

WHALETEQ

PPG Heart Rate Simulator Test System (HRS100+)

User Manual



Software Version 1.0.0.6

Version 2024-03-29



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1 System Introduction

WhaleTeq Heart Rate Simulator (HRS100+) is a test system designed for "Photoplethysmography" (PPG) technology. For PPG sensor suppliers, IC Solution providers, and wearable manufacturers, HRS100+ simulates the reflected light of human skin, and provides different adjustable parameters such as brightness, heart rate, and so on. The HRS100+ supports "4.3.1 PPG simulator test" of IEC 63203-402-3:2024.

1.1 Basic Concept

1.1.1 Photoplethysmography (PPG)

This technology captures blood information via optical signal. Most Pulse Oximeter (SpO₂) equipment on market now uses PPG technology. In the recent years, wearable devices are becoming increasingly popular and most manufacturers and brand companies use PPG technology as the key technology to capture heart rate value.

The theory behind this technology: By shining LED light to the skin and while the light would be partially absorbed by the skin and reflected (or refracted) back to photodiode, the system can then collect and calculate the value differences into heart rate (BPM).

1.1.2 Perfusion Index (PI)

Following the description stated in section 1.1.1, the below diagram can be explained as X-axis representing for the time while Y-axis representing the light reflection received by photodiode.



Figure 1: Perfusion Index (PI)

As shown in the above diagram, there are slight signal fluctuations (AC, refers to Heart rate signal) above the carrier signal (DC) and the ratio of AC to DC is defined as Perfusion Index (PI).

Note: PI value can be adjusted, but the value range would be varied due to the changes of DC value. See upper-right figure.

1.1.3 WhaleTeq Heart Rate Simulator Test System

WhaleTeq HRS test system is based on the concept described in section 1.1.1 and 1.1.2. The simulated light source provided by the system verify if the photodiode of the wearables can receive the LED light properly, and if the module can react well with different simulated light. Meanwhile, the test system has built-in photodiode as well. Users can use the built-in photodiode to verify the light source of different wearables.

On top of simulation of heart rate signals, users can also adjust parameters to simulate reflection of different brightness levels (DC), conditions of peripheral circulation (PI). The WhaleTeq HRS test system provides various settings and multiple operation modes for different PPG sensors and different scenarios.



WhaleTeq HRS test system has 2 different models – HRS200 and HRS100+.

- HRS200:

Premium Model. Designed for R&D and test engineers to provide multiple and stable signal simulations to facilitate the verification of system and heart rate accuracy.

- HRS100+:

Advanced Model. Designed for test engineers and production line application. This model can quickly measure DUT's PD and LED. Furthermore, this test system can conduct heart rate test procedure and quickly sort out defective LED.

This document is mainly for HRS100+ and you may contact WhaleTeq at <u>service@whaleteq.com</u> for details of HRS200.

1.1.4 How HRS100+ interacts with DUT

In order to accurately simulate heart rate, HRS100+ has built-in LED and PD, which are individually corresponding to the wearable's PD and LED. Please note that LED and PD shown in HRS100+ PC software from the view of HRS100+. For example, PD sampling (section 3.2.2) shown in HRS100+ PC software indicates DUT's LED status.







1.2 Appearance and Package Content

This section introduces HRS100+'s appearance and usage. Package content and specification are also listed in this section.

1.2.1 Appearance

HRS100+ is designed for test engineers and production line. The below illustration shows the product appearance and functions:



Figure 3: HRS100+ Hardware Overview



1.2.2 Package Contents

The HRS100+ package contains the following items:

Table 1: Package Contents

No.	Item	
1	HRS100+ unit	
2	Warranty Card	
3	USB Type-A to Type-B Cable (male to male)	

1.2.3 Specifications for HRS100+ Alignment Fixture

User may use the below mechanical drawing to develop the alignment fixture for fitting your wearable. User can also download the HRS 3D model <u>Here</u>.

