GOSSEN METRAWATT

SECULIFE | PS300
MULTI-PARAMETER PATIENT SIMULATOR
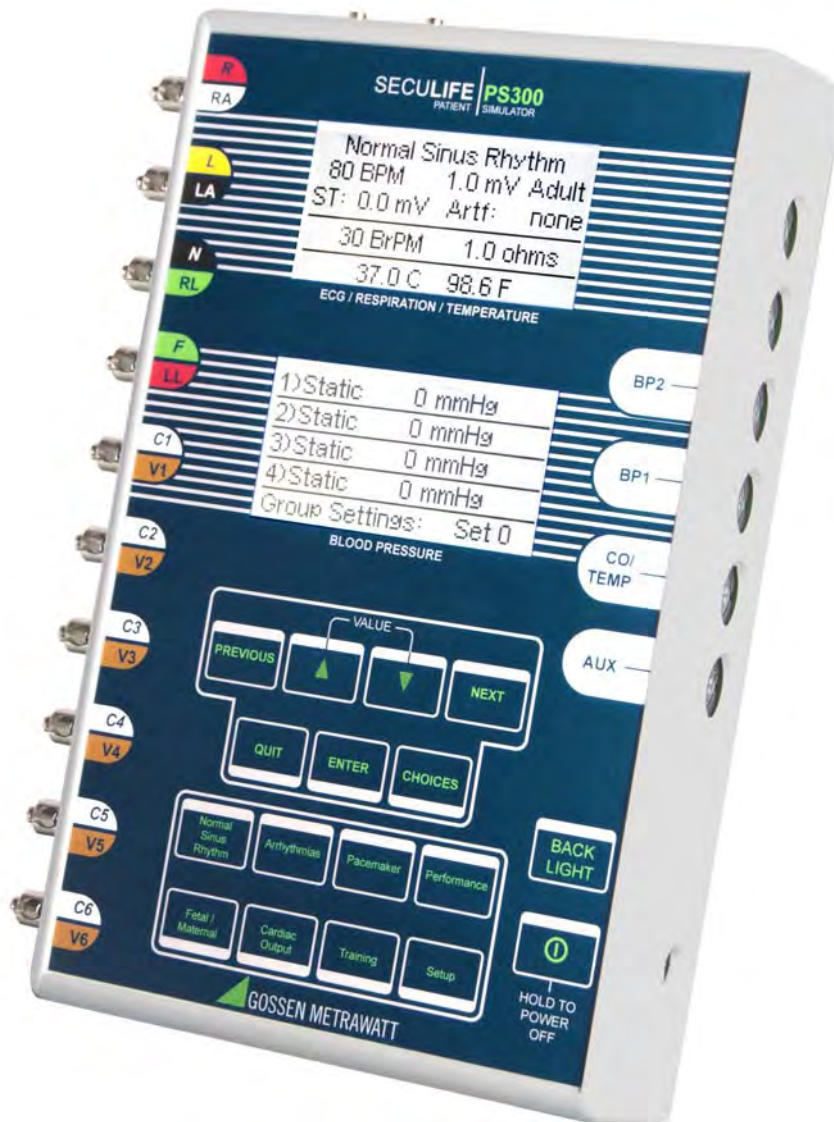
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WARNINGS, CAUTIONS, NOTICES

WARNING - USERS
The SECULIFE|PS300 Series are for use by skilled technical personnel only.

WARNING - USE
The SECULIFE|PS300 Series are intended for testing only and should never be used in diagnostics, treatment or any other capacity where they would come in contact with a patient.

WARNING - CONNECTIONS
All connections to patients must be removed before connecting the DUT to the SECULIFE|PS300 Series. A serious hazard may occur if the patient is connected when testing with the SECULIFE|PS300 Series.

CAUTION - MODIFICATIONS
The SECULIFE|PS300 Series are intended for use within the published specifications. Any application beyond these specifications or any unauthorized user modifications may result in hazards or improper operation.

CAUTION - SERVICE
The SECULIFE|PS300 Series are intended to be serviced only by authorized service personnel. Troubleshooting and service procedures should only be performed by qualified technical personnel.

CAUTION - OPENING / REPAIR

The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.
Even original spare parts may be installed only by authorized service personnel.
In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

CAUTION - INSPECTION

The SECULIFE│PS300 Series should be inspected before each use for obvious signs of abuse or wear. The SECULIFE│PS300 Series should not be used and should be serviced if any parts are in question.

CAUTION - CLEANING

Do not immerse. The SECULIFE│PS300 Series should be cleaned by wiping gently with a damp, lint-free cloth. A mild detergent can be used if desired.

CAUTION - LIQUIDS

Do not submerge or spill liquids on the SECULIFE│PS300 Series. Do not operate the SECULIFE│PS300 Series if exposed to fluid.

CAUTION - ENVIRONMENT

Exposure to environmental conditions outside the specifications can adversely affect the performance of the SECULIFE│PS300 Series. Allow the SECULIFE│PS300 Series to acclimate to specified conditions for at least 30 minutes before attempting to operate them.

$$CE$$

EG - KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

GMC-I **MESSTECHNIK**

Dokument-Nr./ Document.No.:	833 / 11-022
Hersteller/ Manufacturer:	GMC-I GOSSEN-METRAWATT GMBH
Anschrift / Address:	Südwestpark 15 D - 90449 Nürnberg
Produktbezeichnung/ Product name:	Patient Simulator Patientensimulator
Typ / Type:	SECULIFE PS100 /PS200 /PS300
Bestell-Nr / Order No:	M695L /M /N

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein, nachgewiesen durch die vollständige Einhaltung folgender Normen:

The above mentioned product has been manufactured according to the regulations of the following European directives proven through complete compliance with the following standards:

Nr. / No.	Richtlinie	Directive
2006/95/EG 2006/95/EC	Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen - Niederspannungsrichtlinie – Anbringung der CE-Kennzeichnung : 2013	Electrical equipment for use within certain voltage limits - Low Voltage Directive - Attachment of CE mark : 2013

EN/Norm/Standard	IEC/Deutsche Norm	VDE-Klassifikation/Classification
EN 61010-1 : 2010	IEC 61010-1 : 2010	VDE 0411-1 : 2011

Nr. / No.	Richtlinie	Directive
2004/108/EG 2004/108/EC	Elektromagnetische Verträglichkeit - EMV Richtlinie -	Electromagnetic compatibility - EMC directive –

Produktfamiliennorm / Product family standard

EN 61326-1 : 2006

Nürnberg, den 25.03.2013
_____
Ort, Datum / Place, date:

_____
Geschäftsführung / managing director

NOTICE – SYMBOLS

Symbol   Description

Caution
(Consult Manual for Further Information)

Center Negative

Per European Council Directive 2002/95/
EC, do not dispose of this product as
unsorted municipal waste.

NOTICE – ABBREVIATIONS

AHA	American Heart Association
ANSI	American National Standards Institute
BPM	Beats Per Minute
BrPM	Breaths Per Minute
C	Celsius
cc	cubic centimeters
°	degree(s)
ECG	Electrocardiogram
F	Fahrenheit
Hz	hertz
IEC	International Electrotechnical Commission
IBP	Invasive Blood Pressure
kHz	kilohertz
LED	Light Emitting Diode
L/min	Liters per minute
µV	microvolt(s)
mA	milliamp(s)
mm	millimeter(s)
mmHg	millimeter(s) of Mercury
mV	millivolt(s)
ms	millisecond(s)
NEDA	National Electronic Distributors Association
NSR	Normal Sinus Rhythm
Ω	ohm(s)
Lbs	pounds
RMS	Root Mean Square
USA	United States of America
V	Volts
VDC	Volts Direct Current

