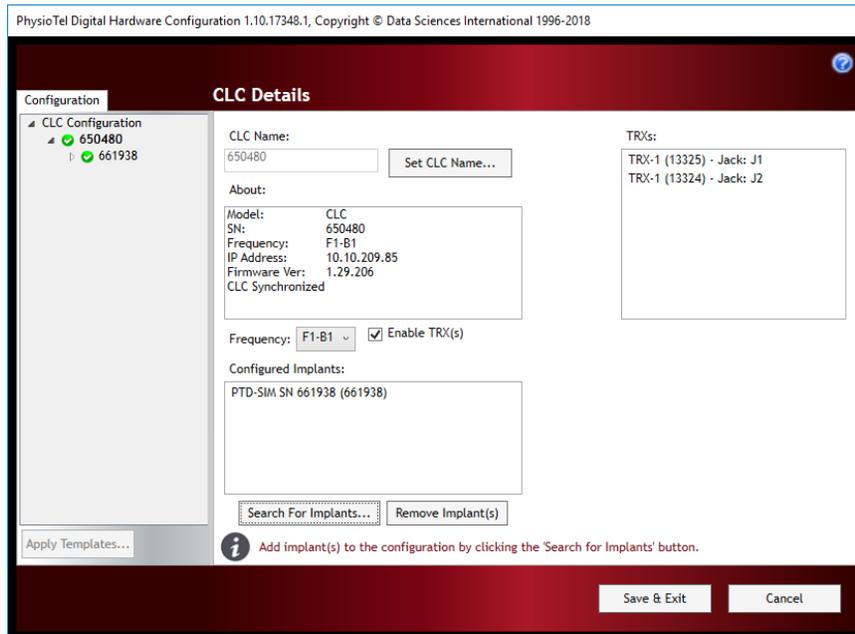


*Note: The **Known Implants** line will provide guidance on which frequencies the CLCs are seeing implants/PTD-SIMs on, as well as the number of implants/PTD-SIMs in brackets on that frequency. New implants/PTD-SIMs that have not been previously configured will be detectable using the default frequency (B1).*

- f. If PTD-SIMs are not listed in the **Implants Found** column, or the PTD-SIMs listed are not the desired PTD-SIMs to configure to this CLC, select the **Scanning Frequency** dropdown to select a new frequency to scan (e.g. F1-B1).
- g. Drag-and-drop the desired PTD-SIMs from the **Implants Found** column to the **Implants Selected** column to assign the PTD-SIMs to this CLC. PTD-SIMs may be multiselectable.

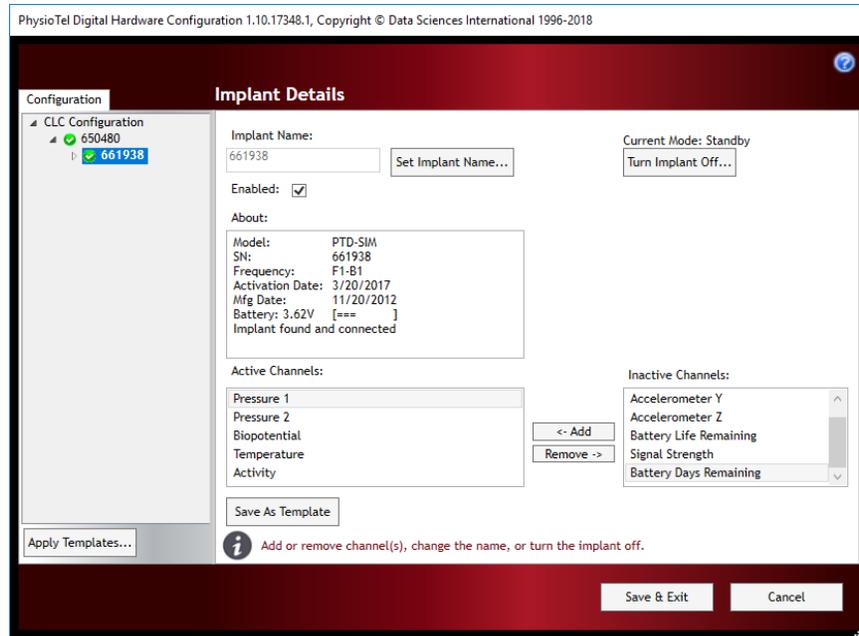


- h. Click **OK**.
- i. The **CLC Configuration** List View will update with the PTD-SIMs, along with the *Configured Implants* list within the *CLC Details*.