• Mechanical Drawing:



Figure 4: Mechanical Drawing of Fixture Mounting Base

✓ Top LED Holder:







Figure 5: Mechanical Drawing of Top LED Holder







• Sectional View:



Figure 7: Sectional View of Fixture Mounting Base

Here is the length and width (135mm x 76mm) of HRS100+:



Figure 8: Length and Width of HRS100+

The following is the height of the machine:

• Fixture mounting base height: 25.4mm



Figure 9: Height of Fixture Mounting Base



• Entire Machine height: 60.2mm







1.3 Using the HRS100+

This chapter introduces the usage modes, cabling diagrams, and recommendations for using this product.

1.3.1 Usage Categories

This product provides standalone mode and PC software mode. Details are listed as below:

1. Standalone Mode:

User can directly place the DUT onto HRS100+ to testify BPM rates.

- In HRS100+ standalone mode, user can measure 10 specific heart rate values. If needed, users may modify the default parameter settings via PC software.
- In HRS200 standalone mode, in addition to measure 10 specific heart rate values, user may also test DUT under 3 preset settings pre-defined by user.

For detailed descriptions, please refer to chapter 2.

2. PC Software Mode:

Software operations require the HRS series product to be connected to a Windows-based PC. HRS100+ software offers main function and command mode function. HRS200 provides main function, fine tune function, raw-date playback function, and command mode function.

- Main function: The major operation mode of this software. It allows user to modify parameters such as DC, PI, and BPM. Also, it can detect LED brightness of DUT. For detailed descriptions, please refer to section 3.2.2.
- II. Fine Tune mode: It provides sine/triangle/PPG waveforms and simulates 50Hz/60Hz/1KHz noise. (This function is only available for HRS200)
- III. Raw-data Playback mode: User can record or manually produce a period of waveform signals, and then play under raw-data playback mode. This is the optimal tool



for developers to improve algorithm. (This function is only available for HRS200)

IV. Command Mode: User can use specified command scripts to play test sequences automatically. Detailed descriptions please refer to section 3.2.1.

1.3.2 Cabling diagram

Cabling diagram is as illustrated below in PC software mode or operate via USB power.



Figure 11: Testing Cabling diagram

1.3.3 Recommended Usage

• <u>Recommendation 1</u>:

As shown in section 1.3.2, WhaleTeq software could fully control the HRS100+ when connected to a PC via USB interface. The panel buttons would have no functions at that time.

Recommendation 2:

As shown in below figure, user can directly place the DUT onto HRS100+ and proceed tests in standalone mode. The recommended distance between DUT and the diffusion film is 1 cm.



Figure 12: Standalone Mode



1.4 Functions and Specifications

1.4.1 Functions in Standalone mode

Below is the function chart in standalone mode:

Table 2: Functions in Standalone mode

Feature	HRS200	HRS100+
Heart rate (BPM) setting 30/60/70/80/90/120/150/180/210/240	•	•
Build-in Photodiode	•	•
Three customizable user modes	•	
Save customizable start-up settings	•	•
USB port (Type B)	•	•
PD BNC monitor port	•	
LED BNC monitor port	•	
Battery powered	•	•
Alignment fixture	•	•

1.4.2 Functions in PC Software Mode

Below is the function list in PC software mode:

Table 3: Functions in PC Software Mode

Mode	Function	HRS200	HRS100+
	Parameter: Reflected brightness (DC) Heart rate (RPM)	•	•
	Parameter: Defusion index (DI)	•	•
	raiameter. renusion index (ri)		
	Save settings to user modes	•	
Main	Save customizable start-up settings	•	•
	View PD sampling	•	
	Show peak maximum	•	•
	LED quick testing, acceptable range settings	•	•
	Parameter: Reflected brightness (DC), Heart rate (BPM)	•	
Sine Tune	Parameter: Amplitude (AC)	•	
Fine Tune	Triangle, PPG waveform	•	
	Noise simulation	•	
	Clinical Database (Optional)	٠	
	Parameter: DC, AC, Gain, Offset, Sample Rate	٠	
Play Raw Data	Save parameters, Restore parameters	٠	
Dutu	Load file, Playback, stop and replay	٠	
	Browse Waveform, Calibration Waveform	٠	
	File upload	٠	•
Command	Input command	٠	•
Command	Storing files	٠	•
	Execute, stop, replay command	٠	•