NOTICE – DISCLAIMER

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┌─────────────────────────────────────────────────────────────────┐
│                         DESCRIPTION                               │
│                      SECULIFE⎪PS300                               │
│                     PATIENT SIMULATOR                             │
└─────────────────────────────────────────────────────────────────┘
```

The SECU**LIFE**⎪**PS300** Family is a series of high end Microprocessor based Patient Simulators. Each model provides ECG, Blood Pressure, Respiration and Temperature Simulation. Models are available with one, two or four independent blood pressure outputs. All models will support the Fetal/Maternal, SpO_2 and Cardiac Output options.

The SECU**LIFE**⎪**PS300** Family makes viewing and selecting the desired waveforms and parameters quick and intuitive, with all operational information being available at the same time on two cursor-based graphic displays, allowing for easy maneuvering through parameters and scrolling through available options.

The following are highlights of some of the main features:

- SIMPLE TO OPERATE
- NO CODES TO REMEMBER OR ENTER
- GRAPHICS DISPLAY WITH SIMULTANEOUS DETAILED STATUS OF PARAMETERS AND SCROLLING CONTROL OF OPTIONS
- DROP DOWN CHOICE SCREENS LIST ALL OPTIONS FOR PARAMETERS
- SPECIAL POWER UP FEATURE ALLOWS THE USER TO CHOOSE TO USE DEFAULT, LAST OR CUSTOM SETTINGS
- AUTO SEQUENCES FOR BPM, STATIC-PRESSURE LEVELS AND
- PERFORMANCE
- 10 UNIVERSAL PATIENT LEAD CONNECTORS
- MINI-DIN CONNECTORS FOR BP CABLES
- 9 VOLT BATTERY POWER
- % BATTERY LIFE DISPLAY
- LOW BATTERY INDICATOR
- AVAILABLE BATTERY ELIMINATOR
- DISPLAY BACKLIGHT
- FULL REMOTE OPERATION VIA RS-232
- FLASH PROGRAMMABLE FOR UPGRADES

ECG NSR FUNCTIONS

The unit can produce a wide variety of ECG NSR simulations. The user simply selects the parameters that match the desired output.

- RATE: 30, 40, 45, 60, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300 BPM
- AMPLITUDE (Lead II):
      0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV
- S-T SEGMENT ELEVATION:
      ± 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 mV
- ARTIFACTS:
      50 Hz, 60 Hz, MUSCLE, BASELINE WANDER, RESPIRATION
- QRS INTERVAL:
      ADULT (80 ms) OR PEDIATRIC (40 ms)
- AUTOMATIC MODE

ARRHYTHMIA FUNCTIONS

The unit can simulate 36 different arrhythmias. For ease of selection, they are grouped into four basic categories. Where applicable, both manual and automatic triggering of the waveform is available.

- 36 DIFFERENT ARRHYTHMIAS
- FOUR GENERAL GROUPS:
      SUPRAVENTRICULAR
      PREMATURE
      VENTRICULAR
      CONDUCTION
- MANUAL AND AUTOMATIC TRIGGERING

PACEMAKER FUNCTIONS

Seven different pacemaker waveforms may be simulated. Additionally, the width and amplitude of the pacer pulse may be selected.

- WAVEFORMS:
      ATRIAL PACER, ASYNCHRONOUS, NON-CAPTURE,
      NON-FUNCTION, DEMAND - OCCASIONAL,
      DEMAND – FREQUENT, AV - SEQUENTIAL
- PULSE HEIGHT:
      1, 2, 3, 4, 5, 6, 7, 8, 9, 10 mV
- PULSE WIDTH:
      0.1, 0.5, 1.0, 1.5, 2.0 ms

ECG-PERFORMANCE FUNCTIONS

The unit will generate Sine, Square, Triangular and Pulse waveforms with adjustable amplitudes for performance testing. A special Automatic mode is available to auto sequence through the entire range of waveforms. Also, a R-Wave (Havertriangle) waveform may be selected with separate amplitude and width settings.

- SINE:
  - 0.1, 0.5, 5, 10, 40, 50, 60, 100 Hz
- SQUARE:
  - 0.125, 2.0 Hz
- TRIANGLE:
  - 2.0, 2.5 Hz
- PULSE:
  - 30, 60, 120 BPM; 60 ms WIDTH
- AMPLITUDE (Lead II):
  - 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV
- AUTOMATIC MODE
- R WAVE RATE:
  - 30, 60, 80, 120, 200, 250 BPM
- R WAVE WIDTH:
  - 8, 10, 12, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 ms
- R WAVE AMPLITUDE (Lead II):
  - 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV

RESPIRATION

Respiration is simulated at 8 different rates, with the ability to select from 4 Baseline Impedances, the Lead in which it will appear, and the Delta Ohms (amplitude) of the signal. Additionally, an Apnea period may be selected.

- RATE:
  - 15, 20, 30, 40, 60, 80, 100, 120 BrPM
- BASELINE IMPEDANCE:
  - 500, 1000, 1500, 2000 OHMS
- LEAD:
  - LA or LL
- DELTA IMPEDANCE:
  - 0.1, 0.2, 0.5, 1.0, 2.0, 3.0 OHMS
- APNEA:
  - 12, 22 and 32 SECONDS PLUS CONTINUOUS

BLOOD PRESSURE

There are two Blood Pressure simulation channels.

Both static and dynamic invasive pressures are simulated. In the static mode, the BP outputs are fixed at the selected level or sequenced through the list using the Automatic mode selection.

In the Dynamic mode, the selected waveform is synchronized with the ECG and provides a continuous output. Additionally, a Respiration Artifact may be added.

A special Swan-Ganz as an option that will allow Manual or Automatic simulation of that sequence.

Each channel has independent settings.

- STATIC:
    -10, -5, 0, 20, 40, 50, 60, 80, 100, 150, 160, 200, 240, 250, 300, 320, 400 mmHg
- AUTOMATIC STATIC PRESSURE MODE
- 8 DYNAMIC WAVEFORMS
- RESPIRATION ARTIFACT:
    0 to 16 mmHg
- SENSITIVITY:
    5 or 40 µV/V/mmHg
- SWAN-GANZ SIMULATION
- 7 PRESET STATIC GROUPS

TEMPERATURE

The unit will simulate seven temperatures. This is done by providing the necessary ohmic levels for both the YSI 400 and 700 Series thermistors.

- YSI 400 SERIES and 700 SERIES SIMULATION
- SELECTIONS:
    0, 24, 30, 35, 37, 40, 42 °C
    (32.0, 75.2, 86.0, 95.0, 98.6, 104.0, 107.6 °F)

LEAD TEST FUNCTION

The unit provides a set of test terminals to quick check leads. It will determine if a lead has less than 1000 Ohms resistance.

TRAINING

The unit has a special training mode that may be used to aid users in practicing the identification of arrhythmias. A series of settings allows the feature to be customized to fit the exact training requirement.

- TIMER:
  MANUAL, 10, 15, 20, 25, 30 SEC
- RANDOMIZER:
  OFF, ON
- ARRHYTHMIAS:
  ALL, SUBSET

SPO$_2$ SIMULATION (Optional)

When used with the SECULIFE OX external module and FingerSim family of SpO$_2$ finger simulators, the system will provide a pulse synchronized SpO$_2$ output for all NSR rates.

- RATE:
  30, 40, 45, 60, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300 BPM
- SpO$_2$ OUTPUT:
  80, 90, 97 %

FETAL/MATERNAL (Option)

This option provides a combination of fetal and maternal ECG waveforms with and without contractions. Additionally, it provides an Intrauterine-Pressure (IUP) waveform.

- FETAL HEART RATE:
  60, 90, 120, 140, 150, 210, 240 BPM
- IUP PERIOD:
  SINGLE CONTRACTION (MANUAL)
  2, 3, 5, MIN (AUTO)
- FHR (DURING CONTRACTION):
  UNIFORM DECELERATION
  EARLY DECELERATION
  LATE DECELERATION
  UNIFORM ACCELERATION

CARDIAC OUTPUT (Option)

When used with an external module, this option provides both the hardware and software to simulate Cardiac Output waveforms for testing devices that utilize Baxter – Edwards type catheters.

- INJECTATE TEMPERATURE:
  0, 24 °C

- INJECTATE FLOW:
  2.5, 5.0, 10.0 L/MIN

- OTHER OUTPUTS:
  FAULTY – INJECTATE
  LEFT-TO-RIGHT SHUNT
  CALIBRATED TEMPERATURE PULSE

OPTIONAL ACCESSORIES

BATTERY ELIMINATOR (USA Version)
BATTERY ELIMINATOR (Euro Version)
FETAL / MATERNAL OPTION
CARDIAC OUTPUT OPTION
SECULIFE OX   PULSE OXIMETRY MODULE (ALLOWS SECU**LIFE**│**PS300** TO SIMULATE SpO_2 OUTPUT WHEN USED WITH FingerSims™)
FingerSim™ KIT   COMPLETE STARTER KIT (INCLUDES 80 %, 90 % AND 97 % FingerSims™, FingerSim™ HOLDER, AND CARRYING CASE)
FingerSim™ SET   REPLACEMENT KIT (INCLUDES 80 %, 90 % AND 97 % FingerSims™ ONLY)
SOFT-SIDED CARRYING CASE
COMMUNICATION CABLE (MINI DIN M TO DB-9F)
COMMUNICATION CABLE (USB TO DB-9M)

INVASIVE BLOOD PRESSURE CABLES
    please contact us for more details

TEMPERATURE SIMULATION CABLES
    UT-1 YSI-400
    UT-2 YSI-700

CARDIAC OUTPUT CABLES
    HP INJECTATE CABLE ASSEMBLY
    HP TEMP CABLE

LAYOUT

This section looks at the layout of a SECU**LIFE**|**PS300** and gives descriptions of the elements that are present.

10 Universal Patient Lead Connectors:

RA   R
LA   L
RL(-) N
LL   F
V1   C1
V2   C2
V3   C3
V4   C4
V5   C5
V6   C6

7 Light Touch Keys for Selecting Parameters and Settings:
LEFT and RIGHT Curved Arrows for Moving through Parameters
UP and DOWN Arrows for Scrolling through Options
ENTER for Selecting Option
CHOICES for Displaying Submenu of All Options for a Given Parameter
QUIT for Returning to Previous Status

8 Light Touch Keys for Category Selection:
Normal Sinus Rhythm
Arrhythmias
Pacemaker
Performance
Fetal/Maternal
Cardiac Output
Training
Setup

Lead Continuity Test Connections

LCD Graphical Display 1: Shows Parameters for ECG, Respiration and Temperature

LCD Graphical Display 2: Shows Parameters for Blood Pressure

6-Pin Mini-DIN Plug Connector for Blood Pressure Cable

8-Pin Mini-DIN Plug Connector for Temperature/CO Cable

7-Pin Mini-DIN Plug Connector for Aux Functions

Back Light Key for turning on and off the backlight

Battery Eliminator Jack

Power Key for Turning Unit On and Off

TOUCH KEYS

General Operation

The unit is controlled by 17 light touch keys. They allow the user to move around within the displayed parameters, select the desired options, choose a specific category and control the setup and power for the unit. When a key is depressed there is an audio click when it is accepted, or a razz tone if the key is invalid.

Two graphics LCD displays provide the user with information about the current status of the ECG, Respiration, Temperature and Blood Pressure settings.

Touch key	Meaning	Used in this Manual
PREVIOUS	The keys move the block cursor through the displayed information; highlighting the parameter available for selection	PREVIOUS
NEXT		NEXT
▲	The keys change the options for the highlighted parameter. The cursor begins flashing if the parameter has been changed.	UP
▼		DOWN
ENTER	This key selects the changed option	ENTER
QUIT	This key returns to the previous state, without any changes being made	QUIT
CHOICES	To make option selection even easier and to make memorizing and using codes unnecessary, the key will bring up a screen that displays all the options for the selected parameter. The UP DOWN and ENTER keys can then be used to quickly scroll through the available options and select the desired setting	CHOICES

Category Key
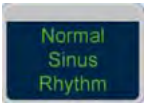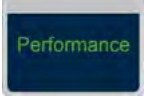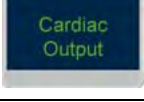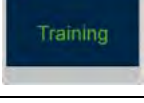
Seven category keys allow for quick setting of output waveforms. The [Normal Sinus Rhythm] , [Arrhythmias] , [Pacemaker] , [Performance] , [Fetal / Maternal] , [Cardiac Output] and [Training] keys move the display directly to the selected category. The | UP | | DOWN | or | CHOICES | keys can then be used to scroll through and select the desired settings.
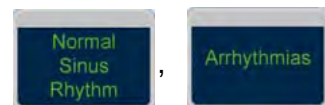
The [Setup] key opens a screen that allows the user to select the unit's general output settings, as well as setup for the system.

Touch key	Meaning	Used in this Manual
Normal Sinus Rhythm	This key enters the NSR category.	**Normal Sinus Rhythm**
Arrhythmias	This key enters the arrhythmia category and changes the first line in the display to the first arrhythmia choice	**Arrhythmias**
Pacemaker	This key enters the pacemaker category and changes the first line in the display to the first pacemaker waveform choice	**Pacemaker**
Performance	This key enters the machine performance testing category and changes the first line in the display to the first performance waveform choice	**Performance**
Fetal / Maternal	This key opens a screen that allows the user to set the conditions for and start the optional Fetal/Maternal mode. (Optional)	**Fetal / Maternal**
Cardiac Output	The key opens a screen that allows the user to set the conditions for and start the optional Cardiac Output mode. (Optional)	**Cardiac Output**
Training	This key opens a screen that allows the user to set the conditions for and start the special training mode.	**Training**
Setup	This key opens a screen that allows the user to select the unit's general output settings, as well as setup for the system	**Setup**

Power Key

Touch key	Meaning	Used in this Manual
⏻	This key turns the unit on and off. To turn off the unit, the key must be held for 1 second.	Power

Backlight

Touch key	Meaning	Used in this Manual
BACK LIGHT	This key is provided to toggle the backlight on or off at any time	BACK LIGHT

The Graphic LCD display may be viewed with or without the backlight. Depressing any key will activate the backlight. However, since the backlight will drain the battery if left on, it will automatically shut off after a few seconds when running on battery power. (**Note:** This time is selectable in the System Setup screen).

The intensity of the backlight can be adjusted in the System Setup screen to conserve battery life.

The **BACK LIGHT** key is provided to toggle the backlight on or off at any time.

NOTE: The backlight parameter in the System Setup screen may be set to Off, 1-30 sec Timed or Manual.

ECG Waveforms

The microprocessor has stored in its memory all of the digitalized waveforms. It sends the individual lead waveforms to D/A converters, which generate accurate analog representations. The waveforms are then sent through resistor networks, developing the appropriate signals on the output terminals.

Respiration

Respiration waveforms are provided that have adjustable rates from 15 to 120 BrPM (Breaths Per Minute) as well as an Apnea (0 BrPM) setting. The signal is generated by a variation in the impedance in either the LL or LA lead (selectable). The amplitude is settable from .5 to 3.0 ohms.

Blood Pressure

There are two 6-pin mini-DIN plug connectors on the right side of the unit for connection of the Blood Pressure cables. Full blood pressure simulation is available through these connectors. The circuits are totally isolated.

Temperature

There is an 8-pin mini-DIN plug connector on the right side of the unit for connection of a Temperature cable. Temperatures are simulated for both YSI 400 and YSI 700 probe types. There are seven different temperatures selectable for each

Universal Patient Lead Connectors

The 10 Universal Patent Lead Connectors allow for 12 lead ECG simulation with independent outputs. AHA and IEC color-coded labels are located on the face of the unit to aid in connecting the corresponding U.S. and International Patient Leads.

AHA Label	IEC Label	Description
RA	R	Right Arm
LA	L	Left Arm
RL	N	Right Leg (reference or ground)
LL	F	Left Leg
V1 V2 V3 V4 V5 V6	C1 C2 C3 C4 C5 C6	V Leads (V1-V6) (U.S. and Canada) also referred to as pericardial, precordial or unipolar chest leads Chest Leads (C1-C6) (International)

High Level Output (+)

A high level ECG output signal (200 x Amplitude Setting) is available in the BP1 6-Pin mini-DIN connector.

Auto Power Off

The unit may be programmed to automatically turn off after a selected number of minutes of no key activity to conserve the battery. (**Note:** This time is selectable in the System Setup screen).

Power Supply

The unit utilizes two 9 Volt Alkaline Batteries in the rear battery compartment. When the unit detects a LOW BATTERY condition (5 % Battery Life), a warning window will appear once per minute to alert the user. The QUIT key may be used to clear this window and continue use of the unit. If the battery is not replaced before the battery reaches a critical level (0 % Battery Life), the unit will shut down. (The percentage of life left in the batteries can be viewed in the System Setup screen.)

Battery Eliminator

The unit has a 2.1 mm jack for connecting the Battery Eliminator (Optional).

Note: The Battery Eliminator will not charge the battery.

Power Up Settings

The unit may be setup to turn on using either the factory default settings, the same settings that it had when last turned off or a custom set of parameters as previously saved by the user (See Power Up Settings section for details).

Automatic Modes

The ECG NSR Rate, ECG Performance and Static Blood Pressure Parameters all allow for an automatic setting. In each of these, the unit will sequence through the full range of settings automatically at a fixed rate (as selected in the Auto Step Time Parameter). When in this mode, the time remaining in each step is displayed.

The ENTER key may be used to manually advance to the next step. The QUIT key is used to terminate the mode.

ECG – NORMAL SINUS RHYTHM

The SECU**LIFE** **PS300** can send waveforms to ECG machines in 3, 5 or 12 lead configurations. It has independent outputs for each signal lead, referenced to the right leg.

Normal Sinus Rhythm (NSR) occurs when the heartbeat is normal, beating at a rate between 50 and 100 BPM with a standard QRS waveform shape and height. The SECU**LIFE** **PS300** simulates the NSR with a default pulse of 80 BPM, amplitude of 1.0 mV on Lead II, P-R interval of 160 milliseconds, no Artifact and no ST Segment elevation.

The SECU**LIFE** **PS300** is placed into NSR mode by pressing the Normal Sinus Rhythm category key.

The display will resemble the following:

RATE
30 BPM
40 BPM
45 BPM
60 BPM
80 BPM*
90 BPM
100 BPM
120 BPM
140 BPM
160 BPM
180 BPM
200 BPM
220 BPM
240 BPM
260 BPM
280 BPM
300 BPM
Auto

ECG/RESPIRATION/TEMPERATURE

Normal Sinus Rhythm
80 BPM   1.0 mV Adult
ST: 0.05 mV Artf: none
20 BrPM   1.0 ohms
37.0 C   98.6 F

PATIENT MODE
Adult* (80 mS QRS)
Ped (Pediatric 40 mS QRS)

ST SEGMENT ELEVATION
-0.8 mV	0.05 mV
-0.7 mV	0.1 mV
-0.6 mV	0.2 mV
-0.5 mV	0.3 mV
-0.4 mV	0.4 mV
-0.3 mV	0.5 mV
-0.2 mV	0.6 mV
-0.1 mV	0.7 mV
-0.05 mV	0.8 mV
0.0 mV*	

ARTIFACT
None*
50 Hz
60 Hz
Muscle
Wander
 (Baseline)
Resp
 (Respiration)

AMPLITUDE
.05 mV
.10 mV
.15 mV
.20 mV
.25 mV
.30 mV
.35 mV
.40 mV
.45 mV
.50 mV
1.0 mV*
1.5 mV
2.0 mV
2.5 mV
3.0 mV
3.5 mV
4.0 mV
4.5 mV
5.0 mV

* Indicates Default Setting
(See Power Up Settings)

The rate, amplitude, adult/pediatric, artifact and ST elevation or depression can be selected by using PREVIOUS NEXT to highlight the parameter to change and using UP DOWN to scroll to the desired value. Then ENTER is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use CHOICES . Use UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.

Auto Rate

If the BPM parameter is set to AUTO, the unit will automatically sequence through all of the BPM settings, starting with 30 BPM, incrementing at a fixed interval. The interval may be set in the System Setup Menu under "Auto Step Time".

Displays time (seconds) remaining before advancing to next rate.
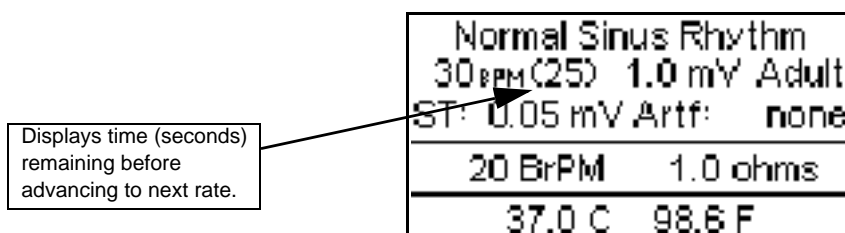
The QUIT key can be used to exit the Auto Mode during the sequence.

NOTE: ST Elevation or Depression is only active in Adult NSR at or below 180 BPM.

ECG – ARRHYTHMIAS

The SECU**LIFE**│**PS300** can send Arrhythmia waveforms to ECG machines in 3, 5 or 12-lead configurations. It has independent outputs for each signal lead, referenced to the right leg.

There are 36 Arrhythmias available that model abnormal heartbeats. The SECU**LIFE**│**PS300** is placed into ARRHYTHMIA mode by pressing the │**Arrhythmias**│ category key.

The top portion of the display shows the currently enabled arrhythmia group and selection, selectable from:

Premature	Supraventricular	Ventricular	Conduction
Atrial PAC - Auto*	Atrial Fib - Coarse	Pair of PVCs - Auto	1^{st} Deg Heart Block
Atrial PAC - Man	Atrial Fib - Fine	Pair of PVCs - Man	2^{nd} Deg Heart Block
Nodal PNC - Auto	Atrial Flutter	Run of 5 PVCs - Auto	3^{rd} Deg Heart Block
Nodal PNC - Man	Atrial Tach	Run of 5 PVCs - Man	Rt Bundle Branch Block
PVC 1 - Auto	Paroxysmal Atrial Tach	Run of 11 PVCs - Auto	Lf Bundle Branch Block
PVC 1 - Man	Supravent Tach	Run of 11 PVCs - Man	
PVC 1 Early - Auto	Sinus Arrhythmia	6 PVCs per Min	
PVC 1 Early - Man	Missed Beat - Auto	12 PVCs per Min	
PVC 1 R on T - Auto	Missed Beat - Man	24 PVCs per Min	
PVC 1 R on T - Man	Nodal Rhythm	Freq Multifocal PVCs	
PVC 2 - Auto		Bigeminy	
PVC 2 - Man		Trigeminy	
PVC 2 Early - Auto		Vent Tach	
PVC 2 Early - Man		Vent Fib – Coarse	
PVC 2 R on T - Auto		Vent Fib – Fine	
PVC 2 R on T - Man		Asystole	
Multifocal PVCs - Auto			
Multifocal PVCs - Man			

| ARRHYTHMIA GROUP |
| ARRHYTHMIA |