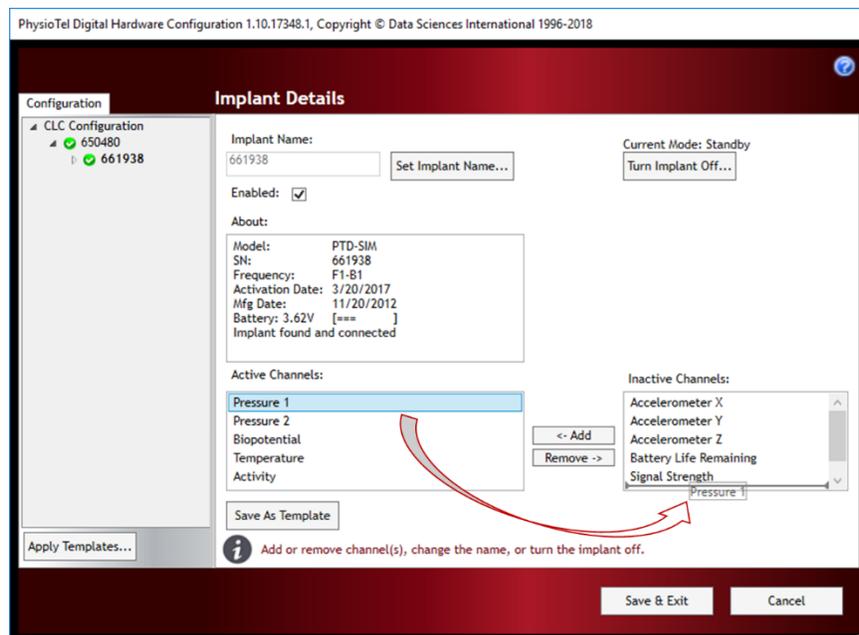
- j. Repeat steps 5-10 for any additional CLCs/PTD-SIMs.

- k. Select the serial number associated with the PTD-SIM from the list view on the left to access the *Implant Details* dialog screen as shown below.



### CHOOSE DEVICE TO SIMULATE.

- i. To simulate an L21 implant, leave the default values/active channel settings.
- ii. To simulate an alternative implant, simply deactivate the appropriate channel by click-and-dragging the item from the Active Channels box to the Inactive Channels box as shown below. This example shows the procedure for simulating the L11 or M11 implant.



- I. Click **Save & Exit**.
4. In Ponemah v5.20, select **Setup | Auto Configure Protocol** to apply the necessary protocol settings to start an acquisition.

*Note:* If using Ponemah v6.x, skip this step as a Subject will be created with the PTD-SIM automatically.

## DEFINE AMBIENT PRESSURE VALUE

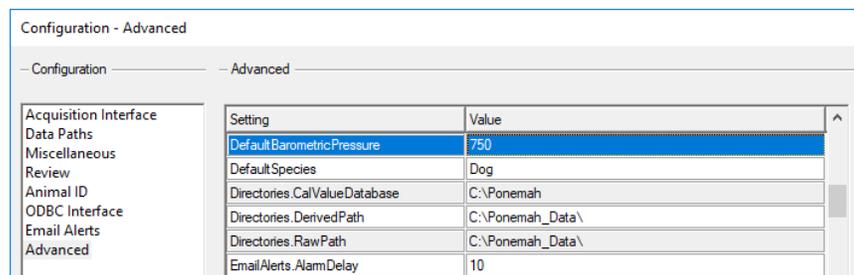
When comparing derived parameter output obtained during an acquisition to the values within this manual, it is important to use the same Ambient Pressure value. This will eliminate any pressure offset introduced by variation between labs (i.e. altitude or normal fluctuation).

To do this:

1. Ensure an Ambient Pressure Reference (APR-1) is not configured (*Selected*) within **Hardware | APR Configuration**
2. In Ponemah v5.20, select **Options | Application Configuration**.