1.4.3 Specifications

HRS100+ product specification is listed as below:

Table 4: HRS100+	- Specifications
------------------	------------------

Parameters	Supported Range / Types	Accuracy
	30 ~ 300BPM (PC software);	
BPM ⁽¹⁾	30 ~ 240BPM (Standalone	±1BPM
	usage)	
DC - Main Mode	1 ~ 20 Level	N/A
DC - Fine Tune Mode	100mV ~ 2500mV	±5mV
PI - Main Mode	0.1% ~ 20% (AC / DC, differs with DC level)	N/A
AC - Fine Tune	0.75mV ~ 25mV	±3%
WIDde	50 ~ 800 ux (5mm from	
Lumen ⁽²⁾	diffusion film)	±3%
Light Wavelength	525nm	±10nm
PD Sampling Rate ⁽³⁾	<8 ksps (Normal Mode of software); 30ksps (High Resolution Mode of software)	±5µS
S/N Ratio	>51dB (with USB isolator)	N/A
Power - USB	USB Type-B Plug connector, DC 5V IN	N/A
Power - Battery	Type AA battery x 3	N/A
Size (L x W x H)	6.12cm x 13.5cm x 7.6cm	N/A
Temperature	10 °C ~ 40 °C	N/A

Note:

- Heart rate test range is different in standalone mode and PC mode. In PC software mode, heart rate range is from 30 to 300BPM; in standalone mode, heart rate value can be set to 30, 60, 70, 80, 90, 120, 150, 180, 210, 240BPM, plus user can manually select other 3 values from 30 to 300BPM as preset parameters.
- (2) Lumen accuracy would be ±10Lux when the light source is lower than 400Lux.



(3) We suggest users to observe PD's analog signals via connecting HRS100+'s BNC port to an oscilloscope. Under High Resolution Mode, users need to check "LED Off" option to switch off HRS100+'s LED and no optical signals will be sent then.



Figure 13: Lux-Voltage (and DC Level) Chart



Figure 14: Time-Lux Chart



Figure 15: Setting Range for PI (in every DC Level)

*Tested by Konica Minolta illuminance meter, model T-10MA



1.4.4 Instruction for Different Version of HRS100+

The photodiode detection range of HRS100+ and HRS200 is enhanced in July, 2017. Therefore, HRS series can measure DUTs with higher LED brightness after the enhancements.

* Please refer to below table for software UI differences between the new version and former version of HRS100+:

	WhaleTeq PPG Heart Rate Simulator HRS100+ Device CONNECTED S/N: WHR1601000
	Main
	Midili
	Synchronized Pulse LED Off
	DC Level (1~20) PI (0.1~4.0%) BPM (30 '300)
	5 v 2.0 v 00 v
	Save to HRS
Former	
· · · · ·	
Version	PD Signal Display
	Setting Start O testing Max Peak :
	160
	400
	 Background color is all white
	HRS Command
	Main
	Synchronized Pulse ELED Off
	BPM (30~300)
	5 A 20 A 60 A
	Save to HRS
	PD Signal Display
New	Scale Scale
I C W	Seung Start O testing Max Peak : O 1000 @ 10000
Version	
	7400
	/4.52
	Background color of PD Signal Display section is
	- Background color of PD Signal Display section is
	grav
	 Two different PD scale ranges: "1000" and
	"10000"
	10000

Table 5: Version Difference of HRS100+



2 Usage in Standalone Mode

1. Setting mechanism

Optical measurement is quite sensitive against the distance and angle. Before HRS100+ is in use, please secure the particular distance and angle between HRS100+ diffusion film and DUT PPG sensor.