```
Premature  Arrhythmias:
    Atrial PAC - Auto
1.0mV ST: 0.0  Art: None
  30 BrPM    1.0 ohms
    37.0 C  │  98.6 F
```

AMPLITUDE		ST SEGMENT ELEVATION		ARTIFACT
.05 mV	1.0 mV*	0.8 mV	0.05 mV	None*
.10 mV	1.5 mV	-0.7 mV	0.1 mV	50 Hz
.15 mV	2.0 mV	-0.6 mV	0.2 mV	60 Hz
.20 mV	2.5 mV	-0.5 mV	0.3 mV	Muscle
.25 mV	3.0 mV	-0.4 mV	0.4 mV	Wander
.30 mV	3.5 mV	-0.3 m V	0.5 mV	(Baseline)
.35 mV	4.0 mV	-0.2 mV	0.6 mV	Resp
.40 mV	4.5 mV	-0.1 mV	0.7 mV	(Respiration)
.45 mV	5.0 mV	-0.05 mV	0.8 mV	
.50 mV		0.0 mV*		

* Indicates Default Setting
  (See Power Up Settings)

The grouping, arrhythmias and amplitude can be selected by using **PREVIOUS** **NEXT** to highlight the parameter to change and using **UP** **DOWN** to scroll to the desired value. Then **ENTER** is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use **CHOICES**. Use **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting.

NOTE: While in the Arrhythmia Group choice screen, the **CHOICES** key may be used for a second time to jump directly to the arrhythmias choices for that group.

Auto/Manual

There are 12 arrhythmias that have both Automatic and Manual versions. Both versions output the same waveform; however, in the Manual version, the arrhythmia is triggered each time **ENTER** is depressed. In the Auto versions, the arrhythmia is automatically triggered periodically.

The following is a brief description of how the SECU**LIFE**│**PS300** simulates the available Arrhythmias:

PREMATURE		
Abbreviation	**Arrhythmia**	**Description**
Atrial PAC – Auto	Premature Atrial Contraction	NSR of 80 BPM with Periodic Abnormal 25 % early P waves (PAC, 7 NSR) (Continuous)
Atrial PAC – Man	Premature Atrial Contraction	NSR of 80 BPM with Periodic Abnormal 25 % early P waves (One-Time event)
Nodal PNC – Auto	Premature Nodal Contraction	NSR of 80 BPM with Periodic Abnormal 25 % early Nodal beat (PNC, 7 NSR) (Continuous)
Nodal PNC – Man	Premature Nodal Contraction	NSR of 80 BPM with Periodic Abnormal 25 % early Nodal beat (One-Time event)
PVC 1 – Auto	Standard Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 20 % premature timing (PVC Type 1, 9 NSR) (Continuous)
PVC 1 – Man	Standard Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 20 % premature timing (One-Time event)
PVC 1 Early – Auto	Early Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 33 % premature timing (PVC Type 1, 9 NSR) (Continuous)
PVC 1 Early – Man	Early Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 33 % premature timing (One-Time event)
PVC 1 R on T – Auto	R on T Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 65 % premature timing, placing R on the previous T (PVC Type 1, 9 NSR) (Continuous)
PVC 1 R on T – Man	R on T Type 1 Premature Ventricular Contraction	NSR of 80 BPM with periodic left focus premature ventricular beats with 65 % premature timing, placing R on the previous T (One-Time event)
PVC 2 – Auto	Standard Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 20 % premature timing (PVC Type 2, 9 NSR) (Continuous)
PVC 2 – Man	Standard Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 20 % premature timing (One-Time event)
PVC 2 Early – Auto	Early Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 33 % premature timing (PVC Type 2, 9 NSR) (Continuous)

PREMATURE		
Abbreviation	**Arrhythmia**	**Description**
PVC 2 Early – Man	Early Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 33 % premature timing (One-Time event)
PVC 2 R on T – Auto	R on T Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 65 % premature timing, placing R on the previous T (PVC Type 2, 9 NSR) (Continuous)
PVC 2 R on T – Man	R on T Type 2 Premature Ventricular Contraction	NSR of 80 BPM with periodic right focus premature ventricular beats with 65 % premature timing, placing R on the previous T (One-Time event)
Multifocal PVCS – Auto	Multifocal Premature Ventricular Contraction	NSR of 80 BPM with Type 1 and Type 2 PVCs (PVC Type 1, 2 NSR, PVC Type 2, 2 NSR) (Continuous)
Multifocal PVCS – Man	Multifocal Premature Ventricular Contractions	NSR of 80 BPM with Type 1 and Type 2 PVCs (PVC Type 1, 2 NSR, PVC Type 2) (One-Time event)

SUPRAVENTRICULAR		
Abbreviation	**Arrhythmia**	**Description**
Atrial Fib – Coarse	Artial Fibrillation	Absence of P-wave, irregular P-R interval rate and a high level signal (Continuous)
Atrial Fib – Fine	Artial Fibrillation	Absence of P-wave, irregular P-R interval rate and a low level signal (Continuous)
Atrial Flutter	Atrial Flutter	Repeating sequence of 5 atrial beats and 1 ventrical beat for twelve seconds, followed by a repeating sequence of 3 atrial beats and 1 ventrical beat for six seconds, followed by a repeating sequence of 2 atrial beats and 1 ventrical beat for six seconds (Continuous)
Atrial Tach	Atrial Tachycardia	160 BPM (Continuous)
Paroxysmal Atrial Tach	Paroxysmal Atrial Tachycardia	160 BPM for five seconds 80 BPM for ten seconds (Continuous)
Supravent Tach	Supraventricular Tachycardia	200 BPM (Continuous)
Sinus Arrhythmia	Sinus Arrhythmia	Normal beats at a fluctuating rate from 60 BPM to 100 BPM (Continuous)
Missed Beat – Auto	Missed Beat	NSR of 80 BPM with a missed beat (Missed Beat, 36 NSR) (Continuous)
Missed Beat – Man	Missed Beat	NSR of 80 BPM with a missed beat (One-Time Event)
Nodal Rhythm	Nodal Rhythm	60 BPM with very short P-R interval (Continuous)

VENTRICULAR		
Abbreviation	**Arrhythmia**	**Description**
Pair of PVCs – Auto	Pair of Premature Ventricular Contractions	NSR of 80 BPM with Periodic Group of 2 Type 1 PVCs (2 PVC Type 1, 36 NSR) (Continuous)
Pair of PVCs – Man	Pair of Premature Ventricular Contractions	NSR of 80 BPM with Periodic Group of 2 Type 1 PVCs (One-Time Event)
Run of 5 PVCs – Auto	Run of 5 Premature Ventricular Contractions	NSR of 80 BPM with periodic group of 5 Type 1 PVCs (5 PVC Type 1, 36 NSR) (Continuous)
Run of 5 PVCs – Man	Run of 5 Premature Ventricular Contractions	NSR of 80 BPM with periodic group of 5 Type 1 PVCs (One-Time event)
Run of 11 PVCs – Auto	Run of 11 Premature Ventricular Contractions	NSR of 80 BPM with periodic group of 11 Type 1 PVCs (11 PVC Type 1, 36 NSR) (Continuous)
Run of 11 PVCs – Man	Run of 11 Premature Ventricular Contractions	NSR of 80 BPM with periodic group of 11 Type 1 PVCs (One-Time event)
6 PVCs per Min	6 Premature Ventricular Contractions per minute	NSR of 80 BPM with 6 Type 1 PVCs per minute (Continuous)
12 PVCs per Min	12 Premature Ventricular Contractions per minute	NSR of 80 BPM with 12 Type 1 PVCs per minute (Continuous)
24 PVCs per Min	24 Premature Ventricular Contractions per minute	NSR of 80 BPM with 24 Type 1 PVCs per minute (Continuous)
Freq Multifocal PVCs	Frequent Multifocal Premature Ventricular Contractions	NSR of 80 BPM with every fourth beat being an alternating Type 1 and Type 2 PVC (Continuous)
Bigeminy	Bigeminal Rhythm	NSR of 80 BPM with every other beat a Type 1 PVC (Continuous)
Trigeminy	Trigeminal Rhythm	NSR of 80 BPM with every third beat a Type 1 PVC (Continuous)
Vent Tach	Ventricular Tachycardia	160 BPM, No P-wave, Beats similar to Type 1 PVC (Continuous)
Vent Fib – Coarse	Ventricular Fibrillation	Irregular waveform with no real P-wave or clear R-R interval and a high signal level (Continuous)
Vent Fib – Fine	Ventricular Fibrillation	Irregular waveform with no real P-wave or clear R-R interval and a low signal level (Continuous)
Asystole	Asystole	Flat line signal (Continuous)

CONDUCTION		
Abbreviation	**Arrhythmia**	**Description**
1st Deg Heart Block	First Degree Heart Block	80 BPM with a long P-R interval of 250 ms (Continuous)
2nd Deg Heart Block	Second Degree Heart Block	80 BPM with increasing P-R interval for four beats (160, 220, 400, 470 ms) followed by a P wave without a QRS (Continuous)
3rd Deg Heart Block	Third Degree Heart Block	80 BPM with P wave rate of 80 BPM and QRS rate of 30 BPM (Continuous)
Rt Bundle Branch Block	Right Bundle Branch Block	80 BPM with Normal P-wave and P-R interval but wider QRS complexes (Continuous)
Lf Bundle Branch Block	Left Bundle Branch Block	80 BPM with Normal P-wave and P-R interval but wider QRS complexes (Continuous)

ECG – PACEMAKER

The SECU**LIFE**│**PS300** can send paced waveforms to ECG machines in 3, 5 or 12 lead configurations. It has independent outputs for each signal lead, referenced to the right leg.

There are 7 paced simulation signals available which model when the heartbeat is accompanied by a pacemaker. The SECU**LIFE**│**PS300** is placed into PACEMAKER mode by pressing the │**Pacemaker**│ category key.

The display will resemble the following:

ARTIFACT
None*
50 Hz
60 Hz
Muscle
Wander
(Baseline)
Resp
(Respiration)

WAVEFORM
Atrial (80 BPM)*
Async (75 BPM)
Non-Capture
Non-Function
Demand – Occasional
Demand – Frequent
AV – Sequential

ECG/RESPIRATION/TEMPERATURE

Pacemaker Waveform
Atrial 80 BPM
1.0mV ST: 0.0 Art: None
Pulse: 5.0 mV 1.0 ms
37.0 C 98.6 F

ST SEGMENT ELEVATION
-0.8 mV
-0.7 mV
-0.6 mV
-0.5 mV
-0.4 mV
-0.3 mV
-0.2 mV
-0.1 mV
-0.05 mV
0.0 mV*
0.05 mV
0.1 mV
0.2 mV
0.3 mV
0.4 mV
0.5 mV
0.6 mV
0.7 mV
0.8 mV

AMPLITUDE	
.05 mV	1.0 mV*
.10 mV	1.5 mV
.15 mV	2.0 mV
.20 mV	2.5 mV
.25 mV	3.0 mV
.30 mV	3.5 mV
.35 mV	4.0 mV
.40 mV	4.5 mV
.45 mV	5.0 mV
.50 mV	

PULSE AMPLITUDE
1 mV
2 mV
3 mV
4 mV
5 mV*
6 mV
7 mV
8 mV
9 mV
10 mV

PULSE WIDTH
0.1 ms
0.5 ms
1.0 ms*
1.5 ms
2.0 ms

* Indicates Default Setting
(See Power Up Settings)

The pacemaker rhythms and signals can be selected by using PREVIOUS NEXT to highlight the parameter to change and using UP DOWN to scroll to the desired value. Then ENTER is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use CHOICES. Use UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.

The following is a brief description of how the SECU**LIFE**|**PS300** simulates the available Pacemaker Waveforms:

PACEMAKER		
Abbreviation	**Waveform**	**Description**
Atrial Pacer	Atrial Pacemaker Wave	80 BPM with Pacer Pulse at the start of each P wave
Asynchronous	Asynchronous Pacemaker Wave	75 BPM with Pacer Pulse at the start of each QRS wave and no P wave
Non-Capture	Ventricular Pacemaker Wave with Periodic Non-Response	75 BPM Ventricular Paced beats with every tenth beat not responding
Non-Function	Ventricular Pacemaker Wave with no Heart Response	75 BPM Ventricular Paced beats with no heart response
Demand – Occasional	Demand Pacemaker Wave with Occasional Sinus Beats	20 NSR beats followed by 20 Ventricular Paced beats
Demand – Frequent	Demand Pacemaker Wave with Frequent Sinus Beats	40 NSR beats followed by 40 Ventricular Paced beats
AV – Sequential	AV-Sequential Pacemaker Wave	75 BPM with Pacer Pulse at the start of both the P and QRS waves

ECG – PERFORMANCE

The SECU**LIFE**│**PS300** can send performance waveforms to ECG machines in 3, 5 or 12-lead configurations. It has independent outputs for each signal lead, referenced to the right leg.

There are 15 Performance waves and 6 R-waves available for testing and verifying. The SECU**LIFE**│**PS300** is placed into PERFORMANCE mode by pressing the Performance category key.

The display will resemble the following:

WAVEFORM	
Square Wave	.125 Hz
Square Wave	2 Hz*
Triangle Wave	2 Hz
Triangle Wave	2.5 Hz
Sine Wave	0.1 Hz
Sine Wave	0.5 Hz
Sine Wave	5 Hz
Sine Wave	10 Hz
Sine Wave	40 Hz
Sine Wave	50 Hz
Sine Wave	60 Hz
Sine Wave	100 Hz
Pulse	30 BPM
Pulse	60 BPM
Pulse	120 BPM
Auto Wave	
R-Wave	30 BPM
R-Wave	60 BPM
R-Wave	80 BPM
R-Wave	120 BPM
R-Wave	200 BPM
R-Wave	250 BPM

ECG/RESPIRATION/TEMPERATURE
Performance
Square Wave   2 Hz
Amplitude: 1.0 mV
37.0 C   98.6 F

* Indicates Default Setting
(See Power Up Settings)

AMPLITUDE
.05 mv
.10 mv
.15 mv
.20 mv
.25 mv
.30 mv
.35 mv
.40 mv
.45 mv
.50 mv
1.0 mv*
1.5 mv
2.0 mv
2.5 mv
3.0 mv
3.5 mv
4.0 mv
4.5 mv
5.0 mV

R-Wave

When one of the 6 R-Wave waveforms is selected, the display changes to allow the setting of the width.

WIDTH
8 ms
10 ms*
12 ms
20 ms
30 ms
40 ms
50 ms
60 ms
70 ms
80 ms
90 ms
100 ms
120 ms
130 ms
140 ms
150 ms
160 ms
170 ms
180 ms
190 ms
200 ms