*Note:* In Ponemah v6.x, select **Setup | Application Configuration**.

3. Select **Advanced** from the list in the left column.
4. Scroll down to **DefaultBarometricPressure**. See the image below.
5. Enter **750** in the text box.
6. Click **OK**.



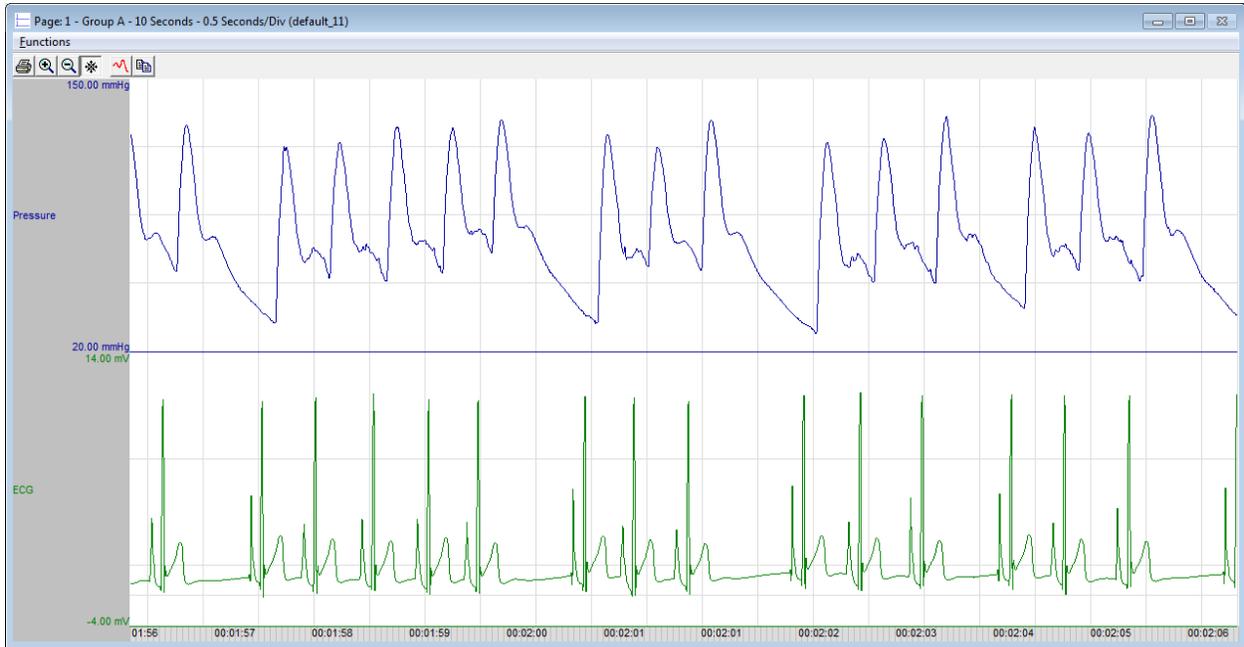
## START ACQUISITION

- In Ponemah v5.20, select **File | Save Protocol As**, enter a unique name, and select **OK**. Then, select **Acquisition | Start Acquisition**.
- In Ponemah v6.x, select the **Play** button associated with the PTD-SIM.