2. Power supply

HRS100+ can be powered via USB interface or Three AA batteries.

3. Heart Rate Measurement

Please use BPM button to select and simulate heart rate. In standalone mode, HRS100+ provides 30, 60,70,80,90,120,150,180,210,240 BPM for selection. The default heart rate value is 60 BPM.

4. Default test parameters

Characteristics of photodiode vary from one to another. This might cause certain DUT being not able to use HRS100+ default test parameters. If this occurs, please use HRS200/HRS100+ PC software. In the main function page, user can adjust and find out the ideal DC level and PI value. After that, user can click "Save to HRS" button to save as default parameters.¹

¹ Default parameters for shipments are DC Level = 5, PI = 2.



3 PC Software Mode

3.1 Installation and Environment

3.1.1 System Requirements

The PPG Heart Rate Simulator Test System uses a Windows PC to connect and control the USB module of HRS100+.

PC requirements:

- Windows PC (Windows 7 or later, suggest to use the genuine version)
- Microsoft .NET 4.0 or higher
- Administrator access (essential for installing software, driver, and Microsoft .Net Framework)
- 1.5 GHz CPU or higher
- 1GB RAM or higher²
- USB port

3.1.2 HRS100+ Software Installation

Please follow the below steps to download and execute HRS100+ software.

- Download HRS100+ software from WhaleTeq website.
- Browse to the download location
- Unzip the file to your destination folder
- Click the installation file in the destination folder to initiate the installation process.
- When the installation is completed, HRS100+ software would be executed automatically. User can also execute HRS100+ software via selecting "All Programs" → "WhaleTeq" → "WhaleTeq" in Windows startup program manager.

² Relative to normal PC processing, there is no special use of PC speed. However, there has been noted a slow increase in system RAM usage over long periods of time up to 30-40MB (related to MS Windows "garbage collection"). PCs with only 512MB or less installed and are running several other programs (in particular, Internet Explorer), may exceed the available RAM, requiring access to the hard drive and dramatically impacting speed. In this case, streaming interruptions and other problems may occur.



	WhaleTeq WhaleTeq CDCA
All December	WhaleTeq CMRR
All Programs	WhaleTeq HRS
Search programs and files	Uninstall Whale Leg HKS
	WhateTeg MECG



If HRS100+ software can't be executed properly or this is the first time using WhaleTeq product, please refer to section 3.1.3 and 3.1.4 to confirm that USB driver and Microsoft .Net Framework 4.0 are all installed.

3.1.3 First Time Using WhaleTeq Product - USB Driver Installation

If Windows device manager can't recognize WhaleTeq product, please follow the below instructions to Install Microchip[®] USB driver.

Microsoft Windows 10

As Windows 10 has built-in Microchip[®] USB Driver, there're no needs to install any drivers. It just takes a while for Windows Device manager to recognize and install the driver.

Microsoft Windows 8 and Windows 8.1

- Windows 8 and Windows 8.1 can't recognize HRS100+, please download "<u>mchpcdc.inf</u>" from WhaleTeq website. This driver is provided by Microchip[®] for using with PIC microprocessors having built-in USB function.
- As mchpcdc.inf provided by Microchip[®] does not contain digital signature, please disable driver signature enforcement in Windows 8 and Windows 8.1. Please click <u>here</u> to watch the tutorial video.
- When the USB module is connected for the first time, select manual installation, and point to the folder containing the



above file. Then continue to follow the instructions to finish the installation. There may be a warning that the driver is not recognized by Windows[®], and this can be ignored. Please click <u>here</u> to watch the tutorial video.