```
ECG/RESPIRATION/TEMPERATURE

            Performance
   R-Wave           60 BPM
   Amplitude:       1.0 mV
►  Width:           8 ms
        37.0 C    98.6 F
```

```
* Indicates Default Setting
  (See Power Up Settings)
```
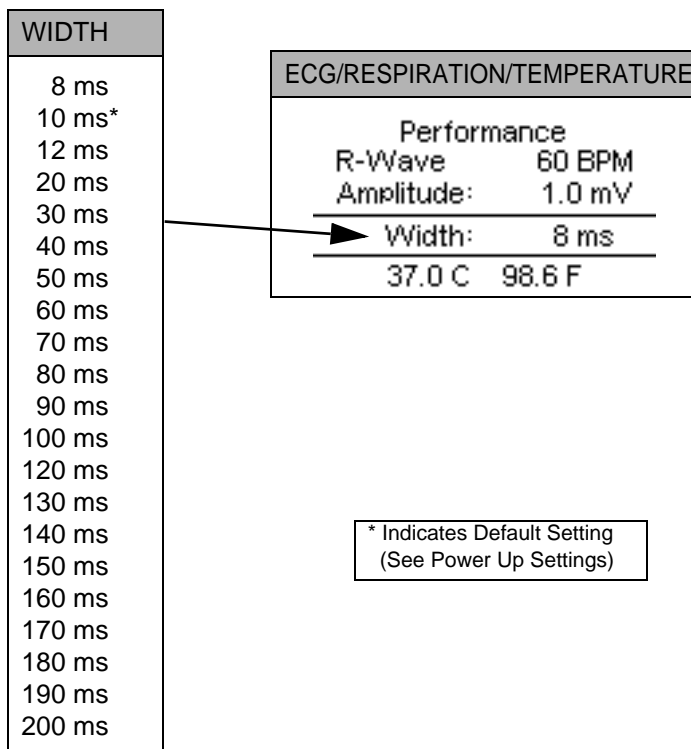
These widths can be selected by using PREVIOUS NEXT to highlight the parameter to change and using UP DOWN to scroll to the desired value. Then ENTER is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use CHOICES. Use UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.

Auto Wave

If the Performance parameter is set to AUTO, the unit will automatically sequence through all of the performance waves, starting with Square Wave .125 Hz, incrementing at a fixed interval. The interval may be set in the System Setup Menu under "Auto Step Time".

A countdown timer is shown in the display:

```
        Performance
   Square Wave .125 Hz
   Amplitude:       1.0 mV
     Auto Timer (22)
       37.0 C    98.6 F
```

Displays time (seconds) remaining before advancing to next waveform.

The QUIT key can be used to exit the Auto Mode during the sequence.

BLOOD PRESSURE

NOTE: The Transducer Sensitivity (5 or 40 µV/V/mmHg) must be set to correlate with the monitoring equipment before simulation can begin. (See SETUP for selection information).

The SECU**LIFE**│**PS300** series offers two Blood Pressure Channels and will simulate the set Blood Pressure wave during ECG waveforms where it occurs.

There are 16 Blood Pressure settings available, 17 static and 8 dynamic. Each of the dynamic waveforms will synchronize with the NSR rate or arrhythmia selection.

Both an automatic and manual Swan-Ganz simulation are also available.

The PS300 dual blood pressure display will resemble the following:
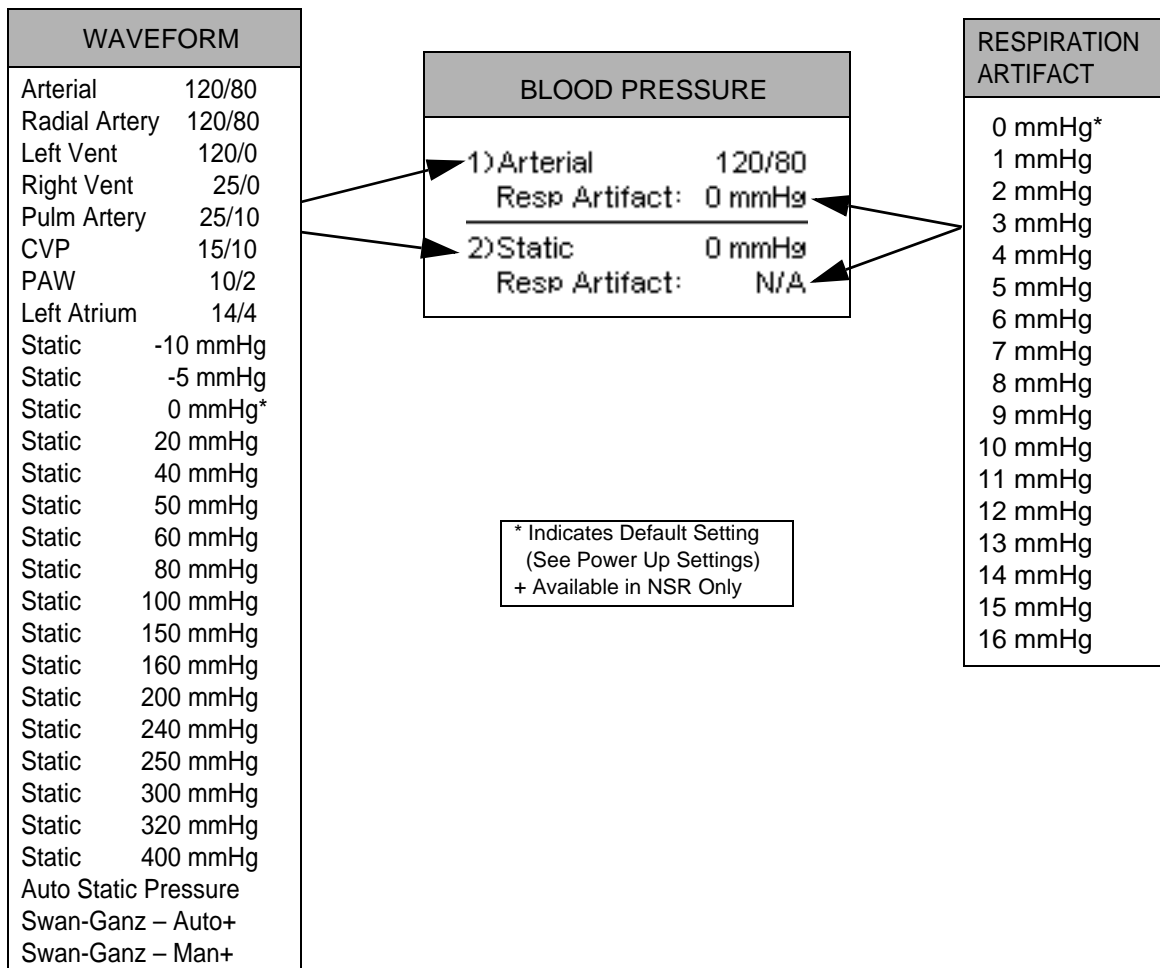
WAVEFORM	
Arterial	120/80
Radial Artery	120/80
Left Vent	120/0
Right Vent	25/0
Pulm Artery	25/10
CVP	15/10
PAW	10/2
Left Atrium	14/4
Static	-10 mmHg
Static	-5 mmHg
Static	0 mmHg*
Static	20 mmHg
Static	40 mmHg
Static	50 mmHg
Static	60 mmHg
Static	80 mmHg
Static	100 mmHg
Static	150 mmHg
Static	160 mmHg
Static	200 mmHg
Static	240 mmHg
Static	250 mmHg
Static	300 mmHg
Static	320 mmHg
Static	400 mmHg
Auto Static Pressure	
Swan-Ganz – Auto+	
Swan-Ganz – Man+	

BLOOD PRESSURE

1) Arterial   120/80
   Resp Artifact: 0 mmHg

2) Static   0 mmHg
   Resp Artifact: N/A

* Indicates Default Setting
  (See Power Up Settings)
+ Available in NSR Only

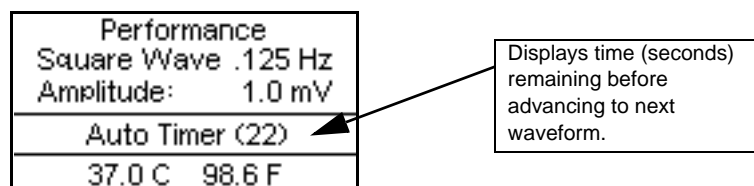| RESPIRATION ARTIFACT |
|---|
| 0 mmHg* |
| 1 mmHg |
| 2 mmHg |
| 3 mmHg |
| 4 mmHg |
| 5 mmHg |
| 6 mmHg |
| 7 mmHg |
| 8 mmHg |
| 9 mmHg |
| 10 mmHg |
| 11 mmHg |
| 12 mmHg |
| 13 mmHg |
| 14 mmHg |
| 15 mmHg |
| 16 mmHg |

These settings can be selected by using PREVIOUS NEXT to highlight the parameter to change and using UP DOWN to scroll to the desired value. Then ENTER is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use CHOICES. Use UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.

Auto Static Pressure

If Auto Static Pressure is selected, the channel will automatically sequence through all of the Static Pressure settings, starting with -10 mmHg, incrementing at a fixed interval. The interval may be set in the System Setup Menu under "Auto Step Time."

NOTE: Each channel can be set independently.