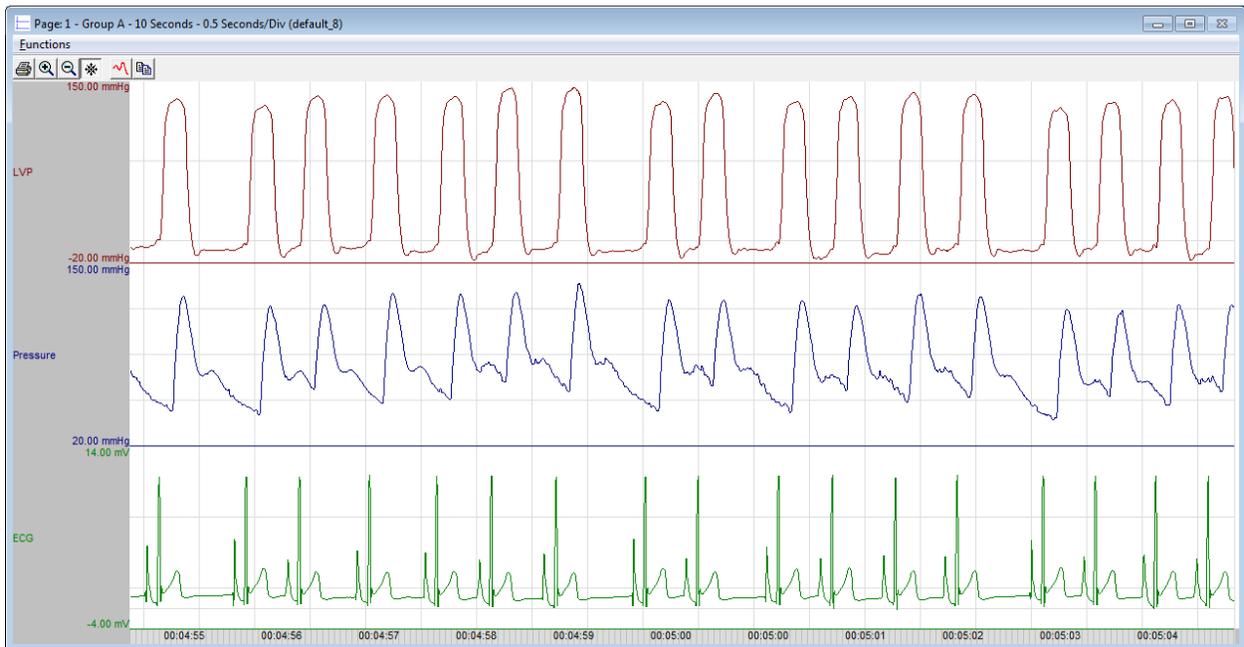
## CALIBRATED PRINTOUTS

The following images are printouts of the waveforms programmed into the PTD-SIM LA simulator as generated by the Ponemah data acquisition system. Note that these waveforms do not include waveforms for the Temperature or Activity channels. The protocol file used to generate these plots are included on this storage media. (\PTD-SIM Data Files\ PTD-SIM.PRO) Please review the protocol file provided to review the exact settings used to generate this output.

## SIMULATION 1: BLOOD PRESSURE, AND ECG



## SIMULATION 2: L21 LV PRESSURE, BLOOD PRESSURE, AND ECG



## PTD-SIM LARGE ANIMAL SIMULATIONS, DERIVED PARAMETERS FROM PONEMAH

The table below lists the derived parameters generated by Ponemah using the physiologic canine data stored on the PTD-SIM.

- The data was reanalyzed in Ponemah Review with the analysis attributes settings listed below.
- The acquisition duration was equal to 30 minutes.
- The logging rate was set to 60 seconds.
- The default ambient pressure value was 750 mmHg.
- Data was reanalyzed in

Simulation ID, Description	Default Sample Rate	Pressure 1: Left Ventricle	Pressure 2: Systemic BP	ECG
<b>L21, Dog</b> Left Ventricular Pressure (LVP), Blood Pressure (BP), ECG, and Temperature	LVP: 500Hz BP: 500Hz ECG: 500Hz Temp: 10Hz	HR: 92 ± 2 BPM Sys: 140 ± 1 mmHg LVEDP: 7 ± 1 mmHg +dP/dt: 3811 ± 20 mmHg/s Tau: mmHg/s CI: 21 ± 1 ms 72 ± 3 (1/s)	HR: 92 ± 2 BPM Sys: 130 ± 1 mmHg Dia: 57 ± 1 mmHg Mean: 83 ± 1 mmHg Pulse: 72 ± 1 mmHg QA: 147 ± 3 ms	HR: 92 ± 2 BPM QT-I: 234 ± 2 ms QRS: 40 ± 2 ms RR-I: 652 ± 2 ms PR-I: 104 ± 2 ms ST-I: 197 ± 2 ms Temp: 37 ± 1 °C
<b>L11, Dog</b> BP, ECG and Temp	BP: 500Hz ECG: 500Hz Temp: 10Hz	N/A	HR: 92 ± 2 BPM Sys: 130 ± 1 mmHg Dia: 57 ± 1 mmHg Mean: 83 ± 1 mmHg Pulse: 72 ± 1 mmHg QA: 147 ± 3 ms	HR: 92 ± 2 BPM QT-I: 234 ± 2 ms QRS: 40 ± 2 ms RR-I: 652 ± 2 ms PR-I: 104 ± 2 ms ST-I: 197 ± 2 ms Temp: 37 ± 1 °C