Microsoft Windows 7

- Windows 7 can't recognize HRS100+, please download "<u>mchpcdc.inf</u>" from WhaleTeq website. This driver is provided by Microchip[®] for using with PIC microprocessors having built-in USB function.
- When the USB module is connected for the first time, select manual installation, and point to the folder containing the above file. Then continue to follow the instructions to finish the installation. There may be a warning that the driver is not recognized by Windows[®], and this can be ignored. Please click <u>here</u> to watch the tutorial video.

3.1.4 First Time Using WhaleTeq Product - Microsoft .Net Framework 4.0 Installation

WhaleTeq software is developed by Microsoft .Net Framework 4.0. If HRS100+ software fails to launch properly, please check whether Microsoft .Net Framework 4.0 or higher versions was installed in the operation system.

If your PC does not install Microsoft .Net Framework 4.0 or higher versions, please download from Microsoft website. Please click <u>here</u> to watch the tutorial video (from 2:03).

3.2 HRS100+ Software Operation

3.2.1 Main Mode

This function is only available for HRS200 and HRS100+. The screen in Main Mode can be briefly separated into two parts:

- "LED" relative settings are on upper half
- "PD" relative settings are on lower half



HRS Commard Main Synchronized Fulse 📃 LED Off BPM (30~300) DC Level (1~20) PI (0.1~4.0%) 60 5 2.0 * Save to HRS PD Signal Display Freezed Max Peak ting Start 0

Below are the details of the interface:

Figure 17: Main Mode

LED Relative Settings:

01 – Synchronized Pulse:

Select whether HRS100+ LED flashes synchronously with DUT LED.

02 – DC Level:

This parameter simulates the reflection of different brightness levels. Range: Level 0 to level 20³

03 – LED Off:

Select whether totally turn OFF HRS100+ LED.

04 – PI Value:

This parameter simulates different AC/DC ratio. Please refer to Section1.1.2 for more details.

05 – Save to HRS:

Save DC Level and PI value into HRS100+ internal system memory as the startup default values.

³ "Main Mode of DC Level" and "Fine Tune the DC (mV)" corresponding relationship: "DC Level" x 125 = "DC (mV)"



06 – BPM Value:

Adjust this parameter to change Heart Rate setting. Range: 30 to 300 Beats-Per-Minute.

• PD Relative Settings: (refers to Section 1.1.4)

07 – Filter Settings:

Click this button to set "Pass/Fail" condition for sorting LED. Please refer to Section 3.2.1.1 for details.

08 – Start/Stop Filter:

After clicking this button, Start or Stop to judge whether the peak value of LED is in range. Please refer to Section 3.2.1.1 for details.

09 - Filter Result:

Show the result or remaining seconds. Please refer to Section 3.2.1.1 for details.

10 - Freezed:

Select whether stay "Display PD Sampling" and "Max Peak" parts no change.

11 – Max Peak:

Show the maximum peak value during the specific time period.

12 – PD range Settings:

Change the PD scale to "1000" or "10000". Select the scale to "1000" while testing DUTs with lower LED brightness. Select the scale to "10000" while testing DUTs with higher LED brightness.

3.2.1.1 LED Sorting

During production, PPG manufacturers/vendors may face a problem – how to certify the quality? WhaleTeq designs the "LED Sorting" feature to help customers to sort out unacceptable LEDs.



Measurement principles for "Filter LED":

- 1. Whether the brightness of the LED is within acceptable range
- 2. Whether the LED itself is stable

Please refer to below diagram for how HRS100+ works these two principles out:



Figure 18: Method of LED Sorting

Note: Since the above diagram is from HRS200, the real interface might be slightly different from this diagram.

In above diagram, there are many pulses displayed on "PD Signal Display" section. The Max Peaks of those pulses are nearly the same. If *the brightness of the LED is in acceptable range*, the Max Peak pulses should be between "Peak Lower Limit" and "Peak Upper Limit". And *if the LED itself is stable*, the LED could emit the N Max Peak in particular seconds.