```
          BLOOD PRESSURE

1)Arterial         120/80
   Resp Artifact:  8 mmHg
 ─────────────────────────
2)Static    -10 mmHg (14)
   Resp Artifact:     N/A
```

Displays time (seconds) remaining before advancing to next static pressure.

The QUIT key can be used to exit the Auto Mode during the sequence.

SWAN-GANZ (OPTION)

The Swan-Ganz simulation is a special feature that will run the typical sequence for a Swan-Ganz catheter. This can be done either manually, with the user triggering each step, or automatically, with the unit continuously running the sequence with each step at a fixed time interval.

The sequence may be run on any channel while in the Normal Sinus Rhythm screen, but only on one channel at a time.

The sequence can be activated by using **PREVIOUS** **NEXT** to highlight the appropriate channel then using **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to select the Swan-Ganz – Man or Swan-Ganz – Auto waveform. When either of these waveforms is selected, a special screen will be displayed to step through the specific Swan-Ganz information.

Manual

In the Swan-Ganz – Man mode, the user controls the sequence using the **UP** **DOWN** keys. (The functions of the keys vary with the steps. The display will indicate the current options on each screen.)

The following is a typical screen:
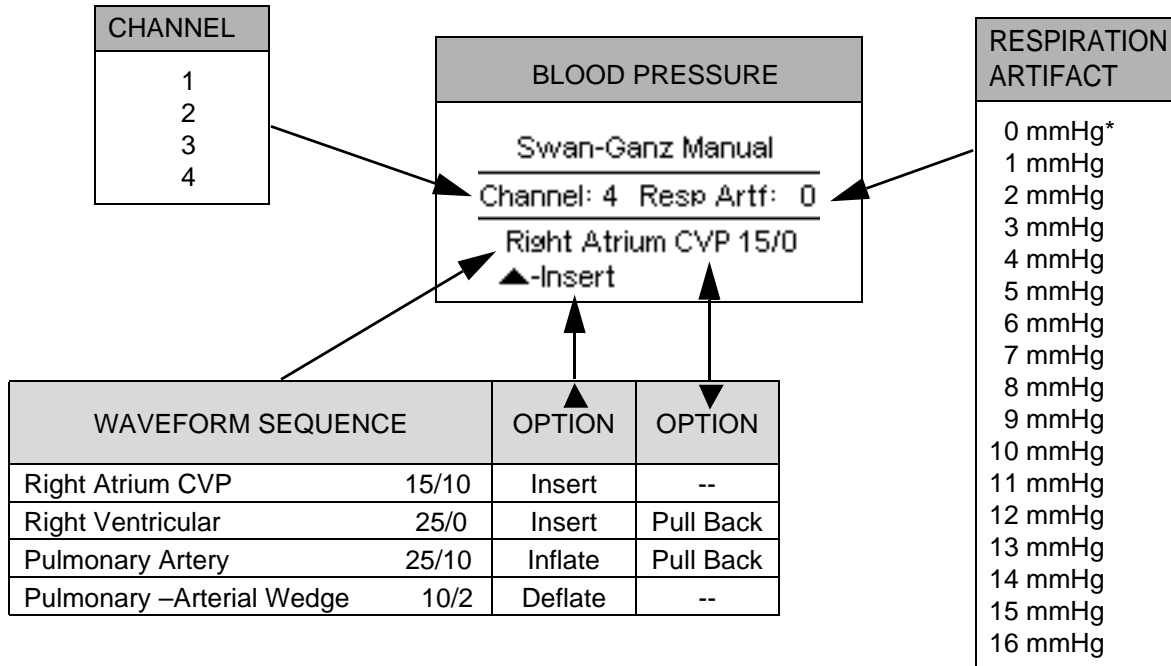
CHANNEL
1
2
3
4

BLOOD PRESSURE
Swan-Ganz Manual
Channel: 4   Resp Artf: 0
Right Atrium CVP 15/0
▲-Insert

RESPIRATION ARTIFACT
0 mmHg*
1 mmHg
2 mmHg
3 mmHg
4 mmHg
5 mmHg
6 mmHg
7 mmHg
8 mmHg
9 mmHg
10 mmHg
11 mmHg
12 mmHg
13 mmHg
14 mmHg
15 mmHg
16 mmHg

WAVEFORM SEQUENCE		OPTION	OPTION
Right Atrium CVP	15/10	Insert	--
Right Ventricular	25/0	Insert	Pull Back
Pulmonary Artery	25/10	Inflate	Pull Back
Pulmonary –Arterial Wedge	10/2	Deflate	--

> **NOTE:** In models 2220 and 2240, the unit will auto select BP based on the channel that was used to enter the mode. However, it may be changed before beginning a sequence.
>
> **NOTE:** The Up and Down Option keys will not be visible when the BP or Resp Artf Parameters are selected for change.

The **QUIT** key can be used to exit the Manual Mode during the sequence.

Automatic

In the Swan-Ganz – Auto mode, the unit continually runs the sequence. The time remaining before proceeding to the next step is counted down in the display.

The following is a typical setup screen:

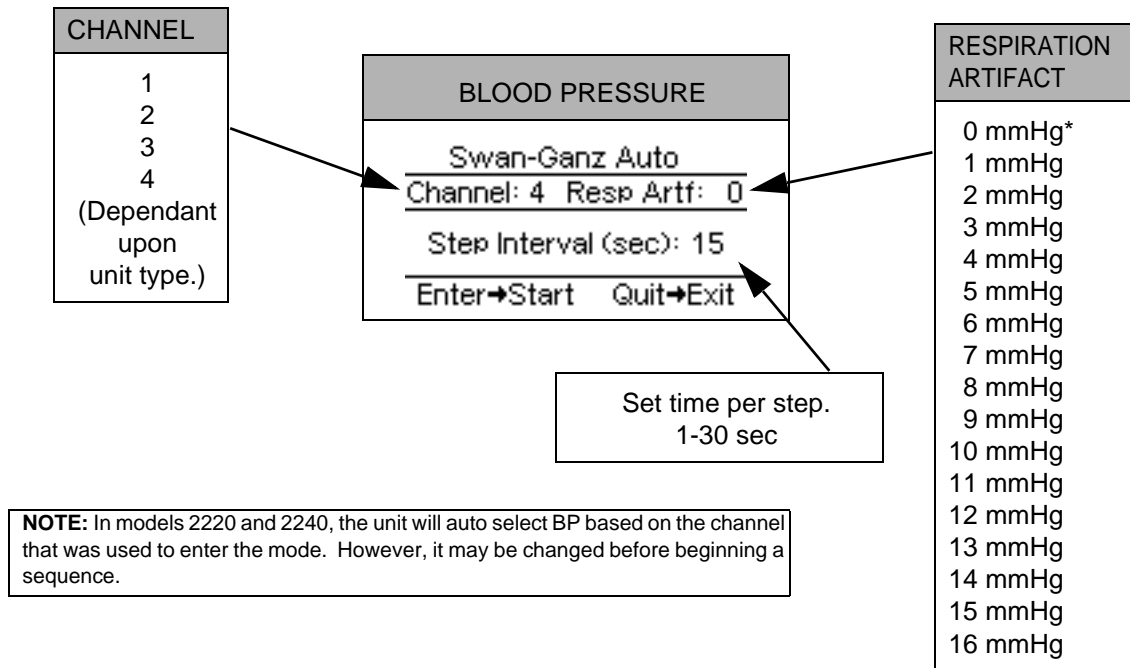| CHANNEL		RESPIRATION ARTIFACT
1		0 mmHg*
2	BLOOD PRESSURE	1 mmHg
3		2 mmHg
4	Swan-Ganz Auto	3 mmHg
(Dependant	Channel: 4 Resp Artf: 0	4 mmHg
upon		5 mmHg
unit type.)	Step Interval (sec): 15	6 mmHg
		7 mmHg
	Enter→Start Quit→Exit	8 mmHg
		9 mmHg

Set time per step.
1-30 sec

RESPIRATION ARTIFACT
0 mmHg*
1 mmHg
2 mmHg
3 mmHg
4 mmHg
5 mmHg
6 mmHg
7 mmHg
8 mmHg
9 mmHg
10 mmHg
11 mmHg
12 mmHg
13 mmHg
14 mmHg
15 mmHg
16 mmHg

NOTE: In models 2220 and 2240, the unit will auto select BP based on the channel that was used to enter the mode. However, it may be changed before beginning a sequence.

The following is a typical running screen:

BLOOD PRESSURE

Swan-Ganz Auto
Channel: 4   Resp Artf: 0
Right Atrium CVP 15/0
(Time Remaining: 10 Sec)
Quit→Pause

Counts down time per step.

SEQUENCE	
Right Atrium CVP	15/10
Right Ventricular	25/0
Pulmonary Artery	25/10
Pulmonary Arterial Wedge	10/2
Right Atrium CVP	15/10
Right Ventricular	25/0
Pulmonary Artery	25/10
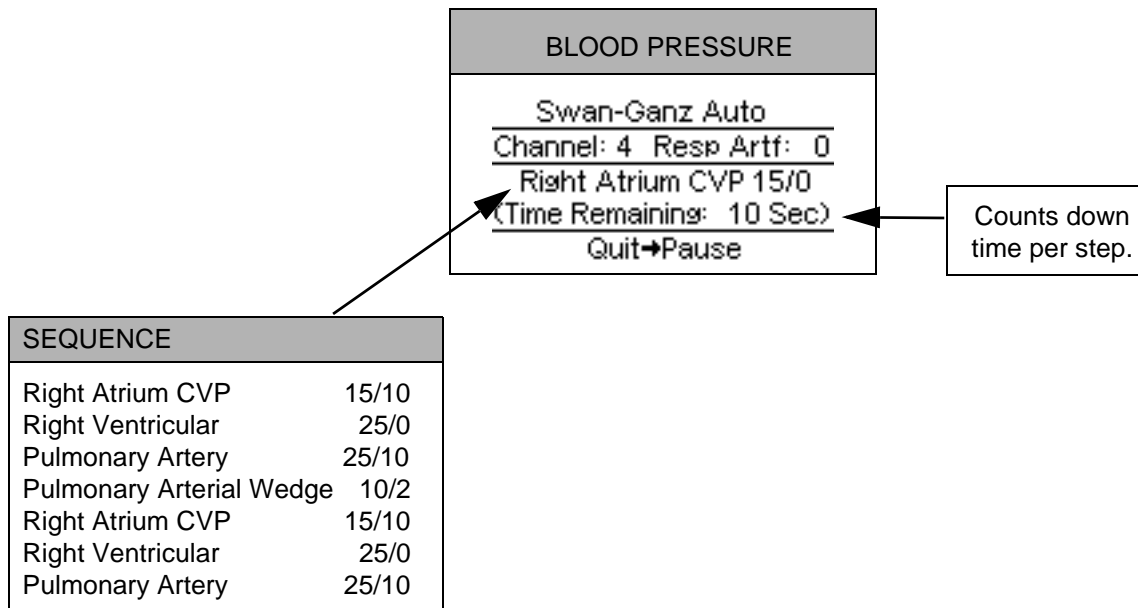
To pause or exit the Swan-Ganz – Auto Mode during a sequence, use **QUIT** . The following message box will be displayed:

Press ENTER to continue.
Press QUIT to exit.

RESPIRATION

NOTE: The delta ohm Respiration Signal can be inserted in either the LL or LA lead. The Baseline impedance can be set to 500, 1000, 1500 or 2000 Ohms. These must be set to correlate with the monitoring equipment before simulation can begin. (See SETUP for selection information).

There are 12 rate settings available (9 BrPM rates, Apnea (0 BrPM) and 3 timed Apneas).
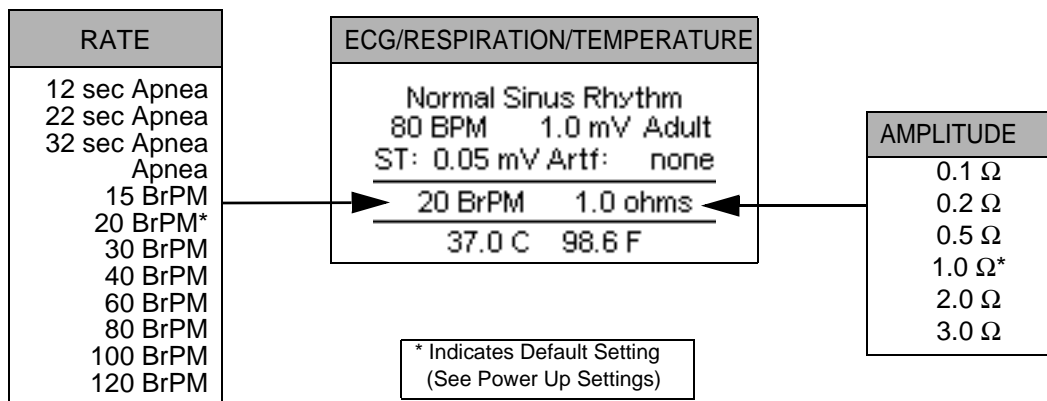
The display will resemble the following:

RATE
12 sec Apnea
22 sec Apnea
32 sec Apnea
Apnea
15 BrPM
20 BrPM*
30 BrPM
40 BrPM
60 BrPM
80 BrPM
100 BrPM
120 BrPM

ECG/RESPIRATION/TEMPERATURE

Normal Sinus Rhythm
80 BPM   1.0 mV Adult
ST: 0.05 mV Artf: none
────────────────────────
20 BrPM   1.0 ohms
────────────────────────
37.0 C   98.6 F

* Indicates Default Setting
(See Power Up Settings)

AMPLITUDE
0.1 Ω
0.2 Ω
0.5 Ω
1.0 Ω*
2.0 Ω
3.0 Ω

These Rates and Amplitude (Impedance Variations) can be selected by using **PREVIOUS** **NEXT** to highlight the parameter to change and using **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use **CHOICES**. Use **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting.

Timed Apnea

To trigger a one time event Apnea for one of the specific periods (12, 22 or 32 seconds), simply highlight the desired period and press **ENTER** .

The Respiration display will change as shown in the following typical display:

```
ECG/RESPIRATION/TEMPERATURE

       Normal Sinus Rhythm
    45 BPM     1.0 mV Adult
  ST: 0.05 mV Artf:    none

  Apnea Countdown:22 sec
       37.0 C   98.6 F
```

The display will count down the Apnea period and then revert to the previous BrPM setting, display and output.

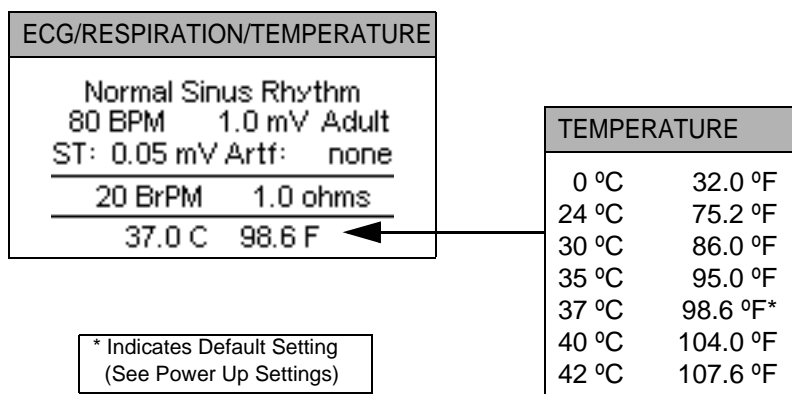The countdown may be manually cancelled with the **QUIT** key.

TEMPERATURE

The SECU**LIFE**│**PS300** simulates 7 temperatures that are independent from the rest of the functions of the unit. The temperature setting can be selected at any time.

The output will simulate both YSI 400 and YSI 700 Temperature probes.

(**Note:** Both outputs are available at the output connector simultaneously.)

The display will resemble the following:

```
ECG/RESPIRATION/TEMPERATURE

    Normal Sinus Rhythm
    80 BPM     1.0 mV  Adult
    ST: 0.05 mV Artf:     none
    ───────────────────────────
       20 BrPM      1.0 ohms
    ───────────────────────────
          37.0 C    98.6 F   ◀────────
```

```
* Indicates Default Setting
  (See Power Up Settings)
```

TEMPERATURE	
0 ºC	32.0 ºF
24 ºC	75.2 ºF
30 ºC	86.0 ºF
35 ºC	95.0 ºF
37 ºC	98.6 ºF*
40 ºC	104.0 ºF
42 ºC	107.6 ºF

These temperatures can be selected by using **PREVIOUS** **NEXT** to highlight the parameter to change and using **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use **CHOICES**. Use **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting.
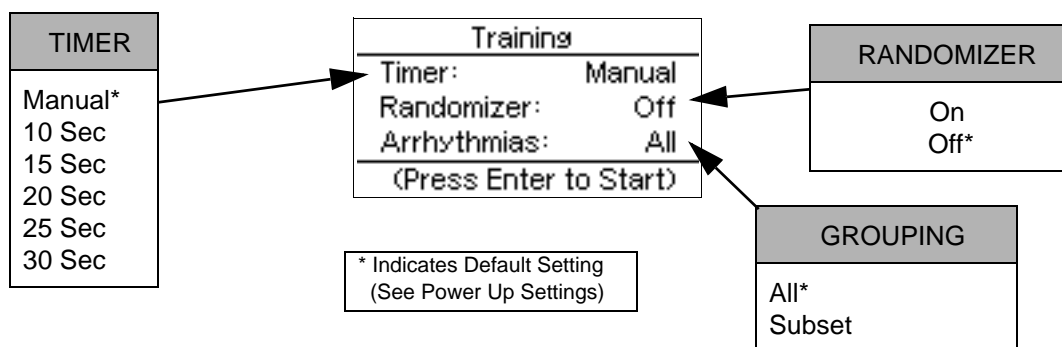
TRAINING

The SECU**LIFE**⎪**PS300** provides the unique feature of a Training Mode to aid the user in practicing the identification of arrhythmias. The unit will sequence through the arrhythmias, allowing the user to look at the output on their equipment, identify the arrhythmia and then verify their conclusion with the correct name shown on the display. The user can select either manual or timed sequencing, as well as whether the arrhythmias will display in order or randomly. Subsets of the Arrhythmias can be selected to allow for individualization.

The SECU**LIFE**⎪**PS300** is placed into TRAINING mode by pressing the Training category key.
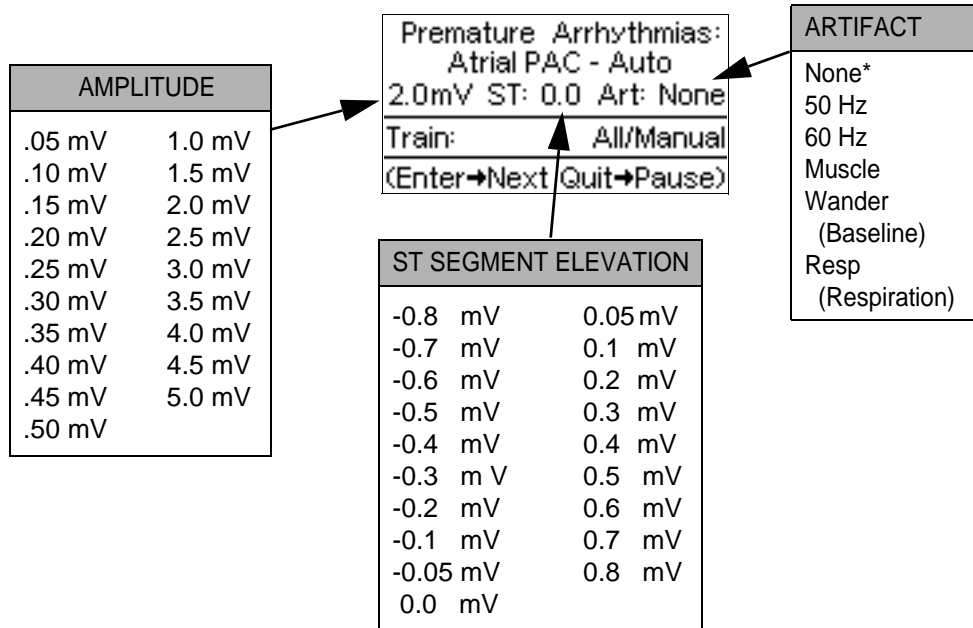
The display will resemble the following:

TIMER		RANDOMIZER
Manual*	Training	On
10 Sec	Timer: Manual	Off*
15 Sec	Randomizer: Off	
20 Sec	Arrhythmias: All	GROUPING
25 Sec	(Press Enter to Start)	All*
30 Sec	* Indicates Default Setting (See Power Up Settings)	Subset

The Timer, Randomizer and Arrhythmias can be selected by using PREVIOUS NEXT to highlight the parameter to change and using UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.

Alternately, to see a submenu of all the options for a highlighted parameter, use CHOICES. Use UP DOWN to scroll to the desired option. Then ENTER is used to accept the new setting.
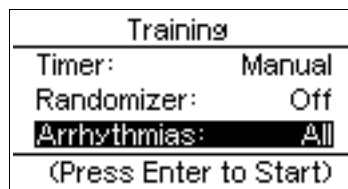
SUBSET

The subset feature allows the user to select specific arrhythmias for a more controlled training. This feature is selected by setting the "Arrhythmias:" parameter to "Subset."

The selection of the subset is done by marking those specific arrhythmias or groups of arrhythmias of interest. After a subset of arrhythmias has been selected, it will remain in memory. It may them be edited at any time prior to starting a training session.

The following procedure is used to modify the subset:

1) From the main screen, highlight Arrhythmias: and use $\boxed{\text{CHOICES}}$ to open the choices screen.

```
         Training
Timer:          Manual
Randomizer:        Off
Arrhythmias:        All
   (Press Enter to Start)
```

2) Highlight Subset and use $\boxed{\text{CHOICES}}$ to open the Arrhythmia Groups Submenu screen.

```
       Arrhythmias:
           All
          Subset

   (Choices → Edit Subset)
```
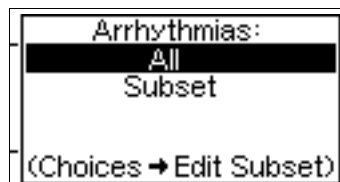
3) To select all the arrhythmias in a group, use $\boxed{\text{UP}}$ $\boxed{\text{DOWN}}$ to scroll to the category and $\boxed{\text{ENTER}}$ to toggle the indicator to "ALL". To select none of the arrhythmias in a group, use $\boxed{\text{ENTER}}$ to toggle the indicator to "NO".

```
     Arrhythmia Groups:
NO   Premature
All  Supraventricular
All  Ventricular
All  Conduction
(ENTER → TOGGLE CHOICES → SUBSET)
```
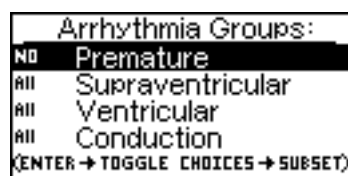
4) To select some of the arrhythmias in a group, use CHOICES to display the list of arrhythmias for a specific group. Then use UP DOWN to scroll through the arrhythmias. Any arrhythmia marked with a check (✓) will be included in the subset. Use ENTER to toggle the selection of an arrhythmia on and off.

```
┌─────────────────────────────┐
│ Premature Arrhythmias:      │
│ ▮Atrial PAC - Auto▮         │
│  Nodal PNC - Auto           │
│ ✔ PVC 1 - Auto              │
│ ✔ PVC 1 Early - Auto        │
│ (Enter➔Toggle Selection)    │
└─────────────────────────────┘
```

NOTE: If the group is pre-selected with "ALL", all of the arrhythmias will be checked, thus making it easy to deselect a few. If the group is pre-selected with "NO", none of the arrhythmias will be checked, thus making it easy to select a few.

5) When completed selecting the desired arrhythmias from that group, use QUIT to return to the Group Submenu. "SOME" will appear to indicate a partial selection of the arrhythmias in that group.