## ANALYSIS ATTRIBUTE SETTINGS

Left Ventricular Pressure Analysis Attributes

Std Attrib	Adv Attrib1	Noise	Marks
Minimum Pulse Height	22.4	mmHg	
% Pressure Drop	25	%	
dP/dt A	40.0	mmHg	
dP/dt B	50.0	mmHg	
dP/dt C	60.0	mmHg	
dP/dt D	70.0	mmHg	
Relaxation Time 1	60	%	
Relaxation Time 2	70	%	
Tau Duration	40	mSec	
Tau Method	Pressure		
ECG Channel	3:CHN3		

Blood Pressure Analysis Attributes (CHN2, I)

Std Attrib	Adv Attrib1	Offsets	Nois
Minimum Pulse Height	22.9	mmHg	
Systolic Validation Time	100	mSec	
Non Detection Time	192	mSec	
Percent Recovery	70	%	
Q-A Trigger Channel	3:CHN3		

ECG Analysis Attributes (CHN3, Input 3)

QRS	PT	Advanced	Noise	Marks	Nc
<b>R Identification</b>					
QRS Detection Threshold	40	%			
Min R Deflection	0.25	mV			
Maximum Heart Rate	300	bpm			
Minimum Heart Rate	20	bpm			
Peak Bias	20	%			
<input type="checkbox"/> Intra Cardiac					
<b>QS Identification</b>					
Baseline Recovery Threshold	50	%			

ECG Analysis Attributes (CHN3, Input 3)

QRS	PT	Advanced	Noise	Marks	Nc
<input checked="" type="radio"/> Max QT Interval					
Max QT Interval	384				
<input type="radio"/> T Window from S					
T Window from S	24				
<input type="radio"/> T Window from R					
T Window from R	100				
<input type="radio"/> P Window from R					
P Window from R	196				
T Direction	Both				
P Direction	Positive				
P Placement				4	
T Placement				3	
Alternate End of T				0	
Peak Sensitivity	100				
Peak Identification	100				
<input type="checkbox"/> High ST Segment					

## CONTACTING TECHNICAL SUPPORT

Getting technical support from DSI will, we hope, be a quick and painless process, as we are strongly committed to helping you—our users—get the very best from our products. In other words, when you hit a road block, our aim is get your experiment, monitoring program, or whatever back up and running *as quickly as possible*. We are here to help!

---

### CONTACT DETAILS

#### DSI TECHNICAL SUPPORT—NORTH AMERICA

Email: [Support@datasci.com](mailto:Support@datasci.com)

Toll-free in U.S. and Canada

Phone: 1-800-262-9687

Monday through Friday: 8 AM to 5 PM CST  
(except Holidays)

#### DSI TECHNICAL SUPPORT—EUROPE

Email: [Europe-support@datasci.com](mailto:Europe-support@datasci.com)

Phone: +44 1359 259400

Monday through Friday: 8 AM to 5 PM CET

#### DSI TECHNICAL SUPPORT—ALL OTHER COUNTRIES

Phone: +1-651-481-7400

---

### ONLINE RESOURCES

DSI systems provide instrumentation, data acquisition and analysis tools for a wide range of applications. We offer resources to help our customers achieve success when using DSI products in their studies.

Please visit [www.datasci.com](http://www.datasci.com) to access the following resources:

- **Software and Firmware Downloads**

Provides access to the latest software updates, services packs, firmware updates, and release notes.

- **DSI Support Center**

Provides easy access to the following self-help tools when they are needed most:

- Quick Start Guides and Videos
- Product Manuals
- Technical Notes
- Troubleshooting Guides
- And much more!

Download the DSI Support Center App for on-the-go access. Available for both Android and Apple devices.

- **DSI Bibliography**

View thousands of citations from scientific biomedical literature discussing preclinical research studies.