Therefore, there are 4 parameters for user settings:



a Config Setting		
Peak Lower Limit:	380	*
Peak Upper Limit:	500	×
Testing Seconds:	10	×
Maximum Count of PASS:	100	T
Restore	Save	Cancel

Figure 19: Parameters of LED Sorting

- **Peak Lower Limit**: Set the acceptable minimum limit for the brightness of LED. Correspond to Min Range in the diagram.
- Peak Upper Limit: Set the acceptable maximum limit for the brightness of LED. Correspond to Max Range in the diagram.
- Testing Seconds: The shorter testing time for production test is better. Therefore, we provide "Testing Seconds" parameter to assist the production line to set and count down testing time.
- Maximum Count of PASS: Correspond to N in the diagram. The device achieves how many Max Peak pulses can PASS directly.

In **Testing Seconds** period, if there are enough Max Peak pulses in acceptable range (between **Peak Lower Limit** and **Peak Upper Limit**), HRS100+ will show "*Pass*", vice versa. In Testing Seconds, if there is no Max Peak of pulse in acceptable range, HRS100+ will show "*Fail*". To reduce the testing time, as long as HRS100+ counts N (=Maximum Count of PASS) Max Peak pulses, HRS100+ will directly show "*Pass*".



3.2.1.2 PD Signal Display

PD Signal Display Setting Start © testing Freezec Saturated!! Max Peak :	Scale
	10000

Figure 20: PD Signal Display

If HRS100+ software shows up "Saturated" in PD Signal Display section, it means the brightness of DUT is over the detection range of HRS100+ PD. Please increase the distance between HRS100+ diffusion film and DUT PPG sensor.

3.2.2 Command Mode

Below are the details of Command Mode interface:



Figure 21: Command Mode

01 – Save File:

Save the completed command list into local PC.



02 – Load File:

Load the command file from local PC.

03 – Execute Command:

Play and execute the programmed commands.

04 – Stop Command:

Stop to execute the ongoing command.

05 – Loop/Replay:

Whenever the command has finished executing, re-execute the command from the beginning.

06 – Help:

List the command list. Please refer to 3.2.2.1.

07 – Command List:

List the programmed or loaded commands. HRS100+ will highlight the ongoing command.

3.2.2.1 Command Table

Table 6: Command Table

Command	Parameter	Range	Description	Example
MainParam eter	DC_Level	Integer:	Condicing wave	
	PI	Change	Send sine wave with specific DC Level, PI value and BPM	MainParameter 8 1.0 60
	BPM	Integer: 30~300		
Continue	Duration	Integer	Continue to play <i>Duration</i> seconds specific waveform	Continue 8

* The detail range for PI, please refer to 1.1.2



3.2.2.2 Command Example

Example	Explain
MainParameter 5 2.0 60	Play Sine Wave with DC Level= 5, PI=2, BPM=60
Continue 5	Continue this wave for 5 seconds
MainParameter 10 2.0 90	Play wave with DC Level= 10, PI=2, BPM=90
Continue 10	Continue this wave for 10 seconds
MainParameter 5 4.0 70	Play Sine Wave with DC Level=5, PI=4, BPM=70
Continue 8	Continue this wave for 8 seconds

3.3 HRS100+ Software and Firmware Update

HRS100+ which were shipped from early 2017 does all support firmware update. HRS100+ software supports auto-update after software version 1.0.0.6.

If you have any questions, please contact WhaleTeq for detailed information.

3.3.1 Software and Firmware Auto Update

When new firmware or software release, a pop-up window shows as below.

It would directly update your firmware or software to the latest version when you click "Yes".



Figure 22: Software and Firmware Update Notification Window



3.3.2 Manually Update Firmware

Please follow the below steps to update firmware manually:

Step 1: Connect HRS100+ to PC and launch HRS100+ software.Step 2: Move the cursor to title bar and right click to select "About".



Figure 23: Manually Update Firmware (Step 2)

Step 3: Click "Update F/W" button and then select the firmware file.