```
┌─────────────────────────────┐
│   Arrhythmia Groups:        │
│ SOME Premature              │
│ NO  Supraventricular        │
│ All Ventricular             │
│ All Conduction              │
│ (ENTER➔TOGGLE CHOICES➔SUBSET)│
└─────────────────────────────┘
```

Additional groups may be modified in the same manor. When done with all the groups, use QUIT again to return to the Training Mode.

SETUP

The SECU**LIFE**│**PS300** allows for setup of the Outputs and the System Parameters through the Setup category key. Depress the key multiple times to toggle between the setup screens.

The Output Setup screen allows for the setting of the SpO_2 Output, Respiration Baseline Ohms, Respiration Lead and the Blood Pressure Sensitivity parameters. These should be set according to the device under test.

Output Setup

The Output Setup screen allows for the setting of the parameters that control the placement and level of the outputs.

The display will resemble the following:
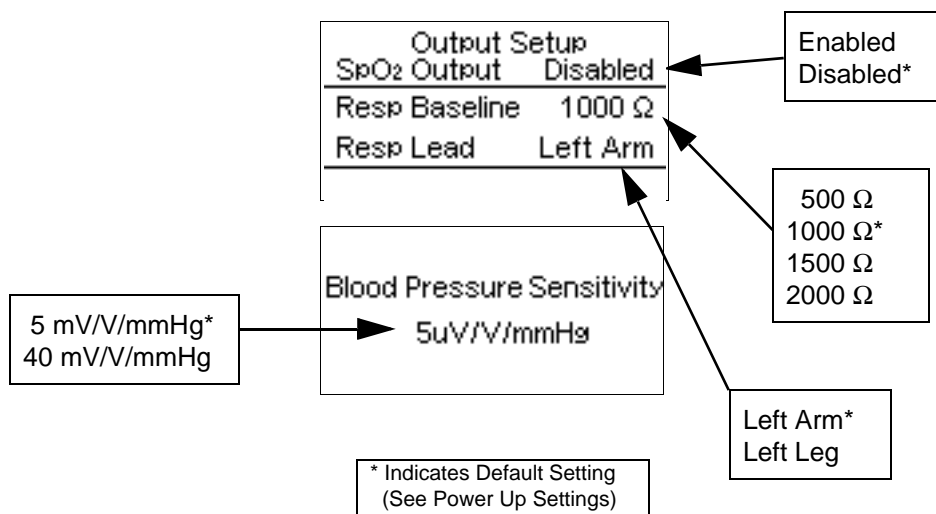
System Setup

The System Setup screen allows for the setting of the parameters controlling various function of the unit as well as the viewing of Battery Life and Software information.

The display will resemble the following:

```
          System Setup
Auto Off Timer (Min)     30
Backlight-Timed (sec)     5
Backlight Intensity   100%
Battery Life          100%
Top LCD Contrast         10
```