Figure 24: Manually Update Firmware (Step 3)

Step 4: HRS100+ software would display the firmware update information.

Cautions:

(1) Do not remove USB cable during the firmware update process.



(2) Once clicking "Yes", the firmware update process cannot be cancelled.



Figure 25: Manually Update Firmware (Step 4)

Step 5: Wait till the firmware update is completed.



Figure 26: Manually Update Firmware (Step 5)

Step 6: Please restart the system to complete firmware update process.

Update Fi	irmware	
Succeed! - Please restart the system to complete firmware update process.		
ОК		

Figure 27: Manually Update Firmware (Step 6)

4 Software Development Kit (SDK)

WhaleTeq provides HRS100+ software development kit. All operating parameters and options have corresponding commands in the software development kit. The software development kit contains DLL (Dynamic-link library), which will provide highly efficient program binding and version upgrade, supports C/C++ header and C# interface, and can also be integrated with third-party tools and script languages.



5 Calibration and Validation

Both WHALETEQ HRS100+ and software have been system verified, and reports can be provided according to your needs.

Prior to shipping, each unit is tested for component values and output voltages, using a calibrated precision multi-meter. As WhaleTeq cannot provide ISO 17025 accredited calibration, laboratories which are required to follow ISO 17025 should perform calibration either periodically or on a before use basis, following normal procedures and practice. The extent of calibration may be limited depending on the needs of the laboratory.

6 Cautions

- We suggest warm up HRS100+ for at least 5 minutes before testing.
- If HRS100+ software shows up "saturated" in PD Signal Display section, it means the brightness of DUT is over the detection range of HRS100+ PD. Please increase the distance between the diffusion film of HRS100+ and DUT PPG sensor.
- When HRS100+/HRS200 is powered by batteries and not in use, please switch off the power to save battery life.
- The blinking Power LED is the indication of low battery. Please replace with new batteries immediately.
- LED luminous decay occurs after using a period of time. It is recommended to send your unit to WhaleTeq for calibration every year and replace the LED base every second year, to ensure LED brightness is qualified. For more details, please contact WhaleTeq Co, Ltd <u>service@whaleteq.com</u>.
- Before using the HRS100+, please set the particular distance and angle between HRS100+ and DUT, to eliminate the influence of ambient light.
- Warranty void if QC PASS label is removed or tampered with.
- The professional testing instrument, not a medical device, is for testing only, and will not involve human or clinical use.



7 Ordering Information

7.1 Standard Package

Table 8: Standard Package

Part No.	Description	Quantity
	Model No.: HRS100+	
	PPG heart rate simulator for	
	healthcare wearable.	
	Supports command line test	
100-HR00002	mode.	1
	Package contents: • HRS100+ x 1	
	• USB cable x 1	

7.2 Optional Accessory

Table 9: Optional Accessory

Part No.	Description	Quantity
100-OT00001	USB isolator for reducing the	1
	power noise from PC.	Ŧ

7.3 Optional Calibration Service and Warranty Extension

Table 10: Optional Calibration Service and Warranty Extension

Part No.	Description	
	Model No.: C3	
YY0007	Provides (3) years of calibration service	
	coverage. WhaleTeq equipment can be	
	calibrated to original performance on the	
	basis of (1) year interval.	
	Model No.: R3	
YY0008	Extends the limited warranty from (1) year	
	to (3) years.	



8 Revision History

Table 11: Revision History

Version	Modified Content	Issued Date
2020-12-31	Add Ch 4 Software Development Kit (SDK) Ch 5 Calibration and Validation Ch 6 Caution Ch 7 Ordering information Ch 8 Version information	2020-12-31
2021-06-21	Add Ch 6 Caution	2021-06-21
2024-03-29	 Update 1 System Introduction 1.2.2 Package Contents 7 Ordering Information Add List of Table List of Figure 	2024-04-30

9 Contact WhaleTeq

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