```
Bottom LCD Contrast   10
Power up with    Defaults
Auto Step Time (sec)  30
Software   DT7347A05G6
```

NOTE: The Software number in this manual is for example purposes only. Specific units may have different software numbers.

These settings can be selected by using **PREVIOUS** **NEXT** to highlight the parameter to change and using **UP** **DOWN** to scroll to the desired option. Then **ENTER** is used to accept the new setting

Use **QUIT** or **Normal Sinus Rhythm** , **Arrhythmias** or **Performance** to exit from the setup screens.

The following is a brief description of the parameters and the available range of settings:

Parameter	Description	Range
Auto Off Timer	The elapsed time after which the unit will automatically power down. This timer is reset by each key depression. (Setting the value to 0 eliminates this feature.)	0-30 min
Backlight Timed	Off – Always off 1-30 sec – The elapsed time after which the backlight will automatically turn off. Manual – The backlight will be manually controlled by backlight key)	Off, 1-30 sec, Manual
Backlight Intensity	Sets the intensity of the backlight. (Note: Lower intensities extend battery life.)	0-100 %
Battery Life	Displays current life of the batteries. At 5 %, a warning screen will appear. At 10 %, the unit will power down automatically.	5-100 % (Read Only)
Top LCD Contrast	Sets the contrast of the upper display screen.	0-20
Bottom LCD Contrast	Sets the contrast of the lower display screen.	0-20
Power up with	Selects the values that will be used when the unit is first turned on. It is also used to Set the Custom Defaults, if used. (See Power Up Settings).	Default/Last/ Custom/ Set Custom Defaults
Auto Step Time	Sets the interval that is used with the Auto increment features in BPM, BP Rate and Performance.	1 to 60 sec
Software	Displays current software program.	(Read Only)

POWER UP SETTINGS

The SECU**LIFE**│**PS300** allows the user to tailor the settings that the unit will have on Power Up. The "Power Up With" parameter in the System Setup Menu allows for the selection of either Default, Last or Custom selections.

Default

If this option is selected the following settings will be used every time the unit is turned on.

ECG – NSR: 80 BPM, 1.0 mV, Adult QRS, 0.0 mV ST Elevation, Artifact - None,

SpO$_2$ Output Disabled

ECG – Arrhythmia: 1.0 mV, Artifact - None, 0.0 mV ST Elevation,

Premature - Atrial PAC - Auto

ECG – Pacemaker: Pulse Amplitude 5 mV, Pulse Width 1.0 ms, Atrial Waveform,

1.0 mV, 0.0 mV ST Elevation, Artifact - None,

ECG – Performance: 2 Hz Square Wave, 1.0 mV,

R-Wave Width 10 ms, R-Wave Rate 60 BPM

Respiration: 20 BrPM, delta 1.0 ohms, 1000 ohms baseline, LA lead

Blood Pressure: 0 mmHg, 5 uV/V/mmHg sensitivity, 0 mmHg Respiration Artifact

Temperature: 37 °C (98.6 F)

Fetal/Maternal: Fhr 120 BPM, Mhr 80 BPM, Manual, Uniform Deceleration

Cardiac Output: Test – Normal, Rate - 2.5 L/min, Injectate- 0 °C

SystemSetup:

Auto Timer Off	30 min
Backlight Time	5 sec
Backlight Intensity	100 %
Contrast Adjust	10
Power Up With	Default
Auto Step Time	5 sec
Swan-Ganz Step Time	15 sec

Last

If this option is selected, the unit will remember the settings that were being used when it was turned off and bring them back when the power is turned on.

Custom

If this option is selected, the user may save a unique set of default parameters and the unit will recall them every time the power is turned on.

Set Current as Custom

To create the set of custom default parameters, this fourth choice is provided in this parameter. The user simply configures the unit to the desired default conditions, selects this option and presses ENTER . The current configuration is then saved as the Custom Power up values.

SPO$_2$ (OPTION)

The SECU**LIFE**│**PS300** has the ability to drive an external SpO$_2$ module. This module (SECULIFE OX) accepts the FingerSim family of SpO$_2$ finger simulators (fingers are available with SpO$_2$ of 80, 90 and 97 %). The output pulses the fingers at the NSR BPM rate (up to 180 BPM). The output is off in Arrhythmia and Performance Modes.

The module plugs directly into the AUX (7 pin mini din) connector and is powered from the PS300. The output is only functional when the unit is powered from the Battery Eliminator provided with the SECULIFE OX Module, since the batteries do no have enough power to run this option.
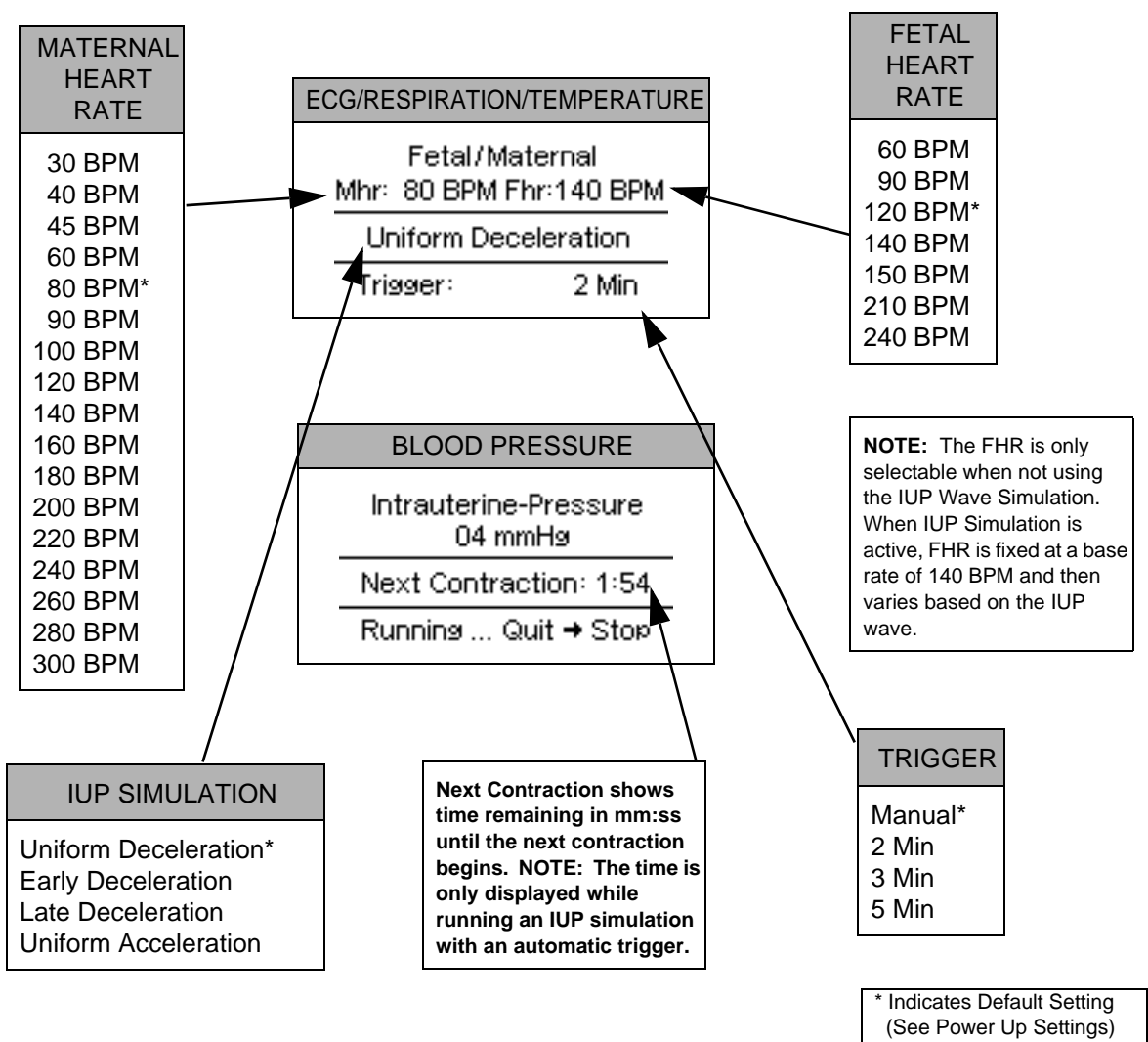
The output is enabled and disabled in the Setup Output screen.

FETAL / MATERNAL (OPTION)

The SECU**LIFE**|**PS300** has the ability to simulate a combined Fetal/Maternal ECG. It assumes a Fetal Scalp Electrode and a Maternal Thigh Electrode. Additionally, it produces a pressure waveform to simulate uterine contractions. The waveform may be triggered manually or set to occur periodically. The Intrauterine-Pressure (IUP) curve causes a change in the Fetal Heart Rate (FHR) based on the type of reaction selected. The IUP waveform is on Blood Pressure Channel 1 (BP1) and simulates an Intra-Amniotic catheter connected to a pressure transducer.

The display will resemble the following:

MATERNAL HEART RATE	ECG/RESPIRATION/TEMPERATURE	FETAL HEART RATE
30 BPM	Fetal/Maternal	60 BPM
40 BPM	Mhr: 80 BPM Fhr:140 BPM	90 BPM
45 BPM		120 BPM*
60 BPM	Uniform Deceleration	140 BPM
80 BPM*		150 BPM
90 BPM	Trigger: 2 Min	210 BPM
100 BPM		240 BPM

NOTE: The FHR is only selectable when not using the IUP Wave Simulation. When IUP Simulation is active, FHR is fixed at a base rate of 140 BPM and then varies based on the IUP wave.

BLOOD PRESSURE

Intrauterine-Pressure
04 mmHg

Next Contraction: 1:54

Running ... Quit → Stop

IUP SIMULATION

Uniform Deceleration*
Early Deceleration
Late Deceleration
Uniform Acceleration

Next Contraction shows time remaining in mm:ss until the next contraction begins. NOTE: The time is only displayed while running an IUP simulation with an automatic trigger.

TRIGGER

Manual*
2 Min
3 Min
5 Min

* Indicates Default Setting
(See Power Up Settings)

NOTE: The Transducer Sensitivity (5 mV/V/mmHg or 40 mV/V/mmHg) must be set to correlate with the monitoring equipment before simulation can begin. (See SETUP for selection information).

IUP Simulation

This feature is designed to simulate the IUP and corresponding FHR that might occur during labor. The base 140 BPM FHR will respond to the contractions based on the setting as follows:

IUP Simulation Type	FHR Response
Uniform Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction but is delayed by 30 seconds.
Early Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction.
Late Deceleration	The FHR goes from 140 BPM down to 100 BPM and back again. The rate follows the 90 seconds bell curve of the contraction but is delayed by 45 seconds.
Uniform Acceleration	The FHR goes from 140 BPM up to 175 BPM and back again. The rate follows the 90 seconds bell curve of the contraction.

The IUP Wave is a bell-shaped curve with a peak of 90 mmHg and duration of 90 seconds. When active, the FHR and IUP displays continuously update to show the current output values. The Trigger is set by selecting Manual, 2, 3 or 5 minutes.

If Manual is selecting, the ENTER key is used to start one contraction.

If a Time is selected, the ENTER key is used to start a continuous cycle with a contraction IUP wave starting every 2, 3 or 5 minutes.
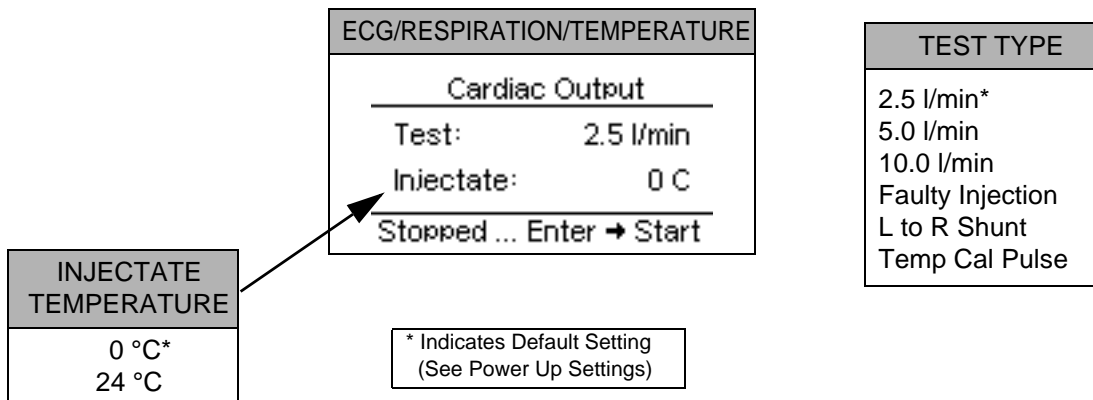
The QUIT key may be used at any point to cancel the simulation run.

CARDIAC OUTPUT (OPTION)

The SECU**LIFE**⏐**PS300** has the ability to simulate Thermodilution Cardiac Output measurements. Thermodilution allows the calculation of heart volume output by measuring the temperature change of the blood after a specific volume of solution, which is room temperature or cooler (typically 0 °C or 24 °C), is injected into the heart. The blood temperature is measured by a thermistor on the catheter. The SECU**LIFE**⏐**PS300** simulation provides an output curve that the Device Under Test (DUT, Cardiac Output Monitor) takes as a blood temperature input.

The SECU**LIFE**⏐**PS300** drives an external Cardiac Output module. This external Module provides both a common connection point for the cabling and a manual simulation setting for the injectate temperature. Abnormal waveforms are provided to simulate Injectate Failure and Left-to-Right Shunt conditions. A special Calibration Pulse that puts out a 1.5 °C drop in the temperature is also provided.

The display will resemble the following:

ECG/RESPIRATION/TEMPERATURE
Cardiac Output
Test: 2.5 l/min
Injectate: 0 C
Stopped ... Enter ➜ Start

TEST TYPE
2.5 l/min*
5.0 l/min
10.0 l/min
Faulty Injection
L to R Shunt
Temp Cal Pulse

INJECTATE TEMPERATURE
0 °C*
24 °C

* Indicates Default Setting
(See Power Up Settings)

Setting Up a Test

1) The DUT (Cardiac Output Monitor) needs to be setup to match the SECU**LIFE**│**PS300**. The following settings are required:

Catheter	Baxter Edwards 93a – 131 – 7f
Calibration Coefficient	0.542 for 0 °C Injectate 0.595 for 24 °C Injectate
Injectate Volume	10 cc
Injectate Temperature	0 °C or 24 °C

2) Connect the external Module to the CO/Temp port on the SECU**LIFE**│**PS300**.

3) Connect the Blood Temperature Sensor Line (BT Thermistor Cable) from the DUT to the small 4-pin connector on the external Module.

4) Connect the Injectate Temperature Sensor Line for the DUT to the larger 4-pin connector on the external Module.

5) Turn on the DUT and the SECU**LIFE**│**PS300**. The DUT should show a blood temperature of about 37 °C.

6) Adjust the trim pot on the external Module until the DUT shows the desired injectate temperature (0 °C or 24 °C)

Running a Test

1) Select the desired test.

Normal	This test allows the selection of a flow rate (2.5, 5.0 or 10.0 L/min). When run, it will produce the normal temperature curve for the selected injectate temperature (0 °C or 24 °C). The DUT should interpret this as the selected flow rate.
Faulty Injectate	This is an abnormal output meant to simulate a condition where the injectate is not delivered in a smooth flow.
Left-to-Right Shunt	This is an abnormal output meant to simulate a physiological condition where the blood is shunted across the heart rather than to the lungs.
Temperature Calibration Pulse	This is a calibration output waveform that drops the normal 37 °C temperature output to 35.5 °C for 1 second.

2) Select the injectate temperature (0 °C or 24 °C).

> **NOTE:** This is different than the selection made on the external Module, which sets
>
> the injectate temperature on the DUT. This tells the SECU**LIFE**│**PS300** which
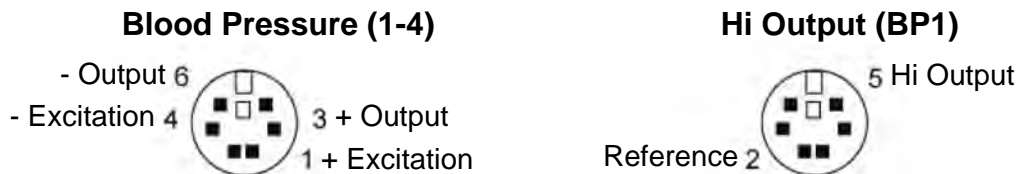>
> injectate temperature to simulate.

3) Select the desired flow for simulation (Normal Test only).

4) Use the **ENTER** key to start the test.

5) The test will run one complete cycle. Use the **ENTER** key to repeat as often as desired.

The **QUIT** key may be used at any point to terminate the cycle.
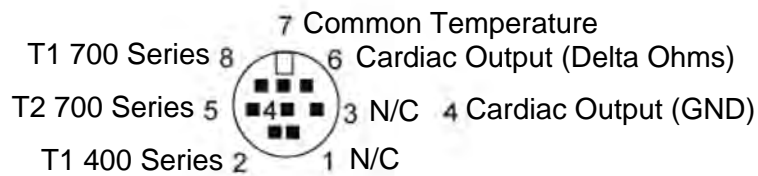
OUTPUT CONNECTIONS

The following are representations of the socket connectors found on the unit. They are viewed as if looking at the socket in the unit, not the cable pins.
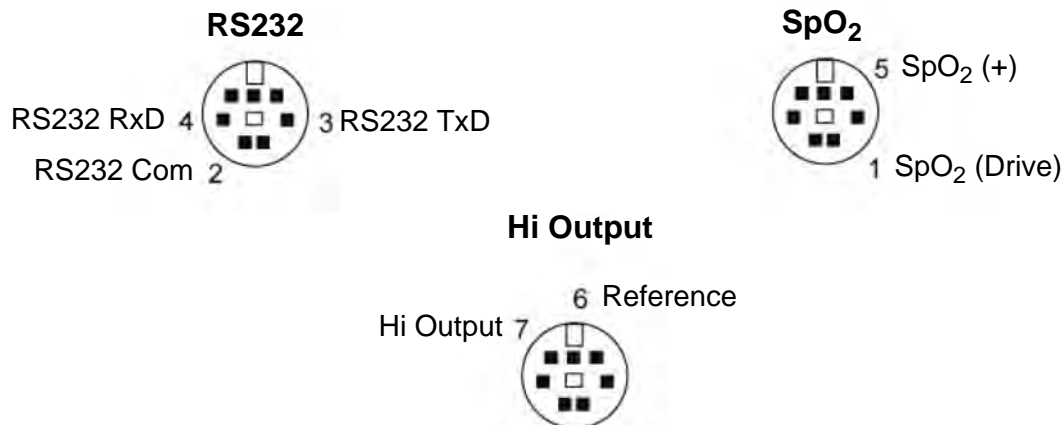
BP CONNECTOR

Blood Pressure (1-4)

- Output 6
- Excitation 4   3 + Output
                     1 + Excitation

Hi Output (BP1)

5 Hi Output

Reference 2

TEMP CONNECTOR

Temperature

7 Common Temperature
T1 700 Series 8   6 Cardiac Output (Delta Ohms)
T2 700 Series 5   3 N/C   4 Cardiac Output (GND)
T1 400 Series 2   1 N/C

AUX CONNECTOR

RS232

RS232 RxD 4   3 RS232 TxD
RS232 Com 2

SpO$_2$

5 SpO$_2$ (+)

1 SpO$_2$ (Drive)

Hi Output

6 Reference
Hi Output 7

LIMITED WARRANTY

WARRANTY: GMC-I MESSTECHNIK GMBH WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

EXCLUSIONS: THIS WARRANTY IS **IN LIEU OF** ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF **MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE.

GMC-I MESSTECHNIK GMBH IS NOT LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

NO PERSON OTHER THAN AN OFFICER IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR ASSUME ANY LIABILITY.

REMEDIES: THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF GMC-I MESSTECHNIK GMBH, THE REFUND OF THE PURCHASE PRICE.

SPECIFICATIONS

ECG SIMULATION			
RATE	NSR		30, 40, 45, 60, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300 BPM
	PERFORMANCE WAVEFORMS	SINE	0.1, 0.5, 5, 10, 40, 50, 60, 100 Hz
		SQUARE	0.125, 2.000 Hz
		TRIANGLE	2.000, 2.500 Hz
		PULSE	30, 60, 120 BPM
		R-WAVE	30, 60, 80, 120, 200, 250 BPM
	ACCURACY		± 1 %
WIDTH	PULSE		60 ms
	R-WAVE (HAVERTRIANGLE)		8, 10, 12, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 130, 140, 150, 160, 170, 180, 190, 200 ms
AMPLITUDE	0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV		
	ACCURACY		± 2 % @ Lead II Except for R-WAVE ≤ 20 ms: ± 5 % @ Lead II
HIGH LEVEL	200 times Amplitude		
	ACCURACY		± 5 %
QRS INTERVAL	Adult (80 ms), Pediatric (40 ms)		
ST SEGMENT (ELEVATION)	± 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 mV		
LEAD TO LEAD IMPEDANCE	RL, LL, RA, LA		500, 1000, 1500, 2000 Ω
	V1-V6		1000 Ω

PACEMAKER WAVEFORMS		
RATE	75 BPM	
	ACCURACY	± 1 %
WIDTH	0.1, 0.5, 1.0, 1.5, 2.0 ms	
	ACCURACY	± 5 %
AMPLITUDE	1, 2, 3, 4, 5, 6, 7, 8, 9, 10 mV	
	ACCURACY	± 10 %

IBP SIMULATION		
CHANNELS	PS300	2
STATIC PRESSURE	-10, -5, 0, 20, 40, 50, 60, 80, 100, 150, 160, 200, 240, 250, 300, 320, 400 mmHg	
	ACCURACY	± (2 % of Reading + 2 mmHg)
IMPEDANCE	300 Ω	
	ACCURACY	± 10 %
EXCITATION RANGE	2 to 16 V RMS	
EXCITATION FREQUENCY	DC to 5 kHz	
SENSITIVITY	5 or 40 µV/V/mmHg	
RESPIRATION ARTIFACT	0 to 16 mmHg	

RESPIRATION SIMULATION		
RATE	Apnea, 15, 20, 30, 40, 60, 80, 100, 120 BrPM	
	ACCURACY	± 1 %
IMPEDANCE DELTA	0.1, 0.2, 0.5, 1.0, 2.0, 3.0 Ω	
	ACCURACY	± 10 %
BASELINE	500, 1000, 1500, 2000 Ω	
	ACCURACY	± 5 %
LEAD	LA or LL	

TEMPERATURE SIMULATION	
SELECTION	0, 24, 30, 37, 40 °C (32.0, 75.2, 86.0, 98.6, 104.0 °F)
ACCURACY	± 0.1 °C
TYPE	YSI Series 400 and 700

FETAL / MATERNAL SIMULATION	
FETAL HEART RATE	60, 90, 120, 140, 150, 210, 240 BPM
INTER UTERINE PRESSURE RESPONSE TYPES	Uniform Deceleration Early Deceleration Late Deceleration Uniform Acceleration
IUP WAVE	Bell Curve with 90 mmHg Peak and 90 second Width
IUP TRIGGER	Manual Auto: 2, 3, 5 minutes

CARDIAC OUTPUT		
INJECTATE VOLUME	10 cc	
INJECTATE TEMPERATURE	0 or 24 °C	
	ACCURACY	± 2 %
INJECTATE CALIBRATION COEFFICIENT	0 °C	0.542
	24 °C	0.595
BLOOD TEMPERATURE	37 °C (98.6 °F)	
	ACCURACY	± 2 %
CARDIAC OUTPUT	2.5, 5.0, 10.0 L/min,	
	ACCURACY	± 5 %
SIMULATIONS	Normal Flow Faulty Injectate Left-to-Right Shunt Temperature Calibration Pulse	
TEMPERATURE CALIBRATION PULSE	1.5 °C Down for 1 sec	
	ACCURACY	± 1 %
CATHETER TYPE	Baxter Edwards, 93a-131-7f	

PHYSICAL & ENVIRONMENTAL		
DISPLAY	Two 128 X 64 Pixel Graphical LCDs, White LED Backlight	
CONSTRUCTION	ENCLOSURE	ABS Plastic
	FACE PLATE	Lexan, Back printed
SIZE	8.97 x 6.04 x 1.72 Inches (227.8 x 153.4 x 43.7 mm)	
WEIGHT	≤ 2 Lbs (0.91 kg)	
OPERATING RANGE	15 to 40 °C (59 to 104 °F)	
STORAGE RANGE	-20 to 65 °C (-4 to 149 °F)	

ELECTRICAL		
BATTERY	9V Alkaline Battery (2 required) (ANSI/NEDA 1604A or equivalent)	
BATTERY ELIMINATOR	WITHOUT SECULIFE OX	9 VDC, 200 mA
	WITH SECULIFE OX	10 VDC, 500 mA

Repair and Replacement Parts Service
Calibration Center* and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service-Center
Thomas-Mann-Strasse 16-20
90471 Nürnberg • Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
E-mail   service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

*** DAkkS   Calibration Laboratory for Electrical Quantities
          D-K-15080-01-01 accredited per DIN EN ISO/IEC 17025:2005**
 Accredited quantities: direct voltage, direct current value, direct current resistance, alternating voltage, alternating current value, AC active power, AC apparent power, DC power, capacitance, frequency and temperature

Product Support

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone: +49-911-8602-0
Fax: +49 911 8602-709
E-mail: support@gossenmetrawatt.com